



CONTENTS

Invited/Lead Papers		
1.	Global research initiatives for sustainable agriculture S.P. Singh, Barjendra, S.S. Gaurav, J.B. Singh, P.B. Singh, Y.K. Singh, Anuj Bansal and S.C. Gaur	1-7
2.	IARI initiatives for enhanced technology outreach and production system efficacy J.P. S. Dabas, Nishi Sharma, Nafees Ahmad, Pratibha Joshi, Sarbasis Chakravorty and Punitha P.	8-13
3.	Conservation of plant genetic resources for food and nutritional security A.S. Jeena, Rohit, Tabassum and Ankit Kumar	14-18
4.	Insights of brucellosis in animals : diagnosis, prevention and control A.K. Verma, A. Kumar, D. Deepak and A. Singh and V. Thakur	19-22
5.	Manage the negative impact of the climate change by redefining the new normal and use of advance tools and technology in agriculture science Bijendra Pal and S.P. Singh	23-25
6.	Management of phytonematodes in agri-horticultural crops for doubling farmer's income Archana U. Singh	26-30
7.	Enantiostyly in <i>Tamarindus indica</i> L. (Fabaceae) – pollination mechanism, self-incompatibility linked to evolution – are there any unanswered questions R. Loksha	31-32
8.	<i>Chara</i> as potential source of bioactive compounds Rajan, Sandeep Chand Upadhyay and Pradip Kumar	33-37
9.	Introgression of host plant resistance through marker assisted back cross breeding Sree Latha Edpuganti	38-42
10.	Process optimization for the production of enriched probiotic yoghurt drink Loksha T.K., Venkateshaiah B.V. and Suresha K.B.	43-47
11.	Biosorption : an alternative treatment method for the removal of textile dye effluents Neetu Kumari, Harish Pal Bhati, B.L. Yadav and Pradip Kumar	48-50
12.	JPM modules for management of major insect pest of chickpea in sub zone v of Jharkhand Nazrussalam, P.K. Singh, Ekhlake Ahmad and D.N. Singh	51-53
13.	Intracellular survival mechanism of <i>Brucella abortus</i> Anu Rahal, Amit Kumar, A.K. Verma and V.K. Gupta	54-55
14.	An overview of agriculture and farmers' welfare schemes and programmes in India Suresh S. Patil, Vijaykumar N. and D.G. Satiha	56-58
15.	Strategies for enhancing rapeseed-mustard production and productivity in India P.K. Rai and Pankaj Sharma	59-60
16.	ICTs for effective transfer of agricultural technologies P. Prashanth and Laxman M. Ahire	61-63



17.	Buffalo : a potential meat producing animal for sustainable development of livestock farmers in India Yashwant Singh and H.K. Verma	64-67
18.	Participatory plant breeding : An overview Sahadev Singh, Shailendra Singh Gaurav and S.P. Singh	68-70
19.	Integrated management of cabbage black rot disease caused by <i>Xanthomonas campestris</i> pv. <i>Campestris</i> (Pammel) downson K.B. Yadahalli	71-73
20.	Climate change and its impact on wheat production Nitin Kumar, S.K. Dhama and S.P. Singh	74-75
21.	Beneficiaries' perception on mgnrega — a study of kullu district (Himachal Pradesh) D.D. Sharma and Raman Chauhan	76-79
22.	Organizational climate : An important determinant of performance of extension personnel Netrapal Malik, P.K. Rathi and Jitendra Yadav	80-82
23.	Screening techniques at seed, seedling and whole plant level for drought tolerance Sangeetha T.R., Suma T.C., Amaregouda A., R.P. Patil and Kisan B.	83-86
24.	Advances in Sclerotinia stem rot management in oilseed <i>Brassica</i> Pankaj Sharma, P.D. Meena, V.V. Singh and P.K. Rai	87-88
25.	Phage lysed bacteria as vaccines against pasteurella and brucella infections in cattle Hari Mohan Saxena, Sabia Qureshi and Sugandha Raj	89-90
26.	Biosorption of malachite green dye by mycomass and phytomass influence by industrial effluent heavy metals Dinesh Kumar, Harish Pal Bhati, Sanjay Kumar, Neetu Kumari and Pradip Kumar	91-94
ABSTRACTS		1-372

Lead Papers/ Invited Papers



GLOBAL RESEARCH INITIATIVES FOR SUSTAINABLE AGRICULTURE (GRISAAS)

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Worldwide demands for food increases (population of over 8 billion by 2025) while land and water become increasingly scarce and human health issues rise and threaten food systems and their sustainability. There will be no sustainable future without eradicating poverty and hunger. Ensuring food security for all is both a key function of and a challenge for agriculture, which faces ever-increasing difficulties – as populations rise, urbanization increases and incomes grow; the agricultural sector will be under mounting pressure to meet the demand for safe and nutritious food. Agriculture has to generate decent jobs and support the livelihoods of billions of rural people across the globe, especially in developing countries where hunger and poverty are concentrated. Furthermore, the sector has a major role to play in ensuring the sustainability of the world's precious natural resources and biodiversity, particularly in light of a changing climate. Climate change will have an increasingly adverse impact on many regions of the world, with those in low latitudes being hit the hardest. Developing countries, in particular, will need support from the global community to facilitate their adaptation and mitigation efforts in relation to climate change and to transform their agriculture and food systems sustainably. As the migration crisis of recent years has shown, no country stands unaffected. What happens in one part of the globe will undoubtedly affect other parts, and domestic and foreign policies must take account of this.

Global Agriculture Research institutes

At global level only mandated international agricultural research organization is the CGIAR. The CGIAR Fund supports 15 international agricultural research centers such as the International Water Management Institute (IWMI), International Rice Research Institute (IRRI), the International Institute of Tropical Agriculture (IITA), the International Livestock Research Institute (ILRI), the International Food Policy Research Institute (IFPRI) and the Center for International Forestry Research (CIFOR) that form the CGIAR Consortium of International Agricultural Research Centers and are located in various countries worldwide (as of 2011). The centers carry out research on various Agricultural commodities, livestock, fish, water, forestry, policy and management. Some other international agricultural organizations include the United Nations Food and Agriculture Organization, Global Forum on Agricultural Research (GFAR), The International Agriculture Center (Netherlands), The World Bank, International Fund for Agricultural Development, The Center for International Food and Agriculture Policy at the University of Minnesota. The CGIAR (Consultative Group on International Agricultural Research) is a small but significant component of the global agricultural research system. With its limited financial resources, it has to be selective in its role and choice of research portfolio. An updated report on CGIAR priorities and strategies is produced every five years by TAC (Technical Advisory Committee to the CGIAR) to guide system-wide resource allocation taking into consideration an appropriate balance between centers, activities, commodities, regions and agro-ecological zones. In considering priorities, TAC is guided by several important factors such as the CGIAR mission and goal, emerging trends in world agriculture, and the evolution of scientific capacity in developing countries. The current approach has been modified to account for the expanded mandate of the CGIAR, greater emphasis on sustainability and resource management issues, allow for meaningful interactions with stakeholders, ensure transparency in decision making, and develop mechanisms which facilitate CGIAR priority setting as a continuing activity.

Research priorities decided by CGIAR

According to Nelson and Mensbrugghe (2013) CGIAR decided public sector agricultural research priorities for sustainable food security and agricultural strategies to support food security in climate change. The focus is on the vulnerable small holder agricultural households that do not consistently and fully meet household nutritional needs. Climate change poses great risks to this group because it is dependent on agricultural production to meet both income and nutritional needs. Climate change also poses additional challenges to meet the individual and collective ambitions of development. The responses to climate change are varied, ranging from increasing resilience by development and adoption of new cultivars, maintaining eco-systems services such as soil health and water quality, diversification, and improved risk management tools. Climate change increases the value of “no-regrets” technologies that enhance flexibility and potentially enable transformative changes. Some technologies exist that can help with adaptation; others need to be developed. But while technology availability is a first step



condition, adoption by farmers is the essential outcome. Adoption requires greater emphasis on building local institutions to support information dissemination, risk management and collective action. Two other important enabling conditions are building coherence across agriculture, food security and climate change policies and increasing the available financing, including from climate finance sources. Priorities include: Better links with the global climate change research community are needed to address the nature of the vulnerability and uncertainties. This has to include better understanding of the likely changes in climate variability in the coming decades and its impacts on food systems and food security at all levels. Therefore, improving tools and guidelines for risk management, including better knowledge of the role of assets (physical, human and social capital), role of collective action and increased engagement of civil society to improve participatory approaches and communication is important in present scenario. There was a lively debate on the relative priorities between technology development and improving systems for technology adoption, and the optimal division between the public and private sectors. How can we better use the new technologies available today for information dissemination? Allocation of water among various users, including agriculture, as well as competition for land use from biofuels merits greater attention. What should be the relative roles of mitigation *versus* adaptation? How much mitigation can be expected from small holder farmers? What are the equity concerns? How can development be made compatible with mitigation? Should we focused on a ‘climate justice’ approach (analogous to the ‘right-to-food’ approach) given the inability of the global community to take effective action to limit greenhouse gas emissions. Attention to gender differences in the way of information is absorbed and transmitted is important for technology adoption and mitigation. More collaboration is needed with a focus on data collection and dissemination and links across the different modeling platforms (across disciplines, e.g. climate to crop to economic, and across dimensions, household/farm to sub-region to country to global).

What is Sustainable Agriculture: Every day, farmers and ranchers around the world develop new, innovative strategies to produce and distribute food, fuel and fiber sustainably. While these strategies vary greatly, they all embrace three broad goals, or what SARE calls the three pillars of sustainability: Profit over the long term, stewardship of nation’s land, air and water and quality of life for farmers, ranchers and their communities. The phrase ‘sustainable agriculture’ was reportedly coined by the Australian agricultural scientist Gordon McClymont. Wes Jackson is credited with the first publication of the expression in 1980 in his book “New Roots for Agriculture”. The term became popular in the late 1980s. It has been defined as “an integrated system of plant and animal production practices having a site-specific application that will last over the long term, for example to satisfy human food and fiber needs, to enhance environmental quality and the natural resource base upon which the agricultural economy depends, to make the most efficient use of non-renewable and on-farm resources and integrate natural biological cycles and controls, to sustain the economic viability of farm operations, and to enhance the quality of life for farmers and society as a whole.

There are several key principles associated with sustainability in agriculture and important thing is the incorporation of biological and ecological processes into agricultural and food production practices. For example, these processes could include nutrient cycling, soil regeneration, and nitrogen fixation.

Using decreased amounts of non-renewable and unsustainable inputs, particularly the ones that are environmentally harmful.

Using the expertise of farmers to both productively work the land as well as to promote the self-reliance and self-sufficiency of farmers.

Solving agricultural and natural resource problems through the cooperation and collaboration of people with different skills. The problems tackled include pest management and irrigation.

Sustainable agriculture can be understood as an ecosystem approach to agriculture. Practices that can cause long-term damage to soil include excessive tilling of the soil (leading to erosion) and irrigation without adequate drainage (leading to salinization). Long-term experiments have provided some of the best data on how various practices affect soil properties essential to sustainability. In the United States a federal agency, USDA-Natural Resources Conservation Service, specializes in providing technical and financial assistance for those interested in pursuing natural resource conservation and production agriculture as compatible goals.

Initiatives by United Nations for sustainable development

The year 2015 signaled the arrival of two landmark initiatives that recognized the need for countries to take collective action to promote sustainable development and combat climate change: the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs), and the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC). Both initiatives reflect evolving thinking around global issues, and both call for a fair and transparent international trade system. In food and agriculture, trade can play a role and contribute to meeting the targets of both the 2030 Agenda and the Paris Agreement.



In the meeting at the United Nations Headquarters in New York from 25-27 September 2015 as the Organization celebrated its seventieth anniversary, have decided on new global Sustainable Development Goals. UN adopted a historic decision on a comprehensive, far-reaching and people-centered set of universal and transformative Goals and targets and committed to working tirelessly for the full implementation of this Agenda by 2030.

The sustainable development goals : The sustainable development goals (SDGs) are a new, universal set of goals, targets and indicators that UN member states will be expected to use to frame their agendas and political policies over the next 15 years. The SDGs follow and expand on the millennium development goals (MDGs), which were agreed by governments in 2001 and are due to expire at the end of this year.

Need for set of goals : There is broad agreement that, while the MDGs provided a focal point for governments – a framework around which they could develop policies and overseas aid programmes designed to end poverty and improve the lives of poor people – as well as a rallying points for NGOs to hold them to account, they were too narrow.

The eight MDGs – reduce poverty and hunger; achieve universal education; promote gender equality; reduce child and maternal deaths; combat HIV, malaria and other diseases; ensure environmental sustainability; develop global partnerships – failed to consider the root causes of poverty and overlooked gender inequality as well as the holistic nature of development. The goals made no mention of human rights and did not specifically address economic development. While the MDGs, in theory, applied to all countries, in reality they were considered targets for poor countries to achieve, with finance from wealthy states. Conversely, every country will be expected to work towards achieving the SDGs.

Proposed 17 Sustainable Development Goals (SDGs)?

- End poverty in all its forms everywhere
- End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Ensure healthy lives and promote well being for all at all ages
- Ensure inclusive and equitable quality education and promote life long learning opportunities for all
- Achieve gender equality and empower all women and girls
- Ensure availability and sustainable management of water and sanitation for all
- Ensure access to affordable, reliable, sustainable and modern energy for all
- Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all
- Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
- Reduce inequality within and among countries
- Make cities and human settlements inclusive, safe, resilient and sustainable
- Ensure sustainable consumption and production patterns
- Take urgent action to combat climate change and its impacts (taking note of agreements made by the UNFCCC forum)
- Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- Strengthen the means of implementation and revitalize the global partnership for sustainable development

The interlinkages and integrated nature of the Sustainable Development Goals are of crucial importance in ensuring that the purpose of the new Agenda is realized. If we realize our ambitions across the full extent of the Agenda, the lives of all will be profoundly improved and our world will be transformed for the better.

The Global Research Alliance (GRA) : It is an international network of nine applied research organizations that works to promote application of science and technology to solve large scale issues facing developing countries. The alliance was formed in 2000 in Pretoria, South Africa. Today, the GRA has access to over 60,000 people across its membership. Vision is for a world where the application of innovative science and technology, through collaboration and co-creation, delivers access equality, improves lives, and solves global development challenges. The GRA uses the best science and technology to solve some of the biggest problems in the developing world. These global issues span borders, cultures and religions and require a cross-boundary response. They address these problems by :

- Mobilizing the creative energy of our globally and culturally diverse researchers to address global development challenges through innovation



Sharing the breadth and depth of our science and technology resources and uniting with local partners, communities, industry and collaborators

Generating and implementing appropriate, affordable and sustainable solutions with positive and lasting impact

The GRA is a dynamic alliance of nine knowledge intensive research and technology organizations from around the world. Its goal is to create 'A Global Knowledge Pool for Global Good'. The focus is to apply science, technology and innovation in the pursuit of solving some of world's gravest challenges.

GRA and Inclusive Innovation : The Global Research Alliance (GRA) believes Inclusive Innovation requires a holistic and new way of approaching demand-driven projects and co-creation with partners such as end-users, technology organizations and both the private and public sectors. This includes: success through technical innovation (products), social innovation (interaction/co-creation), management innovation (business models); and chain innovation (relationships in the value chain). Inclusive Innovation is not new to the GRA. Over the last few years, the GRA has systematically addressed global challenges through the deployment of Inclusive Innovation initiatives.

Why do we need climate-smart agriculture: The UN Food and Agriculture Organization (FAO) estimates that feeding the world population will require a 60 percent increase in total agricultural production. With many of the resources needed for sustainable food security already stretched, the food security challenges are huge. At the same time climate change is already negatively impacting agricultural production globally and locally. Climate risks to cropping, livestock and fisheries are expected to increase in coming decades, particularly in low-income countries where adaptive capacity is weaker. Impacts on agriculture threaten both food security and agriculture's pivotal role in rural livelihoods and broad-based development. Also the agricultural sector, if emissions from land use change are also included, generates about one-quarter of global greenhouse gas emissions.

Practical adaptation options to improve food security and resilience: What practical steps can smallholder farmers take to adapt their agricultural practices to secure dependable food supplies and livelihoods? And can they do this while also decreasing greenhouse gas emissions or increasing carbon sequestration, thereby decreasing future climate change?

In a search for answers the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is working with a vast range of partners to test a range of interventions in climate-smart villages. This Flagship addresses the challenge of how to transition to climate-smart agriculture at a large scale. We work with partners at all levels to test, evaluate, promote and scale up integrated portfolios of technologies and practices that meet the needs of farmers - including women and marginalized groups. We help build adaptive capacity and resilience to climate variability and change, while increasing food availability and generating mitigation co-benefits. We integrate, and apply the best and most promising methods, tools and approaches for equitable local adaptation planning and governance, and develop innovative incentives and mechanisms for scaling out CCAFS identifies agricultural development options that reduce greenhouse gas emissions and increase carbon sequestration. Together with our partners, CCAFS produces research to improve estimates of farm emissions in smallholder systems, provides tools and information to agriculture decision-makers and supports the widespread implementation of low emissions agricultural practices and policies.

The Global Water Partnership's : The vision is for a water secure world. It's mission is to support the sustainable development and management of water resources at all levels. GWP was founded in 1996 by the World Bank, the United Nations Development Programme (UNDP), and the Swedish International Development Cooperation Agency (SIDA) to foster integrated water resource management (IWRM).

IWRM is a process which promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare without compromising the sustainability of ecosystems and the environment. The network is open to all organizations involved in water resources management: developed and developing country government institutions, agencies of the United Nations, bi- and multi-lateral development banks, professional associations, research institutions, non-governmental organizations, and the private sector. In the "Our Approach" section one can read about GWP's global strategy - Towards 2020 - how GWP are currently pursuing vision of water security. Dealing with water issues requires commitment at the highest political level. Water security will only be reached when political leaders take the lead, make the tough decisions about the different uses of water and follow through with financing and implementation. GWP sees its role as having the technical expertise and convening power to bring together diverse stakeholders who can contribute to the social and political change processes that help bring the vision of a water secure world closer to reality. GWP regularly reports on outcomes at the national, regional, and global level. GWP is implementing its strategy and up-to-date information on activities across the globe.



The Global Water Partnership (GWP) has announced the launch of its new 2014-2019 global strategy. The strategy, Towards 2020, outlines a new direction for GWP with the goals of catalyzing change, sharing knowledge, and strengthening partnerships for a water secure world. The 2014-2019 Strategy builds on GWP's previous work and achievements. It was developed through a year-long process of regional dialogues and consultations with GWP's growing network of over 2,900 Partner Organizations across 172 countries. The strategy Towards 2020 stresses the need for innovative and multi-sectorial approaches to adequately address the manifold threats and opportunities relating to sustainable water resource management in the context of climate change, rapid urbanization, and growing inequalities.

Global Soil Partnership: Soil is under pressure. The renewed recognition of the central role of soil resources as a basis for food security and their provision of key ecosystem services, including climate change adaptation and mitigation, has triggered numerous regional and international projects, initiatives and actions. Despite these numerous emergent activities, soil resources are still seen as a second-tier priority and no international governance body exists that advocates for and coordinates initiatives to ensure that knowledge and recognition of soils are appropriately represented in global change dialogues and decision making processes. At the same time, there is need for coordination and partnership to create a unified and recognized voice for soils and to avoid fragmentation of efforts and wastage of resources.

Maintaining healthy soils required for feeding the growing population of the world and meeting their needs for biomass (energy), fiber, fodder, and other products can only be ensured through a strong partnership. This is one of the key guiding principles for the establishment of the Global Soil Partnership.

Responses to soils today :

Soil data : fragmented, partly outdated (fertility, SOC, etc.) heterogeneous and difficult to compare, not easily accessible, not responding to users' needs

Soil capacities : increasingly a scarce resources (loss of soil expertise and skills)

Soil knowledge and research: fragmented (fertility, CC, ecology), domain of soil scientists, not accessible for use by various disciplines and for decision making, not tailored to address problems/development agendas of today

Awareness and investments in soil management : extremely low compared to the needs that soil is a precarious resource and requires special care from its users

Soil policy : Often received as a second tier priority; lack of international governance body to support coordinated global action on their management. Need for compatible and coordinated soil policies - a unified and authoritative voice is needed to better coordinate efforts and pool limited resources (for agriculture, forestry, food security, UNCCD, CBD, UNFCCC, disaster and drought management, land competition, rural and urban land use planning and development).

Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. In the same year, the UN General Assembly endorsed the action by WMO and UNEP in jointly establishing the IPCC. The IPCC is a scientific body under the auspices of the United Nations (UN). It reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research nor does it monitor climate related data or parameters. Thousands of scientists from all over the world contribute to the work of the IPCC on a voluntary basis. Review is an essential part of the IPCC process, to ensure an objective and complete assessment of current information. IPCC aims to reflect a range of views and expertise. The Secretariat coordinates all the IPCC work and liaises with Governments. It is established by WMO and UNEP and located at WMO headquarters in Geneva. Because of its scientific and intergovernmental nature, the IPCC embodies a unique opportunity to provide rigorous and balanced scientific information to decision makers. By endorsing the IPCC reports, governments acknowledge.

The Intergovernmental Technical Panel on Soils (ITPS) was established at the first Plenary Assembly of the Global Soil Partnership held at FAO Headquarters on 11 and 12 of June, 2013. The ITPS is composed of 27 top soil experts representing all the regions of the world. The main function of the ITPS is to provide scientific and technical advice and guidance on global soil issues to the Global Soil Partnership primarily and to specific requests submitted by global or regional institutions. The ITPS will advocate for addressing sustainable soil management in the different sustainable development agendas.



Functions of ITPS :

Provide scientific and technical advice on global soil issues primarily to the GSP and in relation to specific requests submitted by global or regional institutions.

Advocate for the inclusion of sustainable soil management into different development agendas.

Review and follow up on the situation and issues related to soils in the contexts of food security, use and management of natural resources, ecosystem services provision, climate change adaptation and mitigation, and other relevant areas.

Review and endorse from a technical view point the GSP Plans of Action.

Follow up on the implementation of these Plans of Action with due attention to their impact and contributions to different global policies and initiatives related to sustainable development, MDGs, food security, climate change adaptation and other subject matters.

In exceptional cases, when complex technical matters arise, request the Plenary Assembly and the Secretariat to form technical committees aiming to gather specific advice.

Intergovernmental Platform on Biodiversity and Ecosystem Services : The Intergovernmental Platform on Biodiversity and Ecosystem Services is a mechanism proposed to further strengthen the science-policy interface on biodiversity and ecosystem services, and add to the contribution of existing processes that aim at ensuring that decisions are made on the basis of the best available scientific information on conservation and sustainable use of biodiversity and ecosystem services. It was established in 2012 as an independent intergovernmental body open to all member countries of the United Nations. The members are committed to building IPBES as the leading intergovernmental body for assessing the state of the planet's biodiversity, its ecosystems and the essential services they provide to society.

Science-policy interface : Science-policy interfaces are social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making at different scales. This includes two main requirements: scientific information is relevant to policy demands and is formulated in a way that is accessible to policy and decision makers; and that policy and decision makers take into account available scientific information in their deliberations and that they formulate their demands or questions in a way that are accessible for scientists to provide the relevant information.

Need for IPBES : There are already several mechanisms and processes at national, regional and global level that are designed to ensure that scientific information is considered when designing policies or making decisions (examples of this are technical bodies/panels under the environmental agreements or national research institutions attached to ministries, among many others). However, there is no global ongoing mechanism recognized by the scientific and policy communities, that pulls this information together, synthesizes and analyzes it for decision making in a range of policies. Thus, we have listed some of the numerous global alliances which have been established to address the global research platforms. This is in brief and there are others also across the globe taking shapes : One of the fundamental lessons learned through the past half century of agricultural research is that there are no "one size fits all" sustainable management practices and a holistic approach is the need of the hour.

Sustainable development in Indian Agriculture

Agriculture is the main occupation in India as large population is living in the rural areas and having agriculture as their livelihood. Sustainable development in the agriculture sector aims to increase the productivity, efficiency and level of employment and further aims to protect and preserve the natural resources by the over utilization. Agriculture faces many challenges, making it more and more difficult to achieve its primary objective – feeding the world – each year. Agriculture must change to meet the rising demand, to contribute more effectively to the reduction of poverty and malnutrition, and to become ecologically more sustainable India has been witnessing a blinding pace of growth and development in recent times. Experts are now calling for "sustainable development" and the term has gained currency in the last few years. In spite of fast growth in various sectors, agriculture remains the backbone of the Indian economy. Sustainable agricultural development seeks not only to preserve and maintain natural resources, but also to develop them, as future generations would have much more demand quantity-wise and quality-wise for agricultural and food products. Such goals should ensure a balance with the development of livelihoods enjoyed by the individuals concerned. Agriculture plays a crucial role in sustainable development and in hunger and poverty eradication. The challenges faced by agriculture in sustainable development is in working out ways of bringing about a society that is materially sufficient, socially equitable, and ecologically sustainable and one that is not obsessed by growth only, but motivated by satisfying human needs and equity in resource allocation and use. Sustainable agriculture must meet economic, social and ecological challenges. All 4 these challenges are closely related. Sustainable



agriculture needs to protect the natural resource base, prevent the degradation of soil and water; conserve biodiversity; contribute to the economic and social well-being of all; ensure a safe and high-quality supply of agricultural products; and safeguard the livelihood and well-being of agricultural workers and their families. The main tools towards sustainable agriculture are policy and agrarian reform, participation, income diversification, land conservation and improved management of inputs. This policy document is an effort to identify the strategies, guidelines and practices that constitute the Indian concept of sustainable agriculture. This is done in order to clarify the research agenda and priorities thereof, as well as to suggest practical steps that may be appropriate for moving towards sustainable agriculture. Some tend to confuse sustainable agriculture with organic farming. But both are very different from each other. Sustainable agriculture means not only the withdrawal of synthetic chemicals, hybrid-genetically modified seeds and heavy agricultural implements (as in organic farming). Sustainable agriculture involves multiculture, intercropping, use of farmyard manure and remnants, mulching and application of integrated pest management. If this is followed then there is no reason why agriculture cannot be an economically viable activity in addition to being environmentally sustainable.

In India, the crop yield is heavily dependent on rain, which is the main reason for the declining growth rate of agriculture sector. These uncertainties hit the small farmers and laborers worst, which are usually leading a hand to mouth life. Therefore, something must be done to support farmers and sufficient amount of water and electricity must be supplied to them as they feel insecure and continue to die of drought, flood, and fire. India is the second largest country of the world in terms of population; it should realize it is a great resource for the country. India has a huge number of idle people. There is a need to find ways to explore their talent and make the numbers contribute towards the growth. Especially in agriculture, passive unemployment can be noticed. The sustainable development in India can also be achieved by full utilization of human resources. A large part of poor population of the country is engaged in agriculture, unless we increase their living standard, overall growth of this country is not possible. If we keep ignoring the poor, this disparity will keep on increasing between classes. Debt traps in country are forcing farmers to commit suicides. People are migrating towards city with the hope of better livelihood but it is also increasing the slum population in cities. Therefore, rural population must be given employment in their areas and a chance to prosper. India has been carrying the tag of “developing” country for quite long now; for making the move towards “developed” countries, we must shed this huge dependence on agriculture sector.

For promoting sustainable agriculture, following components can be considered :

Yield increase : India need to focus on improving its yields. Currently, yield level of food crops is 2,056 kg/ha, which is far below the yields of many countries. The current average yield of paddy in India is around 3.5 tonnes /ha, while China’s yield is more than 6 tonnes/ha. Similar is the case with wheat and other major crops. This is despite increase in fertilisers and pesticides by several folds.

Water-use efficiency : India is still focusing on supply side management of water. This is leading to major investments while causing degradation of ecosystems without any major benefit to farmers. The investments have to be clearly on reducing the water per unit of production. Currently, the focus of drip irrigation is only on material supply rather than the entire process and training. Creating specific incentives for using less water while improving the productivity have not even initiated. With modern technology, it is possible to create incentives to use less water and set up mechanisms to monitor water use at farm level. Budget should be allocated for creating well-designed projects with institutional mechanisms to implement and monitor. The goal is to use the existing infrastructure far more efficiently—both at system level and individual farm level.

Diversity of food grains: Consumers are aware of the benefits of eating coarse grains such as jowar and bajra. But there are no specific programmes to produce and market these food grains. Farmers need income, not just production. So, incentivizing farmers to produce these grains will not only save water and ecosystems but promote healthy eating habits.

Farm-based approaches: In India, farmers are receptive to experimenting with farm-based approaches. For example, the System of Rice Intensification (SRI), Sustainable Sugarcane Initiative (SSI), and System of Crop Intensification (SCI) of wheat, millets and mustard are very popular with farmers. It is time we had Centre-sponsored scheme to promote these approaches in large scale with large budget provisions and institutional mechanisms.

Organic agriculture: India needs to slowly move from chemical-based farming to organic farming. Phase-wise approach towards removing subsidies to chemical fertilizers and introducing incentives to organic agriculture through budget provisions is the way to go about it.

So, by conducting the conferences like GRISAAS we will be able to address these issues efficiently.



IARI INITIATIVES FOR ENHANCED TECHNOLOGY OUTREACH AND PRODUCTION SYSTEM EFFICACY

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Initiatives for technology assessment and transfer for sustainable agricultural production systems and rural development is as a comprehensive and model approach to examine the potential impact of technology application on certain sustainability issues and to facilitate the development and use of technological interventions for the agricultural development (MANAGE 1999). Access to information and improved communication is a crucial requirement for sustainable agricultural development. The extension systems in India have contributed for attaining self-sufficiency in food production and allied sectors. Extension Education has been the validated tool for transforming agricultural development and rural prosperity. With all the aforesaid efforts, the extent of adoption of farm technology revolved around only 30 per cent clientele as reported by Desai and Reddy (1989); cited in Sharma V.P. 2003.

Innovative initiatives by IARI have contributed immensely to the development of roadmaps for national extension systems. Some of the integrated models of transfer of technology devised by the institute in the past include Community farming approach, Integrated Whole Village Development Approach, Effective Utilization of Mass Media in Agricultural Development, Single Window System, Farmer-to-farmer Quality Seed Production Programme, Indigenous Knowledge System, Farming System Research and Extension, etc., which have been effective not only in reaching the farmers but also in generating socio-psychological knowledge base to better understand the technology utilization and collectivization of behaviour of farmers. In the agriculture system, there are basket of technologies available (IARI, 2019) which address farmer's income, nutritional security, climate change and sustainable agriculture. Since the extension activity jurisdiction of ICAR-Indian Agricultural Research Institute (IARI), New Delhi is limited to National Capital Region (NCR) only and it was often felt that taking the technologies to far off areas, intending for increased production and productivity across the country was a difficult task. Normally, a frontline extension programme targets to disseminate a single technology and involves experts across the disciplines who have developed the technology. However, for boosting the productivity and income of the farmers of an area, a horde of technologies may be required to be reckoned. It will take very long for the conventional frontline extension system of the Institute to reach the unreachable dwellings in different parts of the country. Keeping this in view, an innovative partnership based alternate extension model was conceptualized on the principle of 'sharing of strength' for technology dissemination through 'partnership' involving the public institutions (ICAR institutes and SAUs) as well as Voluntary Organizations (VOs). The strength of IARI was the frontier and high potential technologies and the strength of partner organizations were their reach and rapport with the farmers at grassroots level. Keeping this in view, different ICAR Institutes and SAUs of the country were made as partner in this experiment. Inspired by the outcomes by this collaborative extension model, the base and scope of the project was further expanded by involving voluntary organisations (VOs) of national/regional repute working in the area of agriculture and operating across the country. Under technology assessment and refinement through Institute Village Linkage Programme during 1996-2005, about 3000 farmers were benefited in 12 operational villages in NCR. Technological interventions on crops such as paddy, sorghum, wheat, vegetables convinced the farmers about improved production technologies through which they could get 20 % higher yield of these crops thus improving the social-economic status of the farmers. Presently the Institute lays more emphasis on convergence with different institutes and organisation in PPP mode, community and participatory extension, extension through innovative farmers and ICT-led extension approaches etc.

Innovations in Outscaling Technologies

(A) Collaborative programme with ICAR institutes and SAUs

In order to diffuse IARI technologies all over the country, partnership-led extension was initiated under the National Extension Programme. The partnership project is being implemented with ICAR Institutes / SAUs in different parts of the country. Under these approach, ICAR Institutes/SAUs and Voluntary Organizations make collaborative efforts to develop location -specific strategies for transfer of technology. The analysis of existing farming system was carried out through joint workshops with partner institutions. Suitable farm production, plant protection and post harvest technologies and farm enterprises were identified based on participatory analysis and joint consultations for profitable farming system during workshops held at Institute. The technologies were assessed through demonstrations, trainings, field days etc. by the partner organizations in their respective locations. This programme was found to be effective in dissemination of IARI technologies in far flung areas of the country. Institute is implementing National Extension Programme (NEP) since 2009 in collaboration



with ICAR institutes and State Agricultural Universities for location specific assessment and transfer of IARI technologies in different parts of the country.

All demonstrated varieties of IARI showed significantly higher yield in comparison to local varieties at all locations except one or two instances. The Table 1 below shows yearly season wise major technologies demonstrated over the locations.

Table-1 : Yearly and season wise demonstrations under NEP

Season	No. of Demn	Coverage (ha.)	Major Technologies demonstrated
Kharif 09	175	56.80	Paddy (PRH-10, PB-1, P-1121, P-1509, P-44, P-2511, P-834, P 1612, Imp. PB-1, P 1592, P-1637, P-1609, P1728); Moong (P-Vishal, P-9531); Bajra (PC-443, PC-612, P-1201) Bottle gourd (P-Naveen, P Santusti) Arhar (P-991, P-992, P-2002); Bhindi (A-4); Tomato (P-Rohini) Chilli (P-Jwala), Palak (All green, P Bharti), Sponge guard (P. Sneha), Bitter Guard (Pusa Ausadhi) Maize (PC3) , sem (P- Sem-3), Papaya (P-nanha), Brinjal (P-Shyamla, P. Uttam, P. Kausal), Carrot (P Vrishti), Cauliflower (P Meghna, P. Sharad), Garden Pea (Pusa Prgati)
Kharif 10	643	240.60	
Kharif 11	500	206.40	
Kharif 12	279	130.03	
Kharif 13	336	110.76	
Kharif 14	332	103.72	
Kharif 15	284	73.70	
Kharif 16	388	109.41	
Kharif 17	176	45.28	
Kharif 18	262	76	
Rabi 09-10	690	257.20	Wheat (HD 2967, HD 2733, HD 2985, HD 3059, HD 3086, HD 3043, HD 2932, HD 2851, HD 2894, HD 2987, HI8663, HI1544, HI1531, HI1500, HS507, HS490, HS542, HDCSW 18) Pea (P. Pragati); Lentil (L 4076, L4147) Mustard (Pusa Vijai, Pusa Tarak, PM 30) Carrot (P.Rudhira); Palak (All Green); Gram (BG1103, P547, P3022) Marigold (P. Naragi, P. Basanti), Cauliflower (Pusa Paushija), Tomato (P. Rohani), Sarsoo Sag (Pusa Sag-1), Methi (P-Early bunching), Coepea (Pusa Sukomal), Onion (Pusa Red, Pusa Riddhi)
Rabi 10-11	279	60.06	
Rabi 11-12	494	171.50	
Rabi 12-13	361	125.20	
Rabi 13-14	306	73.92	
Rabi 14-15	541	127.08	
Rabi 15-16	268	57.92	
Rabi 16-17	373	82.45	
Rabi 17-18	126	32.29	
Rabi 18-19	257	46.40	

(B) Collaborative Programme with Voluntary Organizations

Voluntary organizations have emerged as an integral part of the institutional structure for addressing poverty and rural development owing to their proximity to the grassroots level (Singh, 2017). As VOs / NGOs are the grassroot organization working for rural and agricultural development, to utilize the potential of VOs, another collaborative approach for diffusion of IARI technologies to farmers located in far of and remote areas was initiated by the institute through IARI-VOs partnership programmes. IARI-VOs Partnership Project have been conceived and is in operation since 2010 involving aprox 20 VOs on Pan India basis. The quantifiable feedback after the assessment of IARI technologies through this mechanism is benefitted to the research system to work over and find remedies of the various issues raised by the clientele (Nishi Sharma *et al.* 2019). Such partnership has proved cost effective in assessing and transferring improved technologies in shortest possible time and has demonstrated the potentiality and profitability of improved technologies developed under the institutional research programme. The spread of IARI varieties and upscaling the technologies through partnership mode by developing seed production hubs, production of bio-fertilizers and bio-control have benefitted the farmers through enhanced productivity and income.

The demonstrated varieties of IARI showed significantly higher yield in comparison to local varieties at all locations with few exceptional. The Table 2 below shows yearly season wise major technologies demonstrated under the programme.



Table-2 : Yearly season wise demonstrations under IARI-VOs programme.

Season	No. of Demn.	Coverage (ha.)	Technologies demonstrated
Kharif 2010	931	312.60	Paddy (P-44, P-2511, PRH-10, P-1121, P-1509, P-1401, P-1460, P-1612, P-834, PB-1, P 1728) Arhar (P-991, P-992, P-2002) Moong (P-Vishal, P-9531) Tomato (P-Sheetal, P-Rohini) Bottle gourd (P-Naveen); Palak (All green, P Bharti); Sponge guard (P. Sneha); Bitter Guard (Pusa Ausadhi); Maize (PC3); sem (P- Sem-3); Papaya (P-Nanha); Brinjal (P-Shyamla, P. Uttam, P. Kausal); Carrot (P Vrishti); Cauliflower (P Meghna, P. Sharad); Garden Pea (Pusa Prgati)
Kharif 2011	496	117.00	
Kharif 2012	1415	348.70	
Kharif 2013	1545	455.17	
Kharif 2014	931	248.86	
Kharif 2015	627	171	
Kharif 2016	551	207.71	
Kharif 2017	366	108.57	
Kharif 2018	262	76.00	
Rabi 09-10	926	257.20	Wheat (HD 2967, HD 2733, HD 2985, HD 3059, HD 3086, HD 3043, HD 2932, HD 2851, HD 2894, HD 2987, HD 3118, WR 544, HI 1531, HI 1544, HI 1563, HS507, HS 490, HDCSW 18) Lentil (L 4076, L4147); Mustard (Pusa Vijai, Pusa Tarak, PM 28); Bottle guard (P Naveen); Cauliflower (P. Meghna, P. Sarad); Amaranths (Pusa Kiran, Pusa Lal Chaulai); Petha (P. Sabji Petha); Gram (P-112, P-2085, P547, P3022); Pea (Pusa Pragati); Carrot (Pusa Rudhira, P. Vrishti); Tomato (Pusa Rohini); Palak (All Green); Sarsoo Sag (Pusa Sag-1); Fenugreek (P-Early bunching); Marigold (Pusa Naragi)
Rabi 10-11	281	69.00	
Rabi 11-12	808	253.55	
Rabi 12-13	1391	355.32	
Rabi 13-14	1514	433.66	
Rabi 14-15	1279	429.37	
Rabi 15-16	572	170.89	
Rabi 16-17	549	150.07	
Rabi 17-18	321	74.42	

(A) Innovative Model based on Integrated development through village adoption

Integrated development of village approach has been taken up to mainstream adopted villages in Agriculture and allied areas and the set standards of development may hence be replicated by other villages. This approach is organized, systematic and based on technology integration for developing agriculturally sound village. The institute had selected four villages in different agro climatic situations of the NCR region to develop them. The villages were selected based on the preliminary survey /pilot study which showed that these villages were socio-economically backward and had poor adoption of improved and modern Agriculture technologies. These villages were hence called the lighthouse villages.

(B) Partnership and Networking with innovative farmers

IARI has recognized the contributions of innovative farmers, who have successfully demonstrated technology application to enhance yield and income and thus emerged as role models in their area. Since 2012, farmers from different parts of India were felicitated as the 'IARI-Fellow' and Innovative Farmers were awarded with the 'Innovative Farmer Award' during *Pusa Krishi Vigyan Mela* organized annually. Under the innovative initiative, the farmers recognized by the Institute have now become partners in extension programme of the Institute for spreading Agricultural technologies among the larger farming community of the country. The location specific agricultural development depends on farmer's adoption decision. This farmer led extension model is initiated since Kharif 2016 with the aim to disseminate improved IARI technologies through the innovative farmers. Since 2008, IARI has awarded over 300 farmers with 'IARI Innovative farmer' award and 36 farmers with 'IARI Fellow' based on their outstanding contribution in diversified field such as crop production, horticulture, animal husbandry, fishery, farm machinery, processing and value addition, etc from different States. From the pool of over 336 innovative farmers, 25 farmers have been selected and involved in this extension model project representing States of Uttarakhand, J&K, U.P., Haryana, Madhya Pradesh, Bihar, Jharkhand, West Bengal, Rajasthan and Delhi. Among the crop technologies, improved varieties of paddy (PB 1121, PB 1509, PB 1460, P 2511, PB 1637 and PB 1728) in kharif and wheat (HD 2967 and HD 3086) and mustard (Pusa Vijay and PM 31) in rabi have been assessed (Nafees *et al.* 2019).

Achievements and experiences of initiatives for enhanced technology outreach and production system efficacy

1. Identification of appropriate technologies effective across the country :

The findings of the project have revealed that many varieties have performed well at different sites across the zones.



Wheat varieties HD 2967 (5.43 t/ha), HD 2894 (5.21 t/ha) and HD 2733 (5.0 t/ha) performed fairly well across the zones throughout the country on the criteria of yield, heat tolerance and disease resistance.

Paddy P 2511 was preferred for being high yielding, having long grain size, fragrance and good taste, fetching higher price and still continues to be a good choice among several farmers as they have found it consistent in yields and better market price.

2. Addressed the productivity problems of disadvantaged areas/areas bypassed in Green Revolution

- (a) Water scarcity areas
- (b) Jharkhand area
- (c) Flood prone areas
- (d) Hill agro-eco system
- (e) New / non-conventional areas

It is a known fact that varieties of each crop are released for a specific zone after testing in respective crop improvement programme. However, in this model of extension, flexibility was provided to test these varieties outside the zone of their recommendation. This led to generating very interesting information about some crops and varieties proving successful and remunerative in non-conventional areas. Through interventions of the project following newly introduced crops have become popular in non-conventional areas.

3. Facilitating self-reliance through availability of quality seed at local level.

Availability of quality seed is a major constraint in enhancing production and productivity levels. In addition, the cost involved in purchase of quality seed is also a deterrent for resource poor farmers. Therefore, ensuring sufficiency of quality seed at local level and at a reasonable price is crucial in increasing the productivity of all crops. To achieve the twin objectives, following activities were carried out in the project areas :

- (i) Seed hubs to cater the local needs
- (ii) Participatory Seed production
- (iii) Establishment of local seed banks
- (iv) Promoting informal seed production at farmers' level

4. Capacity development of partner organisation for generating pool of master trainers

The scientists visited various sites in the project areas in each crop season and provided hands-on training to the participating farmers about crop growing practices, plant protection practices and soil management. However, to fill the knowledge gap of farmers in project areas an effort was made to generate pool of master trainers in specific technologies through on campus trainings. Towards this endeavor, trainings were organized on use and production of Trichoderma, seed production technologies, good agricultural practices, preparations of products using dry flowers, preparing compost using bio-degradable kitchen and farm waste, etc. These programmes enhanced the awareness level of the intended clients and minimized their knowledge gap in those areas.

5. Promoting sustainable agriculture through bio-pesticides (Trichoderma) and bio-fertilizers (Azolla, PSB, Azotobacter, Rhizobium)

To generate consciousness for safe environment and sustainable agriculture, environmental friendly technologies including bio-pesticides and bio-fertilizers were promoted at different locations. At IVRI, Izatnagar, among farming community Pusa Shivalik Variety of Lentil was demonstrated using *Rhizobium* Culture and PSB which gave an average yield of 1.81 t/ha compared to the local check (1.1 t/ha).

6. Entrepreneurship Development

To provide the work and employment opportunity to increasing workforce, specially youth and also ensuring livelihood opportunities to them, it is imperative to promote entrepreneurship among the farmers. Efforts were made to skill the farmers in the following agriculture related areas.



7. Developing market linkage model

- (i) Establishment of Pusa Kisan Mall at IARI
- (ii) Linking farmers with companies to sell their products :

Technologies demonstrated through this programme have shown the potential of boosting the production and productivity in the target areas and also for employment generation and enhancing farmers' income. These innovations proved useful in promoting food security by enhancing production and productivity, developing eco-friendly sustainable agricultural production system, development of innovative partnership led Front Line Extension model, Enhancing the income of farmers and alleviation of poverty in project areas and Value addition of farm produce.

Concrete recommendations arising out of the project work

1. Related to potential of technologies over large areas

The following technologies have potential to be promoted over large areas (upscaling and out-scaling) of the country :

- Variety P 2511 in almost all paddy growing areas.
- Wheat variety HD 2967 in almost all wheat growing areas.
- Carrot variety Pusa Rudhira
- Bottlegourd variety Pusa Naveen
- PRH-10 rice Hybrid.
- Biofertilizers, Biopesticides and Bio-gas technology.

2. Related to potential of technologies in specific areas

The following varieties have been found good and can be promoted in specified analogous areas in addition to their areas of recommendation. The same has been indicated below :

- Jaldi Dhan 13 at West Bengal, Bilaspur, Himachal Pradesh and Dahod, Gujarat.
- Wheat HS 420, HS 490, HS 507 in Bilaspur and Kangra of HP and Jammu region.
- HI 1563 in West Bengal
- HI 1544, HI 418 in Gujarat
- HI 1539 in Jharkhand
- HI 1544, HI 8663 in Wardha District of Maharashtra.

3. Related to potential of technologies introduced in new areas :

These technologies have been found good and can be promoted in these new areas :

- Seasonal vegetables like Bhindi, Capsicum, Early cauliflower in Bilaspur, HP.
- Pusa Bharati variety of Palak in Karnataka
- Mustard Pusa Bold, Pusa Jaikisan in Ranchi.
- Cauliflower varieties in Karnataka

4. Related to need for refinement of technologies

- A variety good in yield in high fertility areas as P 44 should be developed which atleast 10-15 days early so as to compete with the Sarju-52 in Eastern UP.
- There is need for improvement in PB1121 by incorporating Bakane, BPH, Stem borer, grain shattering and lodging resistance.
- Need to develop Bacterial blight resistant in P 2511.
- A synchronization in maturity required to be developed in Pusa Basmati1401.
- Karnal bunt resistant varieties need to be developed in wheat.
- Mustard P. Jagannath, plant height to be reduced to avoid lodging as experienced in the Eastern India.
- Radish, Pusa Chetki lower part should be tapering instead of club shape.
- Maintenance breeding is required in Radish Pusa Chetki due to variation in roots.



Bottle gourd, Pusa Naveen, fruit setting is needed in high temperature (More than 40°C and low temperature (below 15°C).

1. Related to working mechanism of extension model developed :

Using the present extension model synergy can be developed among technology generating and disseminating stakeholders in a multi organizational and multi-disciplinary set-up for cost effective and faster technology dissemination over varied agro-eco systems.

REFERENCES

1. Agricultural Extension and Research in India – Operation Evaluation Department-(1991) Agri services- Extension Approaches Agri services-Training and Visit Agricultural Extension.
2. Desai and Reddy (1989); cited in Sharma V.P. 2003 Enhancement of Extension Systems in Agriculture. Report of the APO Seminar on Enhancement of Extension Systems in Agriculture held in Pakistan, 15-20 December 2003. ISBN: 92-833-7047-3 pp 1-18.
3. IARI (2019). Technological Options for Enhanced Productivity and Profit, Indian Agricultural Research Institute, New Delhi-110 012, India.
4. MANAGE (1999): Pilot Projects On Farmers Participatory Research And Extension Systems In Irrigated Areas And Rain-Fed Farming Situations. - Farmer's participation in agricultural research and extension systems – National Institute of Agricultural Extension, Management (MANAGE), Hyderabad 1999.
5. Nafees Ahmad, J.P. Sharma, J.P.S. Dabas, Nishi Sharma, Pratibha Joshi, S.Chakravorty and Punitha P (2019). Assessment and Dissemination of Agricultural Technologies through Innovative Farmer Led Extension (IFLED): Reaching the Unreached . National Seminar on “Role of Community Science Education in Rural Development” organized at College of Home Science, G.B.P.U.A.&T., Pantnagar (Uttarakhand)August 21-22, 2019 pp 106.
6. Nishi Sharma, J.P.S. Dabas, Pratibha Joshi, Nafees Ahmad, S. Chakravorty and Punitha P. (2019) Public–Private Partnership Model for Agricultural Technology Assessment. National Seminar on “Role of Community Science Education in Rural Development” organized at College of Home Science, G.B.P.U.A.&T., Pantnagar (Uttarakhand)August 21-22, 2019 pp 107.
7. Patnaik, J and Bhowmick B. (2018). Appropriate Technology: Revisiting the Movement in Developing Countries for Sustainability. International Journal of Urban and Civil Engineering. 12(3):308-12.
8. Shantanu Kumar and Uma Sen (2003), Agricultural Extension For Rural Development: Issues and Challenges - 2003
9. Singh M. (2017). Impact Assessment of IARI-Voluntary organizations Partnership Extension Model: A Multidimensional Study accessed from <http://krishikosh.egranth.ac.in/handle/1/5810078134> dated 23.05.19.
10. Vasimalai. M (1991). Livelihood Promotion Technology For The Rural Poor. The case of PRADAN. Paper presented at the Asian Regional Workshop. NGOs Natural Resources Management and linkage with the public sector. NIRD, Hyderabad, India.



CONSERVATION OF PLANT GENETIC RESOURCES FOR FOOD AND NUTRITIONAL SECURITY

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World population is expected to increase by 2.0 billion over the next 30 years, from 7.7 billion today to 9.7 billion in 2050. The world needs astonishing increase in food production to feed this population. Agriculture will be adversely affected by climate change in its manifold dimensions, but most significantly by the changes in rainfall pattern. The change in total precipitation as also the shift in time and distribution of rainfall will have pronounced effect on cropping pattern and overall productivity. The report of the IPCC indicates a probability of 10-40% loss in crop production in India and other countries of South Asia with increases in temperature by 2080-2100 and decrease in irrigation water (IPCC, 2007). India could lose 4-5 million tons of wheat production with every rise of 1°C temperature throughout the growing period even after considering carbon fertilization. In a study at the International Rice Research Institute, the yield of rice was observed to decrease by 10% for every 1°C increase in growing-season minimum temperature. Plant genetic resources (PGR) constitute the foundation upon which agriculture and world food securities are based and the genetic diversity in the germplasm collections is critical to the world's fight against hunger. They are the raw material for breeding new plant varieties and are a reservoir of genetic diversity. Human civilizations have benefited greatly from the domestication, conservation and use of plants species used for agriculture and food production. For thousands of years, farmers have used the genetic variation in wild and cultivated plants to develop their crops. Genetic diversity is the basic factor of evolution in species. It is the foundation of sustainability because it provides raw material for adaptation, evolution, and survival of species and individuals, especially under changed environmental, disease and social conditions and it will allow them to respond to the challenges of the next century (Hammer *et al.*, 1999). The future food supply of all societies depends on the exploitation of genetic recombination and allelic diversity for crop improvement, and many of the world's farmers depend directly on the harvests of the genetic diversity they sow for food and fodder as well as the next seasons seed (Smale *et al.*, 2004). The considerable genetic diversity of traditional varieties of crops is the most immediately useful and economically valuable part of global biodiversity.

Food and Nutrition Security

'Food security' exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO definition 1996, 2009). Availability of food, Access to food, Utilization and food Stability are the four pillars of Food security. The term 'food security' does not clearly spell out the nutrition dimension of food. Over the time policy makers and practitioners combined both concepts linguistically and conceptually. Emphasizing to achieve both food security and nutrition security. The new proposed definition now is "Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life."

Food Security and Nutrition Scenario

The world population is growing steadily which is surely not doing any help to the Food Security and Nutrition of the World instead it is the major threat. Agricultural production in general and crop production in particular, must increase substantially in order to meet the rising food demand of a population that is projected to expand by some 40 percent over the period from 2005 to 2050. Adding on to this climate change and increasing climate variability and extremes are affecting agricultural productivity, food production and natural resources, with impacts on food systems and rural livelihoods, including a decline in the number of farmers leading to major shifts in the way in which food is produced, distributed and consumed worldwide. According to the FAO, 2019 report more than 820 million people in the world are still hungry today, underscoring the immense challenge of achieving the Zero Hunger target by 2030. Another disturbing fact is that about 2 billion people in the world experience moderate or severe food insecurity.

India has nearly 195 million undernourished people, which make a quarter of the global hunger burden. Nearly 47 million or 4 out of 10 children in India are not meeting their full human potential because of chronic undernutrition or stunting. Since the independence India has no doubt some huge improvements and is committed for future also. Between 2006 and 2016, stunting in children below five years declined from 48% to 38%. Government of India has launched a number of programmes and schemes to farmers for doubling their income by the year 2022. They include: the National Food Security Mission, Rashtriya Krishi Vikas Yojana (RKVY), the Integrated Schemes on Oilseeds, Pulses, Palm oil and Maize (ISOPOM), Pradhan Mantri Fasal Bima Yojana, the e-marketplace, as well as a massive irrigation and soil and water harvesting programme to increase the



country's gross irrigated area from 90 million hectares to 103 million hectares by 2017. The National Food Security Act (NFSA), 2013, aims to ensure food and nutrition security for the most vulnerable through its associated schemes and programmes, making access to food a legal right. The Act legally entitles upto 75% of the rural population and 50% of the urban population to receive subsidized foodgrains under Targeted Public Distribution System. About two thirds of the population therefore is covered under the Act to receive highly subsidized foodgrains (Department of Food and Public Distribution, Government of India).

Plant genetic resources

According to the revised International Undertaking 1983 of the FAO, plant genetic resources were defined as the entire generative and vegetative reproductive material of species with economical and/or social value, especially for the agriculture of the present and the future, with special emphasis on nutritional plants. In easier terms Plant genetic resources refer to the raw material that the breeders use to improve the productivity and quality of a crop species which can be any genetic material of plant origin acquiring some potential value for food and agriculture. The efficiency of global food production depends on the careful use and conservation of plant genetic resources to produce higher yielding, more nutritious, more stable and more eco-efficient crop varieties.

PGR plays an important role in all aspects of life on earth from contributing in biodiversity for ecosystems to providing the genetic diversity to different researcher fields including plant breeders. Majorly it provides following vital services to the planet :

Provisioning services which includes the supply of products from ecosystems, such as food and genetic resources.

Regulating services, these are the benefits, such as water purification obtained from the regulation of ecosystem processes.

Cultural services, it includes non-material benefits obtained from ecosystems such as recreation, education and ecotourism.

Supporting services, these are needed for the production of all other ecosystem services.

PGR are a strategic resource and lie at the heart of sustainable agriculture and food security of the world. The link between genetic diversity and food security has two main dimensions: firstly the deployment of different crops and varieties and the use of genetically heterogeneous varieties and populations, can be adopted as a mechanism to reduce risk and increase overall production stability; and secondly, genetic diversity is the basis for breeding new crop varieties to meet a variety of challenges. The struggle to obtain new plants for food and agriculture has been one of the main motivations of human travel from the earliest times, and has often led to alliances and partnerships, but also to conflicts and wars between different civilizations and cultures. PGR was and will be the basis to shape humanity and mankind.

Conservation of Plant Genetic Resources

Plant genetic resources conservation strategies include *ex situ* conservation, in gene banks, field collections as seed and tissue samples and *in situ* conservation in protected areas under wild conditions. Most *in situ* conservation concerns crop wild relatives, an important source of genetic variation to crop breeding programs. Plant genetic resources that are conserved by any of these methods are often referred to as germplasm, which is a shorthand term meaning "any genetic materials". Nikolai I. Vavilov dedicated most of his life to the collection of plant germplasm resources; at his time, he organized more than one hundred expeditions to economically important plant regions around the world in an effort to resolve famine in Russia. The germplasm collection created from Vavilov's expeditions again saved Russia from starvation after the Great Patriotic War (June 1941 to May 1945). Vavilov collected more than 250,000 samples having estimated value at 8 trillion dollars. In the 1960s and 1970s, organizations such as the Rockefeller Foundation and the European Society of Breeding Research (EUCARPIA) emphasized more on the collection and conservation of plant genetic resources.

The core importance of PGR, for food and nutritional security of the world is well acknowledged now and constant efforts are made to promote and reward the farmers, researchers in the field of PGR conservation. International collaborations on PGR are made with major part of world now involved. A key event in the conservation of plant genetic resources was the establishment of the International Board for Plant Genetic Resources (IBPGR) in 1974. IBPGR promotes the global network of gene banks and assist in global efforts for conservation of PGR.

In 1979, during the 20th Conference of FAO, international agreement was signed for an international agreement and the formation of a network of germplasm banks with international sovereignty, under the assumption that plant genetic resources are a heritage of mankind and that a legal framework was needed to ensure its unrestricted availability. In 1983, first international agreement for the conservation and sustainable use of agricultural biological diversity was resolved



the Commission on Genetic Resources for Food and Agriculture was established, and the voluntary International Undertaking on Plant Genetic Resources was adopted by FAO. In 1991, the national sovereignty of plant genetic resources, plant breeders' rights and farmers' rights were recognized. In 1996, at the Leipzig International Technical Conference on Plant Genetic Resources Global Plan of Action was adopted. All these efforts eventually paved way for the historic adoption of the legally binding International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) in 2001. The Treaty entered into force on 29 June 2004.

The International Treaty on Plant Genetic Resources for Food and Agriculture was adopted by the Thirty-First Session of the Conference of the Food and Agriculture Organization of the United Nations on 3 November 2001.

The Treaty aims at :

- recognizing the enormous contribution of farmers to the diversity of crops that feed the world;
- establishing a global system to provide farmers, plant breeders and scientists with access to plant genetic materials;
- ensuring that recipients share benefits they derive from the use of these genetic materials with the countries where they have been originated (As per as <http://www.fao.org/plant-treaty/overview/en/>)

Conservation of Plant Genetic Resources in India

India has successfully taken strategic steps for conservation of plant genetic resources. For *ex-situ* conservation major activities are carried out under the Indian Council of Agricultural Research (ICAR) by the National Bureau of Plant Genetic Resources (NBPGR), New Delhi, which is the nodal organization for ex situ management of PGRFA. Additionally, several economically important plant species are also conserved in botanic gardens of various plant science-based institutes, most of which come under the vigilance of the Botanical Survey of India (BSI), Ministry of Environment, Forests and Climate Change (MoEFCC). The exchange of PGRFA is crucial for crop improvement programmes and ultimately the food and nutritional security of the world. India has contributed its share of genetic resources to the world through various national and international exchange programmes and would continue in the future also. Department of Agriculture & Cooperation, Ministry of Agriculture, declared all the crops listed in the Annex-I of ITPGRFA to be exempted from Section 3&4 of the Biological Diversity Act, 2002 (18 of 2003) for the purpose of utilization and conservation or research, breeding and training for food and agriculture. The exempted crops will be governed by the guidelines to facilitate the exchange of Plant Genetic Resources under the Multilateral System of ITPGRFA on 30th July 2014.

In India NBPGR also play most vital roles in food security through germplasm and gene conservation in following ways:

1. PGR acquisition through exploration and import.
2. Long term conservation in of accessions in National Genebanks and field repositories.
3. DNA fingerprinting for IPR protection and development of genomic resources.
4. Data base management and enhanced utilization.
5. Characterization and utilization of different yield related and physiological traits in collected germplasm.
6. Plant quarantine and health testing for pathogen, weed and pest free conservation.

The contributions of traditional agriculture to conserving biodiversity

Traditional agriculture has adapted to a wide variety of local environments, producing diversity and reliable food supplies, reducing the incidence of disease and insect problems, using labour efficiently, intensifying production with limited resources, and earning maximum returns with low levels of technology. It utilizes a very wide range of species and land races which vary in their reaction to diseases and insect pests, and to different conditions of soil, rainfall and sunlight. It provides sustainable yields by drawing on centuries of accumulated experience by farmers who did not depend on scientific information, external inputs, capital, credit, or markets.

But with growing populations, steps need to be taken to enhance the productivity of lands under traditional agriculture. In the forested uplands, modern agricultural development should take existing systems as starting points and use modern agricultural science to improve on the productivity of the system. The essential element is the design of self-sustaining agroecosystems. These ensure the maintenance of local genetic diversity available to farmers, thereby enabling rural communities to manipulate production systems to best suit local conditions. In addition, the ability to maintain a stable and permanent system with forested land enables farmers to invest time and effort in other permanent assets like fruit trees, fenced gardens, terraces,



and irrigation canals. Such mixed systems will often enable modern agricultural techniques to be wedded to traditional ones, and lead to the establishment of more permanent villages (McNeely, 1989).

Agricultural ecologists have learned to respect the wisdom inherent in many traditional practices. If traditional farming is developed as part of an overall system of conservation-oriented management, it can continue to make a valuable input into the total agricultural productivity of a region and can contribute to the biological diversity of rural ecosystems. It should be noted that “protection” does not always lead to more biodiversity. On the other hand, some conservation measures can help preserve traditional agroecosystems.

Role of Plant genetic resources for food and nutritional security

In spite of advances in food production, food insecurity and malnutrition are still widespread, which is a consequence of the agricultural and industrial development and the progressive unification of cultural and eating habit or simply globalization. More people migrating towards cities the food choices are becoming narrower and hence triggered pressure on agricultural productivity as a result; the number of crops and the diversity within them has been progressively reduced. A large number of the country reports expressed concern about the increasing use of genetically uniform varieties and the trend for them to be grown on ever larger areas, resulting in increased genetic vulnerability. One aspect to counter is greater use of genetic diversity. The deployment of diversity at the farm and field level helps provide a buffer against the spread of new pests and diseases. Genetic diversity represents a ‘treasure chest’ of potentially valuable traits. PGR plays an important role in providing genetic resources, the raw material for improving the production of more and better food, either directly or indirectly through livestock. They are also important as the basis for improving fibre, fuel or any other crop product.

This has led to a more intensive use of this germplasm in breeding and thereby yields of many crops increased dramatically. Some historical examples of utilization of germplasm for crop improvement are given below:

Wheat Improvement: Wheat is truly global, being one of the few crops grown over most of the world. There are hundreds of thousands of wild species, landraces, and local cultivars within the *Triticum* species that constitute the wheat of the world. Several specific genes that have made major impacts on wheat can be directly traced to contributions from genetic resources, such as dwarfing Genes *Rht1* and *Rht2* from “Norin 10,” a cultivar from Japan, resulted in the reduced height (or dwarf) in wheat. Norin 10, in turn, inherited these genes originally from “Shiro Daruma,” a Japanese landrace (Kihara, 1983). The incorporation of the *Rht1* and *Rht2* genes into the new varieties of wheat led to what is now been termed the “Green Revolution”.

Tomato: Domesticated tomato plants are commonly bred with wild tomatoes of a different species to introduce improved resistance to pathogens, nematodes and fungi. Resistance to at least 32 major tomato diseases have been discovered in wild relatives of the cultivated tomato. Genes responsible for promoting resistance to 16 of these have been bred into commercial cultivars, allowing tomato production in areas where they could not otherwise have grown

Sugarcane Improvement: Sugarcane, a multi species hybrid derivative, termed as *Saccharum* complex by Mukherjee (1957) included the genera *Saccharum*, *Erianthus*, *Sclerostachya* and *Narenga* constituted interbreeding group involved in the origin of modern sugarcane. In sub-tropical regions, low temperature, during December and January, is considered as growth limiting factor. Introgression of genes from *S. spontaneum*, *S. sinense* and *Erianthus* in sugarcane resulted in the growth of progenies during winter months. Uneven and unpredictable rainfall in the climate change regime is expected to result in frequent occurrence of drought in many part of India. Drought tolerance reported in many *Saccharum* species including *S. spontaneum*, *S. officinarum* and *S. barberi* and in the genus *Erianthus* with a well-developed root system is generally perceived as useful for developing drought-tolerant varieties. Water logging is expected to be a big problem in sugarcane cultivation with the altered and unpredictable rainfall pattern. Clones with profuse fibrous floating roots and negatively geotropic roots with aerenchyma were found to be resistant to water logging (Srinivasan and Rao, 1960). However, tolerant to water logging on high water table is a trait present in *S. spontaneum* germplasm and the trait can be transmitted through crossing.

Use of Plant genetic resources in modern era

PGR provides the accessions having variability for enhancing the overall productivity of the crops this helps in development of high yielding varieties. This is most useful for the developing countries where the overall productivity is still low and there is a constant challenge of resources. One of the best examples for this is the NERICA rice. The term NERICA, means ‘New Rice for Africa’, is used to refer to the genetic material derived from the successful crossing by WARDA in the early 1990s, of the two species of cultivated rice, the African rice (*O. glaberrima* Steud.) and the Asian rice (*O. sativa* L.). The *O.*



glaberrima accessions used in the breeding programme came from the WARDA genebank and simple biotechnological techniques were used to overcome sterility barriers with *O. sativa*. NERICA is a new group of rice varieties that adapt well to rainfed ecologies in Sub-Sahara Africa, where 70 percent of smallholder farmers cultivate rice.

PGR are not only limited for providing increased total food production but also nutritional well-being. Normally the best way to healthy diet is ensuring adequate intake of all the macro and micronutrients needed, which can be achieved by eating varied forms of fruits, nuts and other plant or animal based food. However, many poor people in the developing countries of Africa and Asia are unable to afford such diverse diet and have to rely heavily on just a few staple food crops for most of their food. This is majorly responsible for nutrient deficiencies in these countries. In recognition of this, a number of breeding efforts are underway to improve the nutritional quality of staple crops, for example, by producing rice, maize, cassava and sweet potato with higher levels of beta-carotene (the precursor of Vitamin A), pearl millet and beans with higher levels of available iron and rice, wheat and beans with higher levels of zinc. In India biofortified sorghum and pearl millet varieties and hybrids became a solution for malnutrition. ICRISAT developed high iron biofortified pearl millet variety ICTP 8203 Fe, released as Dhanshakti in Maharashtra, India, in 2013 and for all-India cultivation in 2014. Dhanshakti is the first iron biofortified crop cultivar to be officially released in India. It has been included in the Nutri-Farm Pilot Program launched by the Indian government.

Some recently biofortified varieties of crops are released by ICAR institutes in different crops are, rice (CR Dhan 310, DRR Dhan 45, DRR Dhan 49), wheat (HPBW 01, Pusa Tejas (HI 8759), Pusa Ujala (HI 1605), Maize (Pusa Vivek QPM9 improved, Pusa HM4 improved, Pusa HM8 improved, Pusa HM9 improved, Pearl millet (HHB 299, AHB 1200), lentil (Pusa Ageti Masoor, IPL 220), Mustard (Pusa Mustard 30, Pusa Double Zero Mustard 31), Soybean (NRC-127), Cauliflower (Pusa Beta Kesari 1) and Sweet potato (Bhu Sona, Bhu Krishna). These are majorly result of identification and induction of novel genes using PGR.

Millets : a solution to agrarian and nutritional challenges

Millets cultivation can keep dry lands productive and ensure future food and nutritional security. These contain good amounts of vitamins, minerals, essential fatty acids, phytochemicals and antioxidants that can help to fight against global nutritional challenges. As the climate change is expected to rise the global temperature which in turn will turn the agroclimatic conditions mostly in tropical and sub-tropical countries. This situation will demand sustainable crop substitutes and millets the best solution available. Therefore the germplasm conservation of millets holds the prime importance for now and near future. There are multiple benefits of millets that are recognized not only as a best substitute for changing ecological system but also health benefits. Millets are considered to impart role in lowering rate of fat absorption, slow release of sugars (low glycemic index) and thus reducing risk of heart disease, diabetes and high blood pressure. Millets fall under the group of C4 cereals. C4 cereals take more carbon dioxide from the atmosphere and convert it to oxygen, have high efficiency of water use, require low input and hence are more environment friendly. Thus, millets can help to phase out climatic uncertainties, reducing atmospheric carbon dioxide, and can contribute in mitigating the climate change (Kumar *et. al*, 2018). In the year 2018, India has proposed UN food and agriculture to declare 2023 as international year for millets. India enjoys the large diversity and cultural connection with all the millet crops from history.

CONCLUSIONS

Nowadays the utilization of the genebank holdings for crop improvement including abiotic stress tolerance is one of the main challenges. The successful exploitation of genetic resources requires (1) extensive characterization and evaluation and (2) genetic analysis and molecular mapping of the relevant traits. Detected loci determining abiotic stress tolerance at different developmental stages can be combined and transferred to modern cultivars via marker assisted selection. Plant genetic resources play a major role in incorporation of many useful genes including resistant to biotic stresses and tolerant to abiotic stresses. It is imperative that targeted exploration must be conducted to collect new germplasm, characterize for resistance/tolerant to biotic and abiotic stresses and utilize them in pre-breeding activities. Convergence of conventional and biotechnological approaches is expected to bring greater breakthrough in introgression breeding programme to develop climate resilient genetic stocks for utilizing them in commercial breeding programme.

REFERENCES

1. Food and Agriculture Organization of the United Nations Rome, 2019 <https://www.unicef.org/media/55921/file/SOFI-2019-full-report.pdf>
<https://in.one.un.org/un-priority-areas-in-india/nutrition-and-food-security/>
2. Department of Food and Public Distribution, Government of India, <https://dfpd.gov.in/nfsa-act.htm>
3. Kumar, A., Tomer, V., Kaur, A., Kumar, V. and Gupta, K. (2018). Millets: a solution to agrarian and nutritional challenges. *Agriculture & food security*, 7(1) : 31.



INSIGHTS OF BRUCELLOSIS IN ANIMALS : DIAGNOSIS, PREVENTION AND CONTROL

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Abstract

Brucellosis is one of the most important bacterial zoonotic and re-emerging disease caused by different species of *Brucella* organism such as *B. abortus* (cattle and buffalo), *B. melitensis* (sheep and goat); *B. canis* (dogs), *B. ovis* (sheep), *B. neotomae* (rodents). Most of brucella species are host restricted and affects humans as accidental hosts. The *Brucellosis* in livestock cause significant clinical disease and economic losses. The disease is commonly diagnosed using serological tests like Rose Bengal plate test (RBPT), standard tube agglutination test (STAT) and molecular tests like polymerase chain reaction and restriction fragment length polymorphism (RFLP). No vaccine is available for prevention of human brucellosis but for animal brucellosis, vaccines like RB51, S19, Rev.1 and SR82 are available. These animal vaccines encompass certain drawbacks like residual virulence and cross reactions during serological tests. Completion of sequencing of *Brucella* genome, advances in bioinformatics and developments in new vaccine technology like genetic engineering has given new hope for the development of more potent and safe vaccine. The present article will discuss the different aspects of the disease including etiology, epidemiology, zoonotic importance, pathogenesis, clinical signs, diagnosis, treatment, prevention and control in animals.

Introduction : Brucellosis, a bacterial zoonotic disease is caused by *Brucella* spp. and is characterized by abortions in late trimester, still birth, weak calf, retention of placenta, poor reproductive efficiency, orchitis in bulls and arthritis etc. It is an important re-emerging infectious disease causing significant economic loss globally (Kumar *et al.*, 2019). World Health Organization has considered brucellosis as one of seven neglected zoonosis perpetuated by poverty. The bacteria may be used as biological weapon due to highly infectious nature and ability to be transmitted through aerosol. There is induction of abortion spontaneously in cattle thereby causing serious economic loss to dairy farms.

Etiology : There are various species of the organisms infecting a wide range of mammals thereby causing abortion. *Brucella* species are more or less restricted to particular host species such as *B. abortus* is associated with bovine brucellosis; *B. melitensis* (small ruminant brucellosis); *B. canis* (canine brucellosis); *B. ovis* (ram epididymitis) and *B. neotomae* (desert wood rat), *B. microti* (*Microtus arvalis*) and *B. maris*, *B. ceti* and *B. pinnipedialis* (marine mammals). *B. suis* has a wider range of host which is associated predominantly with porcine brucellosis (biovars 1, 2, 3) but also found in hares (biovar 2), rangifers (biovar 4) and rodents (biovar 5). The bacteria are facultative intracellular gram negative cocco-bacilli or short rods about 0.6 to 1.5 μ m long and 0.5 to 0.7 μ m in width, non motile, non-sporing and non-capsulated. Under suitable conditions (pH greater than 4; high humidity and low temperature; absence of sunlight), the organism can survive outside the host system. The organism can maintain infectivity in water; aborted foetuses as well as fetal membranes; faeces and liquid manure; wool and hay; organic material; dust; soil on buildings; equipments and clothes for several months.

Epidemiology : Bovine brucellosis is prevalent in all parts of the world due to extensive cattle farming except certain northern as well as central European countries like Australia, Canada, Japan and New Zealand. Recently in the year 2008, twelve countries of European Union have been considered free from bovine brucellosis. In human beings, brucellosis causes more than fifty thousand infections but the disease has got a limited geographical distribution. As a major public health concern the disease is of great importance especially in the Mediterranean region and western Asia; parts of Africa as well as Latin America. Several sanitary; socioeconomic as well as political factors are responsible for the increased incidence of brucellosis in developing world. The disease is transmitted in both the ways such as horizontal as well as vertical. In early post-natal period vertical transmission occurs periodically mainly by the intake of infected colostrums or milk and then *in utero*. Some of the important factors for the endemicity of brucellosis are uncontrolled movements; lack of veterinary support services including vaccines and animal husbandry practices that support the spread of infection. The disease in human beings is mostly transmitted through soft cheeses, yoghurts and ice creams having high concentration of *B. melitensis* and *B. abortus*. Accurate as well as current epidemiological information is necessary for making decisions and policies.

Status of disease in India : The disease was first time reported in 1942 and since then it is widely spread affecting different species of mammalian farm animals including cattle, goats, buffalo, yaks, camel, horses and pigs. In cattle and buffalo predominant biotypes are *B. abortus* and in sheep, goat and humans are *B. melitensis*. The high demand for dairy products resulting into tremendous growth of dairy sector in India resulted into the high frequency of animal trade and their movements in intensified manner thereby providing a new and increased risk to spread the infection.

Zoonotic Importance : *B. melitensis* and *B. abortus* are the most pathogenic and virulent zoonotic pathogens. The persons that are on high risk are veterinarians, animal health professionals, slaughterhouse workers, laboratory workers, ranchers and



meat-packing employees and consumers of raw dairy products. The disease in human being occurs in different forms: asymptomatic; acute; chronic or allergic. Fever and head ache; lassitude; muscular or joint pain along with profuse sweating are common in acute form of the disease. Pyrexia of unknown origin; acute renal failure; nephritis and orchitis; myelodysplastic syndrome as well as spinal epidural abscesses rarely are observed in localized form. The localization of bacteria in hip, knee and shoulder joints may be associated with spondylitis and peripheral arthritis. Eradication of disease from the natural animal reservoirs leads to a drastic decrease in the human infection incidences.

Pathogenesis : *Brucella* has strong tropism for lymphoreticular and reproductive cells with ability of intracellular sequestration and multiplication inside host phagocytic cells to protect itself from innate as well as adaptive responses of host. *Brucella* can be transmitted by inhalation, ingestion or mucosal epithelium penetration reaching nasal, pharyngeal and lymph nodes respectively and then via macrophage spread, sequestered or multiply in monocytes and macrophage of reticuloendothelial system such as lymph node, spleen, liver, bone marrow and in mammary gland and sex organ. Localisation of *brucella* in reticuloendothelial system is more common. Chronicity of *brucella* infection is due to its ability to survive inside macrophages. Severity of infection is augmented by increased multiplication inside macrophages but cannot avoid killing by neutrophils. *Brucella* infection is a four step process comprising adherence, invasion, establishment and infection. There is also inhibition of fusion of phagosome and lysosome. Endoplasmic reticulum is credited as location for *Brucella* multiplication. Inhibition of host cell responses in *brucella* infection is credited to suppression of bacterial response instead of any virulence factor. Pathogenicity of *brucella* is also addressed by environmental factors like acidic pH, low level of nutrients and reactive oxygen species.

Lipid rafts prevent fusion of *Brucella*-containing vacuole (BCV) with the lysosomes thereby following a novel intracellular trafficking pathway. For this there is interaction with the endoplasmic reticulum (ER) and generation of an ER-derived intracellular organelle that permits intracellular replication. Production of enzymes such as superoxide dismutase, catalase, urease, alkyl hydroperoxide reductase (ahpC & D), nitric oxide reductase and *Brucella* virulence factor A (BvfA) are among the other survival mechanisms. Smooth strains of *brucella* like *brucella suis* enters macrophage by binding to unknown receptor and avoiding fusion with lysosome while rough strains seem to enter by lipid rafts with rapid lysosomal. Smooth strains of *brucella* contain a complete lipopolysaccharide (composed of lipid A, a core oligosaccharide and an O-side-chain polysaccharide) while rough strains do not contain O-side-chains of lipopolysaccharide.

Host cell apoptosis in host cell is inhibited by smooth *brucella* except *Brucella canis* and *Brucella ovis* and this inhibition is credited to the presence of O-polysaccharides through a TNF- α / independent mechanism that is missing from rough *Brucella*. *Brucella* LPS plays a role in protecting against bactericidal cationic peptides (defensin NP-2, lactoferrin, cecropins, lysozyme, bactericcin-derived peptides, and the defensin-like antibiotic polymyxin B and the crude lysosomal extracts from polymorphonuclear leukocytes). LPS inhibits synthesis of immune mediator and of Tumor necrosis factor or nitric oxide synthesis is inhibited by the LPS of *B. melitensis*. The LPS of *Brucella* is unique in that it is much less active and less toxic than LPS of *Escherichia coli*.

Clinical Signs in Animals : Abortion in last trimester is the most common clinical sign followed by still births, reduced fertility and low milk. Classical brucellosis caused by *B. ovis* and ram epididymitis caused by *B. melitensis* are the two forms of ovine brucellosis. Brucellosis may run sub acute or chronic form but in pigs the disease is inapparent with retention of placenta; abortion or premature births; and metritis are characteristic (not specific). Hygromas and abscesses are the major clinical signs in nomadic or semi-nomadic cattle herds in certain parts of Africa that are infected with *B. abortus* biovar 3. Abortion in infected animals occurs only once with fetus carried to full term in subsequent pregnancy. Particularly in cows and goats the udder is often permanently infected or there is localization of organisms in supra-mammary lymph nodes leading to *brucella* secretion in milk. In bulls, there is inflammation of seminal vesicles, testicles and epididymides, therefore, the organisms may be present in the semen. There may be testicular abscesses and in longstanding infections or arthritis in certain cattle. In horses, there is formation of local abscesses in bursae resulting in suppurative bursitis and is most commonly recognized as fistulous withers or poll evil. *B. canis* is mainly responsible for canine brucellosis leading to reproductive failure in dogs and/or non-reproductive tract related conditions.

Diagnosis : The isolation and identification of *Brucella* is required for disease surveillance and monitoring. Routine tests require CO₂ (for growth) H₂S production (detected by lead acetate papers) and growth in the presence of basic fuchsin and thionin (at final concentrations of 20 μ g/ml). When bacteriological examination becomes impractical growth characteristics, serological, bacteriological methods and/or molecular methods should be used.

Culture methods : The 'gold standard' diagnostic test is isolation and characterization of the organism. However, disadvantages are the long time required for definitive identification, usually two weeks. Sample of choice for isolation are spleen as well as lymph nodes (iliac, mammary as well as prefemoral) and for clinical sample are the uterine discharges as well as contents of stomach; spleen; liver; lungs as well as lymph nodes. Colonial morphology; appearance of smears (stained with



the methods of Gram and Stamp) and the results of oxidase and slide agglutination tests (with *Brucella*-specific antisera) are required for presumptive identification. Isolation and culture on solid media limits growth of contaminants and non-smooth mutants while liquid media are preferred for the purpose of enrichment using dehydrated basal media like *Brucella* medium base, tryptose (or trypticase)–soy agar (TSA). For *B. abortus* biovar 2, 2–5% bovine or equine serum must be added. Other media with satisfactory results are Serum–dextrose agar (SDA) or glycerol dextrose agar are other while media of choice for brucella isolation from body fluids, Milk and blood is Castañeda's medium (non-selective biphasic medium). *B. abortus* requires serum and carbon-di-oxide for growth and *B. melitensis* can be cultivated at 37°C under aerobic conditions. 5-10 per cent carbon-di-oxide is required for *B. ovis* for the primary culture. From smears of organs or biological fluids *Brucella* stains red against a blue background (by the Stamp's modification of the Ziehl–Neelsen method). Large aggregates of intracellular, weakly acid-fast organisms with *Brucella* morphology provide presumptive evidence of brucellosis.

Serology : Detection of antibodies in serum, milk, whey, vaginal mucus, or seminal plasma helps in presumptive diagnosis in absence of positive culture and is the most practical means of diagnosis. Standard diagnostic tests are agglutination tests that detect antibodies in milk, whey, semen, and plasma. There has been development of an ELISA for detecting antibodies in milk and serum. Standard plate or tube serum agglutination test when used, complete agglutination at dilutions of 1:100 or more (in serum samples of non-vaccinated animals) and of 1:200 (of animals vaccinated between 4 and 12 months of age) helps in detecting positivity and such animals are reactors. Complement fixation, rivanol precipitation, and acidified antigen procedures are the other tests of choice. As a component of the disease eradication and surveillance programme, immunological testing is done. Standard tube *Brucella* agglutination test (STT) (or serum agglutination test) is commonly used for diagnosis of acute brucellosis. For chronic brucellosis however 2-mercaptoethanol (2ME) and complement fixation test (CFTs) are used to return the agglutination titres to low level. It helps in predicting recovery from the disease and to determine adequacy of the antibiotic. In comparison to other tests buffered *Brucella* antigen tests (BBAT) is more reliable to identify infected herds. Rose bengal test, latex agglutination test, indirect Enzyme linked immunosorbent assay, Coomb's test and Immunocapture agglutination test are some of the important and useful test. A valuable alternative to conventional serological tests is fluorescence polarization assays (FPA) which is of the size of molecule which is fluorescently tagged and aids in detecting either antibodies or antigens through concomitant change in rotational rate. In the diagnosis of the disease immunoassays based upon cell mediated responses (delayed type hypersensitivity) like brucellin-based skin test may have certain application. Over the conventional serological assay it offers advantage where there is suspicion of a possible cross-reaction in conventional serological assays. Based on production of interferon (IFN)- γ that follows antigen stimulation specifically *in vitro* cell mediated immune assays are developed. It has been indicated recently that similar specificity is offered to diagnose brucellosis in porcine.

Molecular Detection and Typing : In certain studies detecting antigen is beneficial over detecting antibodies as Diagnosis can be made earlier with detection of antigen of brucellosis.

PCR-restriction fragment length polymorphism (PCR-RFLP) and Loop mediated isothermal amplification (LAMP) : Since concentration of Brucellae in blood stream is low during acute stage of the disease there is controversy over the use of blood or serum but diagnostic PCRs can amplify various gene segments. Aborted fetuses and maternal tissues are mainly used for diagnosis by PCR. Compared to serological assays sensitivity of PCR is more in blood sample; bone marrow as well as mucus or cerebro spinal fluid of the fetuses amplification of bacterial genome is possible. Real-time PCR is the latest method used in which hybridization probes are used to increase specificity. Polymorphism in a number of genes including *omp2*, *dnaK*, *htr*, and *ery* is evident by PCR. The reproducibility of restriction profile is high. In 2000, loop mediated isothermal amplification (LAMP) has been developed with sensitivity (10-100 times) and specificity challenging PCR and that too without requirement of thermal cycler for whole reaction. By forming turbidity or by using dyes that have the properties of DNA binding it is easy to visualize the results of LAMP (Parida *et al.*, 2004). Standardization of LAMP has been done against the *Brucella* cell surface protein (*bcs*) 31 gene as well as the *omp25* gene.

Random amplified polymorphic DNA (RAPD) and Amplified fragment length polymorphism: RAPD do not require any sequence data and is credited as most quick and easy method. thereby targeting unspecified genomic sequences for generation of a genetic profile. Such amplified sequences exhibits high specificity for identifying or differentiating species or strains. Typing of isolates is done on the basis of number and size of PCR generated set of fragments. For differentiation of several bacterial species amplified fragment length polymorphism (AFLP) has been used to index variation over the whole genome. On the basis of the amplification of genomic restriction fragments use of PCR AFLP technique has been developed.

Outer Membrane Protein typing : Approach using restriction fragment length polymorphism helps in differentiating microbial group on the basis of polymorphic alleles. For typing schemes of brucella, Omo2 locus 36 kDa, porin proteins are used.



Typing of Brucella strains : Tandem repeat (TR) sequences are present in genome of all prokaryotic or eukaryotic organism and are important markers since multiple alleles present at a locus can be achieved as differences in size on electrophoresis.

Insertion sequence (IS) 711 Typing : DNA polymorphism can be indexed using variable numbers chromosomal indexing of DNA and brucella specific mobile insertion sequences are located like IS711.

Treatment : There is no treatment for brucellosis in animals but the treatment for human beings is available. The treatment of choice is the combination of two antibiotics namely rifampicine and doxycycline to prevent relapse. The effective treatment include : the use of a 6 week regimen of doxycycline (at 200 mg per day which must be administered orally) along with the addition of streptomycin at 1 gram per day for a period of 2 to 3 weeks. Several combinations of antibiotics: ciprofloxacin and ofloxacin; rifampicin and doxycycline; doxycycline plus streptomycin and ofloxacin plus rifampin have been clinically tried and similar efficacy is yielded by such combinations comparable to that of the classic regimen.

Prevention and control : Brucellosis is a zoonosis with a strong correlation between animal and human diseases. It remains primarily a veterinary responsibility to control brucellosis, including application of principles of epidemiology and animal husbandry. Vaccination is cost-effective in endemic areas helping in eradication of the disease. Vaccines of *B. abortus* S19 and *B. melitensis* Rev 1 have been successfully used in certain developed countries but both causes' abortions during pregnancy because of their virulence to humans. They elicit antibodies to the smooth (S) lipopolysaccharide (LPS) thereby interfering in serodiagnosis. Compared to inactivated vaccines live vaccine is comparatively good. A S19 vaccine of *Brucella* is the reference vaccine which is most widely used at a dose of $5-8 \times 10^{10}$ viable organisms subcutaneously in female calves and in adult cattle reduction of doses is upto 3×10^8 to 3×10^9 and the vaccine strain can be excreted in milk. Good immunity is provided by *Brucella abortus* S19 vaccine thereby providing a good immunity. Since 1996 there has been report of *B. abortus* strain RB51 as the official vaccine for preventing cattle brucellosis in various nations, but there may be abortion in pregnant animals. 10^9 CFU (colony-forming units) of RB51 does not cause abortion in cattle. *Brucella melitensis* strain Rev.1 is a protective vaccine and can sometimes control infection at field level. Recombinant vaccines have potential to ameliorate present issues associated with brucella vaccine and becoming the bovine and human brucellosis in future. R vaccines can be improved by using R mutants produced by disruption of per, wboA and ablA (putative perosamine synthetase and glycosyltransferase genes) shown better results than RB51 in mouse model. DNA vaccines encoding L7/L12, Cu/Zn SOD, BLS, OMP16, BAB1_0278 and BCSP31 successfully conferred protection against Brucella challenge in mice. Vector based vaccines like *B. melitensis* BP26 in K12 expressing system can induce IFN lymphocyte proliferation -r production, and protection against a *B. melitensis* challenge in mice. Similarly Lactococcus lactis expressing Cu-Zn SOD and SFV packed with RNA of *B. abortus* Cu-Zn SOD has also been used as a Vector-delivered Brucella vaccine and can induce protection in mice (Onate *et al.*, 2005). Sub unit vaccines utilizing trigger factor, periplasmic protein and invasive protein administration induces better immune response against *B. melitensis* paving way to control caprine brucellosis. Reverse vaccinology based programme Vaxign has identified 72 proteins as vaccine target. Brucella ghost vaccines produced by expression of lysis gene E of X0174 phage in bacterial cell causing loss of cytoplasmic contents. Nanoparticles based vaccines mainly encapsulating outer membrane proteins of brucella like omp19, 25 and 31, rL7/L12 ribosomal proteins, cytosolic proteins or LPS resulted in higher immune responses.

Management : Improvement in farm hygiene; trade and animal movement restriction; testing, isolation and removal of infected animals are the other complementary measures. A long lasting effort carefully controlled and monitored is required. Improvement in food hygiene; that include milk pasteurization and high risk group protection can minimize the infection risk in human population. It is also mandatory to provide health education. The brucellosis prevalence in animal reservoirs is the key feature to control the disease in humans. The incidence in humans can be markedly reduced by eradication programs for bovine brucellosis. Misdiagnosis, underreporting, lack of proper laboratory facilities are the few reasons which causes miscalculation of true incidence.

Conclusion : Brucellosis is one of the major public health concern all around the world affecting several species of animals through direct contact with contaminated blood, foetus, placenta, other uterine secretions, consumption of contaminated dairy products (unpasteurized). This is due to the ability of organism to survives for a long time in ice cream and months in butter but in frozen meat they can survive for years together. Combination of molecular and conventional techniques is a reliable policy for diagnosis. The ultimate source of human brucellosis is direct or indirect exposure to infected animals or their products, prevention must be based on elimination of such contact therefore it can be eradicated only by achieving elimination animals, which is not practically possible. In such situation attempt shall be made to minimize impact of the disease and reduce the risk of infection by Biosecurity, Vaccination, personal hygiene, adoption of safe working practices, protection of the environment and food hygiene. The most successful method of these is vaccination.



MANAGE THE NEGATIVE IMPACT OF THE CLIMATE CHANGE BY REDEFINING THE NEW NORMAL AND USE OF ADVANCE TOLLS & TECHNOLOGY IN AGRICULTURE SCIENCE

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Abstract

In India rainfed agriculture still accounts for over 92.8 million hectare or 65 per cent of cropped area. This is a challenging task for the breeding community to improve the water usage efficiency of cultivated plant species for longer sustainability. On a positive note, climate change and cultivar developments move together as every next breeding cycle and selection fall in the changed climate. The most difficult part is climate prediction and estimate are not providing the accurate data and information and hence farming community is left in ambiguity and often fail to initiate the planting at right time and select the right crop which had less risk in the current climatic conditions. Interestingly, large diversity of cropping systems exists under rainfed and dryland areas with an overriding practice of intercropping, due to greater risks involved in cultivating larger area under a single crop. For a longer sustainability out of box thinking is required, by considering socio-economic situations such as; dependency of large population on agriculture, small land-holding size, very high population pressure on land resource etc. Improving household food security has been an issue of supreme importance to millions of farmers in India, who constitute 97.15 million total operational holdings and 56.15 million marginal holding. This lead to redefine the new normal and also important to relook at the total basic work and process of development and evaluation the new cultivars which were formulated quite long and with a little change they are still in practice. Drought, shorter monsoon spread, drought and waterlogging situation in same field are very common now a days in all the tropical and sub-tropical regions. Shorter winter season and early high rising temperature after winter season is becoming very common which lead to reduction in the productivity. On this note, I will be covering a concept where climate changes and our socioeconomic condition need to consider on priority by plant breeding community and move as a concept from tolerance breeding to resilient breeding.

Key words : Climate change, New normal climate cultivar development process and practice and Climate resilient cultivar.

Introduction : Population growth and estimated high food demand are very well-known facts, the interesting part here is to estimate the change over a period where many new and old factor influence the total demography. (Roberta V. Gerpacio, 1999-2000) says a major shift in global cereal demand is underway: By 2020, demand for maize in developing countries will surpass the demand for both wheat and rice. This shift will be reflected in a 50% increase in global maize demand from its 1995 level of 558 million tons to 837 million tons by 2020. Maize requirements in the developing world alone will increase from 282 million tons in 1995 to 504 million tons in 2020 (IFPRI 2000). However world maize production is projected at consecutive peaks from 2020-21 onwards, reaching 1,177MT by the end of the forecasted period, up by 9% from the estimate for 2018-19 which is 1076 million metric tonne (International grain conceal, March 2019). Same situation is there for almost all other crops and this indicates that we need to be careful from these predictions and estimates. Another learning here is, despite all these negative impacts of climate change, agriculture research community has helped in producing much more than what its estimated 15 year ago and required today. This is also a new school of thought where we can incorporate all these influencing factor (natural, climatic & socioeconomic) and design the agriculture research activity which can pave a path to supply healthy food at affordable price to everyone on this earth. I believe very strongly, that world will never go hungry if we continue to improve the productivity by genetic gain, reducing harvesting tools, improve plant nutritional use efficiency, continue improvement in food distribution system and crop diversification. In this article I have tried to cover all these aspects where we need to challenge ourselves and try to redefine our existing system process in order to increase the efficiency and help world to be out from the fear of food security

Climate Change and its influence on the product/cultivar developments : Crop growth conditions and crop productivity are interrelated issues. Basically, crop growth is affected by climate conditions, CO₂ concentration and technology. Concerning climate conditions, the basic variables are precipitation and air temperature that control soil moisture and water availability to plants and affect evapotranspiration. In addition, other variables such as wind velocity, the occurrence of early frosts or ice and the time occurrence of extreme phenomenon are important as they can exercise significant stress on plants and put production at risk. In Asia, where intensity, timing and duration of the rainy season is very critical and put up a very high risk on the productivity. Climate change is a very complex issue and it can be divided in two categories one which can be taken



during the process of breeding and other which are very random event and cannot be incorporated in the selection process while breeding. Increase in temperature and evapotranspiration can be taken care of very well during the breeding process as the entire breeding nursery planted in open field and generation advancement happens in natural climate. Effect of Drought and water logging condition can be taken care through screening and selection in the targeted conditions. In breeding process, it is important to develop the methodology :

- For root trait selection enabling technology.
- Use of plant physiology in plant breeding.
- Screening of the early generation material under stream climatic conditions.
- Offseason screening.
- Use of weather and climate change information for design the breeding schemes.
- Breeding in targeted ecology.
- Emphasis for designing nutrients use efficient plant architecture.

New Plant type for managing the change climate and change farming system : Breeding community always review and change their selection criteria and give very high weightage to the need of farmer at present. These are a moving target and keep on changing time to time and get influenced from climate and other socioecological developments. In many crops we witness the change as an example no. of panicles or ear per unit area has reduced the significance of no. of tiller per plant in wheat, rice and millet which is a very significant yield contributing traits. In case of corn new generation breeder start saying that, the beauty of a corn ear is not in the ear length per plant but ear length per row. All these new perspectives should be considered and our old books, list of traits be reviewed and realign them as per current requirement and design the plant architecture accordingly. The breeder should develop the new list for the yield contributing traits and stress management traits and align the selection accordingly.

Traits used in past for selection	Traits may become significant in future
No. of tillers in Rice, wheat and millets	No. of panicles per unit area
Lodging tolerance – nice to have	Lodging tolerance – Must have
Low seedling mortality – nice to have	Low seedling mortality – Must have
Skipping from droughts	Drought tolerance and /or Climate resilient
High yield / unit area	Profitability (yield /unit area /unit input/per unit times)
Early, medium or late maturity	Suitable for early, medium and late planting season
Grain yield and fodder yield	Grain yield + nutrition value + fodder yield & quality
No. of bolls per plant in cotton	No. of bolls per meter square
No. of fruits/plant in tomato, okra etc.	No. of fruits per meter square

Breeding v/s demands lead breeding : Variability or recombination creation, selection and use of selected variability in developing the improved cultivars the main component of plant breeding will remain unchanged. However every requirement for tailor made and demand lead plant breeder required to revisit these components of plant breeder and see how a breeder can incorporate a commercial angle in his product design concept. It's time to think that expectation from breeding community are increasing and the science of plant breeding is evolving and hence it is necessary to widen the definition of plant breeding from breeding to product designing by using a systemic and phase gate approach, where plant breeding will consider a complete project and pass through the critical evaluation at every phase to pass the gate for next phase as listed below :

- Developing the product profiling and creating product concept note with define time line.
- Project approval, setting the bench marking and mile stones.
- Translating the product profiling in to the breeding objective.
- Assessing the germplasm requirements / supporting breeding tools.
- Progress assessment or project monitoring on every mile stone.
- Product performance validation.
- Product acceptance validating.
- Product scale up plan and product introduction.



This approach is so critical to address the need of farmer and provide the solution to their problem which will help in increasing the productivity and profitability of farmer. Educated farmers are capable to check the label claim by product provider and this approach increase the precision in performance. Here it's very critical to see if our existing varietal release systems are still strong enough to evaluate the performance of product in the way farmers are looking for.

Excellence in Plant breeding to enhance the genetic gain/breeding cycle : Summer, rainy and winter season are getting shorter, but severities of the effects are increasing every year. Drought and waterlogging in the same field, winter and heat stress in the same field in same crop/field is normal nowadays. To handle this new climatic definition our old breeding system and approach will have some limitation and hence excellence in plant breeding is so critical which will enable to handle the current challenges and prepare ourselves for the future challenges. Here it is necessary to widen the scope of plant breeding to :

Increase the speed in plant breeding by shorting the breeding cycle.

Increasing the pre-season in selection.

Increasing the cost effectiveness in the breeding process.

Increase the heat rate or success rate in product acceptance.

Integration of supporting sciences like genomics, gene-editing, double haploid and biotechnology in plant breeding are essential in to manage the complex traits, increase the pre-season and speed in plant breeding. Use of high throughput phenomics, use of artificial intelligence in data gathering and management and advance statistical tools are required for increasing cost effectiveness and improving the label claim.

REFERENCES

1. Roberta V. Gerpacio (1999). Impact of Public- and Private- Sector Maize Breeding Research in Asia, 1966-1997/98.
2. International grain conceal, March 2019
3. Garbrielle J. Persley & Vivienne M. Anthoony - The Business of plant breeding.



MANAGEMENT OF PHYTONEMATODES IN AGRI-HORTICULTURAL CROPS FOR DOUBLING FARMER'S INCOME

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Abstract

Among the pests, Phytonematodes are worst enemies of mankind and causing great damage to all agricultural and horticultural crops like vegetables, cereals, pulses, oilseeds, fruit crops, etc. They are distributed all over the world in different kinds of habitats and found in nearly every biological niche that supports life. They infect plant roots, bulbs, rhizomes, stems, leaves, buds, flowers, seeds etc. and cause great damage to the plants directly or indirectly. They feed upon the surface (Ectoparasitic nematodes) or partially enter into the root with their anterior part of the body (Semi-endoparasitic) or they enter inside the roots (Endoparasitic). The indirect damage by phytonematodes include their involvement in plant disease complex, making the roots more prone to secondary infections by bacteria and fungi and their role as vectors of many plant viruses.

Crop losses due to nematode appear in different forms. It may be loss in yield, deterioration in the quality of product and the increase in cost of production, etc. The degree of damage caused by nematodes depends upon the population density of nematodes, susceptibility of the crop, environmental condition such as soil fertility, moisture and also presence of other pathogenic micro-organisms which may interact with nematodes as they are known to cause complex plant disease in association with fungi, bacteria and viruses.

Sasser and Freckman (1987) estimated annual yield loss in major crops of the world due to plant parasitic nematodes as 12.3 percent. Annual loss worth as high as Rs. 40,000,000/= in wheat and Rs. 30,000,000/= in barely due to cereal cyst nematode (*Heterodera avenae*) in Rajasthan alone have been reported by Seshadri and Dasgupta, 1980. Sasser and Freckman (1987) have indicated an annual crop loss due to Phytonematodes on worldwide basis to the tune of \$100 billion. Large number of plant parasitic nematode is recorded from the rhizosphere of many crops like Root-knot Nematode (*Meloidogyne* spp.), Reniform nematode (*Rotylenchulus reniformis*), cyst nematode (*Heterodera* spp.), lesion (*Pratylenchus penetrans*) etc. Among all the plant parasitic nematodes, root-knot nematode (*Meloidogyne* spp.) are the major phytonematodes causing damage to almost all crops. The losses in our agriculture production due to phytonematodes justify the need for adopting their different management practices to check their population and level of infestation and thereby increasing the farmer's income.

Nematode management can be defined as a practice whereby phytonematodes population are maintained at levels that do not cause economic losses. There are two broad categories for management practices: Chemical and Non chemical. The chemicals used earlier to control plant parasitic nematodes were usually fumigant and non-fumigant nematicides. These are not only expensive but also cause environmental pollution, phytotoxicity, contamination of ground water and adversely affect land and its biotic environment. During the past few decades application of synthetic pesticides to control agricultural pests has been a standard practice. However, with growing evidence regarding detrimental effects of many conventional pesticides on health and environment, requirement for safer means of pest management has become very crucial. The several disadvantages associated with chemical control like hazards to man, effects on non target organism, phytotoxicity, hazards of pesticide residues, upsetting the ecological balance and difficulty in application. The demerits of hazardous chemicals have created interest in searching alternate methods for plant-parasitic nematode management for high yields and quality that are required by high cost of modern crop production for increasing farmer's income. Because of the serious losses caused by the plant-parasitic nematodes principal management strategies i.e, Physical, Chemical, Cultural, Biological, Regulatory and IPM are undertaken to minimize crop losses caused by nematodes thereby enhancing Farmer's income. The various ways are :

(I) Cultural Methods

Fallowing : In many parts of India after harvest of rabi crops, the field is left fallow without host crops. This practice is widely used in Northern India which reduces nematode population and is eco-friendly. If fallow is coupled with summer ploughings, decrease of endoparasite nematodes especially root-knot nematode was recorded to be as much as 40 per cent. The main principle behind this is starvation of nematodes due to non-availability of host crop and killed by solar heat and soil desiccation. Most of the phytonematodes do not survive in upper layers of soil.

Summer ploughing : This is a good practice for controlling plant-parasitic nematodes. At least two summer ploughings



during May and June, under the north Indian conditions will go a long way in reducing soil population of nematodes as well as other soil borne organisms which will help the farmer in getting profitable crop yield.

Solarisation : The solar energy is preserved with the help of transparent polyethylene sheet to increase soil temperature enough to kill the nematodes present in soil profiles. This is only applicable in limited areas. Prasad *et al.* (1995) found about 90 per cent kill of root-knot and reniform nematodes when solarised for 30 day during May-June months. Solarisation coupled with triazophos application @ 1.5 l/ha completely eradicated plant parasitic nematodes under field conditions. This method provided an economical alternative for multiple pest, disease and weed control in small areas like nursery beds, orchards, forestry plantation and high value crops in regions with hot summers. This practice is very effective in reducing plant-parasitic nematodes, fungus, weeds and soil insects population.

Rotation of crops : Crop rotation can be one of the most effective means of controlling nematodes in low-input agricultural systems. Rotating crops in a sequential cropping system is the best known and most widely used cultural practice in traditional and subsistence agriculture. The basic principle of crop rotation for nematode management is to reduce initial populations of damaging nematode species to levels that allow the following crop(s) to become established and complete early growth before being heavily attacked. Mostly, rotation of plant crops is widely practised but rotations can also involve sequential planning of crops with others like green manure, cover and trap crops, antagonistic plants, grass and other fallows.

Antagonistic plants and trap crops : The most widely reported antagonistic plants are *Tagetes* spp., mustard, *Asparagus*, sesame, sunhemp and neem. Antagonistic plants also often act as trap crops, i.e, plants that reduce nematode populations by allowing invasion but only partial development in the roots. Mixed cropping either with non-host or antagonistic crops such as *Tagetes*. The use of trap crops as green manure, not only reduce the nematode population but improves soil fertility in many ways and promotes antagonistic microbial activities. For example, sunhemp (*Crotalaria spectabilis*) or Dhaincha (*Sesbania*) which allow invasion by *Meloidogyne* spp. but does not support development and can serve as good trap crop (Mittal and Prasad, 2005).

Resistant varieties : It is cheap, easy to recommend and most practical method of phytonematode control to farmers. During the last few years, nematologists and breeders followed the conventional approaches of plant breeding to transfer nematode resistance genes into agronomically superior cultivated species. Crop cultivars resistant to phytonematodes can be most useful and cheapest means of nematode control for small-scale farmers. This involves a cross between resistant source usually wild type related species with commercial type plant species. In subsequent steps, F₁ hybrids are back crossed with cultivated species to combine resistance factor however, it is now accepted that on long-term basis polygenic horizontal resistance to nematodes is more desirable than vertical resistance governed by mono gene. Secondly, presence of biotypes of *Meloidogyne* spp. which break resistance of cultivated crops.

Adjusting planting time/escape cropping : This is a practice of reducing nematode damage by growing crops at times that are not favourable for the nematodes such as when temperatures are too low or too high for infection or development or when populations of the nematodes have declined to low thresholds. Sethi and Gaur (1986) found that adjustment of dates or seasons of planting can help to avoid nematode damage to crops for example crops such as tomato, egg plant and other susceptible vegetables are planted in the cooler winter (rabi) months to avoid root-knot nematode damage.

(II) Physical Control

In this method of control, plant-parasitic nematodes are basically eradicated by steam sterilization, hot water treatment, electrical soil heating, radiation treatments, seed cleaning, heat treatment, etc. But, soil solarization is the most recent practice for control of phytonematodes. The nematodes are effectively controlled but the method is restricted to summer seasons and that too only in tropical and sub-tropical regions of the world.

(III) Biological Control

Biological control or biocontrol is broadly defined as the “use of natural or modified organisms, genes or gene products” to reduce the effects of pests and diseases. The different approaches to biological control can be categorized simply into three strategies 1) Regulation of the pest population 2) exclusionary systems of protection and 3) systems of self-defense. This method of control is more inconsistent, less effective and slower acting than control normally achieved with chemicals. This method includes the use of predaceous and parasitic organisms such as fungi, bacteria, viruses, nematodes, tardigrades, mites, etc. (Goswami and Mittal, 2004)

In recent years with the development of a number of fungal bioagents isolated from egg masses of *M.incognita* infecting



vegetables and categorization of two types i.e, a) toxic and b) egg parasitic ones. (Goswami *et al.*, 2005; Mittal and Goswami, 2001; 2005). Attempts have been to test the performance of two types alone as well as together. The combined effect of a toxic bioagent *Aspergillus terreus* with an egg parasitic one, *Paecilomyces lilacinus* showed better performance in reducing nematode population with improved plant health of tomato than when either of the above fungi was used alone. Similar finding is observed by Goswami and Mittal (2000) when *A. fumigatus* was applied to the soil along with *Trichoderma viride* on tomato infested with *M. incognita*. The combined effect of both fungal bioagents *T. viride* and *P. lilacinus* for the control of root-knot nematodes is mainly based on the toxic effect of former followed by the egg parasitic ability of the latter (Mittal, *et al.*, 2005; Mittal and Prasad, 2005). Thus, a reasonable number of the infective second stage juveniles occurring in the soil around the root zone of affected plants would be reduced. The remaining juveniles expected to be less in number as also possessing lower rate of infectivity due to the toxic effect of *T. viride* would invade the roots. Out of these reduced number of juveniles which in turn would invade the fresh egg masses, very few would develop into adult which are attacked by *P. lilacinus* resulting in the production of mostly unviable eggs. Many of the eggs due to this fungus are found empty.

Biopesticides of Botanical Origin

Biopesticides of botanical origin have become the focus of attention today for facing the nematode problems in an eco-friendly manner. (Stirling *et al.*, 2005) The use of botanical pesticides is now emerging as one of the prime means to protect crops and their products and the environment from pesticide pollution, which is a global problem. When extracted from plants, these chemicals are referred to collectively as “botanicals”. Generally, botanicals degrade more rapidly than most conventional (synthetic) pesticides, and so are considered relatively environmentally benign and less likely to kill beneficial insects, mites and nematodes than pesticides with longer residual activity. Since most of them generally degrade within a few days, and sometimes within a few hours, these biopesticides are being frequently used for the management of phytoparasitic nematodes. In India, botanical pesticides are available in many plants for which deep search and testing is required as many of them are still unexplored. As they are available in bulk, they are expected to be cheaper in comparison to synthetic chemicals. Moreover, the farmers can prepare their crude extracts for their use in field. Many plants and plant products when applied in soil are known to cause reduction in the nematode population below damaging level. In few cases plants have been found to be actually antagonistic towards nematodes and some have been shown to produce toxic materials inhibitory to nematodes. (Mojumder and Mishra, 2001)

The botanicals can be used in different ways to reduce nematode infestation viz.,

- By using the parts of botanicals directly.
- By using the extracts of parts of botanicals.
- By using compounds of botanicals possessing nematicidal activities.
- By using plants as oilseed cakes, mature crop residues and organic amendments.

Many plants possess nematicidal and nematostatic properties in their roots, shoot, leaves, flowers, seeds etc. and their extracts, essential oil, oilseed cakes and products have been successfully tested against variety of phytonematodes. As various agricultural plants possess nematicidal activities in their different parts, their parts as such or after chopping if incorporated into the soil would reduce the nematode population and severity of root knot nematode infection (Mittal and Goswami, 2003). The effective parts of plants which have been found to possess nematicidal properties are stems, leaves, roots, fruits, and seeds. Plants are an important source of naturally occurring pesticides. Many compounds with nematicidal activity have been found in plants including alkaloids, diterpenes, fatty acids, glucosinolates, isothiocyanates, phenols, polyacetylenes, sesquiterpenes and thienyls. Oil seed cakes have been widely used to suppress nematode population in soil. Generally amendments of oil seed cakes in soil suppressed the population of phytonematodes through toxic decomposed products like phenolics, ammonia or increased predacious and parasitic activity of soil biota. Similarly the use of cotton waste, alfalfa pellet, alfalfa hay, castor pomace, olive pomace, dried crop residues, corn and soybean meal have been found effective. Different types of oil seed cakes like castor, mahua, mustard, linseed, peanut etc. not only reduced nematode infection and galling but also reduced nematode population in roots and soil and their egg laying capacity. Soil application of leaf and seed kernel of Castor and Karanj @ 10q/ha was found nematicidal against *Rotylenchulus reniformis* and improved plant growth of cowpea.

(IV) Integrated Nematode Management

This deals with the combining of two or more strategies to manage one or more nematode species for increasing crop productivity. These strategies can be applied sequentially or simultaneously. It requires: (i) determining whether pathogenic nematodes are present within the field (ii) determining whether nematode population densities are high enough to cause



economic loss and (iii) selecting a profitable management option. Attempts to manage nematodes may be unprofitable unless all of the above Integrated management procedures are considered and carefully followed. Similarly, some management methods pose risk to people and the environment. The first approach includes the season to season or year to year integration of strategies and is particularly relevant to annual cropping cycles. The second major approach to INM involves simultaneous application of two or more strategies. Increased public concern about nematicide and pollution of streams and groundwater, effects on farm worker health, impacts on non-target species and general food safety has generated interest in programs with the potential to reduce these factors while maintaining farm productivity and profitability. (Nageswari and Mishra, 2005)

The following points suggests ways to increase agricultural productivity of farmers besides different methods mentioned above for nematode control and thereby thus doubling their income if followed religiously :

Transport facilities : To facilitate the farmers to produce new farm inputs and enable them to sell their product in markets, villages should be linked with mandies. It would help to raise their income which in turn stimulates the farmer's interest to adopt better farm technology with sufficient income.

Irrigation facilities : Crop productivity depends not only on the quality of input but also on the irrigation facilities. Therefore, canals, tube wells should be constructed to provide better irrigation facilities for the security of crops. Extensive flood control measures should be adopted to prevent devastation caused by floods.

Institutional credit : To save the farmers from the clutches of money lenders, adequate credit facilities should be made available at reasonable cheap rates in rural areas. The land mortgage banks and co-operative credit societies should be strengthened to provide loans to the cultivators. Moreover, integrated scheme of rural credit must be implemented.

Proper marketing facilities : Marketing infrastructure should be widened and strengthened help the farmers to sell their products at better prices. There should be proper arrangements for unloading of the produce in the markets. Besides, price support policy must be adopted and minimum prices should be guaranteed to the peasants.

Supply of quality inputs : The farmer in the country should be supplied with quality inputs at proper times and at controlled prices. To protect the farmers exploitation, effective steps are needed to be taken to check the sale of adulterated fertilizers.

Consolidation of holdings : In various states consolidation of holdings is not satisfactory. Therefore, efforts should be made towards completing the consolidation work in the specific period of time. Big areas of land which are lying waste can be reclaimed and made fit for cultivation.

Agricultural education : In a bid to guide and advise the farmers regarding the adoption of new technology arrangements should be made for agricultural education and extension services. It would assist the farmers to take proper crop care leading to increase in crop productivity.

Reduction of population on land : As we know that in our country, majority of population depends on agriculture to earn their both ends meet. This increase the pressure of population on land which leads to subdivision and fragmentation of land holdings. Therefore, proper climate should be generated to encourage the farm people to start employment in subsidiary occupations. It will help to reduce the population pressure on land. Surplus labour should be withdrawn from agriculture sector and be absorbed in non-agricultural sector.

Provision of better manure seeds : The farmers should be made familiar with the advantage of chemical fertilizer through exhibitions and these inputs should be made easily available through co-operative societies and panchayats. Liberal supplies of insecticides and pesticides should be distributed at the cheap rates all over the country side.

Land reforms : It is also suggested that efforts should be made to plug the loopholes in the existing land legislations so that the surplus land may be distributed among the small and marginal farmers. The administrative set-up should be streamlined and corrupt elements should also be punished. It will help to implement the law properly.

Cooperative farming : To check the sub-division and fragmentation of holding, the movement of co-operative farming should be launched. Co-operative farming would result in the adoption of modern technology on so-called big farms. In this way, agriculture will become profitable occupation through economies of large-scale farming.

Development of cottage and small scale industries : In rural areas, more emphasis should be made to set up cottage and small scale industries. This will raise the income of peasants and keep them busy during the off season.



CONCLUSION

Scientists all over the world are now looking towards eco-friendly selective, biodegradable, safe and economical biopesticides for use in integrated nematode management programmes. The success of integrated nematode management will depend on a wide range of appropriate expertise on research/demonstration/training projects. It requires a strong research base, to provide information on nematode pests, crops, agronomic practices related to the crop and their interactions. In addition to these, they should also possess communication skills which are needed to work with farmers. Similarly, farmers with their available resources could follow integration of cultural, biological, chemical methods and resistant varieties in suitable combination for each crop cultivation system. However, the bio-pesticide appear to have promising role for development of future commercial pesticides not only for agricultural crop productivity for increasing farmers income but also for safety of the environment and public health. The cost benefit ratio should always be kept in mind before using or applying these plants or their products for nematodes management and will also bring sustainability to agriculture.

REFERENCES

1. Gaur H.S. (1995). *Some ecological considerations of integrated nematode management*. In Nematode Pest Management-An Appraisal to eco-friendly Approach (Eds.) Swarup, G., Das Gupta D.R and Gill, J.S. New Delhi, NSI Publication.
2. Goswami, B.K and Mittal, A. (2004). Management of root-knot nematode infecting tomato by *Trichoderma viride* and *Paecilomyces lilacinus*. *Indian Phytopath* 57 (2) : 235-236.
3. Goswami B.K; Mittal A. and Singh S. (2005). Management of disease-complex caused by root-knot nematode, *Meloidogyne incognita* and root rot fungus, *Rhizoctonia solani* on Balsam, *Impatiens balsamina* by fungal bioagents. *Pesticide Res. J.* 17 (1) : 19-22.
4. Goswami B.K. and Mittal A. (2002). Effect of some fungal bioagents on root-knot nematode, *Meloidogyne incognita* infecting brinjal. *Pakistan Journal of Nematology*, 20 (1) : 5-59.
5. Mittal A. Kumar, V. and Ahmad, I. (2000). Status and prospects of Nematode resistance in crop plants-a review. *Agricultural Reviews* 21 (1) : 16-25.
6. Mittal A. and Goswami B.K. (2001). Role of undi oil seed cake for the management of disease complex caused by *Fusarium solani* and *Meloidogyne incognita* on brinjal. *Pakistan J. Nematol* 19(1/2) : 87-90.
7. Mittal A and Goswami B.K. (2003). Antagonistic botanicals to plant parasitic nematodes and their use in nematode management. (Eds. P. C. Trivedi in book Nematode management in plants) 133-143.
8. Mittal A. and Goswami B. (2005). Interaction of *Meloidogyne incognita*, root-knot nematode of tomato and soil fungi. *Pakistan J. Nematol* 23 (2) : 259-264.
9. Mittal A. and Prasad D. (2005). *Paecilomyces lilacinus*: Fungal Bioagent for controlling Phytonematodes in book entitled "Crop Protection Management Strategies", Daya Publishing House, New Delhi, 549-560.
10. Mojumdar V. and Mishra S.D (2001). Seed coating of pigeonpea with neem formulations for the management of *Heterodera cajani* and other phytoparasitic nematodes. *Current Nematology* 12 (1/2) : 7-10.
11. Mojumdar V. and Mishra S.D. (1991). Nematicidal efficacy of some plant products and management of *Meloidogyne incognita* in pulse crops by soaking seeds in their aqueous extracts. *Current Nematology* 2(1) : 27-32.
12. Nageswari S. and Mishra S.D. (2005). Integrated nematode management schedule incorporating neem products, VAM and soil solarization against *Heterodera cajani* infecting pigeon pea. *Indian J. Nematol* 35(1) : 68-71.
13. Nageswari S. and Mishra, S.D (2005). Neem formulations as seed treatment against *Heterodera cajani* infecting pigeonpea. *Ann. Pl. Protec. Sci.* 13 (2): 515 -516.
14. Prasad D., Mittal A. and Yaduraju N.T. (1995). (Abstr.) Nat. Symp. Perspectives in Eco-friendly approaches to plant protection. Soc. of Pl. Protect Sci. 7-8, Sept. IARI, New-Delhi.
15. Prasad D. and Mittal A. (2004). Effect of Calotropis, oilcakes and phorate on growth of soybean and *Meloidogyne incognita* population. *Annals of Plant Protection Sciences*. 12(1): 234-235.
16. Sasser J.N. and Freckman D.W. (1987). A world perspective on Nematology. The role of the society. In vistas on Nematology a commemoration of twenty fifth anniversary of the society of Nematologists (Eds. J.A. veech and D.W. Dickson). Society of Nematologists. Inc. Hyattsville. M.O. 7-14.
17. Seshadri A.R. and D.R. Dasgupta (1980). Handbook of Agriculture, New Delhi: ICAR, 551-557.
18. Sethi C.L and H.S. Gaur (1986). Nematode management: An overview. In: Plant Parasitic Nematodes of India-Problems and Progress, 424-445.
19. Stirling G.R; Wilson E.J; Stirling A.M; Pankhurst C.E; Moody P.W; Bell, M.J and Halpin, N. (2005) Amendments of sugarcane trash induce suppressiveness to plant parasitic nematodes in a sugarcane soil. *Australasian Plant Pathology* 34(2): 203-211.
20. Vijayalakshmi K; Mishra S.D and Prasad S.K. (1979). Nematicidal properties of some indigenous plant materials against second stage juveniles of *Meloidogyne incognita* (Kofoid and White) Chitwood. *Indian J. Entomology* 41 (4) : 326-331.



ENANTIOSTYLY IN *TAMARINDUS INDICA* L. (FABACEAE) – POLLINATION MECHANISM, SELF-INCOMPATIBILITY LINKED TO EVOLUTION – ARE THERE ANY UNANSWERED QUESTIONS

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Abstract

Tamarind (*Tamarindus indica* L.), commonly termed as Indian date, one of the most important forestry based trees of marginal land, widely cultivated in tropical regions providing a range of produce for domestic and industrial purposes. The productivity of Tamarind tree, under natural conditions is rather very low to low which is mainly attributed to lower fruit set (<1 per cent). Although it produces flowers profusely, large scale abscission of flowers and even early formed fruits has been noticed hence believed to be the prime cause for lower fruit set. When flowers were bagged resulted in no fruit set. However, when flowers were artificially pollinated either using pollen arising from the same plant (self) and or neighboring trees (cross), it was observed that selfed pollen failed to convert flower in to a pod while the crossed pollen could help in increasing the fruit set up to 88 per cent. Intriguingly, crossed fruits were thicker with bold seeds whilst of those selfed pods were more often flat and less sized seeds. Out of 83 tress studies for Self Incompatibility, only one tree was highly compatible (100 per cent), majority was less compatible and a few trees were completely incompatible. This observation has a bearing on establishment of orchards where Self-compatible trees have to be planted or while planting care has to be taken to mix the trees which are compatible and or in compatible to harvest good fruits. Lack of fruit set after bagging observation has made many workers to conclude that it is self-incompatible. Further, the self-incompatibility was characterized by following different methods of pollination and characterized to be Late Acting Self Incompability where the embryo which starts developing abort on a selective basis more often those which arise through selfing are aborted. Either the entire fruit falls off or a seed which is developing will abosrt leading to a constriction within the pod.

Studies on Tamarind indicated that it is known to exhibit Monomorphic Enantiostyly; a type of herkogamy, where the styles are abruptly deflected towards wing petal within a flower, either to left or to right side of the floral axis, eventually resulting in a mirror image flowers. Enantiostyly might have evolved as a mechanism to promote cross pollination especially in bisexual plants. In fact, it is also wide spread mechanism observed in *Cassia* group. The deflection of style is at random with a segregation of 50 to left and 50 to right (Chi Square NS) at both inflorescence level, at plant level, across days within a plant and even at population level. The adaptive significance of enantiostyly was obscure hence an attempt was made to ascertain its importance in pollination and linked to productivity with an hypotheses that the deflection to a particular side may be high yielding trees *vice versa*. Observations, mainly from the point of pollinators behavior, it understood that the flower of Tamarind has been modified to suit for landing by a bee on to wing petal only and the deflection of style and also placing style just above wing petal ensures contact to the dorsal surface of the bee; eventually receive the pollen first and once the pollinator move to the centre zone of the flower and starts collecting nectar from the keel petal; which has been modified and possess nectar, the dorsal surface of bee comes in contact with the anthers which eventually results in pollen donation. This ensures 100 cross pollination if the bee is visiting from an adjacent tree in a population. But the bee visitation pattern seems to promote geitanogamy; a type of pollination system which is as good as selfing owing to serial visit of bee within a tree between flowers. But enantiostyly is ultimately linked to pollination efficiency and productivity. It was hypothesized that styler deflection to left or right and bee landing on to left or right wing petals are acting as two independent variables. This ultimately results in four combinations *viz.* left bending of style and left or right landing of bee *vice versa*. In fact, pollination in any Tamarind tree shall be up to 50 per cent only as an evolutionary constraint. Because left landing by a bee and left deflection of style can result in successful pollination; only when the dorsal surface of bee comes in contact with the style, however when the same been lands on left petal with right deflection does not ensure any pollination. This is how Tamarind has pollination efficiency up to 50 per cent. Among the pollinators which visit Tamarind are *Apis dorsata* (Rock bee); the most perfect bee for pollination because of its size, it can establish contact both the style as also to anthers all the time followed by *Apis cerana india*; the next best pollinator though it is smaller than *Apis dorsata* its efficiency of pollination is low but not nil. However, almost 18 different species of insects have been reported to be the pollinators in Tamarind have raised a question that except *Apis dorsata* no other species of insects could be as useful in effecting pollination. In addition, *Xylocopa* or bumble bees are also found to be effective as they go for buzz pollination but do not follow any rule of landing. *Apis dorsata* is the only bee species which follows 100 per cent landing rule followed by *Apis ceran india*. Smaller the bee size more is the chances of



breach the landing rule. Tamarind plant has evolved a strategy of landing rule to ensure pollination. If any insect which do not follow landing rule are simply visitors and not the pollinators. Tree to tree variation for the gap is too high. Hence, in a population some trees get pollinated by *Apis cerana india* as well. The original home of Tamarind is said to be Mayamnar region which has almost naturalized in Indian sub-continent. However, a question still unanswered is that which could have been the insect which might have evolved in its original place as a effective pollinator.

Phenology of tamarind trees in a population (N=83) across two consecutive seasons revealed that around 60 per cent trees bloom in any blooming season. The flowering started from second week of April and extended up to first week of August; flowering period lasted 3-4 months. Tree to tree variations were evident. There is a shift in flowering time across latitudes; southern Indian region, the blooming period is March – April which it is late in the Northern parts of India. Blooming in Tamarind trees at a given place is linked to rainfall pattern of previous years; better rainfall induce early blooming and scanty rainfall advance the blooming period. Several issues about Tamarind pollination mechanism, self-incompability issues and year to year blooming variations have been discussed in the paper.



CHARA AS POTENTIAL SOURCE OF BIOACTIVE COMPOUNDS

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The potential wellspring of bioactive compounds from algae to upset the medicinal services has been well-promoted. The bioactive substances produced by actively growing cells of algae includes proteins, fats, lipids, carbohydrates, phenol, flavonoid, vitamins, free amino acids, enzymes, growth regulators, pigments, toxins and antibiotics. Truth be told a few items created through some bioactive compounds in the green and blue green algae, these life forms are a rich wellspring of fundamentally novel and organically dynamic metabolites such as antimicrobial, antiviral, antifungal, anti-allergic, anticoagulant, anticancer, antifouling and antioxidant activities dressing. The utilization of bioactive compounds from algae such as *Chara* to the farming are announced as antimicrobial. Notwithstanding, the maximum capacity of bioactive compounds in the agribusiness has still not been figured it out.

Algae are significant segment of oceanic biological system, regularly observed developing at hotter temperature. The Biomass constituents changes with accessible supplement supply however green algae are known for delivering a few naturally dynamic compounds with antiviral, antibacterial, antifungal and anticancer exercises. The extraction of bio dynamic compounds varies as indicated by the idea of dissolvable utilized. Phenolic compounds get extricated in polar dissolvable with contrasting yield, flavonoids in non-polar solvents, strategy for extraction, for example, soxhlet extraction yields heat stable segments, where as chilly extraction yields different lipid. In the past examination of the impact of various solvents, with expanding request of extremity on crisp water green algae to create elective biodegradable regular exacerbates that are all the more ecologically adequate interchange to anti-microbial agents for aquaculture. The disclosure and utilization of characteristic and normal based compounds has been attempted to control hurtful green algae in amphibian frameworks as an option in contrast to engineered Algicides. The announced examinations include lysine and its analogs, Ferulic corrosive, Transcinnamic corrosive, anthraquinone, 1,3-dichloronaphthoquinone, bacillamide fischerellin B, 12-epi-hapalindole-F oxygenated unsaturated fats and potassium ricinoleate harmane and rutacridone epoxide. The algacidal movement of the cyanobacteria has been primarily seen in various genera, for example, *Anabaena*, *Microcystis*, *Calothrix*, *Fischellera*, *Nostoc*, *Nodularia* and *Phormidium*.

Green algae have a critical fascination as a characteristic wellspring of bioactive particles with a expansive scope of natural exercises. The primary examination on anti-microbial action of algae was completed by Pratt. Pastly a days green algae have turned out to be significant constituents, for their bioactive compounds. Algal compounds are incredible enthusiasm as a wellspring of more secure or more successful substitutes than the artificially produce antimicrobial specialists (Snehalatha *et al.*, 2017). In the ongoing years, the enthusiasm for the investigation of green algae as wellsprings of bioactive compounds has expanded. Past investigations demonstrate the nearness of some bioactive compounds in the blue green algae, these living beings are a rich wellspring of basically novel and organically dynamic metabolites (Ely *et al.*, 2004, for example, antimicrobial (Bouhlal *et al.*, 2010), antiviral (Bouhlal *et al.*, 2011, Kim and Karadeniz, 2011), antifungal (de Felicio *et al.*, 2010), hostile to unfavorably susceptible (Na *et al.*, 2005), anticoagulant (Dayong *et al.*, 2008), anticancer (Kim *et al.*, 2011), antifouling (Bhadury and Wright, 2004) and cell reinforcement exercises (Devi *et al.*, 2011). Concentrates of marine green algae were accounted for to show antibacterial action. When all is said in done, segregation of bioactive compounds from cyanobacteria is done to find new compounds for pharmaceutical, horticultural or bio control application. Numerous marine normal items have novel practical gatherings and sub-atomic structures thought about to those from earthly sources. Until this point in time, 21,800 common items have been depicted from marine creatures. Auxiliary metabolites from marine living beings are a significant wellspring of biomolecules for medication disclosure and improvement. Since its commencement in the 1950's, a bunch of novel marine determined compounds with exceptional carbon skeleton never been accounted for from earthly source, have been distinguished. Some of these characteristic items have intense natural properties and right now are either in preclinical or clinical testing for the treatment of different human illnesses. The significant compounds distinguished as antimicrobial are unsaturated fats, acrylic corrosive, halogenated aliphatic compounds, terpenes, sulfur containing hetero cyclic compounds, sugars and phenols (Kannan *et al.*, 2010).

Explored the phytochemical and natural screening of *Chara* and material gathered. Phytochemical screening was guaranteed by substance investigation and the methanol separate uncovered the nearness of D-Norandrostane-16-carboxylate, 17B-hydroxyandrost-4-en-3-one. The concentrate of *Chara* was tried for the nearness of essential and optional metabolites



and antibacterial movement. Around 7310 types of green algae present in fresh water. Among these a large portion of them are blue green algae and green algae. Nature has given numerous things to mankind over years including for the instrument and remedial intercession. To allude herbs, home grown cosmetics dietary enhancements or elective drug. Green algae are autotrophs, a gathering of chlorophyll containing thalloid plant, orchestrate their sustenance material. Green algae, organisms and lichens are assembled under the division of thallophyta (GS *et al.* 2010). The colors run of the mill of higher plants, likewise g-carotene was distinguished in antheridia and without precedent for sterile examples of *Chara tomentosa*. Likely there exists two portions of β -carotene, one intently connected with g-carotene in independent compartments, the other free of g-carotene and situated in the photosystems. Chlorophyll a based on fiery remains free dry mass was equivalent to that of planktonic green algae and submerged angiosperms (about 0.5%), in any case, shade content differed in a wide range, proposing adjustments to biological conditions such as light or temperature. These crisp and dry mass are not reasonable as a kind of perspective amount in stoneworts because of high calcium carbonate precipitation.

Microorganisms have grown new methodologies to avoid the activity of anti-microbials, prompting different medication safe bacterial strains. With expanding obstruction of pathogens to anti-microbials, there is a general wellbeing need for investigating and creating less expensive and powerful characteristic antimicrobial specialists with better potential, less reactions than anti-microbials, great bioavailability, and insignificant poisonous quality. It is likewise beneficial to test the *marine* antimicrobials for conceivable synergism with existing medications. Refreshed data on this exploration region has been ordered as of late, including the antiviral properties of *marine* life forms, the ocean growth related bacterial and parasitic networks, and the assorted variety and bioactives generation of action bacteria related with the *marine* living beings. Vatsos and Rebour explored the antimicrobial properties of ocean growth concentrates related with aquaculture. The antimicrobial impacts of phlorotannins from dark colored green algae, in connection to the sustenance and pharmaceutical ventures. Abu-Ghannam also, Rajauria surveyed the algal antimicrobials with potential nourishment applications. The examinations indicating natural exercises of concentrates from local and some non-local Brazilian ocean growth and the exploration advancement concerning the segregation and basic explanation of the auxiliary metabolites from the sort *Cystoseira* were outlined. The goal of this work is to accumulate the as of late distributed data on the antimicrobial properties of compounds from kelp, their extraction what's more, the significant applications. The filtered concentrate was additionally broke down for its antimicrobial movement against *Xanthomonas campestris*, *Pseudomonas syringue*, and *Agrobacterium tumefaciens*. Well dissemination strategy uncovered that the *Chara* remove indicated most extreme hindrance zone in *Pseudomonas syringue* than *Agrobacterium tumefaciens* and, *Xanthomonas campestris*. Writing uncover that action of green algae has confirmed on different bacterial strains. In the past work *Chlorosarcinopsis* sp, *acholrophycean* unicellular alga when removed with various solvents, displayed different scope of movement against every single bacterial strain tried. Antibacterial against both Gram negative and Gram positive microscopic organisms contrasted with the benzene and methanol concentrate and its contains numerous alkaloids. Green algae individuals demonstrated higher antimicrobial action than red green algae. The antimicrobial movement in Gram negative microscopic organisms *Pseudomonas* species indicates most extreme hindrance in *marine* green algae and new water green algae. Methanol have higher antibacterial action than that of concentrates got natural solvents (Kuamr *et al.*, 2000).

Algae are an incredible wellspring of complex characteristic product that could be a promising wellspring of new bioactive intensifies that can help plant survival by giving security against stress forced by pathogens. Kelp produces metabolites helping in the insurance against various ecological stresses. These compounds show antiviral, antiprotozoal, antifungal, and antibacterial properties (Bouhraoua *et al.* 2018). Macroalgae can be refined in high volumes and would speak to an alluring wellspring of potential compounds valuable for unpredictable medications ready to control new infections or multiresistant strains of pathogenic microorganisms. The substances disengaged from green, dark colored and red green algae appearing powerful antimicrobial action have a place with polysaccharides, unsaturated fats, phlorotannins, colors, lectins, alkaloids, terpenoids and halogenated compounds. This audit exhibits the significant compounds found in macroalga demonstrating antimicrobial exercises and their most encouraging applications (Perez *et al.*, 1990). The shore of new is especially wealthy in algal biodiversity, it contains 143 algal species, with a significant monetary, social and ecologic potential. The point of this examination is to screen the algal species in request to utilize it for antifungal arrangement. The inhibitory impact of 22 *marine* green algae species has been assessed against *Bipolaris sorokiniana* causative specialist of helminthosporal scourge utilizing five natural concentrates (Methanol, Butanol, Methanol/Dichloromethane (50/50), Dichloromethane, and Hexane). Of the 22 species contemplated, those having a place with the *Rhodophyceae* and *Phaeophyceae* were the most dynamic, while *Chlorophyceae* have a low hindrance. Most extreme restraint of *Bipolaris sorokiniana* was acquired by concentrates arranged in methanol and dichloromethane/methanol and the red alga *Gracilaria* sp., speaks to the critical restraint of the pathogen.



Algae have a critical fascination as common wellspring of bioactive atoms with a wide scope of organic exercises, for example, anti-microbials, antiviral, hostile to tumor, cell reinforcement and mitigating proof of phytochemical and pharmacological examinations are accessible. They produce a greater part of concoction metabolites to the encompassing. A portion of the bioactive constituents acquired from green algae are amino acids, terpenoids, phlorotannins, steroids, phenolic compounds, halogenated ketones, alkenes and cyclic polysulphides. Green algae are perhaps the most extravagant hotspot for some known and novel bioactive compounds with a great deal of differed pharmacological exercises, to be specific, anticoagulant, antithrombotic (Adhikari *et al.*, 2006), antiviral, antitumor (Nishino *et al.*, 1981), antioxidant, anti-inflammatory, antimicrobial, reducing blood lipids, therapeutic potential in surgery, immunomodulatory activity (Ahmad *et al.*, 1992; Ghazala *et al.*, 2005; Uma *et al.*, 2011) and against hepatopathy, and uropathy (Jacobsen *et al.*, 1983).

In the past decades, various specialists have examined the substitution of compound pesticides by natural parts of various plant and microalgal sources as bug spray operators (Nassar *et al.*, 1999), acaricide specialists (Amer *et al.*, 2000; Duke, 2002) and fungicidal specialists (Safonova and Reisser, 2005, Volk and Furkert, 2006; Ibraheem and Abdel-Raouf, 2007; Hassan, 2007). These characteristic materials notwithstanding their deadly exercises on bugs, safeguards nature of contamination, keep up the equivalent appropriation of fauna and furthermore to keep the valuable creatures. Growths and microbes are the primary organic operators that have been read for the control of plant pathogens, especially soil-borne fungi. Cyanobacteria have gotten little consideration as potential biocontrol specialists of plant maladies (Hassan, 2007). Kulik (1995) distributed a writing audit abridging the potential for utilizing cyanobacteria and green algae in the natural control of plant pathogenic microorganisms and parasites. Caire *et al.* (1997) announced that various centralizations of weaken fluid concentrate from nitrogen-fixing cyano-bacterium *N. muscorum* were effective in the control of a damping-off. One of the cutting edge and progressed biotechnological inquires about is that led on the utilizing of various algal taxa of various environments (marine, new and soil) as an organic control for some creature or plant illnesses and furthermore against rural irritations. A portion of these researchers studied the counter microbial exercises against some human pathogenic microscopic organisms, growths and lethal small scale algae. The upgraded inquire about movement regarding the matter of natural control is inline with expanded exertion and assurance by microbiologists to adjust to the applied plan of coordinated vermin the board as an adequate eco-framework way to deal with infection control and to understand that organic control must end up one of the fundamental segments in nuisance the board rehearses (Hassan, 2007).

Chara corallina with the low contamination obviously shows that these macrophytes favor water with altogether diverse supplement fixations for their development, and can be utilized as markers of contamination status nature of water. Green algae are the significant gathering of plant kingdom, they happen in verity of living spaces. Green algae are currently a days turned out to be very significant constituents, they are significant suppliers of a wide cluster of bioactive compounds including plant development controllers like gibberellin, auxin, cytokinin, ethylene, abscisic corrosive and jasminc corrosive (Iain *et al.*, 1977).

Embraced to survey the water nature of freshwater lakes supporting vegetation of *Chara corallina*, and furthermore reasonableness of best development medium to develop *Chara corallina*, for its abuse as a hotspot for carbon sequestration programs. Physico-substance parameters of water supporting development of *Chara corallina* additionally demonstrates that *Chara* would lean toward clean water for its foundation and further development. These water bodies need rich biodiversity, might be expected to non-dirtied and poor degrees of nitrogen furthermore, phosphorus (Singh *et al.* 2005).

Chara concentrate were tried for the nearness of essential and auxiliary metabolite. The tests demonstrated the nearness of sugars, proteins, alkaloids, steroids, flavonoids and unsaturated fats, similar to D-norandrostan-16- carboxylic corrosive and steroid like 17 β -hydroxyrost-4-en-3-one in *Chara* and demonstrated the nearness of antimicrobial movement. As indicated by our perception, it was seen that the most noteworthy level of antimicrobial movement in *Pseudomonas syringae* than *Xanthomonas compestris* and *Agrobacterium tumefaciens*. This entire research has been done to know the restorative properties and significance (GS *et al.* 2018).

A depolarisation of the layer potential distinction (about-170 mV) of *Chara corallina* is seen because of changes in cell turgor weight utilizing the weight test system. The depolarisation happens in stage with the weight heartbeat (0.2s term) and is autonomous of the course of the connected weight slope. This last finding is in inconsistency to results anticipated based on electro-dynamic marvels. Weight instigated electrical spillages were discounted by estimating the depolarisation because of weight in individual sections of the internode which were electrically detached from each other. The adjustments in potential were recorded by outside anodes and an inside terminal which was situated near the micropipette of the weight test embedded through one of the electrically disengaged hubs.



The depolarisation because of expanding positive or negative weight angles in the flawless hub locale and in the unblemished center fragments was equivalent to that observed in the hub area containing the weight test. Activity possibilities were started when the weight inclinations surpassed in any event 2 bar. The activity possibilities were evoked aimlessly in one of the two compartments neighboring the hub areas, yet were never observed to be started in the hub districts themselves. The weight instigated activity possibilities are clarified as far as an electro-mechanical pressure (or extension) of a neighborhood film region and examined in their importance to the spread of weight flag because of water and salt worry in higher plants.

The capability of algae goes a long ways past biofuels, with various endeavors in progress to place algae in everything from nourishment to soil revisions to water treatment frameworks. Among the subtleties in Matt's introduction was this slide demonstrating that algae normal biomass yields far surpass numerous conventional crops. The profitability of algae cultivating is plainly amazing, however so is the maintainability profile. Since algae can develop on peripheral grounds, and in water that is unsatisfactory for customary cultivating, the effect of algae development on the earth is much lower than with numerous other crops and on the subject of carbon emanations, green algae cultivating can't be beat with regards to battling atmosphere change. In certainty, some ongoing exploration has demonstrated that huge scale green growth development could even assume job in switching environmental change. Algae become very quick, and need huge amounts of carbon dioxide for photosynthesis. This makes them in a perfect world fit to expend the carbon dioxide radiated from power plants or different procedures before the gas escapes into the air. It additionally implies that territories with huge carbon dioxide supplies may be appropriate to develop algae. The appropriation of coal-terminated power plants and ethanol creation offices in the US shows what districts may have the biggest amounts of CO₂ accessible for nearby algae production. You will see one state with especially great carbon assets for algae generation. Texas. Indeed, the whole Gulf Coast offers some perfect conditions for algae ranchers over various factors, carbon supplies, atmosphere and water (ABO, 2019).

Fungi often infect crops either in the field after harvesting resulting in considerable economic losses to farmers and producers worldwide. A portion of the major phytopathogens influencing sustenance creation additionally cause genuine, and regularly deadly, diseases in man. Taken together, this fairly little gathering of organisms influence the wellbeing and prosperity of a large number of people around the world. Colossal financial issue can happen, both from horticultural issue and restorative consideration costs. Research is expected to build up a progression of novel antifungals focused on explicitly for specific individuals from this multi-sickness creating gathering. Fruitful advancement of such antifungal compounds could demonstrate in the end helpful in fighting irresistible and poison creating growths in both the rural and restorative fields. Plants might be a decent wellspring of such compounds since they have needed to create compounds to oppose parasitic diseases. Biological activities, for example, anti-toxins, antiviral, hostile to tumor, cell reinforcement and mitigating proof of phytochemical antibiotics, antiviral, anti tumor, antioxidant and anti-inflammatory evidence of phytochemical and pharmacological examinations are accessible. They produce a greater part of synthetic metabolites to the encompassing. A portion of the bioactive constituents acquired from algae are amino acids, terpenoids, phlorotannins, steroids, phenolic compounds, halogenated ketones, alkenes and cyclic polysulphides. Cold extraction and utilizing diverse natural solvents of expanding request of extremity has distinguished numerous lipidous compounds with antimicrobial properties, can be utilized as potential objective for treating contaminations in aquaculture. Ordinarily in crisp waters, the small scale algae and *Chara* are perceived by their poisons. These poisons incorporate an assorted variety of nitrogen-rich alkaloids and peptides, dreaded by man yet additionally have an enormous potential for the improvement of pharmaceutical and agrarian applications. Exaction of bioactive compounds to a great extent relies upon dissolvable and strategy embraced for extraction.

At long last, it is finished up from *in-vitro* discussion we concluded that rough concentrates of *Chara* species demonstrated to be commendable by indicating antifungal character in various solvents utilized against the various pathogens in the past examination. It shows that the *Chlorophyceae* individuals additionally have a few therapeutic properties against tried pathogens, in perspective on this in future the examination is required further to distinguish the bioactive compounds and their cleansing and recognizable proof to know the compound properties this alga.

REFERENCES

1. A.B.O. (2018). *The Potential of Algae in Agriculture and Carbon Capture*. Pp: 16–19. <https://algaebiomass.org/blog/10213/potential-algae-agriculture-carbon-capture>.
2. Abdel-Raouf, N. and Ibraheem, I.B.M. (2001). Efficiency of *Dunaliella* sp. and *Aphanocapsa elachistai* removing of copper and nickel from culture media. *Az. J. Microbiol.*, **54**: 192–200.
3. Adhikari, U., Mateu, C.G., Chattopadhyay, K., Pujol, C.A., Damonte, E.B. and Ray, B. (2006). Structure and antiviral activity of sulfated fucans from *Stoechospermum marginatum*. *Phytochem.* **67**: 2474–82.



4. Ahmad, V.U., Aliya, R., Perveen, S. and Shameel, M.A. (1992). Sterol glycoside from marine green algae *Codium iyengarii*. *Phytochemi.* **31**: 1429–31.
5. Amer, S.A.A., Mohamed, S.M., El-Gengaihi, S. and Dimetry, N.Z. (2000). Acaricidal activity of lipoidal matter of dirrerents plants extracts againts the two- ity of lipoidal matter of dirrerents plants extracts againts the two- spotted mite *tetranychus urticae koch*. *Insect Sci. Appl.*, **20**(3): 191–194.
6. Bhadury, P. and Wright, C.P. (2004). Exploitation of marine algae: biogenic compounds for potential antifouling application. *Int. Planta.* **219**: 561–578.
7. Bouhlal, R., Riadi, H. and Bourgougnon, N. (2010). Antiviral activity of the extracts of Rhodophyceae from Morocco. *Int. Afri. J. Biot.*, **9**: 7968–7975.
8. Caire, G., de-Cano, S.M., de-Mule, Z.M.C., Palma, R.M. and Colombo, K. (1997). Exopolysaccharides of *Nostoc muscorum* Ag. (Cyanobacteria) in the aggregation of soil particles. *J. Appl. Phycol.*, **9**: 249–253.
9. Dayong, S., Jing, L., Shuju, G. and Lijun, H. (2008). Antithrombotic effect of bromophenol, the alga-derived thrombin inhibitor. *Int. J. Biot.*, **136**: 5 77–588.
10. De Felicio, R., De Albuquerque, S., Young, M.C.M., Yokoya, N.S. and Debonsi, H.M. (2010). Trypanocidal, leishmanicidal and antifungal potential from marine red alga *Bostrychia tenella* J. Agardh (Rhodomelaceae, Ceramiales). *Int. J. Pharma. Bio. Ana.*, **52**: 763–769.
11. Devi, G.K., Manivannan, K., Thirumaran, G., Rajathi, F.A.A. and Anantharaman, P. (2011). In vitro antioxidant activities of selected seaweeds from Southeast coast of India. *Int. Asi. Paci. J. Tro. Med.*, **4**: 205–211.
11. Duke, S.O. (2002). Chemicals from nature for weed mangement. *Weed Sci.*, **50**: 138–151.
12. Ely, R., Supriya, T. and Naik, C.G. (2004). Antimicrobial activity of marine organisms collected off the coast of South East India. *J. Exp. Mar. Biol. Ecol.* **309**: 121–127.
13. GS, M. and Malammanavar, S.G. (2018). Phytochemistry and anti-microbial activity of *Chara*. *J. Pharma. Phy.* **7**(6): 2047–2050.
14. Hassan, N.A.M. (2007). *Studies on the algal flora distributed at Wadi-Sannur of the Eastern-desert of Egypt*. M. Sc. Thesis, Faculty of Science, Beni-Suef University, Egypt.
15. Iain, E.P., Taylor and Amanda, J. Wilkinson. (1977). The occurrence and gibberlin like substances in algae. *Phyhcologia*. **16**(1): 37–42.
17. Jacobsen, N. and Pedersen, L.E. (1983). Synthesis and insecticidal properties of derivatives of propane-1,3-dithiol (analogs of the insecticidal derivatives of dithioiane and trithiane from the alga *Chara gtohularis Thuillier*). *Pestic. Sci.* **14**: 90.
18. Kannan, R.R.R., Arumugam, R. and Anantharaman, P. (2010). In vitro antioxidant activities of ethanol extract from *Enhalus acoroides* (L.F.) Royle. *Asi. Pac. J. Trop. Med.* **3**(11): 898–901.
19. Kim, S.K. and Karadeniz, F. (2011). Anti-HIV Activity of extracts and compounds from marine algae. *Int. Adv. Food Nut. Res.* **64**: 255–265.
20. Kulik, M.M. (1995). The potential for using Cyanobacteria (blue-green algae) and algae in the biological control of plant pathogenic bacteria and fungi. *Eur. J. Plant Pathol.*, **101**: 585–599.
21. Kumar, K.A. and Rengasamy, R. (2000). Evaluation of antibacterial potential of seaweeds occuring along the coast of Tamil Nadu, India against the plant pathogenic bacterium *Xanthomonas oryzae* pv. *Oryzae* (Ishiyama) Dye. *Bot. Mari.* **43**: 409–415.
22. Na, H.J., Moon, P.D., Lee, H.J., Kim, H.R., Chae, H.J., Shin, T., Seo, Y., Hong, S.H. and Kim, H.M. (2005). Regulatory effect of atopical allergic reaction by *Carpopeltis affinis*. *J. Eth.* **101**: 43–48.
23. Nassar, M.M.I., Hafez, S.T., Nagaty, I., Khalaf, M. and Samy, A.A. (1999). Insecticidal activity of Cyanobacteria against four insects, two of medical importance and two agricultural pests with reference to the action on albino mice. *Egyptian Soc. Parasitol.*, **29**(3): 939–949.
24. Nishino, T. Nagumo, T. Kiyohara, H. (1991). Structure characterization of a new anticoagulant fucan sulfate from seaweed *Ecklonia kurome*. *Car. Res.* **211**: 77–90.
25. Perez, C., Pauli, M. and Bazerque, P. (1990). An antibiotic assay by agar well diffusion method. *Acta. Bio. Med. Exp.* **15**: 113–115.
26. Safonova, E. and Reisser, W. (2005). Growth promoting and inhibiting effects of extracellular substances of soil microalgae and cyanobacteria on *Escherichia coli* and *Micrococcus luteus*. *Phycol. Res.*, **53**: 189–193.
27. Singh, S., Kate, B. and Banerjee, U.C. (2005). Bioactive compounds from cyanobacteria and microalgae: an overview. *Cri. Rev. Bio.* **25**: 73–95.
28. Snehalatha, D. and Rao, B.D. (2017). Antibacterial activity of freshwater green- algae, *Chara vulgaris*. *Int. J. C.R.G.G.* **10**(6): 749–753.
29. Uma, R., Sivasubramanian, V. and Devaraj, S.N. (2011). Preliminary phycochemical analysis and in vitro antibacterial screening of green micro algae *Desmococcus olivaceus*, *Chlorococcum humicola* and *Chlorella vulgaris*. *J. Algal Biomass Util.* **2**: 74–81.
30. Volk, R. and Furkert, F. (2006). Antialgal, antibacterial and antifungal activity of two metabolites produced and excreted by cyanobacteria during growth. *Microbiol. Res.*, **161**: 180–186.



INTROGRESSION OF HOST PLANT RESISTANCE THROUGH MARKER ASSISTED BACK CROSS BREEDING

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Abstract

Marker-assisted backcrossing (MABC) is useful to incorporate major gene/s from a plant (Donor Parent ‘DP’) having desirable genes but agronomically poor into an adaptive superior variety or parent of a hybrid (Recurrent Parent ‘RP’) using molecular markers. At the end of the MABC, the recurrent parent is introgressed with gene/s of interest from donor parent while maintaining all its original genome. Transferring host plant resistance genes through conventional backcrossing involves laborious screening tests and requires many back cross generations for complete recovery of the recurrent parent genome. Introgression of resistant genes using marker-assisted backcrossing reduces the number of back cross generations and gives precise results. The use of molecular markers is increasing in plant breeding after the discovery of markers based on single nucleotide polymorphisms (SNPs), due to their abundance in the genomes and easy detection in high-throughput platforms. In this paper, the procedure for introgression of a dominant resistant gene with foreground and background selection using SNPs was discussed in detail. The expected segregation ratios for trait of interest, approximate recovery of recurrent parent genome in each backcross generation and workflow were presented in the schematic diagram to calculate the desirable number of plants in each generation.

Key Words : *Marker assisted backcrossing, Foreground selection, Background selection, Trait introgression*

Introduction : Backcrossing was first proposed by Harlan and Pope in 1922, as a method of breeding for small grains. In this method two plants, one from donor parent and the other from a recurrent parent were selected, crossed and produced hybrid seed. Hybrid was backcrossed to one of their parent i.e. recurrent parent repeatedly so that the hybrid backcross progeny became incrementally similar to that of the recurrent parent and identical at the end. Backcrossing has been extensively used for almost a century to incorporate one or a few genes into an elite variety. In most cases, the recurrent parent used for backcrossing is a well-adapted variety which has a large number of desirable attributes but is deficient in only or few characteristics (Allard, 1999). Marker-assisted backcrossing is a potential approach that utilizes molecular markers to enhance the backcrossing process by reducing the number of backcrosses required to recover the recurrent parent genome (Hospital *et al.*, 1992). The use of DNA markers like simple sequence repeats (SSRs), single nucleotide polymorphisms (SNPs), etc., in backcrossing, has greatly increased the efficiency of selection (Tanksley *et al.*, 1989 and Visscher *et al.*, 1996).

Method of Marker-Assisted Backcrossing : There are three important steps in marker-assisted backcrossing : (i) Foreground selection (ii) Recombinant selection (iii) Background selection.

Foreground selection is a screening step for which markers are used for the target gene or QTL. This can be used in combination with or to replace the elaborate screening procedure of host plant resistance for a targeted pest. This step is useful to select for traits in the early seedling stage or even in the seeds itself otherwise that that can be screened only in later stages. Furthermore, recessive alleles that cannot be screened phenotypically in conventional backcross generations and for which selfing generation is required to express can be selected easily with molecular markers (Hospital and Charcosset, 1997). MABC helps to select plants having the desired gene i.e. marker allele of the donor parent at the target locus in early stage itself. During entire back cross generations, the marker allele is selected at the heterozygous condition which contains one allele from donor parent and the other is recurrent parent allele. At the end of backcrossing, the selected plants are self-pollinated to select homozygous plants for the donor allele with complete recurrent parent genome. The factors which influence foreground selection are the number of genes or loci to be selected, the association of marker-gene and QTL (linkage distance) and the undesirable linkage to the target gene/QTL (Linkage drag).

Recombinant selection involves the selection of plants with the target gene and recombination events between the target locus and linked flanking markers. It is important to reduce the size of the donor chromosome segment introgressed during the backcrossing. In general for unlinked regions, the rate of decrease of donor fragment and recovery of the recurrent parent genome is easy and faster. In the case of linked regions, it is very slow and if any undesirable genes that negatively affect crop performance are linked to the target gene from the donor parent, it is called ‘linkage drag’ and it is also very important to eliminate potentially deleterious genes introduced from the donor i.e., linkagedrag. (Hospital 2003 and 2011). In conventional backcrossing to minimize the linkage drag sometimes it may need to extend to backcrossing to 10 generations also. By using flanking markers that are within 5 cm on either side of the target gene, linkage drag can be minimized. Recombinant selection is usually recommended at least for two backcross generations for finding recombination events on one side of the target gene per generation (Frisch *et al.*, 1999 and Salina *et al.*, 2003).



Background selection is meant for the selection of recurrent parent marker alleles in all genomic regions except the target locus. It can greatly accelerate the recurrent parent genome recovery. In conventional backcrossing, it takes a minimum of six backcross generations to recover the recurrent parent genome and there may still be several donor chromosome fragments that may be linked to the target gene. Using marker-assisted selection, it is possible to achieve by BC₄, BC₃ or even BC₂ thus saving two to four backcross generations. For complete line conversion, the background selection can be used during marker-assisted backcrossing to accelerate the development of a recurrent parent with additional genes of interest (Ribaut *et al.* 2002). In background selection, undesirable genes introduced from the 'DP' can be eliminated. The recurrent parent genome recovery depends on the number of markers used in background selection and their distribution. If more markers which are evenly located on all the chromosomes are assayed for the recurrent parent alleles then faster recovery of the recurrent parent genome can be achieved in a shorter time but it increases the cost.

Foreground selection and background selection are important, so they can be conducted either simultaneously or successively in the same generation. But it is advisable to use first foreground selection then eliminate the individuals that are lacking trait of interest then subject the selected individuals with desirable trait for background selection of other marker alleles for the 'RP' genome recovery. The selection of the target gene/QTL is the most crucial point for the backcrossing program, and the individuals that do not have the allele of the target gene can be discarded immediately.

Transfer of Single Dominant Gene through MABC : To understand MABC workflow for single dominant gene take an example of a widely grown popular chickpea variety (recurrent parent 'RP') is susceptible to borer attack and another variety (donor parent 'DP') is not suitable for that area but resistant to borer attack. For example, resistance to borer attack is governed by a single dominant gene and it is to be transferred from 'DP' to 'RP' using molecular markers. 'DP' is homozygous dominant (represented as 'RR') for borer resistance and 'RP' is homozygous recessive (represented as 'rr') and susceptible to the borer. During the backcrossing rr of 'RP' is to be replaced by 'RR' of 'DP'. At the end of backcrossing, the genetic background of the recurrent parent is to be recovered completely with the borer resistance 'RR' gene from 'DP'. Let us work out the MABC program considering SNPs (Single Nucleotide Polymorphisms) as molecular markers. SNPs occur throughout the DNA; each SNP represents a difference in a single DNA building block i.e. nucleotide. SNPs are very simple and for example, an SNP may be identified with the replacement of the nucleotide cytosine with the nucleotide thymine in a certain stretch of DNA. These SNPs when occurring within a gene or in a regulatory region of a gene may affect gene's function but for our consideration in MABC, these SNPs are used to track the inheritance and recovery of recurrent parent genome.

The conventional backcrossing is based on screening techniques for borer resistance so it is dependent on the phenotypic performance of target trait but MABC is based on the alleles of markers associated with or linked to the gene(s)/QTL(s) of interest. The sequence of steps followed season wise for MABC by considering borer resistance is governed by single dominant gene 'RR' which is homozygous in 'DP' and 'RP' is recessive 'rr' for it so borer susceptible. The heterozygote of it 'Rr' is also resistant as it is a dominant trait.

Step wise procedure of MABC

Season-I : Crossing of parents and hybrid seed production : Fingerprint both the parents and identify the polymorphic markers between recurrent parent 'RP' and donor parent 'DP'. Identify the QTL for the trait of interest to use in MABC. Make a cross using 'RP' as female and 'DP' as male and produce F₁ seed. The reason for using 'RP' as a female during the first cross is that the cytoplasm flows from female parent will maintain in subsequent backcrosses.

Season-II : Back cross F₁ generation and produce BC₁ seed : Take up sowing of F₁ seed along with recurrent parent and no need to take sowing of the donor parent. Test the F₁ population to detect the presence of the target marker allele at the early stages of growth to eliminate false hybrids. Confirm the zygosity of selected F₁ plants; it should be heterozygous for the trait of interest and polymorphic markers of 'RP' and 'DP'. Only confirmation of F₁ is important as there are chances of self-plants due to improper crossing techniques. No need for any background selection of plants here either 'RP' or F₁. Cross any true F₁ to 'RP', since all the F₁ plants are heterozygous "Rr" for borer resistance and with 50% 'RP' and 50% 'DP' genome. The harvested seed from F₁ plants crossed with 'RP' becomes BC₁F₁ seed.

Season-III : Back cross BC₁F₁ generation and produce BC₂F₁ Seed : Take up the sowing of BC₁F₁ and 'RP'. As per conventional back cross breeding recovery of RP genome in BC₁F₁ is 75%, but based on actual marker data it may range from 65 to 85%. Plants with above 75% 'RP' genome recovery are advantageous to accelerate the backcrossing and to minimize the number of backcrosses required. Selection based on markers starts here. B₁F₁ plants segregate for desirable trait 50% 'Rr': 50% 'rr'. Assay all plants for borer resistant marker and reject 50 % of plants which are lacking dominant resistant allele. If single gene governs resistance approximately assay 200 BC₁F₁ plants and reject 100 plants which are lacking target allele from the donor and proceed for assay of remaining 100 plants with target allele for polymorphic markers between 2 parents. The number of polymorphic markers for an assay depends on the availability of polymorphic markers based on the crop. Generally, SNPs are available in thousands to lakhs. Pick the markers from the available markers which are showing polymorphism between the donor and recurrent parents and well distributed throughout the genome for assay and background



selection. Select the plants which are heterozygous for resistant trait and having the highest recovery of 'RP' genome for further backcrossing.

Table-1 : An example of 10 Polymorphic markers assay for recovery (%) calculation.

Recurrent Parent	GG	TT	AA	CC	GG	AA	AA	CC	GG	AA
Donor Parent	AA	GG	GG	TT	CC	TT	GG	TT	CC	TT
BC ₁ F ₁	GG	TT	AG	CC	GG	AA	AA	CT	GG	AA
Recovery	R	R	NR	R	R	R	R	NR	R	R

Note : R-Recovered (80%), NR-Not Recovered (20%).

Season-IV : Backcross BC₂F₁ to produce BC₃F₁ Generation : Seed harvested from BC₁F₁ plants crossed with 'RP' is BC₂F₁ seed. BC₂F₁ contains 87.5 % 'RP' genome as per conventional back cross breeding if BC₁F₁ recovery is 75 %, But here BC₁F₁ plant with maximum recovery of up to 85% is selected to produce BC₂F₁ seed. Subject 200 BC₂F₁ plants for foreground selection to identify 50% 'Rr' and 50% 'rr' plants and select only resistant plants with 'Rr' genes and reject 'rr' plants. Select borer resistant 'Rr' plants and assay for unrecovered polymorphic markers and extra markers from whole genome with more emphasis from unrecovered regions. Select the recombinants to eliminate linkage drag. From BC₂ to BC₃ the plants selected for backcrossing must have resistance and also the highest recovery in background selection. With MABC there are chances to get plants with RP genome recovery more than 95% in BC₂F₁ itself, select such plants and use for backcrossing with RP. The Back cross seed harvested from it is BC₃F₁ seed.

Season-V : BC₃F₁ to BC₃F₂ Generation : In MABC approximately 99 % and above 'RP' genome recovery can be achieved in BC₃ or BC₄ generation. It takes up to BC₆ generation for recovery of 99.22 % genes from 'RP' in conventional backcrossing. In BC₃ generation 50% of plants will have a borer resistant gene from 'DP' in heterozygous 'Rr' condition. 50% 'rr' plants which are susceptible are to be rejected and removed preferably to avoid cross-pollination/contamination. Best borer resistant 'Rr' plants with 'R' gene are to be subjected to recombinant and background selection with an assay of markers from unrecovered regions for a better estimate of recovery. The plants with the highest 'RP' genome recovery preferably above 99% are to be selfed with appropriate self-pollination technique especially in cross-pollinated crops to avoid cross-pollination. While harvesting true to type to 'RP' may be checked phenotypically for confirmation. (Note : If 'RP' genome recovery is less than 99% go for 1 more backcrossing in the same way and produce BC₄F₁ seed instead of selfing)

The proportion of the 'RP' genome after "n" generations of conventional backcrossing is given by " $1 - (1/2)^{n+1}$ " for a single locus. So to fully recover the genome of the 'RP', 6-8 generations of backcrossing is required if no marker selection is made for the "RP" genome. It is slower than expected for the target gene-carrier chromosome, i.e. linkage drag, especially in case a linkage exists between the target gene and other undesirable traits. On the other hand, the process of introgression of QTLs/genes and recovery of the 'RP' genome may be accelerated by selection using markers flanking QTLs and evenly spaced markers from other chromosomes (i.e. unlinked to QTLs) of the RP simultaneously (Collard *et al.*, 2005).

Season VI. BC₃F₂ Generation : Individual plant progenies are to be grown from BC₄F₂ seed harvested from individual selfed plants. In F₂ generation the resistant genes segregate 1:2:1 "RR:Rr:rr" genotypic ratio. But phenotypically, resistant: susceptible ratio is 3:1. In conventional backcrossing, only 25% 'rr' plants can be rejected based on screening for the expression of susceptibility. Both homozygous for resistance 'RR' and heterozygous for resistance 'Rr' plants express resistance so one more screening generation is required to separate them in the conventional backcross program. But in MABC borer resistance plants which are homozygous for resistance 'RR' and true to type to variety 'RP' can be selected in F₂ itself. Self and harvest selected plants individually.

Season VII. BC₃F₃ Generation : Individual plant progenies are to be grown and homozygous progenies with 100% plants resistant to borer and true to the type of 'RP' are to be harvested in bulk. Several similar progenies are mixed to constitute the new variety.

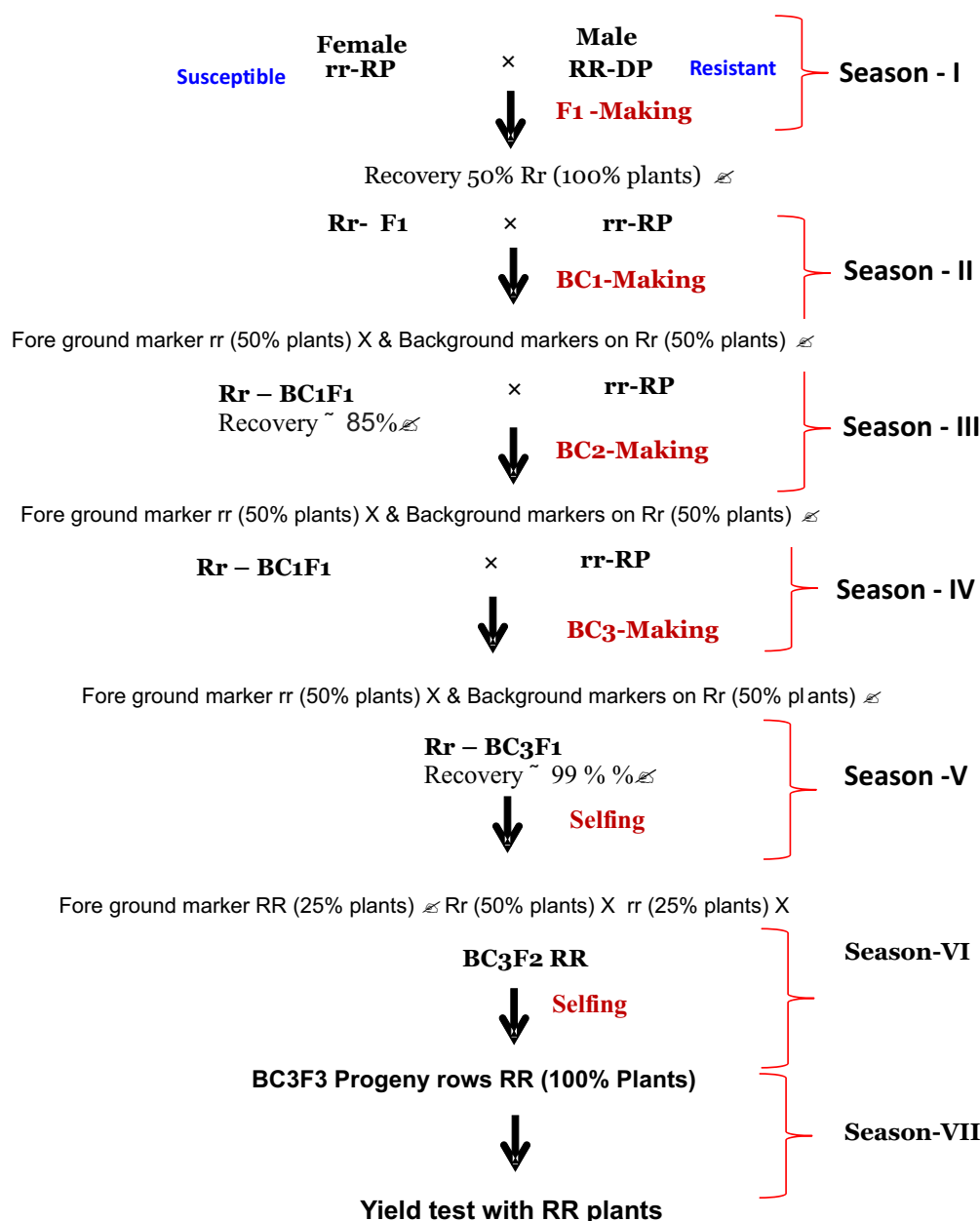
If the converted line is a parent of hybrid, produce hybrid seeds on BC₄F₃ selected progeny rows, label each progeny row and collect self-seed from the same progeny rows to use as parent seed. Evaluate hybrid seed produced from each progeny row with the original hybrid. After the selection of the best performing hybrids, the self-seed from those progeny rows is to be bulked and used for further multiplication.

Season-VIII : Yield Test: As a variety and as a hybrid : The new variety is tested in replicated yield trials along with the variety 'RP' as a check. Plant type, branching pattern, leaf characters, date of flowering, flower characters, date of maturity, yield and product quality are to be evaluated critically under protected conditions to the borer. If it is evaluated under unprotected conditions the results will be biased because converted resistant variety shows superiority in yield due borer resistance. Under protected conditions, the new variety should be identical to old 'RP' in performance. If there is no significant difference in yield before and after conversion, the resistant variety may be directly released for cultivation.



If the line is a parent in the hybridization program make paired crosses of each progeny row with the other parent of hybrid and evaluate hybrid performance of these resistant versions in yield tests along with original hybrid under-protected and unprotected conditions. Under unprotected conditions only check for borer resistance and consider yield data only from protected condition trial for selection of superior progeny. Select the progenies based on combining ability and yield data of hybrid trial for further multiplication. The other parent of hybrid need not be resistant to borer as the resistance is governed by the dominant gene the heterozygous “Rr” ‘F₁’ generation is resistant to the borer.

Transfer of Single Dominant Gene through MABC



(Note : X-Reject & ✓- Select)

Factors affecting MABC : The efficiency of MABC depends on many factors like number of genes governing the trait, dominant or recessive nature of gene, number of plants tested in each generation of backcrossing, genetic distance between donor and ‘RP’, marker-gene association or markers placement from the target locus, type of markers used, number of markers used for foreground selection of target trait, number of markers used for background selection of ‘RP’, linkage drag, tools used like genotyping platforms, software and statistical tools used to calculate recovery etc.



Advantages of MABC :

1. Saves time by knowing the result with foreground selection early in crop growth period for the traits that express later in flowers, fruits, seeds.
2. Saves time by reducing the number of generations due to faster recovery of the 'RP' genome background selection
3. Saves time and money by eliminating elaborate screening procedures of phenotyping.
4. If the trait is governed by recessive genes intermittent selfing generations can be eliminated.
5. Less heritable target traits also can be introgressed.
6. The traits are controlled by genes that require special conditions to express can be introgressed without creating such conditions.
7. Gene pyramiding becomes easy for traits governed by many genes or for more traits at a time.

In plant breeding MABC has been used most widely and successfully for introgression of pest resistance, male sterility, drought tolerance, quality improvement, etc., in major crops like rice, cotton, sunflower, canola, wheat, maize, barley, soybean, millets, vegetables, etc., (Collard *et al.*, 2005; Dwivedi *et al.*, 2007; Michael *et al.*, 2018).

At present MABC use is limited by its high cost but in future let us hope cost-effective MABC technology will help breeders for efficient and quick introgression of genes from diverse resistant sources.

REFERENCES

1. Allard RW. (1999). *Principles of plant breeding*. New York, NY: John Wiley & Sons Inc.; 2nd edn.
2. Collard B.C.Y., M.Z.Z. Jahufer, J.B. Brouwer and E.C.K. Pang (2005). An introduction to markers, quantitative trait loci (QTL) mapping and marker-assisted selection for crop improvement: The basic concepts, *Euphytica* 142: 169–196.
3. Dwivedi, S.L., Crouch J.H., Mackill D.J., Xu Y., Blair M.W., Ragot M., Upadhyaya H.D., Ortiz R. (2007). The molecularization of public sector crop breeding: Progress, problems, and prospects. *Adv. Agron.* 95 : 163-318.
4. Frisch M., Bohn M., Melchinger A.E. (1999). Minimum sample size and optimal positioning of flanking markers in marker-assisted backcrossing for transfer of a target gene. *Crop Sci.*; 39 : 967–975.
5. Harlan H.V., Pope M.N. (1922). The use and value of back-crosses in small-grain breeding. *J. Hered.*; 13: 319-322.
6. Hospital F. (2003). Marker-assisted breeding. In: Newbury H.J., editor. *Plant molecular breeding*. Oxford and Boca Raton: Blackwell Publishing and CRC Press; pp. 30–59
7. Hospital F. (2011). Size of donor chromosome segments around introgressed loci and reduction of linkage drag in marker-assisted backcross programs. *Genetics*; 158(3): 1363–1379.
8. Hospital F and Charcosset A (1997). Marker-Assisted Introgression of Quantitative Trait Loci December *Genetics* 147(3): 1469-85
9. Hospital, F., Chevalet, C and Mulsant, P. (1992). Using markers in gene introgression breeding programs. *Genetics*, 132: 1199-1210.
10. Michael K. Osei, Ruth Prempeh, Joseph Adjebeng-Danquah, Jacinta A. Opoku, Agyemang Danquah, Eric Danquah, Essie Blay and Hans Adu-Dapaah (2018) Marker-Assisted Selection (MAS): A Fast-Track Tool in Tomato Breeding. Chapter 6 *Recent Advances in Tomato Breeding and Production*. 93-113, <http://dx.doi.org/10.5772/intechopen.76007>.
11. Ribaut J.M., Jiang C., Hoisington D. (2002). Simulation experiments on efficiencies of gene introgression by backcrossing. *Crop Sci.* 42: 557–565.
12. Salina E., Dobrovolskaya O., Efremova T., Leonova I., Roder M.S. (2003). Microsatellite monitoring of recombination around the Vrn-B1 locus of wheat during early backcross breeding. *Plant Breed.* 122: 116–119.
13. Tanksley S.D., Young N.D., Patterson A.H., Bonierbale M.W. (1989). RFLP mapping in plant breeding: new tools for an old science. *Nat Biotechnol* 7: 257-263.
14. Visscher, P.M., Haley, C.S. and Thompson. R. (1996). Marker-aided introgression in backcross breeding programs. *Genetics*, 144: 1923-1932.



PROCESS OPTIMIZATION FOR THE PRODUCTION OF ENRICHED PROBIOTIC YOGHURT DRINK

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Abstract

Yoghurt drink is a fermented milk produced from usual yoghurt cultures *Streptococcus salivarius ssp. thermophilus* and *Lactobacillus delbrueckii ssp. bulgaricus*, containing low total solids, which is commonly sweetened, flavoured and is pourable and drinkable at refrigeration condition. A study was undertaken to optimize parameters for the production of Enriched Probiotic Yoghurt Drink using whey proteins and Probiotic cultures, since these possess excellent nutritional, functional and therapeutic properties. Among different levels of Whey protein concentrates (0.5, 1.0, 1.5 and 2.0%), yoghurt drink with 1.5% WPC was found to be superior in flavour, consistency and overall acceptability. Further the probiotic cultures such as *Bifidobacterium bifidum* and *Lactobacillus acidophilus* were used to enhance nutritional and therapeutic properties of yoghurt drink. Among the different levels of probiotic cultures (3, 4 and 5%) used, the product heat treated to 65°C/10s with 4% inoculum level showed more than 10⁶cfu/ml of viable organisms with slight increase in acidity and viscosity up to a period of 4 weeks at 4±1°C and 2 weeks without heat treatment at 30°C in Glass bottle. It was concluded that whey protein concentrate can be successfully used in the preparation of yoghurt drink by employing probiotic bacteria along with conventional yoghurt cultures.

Introduction : The annual milk production in India is estimated at about 92.2 million tonnes (Sadana, 2006). About 55% of the milk produced in the country is being utilized for preparation of various indigenous dairy products like Khoa and Khoa based sweets, Chhana and Chhana based sweets, Paneer, fermented milks etc. Dahi occupies an important place in the diet of average Indian who is mainly a vegetarian as it serves as an important source of protein. Fermented milks have been developed throughout the world as a means of preserving milk against spoilage. The important fermented milks in India are Dahi, Shrikhand, Lassi, butter milk etc. These traditional foods have persisted over the centuries in the developing world. But the scale of production ranged from house hold production to large scale production, wherein use of selected starter cultures, automatic processes and modern equipments are involved. Fermented milks are popular in view of organoleptic and other properties such as the characteristic flavour, refreshing taste and improved digestibility. The composition of fermented milks can be easily tailored to meet various dietary requirements especially in the production of low calorie fermented milks. Even though yoghurt drink is similar to Dahi in its physical appearance, it possesses excellent nutritional and therapeutic properties. There is a need to introduce yoghurt in the daily diet of Indians, especially in the form of drinking yoghurt with incorporation of probiotic organisms. Probiotics are “living micro organisms which, upon ingestion in certain numbers exert health benefits beyond inherent general nutrition” and they have become increasingly popular during the last decades. Yoghurt or yoghurt like products have been used as the most popular vehicle for incorporation of probiotic organisms mainly *Bifidobacteria* and *Lactobacilli*. It has been recommended that foods containing such bacteria should contain atleast 10⁶ live organisms per gram or ml of product at the time of consumption in order to produce therapeutic benefits. Whey is a byproduct obtained during the production of cheese, casein, Paneer, Chhana, Shrikand etc. disposal of whey has always been environmental problem due to its high Biological oxygen demand (BOD). Whey which contains nearly 50% of milk solids, and thus it is great significance to utilize whey solids in human food chain. Whey represents a heterogeneous pool of proteins with wide ranging physico-chemical and functional properties. Whey in the form of whey protein concentrate (WPC) has gained importance as a nutritional and functional ingredient. In view of the changing trend of consumption that has apparently justified man's endeavour in evolving and exploiting newer product concept. This investigation had been made to develop enriched probiotic yoghurt drink by using whey protein concentrates and employing probiotic bacteria along with conventional starter cultures.

MATERIALS AND METHODS

The procedure followed by Ashok (1990) for preparation of yoghurt drink was adopted with suitable modifications. Fresh cow milk procured from Student Experimental Dairy Plant was standardized to 1.5% milk fat and 11.5% MSNF and 1.5% of MSNF and part of MSNF was replaced by whey protein concentrates at various levels like 0.5, 1.0, 1.5 and 2.0%. Required level of cane sugar (10.0%) was added to yoghurt base. Then the mixture (60-65°C) was homogenized at 2000psi at first stage and 500psi second stage and heat treated to 90°C for 10 min followed by cooling to 40°C. Starter culture consisting of



Streptococcus salivarius ssp thermophilus and *Lactobacillus delbrueckii ssp bulgaricus* in the ratio of 1:1 was inoculated at the rate of 2.0 percent along with the probiotic cultures (*Bifidobacterium bifidum* BB12 and *Lactobacillus acidophilus* LA5 (1:1)) at various levels like 3, 4 and 5% and incubated at $42 \pm 1^{\circ}\text{C}$ for $3\frac{1}{2}$ to 4 h. The finished product was diluted at 10% total milk solids by adding potable water and chilled rapidly ($4 \pm 1^{\circ}\text{C}$) and the cold product was homogenized at 500psi (single stage) to get a smooth easily pourable product. The product was packed in wide mouthed glass bottles (200ml) and refrigerated at $4 \pm 1^{\circ}\text{C}$. The enriched probiotic yoghurt drink was then subjected for various physico-chemical and microbial attributes (using ISI procedures) along with the control to know the suitability. The sensory analysis was carried out by serving control and experimental sample of yoghurt drink to a panel five expert judges. The samples were examined for colour and appearance, flavor, sweetness, consistency and overall acceptability on 9-point hedonic scale scorecard to adjudge the quality of the product. The results (average of three trials) were statistically analyzed as per the procedure of Sundararaj *et al.* (1972) by testing for significance using ANOVA.

RESULTS AND DISCUSSION

Effect of MSNF replacement with Whey Protein Concentrate (WPC) on sensory quality of yoghurt drink :

Replacement of MSNF with WPC upto 1.5% level increased the sensory scores for colour and appearance, flavour, consistency and overall acceptability of yoghurt drink. But higher replacement levels (above 1.5%) decreased sensory scores for all attributes. The highest sensory score of 8.08 out of 9.0 was secured for colour and appearance at 1.5% WPC level as against control (7.80) (Table 1). Further replacement lowers the sensory scores for colour and appearance of yoghurt drink. The reduction in score could be due to the brown yellow colour of the spray dried WPC. Steinsholt and Holth (1991) reported an increase in intensity of yellow colour with increase in concentration of WPC. Higher flavour scores of 7.75 was obtained with replacement of MSNF with WPC at 1.5% level. Further increase in replacement level of WPC decreased the flavour score to 7.43; it is evident that replacement of MSNF with WPC at 1.5% was beneficial. The reduction in flavour score above 1.5% level could be attributed due to the characteristic flat flavour of WPC. Similar finding were reported by Jayaprakasha *et al.* (2000) where yoghurt prepared by replacing the MSNF with WPC at higher levels (70%) secured lower sensory scores with respect to flavour. The sensory scores for sweetness of the yoghurt drink decreased from 7.70 to 7.53 with increase in WPC level from 0.5 to 2.0%. This could be due to high water binding capacity of WPC and it contains less carbohydrate which make less sweet. The results are in agreement with Thapa and Gupta (1992). Higher sensory scores of 8.04 and 8.23 out of 9.0 for consistency and overall acceptability of yoghurt drink were secured at 1.5% WPC level. Further addition of WPC (above 1.5%) decreases the sensory scores; this may be partially due to increase in whey separation with increase in WPC at higher level with decrease in consistency of the product. The increased sensory scores for consistency and overall acceptability upto 1.5% WPC level is mainly due to functional properties of WPC such as water binding capacity, gelation, viscosity and emulsification. At higher levels of WPC the product had less consistency with whey separation as a result the product secured lower sensory score of 7.96 out of 9.0. Similar observations were made by Jayaprakasha *et al.* (2000) in the preparation of frozen yoghurt by replacing the MSNF at 50% level, which secured lower sensory scores.

Effect of MSNF replacement with Whey Protein Concentrate (WPC) on physico-chemical properties of yoghurt drink

: The physico-chemical properties of yoghurt drink prepared by replacing the MSNF with WPC from 0.5 to 2.0% levels are presented in Table 2. The protein and ash content of yoghurt drink increased with increased level of replacement of WPC. The protein content of 3.62% and ash content of 0.996% were recorded when MSNF was replaced with WPC at 1.5% levels. This may be due to high protein (70.48%) and ash (3.9%) content of WPC. The results of the present investigation are in agreement with the observations made by Opdhal and Baer (1991). Statistical analysis has confirmed that a non significant decrease in moisture content of the yoghurt drink with increase in replacement level from 0.5 to 2.0%. This may be due to the water holding capacity of WPC, where adsorption of moisture by WPC leads to reduce the availability of free moisture. Whey proteins aggregation begins with initial swelling of the protein structure, when it expose to heat treatment (Parris *et al.*, 1997).

The acidity of experimental yoghurt drink samples ranged from 0.714 to 0.781% lactic acid with corresponding pH of 4.56 to 4.37 respectively with the increase in replacement level of WPC. There was a progressive increase in acidity and decrease in pH of the yoghurt drink. This could be due to the presence of whey proteins and higher amounts of phosphates and citrates in WPC which are more readily utilized by starter organisms and produce higher acidity due to high lactose content of WPC. Similar results were observed by Venkateshaiah (1995), when whey powder was used in place of skim milk powder in the preparation of frozen yoghurt. The viscosity increases from 3.69 to 4.41cP with increase in level of WPC from 0.5 to 2.0%. This may be due to combined effect of whey proteins and heat treatment which created the desired water holding effect thus, increases the viscosity without whey syneresis (Barrentes *et al.*, 1994).



effect of different levels of probiotic culture on sensory quality of enriched yoghurt drink : The average sensory scores for enriched yoghurt drink with different levels of probiotic culture in comparison with control sample are presented in Table 3. There was no significant difference in the colour and appearance attribute between control and experimental samples at different levels of probiotic culture. Incorporation of probiotic culture at different levels showed significant effect on the flavour attribute of the yoghurt drink samples. It is evident from the table that there is a significant increase in flavour scores of 8.23 out of 9.0 upto 4% level and decreased (7.67) significantly with further addition (5%). The increase in flavour scores may be due to the release of higher level of acetaldehyde compound by lactic acid bacteria. Lucas *et al.*, (2004) reported that an increase in inoculation level of *L. acidophilus* in yoghurt increases the acetaldehyde content of the product. The mean sensory scores for sweetness decreased from 7.85 to 7.69 with the increase in the level of inoculation from 3 to 5%. There is no significant effect on sweetness of the yoghurt drink with increase in the inoculation level. The reduction in sweetness score could be due to the developed acidity and subsequent drop in pH of the yoghurt drink causing the product to become slightly acidic. Dave and Shah (1998) reported a drop in pH of yoghurt with increase in the inoculation level of *L. acidophilus*. Higher sensory scores for consistency and overall acceptability of enriched yoghurt drink obtained with 4% inoculation level. Further increase in the inoculation level to 5% decreases consistency and overall acceptability scores than that of control. This is may be due to the excess acidification of yoghurt leads to whey separation in the product. So that, the samples secured lower score for flavour, consistency at higher level of inoculation, which reflects on overall acceptability of the product. These findings are in agreement with the findings of Farnsworth *et al.*, (2003).

Effect of different levels of probiotic culture on viable count, acidity and pH in enriched probiotic yoghurt drink : Enriched probiotic yoghurt drink prepared by inoculating mixed cultures of *L. acidophilus* and *B. bifidum* at different levels from 3 to 5% along with the 2% yoghurt cultures (Table 4). The significant increase in viability of *L. acidophilus* and *B. bifidum* cells from 8.35-9.27 log₁₀ cfu/ml and 7.81-8.55 log₁₀ cfu/ml respectively with increase in the inoculation level from 3 to 5%. The increase in viable count may be due to associative growth and multiplication of cells during incubation (Arunkumar, 1993). Longer periods of incubation resulted in an increase in the acid production and decrease in pH value causing the product with slightly sour (Laroia and Martin, 1990). There was an ascending trend in the acidity development and descending trend in pH with an increase in the level of inoculation of cultures. The acidity increased from 0.69 to 0.78% lactic acid with increase in the level of inoculation from 3 to 5%. Increase in the inoculation level had a significant effect on acidity and pH of the enriched yoghurt drink. Similar findings were reported by Kailaspathy and Chin (2000) use of *L. acidophilus* in yoghurt lowers the pH values as a result of lactic acid production by bacteria.

Viability of probiotic cultures in enriched probiotic yoghurt drink during storage at 4±1°C : The viability of *L. acidophilus* and *B. bifidum* cultures in unheated and heat treated products has decline slightly during the storage period of 14 days and 28 days (Table 5). It can be observed from the results that, with the heat treatment, viability of probiotic cultures in yoghurt drink significantly decline than unheated product. It is interesting to note that, even after 28 days of storage period more than 10⁶ cfu/ml viable cells were retained in the product. These results are in agreement with Christopher *et al.*, (2006) who reported yoghurt with 0.5% WPC even after 28days of storage at refrigeration retained 6.16 log₁₀ cfu/ml viable cells of *B. bifidum* in yoghurt with good sensory qualities. Dave and Shah (1998) reported that, viability of *L. acidophilus* and *B. bifidum* can be increased during refrigeration storage by incorporating WPC, acid casein hydrolyzates or tryptone. Farnsworth *et al.* (2003) reported probiotic cultures were relatively stable in yoghurt and their populations remained above 10⁶ cfu/ml after 8 weeks of storage at 4°C. The decline in viable counts is mainly due to increased acid production during storage. Similar observations were made by Hekmat and McMohan (1992) revealed that, pH of yoghurt could influence the growth and viability of *L. acidophilus* and *B. bifidum* during storage period.

CONCLUSION

The consumption of fermented dairy products is increasing in recent years. Incorporation of *L. acidophilus* and *B. bifidum* into the yoghurt drink would be of paramount importance in making these organisms available to the common population. Whey and whey products are used as potential food ingredients due their excellent nutritional and promising functional properties in fermented milks and thus it is great significance to utilize WPC in human food chain. From this investigation it was concluded that yoghurt drink prepared with WPC and incorporation of probiotic cultures without affecting its physico-chemical, sensory and nutritional aspects of the product. The probiotic cultures in yoghurt drink was found to be viable throughout the storage in heat treated products. Consumption of enriched probiotic yoghurt drink not only improves the nutritional status but also improves the therapeutic properties. In this context the developed enriched probiotic yoghurt drink adds on to the economic



development of Indian dairy industry and competes over other beverage industries. The technology developed for the preparation of enriched probiotic yoghurt drink could be exploited in commercial dairies.

Table-1 : Effect of MSNF replacement with Whey Protein Concentrates (WPC) on sensory quality of yoghurt drink.

Levels of MSNF replacement* (% w/w)	Color and Appearance	Flavour	Sweetness	Consistency	Overall Acceptability
Control (0)	7.80	7.47	7.91	7.36	7.45
0.5	7.81	7.44	7.90	7.42	7.51
1.0	7.93	7.50	7.85	7.77	7.72
1.5	8.08	7.75	7.78	8.04	8.23
2.0	8.00	7.43	7.72	7.96	7.92
CD	0.245	0.155	0.293	0.217	0.269

All the values are average of 3 trials, Sensory scores on 9 point Hedonic scale,

* Extent of replacement of MSNF with WPC.

Table-2 : Effect of MSNF replacement with Whey Protein Concentrates (WPC) on physico-chemical properties of yoghurt drink.

Levels of MSNF replacement* (% w/w)	Protein (%)	Ash (%)	Moisture (%)	Acidity (% lactic acid)	pH	Viscosity (cP)
Control (0)	2.95	0.993	82.24	0.693	4.62	3.69
0.5	3.14	0.993	81.97	0.714	4.56	3.77
1.0	3.36	0.995	81.77	0.730	4.49	3.95
1.5	3.62	0.996	81.67	0.753	4.44	4.23
2.0	3.85	0.998	81.53	0.781	4.37	4.41
CD	0.418	0.018	0.472	0.279	0.345	0.314

All the values are average of 3 trials, * Extent of replacement of MSNF with WPC.

Table-3 : Effect of different levels of Probiotic cultures* on sensory quality of enriched yoghurt drink.

Inoculation levels (%)	Color and Appearance	Flavour	Sweetness	Consistency	Overall Acceptability
Control (0)	7.83	7.55	7.85	7.58	7.61
3	7.85	7.82	7.85	7.73	7.99
4	7.90	8.23	7.78	7.81	8.12
5	7.96	7.67	7.69	7.57	7.56
CD	0.223	0.395	0.273	0.197	0.352

All the values are average of 3 trials, Sensory scores on 9 point Hedonic scale

L. acidophilus LA5 and B. bifidum BB12

Table-4 : Effect of different levels of Probiotic cultures* on viable counts, acidity and pH in enriched yoghurt drink.

Inoculation level (%)	Viable counts (Log ₁₀ cfu/ml)	Acidity (% lactic acid)	pH	
	<i>L.acidophilus</i>	<i>B. bifidum</i>		
Control (0)	-	-	0.69	4.65
3	8.35	7.81	0.72	4.54
4	8.89	8.26	0.74	4.44
5	9.27	8.55	0.78	4.35
CD	0.367	0.281	0.157	0.128

All the values are average of 3 trials, * L. acidophilus and B. bifidum



Table-5 : Viability of Probiotic cultures in enriched probiotic yoghurt drink* stored at $4\pm 1^{\circ}\text{C}$.

Storage period (Days)	<i>L. acidophilus</i> (Log ₁₀ cfu/ml)	<i>B. bifidum</i> (Log ₁₀ cfu/ml)		
	Unheated	Heat treated (65°C/10 s)	Unheated	Heat treated (65°C/10 s)
0	8.97	7.88	8.19	7.13
7	8.21	7.61	7.58	6.91
14	7.63	7.33	7.04	6.79
21	ND	7.11	ND	6.43
28	ND	6.87	ND	6.15

$$Y = 7.3132 - 0.3118D^{**} + 0.6695C^{**} + 0.6005T^{**}$$

All the values are average of 3 trials, ** : Significant at < 0.01 , ND : Not Done

REFERENCES

1. Arun Kumar, G., (1993), Use of human strains of Bifidobacteria in the preparation of some dairy products. *M.Sc. Thesis submitted to University of Agricultural Sciences, Bangalore*.
2. Ashok H. Naik., (1990), Utilization of sweet cream butter milk for the preparation of yoghurt drink. *M.Sc thesis, University of Agricultural sciences, Bangalore*.
3. Barrentes, E., Tamine, A.Y., Muir, D.D. and Sward, A.M., (1994), The effects of substitution of fat by micro particulate whey protein on the quality of set type natured yoghurt. *J. Soc. Dairy Technol.*, 47: 61-68.
4. Christopher, M.D., Padmanabha Reddy, V. and Venkateswarlu, K., (2006), Effect of WPC supplementation on the viability of *B. bifidum* in probiotic yoghurt. *J. Dairy Sci.*, 43: 552-554.
5. Dave, R.I. and Shah, (1998). Ingredient supplementation effects on viability of probiotic bacteria in yoghurt. *J. Dairy Sci.*, 81: 2804-2816.
6. Farnsworth, J.P., Li, J. and Guo, M.R., (2003), Improved structure and consistency of probiotic goat's milk yoghurt. *Australian J. Dairy Technol.*, 58: 187.
7. Hekmat, S. and McMohan, D.J., (1992), Survival of *L. acidophilus* and *B. bifidum* in Ice cream for use as a probiotic food. *J. Dairy Sci.*, 75: 1415-1422.
8. IS: SP: 18, 1981, ISI handbook of food analysis, Part XI, Dairy products. Indian Standard Institution, Manak Bhavan, New Delhi, India.
9. Jayaprakasha, H.M., (2000). Final report of Adhoc research scheme, whey protein concentrate in the formation of dairy and bakery products. Report submitted to ICAR, New Delhi.
10. Kailaspathy, K. and Chin, J., (2000). Survival and therapeutic potential of probiotic organisms with reference to *L. acidophilus* and *Bifidobacterium spp.* *Immunity and Cell Biology*, 78: 80-88.
11. Laroia, S. and Martin, J.H., (1990), Bifidobacteria as possible dietary adjuncts in cultured products – A review. *Cultured Dairy Products J.*, 25: 20-22.
12. Lucas, A., Sodini, I., Monnet, C., Jolivet, P. and Carrieu, G., 2004, Probiotic cell counts and acidification in fermented milks supplemented with milk protein hydrolyzates. *Intl. Dairy J.*, 14: 47-53.
13. Opdhal, L.J. and Baer, R.J., (1991), Composition and consumer acceptance of frozen yoghurt utilizing whey protein concentrates. *J. Dairy Sci.*, 74: 4151-4163.
14. Parris, N., Hollar, M., Hscich, A. and Cookery, D., (1997), Thermal stability of whey protein concentrates mixture: Aggregate formation. *J. Dairy Sci.*, 80: 19-28.
15. Sadana, S., (2006). Dairy Scenario-Vision 2020. All India Dairy Business Directory, (Dairy Year Book), P-47.
16. Steinholt, K. and Holt, J.M., (1991). Demineralized, hydrolyzed and concentrated whey syrup in Ice cream. *Meieriposten*, 80: 553.
17. Thapa, T.B. and Guptha, V.K., (1992). Rheology of processed cheese foods with added whey protein concentrates. *Indian J. Dairy Sci.*, 45: 88-92.
18. Venkateshaiah, B.V. (1995). Utilization of whey solids in the preparation of frozen yoghurt. *Ph.D. Thesis submitted to University of Agricultural Sciences, Bangalore*.



BIOSORPTION : AN ALTERNATIVE TREATMENT METHOD FOR THE REMOVAL OF TEXTILE DYE EFFLUENTS

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Increasing population results in rapid industrialization and urbanization. Due to that, the world has been confronted with two major problems. One is depletion of fossil fuels and another one is polluting the environment. Water pollution is a major problem in the global context and has even been suggested to be the leading cause of death and disease worldwide (UN-Water, 2010). Water pollution has in some cases, been defined as any human-caused contamination of water that reduces its usefulness to humans and other organisms in nature. Most of the pollution of water supplies comes from anthropogenic sources which include contaminants such as herbicides, pesticides, fertilizers, hazardous industrial chemicals, detergents, pathogens, heavy metals, organic solvents and textile dyes (Bunhu, 2011). Dyes and dye pigments are the major sources for polluting the water resource. Pollution caused by dye effluent is mainly due to long durability of dyes in wastewater, stability and resistance to degradation. Dyes have been widely used in textiles, dyeing, cosmetics, paper, leather, color photography, pharmaceutical, food and other industries because of their ease and cost effectiveness in synthesis, firmness and variety in color (Moorthiet *al.*, 2007). Textile industry is the second largest industry in India. The textile industry accounts for two-thirds of the total dyestuff market and consume large volumes of water and chemicals for wet processing of textiles. The discharges of wastewater are the main cause of the harmful environmental impact of the textile industry. Robinson *et al.*, (2001) estimated about 10-15% of textile dyes are discharged into waterways as effluent and effluents discharged from such industries consist of high sodium, chloride, sulphate, hardness and carcinogenic dye ingredients. Amount of dyes in water (1 mg/L) was highly visible and affects the aesthetic merits of water transparency and gas solubility in lakes, rivers and other water bodies but an average concentration of 300 mg/L has been reported in effluents from textile manufacturing processes (Saravanane *et al.*, 2013). Dyeing industry effluent alters the color and quality of the water bodies has been proved to be hazardous to aquatic ecosystem and it reduces the sunlight penetration which is essential for photosynthesis, it leads to toxicity of fish and mammals. They also inhibit the activity and growth of microorganisms. Dyes having higher stability under sunlight and resistance to microbial attack and temperature were identified (Schliephake *et al.*, 2000). The presence of dyes or their degraded products in water will also cause human health disorders such as nausea, hemorrhage, ulceration of skin and mucous membranes. The presence of such toxic compounds also resulted into severe damage to kidney, reproductive system, liver, brain and central nervous system (Ramachandran *et al.*, 2013). Consequently, it is pertinent to develop efficient treatment strategies for removal of color from dye wastewater. Many treatment processes have been applied for the removal of dyes from waste water such as physical, chemical and biological treatments. The physical and chemical treatment methods include ozonization, adsorption, chemical precipitation, flocculation, coagulation, chemical oxidation, photocatalysis, dilution, ion-exchange, reverse osmosis, ultra-filtration, membrane filtration, irradiation and electro-chemical destruction (Gupta *et al.*, 2004). But these methods have certain disadvantages such as inefficient dye removal, costly, sludge formation and not applicable to a wide range of dye wastewaters. Most important drawback of chemical treatments is production of secondary pollutants due to excessive utilization of chemicals (Crini, 2006). Biological methods such as biodegradation, bioaccumulation and biosorption are also employed for dye removal (Fu and Viraraghavan, 2001). Among these techniques biosorption is considered to be more promising technique due to its efficiency, less cost, capacity and capability to eliminate non-biodegradable dyes from industrial effluents on a large scale (Lin *et al.*, 2011). Biosorption has been defined as the property of certain biomolecules (or types of biomass) to bind and concentrate selected ions/other molecules from aqueous solutions. Thus biosorption using microbial biomass especially, fungal biomass as potential sorbent for removal of dyes from industrial wastewater has gained considerable attention (Gowriet *et al.*, 2014). A wide variety of bacteria, yeast, fungi and algae have been used for the purpose of decolorizing dye-containing wastewaters, owing to their special surface properties, high selectivity, cost-effectiveness, abundant availability, and environmental acceptability (Farah and El-Gendy, 2013). Many fungal biosorbents were studied for dye removal which include *Aspergillusniger*, *Neurosporacrassa*, *Penicilliumchrysosporium*, *Rhizopusarrhizus* and *Aspergillusfumigatus*, *Aspergillusnidulans*, *Pleurotusostreatus* (Nanthakumaret *al.*, 2009; Gnanadoss and Jebapriya, 2013; Chen *et al.*, 2014; Ganesan *et al.*, 2014). Both living and dead fungi have been shown to be capable of removing dyes due to the presence of various functional groups on the biomass (Crini, 2006). However, dead cells offer several advantages over living cells. Firstly, for efficient dye removal using living fungal cells, the growth conditions



(nutrients requirements, pH and temperature) of the fungi are extremely important. Use of dead fungal cells obviates the need for nutrients requirements as well as eliminates the problem of waste toxicity. In addition, dead fungal biomass can be stored easily and kept for prolonged periods (Lowaet *et al.*, 2008). Fungi are particularly effective in the decolourization of dyes with different molecular structures by *Cunninghamella elegans* was evaluated under several media condition. The decolourization procedures consisted of adding 72 h of mycelium into the culture medium containing either Orange or Reactive Black or Reactive Red or mixture of these dyes in the presence or absence of sucrose and/or peptone. The decolourization profile was highly dependent upon the incubation time, the molecular structure of the dye and presence or absence of co- substrates (Ambrosio *et al.*, 2004). Fu and Viraraghavan (2000) demonstrated that, compared with commercial activated carbon, dead fungal biomass of *Aspergillus niger* is a promising biosorbent for dye removal. Aksu and Tezer (2000) demonstrated the uptake of 588.2 mg of reactive black 5 per gm using *Rhizopus arrhizus* biomass. Bhole *et al.* (2004) found that the dead biomass of *Aspergillus niger* was effective biosorbents of methyl violet and basic fuchsin. Maximum sorption was seen within 10 minutes. Sharma (2005) also found that both *Rhizopus niger* and *Rhizopus nigricans* biomass were quite effective in the biosorption of basic fuchsin. Waranusantigulet *et al.* (2003) and Chu and Chen (2002) also reported the usefulness of biomass for the removal of basic dyes. The biosorption capacity of fungal biomass could be increased by some pretreatment (by autoclaving or by reactive chemicals) (Fu and Viraraghavan, 2001). Fungi especially the white-rot fungi produce enzymes laccase, manganese peroxidase (MnP) and lignin peroxidase (LiP), which are involved in degradation of lignin in their natural lignocellulosic substrates. This ligninolytic system of white rot fungi is directly involved in the degradation of various xenobiotic compounds and dyes. The ability of the white rot fungi to degrade dye can be directly correlated with its ability to degrade lignin; the dye molecules are degraded along with lignin. Use of white rot fungi is the most unique technology of bioremediation as their ability to degrade structurally diverse xenobiotic organo pollutants is more (Christian *et al.*, 2005; Tripathi *et al.*, 2007). The binding mechanisms of dyes by biosorption could be explained by the physical and chemical interactions between cell wall ligands and adsorbates by ion exchange, complexation, coordination and microprecipitation. The diffusion of the dye from the bulk solution to active sites of biosorbents occurs predominantly by passive transport mechanisms (Veglio and Beolchini, 1997) and various functional groups such as carboxyl, hydroxyl, amino and phosphate existing on the cell wall of biosorbents can bind the dyes (Avery and Tobin, 1992).

REFERENCES

1. UN-Water. UN-Water statement on water quality. www.unwater.org, 2010, (Accessed - 06/10/2011).
2. Bunhu, T. (2011). *Preparation and Evaluation of Lignocellulose-Montmorillonite Nanocomposites for the Adsorption of some Heavy Metals and Organic Dyes from Aqueous Solution*. Ph.D. Thesis. University of Fort Hare.
3. Moorthi, P.I.S., Selvam, S.P., Sasikalaveni, A., Murugesan, K. and Kalaichelvan, P.T. (2007). Decolorization of textile dyes and their effluents using white rot fungi. *Afr. J. Biotechnol.* **6**(4): 424-429.
4. Robinson, T., McMullan, G., Marchant, R. and Nigam, P. (2001). Remediation of dyes in textile effluent: A critical review on current treatment technologies with a proposed alternative. *Biores. Technol.* **77**: 247-255.
5. Saravanan, N., Kannadasan, T., Basha, C.H. and Manivasagan, V. (2013). Biosorption of textile dye using immobilized bacterial (*Pseudomonas aeruginosa*) and fungal (*Phanerochaete chrysosporium*) cells. *Ame. J. Env. Sci.* **9**(4): 377-387.
6. Schliephake, K., Mainwarin, D.E., Lonergan, G.T., Jones, I.K. and Baker, W.I. (2000). *Enz. Microb. Technol.* **27**: 100-107.
7. Ramachandran, P., Sundharam, R., Palaniyappan, J. and Munusamy, A.P. (2013). Potential process implicated in bioremediation of textile effluents: A review. *Adv. Appl. Sci. Res.* **4**(1): 131-145.
8. Gupta, V.K., Mittal, A., Krishnan, L. and Gajbe, V. (2004). Adsorption kinetics and column operations for the removal and recovery of malachite green from wastewater using bottom ash. *Sep. Purif. Technol.* **40**(1): 87-96.
9. Crini, G. (2006). Non conventional low cost adsorbents for dye removal; a review. *Biores. Technol.* **97**: 953-971.
10. Fu, Y. and Viraraghavan, T. (2001). Fungal decolorization of dye waste water-a review. *Biores. Technol.* **82**: 139 – 145.
11. Lin, Y., He, X., Han, G., Tian, Q. and Hu, W. (2011). Removal of crystal violet from aqueous solution using powdered mycelia biomass of *Ceriporia lacerata* P2. *J. Env. Sci.* **23**(12): 2055-2062.
12. Gowri, R.S., Vijayaraghavan, R. and Meenambigai, P. (2014). Microbial degradation of reactive dyes—A review. *Int. J. Curr. Microbiol. App. Sci.* **3**(3): 421-436.
13. Farah, J.Y. and El-Gendy (2013). Performance, kinetics and equilibrium in biosorption of anionic dye Acid Red 14 by the waste biomass of *Saccharomyces cerevisiae* as a low-cost biosorbent. *Turkish J. Eng. Env. Sci.* **37**: 146-161.
14. Nanthakumar, K., Karthikeyan, K. and Lakshmanaperumalsamy, P. (2009). Investigation on biosorption of reactive blue 140 by dead biomass of *Aspergillus niger* HM11: kinetics and isotherm studies. *Global J. Biotechnol. Biochem.* **4**(2): 169-178.
15. Chen, Z., Deng, H., Chen, C., Yang, Y. and Xu, H. (2014). Biosorption of malachite solutions by *Pleurotus ostreatus* using Taguchi method. *J. Env. Health Sci. Eng.* **12**: 63.



16. Gnanadoss, J.J. and Jebapriya, G.R. (2013). Decolourization of synthetic dyes using free and immobilized *Aspergillus* species. *Res. Biotechnol.* **4**(5): 20-23.
17. Ganesan, B., Venkatesaprabhu, K.M. and Ponnusamy, P. (2014). Biosorption studies and kinetics on textile effluent treatment using packed bed reactor. *J. Bioremed. Biodeg.* **5**: 5.
18. Lowa, B.T., Ting, Y.P. and Deng, S. (2008). Surface modification of *Penicillium chrysogenum* mycelium for enhanced anionic dye removal. *Chem. Eng. J.* **141**: 9-17.
19. Ambrosio, S.T. and G.M. Campos-Takaki (2004). Decolorization of reactive azo dyes by *Cunninghamella elegans* UCP 542 under co-metabolic conditions. *Biores. Technol.* **91**: 69-75.
20. Fu, Y. and T. Viraraghavan (2000). Removal of a dye from an aqueous solution by fungus *Aspergillus niger*. *Water Qual. Res. J. Canada* **35**: 95-111.
21. Aksu, Z. and S. Tezer (2000). Equilibrium and kinetic modeling of biosorption of Remazol Black B by *Rhizopus arrhizus* in a batch system: effect of temperature. *Proc. Biochem.* **36**: 431-439.
22. Bhole, B.D., Genguly, B., Madhuran, A., Deshpande, D. and J. Joshi (2004). Biosorption of methyl violet, basic fuchsin and their mixture using dead fungal biomass. *Curr. Sci.* **86**: 1641-1644.
23. Sharma, R. (2005). *Effect of Fungal Pretreatment on the Capacity of Parthenium Stems Biomass to Adsorb Certain Dye*. M.Sc. project Report, Industrial Biotechnology, C.C.S. University, Meerut.
24. Waranusantigul, P., Pokethitiyook, P., Kruatrachue, M. and E.S. Upatham (2003). Kinetics of basic dye (methylene blue) biosorption by giant duckweed (*Spirodela polyrrhiza*). *Environ. Pollut.* **125**: 385-392.
25. Chu, K.H. and K.M. Chen (2002). Reuse of activated sludge biomass: I. Removal of basic dyes from wastewater by biomass. *Process. Biochem.* **37**: 595-600.
26. Christian, V., Shrivastava, R., Shukla, D., Modi, H.A. and Vyas, B.R.M. (2005). Degradation of xenobiotic compounds by lignin-degrading white-rot fungi: enzymology and mechanism involved. *Ind. J. Exp. Biol.* **43**: 301-312.
27. Tripathi, A.K., Harsh, N.S.K. and Gupta, N. (2007). Fungal treatment of industrial effluents: a mini-review. 78-81.
28. Veglio, F. and Beolchini, F. (1997). Removal of metals by biosorption: A review. *Hydrometallurgy*, **44**: 301-316.
29. Avery, S.V. and Tobin, J.M. (1992). Mechanisms of strontium uptake by laboratory and brewing strains of *Saccharomyces cerevisiae*. *Appl. Env. Microbiol.* **58**: 3883-3894.



IPM MODULES FOR MANAGEMENT OF MAJOR INSECT PEST OF CHICKPEA IN SUB ZONE V OF JHARKHAND

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Introduction : Chickpea (*Cicer arietinum* L.) is the second most important pulse crop grown globally and also one of the major pulse crops grown in India. Among the different insect-pests that attack the crop, the gram pod borer, *Helicoverpa armigera* (Hub.) (Lepidoptera; Noctuidae) is one of the most devastating pests worldwide and feeds on more than 300 plant species, and solely responsible for considerable damage to many field and horticultural crops (Arora *et al.*, 2005). In India, it is reported to cause crop damage worth about US \$ 1 billion per annum (Chandrashekhar *et al.*, 2005).

H. armigera causes economic loss in chickpea by damaging tender foliage, flowers and pods. Under favourable conditions the pod damage research up to 90 to 95% (Shegal and Ujagir, 1990). *H. armigera* is a highly polyphagous pest which infests many host plants (Attique *et al.*, 2000; sarwar, 2012). *H. armigera* is a key pest of chickpea (Sarwar *et al.*, 2009, 2011). Apart from chickpea, *H. armigera* is reported to infest cotton, maize, pigeonpea sorghum, sunflower, soybean, groundnut, tobacco and tomato.

Total reliance on the use of insecticides for the control of *H. armigera* have not helped much to manage it effectively apart from inducing pest resistance to chemicals (Armes *et al.*, 1992). Hence, the attempts are being made to find out alternate methods for its control by an IPM modules.

It is therefore, considered to develop a suitable IPM modules for management of major insect pests of chickpea in sub zone V of Jharkhand.

Intercropping is one such method generally understood to mean the growing of a mixture of crop with main crop which can affect microclimate of the agroecosystem and ultimately produce an unfavorable environment for pest (wilken, 1972).

Background : Chickpea can be grown profitable on residual moisture in heavy soils, in rain fed rice fallow lands (RRFL) without and or with minimum irrigation. There is scope for increasing chickpea production in approximately 12 m ha RRFL in central and eastern India. State Agriculture University in Jharkhand, Chhatisgarh, Orissa, West Bengal and eastern Madhya Pradesh by conducting large scale on-farm trials established that short duration varieties of chickpea and lentil can be successfully grown after rice harvest and with reasonably high per hectare yield of 1000 Kg to 2500 Kg. Short duration desi and kabuli chickpea varieties were found suitable. Farmers preferred the kabuli varieties, viz., ICCV2, KAK2 and JGK in most areas as they fetch high market prices. More variety recently, a heat tolerant chickpea variety JG14 has been found to be highly adaptable to late sown conditions in the rice fallow area in above states. Rabi pulses particularly chickpea and lentil can be successfully raised on these rice-fallows which can optimally utilize the available land resources and enhance output of pulses.

Impact of newer technologies on the Indian chickpea scenario : Chickpea is cultivated in 25 states of India, with the major ones like Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, Uttar Pradesh, Gujarat and Jharkhand constituting more than 96 % area of under chickpea. Research efforts made through NARS have led to the development of more than 200 varieties of chickpea which are adapted to varying agro-climatic conditions having in built resistance against key biotic and abiotic stresses. Simultaneously, matching production and protection technologies have also been developed. As a result of all these efforts, the area under cultivation for chickpea has been increased from about 5.19 m ha in 2000-01 to 10.76 m ha in 2017-18.

Chickpea varieties : Chickpea is broadly classified in to two groups, desi and kabuli. desi chickpea varieties are under cultivation from ages and have small seeds, angular to round in shape, dark seed colour having smooth to rough seed coat (less than 25 g/100 seed weight) ; while kabuli varieties usually have large beaked seeds to ram's head shape or round seeds with white or beige seed coat colour and large size (more than 50 g/100 seed weight).

Desi varieties of chickpea suitable for Jharkhand region : Birsa Chana-3, BG-3043, GNG-2207, GCP-105, KWR-108, Vijay, KPG-59, JG-14

Kabuli varieties of chickpea suitable for Jharkhand region : HK-4, KAK-2, BG-1003 and PKV-Kabuli-4

Short duration varieties of chickpea suitable for Jharkhand region (110-115 days) Pant Gram-5, GNG-2144, JSC-55, JSC-56, Pusa-261

Factors responsible for heavy pest infestation in chickpea :

Ignorance of improved cultural practices in the field



Lack of basic knowledge about insect-pests and their time of appearance among farmers.
Adoption of improper plant protection measures.
Ignorance as well as poor transfer of technology to farmers on integrated approach of pest management.
Availability of host plants all the year round.
Indiscriminate use of pesticides.
Inadequate spray technology.
Poor information on pest monitoring among farmers.
Lack of effective bio-control agents.
Poor water and nutrient management.
Adulteration of pesticides.
Lack of well organized, systematic and scientific surveillance system to give advance warning to the farmers.
Lack of systematic efforts to solve the problems through multidisciplinary approach.

Insect pests of chickpea

Pod borer (*Helicoverpa armigera* L.)

Cutworm (*Agrotis ipsilon*)

Pod borer (*Helicoverpa armigera* L.)

Distribution

Widely distributed in chickpea growing areas
Annual yield losses-US \$ 328 million in semi arid tropics

Symptoms

Pod borer can invade the crop from seedling to maturity
Larvae feed on leaves, flowers and pods
Larvae mostly green, can be brown, yellow or pink
The large larvae cut round holes in the pod wall and devour the seed inside

Cutworm (*Agrotis ipsilon*)

Distribution

Widely distributed in chickpea growing regions
Seedling mortality up to 30 % in some locality

Symptoms

Temporary flooding favour damage due to cutworms
Larvae feed on leaves, stems and roots
The larvae are grey-black in colour
Seedlings are cut at or below ground level

IPM modules

Monitoring of pest population using sex pheromone traps can be used for early warning of insect pest incidence. When male moth catch crosses 4-5 trap per night, control measures to manage the pest should be adopted immediately. The economic threshold for gram pod borer larvae @ 1-1.50 larvae per meter of row length has been recognized.

1. Host plant resistance

Use moderate resistance cultivars like ICCV7, ICCV10, ICCL86103, Vijay

2. Cultural control

Deep ploughing help in reducing cutworm population
Early sowing
Crop rotation
Grow short duration varieties like JG11, JG14, JGK-1, JAKI 9218, Vijay, Vikas, Vishal, KAK 2, Rajas, Pusa 547, RVG 202, RVG 203



Spacing (row to row 40 cm and plant to plant 10 cm) helps in reducing the pod damage by way of restricting free movement of larvae

Intercropping with linseed/mustard have significant impact for minimizing *H. armigera* population

Avoid excessive vegetative growth

Avoid excess irrigation

Installation of pheromone traps

Installation of bird perches @ 10-15/ha

Clean cultivation, removal of undecomposed plant debris and conservation of natural enemies help in minimizing population of cutworm effectively

3. Chemical control

Seed treatment with chlorpyrifos 20 EC @ 1.0 L per quintal of seed

Need based application of rynaxypyr 20 SP @1 ml/3.0L water

Need based application of indoxacarb 14.5 SC @ 0.75 ml/L water

Need based application of profenophos 50 EC @ 2.0 ml/L water

Need based application of cypermethrin 10 EC @ 1.0 ml/L water

Spraying of chlorpyrifos 20 EC @ 0.05 % near to the roots in standing crops provides effective control against termite and cutworm

4. Biological control

Application of HaNPH @ 250 LE/ha at 10-15 days interval

Need based biorational spray with NSKE 5%

CONCLUSION

Chickpea is one of the major pulse crops grown in India. It is cultivated in 25 states of India. It can be grown profitable on residual moisture in heavy soils, in rain fed rice fallow lands (RRFL) without and or with minimum irrigation. Chickpea is broadly classified in to two groups, desi and kabuli. Short duration varieties of chickpea is suitable for successful cultivation in the region of Jharkhand. Among the different insect-pests that attack the crop, the gram pod borer, *Helicoverpa armigera* (Hub.) is a polyphagous and one of the most devastating pest worldwide and feeds on more than 300 plant species, and solely responsible for considerable damage to many field and horticultural crops. It can invade the crop from seedling to maturity. Larvae feed on leaves, flowers and pods. IPM modules are the best solution for the management of the crop from insect pest infestation. Cultural practices are an important tool for reducing the pest population in the field of chickpea. Rynaxypyr 20 SP and indoxacarb 14.5 SC are the best insecticide spraying at flower initiation and pod formation stage. Biorational spray NSKE 5% is also effective for reducing the insect pest population of chickpea in the field.

REFERENCES

1. Arora, R., Sharma, H.C., and Dreissche, E. Van. (2005). Biological activity of lectins from grain legumes and garlic against the legume pod borer, *Helicoverpa armigera*. ejournal. icrisat. org, Volume- 1, Issue -1, pp-1-3.
2. Chandrashekhar, K., Kumari, A., Kalia, V. and Gujar, G.T. (2005). Baseline susceptibility of the American bollworm, *Helicoverpa armigera* (Hubner) to *Bacillus thuringiensis* Berl Var. *Kurstaki* and its endotoxins in India. *Current Science*, 88 (1): 167-175.
3. Chaturvedi, S.K., Jha, S.K., Singh, N.P., Gaur, P.M. and Varshney, R.K. technological and policy intervention for increasing chickpea production in India. www.ipga.co.in/vol: 111/issue 01/April-June 2018-11-12
4. Dixit, D.P., Srivastava, A.K. and Singh, N.P. (2019). Marching towards self-sufficiency in chickpea. *Current Science* Review article, 116 (2): 239-242
5. Patra, P.S., Mansur, C.P., Alagundagi, S.C. and Karbantanal, S.S. (2012). Effect of intercropping system on gram pod borer *Helicoverpa armigera* Hubner and its natural enemies in chickpea. *Indian Journal of Entomology*, 74 (2): 136-141.
6. Shegal, V.K. and Ujagir, R. (1990). Effect of synthetic pyrethroids, neem, extracts and other insecticides for the control of pod damage by *Helicoverpa armigera* on chickpea and pod damage yield relationship at Patancheru in Northern India. *Crop Protection*. 9: 29-32.
7. Singh, S.S. and Singh, J.P. (2006). Integrated Pest Management strategies for managing pod borer, *Helicoverpa armigera* in chickpea. *Indian Journal of Entomology*, 68 (2): 152-157
8. Singh, R.P. and Renu, R. (2009). Growth of production and productivity of different pulses in Jharkhand. *J. Economic and Social Development* 5 (1/2) : 35-43.
9. Wilken, G.C. (1972). Microclimate management by traditional farmers. *Geographic Review*, 62 (4) : 544-560.



INTRACELLULAR SURVIVAL MECHANISM OF *BRUCELLA ABORTUS*

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Abstract

Brucella spp. is facultative intracellular pathogen causing brucellosis in a wide range of mammals including humans. The key of establishment of a successful *Brucella* infection is its ability to survive within macrophages. It is reported to adjust within 48 hours post-infection in host system. The mechanism involved includes the modulation of central carbon metabolism in its metabolism. It includes low iron concentration that triggers for reprogramming the protein expression profile. *Brucella* protects itself from damage due to oxidative burst and that involves up-regulation of proteins responsible to reduce the concentration of reactive oxygen species and protein chaperones preventing misfolding of proteins and proteases. It further degrades toxic protein aggregates and help *Brucella* escaping cellular damage.

Brucella, an intracellular bacterial pathogen, infects ruminants and other mammals like sheep, goats as primary host leading to abortions and altered fertility. Brucellosis is a zoonotic disease as *Brucella* can also be transmitted from animals to humans. human are secondary host. Human brucellosis is a worldwide disease and characterized by undulant fever and general malaise. Among all *Brucella* species, *B. abortus*, *B. melitensis* and *B. suis* are reported to be the most zoonotic prevalence. After the entry of *Brucella* in the host, macrophages are first line of defense that come in picture to trap and in gulf brucella. The ability to survive within macrophages, a phagocytic host cell type that is the first line of defense against microbial infections play critical role in the persistence of *Brucella* within the host. Due to its longstanding association with mammalian cells, *Brucella* has developed molecular mechanisms to overcome host cell machinery and subvert programmed cell death. It allows *Brucella* to survive within host cells. After the internalization in macrophage *Brucella* encloses itself in membrane bound compartment named as *Brucella*-containing vacuole (BCV). During early stage of infection BCV interacts with early endosome vacuoles and avoids its fusion to the highly degradative lysosome in order to survive. Within 10–12 hours post-infection, BCVs that have successfully escaped from entering the endocytic pathway fuse with endoplasmic reticulum-derived membranes becoming a permissive compartment for *Brucella* replication. Whereas within 24–48 hours post-infection, *Brucella* start replicating within the cistern of an endoplasmic reticulum-like network and completely occupies the host cell cytosol. The activity of the *Brucella* type four protein secretion system (T4SS) and the production of periplasmic cyclic 1–2 glucans (C₄G) are supposed to contribute as important traits allowing the bacterium to successfully acquire its intracellular replicative niche within macrophages. T4SS is known as a “nanomachine” that is induced within the host cell to allow *Brucella* to translocate a battery of effector proteins to the host cell cytosol to modulate its normal physiology. Whereas, C₄Gs play critical role for allowing BCVs to escape from the endocytic pathway and it might be due to its ability to occlude cholesterol within its inner ring extracting it from membranes disrupting lipid rafts. C₄Gs are also reported to involve in modulation of host inflammatory and immune responses. It is further reported that *Brucella* undergoes an extensive rearrangement of its proteome in order to adapt to the intracellular microenvironment within macrophages.

Brucella Irr is reported to be stable in iron-limiting growth conditions and degraded when iron is available. Because of its stabilization, Irr promotes the induction of iron acquisition systems. Accordingly, isochorismate synthase (BAB2_0015), one of the enzymes required for *Brucella* siderophore biosynthesis also play role through its up-regulation. Siderophores are small iron-chelators molecules that the bacteria excrete to the extracellular medium to capture iron from the environment. The induction of the operon responsible for siderophore synthesis is also reported in an intracellular *Brucella* transcriptome analysis. Iron-loaded siderophores are also transported back to the bacteria mediated by specific ABC transporters. The uptake of ferri-siderophores by the bacteria is challenging since it requires passage through the bacterial outer and inner membranes, a process that proceeds against an electrochemical gradient in the absence of any ATP production. Thus, bacteria have evolved proteins like the periplasmic TonB that energize the process of transporting across the membrane by transducing a proton motive force generated in the inner membrane. Ferric uptake through the outer membrane can be mediated by siderophores or by hijacking host ferric-binding proteins such as transferrin or lactoferrin mediated by receptors. Once the iron cargo is incorporated either by siderophores or by



siderophore-independent pathways, a periplasmic transferrin-like protein named FbpA, captures free iron for further delivery to the cytosol mediated by ferric-specific ABC transporters. *Brucella* is subjected to iron deprivation within the BCV microenvironment. At this point *B. abortus* recovered from macrophages induce the transcription of *irr*, *entC* genes, and reduce the expression of *dps* gene. Therefore, modulation in the expression level of Irr, EntC and Dps proteins can be explain because of the induction or repression of their respective genes. When *B. abortus* grown in an iron-depleted culture medium the up-modulation of Irr is recorded. The up-regulation of Irr is not due to the induction of *irr* transcription (using a transcriptional fusion approach) but rather a consequence of a reduction of Irr degradation. The transcription of *irr* gene is reduced at 24 hours post-infection. It has been observed that iron deprivation can lead to a perturbation of energy producing metabolic pathways. Due to the fact that enzymes of these pathways contain iron-sulfur (Fe-S) proteins or heme-containing enzymes which require iron for their activity. *Brucella* grown in iron-restricted conditions had a greater invasiveness and virulence. This observation is particularly interesting because allow to speculate if iron scarcity in addition of being a nutritional stressor it might also function as a “positioning” signal that tells *Brucella* about its intracellular localization within host cells. The iron deprivation is an important clues that mediate *B. abortus* to shape its proteome in order to increase its intracellular fitness.



AN OVERVIEW OF AGRICULTURE AND FARMERS' WELFARE SCHEMES AND PROGRAMMES IN INDIA

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Abstract

India is an agriculture based country, where more than 50 per cent of population depends on agriculture. Indian agriculture contributes around 17.4 per cent to India's gross domestic product (GDP) in 2018-19 and provides employment to 50 per cent of the country's work force. However, income of the farmers is low due to shortage of resource and land, climatic factors, pest, disease attack and low price at the time of harvesting. Therefore, Indian government has launched several schemes and programmes to boost agricultural output and improve socio economic status of farmers.

Key words : Farmers, Employment, Schemes, Agriculture, Soil, Productivity.

Rashtriya Krishi Vikas Yojna (RKVY) : This is a programme for achieving high growth in agricultural sector, higher returns to the farmers and for integrated development by focusing on food security, sustainable agriculture, and production of oil seeds, oil palm and agricultural extension.

National Food Security Mission (NFSM) : National Food Security Mission aims to enhance the production of Rice, Wheat, Pulses, coarse cereals and commercial crops to make the country self-sufficient in food grains. Pulses take 60% of the allocation from 2019-20, the provision also includes requirement of oilseeds and oil palm.

National Project on Organic Farming (NPOF) : The scheme is designed to encourage production and use of organic and biological sources of nutrients like bio fertilizers, organic manure, compost for sustained soil health and fertility and use of bio pesticides, bio control agents etc. as alternative inputs in organic farming.

National Mission for Sustainable Agriculture (NMSA) : This mission has been made operational from the year 2014-15, which aims at encouraging sustainable agriculture against climate change by integrated farming system, soil health management and synergizing resources conservation in rainfed areas to increase crop productivity.

Neem Coated Urea (NCU) : It aims at inhibiting misuse of urea in chemical factories and slowing down the release of nitrogen in soil for better availability to the crop. It reduces the cost of application, cost of cultivation and improves soil health also.

Pradhan Mantra Fasal Bima Yojana (PMFBY) : It was introduced in January 2016 to provide financial support to farmers suffering crop loss or damage due to unforeseen events. For this, farmers have to give premium of 2% for kharif and 1.5% for rabi and oil seed crops, and 5% for annual commercial or horticultural crops. This scheme is to facilitate prompt claims settlement within two months of harvest.

Pradhan Mantra Matsya Sampada Yojana (PMMSY) : Fishing and fishermen communities are closely aligned with farming and crucial to rural India. Through a focused scheme - Pradhan Mantra Matsya Sampada Yojana (PMMSY) the department of fisheries will establish a robust fisheries management framework. This will address critical gaps in the value chain, including infrastructure, modernization, traceability, production, productivity, post harvest management and quality control.

Pradhan Mantri Krishi Sinchai Yojana (PMKSY) : It was launched in 2015 with a motto "Har Khet Ko Paani" by creating the water resources and protective irrigation by increasing rain water at micro level through **Jal Sanchay and Jal Sinchan**. Per drop-more crops is ensured by micro irrigation. The programme will mainly focus on increased agricultural production and productivity by increasing availability and efficient use of water.

National Agriculture Market (e-NAM) : This scheme was launched in 2016 with a view 'One Nation One Market'. It facilitates the better price discovery and brings in transparency and competition to enable farmers to get improved remuneration for their produce.

Paramparagat Krishi Vikas Yojana (PKVY) : The scheme was launched during 2015 is an elaborated component of Soil



Health Management. Under the scheme, organic farming is promoted through adoption of organic village by cluster approach and Participatory Guarantee System of certification. Total 11891 clusters (of 20 ha. each) have been formed during the period 2015-16 to 2017-18. During the 2nd phase (2018-19 to 2020-21) target of an area of 4 lakh ha. is proposed to be covered.

Soil Health Card (SHC) : This scheme was launched in February 2015. Under this scheme soil health cards issued to the farmers for providing information on nutrient status of their soil and recommendation regarding nutrient dosage to be applied.

Market Intervention Scheme and Price Support Scheme (MIS-PSS) : Under this scheme NAFED, Central Warehousing Corporation, National Consumer Cooperative Federation of India and Small Farmers Agro Business Consortium have been designated as Central agencies to undertake procurement of Oilseed and Pulses under price support scheme and also work to provide remunerative prices to farmers for their produce.

Pradhan Mantri Annadata Aay Sanrakshan Abhiyaan (PM-AASHA) : Pradhan Mantri Annadata Aay Sanrakshan Abhiyaan (PM-AASHA) is a scheme to ensure minimum support price to farmers comprising of Price Support Scheme (PSS), oilseeds and copra, Price Deficiency Payment Scheme (PDPS) and pilot of Private Procurement & Stockist Scheme (PPSS) which is implemented from 2018-19 to 2019-20.

Pradhan Mantri Kisan Samman Nidhi (PM-Kisan) : With a view to provide income support to all farmer families across the country, to enable them to take care of expenses related to agriculture and allied activities as well as domestic needs, the Central Government started PM-Kisan (earlier Income Support Scheme). This would also protect them from falling in the clutches of moneylenders for meeting such expenses and ensure their continuance in the farming activities. The Scheme aims to provide a payment of Rs. 6000 per year in three quarterly instalments of Rs. 2000 to the farmer families, subject to certain exclusion relating to higher income groups. About 14.5 crore farmers are expected to be covered under the Scheme.

Pradhan Mantri Kisan Pension Yojana (PMKPY) : With a view to provide social security network for Small and Marginal Farmers (SMF) as they have minimal or no savings to provide for old age and to support them in the event of consequent loss of livelihood, the Government has decided to implement another new Central Sector Scheme for providing old age pension to these farmers. Under this Scheme, a minimum fixed pension of Rs.3000/- p.m. will be provided to the eligible small and marginal farmers, subject to certain exclusion clauses, on attaining the age of 60 years. The Scheme aims to cover around 5 crore beneficiaries in the first three years. It would be a voluntary and contributory pension scheme, with entry age of 18 to 40 years.

Interest Subsidy for Short Term Credit to Farmers : Under the scheme, interest subvention is provided to NABARD, Regional Rural Banks, Cooperative Banks, and Public Sector Banks and scheduled Private Sector Banks for providing Short Term Credit to farmers at subsidized rate of interest.

Promotion of Agricultural Mechanization for in-situ Management of Crop Residue : A special scheme has been launched to support the efforts of government of Haryana, Punjab, Uttar Pradesh and the NCT of Delhi to address air pollution and to subsidize machinery required for in-situ management of crop residue for the period from 2018-19 to 2019-20.

Distribution of Pulses to State / Union Territories for Welfare Schemes : A new scheme is to dispose the huge stock of pulses procured under Price Support Scheme (PSS) during Kharif marketing season 2017-18 and Rabi Marketing season 2018-19 by offering a subsidy of Rs. 15/- per kg over the issue price to State/UTs for utilization under various welfare schemes like Mid-Day Meal, Public Distribution System, ICDS etc.

Agriculture Marketing :

(i) Agricultural Marketing Infrastructure (AMI) - Includes creation of Scientific Storage Capacity. Under this scheme 40 lakh MT of storage capacity & 400 other marketing Infrastructure projects are targeted for 2019-20. In addition 100 Farmers Consumer Markets are to be established.

(ii) Marketing Research and Information Network (MRIN)-to establish nationwide information network of market data to the producers, traders and consumers.

(iii) Strengthening of Agmark Grading Facilities (SAGF).

(iv) Agri-Business Development (ABD) implemented through interest free Venture Capital Assistance (VCA) and Project Development Facility (PDF) to provide market linkages to farmers.

(v) National Agriculture Market (NAM) for setting up a common e-market platform for wholesale markets in States/ U.Ts



desirous of joining the e-platform-Roll out of NAM software for trading of agri-commodities in selected 1000 markets by 2019-20 across the nation and.

(vi) Equity Grant and Credit Guarantee Fund Scheme- to enable registered farmer- producer companies to access equity grant and also provides a Credit Guarantee to financial institutions, which extends loans to producer companies without collateral up to Rs.1.00 crore.

CONCLUSION

Indian government has launched several programmes and schemes from time to time to assist the farmers. These schemes benefit the farmers by improving soil health, reducing cost of cultivation, increasing crop productivity, availability of fertilizers, water management, providing market information and providing financial assistance on crop damage/failure. Moreover, integration of different schemes will increase the farmer's income in future.

REFERENCES

1. Department of Agriculture, Cooperation and Farmers' Welfare.
www.kisanworld.com
www.Indiastat.com



STRATEGIES FOR ENHANCING RAPESEED-MUSTARD PRODUCTION AND PRODUCTIVITY IN INDIA

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India is the largest producer of oilseeds in the world and oilseed sector occupies an important position in the agricultural economy of the country. Oilseeds are among the major crops that are grown in the country apart from cereals. Regarding acreage, production, and economic value, these crops are second only to food grains. In relation to world, India has the 5th largest vegetable oil economy next to USA, China, Brazil and Argentina. It accounts for 7.4% of oilseed output; 6.1 % of oil meal production; 3.9% oil meal export; 5.8% of vegetable oil production; 11.2% of oil import and 9.3% of the edible oil consumption. In India, oilseeds contribute 3% and 10% to gross national products and values of all agricultural products, with 14 and 1 million people involved in oilseed cultivation and processing, respectively (DRMR Vision 2050). India is one of the biggest importers of vegetable oils. With its rich agro-ecological diversity, India is ideally suited for growing all the major annual oilseed crops. Among the nine oilseed crops grown in the country, seven are of edible oils (soybean, groundnut, rapeseed-mustard, sunflower, sesame, safflower, and niger), and two are of non-edible oils (castor and linseed). India ranks first in the production of most of the minor oilseeds (castor, niger, safflower and sesame). In the case of major oilseeds, India ranks first in the production of groundnut, second in rapeseed-mustard, and fifth in soybean. The export of oil meals was 43.8 lakh tons during 2013-14. Regarding value, the total earning of Rs. 11,508 crores was realized in 2013-14. Since these oilseeds are cultivated mainly in the rain-fed and resource-scarce regions of the country, their contribution to livelihood security of the small and marginal farmers in these regions is very important.

The demand-supply gap in the edible oils necessitated for huge imports accounting to 60 per cent of the country's requirement (2015-16: Import 14 million tonnes; Cost Rs.68000 crores). Despite commendable performance of domestic oilseeds production of the nine annual crops (Compound Annual Growth rate of 3.89%), it could not match the galloping rate of *per capita* demand (~6%) due to enhanced *per capita* consumption (18 kg oil) driven by increase in population and enhanced *per capita* income. The rapeseed-mustard has faced many fluctuations and uncertainties regarding the area, production, and productivity. The production and yield of rapeseed-mustard, which was 2.68 mt and 650 (kg/ha) in 1985-86, which increased to 8.2 mt and 1185 (kg/ha) respectively in 2010-11. However, it followed a decline in production due to a reduction in area. During 2016-17, the productivity will be the tune of 1324 (kg/ha), being highest. This quantum jump attained in production is attributed to the development and wide spread adoption of high yielding varieties, and improved agro-production technologies in specific situations. About 60% area under this crop was irrigated, and there are a lot of possibilities to intensify production systems in such areas. The results of frontline demonstrations on rapeseed-mustard organized during the last ten years indicate the average productivity gap of 10-25% between the improved and farmers' practices while national average productivity gap of 20-63% between FLDs yield and states average. Enhancing the production and productivity of these crops assumes significance; not only from the farmers' view point but also for the edible oil industry and other linked enterprises. A horizontal expansion of rapeseed-mustard in paddy-fallow of NEH states and in non-traditional areas of southern states of India is also need of the time. Apart from the crop improvement and management research should concentrate to improve the nutritional and storage quality of rapeseed-mustard oil and seed meal with special emphasis on oils with low saturated fatty acid (< 6%), high oleic acid (> 60%), moderate linoleic acid (20-25%), low α -linolenic acid (about 9 %) and zero *trans* fatty acid; high level of tocopherols (vitamin E), low phenolic compounds.

FUTURE RESEARCH ACTIVITIES

Genetic improvement of the crop

- Exploiting genetic resource management for effective management of gene pool for improving, streamlining, and fortifying the breeding infrastructure
- Improvement of yield, and quality of oil, and seed meal
- Enhancing the level of heterosis, resistance/ tolerance to various abiotic-biotic stresses.
- Development of climate resilient genotypes
- Concentrated efforts on pre-breeding, and introgression of alien variation and molecular tagging of useful introgressed variability.
- Marker Assisted Selection for white rust, and oil quality
- Identification of QTLs for drought, heat, disease, and pest resistance, and yield components



Natural resource management to improve input (soil, water, and nutrients) use efficiency

Development of resource conservation technologies for mustard based cropping system.

Development of Agronomic strategies for juvenile stage such as high-temperature management (contingency planning).

Enhancing water and nutrient use efficiency in mustard-based cropping systems using water saving and residue management practices.

Critical limits of different micronutrients in soils, and plant in relation to rapeseed-mustard rooting system.

Estimation of root exudates and microbes in the rhizosphere of promising germplasm, and their interaction with soil borne pathogens.

Sustaining Yields

Epidemiology and forecasting of major diseases/ insect-pests under the changing climate.

Studies on the pathogenic variability of major pathogens like *Alternaria brassicae*, *A. candida*, and *Sclerotinia sclerotiorum*.

Bio-intensive IPM module as a functional component of ICM (Integrated Crop Management). It should include insectpests, diseases and weeds as well.

Realizing the untapped potential of the existing technologies

Enhanced use of IT-based decision support systems for technology transfer and development of application software (Decision Support System/Expert System)

Public-Private Partnership for crop diversification, value addition, seed production, capacity building, market driven extension, and feedback generation for research system.

Documentation of ITK having a bearing on the productivity, and its validation for inclusion in the package of practices for a particular agro-eco system.

Policies and Reforms

During the early 1990s, Minimum Support Prices (MSPs) for food grains were kept in check about oilseeds and the government controlled import monopoly dramatically lowered oil imports. It contributed to a sharp improvement in oilseed prices aboutcompeting for crops and increased the oilseed production substantially between 1987-88 and 1994-95. However, since the late 1990s, oilseed prices have declined about other crops, due to increased domestic supplies of oilseeds and liberalization of edible oil imports initiated in 1994. Also, although the government had regularly supported rice and wheat MSPs, price support operations for oilseeds have usually not been adequately funded. As a result, increasingly favorable returns from rice and wheat have drawn area away from oilseeds. Hence, to attract the farmers towards oilseeds, in general, and rapeseed-mustard in particularly, favorable support price, higher tariff rate on import of edible oil, and effective market intervention would have to be looked.

Processing Industry

The edible oil industry comprises four segments-mechanical crushing, solvent extraction, oil refining and hydrogenation. A series of steps have to be initiated not only by the Government but also by the domestic industry to help them to survive. A novel policy framework for the processing industry has to balance the interests of four constituents by providing an incentive price for farmers, an affordable price for consumers, reasonable profit margins for industry and reasonable conformity to public interest, ensuring satisfactory levels of employment, income, exports, and public revenue.

Oil recovery up to 35% only is realized by the mechanical crushing processor, which is the largest segment of edible oil processing industries and substantial amount of oil (5-10%) is left in the seed meal of rapeseed-mustard. Even if 3-4% of this left over oil could be extracted by modernizing the mechanical crushing units, then at least 2.0-2.5 lakh tonnes additional edible oil could be made available. There exists a problem for modernization of oil expeller units, as they come under small scale industries limiting the investment to modernize them for enhanced oil recovery.

Technology Dissemination and Public-private Partnership

FLDs can be used as an effective tool for creating a multiplier effect of technology and for utilizing FLD data in effective technology dissemination. DRMR should forge links between farmers and private sector for the sale of the good quality crop as a seed so that this spreads faster to a large number of farmers. There is a need for providing a price incentive to the farmers for canola types. The possibility of developing public-private-partnership (PPP) for contract farming and branding quality oil should be explored. This kind of move is consistent with the new guidelines of ICAR on commercialisation of technology. It is also important to analyse wide yield gaps in different states/regions.



ICTS FOR EFFECTIVE TRANSFER OF AGRICULTURAL TECHNOLOGIES

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Abstract

Advent of information and communication technologies changed the global scenario in reaching the clientele. In the present era of knowledge revolution, Mass Media Support to Agricultural Extension are supported through Radio, Television Agricultural Programmes in different TV Channels and with the advent of IT tools like computers, mobile phones and other facilities etc. These ICT tools could be used efficiently for knowledge resources management in agriculture in order to address the knowledge gap among the farmers, researchers and extension functionaries. In this context television has to reinvent itself based on changing agricultural scenario and farmer needs. The paper focuses on mass media support for agriculture extension in the state and ways for qualitative improvement of agricultural programs. Mass media TV Channels for agriculture are creating more interest and enthusiasm to the farmer's programmes and phone in live programmes. It is the need of the hour to stress on the need for programmes based on local farming situations, local problems with involvement of local scientists and extension specialists. A dedicated TV channel exclusive for agriculture in local languages may be promoted. It serves as a strategy for administrative and technical reforms in production of TV programmes in agriculture in Telangana and Andhra Pradesh to reach a wider rural farming audience who may not have access to the new generation ICTs. The paper would reveal how the mass media support given in Agriculture through Television, Radio, Mobile Apps, Video-based extension services and Real-Time Agriculture Advisory Service used in agriculture to harness technology access and utilization by rural clientele through knowledge management.

Key words : ICTs, Agriculture, Communication, Mass media, Mobile apps and extension.

Introduction : Emerging digital technologies (Information and Communication Technologies) can play an important role in supporting extension. In recent times, efforts are being made to develop personalized information dissemination systems in agriculture to improve the utilization and performance of agricultural technology among farmers. Recognizing the need to develop improved information dissemination methods by exploiting the recent developments in Information and Communication the GOI has stepped up its efforts in investing on ICT infrastructure.

(I) Mass Media Support to Agricultural Extension

The "Mass Media Support to Agricultural Extension" scheme of Department of Agriculture Cooperation (DAC), GOI, was initially launched to make the farmers aware about modern farm technologies.

(a) Radio : The use of radio as mass communication tool for agricultural development has long been recognized. Various agricultural radio broadcasts like "Vyavasaya suchanalu" (Agricultural information) and "Padipantalu" (Agriculture and Livestock) have been disseminating the information on Agriculture to the farmers. Farmers who are not able to listen the broadcasting programmes of All India Radio can use "AAKASAVANI" mobile app from Google Play store. This app developed by All India Radio.

(b) Television : Television adds a second dimension to radio broadcasting, thus increasing the range of methods available to extension workers. In preparing a television programme the formats of the programme has to be decided depending upon the targeted farmer groups. The impact can be created by selecting proper format suitable for that particular subject / technology to be telecasted. i.e. Informative programmes, Phone in live programmes, Panel discussions, Success Stories, Short films, Jingles, Skits, Dramas, Animation etc.

(c) Agri Websites : On browsing the search engines several thousands of websites come on to the screen. It will be very difficult to retrieve the required information. Some of the handy and useful list of websites related to agriculture is given below.

(i) PJTSAU Agricultural Website www.pjtsau.ac.in : Farmers can access information related to agricultural technologies in telugu language by accessing PJTSAU Agricultural Videos and Vyvasayam Farm magazine

(ii) Farmers Portal www.farmer.gov.in : Farmer Portal is an initiative of the Department of Agriculture & Cooperation, Government of India to facilitate a single point access to information on the Web.



(iii) **Agrisnet** : The aim is also to establish Indian agriculture online in the country. The potential applications monitoring of schemes, crop production, productivity, yield data, weather system, Inputs availability, agriculture credit related information, horticulture details, extension services and watershed management.

(iv) **Agmark net** www.agmarknet.nic.in : AGMARKNET is the Agricultural Marketing Information Network in the country. The project networks over 3000 Agricultural Produce Markets across the country. This is a 'farmer centric' project for speedy collection and diffusion of market information.

(v) **Seed net** www.seednet.nic.in : The Seed Net portal gives access to seed related information. Research institutes, certifying agencies and seed testing organizations can get seed related information such as testing procedures, new crop information etc through the portal.

(vi) **Fertilizer Monitoring System (FMS)** <http://www.urvarak.co.in> : The Fertilizer Monitoring System (FMS) with an attempt to provide comprehensive information of fertilizers.

(vii) **Rice Knowledge Management Portal (RKMP)** www.rkmp.co.in : RKMP developed by the Indian Council of Agricultural Research (ICAR) serves as an information highway to share rice knowledge among the stakeholders.

(viii) **E-Choupal Experience of ITC** : ITC Ltd implemented a project on electronic market place for farmers with an aim to eliminate the middle man and develop easy access to market place.

(ix) **Vikaspedia** www.vikaspedia.in : The Agriculture section of Vikaspedia portal developed by CDAC aims to provide relevant information and knowledge based content related to agriculture and allied sectors, contributed by volunteers in these sectors.

(x) **iKisan** : iKisan is the ICT initiative of the Nagarjuna group of companies established in 2000 in the states of Telangana, Andhra Pradesh and Tamil Nadu meeting farmers agricultural needs.

(xi) **Digital Green** : The Digital Green approach since 2008 involves the use of videos for dissemination information about agricultural techniques that farmers can adopt in order to increase their productivity.

(xii) **E-governance in fisheries** : E-governance was set-up by an NGO in the fishermen colony in Pondicherry. It was customized according to the needs of the rural users, and it helped in developing a systematic knowledge base for sharing within the community.

(xiii) **TNAU Agri portal and e Velanmai** : This portal developed by Tamil Nadu Agricultural University, Coimbatore consists of Open Access, Integrated Portal (A-Z) in English and Tamil languages with 3.5 Lakh pages.

(xiv) **.MSSRF-Information Villages** : MSSRF initiated a project, 'Village knowledge centre' in Pondicherry in 1998 .

(xv) **KVK Knowledge Network** (<https://kvk.icar.gov.in>) : It was developed in collaboration with IIT, Kanpur by ICAR a common platform for KVK experts to share information and experiences, for messaging, blogging, discussion forum, chatting.

(xvii) **Virtual Krishi Vigyan Kendra (VKVK)** : A platform connecting KVKs with farmers through internet and mobile technology, SMS and voice messages facility for efficient agro-advisory service provider

(xviii) **Spice Bazaar** : It was launched by Spices Board (Ministry of Commerce and Industry, Government of India). This portal helps to the farmers who are cultivating spices and condiments to participate in online trading to sold their produce to the buyers

(xx) **Kisan Call Centre** : Kisan Call Centre (KCC) was launched by the Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India in 2004 with a toll-free number 1551 (from landline) or 1800-180-1551.

(xxi) **E sagu** : In esagu, rather than visiting the crop in person, the agricultural scientist delivers the expert advice by getting the crop status in the form of digital photographs and other information.

(xxii) **Telangana Kisan Portal** (<http://kisan.telangana.gov.in>) : It helps to the farmers to access the information pertaining to various schemes launched by Ministry of Agriculture, Telangana.

(xxiii) **e NAM (Electronic National Agriculture market)** : This platform helps to farmers to get maximum market price for



agricultural products sold in markets linked with agricultural markets in the country through National Agricultural Market online portal.

(xxiv) Community Radio Initiative : The community radio of DDS, Medak is being maintained by farm women in Telangana.

(3) Mobile Based Communication Technologies : Mobile phones can be defined as Basic (with talk and text), Featured (with talk, text and some other applications) or Smart – plus they can access the Internet.

(i) m-Krishi Fisheries Advisory Service : It was developed by CMFRI & TCS innovation lab. It provides answers to the queries raised by the farmers on shore at which fish is available, and wind advisories to fisherman.

(ii) IFFCO Kisan Agriculture App : “IFFCO Kisan” is an Indian agriculture farmer App, which helps Indian farmer to take informed decisions by accessing customized agricultural information related to their need.

(iii) m-kisan <http://www.mkisan.gov.in/skoch.aspx> : The project developed by the Department of Agriculture & Cooperation widened the outreach of scientists, experts and Government officers to disseminate information and to provide advisories to farmers through their mobile telephones.

(iv) Plantix : It was developed by ICRISAT to cater the needs of Telugu farmers. Farmers can access information through their Smartphones about more than 350 pests and diseases

(v) Kisan Suvidha : This app helps to the farmers to know daily information about weather, market prices, agro advisory services, pests and disease infestation.

(vi) Pusa Krishi : This app developed by Indian Council of Agriculture Research, New Delhi to help farmers to establish agri enterprises for self employment in rural areas.

(vii) Shatkari Masik : It helps to know information about various farm magazines published in Hindi and Regional languages.

(viii) Agri market app : It provides information about various agriculture products sold to the buyers in peripheral boundaries of 50 Kilometers to the farm premises.

(ix) Mana rythu Bazaar : This app provides information about vegetables prices to the consumers of Telangana state. Small and marginal farmers can sell their vegetables to the customers without intermediaries.

(x) Bhuvan (RKVY Android Application Mobile app to precisely locate RKVY assets). This app helps to assess the crop damage during severe droughts, cyclones, floods.

Social Media Platforms

(i) PJTSAU Agricultural Videos : To benefit the farming community of Telangana PJTSAU has started YouTube channel in the name of “PJTSAU Agricultural Videos” provides information on low cost.

(ii) E-blogs : PJTSAU vari chenu kaburlu e-blog provides information to the farmers about agriculture and Home science.

With ICTs many unreached parts of the country have been reached and many milestones have been achieved but there is still a long way to go to harness the full potential of ICTs in agricultural development. Agricultural extension workers should be empowered to become knowledge workers through ICTs to enable the bottom-up, demand driven technology generation, assessment and transfer.



BUFFALO : A POTENTIAL MEAT PRODUCING ANIMAL FOR SUSTAINABLE DEVELOPMENT OF LIVESTOCK FARMERS IN INDIA

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Livestock play an important role in the national economy of the country. They provide enormous opportunities to uplift the rural economy and to sustain the livelihood of the rural masses. The contribution of livestock sector to the food basket in the form of milk, eggs and meat has been immense in fulfilling the animal protein requirement of ever-growing human population. The rapidly rising demand of animal produce is being driven by increasing population, urbanization and incomes. During recent times, there has been increase in demand for meat and sector has gained importance in terms of contribution to income, employment and foreign exchange. Several studies have depicted that an increase in consumer income in fast-growing BRICS (Brazil, Russia, India, China and South Africa) countries, which account for more than 50% of global population, tends to induce important changes in the amount and composition of food consumption. The livestock sector can positively contribute towards augmenting rural livelihood, poverty alleviation, and food security.

Significance of buffalo to livestock sector : Buffalo is a multipurpose domestic animal that helps the livelihood of people by providing high quality milk and meat, dung as fuel and organic fertilizer; mechanical or draft power and hides and skins as raw material for industry. The performance of this species is superior to other bovine species in tropical or sub-tropical regions, where pastures are poor in terms of their quality. These differences have been attributed mainly to the capacity of buffaloes to transform and digest feeds of low quality. In addition, their diet flexibility, high disease resistance and acceptability to a wide range of housing, feeding, and management conditions give them an edge above other domesticated animals.

In India, importance of buffalo can be gauged by the fact that its numbers is increasing faster than cattle. The primary importance of buffalo in India is to produce more milk, and secondarily, for meat production. Therefore, its role for food security in India is well established. The price of buffalo meat is much cheaper than beef, chevon, mutton, pork and poultry and is therefore, the cheapest source of protein to the weaker section of the society. Because of its competitive prices and better blending characteristics, it forms a major ingredient in corn beef, hotdogs and other value added meat products.

India ranks first in buffalo with 108.7 million population contributing 58% of world's buffalo population. Their slaughter rate is 10.6% with annual meat production of 1.45 million tons. Buffalo meat has registered a growth of 27% in export during the financial year 2012-13. The buffalo meat sector therefore is one of the important sectors in Indian economy. Buffalo meat comes from spent dairy buffalo after full utilization of their productive life. Such meat is a by-product and the average carcass yield varies from animal to animal.

Spent buffalo meat is dark, coarse and tough in texture and has poor organoleptic and processing characteristics. This issue can be resolved by using meat of male animals of lower age (below 18 months) with more collagen solubility. As animals get older the collagen cross links become stabilized and the collagen is much less soluble. This will solve the dairy farmers' problem of raising male buffalo calves. Raising and utilizing such calves for meat production would further potentiate the employment and income generation. Moreover, increased availability of quality meat may help in overcoming the problem of malnutrition in the country. Buffalo meat does not possess any religious taboo against its consumption, is emerging as important red meat source, and is gaining popularity in many parts of the world.

India is the first country in Asia who carried out scientific and technological development in buffalo nutrition, production, reproduction, biotechnologies and genetic improvement. The production of buffalo meat has high growth compared to beef production. The quality and quantity of buffalo meat depend on many factors, the most important of which are the water buffalo type and breed, age, feeding intensity, management system and environmental conditions. Buffalo meat is the healthiest meat among red meats known for human consumption because it is low in calories and cholesterol. It has almost 2-3 folds cost advantage over mutton and goat meat.

Meat production and consumption : Meat production in the country is increasing from 2007-08 onwards. The total meat production in the country is pegged at 7.4 million tonnes in the year 2016-17, which marks a significant progress in the meat production. In India, 47.32% of meat production is contributed by Poultry. Buffalo, Goat, Sheep, Pig and Cattle contributed 19.83%, 14.22%, 7.60%, 6.41% and 4.62% of meat production respectively.



In 2016-17, Uttar Pradesh was the top buffalo meat producing state followed by Maharashtra and Punjab (Table 1). Uttar Pradesh has emerged as the hub for export of buffalo meat in the country.

Table-1 : Five top buffalo meat producing states in India ('000 tonnes).

Sr. No.	State	2016	
		Production	Share (%)
1	Uttar Pradesh	694.64	47.87
2	Maharashtra	165.43	11.40
3	Punjab	124.49	8.58
4	Kerala	106.07	7.31
5	Telangana	96.03	6.22

Source : DAHDF, GOI (2017).

The domestic value chain for buffalo meat production in India consists of a network of stakeholders, who work within specific stages from farm to plate. The chain integrates livestock producers, traders, butchers, wholesale meat dealers and retailers. Most meat consumed in India is produced in municipal slaughter houses. The major consuming states of buffalo meat in India are Uttar Pradesh, Andhra Pradesh (erstwhile), Kerala, West Bengal and Maharashtra. The rising slaughter of buffalo in these states is indicative of increasing consumer demand for buffalo meat.

Export : India's states which are major exporters of buffalo meat include Andhra Pradesh, Maharashtra, Punjab, and Uttar Pradesh, the state with the largest water buffalo population. As for the supply of animals for slaughter, the dairy farmers generally sell water buffaloes to traders. The slaughter houses then procure these animals from these traders and pay them on the basis of carcass weight.

Inherent qualities of buffaloes to produce meat : Buffaloes are endowed with a unique ability to utilize coarse feeds, straws and crop residues converting them into protein rich lean meat. Hence buffaloes fit well in developing and poor countries having poor feed resources. Properly managed buffaloes domesticated as a meat producing animal yields high quality meat at a much lower cost than the cattle when slaughtered at sixteen to twenty months of age. Buffaloes are naturally lean animals. The sub-cutaneous fat layer of the carcass is usually thinner in comparison to cattle. The unique qualities of buffalo meat being lean and less fatty have propelled its demand amongst health conscious consumers. In addition, buffaloes also have proportionately higher degree of disease resistance than cattle.

Characteristics of buffalo meat : Owing to its chemical composition, structural components and functional abilities, the buffalo meat possesses superior meat processing characteristics. The major striking features of buffalo meat are its dark red colour, high protein, desirable texture, water holding capacity, good marbling, myofibrillar fragmentation index, low connective tissue and emulsifying capacity. More pigmentation or less intramuscular fat (1-2% marbling compared with 3-4% in beef) content causes darker appearance of buffalo meat. The dark meat possesses good binding properties and is preferred in product manufacture. -carotene in the fat gives yellow coloration and is totally absent in buffalo fat.

The normal pH of buffalo meat varies from 5.4 to 5.8. The pH of the meat from intensively reared young males was 5.57, which did not differ significantly from spent male buffalo meat. The significantly ($p < 0.05$) lower ultimate pH is spent female buffalo meat might due to the response of a female buffalo to transport stress. pH increased significantly with prolonged freezer.

Composition of buffalo meat : Buffalo meat has certain attributes such as lower intramuscular fat, cholesterol and calories, high unit of essentials amino acid, biological value and iron content. Buffalo meat has moisture (74.04-77.75%), protein (17.33-23.3%), total lipids (1.37%), ash (1.0%) and water soluble proteins (5.1%), salt soluble protein (7.2%), non protein nitrogen (0.37%) and hydroxyproline (0.12%) of LD muscle from male buffalo. The meat of intensively reared young buffalo showed significantly higher moisture content than meat from spent and female buffalo. Meat from spent female buffaloes had a significantly higher fat content compared to the other groups. The energy value for buffalo meat was found to be 57.22 % less than beef. Buffalo meat has less fat and saturated fat than beef. Palmitic, stearic, oleic, and linoleic acids were reported to be predominant fatty acids in the phospholipids of buffalo meat.

Potential for buffalo calves for meat production : In India, every year about 10 millions of male buffalo calves are removed or killed from the production system by farmers due to their intentional negligence in the management practices with a view to



save on mother's milk and feed resources incurring loss of about US\$ 11 million per annum in the country. If salvaged for meat production, these calves will not only improve the economic condition of the farmers but also would increase meat production for domestic consumption and export market. These conditions have stimulated the need for development of technologies which would not only promote the consumption of calf meat but also result in healthier, nutritious and value added finished products. This will provide higher revenue to farmers which in turn will improve the care and management practices and lower the calf mortality rate, which may give the country a much needed quantum jump in the meat production sector. Good quality meat from male buffalo calves can be obtained after about 10-12 months of restricted suckling period. The dressing percentage of buffalo carcass of 130 to 500 kg bodyweight has been found to range between 50 and 55 %.

National commission on Agriculture (NCA, 1976) recommendations on buffaloes for meat :

The buffalo should be developed not only for enhancement of milk production but also for making it a source of production of quality meat.

In buffalo farms and research institutes wide scale investigations and studies should be undertaken on early weaning of buffalo calves and their rearing on low cost calf starters.

Research studies on the effect of feeding and husbandry on fattening of buffalo calves should be undertaken.

Promotional activity for consumption of buffalo meat in the country and consumer educational programmes should be undertaken on a country wide scale.

A deliberate and energetic drive should be made to develop export trade in buffalo meat.

Challenges :

High buffalo male calves mortality (10 million annually) leads to loss of approx. Rs. 200 crore annually.

There are hardly 100 modern abattoirs and meat processing plants with state of the art facilities for hygienic meat production.

Poor meat quality (weak and spent buffaloes constitute major portion of buffalo meat).

Poor cold storage facilities for long term storage of meat and meat products.

Lack of technology for efficient utilization of animal by-products.

Problems in breeding and reproduction, poor nutrition, inadequate animal health services and management practices

Strategies to improve buffalo meat industry :

Upgradation of municipal slaughter houses to semi modern abattoirs with all basic requirements and minimum hygienic standards.

The sanitary and phyto-sanitary (SPS) measures and hygienic standards of meat processing plants should be improved as per international standards.

The Government should encourage setting up cold storages, supply/value chain and 100% export oriented buffalo slaughter houses in major buffalo belts of the country.

Increasing the production of superior calves through embryo transfer technology, better disease control, adequate nutrition and improved levels of hygiene at meat handling will lead to a quantum jump in meat production by utilizing the surplus male calves.

Development of appropriate technologies for improving the quality of meat from spent animals.

Appropriate consumer education programmes on popularization of quality and health benefits of buffalo meat and products will provide a cheap source of animal protein to the masses.

Financial support by government institutions to establish abattoirs and processing industries.

Strong linkage between liaison offices, meat industries, meat corporations, research workers and nodal bodies like APEDA (Agricultural and Processed food products Export Development Authority) and Directorate of Marketing and Inspection (DMI) for exchange of information and overall improvement of meat industry and national economy.

Revising buffalo slaughter regulations for realizing production potential :

Existing buffalo slaughter provisions in some of the states like Madhya Pradesh, Gujarat, Bihar, Jharkhand, Karnataka, Andhra Pradesh and Telangana etc. are not favorable to farmers for realization of buffalo production potential in particular for utility of male buffalo calves which have lost draught function requirement over the decades due to mechanization in agriculture and



relatively much cheaper energy costs from other sources than animal energy source. These states could consider following model buffalo slaughter regulations for amending the existing regulations which are not in the interest of farmers and for realizing higher productivity potential.

Way forward in augmenting buffalo meat :

Farmers should be encouraged to adopt scientific management and feeding practices of buffaloes. Developing specific meat breeds and salvaging of buffaloes calves from early death would augment the sustainable meat production. Growing of excess calves to larger weight (200-300 kg live weight) will enhance the export potential of the country, reduce the farmers' burden and improve their socio-economic status. Efforts to increase productivity of animals should be taken by popularizing silage production, use of urea, molasses and chaffing crop residues for sustained feed supplies. Development of livestock markets and transport facilities; Intensive and semi-intensive system of meat animal production; supply of critical feed inputs in the lean season for efficient animal production; FMD-Disease Free Zones in buffalo populous states to promote meat and dairy exports and improving health care facilities for animals and extension facilities for farmers are some of the steps that would lead to increase buffaloes productivity and hence the meat production. Thus, the approaches in buffalo production and utilization have to be enhancing the role of buffaloes through economic demand driven situation with involvement of all the stake holders for sustained production and utility. Mutual role and benefit of various stake holders need to be realized with priority for buffalo's meat production based entrepreneurship development to achieve sustained livelihood and overall development of livestock farmers in India.



PARTICIPATORY PLANT BREEDING : AN OVERVIEW

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Introduction

The terms PPB were first used in a 1995 workshop hosted by Canada's International Development Research Center (IDRC). The concept of the Participatory Research and Gender Analysis (PRGA) was introduced in 1996, and in the year 2000, PPB becomes an integral part of each CGIAR center's plant breeding programs. PPB is a plant breeding program which is done with the different collaborations between breeders/scientists and farmers, marketers, processors, consumers and policy makers. PPB treats the farmers as partners and allows them to decide which varieties are more appropriate for them by having a better say in the selection progress. PPB is based on close farmer-researcher collaboration to bring about plant genetic improvement within a crop. In respect to PPB another terminologies are commonly used interchangeably terms like: Collaborative plant breeding (CPB), Farmer participatory breeding (FPB), and Participatory crop improvement (PCI). Occasionally, PCI is also categorized into two areas. First is Participatory varietal selection (PVS): where farmers are only involved in selecting pre-existing varieties or stabilized (homozygous) materials and another is Participatory plant breeding (PPB): this involves creation of new varieties in breeding programs by collaboration with breeders and farmers. Selection is done in PVS among advanced or genetically stable populations and lines, while selection is done in PPB within segregating populations. However, this distinction between PVS and PPB is not always clear. Especially in case of cross-pollinating populations, selection among populations in PVS is usually combined with within-population selection PPB (Bhargav and Meena, 2014).

Concept of PPB :

PPB is a combination of two words namely Participation and Plant breeding, participation means "an act of taking part in an event or activity" or a "multi-dimensional, dynamic process of contributing, influencing, sharing, or redistributing power and of control, resources, benefits, knowledge, and skills to be gained through beneficiaries' involvement in decision-making." While plant breeding is a science for improvement of genetic makeup of crop plants using different tools and techniques for the human welfare (Bhargav and Meena, 2014).

Stakeholders in PPB :

There are many participators involve in PPB i.e. breeders and farmers, marketers, processors, consumers, and policymakers (food security, health and nutrition, employment). Out of these farmers have close interaction between breeders for setting objectives, decision-making, sharing responsibility, and generating the desired output. Several governments, non-government organizations, NGOs, and research labs have given due importance to this form of breeding. Research organizations viz. International Crop Research Institute for Semi Arid Tropics (ICRISAT), International Center for Agricultural Research in the Dry Areas (ICARDA), International Maize and Wheat Improvement Center (CIMMYT), International Centre for Tropical Agriculture (CIAT), National Institute for Agricultural Research (INRA), Local Initiative for Biodiversity, Research & Development (LI-BIRD), and Centre for Sustainable Development (CENESTA) along with several governments are actively involved in PPB activities (Bhargava and Shrivastava, 2019).

Significance of PPB :

In conventional plant breeding breeders are centralized to classical breeding right from breeding objectives like priority traits, choice of germplasm, breeding methodologies, and verifying their performances. However, in spite of immense turnaround in productivity conventional plant breeding has several limitations and has done little to improve the life of subsistence farmers across continents. Some of the limitations of conventional plant breeding are; Non-connectivity with Ground Reality, Limited Beneficiaries, Limited Role of Actual Stakeholders, Persistence of Poverty and Food Insecurity, Nutrient Availability, Environmental Issues, Greater Incidence of Diseases. To overcome these problems of conventional breeding PPB are play important role through participation of breeders/scientists with farmers and other collaborators (Bhargav and Meena, 2014).

Major objectives of PPB :

- Increase production and profitability of crop production
- It provides directly benefits to the users



Buildup farmer skills to enhance farmer selection and seed production efforts

Enhancing biodiversity and germplasm conservation

Developing adapted germplasm especially for the disadvantaged user groups (e.g., women, poor farmers)

Make breeding programs more cost efficient that targets more niches especially through decentralization of programs.

To allow different participator in breeding program at different stages.

Activities included in PPB :

PPB can include a wide range of activities some of which are enumerated below :

- (i) Role in the identification of the breeding objectives
- (ii) Generating genetic variability (includes the provisioning of genotypes to be included in breeding program)
- (iii) Selection within diverse populations to develop experimental varieties
- (iv) Evaluation of the experimental varieties
- (v) Release of variety
- (vi) Popularization of the newly developed variety among the farmers
- (vii) Seed production

Role of farmers :

The capacity of farmers to work on improving their own situation is recognized as an important condition for sustainable agricultural development. The importance of different forms of participation and the need to relate these with differences in the institutional context (farmer-led, formal-led PCI) and bio-socio environmental context (variation in agro-ecological and economic conditions) in order to identify successful PCI approaches and opportunities. The farmers can participate in plant breeding at different stages i.e. provide technical leadership, provide key social organizational leadership, information giving role, trainer/skill builder role, field laborer role, input supply role and provide landrace or farmer material used for further breeding work (Bhargav and Meena, 2014).

Contribution of ppb in sustainable agriculture :

Many small holder farmers in developing countries work lands in marginal areas that are either neglected by markets and infrastructure or face harsh growing conditions, or both. Smallholder farmers in developing countries are also one of the groups most vulnerable to the adverse impacts of climate change. Improved crop varieties that are well suited to diverse and individual growing environments, meet both the physical and social preferences of smallholders, and by preserving crop diversity can help to improve food and nutrition security. Greater genetic diversity and the enhancement of crops suited to dry environments can also enable smallholder farmers to increase their resilience and adapt to climate change. Inclusion of farmers in the decision-making and breeding process also strengthens the empowerment of both farmers and often excluded members of communities such as women and less well-off farming households. Participatory plant breeding helps to build stronger and more reliable seed systems for smallholder farmers working in diverse and harsh environments, thus contributing to sustainable food security and strengthened resilience to a variety of risks and challenges (Alpert et al., 2009).

Benefits and limitations of PPB :

(A) Improving adoption rate :

Identification and selection of materials through farmers' collaboration presumably will increase adoption rates. PPB makes use of the traditional knowledge of the farmers involved. By allowing farmers to select varieties suitable for their local soil qualities, rainfall conditions and resource requirements, PPB can lead to crops that not only perform well in their intended environments, but are available more quickly and are more readily adopted. According to the World Bank, PPB reduced the time for varietal development and dissemination from 10-15 years to 5-7 years compared to a conventional plant breeding.

(B) Improving seed system :

PPB can strengthen farmer seed systems, defined as the ways in which farmers produce, select, save and acquire seeds. Encouraging and supporting on-farm seed production by farmers is seen as one approach to sustainable seed delivery in Africa because it gives farmers better access to quality seed of their choice.



C) Strengthening farmers' empowerment, ownership and right :

PPB generally involves a higher and more complex degree of involvement of farmers. When farmers are intimately involved in the early stages of research design, PPB can have a high empowerment effect on participating farmers. If the varietal selection occurs on-farm, ideas from a variety of members with the community, not just those of the farmers selected to participate in the breeding programme, can be more easily incorporated when identifying community needs and preferences. The process in turn generates greater farmer and community ownership over the improved lines and can empower marginalized members of the community. In particular, PPB can be inclusive of women and, importantly, account for their tastes and preferences that often differ from those of their male counterparts.

(D) Restrictive regulator policy :

Release of PPB products into existing informal seed systems is potentially a very efficient, low transaction-cost approach. Yet, policies and laws have a significant impact on the degree to which farmers are able to take full involvement in PPB. PPB and PVS therefore can and should raise farmers' awareness of those regulatory frameworks and, where possible involvement of farmers in efforts to influence the modification of those frameworks.

(E) Increased genetic diversity:

PPB supports the development and maintenance of more genetically diverse varieties. Unlike the current global breeding model, which for the most part has concentrated on developing a limited number of varieties that are stable over time and adapted to a wide range of environments, the breeding model based on PPB methods encourages the maintenance of more diverse, locally adapted crops. Scaling up PPB methods for work at the regional, national, or international level could require large investments in resources.

F) Costs and benefits:

As farmers' participation increases, they must invest increasing amounts of time, energy, and resources; they must also provide increasing amounts of intellectual input and draw on increasingly sophisticated analytical skills..

Slow rate of adoption :

Despite the advantages of PPB, regular or long-term adoption in national and international breeding programmes has been slow. The reasons for slow adoption are not well examined, but some explanations include :

PPB is best suited to cereals and less-so to roots, tubers and pulses;

The general attitude amongst scientists, professionals and decision-makers is that PPB is opposed to conventional plant breeding programmes rather than complementary;

Strict criteria for seed registration in many countries can be a disincentive to both public and private breeding programmes that ultimately seek to recover research costs through release and commercialization.

In order to be a sustainable approach to plant breeding, PPB needs to become a permanent feature of plant breeding programmes, addressing crops grown in agriculturally difficult and climatically challenging environments.

REFERENCES

1. Alpert, E., Smale, M. and Hauser, K., 2009. Investing in poor farmers pays. *Rethinking how to invest in agriculture. Oxfam Briefing Paper*.
2. Bhargav, D.K., Meena, H.P. and PPB, P.P.B., 2014. Participatory plant breeding: farmers as breeders. *Popular Kheti*, 2(1), pp.7-14.
3. Bhargava, A. and Srivastava, S., 2019. Toward Participatory Plant Breeding. In *Participatory Plant Breeding: Concept and Applications* (pp. 69-86). Springer, Singapore.
4. Website: (<https://ag4impact.org/sid/genetic-intensification/conventional-plant-breeding/participatory-plant-breeding/>).



INTEGRATED MANAGEMENT OF CABBAGE BLACK ROT DISEASE CAUSED BY *XANTHOMONAS CAMPESTRIS* PV. *CAMPESTRIS* (PAMMEL) DOWSON

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Abstract

Field experiment was carried out during *rabi* season 2015-16 for the management of black rot disease in cabbage with nine treatments at Noolgeri village of Hirekerur taluk and Haveri district. The treatments included seed treatment with bactericide and bioagent alone before sowing, seedling dip with bio agent at the time of transplanting and in combination with sprays of bactericide, chemicals and bioagent in the main field. Of the different treatments tested, the combined treatment of seed treatment with K-cycline (0.5g) + Copper oxychloride (3.0g), seedling dip with *Pseudomonas fluorescens* (10.0g), first foliar spray with K-cycline (0.5g) + Copper oxychloride (3.0g) and second foliar spray with *Pseudomonas fluorescens* (10.0g) at fifteen days interval starting from fifteen days after transplanting recorded lowest mean disease incidence of 24.93 per cent and significantly highest yield of 309.25 q/ha, as compared to maximum mean disease incidence of 48.41 per cent and lowest yield of 190.76 q/ha in untreated control plots. Seed treatment with seed treatment with K-cycline (0.5g) + Copper oxychloride (3.0g) before sowing followed by two foliar sprays with K-cycline (0.5g) + Copper oxychloride (3.0g) was found to be next best by recording 28.45 per cent mean disease incidence and 287.49 q/ha cabbage yield.

Key words : Black-rot, cabbage, management, Seed treatment, K-cycline, Copper oxychloride

Introduction : Cabbage (*Brassica oleracea* var. *capitata* L) is one of the important winter vegetable crops cultivated throughout the world. In India, its commercial cultivation is limited by various factors among which disease plays an important role. The crop is subjected to attack by a variety of pathogens both in the nursery as well as in field. Black rot, caused by the bacterium *Xanthomonas campestris* pv *campestris* (Pammel) Dowson (Alvarez 2000), is the most common and serious disease of cauliflower and other crucifers like cauliflower, radish, mustard, broccoli and turnip. The bacterium is seed borne and can infect the plant through roots, wounds, hydathodes and leaf stomata (Schaad and Alvarez, 1993). The disease is characterized by V-shaped, chlorotic to necrotic lesions at the leaf margins and blackened vascular tissues (Vicente *et al.*, 2001). The disease affects primarily the above ground parts of plants during any stage of growth causing yield and quality losses, especially in tropical and subtropical regions during rainy season. It has been reported that under severe outbreak, the disease can cause substantial yield loss of up to 70.0 per cent (Jorgensen and Walter, 1955). Managing the disease is very difficult as the bacterium spreads within and between fields by water splashes, wind, insects, machinery and irrigation. There are no resistant cauliflower cultivars available for black rot disease in India. Therefore, an experiment was conducted at Noolgeri village of Hirekerur taluk and Haveri district, to develop a management strategy for the bacterial black rot disease in cabbage.

MATERIALS AND METHODS

Field experiment was carried out during *rabi* season of 2015-16 with cabbage variety Saint (black rot susceptible) for the management of black rot disease. The experiment had nine treatments with three replications each in a randomized block design with each plot measuring 5.0 m x 5.0 m with the spacing of 45 cm between plants and 45 cm between rows. The treatments included, i) Seed treatment with K-cycline (0.5g) + copper oxychloride (3.0g)

ii) Seed treatment with bromopal (0.5g) + copper oxychloride (3.0g) iii) seed treatment with *Pseudomonas fluorescens* (10.0g), iv) T₁ + two sprays of K-cycline (0.5g) + copper oxychloride (3.0g) twice at 15 days interval, v) T₂ + two sprays of bromopal (0.5g) + copper oxychloride (3.0g) at 15 days interval, vi) T₃ + two sprays of *Pseudomonas fluorescens* (10.0g) vii) T₁ + two sprays of *Pseudomonas fluorescens* (10.0g) 15 days interval, viii) T₁ + seedling dip with *Pseudomonas fluorescens* (10.0g) + foliar spray of K-cycline (0.5g) + copper oxychloride (3.0g) followed by foliar spray of *Pseudomonas fluorescens* ix) untreated control (Table 1).



Table-1 : Effect of various treatments on black rot incidence (%) in Cabbage.

Treatment	Mean PDI	*disease reduction over control	*mean yield (q/ha)
T ₁ . Seed treatment with K-cycline + Copper oxychloride	31.80 (34.32)	34.31	254.39
T ₂ . Seed treatment with bromopal + copper oxychloride	32.11 (34.51)	33.67	252.63
T ₃ . Seed treatment with <i>Pseudomonas fluorescens</i>	34.38 (35.89)	28.98	248.53
T ₄ . T ₁ + two sprays of K - cycline + copper oxychloride	28.45 (32.23)	41.23	287.49
T ₅ . T ₂ + two sprays of bromopal + copper oxychloride	30.78 (33.69)	36.41	265.38
T ₆ . T ₃ + two sprays of <i>Pseudomonas fluorescens</i>	31.49 (34.13)	34.95	258.38
T ₇ . T ₁ + two sprays of <i>Pseudomonas fluorescens</i>	29.90 (33.14)	38.23	268.93
T ₈ . T ₁ + seedling dip with <i>Pseudomonas fluorescens</i> + foliar spray of K-cycline + copper oxychloride followed by foliar spray of <i>Pseudomonas fluorescens</i>	24.93 (29.95)	48.50	309.25
T ₉ . Untreated control	48.41 (44.08)	-	190.76
CD at 5%	2.95		8.86
SEm ±	0.98		2.94

*Mean of three replications, Figures in the paranthesis are arc sine transformed values

The treatments were imposed at the time of seed sowing in the nursery bed, during transplantation and also in the main field during cropping period. Agricultural operations generally recommended for cabbage cultivation were followed from nursery till harvest. Observations were made on the incidence of black rot on leaves at fifteen days interval by using disease index standards on a 0-9 scale (0 = no disease; 1 = up to 1 per cent of leaf area with disease symptoms; 3 = 2- 10 per cent disease; 5 = 11- 25 per cent; 7 = 26 - 50 per cent and 9 = > 51 per cent leaf area with disease symptoms) and PDI was worked out as per standard protocol (Kashyap and Dhiman, 2010). All the experimental data were subjected to statistical analysis.

RESULTS AND DISCUSSION

The results of the experiment showed that all the treatments were effective in reducing the black rot incidence and increasing the cabbage yield as compared to untreated control (Table 1). The black rot incidence was significantly reduced to a mean PDI of 24.93, a decrease of 48.50 per cent over control, and recorded a highest yield of 309.25 q/ha, in treatment-T₈. An increase of 41.23 per cent over control, in treatment-T₄, where seed treatment with K-cycline + copper oxychloride before sowing followed by two sprays of K-cycline + copper oxychloride at fortnightly interval (Tables 1) was imposed in the main field. This was followed by the treatment-T₇, which included seed treatment with K-cycline + copper oxychloride before sowing followed by two sprays of *Pseudomonas fluorescens* at fortnightly interval which recorded a mean PDI of 29.90 and cauliflower yield of 268.93 q/ha. The untreated control plot, however, recorded significantly highest PDI of 48.41 and lowest yield of 190.76 q/ha (Tables 1). Seed treatment bactericides and bioagent alone recorded high per cent disease incidence, which shows that seed treatment alone is not sufficient to manage black rot in cauliflower, as it can only take care of the bacterium present inside the seed. Hence the spread of the disease in field can be managed by spraying K-cycline + copper oxychloride. Though the treatment- T₇, i.e. seed treatment with K-cycline + copper oxychloride before sowing and field application of *Pseudomonas fluorescens* has given significant result in reducing the disease incidence and increasing the yield, it is best only next to treatment-T₄, i.e. seed treatment with K-cycline + copper oxychloride followed by application of K-cycline + copper oxychloride. In the present study, treatment with *Pseudomonas fluorescens* did not give encouraging result in controlling black rot in cabbage. Beura *et al.* (2006) also made similar observation with *P. fluorescens*, which gave 15.61 per cent control over the disease and cabbage yield of 17.5 t/ha. However, Mishra and Arora (2010) found that seed and seedling treatment with *P. fluorescens* gave significant control over black rot in cauliflower.

This may be due to strain variations among *P. fluorescens* isolates, as out of 54 bacterial strains isolated from the rhizospheric soils, only one isolate T07 was found to be effective in controlling black rot in cauliflower. In conclusion the study showed that black rot of cabbage was successfully managed by seed treatment with K-cycline + copper oxychloride, seedling dip with *P. fluorescens* followed by first application of K-cycline + copper oxychloride and second application of *P. fluorescens* at fortnightly interval starting from 15 days after transplanting.



REFERENCES

1. Alvarez, A. (2000). Black rot of crucifers. In: Mechanisms of resistance to plant diseases (A. Slusarenko, R. S. S. Fraser and L. C. van Loon, Eds.). Dordrecht: Kluwer Academic publishers. pp. 21-52.
2. Beura, S.K., Mohapatra, K.B., Paul, P.K. and A.Nandi (2006). Integrated management of black rot disease of cauliflower in Orissa. *Journal of Mycopathology Research*, 44 (2): 293-296.
3. Jorgensen, M.C. and Walter, J.M. (1955). The 1953 outbreak of black rot at Ruskin. *Proc. Florida Horticultural Society*, 67: 109-111.
4. Kashyap, P.L. and J.S. Dhiman. 2010. Eco-Friendly Strategies to suppress the development of *Alternaria* Blight and Black Rot of Cauliflower. *Academic Journal of Plant Sciences*, 3 (4): 140-146.
5. Mishra, S. and Arora, N.K., (2010). Management of black rot in cabbage by rhizospheric *Pseudomonas* species and analysis of 2,4-diacetylphloroglucinol by qRT-PCR. *Biological Control*, 61: 32-39.
6. Schaad, N.W. and Alvarez, A. (1993). *Xanthomonas campestris* pv. *campestris* cause of black rot of crucifers. In: *Xanthomonas* (J.G. Swings and E.L. Civerolo (Eds.), London, UK. Chapman & Hall. pp. 51-55.
7. Vicente, J.G., Conway, J., Roberts, S.J. and Taylor, J.D. (2001). Identification and origin of *Xanthomonas campestris* pv. *campestris* races and related pathovars. *Journal of Phytopathology*, 91: 492-499.



CLIMATE CHANGE AND ITS IMPACT ON WHEAT PRODUCTION

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Agriculture and climate change : From ancient times India's agriculture has been dependent on monsoons. Any change in monsoon trends drastically affects agriculture. Even the increasing temperature is affecting Indian agriculture. In the Indo-Gangetic Plain, these pre-monsoon changes will primarily affect the wheat crop (>0.5°C increase in time slice 2010-2039; IPCC 2007). In the states of Jharkhand, Odisha and Chhattisgarh alone, rice production losses during severe droughts (about one year in five) average about 40 percent of total production, with an estimated value of \$800 million.

Increase in CO₂ to 550 ppm increases yields of rice, wheat, legumes and oilseeds by 10 to 20 percent. A 1°C increase in temperature may reduce yields of wheat, soybeans, mustards, groundnuts, and potatoes by 3 to 7 percent. There would be higher losses at higher temperatures. Productivity of most crops decreases only marginally by 2020 but by 10 to 40 percent by 2100 due to increases in temperature, rainfall variability, and decreases in irrigation water.

Agriculture represents a core part of the Indian economy and provides food and livelihood activities to much of the Indian population. While the magnitude of impact varies greatly by region, climate change is expected to impact on agricultural productivity and shifting crop patterns. The policy implications are wide-reaching, as changes in agriculture could affect food security, trade policy, livelihood activities and water conservation issues, impacting large portions of the population.

Wheat [*Triticum aestivum* (L.)] is favoured by long cool, moist weather followed by dry and warm weather/rabi season. Wheat is an essential commodity for human civilization and is planted annually in an area of around 229 million hectares across the world. Wheat provides 21% of the food calories and 20% of the protein for more than 4.5 billion people in 94 countries. Wheat research in India began in a systematic way more than a hundred years ago. The coordinated system of multi-location research to address the needs of different agro-ecological zones in wheat has been in operation for more than fifty years now.

Agricultural system will be affected by both short and long term changes in climate and will have serious implication on rural livelihoods, particularly of the poor being the most vulnerable. The impact of climate change poses serious threats to productivity and sustainability, therefore wheat based cropping system including wheat-rice system, the backbone of food security of India. Conservation agriculture involving continuous minimum mechanical soil disturbance, permanent organic soil cover and diversified crop rotation provides opportunity of mitigation greenhouse gas emission and climate change adoption.

Differences in sowing time is one of the major reasons for variable impacts on yield. Late-sown areas are projected to suffer more than the timely-sown ones. Considerable spatial variation in impacts is projected. Warmer central and south-central regions of India may be more affected. Despite CO₂ fertilization benefits in future climate, wheat yield is projected to be reduced in areas with mean seasonal maximum and minimum temperatures in excess of 27 and 13°C, respectively. However, simple adaptation options, such as change in sowing times, and increased and efficient use of inputs, could not only offset yield reduction, but could also improve yields until the middle of the century. Converting late-sown areas into timely-sown regions could further significantly improve yield even with the existing varieties in the near future. However, some regions may still remain vulnerable despite the adaptation interventions considered. Therefore, this study emphasises the need for intensive, innovative and location-specific adaptations to improve wheat productivity in the future climate.

In India began All India Coordinated Wheat Improvement Project (AICWIP) in 1964 at IARI, New Delhi and was elevated to the status of Directorate of Wheat Research (DWR) in 1978. The Directorate moved to the present location at Karnal in 1990. And with addition of Barley Network it was renamed as All India Coordinated Wheat and Barley Improvement Project (AICW&BIP). The AICW&BIP work has resulted in the release of 412 wheat varieties, tailored for specific growing situations in the six wheat zones of the country. Starting with the first semi-dwarf introductions like Lerma Rojo, Sonora 64 and their further selections like Chhoti Lerma, Kalyansona and Sonalika, the programme went on to release varieties which became extremely popular and occupied large acreage.

The frequency and intensity of severe droughts that negatively affect rain-fed crops like wheat, is expected to increase due to global warming. Previous research has shown that global wheat production is strongly dependent on the availability of water, both during and before the crop-specific and typically unirrigated growing season. Drought effects were also implicated as one of the key drivers in the 2007-2008 spike in global wheat prices. The Food and Agriculture Organization (FAO) projects a



43% increase in the global annual demand for cereals, including wheat, and this increase will predominantly come from developing countries. If sustainable agricultural intensification is not successful in these regions, they will increasingly be forced to depend on expanding their cereal imports. Given the world's dependency on this staple to provide for our daily nutritional needs, an increase in the severity and frequency of droughts in wheat producing areas presents a significant risk in terms of food insecurity and, consequently, political instability and migration.

Abundant and timely pollen production is a key requirement for reproductive success. Inter annual variation in pollen production results in variable seed production in several temperate species (Bramlett, 1981; Burns and Honkala, 1990). Differential responses to high CO₂ and temperature on the male and female reproductive system and their effects on pollen production, release, movement and seed sets may have important implications on population dynamics.

An increase of 1°C in mean temperature is estimated to reduce the annual wheat production by 4-5 million ton in the country. Overall cereal productivity is expected to decrease by 10-40% by 2100 (Trust, 2009).

The importance of understanding the ongoing impact of climate change on agriculture is often underestimated. Domestic policy considerations require that climate change be factored into development activities that are influenced by the weather and climate. At the same time, scientific evaluations of the immediacy of the impact of climate change and the extent of climate vulnerability are essential to the formulation of national negotiating positions at international climate-change negotiations. An early and equitable international agreement on climate change is beneficial to less-developed countries, but the question of how much delay.

During the recent decade, with the growing recognition of the possibility of climate change and clear evidence of observed changes in climate during 20th century, an increasing emphasis on food security and its regional impacts has come to forefront of the scientific community. In recent times, the crop simulation models have been used extensively to study the impact of climate change on agricultural production and food security. The output provided by the simulation models can be used to make appropriate crop management decisions and to provide farmers and others with alternative options for their farming system. It is expected that in the coming decades with the increased use of computers, the use of simulation models by farmers and professionals as well as policy and decision makers will increase. In India, substantial work has been done in last decade aimed at understanding the nature and magnitude of change in yield of different crops due to projected climate change. This paper presents an overview of the state of the knowledge of possible effect of the climate variability and change on food grain production in India.

Needs for further research : Due to the complex interaction of climate impacts, combined with varying irrigation techniques, regional factors, and differences in crops, the detailed impacts of these factors need to be investigated further. Specific recommendations for further research include :

Precision in climate change prediction with higher resolution on spatial and temporal scales.

Linking of predictions with agricultural production systems to suggest suitable options for sustaining agricultural production.

Preparation of a database on climate change impacts on agriculture.

Evaluation of the impacts of climate change in selected locations; and

Development of models for pest population dynamics.

REFERENCES

1. Trust for Advancement of Agricultural Sciences (2009). Brain storming Workshop on climate change, soil quality and food security proceeding and recommendation. August 11, 2009.
2. Burns, R.M. and B.H. Honkala (1990). Silvics of North America, Vol. 1, Conifers. Washington DC: U.S.D.A. Forest Service Agriculture Handbook 654.
3. Bramlett D. (1981) Effectiveness of wind pollination in seed orchards. Pollen Management Handbook, Agriculture Handbook 587 (ed. E. Franklin), pp. 10–13. US Department of Agriculture, Washington, DC.



BENEFICIARIES' PERCEPTION ON MGNREGA - A STUDY OF KULLU DISTRICT (HIMACHAL PRADESH)

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Introduction

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) - an Indian Job Guarantee Scheme was enacted by legislation on August 25, 2005. The scheme provides at least 100 days guarantee wage employment in a financial year to every household in the Gram Panchayat and contains a lot of provisions for the welfare of village people. The scheme aimed at ensuring livelihood security in the rural areas; and has a great potential to change the socio-economic condition of the rural people. The scheme has been operating in the State of Himachal Pradesh for the last one decade or so but what is the perception of the beneficiaries towards MGNREGA and the main problems being faced by them were some of the few burning questions for which the present study was undertaken with the following specific objectives :

To determine respondents' perception towards MGNREGA.

To identify the main problems faced by them.

To provide suggestive measures for effective implementation of MGNREGA.

Methodology

The study was conducted in Kullu district of Himachal Pradesh. Out of the five Development Blocks, one Block (Nirmand) was randomly selected. From the selected block, two Gram Panchayats and from these Gram Panchayat five villages were randomly selected. From each selected village, 15 village people working under MGNREGA were randomly selected, thus, consisting a total sample of 75 respondents. However, despite repeated visits, the data could be collected from 70 respondents.

Respondents' perception on MGNREGA was measured with the help of scale developed for the purpose. The scale consisted of 25 statements which were formulated and edited as per the criteria laid down by the Edwards and Kilpatrick (1948). The response of each respondent for all the twenty five statements were taken on five point continuum scale viz; Strongly agree, Agree, Undecided, Disagree and Strongly disagree with respective scoring of 5,4,3,2 and 1. On the basis of total score and standard deviation, the respondents were classified into following three categories :

High Perception : $> (\bar{X} + SD)$

Medium Perception : $(\bar{X} \pm SD)$

Low Perception : $< (\bar{X} - SD)$

The main problems faced by the respondents were also identified. The suggestions from the respondents were also elicited for further implementation of MGNREGA. The data were collected with the help of well-structured and pre-tested interview schedule by personally interviewing the respondents.

RESULTS AND DISCUSSIONS

Respondents' perception on MGNREGA

The perception of respondents' was taken (statement-wise) on five point continuum scale and accordingly mean perception score was calculated (Table 1).

Table-1 : Respondents' perception (statement-wise) on MGNREGA.

S. No.	Statement	Mean Perception Score (mps)
(i)	MGNREG Programme is useful in improving livelihood of people.	4.09
(ii)	MGNREG Programme has brought significant change in people's life.	3.31
(iii)	MGNREG Programme has helped in controlling migration of people from village/rural areas.	3.86
(iv)	MGNREG Programme has facilitated the people in sending their wards to school due to improved financial position.	3.8



(v)	MGNREG Programme has helped the people to repay their debt (in case of need).	3.14
(vi)	MGNREGA has been useful in creating useful assets for the village.	3.94
(vii)	MGNREG wages has helped people in purchasing medicines and thus, in health care.	3.4
(viii)	MGNREGA wages has helped people in buying durable goods for the family.	3.23
(ix)	MGNREGA has enabled people to buy agriculture inputs like seeds, fertilizers etc.	3.31
(x)	Due to MGNREGA people are able to find job/work in vicinity of their village.	3.83
(xi)	Under MGNREGA people can get work within fortnight of receipt of application.	2.14
(xii)	Work allotted by the Gram Sabha under MGNREGA is for the welfare of village people.	4.26
(xiii)	Wages are timely paid to the workers under MGNREGA.	3.23
(xiv)	Payment of wages in MGNREGA is quite transparent.	3.03
(xv)	Wages as a mean of livelihood are sufficient in MGNREGA.	2.03
(xvi)	There is no gender discrimination in terms of wages under MGNREGA	4.37
(xvii)	Wages under MGNREGA are given as per the State government norms.	3.46
(xviii)	Timely payment of unemployment allowances is given under MGNREGA.	1.89
(xix)	Facilities like drinking water, tools/implements, crèche etc. are available at work site.	2.17
(xx)	There is provision of ex-gratia grant/ compensation in case of causality at the workplace under MGNREGA.	3.09
(xxi)	There are some preventive measures against any accident at the workplace.	2.6
(xxii)	The provision of one-third women workers is mandatory in MGNREGA.	3.46
(xxiii)	There is provision of minimum three percent reservation to the disabled persons under MGNREGA.	3.34
(xxiv)	MGNREGA has been quite useful in improving the socio-economic status of enrolled workers.	3.91
(xxv)	People are satisfied with the functioning of MGNREGA in the village.	3.23

A cursory look at the data revealed that the respondents had positive perception with the statements at serial numbers XVI, XII, I, X, IV and III i.e. there is no gender discrimination in terms of wages under MGNREGA (mps=4.37), The work allotted by the *Gram Sabha* under MGNREGA for the welfare of people (mps=4.26), MGNREGA is useful in improving the livelihood of people (mps=4.09), Due to MGNREGA people are able to find job/work in vicinity of their village (mps=3.83), MGNREGA has been useful in creating useful assets for the village (mps=3.94) and has helped in controlling migration of peoples from village/rural areas (mps=3.86). Similarly, the respondents were found to have favorable perception on the statements like MGNREGA is useful in improving the socio-economic status of enrolled workers (mps=3.91), it has facilitated the people in sending their wards to school due to improved financial position (mps=3.80), the provision of one-third women workers is mandatory in MGNREGA (mps=3.46), wages under MGNREGA are given as per state government norms (mps=3.46) and MGNREGA wages has helped people in purchasing medicines and thus in health care (mps=3.40).

However, respondents were disagreed on the statements that timely payment of unemployment allowances is given under MGNREGA (mps=1.89), desirous job seekers, wages as a mean of livelihood are sufficient in MGNREGA (mps=2.03), people can get work within fortnight of receipt of application (mps 2.14) and that the facilities like drinking water, tools/implements, crèche etc. are available at work site (mps=2.17).

Hence, the study implies that the regular monitoring/checking on the part of administrators, implementers of the programme is needed so that regular facilities like Drinking water, Creche be ensured at work site, Timely payment of unemployment allowance needs to be provided to the peoples working under MGNREGA.

These findings were in consonance with those of Borah *et al.*, (2014) who reported that MGNREGA helped in increasing the income of women which, in turn, enhanced their contribution to their household income and thus, reduced the debt burden on them.

Respondents' perception towards improvement in their socio-economic condition : The respondents were asked whether there was improvement in their socio-economic status, the response has been depicted in Table 2.



Table-2 : Respondents' response (n=70).

Response	Frequency	Percent
Yes	60	85.72
No	10	14.28

More than four-fifths of the respondents (86%) perceived improvement in their socio-economic condition due to MGNREGA whereas the remaining 14 percent replied in negative i.e., there was no improvement because of MGNREGA in their socio-economic status.

Perception regarding execution of MGNREGA by their Gram Panchayat : Respondents' perception was obtained whether they felt satisfied with the implementation of MGNREGA by their Gram Panchayat or not, the response is given in Table-3.

Table-3 : Respondents' perception.

Response	Frequency	Percent
Satisfied with execution of MGNREGA	38	54.28
Not Satisfied with execution of MGNREGA	32	45.72

It is evident from the data, 54 percent of the respondents were satisfied whereas the remaining 46 percent did not express their satisfaction with the execution of MGNREGA by their Gram Panchayat.

Respondents' overall perception about MGNREGA : On the basis of mean perception score and standard deviation, the overall perception of respondents were determined into three categories presented in Table-4.

Table-4 : Overall perception about MGNREGA.

Perception	Frequency	Percent
High	12	17.14
Medium	44	62.86
Low	14	20.00

It is clear from the data that a majority of the respondents (63%) had medium perception about MGNREGA. Those who had high and medium perception were found to be 17.14 and 20 percent respectively.

Problems/Difficulties faced by beneficiaries under MGNREGA

The respondents were asked which main difficulties are being faced by them under MGNREGA, the response was taken on three point continuum scale i.e. Most serious, Serious and Not serious with respective scoring of 3, 2 and 1 presented in Table-5.

It has been observed from the data that lack of facilities like creche, drinking water etc. (Rank I) followed by ignorance about unemployment allowance (in case employment not given within stipulated period of 15 days of application), non maintaining of wage and material ratio (Rank III) and happening of accidents due to lack of facilities at the worksite were the main difficulties faced by the respondents. Similarly, delaying in fund allocation and payment (Rank V), Non-availability of funds causing shortage of work (Rank VI), Shortage of work often leading to turnover of workers from the scheme (Rank VII) and due to illiteracy, the workers remain ignorant about their attendance in the Must Rolls (Rank VIII) were found some of the other main problems faced by them under MGNREGA.

Singh *et al.*, (2017) also reported that workers working under MGNREGA were not satisfied with the number of employment days and facilities at the work-site also These findings were also supported by Pandey (2017) who found lack in proper monitoring and vigilance of social audit and in releasing of funds well in time. The authors further suggested that decisive steps should be taken to ensure proper implementation of the scheme.



Table-5 : Problem/Difficulties faced by beneficiaries under MGNREGA.

Sr. No.	Problems/Difficulties	MS	S	NS	Total Score	Rank
I	Due to delay in fund allocation payment of wages is delayed	30	25	15	155	V
II	Non availability of funds causes shortage of work	25	25	20	145	VI
III	Shortage of work often leads to turnover of workers from the scheme	20	30	20	140	VII
IV	Due to illiteracy, the workers remain ignorant about their attendance in the Muster Rolls	25	15	30	135	VIII
V	Sometimes irrelevant work is allotted to the workers compelling them to leave the work	10	35	25	125	X
VI	Due to lack of facilities, there are accidents at work site	35	25	10	165	IV
VII	Indifferent attitude of supervisors	25	20	25	120	XI
VIII	Time lag in payment of wages adversely affect the morale of workers	30	10	20	130	IX
IX	Due to forgetting of bringing job cards, sometimes the workers are not permitted to the worksite and thus, are deprived of wages	0	0	70	70	XIII
X	Sometimes due to road blockage, the workers reach late at worksite but they are not permitted by the supervisors	0	5	65	75	XII
XI	Wage and material ratio is generally not maintained by the village panchayat	40	30	0	180	III
XII	Worksite facilities like Crèche, Drinking water etc are generally lacking	50	20	0	190	I
XIII	Due to ignorance because of illiteracy, unemployment allowance is not given (in case employment not given within 15 days of application for work)	45	25	0	185	II

Suggestions for effective implementation of MGNREGA : The suggestions were elicited from the respondents and the various stakeholders working under MGNREGA for its effective execution which are given as under :

It has been observed that awareness among the workers about some of the provisions of the MGNREGA particularly in case of compensation for delayed payment, ex-gratia payment, grievance redressal mechanism, unemployment allowance and employment with stipulated distance of 5km was very low. Hence, the study implies that efforts should be made to make the workers/village people aware through the use of mass media like Radio, TV and Newspaper etc and by organizing some type of orientation programs for them.

Facilities of Crèche, drinking water, Shed etc. could be ensured at worksite through proper monitoring and supervision by the implementing authority.

Proper receipt of application demanding work/job can be acknowledged so that the same can be sent to the competent authority well in time for seeking unemployment allowance. Besides, concrete measures should be initiated to take stock of employment demanded by the beneficiaries periodically in order to streamline the preparation of action plan.

It has also been observed that the actual involvement of the local people in the preparation of plan is very low. Hence, the study implies that the efforts should be made to encourage their participation/involvement at the time of formulating work project/plan by the Gram Panchayat.

The study has recommended that the days of employment should be increased from 100 days to 150 to 200 days. Facilities of tools and implements for workers and the first aid at the work place be ensured.

There should not be delay in allocation of funds for payment of wages.

It is also recommended that adequate supervision and inspection of the worksites by the officers concerned is very essential which, otherwise, may lead to increased irregularities at the worksites. Besides, unwanted political interference and involvement of any anti-social elements in the implementation of the same should be avoided.

Action plan and Muster Roll should be properly prepared and properly submitted to the concerned authority by the *gram panchayat*.

The findings were in agreement with those of Chauhan *et al.*, (2015) who reported that more than 12 crores bank accounts were opened under MGNREGA and further observed that women were now ready to come out of their houses to work with men ensured by equal wages for both male and female workers. Mir *et al.*, (2018) in their study on impact of Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) on Unemployment and Village Economy also suggested that number of guarantee days for employment need to be increased and skill initiatives should be taken particularly for the women so that they could feel secure to work under the scheme in their village.



ORGANIZATIONAL CLIMATE : AN IMPORTANT DETERMINANT OF PERFORMANCE OF EXTENSION PERSONNEL

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Government of India has targeted doubling farmers' income by 2022. Dalwai Committee on Doubling Farmers' Income (vol XI) defines Agricultural Extension as 'the empowering system of sharing information, knowledge, technology, skills, risk and farm management practices, across agricultural sub-sectors, all along the agricultural value chain, so as to enable the farmers to realize higher net income from their enterprise on a sustainable basis.' Agricultural extension services can and should play an important role in achieving the target of doubling farmers' income. While a production led strategy was the sole focus of extension earlier, this needs to be expanded to include a market led strategy to deal with the new challenges. To play its role effectively in the changing scenario, extension should expand its mandate beyond disseminating information on technologies so that it can better respond to the evolving demands for support and services of farmers. This includes, organizing user/producer groups, linking farmers to markets, engaging in research planning and technology selection, enable changes in policies and linking producers to a range of other support and service networks (Sulaiman and Hall, 2004, Rivera and Sulaiman, 2009).

The number and diversity of organizations involved in extension and advisory services have increased over the past few years. At present besides line departments of state governments and Krishi Vigyan Kendras (KVKs) as key players of agricultural extension, State Agricultural Universities (SAUs), Institutes of ICAR, Central Agricultural Universities (CAUs), Non Governmental Organizations (NGOs), private input dealers, media houses are also engaged in agricultural extension activities. All the agricultural extension / agricultural developmental activities at field level are carried out by the personnel associated with these organizations. At present time, role of extension personnel is becoming more demanding and challenging. Extension personnel have to play multifaceted roles. It goes beyond the merely technology transfer as perceived earlier the role of extension personnel.

Besides core competencies like technical, managerial and behavioral competencies of extension personnel, organizational climate of the organization to which the extension personnel is associated plays an important role in performance of the extension personnel.

Organizational Climate

The term 'climate' is most commonly associated with the study of meteorology, and more specifically aims to observe, describe and measure the various physical characteristics of the atmosphere such as rainfall, temperature, changes in season and so on. When the term 'climate' is transplanted into the context of the organization, it becomes more complex because it is not so easy to observe and measure and it is constantly changing as such is not necessarily enduring (Gelfand, 1972). Various researchers define organizational climate on the basis of their viewpoint on how climates are formed.

Forehand and Gilmer (1964) explain organizational climate as a set of characteristics that describes an organization, distinguishes it from other organizations, is relatively enduring over time and can influence the behaviour of people in it.

Moran and Volkwein (1992) provide the following definition of organizational climate : Organizational climate is the relatively enduring characteristic of an organization which distinguishes it from other organizations: and (a) embodies members collective perceptions about their organizations with respect to such dimensions as autonomy, trust, cohesiveness, support, recognition, innovation and fairness; (b) is produced by member interaction; (c) serves as a basis for interpreting the situation; (d) reflects the prevalent norms, values and attitudes of the organization's culture; and (e) acts as a source of influence for shaping behaviour.

Wallace, Hunt and Richards (1999) defined organizational climate as the summary perception of how an organization deals with its members and environment.

Garg and Rastogi (2006) define the concept as a 'feeling' that is the result of the physical layout of the organization, the way in which participants interact with one another and how they conduct themselves with other organizational members or outsiders.

According to Haakonsson, Burton, Obel and Lauridsen (2008), organizational climate refers to affective an event that influences employees' emotions and consequent information-processing behaviours.



Climate of an organization is somewhat like the personality of a person. Just as every individual has a personality that makes him unique and different from other persons. Each organization has an organizational climate that clearly distinguishes it from other organizations.

Basically, the organizational climate reflects a person's perception of the organization to which he belongs. It is a set of unique characteristics and features that are perceived by the employees about their organization which serves as a major force in influencing their behavior. In the broad sense, organizational climate can be understood as the social setting of the organization.

Characteristics of Organizational Climate

Following are the general characteristics of organizational climate :

Organizational climate is a general expression of what the organization is. It is the summary perception which people have about the organization. It conveys the impressions people have of the organizational internal environment within which they work.

Organizational climate is a qualitative concept. It is very difficult to explain the components of organizational climate in quantitative or measurable units.

Organizational climate gives a distinct identity to the organization. It explains how one organization is different from other organizations

Organizational climate built up over a period of time. It represents a relatively enduring quality of the internal environment that is experienced by the organizational personnel.

Organizational climate is a multi-dimensional concept. The various dimensions of the organizational climate are individual autonomy, authority structure, leadership style, pattern of communication, degree of conflicts and cooperation etc (Venkatesh).

Organizational climate and work performance

Good organizational climate is instrumental in organizational excellence and objective realization. Pleasant work atmosphere enables to be stimuli for members of organization to work optimally so that producing the optimal performance. On the contrary, if the work atmosphere is unpleasant, it will decrease the work spirit, so that it produces less optimal performance.

Organizational climate affects organizational performance by influencing employee motivation and job satisfaction. Motivated employees are the greatest asset of any organization. Various studies have established the fact that organizational climate affects significantly the work performance of the personnel of the organization. Shashidara and Manjunath (2011) stated that the organizational climate as perceived by agricultural scientist had a positive and highly significant relationship with their overall scientific productivity. The organizational climate of the Agricultural University as found to be favourable and encouraging as perceived by scientists Meena and Agarwal (2014) state that organizational climate or environment of a workplace is one of the factor that explicitly or implicitly influence the level of performance of its employees, their level of job satisfaction, level of motivation and happiness level. There is positive correlation between organizational climate and job satisfaction.

Developing a conducive organization climate

Since organizational climate of any organization clearly influence the performance of the employees working in it, there is need to cultivate and sustain more conducive climate within the organization. Role of extension personnel becoming more demanding and challenging day by day, thus it becomes necessary for the extension organizations to make its climate favorable for the extension personnel. In conducive organizational climate extension personnel can give their optimum performance. To develop good organizational climate is a long term proposition.

There are many factors which help in creating climate of any organization more conducive. Any organization must pay attention on the following components for enhancing the organizational climate :

There should be a two way communication in the organization so that the employees know what is going on and react to it. The administration/manager can modify his decision on the basis of feedback received.

The administration/management should be interested in the human resource development. It should work for the welfare of employees and an improvement in their working conditions. For developing a good organizational climate, the administration/ management should have concern for the people.

The organizational climate can also be changed by making changes in the policies, procedures and rules. It is a time



consuming process but the changes will also be long lasting if the organizational personnel see the changes in policies, procedures and rules as favourable to them.

The technological changes which improve the working conditions of the employees must be adopted.

The administration/management must understand the people in the organization. The importance must be given to what motivates employees' performance in general and building an overall climate conducive to motivation.

The administration/management should involve the employees in decision making process, particularly those decisions which are related to goal setting and affect them. Participative decision making will make the employees committed to the organization and more cooperative. Participation is a very effective tool to develop good organizational climate. There should be mental and emotional involvement of the employees in the administration of the organization. When employees are mentally and emotionally involved in decision making, it develops the sense of responsibility among them. They take organizational goals as their personal goals. They become both decision makers and executors. Under participative conditions people perceive administration/ managers as supportive contributors to the team. Employees are ready to work actively with administration/ managers, rather reactively against them.

Participation motivates people to contribute to the situation. They are given opportunities to use their initiative and creativity towards the objectives of the organization. In participatory situation employees contribute their maximum potential in achieving the organizational goals (Venkatesh).

CONCLUSION

To achieve the target of doubling farmers' income extension organizations must be result oriented. In the current situation, role of extension personnel becoming more demanding and challenging. Organizational climate affects significantly the performance of any employee working within it. Extension organization must develop conducive organizational climate thus, extension personnel can contribute their full potential in achieving the goal of doubling farmers' income. Open communication, welfare of the employees, improvement in working conditions, adoption of innovations, change in policies and procedures (if required) and participatory decision making are the factors which can contribute in developing good organizational climate of any organization.

REFERENCES

1. Amit Debnath, S.R. (2014). Job Satisfaction and Job Autonomy of Extension personnel of the public Agricultural Extension Organization in Tripura State of North East India. *International Journal of Development Research*, pp. 1643-1650.
2. Dalwai Committee Report on Doubling Farmers' Income (2017). Empowering the Farmers through Extension and Knowledge Dissemination Vol XI, Department of Agriculture, Cooperation and Farmers' Welfare, Ministry of Agriculture & Farmers' Welfare.
3. Dzaulkifli Bari'ah, M.N. (2012). Assessing the Organizational Climate towards Developing Innovative Work Behaviour : A literature Review. 3rd International Conference on Business and Economic Research (pp. 1-11). Bandung, Indonesia: Conference Proceeding.
4. Forehand, G.A., and Gilmer, B. (1964). Environmental variations in studies of organizational behavior. *Psychological Bulletin*, 62(6) : 361-382.
5. Garg, P., and Rastogi, R. (2006). Climate profile and OCB's of teachers in public and private schools of India. *International Journal of Educational Management*, 20(7) : 529-541.
6. Gelfand, J. (1972). The modification, development and application of a measure of organisational climate and its relationship to higher order needs. Unpublished MA dissertation. Johannesburg: University of Witwatersrand.
7. Haakonsson, D.D., Burton, R.M., Obel, B. and Lauridsen, J. (2008). How failure to align organizational climate and leadership style affects performance. *Management Decision*, 46(3) : pp. 406-432.
8. K.K. Shahsidahra, L.M. (2011). Determinates of Scientific Productivity of Agricultural Scientists. *Indian Research Journal of Extension Education*, pp. 7-12.
9. Menna Santosh, A.M. (2014). The Relationship among Organizational Climate, Job Satisfaction and Happiness of the employees of educational Institutions. *American International Journal of Research in Humanities, Arts and Social Sciences*, pp. 149-152.
10. Moran, E.T., and Volkwein, J.F. (1992). The Cultural Approach to the Formation of Organizational Climate. *Human Relations*, 45(1) : pp. 19-47.
11. Rivera, W.R and Sulaiman, R.V. (2009). Extension: object of reform, engine for innovation, *Outlook on Agriculture*, 38(3) : pp. 267-273.
12. Sulaiman R.V and Hall, A.J (2004). Extension Plus: Opportunities and Challenges, NCAP Policy Brief 17, National Centre for Agricultural Economics and Policy Research, New Delhi.
13. Venkatesh. Organisational Climate: Meaning, Characteristics and Factors.
<http://www.yourarticlelibrary.com/organization/organisational-climate-meaning-characteristics-and-factors/53226>
14. Wallace, J., Hunt, J. and Richards, C. (1999). The relationship between organisational culture, organisational climate and managerial values. *The International Journal of Public Sector Management*, 12(7) : pp. 548-564.



SCREENING TECHNIQUES AT SEED, SEEDLING AND WHOLE PLANT LEVEL FOR DROUGHT TOLERANCE

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Abstract

The experiment was conducted under green house with two treatments, stress and non stress condition. In the present investigation, the pigeonpea genotypes were subjected to different screening techniques at seed, seedling and whole plant level for drought tolerance such as PEG induced moisture stress at seed level, gravimetric approach at seedling and whole plant level. Observations on root and shoot length, Root to Shoot ratio, Relative Water Content, rate of water loss, proline content, chlorophyll content and catalase activity were taken and finally from the present investigation which includes physiological screening of pigeonpea genotypes, it is evident that genotype ICPL-87 showed best performance under moisture stress condition and considered as a promising drought tolerant genotype and RVK-285 showed poor performance under moisture stress condition and considered as a drought sensitive genotype. However, the genotype TS-3R showed relatively better tolerance to moisture stress condition and considered as a moderately tolerant genotype.

INTRODUCTION

Plants have had to cope with periodic and unpredictable environmental stresses during growth and development because of their early migration from aquatic environments to the land. Surviving such stresses over a long evolutionary scale led them to acquire mechanisms by which they can sensitively perceive incoming stresses and regulate their physiology accordingly (Zhang *et al.*, 2006).

In recent years, interest in crop response to environmental stresses has greatly increased because severe losses may result from heat, cold, drought and high concentrations of toxic mineral elements (Blum, 1996). Drought is one of the most damaging abiotic stresses affecting agriculture. Generally, different strategies have been proposed for the selection of relative drought tolerance and resistance, so some researchers have proposed selection under non stress conditions (Rathjen, 1994; Betran *et al.*, 2003), others have suggested selection in the target stress conditions (Ceccarelli and Grando, 2000; Rathjen, 1994) while, several of them have chosen the mid way and believe in selection under both non-stress and stress conditions (Fischer and Maurer, 1978; Clarke *et al.*, 1992; Fernandez, 1992; Rajaram and Van Ginkle, 2001). Another approach to identify tolerant genotypes to dry environment is that some drought stress indices or selection criteria like relative water content, rate of water loss, proline content and chlorophyll content have been suggested by different researches (Talebi *et al.*, 2009; Pireivatlou, 2010).

The objectives of the present investigation were to screen drought tolerant and susceptible genotypes of pigeonpea by subjecting them to different screening techniques at seed, seedling and whole plant level for drought tolerance

MATERIALS AND METHODS

Thirty genotypes of pigeonpea were used in the study which are the genotypes obtained from the research station, Kalaburgi. They are the genotypes obtained and collected from all over the country (Table 1). So they were selected to test their performance for drought tolerance at two different growth levels :

- (i) Seed level
- (ii) Seedling level
- (iii) Whole plant level

Screening of pigeonpea genotypes at seed level by imposing water stress using Polyethylene glycol (PEG 6000)

The methodology followed in the present experiment was given by Turner (1997). Polyethylene glycol (PEG 6000) has been widely used to induce drought stress in plants. The seeds of selected genotypes were treated with PEG 6000 for imposing drought condition. Ten seeds of each genotype were placed in the moist petri dishes and 5ml each of -0.2 (T₁), -0.6 (T₂), -1.0 (T₃), -1.2 (T₄) and -1.6 (T₅) MPa PEG solution was dispensed once at the start of the experiment along with control (T₆). For absolute control the sprinkling of distilled water was continued to maintain moisture in the petri plate. The incubation period was for 72 hours. After three days of treatment, the percentage of germination and morphology of the root and shoot was



measured using measurement scale and noted down from each replication of absolute control and PEG treated seeds of all genotypes of pigeonpea seedlings.

Screening of pigeonpea genotypes at seedling level

Pigeonpea seeds were sown in polybags containing a soil mixture of 1:1:1 ratio of black soil : sand : FYM and were kept in green house to impose water stress. Gravimetric approach was followed to impose water stress (Uday *et al.*, 1998). Stress was imposed by withholding the irrigation to the seedlings when it attained the age of 30 days and continued till it lost 15 % loss of weight of a plant depicts most severe stress to the plants and hence the experiment was carried out by weighing the polybags. After drought imposition at seedling level the samples were collected for further physiological screening. Relative water content (Barrs and Weatherly, 1962), rate of water loss (Gavuzzi *et al.*, 1997), proline content (Bates *et al.*, 1973) and chlorophyll content (Hiscox and Israelstam, 1979) was estimated.

Selection of promising genotypes for drought tolerance through gravimetric approach

The contrasting drought tolerant and sensitive genotypes were selected based on their response and performance pertaining to physiological screening experiments.

Three drought tolerant genotype was selected on the basis of their physiological performance, two moderately tolerant genotypes were selected as a second line of support to the study if in case the best performing or tolerant lines show poor performance in the further investigations done with regards to yield and yield attributing parameters and three sensitive genotypes were selected on the basis of their physiological performance. Seeds of the drought tolerant, moderately tolerant and sensitive genotypes were sown in pots containing soil mixture in the 1:1:1 ratio of black soil : sand : FYM and grown for 30 days. After 30 days, two levels of water stress (40 % FC and 60 % FC) was imposed to selected genotypes and an absolute control (the maximum water holding capacity of the pot was considered as 100 % field capacity) was maintained. The water stress was imposed for 15 days and the corresponding leaf samples from all the treatments were collected. RWC and RWL were calculated. Proline content, chlorophyll content and catalase activity (Barber, 1980) was estimated.

RESULTS AND DISCUSSION

Selection of contrasting genotypes for further stringent physiological screening

Selection of contrasting genotypes (varying in germination percentage, relative water content, rate of water loss and proline content subjected to stress and non stress condition) for further stringent physiological screening.

The selection of contrasting genotypes *viz.*, drought tolerant and drought sensitive was necessary and were selected based on their performance related to germination percentage, relative water content, rate of water loss and proline content under stress and non stress conditions. The genotypes showing better performance were selected as drought tolerant and the poor performance showing genotypes were selected as drought sensitive genotypes

Among the 30 genotypes subjected for physiological screening, genotypes GC-11-39, ICPL-87 and JKM-7 were selected as drought tolerant genotypes. GC-11-39, ICPL-87, JKM-7 could germinate under reduced water potential (-0.2 MPa) (Plate 4) and showed high root to shoot ratio compared to other genotypes. They also showed high values for the relative water content and proline content under stressed conditions. Relatively lower rate of water loss was observed in these genotypes under stressed conditions. These are some of the parameters supported to select drought tolerant genotypes by comparing their performance under stressed situations for the above mentioned physiological parameters.

In the same manner, NDA-1, RVK-285 and TJT-501 were selected as drought sensitive genotypes, considering their poor performance in terms of germination under reduced water potential treatment, low relative water content, high rate of water loss and low proline content under stressed conditions. NDA-1, RVK-285 and TJT-501 showed low germination percentage at -0.2 MPa which is relatively a high water potential. These three genotypes showed less relative water content and also less proline content under stressed condition. They proved sensitive by showing high rate of water loss under stressed conditions. Therefore NDA-1, RVK-285 and TJT-501 genotypes were selected as the sensitive genotypes in further screening experiments.

However, genotypes TS-3R and WRP-R-29-4 were selected as moderately tolerant genotypes. Considering the same criteria of selection in terms of moderately good germination percentage, relative water content and also proline content. They also performed better than the selected sensitive genotypes in terms of maintaining comparatively lower rate of water loss.



Overall three drought tolerant, three drought sensitive and two moderately tolerant genotypes were selected for subjecting them to stringent physiological screening.

Comparative performance of selected contrasting pigeonpea genotypes varying in different physiological parameters after stringent stress imposition

Among the 8 genotypes subjected for physiological screening, genotypes GC-11-39, ICPL-87 and JKM-7 were selected as drought tolerant genotypes based on their performance under stress. In the same manner, NDA-1, RVK-285 and TJT-501 were selected as drought sensitive genotypes, considering their poor performance under stress. However, genotypes TS-3R and WRP-R-29-4 were selected as moderately tolerant genotypes based on their average performance under stress.

In the present investigation, among the genotypes selected as drought tolerant, ICPL-87 showed the better performance under both stressed (60 % and 40 % FC) and non stressed conditions. This genotype recorded high relative water content, proline, total chlorophyll content and catalase activity. This proved drought tolerant by maintaining low rate of water loss in both the conditions. Among the selected drought tolerant genotypes, JKM-7 stood second followed by GC-11-39 with relatively poor performance in all the physiological parameters used for the drought studies.

Among the moderately tolerant pigeonpea genotypes, TS-3R showed good performance under both stressed (60 % and 40 % FC) and non stressed conditions. This genotype recorded high relative water content, proline, chlorophyll 'a', chlorophyll 'b', total chlorophyll content and catalase activity under both stressed and non stressed condition. The genotype also maintained low rate of water loss in both the conditions. However, the genotype WRP-R-29-4 showed relatively poor performance in all the physiological parameters used for the drought studies

In the same manner, among the drought sensitive genotypes, RVK-285 showed poor performance under both stressed (60 % and 40 % FC) and non stressed condition. The genotype recorded low relative water content, proline, chlorophyll 'a', total chlorophyll content and catalase activity under both stressed and non stressed condition comparing to other genotypes. This genotype showed relatively high rate of water loss compared to other two sensitive genotypes. Among the selected drought sensitive genotypes, NDA-1 and TJT-501 showed relatively better performance in all the physiological parameters used for the drought studies.

CONCLUSION

The present investigation envisages the importance of physiological screening of pigeonpea genotypes under moisture stress conditions. The genotypes were subjected to stringent screening at seedling level as well as whole plant level. ICPL-87 proved to be drought tolerant by showing high relative water content, proline content, total chlorophyll, with relatively low rate of water loss and high catalase activity. Further, from this study, RVK-285 proved to be sensitive genotype by showing less relative water content, proline content, chlorophyll 'a', total chlorophyll, catalase activity with relatively high rate of water loss.

REFERENCES

1. Barber, J. M., 1980, Catalase and peroxidase in primary leaves during development and senescence. *Z. Pflanzen physiol.*, 97: 135-144.
2. Barrs, H. D. and Weatherly, P. E., 1962, A reexamination of relative turgidity for estimating water deficit in leaves. *Australian J. of Biol. Sci.*, 15: 413-428.
3. Bates, L. S., Waldren, R. P. and Teare, I. D., 1973, Rapid determination of free proline for water stress studies. *Plant Soil*, 39:205-207.
4. Betran, F. J., Beck, D., Banziger, M. and Edmeades, G. O., 2003, *Crop Sci.*, 43:807-817.
5. Blum, A., 1996, *Plant Growth Regul.*, 20:135- 148.
6. Ceccarelli, S. and Grando, S., 2000, *Euphytica*, 57:157-167.
7. Clarke, J. M., DePauw, R. M. and Townley-Smith, T. F., 1992, *Crop Sci.*, 32:723-728.
8. Fernandez, G. C. J., 1992, Effective selection criteria for assessing stress tolerance. In: Kuo CG (ed), Proceedings of the international symposium on adaptation of vegetables and other food crops in temperature and water stress. Public Tainan Taiwan 257-270.
9. Fischer, R. A and Maurer, R., 1978, *Aust J Agric Res.*, 29:897-912.
10. Gavuzzi, P., Rizza, F., Palumbo, M., Campanile, R. G., Ricciardi, G. L. and Borghi, B., 1997, Evaluation of field and laboratory predictors of drought and heat tolerance in winter cereals. *Canadian Journal of Plant Science*, 77: 52-531.
11. Hiscox, J. D. and Israelstam, G. F., 1979, A method of extraction of chlorophyll from leaf tissue without maceration. *Canadian J. Bot.*, 57: 1332-1334.
12. Pirevatlou, A. S., Masjedlou, B. D. and Aliyev, R. T., 2010, *Afric J Agric Res*, 5:2829-2836.
13. Rajaram, S. and Van Ginkle, M., 2001, Mexico, 50 years of international wheat breeding, Bonjean AP, WJ Angus.
14. Rajaram, S. and Van Ginkle, M., 2001, Mexico. 50 years of international wheat breeding, Bonjean AP, WJ Angus.



15. Rathjen, A. J., 1994, The biological basis of genotype-environment interaction: its definition and management, In 'Proceedings of the Seventh Assembly of the Wheat Breeding Society of Australia, Adelaide, Australia, pp. 13–17.
16. Talebi, R., Fayaz, F. and Naji, A. M., 2009, *General and Appl Plant Physiol.*, 35:64-74.
17. Turner, N. C., 1997, Further progress in crop water relations. *Adv Agron.*, 58: 293-338.
18. Uday kumar, M., Rao, R. C. N., Wright, G. C., Ramaswamy, G. C., Ashok, Roystephan., Gangadhar, G. C. and Aftab Hussain, I, S., 1998, Measurement of transpiration efficiency in field condition. *J. Plant Physiol Biochem.*, 1:69-75
19. Zhang, J., Wensuo, J., Jianchang, Y. and Abdelbagi, M. I., 2006, *Field Crop Res.*, 97:111-119.

Table-1 : List of pigeonpea genotypes and their salient features.

S. No.	Genotypes	Remarks
1	ASHA	Wilt and sterility mosaic disease (SMD) disease resistant, high yielding variety matures in 185-190 days
2	AKT-9913	High yielding, medium duration variety from Akola
3	BDN-2008-01	High yielding, medium duration variety from Badnapur
4	BAHAR	Long duration variety, Resistant donar for SMD
5	BSMR-736	Sterility mosaic disease (SMD) disease resistant, high yielding variety matures in 185-190 days, suitable for transplanting
6	BENNUR LOCAL	Local land race, matures in about 150 days, high yielding but susceptible to Fusarium wilt disease
7	BDN-2008-12	High yielding, medium duration variety from Badnapur
8	GRG-152	High yielding, medium duration variety, resistant to wilt
9	GRG-811	Wilt resistant and Sterility mosaic disease (SMD) disease tolerant, high yielding variety, matures in about 165 days
10	GRG-333	High yielding, white seeded, mid early duration variety, resistant to wilt
11	GC-11-39	Early maturing variety, determinate type, matures in about 125 days, suitable for double cropping
12	ICP-348	Medium duration germplasm line from ICRISAT
13	ICP-6668	Medium duration germplasm line from ICRISAT
14	ICP-13270	Medium duration germplasm line from ICRISAT
15	ICPL-87	Early maturing variety, matures in about 135 days, suitable for double cropping
16	ICP-7366	Medium duration germplasm line from ICRISAT
17	JKM-7	High yielding, medium duration variety, resistant to wilt
18	MARUTI	Wilt resistant, high yielding variety suited to deep soils, matures in about 165 days. Not suitable for SMD infested area
19	NDA-1	Long duration variety, high yielding variety
20	PT-221	High yielding, medium duration variety from Parbhani
21	PUSA-2001	High yielding, medium duration variety from PUSA, IARI
22	RVK-275	High yielding, medium duration variety
23	RVK-285	High yielding, medium duration variety
24	RVK-284	High yielding, medium duration variety
25	TJT-501	High yielding, medium duration variety from Trombay, BARC
26	TTB-7	High yielding, SMD resistant, medium duration variety
27	TS-3	High yielding, white seeded, medium duration variety with spreading plant habit
28	TS-3R	Presently ruling, high yielding, red and bold seeded, mid early duration variety matures in about 155 days. Resistant to wilt
29	WRP-1	High yielding, white seeded, medium duration variety with resistant to wilt
30	WRP-R-29-4	High yielding, red seeded, medium duration variety with resistant to wilt



ADVANCES IN SCLEROTINIA STEM ROT MANAGEMENT IN OILSEED BRASSICA

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The oil yielding *Brassica* crops grown in India include rai or raya or mustard [*Brassica juncea* (L.) Czern. & Coss.] and rapeseed (*B. rapa* sp. *oleifera*) with three varieties: *B. rapa* var. Yellow Sarson; *B. rapa* var. Brown Sarson and *B. rapa* var. Toria. The other *Brassica* species grown to a limited extent in different parts of the country include *B. napus*, *B. chinensis*, *B. pekinensis* and *B. tournefortii*. The Indian mustard (*B. juncea*) is the main source of cooking oil in Asia. India is one of the leading oilseeds producing country in the world accounting for 11 per cent of the world's rapeseed-mustard production, and ranks third in the world next to China and Canada.

Sclerotinia sclerotiorum (Lib.) de Bary, the causal organism of stem rot of *Brassica* and over 500 host plants is distributed worldwide. Sclerotinia rot is menace to cultivation of oilseed *Brassica* crops in the world. Infection occurs on leaves, stems and pods at different developmental stages, causing seed yield losses of up to 80%, as well as significant reductions in oil content and quality. In India, during the eighties and nineties, the SR disease in rapeseed-mustard was of very minor importance, because the mycelial infection at the ground level occurred very infrequently only on the isolated plants. Significant increase in the sclerotial population in the soil due to monocropping and cultivation of rapeseed-mustard under irrigated conditions, has made SR very serious disease of oilseed *Brassica* crops in states including Rajasthan, Haryana, Punjab, Assam, West Bengal, Madhya Pradesh, Uttar Pradesh, and Bihar

The initial mycelial infection at the base of the stem is an appearance of elongated water-soaked lesions that expand rapidly. Ascosporic (carpogenic) infection is quite general and occurs on the leaves or leaf axil. Effective pathogenesis by *S. sclerotiorum* requires the secretion of pathogenicity factors including oxalic acid and extracellular lytic enzymes. Germination of overwintered sclerotia, and release, survival and germination of ascospores are important factors for the development of disease and in the life cycle of this pathogen.

Management of *S. sclerotiorum* is a major challenge faced by plant pathologists. Management is difficult, inconsistent and uneconomical due to the presence of wide host range and long-term survival of the resting sclerotia. Since no single method can effectively control *S. sclerotiorum*, the best approach to control the pathogen is by the integration of various eco-friendly measures. Sclerotia in the top 2-3 cm soil often germinate carpogenically. The sclerotial populations deteriorate faster by the mycoparasites that dwell in the top soil. But if the soil is ploughed, the sclerotia are buried deeper in the soil and survive for several years. The zero tillage, thus, not only reduces the inoculum load of the sclerotia, but also the infection of host plants by the pathogen. Cultivation of non-host crops, although, reduces inoculum load, a minimum of 5 year rotation of two non host crops is essential to decrease the infection level by the pathogen. Cultural practices including wider row spacing or lower plant populations that reduce the microclimate favorable for disease development are used in some crops. Augmentation of soil with organic or inorganic compounds helps in increasing microbial population capable of suppressing germination of sclerotia. Soil application of compost with higher microbial populations inhibited carpogenic germination of *S. sclerotiorum* and reduced infection.

In the light of present day concern about the environment, human health and development of resistance to fungicides, biological control is an attractive alternative for plant disease management. Soil application of *C. minitans* to different host crops reduced carpogenic germination and viability of sclerotia under wide range of temperature, relative humidity and soil moisture. *T. harzianum* was most effective in reducing the lesion length and disease intensity when applied simultaneously, or seven days prior to the pathogen under the screen house conditions. Antagonists like plant growth promoting rhizobacteria are exploited for the management of both foliar and soil borne pathogens of various economically important crop plants. Several bacterial antagonists including *Bacillus*, *Pseudomonas* and *Agrobacterium* species are commercialized, for their potential role in disease management.

Sclerotinia continues to be a very difficult pathogen to control. Therefore, fungicides have been extensively used for the control of *S. sclerotiorum* in canola, as well as in other crops like soybean, dry bean and some vegetables. Fungicides are effective in reducing severe yield losses. Seed treatment with carbendazim also found effective in minimizing the Sclerotinia rot incidence. Fungicides are often applied at the full bloom stage to prevent infection of the senescing petals, which can fall on the leaf axils leading to infection of the stem. The application of fungicides can be expensive and also has negative environmental impacts. Foliar spray of carbendazim at full bloom stage provided significant disease reduction and highest seed yield among the different treatments over control.



One of the most effective, economical and environment friendly approach to control plant diseases is the development of genetically resistant cultivars. Because of its very wide host range, breeding for resistance against *S. sclerotiorum* is very challenging. Partial resistance has also been identified in some *B. napus* and, to a lesser extent, in *B. juncea* genotypes from China. A cultivar Zhongshuang No. 9, claimed to be better than Zhongyou 821, was reported in 2003. Novel approaches to the introduction of increased *Sclerotinia* resistance into oilseed rape include the development of transgenic plants expressing oxalate oxidase activity capable of degrading oxalic acid, a pathotoxin of the fungus.

During two consecutive cropping seasons (2016-18) at ICAR-Directorate of Rapeseed-Mustard Research, 5442 *B. juncea* germplasm were field-screened under *Sclerotinia* sick plot to determine their relative levels of resistance to SSR. Mean lesion length following stem inoculation with a highly virulent isolate (ESR 1) of the prevailing *S. Sclerotiorum* pathotype ranged from 0.0?mm in germplasm RH 1222-28, EC 597328, EC 766553, EC 766620, EC 765048, IC 492687, IC 492690, IC 492695, IC 511651 to 497?mm in IC 0493022 ($P?<?0.001$).

Breeding programs was immediately utilized the SSR resistance in high yielding varieties, which will enable a shift from the current dependence on fungicidal control to reliance on cost-effective, sustainable host resistance as the basis for better management of SSR. Recombinant inbred lines (RILs) can serve as powerful tools for genetic mapping. RIL is formed by crossing two inbred strains followed by repeated selfing to create a new inbred line whose genome is a mosaic of the parental genomes. . Quantitative Trait Locus mapping has proved to be a powerful approach in understanding the genetic basis of quantitative traits. Results from mapping and genetic analysis of *Sclerotinia* resistance show that QTLs in rapeseed would be very useful for marker-assistant selection and durable resistance cultivar breeding.



PHAGE LYSSED BACTERIA AS VACCINES AGAINST *PASTEURELLA* AND *BRUCELLA* INFECTIONS IN CATTLE

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Abstract

Hemorrhagic Septicemia (HS) is a fatal disease of bovines caused by *Pasteurella multocida*. Marker vaccine could help in control of HS. Bovine Brucellosis is an important zoonotic disease causing huge economic losses worldwide. Currently no effective therapy is available for Brucellosis and animals remain carrier lifelong. We have developed novel marker vaccine for HS and therapeutic vaccine for brucellosis employing bacteriophages.

P. multocida (B:2) grown under iron restricted conditions followed by lysis with a lytic Pasteurellaphage was used as the marker vaccine. Cattle in phage lysate vaccine (PLV) group showed higher antibody titers compared to alum precipitated vaccine (APV) group as revealed by ELISA. Mice and rabbits vaccinated with PLV revealed significantly higher antibody titres than mice and rabbits receiving APV by ELISA ($P < 0.001$). The peak $\log_{10}$ values (3.46) in case of PLV mice by ELISA were attained at 90 days post inoculation (dpi) whereas in APV mice the peak value at 90DPI was 2.82. Mean $\log_{10}$ titres by ELISA in PLV and APV rabbits were 2.43 and 2.35 respectively at 30DPI whereas at 120DPI the titres were 3.29 and 2.75, respectively. The marker vaccine induced higher and longer immune response in cattle, mice and rabbits compared to the APV.

We have developed a therapeutic vaccine for bovine Brucellosis employing phage lysates of RB51 (RL) and S19 (SL) strains of *Brucella abortus*. The SL induced strong antibody response and RL stimulated Cell Mediated Immunity. *In vitro* restimulation of leukocytes from RL immunized cattle induced interferon gamma production. A single subcutaneous dose of 2 ml of cocktail lysate (both RL and SL), eliminated live virulent *Brucella* from Brucellosis affected cattle. The plasma level of *Brucella* specific 223 bp amplicon became undetectable by RTPCR and blood was negative for live *Brucella* in 3 months post-immunization as evident by culture.

Introduction : Hemorrhagic septicemia (HS) caused by *Pasteurella multocida* is an acute, fatal, septicemic disease of cattle and buffaloes (Annas *et al.*, 2015). Currently used alum and oil adjuvanted whole cell vaccines, provide some protection but suffer from short term immunity drawback. Alum precipitated *P. multocida* P52 killed bacterin confers immunity for four to six months only with reports of vaccination failure (Qureshi and Saxena, 2014).

Brucellosis is a major bacterial zoonosis of global importance. Bovine brucellosis is endemic in all states of India. It causes heavy economic loss to the animal industry through abortion, delayed conception, and temporary or permanent infertility in the affected animals (Kollannur *et al.*, 2007).

Bacteriophage mediated bacteria lysis and subsequently generated proteins have been proved to be very good immunogens with stronger protection than conventionally inactivated bacteria especially in case of antibiotic resistant bacteria (Yosef *et al.*, 2015). The conventional methods (heat, chemical, and irradiation) of inactivating/killing bacteria for vaccine production have been reported to damage antigens and reduce their immunogenicity (Lauvau *et al.*, 2001). Bacteriophage mediated lysis releases bacterial antigens that are suited to act as immunobiological agents. We have developed a phage lysate based marker vaccine for Hemorrhagic Septicemia in bovines along with a companion DIVA assay. A therapeutic vaccine for bovine Brucellosis has also been developed by us based on phage lysate.

MATERIALS AND METHODS

Preparation of marker vaccine : *P. multocida* B:2 field strain was used for preparation of a phage lysate vaccine. Pasteurellaphage was added in the culture (phage-bacteria ratio of 1:100) as per the multiplicity of infection of phage (Verma *et al.*, 2013). The lysate was adjuvanted using sterile alum (10% w/v). The protein concentration of the phage lysate was determined by nanodrop spectrophotometer and lowry assay.

Generation of phage lysates of Brucella : The method for generation of phage lysate preparations against *Brucella abortus* using Brucellaphage reported earlier (Jain *et al.*, 2015) was suitably modified and used for making lysates of both S19 and RB51 (Saxena and Raj, 2017). The total viable count (TVC) of 24-48hr *Brucella* selective broth culture of the strains S19 and RB51 incubated at 37°C was adjusted to 2×10^8 cfu/ml. Opacity of broth was adjusted to Mac Farland's tube no 3 to obtain growth sufficient for appropriate antigenic biomass. Phage was added as per optimized MOI and TVC of the respective



indicator strains (with phage bacteria ratio of 1:50) and the mixture was further incubated for 6–7 hours at 37°C for complete lysis and clearance of turbidity. 100 ml each of phage lysate was prepared against both the strains (*Brucella abortus* S 19 and RB51). The phage lysate cocktail was then passed through a 0.1 μ m filter (Pall Life Science) to separate out the phage from the lysate and the filtrate was stored in sterilized vials at 4°C. Sterile aluminium hydroxide gel suspension in saline in ratio of 1:10 was added to the preparation. Total protein content of the phage lysate, as determined by Nanodrop spectrophotometer, was 0.58 mg/ml for S19 lysate and 0.64 mg/ml for RB 51 lysate. The phage lysate cocktail (combination of *Brucella abortus* S19 and RB51 lysates) was prepared by addition of equal quantity of S19 phage lysate and RB51 lysate. Sterilized 1% Aluminium hydroxide gel suspension in saline was mixed aseptically with the test preparations in ratio of 1:10 (final Aluminium concentration 0.1%) and incubated at 37°C for 24 hours and then stored at 4°C. The phage lysates were then subjected to sterility and safety tests.

RESULTS AND DISCUSSION

P. multocida (B:2) grown under iron restricted conditions using 2', 2' dipyrindyl followed by lysis using a lytic *Pasteurella* bacteriophage to prepare the marker vaccine. Animals in Phage lysate vaccine (PLV) group showed higher antibody titers in comparison to conventional alum precipitated vaccine (CAPV) group at all stages of vaccination. The peak titers induced by the PLV group was 2.34 ± 0.21 at 90 days post vaccination (dpv) as revealed by ELISA. In the CAPV group the peak antibody titers were observed at 60 dpv (2.13 ± 0.07) by MAT. The detection of "novel iron restriction protein (137KDa) was done by western blot and ELISA. The serum of marker vaccinated cattle revealed presence of antibody to the 137KDa IROMPN in comparison to conventional alum precipitated HS vaccine group in which it was absent. The new marker vaccine with improved antigenicity and DIVA assays would help in effective vaccination and thus the prevention, control and eradication of this disease.

The S19 lysate (SL) induced strong antibody response and RB51 lysate (RL) stimulated CMI. The antibody titers enhanced considerably by *Brucella abortus* S19 lysate. Interestingly, *Brucella abortus* RB51 lysate immunization contributed to an enhancement in titer at a later stage, whereas cocktail lysate generated a robust antibody response which consistently increased significantly throughout the 3 months period of observation. In case of RB51 lysate immunized animals the increase in lymphocyte counts from 0 day to 30 day and 60 day to 90 day post immunization was significant ($P < 0.05$). The increase in counts from 0 day to 60 day, 75 day and 90 day, 30 to 75 day and 90 day was significant ($P < 0.01$). In animals which were treated with *Brucella abortus* S19 lysate, increase in the neutrophil count was significant ($P < 0.05$) from 30 to 90 day and 60 to 90 day and very significant ($P < 0.01$) from 0 to 90 day. In animals treated with cocktail lysate preparation the difference between the mean neutrophil counts at 0D vs 90D was significant ($P < 0.01$).

In vitro restimulation of leukocytes from RL immunized cattle induced interferon gamma production. A single subcutaneous dose of 2 ml of cocktail lysate (both RL and SL), eliminated live virulent *Brucella* from Brucellosis affected cattle with plasma level of *Brucella* specific 223 bp amplicon undetectable by RT-PCR and blood negative for live *Brucella* by culture in 3 months post- immunization.

Conclusion : Phage lysate of bacteria can be used as prophylactic as well as therapeutic vaccine.

REFERENCES

1. Qureshi S. and Saxena H.M. (2014). Estimation of antibody titers in cattle vaccinated with haemorrhagic septicaemia alum precipitated vaccine by MAT, IHA and Mab-ELISA. *Vet World* 7: 224-28.
2. Lauvau G., Kong V.S., Horng P. (2001). Priming of memory but not effector CD8 T cells by a killed bacterial vaccine. *Science* 294: 1735-39.
3. Yosef I., Miriam Manor M., Ruth Kiro R., (2015). Temperate and lytic bacteriophages programmed to sensitize and kill antibiotic-resistant bacteria. *Proc Natl Acad Sci* 112: 7267-72.
4. Jain L., Rawat M., Prajapati A., Tiwari A.K., Kumar B., Chaturvedi V.K., Saxena H.M. (2015). Protective immune response of aluminium hydroxide gel adjuvanted phage lysate of *Brucella abortus* S19 in mice against direct virulent challenge with *B. abortus* 544. *Biologicals* 43: 1–8.
5. Saxena H.M., Raj S. (2017). Generation of phage lysates of *Brucella* using *Brucellaphage*. [dx.doi.org/10.17504/protocols.io.matc2en](https://doi.org/10.17504/protocols.io.matc2en).



BIOSORPTION OF MALACHITE GREEN DYE BY MYCOMASS AND PHYTOMASS INFLUENCE BY INDUSTRIAL EFFLUENT HEAVY METALS

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INTRODUCTION

The wastewater released from paper and pulp industries contains high amounts of dyes and pigments as well. About 7×10^5 tons of dyes and pigments are produced annually across the world from industries such as paper, textile, rubber, cosmetic etc. (Dorthey *et al.*, 2012). Paper industry in the country discharge huge volumes of highly coloured and toxic waste water in the environment and categorized as one of the 17th most polluting industries in the country. 330 m³ waste water is let out per ton of paper produced per day (S.N. Patanekar, 2009). Dyes are classified according to their applications and chemical structures. These are composed of (i) a group of atoms responsible for the dye colour, called 'chromophores', as well as (ii) an electron withdrawing or donating substituents that cause or intensify the colour of the chromophores and are called 'auxochrome' (Christie, 2001). The most important chromophores are azo ($-N=N-O$), carbonyl ($-C=O$), methane ($-CH=$), nitro ($-NO_2$) and quinoid groups. The most important auxochromes are amine ($-NH_3$), carboxyl ($-COOH$), sulfonate ($-SO_3H$) and hydroxyl ($-OH$).

Malachite green

Malachite green (MG) is water soluble cationic dye that appears as green crystalline powder and belongs to triphenylmethane category (Raval *et al.* 2016), has been widely used not only for the dyeing of cotton, silk, paper, leather wool and jute but also in the manufacture of paints and printing inks (Saravanan *et al.*, 2016). It also functions as a fungicide and antiseptic in aquaculture industry. MG has properties that make it difficult to remove from aqueous solutions and is also toxic to major microorganisms.

Toxicity of malachite green

Malachite Green is environmentally persistent and acutely toxic to a wide range of aquatic and terrestrial animals. Several studies have shown MG to be highly lethal to fresh water fishes, in both acute and chronic exposures (Sitiet *et al.*, 2016). It causes serious public health hazards and also poses potential environmental problems. If a solution containing MG is discharged into receiving stream, it would affect aquatic life and would cause detrimental effects in the liver, gill, kidney, intestine and gonads. In humans, it may cause irritation to the gastrointestinal tract upon ingestion. Skin contact with MG causes irritation, redness and pain. It may lead to permanent injury upon contact with the eyes in both humans and animals. As malachite green adsorbed into the body, it is converted to carbinol form firstly, which is important because it spreads across all membranes faster. When it is inside the cell, it is metabolised into a form called leuco-malachite green (LMG). This form is toxic, and is also retained in the body for a longer period than the original form of malachite green. Malachite Green is most widely used for colouring purpose amongst all other dyes of its category (Jing *et al.* 2008).

Heavy metals in industrial effluent

Heavy metals refer to elements with the atomic weight between 63.5 and 200.6 and a specific gravity greater than 5.0 (Srivastava and Majumder, 2008). Lead, Chromium, Cadmium, Zinc, Copper, Nickel, Mercury, Arsenic are the few examples of heavy metals which are released into the environment due to activities like electroplating, smelting, alloy manufacturing, battery manufacturing, paint manufacturing, printing processes etc. Wastewaters released during processes like dyeing and pigment production, film and photography, galvanometry, metal cleaning, plating and electroplating, leather and mining contain undesirable amounts of metals anions (Abdel-Ghani and El-Chaghaby, 2014). Lead (Pb), present naturally in the environment, has most damaging effects on human health. Inorganic forms of lead are absorbed through ingestion by food and water as also by inhalation (Ferner, 2001). Lead is mainly present in petro-based materials, pesticides, burning of coal, etc. (Sag and Kutsal, 1997). Lead poisoning can cause inhibition of the synthesis of haemoglobin; dysfunctions in the kidneys, joints, reproductive and cardiovascular system. Acute and chronic damage to the central nervous system (CNS) as well as peripheral nervous system (PNS) has also been observed in several cases.



Biosorption

Biosorption has emerged as an economic and sustainable strategy for cleanup (Flores-Garnica *et al.*, 2013). It is a property of both living and dead organisms (and their components), and has been exploited because of its simplicity (Bilal *et al.*, 2013). It can simply be defined as the removal of substances from solution by biological materials (Gadd, 2001). This approach focused on use of inexpensive biomaterials to sequester environmental pollutants from aqueous solutions by wide variety of physico-chemical mechanisms including ion-exchange, chelation, complexation, physical-adsorption, and surface micro precipitation (Abel-Ghaniet *et al.*, 2014). Adsorption is a surface phenomenon, in which molecules of adsorbate are attracted and held to the surface of an adsorbent until equilibrium is reached between adsorbed molecules and those still freely distributed in the carrying gas or liquid. This phenomenon mainly depends on interaction between the surface of the adsorbent and the adsorbed species.

Plant materials as biosorbent

Plant materials can also be used as potential biosorbent as had been reported earlier by many researchers. It was observed that beech leaves, reed leaves, *Solanum elaeagnifolium* (silver leaf nightshade), sugarbeet pulp and tea waste can be used as biosorbent for cadmium (Ho and McKay, 1999;). Rice husks and green tea biomass were used as biosorbent for elimination of malachite green (V.M. muindeet *et al.*, 2017;). *Andrographis paniculata* leaves were used as biosorbent for malachite green (S. nirmala *et al.*, 2016). Several aquatic species have the ability to remove heavy metals from water, viz. water hyacinth (*Eichhornia crassipes*), pennywort (*Hydrocotyle umbellata* L.) and duckweed (Prasad and Freitas, 2003). Biosorption potential of *Prosopis juliflora* seed powder for Pb(II) from aqueous solution was investigated and the results studied through FT-IR revealed the presence of various functional groups which are responsible for the adsorption process and the overall results showed that seed powder of *Prosopis juliflora* can be envisaged as a vibrant biosorbent for metal clean up operations. A wide variety of waste biomaterials, microorganisms, bacteria, fungi, yeast and algae have been reported for removal of metals from aqueous solutions (Ghaidet *et al.*, 2013). Microorganisms are capable of adsorbing heavy metals through different mechanisms; the main mechanism being the interaction of metal ions with the functional groups present on the cell surface. In bacteria, these are the extracellular polysaccharides which are involved in metal binding (McLean *et al.*, 1992). However, the cell walls of the fungi are dominated by polysaccharides combined with proteins, lipids, polyphosphates and inorganic ions (Fosso-Kankeu and Mulaba-Bafubianbi, 2014). However, the performance of microbial sorbents may vary depending on the strain used and the metal in solution. Many bacteria including *Bacillus* and *Pseudomonas* and fungi like *Aspergillus*, *Rhizopus* and *Penicillium* have been identified as good biosorbents (Bai and Abraham, 2003;).

Fungi as dye biosorbent

Dorothy *et al.* (2012) studied the decolorization efficiencies of dyes and effluents by free and immobilised fungal isolates using *Aspergillus flavus* and *Aspergillus wentii*. They observed maximum decolorisation (upto 94.41%) by immobilised *Aspergillus flavus* in Acid Blue dye and 95.88% immobilized by *A. wentii* in Yellow MGR dye. Akaret *et al.* (2009) studied the decolorisation of the textile dye Reactive Red 198 (RR198), by *A. parasiticus* and found the fungus to be an effective candidate for textile dye removal from aqueous solutions. Singh and Singh (2010) studied the biodegradation of dyes Bromophenol blue and Congo red by the fungus *A. flavus* and concluded with observation that the fungus could successfully degrade the dyes. Gnanadoss *et al.* (2013) studied the adsorption of synthetic dyes using oyster mushroom fungus *Pleurotus ostreatus* and found that the decolorisation of Congo red and Erichrome black T was maximum when the mycelium *Pleurotus ostreatus* was immobilized on polyurethane foam (PUF).

Factors effect on biosorption

The efficacy of the dye uptake by microbial biomass is subject to a variety of factors including temperature, pH, time, biosorbent concentration and initial concentration of the dye in the reaction system. The initial pH of solution appreciably influences biosorption of dyes due to change in the surface properties of the adsorbent. Dye colour and solubility are mainly affected by changing the pH of solution Namasivayam *et al.*, (1996). The contact time has been found to affect the sorption process. Namasivayam *et al.* (1996) investigated the effect of contact time on the biosorption of Congo red dye on to orange peel. Initially, the rate of dye sorption was higher and then this rate decreased. Okeola *et al.* (2014) stated that the pH of the system plays an important role on the whole adsorption process of adsorbate molecule, presumably due to its influence on the surface properties of the adsorbent and on the ionization/dissociation of the adsorbent molecules (Zawan *et al.*, 2009). Another important parameter is temperature because hot dye solution is discharged by industries. Several investigators studied the effect of various temperature ranges (10, 20, 30, 40 and 50°C) on dye biosorption. The percentage removal increase with



increase in temperature to a certain extent (Safa and Bhatti, 2010). Since a variety of functional groups play an important role in the biosorption of pollutants, it would be desirable to have an idea of the groups involved in the absorption of malachite green and lead. FT-IR spectroscopy has emerged as an important tool for the identification of such groups on the biomass (Lin *et al.*, 2011). Kumar (2013) recorded the FT-IR spectra of three different fungi viz. *A. flavus*, *A. fumigatus* and *A. niger*, and concluded that biosorption of a dye (MG and BF) increases with increase in dye binding groups. The potential of a fungus to adsorb dyes depends up to the number of functional groups available on its surface. FT-IR has very high resolution of 0.001 cm⁻¹ and can be used for obtaining spectra of gases, liquid or solid. The solid samples are usually examined as a pressed disc or as a deposit on a glass film. The pellet technique exploits the principle that the dry powdered potassium bromide (KBr) or other alkali metal halide can be compacted under high pressure to form a transparent pellet. FT-IR spectroscopy has been found to be very useful for (i) identifying microbial genera and species with a high degree of confidence (ii) for detecting very sensitive small changes in the composition of cell (ii) studying the host-pathogen interactions. In order to explore the mechanism of biosorption for any sorbent-sorbate system, it is essential to identify the functional groups of sorbent which are involved in biosorption. FT-IR spectroscopy allows the identification of different functional groups of sorbent (including mycomass).

Desorption and recovery of dyes and metals

Desorption of dye/metal-loaded biomass enables not only the reuse of the biomass, but also recovery and/or containment of sorbed materials. Of course, it must be ensured that the desorbing agent does not significantly damage or degrade the biomass. The regeneration of the biosorbent may be crucial in (i) keeping the process cost down, and (ii) in opening the possibility of recovery of the metals extracted from liquid phase. For this purpose, it is desirable to desorb the sorbed metals so as to regenerate the biosorbent material for another cycle of application. The desorption process should (a) yield the metal in a concentrated form, (b) restore the biosorbent close to the original condition for effective reuse with the undiminished metal uptake; and (c) must cause no physical change or damage to the biosorbent.

REFERENCES

1. Dorthy, A.M., Sivaraj, R. and R. Venckatesh (2012). Decolorization efficiencies of dyes and effluent by free and immobilized fungal isolates. *International Journal of Environmental Science and Research* 1: 109-113.
2. S. N. Patanekar. (2009). Reuse of treated waste water and sludge for agriculture in India- A case study in 52nd IEC meeting of the instrumental commission on irrigation and drainage international workshop on waste water use and management, Seoul, Korea. Raval, N.P., Shah, P.U and N.K. Shah (2016) Nanoparticles loaded biopolymer as effective adsorbent for adsorptive removal of malachite green from aqueous solution. *Water ConservSciEng* 1: 69-81.
3. Saravanan, R., Sacari, E., and F. Gracia F. (2016). Conducting PANI stimulated ZnO system for visible light photocatalytic degradation of coloured dyes. *J MolLiq* 221: 1029-1033.
4. Siti A.Z., Md P. A., Wan M. A and W. M. Khalik (2016). Removal of malachite green dye from aqueous solution using multi-walled carbon nanotubes: an application of experimental design. *Malaysian Journal of Analytical Sciences*, 20: 258-271.
5. Jing, W.U., Byung-Gil, J., Kyoung-Sook, K. and L. Young-Choon (2009). Isolation and characterization of *Pseudomonas otitidis* WL-13 and its capacity to decolorize triphenylmethane dyes. *J. Env. Sci.* 21: 960-964.
6. Srivastava, N.K. and C.B. Majumder (2008). Novel biofiltration methods for the treatment of heavy metals from industrial wastewater. *J. Hazard Mater.* 151: 1-8.
7. Abdel-Ghani, N.T. and G.A El-Chaghaby (2014). Biosorption for metal ions removal from aqueous solutions: A review of recent studies. *International Journal of Latest Research in Science and Technology* 3: 24-42.
8. Ferner, D.J. (2001). Toxicity, heavy metals. *eMed J.* 2: 1.
9. Sag, Y. and T. Kutsal (1997). The simultaneous biosorption process of Lead(II) and Nickel(II) on *Rhizopusarrhizus*. *Process Biochem.* 32: 591-597.
10. Flores-Garnica, J.G., Morales-Barrera, L., Pineda-Camacho, G. and E. Cristiani-Urbina (2013). Biosorption of Ni(II) from aqueous solutions by *Litchi chinensis* seeds. *Biores. Technol.* 136: 635-43.
11. Bilal, M., Shah, J.A., Ashfaq, T., Gardazi, S.M.H., Tahir, A.A., Pervez, A., Haron, H. and Q. Mahmood (2013). Waste biomass adsorbents for copper removal from industrial wastewater: A review. *Journal of Hazardous Materials* 2: 322-333.
12. Gadd, G.M. (2001). Accumulation and transformation of metals by microorganisms (eds. H.J. Rehm, Reed, G., Phulers, A. and P. Stadler), *Biotechnology, a Multivolume Comprehensive Treatise, Special Process*, Wiley-VCH, Weinheim, pp: 225-264.
13. Ghaedi, M., Hajati, S., Karimi, F., Barazesh, B. and G. Ghezlbash (2013). Equilibrium kinetic and isotherm of some metal ion biosorption. *J. Ind. Eng. Chem.* 19: 987-992.
14. McLean, R.J.C., Beauchemin, D. and T.J. Beveridge (1992). Influence of oxidation-state on iron-binding by *Bacillus licheniformis* capsule. *Appl. Environ. Microbiol.* 55: 3143-3149.



15. Fosso-Kankeu, E. and A.F. Mulaba-Bafubiandi (2014). Review of challenges in the escalation of metal biosorbing processes for waste water treatment: Applied and Commercialized Technologies. *African Journal of Biotechnology* 13: 1756-1771.
16. Bai, R.S., and T.E. Abraham (2003). Studies of chromium (VI) adsorption-desorption using immobilized fungal biomass. *Biores. Technol.* 87: 17-26.
17. Akar, S.T., Akar, T. and A. Cabuk (2009). Decolorization of a textile dye, Reactive Red 198 (RR 198), by *Aspergillus parasiticus* fungal biosorbent. *Brazilian Journal of Chemical Engineering* 26: 399-405.
18. Singh, L., and V.P. Singh (2010). Microbial degradation and decolourization of dyes in semisolid medium by the fungus *Trichoderma harzianum*. *International Journal of Science and Technology* 5: 147-153.
19. Gnanadoss, J.J., Peeris, S.M. and G.R. Jebapriya (2013). Biological enhanced absorption of synthetic dyes using oyster mushroom fungus *Pleurotus ostreatus*. *Asia. J. Exp. Biol. Sci.* 4: 637-640.
20. Namasivayam, C., Radhica, R. and S. Suba (2001). Uptake of dyes by a promising locally available agricultural solid waste: coir pith. *Waste Manage.* 21: 381-387.
21. Okeola, O.F., Odeunmi E.O. and O.F. Bakare (2014). Equilibrium and kinetics studies of adsorption of Congo Red by activated carbon. *Middle-East Journal of Scientific Research* 19: 1425-1431.
22. Zawan, Z., Lukman, C.A. and S.Y. Thomas (2009). Equilibrium, kinetics and thermodynamic studies: Adsorption of remazol black 5 on the palm kernel shell activated carbon. *European J. of Scientific Research* 37: 67-76.
23. Safa, Y. and H.N. Bhatti (2010). Biosorption of Direct Red- 31 and Direct Orange- 26 dyes by rice husk: Applications of factorial design analysis. *Chem. Eng. Res. Desig.* 38: 337-345.
24. Lin, Y., He, X., Han, G., Tian, Q. and H. Wenyoung (2011). Removal of crystal violet from aqueous solution using powdered mycelial biomass of *Ceriporia lacerata* P2. *J. Environ. Sci.* 23: 2055-2062.
25. Kumar. P. and M.U. Charaya (2013). A comparative assessment of the efficiencies of living vs. dead biomass of *Aspergillus niger* Link to adsorb basic fuchsin from its aqueous solutions. *Plant Archives* 13(1): 485-488.
26. Prasad, M.N.V. and H.M.O. Freitas (2003). Metal hyper accumulation in plants-Biodiversity prospecting for phytoremediation technology. *Electron. J. Biotechnol.* 6: 285-321.
27. Nirmala. S., Pasupathy. A. and M. Raja. (2016). Removal of malachite green from aqueous solution by adsorption using low cost adsorbent *Andropogon paniculata* leaves. *International Journal of Scientific and Research Publications.* 6: 689-693.
28. Muinde V.M., Onyari J.M., Wamalwa B., Wabomba J. and R. M. Nthumbi. (2017). Adsorption of malachite green from aqueous solutions onto rice husks: kinetic and equilibrium studies. *Journal of Environmental Protection*, 8: 215-230.
29. Ho, Y.S. and G. McKay (1999). Batch lead(II) removal from aqueous solution by peat: Equilibrium and Kinetics. *Proc. Saf. And Environ. Protec.* 77: 165-173.

Abstracts



INCREASING AGRICULTURAL PRODUCTIVITY OF FARMING SYSTEMS IN PARTS OF CENTRAL INDIA - SIR RATAN TATA TRUST INITIATIVE

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Abstract

Soil health mapping was adopted as entry point activity in the initiative supported by Sir Ratan Tata Trust in Jharkhand and Madhya Pradesh which emphasised on developing soil test based fertilizer recommendations at block level. In Jharkhand, yield benefit with BN was 27-44% in paddy, groundnut and maize with the B:C ratio varying from 7.36 to 12.0. In Madhya Pradesh the BN increased crop productivity between 11-57% in crops like soybean, paddy, green gram, black gram and groundnut with the BC ratio of 1.97 to 9.35. Water harvesting through creation of farm ponds (~500) helped in supplemental irrigation during critical crop stages besides serving as reservoir for fish cultivation. The efforts towards off season cultivation of vegetables, crop intensification, vermicompost units (~200) and seed bank was promoted in pilot villages and capacity development was carried out for ~15000 farmers through direct demonstrations and around 2-3 times more through field days.

BIOCHAR PRODUCTION AND ITS USE IN RAINFED AGRICULTURE

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Abstract

Burning of unusable and surplus crop residues is becoming an issue of concern in India due to loss of valuable residues and environmental pollution. Slow pyrolysis of these crop residues to biochar, a carbon rich solid by-product, is an emerging novel strategy for crop residue management, carbon sequestration, soil improvement and crop productivity enhancement in rainfed ecosystem. Castor, cotton and pigeon pea stalks were chosen as raw materials for biochar production due to their wide availability in rainfed areas. The aim of the study was to develop a biochar kiln, standardize the biochar production process and to evaluate the effects of different biochars on soil properties and yields in pigeon pea. On-farm usable portable biochar kiln unit (1200 per kiln) was developed with single barrel cylindrical design of vertical structure with perforated base. Biochar kiln functions on bottom-lit direct natural up-draft principle. Slow pyrolysis experiments were performed under limited supply of air for three different kiln loads for each residue type for two-color phase development. Reaction time for each loading rate was correlated with internal kiln temperature. Grey gas color was correlated to 350-400°C and blue gas color to 450- 500°C internal kiln temperature range. The biochar was characterized for various physico-chemical properties. The properties of biochar were influenced by the kiln temperature and feedstock type. In general, fixed carbon, ash, TC, total N, P, porosity, MWHC, FC and AWC in the biochar increased, while biochar yield, VM, bulk density, CEC and recovered total C and N decreased with increase in kiln temperature range from 350-400°C to 450-500°C. The estimated cost of pigeon pea stalk biochar production was lowest followed by cotton and castor stalk biochar. A two years field experiment was carried out in Randomized Block Design (RBD) with eight treatments in three replications in rainfed Alfisols at Hayatnagar Research farm, Hyderabad. The field experiment treatments included RDF (20:50:0 N: P₂O₅:K₂O kg ha⁻¹), biochar from stalks of castor, cotton and pigeon pea (each @ 3.0 and 6.0 t ha⁻¹) and a control (with no external nutrient input and biochar). A common dose of recommended fertilizer was applied to all the treatments receiving biochar, with pigeon pea (PRG 158) as test crop. Biochar amendments were applied only in the first year of the study. Addition of cotton stalk biochar @ 6 t ha⁻¹ with RDF not only increased the yield attributes (plant height, LAI, number of pods plant⁻¹, stalk yield and test seed weight), and seed yield of pigeon pea but also significantly improved soil physical (MWHC, FC, AWC, total porosity, infiltration rate and higher moisture content) chemical (CEC, TOC, available N, P and K) and biological (dehydrogenase, urease and acid phosphatase activity) properties of rainfed Alfisols thereby enhanced the net returns and B:C ratio from pigeon pea cultivation over other treatment combinations. The results of the present study clearly showed that the one-time application of cotton stalk biochar @ 6 t ha⁻¹ with RDF has strong potential to, over time, improve soil properties and the crop productivity in rainfed Alfisols.



TURMERIC AS AN INTERCROP : A BOON TO FARMERS

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Abstract

The increasing demand for turmeric (*Curcuma longa*), with oil having enormous culinary and medicinal properties (skin, cancer, inflammation, pain, immunity) has attract to work with turmeric to high its production level. India produces about 78% of the world production, but is still far behind the country and global need. More over huge contamination (chemical and others) in turmeric powder has made production of authentic and pure form of turmeric. Intercropping may serve as an effective approach to increase land area under turmeric cultivation, without affecting the growth pattern of other crops. In India, huge land areas are under litchi and mango cultivation with growing time between March to June. Turmeric with growing period between late June to early March the following year, may prove to be highly productive intercropping system with litchi and mango. Our work included intercropping a high curcumin yielding turmeric variety 'Kesari' in different districts of Uttar Pradesh, Bihar, Jharkhand, Karnataka, Odessa, Uttrakhand and Maharashtra covering a waste land. The growing of turmeric as an intercrop resulted in improved productivity of the fields not only monetary term, but also in quality as well which fetches high demand and the price in market. It also by protecting the main crops from diseases, due to antimicrobial/ antiseptic properties of turmeric. Agro-technology developed for cultivation of turmeric for essential oil extraction from senescing leaves. To extract the highest quantity and best quality leaf essential oil, leaves were harvested at three stages; viz. green, partially senesced and fully senesced. The leaves were hydro-distilled. Minimum amount of oil (0.88%) is obtained from green leaves whereas fully senesced leaves have 1.405% oil. The highest amount of leaf essential oil (1.702%) is obtained from partially senesced leaves. Moreover the waste material of leaf after extraction of oil may be decomposed and used as manures for further increasing soil fertility.

AN INVESTIGATION OF CHROMIUM UPTAKE IN GRAFTED AND NON-GRAFTED TOMATO PLANTS IRRIGATED WITH TREATED WASTEWATER

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Abstract

In Semi-arid tropics water is scarce; hence reuse of treated wastewater offers a reliable and perennial source. The availability of additional water opens-up a scope of revenue generation for the farmer through flower, fodder or cash crop production etc. This additional income has the potential to bring significant difference in the life of resource-poor farmers. The presence of heavy metals in treated wastewater severely diminishes its irrigation potential. Useful utilization of such wastewater remains a challenge. Heavy metal impact on soil and environment is a contemporary reality. Among the heavy metals, chromium (Cr) is ubiquitous in wastewater. Chromium in its hexavalent form is soluble and penetrates the entire food chain once it enters through irrigation. Chromium is released into the environment by a large number of industrial operations such as electro plating, chromate manufacturing, leather tanning and wood preservation. Cr (V₁) is toxic, carcinogenic and mutagenic to animals as well as humans and is associated with decreased plant growth and changes in plant morphology. Grafting has been sustainable tool in providing plant tolerance to various abiotic stresses, in particular of fruiting vegetables. This study focused on evaluating the yield and heavy-metal exclusion capacity of grafted and non-grafted tomato (*Solanum lycopersicum* L.) varieties. Grafted and non-grafted tomato varieties were cultivated using effluent from constructed wetland to which 0.02 mg/L of Cr (V₁) was artificially added using stoichiometric amount of potassium dichromate. Two eggplant root stock R₁ (EG 203) and R₂ (EG 195) was used in combination with scions from three tomato varieties V₁ (Heemsohna), V₂ (Dutch), V₃ (Nirupama), keeping non-grafted tomato varieties as control (i.e. NGV1, NGV2 and NGV3). The study found that plant growth, yield and heavy-metal uptake in plant tissue (terminal leaf or fruit) varies among different combinations, in which grafted tomato plants of R₁V₂ (EG 203 x Dutch) combination gave highest yield for tomato and showed minimal and zero concentration level in the terminal leaf tissue and fruits respectively. These finding can help us to develop suitable grafted varieties enabling utilization of wastewater with Cr (V₁) for revenue generation activities such as seed production.



EFFECT OF IRRIGATION LEVELS AND FOLIAR APPLICATION OF OSMO-PROTECTANTS ON PRODUCTIVITY OF HYBRID BT COTTON

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Abstract

Cotton (*Gossypium hirsutum* L.) is one of the most important fiber crops playing a key role in economic and social affairs of the India and the world. Water is a critical factor which influences on growth and yield of every crop. Cotton crop is very sensitive to water (drought) stress especially during the reproductive stages (i.e. squaring, flowering and boll formation) and has the most drastic effect on the yield. Scarcity of water has put tremendous pressure on researchers to devise various strategies to tackle with this burning issue. A field experiment was therefore conducted at the research farm of ICAR-CICR, Regional Station, Sirsa, Haryana, India on a Gangatic alluvial soil during *kharif* season of 2018-19 to determine the effects of water stress/levels of irrigation and various foliar application of osmo-protectants on productivity of hybrid Bt cotton. The field experiment was conducted in split plot design, keeping three irrigation levels i.e., [(i) recommended irrigation practices / no water stress; (ii) no water after first irrigation and (iii) only pre-sowing irrigation] in main plots and eight osmo-protectants (as foliar application) i.e. [(i) control (water spray); (ii) 2% urea - 4 sprays at weekly intervals; (iii) 2% KNO₃ - 4 sprays at weekly intervals; (iv) 1% thio urea - single spray; (v) salicylic acid @50 ppm - single spray; (vi) glycine betaine @100 ppm -single spray; (vii) salicylic acid @ 100 ppm - single spray and (viii) PPFM @1 % - 3 spray at 10 days interval] in sub-plots and was replicated thrice. Among the water stress / irrigation treatments, growth and yield attributes as well as seed cotton yield was significantly higher under control treatment i.e. recommended irrigation practices / no water stress (2,642.7 kg ha⁻¹) and there was significant reduction in all parameters under stressed treatment i.e. no water after first irrigation (applied at 5 weeks after sowing). Least seed cotton yield (1,883.2 kg ha⁻¹) and other parameters were recorded under extreme water stress treatment i.e. only pre-sowing irrigation. In case of different osmo-protectants, significantly higher yield attributes and seed cotton yield (3,477.2 kg ha⁻¹) was recorded with the foliar application of 2% KNO₃ - 4 sprays at weekly intervals as compared to control (1,519.6 kg ha⁻¹). Second highest seed cotton yield (3,159.5 kg ha⁻¹) was recorded with the foliar application of salicylic acid @ 100 ppm and it was statistically at par with the glycinebetaine @100 ppm (2,670.1 kg ha⁻¹). Significant interaction effects among irrigation levels and osmo-protectants were observed in case of seed cotton yield.

BIOEFFICAY OF IMINOCTADINE TRIS (BELKUTE) 40% WP AGAINSTPOWDERY MILDEW ANTHRACNOSE DISEASES OF CHILLI

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Abstract

Chilli is the most important crop. In the treatments for evaluating the bioefficacy of Iminoctadine Tris (albesilate) 40% WP against Powdery mildew disease, the plots treated with IminoctadineTris (albesilate) 40% WP @ 400g a.i per ha recorded a PDI of 9.46 manifesting its efficacy that is statistically superior over all the standard checks and other doses of Iminoctadine Tris (albesilate) 40% WP. By the end of the 2nd spray, the plots treated with Iminoctadine Tris (albesilate) 40% WP @ 400 g a.i per ha revealed the highest per cent reduction of the disease over the control (37.18%) compared to the other treated plots. By the end of the 4th spray Iminoctadine Tris (albesilate) 40% WP @ 400g a.i per ha revealed the highest per cent reduction (33.85%) of the disease (Anthracnose) over the control. Next in order stands Iminoctadine Tris (albesilate) 40% WP @ 300g a.i per ha that recorded 30.81% and the standard check Tebuconazole 25% WG @125gm a.i per ha recorded 30.98% reduction of the disease over the control with respect to in terms of yield (Q/Ha), the plots treated with Iminoctadine Tris (albesilate) 40% WP @ 400g a.i per ha recorded the highest yields with 59.20% increase over the yield obtained in the untreated control plot. The next highest yield was recorded by the plot treated with Iminoctadine Tris (albesilate) 40% WP @ 300g a.i per ha with 49.26% increase of yield over the control. The yields recorded by the plots treated with the standard checks Tebuconazole 25% WG @ 125g a.i per ha, Myclobutanil 10%WP @ 20 g a.i per ha and Zineb 75% WP @ 1125 g a.i per ha revealed 31.08%, 29.60% and 15.43% increase over the control respectively.



ALTERATIONS IN OXYGEN CONSUMPTION AND AMMONIA-NITROGEN EXCRETION PATTERN OF JUVENILE *MACROBRACHIUM ROSENBERGII* (DEMAN) EXPOSED TO SUB-LETHAL COPPER EXPOSURE

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Abstract

Copper is an essential metal with a recognized biological role but potentially toxic at high concentrations. Long-term bioassay experiments for 30 days were setup to study the changes occurring in oxygen consumption and ammonia-nitrogen (ammonia-N) excretion pattern in the juveniles of *Macrobrachium rosenbergii* exposed to three sub-lethal concentrations of copper- 0.092 mg/L⁻¹, 0.184 mg L⁻¹ and 0.306 mg L⁻¹ (1/3rd, 1/5th and 1/10th toxicity of 96h LC₅₀. 240 juvenile prawns of inter-molt stage (54±0.23 mm length and 1.380±0.213g weight), fasted for one day, were exposed to the above three chronic copper concentrations. In addition, 25 numbers of juveniles were maintained separately for each test concentration along with control to replace juveniles in the experimental setup in case of any mortality. Five juveniles from each control and exposed concentrations were randomly selected at interval of 24h, 48h, 15 days and 30 days for estimation of oxygen consumption and ammonia-N excretion. During the initial exposure, the juveniles showed higher activity and movement in comparison to the controls. After a gap of 72h, prawn showed normal behaviour. Total 36 juveniles died which were replaced by the previously exposed juveniles in the same copper concentrations. Maximum mortalities were observed in 0.306 mg L⁻¹ after a gap of 15 days. In the present investigation, oxygen consumption rate in *M. rosenbergii* juveniles significantly (P<0.05) increased when they were exposed to all the three sub-lethal copper concentrations after exposure period of 24 h. The increased oxygen consumption were 6.32%, 12.36% and 16.045% in copper concentration of 0.092, 0.184 and 0.306 mg L⁻¹, respectively. After 48 h of exposure, oxygen consumption rate was significantly (P<0.05) increased in the juveniles exposed to 0.092 mg L⁻¹ copper concentration whereas those exposed to 0.184 and 0.306 mg L⁻¹ copper concentration, oxygen consumption rate were decreased significantly to 16% and 23%, respectively. The rate of ammonia-N excretion percent increased in the juveniles exposed to 0.092 mg L⁻¹ copper concentration after time interval of 48h. On contrary, the juveniles exposed to 0.184 mg L⁻¹ and 0.306 mg L⁻¹ copper concentration showed decreased ammonia-N excretion over their respective control group. Decrease in ammonia-N excretion were recorded in the juveniles exposed to 0.184 mg L⁻¹ copper concentration to 12.2%, 14.8%, 21.6% and 24.3% after a time interval of 24, 48, 96h 15 days and 30 days, respectively. Similarly decrease in ammonia-N excretion was recorded in the juveniles exposed to 0.306 mg L⁻¹ copper concentration too. It was found that when juveniles were exposed to lower copper concentration (0.092 mg L⁻¹), oxygen consumption rate did not decrease significantly over their respective control after a gap of 15 days suggesting that the lower concentration of copper is not physiologically stressful to *M. rosenbergii* juveniles owing to the adaptability to low levels of the toxicant. The rate of oxygen consumption and ammonia-N excretion of the exposed prawn juveniles over the control increased initially after 24 h exposure period at all the three sub-lethal copper concentrations which indicates that the metabolic rate of the juveniles were increased due to copper toxicity as they require more and more energy or to overcome the stress.

EFFECT OF FLY ASH AND PRESSMUD AS POTTING MEDIA COMPONENTS ON GROWTH AND DEVELOPMENT OF *EPIPREMNUM AUREUM*

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Abstract

Potting medium is considered as one of the most vital factors affecting the production of potted plants. As potting medium influences every cultural practice like fertilization, irrigation etc in the production of potted plants, formulation of a suitable potting medium for a given production system is particularly crucial. With the objective of formulating a suitable potting medium, a pot experiment was conducted during 2017-18 at ICAR-Directorate of Floricultural Research, Pune to examine the possibility of utilizing industrial by-products such as fly ash and pressmud as potting media components for production of



Epipremnum aureum. Ten treatments containing different combinations of fly ash, pressmud, vermicompost and cocopeat were tested in comparison to control being Cocopeat: Vermiculite : Perlite (1:1:1). The results showed that, both fly ash and press mud which contained different plant essential nutrients significantly influenced the growth of *Epipremnum aureum* when compared to control. Among the treatments tested, Fly ash +Vermicompost + Cocopeat (20:30:50) was found to be the best potting medium which resulted in maximum plant height, number of leaves/plant, internodal length, leaf length, leaf width and petiole length of *Epipremnum aureum*. Leaf samples nutrient analysis data also showed significant concentrations of macro and micronutrients in *Epipremnum aureum* grown in potting medium containing fly ash and pressmud when compared to control. The study revealed that both fly ash and pressmud can be effectively utilized as potting media components for production of *Epipremnum aureum*.

CONSERVATION OF MEDICINAL PLANTS *TINOSPORA CORDIFOLIA* AND SUSTAINABLE UTILIZATION UNDER WASTE LAND CONDITION

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Abstract

In India, the unsustainable collection of medicinal plants from the wild for commercial purpose and habitat destruction due to urbanization stand high among the human induced causes of depletion of medicinal plant population. Conservation is the process of management of biosphere in order to obtain the greatest benefits for the present generation and maintaining the potential for future. Over exploitation of natural reservoirs has led to the extinction of various plant species, while some others have become endangered. In order to meet the growing demand of herbal drugs, it is important to conserve genetic diversity by adopting conservation strategies. *Tinosporacordifolia* (Willd.)Miers. (Galo) plant is known, as heart leaved moonseed plant in English and Guduchi in Sanskrit. It is a large, glabrous, deciduous, climbing shrub belonging to the family Menispermaceae. It is distributed throughout tropical Indian subcontinent and China, ascending to an altitude of 300 m. Stems are useful in diabetes, fever, flatulence, hypertension, jaundice and leucorrhoea. Roots are useful in gynecological disorders, spleen troubles. The dried stem and bark are used as tonic, antiperiodic and aphrodisiacs. The starch of roots and stems are nutritious and are used to cure diarrhoea. A variety of constituents such as alkaloids, diterpenoids, lactones, glycosides, steroids, sesquiterpenoids, phenolics, aliphatic compounds and polysaccharides have been isolated from *T. cordifolia* plant and their structures were elucidated. Leaves of this plant are rich in proteins (11.2%) and are also fairly rich in calcium and phosphorus. Fifty nine germplasm of *T. cordifolia* were collected from different localities of Rajasthan, Maharastra, Gujrat, Kerla and Madhya Pradesh. The stem cuttings were grown and maintained in the uniform agro-climatic conditions at CSIR-National Botanical Research Institute, Lucknow. The stem cuttings were used for the further analysis among the accessions. In the present study, an attempt was made to study of morph physiological and molecular.

EFFECT OF DIFFERENT CHEMICALS FOR MANAGEMENT OF ROOT-KNOT NEMATODE (*MELOIDOGYNE INCOGNITA*) IN CUCUMBER UNDER PROTECTED CULTIVATION

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Abstract

Root-knot nematode is a ubiquitous soil pathogen and inflicting substantial losses in yield and income. It limits the production, productivity and quality of the produce. Root-knot nematodes are widely distributed in India and cause severe damage to cucumber. Cucumber is a warm season vegetable, grown throughout the world under tropical and subtropical conditions and also highly susceptible crop to root-knot nematodes, *Meloidogyne* spp. which adversely affects growth and development of plants when grown in light soils. Environmental condition of poly-house is hospitable for nematode growth and reproduction, so chemical method of control is only promising mean for control. In view of this an experiment was carried out for the management of root-knot nematodes in cucumber var. *Kofka* under poly-house by using five different chemicals viz., carbofuran, phorate, metham sodium, dazomet and cartap hydrochloride with untreated control. The application of carbofuran



3% GR as treatment-1 (T_1) @ 1 kg a.i. /ha each at sowing and 45 days after, phorate 10% GR as T_2 @ 1 kg a.i. /ha each at sowing and 45 days after, metham sodium as T_3 @ 200 L/ha at 15 days prior to sowing, dazomet as T_4 @ 600 kg/ha one month before sowing, cartap hydrochloride 4% GR as T_5 @ 1 kg a.i./ha each at sowing and 45 days after and untreated control as T_6 were taken. All the treatments were replicated four times. The data revealed that the maximum fruit yield was 24469.45 and 22245.37 kg/ha and minimum root gall index (RKI) at harvest time was 0.82 and 1.88 found with the application of dazomat followed by metham sodium, respectively as compared with other treatments.

ERGONOMICS ASSESSMENT OF DRUDGERY AND QUANTIFICATION OF LOAD CARRYING ACTIVITIES OF FARM WOMEN

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Abstract

Agricultural activities carried out by women are one of the drudgery prone work demanding physical and psychological energy, arduous, tiring and stress causing due to lack of access to improved agricultural technologies therefore subjected to very strenuous conditions of work that leads to both physical and psychological stress. The poor working conditions coupled with lack of essential facilities; forces adoption of static, repetitive, frequent, neo-neutral postures and unsupported positions, dependence on muscular force and strength while collecting and carrying load or fuel that make the work very laborious and energy intensive. Women are regularly carrying heavy workloads every day in fetching fuel, fodder and water, resulting in various physical load on spine or lumbo-sacral region leads to disorders and health issues. The research paper aims to assess and quantify the drudgery with load carried by rural women in which physiological evaluation was done for different activities by women farm workers with three replications of fifteen minutes work cycle without rest pause. Ergonomic parameters namely Heart Rate, EER, TCCW, PCW, VO_2 Max were measured during the experiments. Observations were recorded on farm women worker with normal health, without any major illness, regularly involved in farm operations and were in the age group of 25 to 45 years. Fuel wood carrying activity of farm women was quantified and a sample of 10 physically fit rural women having permissible limit of physiological parameters, falling in the age group of 25-40 years and who lifted fuel wood on their head were selected for the study. It was found that they are carrying load 32.7 ± 8.08 Kg which is higher than acceptable load limit.

EVALUATION OF ACCEPTABILITY OF FOXTAIL MILLET PRODUCTS THROUGH VALUE ADDITION

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Abstract

Millets are important crops of dry land areas. They have been known for their rich nutrient contents and drought resistance quality. They were traditionally the main components of the food basket of the poor in India. However, the direct consumption of millets as food declined significantly over the past three decades. The major reasons of decrease in consumption was the difficulty in processing, lack of awareness of nutritious merits, inconveniences in food preparation, lack of supply of fine cereals at subsidized rates. Hence developing technology that makes millet value added products available as convenient to make and easy access at reasonable prices will find great demand and market particularly in urban places where there is growing conscious for nutritive intake of food. Thus a study was carried out in the adopted villages of Krishi Vigyan Kendra, Vijayapura, Karnataka. Seeds of foxtail millet were given to 20 farmers and after its harvesting and processing, value added products such as foxtail millet cooked rice, upma, bisibelebath, dosa and paddu were prepared and evaluated for its acceptability by thirty farm women by comparing it with products prepared out of normal rice. Five point scale was used for evaluating the products. The overall acceptability of the products revealed a score of 4.8 for foxtail millet dosa, 4.6 for paddu, 4.3 for upma and bisibelebath and 3.6 for foxtail millet cooked rice which showed higher acceptability of value added products than non-value added product. The results were on par with the products prepared out of normal rice revealing the replacement of normal rice with foxtail millet which is highly beneficial for health.



IDENTIFICATION OF SOCIAL ACTORS IN THE NETWORK AND DEMONSTRATION OF TECHNOLOGY THROUGH SOCIAL ACTORS IN THE PROJECT VILLAGE AT ALWAR DISTRICT, RAJASTHAN

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Abstract

Centrality is the characteristic of an actor's position in a network. The more central an actor, the most important is he or she in diffusion process. It is measured in three ways as degree centrality, closeness centrality and betweenness centrality. This centrality measure was measured with an objective to find out the central actor in the social network so that the IARI technology can be taken through these social actors in the project village at Alwar District, Rajasthan. Due to resource and time constraints, forty samples were taken for analysis. The results revealed that, on an average the mean in-degree and out-degree is 4.1 indicating that every actor shared and received information from four other actors in the network. Network out-degree centralization is 12.86 per cent which implies that most of the actors had zero scores and were not participating in the network. This indicates the dominance of few actors in the network. The Network in-degree centralization is 65.48 per cent indicating moderate level of degree centrality showing that the power of each actor in the network is not so varied but dominance of few central actors is revealed. It can be observed from the result that the three social actors namely Thawar Singh, Rajnarayan and Jai Hind are the most central actors in terms of power and prestige. The density of the network is 10.5 per cent which is very low indicating a sparsely connected network. The total numbers of ties present in the network are 164 may include the number of absent ties also so that it will be more clear. The average geodesic distance is 2.523 which implies that to reach the central actor the other actors have to pass through 2-3 actors in between. External-Internal (E-I) Index indicates the degree of homophily of the network and value near to -1 indicates highly homophilous while value near to +1 indicates highly heterophilous. The E-I index value is -0.4 which is near to -1 indicating a homophilous group meaning sharing of information between same social groups. The Reciprocity of the network is 26.8 per cent which is low showing that most of the actors do not communicate with each other. In order to diffuse the technology, IARI wheat varieties viz., HD 2967, HD-3086 was demonstrated to the important social actors like Thawar Singh. He not only adopted the technology but also started seed production in 2017-18 in an area of 0.8 ha. He increased to 7.2 ha in 2018-19. The seed produced was given to fellow farmers and neighbouring village farmers. Through this identified network, IARI technology is getting diffused to other farmers in the village. Thawar Singh with the facilitation from CATAT, IARI also adopted Biogas technology which is a success. Hence social network analysis helps to identify the important social actor and help to demonstrate technology.

GENETIC ANALYSIS AND IDENTIFICATION OF GENOMIC REGIONS RESPONSIBLE FOR AGRONOMIC AND YIELD RELATED TRAITS IN RECOMBINANT INBRED POPULATION OF RICE (*ORYZA SATIVA* L.)

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Abstract

Higher productivity of new varieties is the most common target for breeders. The discovery of new quantitative trait loci (QTLs) for important traits is an effective method to support this goal. QTL mapping provides opportunities for identification of the genomic region(s) associated with the targeted traits by combining genome information with phenotyping. Grain yield is one of the most important indexes in rice breeding, which is governed by quantitative trait loci (QTLs). Based on the multi-season phenotypic data together with genotypic data, a total of five QTLs for days to fifty percent flowering, number of filled grains per panicle and grain yield per plant. Comparative analysis across the two seasons has revealed one consistent QTLs for days to fifty percent flowering (qDTFF- 8-1), three QTLs for number of filled grains per panicle (qFGPP 2-1, qNFGP 2-2 and qNFGP 2-3) and one QTL for grain yield per plant (qGYPP 8-1) were identified. These QTLs should be useful for molecular breeding in the future, since they represent elite genetic backgrounds. Importantly, the mapping populations were part of the breeding program and the best lines were advanced within the program and developed a new high



yielding variety. Furthermore, marker assisted selection (MAS) was used to make the mapping population, demonstrating an example of molecular genetics research fully integrated with actual breeding.

TIME SERIES PREDICTION OF GINGER PRODUCTION IN INDIA USING ARIMAX AND FEED-FORWARD NEURAL NETWORK REGRESSION

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Abstract

This research article considers univariate time series model and Feed-Forward Neural Network regression models to predict the production of Ginger in India during 1970-2017. The data of Ginger Area, Production and Productivity was collected over 48 years (1970-2017). The data series tested for stationarity using Augmented Dickey-Fuller test found the data non-stationary ($ADF\ test = 1.00, p\text{-value} = 0.99$); it was analyzed using Autoregressive Integrated Moving Average with explanatory variables model with first differencing, and Feed-Forward Neural Network regression. The ARIMAX model outperformed feed-forward regression model with leading indicators. The Autoregressive Integrated Moving Average with explanatory variables (ARIMAX (1, 1, 1)) model predicted the production of Ginger with less Root mean square ($RMSE = 27.62$) and Mean Absolute Percentage Error ($MAPE = 7.36$) than the NNAR (1, 2) model, which considers the average of 1000 networks with linear output ($RMSE = 52.06$ and $MAPE = 9.17$). The residuals of the fitted models were subjected to Box-Pierce test, and it was found that the residuals from ARIMAX model were independent ($\chi^2\ value = 0.145, p\text{-value} = 0.985$) while the residuals of NNAR (1, 2) ($\chi^2\ value = 13.98, p\text{-value} < 0.001$) showed dependency over lagged (t-1, t-2 ... t-48) values. Therefore, Autoregressive Integrated Moving Average, with explanatory variables (ARIMAX) model, is considered to be the better prediction model over NNAR (1, 2) in terms of performance indicators and residuals insignificance.

PHYSIOLOGICAL ASSESSMENT AN EFFICIENT GROUNDNUT GENOTYPES FOR SUMMER

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Abstract

The present investigation entitled, "Physiological Assessment an efficient Groundnut genotypes for summer" was conducted during summer 2018. The field experiment was conducted during summer 2018 at farm of AICRP Groundnut, Cotton Improvement Project, M.P.K.V, Rahuri in a randomized block design with fifteen Groundnut genotypes replicated three times in single row of 5 m length on medium black soil, with the spacing of 30x10 cm. The various morphological, physiological dry matter productions its partitioning source to sink and yield attributing characters were studied at an interval of 20 days 40,60,80,100 and maturity were studied, the efficiency performance was estimated for groundnut during Summer. The ground nut genotypes showed their variation physiology, morphology, dry matter accumulation, partitioning in different parts, yields and yield contributing characters was due to genetics. The genotypes viz. RHRG 1309, 1305, Phule Unnati and RHRG-1348 were found efficient genotypes have longer Vegetative, reproductive phase, higher root dry matter, leaf dry matter, rate of photosynthesis, transpiration, stomatal conductance at 50% flowering with higher source to sink and dry pod yield in shorter period in summer.

THE CHARACTERISTICS OF THERESPONDENTS WITH THEIR EXTENT OF ADOPTION OF GROUNDNUT CULTIVATION TECHNOLOGIESIN SALEM DISTRICT OF TAMILNADU INDIA

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Abstract

Groundnuts known by often local names such as earthnuts, peanuts, goober peas, monkey nuts, pig nuts, and pygmy nuts. Groundnut rich in protein and high in various vitamins, minerals and plant compounds. Groundnut is called as the king of oil



seeds. It plays an important role in oil seed economy of India. Groundnut oil is mainly used as cooking oil and also used for manufacturing soaps, cosmetics, shaving creams and lubricants. Groundnut is cultivated both as rainfed and irrigated crop. Increased productivity greatly depends on available technologies and extent of adoption by farmers. Keeping these in view, this study was conducted to analyze the knowledge and adoption level of groundnut growers. The present study was conducted in Tharamangalam Block of Salem district. Proportionate random sampling procedure was applied to select 120 respondents from six selected villages namely Karukkavadi, Konagapadi, Desavilakku, Pappampatti, Elavampatti, and Selavadai. Fourteen characteristics were selected for studying the profile of respondents. Thirty knowledge items were selected for studying the knowledge level of respondents. Twelve recommended groundnut cultivation practices were selected for studying the extent of adoption. Constraints in the adoption of groundnut cultivation practices were also studied. The data were collected with the help of a well-structured and pre-tested interview schedule and suitable statistical tools were used to analyze the data. The findings will be of use to the officials of the State Department of Agriculture, researchers and policy makers to plan and to modify the extension programmes so as to eliminate these constraints in the adoption of groundnut cultivation technologies and intern to increase the production and income levels of farmers in their region.

SPECTRUM OF BIOEFFICACY OF ENTOMOPATHOGENIC FUNGI AND CHEMICAL INSECTICIDES FOR MANAGEMENT OF WHITEFLY *BEMISIA TABACI* GENNADIUS (*HEMIPTERA* : *ALEYRODIDAE*) IN COTTON

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Abstract

Ever-rising incidence of whitefly *Bemisia tabaci* in cotton and increasing dependence on chemical insecticides for its management has resulted in enormous research thrust for reducing chemical pesticide uses through innovative and environmentally safe biocontrol approaches. The comparative bioefficacy potential of seventeen entomopathogenic fungi, chemical insecticides and commercial biopesticides was evaluated against *B. tabaci* on Bt cotton under polyhouse and field conditions. The Abbott's corrected nymphal mortality was recorded on randomly selected plants in each pot and field plot at pretreatment, 3-, 5- and 7-days post spray treatment. The bioefficacy index was calculated to select most virulent EPFs for field study. The significantly higher nymphal mortality at 7-days post spray was recorded with *Metarhizium anisopliae*-1299 (86.7%) followed by *Beauveria bassiana* - 4511 (85.1%), *Cordyceps javanica*-099 (81.1%), *C. javanica*-102 (81%) and *B. bassiana*-409 (78.2%) than other EPFs, spiromesifen (69.6%), buprofezin (62.2%) and pyriproxyfen (52.7%). However, among all the EPFs the highest overall bioefficacy index was recorded with *C. javanica*-102 (77) followed by *C. javanica*-089 (75.4), *Fusarium moniliforme*-083 (74.6) and *B. bassiana* -4511 (73.1). The pooled data of field trials (2017-18 and 2018-19) revealed that the highest nymphal mortality was recorded with *B. bassiana*-4511 (85.0%) followed by *C. javanica*-102 (83.2%) and pyriproxyfen 10% EC (78.6%) at 7-days post inoculation. Hence, a sequential spray with these EPFs can be used as an IPM component to manage *B. tabaci* nymphal population in an ecologically acceptable manner under field conditions.

HARNESSING THE TROPICAL DIVERSITY IN THE TRADITIONAL HOMEGARDENS OF CENTRAL WESTERN GHATS

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Abstract

Traditional homegardens (HGs) harbor a high level of species diversity and are characterized as sustainable agroecosystem, suitable for on-farm conservation of plant genetic resources. The Western Ghats of India is considered to be the centre of origin for many tropical fruit trees and serves as a prime habitat for in-situ conservation of long lived, largely out-crossed wild/domesticated Tropical Fruit Tree (TFT) species. This study characterizes diversity, density, composition and



socio-economics of homegardens and farmlands in nine villages located in three bioclimatic zones of Central Western Ghats. A total 10,199 individuals belonging to fifty five species were documented. The homegardens and farmlands of Uttara Kannada district showed predominant presence of *Mangifera indica* (n=4493), with higher species richness in Sahyadri interiors (10.92). The coastal zone (5.94) and eastern plain (4.05) documented substantially half of species richness in comparison with Sahyadri interiors, influenced by gradual replacement with exotic cash crops, family income, homegarden size and topographic environment. This region also documented nearly one third non-native tropical fruit tree (TFT) species with highest number of exotics in coastal belt (54.96 per cent) followed by Sahyadri interiors (31.58 per cent) and the plains (13.42 per cent). Contribution of native and exotic TFT species to average family income was recorded highest (US\$ 149) in Eastern plains in comparison with coastal belt (US\$ 135) and Sahyadri interior (US\$ 59). The correlation analysis depicted a positive relationship between diversity and total household income, while regression analysis showed that total family income positively contributed to the level of TFT diversity found in homegardens and farmlands of Western Ghats. Thus, importance of homegardens to food security and the autonomy of families in Western Ghats indicate that public policies should be designed to stimulate more diverse production systems as a strategy to strengthen family agriculture and agro-biodiversity conservation in Central Western Ghats.

SELF LEARNING AND LEARNING THROUGH MASS MEDIA-A SCALABLE SPECIAL EDUCATION IN AGRICULTURE

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Abstract

Education through Mass media is a popular method of instruction in Agriculture since independence. Especially for the illiterate farmers or who find it difficult to invest time and save money in travel to enhance knowledge and skills. The advanced communication technologies in India with improved connectivity to the internet and technologies generated at labs are reaching to the stakeholders due to Mass Media. Internet is accelerating the promotion of online self learning to provide quality education to the scattered group of communities. Due to advanced network development in India, the information and communication technologies are available in a cheaper rate. Hence, it is easy to reach the farmers by using educational mass media which will be helpful for farmers to increase their knowledge and skills for the growth of agriculture. Agricultural education can be provided in the form of formal, non-formal and informal way so that the farmers can learn easily by acquiring specialized skills for adoption of latest technologies. Self learning non-formal education to the farmers is provided from Youtube Channels, and public and private broadcast media such as Television News Channels, Doordharshan and All India Radio. In addition to this other concept like Media in Communication, different extension teaching methods, Combination of Media is also elaborated.

AN EFFICIENT *IN VITRO* SYSTEM FOR PROPAGATION OF QUALITY PLANTING MATERIAL IN CALLA LILLY (*ZANTEDESCHIA SP.*)

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Abstract

In this study, an attempt has been made for *in vitro* mass multiplication of Calla Lilly (*Zantedeschia sp.*) plantlets of Cv. Celesta, Gold affair and Majestic Red and production of bulbs from hardened plantlets. Modified MS medium along with necessary PGRs was used culture medium. Significant differences were recorded among different cultivars in establishment of clean cultures, shoot multiplication ratio and flowering ability of bulbs. The highest and lowest of 91.40 and 80.02 per cent



cultures were clean and showed shoot regeneration in Cv. Majestic Red and Gold Affair, respectively. Shoot multiplication ratio in first subculture was significantly affected among cultivars, whereas, it was non-significant in subsequent subcultures. The highest shoot multiplication ratio in first subculture was 6.0 and average shoot multiplication ratio over next nine subculture passages at 13-15 days interval was 4.17 ± 0.07 with 4.9 shoots and 3.95 cm height in Cv. Celesta. Hundred per cent root induction was recorded in all the cultivars. A minimum of 84.81 ± 4.86 and 66.54 ± 5.84 percent of plants hardened in primary and shade net in Cv. Majestic Red, respectively and plants were ready for sale after 45-50 days of bringing out of laboratory. Hundred percent plants produced from 'A' grade tubers (4-5cm) treated with GA_3 flowered in all the cultivars. Plantlets produced *in vitro* using the present protocol were genetically stable in all the cultivars according to RAPD markers. This bulb-bulb large scale multiplication system involving both *in vitro* and *ex vitro* techniques is simple, low cost, viable and sustainable for large scale production of healthy and quality Calla Lilly planting material for farmers as well as landscapers.

SUCCESS CASES OF MILLETS (BAJRA-PHB3 AND SORGHUM-PYPS2) + REDGRAM (PRG-176) UNDER RAINFED SITUATION BY DAATTC, RANGA REDDY DISTRICT INDIA

*N. Praveen and J.S. Sudharani

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Abstract

Climate change has become important area of concern for India to ensure food and nutritional security for growing population. Erratic rainfall with intermittent or prolonged dry spells Cotton and Maize raised under rainfed condition suffered frequent crop failures resulting in severe financial loss to farmers. A strategic approach as Millets (Bajra-PHB3 & Sorghum-PYPS2), intercropping with Redgram (PRG-176) under rain-fed situation was aimed to increase productivity per unit area per unit time and per unit input applied. was demonstrated, in J. Suresh Reddy field in Gaddamallaihuda, village, Yacharammandal under Ibrahimpatnam Division of Rangareddy district, Telangana state India. The study confirmed that promotion of Millets (Bajra-PHB3 and Sorghum-PYPS2), intercropping with Redgram (PRG-176) under divergent conditions of rainfall both in quantity and distribution. Sorghum (*Sorghum bicolor*) and Bajra under low rainfall situation in the semi-arid and arid parts performed well in low fertile soils. It is also an important source of green and dry fodder for animals. Being a widely row spaced and short to medium duration crop (90-120 days) they provide opportunity for growing intercrops for better use of natural resources. Intercropping cereal with a pulse crop not only produces higher yields per unit area and time but also, minimize the risk and brings stability with intercropping systems was demonstrated, in J. Suresh Reddy field in Gaddamallaihuda, village, Yacharammandal under Ibrahimpatnam Division of Rangareddy district, Telangana state India. An area of 1 ha of land was cultivated with Sorghum + Red gram and Bajra + redgram at 4:1 ratio during *kharif* 2017. The high yielding varieties of sorghum (PYPS-2) and bajra hybrid (PHB-3) recorded a grain yield of 2176 kg/ha and 2085 kg/ha respectively, which were 22 % and 16% higher over local varieties of sorghum (1409 kg/ha) and bajra (1345 kg/ha). The farmers benefited with high yield of sorghum and pearl millet intercropped with redgram, which was introduced as alternate to crop to maize and cotton. DAATT centre conducted field days and showed the results to other farmers in the village. The field demonstrations were conducted in farmers fields during 2017 *kharif*. The demand from farmer was for about 120 ha and the DAATTC Rangareddy facilitated the procurement of seed from Regional Agricultural Research Station, Palem.

EVALUATION OF MYCOFLORA OF *PARTHENIUM HYSTEROPHORUS* L. FROM RHIZOSPHERIC SOIL SAMPLE DURING SUMMER SEASON

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Abstract

Parthenium hysterophorus L. is an aggressive invasive alien weed of family Asteraceae, native to Mexico Central and South America but now widely spread, in India introduced along with imported PL 480 Mexican wheat. It is poisonous, allergic and aggressive and causes a serious threat to human being and livestock. In the present investigation fungi were isolated from rhizospheric soil of *P. hysterophorus* L. Soil collected from Meerut region during summer season, soil suspension of different concentration were prepared by serial dilution method followed by inoculation of fungi on PDA. Dominant isolates were *Aspergillus niger*, *A. flavus*, *A. fumigatus*, *A. giganteus*, *Rhizopus* sp., *Penicillium* sp., *Alternaria alternata*.



COHERITABILITY STUDIES FOR TENDER POD YIELD AND ITS COMPONENTS IN WINGED BEAN (*PSOPHOCARPUSTETRAGON*)

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Abstract

Winged bean (*Psophocarpus tetragonolobus* L.) is an important vegetable known as ChaudhariSem, PankhiyaSem and ManilaSem with high protein content and medicinal value grown in tribal area of Chhattisgarh. Peoples used in their diet in the form of young green pods. Ten promising genotypes among number of diversified germplasm were evaluated to estimate coheritability for tender pod yield and its components in winged bean. High and positive coheritability value were observed for pairs like green pod yield per plant with traits like days to maturity, pod length, green seed yield per plant, green pods per plant and pod width. All these trait pairs will be more effective for selection of green pod yield in winged bean.

IMPACT OF CSR-BIOMICROBIAL CULTURE ON YIELD, QUALITY AND SOIL FERTILITY OF BANANA UNDER SODIC SOIL CONDITIONS

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Abstract

A field experiment was conducted during 2014 and 2015 as a fixed layout in sodic soil at farmers field village Vinovanagar district Kanpurdehat in the jurisdiction of C.S.A. University of Agriculture and Technology, Kanpur using high yielding variety G-9 of banana. The initial physico-chemical properties of soil were pH 8.9, EC 0.76 dSm⁻¹, ESP 37.2% and organic carbon 2.9 g kg⁻¹. The soil was sandy loam in texture having available N 165.2 kg ha⁻¹, available P₂O₅ 17.3 kg ha⁻¹ and available K₂O 224.3 kg ha⁻¹. The experiment was laid out under randomized block design with four replications. The experiment consist of four treatments viz., T₁- Control, T₂- CSR-Bio microbial culture (soil application), T₃- CSR-Bio microbial culture (foliar spray) and T₄- CSR-Bio microbial culture (soil application + foliar spray). The studies confined to the Impact of CSR-Bio microbial culture on yield, quality and soil fertility of banana under sodic soil conditions. Maximum plant height (186.5 cm), stem girth (65.4 cm), leaves/plant (12.9), finger/hand (18.1), finger length (17.1 cm) and finger weight (126.4 g) were recorded with the application of CSR-Bio microbial culture (soil application + foliar spray). Highest hands/bunch (9.08), fingers/bunch (157.3), weight of bunch (24.5 kg) and yield (106.7 mt/ha) were recorded with CSR-Bio microbial culture (soil application + foliar spray) treatment which showed its superiority over rest treatments. The range of pulp:peel from 2.27 to 3.84, TSS from 17.2 to 25.3 q/ha, acidity from 0.34 to 0.21 % and total sugar from 14.4 to 21.1 % were recorded with the application of deferent treatments. The maximum pulp:peel 3.84, TSS 25.3, acidity 0.34 % and total sugar 21.1 % were recorded with the application of CSR-Bio microbial culture (soil application + foliar spray) over control plot. The maximum changes in soil pH from 8.9 to 8.5, EC from 0.76 to 0.68 dSm⁻¹, ESP from 37.2 to 30.2 %, organic carbon from 2.9 to 3.9 g kg⁻¹, available N from 165.2 to 179.3 kg ha⁻¹, available P from 17.3 to 25.4 kg ha⁻¹ and available K from 214.3 to 231.2 kg ha⁻¹ with the application of CSR-Bio microbial culture (soil application + foliar spray) than other treatments. The use of CSR- Bio microbial culture as soil application is better than foliar spray in case of changes in physico-chemical properties of soil.

EFFECT OF SOIL PROPERTIES ON SUSTAINABLE COFFEE YIELD

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Abstract

Coffee is grown in three regions of India namely traditional coffee growing region (Karnataka, Kerala and Tamil Nadu) followed by the new areas developed as non-traditional areas NTA (Andhra Pradesh and Orissa) and third region comprising of North Eastern Region (NER). A total area under coffee in India is 4.55 lakh hectares, of which a net arabica



cultivated area is 2.29 lakh hectares and remaining 2.26 lakh hectares area belongs to robusta. The area under arabica in NTA has been increased gradually to 0.8 lakh hectares in 2017-18. There is mass sifting of a *robusta* cultivation to *robusta* intraditional areas. But the arabica coffee is known for its unique test, aroma and fetches higher price. NTA is the only area having scope for arabica cultivation in future in India. The productivity of arabica coffee in NTA is low (153 kg/ha) compared to national average (734 kg/ha). The main reasons for the lower productivity may be due to the natural cultivation of coffee by economically weaker section (tribals) and water stress condition. Hence, to understand the effect of soil nutrient status on yield of naturally cultivated coffee, the soils parameters were studied in different regions of NTA. The study revealed that, soil test based nutrients application in Coffee Board Research farms (Regional Coffee Research Station (RCRS), R.V. Nagar; Technology Evaluation Center (TEC), Minumuluru and Koraput shows the significant higher yield (725 kg/ha) compared to cultivation of coffee under natural system. Further, a wide variation in the soil pH (4.5 to 5.3) and low in available P (7.36 to 10.84 kg/ha) status in coffee soils was observed under natural cultivation. But in Coffee Board research farms soil pH were ideal (6.2 to 6.5), sufficient levels of available P (38.60 to 46.80 kg/ha) and K was noticed in these soils. Most of the growers in the region seldom apply inputs like fertilizers to the coffee due to their poor financial status. Since the farmers are unable to provide any nutrients either in the form of inorganic or organic, the nutrients statuses of the coffee growing soils are depleted thereby leading to decreased production levels. As the NTA is recognized as organic coffee growing region, exploiting the positivity of coffee productivity levels based on soil test is one of the assured strategies to improve the coffee yield by application of organic manures or compost @ 1.5 t/ha.

LOW COST HYDROPONICS FODDER PRODUCTION : ROUND THE YEAR GREEN FODDER FOR SMALL, MARGINAL AND LANDLESS FARMERS

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Abstract

Livestock plays critical role in income of rural India, particularly for small and marginal farmers. Green fodder is the natural diet for cattle and it enhances production and quality of milk. Feed cost is about 70 to 75% of the total milk cost. Green fodder is an economic source of nutrients for dairy animals. Feed scarcity is the main limiting factor for the livestock productivity. Cultivated fodder is limited to less than 4.5 per cent of the area under cultivation in country. Country faces a net deficit of 61.1% green fodder. Green fodder production suffers due to the unavailability of land, more labour requirement for cultivation, more growth time, non-availability of same quality round the year. Due to the above constraints, hydroponics fodder technology is coming up as an alternative to grow fodder in green houses. Hydroponic fodder is rich in vitamins, minerals, and it is highly digestible. There are two type of hydroponics fodder production system present in India (i) hi-tech greenhouse (ii) low cost device. In order to meet this increasing demand for green fodder, the next best alternative is hydroponics fodder production due to land less cultivation, conservation of water, fast growth and contamination free fodder, minimal use of fungicide and pesticide, less labour requirement, time saving, continual production, weed free production system, highly palatable & nutritious fodder. The low cost device can be constructed with the local material which is cost effective. For low cost device locally available bamboo and GI pipes were used for the construction of outer structure. For making tray stand bamboo and PVC pipes are used. The entire arrangement is covered with green net shed cloth. For watering system 1000 to 500 liter water tank are used as water reservoir. Water tank is connected with ½ HP water pump and pump is connected with cyclic timer. Cyclic timer is adjusted with the time of water application according to season, crop and climatic condition. For watering irrigation pipes are fitted in each rack with micro Sprinkler/Fogger system just above center of each tray. The cost of the low cost device depends on the material used construction cost of 10x12 square feet bamboo based structure with automatic watering system is Rs 27000 to 30000. Approximate cost of 10x12 square feet size semi-automatic low cost hydroponic fodder production system constructed with iron frame and PVC rack is Rs 80,000. In hydroponic maize, oat, barley and cowpea can be produced easily among this maize is best suited crop due to easily availability of seed. In Raipur Chhattisgarh condition production cost of maize green fodder is about Rs 3.5 to 4 per kg. Production cost depends on the seed cost of the maize. Production of maize hydroponic is 5-6 folds on fresh basis (1 kg seed produces 5-6 kg fodder) and its contents 11-14% dry matter. Feeding mixture of hydroponics green fodder with other dry and green fodder to dairy animals is beneficial. For production of green fodder good quality dry seeds are washed the with proper scrubbing by hand after that soak the seed for 12-24 hour and place the soaked seed in clean gunny bag and put away from direct sunlight for 12 hour. Now



spread germination seed in clean tray and place them in green house shed. Sprinkle water in regular interval after nine to ten days fodder is ready for feeding. There are a number of challenges in producing hydroponic fodder common challenge is fungal attack which can be managed by good quality seed, hygiene and seed treatment. Production of hydroponic green fodder depends on the seed quality, climatic condition and management factor. Therefore, hydroponic fodder production is best alternate solution for small, marginal and landless farmers.

EFFECT OF SALICYLIC ACID ON CURVULARIA LEAF SPOT (*CURVULARIA LUNATA*) DISEASE MANAGEMENT IN MAIZE

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Abstract

Maize (*Zea mays*) is the most important staple food for over two billion people in Asia and for hundreds of millions in Africa and America continents. The world's annual maize production must be increased to feed the ever increasing population of these regions. Hence, the application of systemic resistance inducing chemicals along with seed priming would be the suitable alternative strategy to improve the curvularia leaf spot disease management in maize. On this aspect, the study was carried out to evaluate the effects of salicylic acid in maize cultivar GM-6 for reducing the pathogenesis of *Curvularia lunata* in maize under artificial inoculated conditions. The experiment plots were inoculated by *C. lunata* two weeks before tasselling stage. Seed priming with salicylic acid @ 0.75 mM served as T₁ and along with two spray of 0.2, 0.5, 1, 2, 3 and 4 mM of salicylic acid, first at 20 days after germination and second 15 days after first spray were served as T₃, T₄, T₅, T₆, T₇ and T₈, respectively. Seed treatment with *P. fluorescence* @ 0.025% (T₂) and four foliar spray of cow urine @ 10% from 30 days after sowing to 10 days interval were served as T₉ and water spray plot served as control (T₁₀). Among treatments 3mM concentration of salicylic acid resulted in 73% reduction in the infected symptoms on maize leaves. The results also showed that the plant height and number of cobs were increased by the application of 3mM salicylic acid to plants with reduction of yield losses and gave higher grain yield and fodder yield as compared to control caused by *Curvularia* fungi.

WOMEN EMPOWERMENT THROUGH ESTABLISHMENT OF AGRO-PROCESSING FACILITIES

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Abstract

India produces large number of commodities for human and animal consumption. Normally almost all the commodity requires processing and value addition prior to actual use or consumption irrespective of nature of consumption or use. The processing and value addition activities are grouped into primary, secondary and high value processing depending upon the nature of operation and value added to the commodity. There can be simple minimal processing operations given to the commodities such as cleaning, grading, sorting, washing etc. Majority of the commodities require conversion or transformation of their state to make them ready-to-eat or ready-to-serve or ready-to-cook or ready-to-use which facilitate the consumers. In India processing and value addition of commodities activities are accomplished either in organized sector industries or cottage level small industries. Though the agricultural commodities received considerable attention towards processing and value addition and subsequent development made in India by various organizations during previous years but still the economic health of growers or the collectors at the root level is pathetic as they do not get proper share for their contribution. It has also been well documented that producers/collectors sale their unprocessed produce at a throw away prices to the middleman due to lack of awareness and unavailability of processing facilities coupled with lack of skills. Therefore, it is essential to augment this important activity at the production catchment. To address this issue creation of community level or cottage scale agro-processing facilities at rural level or in the production catchment for primary/secondary processing of specific commodity could be the best solution. Skill development and capacity building of women for processing and value addition for the identified commodity and management of its value chain will definitely be helpful to empower the women. The marketing channel of processed commodity can also be explored easily and the system of middleman can be eliminated. This will not only help the poor stakeholders but at the same time reduce the cost of commodities.



STUDIES ON UTILIZING DIFFERENT ORNAMENTAL PLANT SPECIES IN THE VERTICAL LANDSCAPE SYSTEM FOR AIR QUALITY IMPROVEMENT

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Abstract

Vertical landscaping is a distinctive method of gardening which expands the possibility of growing ornamental plants in a vertical space wherever space is a constraint. The present study envisages on identifying appropriate ornamental species for developing green walls. Objectives of the study are to evaluate different ornamental plant species for their performance in the vertical landscape system and to estimate the Air Pollution Tolerance Index of different ornamental plant species used in vertical landscape system. The experiment was laid out in RBD with 18 treatments and 3 replications. Out of the eighteen species evaluated for their vegetative characteristics, least plant height was observed in *Peperomia obtusifolia variegata* followed by *Rhoeodiscolor*, *Tradescantias pathaceavariegata*, *Syngonium podophyllum* 'Cream Allusion' and *Syngonium podophyllum* 'Strawberry Cream'. Longest and broadest leaves was observed in *Syngonium podophyllum* 'White Butterfly' whereas, shortest and narrowest leaves were observed in *Alternanthera* Green. The covering percentage was observed maximum in *Syngonium podophyllum* 'Bold Allusion' which recorded the highest leaf area of 247.50 cm² followed by *Syngonium podophyllum* 'White Butterfly' (223.50 cm²). Highest total chlorophyll content was observed in *S. podophyllum* 'Maria Allusion' and 'Pink Allusion' whereas lowest in *Peperomia obtusifolia*. Higher level of leaf-extract pH was observed in *Syngonium podophyllum* 'Cream Allusion' and 'Maria Allusion' whereas least observed in *Philodendron scandens*. Maximum relative water content was observed in *Peperomia obtusifolia variegata*, *Syngonium podophyllum* 'Maria Allusion' and 'Berry Allusion'. The ascorbic acid content varied from 0.40 in *Philodendron scandens green* to 3.99 in *Peperomia obtusifolia*. *Syngonium podophyllum* 'White Butterfly', 'Maria Allusion', 'Berry allusion' and 'Bold Allusion' are promising in respect of growth and quality for vertical landscape system. The study shows that inclusion of ornamental plants having pollution mitigating ability in the landscape plan will serve the dual purpose of making the environment green and pollution free in the long run.

IDENTIFICATION OF STABLE HIGH YIELDING VARIETIES OF TURMERIC (*CURCUMA LONGA* L.) FOR DIFFERENT AGRO-CLIMATIC ZONES OF CHHATTISGARH

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Abstract

GGE and AMMI biplot methods with Eberhart and Russell regression model were applied on the set of 12 turmeric (*Curcuma Longa* L.) genotypes grown in nine environments for quick and relevant method *vis-a-visto* delineate genotype by environment interaction, stable genotypes and environmental discrimination. The average rhizome yield over the locations was depicted as 12.01 ton/ha, which ranged from 7.87 ton/ha (Jagdalpur) to 20.02 ton/ha (Raigarh). The genotype IT 10 (ton/ha) exhibited the highest rhizome yield followed by IT 36 (15.00 ton/ha), over national checks Roma (13.53 ton/ha), Suranjana (11.73 ton/ha) and over state/local check Chhattisgarh Haldi-1 (10.57 ton/ha). In Eberhart and Russell model, the genotypes IT 10, IT 36, Roma, and Narendra Haldi were found suitable for favourable environments and BSR 2, IT 38, Suranjana, IT 2, IT 7, and IT 8 for poor environments. In AMMI analysis, IPCA 1 (62.60 %), IPCA 2 (21.80 %), IPCA 3 (11.70 %), and IPCA 4 (2.60 %) were explained the interaction mean squares, respectively. While, in GGE biplot, PC 1 and PC 2 captured 47.28 % and 34.62% interaction variation, respectively. The genotypes T-111 (IT 10), T-101 (IT 36), and national check T-106 (Roma) were high yielding and as well as found stable in GGE and AMMI 1 biplot. The test environments RG 17, RG 16 and RG 15 exhibited different niches, whereas, AM 17, AM 16, JD 16, JD 17, JD 15 and AM 15 were representative with better discriminating ability. Between biplot models applied, the GGE biplots were clear in visualization for polygon view, genotypic stability and environmental discrimination. The GGE method considered both G+GE for biplot generation and found most suitable for stability analysis.



STANDARDIZATION OF SCREENING TECHNIQUE FOR IDENTIFYING WATER LOGGING TOLERANT GENOTYPES AT EARLY VEGETATIVE STAGE IN SOYBEAN

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Abstract

Soybean (*Glycine max* [L.] Merr.) is one of the most valuable crops worldwide mainly grown for human food and animal feed. Water logging affects approximately 16% of worldwide soybean production and is considered the second major abiotic stress after drought. Several soybean growing regions of central and north eastern states of India are suffering with water logging problem, particularly in early vegetative stages of crop cycle. Water logging stress causes damage to the crop in form of chlorosis, necrosis, stunting, defoliation, reduced nitrogen fixation and plant death. In this experiment, six diverse soybean genotypes were evaluated under eight treatments (3, 6, 10, 12 days of water logging with level of 5 cm & 10 cm at V₂ stage) along with their respective controls in water logging structures where water logging stress can be induced artificially. Genotypes were evaluated for different traits associated with water logging tolerance viz., plant mortality, plant height, SPAD Chlorophyll Meter Reading (SCMR), foliar damage score and total dry weight. In this study, foliar damage score and plant mortality were found the most contrasting parameters among others. Plants flooded with 10 cm water level above the collar region for 10 days at V₂ stage was found critical to identify tolerant genotypes. JS 97-52 and JS 20-38 were found most tolerant, while JS 90-41 found most sensitive genotype for water logging stress. Currently, a total of 126 Recombinant Inbred Lines (RILs; F₉) derived from cross JS 97-52 x JS 90-41 are being phenotyped for water logging tolerance using this protocol. This screening technique will help plant breeders to develop soybean genotypes tolerant to water logging stress at seedling stage.

COMPARATIVE EFFECT OF OVAPRIM AND PITUITARY GLAND EXTRACT HORMONE INJECTION ON MORTALITY IN *CYPRINUS CARPIO*

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Abstract

The present study was performed to compare the effect of artificial hormone (ovaprim) and natural hormone (Pituitary gland extract) used in induced breeding on survival of female brooders in common carp (*Cyprinus carpio*) with repeated dose in same fish. The 1st group treated with pituitary gland extract (PGE) with double dose (2-3 mg/kg, 6-8 mg/kg) and 2nd group treated with single dose (0.5 ml/kg) of ovaprim. In 1st breeding period avg. wt. of brooder was 1.0-1.5 kg selected and treated with intra muscular hormonal injection. After spawning no mortality occurred in both groups. In 2nd breeding period the same brooders attaining wt. 1.5 - 2.0 kg, treated with hormone injection, no mortality occur after spawning. But in 3rd breeding period with avg. wt. 2.0-2.5 kg treated, 60% mortality takes place in 2nd group and near injection site in body redness, wound and hypo-pigmentation were observed in skin. It can be concluded that the efficiency of ovaprim is better for short period of time but for long term efficiency natural hormone is the better choice.

ASSOCIATION OF POLYMORPHIC VARIANTS OF BETA () CASEIN GENE WITH MILK PRODUCTION TRAITS IN MALVI, NIMARI, SAHIWAL AND H.F. CROSS BREEDS COW

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Abstract

Research work was carried out on 50 Malvi and 50 Nimari, 50 Sahiwal and 50 HF Cross bred cow. In present research work



the PCR amplicons of 121bp were digested by restriction endonuclease enzyme DdeI, which recognizes G^AAATTC sites. Present association study of polymorphic variants' showed that the presence of no restriction sites for the enzyme DdeI in both Malvi and Nimari. So one band of 121bp was observed on the gel and such genotype was designated as A2A2 type. Whereas in Sahiwal and HF Crossbred showed two type of genotypes A1A2 and A2A2. The result of RFLP revealed that the gene and genotypic frequencies of α -casein (CSN2) gene for A2A2 was 1.00 for both Malvi and Nimari breed of cattle but 0.00, 0.30, and 0.70 in Sahiwal and 0.00, 0.64 and 0.36 in HF crossbred cattle, respectively. So as per significantly higher LL was noticed in A2A2 genotype of HF crossbred among all the four breeds of cattle. The higher LL was also noticed in A2A2 genotyped animals as compared to A1A2 genotyped animals of Sahiwal and HF crossbred cattle. The effect of genotypes was found significant ($P < 0.01$) for fat per cent trait. Significantly higher fat per cent was recorded in the different genotypes of indigenous breeds of cattle as compared to HF crossbred cattle. The highest Fat % was noticed in Sahiwal (3.19 ± 0.19) for A1A2 genotype, whereas the lowest fat per cent was observed in HF crossbred for A1A2 genotype among all the four breed of cattle. The effect of genotypes was found significant ($P < 0.01$) for protein per cent trait. A1A2 was not observed in Malvi and Nimari. There was a non significant difference of mean protein per cent in the milk of Nimari, Sahiwal and HF crossbred but all these three breeds showed significantly higher protein per cent than Malvi breed of cattle.

E-COMMERCE—A BOON FOR THE AGRICULTURAL ECONOMY OF INDIA

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Abstract

Recent global issues such as liberalization, privatization, democratization and decentralization determine the policy process for agricultural and rural development. The information and communication technologies has made it possible to consider the whole world as a global village. ICT is emerging as the backbone of commerce. As about 80% of India's population resides in villages and our economy is agriculture dependent ICT has a great role to play in promoting and establishing Indian agriculture worldwide. Meeting challenges to reduce hunger and poverty, increasing agricultural productivity, protecting the environment, narrowing the gap between production and demand are few reasons for the need of adapting new technologies in agriculture. E-Agriculture is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. Establishment of e-kiosks, info-shops provide various agricultural based information. The Indian farmers did not get the profit they deserved on their produce as they had no direct access to the market and were dependent on retailers for selling their produce. e-Commerce gives the farmer direct access not only to Indian but also International market. The paper discusses two channels of marketing first the conventional and the second using e-Commerce the latter being more efficient and effective and fetches higher profit returns to the marginal small scale farmers.

INFORMATION COMMUNICATION STRATEGIES FOR DAIRY WOMEN

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Abstract

Dairy farming is one of the prominent enterprises, which supports the rural households by providing profitable employment and steady income. Dairy farming is an integral part of homestead farming system. In hill areas dairy farming is totally dependent on women. Many research studies have indicated that women in hill areas are unaware about many aspects. Thus, present research investigation was conducted in Jeoli, Bhaluti, Sariyatal and Kausani villages of Bhimtal block of Nainital district to assess the needs of hill women engaged in dairy farming. The study revealed that majority of respondents belonged to middle age group category and belonged to General caste. They were educated upto primary level. Majority of respondents were involved in dairy farming and farming and have 3-7 nali. All the farmers owned Mobile Phone and television. Majority of respondents have Cow, buffalo and goats. Majority of respondents were unaware about feeding schedule for milch animal, feeding schedule for young heifer, feeding schedule for pregnant animal, time and frequency of feeding, information on



mineral mixture, formulation of ration, complete feed block, feeding schedule for young calves, colostrums feeding for new born calf, selection of breed, high yielding breed, pregnancy diagnosis, gestation period, suitable cross breed to their region, selection of adult of Bull or Semen, age of breedable heifer, selection of milch animal, castration of scrub bulls, care and management of new born calf, milking methods, vaccination schedule, knowledge about disease, control of external parasite, deworming practice, disinfection of shed, disposal of dead animal, treatment against contagious disease, precaution against parasitic disease, sterility treatment, Govt. programme for Dairy farming etc. Information Communication strategy is necessary to impart the education on the above subjects among the dairy women.

NUTRIENT RICH MORINGA TO SOLVE MALNUTRITION PROBLEM

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Abstract

Drumsticks (*Moringaolifera* Lam.) is one of the important perennials grown in the state of Chhattisgarh in India. It is also known as a 4F plant (Food, Fodder, Fuel and Fertility). Moringa is the traditional vegetable crops of Chhattisgarh state of India, because it is grown by every house and it is used. Moringa is a nutritious vegetable, which can play a major role in solving problems of malnutrition in South East Asia. It is rich in medicinal properties and antibiotic teregospermin is also found, which helps in resolving more than 300 diseases. By adding Moringa to Anganwadi centers and other ongoing programs in rural areas, we can increase the nutritional level of rural people. Moringa can be linked with pulses to provide iron and other nutrients for rural women and children so that we can remove malnutrition for some degree. Moringa plant is beginning to gain more popularity as a new “superfood” for its highly nutritious profile and powerful anti-inflammatory, antioxidant, and tissue-protective properties among many other health benefits. Its over the past seven years, we are doing research in drumstick and has highest 240 types of germplasm, for which characterization and evaluation is going on. First time, Moringa Day was celebrated on 18/08/2017 at Village Bharregaon, Distt. Rajnandgaon. This is the new innovative approach to organize the Moringa Day. In last year, 2018-19, Moringa Day was organized on 18/08/2018 in two villages, Dholpittha, Block Chhuikhadan and village Dhamansara, Block Rajnandgaon. Through this program, we distributed the better variety of Moringa (PKM-1) to the farmers and to spread the production technology in the villages like Nathunagaon, Navagaon, Bhargaon, Dhamsara to make Moringa village in the state. The tender leaves of moringa are specially rich in all contents and this can be better utilized after value addition. Value addition of moringa leaves is now urgent need to solve malnutrition problems of weaker sections. It can be achieved by making nutri rich various biofortified products i.e., (moringa leaves powder, moringa tea bags, ready to eat moringa rice, moringa biscuits, moringa bread, moringa toast, ready to eat moringapoha, moringa capsules, moringa tablets and moringa face pack etc.).

EFFECT OF SYNBIOtic SUPPLEMENTATION ON GROWTH PERFORMANCE AND MORTALITY OF PRE-RUMINANT BUFFALO CALVES UNDER FARMER'S FIELD

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Abstract

Probiotics are defined as live microbial feed supplements that improve the health of livestock, or in other words, organisms or substances that contribute to intestinal microbial balance referred as probiotics. The main objectives of application of probiotics in the rearing of young animals are improved survival, inhibition of diarrhea, decrease mortality, superior growth and better feed conversion efficiency. Prebiotics enhance growth, decrease faecal coliform count, enhance immunity and are found to be most effective in times of stress or increased pathogen exposure throughout the calf's lifetime. Lactic acid bacteria compete with the pathogenic bacteria by competitive attachment and production of lactic acid which results in lowering of pH of large intestine. Mannan oligosaccharides (prebiotic) are cell wall products of *Saccharomyces cerevisiae* and inhibit pathogenic bacterial adhesion to mucous epithelium by blocking their fimbriae. Synbiotics are the combination of probiotics and prebiotics which work in supplementary to each other. So the present OFT was conducted on supplementation of synbiotic (*Lactobacillus acidophilus* @ 0.5 gm (2 x 10¹⁰ cfu/ g) + 2 g Mannan oligosaccharide per calf/day) to enhance the growth rate



and reduction mortality in buffalo calves under the semi-arid condition of Gujarat, India, during the year 2018-19. Twenty pre-ruminant female buffalo calves with average age of fifteen days were divided into 2 groups of 10 calves each. The calves were assigned to two dietary treatments viz. T₁- basal diet (control) and T₂ (synbiotic group) basal diet + *Lactobacillus acidophilus* @ 0.5 gm (2 x 10¹⁰ cfu/ g) + 2 g Mannan oligosaccharide per calf/ day, respectively for a period of 90 days. The powder containing synbiotic was mixed in milk and was fed early in the morning. The average initial body weight of calves was 30.2 and 29.9 kg, respectively in T₁ and T₂ groups. Results of the study revealed that the supplementation of synbiotic achieved significantly highest body weight (56.32 kg.) and average daily weight gain (355 g) as compared to control (51.27 kg) body weight and (281g) daily weight gain. The synbiotic group gained 6.02 kg more weight than control group. No mortality observed in T₂ whereas, 30 % mortality found to be in T₁. The additional B; C ratio was found to be 9.01 in synbiotic group. On the basis of the findings of the present experiment, it may be concluded that supplementation of synbiotic (*Lactobacillus acidophilus* @ 0.5 gm (2 x 10¹⁰ cfu/ g) + 2 g Mannan oligosaccharide per calf/ day) was more beneficial in initial (pre-ruminant) stages of calves with special references to improving body weight gain, reduced mortality and are affordable to farmers.

LOOP MEDIATED ISOTHERMAL AMPLIFICATION ASSAY FOR EARLY DETECTION OF *PHYTOPHTHORA INFESTANS* FROM POTATO TUBERS : A NOVEL DIAGNOSTIC APPROACH FOR ITS MANAGEMENT

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Abstract

Phytophthora infestans (*P. infestans*) is an economically important pathogen of potato causing devastating disease worldwide. Overwintering on seed potatoes serve in early disease appearance and quick progression from season to season. A sensitive and early detection assay of pathogen provides choices for adopting good management practices. The present study was carried out to develop a fluorescent based loop-mediated isothermal amplification (LAMP) assay for a simple, sensitive and visual detection of *P. infestans* from tubers targeting a novel internal transcribed spacer 1 (ITS-1) region of ribosomal DNA. The optimization of LAMP reaction conditions and reagents concentrations were carried out with time, temperature, MgSO₄, dNTPs and *WarmStartBst* DNA polymerase. The amplified products were analysed using SYBR Green I dye and by agarose gel electrophoresis. The target specificity of primers was assessed with PCR, restriction digestion and sequence analysis. The developed LAMP assay was evaluated for its analytical specificity, sensitivity and validation in field tuber samples. We were able to detect down to 1 pg/ul of DNA using the newly developed LAMP primers whereas the minimal amount detectable for conventional PCR was 0.1ng/μl. The detection of LAMP assay for inoculum of *P. infestans* was determined in the artificially inoculated leaves and tubers. Further, the developed assay were applied in field tubers and compared with PCR. The LAMP assay developed in this study has a potential to be a beneficial tool in early detection of *P. infestans* in low cost laboratory. Because the LAMP assay performed well in aspects of sensitivity, repeatability, target specificity, reliability, and visibility, it is suitable for detection of *P. infestans* in infected potato tubers.

PERFORMANCE OF GUAVA VARIETIES INFLUENCED BY CSR-BIOMICROBIAL CULTURE ON YIELD, QUALITY AND SOIL FERTILITY IN SODIC SOIL

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Abstract

A field experiment of guava was established in the year 2013 in sodic soil at farmers field village Vinovanagar, district Kanpurdehat in the jurisdiction of C.S.A. University of Agriculture and Technology, Kanpur using high yielding varieties Sweta and Lalita of guava. The initial physico-chemical properties of soil were pH 8.8, EC 0.72 dSm⁻¹, ESP 37.8% and organic carbon 2.8 g kg⁻¹. The soil was sandy loam in texture having available N 162.2 kg ha⁻¹, available P₂O₅ 17.6 kg ha⁻¹ and available K₂O 215.3 kg ha⁻¹. The experiment was laid out under randomized block design with four replications. The experiment consist of four treatments viz., T₁- Control, T₂- CSR-Bio microbial culture (soil application), T₃- CSR-Bio



microbial culture (foliar spray) and T₄- CSR-Bio microbial culture (soil application + foliar spray). The studies confined to the Impact of CSR-Bio microbial culture on yield, quality and soil fertility of guava under sodic soil conditions. The highest fruit size (57.1 cm²), fruit weight (141.5 g), seed weight (5.71 g) and specific gravity (1.17 g/cm³) were recorded in sweta variety and fruit size (59.9 cm²), fruit weight (147.5 g), seed weight (5.74 g) and specific gravity (1.22 g/cm³) were recorded in Lalita variety of guava with the application of CSR-Bio microbial culture (soil application + foliar spray). The maximum yield/plant (65.5 Kg), yield/ha (18.7 mt), suger content (8.35%) and ascorbic acid (272.5 mg/100g) with the average values of yield/plant (53.1 Kg), yield/ha (15.0 mt), suger content (7.34%) and ascorbic acid (246.5 mg/100g) were recorded in sweta variety and yield/plant (70.2 Kg), yield/ha (19.5 mt), suger content (8.44%) and ascorbic acid (278.6 mg/100g) with the average values of yield/plant (58.0 Kg), yield/ha (15.6 mt), suger content (7.54%) and ascorbic acid (252.9 mg/100g) were recorded in Lalita variety of guava with the application of CSR-Bio microbial culture (soil application + foliar spray). The performance of Lalita is better in comparison to sweta variety of guava. The maximum changes in soil pH from 8.8 to 8.4, EC from 0.72 to 0.65 dSm⁻¹, ESP from 37.8 to 30.2 %, organic carbon from 2.8 to 3.8 g kg⁻¹, available N from 162.2 to 177.3 kg ha⁻¹, available P from 17.6 to 22.5 kg ha⁻¹ and available K from 215.3 to 230.2 kg ha⁻¹ with the application of CSR-Bio microbial culture (soil application + foliar spray) than other treatments. The use of CSR-Bio microbial culture as soil application is better in comparison to foliar spray in case of changes in physico-chemical properties of soil.

STABILITY ANALYSIS AND IMPROVED MINERAL QUALITIES IN ADVANCED MUTANT LINES OF SORGHUM (*SORGHUM BICOLOR* (L.) MOENCH)

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Abstract

Twenty seven sorghum genotypes having both seventeen advanced mutant lines and ten checks were evaluated for stability analysis and mineral analysis during *rabi* 2017-18 at Agricultural Research Station Kalburagi, Main Agricultural Research Station Raichur, Agricultural Research Station Hagari and Agricultural Research Station Malnoor. Based on ten quantitative traits, pooled analysis of variance revealed, significant differences for all the quantitative traits for MSS due to genotypes except for panicle width and seed yield per plant. MSS due to E+ (GxE) was significant for most of the character except for days to 50% flowering, days to maturity and 100 seed weight. Environment linear component was significant for all traits. Variance due to GxE was significant for panicle length. Whereas, GxE (linear) interaction was non-significant for most of the characters except plant height, panicle length panicle width and seed yield per plant. The genotypes J-12, C-28 and JP-1-5 had mean value more than population mean and regression coefficient near to unity for days to 50 % flowering. Genotypes J-6-1 had mean value less than population mean and regression coefficient around unity and significant deviation from regression indicates average stability. The genotypes J-12, J-3 and GS-23 had mean value more than population mean and regression coefficient near to unity and significant deviation from regression coefficient shows average stability and adapted to all situations. Two mutant lines J-35 and J-11 and their parent JP-1-5 showed high seed yield per plant and stable performance across environments. New AML J-11 is rich in zinc and calcium compare to parents JP-1-5 and C-18 is rich in iron compared to checks Chincholi and JP-1-5 used for variety development.

NUTRICEREALS AND ITS RESEARCHABLE ISSUES IN INDIA

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Abstract

Nutricereals are small grained cereals, the smallest of them include sorghum, bajara, finger millet, kodo millet, foxtail millet, proso millet, little millet and barnyard millets. The untapped grain yield potential coupled with nutritional superiority makes



the potential future food crops particularly in the drought prone areas. Initiation of Nutricereal Mission for the 2018-2023 in India is remarkable challenge for improving small millets status in India. Small millets possess a wealth of genetic diversity in India has assembled at different ICAR, AICRP small millets headquarters of the Small Millets Improvement Project. Which need to retrieve the genetic diversity under natural conditions. This acquires significance in countries which are faced with chronic drought. Besides cultivated land races there is a need to collect related wild species also. Further, it made available to researchers to facilitate quick and need based exchange of germplasm. Small millets are highly self-fertilized crops and pure line selection has been primarily used to improve the performance of land races. Hybridization, offers immense potential for combining the desirable features. Contact, hot water and gametocide methods have been used in hybridization with certain amount of success in these crops. The smallness of the spikelet and their delicate nature has been hindering hand emasculatation. An urgent need to standardize hybridization techniques for changing the genetic background of the local cultivars. Mechanisms like protogyny which promote cross pollination need to be looked for in other small millets. Traditionally small millets are the constituents of dry land farming system. However, they also respond to irrigation. Thus, immediate need to select genotypes with better water use efficiency. Small millets are low input crops and often grown in infertile depleted soils. It responds remarkably to fertilizer management and which demands identification of genotypes which have high fertilizer use efficiency. Small millets are vulnerable to different spectrum of field pests and diseases. Finger millet is more vulnerable to diseases like blast and barnyard millet to smuts. Little and proso millets are more susceptible to pests like shootfly while stem borer occur on finger and barnyard millet. The incorporation of genetic resistance offers the best choice in small millets. Cultural controls like early planting and appropriate cropping systems could reduce pest and disease incidence. As small millets are well protected in glume encasements the post-harvest processing technology of the grain to usable form time consuming as well as cost saving. Nutricereals are the staple food of the poor and the working classes and hence their health depends on the quality of food consumed. Improvement made in nutritive quality of small millet grain would indirectly help in bettering the general health of the rural people. So, quality breeding to improve the protein content, mineral composition and amino acid should be given due priority. Quality specific genotypes can also be bred in order to widen consumer base to offer a choice of foods. The manufacture of value added products from small millets will help to upgrade economic status. They could also be processed into new foods suitable to infants and invalids alike after necessary biofortification and value addition.

DIETARY DIVERSITY AMONG THE TRIBAL AND URBAN POPULATION OF TELANGANA

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Abstract

This study measured dietary diversity of the household food access to a variety of foods by using the data on food consumption frequency collected using a structured questionnaire (FAO, 2010) and daily consumed food groups were given a score of '1' each and for those which were not consumed daily were scored '0'. A sample of 400 respondents out of which 200 tribal with equal number of males and females also same was taken from the urban area. The high dietary diversity was noticed among the urban respondents than the tribals which is an indicative of better food intake practices. The percentage of females was high in the high diversity range, percentage of males was high in the medium diversity range, which shows the intake was better diversified in the female respondents than the male respondents. It was observed from the data that except for the food groups of cereals, pulses, fats and oils and sugars in the case of urban respondents, while fats and oils for the tribal respondent's consumption was noticed to be on par with the Recommended Daily Intake (RDI), whereas other groups intake was lower when compared to RDI. When compared to the tribal respondents, urban respondents were consuming a better variety and quantity of food groups which is also an indication of better status and prosperity. Fats and sugars were consumed higher than the RDI by urban respondents which is a contributing factor for obesity. Tribal respondents were also taking fats more than the RDI, which shows the need to cut down fats in order to prevent the metabolic disorders. Despite of decline in food and nutrient intake an improved nutritional status noticed due to non-nutritional factors such as improvement in access to safe drinking water, better out-reach of health care services coupled with improvement in socio-economic conditions. Low intake of different food items was related to poor economic status. There is need for awareness programs because poor dietary habits were noticed from the both tribal and urban areas. In spite of constant efforts by government and other NGO's India is



suffering with nutritional and food security problems, one of the underlying factors could be lack of awareness and knowledge on how much and what to eat. Policy makers can include awareness programs in order to improve the dietary habits among the population to tackle the nutritional problems of the India.

QUALITY IMPROVEMENT OF LITTLE MILLET (*PANICUM SUMATRENSE* L.) THROUGH INTERRELATIONSHIP STUDIES BETWEEN YIELD AND QUALITY TRAITS

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Abstract

Association study was conducted using 32 genotypes of little millet (*Panicum sumatrense* L.) for sixteen different morphological and quality traits. This study revealed that, grain yield per plant showed highly significant and positive correlation with days to 50 % flowering, plant height at maturity, number of tillers per plant, panicle length, straw yield per plant, days to maturity, protein content at both genotypic and phenotypic levels while, iron content had highly significant positive correlation with grain yield per plant at genotypic level. Thus, selection practiced for the improvement in one trait will automatically result in improvement of other trait even through direct selection. On the basis of present investigation of interrelationship, it can be presumed that for improvement of quality characters such as for improving protein content, the characters viz., days to 50 % flowering, plant height at maturity, number of productive tillers per plant, number of branches per panicle, panicle length, grain yield per plant, straw yield per plant and days to maturity; for improving ash content, the character fiber content; for improving iron content, the character number of productive tillers per plant, panicle length and protein content are ideal characters. The characters number of branches per plant, ash content and fiber content exhibited negative correlation with grain yield per plant indicates, for the improvement of quality traits at the cost of yield penalty. Hence, these characters could be utilized as selection criteria for improving quality characters.

PERFORMANCE EVALUATION OF HYDROPONIC SYSTEMS FOR DIFFERENT CROPS UNDER SOIL LESS MEDIA

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Abstract

Hydroponic system of cultivation does not use soil, instead the roots are supported through some inert media like rock-wool, clay-pellets, coco-peat, and vermiculite. The use of hydroponic systems can be beneficial to small-scale farmers by enabling them to take advantage of favorable climatic conditions to improve productivity. Present study was carried out for performance evaluation of hydroponic systems for different crops under soil less media at the Centre of Excellence on Protected Cultivation and Precision Farming, IGKV, Raipur (C.G.) during the year 2018-19. The experiment was laid out with four treatments T₁ (A-frame structures Clay-pellets media), T₂ (A-frame structures Coco-peat media), T₃ (U-shaped structures Clay-pellets media), T₄ (U-shaped structure Coco-peat media) of hydroponic systems. Performance of hydroponic system was evaluated by transplanting two vegetable crops (Pak-choi and Leafy-garlic) and two flower crops (Chrysanthemum and Petunia) in two different media i.e. coco-peat and clay-pellets. In this system irrigation was applied to the crop by ebb and flow system. Nutrient solution was made by mixing Nitrogen, Phosphorus, and Potassium in water at right balance. Different concentration of nutrient solution was made for different plant growth stages for optimizing the nutrient solution. Results of this study revealed that the yield of pak-choi was more in coco-peat media as compared to clay-pellets media. On the other hand, chrysanthemum crop was recorded to be more in clay-pellets media as compared to coco-peat media. Further, petunia crop yielded higher in clay-pellets media, however, yield of leafy-garlic was more in coco-peat media clay-pellets. In the present investigation it was found that the fibrous roots crop growth rate is high in coco-peat media, but tap-roots crop growth rate was high in clay-pellets media. In hydroponic cultivation high water use efficiency can be achieved with comparatively lesser area. Under protected cultivation with less cultivated area, more number of plants can be grown as that is more beneficial to small or marginal farmer, they can earn more profit. It can be revealed that if hydroponic system of cultivation under protected condition is done one can plant 1.5 times more plants as compared to over land cultivation, because vertical



farming is possible in case of hydroponic system of cultivation. This system requires less unit area per plant for planting. On the basis of this study it can be concluded that hydroponic system is very helpful in cultivation of high valued crop like vegetable and flower under protected condition for increasing the farmer income.

EFFICACY OF PRE AND POST-EMERGENCE HERBICIDES IN MAIZE (*ZEA MAYS* L.) UNDER ZERO TILLAGE SYSTEM AFTER RAINY SEASON PADDY

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Abstract

A field experiment in participatory mode was conducted on farmers' field at Agriculture Extension Education Centre, Lingsugur, in UKP irrigation command in Karnataka to evaluate the efficacy of different pre- and post-emergence herbicides singly or as tank-mix and in sequence in maize grown under zero tillage as a second crop after rainy season paddy. Among the different weed control treatments, sequential application of atrazine 50 WP @ 1000 g a.i./ha at pre-emergence (PE) fb 2, 4-D 80 % WP @ 2500 g a.i./ha as post-emergence (POST) recorded significantly lower weed dry weight (18.3 g m²), higher weed control efficiency (86 %), herbicide efficiency index (1.85) and consequently higher grain yield (5425 kg ha⁻¹). Overall, the treatment also recorded higher net returns (Rs. 38328/-) and higher BC ratio (2.48).

NUTRIENT MANAGEMENT THROUGH ORGANIC SOURCES IN RAINFED PEARL MILLET

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Abstract

Due to intensive cultivation, the soils of the country became deficient in macro and trace elements causing yield stagnation of pearl millet. The field experiment aimed to enhance productivity and improve quality of pearl through organic and inorganic nutrient sources was started during *Kharif*, 2017. The experiment comprises of nine treatments were evaluated in randomized block design keeping three replications. The treatments were T₁: Recommended dose of fertilizer, T₂: Recommended dose of nitrogen through farm yard manure, T₃: 75% Recommended dose of Nitrogen through farm yard manure, T₄: Recommended dose of nitrogen through vermicompost, T₅: 75% Recommended dose of nitrogen through vermicompost, T₆: T₂ + Biomix, T₇: T₃ + Biomix, T₈: T₄ + Biomix and T₉: T₅ + Biomix. The trial was successfully conducted at ICAR-AICRP on Pearl Millet, Mandor in year 2018. The perusal of the data revealed that in comparison to the grain yield (12.22 q/ha) and stover yield (24.79 q/ha) recorded in recommended dose of fertilizer, the treatment T₈ (Recommended dose of Nitrogen through vermicompost+biomix) produced statistically at par yield of 11.94 q/ha and 23.22 q/ha, respectively. However, all other organic sources had statistically lower grain and stover yield than the inorganic treatment. The ancillary characters; total and effective tillers/plant were found maximum in the T₈ treatment compared to all other treatments of organic and inorganic sources.

PROBIOTICS, A BENEFACTION FOR HUMAN HEALTH

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Abstract

Human gut is the reservoir of diverse and vast communities of microbial species, makes a complex ecosystem of microorganisms, which include around 400 cultivable species. Beneficial intestinal bacteria have different and overlapping benefits, e.g., nutrients supply for their host, compete for adhesion site with intestinal pathogens, stimulate, modulate and regulate a normal immunological response, and suppress excessive inflammation. Some microbes also possess the potential to cause disease such *E. coli*, *Salmonella*, *Shigella* and *Clostridium* are considered detrimental to health. A slight change in the



composition of microbial population in intestinal tract may lead to several health complications. Modifications of the intestinal microbiota in order to achieve, restore, and maintain favorable balance of the gut, and the activity of microorganisms present in the gastrointestinal tract is the prime requirement of the host to remain healthy. Research over the past two decades has sufficient evidence that administration of probiotics are used to optimize gut flora and to prevent and treat a range of diseases. Researchers confirm their positive effect on the host's health. Probiotics are the living micro-organisms, when administered in sufficient amount provide a health benefit to the host. They may be consumed in the form of dairy (milk, curd and buttermilk) and non dairy fermented products (sauerkraut, temeph and pickles), raw vegetables and fruits. Another source may be pharmaceutical formulations and functional foods. Current research is focused on evaluating the novel strains of probiotics and to explore their potential in biomedical and clinical research to improving human health.

BIOFERTILIZERS-A KEY COMPONENTS FOR IMPROVING SOIL HEALTH MANAGEMENT AND PADDY PRODUCTIVITY

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Abstract

Nutrients are essential for the production of crops and healthy food for the world's ever increasing population. Soil management strategies today are mainly dependent on inorganic chemical-based fertilizers, which cause a serious threat to human health and the environment. Bio-fertilizer has been identified as an alternative for increasing soil fertility and crop production in sustainable farming. The exploitation of beneficial microbes as bio-fertilizers has become of paramount importance in agricultural sector due to their potential role in food safety and sustainable crop production. Front Line Demonstrations was conducted at morumpudi, Ramachandrapuram and Pedagajulavarru villages of Guntur district of Andhra Pradesh adopted by Krishi Vigyan Kendra, during Kharif season from the year 2017 to 2018. Studied the impact of liquid Biofertilizers viz., Azospirillum, Phosphate Solubilizing Bacteria (PSB), and Vermicompost on Paddy yield using the variety BPT 5204. Demonstration plot (T_1) consists of 25% Liquid bio fertilizers (1250 ml Azospirillum + 1250 ml Phosphobacterium + 250kgs Vermicompost) + 75 % Recommended Dose chemical fertilizers (67.5 Kg N + 45 kg P_2O_5 + 60 kg K_2O per ha) where as 100 % recommended dose of chemical fertilizers as Farmers Practice plot (T_2). The Experiment was laid out in Randomized Block Design (RBD) with two treatments and fifteen replications. Maximum grain yield 76.50 q/ha was recorded in T_1 as compared to T_2 (71.76 q/ha). Higher net return (66200 Rs/ha) was obtained in the Demonstration plots compared to farmers practice plots (52714 Rs/ha). Further Benefit cost ratio was recorded higher in front line demonstrations (2.6:1) as compared to farmers practice plots (2.1:1). The increase in yields of paddy crop under front line demonstrations was attributed to impact of liquid Biofertilizers viz., Azospirillum, Phosphate Solubilizing Bacteria (PSB), Vermicompost and use of proper dose of chemical fertilizers, plant protection measures and regular trainings to farmers.

ENRICHMENT OF IRON DENSITY IN AEROBIC RICE CULTIVARS THROUGH SOIL AND FOLIAR APPLICATION

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Abstract

Field experiments were carried out during *kharif* season, 2012 and 2013 at College Farm, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad to evaluate the response of rice cultivars and iron nutrition in aerobic rice on growth, yield, nutrient uptake and economics. Treatments comprised of three rice cultivars *i.e.*, Tellahamsa (M_1), MTU 1010 (M_2) and KRH 2 (M_3) as main treatments and twelve iron nutrition treatments *i.e.*, control (RDF) (S_1), basal application of iron sulphate @ 25 kg ha⁻¹ (S_2), basal application of iron chelate @ 25 kg ha⁻¹ (S_3), 3 foliar sprays of iron sulphate from 21 DAS @ 7 days interval (S_4), 3 foliar sprays of iron sulphate from 21 DAS @ 10 days interval up to maximum tillering (S_5), 3 foliar sprays of iron sulphate from 21 DAS @ 15 days interval up to panicle initiation stage (S_6), basal application of iron sulphate @ 25 kg ha⁻¹ + 3 foliar sprays of iron sulphate from 21 DAS @ 7 days interval (S_7), basal



application of iron sulphate @ 25 kg ha⁻¹ + 3 foliar sprays of iron sulphate from 21 DAS @ 10 days interval up to maximum tillering (S₈), basal application of iron sulphate @ 25 kg ha⁻¹ + 3 foliar sprays of iron sulphate from 21 DAS @ 15 days interval up to panicle initiation stage (S₉), basal application of iron chelate @ 25 kg ha⁻¹ + 3 foliar sprays of iron sulphate from 21 DAS @ 7 days interval (S₁₀), basal application of iron chelate @ 25 kg ha⁻¹ + 3 foliar sprays of iron sulphate from 21 DAS @ 10 days interval up to maximum tillering (S₁₁), basal application of iron chelate @ 25 kg ha⁻¹ + 3 foliar sprays of iron sulphate from 21 DAS @ 15 days interval up to panicle initiation stage (S₁₂) as sub treatments laid out in split plot design replicated thrice. Study results indicated that, out of three cultivars KRH 2 was superior in registering higher growth, yield, nutrient uptake and economics. Among twelve iron nutrition treatments, basal application of iron chelate @ 25 kg ha⁻¹ + 3 foliar sprays of iron sulphate from 21 DAS @ 7 days interval was ideal for realizing higher growth parameters, yield attributes, grain and straw yield, iron uptake and gross returns whereas, basal application of iron sulphate @ 25 kg ha⁻¹ + 3 foliar sprays of iron sulphate from 21 DAS @ 7 days interval had shown better in terms of net returns and B:C ratio.

QUANTITATIVE TRAIT LOCI MAPPING FOR SEED COAT IMPERMEABILITY IN INTERSPECIFIC RECOMBINANT INBRED LINES OF SOYBEAN

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Abstract

Soybean (*Glycine max* (L.) Merr.) is a major oilseed crop that represents a major source of protein and vegetable oil supplements for humans and livestock worldwide. Hard seededness or seed coat impermeability in the cultivated soybean is typically associated with various functions likewise seed viability under delayed-harvest field condition, seed longevity under humid environments, tolerance to fungal activity, and inhibition against rapid imbibition of water, which often deteriorates the germination. In this study, 122 genotypes of cultivated (*Glycine max*) and wild soybean (*Glycine soja* and *Glycine tomentella*) were screened for seed coat impermeability trait and extreme genotypes were identified for genetic studies. 300 Recombinant Inbred Lines (RILs) were developed using parent DC 2008-1 (*G. soja*) and DS 9712 (*G. max*) as seed coat impermeable and seed coat permeable genotype respectively. 204 RILs were surveyed with 400 SSR markers and 218 markers identified as polymorphic (54.56%) between the parental lines. The linkage map was developed by using 207 SSR markers with an average marker distance of 8.94 cM. Seven QTL affecting seed coat permeability after 6 hours of seed soaking in water (SCPH), were mapped on chromosome Nos. 2, 5, 12, 13 and 16 in the seeds stored for 1-3 years. Five QTL affecting seed coat permeability after 7 days of imbibition (SCPD) were mapped on chromosome Nos. 2, 9, 10 and 20 in the seeds stored for 1-3 years. Phenotypic variation explained (PVE) by each QTL ranged from 5.96 to 39.67%. Two major stable QTL viz., qSCPH2-1 and qSCPH2-2, which are located in tandem on chr.2, together explained 62.92% and 43.09% phenotypic variance on the seeds of two years and one year of ambient storage respectively. One major and five minor QTLs identified in this study for both types of seed coat impermeability was novel. The QTL and markers identified in this study will pave the way for developing genotypes with enhanced viability and optimum permeability through molecular breeding in wide hybridized populations in soybean.

EVALUATION OF CHILLI (*CAPSICUM ANNUM* L.) GENOTYPES FOR GROWTH AND YIELD CHARACTERS UNDER NORTHERN ZONE OF KARNATAKA

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Abstract

Eight chilli genotypes were evaluated at Regional Horticultural Research and Extension Centre, Dharwad during 2016, 2017 and 2018 for growth and yield traits. The experiment was conducted in randomized complete block design with 3 replications, three years data were pooled data were analyzed, among the eight genotypes 2016/CHIVAR-1 recorded highest fruit length (8.60 cm), average fruit weight (4.06 gm) and yield per hectare (100.84 q/ha) followed by 2016/CHIVAR-3 fruit length (8.60 cm), average fruit weight (4.06 gm) and yield per hectare (100.84 q/ha) were significantly superior to other genotypes and compared to local check fruit length (5.26 cm), average fruit weight (2.34 gm) and yield per hectare (83.17 q/ha). From the results it was concluded that the genotype 2016/CHIVAR-1 and 2016/CHIVAR-3 which gave maximum fruit length, average



fruit weight and yield per hectare (100.84 q/ha) characters can be recommended for northern zone of Karnataka. Identification of a superior variety with higher yield better suited for a particular region and its improvement is of immediate task to exploit its potential.

DIRECTION OF TRADE AND CHANGING PATTERN OF INDIAN COFFEE EXPORTS—AN APPLICATION OF MARKOV CHAIN ANALYSIS

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Abstract

Among the plantation crops, coffee contributes significantly to the nation's economy, as India is the third largest producer and exporter in Asia and it exported 2,82,872 tonnes (Rs. 5721 Crore) in 2018-19. Present study made an effort to investigate the direction of trade, trade competitiveness of Indian Coffee by Application of Markov Chain Analysis with secondary data from 2000-01 to 2018-19., further growth and stability in the export of Indian coffee were studied by Compound growth rate and Cuddy Della instability Index respectively. As per statistics top three importers of Indian coffee are Italy (25.16 per cent), Germany (10.51 per cent) and Belgium (5.97 per cent). By using the estimated transitional probabilities, the export of coffee to various destinations was predicted for next three years (2019, 2020 & 2021).

SURVEY AND SURVEILLANCE OF DISEASES IN MAJOR HORTICULTURAL CROPS EXISTING IN RAYALASEEMA ZONE OF ANDHRA PRADESH

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Abstract

Survey was conducted in vegetable and fruit crop growing areas in Kurnool, Anantapur and Prakasam districts of Andhra Pradesh during 2014-15. In roving survey at Kurnool district more Per cent Disease Index (PDI) of purple leaf blotch disease noticed in Kharif (36.5) than in Rabi (30.5) in onion crop. Neck elongation and chlorotic leaves observed due to leaf blight disease in onion. In tomato crop observed early blight disease (21.5) and bud necrosis virus (12.5%). In Chilli crop observed wilt (6.0%) and viral disease (15.0%). The Powdery mildew disease observed in Chilli (16.0), Capsicum (15.0) and Cluster bean crops (16.0). In Turmeric observed leaf spot (22.5) and Rhizome rot (14.5%). Fixed plot survey was conducted at Horticultural Research Station, Mahanandi. In Okra highest yellow vein mosaic virus disease incidence (55.0) was recorded at 3rd week of October 2014. The disease incidence was negatively correlated with maximum and minimum temperature and positively correlated with relative humidity and rain fall. In tomato, highest Leaf curl (12.55) and bud necrosis (11.58) disease incidence was recorded at 2nd week of November 2014. The disease incidence was negatively correlated with maximum and minimum temperature and positively correlated with relative humidity. In Chillies, highest leaf spot incidence (19.0) was recorded at 4th week of October 2014. The disease incidence was negatively correlated with maximum and minimum temperature and positively correlated with evening relative humidity and rain fall. Highest virus complex incidence (7.24) was recorded at 2nd week of November 2014. The disease incidence was negatively correlated with maximum, minimum temperature and rain fall and positively correlated with relative humidity.

VARIABILITY STUDIES AMONG RICE GENOTYPES (*ORYZA SATIVA* L.) UNDER COASTAL SALINE CONDITION

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Abstract

The present investigation was carried out at the Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai nagar during Samba. The study was carried out in an effort to assess the extent



of genetic variability in 35 genotypes for 11 character viz., days to first flowering, plant height at maturity, number of tillers per plant, number of panicles per plant, panicle length, number of grains per panicle, 1000 grain weight, grain length, grain breadth, grain L/B ratio and grain yield per plant. The characters namely, grain yield per plant, number of panicles per plant, number of tillers per plant and number of grains per panicle recorded high phenotypic and genotypic coefficient variation. High heritability along with genetic advance as percent of mean was observed for grain length and plant height at maturity followed by grain breadth, grain L/B ratio, number of grains per panicle, grain yield per plant, 1000 grain weight, number of tillers per plant, number of panicles per plant and panicle length. This may be attributed to additive gene action. Selection for these characters will play both short term and long term benefit.

EFFECT OF SALINE WATER IRRIGATION WITH AMENDMENTS ON KACHARI CROP PERFORMANCE UNDER ARID REGION

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Abstract

In hot arid region, Kachari (*Cucumis melo*) is the most important vegetable crop and potential source of income for farmers. The availability of good quality of irrigation water is very less. Thus sustainable irrigation systems using saline soils and waters have the potential to improve crop production in arid region. This will require a comprehensive approach to soil, water and crop management. The field experiment was conducted at ICAR-Central Institute for Arid Horticulture (CIAH), Bikaner research farm with cucurbitaceous crop (kachari) during 2017-18 in the kharif season to investigate the effect of saline water with the combination of different amendments on kachari crop performance. It was observed that the maximum vine length (cm), number of fruit /plant number of vine plant⁻¹ and leaf size (cm) were (1.47cm, 16, 5.8.77cm x 5.67cm) respectively observed under the treatment of gypsum @5ton/ha + 4EC_{IW} (dS m⁻¹) followed by vermicompost @10 ton/ha+ 4EC_{IW} (dS m⁻¹) and FYM @15 ton/ha + 4EC_{IW} (dS m⁻¹). The highest yield was observed with the treatment of gypsum @5ton/ha+ 4EC_{IW} (dS m⁻¹) that was (66.25 q/ha) followed by vermicompost @10 ton/ha+ 4EC_{IW} (dS m⁻¹) (60.00 q/ha) and FYM @15 ton/ha+ 4EC_{IW} (dS m⁻¹) (57.50 q/ha). This is clearly indicated that kachari crop performance was good in the treatments where gypsum @5ton/ha+ 4EC_{IW} (dS m⁻¹) were applied.

ASSESSMENT OF GENETIC VARIABILITY OF LARGE CARDAMOM (*AMOMUM SUBULATUM* ROXB.) IN NORTH SIKKIM, INDIA

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Abstract

Large cardamom has been a major cash crop for sub-Himalayan region especially for Sikkim and it has cultivar wise a wide range of adaptability from low to high altitude (600 to 2200 amsl or above). However the changing climate has contributed significantly to the adaptability of cultivars to a particular set of environment. In present study, we have tried to find out the genotypic ability of six cultivars viz. Sawney, Seremna, Varlangey, Golsey, Ramla and Ramsey by assessing morpho-physiological and yield attributing traits in climatic conditions of at ICRI, RRS Research Farm, Kabi, North Sikkim.

CLIMATE CHANGE AND FOOD SECURITY IN INDIA

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Abstract

India's food security continues to be high on its list of development priorities because the country's relatively high rates of economic growth have not led to a reduction in hunger and under nutrition. India's gross domestic product at factor cost and



per capita income grew at seven percent and five percent per annum, respectively, from 1990-91 to 2013-14. However, the incidence of under nutrition has dropped only marginally from 210.1 million in 1990 to 194.6 million in 2014, and India has failed to meet the Millennium Development Goal of halving the proportion of people who suffer from hunger. Climate change has added to the enormity of India's food security challenges. While the relationship between climate change and food security is complex, most studies focus on one dimension of food security, i.e., food availability. This paper provides an overview of the impact of climate change on India's food security, keeping in mind three dimensions-availability, access, and absorption. It finds that ensuring food security in the face of climate change will be a formidable challenge and recommends, among others, the adoption of sustainable agricultural practices, greater emphasis on urban food security and public health, provision of livelihood security, and long-term relief measures in the event of natural disasters.

ASSOCIATION STUDIES FOR YIELD COMPONENTS AND DORMANCY RELATED TRAITS IN RICE (*ORYZA SATIVA* L.)

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Abstract

Rice is a staple food crop for more than half of the world's human population. Yield enhancement is the major objective in rice breeding programmes. One of the important agronomic problem in rice production in humid climates is pre-harvest sprouting. Genetic variation for tolerance to pre-harvest sprouting is associated with seed dormancy and the resistance to pre-harvest sprouting is correlated with the level of dormancy in dry and matured seeds. The experimental material consisted of 119 recombinant inbred lines derived from a cross between BPT 2231 (non dormant parent) and MTU 1001 (dormant parent). The experiment was conducted in simple lattice design with two replications at Agril. College Farm, Bapatla during *kharif*, 2018-19. The data was collected for 10 characters viz., days to 50% flowering, number of ear bearing tillers per plant, plant height, panicle length, test weight, grain yield per plant, germination (%) at 5 days after harvesting, germination (%) at 10 days after harvesting, free amino acids and total soluble sugars. The results of correlation coefficients revealed that grain yield per plant exhibited significant and positive relationship with test weight (0.138) while its association with total soluble sugars (0.201) is significant and negative. Studies on inter-character associations for yield components and dormancy related traits revealed that plant height manifested significant positive relationship with panicle length (0.4751 and 0.6475) and test weight (0.3517 and 0.3611) whereas total soluble sugars and free amino acids manifested positive and significant relationship with germination (%) at 5 days and 10 days after harvesting. Test weight, days to 50% flowering, plant height and panicle length also exhibited positive correlation coefficient indicating the true relationship and selection through these traits will be effective for improvement of grain yield per plant. The studies of path analysis revealed maximum direct effect for germination (%) at 10 days after harvesting followed by test weight. Results of the present investigation conducted on character association and path co-efficient analysis revealed the importance of test weight as selection criteria for effective yield improvement. The traits total soluble sugar significantly associated with germination percentage at 5 days after harvesting, 10 days after harvesting and free amino acids there by it inversely related to level of dormancy.

CHARACTERISTICS OF SOILS UNDER NAGPUR MANDARIN

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Abstract

The present investigation entitled "potassium fractionation of mandarin growing soil of Katol tahsil of Nagpur" was conducted on farmer's field at Katol tahsil, Dist. Nagpur during Kharif 2017-18. Seven locations viz., Niravha, Iratni, Botesari, Silli, Savangi, Salaidhaba and Baravha were selected to determine the different fractions of soil potassium and its correlation with soil properties. 35 surface soil samples (5 soil samples each from one location) were taken from 0-20 cm depth over the field of Nagpur mandarin orchards. The results revealed that soil reaction of study area exhibited slightly alkaline in nature. In all locations, there is no much variations in electrical conductivity of soil and these soils are non-saline in nature. The values of soil organic carbon found (4.0-8.9 g kg⁻¹) comes under low to moderately high content. Soils under study area were low to medium in available nitrogen and available phosphorus in soils found to be low to moderately high. All the soils of Katol tahsil were found high to very high in available potassium status. The DTPA extractable micronutrients soils (Zn, Fe, Cu and Mg) in



these were observed sufficient except Zn which was found deficit by 48.57 per cent among 35 surface soil samples. The data on exchangeable cations follow order of $\text{Ca}^{2+} > \text{Mg}^{2+} > \text{Na}^+ > \text{K}^+$, calcium is a dominant cation followed by Mg, Na and K on exchange complex in all the soils of orchards.

DIVERSITY OF GENUS *ATHYRIUM* ROTH IN JAMMU AND KASHMIR, INDIA

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Abstract

The genus *Athyrium* Roth, established by Albrecht Wilhelm Roth in 1799, is represented by 220 species in world. Most of the species are distributed in the Northern Hemisphere mainly in Eastern, South-eastern Asia, Himalaya and adjacent mountains. Few species are found in tropical and South Africa or in South America and very few are in Europe. Member of this genus are mainly distributed in the sub-temperate, temperate zone and understories of subtropical mountainous regions of world and prefer to grow in cool, humid, shady and semi sun exposed condition but it can be grown in exposed areas under moist and cool conditions. That's why the maximum diversity of *Athyrium* Roth is found in Himalayan region. Of these, 59 taxa (48 species, 1 subspecies and 10 hybrids) are known from India contributing ca 27% global diversity of genus *Athyrium*. Maximum diversity of this genus is recorded from North-eastern India (50 taxa) followed by Northern India (30 taxa), Southern India including Western Ghats and Peninsular India (10 taxa) and Central India (6 taxa). Jammu and Kashmir, located in the extreme north of India, The state shares the international boundary with Pakistan on west and China on north and east. On south the state is bounded by Himachal Pradesh and a small portion of Punjab. The major rivers of the state and their tributaries are: Indus, Jhelum, Chenab, Ravi, Tawi, Lidder, Kishanganga, Hunza, etc. Present study is based on extensive literature scrutiny as well as field survey and herbarium examination of the genus *Athyrium* Roth housed at different herbaria viz. CAL, BSD, DD, PAN, PUN, LWG, GUH, ALM etc. Present communication includes 9 species of genus *Athyrium* Roth reported from Jammu and Kashmir. Which share 15.25% of total species diversity of genus *Athyrium* Roth in India and 30% diversity of Northern India. Among these *Athyrium attenuatum* (Wall. ex C.B. Clarke) Tagawa, *A. mackinnoniorum* (C. Hope) C. Chr., *A. pectinatum* (Wall. ex Mett.) T. Moore, *A. strigillosum* (T. Moore ex E.J. Love) Salomon are common species of the area while *A. rubricaula* (Edgew. ex C.B. Clarke) Bir is rare species of the area.

GENETICS AND INHERITANCE STUDY OF STEM RUST RESISTANCE IN FOUR DURUM WHEAT CULTIVARS OF CENTRAL INDIA

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Abstract

Wheat stem rust (causal organism: *Puccinia graminis* f. sp. *tritici* - *Pgt*) is an important disease effecting wheat crop and causing significant yield losses. Use of host resistance is the most effective, economic and eco-friendly method of rust management in wheat. Effective deployment of host resistance requires knowledge about the genetic basis of resistance in the cultivars recommended for growing in an agro-ecological zone. Durum wheat (*Triticum turgidum* sp. *durum* L.) is the second most important wheat species, occupying nearly 10 % of the wheat area in India with 2.5 million tons of annual production and with tremendous export potential. Four popular durum wheat cultivars viz., HI 8498, HI 8663, HI 8713 and HI 8737 were studied for understanding the genetic basis of their resistance against the prevalent and durum-virulent *Pgt* pathotype (pt.) 15-1 (123G15) at the ICAR-IARI, Regional Station, Indore. These four cultivars were intercrossed in all possible combinations without reciprocals (RxR crosses) and also were crossed with two susceptible lines, namely, Malvi Local and Motiawhich were used as female parental lines (SxR crosses). The F₁, F₂ and F₃ populations were raised and the inheritance of seedling resistance against the *Pgt* pt. 15-1 was studied during 2016-19. The F₂ and F₃ segregation in SxR crosses showed that a single dominant gene conditioned resistance in each genotype. The F₂ populations derived from RxR crosses showed



segregation for susceptibility in all crosses except HI 8713/HI 8737, indicating the presence of a total of three diverse genes with at least one gene common among HI 8713 and HI 8737 conferring seedling resistance to *Pgt* pt. 15-1 among the four test cultivars.

INTEGRATED FARMING SYSTEM A PROMISING APPROACH FOR DOUBLING THE FARM INCOME

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Abstract

Integrated Farming Systems research was initiated at Rajendranagar, Telangana State during 2010-11 and a crop + horticulture + livestock model for irrigated dry situation of Southern Telangana Zone suitable for small and marginal farmers was developed. The model includes, Cropping systems viz., Rice-Maize, Rice-Castor, Bt Cotton+Greengram-Fodder Sorghum, Maize-Groundnut, Pigeonpea+Sweetcorn-Bajra, Pigeonpea+Maize-Sunhemp. Horticulture block, Napier/Lucerne fodder block. Livestock unit including residue recycling. In terms of CO₂ equivalence, a total emission of 1862.0 kg CO₂ was recorded from 9000 sq.m area (cropping systems and horticulture) of IFS unit. Inclusion of leguminous crops in the system resulted lower emissions than other cereal or millet crops. From the livestock unit due to enteric fermentation 3422.45 kg CO₂-e were recorded and maximum enteric emissions were observed in cow unit with 2 cows. Carbon crediting indicated that there was more of sink (8133.0 CO₂-e(kg)) through biomass production, agroforestry and soil organic carbon sequestration than the emissions (5284.45 CO₂-e (kg)) from crops, livestock and energy use etc. This higher sink is making the system carbon negative and environmentally safe.

MARKETING CHANNEL OF SOME IMPORTANT NTFPS IN SUNDERGARH DISTRICT OF ODISHA

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Abstract

The present study was carried out in Sundergarh forest division with 100 respondents who were randomly selected. The major findings of the study revealed that NTFP was collected by all households irrespective of income contribution. Proper marketing is a crucial element of non-timber forest product (NTFP) commerce. In the study area the respondent family ensued to collect almost 30 to 40 different NTFPs. However, only few of these contributed significantly to the total house hold income. In the study area, chara seeds and mahua flowers accounted around 60% of total annual NTFP income. It was found that, after chara and mahua flowers, the next important NTFP is salleaves which contributed 13% to the total income followed by kendu leaves (11%). Chara seeds provided good employment generation in the study area. The primary collectors collected the fruits in groups and use some part for home consumption. There were two marketing channel for chara (*Buchananianalan*) seeds i.e., (i) Primary collector home consumption and (ii) Primary collector panchayatoffice privatetraders (in side state) Big traders (Out side state). The different market channels for mahua flower (*Madhuca latifolia*) are : (i) Primary collector Local consumption, (ii) Primary Collector Intermediate Trader Whole Sellers Big Trader (Outsidestate), (iii) Primary Collector Intermediate Trader Big Trader (Inside state)?Commission Agent-Big Trader (Outside state) and (iv) Primary Collector Whole Sellers?Big Trader (Outside state). There were three different marketing channel or salleaves (*Shorea robusta*) in the study area. They were (i) Primary collector khaliagent contractual processors bigtrader consumer. (ii) Primary collector weekly/biweekly at-processors cumtrader bigtrader whole seller and (iii) Primary collector agent-contractual processor bigtrader-whole sellers-retailer-consumer. There were two ways of kendu leaves (*Diospyros melanoxylon*) disposal was observed i.e., (i) Primary collector-OFDC (Forest dept.) Trader-Bidifactories Whole seller Retailer Consumer and (ii) Primary collector?Plate making factories (blended with Sal leaves) Whole seller Retailer. The marketing channel-I of kendu leaf is presented as follows: The first channel is more efficient than other channels in the whole marketing of kendu. Market efficiency is more in first route (263.6%) and less in second route (204.9%). The challenges were well established market involving primary stake holders, information about market and price of the produce through SMS or



by different government institution, market functionaries may be proactive for timely disposal besides, value addition may be made to increase edurability and marketability.

EVALUATION OF INDIGENOUS VARIETIES OF GLADIOLUS UNDER PUNE CONDITIONS

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Abstract

The impetus to improvement of gladiolus in India resulted many varieties which were bred under Indian conditions. To evaluate these indigenously developed varieties an experiment was conducted with 34 gladiolus cultivars at the Research Farm of Directorate of Floricultural Research, Pune. These 34 indigenously developed genotypes were evaluated for morphological traits. Based on the evaluation for important commercial traits the cultivars Suchitra (113.37 cm), Arka Amar (110.73cm), Melody Open (105.50cm), Phule Ganesh (102.84cm) and Phule Neelrekha (102.54 cm) were found superior for spike length. Maximum rachis length was recorded in cultivars Melody Open (71.06 cm), Sweta (68.32 cm), Phule Ganesh (67.60 cm), Suchitra (65.92 cm), Phule Neelrekha (64.39 cm) and Pusa Kiran (62.22 cm). The maximum number of florets were recorded in cultivars Pusa Urmi (19.56), Pusa Suhagin (19.55), Subhangani (19.00), Suryakiran (18.56), Ps Hybrid 40 (18.22) and Phule Neelrekha (18.11). Based on evaluation for days required for spike initiation and first floret showing colour the varieties were classified into early mid and late groups. The varieties viz., Dhanwantari, Gulal, Pusa Shubham, Melody Open, Chandani, Punjab Glance, Arka Kesar, Punjab Down, Shobha, Arka Darshan and P.S. Hybrid were found to be in early group. These early, mid and late flowering varieties could be effectively utilized for crop planning and thereby profit can be maximized. Indigenous varieties with targeted effort towards making availability of quality planting material could help the small and marginal farmers in the region to improve their economic condition.

TO BRING AWARENESS ON THE RISKS OF CONVENTIONAL FARMING AND TO TRAIN SELECTED GROUPS OF FARMERS ON VERMICOMPOST PRODUCTS PRODUCTION TECHNIQUES IN ORDER TO ACHIEVE SUSTAINABILITY IN FOOD PRODUCTION

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Abstract

In the modern system of farming, it is increasingly felt that it is becoming unsustainable as evidenced by declining soil productivity and crop production, damage to environment and chemical contaminations. Organic farming is recognized as the best known alternative to the conventional agriculture. Farmers are aware of the use of vermicompost and the vermiwash for betterment of soil health and soil productivity. In many instances the procedures followed one not scientifically up to the mark. Attempts were made to create farmers awareness in the selected rural districts of Bengaluru. Regarding the benefits of the vermicompost products feedback from farmers was delightful and they were happy to adopt vermicompost technology. Many progressive farmers came forward to establish production units in their farm and were provided production procedure. Very purpose of the project is a lab to land programme to empower the rural population.

IMPROVING TERMINAL HEAT TOLERANCE AND LODGING RESISTANCE IN DROUGHT TOLERANT BREADWHEAT VARIETIES THROUGH INDUCED MUTATIONS

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Abstract

Wheat is one of the most important food crops of the world. In India, wheat is the second most important crop having highest cropped area ranging across different climatic conditions. It serves as the highest contributor to vegetarian protein in diet; and



having maximum trade compared to any other crop. In central India, wheat cultivation under limited irrigation conditions is more prone to early and terminal heat stress due to rising temperatures. Improved bread wheat varieties viz., HI 1500 (Amrita) and HI 1531 (Harshita) are prevailing varieties for cultivation under limited irrigation conditions with a yield potential of 25-40 q/ha. The grain quality and chapatti making traits are comparable to traditional sharbati wheat cultivars (C 306/Sujata) of Madhya Pradesh. However, these varieties are terminal heat sensitive and tend to lodge with additional irrigation or winter rains, due to their tall stature and medium late maturity. Therefore, there is an urgent need to improve these varieties for tolerance to terminal heat and lodging by reducing the plant height and growth period (inducing earliness) leading to enhanced yield potential while maintaining their rust resistance. As induced mutations are random in nature, they are useful in creating a good amount of variations rather rapidly, and hence add to resources for crop breeding and functional analysis. Thus, mutation breeding can be an appropriate tool for correcting in a relatively short period of time only a couple of aforesaid shortcomings in these varieties, while maintaining their basic genetic architecture intact. Better mutants can be directly used for variety release or the mutant allele may be transferred to other backgrounds, and then advanced for varietal release. By keeping these objectives, improvement of wheat varieties HI 1500 and HI 1531 was initiated. The seeds were subjected to various doses of gamma irradiation. These irradiated seeds were sown to raise mutant populations. Several of these mutants were identified to be having short plant type with reduced growth duration. These mutant plants need to be assessed for yield and other characters at multi locations. Thus, it can be concluded that mutation breeding could be effectively utilized to alter the plant traits in a relatively short time without much changing their basic genetic architecture.

MICRONUTRIENTS DEFICIENCIES THROUGH EDIBLE OIL AND MILK FORTIFICATION

Pragati

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Abstract

Vitamin and mineral deficiencies termed as silent epidemics affect people of all ages and gender but most specifically the vulnerable groups including children, women and elderly. In both developing and developed countries, micronutrient deficiencies affect an estimated 2 billion people leading to nutrition insecurity. India is home to 1/3rd of the estimated micronutrient deficient individuals globally. Around 330000 child deaths due to vitamin A are predicted each year in India and anaemia contributes to 22000 deaths with a high proportion being pregnant women. Two lakh infants are born with neural tube defects due to folic acid deficiency during pregnancy. The deficiency of vitamin A causes night blindness, wasting, anaemia, weakened immunity, reproductive morbidity and mortality. It is estimated that 761000 individuals are vitamin A deficient. Sub-clinical vitamin D deficiency is prevalent in both urban and rural population across socio-economic strata.

EVALUATION OF FUNGICIDES FOR THE MANAGEMENT OF RICE FALSE SMUT DISEASE CAUSED BY *USTILAGINOIDEA VIRENS*

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Abstract

False smut has gained importance as one of the important diseases of rice. The pathogen *Ustilaginoideavirens* converts individual grain into powdery mass and causes direct economic and yield loss. In addition, it produces two types of toxins known as Ustiloxins and Ustilaginoidins. The infection of the pathogen starts before the emergence of the panicle and application of fungicide after the appearance of the smut ball in the panicle is generally not very helpful for the management of the disease and it mainly depends on the prophylactic spray of effective fungicide. Though exact mode of infection of the pathogen not yet revealed, it is known that *U. virens* infect the spikelets in the booting stage. Based on this information, nine commercially available fungicides were evaluated at three AICRIP Plant Pathology centers against false smut viz., Ludhiana, Kaul and Titabar (hot spot locations) during the year 2016 and 2017. The spraying was done at booting stage and the number



of sprays was limited to 2 at 10 days interval. At Ludhiana and Kaul the trial was conducted under natural disease pressure and at Titabar the disease pressure was created artificially by spraying of chlamydospores collected from naturally occurring false smut balls. The fungicides viz., azoxystrobin 25 SC (1.0ml/l), difenoconazole 25 EC (1.0 ml/l), azoxystrobin 18.2 % + difenoconazole 11.4 % w/w SC (1.0 ml/l), metiram 55% + pyraclostrobin 5% WG (1.5 g/l), penicuron 22.9 % (1.25 ml/l), tebuconazole 250 EC (1.25 ml/l), thiafluzamide 24 % SC (1.0 ml/l), flusilazole 25%+ carbendazim 12.5% (1.0 ml/l) and propiconazole 25 EC (1.0 ml/l) were evaluated. Among them, two sprays of propiconazole 25 EC @ 1.0 ml/l at booting stage at 10 days interval significantly reduced the mean percentage of infected panicles into 8.39% (2016) and 6.65% (2017) compared to control treatment (33.68% in 2016 and 28.78% in 2017) in all the three locations. The overall mean yield increased from 4641 to 5770 kg/ha and 4826 to 5873kg/ha during the year 2016 and 2017, respectively.

A COMPARATIVE STUDY ON FEEDING OF TOTAL MIXED RATION VS CONVENTIONAL FEEDING ON MILK YIELD AND COMPOSITION IN CROSSBRED DAIRY CATTLE UNDER TROPICAL ENVIRONMENT

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Abstract

The present study was conducted to explore the effect of feeding total mixed ration (TMR) vs conventional feeding system on milk yield and milk composition in crossbred dairy cattle maintained at Livestock Research Station, Thiruvazhamkunnu, Palakkad, under Kerala Veterinary and Animal Sciences University. The farm is located at latitude, longitude and altitude of 11°21' N, 76°21' E and 60-70m above sea level and having a mean annual rainfall of 2,570 mm. The study was carried out using 40 crossbred dairy cattle maintained under uniform managerial practices except for feeding. The animals were grouped into two based on milk yield, parity and stage of lactation. One group was maintained on TMR feeding system (treatment group) and the other group on conventional feeding system as a control. After giving a adaptation period of one week the treatment group was fed with commercial TMR blocks based on hay along with 5 kg green fodder for next two weeks and the control group was fed with concentrate feed (type II) and green fodder separately (conventional feeding system). Daily milk yield was recorded and milk composition was determined at weekly interval. The average milk yield during the trial period was 9.21 ± 1.95 kg/day in the treatment group and 10.23 ± 1.99 kg/day in the control group which did not differ significantly. The control group had significantly higher milk yield when compared to the treatment group on the 7th day of trial period (10.65 ± 2.12 kg/day vs 9.18 ± 2.3 kg/day) whereas there was no significant difference among the both at the 14th day (9.48 ± 2.18 vs 8.83 ± 1.59 kg/day). The mean milk yield of the treatment group was significantly lower on the 7th day (9.18 ± 2.3 kg/day) and 14th day (8.83 ± 1.59 kg/day) when compared to the 1st day (9.90 ± 2.32 kg/day) of the trial. Milk composition viz fat, SNF, lactose & protein percent did not differ significantly among the groups on 7th and 14th of the trial.

EVALUATION OF DESI CHICKPEA (*CICER ARIETINUM* L.) GENOTYPES SUITABLE FOR MECHANICAL HARVESTING

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Abstract

Chickpea, one of the major pulses cultivated across countries in the world, is one of the important sources of vegetable protein to large masses of people both in India and around the world. Adoption of short duration, high-yielding varieties, which can escape terminal drought coupled with matching production and protection technologies have contributed to the success of chickpea cultivation in most of the states of India. But ever increasing pressure on labour demand and increased cost on hiring labours has made chickpea harvesting a challenging task. Hence, mechanization of chickpea harvesting is desired by the farmers for saving cost and time. Traditionally, chickpea cultivars have a short and bushy architecture which makes machine harvesting difficult and causes significant yield losses. Genotypes with upright and tall growth habit with fruiting zone starting



at about 30 cm from the ground are considered suitable for machine harvesting. Intensive breeding efforts to develop such genotypes at ICRISAT, Hyderabad has resulted into development of several genotypes suitable for mechanical harvesting. In the present study, such 18 genotypes developed at ICRISAT, Hyderabad were evaluated for yield and yield related traits along with two checks viz., NBeG 47 and BGD 103 at College of Agriculture, Vijayapur during *rabi*2018 to identify suitable genotype for the region. Among the test entries two genotypes viz., ICCV 181608 (1633.00kg/ha) and ICCV 181667 (1609.39kg/ha) were found to be significantly superior over both the checks, BGD103 (1085.48kg/ha) and NBeG47 (1029.74kg/ha). Genotypes ICCV 181604 (45.83cm), ICCV 181668 (49.17cm) and ICCV 181674 (46.67cm) were found to be on par with the check variety NBeG47 (52cm) for plant height. 100 seed weight is another important seed trait in chickpea. There were three entries viz., ICCV 181611 (34.18g), ICCV 181668 (35.55g) and ICCV 181674 (38.84g) found to be superior over check NBeG47 (31.03g) for 100 seed weight. Further, evaluation and selection of the high yielding genotypes will be continued to identify the superior genotype for mechanical harvesting to address the challenge of labour scarcity for chickpea harvesting.

EFFECTS OF CLIMATE CHANGE ON THE PESTS AND DISEASES OF SOYABEAN CROP

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Abstract

Soybean (*Glycine max* L.) also known as Golden bean and miracle crop of 20th century has great nutritive potentiality as it is very rich in proteins (40%). The low productivity of soybean both at national and state level is attributed to a biotic and abiotic stresses like drought, weeds, insect pests and diseases. Among these, insect pests often pose a serious threat to soybean production and increase the cost of cultivation and impair quality of produce in many ways. Several factors influence or affect the low productivity. Among them climatic conditions, systematic losses due to sudden rainfall pattern, outbreak of diseases and pests are important. It was seen that there were positive relationship between rainfall intensity and moth collections of *Spodopteralitura* and between morning relative humidity and collections of female alone or both sexes. Collection of males, females or both sexes had significant positive relationship with sunshine hour and significant negative relationship with wind velocity. Also in case of *Caliothrips indicus* ambient temperatures (32- 34 °C) and high RH favored increase in population whereas high temperatures and heavy rainfall decreased the pest population during kharif season. Similarly in case of diseases it was reported that the maximum germination of uredospores was observed at 25°C and at 100 per cent relative humidity. It is also reported that for the development of rust on soybean, six to eight days were required for the primary rust infection to become apparent at temperature between 19 to 30°C (optimum 25°C) and with high relative humidity (> 90%) in the early hours. Temperature below 19°C and above 32°C continuous rainy days, delayed the time required for rust development in the field. This paper will review the literature on how these pests and diseases are predicted to affect soybean crops under climate change models. In general, increased temperatures will increase the spread of pest and disease. Projected decreased rainfall may decrease the spread of pest and disease. However, these are complex issues which still require further study.

EFFECT OF MULCHING AND INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON GROWTH AND YIELD OF BT COTTON

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Abstract

A field experiment was conducted for two years during the rainy season of 2015-16 and 2016-17 at College farm, College of Agriculture, Rajendranagar, Professor Jayashankar Telangana State Agricultural University, Hyderabad in strip-plot design with three replications to study the effect of different land configurations (flat bed sowing, ridge and furrow, broad bed and furrow (BBF) and poly mulch on BBF) and integrated nutrient management treatments (Farmer's practice, 100% RDF of 150:60:60 NPK kg ha⁻¹, 125% RDF, 100% RDF along with 25% N through FYM or press mud) and their integration effect on



growth, yield attributes and productivity of Bt cotton. Pooled data of two years indicated that poly mulch on BBF increased the growth, yield attributes and yield (2183 kg ha^{-1}) followed by ridge and furrow method, BBF and flat bed methods. Among the INM practices, application of 100% RDF along with 25% RDN through press mud improved the growth, yield attributes and yield (2103 kg ha^{-1}). Application of 100% RDF along with press mud equivalent to 25% RDN was on par with 100% RDF + 25 % RDN through FYM (2042 kg ha^{-1}) and was in turn on par with 125% RDF (1990 kg ha^{-1}) followed by farmer's practice (1785 kg ha^{-1}) and 100% RDF (1676 kg ha^{-1}). Interaction between soil moisture conservation practices and integrated nutrient management practices was found to be significant. Treatment combination involving poly mulch on broad bed and application of 100% RDF along with 25% RDN through pressmud (2370 kg ha^{-1}) recorded significantly higher mean seed cotton yield and was comparable with poly mulch on broad bed with application of 100% RDF along with 25% RDN through FYM (2346 kg ha^{-1}) or 125% RDF.

STUDIES ON CORRELATION AND PATH COEFFICIENT ANALYSIS IN DOLICHOS BEAN (*LABLAB PURPUREUS* L. (SWEET)) GENOTYPES

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Abstract

Dolichos bean [*Lablab purpureus* L. (Sweet)] is consumed as vegetable in several parts of Asia including India due to its high nutritive value. The present study was carried out in Annamalai University with twenty genotypes of dolichos bean. Among the twenty genotypes of dolichos bean for thirteen yield and yield contributing characters, which are diverse in origin. Indolichos bean pod yield per plant showed positive and significant correlation with number of pod per plant, number racemes per plant, pod length, single pod weight and significant negative correlation with days to first flowering, days to 50% flowering and days to first pod harvest at both phenotypic and genotypic levels. Path analysis revealed that number of pod per plant exhibited high positive direct on pod yield per plant followed by single pod weight at both levels of significance, day to 50% flowering showed moderate positive direct effect on pod yield per plant. The direct negative effects on pod yield were observed by number of racemes per plant, pod length, pod width and protein content.

SUPER ABSORBENT POLYMER AND PLANT BIO-REGULATORS : ALTERNATIVE OPTIONS OF DROUGHT MITIGATION IN RAPESEED-MUSTARD

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Abstract

Rapeseed-mustard is one of the important oilseeds crop of the India and it contributing immensely in meeting the edible oil requirements of the country. However, its productivity is greatly hampered frequently due to deficit moisture stress at reproductive stages. Further, climate change has increased the possibility and intensity of drought in the near future. Therefore, development of drought mitigation strategies is need of the hour to enhance the water productivity and minimize the yield losses of the mustard. To address this problem, a field experiment was conducted with mustard crop at ICAR-Directorate of Rapeseed-Mustard Research, Bharatpur during *rabi* season of 2018-19. The experiment was laid down in factorial-RBD with twelve treatment combinations of plant bio-regulators (PBRs; salicylic acid, SA; thiourea, TU; potassium nitrate, PN) and super absorbent polymer-hydrogel (SAP) under no moisture stress and deficit moisture stress conditions with three replications. The values of growth and yield parameters were reduced due to deficit moisture stress but these were improved with the use of SAP either alone or in combinations with PBRs. Averaged across the treatments, the seed, stover and biological yields were significantly decreased by 11, 7 and 8 %, respectively due to deficit moisture stress over no moisture stress condition. However, the maximum values of the seed, stover and biological yields and harvest index of the mustard were recorded with SAP+SA followed by SAP+TU, SAP+PN and SAP whereas the lowest values of these parameters were recorded with control (without SAP and PBRs). Seed and biological yields with SAP+SA were found on par with other PBRs but significantly improved by 9 and 5 % over SAP alone and by 25 and 18 % over the control, respectively. Similarly, deficit moisture stress at reproductive stage has resulted in significantly lower oil yield than the no moisture stress condition.



However, oil yield with the use of SAP along with PBRs was significantly improved by 20–30 % over the control. Thus, the use of SAP in combinations with PBRs was found beneficial in improving the seed and oil yields of the mustard and these molecules could be alternative options for mitigating the adverse impact of drought in the rainfed ecologies.

VARIABILITY STUDIES IN PROVENANCE OF JAMUN (*SYZYGium CUMINI* SKEELS) FOR CHARACTERIZATION OF FRUIT MORPHOLOGICAL TRAITS AND SEED GERMINATION IN NORTHERN TRANSITION ZONE OF KARNATAKA

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Abstract

A survey was carried out during 2018 in Northern Transition Zone of Karnataka, University of Agricultural Sciences, Dharwad to identify elite seed source of jamun. Morphological qualitative, quantitative characteristics and Seed germination attributes of Ten provenance were studied in completely randomized design with three replications. The study revealed that there was a wide variation among the provenance. The fruit length (21.75 mm and 21.26 mm), fruit width (14.9 mm and 14.79 mm), fruit test weight (395.25g and 370.71g) were, found highest in Dharwad followed by Belagavi seed source respectively. However, Seed length (15.75 mm and 14.10 mm), seed width (8.72mm and 8.12mm) and test weight (54.5g and 53.25g) were observed highest in Dharwad and Belagavi seed source, which were found to be superior from rest of the seed sources. Significantly, higher germination was recorded in Dharwad and Belagavi (91.25 % and 90.66 % respectively) and lower in Haveri and (69.33 %) seed sources. Dharwad was the most promising provenance among the other seed source.

GLOBAL CLIMATE CHANGE : SCENARIO AND FOOD SECURITY

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Abstract

Global climate change, judging from the debate on the subject, is one of the major concerns of the world today. However, the concern of those closely following the debate is that it has created more panic than concrete strategies to abate and adapt to the global change. It will have an impact on human health, livelihood assets, food production and distribution channels, as well as changing purchasing power and market flows. Great progress has been made in addressing global under nutrition over the past several decades, in part because of large increases in food production from agricultural expansion and intensification. Food systems, however, face continued increases in demand and growing environmental pressures. Most prominently, human-caused climate change will influence the quality and quantity of food we produce and our ability to distribute it equitably. Our capacity to ensure food security and nutritional adequacy in the face of rapidly changing biophysical conditions will be a major determinant of the next century's global burden of disease.

IN SILICO ANALYSIS OF EARLY GENES OF FLAVONOID BIOSYNTHESIS IN *PHYLLANTHUS EMBLICA* L.

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Abstract

Chalcone synthase (CHS) and chalcone isomerase (CHI) are key enzymes in flavonoid biosynthetic pathway. In this study, we made extensive sequence to structure based bioinformatics study to gain functional and structural insight into PeCHS and PeCHI genes. The phylogenetic distribution of PeCHS and PeCHI genes encoding proteins demonstrated the close evolutionary relationship with different CHS and CHI proteins in other plants. MicroRNA target analysis revealed that PeCHS gene targeted by miR169n-3p, and miR5053, while PeCHI gene targeted by miR169c-3p and miR4248a. We inferred the three-dimensional structural models of PeCHS and PeCHI proteins using homology modeling and further evaluated those



protein models using Ramachandran plots. Further, evaluated structural models of PeCHS and PeCHI proteins were docked with Cinnamoyl-coa and Naringenin chalcone substrates, respectively. Moreover, docking complexes of proteins and ligands were yielding refined to check the stability of ligands in the binding pocket and behavior of protein complexes during simulation by using molecular dynamics simulations.

FORTIFIED DEFATTED SOYA FLOUR AND SKIMMED MILK POWDER PAPAYA GUAVA FRUIT BAR : A NOVEL INTERVENTION TO COMBAT MALNUTRITION

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Abstract

In recent years, consumers have become more health conscious in their food choices but have less time to prepare healthy meals. The fruits which normally lack protein and fat can be fortified with protein enriched products viz., soya bean powder or skimmed milk powder. Supplementing the value added papaya fruit bar to preschool children and adolescents will be a promising effort to reduce malnutrition. aim of enhancing the protein content of papaya-guava fruit bar and increasing its nutritional quality by fortifying with defatted soya flour and skimmed milk powder. Different fortified fruit bars contain Total Soluble Solids ranged from 77.45 to 79.24 °Brix, moisture content from 14.92 to 15.01 percent, pH from 3.38 to 3.87, titrable acidity from 0.80 to 0.98 per cent, reducing sugars from 36.59 to 48.94 per cent, total sugars from 61.15 to 74.45 per cent, ascorbic acid from 81.70 to 133.70 mg/100g, total carotenoids from 849 to 1340 µg/100g and protein content from 0.69 to 2.10 per cent. However, on the basis of sensory evaluation, the treatment seven (60% papaya pulp + 40% guava pulp (Allahabad Safeda) + 6% skimmed milk powder (T₇) found to be the best with maximum score for colour and appearance, flavour, texture, taste and overall acceptability among all treatments at zero as well as 30, 60 days of storage. The microbial analysis of fruit bars with fortified with defatted soya flour and skimmed milk powder revealed that there were no detectable yeast and mould at zero days and negligible at 30 and 60 days of storage indicates, that the product was safe for consumption.

DIVERSITY STUDIES FOR YIELD AND ITS COMPONENT TRAITS IN LENTIL (*LENS CULINARIS* MEDIK.) ON THE BASIS OF MORPHOLOGICAL AND MOLECULAR TRAITS

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Abstract

The present investigation was carried out on thirty six lentil genotypes procured from NBPGR, New Delhi, IIPR, Kanpur, locally adapted genotypes from different districts of Bihar and ICARDA, Lebanon at Model Vitti farm of Bihar Agricultural University, Sabour, Bhagalpur in rabi season 2018-19. The genetic divergences were estimated through Malalanobis D² statistics with molecular divergence study with SSR markers under normal sown condition. The presence of variation among genotypes was revealed by ANOVA for considerable traits which come out as significant for all traits under study except number of primary branches per plant, number of pods per cluster and number of seeds per pod. The study on genotypic diversity revealed the grouping of total genotypes into seven clusters under timely sown condition viz. Cluster I being the largest comprising 10 genotypes, followed by cluster II with 8 genotypes, cluster III with 7 genotypes, cluster IV had 6 genotypes, cluster V with 3 genotypes and lastly, cluster VI and cluster VII were monogenic. 100 seed weight contributed maximum towards genetic divergence followed by grain yield per plant and number of pods per plant which can be integrated in enhancement of productivity of lentil. Owing to the results of inter-cluster distance and mean performance of clusters for different traits, the genotypes viz. FLIP 2010-86L and X2011S-172-1 under timely sown condition are expected to trigger the heterotic combination and obtain the desirable segregants for yield and its determinants. Molecular genetic diversity through 20 SSR markers also exhibited maximum diversity between them. The result revealed diversified lentil genotypes which can be utilized in further crossing programme for exploring choke-full yield potential in lentil.



EVALUATION OF SOME POTENTIAL RICE VARIETIES OF CHHATTISGARH FOR PUFFING AND FLAKING

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Abstract

Numerous varieties of paddy are grown in the different parts of the state comprising of bold, long, cylinder, fine, and scented etc. Many varieties are best suited for raw milling whereas many are suitable for parboiling to produce rice for table purpose with direct cooking. On the other hand, many of the varieties are better suited for the production of rice value added products such as flaked rice (Poha or Chiwda), puffed rice (Muri or Murra or Murmura). The moisture content of paddy varieties varied from 11.38 to 11.99 % (wb). Average length, width, thickness, geometric mean diameter, aspect ratio, porosity, true density, bulk density and coefficient of friction were measured. All varieties had different dimensions, the length of Mahamaya, Rajeshwari and Dokra Mecha varied from 8.41 to 10.45, 8.05 to 11.15 and 10.87 to 13.20 mm, width varied from 2.08 to 3.29, 2.09 to 3.18, and 2.27 to 3.83 mm and thickness varied from 1.85 to 2.93, 1.88 to 3.26 and 1.49 to 3.21 mm. After processing of paddy it was found that the yield of flakes of Mahamaya, Rajeshwari and Dokra Mecha were 64.6, 68.5 and 62.9 % respectively. After processing to puffed rice found that yield of puffing was more in Mahamaya variety at temp. 310°C, 290°C and 270°C it was 79.56, 75.95 and 70.9 % and in Rajeshwari variety it was 75.25, 71.24 and 55.26 % respectively. Length, width and volume were increased after processing to puffed rice and found more expansion in Mahamaya variety. Finally observed that Rajeshwari and Mahamaya varieties were more suitable for flaking and puffing.

FOLIAR APPLICATION OF OSMO PROTECTANT ON MORPHO-PHYSIOLOGICAL PARAMETERS FOR ENHANCING THE PRODUCTIVITY IN COTTON

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Abstract

The role of different osmo protectants in plant tolerance to drought stress is significant because they regulate multitude of metabolic processes. The present study was therefore conducted to investigate the influence of foliar application of different potential osmoprotectants, on morpho-Physiological parameters for enhancing the productivity in Cotton under stress and unstress condition. The experiment consisted of eight treatments applied under both the conditions which are 2% urea, 2% KNO₃, 1% Thiourea, Salicylic acid@50ppm, Glycine Betaine @ 100ppm, salicylic acid @100ppm and PPFM 1%. Among all the treatments foliar application of KNO₃ at weekly interval of four sprays after 50% flowering recorded significantly highest plant height, monopodial, sympodial, no of bolls per plant, total dry matter production and boll weight per plant under stress condition as compared to unstress. Also 2% KNO₃ application recorded highest seed cotton yield (1970.3 Kg/ha) under stress condition as compared to other treatments and unstress (1558.1 Kg/ha) and it was on par with Glycine Betaine @100ppm single spray at 50%flowering (1838.7 Kg/ha) under stress condition.

DROUGHT TOLERANCE INDICES FOR SELECTION OF DROUGHT TOLERANT, HIGH YIELDING RICE GENOTYPES FOR RAINFED UPLAND ECOSYSTEM OF UTTARAKHAND HILLS

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Abstract

In rainfed upland rice ecosystem, drought is the most severe abiotic stress reducing grain yield therefore, identification of suitable genotypes for drought tolerance is one of the major research priority area under this ecosystem. Forty eight rainfed upland genotypes were evaluated under drought stress at reproductive stage and non-stress (irrigated) conditions during kharif 2017 to identify drought tolerant genotypes. Different drought tolerance indices viz., drought tolerance efficiency (DTE),



mean productivity index (MPI), Relative efficiency (REI), mean relative performance (MRP), stress tolerance index (STI), drought yield index (DYI), stress tolerance (TOL), stress susceptibility index (SSI) and Schneider's stress susceptibility index (SSSI) were used for screening of the genotypes. The reduction in grain yield was observed in all the genotypes grown under drought stress condition and the per cent reduction in grain yield between stress and non-stress trial varies from 23.62% to 67.69%. DTE varied 32.31-76.38%, MPI value varied between 1792-2656, REI ranged between 0.52-1.48, MRP ranged 1.49-2.44, STI varied between 0.28-0.79, DYI ranged between 1.31-3.10, TOL value varied 625-1833, SSI ranged 0.51-1.45 and SSSI ranged between -0.23 to 0.21. The highest value of DTE was recorded in VL 20541 (76.38%) whereas VL 20441 showed highest value for MPI (2656), REI (1.478), MRP (2.44) and STI (0.79). The lowest value of DYI (1.31), TOL (625), SSI (0.51) and SSSI (-0.23) was observed in VL 20541. Highest value for DTE, MPI, REI, MRP, STI and lowest value for DYI, TOL, SSI, SSSI are preferred and desirable as it indicate drought tolerance. Based on drought tolerance indices genotypes VL 20541 and VL 20441 were identified as drought tolerant genotypes.

PERFORMANCE OF FRUIT BASED AGRISILVIHORTICULTURAL SYSTEMS IN RAINFED UPLAND OF ODISHA

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Abstract

Introduction of fruit trees into agroforestry system proves remunerative to the farmers which in turn impart stability to their income. Farmers have natural preference for horticulture based agroforestry system in rainfed areas. Similar interest is also shown for the fast growing timber trees for higher return in short time. There is significant increase in fruit growing areas in Odisha state in past few years. Mango is the most predominant commercial fruit crop species followed by cashew nut. In the past few years jackfruit which was not considered as an economically important fruit crop is gaining popularity for its use in culinary purpose rather than table purpose. Fruit trees being income generating its inclusion with timber trees and field crops provide remunerative agroforestry systems for the rainfed uplands. Inclusion of Eucalyptus hybrid as a filler crop which is a fast growing species which can be harvested before the fruit crop attains full bearing stage. This experiment was conducted during 2017 in a randomized block design (RBD) with three replications. The system consists of three year old fruit trees species such as Mango (*Mangifera indica*), Jackfruit (*Artocarpus heterophyllus*), Cashew (*Anacardium occidentale*) planted at a spacing of 15m × 7.5m with Eucalyptus hybrid as filler crop planted in between two fruit trees in east west direction with four leguminous intercrops i.e., arhar, groundnut, blackgram and cowpea which were grown in the kharif season in rainfed condition to increase the productivity of the system and improve the soil health in the initial years. Among four intercrops arhar was the best suitable crop with net returns of Rs. 36,920, Rs 32,920 and Rs 18,520 ha⁻¹year⁻¹ when intercropped with mango + eucalyptus, jackfruit + eucalyptus and cashew + eucalyptus having B:C ratios of 2.48, 2.32 and 1.74, respectively.

SCREENING OF FUNGAL AND BACTERIAL ENDOPHYTES : AS POTENTIAL BIOCONTROL AGENTS AGAINST MAJOR SOYBEAN DISEASES OF INDIA

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Abstract

The soybean is a crop of economic importance and has a great number of potential diseases which cause significant economic losses. For management of soybean major diseases such as anthracnose, charcoal rot and *Rhizoctonia* aerial blight soybean endophytes was isolated from different variety i.e., JS 335, JS 9560, JS 2098, JS 9752 and MAUS 732. Soybean endophytes was isolated in flowering initiation stage from different parts of plant such as leaves, stems and roots, after immediately after complete seed formation soybean endophytes was isolated from seed also. Maximum 10 isolates were obtained from JS 335 and JS 20-98. Maximum 20 isolates were obtained from stem while 14 isolates were obtained from leaves and 9 isolates were obtained from root. 4 isolates was isolated from seeds of JS 335, JS 95-60 and JS 97-52. A total of 47 fungal morphospecies were obtained corresponding to 21 taxa that were identified through morphologically, where as 23 bacterial morpho species identified to 13 different taxa. *In vitro* evaluation of 37 fungal isolates and 13 bacterial endophytes was performed against *M.*



phaseolina, *C. truncatum* and *R. solani*. Out of 47 fungal isolates 10 isolates found most effective against all there pathogen with inhibition percentage more than 50 % and Out of 13 bacterial endophytes 5 bacterial endophytes identified as effective against all there pathogen with inhibition percentage more than 50 %. *Paenibacillus-polymyxa* found most effective ndophytes with 60.71% inhibition of *M. phaseolina*, 85.96 % inhibition of *C. truncatum* and 74.19 % inhibition of *R. solani*.

EFFECTS OF NORETHINDRONE ON MASCULINIZATION OF SIAMESE FIGHTING FISH, *BETTA SPLENDENS*

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Abstract

The present study was conducted to examine the effect of norethindrone (a steroid) on masculinization of Siamese fighting fish. In this investigation, different doses of norethindrone at 25, 50, 75 and 100 ppm (mg/kg feed) were incorporated into diet and fed for periods of 30 and 50 days. The oral administration of norethindrone for 30 and 50 days did not have any significant effect on the sex ratio. The norethindrone treatment produced a maximum of 50% male population at doses of 25 and 100 ppm for 30 days and 25 ppm for 50 days. The males from norethindrone treated groups when mated with normal females, produced 50, 59.10 and 58.34% females, indicating that the sex ratio was not significantly ($P < 0.05$) different in each of the progenies. Norethindrone treatments showed slightly suppressed ovarian development. On the other hand there were no significance differences in the testicular development among the treated groups of *B. splendens*.

EXPORT POTENTIAL OF INDIAN AGRICULTURAL COMMODITIES

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Abstract

Growth of a Nation economy depends on its export potential. More exports mean more foreign exchange and it leads to more purchasing capacity of a nation in the international market. India is emerged as leading exporter of agricultural commodities with exports increased from over \$5 billion in 2003 to more than \$39 billion in 2013. According to Annual Report 2017-18, Ministry of Agriculture, Agricultural exports in India was increased from Rs. 2,27,193 crores in 2012-13 to Rs. 2,27,554 crore in 2016-17 financial year showing a growth of nearly 0.15%. Increase in the agricultural exports value in year 2016-17 was primarily due to higher exports of basmati rice, spices, non-basmati rice, raw cotton, sugar etc. The share of agricultural commodities exports in India's total exports decreased from 13.90% in year 2012-13 to 12.27% in year 2016-17. So it is important to identify the export potential of agriculture commodities to develop clusters and to create value chains for these commodities. Keeping this in view a study was conducted to identify the export trend of different agricultural commodities and constraints faced by the exporting farmers. Structured schedule, group discussion, online questionnaire and case study methods were used for collecting primary data and secondary data was collected by qualitative and quantitative data, documents, records and information available in public domain and. Top ten exporting agricultural commodities; Basmati rice, Maize and Non-Basmati Rice, Bananas, Mango and Grapes, Onion, Groundnut, Coffee and Cashew are selected on the bases of last five-year data. It was found that if we compare the last decade data than the export quantity and value of these commodities were increased but there was fluctuation in between due to drop in price and production constraints. It was also found that 48.5 percent farmers reported that complex, rigid and lengthy procedure of bank finance are the major situational constraint faced by them followed by the quantity of credit is inadequate (40%) and less guidance on credit availability. High marketing commission is major marketing constraint (62.85%) followed by lack of information on export procedure (50%) and low prices of the produce in the market (50%) and lack of the refrigerated vans (65.71%) is the major logistic constraint faced by the exporting farmers in India. So attention should be given on increasing productivity and improving extension services, and also on increasing advocacy efforts through various channels to involve farmers into the value chain and export of agricultural commodities. Commodity specific groups of farmers should be formed for the quality and quantity production of crops which can be exported to international markets. Government should support to these institutions through development of various focused export schemes.



E-COMMERCE IN AGRI-FOOD SECTOR : EMERGING APPROACHES AND OPPORTUNITIES

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Abstract

Agriculture in India is one of the largest sources of livelihood of its population and touches almost every sphere of economic activity. Around 58 % population of India depends on Agriculture. Average growth rate for the agriculture and allied sectors is estimated to be 4.1 per cent for 2016-17. 140.7 million hectare area is available for major agricultural products include sown- rice, wheat, oilseed, cotton, jute, tea. However there are many issues hurdling the Agriculture sector such as declining production and productivity, fragmented land holding, irrigation problems, sustainability problems, inadequate investment in irrigational and agricultural infrastructure in India, non- availability of fair prices to farmers for their crops as well as over dependence on traditional crops. Agricultural markets are characterized by poor competitiveness, fragmentation, inefficiency, presence of executive middlemen and frequent price manipulations. To overcome these defects new techniques and trends should be adopted, one of which is E-Commerce/ E-Agribusiness. Agri-marketing can benefit immensely from e-commerce both in B2B and B2C markets. This paper discusses the major initiatives playing important role in information dissemination, providing market intelligence, input supply, supply chain management and trading platforms. In this paper emphasis is placed on the potential role of e-Commerce in the agribusiness sector.

STUDIES ON SEED TRANSMISSIBLE NATURE OF URDBEAN LEAF CRINKLE DISEASE IN URDBEAN

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Abstract

Urdbean leaf crinkle disease caused by Urdbean leaf crinkle virus (ULCV) is an economically significant, widespread and devastating disease the virus is carried internally through seed. In fact, infected seed plays an important role in transmission of the virus to the next generation of the crop. During present studies, the seed transmissible nature of ULCV was investigated. The seed was collected from virus infected plants from various locations. Prior to this, during crop growth period, the plants showing typical symptoms of ULCV were tagged. Pods from such virus infected plants were harvested separately. In all, seed from eight different geographic locations and various cultivars was collected. The seed such obtained from the virus infected plants was sown under glasshouse conditions in earthen pots under insect proof conditions. It was observed that seed germination was not affected and more than 83 per cent germination was recorded in all the samples. The plants were observed for virus symptoms up to 45 days after germination and percentage of infected plants in each seed sample was worked out. The per cent disease incidence ranged between 40 to 54. This clearly indicated that the virus was transmitted from infected seed to the next generation and thus seed plays a vital role in transmission of the virus.

SIGNIFICANCE OF INTELLECTUAL PROPERTY RIGHTS IN INDIAN AGRICULTURE

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Abstract

Intellectual Property Rights (IPRS) can be broadly defined as legal right established over creative or inventive ideas. Such legal right generally allows right holders to exclude the unauthorized commercial use of their inventions by third persons. (8 July 9, 1998 By ICAR). The intellectual property rights (IPRs) were essentially recognized and accepted all over the world due to reasons like to provide incentives to the individual for new creations, providing property, ensuring the availability of the



genuine and original products. Since, India is one of the fastest developing economies and is having diversified Industrial background with suitable economic development mantra. The intellectual property rights broadly divided into two groups, viz, primary rights and Sui-generics. Primary Right include copyrights, Patents, Trademarks, Industrial designs rights, utility models, geographical indication, trade secret, related right, trade name and domain name. Sui-generis rights includes, viz., database rights, mark work, moral rights, supplementary protection certificate, plant breeder rights and traditional knowledge.

DECADAL GROWTH PATTERN OF FOOD GRAINS PRODUCTION IN THE STATES OF NORTH EASTERN REGION OF INDIA

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Abstract

This paper investigates the temporal variations in area, production and yield of food grains in the states of north eastern India. The study period was from 1966-67 to 2014-15 and it has been divided into five periods: 1966-67 to 1974-75, 1975-76 to 1984-85, 1985-86 to 1994-95, 1995-96 to 2004-05 and 2005-06 to 2014-15 to have an understanding of decadal performance among the states. Growth rate performance of the period 2005-06 to 2014-15 may be regarded as the best among the five study periods. The comparison of production growth rates in all the periods reveals that Nagaland exhibits better performance followed by Arunachal Pradesh while states like Mizoram and Sikkim are running behind. Growth performance of Nagaland has shown even better than that of north east total and national average. The decomposition analysis reveals that sources of output growth in the states of the region are due to yield improvements (56%) followed by area expansion (44%). Variance analysis depicts that yield varies slowly over each study period with a large variability among the states suggesting the identifiable state specific factors. Study shows in 2005-06 to 2014-15 the average yield of an individual state over the years ranges between 284.6 (Mizoram in 2008) to 2782.9 (Tripura in 2015) and varies by 1303.4 across the states (between variation), but varies by 287.2 for each individual state over time (within variation). Similar pattern has been observed in rest of the periods as well as in the entire period. Over the north eastern region, area, production and productivity of food grains have shown a steady upward trend in every period of the study. Despite of a positive growth in rice production during the last decade, north east region still has a deficit of 836 thousand tons of food grains against the requirement of the last census year during which only Arunachal Pradesh, Manipur, Nagaland, Sikkim and Tripura have shown sufficiency while other three states have witnessed deficiency in food grains requirement. Considering that food grains are irreplaceable staple of the region and states like Mizoram and Sikkim showing decreasing growth rates in area under food grains during the last decade, the scope of meeting the food grains requirement of the region depend highly on productivity improvement.

EVALUATION OF ICAR-CRIJAF DEVELOPED MICROBIAL RETTING INTERVENTION IN JUTE THROUGH PARTICIPATORY APPROACHES

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Abstract

In West Bengal, jute growers are forced to ret their jute in muddy water leading to the inferior quality jute fibre and less net income. In recent years, it has been found that due to lack of sufficient rainfall during the retting period particularly non-availability of suitable water resources for retting process and lack of clean water in particular. So, there was an urgent need to develop improved methods of retting which - require less amount of water, lesser time than conventional method, improvement in fibre quality, and above all user-friendly and eco-friendly in nature. ICAR-CRIJAF had been working on this aspect and came out with three improved retting interventions known as "Mechano-microbial retting, In situ retting method and microbial formulation mediate retting. Since last four years the focus has been mainly on the use of microbial formulation (powdery form) for retting even in the scarce/stagnant water conditions. The demonstration on improved retting through CRIJAF SONA have been conducted through the extension centres as well as through other collaborative programmes in major jute growing districts of West Bengal and in other jute growing states. Farmers' feedback with respect to



the performance of the new technology were collected through participatory approach for assessment of this intervention. It was done by responses collected through interview schedule w.r.t. the potential as well as direct advantage of this technological intervention. Majority of the farmers (73%) were very much satisfied with the result of CRIJAF SONA as it has reduced the retting duration period (18–21 days to 11–13 days) and improved the fibre quality and grade which gave them a substantial profit.

SPECTRUM OF BIOEFFICACY OF ENTOMOPATHOGENIC FUNGI AND CHEMICAL INSECTICIDES FOR MANAGEMENT OF WHITEFLY *BEMISIA TABACI* GENNADIUS (HEMIPTERA: ALEYRODIDAE) IN COTTON

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Abstract

Ever-rising incidence of whitefly *Bemisia tabaci* in cotton and increasing dependence on chemical insecticides for its management has resulted in enormous research thrust for reducing chemical pesticide uses through innovative and environmentally safe biocontrol approaches. The comparative bioefficacy potential of seventeen entomopathogenic fungi, chemical insecticides and commercial biopesticides was evaluated against *B. tabaci* on Bt cotton under polyhouse and field conditions. The Abbott's corrected nymphal mortality was recorded on randomly selected plants in each pot and field plot at pretreatment, 3-, 5- and 7-days post spray treatment. The bioefficacy index was calculated to select most virulent EPFs for field study. The significantly higher nymphal mortality at 7-days post spray was recorded with *Metarhizium anisopliae*-1299 (86.7%) followed by *Beauveria bassiana* - 4511 (85.1%), *Cordyceps javanica*-099 (81.1%), *C. javanica*-102 (81%) and *B. bassiana*-409 (78.2%) than other EPFs, spiromesifen (69.6%), buprofezin (62.2%) and pyriproxyfen (52.7%). However, among all the EPFs the highest overall bioefficacy index was recorded with *C. javanica*-102 (77) followed by *C. javanica*-089 (75.4), *Fusarium moniliforme*-083 (74.6) and *B. bassiana* -4511 (73.1). The pooled data of field trials (2017-18 and 2018-19) revealed that the highest nymphal mortality was recorded with *B. bassiana*-4511 (85.0%) followed by *C. javanica*-102 (83.2%) and pyriproxyfen 10% EC (78.6%) at 7-days post inoculation. Hence, a sequential spray with these EPFs can be used as an IPM component to manage *B. tabaci* nymphal population in an ecologically acceptable manner under field conditions.

EFFECT OF DIFFERENT DOSES OF PHOSPHORUS FERTILIZER AND MICROBIAL CULTURE ON YIELD AND ECONOMICS OF *RABI* GROUNDNUT IN EAST AND SOUTH EASTERN COASTAL PLAIN OF ODISHA

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Abstract

Groundnut is an important oil seed crop of India which is cultivated in nearly 6 million ha area with the production of 7.5 million tones and average productivity of 1.27 t/ha. Though India ranks first in the world under groundnut area and there is need to import 8.03 million tones of edible oil. In Odisha, Groundnut is cultivated in 2.83 l ha area, mostly as a *rabi* crop. Yield of groundnut is always unpredictable for the major producers the average is not only low (t/ ha) but very variable because of about 80 % of the world production comes from rainfed areas. Although legumes can fix their own nitrogen, they often need phosphorus and potassium for good seed formation. Phosphorus known to plays important role in increasing root growth, nodulation, nutrient and water use efficiency and also in enhancing yield. Due to the importance of phosphorus in the physiology of groundnut, application of phosphorus to soil deficient in the nutrient leads to increase groundnut yield. Therefore this study was planned to examine effect of different doses of phosphorus use along with microbial culture in groundnut production by exploiting phosphorus build up in soil and its effect on yield and other yield attributing traits. Phosphorus deficiency is known to reduce flower production, size of pods and adversely affect the formation of root nodules.



This has been shown to improve the effective utilization of soil nutrients by the crop and greater biological N fixation through enhancement in nitrogenase activity.

PRINCIPLES OF COMMON BUCKWHEAT PRODUCTION AND STILL VALUABLE CROP FOR NORTHERN HILLS ZONE OF CHHATTISGARH

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Abstract

The buckwheat *Fagopyrum esculentum* Moench. (family-Polygonaceae) is a fast growing plant with a excellent nutritional value. Buckwheat is a multipurpose crop. The common name of Buckwheat is Tau (Chhattisgarh), Buckwheat is grown globally but Russia is the largest producer and China is the second largest producer whereas India constitutes few percent of total world production. Estimated production under area of buckwheat in northern hills approximate 5514 ha. In Chhattisgarh the crop is being cultivated in the hills particularly in Mainpat of Sarguja district. The crop is being also cultivated in the Sannapat in Jashpur district and Samripat in Balrampur District. In Mainpat Refugee from Tibbat started cultivation of Tau (buckwheat) since 1965. Now, local farmers of Mainpat are also cultivating this crop during Sep-Nov as pre rabi crop. The tender shoots are used as leafy vegetable, the flowers and green leaves are used for extraction of rutin used in medicine and the flower produces honey of good quality. Buckwheat grain is used primarily for human consumption but also for livestock feed. Its usages as a green fodder, green manure and bee pasture are also worth mentioning. Because of its rapid growth buckwheat can be grown as a second crop as well. Buckwheat constitutes a multifeed-use pseudo cereal with nutritional benefits consisting in the absence of gluten in the flour, the richness in water soluble fibres, high quality proteins, unsaturated fatty acids, and appreciable mineral and vitamin content. The anti-oxidative action of buckwheat as a result of the presence of rutin and other phenolic substances is exploited by the pharmaceutical industry as well as good for increasing soil organic matter content and improving soil structure.

PHOTOSYNTHETIC RESPONSES OF WHEAT GENOTYPES TO EXOGENOUS APPLICATION OF SALICYLIC ACID UNDER HIGH TEMPERATURE STRESS

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Abstract

Wheat (*Triticum aestivum* L.) is very sensitive to high temperature and experiences heat stress to varying degrees at different phenological stages, but heat stress during the reproductive phase is more detrimental than during the vegetative phase. Yield reduction in wheat under high temperature stress is caused by hastened phasic development, decrease in photosynthesis and photosynthetic pigments, decrease in membrane stability, fast senescence, enhanced respiration and inhibition of starch deposit in emergent kernels. Salicylic acid (SA) is a natural phenolic compound and acts as an endogenous signal molecule that plays a crucial task in the regulation of plant growth, development, interactions with other organisms, and responses to environmental stress. Therefore, in order to test the possibilities of foliar application of salicylic acid in improving the photosynthesis under normal and late sown high temperature condition. In this regard pot culture experiment was conducted with four wheat genotypes, two relatively tolerant (HD2985 and HD3086) and two susceptible (HD3076 and HD3043) and staggered sowing were done to induce high temperature stress at reproductive stage. At the onset of anthesis, foliar application of salicylic acid (SA) (0.1mM) was made with water sprayed on the control plant. The observations as TBARS content (indicator of lipid peroxidation and stress level), membrane stability index (MSI), photosynthetic pigments, photosynthetic rate (Pn), and photochemical efficiency (Fv/Fm) were recorded in flag leaf two and ten days after foliar spray of salicylic acid. The TBARS contents increased significantly in all genotypes grown under late sown (high temperature stress) condition as compared to the normal sown condition. Foliar spray of SA decreased TBARS contents significantly in late sown crop with the maximum decrease validated in HD3086 (16%) and HD2985 (14%) and minimum in HD3076 (9%). In SA treated plant, MSI enhanced significantly in the late sown crop, with maximum increase evinced equally by HD 2985 (15%) and HD3086



(15%) and minimum by HD3076 (7%). Photochemical efficiency of PSII (Fv/Fm), and photosynthesis increased by 8.3 % and 13% respectively in SA treated plant compared to untreated plant and maximum increase measured in HD 2985. Total chlorophyll contents was also higher in SA treated plants. From present study, it can be concluded that the exogenous application of SA (0.1mM) positively modulated the photosynthetic apparatus and helped in maintaining the higher Pn and pigment contents

SCREENING OF SOYBEAN GERMPLASM FOR RESISTANCE AGAINST MAJOR FOLIAR DISEASES

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Abstract

Soybean (*Glycine max* L.) is facing huge loss in yield due to climate change. Its production is limited by high temperature and prolonged dry spell which leads to aggravated pathogen. During *Kharif* 2019, a total of 1220 soybean germplasm lines have been screened for resistance against major diseases of soybean such as anthracnose and Myrothecium leaf spot under field conditions. Anthracnose disease caused by *Colletotrichum truncatum* (Schw.) Andrus and W.D. Moore is one such disease that aggravates usually under high relative humidity and heavy rain fall conditions. Disease scoring was done using 0-9 scale. Disease score was recorded in five randomly selected plants in each line and was averaged. Out of 1220 genotypes screened, 429 germplasm lines showed highly susceptible reaction, 744 lines were moderately susceptible, 39 lines showed resistance reaction while 8 lines were highly resistant for anthracnose disease. Genotypes, EC 389160, EC 41318, EC 993294, DS 3105, DS 3106, RS 10-46, JS 20-69 and IC 391443 were found to be highly resistant. Myrothecium leaf spot of soybean is another disease occurring in major soybean growing areas of India. For this disease scoring was done using 0-9 scale. Out of 1220 genotypes screened, 474 germplasm lines showed highly susceptible reaction, 635 lines were moderately susceptible, 79 lines showed resistance reaction while 32 lines were highly resistant for Myrothecium leaf spot of soybean. However, three lines RSC 10-46, EC 993294, IC 391443 showed highly resistant reaction for both the diseases. These contrasting genotypes for the disease reaction will be used for genetics of anthracnose and Myrothecium leaf spot resistance, mapping of genes/QTL governing resistance. Resistant sources will be deployed in breeding program to develop soybean cultivars resistant to anthracnose and Myrothecium leaf spot.

TOPICAL ADMINISTRATION OF SERIMORE DURING FIFTH INSTAR LATE AGE SILKWORM AND PERFORMANCE OF QUANTITATIVE AND QUALITATIVE TRAITS OF SELECTED HYBRIDS

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Abstract

The present investigations is novel approach for the enhancement of quantitative and qualitative traits of selected silkworm hybrids namely, PM X CSR2 and FC1 and FC2 by utilizing the growth promoting active agent serimore. However the parameters namely, cocoon weight, shell weight, shell ratio, filament length, filament weight, denier and renditta of the silkworm hybrids were assessed as per the standard procedure and showed significant performance in the expression of above said traits after the topical administration of serimore at different time intervals during fifth instar healthy silkworm larvae maintained in three different replications for assessment of cocoon traits. It is presumably reflected that, serimore is an active plant based promoter contributed towards rate of biosynthesis of silk protein content in silkgland due to physiological cellular and sub cellular activities and mobilization, utilization of energy budget for the cellular respiration in late age of the silkworm in favour of activities of serimore, the results obtained are recorded, analyzed statistically and discussed in the present approach, it has a greater relevance in boosting the rate of increase in the quantum of silk content and manifestation of economic traits of PM X CSR2 and FC 1X FC2 hybrids were narrated in the present context.



PERFORMANCE OF FRUITS AND VEGETABLE PROCESSING SECTORS IN KARNATAKA STATE

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Abstract

Agro-processing can be grouped as cereals and pulses processing, fruits and vegetables processing units and Commercial crops processing units. It is found that 48 per cent of the household expenditure in India is on fruits and vegetable items and the demand for processed/convenience food is constantly increasing. Fruits and vegetables account for nearly 90% of total horticulture production in the country. India is now the second largest producer of fruits and vegetables in the world and is the leader in several horticultural crops, namely mango, banana, papaya, cashew-nuts, areca nut, potato and okra. However the nature of horticulture crops being such its not easy to make assessment of their production. These crops, especially vegetables are grown in small plots, fields or in the back of the houses, do not have single harvesting in most of the cases which makes their assessment difficult. Many horticulture crops have multiple pickings in a single season. Similarly many fruit trees are scattered, which do not count for assessment. The Fruits and Vegetable Processing industry in India plays a vital role in the national economic development and has potential to meet the local needs and export requirements. In this context there is a need for improving the capacity of the fruit and vegetable processing units to harness backward linkages allied activities in order to efficiently convert part of the output to value added products acceptable to the domestic and international markets. This would generate employment opportunities for different types of skills through food processing, packaging, grading and distribution. Keeping the above aspects in consideration the study was carried out in the state of Karnataka. Fruits and vegetable processing industries has got a considerable growth which signified the importance of agro processing industries. Therefore it has great scope for development in the state. Hence, it must be promoted extensively. Existing investment in this sector are found facing many problems which affect their operation.

PURIFICATION AND CHARACTERIZATION OF CRUDE GLYCEROL PRODUCED BY BIODIESEL PROCESS FROM NON- EDIBLE TREE BORNE SEED OILS TO BE USED AS GLYCOGENIC SUPPLEMENT FOR CATTLE

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Abstract

Industrialization and modernization has led to a huge demand for energy. The dependency on fossil fuel since years has exhausted most of the oil wells and reserves on the earth. This limited oil reserves have led to many research on alternative fuels from renewable raw materials. Biodiesel obtained from a renewable non-conventional raw material and is an environmentally friendly fuel. About 10% glycerol is produced as by-product of biodiesel production. The large amount of glycerol produced cannot be disposed directly into the environment due its high salt and impurities. Glycerol, speculated as a good energy source in cattle feeds. However, knowledge is limited on the nutritional value of crude glycerine. In the present work, the glycerol obtained by producing biodiesel from non-edible oils was purified, characterized and used a glycogenic source in cattle feed.

UPSCALE AN INNOVATIVE PLANTING AND EFFECT OF ORGANIC INPUTS ON THE GROWTH AND ROOT YIELD OF INDIAN SARASAPARILLA UNDER COSTAL ECO-SYSTEM AND PROBLEMATIC SOIL

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Abstract

Indian sarasaparilla (*Hemidesmus indicus*) also known in ancient Ayurveda medicine has a great medicinal importance. Since the root portion is the economic part, during harvest damage and wastage cause reduction in yield. Root development and



harvesting of roots in the field condition is a major problem, more over harvesting is too expensive. Salinity, heavy clay and water logging is a serious problem in the costal eco-system. Under such conditions, there is a need to explore the possibility of cultivating *Hemidesmus indicus* organically and in an innovative method under commercial scale, which will be helpful in recommending this crop as intercrop and boundary crop in various perennial fruit crops to enhance the farm income. Hence an experiment was conducted in a Controlled Randomized Design with 10 treatments in three replications. Healthy uniform size wild Indian sarasaparilla seedlings were planted in the PVC pipes. The treatment consisted of three organic manures as potting media (farmyard manure, vermicompost and coir pith compost), along with three organic foliar nutrients (panchakavya @ 3%, sea weed extract @ 3% and humic acid @ 0.2 %) were sprayed at monthly intervals. The results of the study revealed that media containing sand: red soil vermicompost+foliar application of seaweed extract @ 3 per cent resulted in improving the growth characters like plant height, intermodal length, number of laterals, leaf area and maximizing the root yield of Indian sarasaparilla without damage and wastage during harvest.

PERFORMANCE OF PRODUCTION EFFICIENCY INDICES UNDER SUGARCANE AND SUGARBEET INTERCROPPING SYSTEM

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Abstract

The field experiment was carried out during 2011-12 at Agricultural Research Station (ARS), Madhurakhandi (Dist. Bagalkot), University of Agricultural Sciences, Dharwad to evaluate tropical sugar beet cultivars (Cauvery, Shubhra, Magnolia and Calixta) with different row proportions (1:1, 1:2 and 1:3) in sugarcane. There were seventeen treatment combinations laid out in randomized complete block design with three replications. On the basis of results obtained from present investigation Intercropping of Sugarcane+sugar beet (irrespective of sugar beet cultivars) in 1:2 and 1:3 RP recorded significantly higher net returns (Rs.205456 to 218446 ha⁻¹ and Rs.193217 to 207339 ha⁻¹ in 1:2 and 1:3 RP, respectively) but B:C was significantly higher in 1:1 RP (3.22 to 3.26). Similarly with respect to production efficiency indices, Sugarcane + sugar beet (irrespective of sugar beet cultivars) in 1:2 and 1:3 RP recorded significantly higher sugarcane equivalent yield (SEY) (120.58 to 126.32 t ha⁻¹ and 118.01 to 124.24 t ha⁻¹ in 1:2 and 1:3 RP, respectively), LER (1.67 and 1.65 in 1:2 and 1:3 RP, respectively), ATER (1.08 and 1.05 to 1.08 in 1:2 and 1:3 RP, respectively) and SPI (182.18 to 203.79 and 181.58 to 201.91 in 1:2 and 1:3 RP, respectively), when compared to 1:1 RP [(SEY:114.58 to 116.27 t ha⁻¹), (LER: 1.40 to 1.42), (ATER:0.99 to 1.01) and (SPI:158.04 to 183.57)].

DEVELOPMENT OF SUNFLOWER CORE COLLECTION FOR EFFECTIVE UTILIZATION IN SUNFLOWER BREEDING UNDER DIFFERENT AGRO-CLIMATIC CONDITIONS

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Abstract

Establishing a core collection that represents genetic diversity of the entire collection with minimum loss of its original diversity and minimum redundancy is an important issue for gene-banks curators and crop breeders. The work on collection, evaluation and maintenance of sunflower germplasm was carried out at Germplasm Management Unit (GMU) located at the Project Coordinating Unit (PC, Unit Sunflower), Bengaluru from 1983 till 2001. Subsequent to the shifting of the Project Coordinating Unit (Sunflower) from UAS, Bengaluru, the germplasm maintained at PC Unit has also been shifted to IIOR (formerly DOR) during July 2001. During this period, 1353 populations, 41 CMS lines from 3 CMS sources, 54 maintainer lines, 48 restorers, 232 inbreds, 57 accessions of wild species were conserved. During this period important introductions for useful traits were made from the countries viz., Rome, Hungary, Yugoslavia, Turkey, USA, USSR, Israel, Netherlands, Serbia,



France, and East Germany. In the recent past introductions were made from France, Serbia, and USDA. To develop sunflower core the 'R software' based package "ccChooser" was used. This package is used to establish core collection based on passport data (agronomic, morphological and phenological). For the development of core collection the analysis was carried out in three parts in a stepwise approach and grouping methods. In the first part, the cluster analysis was performed. Two classical methods (UPGMA and Ward methods) and number of groups designated based on the dendrograms (function-cutree). Second part of the analysis was allocated to assign genotypes from original collection to core collection based on four allocation methods. The last part of the analysis was used to evaluate the cluster analysis methods and allocation methods. The Ward cluster analysis and D3 allocation method proved to be the most optimal and efficient in development of the sunflower core collection from the dataset. The representativeness of the core collections was validated by the difference of means (MD%) and difference of mean squared Euclidean distance (dD%) for the studied traits in the core subsets and the entire collection. From the results of the analysis sunflower core collection was created as a result of lowest value for dD% (5.080867) and relatively low value for MD% (0.78302285). Based on this strategy, a total of 216 accessions were selected for core collection which is approximately 10% of the entire collection. The core set developed will be further validated at different agro-climatic conditions and will be utilized for development of mini core set to enhance the germplasm utilization by sunflower researchers and development of climate resilient improved varieties and hybrids.

EFFECT OF PLANT HORMONES ON FLORAL BUD RETENTION AND ARTIFICIAL HYBRIDIZATION IN GREEN GRAM (*VIGNA RADIATA* L. WILCZEK) DURING THE SUMMER SEASON

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Abstract

Green gram (*Vigna radiata* L. Wilczek) is an important pulse crop of Central Asia and India. It is a protein-rich staple food. It contains about 25 percent protein, which is almost three times that of cereals and supplies the protein requirement of vegetarian population of the country. Artificial hybridization in green gram being a laborious coupled with low rate of crossing success particularly during the *summer* season probably due to the unfavourable weather conditions, heat stress leading to reduced hybrid pod setting. The investigation carried out during the *summer* 2019 in green gram using two methods of artificial hybridization system one is emasculation in the evening followed by pollination in upcoming day morning and another method is emasculation and pollination simultaneously in the morning along with various hormone treatment and different mode of hormones application. This study has revealed the presence of significant difference among the different treatment combination. During *summer* season, without any treatment combination, Formal method of artificial hybridization scheme yield significantly higher hybrid pod setting per cent of 41.27 followed by another method resulting in 32.58 per cent hybrid pod setting. For both the methods of artificial hybridization, hormonal treatments using fine mist spray bottle containing combination of GA₃ @ 80mg/L + Kinetin @ 10mg/L; and fine mist spray bottle containing water has resulted in 40 per cent higher hybrid pod setting than control. Hormone treatment has been found to present stigmatic surface from desiccation, delays floral bud drop and thereby providing an extra window for the increased success of hybrid pod setting during the *summer* season.

PROCESSING OF MORINGA LEAVES

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Abstract

Moringa oleifera is one of the most useful tropical trees. Its leaves are extremely valuable source of nutrition for people of all ages. Nutritional analysis indicates that Moringa leaves contain affluence of essential, disease preventing nutrients. The young leaves are edible and are commonly cooked and eaten like spinach or used to make soups and salads. They are an exceptionally good source of vitamin A, vitamins B, and C, minerals (in particularly iron), and the sulphur-containing amino acids methionine and cystine. The composition of the amino acids in the leaf protein is well balanced since the dried leaves are



concentrated; they contain higher amounts of many of these nutrients. Moringa leaves were processed in two steps (1) drying and (2) grinding. In the first step, leaves were dried with different drying treatments including conventional, laboratory and advanced methods to optimize drying conditions in terms of maximum nutrients preservation and color quality. During the second step, leaves were ground with different grinding mills. Oven drying at 50°C was found to be the optimum conditions in terms of maximum nutrients and color preservation of Moringa leaves. Dried Moringa is restricted to use as dietary purposes because of its unpleasant taste, which becomes further bitter after drying procedure. Therefore, powder of Moringa leaves can be processed into different forms such as tablet, capsules and cereal formulations.

DIGGING STIMULATING FACTORS FOR RANCIDITY DEVELOPMENT IN NUTRI CEREAL PEARL MILLET

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Abstract

In the coming decades the growing population will put pressure on the production of food. Also, rising incomes and altering diet preference will shift the diet pattern. In this scenario pearl millet can be one of the non staple options by understanding the consumer's need of malnourished affluent and malnourished resource poor people. Pearl millet is a multi-purpose cereal crop providing food, fodder and fuel worldwide. Pearl millet has a potential to contribute food and nutritional security of the country as it is a powerhouse of nutrients possessing unique nutritional characteristics. It is enriched with vital nutrients like vitamin-B, folic acid, iron, magnesium, calcium, phosphorus, manganese, potassium, copper, zinc, and chromium. It is known to have the highest levels of potassium, calcium, and iron amongst other cereal crops. Because of high nutritional value it has several health benefits in diseases like diabetes, cancer, constipation, stomach ulcers etc. Dieticians and nutritionists are trying to educate the people to increase the consumption of pearl millet grains. But the rapid development of rancidity and bitterness in the flour is a major problem in the acceptability and utilization of pearl millet. The flour of the grain develops off-flavor upon storage after a short time. Thus use of pearl millet in food industry and consequently its consumption by urban population is very low. Hence, identification of genotypes with low rancidity and testing of these for stability of the character is a prerequisite for any breeding programme. Keeping this fact in view the present investigation was undertaken to examine the effect of storage period on pearl millet flour and investigate the factors responsible for their deterioration during storage under refrigerated (4-5°C) and ambient temperature (25°C to 28°C) storage conditions. The results of the study showed the diversity in the rancidity profile among landraces and inbreds. The identified low rancid lines shall be further utilized in the breeding programme.

EVALUATION OF DROUGHT TOLERANCE IN THE INDIAN SOYBEAN GENOTYPES USING MORPHO-PHYSIOLOGICAL, BIOCHEMICAL AND MOLECULAR MARKERS

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Abstract

Soybean [*Glycine max* (L.) Merrill] is a major crop that provides an important source of nutrients to humans and animals, but its production can be dramatically decreased due to the incidence of drought stress. The present study was performed to identify drought tolerant genotypes of soybean on the basis of different morpho-physiological, biochemical, protein profiling and linked SSR molecular markers. Morpho-physiological analysis among 53 genotypes revealed the presence of drought tolerance trait in three genotypes viz.: JS97-52, RVS-14 and JS95-60. Biochemical and molecular analysis justified the same results obtained during the study. Presence of variability was demonstrated with biochemical, protein profiling and molecular marker analysis. Among applied linked SSR markers, the highest genetic diversity (0.6629) was demonstrated in Satt520 while lowest (0.0370) was in Satt557. The average genetic diversity was 0.3746. Among all twelve SSR markers the highest PIC value was 0.5887 given by Satt520 and lowest 0.0363 by Satt557. The average PIC value was 0.3063. Data obtained in



the present study may contribute towards improvement of soybean genotypes with the development of drought tolerant varieties.

CORRELATED RESPONSE OF WEATHER AND SUBTENDING LEAF CONDITIONS ON THE ARTIFICIAL HYBRIDIZATION IN CHICKPEA (*CICER ARIETINUM* L.) UNDER FIELD CONDITIONS

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Abstract

In chickpea (*Cicer arietinum* L.) artificial hybridization is a very tedious process with low success rate. The present investigation had shown the percent of hybrid pod setting was influenced by the weather conditions and maturity index of subtending leaf of each floral bud. During favorable weather conditions—fully matured subtending leaf gave 33.40 percent hybrid pod set; followed by fully emerged subtending leaf gave 9.20 percent hybrid pod set and lowest percent hybrid pod set of 1.40 was observed in immature subtending leaf. During unfavorable weather conditions—fully matured subtending leaf gave 26.47 percent hybrid pod setting; followed by fully emerged subtending leaf gave 5.13 percent and 0.00 percent hybrid pod set was observed in the immature subtending leaf. The correlated response of weather conditions and maturity index of subtending leaf indicated that fully matured subtending leaf florets upon crossing resulted in better percent of hybrid pod setting under both favorable and unfavorable weather conditions than fully emerged and immature subtending leaf florets. Higher crossing success rate in chickpea can be obtained by selecting the floral bud in fully matured subtending leaf and it also provide better buffering against environmental fluctuation by maintaining a constant micro-climate required for hybrid pod setting and hybrid seed development.

LOW COST WATER SAVING TECHNIQUES FOR IRRIGATION WATER MANAGEMENT IN MALAPRABHA COMMAND AREA

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Abstract

Developing infrastructure for the water resources and their management have been the common policy agenda in many developing economies, particularly in the arid and semi-arid tropical countries like India. International Water Management Institute (IWMI) has shown that around 50 per cent of the increase in demand for water by the year 2025 can be met by increasing the effectiveness of irrigation. Water is the most crucial input for agricultural production. Globally, agriculture accounts for more than 80% of all freshwater used by humans, most of that is for crop production security and contribute about 40% of total food production. Since productivity of irrigated land is almost three times higher than that of rainfed land. FAO has predicted a net expansion of irrigated land of about 45 million hectares in 93 developing countries (for a total of 242 million hectares in 2030) and projected that water withdrawals by the agriculture sector will increase by about 14% during 2000 – 2030 to meet food demand. The concept of Integrated Water Management emerged around the 1980s in response to increasing pressures on water resources from competition amongst various users for a limited resource, the recognition of ecosystem requirements, pollution and the risk of declining water availability due to climate change. Growing more crops per drop of water use is the key to mitigating the water crisis, and this is a big challenge to many countries. Strategies for efficient management of water for agricultural use involve conservation of water. Suitable irrigation methods and water saving techniques adoption in farmers field in the project of Ministry of Water Resources is implementing Farmers' Participatory Action Research Programme, RKVY (2001-12 and 2012-13), GOK projects demonstrations at farmers' fields. FPARP involves field demonstration of water saving technologies (alternatively alternate furrow irrigation in maize, border strip method of irrigation with 80% cut off length in chick pea and wheat in command area. By adopting the research cum demonstration technology two years (2008-09 and 2009-10) i.e., alternatively alternate furrow irrigation in maize for, it was recorded the higher grain yield (7286 kg/ha) as compared to the control (6533 kg/ha), increase in the yield (753 kg/ha) was



more by 11.53 % over all furrow irrigation (control). This resulted in increase in the gross income, net income and water use efficiency in farmers' field. Another Border strip method of irrigation with 80% cutoff length in chickpea demonstrated on farmers field and the research cum demonstration results revived higher chickpea grain yield (2,125 kg/ha) as compared to control (1,821 kg/ha). Increase in the gross income and net income, higher water use efficiency (5.20 kg/ha – mm) in the treatment over control (3.77 kg/ha-mm) of the farmer due to adoption of the improved irrigation technology. In same method (Border strip method of irrigation with 80% cutoff length) in wheat, recorded higher wheat grain yield (2,124 kg/ha) as compared to control (1,843 kg/ha), increase in the gross income, net income and yield was produced per unit of water spent as indicated by higher water use efficiency (4.52 kg/ha – mm) in the treatment over control (3.40 kg/ha-mm) of the farmer's due to adoption in this methods saving water and avoid excess improper use of irrigation methods and heavy irrigation in command areas and under lift irrigation schemes in basins.

RESPONSE OF VARIED IRRIGATION LEVELS AND SITE-SPECIFIC NUTRIENT MANAGEMENT (SSNM) FOR MAIZE-CHICKPEA SEQUENCE UNDER MALAPRABHA COMMAND AREA

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Abstract

Due to the serious water shortages the great challenge for the coming decades is the task of increasing food production with less water, particularly in countries with limited water, land resources (FAO, 2017). Therefore, techniques are needed to increase the water use efficiency. Irrigation scheduling has conventionally aimed to achieve an optimum water supply for productivity, with soil water content being maintained close to field capacity. The increasing worldwide shortages of water and costs of irrigation are leading to an emphasis on developing methods of irrigation that minimize water use and maximize the water use efficiency. Irrigation scheduling is the decision of when and how much water to apply to a field in order to maximize profit. Its purpose is to maximize irrigation efficiencies by applying the exact amount of water needed to replenish the soil moisture to the desired level, thus saves water and energy. It minimizes water-logging problems by reducing the drainage requirements and control root zone salinity problems through controlled leaching. It results in additional returns by using the saved water to irrigate non-cash crops that otherwise would not be irrigated during water-short periods. This requires knowledge on crop water requirements and yield responses to water, the constraints specific to each irrigation method the limitations relative to the irrigation water supply system and the financial and economic implications of the irrigation practice. Despite of the fact, that irrigation scheduling is important tools for decision making process but only very few farmers understand and not yet utilized by the majority of farmers. Furthermore, limited irrigation scheduling information is utilized by farmers. A regulated deficit irrigation experiment was conducted to investigate the effect of different irrigation depths on yield of Maize-chick pea sequence cropping steam by using pan evaporation method. A field experiment was conducted at Water Management Research Centre, Belvatagi in University of Agricultural Sciences, Dharwad, Karnataka state to Site-Specific Nutrient Management (SSNM) for Maize-Chickpea sequence under varied levels of irrigation under Malaprabha command area. Among the several technologies of precision agriculture farming has to be treated as any other business and we must try to exploit the available resources like water and nutrients in a judicious and efficient manner. Due to the critical importance of plant nutrition and its influence on crop yield and quality, it is expected that SSNM definitely improve the economic status of farming community and maintains the soil fertility status. Pooled data indicated that, irrigating the crop at 0.8 IW/CPE recorded higher yield over 0.6 IW/CPE. However, this significance was not observed during 2014 and in pooled analysis. Among the targeted yield levels the significant target yield like 80 q/ha 100 q/ha could be possible, to achieve easily during 2014 and observed in pooled analysis also. (during 2013, the actual yields were lower than targeted yield levels). It shows the hybrid have a capacity to yield up to particular target levels (100 q/ha) compare to higher target levels like 120 or 140 q/ha. However, the yields levels are very nearer to the higher targeted yields of 120 q/ha and 140 q/ha. (117.6 q/ha and 130.5 q/ha respectively). Economics of net returns (Rs.1, 01,593) B: C ratio (3.98) and WUE (24.47 kg/ha.mm) were also higher at 140 q/ha target yield level treatment. The former treatment was significantly superior over 80 and 100 q/ha targeted treatment. The higher targeted yield can be achieved by maintaining the moisture level at 0.8 IW/CPE with nutrients levels of 483 kg of N, 72 kg of Phosphorus and 336 kg of Potash to the crop. Rabi (chickpea) crop grown after maize recorded non significant yields due to varied level of irrigations. However, the different levels of fertilizers applied to maize 9 140q/ha targeted yield) showed significantly higher yield as compare to 80 q/ha targeted yield. The same treatment also recorded the



higher net returns and B:C ratio and WUE. In whole system also, the former treatment recorded higher gross returns (Rs.1, 43,968) and net returns (98,569) compare to other targeted yield levels. In Malaprabha Command Area following cropping system like growing maize in *Kharif* followed by chickpea in *Rabi* season is seems to be more profitable. If the farmers adopt this SSNM method.

TRANSFER OF TECHNOLOGIES (TOT): PRINT MEDIA IS KEY SOURCE IN COMMUNICATING AGRICULTURAL DEVELOPMENT AMONG BANANA GROWERS IN TAMIL NADU

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Abstract

Agricultural communication is the process to disseminate the information or content about agricultural technologies and related knowledge among their stakeholders for the development of the Indian society. In India, more than 70 percent of the people are still live with agriculture and its related trades in rural Communities (<http://m.kkhsou.in>). These agriculturist producing less amount of agricultural products without adoption of modern agricultural practices and inadequately use of Green Revolution methods and technologies. They were characterized as low literates or illiterates, and lack of innovativeness to adopt and accept the modern technologies including agricultural sector. These factors have rendered our rural and agricultural communities into islands of underdevelopment. Development in Agricultural sector is the most important aspect for the development of the nation. Development communication, especially agricultural communication is needed the services to mobilize development in agriculture sector. Farm productivity depends on the timely availability of farm technologies from knowledge centers like State Agricultural Universities and Research stations (Agricultural communicators) to the clientele system. The diffusion of knowledge depends on the use of communication channels both by the scientists and farmers. Among the mass media, Print and electronic media found to be the most suitable for rural as well as agricultural target audiences. Mass media are wide use among the farmers, and print media is still the key source for farmers to get information related to agriculture. The present study is carried out to assess usage of print media in dissemination of agricultural information among the banana growers in Tiruchirapalli district of Tamil Nadu. A random sampling technique was used for selecting samples. The total sample size was 644 respondents. Data were collected through a well structure questionnaires schedule and analyzed with descriptive statistics and inferential statistics. Nearly of half of the respondents relied mainly on newspapers for Planting information, Plant protection, Water source/ supply and Marketing aspects. The study found that half of the total respondents (40% Newspapers 10% magazines) use print media to get information on banana cultivation.

MICROTOMY STUDIES OF RICE TUNGRO DISEASE INFECTED LEAVES

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Abstract

Tungro disease is not always easy to identify in the field, as characteristic symptoms are not expressed in all varieties. Tungro may be detected by the iodine/starch test or through the use of insect transmission tests to assay plants. Identification of this disease in the early stage is difficult and the management is a daunting task. The yield loss can be reduced substantially, if the disease was diagnosed at correct stage. Various improved detection methods have been standardized and among them molecular method of detection seems simple, ingenious method to detect RTD from the suspected samples. This abstract paper emphasis on the microtomy studies of healthy and Rice Tungro disease infected rice leaf samples. Cross section of the healthy and Tungro infected leaf sample of rice exhibited wide differences among the cells. The area of vascular bundles was reduced in the Tungro infected rice samples and lower epidermis cells got damaged wherein the area was large in the healthy rice leaf. In case of healthy leaves of rice, the cells were normal in size with properly distributed intercellular spaces and evenly present



bundle sheath cells. The xylem and phloem tissues showed no damage in healthy sample. Bundle sheath cells remained undisturbed above the phloem tissues. In the infected rice leaf section, due to the invasion by both the RTBV and RTSV viruses, bundle sheath cells and phloem got distorted.

CONSTRAINTS FACED BY THE FARMERS IN SOIL HEALTH CARD USAGE

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Abstract

India is on the verge to improve the agricultural productivity by improving the soil quality and crop quality in a sustainable way. In the view, central government had launched the soil health card scheme in February 2015 with an aim to promote soil test based application of fertilisers in respect of all the 14 crore holdings in the country and to implement uniform norms in sampling and testing of soil. The soil health card scheme brings together the scientific community in the field of agriculture, the information repository of latest tool, techniques and cropping practices, the farmers and the government for the economics upliftment of the people at large. Since, change in knowledge preceded acceptance and application of an innovation, it is therefore, always important to find out the factors responsible for positive or negative disposition associated with farmer toward the soil health card. The constraint analysis would help to lubricate the process of diffusion of new technologies among farmers. Delay in distribution of soil health cards to the farmers was perceived as a major constraint by 68.67 per cent farmers in the usage of soil health card due to which farmers were not able to practice recommended fertilizer application. Results need to be provided before sowing season so that farmers can be benefitted more. Favouritism in provision of input subsidies (56.00 %) was the next major constraint. Small and resource poor farmers felt neglected because the frequency of contact of extension personnel with these people was limited. More attention need to be paid for this people to overcome that notion and maximum care should be taken in distribution of subsidies. Equal per cent of farmers (50.67 %) each perceived illiteracy of farmers and outcomes of soil health card recommended applications are not distinctly observable as the other constraints. It is difficult for the illiterate farmers to refer and understand the content of soil health card they need the assistance of other literate farmers in this regard. It needs substantial about of time to realise the benefits of soil health management. As the scheme was fully operational from 2015, it takes minimum of 3-4 years for farmers to observe the impact of the soil health card recommendations.

TIME SERIES PREDICTION OF GINGER PRODUCTION IN MEGHALAYA USING ARIMAX AND FEED-FORWARD NEURAL NETWORK REGRESSION

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Abstract

This research article considers univariate time series model and Feed-Forward Neural Network regression models to predict the production of Ginger in Meghalaya during 1989-2018. The data of Ginger Area, Production and Productivity was collected over 30 years (1989-2018). The data series tested for stationarity using Augmented Dickey-Fuller test found the data non-stationary (ADF test-value = -3.522, p-value = 0.06); it was analyzed using Autoregressive Integrated Moving Average with explanatory variables model with first differencing, and Feed-Forward Neural Network regression. The ARIMAX model outperformed feed-forward regression model with leading indicators. The coefficients AR (2) [p-value < 0.05], MA (1) [p-value < 0.02], Area [p-value < 0.001] and Productivity [p-value < 0.001] found significant. The Autoregressive Integrated Moving Average with explanatory variables (ARIMAX (2, 1, 1)) model predicted the production of Ginger with less Root mean square (RMSE = 0.778) and Mean Absolute Percentage Error (MAPE = 1.265) than the NNAR (1, 2) model, which considers the average of 1000 networks with linear output (RMSE = 1.967 and MAPE = 3.038). The residuals of the fitted models were subjected to Box-Pierce test, and it was found that the residuals from ARIMAX model were independent (χ^2 value = 0.068, p-value = 0.793), and residuals autocorrelation for NNAR (1, 2) (χ^2 value = 3.505, p-value = 0.091) over lagged (e_{-1} , e_{-2} ... e_{-30}) values were also found non-significant. Therefore, Autoregressive Integrated Moving Average, with



explanatory variables (ARIMAX) model, is considered to be the better prediction model over NNAR (1, 2) in terms of performance indicators and the significance of the estimated coefficients.

GENETICS OF BRANCHING IN SUNFLOWER (*HELIANTHUS ANNUUS* L.).

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Abstract

Inheritance of branching behaviour experiment was conducted at Elite Sunflower Seed Production Scheme, UAS, GKVK, Bengaluru for three seasons. The study consists of four F₁ crosses obtained by crossing CMSF with 265R and 6D-1, CMSPF and CMSI with 6D-1, their respective F₂ and BC₁ Populations by selfing F₁s and F₁s crossed to female parents, respectively. F₁ plants did not show branching, however, in F₂ and BC₁ populations they segregated into branching and non-branching types. It was found that non-branching was dominant over branching. In all the four crosses branching behaviour was controlled by a single recessive gene and could easily be eliminated by roughing before flowering occurred.

EMPOWERMENT OF RURAL WOMEN THROUGH SELF HELP GROUP

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Abstract

The study empowerment of rural women through self help group was conducted in churiya block of Rajnandgaon district. The sample consisted of 100 women of 12 SHGs purposively selected for the study. Majority (88.14 %) of the women responded that there is increase in power of decision making and self dependency moving outside locally. Majority of respondent (92%) had increased their self reliance and self confidence after joining SHGs. 88% of the respondent were interacting with male members outside in bank, school, block office. 92 % of the respondent were taking active part in SHGs activities for social activities undertaken on girl education, plantation of tree, swatchata abhiyaan, save water campaign, etc. 89% of respondent were taking active part in economic activities. 78% of the respondent has increased awareness about the political institutions and their functions. The economic empowerment was 89 % followed by social 82%, politically 58% and culturally 32% respectively.

EFFECT OF DIETARY SUPPLEMENTATION OF CHROMIUM AND VITAMIN E WITH SELENIUM ON PHYSIOLOGICAL PERFORMANCE AND FEED INTAKE OF HOLSTEIN FRIESIAN CATTLE UNDER HEAT STRESS

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Abstract

An experiment was conducted on 24 Holstein Friesian cows (average body weight 450.92±2.87 kg) under heat stress to elucidate the effect of supplemental chromium, vitamin E and selenium on physiological performance and feed intake. Group I (T₀) served as control (without any supplementation), groups II (T₁), III (T₂) and IV (T₄) were supplemented with chromium propionate @ 0.5mg/kg DM; vitamin E @ 500 IU/animal/day and selenium @ 0.3mg/kg DM and chromium @ 0.5mg/Kg DM, vitamin E @ 500 IU/animal/day and selenium @ 0.3mg/kg DM, respectively. Animals were fed on total mixed ration to meet their nutrient requirements. Dry matter, organic matter, crude protein, ether extract, crude fibre, nitrogen free extract, total ash, neutral detergent fibre and acid detergent fibre of TMR were 53.82, 86.59, 17.19, 1.48, 13.31, 54.61, 13.41, 59.91 and 21.88 per cent, respectively. Physiological responses like rectal temperature, pulse rate and



respiration rate did not show any significant difference ($P>0.05$) in the morning but the values were significantly higher ($P<0.05$) in the afternoon in cows fed with the basal diet without any supplementation. Supplemented groups had higher dry matter intake (DMI) compared to control group but the difference was significant ($P<0.05$) between T3 group supplemented with chromium, vitamin E and selenium and control.

HOMESTEAD VEGETABLE PRODUCTION FOR ENHANCING DIETARY DIVERSITY AND FOOD SECURITY IN HILL REGION

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Abstract

Hill and mountainous ecosystem are highly fragile due to geological, topographical, climatic and demographic reasons, rugged terrain, less resource, fragmented farm and several other complexity of hill ecosystems. Cereal based cropping system is prevalent in hill regions. The present availability of food especially cereals, may be enough for consumption of all people, but it is not possible for all to consume nutritious diet. Fruits and vegetable availability cannot meet the population needs to achieve dietary recommendations. The strenuous physical activities, limited food intake, imbalanced diet, emphasis on staple crop production create malnutrition especially among children and women who are the backbone of hill farming. Low nutritional status makes women more prone to certain ailments. The strenuous physical task allocated to women combined with limited food intake, exacerbate malnutrition. Majority of rural women in Uttarakhand are suffering from Chronic Energy Deficiencies (CED) and their intake of micronutrients is lower than Recommended Dietary Allowances. Therefore, women require high quality nutrients as their work load and energy expenditure is more. One of the feasible pathways towards the improved nutritional status of hill community with special emphasis on women, is to diversify and intensify production system through a sustainable ecosystem approach. It will improve the food basket qualitatively and quantitatively in hill region. In Hill region of Uttarakhand, climatic conditions are very much favorable for growing many diversified crops round the year. Agriculture related interventions typically aim at improving nutrition by increasing food production and family income. Therefore, a project was designed under National Mission for Himalayan Studies to improve nutritional level of women in high hills of Uttarakhand through nutrition sensitive agriculture interventions. Homestead vegetable cultivation by developing a nutri-garden in the limited available land or roof gardening for family consumption is an affordable nutrition intervention for rural community as well as urban people irrespective of their available land resources and socio-economic status. Homestead vegetable gardening has resulted in enhanced intake of vegetables. Vegetables are the most affordable source of micronutrients especially for small land holders but there is a need in hill region to recognize its both economic and nutritional importance. Focusing on nutrition helps to build the resilience of rural households.

QTL MAPPING OF STAY GREEN TRAITS IN TWO RECOMBINANT INBRED POPULATIONS DERIVED FROM CROSS IS9830 X E36-1 OF SORGHUM (*SORGHUM BICOLOR* (L.) MOENCH)

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Abstract

The excellent drought tolerance of sorghum makes it an important food and feed crop in arid and semi-arid regions of the world. Drought stress in sorghum has been characterized at both pre-flowering and post-flowering stages. Post-flowering drought adaptation in sorghum is associated with the stay-green phenotype. To map QTLs that contribute to this complex trait, sorghum recombinant inbred population derived from cross IS9830 X E36-1 was evaluated during post-rainy seasons at Dharwad (2007, 2008, 2009) and Bheemarayanagudi (2008, 2009) in India. The E36-1, a donor for stay-green trait, a high yielding line from guinea-caudatum hybrid race with Ethiopian origin. The component traits of stay-green were per cent green leaf area at 15, 30 and 45 days after flowering. Pooled analysis of variance for component traits showed significant difference among the RIP and was positively correlated with grain yield per plant. The length of the genetic linkage maps spanned was 1661.1 cM and distributed over ten linkage groups; same were used for composite interval mapping and kosambi as mapping function over seasons and locations to arrive at stable QTLs. Stable QTLs for stay-green viz., *stg1*, *stg2* and *stg3* on linkage



groups A, E and J respectively on RIPs, the positive additive effect at all these loci was contributed by E36-1. All three stable QTLs, collectively contributing 34.6 - 48.63% of phenotypic variation. These QTLs were therefore stable across the mapping population, environments and over seasons. These stable QTLs can be exploited for marker assisted selection and back crossing, while improving and manipulating the traits to develop a variety.

EVALUATION OF CHILLI GERMPLASM (*CAPSICUM ANNUUM* L.) FOR GROWTH, YIELD AND QUALITY UNDER PROTECTED CONDITIONS

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Abstract

Chilli (*Capsicum annuum* L.) is an indispensable spice due to its pungency, taste, appealing colour, flavour and has its unique place in the diet as a vegetable cum spice crop. The present investigation was carried out with a view to evaluate chilli germplasm for different horticultural traits. The performance study of thirty lines of green chilli collected from NBPGR, New Delhi was carried out under net house. The data pertaining to morphological characters revealed that the plant height varied from 40.15 in 'Kashi Anmol' to 96.46 cm in 'EC777197'. Number of days taken for first flowering varied from 30-55 days after transplanting while first harvest ranged from 52-88 days. The yield characters revealed that fruit weight ranged from 1.03-7.85g, fruit length varied from 2.9-13.67 cm while fruit diameter 1.44-0.35 cm. Some promising germplasm like 'EC777199' and 'EC777201' recorded highest fruit weight (7.85 and 7.17g); fruit length (11.96 and 13.67cm); fruit diameter (1.36 and 1.44 cm) and with maximum number of seeds per fruit (170 and 173) in comparison to check 'Kashi Anmol' with 4.57 g fruit weight, 5.60 cm fruit length, 1.05 cm fruit diameter and with 40.14 number of seeds per fruit. 'EC777199' had long, slender fruits while 'EC777201' had long thick fruits with whitish green fruits at immature stage and attractive dark red colour at ripened stage. These lines had more number of fruits per plant in comparison to other test lines. In recent times, the productivity of the chilli is low due to many limiting factors such as lack of superior genotypes/improved cultivars for use in breeding programme to develop potential hybrids or due to biotic and abiotic stresses. Obviously, there is need for development of new varieties and hybrids with high productivity, and these promising lines can be used in breeding superior hybrids.

PROMISING TUBEROSE LINES FOR DWARFNESS

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Abstract

Tuberose (*Polianthes tuberosa*) is an important commercial flower which is used as loose flower, cut flower as well as essential oil extraction. It is native of Mexico and belongs to family Amaryllidaceae. It bears white fragrant flowers with pinkish or greenish tinge in its buds. The main limitation in tuberose breeding is lack of genetic variability. Therefore the number of varieties which is available in tuberose is very limited and they all are medium to tall in plant height. Plant height in the conventional varieties of tuberose is minimum 80 cm (Varieties like Prajwal and Mexican Single reaches more than 125 cm). There is no report of dwarf types in tuberose. Therefore attempts were made to breed and identify dwarf types tuberose cultivars involving the female parent Phule Rajani. Among the sixteen OP population of cultivar Phule Rajani evaluated, the lines namely PR-1 (Slight Pinkish tinge buds), PR-3 (Greenish tinge buds), PR-4 (Greenish tinge buds), PR-9 (Greenish tinge buds) were found to exhibit dwarf character. The analysis of data on plant height revealed that PR-4 (53.70cm) was tall among the selected lines, followed by PR-9 (47.00 cm), PR-3 (46.1 cm) and least in PR-1 (44.10cm). Maximum spike length was found in PR-4 (46.00 cm), followed by PR-3 (39.40 cm) and PR-9 (38.10 cm). However, rachis length an important parameter for judgement of quality flowering spike was found maximum in PR-9 (26.6 cm), followed by PR-1 (24.1cm). The number of flowers was found more in PR-9 (42.8) with flower diameter of 3.9 cm and flower length (4.5 cm). Based on all the traits studied PR-9 was found dwarf with good floral traits. The plants of PR-9 exhibited light pink at bud stage, turning greenish white at anthesis. Petals show a distinguished spot/mark in the outer end. Plants are erect with robust stems. The short



stature/dwarf nature makes it highly suitable for pot culture, vertical panels, gardening/landscaping besides vase decoration as cut flower. Each bulb produces on an average 8-10 spikes per clump per years with 7-8 leaves. The florets arranged compactly on short rachis gives an impression of hyacinth spike. Also, the floret opening is proper till the end of spike. Sweet fragrance of the florets is an additional attraction.

STRENGTHENING VALUE CHAINS FOR FRUITS AND VEGETABLES IN INDIA : ENABLERS AND ALTERNATIVE APPROACHES

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Abstract

India is second largest producer of fruits and vegetables after China in world, but there still exists huge gap between per capita demand and supply due to enormous wastage after harvesting. Hence there is need for proper Value chain management for fruits and vegetables in order to minimize the post-harvest losses and to meet the country's demand of fruits and vegetables. At present the growth and development of value chains for local and external markets is considered as a powerful tool to fight against the challenge of food security in India. As the term value chain describes the full range of activities that are required to bring a product from conception, through the different phases of production up to delivery and to the final consumers. In this regard this paper assesses the present status of fruits and vegetables production and its export from India and examines the overview of fruits and vegetables value chains in India. Also the paper focuses on different value chain approaches adopted by various agri-businesses in India. Finally, the paper identifies the major issues related to the agriculture value chains and puts forward some suggestions for the growth of fruits and vegetables value chains in India.

ASSESSMENT OF GENETIC VARIABILITY IN MUNGBEAN [*VIGNA RADIATA* (L.) WILCZEK]

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Abstract

The current experiment was held in summer season, 2018 at rice upland area, near rice bore well of Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India. The experiment was conducted using 36 mungbean genotypes in 3 replications in RBD design. The analysis of variance (ANOVA) disclosed highly significant differences for all the traits studied in the experiment among all the genotypes. The high PCV and GCV values were observed for harvest index, number of pods per plant, biological yield per plant, seed yield per plant, number of clusters per plant, number of secondary branches and number of primary branches indicating the presence of enough genetic variability in all the genotypes that helps in selection of genotypes based on these traits. High heritability coupled with high genetic advance as percent of mean were exhibited by the characters like harvest index, seed yield per plant, number of pods per plant, number of clusters per plant, biological yield per plant, number of primary branches, number of secondary branches, number of pods per cluster, plant height and 100 seed weight which depicts that these characters are governed by additive gene action and could go for selection program.

ENERGY AUDITING AND CARBON FOOTPRINT IN VARIED CROP ESTABLISHMENT METHODS OF FINGER MILLET IN SOUTH INDIAN CONDITIONS

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Abstract

Finger millet, a nutri-cereal is gaining momentum as a potential vehicle for elimination of malnutrition in economically underprivileged countries. Increased productivity with little or no harm to environment assumes significance for sustenance of the finger millet crop. Crop establishment method is one such effort, which determines the optimum plant population per unit



area. In this endeavour, a two year field experiment was conducted during rabi, 2016-17 and 2017-18 at Agricultural Research Station, Vizianagaram under irrigated conditions in red sandy loam soils to assess the impact of crop establishment on productivity, profitability, energy use efficiency and environmental sustainability. The results indicated that square planting at 30 cm has shown 20% and 13% increase in productivity and 35% and 46% increase in B:C ratio respectively over the most common practices of South India viz., direct sowing by broadcasting and transplanting on flat beds. Square planting at 30cm also showed lowest specific energy (3.99MJ/kg grain), carbon footprint (0.063kg CE/kg grain) and Green House Gas Intensity(0.23 kg CO₂-e/kg grain). However, it was on par with square planting at 22.5cm and SRI method of planting (25cm×25cm). Hence, Square planting is the best method among different establishment methods and with adoption of mechanization and substitution of chemical nitrogen fertilizers with biofertilizers, crop rotation with legumes, etc. may further benefit the environmental safety.

RESPONSE OF CHICKPEA TO DIFFERENT FORMULATION OF MULTI NUTRIENT MIXTURE SPRAYS IN BLACK SOILS OF NORTHERN DRY ZONE, KARNATAKA

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Abstract

Chickpea is most important *rabipulse* crop in Vijayapur district of Karnataka. Yield of chickpea is decreasing due to flower drop and pod setting in climatic vulnerability situation. The low availability of mineral elements lead to the abscission of flower buds flowers and pods. Nutrients play pivotal role in increasing the seed yield in pulses. Generally, a balanced supply of nutrients is essential for optimum yield and fruit quality. A field experiment on “Response of Chickpea to different formulations of multi nutrient mixture sprays in black soils of Northern Dry Zone, Karnataka” was conducted at College of Agriculture Vijayapur, University of Agricultural Sciences, Dharwad during *rabi*2018. The experiment was laid out in randomized block design with seven treatments and four replication. Treatment consisted of two formulation of nutrient mixture viz. water soluble and EDTA formulation each at different doses (0.5, 0.75 and 1.0 per cent). The results of the experiment showed that foliar application of 0.5 % EDTA formulation recorded significantly higher plant height, dry matter accumulation, pods per plant, seed yield (541 kg ha⁻¹) and straw yield (899.75 kg ha⁻¹) over control. However the growth and yield of chickpea increased with increasing doses of both water soluble and EDTA formulation sprays from 0.5 to 1.0%. Similarly 0.5 % EDTA formulation spray recorded significantly higher macro and micronutrient uptake by the crop over control. The post harvest soil macro and micronutrient status was also significantly higher in above said superior treatment. However highest values of growth, yield, nutrient uptake and post harvest nutrient status recorded in 1.0 % foliar spray of EDTA formulation. The net returns and benefit cost ratio of chickpea production was higher in the treatment receiving foliar spray of 0.5 % EDTA formulation (8210 kg ha⁻¹ and 1.45, respectively) followed by 0.75 % EDTA formulation (7858 kg ha⁻¹ and 1.40, respectively). Even though growth and yield parameters were higher with application of 1.0 % foliar application, 0.5 % EDTA formulation spray has resulted in highest benefit cost ratio among all other treatments. Hence the treatment with 0.5 % EDTA formulation spray is practically feasible and beneficial for getting higher yield and returns of chickpea.

SURVIVAL OF *PANGASIANODONHYPOPHTHALMUS* IN INLAND SALINE WATER WITH DIFFERENT SALINITY

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Abstract

The present study was carried out to investigate the optimum salinity for survival of *Pangasianodon hypophthalmus* in inland saline water. *P. hypophthalmus*, (0.41±0.03g) was stocked in five treatments in triplicate for 60 days. The experimental design consisted of as treatment groups T₁, T₂, T₃, T₄ and T₅ of inland ground saline water with salinities 5,10,15,20 and 25ppt respectively and freshwater as control. The results indicated that *P. hypophthalmus* can tolerate up to 15 ppt salinity in inland saline water where as 100% mortality was recorded in treatments (20ppt) and (25ppt) after 48 hours and 18 hours respectively. The higher blood urea level, reduction in total serum protein, variable calcium and magnesium concentration in



serum, confirmed the stress level in the animals at higher salinities. Osmotic study like osmoregulatory capacity, serum osmolality, water osmolality showed that, *P. hypophthalmus* not a suitable culture species at higher salinity more than 10 ppt. Though *P. hypophthalmus* survived up to 15 ppt, but inland saline water up to 10 ppt salinity can be utilised for culture of *P. hypophthalmus*.

FORTIFIED DEFATTED SOYA FLOUR AND SKIMMED MILK POWDER PAPAYA GUAVA FRUIT BAR : A NOVEL INTERVENTION TO COMBAT MALNUTRITION

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Abstract

In recent years, consumers have become more health conscious in their food choices but have less time to prepare healthy meals. The fruits which normally lack protein and fat can be fortified with protein enriched products viz., soya bean powder or skimmed milk powder. Supplementing the value added papaya fruit bar to preschool children and adolescents will be a promising effort to reduce malnutrition. aim of enhancing the protein content of papaya-guava fruit bar and increasing its nutritional quality by fortifying with defatted soya flour and skimmed milk powder. Different fortified fruit bars contain Total Soluble Solids ranged from 77.45 to 79.24 °Brix, moisture content from 14.92 to 15.01 percent, pH from 3.38 to 3.87, titrable acidity from 0.80 to 0.98 per cent, reducing sugars from 36.59 to 48.94 per cent, total sugars from 61.15 to 74.45 per cent, ascorbic acid from 81.70 to 133.70 mg/100g, total carotenoids from 849 to 1340 µg/100g and protein content from 0.69 to 2.10 per cent. However, on the basis of sensory evaluation, the treatment seven (60% papaya pulp + 40% guava pulp (Allahabad Safeda) + 6% skimmed milk powder (T₇) found to be the best with maximum score for colour and appearance, flavour, texture, taste and overall acceptability among all treatments at zero as well as 30, 60 days of storage. The microbial analysis of fruit bars with fortified with defatted soya flour and skimmed milk powder revealed that there were no detectable yeast and mould at zero days and negligible at 30 and 60 days of storage indicates, that the product was safe for consumption.

INSIGHTS INTO STRESS RESISTANCE IN CHICKPEA : MOLECULAR AND GENETIC PERSPECTIVES

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Abstract

Chickpea (*Cicer arietinum* L.) is the third most economically important food legume in the world. The major abiotic and biotic stresses that adversely affect yield of chickpea (*Cicer arietinum* L.) include drought, heat, *Fusarium* wilt, *Ascochyta* blight and pod borer. Extensive searches for resistances have been conducted by screening commercial varieties, landraces and closely related species. Resistance to disease such as *Ascochyta* blight and *Fusarium* wilt have been identified but fertility barriers and linkage drag minimize the effective utilization of identified resistance in commercially viable crop breeding programs. It is unlikely that a single technology will be adequate to overcome the harmful effect of these abiotic stresses on chickpea. An integrated approach of combining conventional breeding techniques with advanced biotechnology could result into best suited chickpea varieties. Significant chickpea genomic resources have been developed in order to investigate resistant genes. Such resources include an integrated genetic map, expressed sequence tag libraries, bacterial artificial chromosome libraries, microarrays and draft genome sequences. Wild varieties of chickpea carry sources of resistant gene for biotic and abiotic stresses. Molecular tools are being used to increase the efficiency of gene transfer from wild species into chickpea elite genotypes to develop resistance against stresses. Marker-assisted breeding is currently being used for improving drought tolerance and combining resistance to diseases. Quantitative trait loci (QTL) for resistance genes have been located on linkage maps and molecular markers associated with these loci can potentially be used for efficient pyramiding of the traits.



SIMULATED EFFECT OF MOISTURE STRESS AT CRITICAL PHASES ON THE PERFORMANCE OF KHARIF SORGHUM VARIETIES

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Abstract

Kharif Sorghum is one of the important crops in Northern Transitional Zone (NTZ) of Karnataka. With the increasingly unpredictable monsoon and intermediate dry spells the crop is often subjected to moisture stress at one or the other critical growth stages. Therefore it is important to quantify the effect of dry spell on growth and performance of the crop and such studies can be effectively done using crop growth simulation models. The calibrated (2011) and validated (2012) DSSAT-CERES-Sorghum model was used to simulate grain yield, above ground biomass and root weight. The model was run for two consecutive years (2011 and 2012), for two *kharif* sorghum varieties (CSV-17 and CSV-23), sown across three dates (15th June, 30th June and 15th July). The daily weather files of 2011 and 2012 were used to create four dry spell scenarios by skipping rainfall for two weeks (2W) and four weeks (4W) prior to panicle initiation (PI) and, 2W and 4W prior to the end of grain filling (EGF). Pooled data of two years, simulated outputs showed that irrespective of variety, date of sowing and phase of the crop, withdrawal of rainfall for 4W resulted in higher reduction of grain yield (46.44 %) as compared to withdrawal of rainfall for only for 2W (23.25 %). Among the two crop phases tested, crop phase before PI was found to be more sensitive to dry spell as model simulated 35.54 and 64.14 per cent reduction in grain yield with 2W and 4W skipping of rainfall, respectively. Whereas only 11.96 and 28.74 per cent reduction in grain yield was observed with skipping of rainfall for 2W and 4W prior to EGF. This study concludes that exposure of crop to low moisture stress at peak vegetative phase *i.e.*, 2W to 4W before PI results in higher reduction of the grain yield. Hence, if dry spell occurs at this phase supplemental irrigation should be provided to realize higher grain yield.

BIOTECHNOLOGY AND IPM : PROSPECTS AND CHALLENGES

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Abstract

Sustainable agriculture could be achieved not only through proper agricultural practices but also through continuous research and development of new technologies, particularly agricultural biotechnology, which is probably a very important investment to achieve greater Competitiveness in the world market. Knowledge and continuous research is the key to assess the potential of biotechnology to increase agricultural productivity and to contribute to sustainability of agricultural systems. Potential improvements of bio-control agents involving beneficial insects and microorganisms that work in harmony with genetically engineered plants are examples of the utilization of biotechnology that lead to sustainable control practices. Public concerns on extensive use of chemical insecticides, insect resistance development, and the rising cost of developing new synthetic insecticides, all suggest that integrated insect pest management utilizing biological control products will become increasingly important in the years to come. However, products of biotechnology should be handled and marketed in much the same way as chemical pesticides. It is important to provide appropriate regulatory mechanisms to ensure that products produced by using new techniques are as safe as the products of traditional biotechnology. It is wiser, especially for the Asian countries to look into bio-control products that complement synthetic pesticide instead of replaces them. Bio-insecticides should bring great benefit in reducing the use of synthetic pesticides, especially those that are toxic and persistent. An integrated insect pest management underlying less input, cost effective and friendly environment is the key for sustainable agriculture. Despite tremendous benefits of biotechnology in insect pest management, there are still questions that require answers especially in Asian countries where biotechnology could be most profitable. Specific examples are the uncertainty of the technology in terms of successful research and adoption by the end users; high start-up investment; public awareness and acceptance; national policies on bio-safety and intellectual property issues; technology dissemination and proper implementation; human



resource and institutional development; and limited funding due to long-term and continuous nature of the research. Responsible national institutes and other affiliated research centers should engage in educational and training programs aimed at the general public for better understanding of the risks and benefits of biotechnology application.

EFFECT OF CROP RESIDUE BURNING ON SOIL NUTRIENTS AND MICROORGANISM

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Abstract

The crop residue hazard for soil after burning and disbalance of availability various component in soil as like Nitrogen, Phosphorous, Potash, calcium, Magnesium, soil moisture, Micro-organism, Flora, Fauna and harmful for wildlife, animal and human health and increase of environment temperature to affect the climate condition and physical chemical and biological properties of soil. Agronomical practices and measurement of various soil sample at field level. To the study of crop residue burning (before/after) analyzed pH, Organic carbon, C: N ratio, total Nitrogen, available phosphorous, exchangeable potash, Calcium, magnesium, Soil Moisture (Water Holding Capacity) and Microorganism. To affect the population of beneficial insect and pest because burning of crop residue and emission of carbon di-oxide due to increase the environment temperature and help of Global warming. In this condition soil erodibility is more because high rate of different type soil erosion like water erosion, wind erosion. Whereby decrease yield of many crop due to decrease the level of organic matter, soil nutrient and helpful soil microorganism. This has a bad effect on fertility and productivity of soil. To observe the soil sample in lab condition various results was defected decreases pH, organic carbon, total nitrogen, C:N ratio, soil moisture and soil microorganism but increased available phosphorous, exchangeable potash, calcium, magnesium etc.

MANAGEMENT OF PHYTONEMATODES IN AGRI-HORTICULTURAL CROPS FOR DOUBLING FARMER'S INCOME

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Abstract

Indian agriculture is composed of many crops with the foremost food staples being rice and wheat. Indian farmers also grow pulses, vegetables, fruits, oilseeds, sugarcane and non-food items as cotton, tea, coffee, rubber and jute. Despite the overwhelming size of the agricultural sector, however, yields per hectare of crops in India are generally low compared to international standards. Despite the fact that agriculture accounts for as much as a quarter of the Indian economy and employs an estimated 60 percent of the labour force. It is considered highly inefficient, wasteful and incapable of solving the hunger and malnutrition problems. Despite progress in this area, these problems have continued to frustrate India for decades. It is estimated that as much as one-fifth of the total agricultural output is lost due to inefficiencies in harvesting, transport, storage of government-subsidized crops and also by pests and diseases. Among the pests, phytonematodes are worst enemies of mankind and causing great damage to all agricultural and horticultural crops like vegetables, cereals, pulses, oilseeds, fruit crops, etc. They are distributed all over the world in different kinds of habitats and found in nearly every biological niche that supports life. They infect plant roots, bulbs, rhizomes, stems, leaves, buds, flowers, seeds etc. and cause great damage to the plants directly or indirectly. They feed upon the surface (Ectoparasitic nematodes) or partially enter into the root with their anterior part of the body (Semi-endoparasitic) or they enter inside the roots (Endoparasitic). The indirect damage by phytonematodes include their involvement in plant disease complex, making the roots more prone to secondary infections by bacteria and fungi and their role as vectors of many plant viruses. Sasser and Freckman (1987) estimated annual yield loss in major crops of the world due to plant parasitic nematodes as 12.3 percent. Annual loss worth as high as Rs. 40,000,000/= in wheat and Rs. 30,000,000/= in barely due to cereal cyst nematode (*Heterodera avenae*) in Rajasthan alone have been reported by Seshadri and Dasgupta, 1980. Sasser and Freckman (1987) have indicated an annual crop loss due to Phytonematodes on world wide basis to the tune of \$100 billion. Large number of plant parasitic nematode is recorded from the rhizosphere of many crops like Root-knot Nematode (*Meloidogyne* spp.), Reniform nematode (*Rotylenchulus reniformis*), cyst nematode



(*Heterodera* spp.), lesion (*Pratylenchus penetrans*) etc. Among all the plant parasitic nematodes, root-knot nematode (*Meloidogyne* spp.) are the major phytonematodes causing damage to almost all crops. Crop losses due to phytonematode appear in different forms. It may be loss in yield, deterioration in the quality of product and the increase in cost of production, etc. It is now well established that plant damage done by two or more pathogens is much more severe than what the pathogens cause independently. In such a complex situation, nematodes may either act as wound causing agents, as resistance breaking agents or as modifiers of host tissues or as vectors. The degree of damage caused by nematodes depends upon the population density of nematodes, susceptibility of the crop, environmental condition such as soil fertility, moisture and also presence of other pathogenic micro-organisms which may interact with nematodes as they are known to cause complex plant disease in association with fungi, bacteria and viruses. The losses in our agriculture production due to plant parasitic nematodes justify the need for adopting their different management practices to check their population and level of infestation and thereby increasing the farmer's income. Nematode management can be defined as a practice whereby plant parasitic nematodes population are maintained at levels that do not cause economic losses. There are two broad categories for management practices: Chemical and Non chemical. The chemicals used earlier to control plant parasitic nematodes were usually fumigant and non-fumigant nematicides. These are not only expensive but also cause environmental pollution, phytotoxicity, contamination of ground water and adversely affect land and its biotic environment. During the past few decades application of synthetic pesticides to control agricultural pests has been a standard practice. However, with growing evidence regarding detrimental effects of many conventional pesticides on health and environment, requirement for safer means of pest management has become very crucial. The several disadvantages associated with chemical control like hazards to man, effects on non target organism, phytotoxicity, hazards of pesticide residues, upsetting the ecological balance and difficulty in application. The demerits of hazardous chemicals have created interest in searching alternate methods for plant-parasitic nematode management for high yields and quality that are required by high cost of modern crop production for increasing farmer's income. Because of the serious losses caused by the phytonematodes principal management strategies i.e, Physical, Chemical, Cultural, Biological, Regulatory and IPM are undertaken to minimize crop losses caused by nematodes thereby enhancing Farmer's income.

SIMULATED EFFECT OF DRY SPELLS AT CRITICAL GROWTH STAGES ON THE PERFORMANCE OF KHARIF SORGHUM HYBRIDS

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Abstract

Impacts of changing patterns of rainfall on *kharif* hybrid sorghum was studied using DSSAT-CERES sorghum model. The calibrated and validated model using 2011 and 2012 experimental data was used to study the effect of simulated moisture stress vis-à-vis dry spells on yield. Scenarios included skipping of rainfall for two weeks and four weeks before panicle initiation as well as before end of grain filling stage. These scenarios were created by using daily weather data of 2011 and 2012. These scenarios were tested on two hybrids (CSH-16 and CSH-23) grown across three dates of sowing (15 June, 30 June and 15 July). As per the treatments rainfall data for two weeks and four weeks before crop reaches panicle initiation and end of grain filling were turned to zero. The simulations for 2011 and 2012 were pooled, compared with observed and presented here. Between two hybrids, CSH-16 performed better than CSH-23 both under observed (5804 and 5506 kg/ha, respectively) as well as stressed environment (3923 and 3429 kg/ha, respectively). Dry spells for four weeks before panicle initiation simulated higher yield reduction (69.35 %) as compared to dry spell for two weeks before panicle initiation (36.71 %) over observed. Model also simulated that moisture stress before end of grain filling stage has lesser adverse impact on yield both for two and four weeks stressed environment than that of panicle initiation. However, four weeks of dry spell before end of grain filling resulted in maximum yield reduction of 25.25 % as compared to two weeks dry spell before end of grain filling stage (8.98 %) over observed. Similar trend was observed for tops weight, leaf weight, stem weight and root weight. This study showed that dry spells either of two or four weeks before panicle initiation results in maximum yield reduction than two or four weeks before grain filling stage. This study also suggest that to realize higher yields of *kharif* sorghum, crop needs supplemental irrigation during vegetative phase leading to panicle initiation if dry spells occurred. This study also proves that crop simulation models show their applicability as effective tools to assess and quantify impacts of climatic factors on sorghum.



EFFECT OF DIFFERENT PRE-HAND MILKING TREATMENTS OF NEEM LEAF EXTRACT ON BACTERIOLOGICAL QUALITY OF RAW MILK

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Abstract

An experiment was conducted to determine the effect of different pre-hand milking treatments of Neem leaf extract as udder wash on bacteriological quality of raw milk on 12 healthy cross-bred cows at SHIATS, dairy farm, Allahabad with treatments as T₁(control), T₂, T₃ and T₄ (prepared by boiling 100, 150 and 200 g green Neem leaves in 1 litre water for 5 minutes, respectively). Collected milk samples were analyzed to determine Standard plate count (SPC), Lactic acid bacterial count (LABC), Lipolytic bacterial count (LBC), Proteolytic bacterial count (PBC) and coliforms in milk. Statistical analysis of different bacterial parameters in pre-hand milking treatments of neem leaf extract revealed significant difference in SPC, LABC, LBC, and PBC but shown non-significant difference in coliform count of milk. Results of the experiment indicated that the bacteriological quality of raw milk adjudged on the basis of SPC and physiological groups of bacteria was best in T₄ followed by T₃, T₂ and control shown superiority of T₄ over rest of the pre-hand milking treatments of washing udder with Neem leaf extract.

IMPACT OF LONG-TERM INTEGRATED NUTRIENT MANAGEMENT ON SOIL ORGANIC CARBON STOCK AND CARBON SEQUESTRATION INCOTTON + GREENGRAM INTER-CROPPING SYSTEM ON VERTISOLS

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Abstract

A field study was conducted during 2016-17 on a long term experiment initiated since 1987 with the objective of assessing the impact of continuous conjunctive application of chemical fertilizers and manures on soil organic carbon stock (SOC stock), soil organic carbon sequestration rate (SOCSR) and yield sustainability under cotton + greengram (1:1) intercropping system in Vertisols. The experiment was initiated since 1987 on Vertisols at the same site and with the same randomization laid out with eight treatments in three replications at Research field of AICRP for Dryland Agriculture Akola, Maharashtra. The eight treatments comprised of control, 100% RDF(50:25:00 NPK kg ha⁻¹) through chemical fertilizer, 50% RDF through chemical fertilizer, 50% N through FYM/giricidia, 50% N through fertilizers + 50% N through FYM/giricidia + 100% P₂O₅ ha⁻¹ fertilizers and 100% N ha⁻¹ giricidia + 100% P₂O₅ ha⁻¹ fertilizers. The results after 30th cycle of experimentation indicated that the highest soil organic carbon stock (14.39 Mg ha⁻¹) and carbon sequestration rate (0.14 Mg C ha⁻¹yr⁻¹) was observed under integrated nutrient management comprising 50% N through fertilizers + 50% N ha⁻¹ through giricidia + 100% P₂O₅ ha⁻¹ through fertilizers followed by 50% N through FYM + 50% N + 100% P₂O₅ ha⁻¹ through fertilizers, indicating considerable enhancement in soil organic carbon stock (SOC stock) and carbon sequestration rate (SOCSR) due to integrated nutrient management. Among the various treatments 50% N through fertilizers + 50% N ha⁻¹ through giricidia/FYM + 100% P₂O₅ ha⁻¹ through fertilizers not only enhanced soil organic carbon stock (SOC stock) and carbon sequestration rate (SOCSR) but it was found as the most promising approach from the view point of yield sustainability under cotton + greengram intercropping system in Vertisols under semi arid agroecosystem.

DECLINING CONTRIBUTION OF AGRICULTURE TO INDIAN GDP

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Abstract

Indian agriculture is a miscellaneous and extensive sector. India has one of the largest and institutionally most complex agricultural research systems in the world and one among the top producers of several crops. Although agriculture has been playing the most vital role in Indian economy, it has been observed that not much emphasis has been given to the history of



evolution of agricultural research in India. The agriculture sector's contribution has decreased from more than 50% of GDP from the 1950's i.e, (51 %) to (14p.c.) in 2018-19. It has been seen in the last few years that the input of the agriculture sector has been declining, but it is still one of the biggest contributors. The commitment of agribusiness in the national income in India is all the more, subsequently, it is said that agriculture in India is a backbone for Indian Economy. The Indian economy has undergone structural changes over time with the anticipated decline in the share of agriculture in the GDP, but it is still one of the biggest contributors. The sector is vital in ensuring the country's general food security and in addressing poverty. It is a general global trend that as the country's economy develops, and the economy becomes more industrialized, the agricultural sector's contribution to GDP also shrinks. The main objective of this report is to investigate growth trends in the agricultural sector, and observe the role of agriculture in economic development and its declining contribution in Indian GDP. Agriculture occupies a prominent position in Indian policy-making not only because of its contribution to GDP but also because of the large proportion of the population that is dependent on the sector for its livelihood.

EFFICACY OF PASHU CHOCOLATE (UMMB) ON MILK PRODUCTION AND REPRODUCTIVE PERFORMANCE OF LACTATING BUFFALO

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Abstract

The crop residues based system of animal feeding is not adequate to meet even maintains requirement of the animals. These feed and fodder are insufficient to support nutrients requirements, optimal reproductive performance and sustainable milk production from the dairy animals. Generally, in Panchmahal area buffaloes are suffering from anestrus problems and low milk yield. The availability of molasses, urea and minerals as source of energy, protein and minerals respectively through UMMB optimize rumen fermentation and consequently increase utilization of crop residues. and results into higher consumption which decrease the requirement of concentrate. KVK Panchmahal formulated *PASU CHOCOLATE* (UMMB) by using of urea, molasses, wheat bran, pulse churi, area specific mineral mixture, black salt, etc. for increase milk production and reproductive performance of dairy animals. Keeping the above facts in view, a trial was conducted at KVK, Panchmahal on the efficacy of *Pashu chocolate* (UMMB) on milk production and reproductive performance of lactating buffalo and also determined the cost effectiveness of supplements under semi-arid conditions. Twenty lactating Mahasana breed of buffaloes were divided into two groups of 10 buffaloes in each i.e. T₁ (control) and T₂ (*Pashu chocolate*). The feeding of selected animals in group (T₁) was consisted of 5-6 kg dry fodder and 20-25 kg green fodder with 2.5 kg /day/animal concentrate mixture. In group T₂, in addition to the above, a regular supply of *Pashu chocolate* (UMMB) as a lick was offered during the study period without interruption. Results of the study revealed that the average milk yield was recorded 6.23±0.4 and 7.75±0.54 lit. / day in control and *Pashu chocolate* (UMMB) group, respectively. *Pashu chocolate* (UMMB) supplemented buffaloes produced 24.40 per cent more milk as compared to control without any adverse affect on health of the animals. The study also indicated that 80.00 % buffalo conceived in T₂ group as compared to control (50.00 %). The service period (81.60 ± 7.54 days) was reduced significantly in *Pashu chocolate* group than the control group (132.00±13.34 days). The net return per buffalo was calculated Rupees 215.00 and 160.20 in *Pashu chocolate* and control group, respectively. The B:C ratio was recorded 2.80 and 3.28 in T₁ and T₂ groups, respectively. Based on observations, it can be concluded that the feeding of *Pashu chocolate* (UMMB) approximate 200g per day increased milk production and improved the reproductive performance of milch buffalo under hot semi-arid ecosystem.

RELATIONAL ANALYSIS OF PROFILE OF BT COTTON GROWERS WITH THEIR ADOPTION OF IPM PRACTICES FOR CONTROLLING PINK BOLLWORM

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Abstract

The present study was conducted in Beed district of Marathwada region from Maharashtra state. In Beed district there are 11 tehsils, out of which three tehsils namely Beed, Wadwani and Majalgaon were randomly selected on the basis of area under Bt



cotton. From each tehsils 4 villages were randomly selected and from each village 10 respondents were randomly selected to comprise 120 respondents. Regarding independent variables age had negative significant relationship with their adoption of Integrated Pest Management for controlling pink bollworm. Independent variables of education, occupation, land holding, annual income, social participation, economic motivation, innovativeness, risk orientation and knowledge had significant relationship with their adoption of Integrated Pest Management for controlling pink bollworm and extension contact had positive and highly significant relationship with their adoption of Integrated Pest Management for controlling pink bollworm.

IMPROVEMENT TECHNOLOGY OF GARDEN PEA (*PISUM SATIVUM*) MANAGEMENT

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Abstract

Garden pea (*Pisum sativum* L. var. hortense) is an important legume vegetable grown which is rich in proteins, vitamins and minerals and for its fresh shelled seeds. Presently 1000 germplasm lines are available in India. Improvement of garden pea in the country was initiated during the 1940s in IARI and later in several other agricultural universities/ ICAR institutes. Currently, 27 early-varieties and 59 mid-season varieties are under cultivation in India. Initially, focus was given mainly on developing early-maturing varieties with high yield and quality. Subsequently, emphasis was laid on developing mid-season varieties which are having resistance to powdery mildew and other major diseases like Fusarium wilt and rust. Varieties which are resistance to bruchids and the leaf miner are also available. Improvement of garden pea in India, covering its genetic resources, variability, heritability, genetic advance, heterosis and combining ability, G x E interaction, male sterility, breeding for biotic and abiotic stresses, mutation breeding and biotechnological applications is quite mandatory. In recent years, there has been an increase in demand for varieties suited to kharif and early summer seasons, with resistance to powdery mildew, rust, Fusarium root wilt/rot and stemfly and also for processing and export. Breeding varieties for resistance to biotic and abiotic stresses (mainly high temperature) and suitable for processing (freezing) to meet the internal demand and for export. Therefore, future thrust in the improvement of garden pea would be on developing varieties tolerant to biotic and abiotic stresses (mainly high temperature), and also for processing and export.

STUDIES THE FARM STRUCTURE, CROPPING INTENSITY, CROPPING PATTERN, PATTERN OF RESOURCES AND COST OF RETURN IN WHEAT CULTIVATION OF DIFFERENT SIZE FARMS

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Abstract

The Comparable food grain position in India over the year is attributed mainly to the better performance of wheat crop. Among the cereals cultivated in India, wheat occupied a premier next only to rice accounting for nearly 30 per cent of total cereals production. During *Rabi* season it has the single largest crop occupying about 50 per cent of area and contribution 70 per cent of the total *Rabi* grain production. As regards research methodology the district Azamgarh and block Koilsa was selected purposively. A two stage stratified random sampling technique was adapted to selected villages and cultivators from Koilsa block. Among the villages five were selected randomly and fifty cultivators (wheat growers) were also selected randomly from five selected villages. The selected cultivators were again sub-grouped into three size groups of holding *i.e.*, 0-1, 1-2 and above 2 hectare. The data were collected by respondent by survey method with the help of questionnaires and schedules prepared in advance. The all holding groups were found below average size. The wheat occupied higher area in the cropping pattern in all groups of farms. The percentage share of wheat crop area under cultivation of the total cropped area of different size group worked out of 40.61% below 0-1ha size group and 31.61% above 2ha and size group. The second main crop was rice in all size of farms. The average value of gross income was Rs. 32662.5, which was highest being Rs 35300.00 on 1 to 2 ha size of farms and the lowest being in Rs. 30830.00 on 2 and above ha in size of farms.



CONTROL OF CITRUS CANCKER DISEASE IN ROUGH LEMON (*CITRUS JAMBHIRI* LUSH.)

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Abstract

Rough lemon (*Citrus jambhiri* Lush.) rootstock refers to selected plants within the genus citrus, that furnish as rootstock for other citrus plants. A rootstock plant must be compatible to specific scion variety of choice, and resistant to common threats, such as drought, frost, and common citrus diseases. Citrus canker it is a disease affecting Citrus species caused by the bacterium *Xanthomonas axonopodis*. Infection causes lesions on the leaves, stems, and fruit of citrus trees. Experiment was conducted during 2018-19 to find out the best chemical to control of Citrus canker disease in Rough lemon. Two types of plants (Pruned and Un pruned) were selected for present study. Blitox 50 (@ 0.25 %) and streptocycline halone and in combination (@ 100 and 200 ppm) were used alone and in combinations. Spraying of above chemicals was done during the 2nd week of January, July and October 2018. The disease severity was recorded before spray and one month after the last spray. The minimum disease incidence was recorded on pruned plants with the spray of blitox 50 + streptocycline followed by blitox 50 + streptocycline in un pruned plants.

ISOLATION AND CHARACTERIZATION OF PHYLLOSPHERE MICROFLORA OF MAIZE

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Abstract

Globally, maize is known as queen of cereals and is one of the important cereal crops of the world. Maize crop is prone to several foliar and stalk rot diseases. Most of the released cultivars became susceptible to the disease. With the development of ecological agriculture, the impact of over use of chemical fungicides on environment and food safety has become a serious concern. Phyllosphere inhabitants are termed as epiphytes and may consists of a variety of bacteria and filamentous fungi. microbial interactions in the phyllosphere suppress and stimulate the colonization and infection of tissues by plant pathogens, increase disease resistance and the productivity of agricultural crops, thus phyllosphere microorganisms can play an important role in growth promotion and disease suppression. Individual colony bacteria were examined for shape, size, colour, Gram staining, endospore staining, elevation and texture for morphological studies. Different biochemical tests viz., Catalase test, Oxidase test, Voges Prausker's test, Indole test, Methyl red test, Gelatin liquefaction were done for phyllosphere bacteria.

AWARENESS ABOUT MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE ACT (MGNREGA)–A STUDY OF DISTRICT KULLU OF HIMACHAL PRADESH

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Abstract

Mahatma Gandhi National Rural Employment Guarantee act (MGNREGA) perceived as one of the poverty alleviation programmes aimed at providing guaranteed employment to rural peoples. The scheme is believed to have potential to change the socio-economic status of village people by ensuring livelihood security. The study conducted on a random sample of 70 respondents selected from five villages of Nirmand block of Kullu district (H.P) revealed that a majority of them were aware about the job card (100%), receipt of application of employment (74%), about the number of employment days (100%), necessity of opening of bank account (60%), employment within stipulated period of 15 days (100%), regular marking of attendance (100%), installation of Notice board at work-site (94%), equity in wages of male and female workers (100%), regular checking of work done (66%) and social audit by the Gram Sabha (89%). However, they were found ignorant about unemployment allowance in case work not given within stipulated period of 15 days (100%) and the ratio of wage and



material (80%). Lack of facilities like crèche, drinking water, shed etc. at the work-site followed by ignorance about unemployment allowance, not-maintaining wage and material ratio, happening of accidents at work-site due to lack of facilities and delaying of funds allocation causing shortage of work, consequently leading to turnover of workers etc were the main problems/difficulties. Hence, the study implies that basic facilities as per the provisions under MGNREGA should be provided at the work-site besides ensuring timely allocation and release of funds to the Gram Panchayats.

BENEFICIARIES' PERCEPTION ON MGNREGA – A STUDY OF KULLU DISTRICT (HP)

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Abstract

Mahatma Gandhi National Rural Employment Guarantee (MGNREGA) scheme—A job guaranteed scheme aimed at ensuring livelihood security in the rural areas and has a great potential to change the social-economic condition of the rural people. The study conducted on 70 respondents selected from Nirmand Block of Kullu District (HP) revealed that a majority of them (62.86%) had medium level of perception about MGNREGA. Lack of facilities like crèche, drinking water etc (Rank I) followed by ignorance about unemployment allowance (in case employment not given within stipulated period of 15 days of application), non maintaining of wage and material ratio (Rank III) and happening of accidents due to lack of facilities at the worksite were the main difficulties faced by the respondents. Similarly, delaying in fund allocation and payment (Rank V) etc. were found some of the other main problems faced by them under MGNREGA. A simple majority (54%) were satisfied with the execution of MGNREGA by their Gram Panchayat. Hence, the study implies that awareness among the workers about some of the provisions of the MGNREGA particularly in case of compensation for delayed payment, ex-gratia payment, grievance redressal mechanism, unemployment allowance and employment with stipulated distance of 5km was very low. Hence, the study implies that efforts should be made to make the workers/village people aware through the use of mass media like Radio, TV and Newspaper etc and by organizing some type of orientation programs for them. Facilities of Crèche, drinking water, Shed etc. could be ensured at worksite through proper monitoring and supervision by the implementing authority and the study has recommended that the days of employment should be increased from 100 days to 150 to 200 days.

ROOT ANATOMICAL STUDY ON INTERACTIONS BETWEEN *FUSARIUM OXYSPOURUM* F. SP. CICERI AND CHICKPEA

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Abstract

A field experiment was conducted at All India Pulses Improvement Project, MPKV, Rahuri for the year 2014-2016. The *Fusarium* wilt resistant lines viz., WR 315 and susceptible line viz., JG 62 were taken for the study of vascular anatomical features. The fifteen days old seedlings grown in wilt sick soil as well as in sterilized soil were used for observation. Transverse section (TS) of tap roots of resistant and susceptible lines were observed under electron microscope for vascular elements. Marked difference between resistant and susceptible lines were observed with reference to anatomical structures. In the microscopic observation, transverse section of tap root has shown correlation between resistant traits and vascular anatomy. After 48 hrs of inoculation, the uninfected roots remained free of any hyphal growth whereas *fusarium oxysporum* f.sp.*ciceri* produced a net like mycelium on the surface of the infected 'JG-62' root tip which was detected with lactophenol-cotton blue staining. Also the germinating conidia of *fusarium oxysporum* f.sp.*ciceri* and their germ tubes appeared to be attached to the root surface of infected 'JG-62' by a mucilaginous sheath. Whereas, 'WR-315' root did not show any prominent mycelial growth on its root surface. After 72 hrs of inoculation, the vascular region of infected 'JG-62' roots was observed as a disorganized mass of few protoxylem and sparsely distributed enlarged metaxylem. After 86 hrs of inoculation, the vascular region was seen as a cross-shaped structure with four xylem arcs alternating with phloem tissue. In the infected 'WR-315' plants, staining with PAS reagent marked the presence of many densely stained polysaccharide deposits comprising of gums and resins. Similarly, the occurrence and intensity of these polysaccharide deposits was apparently less in



the infected 'JG-62' plants. The study of root anatomical parameters reveals that with the help of root anatomy able to differentiate the Fusarium wilt resistant and susceptible lines of chickpea.

GENE ACTION FOR SEED YIELD AND MATURITY TRAITS IN MUNGBEAN (*VIGNA RADIATE* (L.) R.WILCZEK)

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Abstract

Generation mean analysis in two crosses, involving four parents (SML-668, BM-2002-1, PKV Green Gold and BPMR-145) was studied to estimate nature of gene action involved in the inheritance of seed yield and maturity related traits. The mean data on six generation (P1, P2, F1, F2, B1 and B2) was subjected to joint scaling test. As per Cvalli's joint scaling test in the presence of epistatic, six parameter model was applied to detect the gene effects. Additive, dominance and epistasis interactions were found important in two crosses for three traits under studied. Dominance gene action was predominant for seed yield plant⁻¹ in both crosses. The cross PKV Green Gold x BPMR-145 was found promising for further exploitation through biparental mating followed by selection.

IMPACT OF FARMERS-LED INTEGRATED PEST MANAGEMENT IN CAULIFLOWER CULTIVATED IN SOUTH-WEST DELHI

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Abstract

Implementation of Integrated Pest Management programme in irrigated cauliflower crop led to reduction in number of conventional pesticide sprays by 50-60%. Krishi Vigyan Kendra, Delhi had conducted Front Line Demonstration (FLD) on Integrated Pest Management (IPM) at the farmers' field in the villages of South-West district of Delhi during 2010-11, 2012-13 and 2013-14. 15 farmers during 2010-11 and 10 each during 2012-13 and 2013-14 respectively were selected randomly from the villages. The farming situation of demonstration fields were irrigated, low in nitrogen, medium in phosphorus and potash and the soil was sandy loam.

SEVERITY OF STUDIES ON SEED HEALTH STATUS OF FARMERS OWN SAVED SEEDS OF SOYBEAN

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Abstract

Soybean (*Glycine max* (L.) is attacked by a wide range of diseases many of which are seed borne. There were at least 66 fungi, 6 bacteria and 8 viruses found to be associated with soybean seeds. These seed-borne micro-organisms have adverse effects on soybean seeds. They can reduce seed germination, seedling emergence as well as cause blight and leaf spot. Some of micro-organism which were found associated with soybean seeds like *Cercospora kikuchii*, *Colletotrichum dematium*, *Diaporthe phaseolorum*, *alternaris* and *cercospora sojina*. The experiment was conducted for three season during kharif 2016, 2017 and 2018 at Seed Pathology laboratory, Mahatma Phule Krishi Vidyapeeth, Rahuri to study the extent of seed borne pathogens associated with soybean seeds saved and used by farmers. The four hundred forty one seed samples of soybean were collected from Ahmednagar, Nasik, Dhule, Nandurbar, Jalgaon, Pune, Solapur, Sangali, Kolhapur and Satara districts and their seed health status was studied. The seed health status of farmers own saved seeds was tested by different



methods viz .Seed germination, Seed mycoflora and Visual observation . The observation of seed germination was recorded by Rolled towel paper method, Seed Mycoflora by standard blotter test and Soybean mosaic virus and Purple stain of soybean by visual observation. The seed germination of these four hundred forty one samples was ranged from 33 to 98 per cent while the total seed mycoflora associated with the seeds was ranged from 1.0 to 7.1 per cent. The pre-dominant mycoflora associated with the seeds of soybean were *Colletotrichum truncatum* (1.0 to 3.5%), *Macrophomina phaseolina* (2.2 to 7.1%), *Cercosporakichii* (1.0 to 3.5%), *Fusarium oxysporum* (2.6 to 6.7%), *Fusarium moniliforme* (1.2 to 6.8%), *Phomamedicaginis* (1.1 to 4.7%) and *Alternaria alternata* (2.2 to 6.3%). The seeds infected with soybean mosaic virus were observed visually which was ranged from 1.0-2.1%. Out of 441 seed samples, 85 samples showed the germination below the minimum seed certification standard (MSCS) i.e.70.00 percent.

CHARACTERIZATION OF RICE GERMPLASM LINES FOR YIELD AND YIELD RELATED TRAITS AND IDENTIFICATION OF ASSOCIATED MOLECULAR MARKER

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Abstract

Assessment of genetic diversity in a crop germplasm is a vital part of plant breeding. DNA markers such as microsatellite or simple sequence repeat markers have been widely used to estimate the genetic diversity in rice. The present study was carried out to decipher the pattern of genetic diversity in terms of both phenotypic and genotypic variability a set of 251 rice accessions that included landraces, farmer's varieties and popular yielding lines were evaluated for agronomic traits and molecular diversity. The random set of SSR markers included 50 diversity panel markers developed trait-linked/gene based markers comprised of 50 SSR markers reportedly linked to yield and related components. Association analysis was conducted on a panel of accession of indigenous rice using SSR markers for nine traits related to grain and cooking quality parameters of rice. The value of PIC ranged from 0.37 (RM128) to 0.76 (RM252) with an average of 0.505 for all the genotypes under study. Marker trait association analysis for various characters identified 32 significant associations ($P < 0.05$), with the R^2 values ranging from 1.6% to 10.75%. The highest number of alleles 5 was recorded for 13 marker whereas, the lowest number of allele 2 was obtained for 2 markers breeding approach can lead for improvement of yield potential of rice. Assessment of diversity of rice germplasm for yield related traits using phenotypic and molecular characterization is therefore, necessary to fulfil the present and estimated yield requirement gap of everything world population in this study thus a combination of phenotypic and DNA marker based molecular characterization employed to unveil the yield potential of set of selected germplasm lines many studies have been conducted to assure the yield A total of 200 alleles generated through 49 markers were selected and subjected to analysis. The accessions were grouped into 2 major sub-cluster containing 2 and 6 clusters. Major cluster I and II contain 30 and 189 accessions respectively rice diversity from land races to elite cultivars were sourced from different parts of India and then characterized for morphological and molecular variability. Wide range of genetic variability was found to each for 17 yield related traits. The analysis of variance exhibited existence of sufficient genetic variability for all major trait. Frequency distribution revealed continuous variation with normal distribution. A total of 49 trait linked markers were used for genotyping of 219 germplasm lines

IMPACT OF CSR-BIO MICROBIAL CULTURE ON YIELD, QUALITY AND SOIL FERTILITY OF BANANA UNDER SODIC SOIL CONDITIONS

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Abstract

A field experiment was conducted during 2014 and 2015 as a fixed layout in sodic soil at farmers field village Vinovanagar district Kanpur dehat in the jurisdiction of C. S. Azad University of Agriculture and Technology, Kanpur using high yielding variety G-9 of banana. The initial physico-chemical properties of soil were pH 8.9, EC 0.76 dSm⁻¹, ESP 37.2% and organic carbon 2.9 g kg⁻¹. The soil was sandy loam in texture having available N 165.2 kg ha⁻¹, available P₂O₅ 17.3 kg ha⁻¹ and available K₂O 224.3 kg ha⁻¹. The experiment was laid out under randomized block design with four replications. The



experiment consist of four treatments viz., T₁- Control, T₂- CSR-Bio microbial culture (soil application), T₃- CSR-Bio microbial culture (foliar spray) and T₄- CSR-Bio microbial culture (soil application + foliar spray). The studies confined to the Impact of CSR-Bio microbial culture on yield, quality and soil fertility of banana under sodic soil conditions. Maximum plant height (186.5 cm), stem girth (65.4 cm), leaves/plant (12.9), finger/hand (18.1), finger length (17.1 cm) and finger weight (126.4 g) were recorded with the application of CSR-Bio microbial culture (soil application + foliar spray). Highest hands/bunch (9.08), fingers/bunch (157.3), weight of bunch (24.5 kg) and yield (106.7 mt/ha) were recorded with CSR-Bio microbial culture (soil application + foliar spray) treatment which showed its superiority over rest treatments. The range of pulp:peel from 2.27 to 3.84, TSS from 17.2 to 25.3 q/ha, acidity from 0.34 to 0.21 % and total sugar from 14.4 to 21.1 % were recorded with the application of deferent treatments. The maximum pulp:peel 3.84, TSS 25.3, acidity 0.34 % and total sugar 21.1 % were recorded with the application of CSR-Bio microbial culture (soil application + foliar spray) over control plot, The maximum changes in soil pH from 8.9 to 8.5, EC from 0.76 to 0.68 dSm⁻¹, ESP from 37.2 to 30.2 %, organic carbon from 2.9 to 3.9 g kg⁻¹, available N from 165.2 to 179.3 kg ha⁻¹, available P from 17.3 to 25.4 kg ha⁻¹ and available K from 214.3 to 231.2 kg ha⁻¹ with the application of CSR-Bio microbial culture (soil application + foliar spray) than other treatments. The use of CSR- Bio microbial culture as soil application is better than foliar spray in case of changes in physico-chemical properties of soil

EVALUATION OF SALT TOLERANT RICE, WHEAT AND MUSTARD VARIETIES UNDER SODIC SOIL CONDITIONS

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Abstract

A field experiment was conducted during 2015 to 2018 as a fixed layout in sodic soil at Crop Production Farm Dalipnagar in the jurisdiction of C. S. Azad University of Agriculture and Technology, Kanpur. The initial physico-chemical properties of soil were pH 9.30, EC 0.89 dSm⁻¹, ESP 45.3% and organic carbon 2.3 g kg⁻¹ soil. The soil was sandy loam in texture having available N 164 kg ha⁻¹, available P₂O₅ 17 kg ha⁻¹ and available K₂O 212 kg ha⁻¹. The experiment was laid out under randomized block design with three replications. Salt tolerant and high yielding varieties CSR-23, CSR-27, CSR-30, CSR-36, CSR-43, Pant-12, NDR-359 and Kranti of rice, KRL-210, KRL-213, PBW-343, PBW-502, WH-147, K-307, K-8434, and DBW-17 of wheat and CS-52, CS-54, CS-56, Varuna, Pitamvari, Rohini, Urvashi and Kanti of mustard were tested. The grain, straw and biological yield of rice ranged from 22.63-44.29 q ha⁻¹ with the mean value of 35.81 q ha⁻¹, from 27.98-63.59 q ha⁻¹ with the mean value of 43.80 q ha⁻¹ and from 50.61-97.88 q ha⁻¹ with the mean value of 79.61 q ha⁻¹ respectively. The maximum grain yield 44.29 q ha⁻¹ was received from CSR-36 followed by CSR-23 (41.65 q ha⁻¹), CSR-43 (39.03 q ha⁻¹), CSR-27 (38.86 q ha⁻¹) and NDR-359 (37.26 q ha⁻¹) and minimum 22.63 q ha⁻¹ from CSR-30 variety of rice. The maximum grain yield 36.70 q ha⁻¹ was received from KRL-210 followed by KRL-213 (35.23 q ha⁻¹), PBW-343 (33.98 q ha⁻¹) and PBW-502 (31.75 q ha⁻¹) and minimum 27.94 q ha⁻¹ from WH-147 variety of wheat. The maximum grain yield 58.91 q ha⁻¹ was received from CS-56 followed by CS-54 (15.04 q ha⁻¹), CS-52 (13.81 q ha⁻¹), Varuna (12.98 q ha⁻¹) and Rohini (12.28 q ha⁻¹) and minimum 10.88 q ha⁻¹ from Urvashi variety of mustard.

PERFORMANCE OF GUAVA VARIETIES INFLUENCED BY CSR-BIO MICROBIAL CULTURE ON YIELD, QUALITY AND SOIL FERTILITY IN SODIC SOIL

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Abstract

A field experiment of guava was established in the year 2013 in sodic soil at farmers field village Vinovanagar district Kanpur dehat in the jurisdiction of C. S. Azad University of Agriculture and Technology, Kanpur using high yielding varieties Sweta and Lalita of guava. The initial physico-chemical properties of soil were pH 8.8, EC 0.72 dSm⁻¹, ESP 37.8% and organic carbon 2.8 g kg⁻¹. The soil was sandy loam in texture having available N 162.2 kg ha⁻¹, available P₂O₅ 17.6 kg ha⁻¹ and available K₂O 215.3 kg ha⁻¹. The experiment was laid out under randomized block design with four replications. The experiment consist of four treatments viz., T₁- Control, T₂- CSR-Bio microbial culture (soil application), T₃- CSR-Bio



microbial culture (foliar spray) and T₄- CSR-Bio microbial culture (soil application + foliar spray). The studies confined to the Impact of CSR-Bio microbial culture on yield, quality and soil fertility of guava under sodic soil conditions. The highest fruit size (57.1 cm²), fruit weight (141.5 g), seed weight (5.71 g) and specific gravity (1.17 g/cm³) were recorded in Sweta variety and fruit size (59.9 cm²), fruit weight (147.5 g), seed weight (5.74 g) and specific gravity (1.22 g/cm³) were recorded in Lalita variety of guava with the application of CSR-Bio microbial culture (soil application + foliar spray). The maximum yield/plant (65.5 Kg), yield/ha (18.7 mt), suger content (8.35%) and ascorbic acid (272.5 mg/100g) with the average values of yield/plant (53.1 Kg), yield/ha (15.0 mt), suger content (7.34%) and ascorbic acid (246.5 mg/100g) were recorded in Sweta variety and yield/plant (70.2 Kg), yield/ha (19.5 mt), suger content (8.44%) and ascorbic acid (278.6 mg/100g) with the average values of yield/plant (58.0 Kg), yield/ha (15.6 mt), suger content (7.54%) and ascorbic acid (252.9 mg/100g) were recorded in Lalita variety of guava with the application of CSR-Bio microbial culture (soil application+foliar spray). The performance of Lalita is better in comparsion to Sweta varity of guava. The maximum changes in soil pH from 8.8 to 8.4, EC from 0.72 to 0.65 dSm⁻¹, ESP from 37.8 to 30.2 %, organic carbon from 2.8 to 3.8 g kg⁻¹, available N from 162.2 to 177.3 kg ha⁻¹, available P from 17.6 to 22.5 kg ha⁻¹ and available K from 215.3 to 230.2 kg ha⁻¹ with the application of CSR-Bio microbial culture (soil application+ foliar spray) than other treatments. The use of CSR- Bio microbial culture as soil application is better in comparsion to folior spray in case of changes in physico-chemical properties of soil.

ITK METHODS TO CONTROL INSECT PESTS OF OKRA AT BALAGHAT DISTRICT M.P.

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Abstract

Okra (*Albelmoschus esculentus*) is an important vegetable crop grown throughout the year in India. The crop is attacked by number of pests of which shoot and fruit borer, leafhopper, whitefly, red spider mite, solenopsis mealybug and root knot nematode are most serious causing pests which causes substantial reduction in crop growth and yield. Mainly okra crop was found infested with sucking insect pests these are, whitefly (*Bemisia tabaci*), leafhopper (Jassids) *Amrasca bigutulla* *bigutulla*, aphids and thrips (*Thrips palmi* karmy). This study was conducted to evaluate the efficacy of some IT K (indigenous technical knowledge) methods or botanical products to control insects pests population in okra We set up trial with plot size (5x5mm) in random completely block design RCBD with 3 replication at College of Agriculture Balaghat waraseoni during 2017 and 18 for kharif season. Seven ITK methods were applied viz; garari leaves extract (*Cleistanthus collinus*), alcoholic decoction of garari leaves, amrit Pani, buttermilk, compost made of garari leaves, neem oil and control (no botanical extract). There were significant reduction in pests population for all the botanical extract applied (P<0.05) on okra plants as compared to the control. The plants on which ITK methods applied show more healthy vegetables and plants growth. The weight of each cultivar was maximum and yield was also more. The botanical extract used for these study show good results against sucking type of pest of okra. All extract reduce the insect population but Garari leaves and Neem oil show the best result as compared to other. These ITK methods are very useful, although it controls the insect pests population with herbal insecticides and also contributes in reducing the pesticides pollution and insecticidal residual problems in vegetables which is good for human health and environment also.

LOW COST SOIL MOISTURE SENSOR SYSTEM BASED AUTOMATED DRIP IRRIGATION SYSTEM

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Abstract

The present study was conducted at the demonstration farm of Krishi Vigyan Kendra, Raipur carried out by the Department of Soil and Water Engineering, SVCAET and RS, Faculty of Agricultural Engineering, IGKV, Raipur, Chhattisgarh during the



rabi season 2018-2019 with the aim to integrate and set up a low cost sensor system for monitoring of available soil moisture content in conjunction with low cost gravity operated drip irrigation system for efficient utilization of precious irrigation water. Electrical resistivity based alfamart soil moisture sensor system was calibrated and validated in conjunction with indigenously designed and developed relay based Programmable Logical Controller (PLC) to operate efficiently between the volumetric moisture content from 80-50% of field capacity. As the soil moisture turns down below 50% available soil moisture, the sensor transmits the information to the PLC which in turns power on the pumping unit to the fill the overhead tank of the gravity operated drip irrigation system which will again make the field soil moisture content to reach 80%. As the height of overhead tank was 15 ft, the operating pressure was measured to be 0.5 kg cm^{-2} only. The hydraulic performance of the currently started drip irrigation system was tested and it was found that the average discharge of emitter is 1.08 lph (in-line emitter) and it was tested at different points (10 m distance) at 10 min interval of different operating head, Emission uniformity (98.80%), Uniformity coefficient (98.45%), Distribution efficiency (96.55%) and Application efficiency (98.91 %) were found maximum at operating head 6.18 m to 5.94 m. Water use efficiency was found ($73.4 \text{ kg ha}^{-1} \text{ mm}^{-1}$) under sensor based treatment And Control irrigation was $57.13 \text{ kg ha}^{-1} \text{ mm}^{-1}$.

EFFECTS OF CONSERVATION AGRICULTURE ON THE CLUSTER BEAN-WHEAT SYSTEM IN SANDY SOIL OF HARYANA (INDIA)

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Abstract

Rotating crop over the years, uncultivating the soil and leaving crop residues on the soil surface in the practice of zero tillage/conservation agriculture (ZT/CA) reverses the historically accelerating degradation of soil organic matter (SOM) and soil structure, while increasing the soil biological activity and influence soil physico-chemical and microbiological properties and bring about changes in the soil microbial community and function. In present study, the effect of long-term zero-tillage practices on selected physico-chemical properties, viable count of microbes and enzymatic activities was determined in cluster bean-wheat system at 0-15 and 15-30 cm soil depth in Mahendergarh district of Haryana (latitude 28.03°N and longitude 76.10°E). The texture of different soil samples collected from conventional and zero-tillage cultivated farms was sandy. The long-term zero-tillage practices resulted, relatively higher soil nitrogen and organic carbon contents, microbial biomass, dehydrogenase, alkaline phosphatase, cellulase and urease activities at the 0-15 cm depth than conventional tillage. The abundance of various microbes viz. Bacteria, fungi, actinomycetes, *Azotobacter* and phosphate solubilizing bacteria was relatively higher in zero-tillage surface layer. Soil organic carbon content was positively correlated with most of the soil physico-chemical and microbiological properties and was found to be suitable for cluster bean-wheat crop-rotation. These results indicated that the zero-tillage system under cluster bean-wheat crop-rotation and soil depth were two important factors affecting soil microbial community and activity. The zero-tillage practices improved physico-chemical as well as microbiological properties of soil that may lead to enhanced crop yield.

EFFECT OF SOWING DATES ON WHEAT VARIETIES

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Abstract

Experiment was carried out during rabi 2017 and 2018. The experiment was comprised of four date of sowing D1-5th November, D2-25th November, D3-15th December and D4-5th January as main plot with six different varieties i.e. V1-HS 562, V2-HD 2967, V3-HD 3086, V4-HI1544, V5-MACS 6222 and V6-WR 544 as sub plot in split plot design with three replication. The soil of experiments was clay-loam in texture (*Vertisols*) neutral in reaction. Sowing was done as per scheduled programme and harvested on D1-06th March, D2-20th March, D3-12th April and D4-24th April, 2018 and D1-06th March, D2-20th March, D3-12th April and D4-26th April, 2019. Sowing was done using normalized seed rate of 100 kg/ha at a row spacing of 20cm., recommended practices were followed with respect to fertilization and weed control. The grass plot size: $1.80\text{m} \times 8\text{m} = 14.40 \text{ sq.m}$ (9 rows at 20 cm. spacing) was taken during both the year of experiments. The significantly higher



mean productivity was observed under D₁ (48.01 and 49.68qt/ha) during both the year of experiments, which is 43.84 & 33.57 per cent higher than D₄ (26.96 and 33.57 qt/ha). This yield gain, might be due to statistically higher ear head/sq.m and 1000 grain weight, g under D₁. HI-1544 recorded significantly higher seed yield (43.84 and 46.68 qt/ha) during both the year. Wheat cultivar WR 544 was lowest yielder during both years. Higher ear head/sq.m and 1000 grain weight, were recorded under HI 1544, which was significantly superior to other varieties during both the year. MACS 6222 recorded higher number of grains/earhead, which was at par with varieties HD 2967 and HS 562 during 2018 and similar trained, was observed during next year of experiment.

RESPONSE OF SOIL AND FOLIAR APPLICATION OF MICRONUTRIENTS BIOPHYSICAL AND FRUIT YIELD PARAMETERS OF SAPOTA CV. KALIPATTI HDP SYSTEM

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Abstract

Present study was carried out to know the response of soil and foliar application of micronutrients (Zn, Fe and B) on biophysical and yield parameters of sapota Cv. Kalipatti under high density planting (HDPS-3x3 m) system and the micronutrients are applied through soil and foliar. The zinc and iron sulphates are used for soil and foliar application, whereas for soil application of boron, the sodium tetraborate (Jai bore) used and for the foliar application solubor were used. The present research results indicated that, the foliar application of 0.5% ZnSO₄ + 0.5% FeSO₄ + 0.3% B tree⁻¹ (i.e. in two times as foliar i.e. 1st at 50 per cent flowering and another at fruits at pea size) along RDF (i.e. 100: 40: 150 g NPK and FYM 50 kg tree⁻¹ for four to six years plants) were noted the increased photosynthetic rate (14.57 mol CO₂ m⁻²s⁻¹), transpiration rate (9.24 mmol H₂O m⁻² S⁻¹), Stomatal conductance (0.29 mol m⁻²s⁻¹), sub stomatal CO₂ (232.94 ppm), leaf temperature (42.77 °C), total chl (2.79 mg g⁻¹) and chl a/b (6.15) has resulted the minimum number days to fruit set (29.50 days), maximum fruit set (23.03%), fruit retention (85.91 %) and less number of days to reach harvestable stage (195.88 days) were noticed. Similarly superior fruit yield characters like fruit weight (113.33 g), volume (101.50 ml) and yield (20.60 kg tree⁻¹ and 23.44 t ha⁻¹) were noticed. Whereas with 50 g ZnSO₄ + 40g FeSO₄ + 25g B soil along with 0.5% ZnSO₄ + 0.5% FeSO₄ + 0.3% B foliar application and RDF, control (RDF) and water spray + RDF treatments has shown reduced biophysical resulted in reduced fruit yield parameters.

FIELD EFFICACY OF NEW GENERATION INSECTICIDES AGAINST YELLOW MOSAIC DISEASE (YMD) OF BLACKGRAM (*VIGNA MUNGO* L.)

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Abstract

Yellow Mosaic is a major observed disease in pulses during recent years. It is one of the most vicious diseases of blackgram and has been renowned in India for more than five decades. It results in heavy crop loss from 50-70 per cent, especially if the disease occurs in the early stage of crop growth. For this purpose the present study was conducted at the experimental field of Krishi Vigyan Kendra, Satna (M.P.) during *Kharif* season of 2018-19 to know their efficacy in controlling yellow mosaic disease in blackgram using 5 treatments in 3 replications following Randomized Completely Block Design (RCBD). The treatments namely; Flonicamid 50 % (WG) @ 80 gm/acre (T₁), Denotefuran 20 % (SG) @ 100 gm/acre (T₂), Afidopyropen 50 % (DC) @ 400 ml/acre (T₃), Diafenthiuron 50 % (WP) @ 250 gm/acre (T₄), Thiamethoxam 25 % (WG) @ 100 gm/acre (T₅) and control (Spray of plain water). Foliar sprays of insecticides were given twice at 30 and 45 DAS. All the tested insecticides were found to be significantly superior over check in reducing the incidence of yellow mosaic disease. Analysis of the data showed that the minimum Per cent Disease Incidence (PDI) was recorded with Afidopyropen 50 % DC @ 400 ml/acre (11.32 %), followed by Flonicamid 50 % WG @ 80 gm/acre (16.73 %) over control (59.98 %), respectively. The highest grain yield (787.96 kg/ha) was obtained in treatment with Afidopyropen 50 % DC, followed by Flonicamid 50 % WG (675.71 kg/ha), respectively. Further it was observed that two foliar sprays of Afidopyropen 50 % (DC) @ 400 ml/acre at 15 and 45 days after



sowing showed minimum per cent disease incidence (11.32 %) and significantly enhancement of grain yield of blackgram as compared to other treatments employed, hence this treatment is recommended for getting maximum yield advantage.

EFFICACY OF DIFFERENT COMBINATION FUNGICIDES AGAINST BROWN LEAF SPOT (*DRECHSLERA ORYZAE*) OF RICE (*ORYZA SATIVA* L.) UNDER FIELD CONDITIONS

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Abstract

Brown spot, caused by *Drechslera oryzae*, is one of the most important diseases of rice and is responsible for significant loss in yield and grain quality. The present study had been planned to evaluate the efficacy of different combination fungicides against brown spot of rice was conducted at the experimental field of Krishi Vigyan Kendra Majhgawan, Satna (M.P.), during Kharif season of 2017-18. The six fungicides that were compared with control allocated in Randomized Completely Block Design (RCBD) and replicated for three times. The fungicides viz., captan + hexaconazole (Taqat 75 % WP) @ 750 gha⁻¹ (T₁), tebuconazole + trifloxystrobin (Nativo 75 % WG) @ 250 gha⁻¹ (T₂), zineb + hexaconazole (Avtar 72 % WP) @ 1000 gha⁻¹ (T₃), carbendazim + mancozeb (Saaf 75 % WP) @ 750 gha⁻¹ (T₄), difenoconazole (Score 25 % EC) @ 250 mlha⁻¹ (T₅), propiconazole (Tilt 25 % EC) @ 500 mlha⁻¹ (T₆) and untreated control (Spray of plain water). All the tested fungicides were found to be significantly superior over check in reducing the disease incidence of brown spot. The fungicidal spray was given twice at 15 days interval. Observations were recorded at 15 and 30 days after the spray. The data reveals that, the minimum Per cent Disease incidence (PDI) (11.69 %) was recorded with tebuconazole + trifloxystrobin 75 % WG sprayed plot, followed by captan + hexaconazole 75 % WP (14.27 %), respectively. Whereas the highest percent disease incidence (69.54 %) was recorded with untreated control plot. Maximum grain yield was recorded by tebuconazole + trifloxystrobin 75 % WG (3.49 tha⁻¹), followed by captan + hexaconazole 75 % WP (3.32 tha⁻¹), respectively. Whereas lowest grain yields of 2.53 tha⁻¹ was recorded by untreated control plot. tebuconazole + trifloxystrobin 75% WG gave maximum net return (25670 Rs. ha⁻¹), followed by hexaconazole + captan 75% WP (23285 Rs. ha⁻¹), respectively. From the present study we concluded that, tebuconazole + trifloxystrobin 75% WG and captan + hexaconazole 75% WP were found most effective fungicides for controlling brown spot disease severity and getting higher grain yield.

EFFECT OF PGPR MICROORGANISMS ON GROWTH AND YIELD OF MAIZE (*ZEAMAYS* L.)

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Abstract

The investigation was carried out under field conditions. The Plant Growth Promoting Rhizomicroorganisms (PGPR) were applied along with different levels of inorganic fertilizers to study their influence on maize crop. The different growth parameters like plant height, number of leaves was found to be significantly high in the treatment receiving *A. chroococcum* + *A. awamori* + *Pseudomonas fluorescens* with 100 per cent of RDF. Similarly the yield parameters like grain yield, stover yield, test weight, grain weight per cob and number of seeds per row were also increased in plants inoculated with *A. chroococcum* + *A. awamori* + *Pseudomonas fluorescens* with 100 per cent RDF.

SUSTAINABLE AGRICULTURE ? A SYSTEMATIC REVIEW

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Abstract

Sustainable Agriculture activity seek to increase agricultural productivity through adoption of practices that maintain the long term ecological and biological integrity of natural resources. Activities in this sub-sector cut across the rural, social, and environmental issues of natural resource management to sustain significant increases in farm productivity through the efficient use of land and other resources. The review revealed that it is imperative to establish a new generation of innovation systems



research in renewable natural resources that integrates three apparently distinct fields of studies-environmental management, international development and innovation studies. The concept of sustainable agriculture is very vague and ambiguous in its meaning, which renders its use and implementation extremely difficult. In this systematic review paper, we aim to advance understandings of sustainable agriculture from a social science and governance perspective by identifying areas of complementarity and concern between emerging definitions of sustainable agriculture. The goal is to provide better economic returns to individuals and contribute to the quality of life and economic development. Strategies for sustainable agriculture development and NRM stress participation and empowerment of farmers and communities, as well as partnership development among all stakeholders. Gender relations at the community and family levels play a crucial role in the success of their efforts to harmonize agricultural intensification with environmental integrity and promote social equity while maintaining economic and production objectives.

EFFECT OF PLANT GROWTH PROMOTING RHIZOMICROORGANISMS (PGPR) ON GROWTH AND YIELD OF MAIZE (*ZEA MAYS* L.)

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Abstract

The investigation was carried out under field conditions. The Plant Growth Promoting Rhizomicroorganisms (PGPR) were applied along with different levels of inorganic fertilizers to study their influence on maize crop. The different growth parameters like plant height, number of leaves was found to be significantly high in the treatment receiving *A. chroococcum* + *A. awamori* + *Pseudomonas fluorescens* with 100 per cent of RDF. Similarly the yield parameters like grain yield, stover yield, test weight, grain weight per cob and number of seeds per row were also increased in plants inoculated with *A. chroococcum* + *A. awamori* + *Pseudomonas fluorescens* with 100 per cent RDF. Population of total bacteria, *Azotobacter spp.* and *Pseudomonas spp.* in the maize rhizosphere was found to be significantly high in coinoculated treatments receiving *A. chroococcum* + *A. awamori* + *P. fluorescens* with 100 per cent of RDF. The fungal and actinomycetes population was found to be significantly high in the treatment with *A. chroococcum* + *A. awamori* + *Glomus fasciculatum* with 100 per cent of RDF. The maximum uptake of N was noticed in the treatment with 75 per cent N and P + 100 per cent K with *A. chroococcum* + *A. awamori* + *Glomus fasciculatum*, where as maximum uptake of P and K was observed in the treatment receiving 100 per cent RDF with *A. chroococcum* + *A. awamori* + *G. fasciculatum*.

EVALUATION OF DIFFERENT COMBI FUNGICIDES AGAINST DOWNY MILDEW OF CUCUMBER (*CUCUMIS SATIVUS*) CAUSED BY *PSEUDOPERONOSPORA CUBENSIS*

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Abstract

Downy mildew of cucumber caused by *Pseudoperonospora cubensis* is an important disease of cucumber and cause approximately 40-45 % yield losses. The present study was conducted at the experimental field of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, (M.P.) during Kharif season of 2018-19 to evaluate different foliar fungicides against downy mildew of cucumber. The six fungicides with three replications were taken up by using Randomized Completely Block Design (RCBD). The fungicides viz; cymoxanil + mancozeb (Curzate 72 % WP) @ 0.25 % (T₁), metalaxyl-m + mancozeb (Ridomil Gold 68 % WP) @ 0.25 % (T₂), fenamidone + mancozeb (Sectin 60 % WG) @ 0.3 % (T₃), iprovalicarb + propineb (Melody duo 66.75 % WP) @ 0.3 % (T₄), Dimethomorph (Lurit 50 % WP) @ 0.25 % (T₅) and chlorothalonil (Kavach 75% WP) @ 0.2 % (T₆). The fungicidal spray was given twice at 15 days interval. Observations were recorded at 15 and 30 days after the spray. Analysis of the data showed that among six fungicides, the highest per cent inhibition of mycelial growth of fungus was recorded in Fenamidone + Mancozeb 60 % (WG) @ 0.3 % (96.90 %), followed by Cymoxanil + Mancozeb 72% (WP) @ 0.25 % with the inhibition of 92.63 per cent, respectively. Minimum inhibition of mycelia growth was observed in Chlorothalonil 75 % (WP) @ 0.2% with 53.83 per cent, respectively. Further no phytotoxicity symptoms were observed in the plants against these fungicides, hence from the present study we findings it may be concluded that, Fenamidone + Mancozeb 60 % (WG) and



Cymoxanil + Mancozeb 72 % (WP) (1.33 %) were promising fungicides for lowering downy mildew disease severity and getting higher yield.

CLASSIFICATION AND CHARACTERIZATION OF INDIAN MUSTARD VARIETY FOR DIFFERENT MORPHOLOGICAL TRAITS

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Abstract

twenty genotypes accessions of Indian mustard [*Brassica juncea* (L.) Czern. Coss.] were evaluated and characterized for 16 agro-morphological traits as per for morphological traits as per DUS descriptor of Indian mustard at department of seed science and technology, CCS Haryana Agricultural University, Hisar and established distinctness among different accessions for the traits under study. majority of the accessions were leaf hairiness, leaf color, leaf lobes, leaf number of lobes, time of flowering (50%), leaf length, leaf width, flower color of petals, plant main shoot length, plant height, siliqua texture, siliqua length, siliqua number on main shoot, number of seed per siliqua, maturity period, seed color and test weight (g). majority of the accessions were medium in flowering, medium in maturity, characterization and classification on the basis of qualitative traits revealed that leaf color of more than 80% genotypes was dark green, whereas majority of the cases were yellow color of petals was pre-dominant and dark-brown seed coat color was also most common in the genotypes. maximum genetic distance was observed between the accessions, the results of present study can be used for formation of data base and reference lines and observations were recorded on the basis of scores given in the DUS descriptor. varietal/genotype identification and will also be helpful in augmentation of future Indian mustard improvement programmes.

ATTITUDE TOWARDS SUSTAINABLE AGRICULTURAL PRACTICES

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Abstract

The present study was conducted mainly with the objective to study 'Attitude of farmers towards sustainable agricultural practices.' For the study, Latur district was selected from Marathwada region of Maharashtra state during the years 2018-19. Three talukas viz., Latur, Ausa and Renapur of Latur District were selected randomly and three villages from each talukas were selected randomly. From each village ten members were randomly selected constituting the sample size 120. Ex-post-facto research design was used for the study. Study revealed that majority (67.50%) of the respondents had favourable attitude towards sustainable agricultural practices, 17.50 per cent of the farmers had unfavourable attitude and 15.00 per cent had more favourable attitude towards sustainable agricultural practices.

FIELD EFFICACY OF NEW GENERATION INSECTICIDES AGAINST YELLOW MOSAIC DISEASE (YMD) OF BLACKGRAM (*VIGNA MUNGO* L.)

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Abstract

Yellow Mosaic is a major observed disease in pulses during recent years. It is one of the most vicious diseases of blackgram and has been renowned in India for more than five decades. It results in heavy crop loss from 50-70 per cent, especially if the disease occurs in the early stage of crop growth. For this purpose the present study was conducted at the experimental field of krishi vigyan kendra, Satna (M.P.) during Kharif season of 2018-19 to know their efficacy in controlling yellow mosaic disease in blackgram using 5 treatments in 3 replications following randomized completely block design. The treatments namely; Flonicamid 50 % (WG) @ 80 gm/acre (T₁), Denotefuran 20 % (SG) @ 100 gm/acre (T₂), Afidopyropen 50 % (DC) @ 400 ml/acre (T₃), Diafenthiuron 50 % (WP) @ 250 gm/acre (T₄), Thiamethoxam 25 % (WG) @ 100 gm/acre (T₅) and control



(Spray of plain water). Foliar sprays of insecticides were given twice at 30 and 45 DAS. All the tested insecticides were found to be significantly superior over check in reducing the incidence of yellow mosaic disease. Analysis of the data showed that the minimum Per cent Disease Incidence was recorded with Afidopyropen 50 % DC @ 400 ml/acre (11.32 %), followed by Flonicamid 50 % WG @ 80 gm/acre (16.73 %) over control (59.98 %), respectively. The highest grain yield (787.96 kg/ha) was obtained in treatment with Afidopyropen 50 % DC, followed by Flonicamid 50 % WG (675.71 kg/ha), respectively. Further it was observed that two foliar sprays of Afidopyropen 50 % (DC) @ 400 ml/acre at 15 and 45 days after sowing showed minimum per cent disease incidence (11.32 %) and significantly enhancement of grain yield of blackgram as compared to other treatments employed, hence this treatment is recommended for getting maximum yield advantage.

EFFECT DIFFERENT COTTON VARIETIES AND BT HYBRID ON GROWTH AND YIELD ATTRIBUTES AND SEED COTTON YIELD IN HIRSUTUM COTTON

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Abstract

A field experiment was conducted during *Kharif* season of 2016 at C.S.A University of Agricultural and Technology, Kanpur to see the effect of different cotton varieties and Bt hybrid on growth and yield attributes and seed cotton yield in hirsutum cotton. Data indicated that all the yield attributing character viz., no of bolls/plant and boll wt (g) improved significantly with Bt hybrid than check varieties. Bt hybrid 6588 BG II (2510-2 BGII) recorded significantly higher seed cotton yield (3427 kg/ha) over all the check varieties and gave 22.6% more seed cotton yield than Bt check 6488 BGII (2795 kg/ha). Significantly GOT% (35.9%) was obtained with the tested Bt hybrid 6588 BGII as compared to all the varieties and hybrid check.

EFFECT OF DIFFERENT ORGANICS, BIO-FERTILIZERS AND GREEN MANURE ON SEED COTTON YIELD IN ARBOREUM COTTON (PA-812) AND SOIL HEALTH

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Abstract

A field experiment was conducted during *Kharif* 2017 at Oil seed farm, C.S.A. University of Agriculture and technology, Kanpur to effect of different organics, bio fertilizers and green manure. Data indicated that all the growth and yield attribute characters were improved with Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM+Neem cake 250 kg/ha+Raising of Sun hemp/fodder cowpea between rows incorporated before flowering than absolute control. Significantly higher seed cotton yield(1789 kg/ha) with Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM+Neem cake 250 kg/ha+Raising of Sun hemp/fodder cowpea between rows incorporated before flowering than control (1162 kg/ha) by 51%. Application of 250 kg Neem cake produced significantly higher seed cotton yield (1563 kg/ha) as compared to control. Higher seed cotton yield (1296 kg/ha) was obtained with 100 % RDF than control. Higher net return (Rs 36084/) and B:C ratio (1.89) was recorded with seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM+Raising of Sun hemp/fodder cowpea between rows incorporated before flowering. Higher OC % (0.44 %) in the soil was recorded with Seed treatment and soil application of recommended bio fertilizers and foliar application of PPFM+Neem cake 250 kg/ha+ Raising of Sun hemp/fodder cowpea between rows incorporated before flowering than absolute control (0.32 %).

GENETIC DIVERSITY ASSESSMENT OF PEARL MILLET MAINTAINER LINES

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Abstract

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is also known as multipurpose cereal which belongs to the family Poaceae. It is primarily grown for grain in the arid and semi-arid tropical regions of Asia and Africa. Pearl millet is also grown for fodder. An



experiment was conducted by taking 48 maintainer genotypes of pearl millet developed at CCSHAU, Hisar and the material was evaluated in a Randomized Block Design (RBD) with three replications in *Kharif* season of 2014. The 48 maintainer lines were grouped into 7 clusters using cluster analysis method in such a way that lines within each cluster had smaller D^2 value than those between clusters. While studying clustering pattern, it was revealed that cluster 2 and cluster 4 had highest number of genotypes (10 each) followed by cluster 1 and cluster 3 (9 each) and maximum intra-cluster difference among the maintainer lines within the same cluster was shown by cluster 7 (4.498). Clusters 1 and 7 showed maximum inter-cluster distance of (7.421) whereas the lowest inter-cluster distance was recorded between clusters 2 and 3 (3.742). The crosses between the genotypes belonging to distantly located clusters are likely to produce good transgressive segregants.

SUSTAINABLE AGRICULTURE

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Abstract

The expression “safeguard,” from the Latin sustainers (suss, from underneath and tinier, to keep up), to hold in life or keep, infers long-term period help or lastingness. Since it relates to horticulture, reasonable portrays cultivating frameworks which may be “equipped for holding their profitability and quality to society inconclusively. Practical horticulture is both reasoning and an arrangement of cultivating. It has its roots in an immovable of qualities that shows a perception of both natural and social substances. It includes plan and control methods that work with natural procedures to save all assets, diminish waste and ecological harm, even as keeping or enhancing ranch gainfulness. Working with characteristic soil systems is of exact noteworthiness. Economical farming structures are intended to take amplify advantage of ebb and flow soil supplement and water cycles, vitality streams, and soil life forms for nourishment producing. As pleasantly, such structures expect to give sustenance this is nutritious, without being polluted with stock that would harm human wellness.

STUDY OF TOPPING WITH DIFFERENT SPACING ON SOIL AND QUALITY OF DESHI COTTON

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Abstract

A field experiment was conducted during the year 2016 at Post Graduate Research Farm, Agronomy Section, College of Agriculture, Dhule. The experiment consist of twelve treatment combinations were laid out in split plot design in three replications with gross and net plot size of $3.60 \times 4.50\text{m}^2$ and $1.80 \times 3.60\text{m}^2$, respectively. The main plot treatment consisted of three plant spacings viz., S_1 . $45 \times 15\text{cm}$, S_2 . $45 \times 22.5\text{cm}$, S_3 . $60 \times 15\text{cm}$ and four sub plot treatments of topping viz., T_0 - No topping, T_1 - Topping at 50 DAS, T_2 - Topping at 60 DAS and T_3 - Topping at 70 DAS. Application of organic manure was done through farmyard manure (FYM) @ 10 tones ha^{-1} before last harrowing. The recommended dose of fertilizer for cotton 50:25:25 N: P_2O_5 : K_2O kg ha^{-1} was applied. Half dose of nitrogen and full dose of phosphorus and potash were applied as basal application at the time of sowing. Remaining half dose of nitrogen was applied at 30 DAS. The mean available nitrogen, phosphorus and potassium content after harvest of *deshi* cotton were 158.70, 19.88 and 359.34 kg ha^{-1} , respectively. Soil nutrient content at harvest of crop were not significantly influenced due to different treatments. Also the soil moisture contents were not significantly influenced by different spacing at all stages of crop growth.

ROOT AND SHOOT GROWTH CHARACTERS OF KARONDA CULTIVARS STEM CUTTINGS IN RESPONSE TO DIFFERENT CONCENTRATIONS OF GROWTH REGULATORS

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Abstract

The experiment entitled ‘Studies on propagation through semi hard wood cuttings in karonda’ was carried out at College of Horticulture, Dr.Y.S.R. Horticultural University, Venkataramannagudem, Tadepalligudem, West Godavari District. The semi



hard wood cuttings of karonda cultivars viz., pink-fruited plants and green-fruited plants were treated with different growth regulators treatments (IBA and NAA) along with control and the experiment was carried out in Factorial Randomized Block Design with 3 replications comprising 14 treatment combinations. The experiment results indicate that among cultivars, semi-hardwood cuttings of green fruited plant performed better than semi-hardwood cuttings of pink fruited plant with respect to root and shoot parameters like fresh weight of roots (1.63 g), dry weight of roots (1.21 g) fresh weight of shoots (3.23 g), dry weight of the shoot (2.57 g) and root to shoot ratio (0.420). Among growth regulator treatments, IBA @ 8000 ppm was found superior for parameters like fresh weight of roots (2.45 g), dry weight of roots (1.43 g), fresh weight of shoots (4.34 g), dry weight of the shoot ((3.67 g), root to shoot ratio (0.508) and level of interaction between type of cultivar and growth regulator treatments, green-fruited plant cuttings treated with IBA @ 8000 ppm registered superior performance with respect to fresh weight of roots (2.87 g), dry weight of roots (2.21 g) fresh weight of shoots (4.89 g), dry weight of the shoot (4.23 g) and root to shoot ratio (0.524).

PEARL MILLET- A NUTRI-CEREAL CROP

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Abstract

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is a multipurpose cereal belonging to the family Poaceae and commonly known as bajra, bulrush or cattail millet. It is primarily grown for grain in the arid and semi-arid tropical (SAT) regions of Asia and Africa. Globally, pearl millet is fifth most important cereals after rice, wheat, maize and sorghum. Pearl millet is an indispensable source of fodder in many regions of the world. It is used for pasture, silage and hay and grazing in several countries like USA, Australia, South America, South Africa, Pakistan and India. Its green fodder is a valuable feed for livestock. Pearl millet provides multiple securities in terms of food, fodder, health, nutrition, livelihood and ecological making them the choice of crop in the arid and semi-arid regions of the world. It is a highly nutritious cereal crop with wide agroecological adaptation. Pearl millet is rich in several nutrients as well as non-nutrients such as phenols. It has 70% starch in dry grain, 8 to 12% protein, 5-7% fat, high fiber (1.2g/100g, most of which is insoluble), high iron (30-146 ppm), zinc (25-94 ppm) and calcium (13-52 mg/100g) and is gluten free. Pearl millet contains antioxidants which may be beneficial for the overall health and wellbeing. Pearl millet is a rich source of energy (361 Kcal/100g) which is greater than sorghum and nearly equal to that of brown rice because the lipid content is generally higher (3 to 6%). That's why pearl millet is also known as poor man's crop.

IMPACT OF TILLAGE AND HERBICIDE APPLICATION ON SOIL ENZYMATIC ACTIVITIES IN WINTER RICE UNDER ACIDIC SOILS OF ASSAM, INDIA

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Abstract

Rice is one of the most important crops of India as well as North East India. Weed management is one of the major considerations for realizing higher productivity. Yield loss due to uncontrolled weed growth in transplanted rice ranges from 16 - 86%. Diversified weed flora consisting of grassy and broad-leaved weeds, often requires a variety of herbicides. Chemical control of weeds is often preferred due to its economic and efficient control compared to manual and mechanical methods. Herbicides constitute only 12 % of the agrochemicals used in rice cultivation. Among the herbicides, the pre-emergence herbicides preventing the emergence of weeds are very popular among the rice farmers of north-east India. Pretilachlor [2-chloro-2,6-diethyl-N- (2-propoxyethyl)acetanilide] is a chloroacetanilide herbicide and used in controlling grasses by inhibiting growth and reducing cell division. The recommended field rate (RFR) of pretilachlor is 0.75 kg a.i. ha⁻¹ and is 80-90 % effective. However, the potential hazard of herbicide residue in soil is a great concern. Herbicide residues may have undesirable effect on soil microbes. Soil Microbial Biomass Carbon is one of the key indices of soil health and fertility. Soil enzymatic activities such as dehydrogenase, phosphomonoesterase, beta-glucosidase and urease are also considered



primary indicators of soil health. Enzymatic activities can therefore be used to determine the impact of xenobiotics such as herbicides or pesticides on soil microbiological quality. Accordingly, a study was initiated during 2016 to evaluate the effect of tillage practices and herbicides in rice – mustard–sesbania cropping system at Research Farm of the university, Jorhat. Treatments comprised of (A) Tillage practices viz., Conventional Tillage (Sesbania)- Conventional Tillage (Transplanted Rice)- Conventional Tillage (Indian Mustard), Minimum Tillage (Sesbania)- Conventional Tillage (Transplanted Rice)- Minimum Tillage (Indian Mustard), Minimum Tillage (Sesbania)- Conventional Tillage (Direct Seeded Rice)- Conventional Tillage (Indian Mustard), Minimum Tillage (Sesbania)- Minimum Tillage (Direct Seeded Rice)- Minimum Tillage+Residue incorporation (Indian Mustard), Minimum Tillage (Sesbania)- Minimum Tillage (Direct Seeded Rice)- Minimum Tillage (Indian Mustard) and (B) weed management practices viz., Pretilachlor 0.75 Kg/ha, Pretilachlor 0.75 Kg/ha+hand weeding 30 DAS, Hand weeding 20 and 40 DAS, Weedy check. The rice variety “Basundhara” was grown both as transplanted and direct seeded rice. The soils of the experimental field was sandy loam, acidic (pH 4.5) with CEC 6.18 cmol (p⁺) kg⁻¹. Significantly higher Phosphatase (µg p-nitrophenol/g dry soil/hr), B-glucosidase (µg p-nitrophenol/g dry soil/hr), Urease (g of NH₄⁺ g⁻¹ soil h⁻¹), Dehydrogenase activities (g TPF h⁻¹g⁻¹ soil) and Microbial Biomass Carbon (µg/g dry soil) were observed with the treatments receiving minimum tillage with direct seeded rice over conventional tillage and transplanted rice. However, the herbicide application resulted in inhibition of the enzyme activities and MBC up to 15th day of application of herbicide, beyond which an increasing trend in microbial activities was observed irrespective of treatments.

STUDIES ON GENETIC DIVERGENCE FOR YIELD AND YIELD ATTRIBUTES IN CHILLI (*CAPSICUM ANNUUM* L.)

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Abstract

A field experiment was conducted in *Kharif*, 2018 at P.G. research farm, College of Horticulture, Rajendranagar, Hyderabad in randomized block design with three replications using forty genotypes of chilli for 20 characters. Significant difference was observed for all the characters under study. A study of genetic diversity in 40 chilli genotypes for various characters revealed substantial differences for all the traits. Based on D² values, the genotypes were clustered into fifteen clusters. Cluster I contained twelve genotypes followed by cluster-II and III (seven each) and cluster VIII with three genotypes. Cluster VIII had the maximum D² value (890.71). The highest inter cluster generalized distance (4919.75) was between cluster XIV and cluster XV. Intercrossing among the genotypes belonging to the above clusters was suggested to develop high yielding varieties with other desirable characters or may be used as potential donors for future hybridization programme to develop better chilli variety with good fruit yield.

COMMERCIAL SIGNIFICANCE OF MEDICINAL AND AROMATIC PLANTS OF MEERUT DISTRICTS

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Abstract

Agro climatic conditions of Meerut region support natural growth of medicinal and aromatic plants. Arid and semiarid conditions that prevail in Meerut region are relatively better suited for the sustenance and growth of medicinal and aromatic plants. Price response and popular use of any object in the socio-economic milieu favors commercial production of these items. Consumer demand depends on the cultural contexts of the society and its level of modernization for routine uses in the exchange of gifts and as an object of healing the wounds and other common ailments. Market response related to demand for mass production and quality contexts further augments production and supply chain in local, regional, national and global markets. The study is based on the intensive field surveys conducted in two sample villages of Meerut Region viz. Sholda and Bajot where medicinal and aromatic plants are grown on commercial scale and are regularly supplied to the national market Delhi for onward supply to the domestic and world markets. Functional contexts of field preparations, developing nurseries, planting, weeding, application of fertilizers, pesticides, insecticides watering, plucking, packaging, truck farming, marketing, storage and other processing systems have been studied. The data so collected is processed through input output analysis for



working out investments, losses and net profit. In all three group of variables have been used in this exercise which are broadly classed as environmental, technological and institutional. Stepwise regression has been used to assess the impact of one variable upon the other besides their joint impacts on the overall development and expansion of the commercial farming of medicinal and aromatic plants. Results reveal that the production of medicinal and aromatic plants has a diverse use in the society and its application and quantity of use is increasing at a fast pace making it a viable alternative to the farmers. Price response and seasonality has a high positive association ($r=0.69$), extreme climatic events result into high mortality of plants showing a negative association ($r = -0.56$).

IMPACT OF CLIMATE CHANGE ON INSECT-PEST

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Abstract

Climate change is key determinant of distribution and abundance of insect-pest. Changes in climate extremely affect the population dynamics and the status of insect pests through directly or indirectly influencing their physiology, behaviour or by affecting their hosts, competitors and natural enemies. It also leads extinction of species by creating impact on their phenology, distribution and community composition in ecosystem. Effect of warming includes additional generations of insects in a year; early arrival of insect pests in their agricultural habitats; outbreaks of insect-pests; failure of effectiveness of insect-pest management practices. Alteration in abiotic and biotic elements of the environment are predicted as primary drivers of Global warming have been found to affect intensely the crucial events such as stem elongation, blossoming and fruiting and life cycles of the plant species which may affect notably feeding and reproduction prototype in related insect-pests which can greatly aggravate the downbeat ecological and economical consequences. Escalating pressures exerted by increasing population, diminishing natural resource base and global climate and water availability affect profoundly the pollinators. Appearance of the plant resistance to insects is significantly subjective to environmental aspect like temperature, sunlight, soil moisture, air pollution etc. and changes in these modify the interactions between insect pests and their host plants which creates chances of breakdown of host plant resistance. Considering such declining production efficiency due to climate change food security for 21st century is the biggest challenge for human kind in years to come. It will be important to keep ahead of undesirable pest adaptations, and consider global warming and climate change for planning research and development efforts for integrated pest management (IPM) in the future.

PHENOTYPING ADVANCED RABI SORGHUM ENTRIES FOR DROUGHT ADAPTIVE TRAITS UNDER SHALLOW SOILS

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Abstract

The productivity levels of post-rainy rabi grain sorghum in India is much lower compared to kharif grain sorghum. Much of the post-rainy season sorghum grown on residual and receding soil moisture on shallow soils in Maharashtra, Karnataka and Andhra Pradesh are still under local cultivars or landraces. A field experiment was conducted to evaluate the promising rabi sorghum line for drought adaptation under shallow soils at Regional Agricultural Research Station, Vijayapur during 2018-19. Genotypes P. Anuradha (64 days), CRS 65 (68 days) and CRS 67 (68 days) recorded early flowering. Physiological traits *via.*, LAI and SPAD values were significantly higher in P. Anuradha (1.90 and 52.53, respectively). However, the total dry matter was maximum in BJV 129 (2265 g m²) followed by P. Aruradha (2193 g m²). The check variety M 35-1 recorded maximum relative water content (82.15%) indicated better adoption under drought condition. Further, RSV 2138 higher RWC and total



chlorophyll content at 50% flowering (81.66% and 2.847 mg g⁻¹ fr. wt, respectively). The yield and yield associated traits were significantly higher in genotypes BJV 129, grain yield (3394 kg ha⁻¹), HI (33.45), test weight (36.19 g) and grain number (9475 m²) compared to other genotypes. Genotypes RSV 2138 (2989 kg ha⁻¹), RSV 2121 (2933 kg ha⁻¹) and RSV 1822 (2247 kg ha⁻¹) recorded higher grain yield showing drought tolerance under shallow soils with higher physiological adoptive traits. The experiment concluded that, the identified genotypes showed higher performance compared to local lines or landraces under shallow soils and further utilization in identify the cytoplasmic male sterile (CMS) lines and pollinators for further use in hybrid breeding for post-rainy season.

DNA FINGER PRINTING IN SOME GERMPLASM LINES OF PEARL MILLET (*Pennisetum glaucum* (L.)) USING

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Abstract

Pearl millet (*Pennisetum glaucum* L.) is a major cereal in the arid and semi arid regions of Asia and in Africa. It is extensively cultivated for grain as well as fodder in the dry areas of north western and southern India. It is the fourth most important staple food crop after rice, wheat and sorghum. Pearl millet is well adapted to growing areas characterized by drought, low fertility, and high temperature. It performs well in high salinity or low pH. Morphological descriptors alone are not enough, because, environmental component is not fully eliminated using biometric procedure; therefore, molecular markers have gained importance. PCR based markers like SSRs have been adjudged as more reliable for such studies. Molecular markers based on PCR are choice of marker assisted breeding in several crops including pearl millet. For this research molecular characterization of diverse germplasm lines of pearl millet was done using diluted DNA with NFW (nuclease free water) according to concentration of DNA. For good quality DNA A260/A230 and 260/280 ratio was between 1.5-2.0. SSRs are a good choice of markers for pearl millet due to their co-dominance and high reducibility. The present study was conducted, reported highly polymorphic SSR marker on germplasm lines of pearl millet which will further help to improve variety of crop with a lot of authentic genetic diversity in the genotype.

MOLECULAR CHARACTERIZATION OF (*Rhizoctonia solani* KUHN) OF PADDY CAUSING SHEATH BLIGHT DISEASE IN RICE

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Abstract

Rice (*Oryza sativa* L.) is the staple food of India and grown extensively in south Gujarat which was reported to severely affected by sheath blight disease. The diseased symptoms initially are observed on sheath just near the water level as water-soaked lesions that were circular to oblong, ellipsoid, ovoid and even irregularly elongated (3×1cm) and discolored, that later turn into discrete lesions with pale greenish-grey white centre with narrow blackish to dark brown margin. For molecular characterization the genomic DNA was isolated by CTAB method from eight isolates of *R. solani* and utilized for studying the genomic diversity analysis using RAPD primers. The primers RPI-5 to RPI-10 were showed the highest percentage of polymorphism. As per the obtained dendrogram, these isolates were grouped in the three clusters based on genetic diversity. The first group contains six isolates viz., Navsari, Dang, Vyara, Surat, Valsad and Hansot. This group was sub- divided into two sub-groups. Sub-group Ia contains Navsari isolate and sub group Ib contains five isolates viz., Dang, Vyara, Surat, Valsad and Hansot. The variation in Jaccard's similarity co-efficient ranged from 0.39 to 0.77. The highest similarity coefficient (0.77) was observed between Surat and Valsad isolates followed by Vyara and Dangs (0.68). Whereas, minimum similarity coefficient (maximum diversity) was observed in Anand and Wagahi isolates.



GENETIC DIVERSITY STUDIES USING D² STATISTICS VIS-A-VIS DNA FINGER PRINTING OF SOME DUAL PURPOSE PROMISING GERMPLASM LINES OF PEARL MILLET (*Pennisetum GLAUCUM* (L.) R. BR.)

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Abstract

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] belongs to the family poaceae and genus Pennisetum. Pearl millet is diploid ($2n=2x=14$) in nature and commonly. It is highly cross pollinated with protogynous nature leads to high out crossing rate ranging between 70 to 80%. Pearl millet has a good nutritional status and economically cheap source of protein, calcium etc; therefore can be easily available for poor people to fight malnutrition. The present experiment is conducted to study genetic diversity among 40 germplasm lines using D2 statistics and at molecular level by DNA fingerprinting using gene-specific molecular marker. SSR marker is used in our study as they are more informative. SSR marker are multi-allele genetic markers that are experimentally reproducible and transferable, they can be used to measure diversity on the basis of genetic distance. They are also commonly used in mapping loci involved in quantitative traits estimating the degree of kinship between genotypes.

HERBICIDE RESIDUES AND THEIR MANAGEMENT IN SOIL

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Abstract

Herbicide usage is increasing throughout the world due to increasing labour cost, flexibility in time of application, quick weed control in cropped and non-cropped areas. Usage of herbicides occupies 30% of the total agrochemicals in India. Most herbicides breakdown within a few days or weeks after application when applied at recommended rates and impose no restrictions on cropping options for the next year. Some herbicides however do not degrade quickly and can persist in the soil for weeks, months or years following application. Mostly the triazines, isoxazolidinones, imidazolinones and a few of sulfonylureas are persistent herbicides. Herbicide residues in soils pose four potential problems or hazards: (i) injury to sensitive plants grown in rotations with sprayed crops, (ii) accumulation of residues from application rates which exceeds rates of dissipation, (iii) unlawful residues in crops grown in rotations with treated crops and (iv) hampers the growth of beneficial soil microorganisms. Integration of physical (mechanical and manual) and cultural practices with herbicides is a viable protecting option for managing weeds. Further the combination of bioaugmentation and biostimulation in conjunction with other tools like crop rotation and increasing the soil organic matter content is definitely a promising technique for managing the herbicide persistence and minimizing its residues in the soil.

CLIMATE SMART AGRICULTURE–AN ANSWER TO CLIMATE CHANGE

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Abstract

Climate change refers to the variation in the earth's global climate or in regional climates over time. It could show up as a change in climate normal's for a given place and time of year, from one decade to the next. Agricultural productivity, production stability and house income in some areas is likely to reduce due to climate change. Need to understand the impacts of increasing climatic risks and possible adaptations. In order to achieve food security developing countries must undergo a significant transformation under climate change related problems. Developing climate-smart agriculture is thus crucial to achieving future food security and climate change goals. Climate-Smart Agriculture (CSA) is an approach to help the people who manage agricultural systems respond effectively to climate change. The CSA approach pursues the triple objectives of sustainably increasing productivity and incomes, adapting to climate change and reducing greenhouse gas emissions where possible. Some simple adaptations such as change in planting dates and adapting resource conservation techniques (RCTs)



could help in reducing impacts of climate change to a large extent. Resource conservation technologies (RCTs) are the practices, results in saving of energy, cost and also reduces the environmental pollution when followed over the conventional practices. The resource conservation technologies primarily focus on saving of resources through minimal tillage, ensuring soil nutrients and moisture conservation through crop residues and cover crops and adoption of spatial and temporal crop sequencing. Adoption of RCTs which allow alterations in water use, tillage and surface residue management practices can have a direct effect on greenhouse gases and increase the carbon stocks in the soil. With the increasing soil organic matter, soils under RCTs can retain carbon from CO₂ and store it safely for longer time. Techniques like laser land-levelling, System of Rice Intensification, Direct seeded rice, permanent raised bed planting system would ensure crop production under extreme weather events.

PERFORMANCE OF PHOSPHATE SOLUBLISING BACTERIA FOR PROMOTION THE OILSEED PRODUCTION

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Abstract

Field investigation was carry out at Krishi Vigyan Kendra, Basti, Uttar Pradesh on mustard to evaluate mustard yield under field level demonstration (FLD) using improved high yielding variety (T-59) of seed plus phosphate solubilizing bacteria with nutrient management over farmers practices for year 2017-18. Phosphate solubilizing bacteria (PSB) was used to improve phosphorus uptake and its impact on the yield of oil seed under rainfed conditions. The highest yield 18.4 q/ha (average of maximum and minimum yield) was observed in 2017-18 which was 41.5% higher yield over the farmers practice (13.0 q/ha). A pronounced rise in mustard production was observed under FLD compared to farmer practices. The present investigation showed that oil seed yield under FLD enhances the productivity of mustard over traditional farmers' practices which might be due to variation in agro-climatic factors. The demonstrated technology offers better productivity potential and profitability under existing farming conditions. It is concluded that phosphate solublising bacteria alone or along with other controlled agro-climatic factors exert profound effect on mustard yield.

RURAL YOUTH MIGRATION AT ITS ROOT CAUSES IN BUNDELKHAND REGION OFMADHYA PRADESH

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Abstract

Migration denotes any movement of groups of people from one locality to another and takes different forms. The prevalence of small farmers having small size land holdings, Seasonal unemployment, the non-application of modern technology in agriculture in had forced the people to search for alternate sources of livelihood. People of the rural areas migrate to urban areas within and outside their district and also to the neighbor in states. The impact of migration on agriculture and rural development cannot be overemphasized. The rural areas in India are endowed with both human and material resource, unfortunately, these potentials are yet to be harnessed and used for agricultural and rural development. The study was carried out in Tikamgarh district of Madhya Pradesh, to study entitled Impact of rural youth migration on livelihood security in Bundelkhand region of Madhya Pradesh. Total 120 respondents were selected from 12 villages using simple random sampling method. Data were collected with the aid of structured interview schedule and analyzed using descriptive statistical tools namely; mean, frequency, percentage, S.D., C.V. and correlation coefficient. From the study it was observed that majority of respondents had medium age, educated up to Middle level, male migrant, unmarried marital status, Hindu religion, schedule tribe cast, medium land holding, nuclear family type, single generation house hold composition, illiquid assets, medium level of employment status, medium level of annual income, factories source of income group, medium level of Individual inspiration, medium level of social status. Overall impact of migration of rural youth in terms of livelihood security, the higher number 65.00 per cent migrant found to full migrate followed by partial migrate 19.16 per cent and little migrant 15.84 per cent.



IMPACT OF RURAL YOUTH MIGRATION ON LIVELIHOOD SECURITY IN BUNDELKHAND REGION OF MADHYA PRADESH

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Abstract

In present time not any specific employment opportunity available in Bundelkhand region of Madhya Pradesh like any industries, mills, small industries, and Also this region affected by drought, low rainfall, seasonal employment availability, and lack of the awareness. These problems are of larger dimension, pervasive and are continuing unabated, not any government has launched any regular research programme to monitor the trend of the movement of their subjects on the sustainable basis. Thus the motivation of this research is to evaluate the problems encountered by migrants. The study was carried out in Tikamgarh district of Madhya Pradesh, to study entitled Impact of rural youth migration on livelihood security in Bundelkhand region of Madhya Pradesh. Total 120 respondents were selected from 12 villages using simple random sampling method. Data were collected with the aid of structured interview schedule and analyzed using descriptive statistical tools namely; mean, frequency, percentage, S.D., C.V. and correlation coefficient. From the study it was observed that majority of respondents had medium age, educated up to Middle level, male migrant, unmarried marital status, Hindu religion, schedule tribe cast, medium land holding, nuclear family type, single generation house hold composition, illiquid assets, medium level of employment status, medium level of annual income, factories source of income group, medium level of Individual inspiration, medium level of social status. The Migration Behaviour Index has included major indicators viz., aspiration, migration intention, nature of migration, nature of work in the migrated destination, distance of work place, migration decision making, migration network, parental and peer influence. The composite Migration Behaviour Index worked out was 0.69. The important strategies as offered by the rural youth were to reduced the migration towards urban area.

EFFECTIVENESS OF INTEGRATED NUTRIENT MANAGEMENT IN TRANSPLANTED RICE (*ORYZA SATIVA*) FOR SUSTAINABLE AGRICULTURE

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Abstract

Chemical fertilizers became popular throughout the World. They were associated with instantaneous increased in the crop yield, thereby increasing the profit to the farmers. But in recent years notable environmental damage is observed because of their continuous field application and overuse. Water and soil pollution, loss of micro-organisms and beneficial insects and overall reduction in soil fertility are some of the ill effects of chemical fertilizers. Durg District of the Chhattisgarh is a major rice growing District situated in agro climatic zone of Chhattisgarh plains. Average rainfall of the Durg district is 1200-1300 mm. The experiment was conducted at Village-Batang, Durg district of the Chhattisgarh. It was concluded that application of Integrated Nutrient Management in Transplanted rice produce 26 tillers per plant and 44.5q/ha yield as compared to farmer's field, which produced 24 tillers/plant, produced 43.5q/ha positively it was almost similar. Hence it could be recommended that Integrated Nutrient Management being essential component and play vital role in maintaining long term soil fertility and sustainability and also reducing overuse of chemical fertilizers.

EVALUATION OF LIQUID BIO-FERTILIZERS IN RICE (*ORYZA SATIVA*)

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Abstract

Rice is one of the most important food crops in India and feeds more than 60 per cent population of India. Normally farmers use fertilizers indiscriminately in rice in order to get higher yields which leads to soil, environment and ground water pollution



and reduction of soil fertility which makes the crop very difficult to grow. Indiscriminate use of fertilizers not only cause pollution but also increases cost of cultivation. Reducing the use of chemical fertilizers and increasing the usage of organic manures, green manures and liquid bio-fertilizers will increase the soil fertility status. Bio-fertilizers contain strains of soil microorganisms which is bacteria or in combination with fungi or algae which increase the availability and uptake of mineral nutrients by plant. Bio-fertilizers viz. *Azospirillum* and *Phosphobacteria* are being used in rice. *Azospirillum* is a nitrogen fixing bacteria. It fixes the atmospheric nitrogen and add to soil through which nitrogen content in soil and uptake by plant will be increased and usage of chemical fertilizers for nitrogen can be reduced. *Phosphobacteria* is a phosphorus solubilizer. Excess phosphorus supplied to crop in previous seasons will settle in soil in solid form. Application of this phosphobacteria will solubilize the phosphorus present in soil and made it available to plant which reduce the chemical fertilizers. Bio-fertilizers not only increase the availability and uptake of nutrients but also increase organic carbon content and soil microorganisms population in soil. Liquid bio-fertilizers can be applied by different methods like seedling dip method and broadcasting method. In seedling dip method, 300-500 ml of each bio-fertilizer has to be poured in 70 litres of water. Later seedlings have to be dipped in that water for 10 minutes before transplanting. In broadcasting method, 300-500 ml of each bio-fertilizer has to be mixed with organic manures and has to be broadcasted within 1 week to 10 days after transplanting. Application of bio-fertilizers with 50% RDF in rice in Prakasamdt obtained B:C ratio of 2.01. Whereas, application of 100% RDF obtained B:C ratio of 1.7. Highest B: C ratio is due to reduced cost of cultivation as the dosage of chemical fertilizers is reduced. Cost of liquid bio-fertilizers is also low. Application of bio-fertilizers also increased organic carbon content in soil.

SITA ASHOK : A BOON FOR SOCIETY

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Abstract

It is native to India and Malasia. Its botanical name is *Saraca indica* L. (*Saracaasoca* Roxb. De Wilde) and family Caesalpiniaceae. Sita Ashoka is a state tree of Uttar Pradesh. It is a small evergreen tree with drooping branches, leaves peripinnate. It is commercially propagated by seed. It is associated with Goddess Sita. Its flower colour is scarlet red in the month of April. It is planted in park for shade. Sita Ashok used in Leucoderma, Calculii, Cardiacstimulant, Anti-bacterial, Anti-fungal, Anti-tumour, Anti-cancer, Colic-dysentery, Piles, Ulcers and regularization of mensus, etc. Bark is used for medicines. It is a avenue tree for society.

RESPONSE OF GREENGRAM TO CLIMATE CHANGE IN NORTHERN TRANSITION ZONE OF KARNATAKA : DSSAT MODEL BASED ASSESSMENT

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Abstract

Climate change and agriculture are highly interrelated, both of which take place at global level with variation at regional and zonal level. The effect of climate on agriculture is related to both variability in local weather (i.e., changes in rainfall pattern) and global climate pattern (i.e., temperature). Rising temperature and erratic rainfall patterns projected under future climates are expected to affect the performance and productivity of most of the crops including greengram. Therefore, it is important to study the impact of projected elevation in temperature and changes in rainfall on the performance of greengram, a major *kharif* crop of Northern Transition Zone (NTZ) of Karnataka. The experimental data collected at AICRP on MULLaRP at MARS, Dharwad, was used to calibrate and validate the DSSAT4.6 (CROPGRO) model. The quantification of the impact of projected changes in temperature and rainfall on greengram was assessed using validated model for NTZ of Karnataka. The model was used to simulate the phenology, yield and total biomass using weather data for the period of 32 years (1985-2016). Model based sensitivity analysis showed that the green gram is more sensitive to change in rainfall amount than temperature. Under elevated temperature by 1-2°, days required for physiological maturity was reduced by 2 to 3 days. Whereas, reduction in rainfall by 10-20 % did not show any impact on days to physiological maturity. On the contrary, reduction in 20 % rainfall



alone reduces grain yield and total biomass by 9.5 % and 10.48 %, respectively. Whereas, increase in temperature by 2? decreased grain yield and total biomass by 3.56 and 9.36 %. Combined effect of reduced rainfall (-20 %) and elevated temperature (2?) resulted in 16.36 and 21.16 % reduction in grain yield and total biomass. This clearly indicates that, rainfall and temperature has pivotal role in deciding the kharif greengram yield and in coming decades yield of greengram will be reduced unless adaptive measures were taken up.

INNOVATIVE TECHNOLOGY FOR CROP IMPROVEMENT, BIOTECHNOLOGY AND GENETIC ENGINEERING

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Abstract

Genetic-engineering technologies, including synthetic biology and genome editing, and speculates about how they might shape the future of crops. The expected applications of genome editing and the technologies available for assessing associated non target effects are discussed in more detail. Finally, “-omics” (genomics, transcriptomics, proteomics, intended and unintended effects of genetic engineering and conventional plant breeding metabolomics, and epigenomics) approaches are reviewed to evaluate their potential to asses. Antisense or RNA Interference Approaches to Decrease Gene Expression method that was used to decrease the expression of genes in GE plants is termed antisense silencing. In an antisense gene construct delivered into the plant genome, the gene to be down regulated (that is, silenced) is essentially put in “backwards” into a plant transformation vector. When the backwards gene is transcribed, the messenger RNA (mRNA) produced from the transgene interferes with the translation of complementary mRNA of the gene to be silenced in the plant or pest into protein (or it can lead to RNA interference, described below). The FLAVR SAVR™ tomato is one of the first examples of the use of antisense technology to produce a GE crop. CRISPR was the most recently developed genome-editing tool. Bacteria harbor CRISPR as an innate defense mechanism against viruses and plasmids that uses RNA-guided nucleases to target the cleavage of foreign DNA sequences. Newer applications of CRISPR include the use of two unique guide RNAs with a modified nuclease that “nicks” one strand of the DNA, providing greater specificity for targeted deletions. The ease of design, the specificity of the guide RNA, and the simplicity of the CRISPR/Cas9 system have resulted in rapid demonstration of the utility of this method of editing genomes in plants and other organisms.

COMBINING ABILITY ANALYSIS OF RICE GALL MIDGE RESISTANCE

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Abstract

Rice gall midge, caused by *Orseolia oryzae*, is an important constraint to rice. Few genotypes resistant to rice gall midge have been reported. However, for genetic improvement, there is need to understand the mode of resistance to gall midge in these genotypes. Combining ability is an analysis tool which is not only useful for selecting favourable parents but also provides information concerning the nature and importance of gene effects influencing desired traits. Hence, the present study was conducted with the aim to investigate the nature of gene action governing the inheritance of resistance to rice gall midge and to identify parents with good GCA and crosses with good SCA effects. Six cytoplasmic male sterile lines were crossed to seven testers in Line x Tester mating design to produce 42 hybrids. The parents and hybrids along with four checks were evaluated at a Regional Agricultural Research Station, Polasa, Jagtial of Telangana state considered to be a gall midge hot spot. The result showed that non-additive gene action was important in the inheritance of resistance to gall midge. The estimate of heritability in narrow sense showed that the gall midge resistance was not highly heritable. Estimates of GCA and SCA effects suggested that the parents JMS 21B and JR 83 were the best combiner for resistance to gall midge. Crosses JMS 20A X JBR 6 and CMS 64A X JMBR 31 were best for the resistance to gall midge. Though conventional breeding programs and the development of resistant varieties are expected to play a large role securing agriculture production, new approaches such as QTL mapping will be required to increase the likelihood of achievement.



EVALUATION OF GROUNDNUT GENOTYPES FOR YIELD AND YIELD ATTRIBUTING TRAITS FOR CHHATTISGARH

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Abstract

The present study consisted of 13 released groundnut varieties given by AICRP on Groundnut, Directorate of Groundnut Research (DGR), Junagadh for cultivation to central zone-III. Thirteen genotypes were evaluated during Kharif 2016 to study association of pod yield and its component traits at College of Agriculture and Research Station (CARS), Raigarh. The experiment was conducted by following Randomized Block Design with four replications. Each entry was grown in five rows of four meter length. The row to row distance was 30 cm and plant to plant distance was 10 cm. The experiment was conducted under rainfed condition and recommended agronomic practices were followed for raising good crop. The analysis of variance revealed significant genotypic difference among the treatment studies. This indicating presence of variation among tested materials. Pod yield (kg/ha) ranged from 1287 (kg/ha) to 3346 (kg/ha) with average pod yield 1654 kg/ha. The genotype JL 776 (3346 kg/ha & 2416 Kg/ha) recorded highest pod yield and kernel weight respectively followed by Girnar -3 (2366 kg/ha & 1458 kg/ha) and ICGV 91114 (2016 kg/ha & 1461 kg/ha). In the present study pod yield per plant had strong positive association at genotypic level for flower initiation (days), plant height (cm), branches /plant, leaf length (cm), leaf breadth (cm), pod number /plant, sound mature kernel (%), and kernel weight (kg/ha). At phenotypic level pod yield per plant had significantly correlated with flower initiation (days), 50 % flowering, plant height (cm), leaf breadth (cm), and kernel weight (Kg/ha). Hence simultaneous selections for these traits will be more reliable to develop high yielding groundnut genotypes. From the results of path coefficient analysis in groundnut it may be concluded that improvement in pod yield per plant could be brought through by selection for component characters like flower initiation (days), 50 % flowering, plant height (cm), branches per plant, pod number per plant, sound mature kernel (%) and kernel weight (kg/ha).

CLIMATE SMART AGRICULTURE FOR ITS SUSTAINABLE GROWTH

Shailza

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Abstract

Climate change is an environmental phenomenon with the potential to exacerbate existing disaster risks and cause extensive human, financial and environmental losses. The Mooifontein agricultural region in South Africa is considered to be a region vulnerable to climate change-associated risks. These climate risks would pose a substantial threat to the livelihoods of farmers in the Mooifontein area. This article aims to explore climate-smart agriculture (CSA) as a resilience-building tool to ensure sustainable agricultural practices. A qualitative research approach was utilised to gain insights into climate change and the lived experiences of farmers and agricultural experts in Mooifontein. The findings revealed that agricultural communities should focus on the identification and application of adaptation strategies like CSA. The adoption of appropriate CSA practices will play a vital role in ensuring sustainable livelihoods and improved community resilience for farming communities in the Mooifontein region.

Climate change is an environmental phenomenon with the potential to exacerbate existing disaster risks and cause extensive human, financial and environmental losses. The Mooifontein agricultural region in South Africa is considered to be a region vulnerable to climate change-associated risks. These climate risks would pose a substantial threat to the livelihoods of farmers in the Mooifontein area. This article aims to explore climate-smart agriculture (CSA) as a resilience-building tool to ensure sustainable agricultural practices. A qualitative research approach was utilised to gain insights into climate change and the lived experiences of farmers and agricultural experts in Mooifontein. The findings revealed that agricultural communities should focus on the identification and application of adaptation strategies like CSA. The adoption of appropriate CSA practices will play a vital role in ensuring sustainable livelihoods and improved community resilience for farming communities in the Mooifontein region.

Climate change is an environmental phenomenon with the potential to exacerbate existing disaster risks and cause extensive



human, financial and environmental losses. The Indian agriculture is considered to be vulnerable to climate change–associated risks. Agricultural production is sensitive to weather and thus directly affected by climate change. Plausible estimates of these climate change impacts require combined use of climate, crop, and economic models as now a days economic optima is also necessary along with the maximization of yield. This article aims to explore climate-smart agriculture as a resilience-building tool to ensure sustainable agricultural practices. A qualitative research approach utilized to gain insights into climate change and the lived experiences of farmers and agricultural experts. The findings reveal that agricultural communities should focus on the identification and application of adaptation strategies like Climate Smart Agriculture. The adoption of appropriate Climate Smart Agriculture practices will play a vital role in ensuring sustainable livelihoods and improved community resilience for farming communities in the developing countries which are dependent on climatic conditions for agriculture like India. Climate change is an environmental phenomenon with the potential to exacerbate existing disaster risks and cause extensive human, financial and environmental losses. The Mooifontein agricultural region in South Africa is considered to be a region vulnerable to climate change–associated risks. These climate risks would pose a substantial threat to the livelihoods of farmers in the Mooifontein area. This article aims to explore climate-smart agriculture (CSA) as a resilience-building tool to ensure sustainable agricultural practices. A qualitative research approach was utilised to gain insights into climate change and the lived experiences of farmers and agricultural experts in Mooifontein. The findings revealed that agricultural communities should focus on the identification and application of adaptation strategies like CSA. The adoption of appropriate CSA practices will play a vital role in ensuring sustainable livelihoods and improved community resilience for farming communities in the Mooifontein region.

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RESPONSE OF DIRECT SEEDED RICE AS AFFECTED BY MICRONUTRIENTS AND ORGANIC MANURE APPLICATION

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Abstract

An experiment was conducted at N.E. Borlaug Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar (Uttarakhand) during two consecutive years (2014-15 and 2015-16) to assess the performance of direct dry seeded rice (irrigated ecosystem) under micronutrients and organic manures application. The soil was silty clay loam in texture, slightly alkaline in reaction (pH 7.7) with low in available nitrogen (236.5 kg ha⁻¹), medium in available phosphorus (19.6 Kg ha⁻¹) and potassium (178.9 Kg ha⁻¹). The experiment was set out in randomized block design with three replications. Rice variety NDR 359 was used. Total fourteen treatments were allotted to rice crop consisting of (1) Absolute control (2) RDF 120:60:40 (control) (3) RDF + Soil application of ZnSO₄ @ 25 kg ha⁻¹ (4) RDF + 1 Foliar spray of 0.5% ZnSO₄ (5) RDF + Soil application of FeSO₄ @ 30 kg ha⁻¹ (6) RDF + 3 Foliar spray of 1% FeSO₄ (7) RDF + Soil application of ZnSO₄ @ 25 kg ha⁻¹ + FeSO₄ @ 30 kg ha⁻¹ (8) RDF + 1 Foliar spray of 0.5% ZnSO₄ + 3 Foliar Spray of 1% FeSO₄ (9) RDF + 3.0 t Vermicompost (10) RDF + 5.0 t FYM (11) RDF + brown manure (12) RDF + Brown manure + 1.5 t Vermicompost (13) RDF + Brown manure + 2.5 t FYM and (14) RDF + ZnSO₄ @ 25 kg ha⁻¹ (Transplanted rice). Results revealed that among all micronutrients and organic manure treatment RDF + BM + 1.5 t VC accumulated significantly higher dry matter and leaf area index, Crop growth rate but remained at par with RDF + BM + 2.5 t FYM and RDF + 1 FS of 0.5% ZnSO₄ + 3 FS of 1% FeSO₄ and RDF + 3.0 t VC. In terms of yield grain yield and straw yield RDF + BM + 1.5 t VC was found significantly superior over all the treatments but did not differ significantly with RDF + Brown manure + 2.5 t FYM, RDF + 1 Foliar spray of 0.5% ZnSO₄ + 3 Foliar spray of 1% FeSO₄ and RDF + 3.0 t Vermicompost. While alone spray of zinc sulphate @ 0.5% was at par with RDF. Direct seeded rice and transplanted rice supplied with same nutrient dose RDF + SA of ZnSO₄ @ 25 kg ha⁻¹, exhibited that both establishment methods remained at par with respect to grain yield during both the years. Hence, it made clear that under the same dose of nutrient TPR and DSR are equally effective under silty clay loam soil at Pantnagar.

EVALUATION AND ANALYSIS OF GAPS IN ADOPTION OF IMPROVED CHICKPEA PRODUCTION TECHNOLOGY UNDER RAINFED CONDITION OF BUNDELKHAND REGION, U.P., INDIA

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Abstract

The present study was undertaken in Hamirpur district of Bundelkhand region to analyze the status of Chickpea production technology, constraints in its cultivation and the possibilities of increasing production. Adoption of faulty practices viz., faulty



methods of sowing, lack of improved varieties, improper knowledge of nutrient, weed and pest management resulted in low yield of chickpea in this area. Keeping these aspects in mind KVK conducted chickpea frontline demonstration during 2018-19. Frontline demonstrations on chickpea were conducted by using variety JG-14. The improved package and practices adopted by the farmers under FLD were: line sowing of crop (30x10 cm), High yielding varieties seed @ 80 kg, seed treatment with SAAF 75 WP (carbendazim 12 % + mancozeb 63%) @ 2.0 g/ kg seed, soil treatment with *Trichoderma viride* @ 2.5 kg/ha mixed with 20 kg FYM, recommended doses of fertilizers as per recommended of practices (PoP) and need based plant protection measures. Results of the study revealed that average highest yield 22.8 q/ha found in demonstration plots followed by 15.5q/ha in control plots. The same trend found in case of FLDs under demonstration, gross and net monetary returns was Rs. 100320/- and Rs. 74410/- ha, for control Rs. 68200 /- and Rs. 34214/-ha, respectively. Benefit cost ratio for demonstration and control was 3.87 and 2.85, respectively. This improvement in yield might be due to the line sowing, adoption of seed and soil treatment, use of RDF, timely weed and water management and integrated pest management practices. The findings of the study also revealed that farmer's adoption for the technology was ranging from 16-23 percent. The majority of the respondent farmers expressed medium to the high level of satisfaction for extension services and performance of technology under demonstrations. It can be concluded that the FLD is playing important role in motivating the farmers for adoption of improved production technology.

RESPONSE OF CLUSTERBEAN (*CYAMOPSIS TETRAGONALOB* (L.) TAUB.) GENOTYPES (GUM) TO PLANT DENSITY AND BIOINOCULANTS

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Abstract

A field experiment was conducted at Agricultural Research Station, Annigeri, University of Agricultural Sciences, Dharwad during late *khari* 2014. Treatments consisted of two clusterbean genotypes (HG-365 and Gaurishankar-9) as main plots, two spacing levels (30x10cm and 45x15cm) as sub plots and bio inoculants (*Bradyrhizobium*, PSB, AM fungi, *Bradyrhizobium*+PSB+AM fungi) as sub - sub plots. The experiment was laid out in split - split plot design with three replications. Between the genotypes, Gaurishankar-9 recorded significantly higher seed yield (643 kg ha⁻¹) and net returns (Rs. 70, 126 ha⁻¹). Similar trend was also observed with respect to growth and yield parameters such as plant height, number of branches, dry matter production, number of clusters plant⁻¹, number of pods plant⁻¹, pod length, seeds pod⁻¹, test weight and quality parameters like protein content, gum content. Between the spacing levels 45 x 15 cm, recorded higher seed yield (587 kg ha⁻¹), gum yield (174 kg ha⁻¹), net returns (Rs. 63, 458 ha⁻¹), number of branches, dry matter production, number of pods. Among bioinoculant treatments, application of *Bradyrhizobium*+PSB+AM fungi recorded higher seed yield (583 kg ha⁻¹), gum yield (173 kg ha⁻¹), soil enzymes and mycorrhizal parameters. However, net returns (Rs. 42, 328 ha⁻¹) and B:C ratio (2.50) were recorded higher with application of *Bradyrhizobium* alone. Among the interaction effects, Gaurishankar-9 genotype at spacing of 45x15 cm with application of *Bradyrhizobium*+PSB+AM fungi recorded higher seed yield (673 kg ha⁻¹) and gum yield (221 kg ha⁻¹).

NUTRITIONAL ANEMIA, A NEGLECTED PUBLIC HEALTH PROBLEM IN MARRIED WOMEN (NON-PREGNANT/NON LACTATING) OF REPRODUCTIVE AGE GROUP IN SELECTED ZONE OF AN URBAN INDIAN CITY VADODARA, GUJARAT

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Abstract

Anemic mothers are at greater risk of delivering premature and low-birth-weight babies who have an increased risk of dying. Prevention of anemia in non-pregnant women (preconception) could improve the health status of the pregnant women, with reduction of both maternal and perinatal mortality. Purposive selection of the western zone of an urban city of India (Vadodara, Gujarat) and its 1 Urban Health Center (UHC) was done. Anganwadi of Navawas of selected UHC was also purposively selected to get a sample size of 250 married women (NP/NL) of the reproductive age group (calculated based on 19%



prevalence of under nutrition reported as per NFHS IV, with 95% CI & 5% Precision). All married women (NP/NL) of reproductive age group residing in slums, which were planning to have a child or were using temporary family planning methods & gave written consent were enrolled for the study. Hemoglobin status, mean intakes of iron rich foods in 9 food groups namely grains, white roots, tubers and plantains, pulses, fruits and vegetables, fats and oils, sugars, meat, poultry, fish and eggs, nuts and oilseeds, dairy and discretionary foods was assessed by 24 hours dietary recall method to compute the consumption of each food groups in gms/CU/day. More than half (54.7%) of the subjects were found to be anemic, with 23.4% mildly anemic (11-11.9g/dl), 26.04% moderately anemic (8-10.9g/dl) and 4.69% severely anemic. Knowledge about anemia was poor (69.6%), with 48.8% of the subjects being aware of IFA supplementation for the control of anemia. Majority (90.4%) did not consume IFA regularly, where 63.2% responded non availability of IFA tablets as the reason for irregular consumption. Counselling by ASHA on IFA intake was poor (26.4%). Deworming tablets delivery was almost absent (98%). Based on the 24 hour diet recall the mean daily iron intake from food groups was reported to be 4.925 ± 1.28 . Minimum Dietary Diversity Score (MDD-W) was that majority (52%) of the women did not consume 4 food groups daily, making them vulnerable for micronutrient deficiencies. The study demonstrates that controlling anemia in reproductive age group populations has remained a neglected area, inspite of the existence of National Iron plus initiative (NIPI) which adopts a life style approach. Ensuring regular supply of IFA with greater focus on education for regular consumption of IFA and preventing its side effects are simple interventions that need to be delivered at scale to overcome the problem of nutritional anaemia. Government initiative to supply double fortified salt in nutrition supplementation programs and in PDS has the potential to overcome the problem.

NUTRIENT MANAGEMENT IN RUBBER BASED AGROFORESTRY SYSTEM

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Abstract

The management strategies and inputs applied for growth of tree crops also benefitted associated crops and vice versa in agroforestry systems. Several workers have studied influence of fertilization to tree crop and intercrop on growth of tree species. a field study was conducted to determine effect of organic inorganic fertilizers applied on tree crop and intercrop on growth of rubber at farmers' during 2017 to 2019. Two practices applied on rubber were application of Farm Yard Manure (FYM) as an organic practice and NPK as inorganic practice and nine treatments consisting of different organic manures, biofertilizers and NPK as inorganic fertilizer were applied on Bird's Eye Chilli (BEC) grown as an intercrop. The results revealed that maximum growth parameters were noticed under inorganic practice on rubber in two year old rubber. Among nine treatment applied on BEC, application of NPK resulted in higher growth parameters of rubber. Among interactions, the interaction where rubber and BEC plants received NPK fertilizer (P_2T_8) recorded a better performance. Hence application of NPK both at tree and intercrop at recommended dose may be recommended for cultivation of two year old rubber plantation.

COMBINIG ABILITY STUDY FOR YIELD AND IT'S CONTRIBUTING TRAIS IN BREAD WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

Wheat is one of the most important cereal crop for majority of world's population, which provides large fraction of food, feed and fodder. It is the most important staple food of about two billion people (36% of the world population). Eight diverse genotypes of wheat viz., HD 2967, WH 1105, K 0307, K 1601, DBW 187, WH 1218, K 9107 and DBW 14 were crossed in all possible combinations excluding reciprocals during Rabi 2017-18. The eight parent and their 28 F_1 s were grown in Randomized Block Design with three replications at Crop Research Farm, Nawabganj of C.S.A. University of Agriculture and Technology, Kanpur during Rabi 2018-19. The observation were recorded on 5 randomly selected plants in parent and F_1 generation for days to 50% heading, number of productive tillers/plant, plant height (cm), days to maturity, spike length (cm),



number of spikelets/spike, number of grains/spike, 1000-grain weight (g), Biological yield/plant (g), grain yield/plant (g) and harvest index (%). Analysis of variance for combining ability showed highly significant GCA and SCA variances for all the characters, indicating the importance of both additive and non-additive gene action for inheritance of these attributes. However, estimated values of GCA variance were lower than those of SCA variance for all the traits, indicating the preponderance of non-additive gene action for inheritance of these of these characters. The ratio of average degree of dominance was observed to be more than unity for all the attributes, indicating major contribution of non-additive gene effects in the expression of these characters. The parents namely, K 0307, WH 1218 and HD 2967 were observed as good general combiners for grain yield/plant. The crosses namely, HD 2967/DBW 14, K 1601/DBW 14, K 0307/DBW 14 and K 1601/WH 1218 were observed as good specific combiners for grain yield/plant. Biparental mating followed by recurrent selection may be utilized to obtain transgressive segregants in advanced generations for characters governed by such type of gene action.

POPULATION DYNAMICS OF SUCKING INSECT PESTS ON MAIZE CROP

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Abstract

Maize (*Zea mays* L.) or corn is a grass of the family Poaceae grown primarily for its kernel. It is the most versatile crop with wider adaptability in varied agro-ecologies and has highest genetic yield potential among the food grain crops. Insects attack maize throughout the cropping cycle and during storage, resulting in as little as 10% to complete loss. The present investigation conducted during spring season of 2013-14 and 2014-15. Field experiments were conducted at Research Farm, IGKV, Raipur (C.G.). The maximum population of aphid (cm^2) were observed during 12th SMW (48.92 aphids/ cm^2) and 13th SMW (57.43 aphids/ cm^2) during spring season 2013-14 and 2014-15, respectively. The interaction between the aphid population and weather parameters showed a non-significant relationship. The green stink bugs were active till late vegetative period of crop. The interaction between the population of green stink bugs *Nezaraviridula* and weather parameters during spring season, 2013-14 and 2014-15, revealed negative as well as non – significant correlation with maximum temperature ($r = -0.402$ and -0.5400), minimum temperature ($r = -0.4714$ and -0.3642), while the interaction with morning humidity ($r = 0.355$ and 0.634) and evening relative humidity ($r = 0.01$ and 0.57) was positive and non-significant for first year and significant for the second year.

GENOTYPE X ENVIRONMENT INTERACTION AND STABILITY ANALYSIS OF ADVANCE BREEDING GENOTYPES OF SOYBEAN FOR YIELD AND ITS COMPONENTS IN CENTRAL NARMADA REGION OF M.P.

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Abstract

Forty five advance breeding genotypes of soybean were evaluated for stability over three environments, in three seasons for two years i.e. Kharif 2013, Rabi 2013-14, Kharif 2014 for phenological and economic traits at JNKVV, Jabalpur (Central Narmada region). The mean sum of square of variance revealed that genotypic differences were highly significant ($P < 0.01$) for seven traits viz., vegetative phase, plant height, number of pod cluster plant⁻¹, number of branches plant⁻¹, number of seeds plant⁻¹, 100 seed weight, seed yield plant⁻¹. Mean sum of squares due to Environment (linear) was found highly significant for all the traits under study. The genotype x environment interaction showed significant values for five traits viz., vegetative phase, reproductive phase, number of pods plant⁻¹, number of nodes plant⁻¹, biological yield plant⁻¹. The mean sum of squares due to genotype × environment (linear) component against pooled deviation were found significant among the traits viz., plant height, number of branches plant⁻¹, number of seeds plant⁻¹, biological yield plant⁻¹, seed yield plant⁻¹, 100 seed weight and harvest index. JS 335, JS 93-05, JS 95-60, JS 97-52, JS 20-34, JS 20-73, JS 20-84, JS 20-85, JS 20-90, JS 20-93, JS 20-94, JS 20-98, JSM 246 were identified as stable genotypes over all environments exhibited constant performance for more than four traits including economic traits. Where as JS 20-64, JS 20-73, JS 20-94, JS 20-96, JSM 302, Bragg were found appropriate for



poor environments. JS 20-53, JS 20-41, RVS 2007-4 and JSM 283 found stable for favorable environment. On the basis of genetic divergence analysis over three environments, most diverse genotypes identified were JS 335, JS 20-34, JS 20-29, JS 20-41, JS 20-50, JS 20-59, JS 20-65, JS 20-69, JS 20-71, JS 20-89, JS 20-92, JS 20-94, JS 20-95, JS 20-96, JS 20-98, JSM126, JSM 127, JSM 175, JSM 230, JSM 242, JSM 283, JSM 302 and Bragg. On account of results from genetic divergence and stability analysis above genotypes were considered as potential sources to be utilized in hybridization programs to accomplish the desirable future varieties of soybean with wider adaptability and better stability.

A BRIEF PROFILE OF PARTICIPANTS OF COMMUNICATION SKILLS TRAINING PROGRAMMES CONDUCTED IN NAARM

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Abstract

The study explores the profile characteristics of trainees of Communication Skills training programs conducted at National Academy of Agricultural Research Management (NAARM), Hyderabad between 2012 and 2018. The cumulative number of total respondents were 219 to whom the survey was sent using 'Survey Monkey'. The effective response rate turned out to be 37 percent. Majority of respondents were found to be 36 to 50 years old (51.25%), male (61%) with Doctorate as the highest level of education (78.75%). Almost half of them were serving as an assistant or associate professor (50%) with total work experience of 16 to 30 years (55%) and 75 percent of them had less than or equal to 10 years of work experience in the current cadre. They belong to various disciplines, but the highest frequency of respondents identified social science as their discipline.

SEED ENHANCEMENT TREATMENT FOR OPTIMIZING SEED RATE AND ITS EFFECT ON YIELD ATTRIBUTING PARAMETERS IN CHICKPEA

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Abstract

The experiment was conducted in Adhartal, Livestock farm of Jawaharlal Nehru Krishi Vishwa Vidyalaya with Chickpea variety JG-14 under irrigated condition in Split Plot Design with three replications. The treatments consisted of four seed rate of chickpea i.e., 75Kg, 65Kg, 55 Kg and 45Kg ha⁻¹ respectively with seven seed enhancement treatments along with Thiamethoxam in combination with seed protectants. The yield attributing parameters like the number of leaves/plant, leaf dry weight, shoot dry weight, number of primary and secondary branches per plant, total dry matter accumulation, number of pods, Harvest index and seed yield per plant was significantly maximum in 45 Kg/hectare seed rate while it was minimum in 75 Kg ha⁻¹. The dry matter accumulation increased steadily upto 75 days of sowing, thereafter exhibited a decreasing trend.

CURSORY INFLUENCE OF GLOBAL CLIMATE CHANGE ON AGRICULTURE

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Abstract

Global climate change is one of the most serious environmental scourge facing mankind worldwide. It affects agriculture in several ways, including its direct impact on food production. Physical effects of climatic change on agriculture, such as changes in crop and livestock yields as well as the economic consequences of these potential yield changes. Global climate change is in solution theory purpose, the perfect valuable topic for worldwide discussion. Global warming is expected to have far-reaching and rapid effects on conditions affecting agriculture, including temperature, carbon dioxide, glacial runoff, rainfall and the interaction of these elements. The impact of climate change are reducing the capacity of natural resources (biodiversity, soil and water) to sustain the food demand of the world's increasing population. Food security and climate change are therefore interlinked challenges that need to be addressed simultaneously. Global mean surface temperature will



likely rise and may result into uneven climatic changes. This rising temperature may affect crop yield at large scale. It has been reported over 20th century that rising temperature plays an important role towards global warming as compared to precipitation. Researchers have confirmed that crop yield falls 3% to 5% for every 1^oF increase in the temperature. The consequences of agriculture's contribution to climate change and of climate change's negative impact on agriculture, are severe which is projected to have a great impact on food production and may threaten the food security and hence require special agricultural measures to combat with. The greenhouse effect is a natural process that plays a major part in shaping the earth's climate.

DESIGN AND DEVELOPMENT OF INCLINED PLATE SEED METERING MECHANISM FOR CHICKPEA INTENSIFICATION

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Abstract

Chhattisgarh state has good agro-ecological situation for chickpea production. In state it is grown over an area of 356.52 thousand hectares with an annual production of 433.15 thousand tonnes and an average productivity of 1140 kg/ha. So, inclined plate was developed and test in field condition for chickpea seeds. Physical properties of chickpea i.e. average aspect ratio, surface area, bulk density, true density, moisture content and porosity of chickpea were observed 75.54 %, 157.379 mm², 709.55 kg/m³, 875.50 kg/m³, 19.81 % and 18.62 % respectively. Mean spacing was found more accurate in 45° inclination of seed box from horizontal which was 20.03 cm. and average field efficiency and time required for one ha was 63.63% and 0.44 h/ha respectively.

COMBINATION OF TILLAGE TOOLS TO IMPROVE THE SOIL CONDITION FOR CULTIVATION

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Abstract

Many agricultural equipments are using for agricultural operation for improve quality of production. Technology introduced combine harvester which left the residue of the crop after harvesting. Some time it was difficult to remove this residue when we want to take next crop, so straw management practice is a better option to mix this residue in the soil for better soil condition for agriculture activity. A combination of machinery was used for soil residue incorporation. The study was done in the farmer field at village Avari, Raipur (C.G.) by using a machinery combination i.e., 1 pass of mulcher, 1 pass of disc plough and 1 pass of rotavator. Many parameters were taken in consideration to evaluate the performance of that combination. Bulk density reduction, reduction in straw length and carbon content improvement was observed 23.81%, 82.34% and 24.49% respectively. Energy requirement and cost of operation was observed 2995.79 MJ/ha and Rs/- 5179.57 per ha respectively.

THE IMBALANCE OF CLIMATE CHANGE ON ECOSYSTEM AND BIODIVERSITY

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Abstract

Climate change and biodiversity loss are two of the greatest challenges of the 21st century. To date, actions proposed by the international community to address these problems have largely been conducted in a piecemeal fashion. Ecosystems influence climate through multiple pathways, primarily by changing the energy, water and greenhouse gas balance of the atmosphere. Consequently, efforts to mitigate climate change through modification of one pathway, as with carbon in the Kyoto protocol, only partially address the issue of ecosystem climate interactions. For example, the cooling of climate that results from carbon sequestration by plant may be partially offset by reduced land albedo which increases solar energy absorption and warms the



climate. The relative importance of these effects varies with spatial scale and latitude. Although feedback dynamics between land, atmosphere and oceans are not modeled, the metric compares well with previous studies for several regions. Carbon Sequestration in Terrestrial Ecosystems (Soils and Vegetation) Enhancing the natural processes that remove CO₂ from the atmosphere may be one of the most cost-effective means of reducing atmospheric levels of CO₂. Advanced biological technologies will augment or improve natural biological process for carbon sequestration from the atmosphere in terrestrial plants, aquatic photosynthetic species, and other microbial communities. Enhanced biological carbon fixation significantly increases carbon sequestration without incurring costs for separation, capture, and compression. Available technologies encompass the use of novel organisms, designed biological systems, and genetic improvement of metabolic networks in terrestrial and marine microbial, plant, and animal species.

EFFECT OF DIFFERENT CONCENTRATION OF FUNGICIDES ON SPORE GERMINATION OF *BIPOLARISSOROKINIANACA* CAUSING SPOT BLOTCH OF WHEAT

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Abstract

Spot blotch of wheat is one of the most important diseases in almost all the wheat growing areas of country. Present investigation were carried out with *B. sorokiniana* on seven fungicide (Raxil060FS), Trifloxystrobin 500SC, Trifloxystrobin + Tebuconazole 80FS, Vitavax, Flint (Trifloxystrobin 50WG), Natio 75WG (Trifloxystrobin 25% + Tebuconazole 50%) *Trichoderma viride*, Neemexcel and Tebuconazole 2% DS) tested with different doses against spore germination of *B. Sorokiniana* in-vitro test (cavity slide method). To evaluate the potentiality of different concentration (0.33 ml/lit, 0.66 ml/lit, 1.25 ml/lit, 2.50 ml/lit. in liquid and 2.0 g/lit, 3.0 g/lit, 3.5 g/lit and 4.0 g/lit in dry form) of seven fungicides, bioagent and botanical were tested against spore germination of *B. sorokiniana*. The effect of these fungicides with respect to suppression of spore germination of *B. sorokiniana* was recorded up to seven days of incubation. All fungicides and biocides were effective to suppression of spore germination of test fungus @0.25 per cent (2.5 ml/lit and 4g/lit) It has found that the maximum germination of conidia declined up to 5.6 per cent at 0.25 per cent concentration of Natio 75 WG in comparison to control. It was 96.21 followed by Tebuconazole (Raxil60 FS), Vitavax and Trifloxystrobin + Tebuconazole 80FS with 6.0 percent, 6.2 percent and 6.2 percent, respectively at 0.25 percent concentration.

ARTIFICIAL INTELLIGENCE (AI) IN AGRICULTURE FOR SUSTAINABLE AND SMART PRODUCTION

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Abstract

Artificial Intelligence (AI) is a Branch of Computer Science dealing with the simulation of intelligent behavior in computers. AI is not a man versus machine, but it is in fact man with machine synergy. In this process an installed application guides our farmers through the process sowing, growing, harvesting and sale of Agr. Produce AI is a software programme that can adopt itself to executive task in real time situations using cognitive processing and does not require constant supervision. AI comes as a great boon to agri sector which is heavily dependent on unpredictable climatic conditions. AI models assess the moisture content in the field by using satellites. Robots and Drones have revolutionized our future agriculture system. AI in agriculture segmented into 5 categories 1) Soil analysis 2) Crop sowing 3) Weed and Pest Control 4) Crop Harvesting 5) Supply chain management. AI aided crop sowing helps in making predictions on right time to plant (sowing seeds), apply fertilizers harvesting crops based on climatic conditions. Crops can also be sowed by using AI aided machinery at equidistant intervals. Microsoft partnership with ICRISAT initiated a project in Devanakonda (Kurnool Dist. AP) sample base of 175 farmers who were alerted on their mobile phones regarding suitable cropping dated land preparation soil test based fertilizers; The project increased output of crops by 30% (2017). This same projects was extended to 3000 farmers in AP and



Karnataka for getting increased crops like Ground Nut, Paddy, Ragi and Maize, cotton. AI supported agriculture is most challenging and compelling for getting greater agri production and food security. Govt. of India had recommended a strategic to be achieved doubling of farmers income in a real time by year 2022.

APPLICATIONS OF IT AND ICT IN AGRICULTURE FOR E-RURAL DEVELOPMENT

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Abstract

E-rural development is the provision of information, knowledge and business services to the people living in rural area for improving their livelihoods using a variety of electronic means of communication. The information needs of landless poor are regarding entitlements, employment opportunities, social services, education and training, entertainment, health and other. Subsistence farmers need the information regarding new technologies to maintain at least subsistence levels of agriculture production, cultural practices, prices, weather, inputs, credits etc. The other farmers need to know about market opportunities as well as environment rules and regulations. The emerging trend in demand for information and knowledge is on the increase, becoming complex and a basic need. At the same time, the information must be timely, relevant, easily accessible, understandable and affordable. Second trend is evolution of information and communication technology (ICT). The ICTs are tools that help build human network, increase public awareness and provide access to information and knowledge for the use of people. These consist of a range of communication media and devices viz., print, telephone, fax, radio, television, video, audio, computers, remote sensing, GIS, RFID etc. ICT is emerging from single to integrated and complex systems. Existing tools are now changing into multimedia information and knowledge centers providing multi-sectoral, multi-disciplinary content from multiple sources to serve multiple users with feedback mechanisms. Essential elements of ICT are enabling policy environment to promote access in rural areas like pricing, competition, regulatory environment etc. This paper presents the various promising IT and ICT tools and technologies in agriculture for development of the Rural India.

WEED FLORA OF FLUE CURED TOBACCO GROWING REGIONS OF INDIA

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Abstract

Tobacco (*Nicotiana tabacum* L.) is one of the main commercial crop cultivated in about 4.5 lakh ha which is about 0.23 % of cultivated land in India with production of 770 m kg (2013-17). India stands second in area and third in production of tobacco in the world. Foreign exchange earnings through the export of tobacco and tobacco products garner around Rs. 6,000 Cr per annum. The economic part of tobacco plant is leaf and the quality of leaf is as important as productivity in tobacco production system. The tobacco crop is rich in foliage and responds well to agronomic practices. The crop is prone to abiotic stress in case of any aberration in normal course of production package. The biotic stress components in tobacco production are insect damage, disease infection and competing weed flora. Weeds are one among the biotic limiting factors responsible for declining productivity levels besides negatively impacting leaf quality. The weed flora of tobacco not only compete for light, water, nutrients and space, they also act one of the host for many viral diseases like Tobacco Mosaic Virus and Leaf Curl Virus. Tobacco weeds like *Chromolaena* sp act as host for white fly in turn causing leaf curl disease which is one of the economically important diseases of tobacco. Crop-weed competition in tobacco is one of the most important productivity and quality limiting factor especially infestation of broad leaved weeds, grasses and sedges reduce the primary productivity and profitability and impacts the long term sustainability of crop. On conducting the weed survey of the tobacco crop lands consecutively for 2 seasons (2015-17) recorded wide range of broad leaved and grassy weeds in the tobacco ecosystems of Northern Lights Soils (West Godavari district), Southern Light Soils (Prakasam and Nellore districts) and Karnataka Light Soils (Mysore district) regions. The broad leaved weeds recorded were *Cleome viscosa*, *Portulacaoleracea*, *Phyllanthus niruri*, *Physalis minima*, *Euphorbia hirta*, *Amaranthusviridis*, *Amaranthusspinosus*, *Abutilon indicum*, *Ageratum conyzoides*, *Chromolaenaodorata*, *Commelinabenghalensis*, *Commelinadiffusa*, *Daturametel*, *Eclilpta prostrate*, *Heliotropiumindicum*, *Hygrophilapolysperma*, *Lantana camara*, *Leucasaspera*, *Oxalis corniculata*, *Sidarhombifolia* and



Trianthemaportulacastrum. The grassy weeds include *Dactyloctenium aegyptium*, *Echinochloa colona*, *Cynodon dactylon*, *Digitaria sanguinalis* and the major sedges were *Cyperus rotundus*, *Cyperus compressus*. Heavy infestations of total root *Orobanchecernua* was also recorded in Northern Light Soils, Southern Light Soils and Karnataka Light Soil regions. The study has great relevance in crop productivity as the identification of weed flora and timely weed management help in preventing the spread of weeds besides managing pests and diseases.

SELF-HELP GROUPS AS CATALYSTS IN EMPOWERING RURAL WOMEN

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Abstract

Women play an important role in the family and society. In India, during last two decade women made significant contribution in various professions and are working in different sectors of the economy. Women represent 50 percent of world population and receive 10 percent of the world income and own even less than 1 percent of the world's property. They suffer many disadvantages as compared to men in terms of literacy rates, labour participation rates and earnings. Empowerment of women has emerged as an important issue in recent times. The major strategies of women empowerment include social empowerment, economic empowerment, political empowerment and gender justice along with demographical justice (rural and urban). Empowering women particularly rural women is a challenge. Women are economically empowered through small scale entrepreneurship programme with the help of Self-Help Movement. Economic empowerment of women has led to the empowerment of women in several aspects such as socio-economic opportunity, property rights, political representation, social equality, personal rights, family development, and community development and at last the nation development. For rural women, economic empowerment through the concept of Self-Help Groups (SHGs) based on group approach to rural development is indeed a boon to the rural poor women who undertake viable economic activities on their own. The women organize themselves at the grass root level to find innovative solutions to the specific problems which develops self- esteem, self-reliance and self- confidence among them. It is the need of the hour to recognize the importance of SHGs and create awareness among the rural women in this regard. Thus, the study highlights the role of SHGs as catalysts in empowering the rural women.

AUTOMATED QUANTIFICATION OF ROOT TRAITS OF SOYBEAN GENOTYPES USING AN OPTICAL SCANNER-BASED IMAGE ANALYSIS

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Abstract

Better root phenotypes are right now considered than be critical to improved drought resilience qualities that permit better plant execution through increasingly effective water take-up in soybean. A quantitative characterization of root parameters is currently being attempted for various reasons. Non-destructive, rapid analyses of root system are difficult to perform due to the hidden nature of the root. Hence, improved methods to measure root traits are necessary to support knowledge based plant physiology and to analyse root growth responses to drought stress. Here, we conducted a rizotrone study to investigate automated quantification of root traits of soybean genotypes. Be that as it may, automation of the filtering procedure and proper programming remains the bottleneck for high throughput investigation. The JS 9752 (2.22) possessed the higher root volume though did not vary significantly with KDS 344 (0.99). JS 9752 (455.03) and JS 335 (450.31) recorded the significantly higher analyzed region area. MACS 1188 (0.23) lower average diameter of root. These findings demonstrate that root phenotyping using optical scanner-based image analysis that are easy-to-apply and determine root genotypic differences in soybean genotypes.



TRANSGENIC FRUIT CROPS

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Abstract

Present increasing trend of population is alarming for food shortage. It was estimated that by the year of 2050 the population rate may increase up to 9 billion. Rapid increase of human population in this changing climate scenario, resulted in increased demand of plant based food and energy sources. Fruits are often referred as "protective food" being rich in vitamins and minerals. However, fruit production is severely impacted by many abiotic and biotic stresses. Because an increase demand exists in global fruit production, therefore many economically important fruit crops are need to be improved. During the past, some efforts were made through conventional breeding with respect to these problems. However, classical fruit breeding has had little success in improving fruit plants and is constrained due to long juvenile period, genetic erosion, genetic drag and reproductive barriers that limit the transfer of favourable alleles from diverse genetic resources. Thus, there is an urgent need for the biotechnology-assisted crop improvement, which ultimately aimed to obtain novel plant traits. In the recent past advances in genetic engineering methods based on the introduction of transgenes and development of transgenic plant have been successfully adopted to improve crops. Genetically modified crops offer dramatic promise for meeting the great challenges of twenty first century. Transgenic breeding help us for trait specific breeding, it can be a tool to increase productivity. The transgenic foods are safe to human as there is no scientific report on health and environmental hazards, since nutritionists and scientists have taken care of safety issues.

GENETIC DIVERGENCE ANALYSIS ON SOME BREAD WHEAT (*TRITICUM AESTIVUM* L. EM. THELL) GENOTYPES

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Abstract

In the present investigation, an experiment was conducted to estimate the nature and magnitude of genetic divergence in improved varieties of bread Wheat (*Triticum aestivum* L. em. Thell) during *rabi* 2017-18. A Total number of 84 exotic and indigenous lines of bread wheat including 3 checks were appraised in normal soil, timely sown and irrigated conditions. The experiment was conducted in Augmented Block Design (ABD) at Agriculture Research farm of B.R.D.P.G. College (Campus), Deoria (U.P.). All the wheat germplasm were grouped into 10 different non-overlapping clusters by estimating genetic divergence of 14 quantitative characters. Cluster IX had highest (13) number of genotypes followed by cluster X with 11 entries. The highest inter-cluster distance was present between clusters VIII and X (3019.404). This indicates the existence of high degree of genetic diversity in the wheat exotic and indigenous lines. The genotypes having high mean performance for grain yield per plant and several other yield traits were concentrated in cluster III and V. In the divergence analysis, the formed 10 clusters contain heterogeneous origin of genotypes; indicating non-parallelism between genetic and geographic diversity. Selection of such types of genotypes parent in hybridizing programmes would play an important role in the improvement of yield attributing traits.

BIO DIVERSITY AND INTELLECTUAL PROPERTY RIGHTS : ISSUES AND CONCERNS

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Abstract

Biological diversity is the hallmark of life on earth. It is very backbone of sustainable development. The current Intellectual Property Rights (IPR) regime is encouraging commercialization of seed development, monoculture and protection of new plant varieties, microorganisms, and genetically modified organisms. Monetary profit is the most important, in most cases, the



only motive behind man's relentless toil, inventiveness and ingenuity. With the advent of biotechnology one of issue is legal characterization of the new invention. It is created to protect the rights of individual to enjoy their creations and invention. Created to insure protection against unfair trade practices. To assure the world a flow of useful, informative and intellectual works. To encourage the continuing innovativeness and creativity of owners of IP. It encourages and safe guard intellectual and artistic creation. It encourages investment in research and development efforts. It provides the consumers with the result of creations and invention. It enables the dissemination of new ideas and technologies quickly and widely. IPR has encouraged monopolies; many take overs have been motivated by access to an IPR. It may adversely affect biological diversity and ecological balance. Adversely affect the livelihood of the poor in developing countries.

RESPONSE OF CHICKPEA TO DIFFERENT FORMULATION OF MULTI NUTRIENT MIXTURE SPRAYS IN BLACK SOILS OF NORTHERN DRY ZONE, KARNATAKA

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Abstract

A field experiment on "Response of Chickpea to different formulations of multi nutrient mixture sprays in black soils of Northern Dry Zone, Karnataka" was conducted at College of Agriculture Vijayapur, University of Agricultural Sciences, Dharwad during *rabi* 2018. The experiment was laid out in randomized block design with seven treatments and four replication. Treatment consisted of two formulation of nutrient mixture viz. water soluble and EDTA formulation each at different doses (0.5, 0.75 and 1.0 per cent). The results of the experiment showed that foliar application of 0.5 % EDTA formulation recorded significantly higher plant height, dry matter accumulation, pods per plant, seed yield (541 kg ha⁻¹) and straw yield (899.75 kg ha⁻¹) over control. However the growth and yield of chickpea increased with increasing doses of both water soluble and EDTA formulation sprays from 0.5 to 1.0%. Similarly 0.5 % EDTA formulation spray recorded significantly higher macro and micronutrient uptake by the crop over control. The post harvest soil macro and micronutrient status was also significantly higher in above said superior treatment. However highest values of growth, yield, nutrient uptake and post harvest nutrient status recorded in 1.0 % foliar spray of EDTA formulation. The net returns and benefit cost ratio of chickpea production was higher in the treatment receiving foliar spray of 0.5 % EDTA formulation (8210 ? ha⁻¹ and 1.45, respectively) followed by 0.75 % EDTA formulation (7858 ? ha⁻¹ and 1.40, respectively). Even though growth and yield parameters were higher with application of 1.0 % foliar application, 0.5 % EDTA formulation spray has resulted in highest benefit cost ratio among all other treatments. Hence the treatment with 0.5 % EDTA formulation spray is practically feasible and beneficial for getting higher yield and returns of chickpea.

EFFECT OF MULBERRY VARIETIES AND MAGNETIC FIELD ON CARBOXYL ESTERASE ACTIVITY IN LARVA OF *BOMBYX MORI* L.

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Abstract

Six mulberry varieties (S₁₆₃₅, M₅, S₁₃, S₃₆, S₃₄, V₁) and five rearing methods M₀, M₃, M₆, M₁₂, M₂₄ were evaluated in Department of Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. For the study PM X CSR₂ race of mulberry silkworm, *Bombyx mori* L. was used. The data thus obtained was analysed in FCRD design with varieties as Factor 'A' and rearing method (magnetic field) as Factor 'B'. The pooled results for interaction effect of mulberry varieties and magnetic field indicated that silkworm reared on S₁₃ mulberry cultivar for 12 h magnetic field (S₁₃M₁₂) had significant effect on the activity of detoxifying enzyme in larva of mulberry silkworm and observed maximum enzymatic activity in midgut and haemolymph for carboxyl esterase (CE) was (0.716 µM mg⁻¹ protein) and (0.959 µM mg⁻¹ protein) over normal method of rearing on mulberry cultivar in zero hour magnetic field (V₁M₀) in which minimum enzymatic activity in midgut and haemolymph for carboxyl esterase (CE) was estimated as 0.452 µM mg⁻¹ protein and 0.757 µM mg⁻¹ protein respectively. However other method of rearing on different mulberry varieties in different hour of magnetic field treatment observed lowest activity of detoxifying enzyme i.e., carboxyl esterase (CE). Thus, the study indicated that for minimizing the larval



mortality rate in silkworm larvae they should be reared on S₁₃ cultivar of mulberry in 300 gauss magnetic field for 12 h every day.

HYDRAULIC PERFORMANCE STUDY OF CANAL IRRIGATION SYSTEM IN EAST COAST PLAIN REGION

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Abstract

The performance of the Nagpur minor canal (Hirapur and Nagpur village, Block-Baliata, Bhubaneswar Odisha) irrigation system was evaluated during the Rabi season of 2018-19 under the four crops viz. ground nut, pointed gourd, sesame and bitter gourd grown in the command area. The irrigation water requirements for those four crops were calculated using Hargreaves method. The water requirements of these crops viz., groundnut, pointed gourd, sesame and bitter gourd were found to be 45cm, 30cm, 69cm and 58cm, respectively. The performance indicators values in terms of adequacy, equity and relative water supply were computed as 0.31, 0.69 and 0.74 respectively. These values reflect the poor performance of Nagpur minor canal irrigation system. This investigation aimed at improving the capacity of selected minor for proper utilization of canal delivery water and efficient water management for crop production.

IMPACT OF WEATHER PARAMETERS ON CHILLI THRIPS, *SCIRTOTHRIPSDORSALIS* (HOOD) POPULATION IN ANDHRA PRADESH

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Abstract

To know the initial occurrence and subsequent build up of thrips population on chilli crop in relation to weather parameters, the field experiments were carried out from 2005-06 to 2011-12 at Horticultural Research station, Lam, Guntur, Andhra Pradesh. Seasonal incidence of thrips was recorded from leaves and fruits at weekly intervals during the crop growth period. Based on the six years data, the results revealed that the infestation and severity of insect pests were highly influenced by weather parameters. Correlation coefficients were worked out between thrips population and weather parameters of preceding one and two weeks, indicated that among the various weather parameters significant positive correlation with maximum temperature, where as negative correlation with minimum temperature, morning relative humidity, evening relative humidity, rainy fall with thrips population throughout the study. The overall results obtained from the seasonal incidence of chillithrips and its relation with weather parameters clearly indicated that the significant role of weather parameters on peak period of activity of thrips species on all plant parts of chilli crop. The information obtained from these studies used to develop weather based pest prediction models which in turn are helpful in taking up timely control measures.

RESPONSE OF PIGEONPEA (*CAJANUS CAJAN*) TO DROUGHT MITIGATION STRATEGIES

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Abstract

A field experiment was conducted over three years (Kharif – 2016-17, 2017-18 and 2018-19) at Pulses Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra to evaluate the impact of various drought mitigation strategies on growth, yield attributes, yield and economics of pigeonpea (variety-Vipula). Altogether ten drought mitigation practices i.e., T₁- Seed hardening with CaCl₂ (2 %), T₂-Vermicompost @ 2.5 tha⁻¹, T₃- FYM @ 5 tha⁻¹ + 2% KH₂PO₄ spray at flowering, +



2% KNO₃ spray at pod development stage, T₄-Mulching with organic residues @ 5 tha⁻¹, T₅ – Pusa hydrogel @ 2.5 kgha⁻¹, T₆-Seed hardening with CaCl₂ (2%),+ Pusa hydrogel @ 2.5 kgha⁻¹, T₇- Vermicompost @ 2.5 tha⁻¹+ Pusa hydrogel @ 2.5 kgha⁻¹, T₈- FYM @ 5 tha⁻¹+ 2% KH₂PO₄ spray at flowering, + 2% KNO₃ spray at pod development stage + Pusa hydrogel @ 2.5 kgha⁻¹, T₉- Pusa hydrogel @ 2.5 kgha⁻¹ + Mulching with organic residues @ 5 tha⁻¹, T₁₀-control were taken under rainfed condition with three replications in RBD design. On the basis of pooled results of three years it was revealed that treatment T₉ i.e. Pusa hydrogel @ 2.5 kgha⁻¹ + Mulching with organic residues @ 5 tha⁻¹, recorded significantly higher grain yield (2135.7 kgha⁻¹) and stalk yield (9396 kgha⁻¹), with highest net returns (Rs-59560/-ha⁻¹) and B:C ratio (2.2). Pusa hydrogel @ 2.5 kgha⁻¹+ Mulching with organic residues @ 5 tha⁻¹ treatment enhanced yield to the extent of (36.5%) over control. Thus application of Pusa hydrogel @ 2.5 kgha⁻¹ + mulching with organic residues @ 5 tha⁻¹ may be useful for mitigating of drought in pigeonpea.

ASSESSMENT OF GENETIC VARIABILITY IN TURMERIC (*CURCUMA LONGA* L.) VARIETIES UNDER GANGETIC ALLUVIAL PLAINS OF WEST BENGAL

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Abstract

The genetic variability, heritability and genetic advance over mean were estimated for yield and quality traits in five turmeric germplasm. Wide genetic variation was observed for all genotypes like plant height, yield per plot, number of leaves per plant and curcumin content. Considering genetic parameters, high GCV was found for curcumin content (52.69%) followed by yield per plot (19.07), number of primary rhizomes per clump (14.20) and number of leaves per plant (14.02) respectively. In all cases, phenotypic variances were higher than the genotypic variances except girth of primary rhizomes which were found exactly same. Based on high heritability (h² b.s.) oleoresin content (99.59%), yield per plot (98.63), number of primary rhizomes per clump (97.59), number of leaves per plant (96.75) and length of primary rhizomes (96.72) were found superior and high GAM was observed for curcumin content (108.34%), yield per plot (39.01) and number of primary rhizomes per clump (28.90) found superior traits and representing additive genetic variance. Effective selection would be made considering these traits.

NUTRIENT MANAGEMENT THROUGH STCR EQUATION EFFECT ON YIELD OF GROUNDNUT-POTATO CROPPING SEQUENCE

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Abstract

A field investigation on “Nutrient management through STCR equation in groundnut-potato cropping sequence” was carried out at Post Graduate Institute Research Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.) during the year 2014-15 and 2015-16 to study production potential of groundnut– potato cropping sequence. Experiment was laid out in split plot design with three replications. The main plot comprised of six nutrient management treatments viz., STCR equation 20 q ha⁻¹ without FYM, STCR equation 25 q ha⁻¹ without FYM, STCR equation 30 q ha⁻¹ without FYM, STCR equation 35 q ha⁻¹ without FYM, GRDF and RDF. Sub plot treatments consisted of three fertilizer levels viz., Control (No fertilizer), 75 per cent of RDF and 100 per cent RDF. GRDF produced significantly higher number of pods plant⁻¹ (34.59, 37.45) and pod weight plant⁻¹ (19.61, 20.21g) in case of groundnut and number of tubers plant⁻¹ (10.99 and 12.31) and tuber weight plant⁻¹ (352.49 and 373.91 g) in case of potato. STCR equation 35 q ha⁻¹ without FYM produced found second rank in respect of number of pods plant⁻¹ (33.49, 36.89) and pod weight plant⁻¹ (18.98, 19.62) in case of groundnut and total number of tubers plant⁻¹ (10.98 and 12.21) and total yield of tuber plant⁻¹ (350.89 and 373.89 g) in case of potato, during 2014-15 and 2015-16 respectively. The fertilizer level of 100 per cent RDF produced significantly higher number of tubers plant⁻¹ (11.13 and 12.25) and tuber weight plant⁻¹ (305.76 and 326.09g) in case of *rabi* potato, Nutrients applied to potato as per fertilizer level of 75 per cent RDF was found at



second rank in respect of number of tuber plant⁻¹ (10.60 and 11.13) and tuber weight plant⁻¹ (305.34 and 325.39g) during 2014-15 and 2015-16 respectively. GRDF recorded significantly maximum pod yield (30.36, 31.16 q ha⁻¹) of groundnut and potato (32.49 and 34.82 t ha⁻¹) followed by STCR equation 35 q ha⁻¹ without FYM in case of groundnut (29.90, 30.54 q ha⁻¹) and potato (31.96 and 33.79 t ha⁻¹) during 2014-15 and 2015-16. Fertilizer level of 100 percent RDF recorded significantly higher tuber yield (28.37, 30.29 t ha⁻¹) of potato and fertilizer level of 75 percent RDF (28.18, 30.06 t ha⁻¹) in potato was at par with fertilizer level of 100 per cent RDF in case of potato during both the years respectively.

FIELD EVALUATION OF CONVENTIONAL DRIP IRRIGATION SYSTEM FOR SUMMER RICE CROP IN TARAI REGION OF UTTARAKHAND

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Abstract

A field experiment was conducted at experimental farm of college of Technology, Govind Ballabh Pant University of Agricultural and Technology Pantnagar, Uttarakhand to evaluate the hydraulic performance of drip system for summer rice crop. The different performance evaluation parameters were Distribution uniformity, Wilcox and Swails uniformity coefficient, Christiansen's uniformity coefficient and Hart Uniformity coefficient. In this study the values of Distribution Uniformity, Christiansen's Uniformity Coefficient, Wilcox & Swails Uniformity Coefficient and Hart Uniformity Coefficient ranged from, 83.81 to 93.71, 90.42 to 95.82, 92.91 to 96.21 and 91.81 to 94.31 respectively. The results revealed that the yield of summer rice crop increases with increase in irrigation uniformity.

CORRELATION STUDIES IN AMARANTHUS (*AMARANTHUS SPP.*) GENOTYPES COLLECTED FROM CHHATTISGARH PLAIN CONDITION

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Abstract

The nature and magnitude of association among 13 characters and their contribution towards leaf yield was carried with twenty five genotypes of *Amaranthus* (*Amaranthus* spp.) collected from various agro climatic zones of Chhattisgarh and were evaluated during Rabi 2014-15 in randomized complete block design with three replications to quantify the association between leaf yield and its components. Results revealed that the leaf yield (kg) plot⁻¹ was recorded having positive and significant correlation both at phenotypic and genotypic levels with seed yield (gm) plot⁻¹, petiole length, leaf breadth, leaf length, number of branches plant⁻¹, stem girth plant⁻¹ and test weight. Hence, the characters namely leaf yield plot⁻¹, high plant height, more number of leaves plant⁻¹, number of branches plant⁻¹, high leaf length and high leaf breadth recorded to be key traits and given prime importance while making selections for improvement of *Amaranthus* for Chhattisgarh Plains.

TOXIC AND BEHAVIORAL EFFECTS OF PESTICIDES ON BENEFICIAL ARTHROPODS

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Abstract

Pesticides are the major factor affecting biological diversity along with habitat loss and climate change. They have toxic effects in the short term in directly exposed organisms, or long-term effects by causing changes in habitat and the food chain. Pesticides exert a variety of effects on natural enemies, of which the most frequently reported is acute toxicity. Although understanding the acutotoxicity of insecticides to natural enemies is important and relevant to IPM, pesticides can exert other effects which can be equally or more important for IPM. Studies of the effects of pesticides on natural enemies rarely consider



how pesticides influence biological attributes of the natural enemies. Some pesticides have been reported to exert sub-lethal effects on natural enemies. In other words, the pesticides fail to kill them directly, but adversely affect the biology of the natural enemy and reduce or eliminate its effectiveness. Traditionally, measurement of the acute toxicity of pesticides to beneficial arthropods has relied largely on the determination of an acute median lethal dose or concentration. However, the estimated lethal dose during acute toxicity tests may only be a partial measure of the deleterious effects. In addition to direct mortality induced by pesticides, their sub-lethal effects on arthropod physiology and behavior must be considered for a complete analysis of their impact. The process of food detection, whether the food is prey (predators and host-feeding parasitoids), nectar, or honeydew, involves sophisticated nervous activity that can be disrupted by neurotoxic pesticides.

EFFECT OF DIFFERENT FERTILITY LEVELS ON MORPHOLOGICAL AND YIELD OF MUSTARD (*BRASSICA JUNCEA* L.)

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Abstract

A field experiment was conducted to “Effect of organic and inorganic fertilizers on growth, yield and oil content of mustard (*Brassica juncea* L.)” The experiment was carried out during Rabi season 2015-16, at Department of Biological Sciences, SHIATS, Allahabad (U.P.) which is located at 25° 24’ 42” N latitude, 81° 50’ 56” E longitude and 98 m altitude above the mean sea level. This area is situated on the right side of the river Yamuna by the side of Allahabad Rewa Road about 5 km away from Allahabad city. The experiment consisted of seven treatments with different organic and inorganic manures and laid out in randomized block design with three replications. Results indicated that the application of 75% recommended dose N,P,K + 20 kg ha⁻¹ Azotobacter + 20 kg ha⁻¹ phosphate solubilizing bacteria recorded significantly plant height (cm) 30 days (12.60), 60 days (125.55) and 90 days (141.73), Number of leaves plant⁻¹ 30 days (3.53), 60 days (28.60) and 90 days (38.53), Number of primary branches plant⁻¹ 60 days (15.53) and 90 days (17.43), Dry matter plant⁻¹ (37.00), Number of siliqua plant⁻¹ (369.33), Length of siliqua plant⁻¹ (cm) (6.43), Number of seeds siliqua⁻¹ (17.17), 1000 seed weight (Test weight) (11.07), Seed yield plant⁻¹ (g) (13.53), Harvest index (36.61), compared to others treatments.

IMPACT OF TRAININGS ON KNOWLEDGE LEVEL OF GOAT KEEPERS AND NEW ENTREPRENEURS IN WESTERN RAJASTHAN

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Abstract

The present study was conducted purposefully on the district level On-campus vocational and Off-campus training programme on commercial goat farming conducted by Krishi Vigyan Kendra, Pali in Rajasthan, during the financial year 2017-18. The data were collected from participants of randomly selected four blocks from Pali district and three off-campus training conducted by KVK, which constituted a sample size of 250 respondents for the study. The impact of training was measured in terms of gain in knowledge. The ‘t’ value of all the trainings were found to be highly significant which indicated that highly significant gain in knowledge was recorded in all the trainings. It was noticed that women participation was more in off-campus trainings (68.80 %) when compared to district level On-campus trainings (11.02%). It was also observed that most of the respondents were fully satisfied with major instructors (74.40%), relevance to the trainee’s need (71.60%); programme in general (69.60%). It was also found that some of the trainees were not at all satisfied with lodging facilities (47.60%), availability of reading materials (34.80%), physical facilities in classroom (21.60%) and programme content (19.60 %). The study also revealed that 52.60 per cent of the respondents had medium to high favorable opinion regarding the training. Major suggestion given by trainees includes provision of more OFF-campus training preferably in their villages during summer season in the afternoon. Provision of good boarding and lodging facilities in case of ON-campus trainings,



provision of more reading materials and literature regarding scientific goat farming and providing more continuing learning opportunities to keep them updated with the new-technologies and changes happening in the field.

SCREENING FOR HEAT TOLERANCE IN RICE GENETIC RESOURCES

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Abstract

Rice (*Oryza sativa* L.) is the world's most important cereal crops. Rice productivity is threatened by climate change i.e. high temperature stress. Rice cultivation has gradually changed in single season from double season, because summer rice faces adverse climate condition in growth period i.e. low temperature during germination period and high temperature during flowering period. The low temperatures occurs during the germination period it leads to delayed and lower percentage of germination and suppress the normal growth of seedlings. High temperature at flowering stage leads to lower spikelet fertility, low grain weight per panicle and low grain yield per plant. Development of heat stress-tolerant varieties is one of the best strategies to maintain its productivity. The present study was undertaken for heat tolerance screening of eighty six rice genotypes. On the basis of cold tolerance and heat tolerance screening methods three genotypes RJR:II, Banspatri and Ganga Kali were identified as tolerance for both heat and cold stress.

AN ANALYSIS OF ADOPTION LEVEL OF IMPROVED OIL PALM CULTIVATION PRACTICES IN KOLASIB DISTRICT OF MIZORAM

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Abstract

The present study was conducted in Kolasib district of Mizoram during 2018. Kolasib district was selected purposively as it has the highest area under oil palm cultivation in the state. Four villages viz., Thingdawl, Khamrang, Bualpui and Kawnpui were selected from Thingdawl R.D. Block and four villages viz., Saihapui, Buhchangphai, Bukvannei and Meidum from Bilkhawthlir R.D. Block were selected. Fifteen respondents were selected from each village making a sample size of 120. Descriptive design was used for the present study. The findings revealed that majority (64.17%) of the respondents had medium level of overall adoption followed by high level (25%) and low level (15%) of overall adoption. The main reason behind medium adoption level is the topography of the land that does not permit the farmers to follow certain recommendations such as spacing, irrigation, harvesting etc. The study further revealed that variables viz., educational status, annual income, income from Oil palm cultivation, extension contact, training within the state and experience in Oil palm cultivation had a positive significant association with the adoption level of the respondents at 1% level of significance while size of land, occupation and training outside the state had 5% level of significance. The remaining variables such as age, sex, marital status and family size had no significant relationship with the adoption level of the recommended practices.

BACKYARD POULTRY FARMING IN INDIA : A CALL FOR SKILL UPLIFTMENT

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Abstract

Poultry farming has become a remunerative business and pre-eminence over all other livestock enterprises in the developing countries. It carries a scope for quick and large profit. In recent years, backyard poultry production has been extremely emphasized in sustaining and enhancing rural livelihoods. In this farming, birds are kept in low-input and low-output system and can easily be managed by women and children of the households. Now-a-days as there is growing concern about meeting



of per capita requirement of protein for rural citizens of India, poultry meat and especially eggs have been proved to be the best and cheapest solution to this. Though India has shown a tremendous growth in poultry production over decades, rural poultry farming is still lagging behind and always found neglected. As it is the best alternative for the small scale farmers to their subsidiary income with negligible input, this farming system needs an upliftment. Therefore the sole objective of this review is to focus on various aspects of backyard poultry farming in rural India including basic understandings, its advantages, different government schemes and some technical tips for better management practices which the authors think will raise more awareness among farmers, researchers and Government organizations.

EVALUATION OF PROMALIN DOSES FOR IMPROVING FRUIT SIZE, SHAPE AND YIELD OF APPLE

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Abstract

A two years (*Kharif* 2016 and 2017) field experiment using uniform and healthy 6 years old Golden Delicious tress planted at 5.0 x 2.0 m distance was conducted at Kanatal Research Station, College of Forestry, Ranichauri, Tehri Garhwal, Uttarakhand for the evaluation and standardization of Promalin doses for enhancing apple fruit size and yield per unit area. The treatments comprised of four level of Promalin viz., T₁(10ppm), T₂ (30ppm), T₃ (60ppm), T₄ (90ppm), one level of GA₃ viz., T₅ (100ppm) with T₀ (control). During both the years, the experiment was arranged according to a randomized complete block design with four replications. The replication represented individual tree. The selected apple trees were sprayed to run off each year with 10, 30, 60 and 90 ppm Promalin and 100 ppm GA₃ at full bloom stage while control trees were sprayed with water. When fruits reached to maturity stage, twenty five fruits per replication were selected randomly from each treatment for evaluation. The plants treated with Promalin @ 60ppm concentration showed the maximum fruit length (8.28cm and 6.98cm), fruit diameter (7.43cm and 7.35cm), fruit length/diameter ratio (0.98 and 0.95), fruit weight (238.72gm and 238.49gm), fruit yield (39.20kg and 39.56kg/tree) with minimum russetting on fruit (11.67% and 10.00%) during first year (2016) and second year (2017), respectively. Based on the two years field evaluation under natural condition, it can be concluded that the Promalin @ 60 ppm foliar spray at full bloom stage on apple shows significant influence on fruit size, shape, fruit yield and other yield contributing traits with no phytotoxicity and thus can be used for improving fruits size, shape and yield in apple particularly under Uttarakhand hills.

ECONOMICS OF CAMEL FARMING UNDER DRYLAND CONDITION IN WESTERN RAJASTHAN, INDIA

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Abstract

As the camel breeds' population is mainly concentrated in arid zone of Rajasthan, Pali and Jalore districts were selected for present study. Primary data were collected during 2017-18 from 50 camel breeders in Bali and Sumerpur blocks of Pali district and 35 camel breeders in Bhinmal block of Jalore district, which were selected randomly. The information collected from selected respondents was mainly related to investment on camel and other permanent items, if any used by breeders, feeding practices followed round the year, supplemental feed given, if any, health management of animals, age at the time of sale of camel calves, place of sale, value of animals sold, losses if any, etc. personal interview technique and group discussion method were followed to collect the information. Camel breeding is traditional occupation of Rajasthan of *Raika* community in western Rajasthan. The economics camel was studies in Pali and district of the Rajasthan to find its economic viability. The camel production by the *Raikas* was found to be dominated by the traditional methods with average herd size of 36.8 camels with estimated value of Rs. 725230. The fixed investment was found to be Rs. 729093 and 99.5 per cent of it accounted for animals with average maintenance cost of Rs. 117225 per year per herd. Average net return worked out per herd per year was



Rs. 38873/- with family labour income of Rs. 64022 and B: C ratio of 1.33 indicating that camel production is a profitable venture in this region of Rajasthan. The financial viability of camel production was proved by positive NPV and BCR greater than unity, the IRR estimated to be 10.94-14.69, the maximum paying capacity of the camel production; it implies that it would be financially viable to invest in camel production for breeders.

YIELD ATTRIBUTES AND YIELD OF CASTOR GENOTYPES AS INFLUENCED BY PLANTING GEOMETRY UNDER DRYLAND CONDITION

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Abstract

The field experiment was conducted during *kharif* season of 2018 at College of Agriculture, Vijayapur, in medium deep block soils to study the response of castor genotypes to planting geometry under dryland condition. The experiment was carried out in a split plot design with three replications. There were twelve treatments involving four different castor genotypes *viz.*, two hybrids (DCH- 519 and DCH- 177) and two varieties (GC- 3 and 48- 1) and three planting geometry 90 cm x 60 cm, 120 cm x 60 cm and 120 cm x 45 cm. Among the genotypes, castor hybrid DCH- 519 recorded significantly higher seed yield and stalk yield (1,474 kg ha⁻¹ and 4166 kg ha⁻¹) due to higher yield parameters such as number of racemes plant⁻¹ (9.99), number of capsules plant⁻¹ (286.3), capsule weight plant⁻¹ (342.6 g plant⁻¹) and test weight (25.93 g) as compared to all other genotypes. Among the sub plot, planting geometry of 120 cm x 60 cm recorded significantly higher seed yield and stalk yield (1,462 kg ha⁻¹ and 4198 kg ha⁻¹) due to higher yield parameters such as number of racemes plant⁻¹ (9.44), number of capsules plant⁻¹ (285.6), capsule weight plant⁻¹ (317.4 g plant⁻¹) and test weight (24.72 g) as compared to all other planting geometry. Among interactions, the treatment combination of castor hybrid DCH- 519 under planting geometry of 120 cm x 60 cm recorded significantly higher seed yield (1688 kg ha⁻¹), stalk yield (4847 kg ha⁻¹), net returns (Rs. 34,336 ha⁻¹) and B:C (2.7) as compared to all other treatment combinations.

CROPPING SYSTEMS FOLLOWED IN VEGETABLES FOR PROFITABLE YIELDS : A REVIEW

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Abstract

Our necessity of vegetables has expanded to around 220 million tons/annum to meet the nourishing prerequisite of an expected 1200 million populace expected by 2020. Vegetables are an amazing decision of cash crops as they can be grown effectively, produce great yields and create more expensive rate in market contrasted with cereals. Besides, these vegetable crops are suitable for production on small pieces of land and their incorporation in traditional cropping frameworks can improve the dietary capability of the system as vegetables are wealthy in nutrients, minerals and other health factors. A cropping system refers to a combination of crops in time and space. At the point when annual crops are considered, a cropping system generally implies the mix of crops within a given year. With higher cropping intensities higher returns are expected, but lower cropping intensity with high market value crops results in higher price than the crops of low market value with high cropping intensities. By and large, cropping system is the form and sequence of crops grown on a given area of land over a period of time. The term cropping system is regularly utilized vary with multiple cropping, which in key nature speaks to a thought of most extreme yield generation per unit zone of land within a year or some other significant time unit with less land degradation. Cropping systems are different types *viz.*, Monoculture: Under monoculture system, one crop is grown on a piece of land year after year or repetitive growing of the same sole crop in the same land so that the cropping intensity is always 100%. Multiple cropping: The main aim of multiple cropping is to make effective use of modern farm technologies and farm inputs with minimum cost of cultivation and without affecting the fertility of land. In multiple cropping systems, the possibility of more efficient use of resources like sunlight, nutrients and water is higher leading to increased biological diversity and higher production stability. It includes sequential cropping, mixed cropping, ratoon cropping and intercropping.



DESIGN AND DEVELOPMENT OF PELLET MACHINE FOR BIOGAS SLURRY AS ORGANIC MANURE

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Abstract

Biogas slurry is considered a good source of organic manure as it contains a considerable amount of nutrients that necessary for crop production. The pellet machine was designed and developed for 50 kg h⁻¹ capacity. The power supply for the machine was 1 hp, 1440 rpm, single-phase electric motor and 20:1 reduction unit of gearbox was attached with the help of power transmission through chain and sprockets to the shaft. The best performance of the machine for combination 2 (80:20) 80% BS and 20% CS in terms of pelleting efficiency and throughput capacity was 76.01% and 24 kg hr⁻¹ respectively. The economical evaluation in terms of net present worth, benefit-cost ratio, internal rate of return and payback period was found to be \$3066.20, 1.40, 108.6% and 0.92 years respectively. The adaption of pellet machine by small and medium farmers would go a long way in helping them to produce their own fertilizer as organic manure with locally available material like biogas slurry from the biogas plant.

EFFICACY OF TRIPLE LAYER STORAGE BAGS FOR CONTROL OF AFLATOXINS AND RETAINING OF BIOCHEMICAL CONSTITUENTS IN DRY CHILLIES

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Abstract

Aspergillus flavus is predominant component of the mycoflora of red chilli. It can deteriorate the quality chillies, so that finally it leads to failure of the seed germination. Four types of bags (first factor) and three storage periods (second factor) effect was studied in respect of test weight, moisture content, germination per cent of seed, aflatoxins and biochemical constituents viz., carbohydrate, protein, oleoresin and fat of dry chillies. After 2, 4 and 6 months storage period, aflatoxin accumulation was nil (0 g/kg) in case of triple layer bag and jute bag treated with fungicide. Maximum accumulation of aflatoxins was seen in jute bag (3.0 ppb, 4.0 ppb and 5.0 ppb) followed by polythene bag (2.0 ppb, 3.0 ppb and 4.0 ppb) at different storage periods such as 2, 4, and 6 months of storage respectively. The low production of aflatoxins in triple layer plastic bags was due to hypoxia and hypercarbia. From the present investigation, it is concluded that the triple layer plastic bags as a hermetic technology, efficient in controlling mycotoxin producing storage fungi compared to traditional storage bags. The study also revealed that triple layer plastic bags protected the biochemical constituent's viz., carbohydrate, protein, oleoresin, fat and seed parameters i.e. test weight, moisture content, and germination of the stored chilli. Triple layer plastic bag could be best alternative for traditional storage bags for short (2,4 months) and medium (6) term storage, provided the produce is sufficiently dried (<10%) before storage.

COST OF OPERATION AND ENERGY ANALYSIS FOR RICE USING FYM APPLICATOR CUM PLANTER

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Abstract

A field experiment was conducted to investigate the effects of direct seeding method of rice with and application of farmyard



manure (FYM) (by tractor drawn FYM applicator cum planter) on the energy consumption and cost of operation. Direct seeding of rice with FYM applicator cum planter were applied in IGKV university field in kharif at the seed rate of 30 kg/ha, respectively. The experimental area in IGKV research farm Raipur, Chhattisgarh was selected for study during the period of 2018-19 in *kharif* season. Total energy parameter and cost of cultivation of different operation from the experimental area were collected and analyzed in the randomized block design with 5 treatments and 4 replications. Cost savings may be achieved when considering the increased value of manure as fertilizer and lower negative environmental impact offered by precision manure application. Cost of FYM application and seeding operation through FYM applicator was 1078/ha whereas in traditional method additional cost ? 538/ha was required. The developed machine was saved cost and energy 38 and 45 percent, respectively as compare to the traditional method of FYM application and seeding. The machine was found efficient, economical and energy efficient.

INFLUENCE OF METACOGNITION OF ADOLESCENTS IN RELATION TO THEIR RESIDENTIAL AREA

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Abstract

Adolescence is an age of opportunity for children and a pivotal time for us to build on their development in the first decade of life, to help them navigate risks and vulnerabilities and to set them on the path to their fulfilling their potential. During this period of development great physical, mental and cognitive changes occur. Cognition helps to generate new knowledge through mental processes and also helps to use the knowledge that people have in daily life. Metacognition is a subdivision of cognition, or a type of cognition. Metacognition as one's knowledge and beliefs about one's own cognitive processes and one's resulting attempts to regulate those cognitive processes to maximize learning and memory". Cognitive skills are those needed to perform a task whereas metacognitive skills are necessary to understand how it was performed. This study examines the influence of metacognition in relation to their residential area of adolescents. The study was conducted in Hisar district of Haryana state where three Government Senior Secondary Schools from rural area and four from urban area were selected. Metacognition Awareness Inventory (MAI) by Schraw and Dennison (1994) was used for assessing metacognition. The results divulged that on total sample the status of respondents on metacognition indicated that higher percentage of the respondents had moderate level of metacognition showing higher percentage of urban adolescents as compare to rural respondents.

MONITORING OF AGRICULTURAL SOIL DEGRADATION BY REMOTE-SENSING

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Abstract

Agricultural soil degradation is a global problem that severely hampers the production of food needed to sustain the growing world population..It is considered that land degradation, a process of reduction in vegetation cover and water resource, soil erosion and of salinization, etc., is a subtle and progressive environmental change in time. Mapping of soil degradation by remote sensing is instrumental for understanding the spatial extent and rate of this problem. Methods aimed at detecting soil loss, soil drying, and soil-quality deterioration have been demonstrated in numerous studies utilizing passive and active remote sensors. The first concerns the complex and non-unique relationships between remote-sensing indicators and different soil properties, such as roughness, soil moisture (SM), soil salinity, and organic matter content. The second concerns the difficulties involved in acquiring data on subsurface soil properties. In view of these difficulties, we recommend expanding the use of phenomenological models capable of estimating soil-degradation potential according to combinations of environmental conditions, thus enabling remote-sensing efforts to be focused on local areas where the environmental threat is highest. To avoid bad-interpretation, meteorological data should be combined in analyses to make sure that the differences in



spectral reflectance observed are representing true changes but not climate related events like droughts. Furthermore, it is essential to link remote sensing with human activity to understand the mechanism of land degradation and its driving forces. In this way, remote sensing will be not only a powerful tool for providing dynamic information to monitor land surface changes and degradation on different scales but also for helping decision-making in producing relevant mitigation measures for sustainable resource exploitation.

STUDY OF HETEROSIS AND HETEROBELTIOSIS IN BARLEY (*HORDEUM VULGARE*L.) UNDER HEAT STRESS ENVIRONMENT

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Abstract

Barley (*Hordeum vulgare* L.) is an important *rabi* cereal crop grown throughout the temperate and tropical regions of the world. The present investigation was carried out to estimate relative heterosis and heterobeltiosis in barley genotypes to identify desirable cross combinations under heat stress for days to anthesis, duration from anthesis to maturity, days to maturity, plant height, number of effective tillers per plant, flag leaf area, number of grains per spike, peduncle length, spike length, 1000-grain weight, biological yield per plant, grain yield per plant and harvest index. The F_1 crosses were made in half diallel fashion using 10 genotypes. The experiment was conducted in randomized block design with three replications during *rabi* 2016-17. The results revealed sufficient degree of heterosis and heterobeltiosis for all the characters studied. On the basis of *per se* performance, heterosis and heterobeltiosis, the crosses RD-2035XRD-2052 and RD-2592XRD-2660 emerged as good cross combinations for grain yield per plant in heat stress environment. Therefore, it could be concluded that these cross combinations may be exploited in future breeding programme for the development of good heterotic gene pool of barley for improving grain yield and other contributing traits under heat stress environment.

EVALUATION OF DIFFERENT COMBI FUNGICIDES AGAINST DOWNY MILDEW OF CUCUMBER (*CUCUMIS SATIVUS*) CAUSED BY *PSEUDOPERONOSPORA CUBENSIS*

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Abstract

Downy mildew of cucumber caused by *Pseudoperonospora cubensis* is an important disease of cucumber and cause approximately 40-45 % yield losses. The present study was conducted at the experimental field of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, (M.P.) during *Kharif* season of 2018-19 to evaluate different foliar fungicides against downy mildew of cucumber. The six fungicides with three replications were taken up by using Randomized Completely Block Design (RCBD). The fungicides viz; cymoxanil + mancozeb (Curzate 72 % WP) @ 0.25 % (T_1), metalaxyl-m + mancozeb (Ridomil Gold 68 % WP) @ 0.25 % (T_2), fenamidone + mancozeb (Sectin 60 % WG) @ 0.3 % (T_3), iprovalicarb + propineb (Melody duo 66.75 % WP) @ 0.3 % (T_4), Dimethomorph (Lurit 50 % WP) @ 0.25 % (T_5) and chlorothalonil (Kavach 75 % WP) @ 0.2 % (T_6). The fungicidal spray was given twice at 15 days interval. Observations were recorded at 15 and 30 days after the spray. Analysis of the data showed that among six fungicides, the highest per cent inhibition of mycelial growth of fungus was recorded in Fenamidone + Mancozeb 60 % (WG) @ 0.3 % (96.90 %), followed by Cymoxanil + Mancozeb 72 % (WP) @ 0.25 % with the inhibition of 92.63 per cent, respectively. Minimum inhibition of mycelia growth was observed in Chlorothalonil 75 % (WP) @ 0.2 % with 53.83 per cent, respectively. Further no phytotoxicity symptoms were observed in the plants against these fungicides, hence from the present study we findings it may be concluded that, Fenamidone + Mancozeb 60 % (WG) and Cymoxanil + Mancozeb 72 % (WP) (1.33 %) were promising fungicides for lowering downy mildew disease severity and getting higher yield.



EFFECT OF DIFFERENT MICRONUTRIENTS ON SUSTAINABLE PRODUCTION OF CLUSTER BEAN (*CYAMOPSIS TETRAGONOLOBA*)

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Abstract

A field experiment was conducted at RARI, Durgapura, Jaipur in irrigated coarse textured agro ecological situations during Kharif 2014, 2015 and Kharif 2016 to find out the effect of micronutrient application on seed and straw yield of guar in wheat – guar cropping system. Eight treatments i.e. T₁ - (100% RDF), T₂ - (T₁+ 25kg/ha ZnSO₄), T₃ - (T₁+50kg/ha FeSO₄), T₄ - (T₁+20kg/ha MnSO₄), T₅ - (T₁+T₂ +50 kg/ha FeSO₄), T₆ - (T₁+T₂+20kg/ha MnSO₄), T₇ - (T₁+T₃+20kg/ha Mn SO₄), T₈ - (T₁+T₂+T₃+T₄) were taken in randomized block design with three replications. Soil application of FeSO₄ @ 50 kg/ha gave significantly higher seed and Stover yield in all the three years (9.92, 11.08; 6.88 (seed) and 20.40; 22.17;12.87(Stover) q/ha) of guar. The lowest yield was recorded in control (7.83, 8.50; 6.25 (seed) & 17.40, 18.17; 10.75 (stover) q/ha) of seed and Stover. All combinations of iron with other micronutrients gave significantly higher grain and Stover yield of guar, but at par with iron alone. There was no response of zinc and manganese and there combination to each other due to higher initial status of zinc and manganese. Initial Status of Zn: 1.80 ppm (above the critical limit 0.6ppm), Fe: 2.86 ppm (below the critical limit 4.5 ppm) and Mn : 7.9 ppm (above the critical limit 2.0ppm)

OPTIMIZATION OF RAPID AND COST EFFECTIVE GENOMIC DNA ISOLATION PROTOCOL FOR *WITHANIA SOMNIFERA* (L.) DUNAL FOR MOLECULAR DIVERSITY ANALYSIS

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Abstract

High high-quality DNA is pre-requisite for molecular research. The isolated DNA ought to be free from different contaminants, which could probably act as PCR inhibitors. Hence the existing study reviews the applicability of a simple and speedy method for setting apart genomic DNA from *Withania somnifera*, which can be correctly applied for PCR primarily, based genotyping of that flora. Without the want for phenol-chloroform and liquid nitrogen, our protocol is safer and greater cost-green than conventional DNA extraction strategies. Genomic DNA from the mature leaf tissues of Ashwagandha (*Withania somnifera* L.), was extracted using present protocol. Purity and quantity of DNA was measured via UV spectrophotometer and agarose gel electrophoresis. The spectral exceptional of DNA as measured by using the A260/A280 ratio was ranged from 1.72 to at least 1.88. Isolated DNA may be used for any molecular evaluation. PCR changed into completed with random amplified polymorphic DNA (RAPD) and inter simple sequence repeat (ISSR) primers. Results advocate the applicability of this method for genotyping of medicinal and aromatic plants.

EXTRACTION AND OPTIMIZATION OF BIODEGRADABLE FENUGREEK SEEDS GEL APPLICATION AS COATING AGENT IN MICRO-ENCAPSULATION OF IRON (FERROUS SULFATE)

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Abstract

Natural coating polymer material is help to possess the application of fenugreek seeds in encapsulation which contained gel after gelatinization has the functional and nutraceutical capability. Microencapsulation is of Iron is one of the best approach to achieve controlled iron release in coating which help in to fortification of food as it not only reduces the texture, appearance and organoleptic problems but also help to increases the bioavailability of iron. It is important to select a coating material that maintains an adequate balance between stability and bioavailability. In this work studied fenugreek seeds proximate, yield,



solubility, stability, gelatinization property and Prepare iron micro-capsules by using simple extrusion technique as well as investigated encapsulation efficiency. Thus the results revealed that moisture 9.35%, fat 4.62%, protein 15.38%, fiber 11.8%, ash 4.91% and carbohydrate 53.99 % content in fenugreek seeds. Extracted fenugreek seeds gel was better gelling property, gel percentage yield and was not soluble when washed with 90% ethanol but soluble more in hot water rather than cold. The study suggested that gel was better stability at low temperature ($4 \pm 3^\circ\text{C}$) as no changes were observed while with gel at room temperature $28 \pm 3^\circ\text{C}$ also the result Proposed EE 86.13% respectively. The release of EE was increase when were added sodium alginate and Fenugreek seeds gel in beads through extrusion technique. This study offer added advantages of being fenugreek gel towards the enhancement of bioavailability in the gastrointestinal atmosphere.

STUDY ON THE DIVERSITY OF COLOCASIA (*COLOCASIA ESCULENTA*) GERMPLASMS OF DIMA HASAO DISTRICT OF ASSAM

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Abstract

An experiment entitled “Study on the diversity of Colocasia germplasms of Dima Hasao District of Assam” was carried out during the period of 2017-19. A total of 16 germplasms were collected from the five blocks of the district namely Harangajao, Mahur, Maibang, Diyungbra and Sangbar. The Morphological study of the cultivars was done in the Experimental Farm and their taxonomic identification was carried out. A total of 16 different cultivars were evaluated for their morphological traits with three replications in Randomized Block Design. The mean performance of growth and yield parameters revealed that the local cultivar Thaklong-1 registered the maximum plant height (138.67cm), plant girth (23.13cm), number of leaves (4.67), corm length (48.95 cm), weight of corms per plant (2250 g), weight of cormels per plant (846.67g), yield per plant (3.36 kg). The agronomic evaluation of the cultivar revealed that the cultivar namely Thaklong-1 (Mahur collection) was found to be promising and produced significantly higher yield compared to other varieties.

ROLE OF NITROGEN AND PHOSPHATE ON UPTAKE AND TRANSLOCATION OF ARSENATE AND ARSENITE IN RICE SEEDLINGS

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Abstract

A hydroponics study was carried out to investigate the impact of nitrogen (N) and phosphate (P) on accumulation of arsenate (As-V) and arsenite (As-III) in root and leaves of rice seedlings (genotype Shatabdi). The seedling were subjected to four concentration of N and P, i.e., full Hoagland solution (CH), Hoagland solution with high P (P_H), Hoagland solution with low P (P_L) and Hoagland solution with P deficient (P_D) with As-V and As-III contamination along with CH as a control treatment. Analysis of N, P and As species of the leaves and root of seedling indicated that uptake of As-V was significantly affected by both N and P but As-III was significantly affected by only P. Low N and P escalate As uptake compared to P_D solution. In contrast higher concentration of N and P reduced the uptake and translocation of As compared to P_D .

IMPORTANCE AND SCOPE OF HUMANITIES IN EDUCATION

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Abstract

The humanities can be described as the study of human culture. Most disciplines as we know them today have been influenced by humanistic thinkers. Humanities subjects include history, literature, law, philosophy, art and music. The humanities, in many ways, aim to provide meaning to the observable world. Most other disciplines are looking for facts; the humanities seek meaning. Why is this valuable? Without a human context, we risk weakening the moral compass that defines our culture. In



science, for instance, studies involving human and animal subjects are required to go through an ethical board. Even our laws are deeply rooted in humanistic considerations. And no matter how far we push the boundaries of art and music, the most successful forms of expression focus on the human condition. New studies and researches carried out in the field of education actively challenge the existing notions that some students and parents have about careers in humanities and social sciences. Often catalogued under terms such as “standard” or “non-technical”, humanities and social sciences have more to them than is talked about. While such reports do not defy that technical degree holders can earn more than a humanities graduate, they do state that the latter too has prospects for profitable employment. Those studying a Humanities or Social Science subject gain understanding of the vital aspects of the society. These subjects, with their all-encompassing approach, help students develop core skills such as critical thinking, problem solving, and communication, both oral and written, and so on. For a civilization to run smoothly, the existence of such skill sets is as important as of those that are technical in nature. Some researchers even explain these subjects as one that helps make life and not simply a living.

IMPACT OF TRAININGS IMPARTED BY KVKs ON KNOWLEDGE SKILLS PRODUCTIVITY AND PROFITABILITY OF THE FARMERS OF CHHATTISGARH

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Abstract

The present study was conducted in eight selected KVKs of Chhattisgarh state during the year 2017-2018. The data were collected purposively from the 400 beneficiaries' farmers of eight of KVKs situated in three agro-climatic zones of Chhattisgarh state. The investigation aimed to assess the impact of different trainings imparted by the KVKs in selected districts on production, productivity and profitability of different crops and also find out the changes occurred in the knowledge and skills of the farmers due to training imparted by the KVKs. Study revealed that the training imparted on INM, SRI, weed management and seed production of rice crop, resulted in the increased knowledge of farmers up to 90.00 percent. The training imparted regarding cashew production technology resulted in positive change (88.75%) in knowledge of the farmers. Training on vermi-compost and mushroom cultivation results in positive change in knowledge of the respondents up to 78.87 and 72.46 percent respectively. Training imparted on INM in gram, SRI, weed management in rice, cashew production technology, INM in rice and tomato production technology were resulted in improvement in skills up to 85.00, 80.90, 78.75, 76.66 and 75.00 percent respectively. Positive and significant changes in attitude farmers were observed as the impact of training programme conducted on INM in gram (77.50%) followed by SRI (75.00%), INM in rice (72.50%), weed management in rice (68.75%) and cashew production technology which was 67.50 percent. An increment of 50.00 and 33.33 percent in the productivity tomato and brinjal was observed as result of training imparted to farmers. While, training on weed management and SRI of rice resulted in 33.35 and 27.26 percent enhancement in productivity. It was found that, the on IPM was resulted in 25.00 percent more yield of gram. In case of profitability of different crops, the major changes were observed as the result of training on IPM in gram and rice which increased the profit up to 40.00 and 36.00 percent respectively. The training on brinjal production technology, weed management and INM in rice crop increased the profit up to 35.00 and 34.48 and 33.13 percent respectively. Majority of the farmers (87.25%) perceived that the quality of training materials used by the KVK scientists were quite good, followed by the responses that effective teaching aids were used by the KVK scientists and useful information provided by the KVK scientist during the training programme which were 68.25 and 66.25 percent respectively.

EFFECT OF SOWING DATES ON GROWTH, YIELD AND QUALITY OF LINSEED VARIETIES

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Abstract

A field experiment was conducted during two consecutive seasons of *rabi* 2015-16 and 2016-17 at JNKVV, College of Agriculture, Tikamgarh (Madhya Pradesh) India to evaluate the performance of linseed varieties under different sowing dates. The experiment was laid out in split plot design with three replications consisting three sowing dates *viz.*, D1: 25th October, D2: 14th November and D3: 4th December as main plot treatments and three varieties *viz.*, T-397, JLS-9 and JLS-67 as sub-plot



treatments. Data were recorded for growth characters, yield attributes, seed yield, harvest index and oil content. Various sowing dates significantly influenced the growth, yield and quality of linseed varieties. Pooled data over two years revealed that successive delay in sowing from 25th Oct. to 14th Nov. and 4th Dec. significantly reduced the plant height, total dry biomass accumulation (g plant⁻¹), number of capsules plant⁻¹, seed yield (kg ha⁻¹) and harvest index. It was found that seed yield generally decreased by delayed sowing. Oil content was higher in D1 (38.7%) followed by D2 (38.1%) and D3 (37.4%). Among the varieties, JLS-67 recorded the higher growth and yield attributes which resulted into significantly higher seed yield over the varieties T-397 and JLS-9. Number of days required for maturity and growing degree-days from sowing to maturity were also varied among varieties. From the study, it is inferred that sowing of linseed in last week of October was found suitable for higher yield, while variety JLS-67 performed better than varieties T-397 and JLS-6.

SEASONAL INCIDENCE OF TOMATO FRUIT BORER, *HELICOVERPA ARMIGERA* ON TOMATO, *LYCOPERSICON ESCULENTUM* UNDER OPEN CULTIVATION

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Abstract

Tomato (*Lycopersicon esculentum* Mill.), belonging to family Solanaceae is the most important vegetable grown widely both for fresh market and processing. It is said to be a native of tropical America. Tomato is the world's largest vegetable crop after potato and sweet potato and it tops the list of canned vegetables and occupies an area of 4.5 mha in world with an annual production of 130 MT. (Anonymous, 2016). The productivity of tomato in India is very low (15.60 t/ha) compared to the global average (25.09 t/ha). Tomato is one of the important vegetable grown in India with 774 ('000 ha) area with a production of 18732 ('000 MT) (NHB, 2016). The production and quality of tomato fruits are considerably affected by array of insect pests infesting at different stages of crop growth. Though there are dozens of pests on tomato, besides other insect pests causing considerable damage, fruit borer *Helicoverpa armigera* (Lepidoptera : Noctuidae) is the serious one which causes considerable losses in quantity as well as quality of tomato fruits. The investigations were conducted on JNKVV, KVK, Chhindwara during Kharif 2018. Seasonal incidence of *H. armigera* the population started during 35th SMW (0.5 larvae/plant) and there after the population reaches 3 larvae plant in the 47th SMW and the highest population recorded during fruiting stage of the crop in the range of 4.2 larvae per plant. Whereas average of percent damage of fruit 41.85 percent due to *H. armigera* was found in total six picking.

VARIABILITY AND DIVERSITY ANALYSIS IN GENOTYPES OF POTATO (*SOLANUM TUBEROSUM* L.) FOR YIELD AND YIELD ATTRIBUTING TRAITS

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Abstract

Potato (*Solanum tuberosum* L.) family solanaceae and chromosome number 48. Potato is one of the most important staple food crops among the vegetables; which is utilized throughout the year in India. Potato content 17.47g, carbohydrate, 0.1g. fats, protein 2.0g, fiber 2.2g per 100g. The area and production and productivity of potato in India is around area 2124.41 in hectare, production 48604.57 in mt. and productivity 21.51 in mt per hectare but in case of Chhattisgarh planted area 45435 in hectare, production 682342 in metric tonnes and productivity 15.02 in metric tonnes per hectare during 2018-19. In the past the cultivation area for the potato has increased but there is lack of suitable cultivars for this State, therefore it is an urgent need to evolve the potato genotypes suitable for Chhattisgarh Plains. The experiment material of eighteen potato genotypes were conducted at Research Cum Instructional farm, Department of Horticulture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur Chhattisgarh grown in a the randomized complete block design with four replication of plot size 4.8 m² (3.0 x 2.4) with recommended dose of fertilizer 150:100:0100 NPK, 60cm x 20cm spacing during Rabi 2018-19. All the recommended package of practices were adopted for the raising a good crop. The analysis of variance observed highly significance for all the characters studied except foliage senescence percent, which is indicating that the genotypes were widely variable. High heritability coupled with high genetic advance was recorded for the traits viz. number of leaf plant⁻¹,



marketable tuber yield, tuber roting, total tuber yield. Hence, these characters were predominantly governed by additive gene action and can be improved through simple selection. Genotypes were grouped into five distinct clusters depending upon the similarities of their D^2 values. The maximum numbers of five genotypes were included in cluster-IV and maximum genetic divergence 4.008 was noted between cluster II and III. Hence, genotypes having maximum distances should be selected from different clusters and can be utilized in future hybridization programme.

ROLE OF DIGESTIVE ENZYMES IN INSECT PEST MANAGEMENT

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Abstract

Increase food production necessitates the development and application of novel biotechnologies to enable the provision of improved crop varieties in a timely and cost-effective way. The development requires an uninterrupted increase in food production and application of novel biotechnologies to enable the provision of improved crop varieties in a timely and cost-effective way. Plant and herbivore interaction is a natural phenomenon in which plants have defence mechanism that offers protection against many herbivores. Specific inhibitors against the digestive enzymes viz., amylases and proteases, suppress their activity resulting in an overall disturbance in digestion. The major digestive enzymes in the midgut of insects consist of α -amylases and proteases that are similar in their hydrolytic nature. In lepidopteran larvae protein digestion mainly relies on serine proteases such as trypsin and chymotrypsin. So, the use of PIs targeting digestive proteases of insect pests is one of the beneficial approaches used in integrated pest management. Proteinase inhibitors (PIs) are natural defense proteins of plants found to be active against gut proteases of various insects. The PIs are known to influence the growth and development of insects by binding tightly and irreversibly to the active site of its digestive gut proteases, which are essential for various metabolic processes such as proteolytic digestion. This mechanism leads to a critical amino acid deficiency and eventually insect death due to overproduction of digestive proteases by diverting the essential amino acids available for the production of other proteins. Also, the development of insect resistant transgenic plants through incorporation of PIs is beneficial as they protect other natural defense proteins of plants from proteolytic degradation during insect invasion.

PERFORMANCE OF KNOLKHOL (*BRASSICA OLERACEA* L. VAR. *GONGYLODES*) AS INFLUENCED BY ORGANIC INPUTS AND MICROBIAL CONSORTIUM

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Abstract

An experiment was carried out on knolkhol (*Brassica oleracea* L. var. *gongylodes*) during 2014-2016 at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat with the objective to assess the 'Performance of knolkhol (*Brassica oleracea* L. var. *gongylodes*) as influenced by organic inputs and microbial consortium'. The experiment was conducted in Randomized Block Design and replicated three times. There were eight treatments consisting of T₁ (Rock Phosphate as per SSP dose + Consortium), T₂ (T₁ + Compost 2.5t ha⁻¹), T₃ (T₁ + Compost 5t ha⁻¹), T₄ (T₁ + Vermicompost 2.5t ha⁻¹), T₅ (T₁ + Vermicompost 5t ha⁻¹), T₆ (Enriched compost 2.5t ha⁻¹), T₇ (Enriched compost 5t ha⁻¹) and T₈ (Recommended dose of fertilizer + 10t ha⁻¹ FYM). Pooled analysis over two years revealed that growth and yield attributing characters were significantly influenced by the application of different nutrient sources. The highest plant height of 46.16cm, leaf number of 25, leaf area of 136.20cm², leaf weight of 114.41g, knob yield of 191.45q ha⁻¹ and knob diameter of 8.41cm were recorded at T₈. Among the organic treatments, T₇ showed the highest values for these growth parameters. Among the quality parameters, T₈ recorded the maximum moisture content (90.43%), crude fibre content (10.13%) and protein content (2.98%). Further, the highest ascorbic acid content (63.54mg 100g⁻¹), carbohydrate content (6.74%), carotene content (4.73µg g⁻¹), calcium content



(2.06%), phosphorus content (0.69%) and potassium content (4.60%) were observed in T₇. Besides, the highest ash content of 8.66% was recorded in T₅ (T₁ + Vermicompost 5t ha⁻¹). The lowest PLW (19.57%) was found in T₆ (Enriched compost 2.5t ha⁻¹) followed by 19.66% in T₇ during the storage period. In case of texture, the fibrousness was lowest in T₇ and highest in the inorganic treatment (T₈). Moreover, the highest colour retention was observed in T₇ followed by T₆. Soil physico-chemical and biological characters showed significant difference among the treatments. The T₇ recorded the best for all the soil parameters viz., soil p^H (5.62), N (293.82kg ha⁻¹), P₂O₅ (66.91kg ha⁻¹) and K (141.22kg ha⁻¹). However, the highest soil organic carbon content (0.88%) was recorded in T₅. In case of soil biological characters T₇ was found to be statistically superior in respect of microbial biomass carbon (315.94 g g⁻¹ soil 24 hour⁻¹), dehydrogenase activity (233.87 g TPFg⁻¹ soil 24 hour⁻¹), phosphomonoesterase activity (413.77 g p-nitrophenol g⁻¹ soil hour⁻¹), fluorescein di-acetate hydrolysis activity (8.60 g fluorescein g⁻¹ soil hour⁻¹). Similarly, T₇ treatment was obtained with significantly higher bacterial population (9.11 × 10⁷ cfu g⁻¹ soil) and fungal population (6.11 × 10⁷ cfu g⁻¹ soil) followed by T₆. The cost economics indicated superiority of T₈ with 4.16 benefit cost ratio followed by 3.42 in T₆. Hence, considering the positive effect on growth, yield, quality and soil health, T₆ is considered the best for adopting at field level to reap good economic yield with better quality, shelf life, sustained soil health and high return.

A SCALE TO MEASURE ATTITUDE OF FARMERS TOWARDS TECHNOLOGICAL DEMONSTRATION

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Abstract

A scale was developed to measure the attitude of farmers towards technological demonstration based on Likert's technique. A tentative list of 40 statements was drafted keeping in view the applicability of statements suited to the area of study. The statements collected were edited in the light of the informal criteria suggested by Edward and Kilpatrick. These statements were framed in such a way that they expressed the positive or negative attitude of the farmers. The score of each individual item on the scale was calculated by summing up the weights of the individual items. Finally the scale consisted of 10 statements (7 positive and 3 negative) whose t value was greater than 2.0. Reliability was tested with 25 respondents and its value was 0.70 and validity of the scale was cross checked with the non-sample respondents and 't' was found significant at five percent.

QUANTITATIVE AND SEASONAL DISTRIBUTION OF AEROFUNGI FROM PAPER HOUSE AND EVALUATION CENTRE OF CCS UNIVERSITY, MEERUT

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Abstract

Total of 32 genera of viable aerofungi belonging to 55 spp. were isolated from the Paper House and Evaluation centre of Chaudhary Charan Singh University Meerut. Of these, *Aspergillus*, *Alternaria*, *Cladosporium*, *Penicillium* and *Curvularia* with 8,7,4,3 and 2 spp. were the most dominant. November-December and January-February were found to be two peak periods of fungal load. Frequency wise and season wise variations in the aeromycoflora were well marked and hitherto, many rare fungi have been reported from the air of the Paper house and evaluation centre.

WOOD APPLE : A WONDER UNDER-EXPLOITED NUTRITIONALLY AND MEDICINALLY RICH WILD FRUIT OF BUNDELKHAND REGION

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Abstract

Underutilized fruit crops are a major source for a large number of traditional medicines that have been in existence for



thousands of years in country like India. Ayurveda, one of the oldest medicinal systems in the world, provides leads for a vast number of therapeutically useful compounds. A combination of traditional and modern knowledge can produce better treatment of diseases with fewer or no side effects. Now a days there is an increasing interest of today's population towards natural products, *Feronia limonia* L. (wood apple) emerged out to be one of the most promising plant having multiple medicinal and nutritional and therapeutic properties, belonging to family Rutaceae. Various claims for cure of numerous diseases, efforts have been made by researchers to verify the efficacy of the plant through scientific biological screening. This deals with the traditional and recent medicinal, pharmacological activities of different parts of *Feronia limonia* L. Besides their medicinal and nutritional properties, it thrives well under semi-arid condition due to its hardy nature and having resistance against adverse climatic conditions.

IRON CLAD RICE USING BIOFORTIFICATION APPROACH

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Abstract

Biofortification is the process of improving the bioavailability of essential nutrients in food crops either through conventional breeding or modern biotechnology techniques. Rice is one of the most demanding staple foods contain low iron (Fe) levels, most of which is lost during grain processing. Most global population live on a diet based on rice as the main carbohydrate source that serve as suitable target for biofortification. Iron deficiency is a serious problem around the world, especially in developing countries. There are three basic ways to solve micronutrient deficiencies: micronutrient supplementation, food fortification, and biofortification. Among these options, biofortification does not require specific processing after harvest or a special infrastructure. The production of iron-biofortified rice will help ameliorate this problem. In general, polished grain or white rice contains nutritionally insufficient concentration of iron (Fe) to meet the daily requirements in diets. Therefore, iron biofortification in rice offers an inexpensive and sustainable solution to mitigate iron deficiency. However, understanding on the mechanism and genes involved in iron uptake in rice is a prerequisite for successful iron biofortification. One option is to use modern biotechnology to introduce other genes to increase the uptake and storage of iron in the rice endosperm (white rice when polished). Biofortification can serve as an important sustainable tool in combination with existing ways of overcoming iron deficiency and iron deficiency anemia; these existing approaches include a diverse diet, fortification, and supplements. The main advantages of developing varieties with high iron content are that this is a food-based approach and delivering the solution in such a widely consumed crop could contribute to a large effect.

EFFICACY AND ECONOMICS OF NEW MOLECULES AGAINST *SCIRPOPHAGAINCERTULAS* (WALKER) UNDER RICE CROP ECOSYSTEM OF CHHATTISGARH PLAIN

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Abstract

Rice (*Oryza sativa* L.) is one of the most important staple food crop of Asia and a primary stable diet of over half of the world population relying on rice as the major daily source of calories and protein. The major factor responsible for poor yield is pest epidemic. Present investigation on yellow stem borer *scirphophagain certulas* (Walker) of paddy was conducted during *kharif*, 2017 and 2018 at the College of Agriculture, Balaghat (M.P.) to estimate the effectiveness of insecticides against yellow stem borer. The seven treatments and four replications in plot size measuring 5 x 4 sqm were laid out in Randomized Block Design. The incidence of insects was recorded one day before of spray as pre-treatment observation and post treatment observations were taken at 3, 5, 7 and 10 after spraying. The total number of tillers/panicles and total damaged tillers (DH/WE) were counted on 10 randomly selected hills in each plot for calculating the damaged per cent. The economics of the treatments was determined in term of cost:benefit ratio. Ten days after insecticidal application indicated that Cyclaniliprole 50 SL @ 400 ml/ha was recorded lowest per cent of dead hearts (3.09%) followed by Flubendiamide 20% WG @ 125 g/ha. with 3.93 per cent dead hearts and Cyclaniliprole 50 SL @ 450 ml/ha and Cyclaniliprole 50 SL @ 350 ml/ha with 4.01 and 4.08 per cent



dead hearts were significantly superior over all other treatments and at par with each other in controlling the stem borer damage at vegetative stage of the crop. Regarding % WE reduction over control during *Kharif* 2017 and 2018, Cyclaniliprole 50 SL @ 400 ml/ha with 77.16 per cent was significantly superior over other treatments in controlling white ear damage followed by Flubendiamide 20% WG @ 125 g/ha (73.12% WE reduction) during the reproductive phase of the crop. The insecticides were applied as and when the pest population reached at their ETL (Economic threshold level) with their respective doses. The maximum Cost: Benefit ratio was obtained in plot treated with Cyclaniliprole 50 SL @ 400 ml/ha (1:8.1) followed by Flubendiamide 20% WG @ 125 g/ha (1:7.8). The maximum net income of Rs 37049.00/ha was obtained in Cyclaniliprole 50 SL @ 400 ml/ha treated plot followed by Flubendiamide 20% WG @ 125 g/ha (34137.00/ha).

NEGLECTED AND UNDERUTILIZED CROPS ARE THE POTENTIAL FOOD CROPS OF TOMORROW'S WORLD

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Abstract

Dependence on a few major crops remain a major challenge due to its potential impact and contribution to food security. Higher temperatures, unpredictable rainfall and weather patterns, changes in growing seasons, increased occurrences of drought and extreme weather events will exert a greater strain on agriculture. Underutilised crops play an important role in food security, nutrition, and income generation of many resource-poor farmers and consumers especially in the developing world. Some of Underutilized crops are grain amaranth, buckwheat, ricebean, adzuki bean, chenopods etc. these crops have high nutritional values, forage importance and grown in marginal land without much agricultural inputs. These crops require less water and able to defend themselves according to natural calamities. Emerging evidence suggests that climate change will cause shifts in food production and yield loss due to more unpredictable and hostile weather patterns. There is now an increasing realization of this fact, and a greater awareness that these crops merit more research and development. The growing demand for food and a variety of food products also calls for interest and investment in underutilized crops by scientist, people and peasants. Underutilized, therefore hold the key to the future of mankind. They are the 'Potential food crops of tomorrows' world.

SOIL HEALTH MANAGEMENT AND PRACTICES : KEY FACTOR FOR CROP PRODUCTIVITY

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Abstract

Currently, increase in food production is the one of the primary objective of all countries as world population is expected to grow to nearly 9-10 billion by 2050. In developing countries, the population growth rate is 3% year. Demand for food increases by 3.8% year. However, food production is increasing by only 1.2% year. World food production needs to increase by 70%, in order to keep pace with the demand of growing population. Use of chemical fertilizers is must. But crop production inputs such as mineral fertilizers, organic amendments, microbial inoculants and pesticides are applied with the ultimate goal of maximizing productivity and economic returns while side effects on soil health are often neglected. Here the concept of soil health takes into account, healthy soils have the ability to sustain plant and animal life and productivity, as well as soil biodiversity; maintain or enhance water and air quality; and support human health and wildlife habitat. Proper soil health management practices are considered as a better way to enhance agriculture production in sustainable healthy soil without forgetting environmental quality, human and animal health. Such soil health management practices includes plant diversity, cover crops, reduce pesticide use, provide habitat for beneficial organisms, residue management, use cover crops, tillage considerations, crop rotation considerations, organic amendment considerations etc. Soil health management provides an opportunity to increase profits and decrease risks through adaptations to a changing climate, and to contribute to solving this critical environmental issue. In summary, healthy soils store more carbon and require fewer inputs. Thus, they have reduced carbon emissions associated with manufacture, transport, and application of inputs. They are also better able to prevent



saturation and soil loss, and store water from large rainfall events to carry a crop through a short-term drought. Healthy soils therefore minimize greenhouse gas emissions, plant stress, and risk to the farmer of challenging weather events. Sustaining healthy productive soils also reduces the need for land clearing, deforestation, and related CO₂ emissions internationally.

GLOBAL CLIMATE CHANGE : SCENARIO AND FOOD SECURITY

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Abstract

Global climate change is a change in the long-term weather patterns that characterize the regions of the world. Climate change could potentially interrupt progress toward a world without hunger. A robust and coherent global pattern is discernible of the impacts of climate change on crop productivity that could have consequences for food availability. Climate change scenarios are scenarios of plausible changes in climate. We use them to understand what the consequences of climate change can be. We can also use them to identify and evaluate adaptation strategies. There are several types of climate change scenarios. They range from scenarios that are devised arbitrarily based on expert judgement (arbitrary climate change scenarios) to scenarios based on past climate (analogue climate change scenarios) to scenarios based on climate model output. Food insecurity is the single greatest danger of climate change to vulnerable human populations and indeed to all humanity. The ill effects of climate changes are reduced yields, increased irrigation, planting and harvesting changes, decreased arability, more pests, risks to fisheries, impact on crops and livestock, impact on nutrition and health. Many weeds, pests and fungi thrive under warmer temperatures, wetter climates, and increased CO₂ levels. Currently, farmers spend more than \$11 billion per year to fight weeds in the World. The ranges of weeds and pests are likely to expand northward. This would cause new problems for farmers, crops previously unexposed to these species. Which in turn have negative impact on human health. The available quantitative studies suggest that climate change will negatively affect food security at the global level in the long run. The research suggests that, at the global level, climate change will reduce crop yields and the land suitable for agricultural production with the greatest impacts in tropical latitudes where the greatest food security challenges persist.

A STUDY OF PHYSICAL AND MENTAL WELL-BEING OF VARSITY STUDENTS PURSUING PROFESSIONAL COURSE IN AGRICULTURE : WITH REFERENCE TO PARTICIPATION IN SPORTS

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Abstract

The aim of the present study was to compare physical and mental well-being of varsity students pursuing their professional course in agriculture on the basis of their participation in sports. To conduct the study 181 students pursuing their professional course from Indira Gandhi Krishi Vishwavidyalaya, Raipur Chhattisgarh were selected as sample. The average age of selected subjects was 22.19 years. Out of these selected subjects 94 have active participation in competitive sports while 87 subjects have no involvement in competitive sports. To assess physical fitness of selected Cooper 12 minute run/walk test was used. The mental health of students from agriculture stream was assessed by 03 dimensional mental health inventory prepared. Results revealed that physical fitness and mental health of student athletes was found to be significantly superior as compared to student non-athletes. It was concluded that competitive sports is a good medium to boost physical and mental well-being of students pursuing their professional course in agriculture.

IMPACT ASSESSMENT OF FRONT LINE DEMONSTRATION ON MUSTARD CROP

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Abstract

Indian mustard is one of the most important oilseeds crops of Rajasthan, which is primarily raised for its edible oil. Frontline



demonstration (FLD) is one of the most powerful tools for transfer of technology. Keeping in view of an effective extension approach of FLDs for dissemination of improved varieties of Indian mustard, an impact assessment of FLDs conducted by KVK, Bikaner-II in different villages of Lunkaransar tehsil. Krishi Vigyan Kendra, Bikaner-II (Lunkaransar) conducted 21 demonstrations on mustard variety Giriraj, during *rabi* 2017-18. The critical inputs were identified in existing production technology through meetings and discussions with farmers. The required inputs were supplied and regular visits to the demonstration field by the KVK scientists ensured proper guidance to the farmers. The results of the study (Table: 1) revealed that the yield of mustard in demonstration ranges from 22.0 to 30.00 q/ha with average yield of 26.00 q/ha, whereas in Farmer Practices the yield was 21.0 q/ha. The per cent increase in yield with Improved Practices over Farmer Practices was recorded 23.80%. As far as economics of mustard (Table:2) is concerned; gross cost, gross return and net return were Rs. 27000/ha, Rs. 75400/ha and Rs. 48400, respectively under demonstration plot. The cost benefit ratio was 2.80 under demonstration, while it was 2.30 under control plots. By conducting front line demonstration of proven technologies, yield potential from mustard cultivation can be enhanced to a great extent with increase in the income level of the farming community.

BIOEFFICACY OF NEW INSECTICIDE MOLECULES AGAINST LEPIDOPTERAN PESTS OF SOYBEAN

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Abstract

Soybean (*Glycine max* (L.)) is the premier pulse and oil seed crop in India. The low productivity of soybean is attributed to abiotic and biotic stresses like weeds, insect pests and diseases. The crop is infested by more than 275 insect pests on different plant parts of soybean and about a dozen of them have been reported causing serious damage from sowing to harvesting (Ramesh Babu, 2010). An Experiment comprising six treatment and including control was laid out variety JS-93-05 to manage lepidopteran pests (*Helicoverpa armigera*, *Chrysodeixis acuta* and *Spodoptera litura*) through five new insecticides i.e. Brofanilide 30% SC @ 6.6 g a.i./ha, Brofanilide 30% SC @ 12.6 g a.i./ha, Brofanilide 30% SC @ 18.6 g a.i./ha, Emamectin benzoate 5% SG @ 11 g a.i./ha and Flubendiamide 39.35% M/M SC @ 48 g a.i./ha. The observation of lepidopteran pests were recorded as number of larvae recorded from ten randomly selected plants at weekly interval. To calculate the efficacy of each treatment, the per cent reduction of insect pest's population was calculated by using Henderson and Tilton formula. Effect of new insecticide molecules on spider was observed on 1, 3, 5, 7 and 10 days after application of insecticides. The highest mean per cent reduction in the larval populations of *Helicoverpa armigera*, *Chrysodeixis acuta* and *Spodoptera litura* were observed in the plot treated with Brofanilide 30% SC @ 12.6 g a.i./ha followed by plot treated with Brofanilide 30% SC @ 18.6 g a.i./ha having no significant difference between them. The lowest per cent reduction of 23.59 per cent was recorded in control plot. Lowest spider population (0.71 spider/plant) was recorded in Emamectin benzoate 5% SG @ 11 g a.i./ha and which was on par with other remaining treatments. However, highest spider population (1.55/plant) was recorded in control.

INFLUENCE OF FOLIAR NUTRITION OF UREA, BORAX AND ZINC SULPHATE ON GROWTH, YIELD AND QUALITY OF GUAVA (*PSIDIUM GUAJAVA* L.) CV. REWA-72

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Abstract

A field experiment entitled influence of foliar nutrition on growth, yield and quality of guava (*Psidium guajava* L.) cv. Rewa-72 was conducted at the Instructional cum research fruit orchard Department of Fruit Science KNK College of Horticulture, Mandsaur (MP) during 2016-17. The experiment was consisted of 15 treatments i.e. T₁ -control (water spray), T₂ -urea (1%), T₃ -urea (1.5 %), T₄ -urea (1%) + borax (0.2%), T₅ -urea (1%) + borax (0.4%), T₆ -urea (1%) + borax (0.6%), T₇ -urea (1.5 %) + borax (0.2%), T₈ -urea (1.5%) + borax (0.4%), T₉ -urea (1.5%) + borax (0.6%), T₁₀ - urea (1%) + borax (0.2%) + zinc sulphate (0.2%), T₁₁ - urea (1%) + borax (0.4%) + zinc sulphate (0.4%), T₁₂ - urea (1%) + borax (0.6%) + zinc sulphate (0.6%), T₁₃ - urea (1.5%) + borax (0.2%) + zinc sulphate (0.2%), T₁₄ - urea (1.5%) + borax (0.4%) + zinc sulphate (0.4%) and T₁₅ - urea (1.5%) + borax (0.6%) + zinc sulphate (0.6%). The experiment was laid out in randomized block design with three replications. Result revealed that urea (1.5%) + borax (0.6%) + zinc sulphate (0.6%) (T₁₅) was found significantly superior



over control and rest of treatments with respect to growth, yield and quality attributes of guava under malwa plateau conditions of Madhya Pradesh.

INFLUENCE OF SEEDLING AGE AND SULPHUR DOSE ON YIELD OF ONION (*ALLIUM CEPA* L.)

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Abstract

The present study was focused on the response of three seedling age (6, 8 and 10 week old seedling) of onion cultivar Nasik red was studied against different sulphur dose treatment viz., sulphur (20 kg/ha), sulphur (40 kg/ha) and sulphur (60 kg/ha) along with control in factorial RBD replicated thrice at the experimental field of Krishi Vigyan Kendra Majhgawan, Satna (M.P.), during *Rabi* season of 2016-17. The result showed that 8 week old seedling outperformed other aged seedlings with highest yield, quality and plant establishment (89.87 %). Data with respect to yield attributes clearly pointed out that 8 week old seedlings performed better and showed statistically highest bulb size (27.14cm²), bulb weight (97.36g) and marketable yield (246.28q/ha). All sulphur treatment significantly reduces vegetative growth as compared to control. Sulphur @ 60 kg/ha was found statistically superior in increasing bulb size (26.37cm²), bulb weight (86.85g) and marketable yield (223.18q/ha) as compared to other treatments. Interactive effect of sulphur @ 60 kg/ha dose on 8 week old seedlings produced maximum bulb size (34.67cm²), bulb weight (116.36g) and marketable yield (304.29q/ha). Economic of the experiment showed maximum B:C ratio in 8 week old seedling with 60 kg/ha sulphur as compared to other treatment as well as control.

IMPACT ANALYSIS OF FRONT LINE DEMONSTRATION ON YIELD ENHANCEMENT OF GINGER THROUGH DRIP AND FERTIGATION IN UPLAND RICE ON TRIBAL BELT OF KOREA DISTRICT IN CHHATTISGARH

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Abstract

A front line demonstration was conducted at five farmers field comprising of 0.20 ha under each demonstration in Korea district of Chhattisgarh during *Kharif* 2015-16 to 2018-19 to demonstrate the improved package of practice of Ginger. There were two treatments in which one was local check and second was cultivation of ginger with full package of practice with drip and fertigation. Field diagnostic visits, regular surveys, farmer meetings and training programmes ensured application of balanced and optimum doses of nutrients through fertigation and timely plant protection measures. The result revealed that local check gives a yield of 11.36t/ha. While ginger cultivation with full package of practices along with drip and fertigation gives a yield of 18.91 t/ha. which shows that by adopting package of practices there were 66.56% increase in ginger yield. Similarly, net return was also calculated which shows that local check gives a net income of Rs. 301775 with a B:C ratio of 1.14 against a net income of Rs. 582725 with B:C ratio of 1.61 in demonstration field. With frontline demonstration (FLD) of proven technology revealed that yield potential and net income from ginger cultivation could be enhanced to a great extent resulting in higher income to the farming community.

PROBLEMS AND PROSPECTS OF RESEARCHS, EXTENSION AND FARMERS

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Abstract

Agriculture provides employment for majority of the nation's population, food for the country and raw materials for agro-based industries. To strengthen the network and for substantial farmer benefits all the stakeholders involved, linking with technical innovations, creativities in agriculture and collective action initiatives. A number of farmer-led research and extension (FRE) approaches required collective action for different perspective and at different levels in the innovation



process. The research-extension-farmer linkages should be viewed as an interdependent and inter-related continuum. More precisely, interdependence among the researchers, extension workers and farmers prevents isolation, which impedes technology transfer. Close relationship among these key players also promotes development of relevant technologies that provide directly measurable results or perceived benefits to the target population and adapted to local conditions. The lack of a close working relationship between national research in agriculture, extension organizations and with different categories of farmers and farm organizations is one of the most difficult institutional problems confronting ministries of agriculture in many developing nations. Research and extension organizations generally compete for scarcity of resources and, frequently, leaders of these institutions do not see themselves as part of agricultural technology system. Collective action can be useful in sharing knowledge, setting priorities, experimenting, evaluating and disseminating technologies. Various participatory research approaches such as farmer field schools (FFSs), local agriculture research committees (CIALs), farmer research groups (FRGs), and farmer innovation approaches (FIAs) taken into consideration to solve the problem related to strong linkages.

MOLECULAR CHARACTERIZATION OF GENETIC VARIATION IN SOMACLONES AND GAMMA IRRITATED MUTANTS/VARIANTS OF STRAWBERRIES THROUGH SSR MARKERS.

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Abstract

This study is a continuation of a previous work; the main objective is to characterize the induced somaclonal variation and gamma irritated mutants in the strawberry plantlets. In a previous experiment, *in vitro* plantlets of strawberry cv. Chandler were obtained by treating axillary buds of strawberry with different doses of gamma rays (10Gy, 30Gy, 50Gy and 60Gy) and through callus regeneration of leaf explants of strawberry. A total of 6 variants were obtained on screening the somaclones and irradiated plantlets on the basis of morphological characters. Molecular analysis of somaclones, gamma rays induced variants and field grown plants (control) using 23 SSR primers revealed that only 6 SSR primers showed polymorphism. The presence of selective agent in the medium could explain the observed genetic variations. Somaclonal variation cannot always be detected at the gross morphological level. The selected SSR markers could be used to study the uniformity of plants obtained from tissue culture and callus generated plants.

GENETIC ANALYSIS FOR SEED YIELD AND ITS CONTRIBUTING TRAITS IN INDIAN MUSTARD [BRASSICA JUNCEA (L.) CZERN. & COSS.]

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Abstract

An experiment was carried out at Oil Seed Research Farm, Kalyanpur of Chandra Shekhar Azad University of Agriculture & Technology, Kanpur, during rabi season 2017-19. 7-parents/strains (Varuna, Pusa Bold, RH-30, RLM-198, PR-15, Urvashi and B-85) were crossed in diallel mating design. (excluding reciprocal crosses) 28 genotypes (21 F₁ + 7 parents) were evaluated for 10 characters viz., days to 50% flowering, days to maturity, plant height (cm), length of main raceme (cm), number of siliques per plant, number of primary branches per plant, number of secondary branches per plant, oil content (%), 1000-seed weight (g) and seed yield per plant (g). Analysis of variance revealed that the genotypes were genetically differ to each for all the characters. Genetic components analysis exhibited that both additive and dominance components were highly significant for almost all the traits indicating the role of both additive as well as non-additive gene action in controlling the expression of concerned traits. In general dominance component values were higher than that of additive component for all the traits. The estimates of average degree of dominance indicated presence of over-dominance for all the traits. The parents namely, Varuna, Pusa Bold, PR-15, Urvashi and RH-30 were best general combiners for seed yield per plant. The crosses namely, varuna x RLM-198, varuna x PR-15, varuna x B-85, RH-30 x RLM-198, RH-30 x B-85 and Urvashi x B-85 were best specific combiners for seed yield per plant. In hybrid high heterosis over better parent varuna x PR-15, Pusa Bold x RH-30, Pusa Bold x PR-15, RH-30 x RLM-198 and RH-30 x B-85 and varuna x RLM-198, varuna x B-85, RH-30 x RLM-198, RH-30 x B-85 and Urvashi x B-85 for mid parent and high x high general combiners with significant sca effects. A perusal of heritability estimates indicated high heritability values in all the ten characters under study such as days to 50 % flowering (73.84%), days to maturity (69.38%), plant height (76.69%), number of primary branches per plant (79.15%), number of



siliquae per plant (91.09), 1000-seed weight (81.16%), oil content (77.58%) and seed yield per plant (81.12%). The high values were found number of primary branches per plant (21.13%), length of main raceme (14.52%), number of secondary branches per plant (14.16%), seed yield per plant (12.02%) and days to 50% flowering (10.44%). Significant positive correlations are found in seed yield per plant have positive correlated with days to 50% flowering, plant height, length of main raceme, number of siliquae per plant, number of primary branches per plant, number of secondary branches per plant, oil content and 1000-seed weight at both genotypic and phenotypic level.

STUDIES ON SEED YIELD AND ITS RELATED TRAITS IN INDIAN MUSTARD [*BRASSICA JUNCEA* (L.) CZERN. & COSS.]

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Abstract

An experiment was carried out at Oil Seed Research Farm, Kalyanpur of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, during rabi season 2017-19. 7-parents/strains (Maya, Basanti, PM-28, PM-29, PM-30, Rohini and Kanti) were crossed in diallel mating design. (excluding reciprocal crosses) 28 genotypes (21 F₁ + 7 parents) were evaluated for 10 characters viz., days to 50% flowering, days to maturity, plant height (cm), length of main raceme (cm), number of siliquae per plant, number of primary branches per plant, number of secondary branches per plant, oil content (%), 1000-seed weight (g) and seed yield per plant (g). Analysis of variance revealed that the genotypes were genetically differ to each for all the characters. Genetic components analysis exhibited that both additive and dominance components were highly significant for almost all the traits indicating the role of both additive as well as non-additive gene action in controlling the expression of concerned traits. In general dominance component values were higher than that of additive component for all the traits. The estimates of average degree of dominance indicated presence of over-dominance for all the traits. The parents namely, PM-30 and Rohini were best general combiners for seed yield per plant. The crosses namely, Maya x PM-28, PM-29 x Rohini, PM-30 x Rohini, PM-30 x Kanti and Rohini x Kanti were best specific combiners for seed yield per plant. In hybrid high heterosis over better parent Maya x PM-28 (16.34**), PM-29 x Rohini (12.30**), PM-29 x Kanti (11.54**), PM-30 x Rohini (8.19**) and Rohini x Kanti (19.72**) and Maya x PM-28 (18.77), Maya x Kanti (11.21**), PM-29 x Rohini (16.31**), PM-30 x Rohini (14.07**) and Rohini x Kanti (23.56**) for mid parent and high x high general combiners with significant sca effects. A perusal of heritability estimates indicated high heritability values in all the ten characters under study. The estimates of heritability (narrow sense) were observed high for the characters varied from 21.86 for number of primary branches per plant to 83.81 for days to maturity. As per calculation the high heritability were recorded for all the characters. The high value were found days to maturity (83.81%) followed by oil content (82.89%), days to 50% flowering, seed yield per plant (79.02%), 1000-seed weight (72.23%), number of secondary branches per plant (69.15%), plant height (68.59%), number of siliquae per plant (45.86%), length of main raceme (41.13%) and number of primary branches per plant (21.86%). The genetic advance in percent over mean was estimated for all the 10 characters which ranged from 1.85% number of siliquae per plant to 11.63% for number of secondary branches per plant. The high values were found number of secondary branches per plant (11.63%) followed by days to 50% flowering (11.19%), seed yield per plant (10.86%), 1000-seed weight (10.17%), days to maturity (7.44%), oil content (5.66%), plant height (5.48%), length of main raceme (4.76%), number of primary branches per plant (4.75%) and number of siliquae per plant (1.85%). Correlation coefficient analysis in the present investigation is also carried out in F₁'s generation. Significant positive correlations are found in Seed yield per plant have positive association with plant height, length of main raceme, number of siliquae per plant, number of primary branches per plant, number of secondary branches per plant, oil content and 1000-seed weight at both genotypic and phenotypic level.

ORGANIC MANAGEMENT OF ROOT-KNOT NEMATODE [*MELOIDOGYNE JAVANICA* (TREUB, 1885) CHITWOOD, 1949] IN PIGEON PEA [*CAJANUS CAJAN* (L.) MILLSP.] CV. GT-101

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Abstract

Pot experiment conducted on integrated management of root-knot nematode in pigeon pea cv. GT-101, revealed significant



reduction in nematode population parameters viz., number of galls per plant, different stages of embedded females and egg masses per plant per pot, soil nematode population per pot, total nematode population build up per pot and reproduction rate (pf/pi) in all the treatments compared to infected check. Maximum reduction in nematode population parameters was observed in the treatment with neem cake @ 1 t/ha (2.00 g/pot) enriched with *Purpureocillium lilacinum* 10^6 cfu/g @ 5 kg/ha (0.01 g/pot) followed by the treatment with poultry manure @ 5 t/ha (10.00 g/pot) enriched with *Purpureocillium lilacinum* 10^6 cfu/g @ 5 kg/ha (0.01 g/pot). Among alone treatments (without combination of organic amendments and bio-agents), maximum reduction in nematode population parameters was recorded in the treatment with neem cake @ 5 t/ha (2.00 g/pot).

MORPHO-PHYSIOLOGICAL EVALUATION OF COW PEA GENOTYPES UNDER SALT STRESS

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Abstract

The present study was carried out to evaluate and Screen the cowpea genotype under salt stress. A field experiment was conducted with fourteen cowpea genotypes with two replication in controlled conditions under Salt stress. Morpho-physiological parameters were studied. Higher the salt stress Morpho-physiological, changes were observed net photosynthesis, transpiration, stomatal conductance, Chlorophyll (%) significantly decreased, Na^+ , Cl^- and K^+ ion concentration increases up to maturity stage. Yield and yield contributing characters significantly decreased due to salt stress. The genotypes viz., Phule Vithai Phule Rukmini, PCP-1123, PCP-1124, PCP-1122 early genotypes performed better due to salt exclusion mechanism and PCP-1112, PCP-1131 performed poor under salt stress conditions

STUDY OF LEAF OIL COMPOSITION FROM VARIOUS ACCESSIONS OF *CURCUMA LONGA* L. GROWN ON PARTIALLY RECLAIMED SODIC SOIL

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Abstract

The essential oils of *Curcuma longa* L. (Zingiberaceae) were extracted from senescent leaves by hydrodistillation and analyzed by GC/MS. Leaf essential oils of turmeric were found to be rich in monoterpenes. The GCMS analysis of leaf essential oil of 29 accessions showed presence of total 41 compounds mainly α -phellandrene, p-cymene, γ -terpinolene and p-cymen-8-ol as the four major compounds. Based on identification of three major compounds from each oil, 13 compounds viz. α -Myrcene, α -Phellandrene, γ -Terpinene, Limonene, 1,8-Cineole, p-cymene, γ -Terpinene, γ -Terpinolene, 1,3,8-p-Menthatriene, p-menth-1-en-4-ol, Borneol, p-menth-1-en-8-ol and p-cymen-8-ol were found to be the major constituents from each accession. The number of compounds in accessions varied from five in NBH-20 to 22 in Prabha. Out of 41 compounds, α -Elemene was reported only in R. Sonia while α -Bisabolene was detected in Roma and PantPeetabh only. Based on the major compound(s) of turmeric leaf oil, industrial applications can be explored.

STUDIES ON INTEGRATED NUTRIENT MANAGEMENT ON QUALITY PARAMETERS OF BANANA (*MUSA PARADISICA* L.) CV. GRAND NAIN

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Abstract

An investigation on “Studies on integrated nutrient management on quality of banana (*Musa paradisica* L.) Cv. Grand Naine” was conducted at Banana Research Station, Nanded, Taluka + District Nanded, Maharashtra, during year 2016-2017. The field experiment was laid out in Randomized Block Design (RBD) and replicated thrice. The experiment consist of nine treatment combinations viz., T_1 - 100% RDF (Control), T_2 - 75% RDF + Soil application of VAM (25 g/plant), T_3 - 75% RDF + Soil application of *Azospirillum* (25 g/plant), T_4 - 75% RDF + Soil application of PSB (25 g/plant), T_5 - 75% RDF + Soil application of VAM (25 g/plant)+ *Azospirillum* (25 g/plant)+ PSB (25 g/plant), T_6 - 100% RDF + Soil application of VAM (25



g/plant), T₇ - 100% RDF + Soil application of *Azospirillum* (25 g/plant), T₈ - 100% RDF + Soil application of PSB (25 g/plant), T₉ - 100% RDF + Soil application of VAM (25 g/plant) + *Azospirillum* (25 g/plant) + PSB (25 g/plant). The experiment farmed was to study the effect of inorganic fertilizers and bio-fertilizers on growth, yield and quality of banana. Observations on quality attributes of individual treatments were recorded. The results of present study indicated significant difference with respective quality parameters viz., days taken for ripening (6.21), shelf life (14.19 days), weight of pulp (115.45 g), weight of peel (34.23 g), pulp to peel ratio (3.44), TSS (22.88 °Brix), reducing sugar (11.37%), non-reducing sugar (4.64%) and total sugar (16.21%) were recorded by treatment T₉ i.e., 100% RDF + Soil application of VAM (25 g/plant) + *Azospirillum* (25 g/plant) + PSB (25 g/plant). However, the minimum days taken for ripening, shelf life, weight of pulp, weight of peel, pulp to peel ratio, TSS, reducing sugar, non-reducing sugar and total sugar recorded by treatment T₁ i.e., 100% RDF (Control).

POPULATION DYNAMICS OF SUCKING INSECT PESTS ON MAIZE CROP

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Abstract

Maize (*Zea mays* L.) or corn is a grass of the family Poaceae grown primarily for its kernel. It is the most versatile crop with wider adaptability in varied agro-ecologies and has highest genetic yield potential among the food grain crops. The present investigation conducted during spring season of 2013-14 and 2014-15. Field experiments were conducted at Research Farm, IGKV, Raipur (C.G.). The maximum population of aphid (cm²) were observed during 12th SMW (48.92 aphids/cm²) and 13th SMW (57.43 aphids/cm²) during spring season 2013-14 and 2014-15, respectively. The interaction between the aphid population and weather parameters showed a non-significant relationship. The green stink bugs were active till late vegetative period of crop. The interaction between the population of green stink bugs *Nezaraviridula* and weather parameters during spring season, 2013-14 and 2014-15, revealed negative as well as non – significant correlation with maximum temperature ($r^2 = -0.402$ and -0.5400), minimum temperature ($r^2 = -0.4714$ and -0.3642), while the interaction with morning humidity ($r^2 = 0.355$ and 0.634) and evening relative humidity ($r^2 = 0.01$ and 0.57^*) was positive and non-significant for first year and significant for the second year.

IMPACT OF DIFFERENT FUNGICIDES, ORGANIC AMENDMENTS AND BIO-AGENTS ON WHEAT AGAINST FOLIARDISEASES

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Abstract

An experiment was conducted for studying the impact of organic amendments, chemical fertilizers and their combination with bio-agents on the growth, production and management of foliar diseases in Rabi 2019 under pot conditions by using CRD method with three replications and seven treatments at Crop Research Farm, Nawabganj of Chandra Shekhar Azad University Agriculture and Technology, Kanpur. The various parameters studied during the present investigations were growth parameters, namely, root length, shoot length, fresh weight, dry weight, plant biomass which were studied at 15, 30, 60 and 90 days after sowing as well as yield attributes, viz., spikes, number of tillers, weight of grains, length of spike etc. and disease severity. The results revealed that all the growth parameters were significantly enhanced in all the mixed combinations than the check pots. Among all the combinations of seed treatment, soil application and spraying of organic and inorganic fertilizers, the combination of seed treatment with Tabuconazole + Soil application of *Trichoderma* and Mushroom spent + Neem extract spray was most effective followed by the combination of seed treatment with *Trichoderma* + soil application of *Azotobacter* and Mushroom spent + Propiconazole spray. Moreover, the level of susceptibility of disease development in these treatments were also lower than that observed in all treatments, it was not exceed 10S in case of both yellow rust and brown rust diseases. The study concluded that combination of seed treatment (*Azotobacter*, *Trichoderma*, Tabuconazole), soil application (*Azotobacter*, *Trichoderma*, Neem cake, Vermicompost, Mushroom spent) along with spraying of organic and inorganic chemicals (Neem extract, Zinc, Propiconazole and Tabuconazole) is more helpful for the enhancement of growth,



production and disease prevention in wheat as compared to separate use of organic amendments, bio-fertilizers and chemical fertilizers. Similarly, the yield attributes and yield were significantly improved by the combination of integrated treatments than untreated ones and were more in the combination of seed treatment with Tabuconazole + Soil application of Trichoderma and Mushroom spent + Neem extract. This combination registered maximum disease suppression as well as maximum yield (186gm/pot) in compare to control (67.32gm/pot). However, results obtained reflect the possibility to use two foliar sprays of fungicides at low doses combined with bio-control against and organic amendments.

NUTRITIONAL COMPOSITION OF MORINGA (*MORINGA OLEIFERA*) LEAVES AS AN ULTERNATIVE FOR CONVENTIONAL CONCENTRATE FEEDING IN SMALL RUMINANTS

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Abstract

One of the multipurpose trees is *Moringa oleifera*. Its leaf fodder has been tried in the livestock ration and observed to increase animal performance in many parts of the world. *Moringa Oleifera* tree belongs to the genus *Moringa* of *Moringaceae* family and is locally popular as drumstick tree. The objective of the study was to assess the nutritional value of Moringa leaves of the Telangana region of India. The proximate and Van Soest methods were used to determine the nutritional values of Moringa leaves. The dried leaves had crude protein levels of 24.39% and 18 amino acids. The dried leaves had following minerals contains: calcium (2.07%), phosphorus (0.65%). The fibre contain was Neutral detergent fibre (NDF) (38.84%), Acid detergent fibre (ADF) (12.94%) The values of amino acids, fatty acids, minerals and vitamin profiles reflect a desirable nutrient balance.

EFFECT OF NIPPING AND SPACING ON GROWTH AND YIELD OF CHICKPEA (*CICER ARIETINUM* L.) UNDER IRRIGATED CONDITION

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Abstract

Nipping appeared to be a factor increasing yield and yield contributing parameters. To investigate the appropriate nipping technique as well as to sort out combination of spacing and nipping. Nipping was done on three different crop growth stages one nipping at 30 to 45 DAS recorded higher number of pods plant⁻¹ compared to no nipping with rows 40 and 50 cm apart. Among the parameters studied, number of plants par plot, plant height and grain yield appeared statistically significant across nipping methods and row spacing whereas number of pods par plant, number of grains par pod and 1000-grain weight were found non-significant. Control plot produced tallest plants (78.80 cm) whereas maximum yield (1792 kg/ha) was obtained One nipping at 30 to 45 DAS with rows 40 cm apart. The research concluded that nipping is a profitable practice for chickpea growers.

OCCUPATIONAL HEALTH PROBLEMS OF WOMEN WORKERS IN BUILDING CONSTRUCTION INDUSTRY

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Abstract

Construction sector is providing employment to 70 per cent of total world population. Total number employed in construction sector is 10,27,900 in 2012. Indian construction industry employs about 33 million people and creates assets worth over Rs 5,



00,000 million annually (Indian construction industry at glance 2011-2012). In India, it is the largest employer of unorganized labour next to agriculture sector. The workers engaged in this industry are victims of different occupational health problems. Excessive ergonomic stress can cause a variety of occupational health problems including fatigue, discomfort and disability, these stresses may result from awkward posture. Therefore, an effort was made to study the occupational problems of women workers in building construction industry. The study was conducted in Dharwad city. Purposive random sampling technique was used to select 120 respondents for the study. Structured interview schedule was used for collection of information. Results revealed that as concerned to the age group of women majority of them belong to age range of 34-42 years (39.17 %). Maximum percent of the women (74.16 %) were illiterate. More than 30 percent of respondents belonged to SC / ST (38.34 %) caste category. Maximum percent of women were married (79.17 %). As high as 65 percent of women had 1-3 children. Cent per cent of the women performed carrying load activity and sieving sand, followed by mixing concrete (73.40 %), wetting concrete (70.00 %) and watering to building (68.40 %) in construction sites. Cent per cent women carry all types of load like stone, bricks, mud, sand and concrete in construction sites. Maximum per cent women had reported health problems for load carrying activity. While performing load carrying activity 91.70 per cent of women experienced cervical pain, followed by headache (71.70 %), back pain (51.70 %) and chest infection (16.70 %). Less than ten per cent women reported miscarriage (7.50 %), asthma (4.20 %) and intestinal diseases (1.70 %). Occupational hazards experienced by women workers in building construction industry. Swelling of body parts were the hazard experienced by 19.17 per cent women, followed by skin infection (6.67 %) and fall / fractures (7.50 %). Only 1.67 per cent of women experienced cuts/ bleedings and equal per cent of women experienced eye injury and twists of body parts (0.83 %) in building construction work. Thus it can be concluded since women workers were working in construction industry carried enormous load on their various parts of the body, exposed to various materials in sites. Due to prolonged maintain of poor working postures, bent position, and manual handling of heavy weights with repetitive work, lack of rest. Women workers suffered from various occupational health problems. The working conditions at construction sites therefore need to be improved to make them women friendly.

YIELD RESPONSE OF MAIZE GENOTYPES AS INFLUENCED BY MICRO IRRIGATION

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Abstract

Water—a critical input for sustained crop production and it is becoming limiting both under rainfed and irrigated condition. Efficient use of water is highly critical to sustain agricultural production, more particularly in the context of declining per capita land and water availability. Maize crop is a conventionally furrow irrigated crop hence it calls for an effective on-farm management of water in field crops through micro irrigation. Drip irrigation is now being used in row crops in water scarcity areas as there can be a considerable saving of irrigation water under this method, as water is applied most precisely and directly in the root zone without wetting the entire surface area. Therefore, the present field study was conducted during summer 2018 to study the effect of drip irrigation levels on yield performance of maize genotypes at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, Karnataka. The experiment was laid out in strip plot design with three replications comprising of sixteen treatment combinations. The treatments included were four irrigation levels such as drip irrigation at 0.6 ETc, 0.8 ETc and 1.0 ETc and furrow irrigation at 0.8 IW/CPE ratio and four maize genotypes such as NK-6240, Pinnacle, CP-818 and RCRMH-2. The results revealed that, effect of irrigation levels differed significantly with respect to grain yield of maize. Furrow irrigation at 0.8 IW/CPE ratio (77.1 q ha⁻¹) and drip irrigation at 1.0 ETc (73.3 q ha⁻¹) were found statistically on par with each other. However, significantly higher grain yield was noticed as compared to drip irrigation at 0.8 ETc (54.4 qha⁻¹) and 0.6 ETc (38.8 qha⁻¹). The genotypes differed significantly. NK-6240 recorded significantly higher yield (68.7 q ha⁻¹) as compared to the rest of the genotypes tried. Significantly the lowest grain yield was recorded with Pinnacle (57.3 qha⁻¹). The interaction effect due to irrigation levels and maize genotypes was found significant with respect to grain yield of maize. The combination of furrow irrigation at 0.8 IW/CPE ratio with NK-6240 genotype recorded significantly higher grain yield (83.3 q ha⁻¹) as compared to other treatment combinations. However, this treatment remained statistically non significant with drip irrigation at 1.0 ETc with NK-6240 (79.8 q ha⁻¹), CP 818 (74.5 qha⁻¹), Pinnacle (69.6 qha⁻¹) and RCRMH-2 (69.4 qha⁻¹) and furrow irrigation at 0.8 IW/CPE ratio with CP-818 (78.9 qha⁻¹) and Pinnacle (75.3 qha⁻¹) and RCRMH-2 (70.8 qha⁻¹). Significantly the lowest grain yield was obtained with the combination of drip irrigation at 0.6 ETc with Pinnacle (34.5 qha⁻¹), CP-818 (41.4 qha⁻¹), RCRMH-2 (42.8 qha⁻¹) and NK-6240 (45.1 qha⁻¹).



AGRONOMIC MEDIATION FOR YIELD SCALED PROFITABLE GREENHOUSE GAS INTENSITY OF RICE-WHEAT CROPPING SYSTEM

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Abstract

A field study was carried out at experimental farm of Bihar Agricultural University, Sabour, Bhagalpur, India to gain insight crop phenology mediated greenhouse gas emission into GWP, GHGI and economic viability on crop seasonal scale over two cycles of rice–wheat rotations under subtropical climatic condition. The treatments consisted of two tillage practices viz. zero and conventional tillage as main plot and four nutrient management practices viz. 100% inorganic fertilization, SPAD based nitrogen management, 25% of N supplement with vermicompost and split application nitrogen as sub plot. The highest rice equivalent yield (92.1 qha⁻¹), system productivity (25.23 kgha⁻¹ day⁻¹) and B:C ratio (1.67), was recorded under zero tillage treatment as compare to conventional treatment. Further, rice equivalent yield (91.9 qha⁻¹), system productivity (25.18 kgha⁻¹ day⁻¹) and B:C ratio (1.60), was maximum under split application of nitrogenous fertilizer among the other sub plot treatments. However, minimum amount of total seasonal methane (48.89 kg ha⁻¹ in kharif and 6.25 kg ha⁻¹ in rabi), carbon dioxide (38.26 kgha⁻¹ in kharif and 157.03 kgha⁻¹ in rabi) and nitrous oxide (1.60 kgha⁻¹ in kharif and 21.67 kg ha⁻¹ in rabi) emission was obtained from zero tilled plots and Split top dressing of nitrogenous fertilization emitted lowered methane (55.44 kg ha⁻¹ in kharif and 5.52 kg ha⁻¹ in rabi) carbon dioxide (40.39 kgha⁻¹ in kharif and 147.52 kgha⁻¹ in rabi) and nitrous oxide (1.61 kg ha⁻¹ in kharif and 19.35 kg ha⁻¹ in rabi) irrespective of all stages of crop growth following decreasing trend from maximum tillering to harvesting stage. The Global Warming Potentiality and greenhouse gas intensity was lower under the same treatment. Thus, the wider adoption of resource conservation practices along with zero till direct seeded rice followed by zero till wheat with residue retention has long run benefits in terms of conserving natural resources, saving energy, higher production and cost effectiveness in the perspective of climate change.

EVALUATION OF HIGHLY AROMATIC KALANAMAK RICE GERMPLASM IN EASTERN UP REGION OF CHAURICHAURA, GORAKHPUR DISTRICT FOR YIELD AND QUALITY ATTRIBUTING TRAITS

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Abstract

Oryza (*Oryza sativa* L., 2n=24) has two cultivated 22 wild species. Most cultivated species are *Oryza sativa* L., cultivated all over the world. Rice is the staple food for most of the developing countries as well as for the majority of the human population. Some rice germplasm found in India is very fine and highly aromatic. Marketing status of rice depends upon the grain quality and aroma content of rice. In India aromatic rice is generally called as basmati rice. India is the largest producer and exporter of basmati rice in the world. Kalanamak is a pride and heritage rice variety of north-eastern Uttar Pradesh. It is cultivated about 21,000 hectare land. Kalanamak rice has very fine grain, non steaky, fluffy, long shelf life, easy cooking and easily digestible property. Its name Kalamanak has been derived from their black colour husk. It defeats many other basmati rice varieties in case of quality and aroma except grain length. Kalanamak rice has been granted the Geographical Indication (GI) Tag which was applied to the Government of India by Kalanamak Scented Paddy Production & Conservation Society. The GI tag is an indication which is definite to a geographical territory. Present study was carried out on 60 different Kalanamak rice local land races collected from the eastern part of the Uttar Pradesh especially from the Siddhath Nagar district. All these entries were evaluated in RBD with three replication along with the famous aromatic check variety (KN-3) of this region in Centre for research and development, Chaurichaura district Gorakhpur district. In our study we have taken observation on 17 different morphological traits including 7 grain quality traits. Based on grain quality parameters viz., Hulling %, Milling %, Grain Length (mm), Grain Width (mm), Alkali test, G.L.0 and Amylose Test, the top few Kalanamak collections could be considered for further improvement in grain quality and/or agronomic traits. Such analysis helps us in finding which characters need the most attention for further improvement. For example, KTGR7 needs its hulling percentage to be improved; SLO3 needs milling percentage to be improved; KTGR45 needs amylose content to be improved/ adjusted as per consumers' choice; KTG



R8 needs its grain size (length & width) improvement and so on. Similarly, the agronomic traits could also be looked at for further improvement. In fact, the general perception of a few rice breeders is to develop small grained dwarf Kalanamak paddy ideotypes so as to improve its hulling-milling percentage and avoid lodging losses. Alkali test does not seem to be a very differentiating character as depicted by only two values (1 and 46). Such characters could be ignored in NCR analyses. Similarly, in Kalanamak rice intermediate amylose content (21-25%), is preferred, the varieties having this range of amylose content could be given top ranks in the ranking process. This way, each and every trait could be given proper consideration for the development of aromatic Kalanamak rice with high yielded. Based on quality traits, performance order of top ten varieties are KTGR7, SL03ADD, KTGR45, KTGR8, KTGR21, KTGR26, SL04ADD, SL01ADD, BADSHAHBHOG and PUSA 1121, these variety can be use for the development of aromatic rice with appropriate breeding procedure. If only grain quality traits are to be considered then these varieties are recommended for cultivation. Based on 17 different agronomic traits, performance order of top ten varieties are SL03ADD, KTGR5, KTGR2, KTGR21, KTGR7, Pusa Basmati-1, KTGR36, KTGR19, Pusa 1176 and KTGR6. However if all the 24 traits are considered together then the performance order will be KTGR-1, Pusa 1638ADD, KTGR4, KTGR32, Sambha sab-1, KTGR24, KTGR42, KTGR35, KTGR33 and KTGR 38. So these varieties should be recommended for cultivation in different geographical region. It could be safely concluded from the above analysis that varieties selected and recommended to farmers for cultivation based on considering all the traits would provide maximum satisfaction to the farmers.

STUDY OF MOLECULAR DIVERSITY AND PHYLOGENETIC RELATIONSHIP AMONG SELECTED RICE LINES OF CHHATTISGARH USING SSR MARKERS

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Abstract

A total of 152 SSR primers were taken to assess the genetic diversity among sixty rice germplasm with six checks. Out of 152 SSR markers, one hundred and thirteen primers were found polymorphic across all accessions. A total of 439 alleles were amplified and the number of alleles per locus generated by each marker ranged from 1 to 9 alleles with an average number of 2.89 alleles per locus. Maximum number of alleles (9) was amplified by markers RM 1 and RM 27493. Microsatellite markers (SSR) are also used to detect the genetic similarity of rice under study. The genetic similarity coefficient ranged from 0.21-0.93 as revealed by UPGMA cluster analysis using the 152 SSR markers. The sixty lines were classified into three clusters at 25% of genetic similarity coefficient and it was ranged from 1 to 26% with the help of 152 SSR primers. Three major clusters have formed which contains two, four and fifty-four genotypes. A very high genetic diversity was found in the studied material and this may be due to the panel consists of landraces, breeding lines and some improved varieties which are from different origin and are collected from various geographic areas of Chhattisgarh.

AEROBIC RICE A NEW SCIENTIFIC METHOD OF RICE CULTIVATION

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Abstract

Rice is a staple food of developing world as well as majority of the world's human population. Asia cultivates rice in over 137 million hectares. In India, rice is the most important and extensively grown food crop, occupying about 44.8 m ha and share about 15 percent to the annual gross domestic product (GDP) (Prasad, 2015). Present investigation carried out during the year 2015-16 and 2016-17 design non replicated. My investigation conducted some village of District Deoria, Kushinagar, Gorakhpur, and Maharajganj. The field experiments at Centre for Research and Development (CRD) during 2015-16 and 2016-17. Experiments comprised eight varieties seg. Samba Sub-1, Swarna Sub-1, Swarna, Ciherang Sub-1, CR dhan 202, IR 64 drt-1 Sarjoo 52, Sahbhagi, Abhishek, Sadabahar WITA 12 and Hybrid varieties Arize 6444 Gold, PAC837, NK 5251, KRH4 Loknath 505, combination of unreplicated. The data where recorded Plant height, Panicle Length, Yield per hectare, Lodging percentage, and Submergence after flooding. The result revised that the present investigation Smba Sub1, Swarna Sub1, Ciherang Sub 1 are better performance than self pollinated and Open pollinated varieties in Submergence area, WITA



12, CR dhan 202, Abhishek, Sadabahar, IR 64 drt1 better performance in drought conditions than other Open Pollinated and Self Self Pollinated varieties and Arize 6444 Gold, PAC 837, NK 5251 higher yield performance (around 70 q/ha) than other self pollinated varieties in normal conditions.

MARKETING SYSTEM OF PRIVATE MILK COLLECTION AND DISTRIBUTION AGENCIES IN DISTT SAHARANPUR OF UTTAR PRADESH

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Abstract

India is the largest producer of milk in the world, accounts for around 17 percent of the total milk production of the world. In 2016-17 India produced around 165.4 million tonnes of milk which makes per capita availability of milk in India around 355 gm/day. In Saharanpur city milk collection and distribution by private agencies is totally depended upon dairymen of urban and urban periphery areas. This paper attempts to study about (i) the system of collection, containing., transportation, packaging, weighing/measurement, classification, grading, standardization and quality control of milk followed by various collection and distribution agencies, (ii) the production, marketable surplus and supply pattern of milk on different categories of dairymen in urban and urban periphery of Saharanpur, Uttar Pradesh, and (iii) marketing charges, purchase and sale price of different kinds of milk of various collection and distribution agencies.

MEASUREMENT OF DIELECTRIC CONSTANT OF SOIL OF KORBA DISTRICT IN CHHATTISGARH

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Abstract

Moisture content is very important parameter of soil. The parameter of soil affects the production of crops. For various moisture content at X-band frequency dielectric constant of soil collected from Korba district of Chhattisgarh have been measured. It has been observed that initially dielectric constant of soils increases slowly with increasing moisture content in the soil up to the transition moisture, after that it increases rapidly. Dielectric constant of dry and wet soils with various moisture contents at microwave frequencies from different empirical models and measured values are found to be agreement.

INDIGENOUS KNOWLEDGE SYSTEM FOR STORAGE OF SEEDS

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Abstract

Agriculture is the main occupation in India. More than 70.00 percent of the people depends on agriculture for their livelihood. In India grain production has steadily increased due to advanced technologies. But, a storage facility is the main problem in India. Post harvest loss is constant at 10.00 percent in agricultural crops and 15.00-20.00 percent in fruits and vegetables. Indigenous technical knowledge of farmer are developed based on experience, adopted to local culture and environment with objectives of minimizing risk and maximizing profit. Factors affecting storage are internal and external factors. Internal factors are variety of seed, quality of seed and moisture content of the seed. External factors are mainly environmental conditions like relative humidity, temperature, insect and micro-organisms in the storage area. Indigenous practices are eco-friendly and low cost to establish such practices are, sun drying, use of ash, Red soil coating method, plastering of storage bins with clay and cow dungs, storage of pulses with common salts, turmeric application method, use of camphor, use of garlic cloves, use of castor powder, sand mixture method, use of neem leaves and neem oil, Fumigation of the storage godowns, use of tulasi seeds and steeping or stamping method. So, it can be concluded that many of the indigenous practices find credibility



even in today's period. Moreover, their user-friendly approach, local availability associated with scientific reasoning provides enjoyment and satisfaction to the users.

EFFECT OF SEWAGE SLUDGE ON SOIL PHYSICO-CHEMICAL PROPERTIES AND GROWTH OF WHEAT

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Abstract

Sewage sludge is a rich source of plant nutrients like nitrogen, phosphorous, potassium, magnesium, iron, sulphur, etc. Sewage sludge is organic in nature which improves the physical and chemical properties of soil. The experiments were carried out to determine the effect of sewage sludge on soil physicochemical properties and growth of wheat. Sewage sludge was applied in different doses at the rate of 2.5, 5 and 10 kilogram/Plot to wheat crop. The samples were taken at the depth of 0-15 cm. Soil parameters, namely, pH, electrical conductivity, organic carbon (%), available nitrogen (kg/ha), available phosphorous (kg/ha) and available potassium (kg/ha) were studied in different treatments. The results showed significant effect of sewage sludge application on most soil properties. Application of sewage sludge increased soil nitrogen and phosphorous contents significantly in the soil. It was also reported that application of sewage sludge significantly affects the yield attributing characters and yield of wheat crop. It is concluded that the application of sewage sludge in agriculture field as a fertilizer may improve nutrient contents and crop growth.

MODIFIED PADDY STRAW MUSHROOM CULTIVATION TECHNIQUES – EXPERIENCES INNOVATIVE FARMERS OF JANJGIR-CHAMPA DISTRICT OF CHHATTISGARH IN THE CONTEXT OF DOUBLING THE FARMERS INCOME

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Abstract

The farmers of Janjgir-Champa district majorly cultivated a Paddy crop and also traditionally cultivated paddy straw mushroom especially in rainy season from month June to September. Also, the farmers are interested to cultivate commercially paddy straw mushroom, but the farmers adopted traditional method to grow paddy straw mushroom. Paddy straw mushroom also called as a 'straw mushroom' is a fungus of the tropics and subtropics and has been cultivated for many years in India. Paddy Straw Mushroom (*Volvoriella volvacea*) being the third most important cultivated mushroom in the world is well known for its pleasant flavour and taste. This mushroom has several advantages like requirement of the tropical or sub tropical climate, fast growth rate, easy cultivation technology and good acceptability at consumer's level. The raw materials required for its cultivation are also available in abundance in district janjgir-chjampa at very nominal rates. The high temperature requirements for its cultivation are also available makes it a good choice for adoption in round the year cultivation of mushrooms. Paddy straw mushroom contains good amount of protein, crude fibers and ash, all make it a healthy diet along with superior composition of various elements and essential amino acids. Although there is a big demand in Janjgir-Champa district and there was no proper method of cultivation since it needs high temperature (28-32 °C) and 85-90% relative humidity in the growing environment. The locally/naturally grown mushroom also called as "Futu" collected from the forest and directly sale in the market by village people. This mushroom nearly similar to paddy straw mushroom but the colour of both mushrooms are quit differ to each other, futu is milky white in colour and paddy straw mushroom black to grey in colour. Mushroom cultivation is one of the enterprises which have the vast potential to double the existing income level of farmers and this enterprise can easily be adopted by any category of farmers irrespective of their land holding size. Farmers need very less investment for paddy straw mushroom cultivation. The present study concluded that the improved technique of mushroom cultivation can be successfully used as compared with locally grown mushroom cultivation technique because by using this modified technique framers earn more money along with their traditional farming. It developed entrepreneurship



among the village people and generate self employment. The present study showed that by using modified techniques farmers will generate more income year after year with increasing yield of 40% in the year 2016-17, 60% in 2017-18 and 68% in the year 2018-19 respectively. The result is that farmers taking more interest for cultivation of paddy straw mushroom commercially.

EVALUATION OF IPM MODULES AGAINST SHOOT AND FRUIT BORER IN OKRA

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Abstract

Okra (*Abelmoschus esculentus*) locally known as 'Bhendi' or 'Dherosh' also known as lady's finger is a popular and most common annual vegetable crop grown from seed in Bangladesh and in other tropical and subtropical parts of the world. Several insect pests have so far been recorded to attack okra but okra shoot and fruit borer (OSFB), is the most destructive insect pest responsible for considerable damage inflicting yield loss up to 40-50 % or more. Now-a-days, IPM has been attaining immense importance in the agricultural scenario of India. Hence formulation of a sustainable IPM module was felt necessary. The experiment was conducted at Regional Horticultural Research and Extension Centre, Dharwad during khariff season of 2017-18 and 2018-19. There were 4 modules, M-I: Bio-intensive module, (100 % organic) : Azadirachtin 10000ppm@1.0mL, *Lecanicillium (Verticillium) lecani*@ 5g/L, *Bt* @ 1ml/L, *Beauveria bassiana* 5g/l. The treatments in the IPM module M-II comprised of Azadirachtin 10000ppm@1.0mL, *Lecanicillium (Verticillium) lecani*@ 5g/L, Chlorantrilipole 20 SC @0.25ml/L. M-III: Chemical module (100% chemical) : Azadirachtin 10000ppm@1.0mL Dimethoate @ 1.7ml/L, Thiamethoxam 25 WG @ 0.2g/L, Chlorantrilipole 20 SC @0.25ml/L. M-IV: POP : Quinalphos 25 EC @ 2.0ml/L. The percent fruit damage was observed and pooled analysis of 2017-18 and 2018-19 revealed that the percent mean shoot and fruit borer infestation fruiting phase was 9.49 in IPM module (M-II). The chemical module recorded significantly lesser fruit infestation. The IPM module recorded 14.14 tonnes/ha fruit yield with highest B:C ratio against shoot and fruit borer. Further, highest B:C ratio was recorded in M-II followed by M-III. Hence, M-I in comparison with M-II and M-III seemed to be a quite promising strategy as it did not require much insecticidal interference, reduced of insecticidal residue problem and safe to bees and natural enemies.

RESPONSE OF BITTER GOURD TO FOLIAR APPLICATION OF MICRONUTRIENTS UNDER NORTHERN ZONE OF KARNATAKA

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Abstract

Field experiment was carried out to study the effect of micronutrients on growth, flowering and yield of bitter gourd to explore the possibilities of enhancing the production of bitter gourd with better quality by foliar application of different micronutrients. Experiment was conducted during 2018 at University of Horticultural Science, Bagalkot, Regional Horticultural Research and Extension Centre, Dharwad, Karnataka. Fourteen treatments such as Boric acid (B) @ 100 ppm, Zinc sulphate ($ZnSO_4$) @ 100 ppm, Ammonium molybdate (Mo) @ 50 ppm, Copper sulphate ($CuSO_4$) @ 100 ppm, Ferrous sulphate ($FeSO_4$) @ 100 ppm, Manganese sulphate ($MnSO_4$) @ 100 ppm, Mixture of all without B, Mixture of all without Zn, Mixture of all without Mo, Mixture of all without Cu, Mixture of all without Fe, Mixture of all without Mn and Commercial formulation were imposed with three replications in randomized block design. The data on growth yield and quality attributes were recorded and were analyzed statistically. Among the treatments there is significant difference between treatments for yield. Maximum Fruit length (14.18 cm), Fruit girth (13.13 mm), average fruit weight (123.33 gm), Number of fruits per plant (20.45) and the mean yield was highest in (148.52 q/ha) were recorded in treatment application of Mixture of all (Boric acid + $ZnSO_4$ + $CuSO_4$ + $FeSO_4$ + $MnSO_4$ + Ammonium molybdate) @100ppm followed by treatment application of Commercial formulation (Multiplex @ 6ml/lit) recorded 142.78 q/ha under Dharwad conditions.



FISH BIODIVERSITY IN NANDESHWER DAM, UDAIPUR, RAJASTHAN

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Abstract

The study incorporates the fisheries potential of Nandeshwer dam in relation to current water quality status. The Nandeshwer dam has a rich fish fauna and so far 25 species representing 8 families have been recorded from dam. Out of which *Catlacatla*, and *Labiorohita* have dominated the catch of this dam.

ASSESSMENT OF GENETIC DIVERGENCE USING MAHALANOBIS D^2 IN TOMATO GENOTYPES (*SOLANUM LYCOPERSICUM* L.) UNDER SOUTHERN TELANGANA CONDITIONS

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Abstract

Collection and evaluation of genotypes of any crop is a pre requisite for any programme, which provides a greater scope for exploiting genetic diversity. The genetic divergence was studied among a set of twenty three genotypes of tomato (*Solanum lycopersicum* L.) for twenty four characters in *Kharif*, 2018. The lines/varieties differed significantly for all the characters. By using D^2 analysis, the twenty three strains were grouped into nine clusters. The intra cluster D^2 values ranged from 0.00 to 1795.01. Cluster IV had the maximum D^2 value (1795.01). Highest inter cluster generalized distance (20323.09) was observed between cluster IX and cluster V. Hence, the crossing between the types of these two clusters may result in the development of useful progenies. The characters, which are contributing maximum towards divergence, were average fruit weight contributed maximum (3873.52 %) towards divergence by 98 times followed by total soluble solids (1857.71 %) by 48 times whereas, membrane stability, number of flowers per cluster, root length, number of fruits per cluster did not contribute towards divergence.

GENETIC DIVERSITY ASSESSMENT FOR CANE YIELD AND JUICE QUALITY CHARACTERS IN SUGARCANE

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Abstract

Mahalanobis D^2 statistic is a powerful tool in quantifying the degree of divergence at genotypic level. The present investigation was conducted with 142 sugarcane genotypes along with five checks and two parental varieties to assess genetic diversity among clones. Based on the distances, all the 149 genotypes were clustered into 18 clusters. The cluster I was the largest with 110 clones falling under this cluster followed by cluster II with 17 clones and cluster IX with 7 clones. Clustering pattern reflected that considerable amount of genetic divergence was present among the clones under study. Cluster IX (34.57) recorded highest intra cluster D^2 values followed by cluster II (30.91) and cluster I (25.60). Maximum inter cluster D^2 value was observed between clusters XVI and XVII (222.90) followed by cluster XIV and XVI (186.32). Cane yield recorded maximum cluster mean for cluster XVII (138.62) followed by cluster II (110.97). For CCS yield maximum cluster mean was recorded for cluster XVII (24.14) followed by cluster II (21.26). The study also revealed that number of millable canes exerted the maximum contribution towards genetic divergence followed by germination per cent. PC-2013-14-180 (XVII), PC-2013-14-142 (XIV) and PC-2013-14-509 (XVIII) were identified as potential donors for cane yield characteristics. PC-2013-14-376 belonging to cluster XIII was identified as most promising clone as it has high mean value for nine cane yield as well as juice quality characters namely germination per cent, number of tillers, number of millable canes, brix per cent, polarity per cent, sucrose per cent, purity per cent, CCS per cent and CCS yield. These clones could be utilized as potential donors owing to high values for desired character and these clones are from different cluster having a sufficient level of inter-cluster divergence. Hence, these donors could be intercrossed as parents for future breeding programmes to generate clones having greater variability and potential for cane yield with higher sucrose content.



EVALUATION OF VEGETABLE AMARANTH (*AMARANTHUS TRICOLOR* L.) GENOTYPES FOR YIELD AND YIELD ATTRIBUTING TRAITS

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Abstract

A set of 27 genotypes comprising of 25 germplasm lines and two checks of amaranthus (*Amaranthus tricolor* L.) were evaluated in a Randomized Block Design with three replications at College of Horticulture, Rajendranagar, Hyderabad for nineteen characters so as to identify the horticulturally superior genotypes for leaf production and quality. The analysis of variance revealed highly significant differences among the genotypes for all the 19 characters. On the basis of mean performance of the genotypes, five genotypes viz., IC-522214, IC-536718, IC-536712, IC-536699 and IC-536728 have been identified as promising genotypes with reference to the characters viz., leaf length, leaf width, leaf area index, leaf weight per plant, total foliage yield per plant, total chlorophyll content, protein content, ascorbic acid, moisture content, iron content and folic acid. The present study reveals that the genotypes identified should be considered as the promising genotypes and can be used as parental source in breeding programmes for multi-trait improvement.

FIRST REPORT OF FALSE HEAD SMUT (*USTILAGINOIDEA VIRENS*) OF MAIZE FROM MAHARASHTRA

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Abstract

Incidence of false smut disease was noticed on maize crop in Nadurbar district of Maharashtra state during October, 2018. The fungus infected male florets in the tassel at flowering stage and florets were converted in large, velvety, green balls (Pseudomorphs) which were more than twice the diameter of normal florets. The ball surface was covered by powdery dark-green chlamydospores, conidia and mycelia. Microscopic observations revealed that, conidia were round to elliptical with rough surface and 3-6 μ m in diameter. The pathogen was identified as *Ustilaginoidea virens* (Cooke) Takahashi. Though, the disease is minor, it may cause heavy reduction in the production of pollens from individual tassel. A perusal of literature revealed that, this is the first report on occurrence of false head smut of maize [*Ustilaginoidea virens* (Cooke) Takahashi] from Maharashtra.

AVOIDANCE OF AGRICULTURE AS A PROFESSION BY THE FARMER OF NORTH SAURASHTRA AGRO CLIMATIC ZONE

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Abstract

Agriculture is the mainstay of Indian economy where in a tone of grave respect refers to the farmer as the anna data, the provider of grain. This is because in India, agriculture has been the life and the means of sustenance for the majority of the people. Even today, more than half of the country's population is directly and indirectly depends on agriculture. Through the centuries, the farmers have been the backbone of the country and yet today, in spite of being in the majority, the farmers in India are in dire straits. What's more, their living options and conditions are getting from bad to worse. Hence the present investigation entitled "Avoidance of agriculture as a profession by the farmer of North Saurashtra agro climatic zone" was envisaged with following objectives: profile of respondents, attitude of respondents towards avoiding of agriculture as a



profession, relationship between attributes of respondents and their attitude, factors related for avoidance of agriculture, sustainability of agriculture as a profession and suggestion of the respondents. In order to realize the objective of the study, 160 respondents were selected from 16 different villages of 4 talukas of Jamnagar and Rajkot district North Saurashtra agro climatic zone by applying multistage random sampling technique. The majority (63.13 per cent) of the farmers had medium attitude towards avoidance agriculture as an occupation, followed by 23.13 per cent of them had low, 10.63 per cent of them were with high and 03.12 per cent of the farmer very low attitude towards avoidance of agriculture as a profession, while none of them was with very high attitude towards avoidance of agriculture as a profession. There was positive and highly significant relationship between education and risk orientation and their attitude and also positively and significant relationship between occupation, social participation, mass media exposure and achievement motivation and their attitude. The characteristics of the respondents like type of family, size of family, annual income, land holding and economic motivation were non-significant and age self confidence were negatively significant associated with the attitude towards avoidance of agriculture as a profession. Among the total eight categories related to avoidance of agriculture as a profession descending order of rank were; economical, situational, personal and social, marketing, environmental, psychological, technological; and governmental. About 64.38 per cent of the respondents had medium level sustainability of agriculture as profession. The considerable amount (19.37 and 16.25 per cent) of respondent was in low and high sustainability group. Major suggestions from the respondents to attract new generation toward agriculture in sequential order were: support price of the production should be higher, chemical fertilizers, insecticides and fungicides should be provided at reasonable rates and farmer should be protected by crop insurance during crop failure by pest.

VARIABILITY STUDIES FOR GROWTH, YIELD AND QUALITY CHARACTERS OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL.)

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Abstract

Tomato [*Lycopersicon esculentum* Mill.] being an under exploited vegetable has a wide range of variability. Exploitation of hybrid vigour provides ample scope for improving the genetic architecture of tomato. The study material comprised of genetically diverse thirteen tomato genotypes, which were evaluated in randomized block design. The genotypes were evaluated on the basis of plant height, number branches, days to 50% flowering, number of trusses per plant, number of flowers per cluster, number of fruits per truss, number of fruits per plant, leaf area index, marketable yield, average fruit weight, equatorial and polar diameter of fruit, number of locules per fruit, pericarp thickness of fruit, total soluble solids, acidity, ascorbic acid content, chlorophyll a:b ratio, test weight of seed and days to first harvest, which differentiate the tomato genotypes. Analysis of variance studies indicated a significant difference among all the genotypes for all the characters under study. Genetic variability studies showed high PCV and GCV values for number of branches per plant, pericarp thickness and acidity indicating that a greater amount of genetic variability was present for these characters. High heritability coupled with high genetic advance as per cent of mean was observed for marketable yield, days to 50% flowering, plant height at 90 days after transplanting, number of fruits per plant, number of branches per plant, total soluble solids number of locules per fruit, which indicated that these traits were under the strong influence of additive gene action.

IN-SILICO STRUCTURE PREDICTION AND FUNCTIONAL CHARACTERIZATION OF IRT2 GENE RESPONSIBLE FOR IRON TRANSPORT IN PEARL MILLET [*Pennisetum glaucum* (L.) R. BR.]

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Abstract

Micronutrient deficiency, especially of iron is the most common nutritional deficiency worldwide and an important public



health concern particularly in developing countries. Pearl millet is an important staple food crop grown in semi-arid regions of India and Africa, where iron deficiency is widespread whose biofortification can desirably alleviate the problem of malnutrition. Thus, identification and validation of candidate genes governing grain Fe content in pearl millet is of prime interest for desirably modifying the genotypic performance. The present study aimed at identification and prediction of three-dimensional structure of iron transport protein in response to iron transport through homology method of protein modelling. Orthology analysis of *IRT2* (Iron Regulated Transporter) gene from rice against pearl millet reference genome (Tift23D2B1) is identified as putative candidate gene responsible for enhancing iron transportation in pearl millet. Homology modelling approach was employed in order to derive structures for these proteins. A program meant for comparative modelling phyre2 was utilized for the purpose. The phyre2 proteins were further validated by PDBsum (Pictorial database of 3D structures in the Protein Data Bank) and Verify-3D. Amino acid composition, polarity, physico-chemical and functional characterization of these proteins was determined by ExPASy's Prot-param tool. Studies of secondary structure of these proteins were carried out by computational program, Accelrys DS visualize was used to visualize and analyse these homology derived structures.

SOIL QUALITY FOR RICE-WHEAT PRODUCTIVITY AND YIELD SUSTAINABILITY UNDER LONG-TERM FERTILIZER AND MANURE APPLICATION IN VERTISOL

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Abstract

Productivity and sustainability of rice-wheat cropping system depend upon the soil quality which is primarily governed by application of fertilizers and manures. However, such information is limited and hence, the present investigation was carried out in a 17-year-old long-term fertilizer experiment at IGKV, Raipur Chhattisgarh. There were ten treatments Control, 50% NPK, 100% NPK, 150% NPK, 100% NPK + Zn @ 10 kg ha⁻¹, 100% NP, 100% N, 100% NPK + FYM @ 5 t ha⁻¹, 50% NPK + BGA, 50% NPK + GM laid out in randomized block design with four replications. Indicators of soil quality (physical, chemical, and biological) were diagnosed from many soil properties measured on the winter wheat soil and soil quality was assessed taking productivity and sustainability of dry season rice as goal functions. Results revealed that the highest productivity and sustainability of both season was found with application of 100% NPK + FYM followed by 150% NPK and lowest in control. This treatment, in general, showed better physical, chemical, and biological properties than rest of the treatments. The highest soil quality index (SQI) was recorded in 100% NPK + FYM treatment followed by 150% NPK. For yield sustainability in both season, highest yield was found in 100% NPK + FYM followed by 150% NPK and lowest in control. Therefore, these soil properties could be used to monitor soil quality and sustainability of soil. Application of FYM along with 100% NPK could sustain the productivity of dry and wet season by improving soil properties under rice-wheat cropping system.

ROLL OF MOISTURE CONTENT OF WHEAT ON PARTICLE SIZE DISTRIBUTION OF FLOUR FROM HAMMER MILLING

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Abstract

Wheat is the main cereals crop of India. India is the second largest producer of wheat in the world, with production covering around 68-75 million tons for past few years. The latest estimated demand for wheat production for year 2020 is approximately 87.5 million tons. A study was undertaken to obtain average particle size of wheat flour when milled at different moisture content in hammer milling. The average particle size obtained on milling by hammer mill using screen having round opening of 0.21 mm at 13%, 14%, 15%, 16% and 17% moisture content (db) was found to be 0.2233, 0.2326,



0.2393 and 0.2324 mm respectively. Average particle size on hammer milling by using screen having opening of 0.25 mm was found to be 0.3142, 0.2401, 0.3046, 0.3052 and 0.3035 mm for 13%, 14%, 15%, 16% and 17% moisture content (db) moisture content of wheat sample respectively. Average particle size on hammer milling using screen having 0.3 mm was found to be 0.2473, 0.2516, 0.2487, 0.3106 and 0.2918 mm for 13%, 14%, 15%, 16% and 17% moisture content (db) moisture content of wheat samples respectively. The finding of this study may be helpful in better milling quality of wheat under different areas milling. This work also provides idea about uniformity of flour particle size at given moisture content. The result may also be helpful for careful milling of wheat at different moisture contents.

INTEGRATED DISEASE MANAGEMENT OF FUSARIUM WILT OF LINSEED (*LINUM USITATISSIMUM* L.) CAUSED BY *FUSARIUM OXYSPORUM* F. SP. *LINI* (BOLLEY) SNYDER AND HANSEN

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Abstract

Linseed is an important oil seed crop in India popular among the farmers due to its technical grade vegetable oil and medicinal uses. Linseed wilt is caused by *Fusarium oxysporum* f.sp. *lini*. The pathogen was reported by Luggar (1890) and it has a wide host range causing severe damage to linseed crop. Wilting of linseed appears on leaves at all the growth stages of the plant but often appears in the early reproductive stages. A survey of Linseed wilt was conducted at Nawabganj Farm of CSAUAT, Kanpur and at farmers' field near Kanpur during Rabi season of the year 2016-2017, in which the linseed crop was found moderately to severely affected with wilt disease. The isolated fungus, *Fusarium oxysporum* f.sp. *lini* produced velvety white to very pink coloured colony. The morphological studies revealed that the mycelium was septate, branched and intra cellular forming a thin stroma whereas the conidia were hyaline, single celled, falcate or sickle in shape. The *in-vitro* evaluation of bio-agents revealed that *T. harzianum* had maximum inhibitory effect on the pathogen growth as compared to *T. viride*, *Pseudomonas fluorescence* and *Bacillus subtilis*. Out of 336 germplasm that were screened for resistance against the pathogen, 25 germplasm were found to be resistant, 55 genotypes fell in moderately resistant category, 105 genotypes were moderately susceptible, 88 susceptible and rest 63 were found to be highly susceptible. In the *in-vitro* evaluation of different fungicides against *Fusarium oxysporum* f.sp. *lini*, Carbendazim, Metalaxyl+Mancozeb, Carboxin+Thiram, Thiophanate methyl and Tricyclazole at 1000 and 1500 ppm, completely inhibited the growth of the pathogen. Copper oxy chloride at 1000 ppm concentration was found to be least effective and Saltaf, Chlorothalonil, and Mancozeb were at par. A pot experiment was conducted for integrated disease management by FYM, Chemicals and Bio agents as seed and soil treatments in which the soil treatment with *Trichoderma harzianum* at 5 per cent concentration was found to be most effective in reducing disease incidence (5.55%).

INTEGRATED DISEASE MANAGEMENT PACKAGE FOR TOMATO WILT CAUSED BY *FUSARIUM OXYSPORUM* F. SP. *LYCOPERSICI*

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Abstract

Tomato is one of the most important vegetable crops grown throughout the world. The crop is attacked by a number of diseases which cause huge amount of crop loss. Fusarium wilt incited by *Fusarium oxysporum* f.sp. *lycopersici* (Snyder and Hans) is one of the world's most catastrophic diseases of tomato. An *in vitro* investigation of two bio-agents viz. *T. harzianum* and *T. viride*, three plant extracts viz., *Azadirachta indica* (Neem), *Allium sativum* (Garlic), *Allium cepa* (Onion) at 5 and 10 per cent, and four fungicides viz., Carbendazim, Topsin M, Mancozeb and Thiram at 100, 150, 200 ppm concentrations, was carried out. Among the two bio- agents, most effective was *T. viride* which exhibited 25.98 per cent inhibition followed by *T. harzianum*. Out of the three plant extracts tested against *Fusarium oxysporum* f.sp. *lycopersici*, *Azadirachta indica* @ 10% was found to be the most effective plant extract which exhibited maximum percent inhibition (71.72%) followed by *Allium*



sativum @ 10% (59.25%). Among all the fungicides and their concentrations, the maximum inhibition of pathogen growth was observed with Carbendazim at 200ppm concentration (85.08%) which was statistically at par with Mancozeb (83.98%). However, Topsin M showed minimum response in inhibition of mycelial growth of pathogen. A pot experiment was conducted in the glass house, Dept. of Plant Pathology, CSAUAT, Kanpur for the integrated disease management of tomato wilt. Among the various treatments, the treatment T₃ (soil application of FYM @ 300 gm /pot + neem cake @100 gm + seedling treatment of *Trichoderma harzianum* + foliar spray carbendazim @0.1%) not only recorded maximum plant height, root length, fresh weight of the tomato root, branching pattern enhancement of the root and maximum tomato yield but also recorded least wilt incidence at 7,14 and 21 days (6.35%,9.90%,11.78% respectively). Therefore this treatment was regarded as the best strategy for the management of Tomato wilt.

BIODEGRADATION OF INSECTICIDE BY MICROBIAL STRAIN ISOLATED FROM INSECTICIDE APPLIED FIELD

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Abstract

It has been recognized that excessive use of pesticides is harmful to the ecosystem, affecting soil fertility as well as imparting toxicity to living humans. Physical, chemical, biological and enzymatic methods have been presently involved in reducing pesticides. Physical and chemical techniques are inefficient, although they are intended to eradicate. Curiously, remediation of microbial pesticides has been cost-effective and thermodynamically more accessible, which could use any soiled pesticide physical material. Different kind of beneficial microorganisms are isolated from insecticide contaminated soil and are used as a bioremediation agent. Microbes were revealed to use pesticides as a source of carbon, sulfur and electron donor under favorable circumstances. Microbes; bacteria, and actinomycetes have been isolated to aid in the removal or detoxification of chlorinated pesticides; polychlorinated diphenyl, polycyclic aromatic hydrocarbons, organophosphorus. Major bacterial genera includes; *Bacillus*, *Pseudomonas*, *Flavobacterium*, *Moraxella*, *Acinetobacter*, *Arthrobacter*, *Paracoccus*, *Aerobacter*, *Alkaligenes*, *Burkholderia* and *Sphingomonas*. It includes : *Fusarium*, *Aspergillus niger*, *Penicillium*, *Lentinula edodes*, *Lecanicillium*, *Oxysporum*. The streptomycetes were discovered among the actinomycetes to effectively detoxify pesticides. Microbial enzymes viz; Dehydrogenase, ligninase, oxygenase, peroxydises, phosphotriesterase, hydrolase and organophosphorus acid anhydrolase were reported to take care of persistent organic pollutants in the form of pesticides.

NORMALIZED CUMULATIVE RANKS : A NEW NON-PARAMETRIC ANALYSIS OF SOME WHEAT (*TRITICUM AESTIVUM* L. EM THELL) VARIETIES.

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Abstract

The present study was carried out at the center for research and development, Gaunar Usaraha, Gorakhpur, Uttar Pradesh during Rabi season 2016-17. The experiment was conducted in randomized block design comprising in three replications. There was 8 genotypes along with standard checks with nine parameters were recorded. The objectives of the experiment was to identify yield gaps as well as to evaluate germplasm collection for various important characters, to study the nature and magnitude of genetic variability for important characters, to do normalized cumulative rank analysis and to find out the top four performing wheat genotypes compared to check varieties. The materials and the methods used during the course of present investigation was ranking method with a non parametric statistical analysis (Normalized cumulative ranks method) procedure. The proposed NCR considered all the nine parameters and gave an ordered list of genotype. Each parameter was given due consideration and a normalized cumulative rank for each genotype was calculated. The cumulative ranks could be normalized in any desired way either by minimum, maximum (Directional selection) or mid values (stabilizing selection). The parameters needing further attention for the improvement in desired genotypes were identified. On the basis of rank



performance of eight genotypes for nine characters were presented very wide range of variation in ranks of genotypes was observed for all the nine characters under study. The comparison of mean performance of genotypes for nine parameters using ranks revealed existence of very high level of variability in the wheat genotypes evaluated in the present study. On the basis of the experiment it could be concluded that the preference order of the examined wheat varieties is HD-2967, PBW-677, PBW-660 and WH-711. PBW-343 is very popular variety in this region, however gradually its performance declined compared to other varieties. Hence, it is being replaced by better one. Thus we could say these top four varieties should be recommended for cultivation to the farmer of this area.

PERFORMANCE EVALUATION OF ANIMAL DRAWN MULTI-CROP PLANTER FOR INTERCROPPING OF SELECTED CROPS

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Abstract

The intercropping is “growing two or more crops simultaneously on the same field. To provide assistance to the small and marginal farmers in taking up intercropping practices followed in Chhattisgarh region, a study was undertaken to evaluate the performance of an animal drawn multi-crop planter for intercropping. This will help in mechanization of small and marginal farms in the aspect of intercropping as still traditional method of operation is being practiced in this region. The study was conducted at research field of SV College of Agricultural Engineering & Technology, IGKV, Raipur during Rabi 2018. Results showed that average speed of operation, draft, power, actual field capacity and field efficiency of the developed implement were recorded as 1.89 km/h, 41.71 kgf, 0.22 kW, 0.28 ha/h and 84.68 % respectively. The developed implement was tested for different sets of intercropping viz., Wheat and Mustard, Wheat and Black gram and Linseed and Coriander. The developed implement was tested in laboratory and field, the velocity ratio was kept at 2.1:1. In laboratory the seed rates observed for selected seed viz. wheat (four rows), mustard (single row), black gram (single row), linseed (three row) and coriander (two row) were 53.77, 0.98, 3.50, 18.10 and 8.02 kg/ha respectively, similarly in field condition the seed rates were 54.43, 1.87, 4.46, 19.75 and 10.15 kg/ha respectively. The observed values for missing index, multiple index, mechanical damage, and plant to plant spacing were 0 %, 10 %, 0.53 % and 14.2 cm, respectively for wheat; 10%, 5%, 0.30% and 9.11 cm respectively, for black gram; 0 %, 10%, 0.30% and 7.06 cm, respectively, for coriander; 0 %, 15 %, 2 % and 4.61 respectively, for linseed. The developed implement take 3.57 h to cover a hectare of land. The cost of implement was Rs. 12,500 and cost of operation was found to be 271 Rs /ha. The intercropping patterns of mustard with wheat crop may produce good yield, higher LER. Among the various inter cropping system tested, the data indicate that wheat + mustard, Line seed + coriander and wheat + Black gram in 4:1, 3:2 and 4:1 of row ratio recorded significantly higher land equivalent ratio (LER) of 1.30, 1.74 and 1.14 followed by respectively. These LER indicate 30 percent 74 percent and 14 percent more land would be needed to produce a given amount of each of the two crop components in pure stands as in mixtures.

ENERGETICS AS INFLUENCED BY WEED CONTROL PRACTICES IN RAINFED COTTON

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Abstract

Energy balance of the weed control options adopted in rainfed cotton were studied in an experiment conducted at College farm, PJTSAU, Hyderabad, Telangana State during *kharif*, 2017 in red and black soils. The treatments included on the experiment were three doses of Diuron (0.5, 0.75 and 1.0 kg ha⁻¹), pendimethalin 38.7% CS at 677 g ha⁻¹ as PE followed by sequential application of pyriproxyfen sodium 10% EC 62.5 g ha⁻¹ + quizalofop p ethyl 5% EC 50 g ha⁻¹, intercropping of cotton with green manure crop (Sunhemp), mechanical weeding thrice at 20, 40 and 60 DAS (weed free), polymulch and unweeded control in RBD design which was replicated thrice. The energy balance studies were determined by using direct and indirect energy. Among soil types, higher energy input was recorded in black soil when compared to red soils. The difference in energy input in both soil types was due to higher fuel consumption for land preparation in black soil. Polymulch recorded highest energy in both the soils which might be due to the energy required for the production of polymulch. This was followed by diuron 1.0 kg ha⁻¹ PE + pyriproxyfen sodium + quizalofop p ethyl PoE, mechanical weeding thrice in red and black soils.



Highest kapas energy output (EOk) was observed in polymulch and mechanical weeding which was followed by diuron 1.0 kg ha⁻¹PE fb pyriithiobac sodium + quizalofop p ethyl PoE in red soil, whereas in black soils, diuron 0.75 kg ha⁻¹PE fb pyriithiobac sodium + quizalofop p ethyl PoE followed polymulch and mechanical weeding treatments. EUE of both kapas and total output was significantly higher in diuron 1.0 kg ha⁻¹PE fb pyriithiobac sodium + quizalofop p ethyl PoE in red soil. While in black soil, significantly highest EUE of kapas and total output was recorded in diuron 0.75 kg ha⁻¹PE fb pyriithiobac sodium + quizalofop p ethyl PoE. Significantly highest EP of both kapas and total output was reported with diuron 1.0 kg ha⁻¹ and mechanical weeding thrice (0.15, 0.46 respectively) which were significantly superior over other treatments in red soil. Significantly higher EP of both kapas and total output was registered by diuron 0.75 kg ha⁻¹fb pyriithiobac sodium + quizalofop p ethyl (0.18, 0.48 respectively) and mechanical weeding thrice (0.17, 0.45 respectively) in black soil.

POTENTIAL OF RICE BRAN OIL AND VALUE ANALYSIS OF RICE BRAN LECITHIN

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Abstract

Rice is a major cereal crop cultivated globally. Rice (*Oryza sativa* L) is grown over vast areas of land around the world and is a major staple food for more than half the world population (juliano, 1985). The Asian continent accounts highest (90 %) rice production and is also the major consumer. Rice bran, a by-product from rice milling, is mainly used as animal feeds because of the rapid hydrolysis of oil into free fatty acids. The biochemical instability of rice bran occurs immediately after milling. Rice bran is rich in natural antioxidants. In Durg, Chhattisgarh Kamal Solvent Pvt. Ltd. and Shree Seeta Refinery Pvt. Ltd. Were selected for in-depth analysis of rice by products, identify and analyze the value of rice bran and there By-product's along with identification of their benefits and opportunities in future and there uses of human life. In milling rice bran edible oil is produced as the main product and de-oiled rice bran, gum, free fatty acid, wax, and splint earth are also produced as by-products. The phospholipids in crude RBO is a major problem during processing of the oil in various food applications this Phospholipids is used to making lecithin. It has been founded that water degumming process is suitable for the safe removal of hydratable phospholipids (NHPL). The lecithin is very efficient ingredients for cosmetic, anti-dusting agent, nutritional supplements and soap making purpose. There is a huge unmet demand of rice bran edible oil chemical by-products especially lecithin for producing nutritional supplements & soap, but the country are not aware about the rice bran lecithin products.

IMPACT OF DIVERSIFICATION OF UPLAND RICE WITH MAIZE, PULSES AND VEGETABLES IN TRIBAL AREA OF CHHATTISGARH PLAIN

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Abstract

Paddy cultivation is one of the most important food crops of India and is second largest producing country after china in the world. As the rice is the major crop of the Chhattisgarh state, it is also known as the "rice bowl" of the country . In Chhattisgarh, rice occupies average of 3.6 million ha. with the productivity of the state ranging between 1.2 to 1.6 t/ha depending upon the rainfall. Chhattisgarh receives pretty decent amount of rainfall with an average of 1292 mm and is the main source of irrigation in rice. A significant variation in the annual rainfall adversely affects the yield of rice specially under rainfed upland situation .The upland areas where rice is grown, constitute about 15-20% of the total cultivated area. Rice grown in these lands normally are not being irrigated through canal or other sources. The crops invariably suffer due to moisture stress in one stage or the other. The average productivity of rainfed rice is very far below the national average and very poor in upland rainfed situation. Maize is an exciting and leading crop contributing significantly to world agriculture and more importantly to world's food basket. In Chhattisgarh, maize is a *kharif* season crop and second most important crop next to paddy in terms of both area and production. In view of above the study was undertaken to diversify upland paddy with maize, pulses and vegetables under rainfed upland situation in tribal area of Chhattisgarh plain. The demonstrations were conducted to assess the maize and different pulses in upland rainfed situation in adopted village i.e., Kaudikasa, Muretitola, Arajkund, Netamtola and Bhagwantola of Ambagarh Chowki block, Rajnandgaon, district of Chhattisgarh during the year 2017-18 under the farmers first project funded by Indian Council of Agriculture Research, New Delhi to diversified upland rainfed rice. The average yield and net return from maize were 28.50 q/ha and Rs. 20500/- per ha under demonstration higher



than that of average yield of upland rice 17.07 q/ha and Rs.7600/- per ha. Pulses urd and arhar demonstrated under study also gave higher yield and net return under rainfed upland situation i.e., 5.41 and 6.92 q/ha and Rs. 8923/- and Rs. 18617/- per hectare. Vegetable i.e., okra and cowpea gave 87.70 and 110 q/ha. yield with net return of Rs 25460/- and Rs. 54400/- per ha . Thus the diversification of upland rice with maize, pulses and vegetables were very remunerative and nutritionally secured for livelihood security of tribal farming community in Chhattisgarh plain.

CORRELATION AND PATH ANALYSIS STUDIES IN TOMATO

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Abstract

Thirteen genotypes of tomato were evaluated under semi-arid and subtropical climatic conditions in the Research Farm and Laboratory of the Department of Vegetable Science, CCS Haryana Agricultural University, Hisar during spring-summer season of the year 2017-18. Analysis of variance studies indicated a significant difference among all the genotypes for all the characters under study. High heritability coupled with high genetic advance as percent of mean was observed for marketable yield, days to 50% flowering, plant height at 90 days after transplanting, number of fruits per plant, number of branches per plant, total soluble solids and number of locules per fruit. The total yield per plant had positive and highly significant correlation with number of branches per plant, number of flowers per cluster, number of trusses per plant, number of fruits per truss, number of fruits per plant, average fruit weight, number of locules per fruit, ascorbic acid and days to first harvest. It indicated that the improvement in these traits leads to increase in total yield. The highly positive direct effect on total yield was shown by the characters leaf area index, number of flowers per cluster, number of trusses per plant, number of fruits per truss, polar diameter of fruit, pericarp thickness of fruit, total soluble solids, chlorophyll a:b ratio and days to first harvest, suggested that direct selection based on these characters would result in higher breeding efficiency for improving the yield in tomato.

ROLE OF PARTICIPATORY RURAL APPRAISAL FOR AGRICULTURAL PLANNING IN NAGALA BAL SINGH VILLAGE OF ETAWAH

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Abstract

Participatory Rural Appraisal (PRA) is the most effective tools which can be utilized to understand the technology adoption profit of the farming community and to get the first hand information about the needs, resources available, priorities, problems and prospects of the farming community.. Main thrust should be given on critical assessment of the available technologies in term of local farmers' natural and socio economic situations. It is approach which emphasizes rural knowledge and enables rural people to take their own appraisal, analysis and plans to take action. PRA uses group exercises to share information, analysis and action among stakeholders. This process helps understanding the technology dissemination process, rural development activities, linkage mechanisms existing among research, training and extension, credit and input supply systems etc. PRA was carried out by a multidisciplinary team of scientist in the village Nagala Bal Singh of Etawah district of Uttar Pradesh. It is located approximately 38 km. away from Krishi Vigyan Kendra, Etawah. The Agro climatic is south western semi arid zone with extreme summer and winter. Triangulations- Different methods were used for data collection to ensure objectively of data. These methods are briefly discussed here. On the spot visualization, personal and group interview, Key information interview, Secondary data source, Semi structured interview and Cartographic representation or mapping. To study was conducted with the objective- To analyze the agricultural problems and prospects with reference to the local resource base, agro-ecology, technology dissemination planning and adoption for improvement of the socio-economic status of the villages. On the basis of PRA survey, Lack of quality seed according to demand and locally. (i) Non availability of labour (ii) Weed infestation (iii) Non timely supply of water in canal and electricity (iv) Lack of awareness among the farmers regarding the innovative agriculture technology (v) Non availability of fertilizers, chemicals at timely and locally (vi) Problem to animals from crop (vii) Problems milk sale at higher rate (viii) Lack of ponds/watershed (ix) Degradation in soil health day by day (xi) Average production less day by day (xi) Problem of market which give higher profit. Venn diagram describes



working of organization in the village and their relationship with regards to overall development and welfare of the village people. District Head quarter have ranking I followed by organization of KVK. But, horticultural/vegetables crops can be grown in the village with available of market at local level because area of guava crop are much better in the surrounding of the village with more fertile land and guava market channel available.

MILLETS AS CLIMATE CHANGE COMPLIANT CROPS

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Abstract

Millets are small-seeded grasses that are hardy and grow well in dry zones as rain-fed crops, under marginal conditions of soil fertility and moisture. Millets are also unique due to their short growing season. Millets are all-season crops cultivated round the year. Whereas wheat is season specific. While wheat and rice might provide only food security, millets produce multiple securities (food, fodder, health, nutrition, livelihood and ecological) making them the crops of agricultural security. All these qualities of millet farming system make them the climate change portends less rain, more heat, reduced water availability and increased malnutrition. If there is any cropping system that can withstand these challenges, survive and flourish, it is the millet system. Since they are already capable of growing under drought conditions, they can withstand higher heat regimes. Millets grow under non-irrigated conditions in such low rainfall regimes as between 200 mm and 500 mm. Thus, they can also face the water stress and grow. Each of the millets is a storehouse of dozens of nutrients in large quantities. They include major and micro nutrients needed by the human body. Hence they can help people withstand malnutrition. Due to all the qualities mentioned above, Millets remain our agricultural answer to the climate crisis that the world is facing.

RESPONSE OF WHEAT (*TRITICUM AESTIVUM* L.) VARIETIES FOR SALT STRESS AT REPRODUCTIVE STAGE BY PHYSIO-MOLECULAR APPROACHES

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Abstract

An experiment was conducted with six wheat varieties RAJ-4463, KRL-213, KA-1508, WH-1316, KRL-370 and HD-2967 for identification of salt tolerance at reproductive stage. Salt treatment was given by sowing in saline soil so that wheat varieties could experience severe salt stress at reproductive stage. The pH and EC of the field soil was 9.4 and > 4mmhos respectively. Agronomic practices were followed as per recommendation for wheat crops in saline soil. Wheat varieties were screened on the basis of membrane stability index (MSI), chlorophyll stability index (CSI), relative water content level (RWC), salt susceptible index (SSI) and salt tolerant index (STI) at reproductive stage. KRL-213, KRL-370 and WH-1316 had high MSI, CSI, RWC, SSI and STI as compare to RAJ-4463, KA-1508 and HD 2967. Na⁺/K⁺ ratio were recorded for assessing genetic variability for salt tolerance after seven days treatment. Out of six varieties KRL-213, KRL-370 and WH-1316 had low Na⁺/K⁺ ratio as compare to RAJ-4463, KA-1508 and HD-2733. Therefore, MSI, CSI, RWC, SSI, STI and Na⁺/K⁺ ratio can be used as major criteria for salt tolerance in wheat.

EFFECT OF GERMINATION TIME ON PROXIMATE COMPOSITION OF LEGUMES

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Abstract

The legumes belongs to the family *leguminosae* and subjected to various processing techniques such as soaking, germination, boiling, autoclaving, fermentation and other processing methods prior to consumption. Germination is simple and inexpensive process which improves the palatability, digestibility and availability of certain nutrients. The purpose of the current study was



to investigate the effects of germination for 6, 12 and 18 hours on proximate content of legumes (green gram, moth bean, chickpea and lentil). Legume grains were soaked in distilled water for overnight (12h) at room temperature ($\sim 25^{\circ}\text{C}$), then kept in incubator for 6, 12 and 18 hours for germination, respectively. The proximate content of unprocessed and germinated legume samples were determined using standard official procedure (AOAC). The moisture, crude protein, fat, crude fibre and ash content in unprocessed legumes were between the range of 7.04 to 9.28, 17.43 to 21.93, 1.02 to 2.87, 2.83 to 4.12 and 2.78 to 3.69 g/100g, respectively. The crude protein content of all the legumes increased significantly ($P=0.05$) after 6h of germination, being highest in chickpea (20.13%) followed by moth bean (8.39%), green gram (6.50%) and lentil (4.87%). Further, 12 h of germination brought about a significant ($P=0.05$) increase in crude protein content of all legumes. The per cent increase in crude protein content was highest in chickpea (29.94%) and the lowest in lentil (13.49%) at 12h germination. As the germination time was increased to 18h, the crude protein content increased in all legumes upto the extent of 20.06 to 42.79 per cent and the values were 26.52, 26.71, 24.89 and 26.33 g/100g in green gram, moth bean, chickpea and lentil, respectively. The crude protein content of all the legumes was higher at 18h of germination in comparison to 6h and 12h of germination. Likewise moisture and crude fibre content of legumes also increased significantly ($P=0.05$) after 6, 12 and 18h of germination, whereas fat and ash content decreased after each germination period. Based on these results, germination process is recommended to improve the nutritive value of legumes.

CORRELATION BETWEEN ASPECTS OF QUALITY OF LIFE AND HEALTH STATUS AMONG WIDOW ELDERLY WOMEN

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Abstract

The study was conducted in five cultural zone of Haryana state. For the rural sample 400 widow elderly women of age group 60-75 years were selected. Quality of life scale developed by World Health Organization (1997) was accessed to quality of life of widow elderly women. The questionnaire short form-36 health survey by Mchorney (1993) was used to assess the perceived health status of elderly women. Clearly shows that relationship between aspects of health status and quality of life among widow elderly women. Physical aspects of quality of life was positively significantly correlated with vitality ($r=0.13^{**}$, $p<0.01$), body pain ($r=0.39^{**}$, $p<0.01$), physical role functioning ($r=0.23^{**}$, $p<0.01$), mental health ($r=0.10^{*}$, $p<0.01$) negatively significantly correlated with general health perception ($r=-0.17^{**}$, $p<0.01$) and emotional role functioning ($r=-0.28^{**}$, $p<0.01$). Psychological aspects of quality of life was positively significantly correlated with physical functioning ($r=0.13^{**}$, $p<0.01$) and body pain ($r=0.10^{*}$, $p<0.05$). Another aspects social relationship of quality of life was negatively significantly correlated with physical functioning ($r=-0.18^{**}$, $p<0.01$), body pain ($r=-0.12^{**}$, $p<0.01$) and social role functioning ($r=-0.11^{**}$, $p<0.01$). Physical role functioning, Emotional role function was negatively correlated with ($r=0.28^{**}$, $p<0.01$). Further aspects of environment was positively significantly correlated with vitality ($r=0.09^{*}$, $p<0.05$), Physical Functioning ($r=0.46^{**}$, $p<0.01$), body pain ($r=0.14^{**}$, $p<0.01$), General health perception ($r=0.30^{**}$, $p<0.01$) and Physical role functioning ($r=-0.09^{*}$, $p<0.05$).

EVALUATION OF BIOPESTICIDE, BOTANICALS AND PLANT EXTRACTS AGAINST LEAF FOLDER OF RICE, *CNAPHALOCROCIS MEDINALIS* (GUENCE)

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Abstract

The field experiment was undertaken at Agriculture Research Station, Sakoli, Dist. Bhandara (MS) under Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during kharif 2018 to study the performance of herbal against leaf folder of paddy. This experiment incorporating eight treatments consisting of *Metarhizium anisopliae* (1×10^8 cfu/ml) @ 4 g/litre of water, neem oil



@ 5 ml/litre of water, 5 % NSKE, 5 % bitter gourd leaf extract, 5 % custard apple leaf extract, 5 % garadi leaf extract, 5 % bitter gourd leaf extract + 5 % garadi leaf extract + 5 % custard apple leaf extract and control. The results revealed that the treatment of 5 % bitter gourd leaf extract (2.06 % damaged leaves) was found significantly superior in reducing the incidence of leaf folder to other treatments and at par with the 5 % bitter gourd leaf extract + 5 % garadi leaf extract + 5 % custard apple leaf extract (2.38 % damaged leaves). It was followed by *Metarrhizium anisopliae* (2.91 % damaged leaves), 5 % NSKE (3.46% damaged leaves), 5 % custard apple leaf extract (3.51 % damaged leaves), 5 % garadi leaf extract (3.52 % damaged leaves) and neem oil (3.66 % damaged leaves), However, the highest incidence of leaf folder was recorded in control (6.30% damaged leaves).

DECIPHERING MORPHOLOGICAL AND PHYSIOLOGICAL DIVERSIFICATION AT DIFFERENT SALINITY REGIMES IN PIGEONPEA

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Abstract

Besides its high nutritional and economic value, pigeon pea has an ability to fix atmospheric nitrogen and withstand adverse climatic conditions which make this crop a good candidate to bringing new areas under cultivation. It exhibits sensitive behaviour towards salinity which is aggravated in arid and semi-arid regions. Salinity affects plant growth by reducing osmotic potential, creating ion-toxicity and interfering with mineral uptake causing physiological and biochemical changes in plants leading to 35% drop in crop yield. Soil and water management approaches for amelioration of soil salinity are expensive for small holding farmers. Therefore, development of salt-tolerant genotype and its further deployment in high yielding cultivars is the most appropriate and cost effective strategy for increasing yield in saline soil conditions. The present study involves screening of sixty-five diverse genotypes of pigeonpea to assess the exploitable genetic variability for salinity tolerance and to detect the salt tolerant pigeonpea lines in hydroponics at 40, 80, 100 and 120 mM sodium chloride (NaCl) concentration for 30 days. The electrical conductivity was regularly maintained. Salt stress responses of these genotypes on various morphological and physiological attributes were recorded on the basis of different relevant parameters viz. germination percentage, seedling growth, seedling survivability, shoot and root length, biomass accumulation (Fresh weight and dry weight), chlorophyll content, membrane stability index (MSI), relative water content (RWC), Na⁺/K⁺ (sodium potassium ratio) and the plants were also scored on the basis of visual symptoms on 1 to 5 scale for comparative evaluation of all the genotypes taken under study. Significant genotypic variation for salinity stress was observed among the genotypes screened under hydroponic conditions. Two tolerant and two sensitive genotypes were identified at 100 mM concentration of sodium chloride and shall be used in breeding programme for further generation of mapping population so that the gene(s) for the concerned trait can be mapped.

ISOLATION, IDENTIFICATION AND MASS MULTIPLICATION OF DIFFERENT STRAINS OF RHIZOBIUM TO BE USED AS BIOFERTILIZER

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Abstract

Now a days the soil practices for improving the nutrient content of soil are mainly based on chemical fertilizers, which cause a serious threat to human health and environment. Nitrogenous fertilizers produced in Industries by Haber –Bosch process consumes high energy like coal and petroleum, above all the chemical fertilizers are pollutants of the soil in long use, therefore it is necessary to have an alternative method of supplying nutrient to the plants. In order to keep a check on this serious issue the use of biofertilizer has to be promoted. Biofertilizers are defined as “biologically active products or microbial inoculants involving bacteria, algae and fungi, which help in biological nitrogen fixation for the plants”. Biofertilizer also include manures that have nutrients in them, which is only available to the plants after interaction of microbes. Simply we can say that



Biofertilizers are the microorganisms or products of biological origin, which enrich the fertility of the soil. In recent years the use of microbial inoculants as a source of biofertilizer have become a hope for most of the countries. Biologically fixed nitrogen can supply adequate amount of nitrogen to plants along with other nutrients. In developing country Like India, Biofertilizers can solve problem of high cost chemical fertilizers and help in saving economy of the country. The current study deals with isolation, identification and mass multiplication of different strains of *Rhizobium*, which is an ideal microbe used as biofertilizer.

ADVANCED GENOMIC TECHNIQUES FOR PLANT GENETIC RESOURCES: CONSERVATION AND UTILIZATIONS PERSPECTIVES

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Abstract

Plant genetic resources (PGRs) are the common heritage of humankind and essential for genetic improvement of crop plants. PGRs are endowed with abundant genetic diversity and are source of valuable and rare genes which could be identified, mapped and exploited for crop improvement program through modern advanced genomic techniques. PGRs play a pivotal role for food, nutritional and health security besides resistance to diseases and pests, adaptation to stressful environments and resilience to climate changes which is needed for the survival of human civilization on earth. The conjunction of genomics with conventional genetics and plant breeding has spawned several new disciplines, such as comparative genomics, bioinformatics, evolutionary genomics and developmental genomics, all have begun to influence the conventional disciplines. Advances in PCR, molecular markers, genomics, next generation sequencing (NGS) and data analysis has resulted in powerful techniques for characterization, conservation, evaluation and other analysis of germplasm by which plant genetic resources can be utilized for crop improvement and varietal development in systematic and proper way. Advances in molecular markers has revolutionized the understanding of genetic diversity of plant genetic resources, establishment of core collections based on genomic information, association mapping, comparative genomic studies, allele mining, synteny study, genomics-based gene discovery, enhancement of breeding materials and the improvement of genetic/genomic stocks and many more applications. These advancements have greatly empowered the better exploitation and planned conservation of the genetic resources.

STUDY OF GAMMA RAY INDUCED MUTAGENESIS IN INDIGENOUS RICE LANDRACES OF CHHATTISGARH

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Abstract

Indigenous rice genotypes are rich in genetic diversity and are carrier of valuable genes. These traditional rices are generally tall in nature thus susceptible for lodging. Mutation is one of the methods of improving the plant stature and grain type of these landraces and hence improving their yield potential which is essential for farmer's acceptance. By analyzing the significance of above idea a study was conducted on mutation breeding at IGKV research farm, Raipur on two traditional rice genotypes i.e. Samundchini and Vishnubhog. Samundchini has a tall stature and long duration crop having plant height of near 155 cm; maturity period is around 150 days and has short, medium slender aromatic grain type. Vishnubhog having short aromatic medium slender grain type with plant height of 145 cm and crop duration is around 140 days. The present research work was initiated in the kharif 2017 where 1000 seeds of both the genotypes were treated with the 300Gy dose of gamma rays at the BARC, Mumbai. Treated seeds were the M₁ seeds and were grown in the IGKV research farm, Raipur in June 2017. On November 2017 the M₂ seeds were harvested and mother panicle of each of the plant were kept in envelope. In kharif 2018, M₂ seeds were sown as panicle to row in the nursery bed at research fields of IGKV, Raipur. After 21 days of sowing, these seedlings were transplanted in the field with row to row spacing of 15cm and plant to plant spacing also 15cm. The total



number of M₂ plants was 13712 and 12306 of Samundchini and Vishnubhog respectively. A number of putative mutants were screened in the field and their mutation frequency was calculated. In Samundchini, 33 putative mutants were observed in M₂ generation. Among these mutants, there were six chlorophyll mutants (mutation frequency of 0.048%), six broad and dark colour leaf mutants (0.048%), one with broad leaves and high tillers (0.007%), one purple leaf mutant (0.007%), two grassy mutants (0.014%), two thick stem, broad leaf and dark green colour mutants (0.014%), five semi dwarf mutants (0.036%), two high tillering mutants (0.014%), five mid early and semi-tall mutants (0.036%) and five semi-dwarf and early mutants (0.036%) were observed. In Vishnubhog 29 putative mutants were observed. Among these mutants, there were five chlorophyll mutants (having mutation frequency of 0.041%), six broad and dark green colour leaf mutants (0.049%), one narrow leaf mutant (0.008%), one dark green leaf mutant (0.008%), two grassy dwarf mutants (0.016%), four semi dwarf mutants (0.032%), one high tillering mutant (0.008%), one dwarf with dark green leaves mutant (0.0081), three semi-tall (0.024%), two high tillering (0.016%) and four mid early mutants (0.032%) were observed. Economically important mutants are being promoted to next generation for stabilization and varietal development. In addition to this dose standardization study was also done for both the genotypes by irradiating with x-rays, electron beam and proton beam along with gamma rays. A comparative study for the estimation of LD50 and GR50 doses for both aromatic landraces is under process. It would be useful for determining the actual dose to be induced on aromatic rice for getting maximum number of mutants with minimum lethal effect on survival of seedlings. This study would also help to justify the comparison in mode of action of different radiations towards rice growth. In Samundchini, one high tillering dwarf mutant has been obtained and is showing stable performance upto M₄ generation. Transcriptomic study is to be done for studying the differential expression of genes for high number of tillers in mutant and wild type plants. This study will aid to comprehend the mutated genes at molecular level and decipher the new genes and pathways associated with the high tillering trait of the plant.

BIOCHAR TO COMBAT CLIMATE CHANGE FOR SUSTAINABLE AGRICULTURE

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Abstract

Biochar, (commonly known agrichar) is a carbon rich product derived from the slow pyrolysis (heating with limited supply of O₂) of organic materials at 250 - 700° C. It stores carbon for long time since it is chemically and biologically more stable than the original carbon form it comes from, making it more difficult to convert back to CO₂. Greater surface area, negative surface charge and high charge density of biochar enables greater ability to adsorb cations and to retain and exchange nutrients with soil environment, including microorganisms and plant roots. The special structure and high surface area of biochar helps to adsorb various soil contaminants. It also stabilizes biomass and native SOM, which enhances soil aeration, improves microbial activity and immobilize N which together reduces the emission of major green house gases viz., CH₄, CO₂ and N₂O. The role of biochar in developing a sustainable agriculture production system is immense and so is its potential in mitigating climate change, which stands much beyond its uses in agriculture. Biochar has very promising potential for the further development of sustainable agriculture production systems. Also, biochar production provides a great potential for worldwide climate change mitigation that goes beyond its uses in agricultural production alone. It also makes soil cleaner and healthier through decontamination effect. Promotes better CO₂ absorption through improved crop stand and helps in C sequestration.

ROLE OF RICE LANDRACES FOR FUTURE FOOD SECURITY : CURRENT STATUS AND WAY FORWARD

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Abstract

Rice (*Oryza sativa* L.) is the most important cereal crop and staple food for more than half of the world's population. It is popularly called as 'global grain' because of its ability to adapt to a wider range of environmental conditions. Rice landraces



are playing a vital role in food security and is a means of livelihood for millions of rural household. Rice germplasm comprising over 150000 genotypes at different ecological conditions is one of the richest among crop species. This vast wealth of rice germplasm including landraces and traditional varieties is a good source of valuable/rare genes/alleles to develop new rice varieties. Importance of landraces can never be denied in agriculture system, because the rice landraces, best adapted in their inhabitant environment harbour valuable genetic potential for nutritional and food security of human being. Unlike high-yielding varieties, the rice landraces maintained by farmers are endowed with tremendous genetic variability for several desirable traits, as they are not subjected to subtle selection over a long period of time. This aids in the adaptation of rice landraces to wide agro-ecological niches and they also have unmatched quality traits, nutritional traits and medicinal properties. Owing to their specific domination in geographical niches, landraces have genes of resistance to biotic and abiotic stresses, which have not been widely utilized or incorporated into modern varieties. Now days advanced genomic techniques are employing for characterization, utilization and improvement of rice landraces. Whole world is working for development of high yielding/nutritive/stress resistance/climate smart rice varieties by exploiting the untapped genetic variation in rice landraces/ germplasm with the help of molecular marker and genomic techniques. A flourishing rice breeding programme greatly relies upon existence and availability of diverse landraces/germplasm lines for various traits. Therefore, it could be said that landraces are the primary source for developing desirable rice varieties to secure the food demand of increasing human population.

VEGETABLE PLANTING TECHNIQUES IN INDIA

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Abstract

India is the second largest producers of vegetables in world. The various vegetable planting techniques were adopted over country. The seedlings were commonly grown over raised-beds or flat/multi-cell(plug) trays, whereas few attempts were made to grow in individual recyclable paper-pots under fully or partial controlled protected structure in the various proportionated media mix of soil, sand, FYM, vermicompost and peat moss. For planting 30 to 45 days aged vegetable seedlings, the researchers have been developed manual-hand-held, semi-automatic and automatic type transplanters suitable for bare-root seedlings, plug seedlings as well as paper-pot seedlings. The hand-held planters observed to be 0.015 to 0.020 ha/h at rate of 3 to 3.66 plants per minute with two labour requirements, whereas in semi-automatic type planters have higher field capacity in the range from 0.08 to 0.13 ha/h with forward speed of 0.8 to 1.75 km/h to plant in a 2 to 3 rows suits for manual feed of bare-root plug and paper-pot seedlings. The transplanting efficiency up to 90% and time saving of 70 to 93.5% were observed in semi-automatic transplanting method over manual planting method. The research was reveals that automatic transplanters suits for plug or paper-pot type seedlings and field capacity achieved up to 0.11 ha/h. These pots were found to be suitable option for self-feeding in fully automated transplanters with less complexity metering mechanism. In developing countries like India, the suitable metering mechanism for singulation and careful furrow-placing system of seedlings with simplicity needs future in concern to mechanization of vegetable transplanters.

AUTOMATION TECHNIQUE : A SOLUTION FOR MONITORING SILKWORM REARING-HOUSE ENVIRONMENT

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Abstract

Globally, India is second largest producer of silk after China. In India, silkworm rearing is highly labour intensive, profit oriented, low input indoor activity. Silkworm is very sensitive to variation in atmospheric condition. When this goes beyond favourable state it significantly affects the quality and quantity of silk produced. Presently, the environmental condition



required in rearing houses are maintained manually by adopting traditional techniques which are inaccurate and unreliable for maintaining healthy environment. This might be one of the reasons why Indian silk is not meeting the grade of international market. Hence, there is a need of technique suitable for sensing, decision making and controlling the environmental condition of rearing house. This can be fulfilled by the automation technique, which precisely control and maintain the ideal condition inside the rearing house. An automation system comprises the sensing unit, datalogger, data processing and decision-making unit, controlling unit and user interface. Further, this will help in reducing the labour-intensive manual operation, moreover this can be powered by renewable energy system.

ADVANCES IN GROWTH REGULATION OF FRUIT PRODUCTION

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Abstract

Plant growth regulators or phytohormones are organic substances produced naturally in higher plants, controlling growth or other physiological functions at a site remote from its place of production and active in minute amounts. Thimmann proposed the term Phytohormone as these hormones are synthesized in plants. Plant growth regulator or phytohormone may be defined as an organic substance produced naturally in plants controlling growth and other functions at a site remote from its place of production in minute quantities. Plant growth regulators include auxins, gibberellins, cytokinins, ethylene, growth retardants and growth inhibitors. Plant growth regulators (PGRs) are chemicals used to modify plant growth such as increasing branching, suppressing shoot growth, increasing return bloom, removing excess fruit, or altering fruit maturity. Numerous factors affect PGR performance including how well the chemical is absorbed by the plant, tree vigour and age, dose, timing, cultivar, and weather conditions before, during, and after application. Plant growth regulators can be grouped into five classes: compounds related to auxins, gibberellins and inhibitors of gibberellin biosynthesis, cytokinins, abscisic acid and compounds affecting the ethylene status. Use of PGRs is a unique fact of biotechnology and a new approach of manipulating plant biological activities for enhancing growth, yield, quality, nutritive value and also to reduce biotic and abiotic stress in plants. Ethylene serves as a key ripening hormone of climacteric fruits and can influence ripening in many non-climacteric fruits. In order to increase the yield of monoecious crops, the increase female flowers are prerequisite for the same, Ethrel (250-1000 ppm) and CPPU (20-80 ppm) sprays work to induce female and intersexual flowers in male plants of papaya (Kumar, 1998). Foliar sprays of PGRs (GA₃ at 20-40 ppm or NAA at 25-50 ppm) enhanced apple yield and fruit quality traits. Gibberellic acid and salicylic acid are also reported to increase yield, fruit acidity, reducing sugars, TSS, TSS/acid ratio, fruit firmness and fruit chlorophyll a and b content peach trees. The influences on fruit production by the growth regulators are numerous and are employed in a wide range of circumstances varying from tissue culturally propagated plants to enhancing post-harvest storage life through almost all stages of plant life in between. It is not always the effect of single growth regulator but the interaction effect of different hormones in combination for instance; the ratio of cytokinin to auxin determines the fate of callus if it is high it promotes shoot proliferation while as low cytokinin : auxin ratio enhances root formation.

RESPONSE OF MOTHBEAN TO DIFFERENT LEVELS OF FERTILIZERS AND MANURES IN SHALLOW BLACK SOILS OF NORTHERN DRY ZONE, KARNATAKA

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Abstract

The study on “Response of Mothbean to different levels of fertilizers and manures on soil fertility, growth and yield in shallow black soils of Northern Dry Zone, Karnataka was conducted at RARS, Vijayapur, University of Agricultural Sciences, Dharwad during *kharif* 2018. The experiment was laid out in split plot design replicated thrice with four main plots (organic manures) viz., M₁- No organics (Control); M₂- Vermicompost 0.5 t ha⁻¹; M₃- Vermicompost 1 t ha⁻¹ and M₄- FYM 2.5 t ha⁻¹ and five sub plots consisted of different levels of fertilizers viz., S₁- No inorganics (Control); S₂-7.5:15:0 NPK kg ha⁻¹; S₃-10:20:0 NPK kg ha⁻¹; S₄-12.5:25:0 NPK kg ha⁻¹; S₅-15:30:0 NPK kg ha⁻¹. Combined application of vermicompost @ 1.0 t ha⁻¹ and fertilizer @ 12.5:25:0 NPK kg ha⁻¹ recorded highest plant height, dry matter accumulation, pod numbers per plant, length of pod, test weight, protein content, grain yield (625 kg ha⁻¹), straw yield (2340 kg ha⁻¹) and uptake of macro (N,P,K,S,Ca and Mg) and micro (Fe,Zn,Mn and Cu) nutrients by mothbean crop. Similarly, higher available N,P,K,S,Ca and



Mg at both flowering and harvest stage was found with above said treatment and it was comparable with application of FYM @ 2.5 t ha⁻¹ + fertilizer @ 12.5:25:0 NPK kg ha⁻¹. Further, highest gross returns was recorded with same said treatment but maximum net returns (17418 ha⁻¹) and B:C (2.02) ratio was recorded with combined application of FYM @ 2.5 t ha⁻¹ + 12.5:25:0 NPK kg ha⁻¹ and was comparable with vermicompost @ 1.0 t ha⁻¹ + fertilizer @ 12.5:25:0 NPK kg ha⁻¹.

CARBON MINERALIZATION RATES AND KINETICS IN SURFACE-APPLIED AND INCORPORATED RICE AND MAIZE RESIDUES IN DIFFERENT SOIL TYPES

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Abstract

A 126-days laboratory incubation experiment was conducted to assess the carbon (C) mineralization rates and its kinetics of crop residues (rice and maize) when applied on surface and as incorporation in four different soil types of West Bengal state, India. Results showed that a sharp rise in CO₂-C fluxes during the 1st 7 days of incubation for all the soils studied irrespective of residue types and their methods of application. After the day 7, there was a rapid phase of decrease in CO₂-C which continued up to day 14 followed by a sluggish nature of CO₂ emission up to day-42 and thereafter almost levelled off in all subsequent periods up to the end of 126 days of incubation. A progressive release of cumulative total carbon from the soils with increase in time till 126 days of incubation was noted. The % residue C released showed that at earlier phase (day-3 to day-21) the % C lost was significantly higher in case of rice residue (30%) than maize, thereafter the variation failed to show any significant effect till 126 days of incubation period. From the kinetic models, it was evident that C mineralization from the residues followed the exponential model: $C = C_0 * \text{EXP}^{(-kt)}$. Similar rate constant (k) values were recorded in both the methods of placement but the rate of maximum potential mineralizable (C₀) residue C was higher under residue incorporation treatments for both rice and maize residue. However, the rice and maize residues showed almost similar amount of C mineralized over time when applied on surface. The extrapolation of the data predicted the future outcomes of 0-day to 126-days of experiment using the equation revealed that the treatment where residue was incorporated in soil releases maximum amount of C after 156 days of incubation irrespective of residue type.

STUDY ON GROWTH AND YIELD PARAMETERS OF MUNG BEAN (*VIGNA RADIATE* L.) VARIETIES UNDER DIFFERENT IRRIGATION LEVELS AT LOW SOIL MOISTURE CONDITION

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Abstract

A field trial was carried out at the field experimentation centre, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, U.P. during *zaid*-2018. A legume crop, Mungbean (*Vigna radiata* (L.)) was selected for the present study. An experiment was undertaken with two varieties viz., Samrat and Sulabh for evaluating the growth and yield attributes as affected by various soil moisture levels at three critical crop growth stages. Thus, our treatments involved with the targeted single irrigation supplement at specific crop growth stages viz., T₁—at vegetative stage; T₂—at flowering and pod filling stage; T₃—at pod filling and maturity stage and T₀— control (no critical growth stages considered). Growth parameters and yield were recorded in different irrigation levels. Present investigation revealed that there was 12-18% better growth and yield performance recorded where no critical growth stages considered for irrigation (T₀-control) in both the selected varieties when compared with the rest treatments (T₁–T₃). It was further noted that supplying irrigation at critical crop growth stages (T₁, T₂ and T₃) may enhance the growth of the plant but limit the yield levels when compared with normal irrigation (T₀). Critical examination of the selected crop varieties reported that all the determined growth and yield attributes were recorded to be maximum in var. Sulabh among all the considered treatments over the var. Samrat. Interestingly, though the number of flowers and pods per plant noted higher in the var. Samrat, it failed to show any such significant effects on the amount of yield ultimately resulting lower harvest index (HI) due to faded seeds produced during the maturity stage. Conclusively, the growth and yield traits of both the mung bean varieties under low soil moisture levels were relatively considerable when compared under normal irrigated conditions.



BIOCHAR AS A SOURCE FOR AUGMENTING SOIL HEALTH

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Abstract

Soil health assumes major concern as it is a significant factor governing agricultural production. The population is increasing at an alarming rate and to provision the escalating food and nutritional demands, intensive and extractive farming practices are been adopted which eventually would contribute to soil degradation and depletion of soil quality. This situation calls for strategic adoption of management practices which would aid in enhancing and sustaining soil health. Efficient utilization of crop residues as soil amendments can contribute to enrichment of soil health. Crop residues are rich source of nutrients and their addition to soil can bring several benefits aiding in soil health enrichment. The practice of crop residue burning results in considerable loss of nutrients and environmental problems. The conversion of these surplus and unused residues to biochar (by pyrolysis) can be regarded as an efficient method towards soil health enhancement. Biochar as soil amendment contributes to improvement in soil physical, chemical and biological properties eventually aiding in enhancing crop productivity levels. Biochar also holds potential to remediate and restore contaminated soils. Biochar by way of carbon sequestration curtails carbon emissions ultimately reducing global warming. Biochar provisions multiple benefits towards soil health and quality enhancement and can be regarded as a novel approach to augment soil health and enhancing agricultural productivity.

GENETIC DIVERGENCE ANALYSIS FOR YIELD, YIELD CONTRIBUTING TRAITS AND SEED QUALITY PARAMETERS IN SOME BREAD WHEAT GENOTYPES

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Abstract

The experiment was conducted in Augmented Design comprising of 8 blocks of 12 plots including checks at Student Instructional Farm (SIF), and Seed Testing Laboratory of Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayodhya. The non-hierarchical Euclidean cluster analysis was employed to study the genetic diversity existing among 72 wheat germplasm on the basis 14 quantitative and qualitative characters *i.e.* days to 50% flowering, days to maturity, plant height, number of tillers per plant, length of spike, number of spikelets per spike, 1000-grain weight, length of seed, breadth of seed, seed germination, seedling length, vigour index, grain yield per plant. Cluster-I and cluster-III which contained 14 entries each, followed by Cluster-V had 12 entries. Cluster-VI possessed 9 genotypes each while cluster-VIII having 8 entries, cluster- IV having 7 entries, cluster- IX having 6 entries, cluster-VII having 3 entries and cluster-II having 2 entries each. The genotype existing in Cluster-II was exhibited highest cluster mean for vigour index, days to 50% flowering and seedling length. Cluster-I exhibited highest cluster mean for days to maturity, plant height and 1000- test weight. Cluster-VII exhibited highest cluster mean for no. of tillers per plant, length of spike, no of spikelet's per spike, breadth of seed, seed germination and speed of germination. Cluster-IV exhibited highest cluster mean for seed germination. Cluster-XI exhibited highest cluster mean for seed yield per plant. While cluster-IV exhibited lowest cluster mean for days to maturity, seed germination. Cluster-V exhibited lowest cluster mean for days to 50% flowering, no of tillers per plant, length of spike, no of spikelets per spike. Cluster-XI exhibited lowest cluster mean for plant height, speed of germination, seedling length, vigour index. Cluster-VI exhibited lowest cluster mean for seed yield per plant. Cluster-VIII exhibited lowest cluster mean for 1000- seed weight. Cluster-I exhibited lowest cluster mean for breadth of seed. Cluster-IV exhibited lowest cluster mean for length of seed. Cluster-V exhibited lowest cluster mean for no of tillers per plant. The nine clusters in genetic divergence analysis contained frequently the genotypes of heterogeneous origin. Although the genotypes originated in the same place or geographic region were also found to be grouped together in same cluster, the instance of grouping of genotypes of different origin or geographic region in the same cluster were observed in case of all the nine clusters. In this context, the highest inter-cluster distance was recorded between cluster- II and XI followed by cluster-VII, cluster-IV, cluster-VIII, cluster-VII, cluster-VI, cluster-V, cluster-VII, cluster-II, and cluster-III. This showed that genotypes in different cluster are genetically variable. The minimum inter-cluster distance was observed between cluster-V followed by cluster- VII indicating that



members of these clusters were genetically close to each other. The inter-cluster distance ranged between 27.91 (cluster-VII and cluster-II) to 62.60 (cluster-XI and cluster-II). The highest intra-cluster was recorded for cluster-II followed by cluster-VIII, I, IV, VI, XI, III, and VII. The information obtained from this study can be used as valuable source for selecting diverse parents for use in hybridization programme.

STUDIES ON FOLIAR SPRAY OF LIQUID ORGANIC MANURES IN BITTER GOURD (*MOMORDICA CHARANTIA* L.)

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Abstract

An experiment was conducted to determine suitable combination of variety and liquid organic manures for production of one important warm season vegetable crop bitter gourd during spring month considering its high market demand under terai zone of West Bengal. The experiment was carried out at Instructional Farm, UBKV, Pundibari, Cooch Behar during 2016 and 2017. The experiment was laid out in Factorial RBD design with three replications by using liquid organic manures spray for better growth and fruit yield in bitter gourd. The pooled results revealed that all the growth and yield parameters varied significantly with respect to different sprays of panchagavya and vermiwash. Among the varieties Gangajal-1 should be selected for organic bitter gourd cultivation. Among the varieties, Gangajal-1(V₃) emerged as the better in terms of number of nodes at first harvest (41.48), vine length at first harvest (250.46 cm), vine length at last harvest (288.69 cm). Among the number of sprays of panchagavya, panchagavya 3% at 20, 40 and 60 DAS (P₃) emerged as the best in terms of number of nodes at first harvest (41.48), vine length at first harvest (258.72 cm), vine length at last harvest (290.98 cm), days to first flowering (46.72 days), days to first harvest (64.66 days) and days to last harvest (114.52 days). Among the number of sprays of vermiwash, vermiwash 10% at 25, 50 and 75 DAS (W₃) emerged as the best in terms of number of nodes at first harvest (39.27), vine length at first harvest (236.13 cm), vine length at last harvest (271.91 cm), days to first flowering (47.55 days), days to first harvest (66.56 days) and days to last harvest (116.34 days). Among the different sprays, use of panchagavya 3% at 20, 40 and 60 DAS and vermiwash 10% at 25, 50 and 75 DAS enhanced crop growth and yield of bitter gourd. Highest fruit yield in bitter gourd was recorded with the use of three sprays of panchagavya and three sprays of vermiwash followed by two sprays of panchagavya and two sprays of vermiwash. Highest fruit yield of 19.37 t/ha in bitter gourd was recorded with the use of combination Gangajal-1, panchagavya 3% at 20, 40 and 60 DAS, vermiwash 10% at 25, 50 and 75 DAS and it may be recommended for commercial cultivation under the terai zone of West Bengal. The findings conclude that along with regular organic nutrient schedule the bitter gourd crop can be supplied with spraying of above liquid organic manures for better growth and yield.

STCR APPROACH FOR EVALUATING SOIL ORGANIC CARBON AND PLANT NUTRIENT UPTAKE UNDER COTTON CULTIVATION IN RAINFED VERTISOL

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Abstract

A field trial was conducted at Integrated Farming Systems Research Field, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during kharif season 2016-17 to assess the impact of soil test crop response (STCR) equation on soil organic carbon (SOC) and nutrient uptake in cotton under rainfed cultivation. The experiment was laid out in RBD with eight treatments replicated thrice. Organic sources (FYM) along with chemical fertilizers applied based on STCR equation developed by the department of soil science PDKV, Akola. The treatments involved in our present investigation were (i) Without FYM (chemical fertilizers only) : $FN = 9.53 T - 0.38 SN$; $FP_2O_5 = 6.26 T - 2.66 SP$; $FK_2O = 3.89 T - 0.07 SK$ (ii) With FYM (chemical fertilizers + FYM):- $FN = 9.67 T - 0.51$; $SN = 0.73$ $FYMFP_2O_5 = 6.83 T - 3.89$; $SP = 0.30$ FYM ; $FK_2O = 3.29 T - 0.06 SK - 0.11$ FYM , Where, F and S indicate the fertilizer and soil nutrients respectively ($kg\ ha^{-1}$) and T indicates the targeted yield ($q\ ha^{-1}$). Results showed that the highest soil organic carbon content ($4.75\ g\ kg^{-1}$) was documented in the treatment



comprising 15 q targeted yield with FYM + chemical fertilizers application over control. Maximum plant nutrient uptake (N - 69.5 kg ha⁻¹; P - 16.18 kg ha⁻¹; K - 33 kg ha⁻¹) was documented in the same treatment. The results further revealed that the conjunctive use of FYM along with chemical fertilizers proved that a positive significant ($p < 0.05$) amount of SOC and nutrient uptake by cotton was well performed with the combined effect of FYM and chemical fertilizers.

EVALUATION OF SOIL AND GROUND WATER QUALITY OF THE KRISHNA VALLEY IN MARATHWADA REGION OF MAHARASHTRA FOR LAND USE PLANNING

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Abstract

The present investigation was carried out on the topic “Evaluation of soil and ground water quality of the Krishna valley in Marathwada region of Maharashtra for land use planning”. Fifteen representative pedons representing different topographic units of Krishna valley in Marathwada region were characterized and classified. The soils were very shallow to very deep in depth, black (10YR 2.5/1) to very pale brown (10YR 7/4) in colour, silty clay loam to clayey in texture, granular to angular blocky in structure. The PAWC of the soils varied from 59.98 to 392.15 mm. The soils were slightly to moderately alkaline (pH 7.10 to 8.27) in reaction, low to medium in organic carbon content (0.09 to 0.93 per cent) and calcareous in nature (0.92 to 23.11% CaCO₃). The cation exchange capacity of soils varied from 24.56 to 78.18 cmol (p⁺) kg⁻¹. The calcium was the dominant cation followed by magnesium, sodium and potassium. The base saturation varied from 63.03 to 114.80 per cent and exchangeable sodium varied from 1.42 to 16.95 per cent. The ground water quality of the study area showed medium salinity low sodicity (C₂S₁) to high salinity low sodicity (C₃S₁). The Kelley’s ratio of some water samples were more than unity and RSC values more than 1.25 me l⁻¹, suggests that the unsuitability of these water resources for irrigation. The soils of Typic Haplusterts were found as highly suitable (S₁); soils of Calcic Haplusterts, Sodic Haplusterts and Vertic Haplustepts as moderately suitable (S₂); soils of Typic Haplustepts and Typic Ustorthents as moderately (S₂) to marginally (S₃) suitable for cultivation of sorghum, cotton, pigeonpea and soybean crops. It was concluded that the Typic Ustorthents and Typic Haplustepts soils are suitable for shallow rooted and short duration crop, whereas Typic Haplusterts, Calcic Haplusterts, Sodic Haplusterts and Vertic Haplustepts soils are suitable for both short and long duration crops as well as shallow and deep rooted crops in study area. For the management of Calcic and Sodic Haplusterts soils improved management practices are required to grow crops successfully on these soils.

MANAGEMENT OF CHILLI INSECT PESTS BY USING DIFFERENT DOSES OF EMAMECTIN BENZOATE 3.7%+ DIFENTHIURON 46.3% W.P.

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Abstract

The experiment was conducted in *Rabi* season of 2015-16 at College of Agriculture farm, Indore (M.P.) in a Randomized Block Design (RBD) with seven treatments and three replications with variety Aakansha (hybrid), transplanted on 27th November 2015 with 60x45 cm spacing. Three doses of emamectin benzoate 3.7%+difenthiuron 46.3%WP @ 5.60+69.45 gai/ha, 7.40+92.60 gai/ha and 9.25+115.75 gai/ha were marked as T₁, T₂ and T₃, respectively. T₄- Emamectin benzoate 5%SG @ 10gai/ha, T₅- Difenthiuron 50%WP 300 gai/ha and T₆- Lambda cyhalothrin 5%EC @ 15 gai/ha were alone insecticidal treatments including T₇-Untreated check. Treatments were sprayed thrice at 15 days interval as foliar application with knapsack sprayer @ 500 liter water per hectare. Thrips and whitefly population were counted on five tagged plants from each plot and five leaves per plant *i.e.* Two leaves from top, two from middle and one leaf from lower portion of plant. Thrips were counted by jerking the twig on a white paper. Observations were recorded at one day before and 7 and 14 days after each spray. Leaf curling was recorded 10 days after each spray visually on five plants selected randomly in each. The green chilli yield data (q/plot) was recorded for economic assessment of treatments. The highest reduction in thrips and whitefly population was recorded with highest dose of emamectin benzoate 3.7%+ difenthiuron 46.3% WP @ 250 g.a.i / ha and found at par with



the second highest dose of emamectin benzoate 3.7%+ difenthiuron 46.3% WP @ 200 g.a.i / ha in all the sprays. After first spraying minimum leaf curling was noted in highest dose of emamectin benzoate 3.7%+ diafenthiuron 46.3% WP @ 250 g.a.i./ha (21.69%) and found at par with second highest dose of emamectin benzoate 3.7%+ diafenthiuron 46.3% WP @ 200 g.a.i./ha (24.14%). Similar trend was recorded as 16.20% and 18.79% in second spraying and 9.61% and 11.86% in third spraying, respectively. The highest green chilli yield was obtained again with highest dose of emamectin benzoate 3.7%+ difenthiuron 46.3% WP @ 250 g.a.i./ha (171.11 q/ha and 44.40) and found at par with rest of its two doses as 166.29 q/ha and 147.03 q/ha, respectively. Cost benefit ratio was calculated in same trend as 4.40, 4.30 and 3.82, respectively.

AN EVALUATION OF MARKETING PATTERN AND VALUE ADDITION OF SAFED MUSLI (*CHLOROPHYTUM BORIVILLIANUM* L.) UNDER MALWA REGION OF MADHYA PRADESH

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Abstract

The paper aims to analyze marketing pattern and value addition of safed musli crop. The primary data were collected from 120 randomly selected safed musli growers of Indore and Dhar districts of Madhya Pradesh. The result revealed that the safed musli was sold in the market in to two form as a planting material and dry form by the grower. It was observed in case of planting material that 65.96 percent planting material sold by the farmers to large grower and 34.04 percent through traders/agent of all size of farm group and whole quantity of dry form of safed musli was sold by the farmers to the traders. For the studies of marketing pattern of safed musli in malwa region of Madhya Pradesh, two marketing channels were identify for selling of planting materials and in case of dry form three marketing channel were identified. In case of value addition of safed musli it was observed that net profit (Rs. 350.66/kg) of dry safed musli as compered to the planting material of Rs.66.62 per kg which shows that there is large scope of value addition of safed musli crop in the study area. It was concluded in the study maximum farmers sold their product as a planting material. There is need to set up safed musli processing unit near Dhar and Indore district where the safed musli growers in concentrated.

SPECTRUM OF BIOEFFICACY OF ENTOMOPATHOGENIC FUNGI AND CHEMICAL INSECTICIDES FOR MANAGEMENT OF WHITEFLY *BEMISIA TABACI* GENNADIUS (HEMIPTERA : ALEYRODIDAE) IN COTTON

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Abstract

Ever-rising incidence of whitefly *Bemisia tabaci* in cotton and increasing dependence on chemical insecticides for its management has resulted in enormous research thrust for reducing chemical pesticide uses through innovative and environmentally safe biocontrol approaches. The comparative bioefficacy potential of seventeen entomopathogenic fungi, chemical insecticides and commercial biopesticides was evaluated against *B. tabaci* on Bt cotton under polyhouse and field conditions. The Abbott's corrected nymphal mortality was recorded on randomly selected plants in each pot and field plot at pretreatment, 3-, 5- and 7-days post spray treatment. The bioefficacy index was calculated to select most virulent EPFs for field study. The significantly higher nymphal mortality at 7-days post spray was recorded with *Metarhizium anisopliae*-1299 (86.7%) followed by *Beauveria bassiana* - 4511 (85.1%), *Cordyceps javanica* -099 (81.1%), *C. javanica* -102 (81%) and *B. bassiana*-409 (78.2%) than other EPFs, spiromesifen (69.6%), buprofezin (62.2%) and pyriproxyfen (52.7%). However, among all the EPFs the highest overall bioefficacy index was recorded with *C. javanica*-102 (77) followed by *C. javanica*-089 (75.4), *Fusarium moniliforme*-083 (74.6) and *B. bassiana* -4511 (73.1). The pooled data of field trials (2017-18 and 2018-19) revealed that the highest nymphal mortality was recorded with *B. bassiana*-4511 (85.0%) followed by *C. javanica*-102 (83.2%) and pyriproxyfen 10% EC (78.6%) at 7-days post inoculation. Hence, a sequential spray with these EPFs can be used as an IPM component to manage *B. tabaci* nymphal population in an ecologically acceptable manner under field conditions.



IMPACT OF HERBICIDE MANAGEMENT ON WEEDS, YIELD AND ECONOMICS OF RABI GROUNDNUT (*ARACHIS HYPOGAEA*)

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Abstract

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop of India, occupying about 5.4 m ha area, grown throughout the year in *kharif*, *rabi* and *summer* seasons in one or other part of the country. Yield loss due to weeds in groundnut varied from 31 to 77% (AICRPG report, 2009), depending on the weed flora, their density and duration of competition. Manual weeding is not only labour-intensive but their timely availability is a big problem. Chemical control proved to be a viable strategy with higher economic returns (Reddy *et al.*, 2016). Now-a-day, the use of herbicides is gaining popularity in groundnut owing to their rapid effects and the lower costs compared with the traditional methods. Therefore, the field investigation was conducted during the *rabi* season of 2016-17 and 2017-18 at Bhubaneswar, Odisha to study the impact of different herbicide management on weeds, yield and economics of *rabi* groundnut (*Arachis hypogaea* L.). At 40, 70 days after sowing (DAS) and harvesting, amongst the different herbicide management treatments, Pendimethalin 30% EC@1.5 kg/ha followed by (fb) 1 hand weeding at 25 DAS reduced the weed density of grasses, sedges and broad-leaf weeds and their dry weight than Pendimethalin 30% EC + Quizalofop-ethyl 5% EC@50g/ha at 20-30 DAS and Pendimethalin 30% EC + Imazythapyr 10% SL@75g/ha at 20-30 DAS, thus resulting in the lowest weed index. Pendimethalin 30% EC@1.5 kg/ha fb 1 hand weeding at 25 DAS exhibited the highest weed-control efficiency over rest of the treatments except 2 hand-weedings at 20 and 40 DAS. Pendimethalin 30% EC@1.5 kg/ha fb 1 hand-weeding at 25 DAS statistically influenced the pod and haulm yields over all other treatments except hand-weeding at 20 and 40 DAS. Also the highest net return and benefit: cost ratio was observed under Pendimethalin 30% EC@1.5 kg/ha fb1 hand-weeding at 25 DAS.

CORRELATION AND PATH COEFFICIENT ANALYSIS FOR YIELD AND ITS COMPONENT TRAIT IN PIGEONPEA [*CAJANUS CAJAN* (L.) MILLSPAUGH]

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Abstract

Fifty seven genotypes of pigeonpea were used to investigate the nature and magnitude of association of seed yield with major agronomic traits viz., days to 50 % flowering, plant height (cm), primary branches per plant, pod length (cm), seeds/pod, 100 seed weight (g), days to maturity and seed yield per plant. This research also focused on finding the direct and indirect effect of the various yield contributing characters on seed yield by path coefficient analysis. Seed yield per plant revealed the positive and significant correlation with primary branches per plant, seeds per pod and 100 seed wt. (g) on the other hand days to 50% flowering showed negative and significant correlation with days to maturity at genotypic and phenotypic level. Correlation studies provide better understanding of yield components which helps the plant breeder during selection. Seed yield per plant indicate the direct effects with primary branches per and 100-seed weight. There is correlation between seed yield per plant with primary branches per plant and 100-seed weight are due to direct effect, it reveals true relationship between them and direct selection for this trait will be rewarding for yield improvement.

EFFECT OF NANOCADMIUM ON FISH CHROMATOPHORES

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Abstract

Effect nanocadmium on the melanophores of a freshwater fish *Channa punctatus* has been studied. Fish were collected from



local source and maintained under laboratory conditions. Suitable numbers of fish were exposed to sub lethal concentration of cadmium (0.5 ppm) and nanocadmium (0.5ppm) for 192 hrs. The morphological changes occurring in the melanophores and melanophore indices were recorded after 24 hrs to 192 hrs of exposure. The effects of cadmium and nanocadmium were found to be different after different time intervals. Pituitary gland of the fish was also studied so as to localize, melanocyte stimulating hormone (MSH) cells. The number of these cells was higher in cadmium treated fish than those treated with nanocadmium. To explain these changes in pigmentation, it has been hypothesized that cadmium and nanocadmium manifest their effects through dynein granules of cytoskeleton. These granules disperse or aggregate under the physiological stress caused by cadmium and nanocadmium. Further role of melanocyte stimulating hormone (MSH) and Ca^{+} in signal transduction processes has also been suggested. These mechanisms seem worthy of consideration for cadmium but further studies are warranted for nanocadmium. Since nanoparticles of cadmium have now entered in the aquatic ecosystems and food chain, these results on melanocytes of fish seem to be important from its biosafety point of view.

STUDIES OF BI-IONIC POTENTIAL OF NATURAL MEMBRANE BASED ON IRREVERSIBLE THERMODYNAMICS

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Abstract

Bi-ionic Potential of Hen egg shell membrane bathed in different concentration of uni-univalent electrolytes ($NaNO_3$, KNO_3 , NH_4NO_3) have been measured. The irreversible thermodynamic equation originally meant for understanding the behavior for synthetic membrane have been found to be equally applicable to those of the natural membrane. The natural membrane has been characterized by sophisticated techniques like SEM, TEM, TGA/DTA, XRD and FTIR studies.

UTILIZATION OF INTERNET BY THE STUDENTS OF AGRICULTURAL UNIVERSITY

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Abstract

Internet is an existing arena where you can find information about almost every topic-you have books, encyclopaedias, magazines, articles and every other type of reference material at your fingertips. College students are heavy users of the Internet compared to the general population. The present study was conducted to know about utilization of internet by the students of Akola and Nagpur Agricultural colleges in Maharashtra. Data was collected with the help of questionnaire from 140 respondents. Ex-post facto research design was used for the study. Appropriate tools and technology were applied for the collection and interpretation of the data. In this study two indicators were considered viz., frequency of internet use and purpose of internet use to know about internet utilization by students. It is observed that majority of the respondents (71.4%) were using internet daily up to 2hrs/day and the best three mostly preferred purposes on Internet use were, to collect information for research reference (71.43%), and for the purpose of career development (70.00%) and for sending and receiving e-mail to their friends & relatives (67.54%). From the present study it is concluded that majority (62.20%) level of the respondents are having medium level of internet utilization

PRINCIPLES OF COMMON BUCKWHEAT PRODUCTION AND STILL VALUABLE CROP FOR NORTHERN HILLS ZONE OF CHHATTISGARH

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Abstract

The buckwheat *Fagopyrum esculentum* Moench. (family- Polygonaceae) is a fast growing plant with a excellent nutritional



value. Buckwheat is a multipurpose crop. The common name of Buckwheat is Tau (Chhattisgarh), Buckwheat is grown globally but Russia is the largest producer and China is the second largest producer whereas India constitutes few percent of total world production. Estimated production under area of buckwheat in northern hills approximate 5514 ha. In Chhattisgarh the crop is being cultivated in the hills particularly in Mainpat of Sarguja district. The crop is being also cultivated in the Sannapat in Jashpur district and Samripat in Balrampur District. In Mainpat Refugee from Tibbat started cultivation of Tau (buck wheat) since 1965. Now, local farmers of Mainpat are also cultivating this crop during Sep-Nov as pre rabi crop. The tender shoots are used as leafy vegetable, the flowers and green leaves are used for extraction of rutin used in medicine (McGregor and McKillican, 1952), and the flower produces honey of good quality (Morrison, 1945). Buckwheat grain is used primarily for human consumption but also for livestock feed. Its usages as a green fodder, green manure and bee pasture are also worth mentioning. Because of its rapid growth buckwheat can be grown as a second crop as well. Buckwheat constitutes a multfood-use pseudo cereal with nutritional benefits consisting in the absence of gluten in the flour, the richness in water soluble fibres, high quality proteins, unsaturated fatty acids, and appreciable mineral and vitamin content. The anti-oxidative action of buckwheat as a result of the presence of rutin and other phenolic substances is exploited by the pharmaceutical industry as well as good for increasing soil organic matter content and improving soil structure

EVALUATION OF DIFFERENT VARIETIES AND HYBRIDS OF OKRA [*ABELMOSCHUS ESCULENTUS* (L.) MOENCH.] UNDER SOWN CONDITION OF MALWA REGION'

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Abstract

The experimental materials for the present investigation were comprised of fifteen varieties (Parbhani Kranti, Jhilmil, No.55, Shakti, Arya Mohini, Sahiba, NO.64, Okra Hrita, Sarmili, Hisar Unnat, Sonal, Shaan, Cos.2106, Ns-801 Saarika of the okra. These varieties were sown in experimental field, Randomized Block Design with three replications. Observations were recorded for morphological, phenological, yield and quality parameters were evaluated as per standard procedure. The silent features of the present investigation are as under: The maximum vegetative growth in terms of plant height (cm) was recorded in the variety Saarika and minimum was recorded in variety Cos.2106, the maximum number of leaves per plant was recorded in the variety and minimum in T.S.-0017, the maximum leaf length was recorded in the variety Saarika and minimum in the variety Cos.2106, leaf area (cm²) was recorded in the variety Saarika and the minimum in the variety Cos.2106. The maximum days taken to first flowering, first fruit initiation and edible maturity was recorded in variety Sarmili whereas, minimum days recorded in the variety Sahiba. The variety Saarika was found significantly highest number of fruits per plant and the lowest in the variety Cos.2106. The variety Sahiba was recorded the highest fruit length and lowest was found in the variety Cos.2106. The highest fruit diameter was recorded in the variety Sonal and Cos.2106 was recorded minimum diameter of fruit. The variety Saarika was recorded maximum fruit yield per plant or per hectare and minimum in the variety Cos.2106. Colour of fruits was observed to be green, light green and dark green. Variation in visual observation for shape of fruits was noted among the varieties long slender shape, slightly medium slender and finger shaped. The maximum shelf life recorded in the variety Saarika and the minimum Sonal. The significantly highest marketable fruit yield of 142.64 q/ha and net return of Rs 213960 /ha along with benefit cost ratio 3.27 was obtained under okra variety Saarika. The minimum incidence of both insects and diseases was recorded in variety Saarika and the maximum incidence was noted in Cos.2106.

PROFITABILITY OF SPRING PLANTED SUGARCANE BASED INTERCROPPING SYSTEM AND ITS INFLUENCE ON CANE YIELD IN PLAINS OF UTTARAKHAND

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Abstract

A field experiment was conducted at Sugarcane Research Centre, Kashipur, Uttarakhand during 2017-18 & 2018-19 to study the profitability of spring planted sugarcane based intercropping system and its effect on the growth and yield of sugarcane (*Saccharum officinarum* L.). The reduction in cane yield was recorded lowest with pulses (mung bean 4.9%, black gram 5.0%



and french bean 5.4%) and highest in okra (19.8%) and maize (20.4%) based intercropping system. Sugarcane yield equivalent was recorded significantly higher with all intercrops. Sugarcane + French bean (vegetable) was gave significantly highest sugarcane yield equivalent (154.4 t/ha), net return (Rs 275102.5/ha) and B: C ratio (2.20). Sugarcane alone gave cane yield (99.2 t/ha) and B:C ratio (1.97) whereas in sugarcane + okra followed by sugarcane + maize intercropping treatment had lowest net return (Rs 72245.5 and 110341.0/ha respectively) and minimum B:C ratio (1.29 and 1.57 respectively). Therefore, importance of intercropping with sugarcane + frenchbean vegetable) has been recognized profitable and economical for combating the future problems.

MORINGA CULTIVATION : A POSSIBLE WAY AS GOOD QUALITY FODDER FOR LIVESTOCK

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Abstract

Dairy and meat production in dry regions is very complex due to low quality and shortage of fodder, especially in dry periods. In case of fodder shortage *i.e.* unavailability of fodder in December through May as currently green fodder is least available after wheat, alfalfa, brassica, and maize harvesting. This leads towards reduced livestock production and low-quality milk and meat products and enlarging the gap between the availability of resources and the meeting of human and animal's necessities. People are fulfilling their requirements for food and shelter by depleting natural resources. *Moringa oleifera* is one of those plants that has been neglected for several years but now is being investigated for its fast growth, higher nutritional attributes, and utilization as a livestock fodder crop. It can be grown as a crop on marginal lands with high temperatures and low water availability, where it is difficult to cultivate other agricultural crops. Scientists devoted to livestock research, however, are not only interested in finding good-quality fodders that can increase milk and meat production, but they are also looking for species that can be grown and exploited in environmentally friendly ways and cultivated inexpensively. Moringa trees are used for diverse purposes because they are easy to maintain once their roots have developed and established (moringa trees have a deep tap root system when they are grown from seeds, and an adventitious root system when they are grown from stem cuttings). Moringa crop produces high dry matter (DM), between 4.2 and 8.3 t ha⁻¹, depending on the fertilizer, accession, season, and ecological zone. Moringa leaves are rich in nutrients like iron, potassium, calcium, and multivitamins, which are essential for livestock weight gaining and milk production. Moringa leaves also contain 21.8% crude protein (CP), 22.8% acid detergent fiber (ADF), and 30.8% neutral detergent fiber (NDF), as well as 412.0 g kg⁻¹ of crude fat, 211.2 g kg⁻¹ of carbohydrates, and 44.3 g kg⁻¹ of ash. All these compounds are useful to increase livestock production. Moreover, low-quality livestock fodders or rations can be improved by adding moringa leaves as a supplement, which increases the dry matter intake (DMI) and the digestibility of the fodder by livestock, as well as increasing the protein intake in fish diet.

INFLUENCE OF INTEGRATED APPROACHES OF ORGANIC AND INORGANIC FERTILIZATION ON SUSTAINABLE PRODUCTIVITY OF ONION (*ALLIUM CEPA* L.) IN KYMORE PLATEAU OF MADHYA PRADESH

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Abstract

The experiment was carried out during *kharif* season 2016-17 and 2017-18 in factorial randomized block design to find out the effect of different organic and inorganic sources on sustainable productivity of onion (*Allium cepa* L.) in kymore plateau of Madhya Pradesh. The treatment combinations involving three levels of organic manure *i.e.* O₁- FYM farm yard manure@20.t/ha, O₂-Vermicompost@10.t/ha and O₃-Poultry manure@05.t/ha, Inorganic fertilizers in three levels *i.e.* I₁-Control, I₂-100% RDF (NPK=150:80:60) and I₃-50% RDF (NPK=75:40:30), Bio-enhancers in three levels *i.e.* B₁-Panchgavya (45 and 60 DAT), B₂-Jivamrit-500 lit./ha (with every irrigation) and B₃-Bijamrit-seed treatment + seedling treatment in Agrifound Dark Red (ADR) variety of onion. Maximum Plant height (cm), number of leaves per plant, leaf area per plant (cm²) fresh weight of shoot per plant (g), dry weight of shoot per plant (g), fresh weight of bulb per plant (g), dry weight of bulb per plant (g), chlorophyll content of fresh leaves (SPAD value), horizontal bulb diameter (cm), vertical bulb diameter (cm), no. of doubles (%), average weight of bulb (g), bulb yield per hectare (q/ha), marketable bulb yield (q/ha), neck



thickness of bulb (cm), total soluble solids content in bulb (%), vitamin-C (Ascorbic acid) and allyl-propyl disulphide were observed by combine application of 15 O₁-FYM farm yard manure@20.t/haI₂-100% RDF (NPK=150:80:60) and B₂-Jivamrit-500 lit./ha (with every irrigation) at all the growth stages.

EFFECT OF DIFFERENT TANK COLOUR ON SKIN COLOUR OF *CLARIAS MAGUR* (HAMILTON, 1822) LARVAE

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Abstract

The present experimental period and the values of water quality were within the recommended range for rearing of *Clarias magur* larvae. The CIE L* (Luminosity) of magur are varied in different treatments and it was maximum in T₁ (89.32±0.09) where the fishes were reared in White colour tubs. The minimum Luminosity was found in T₃ (69.99±0.06) for the fishes reared in Black colour tubs and followed by T₂ (84.24±0.06) for in Blue colour tubs in the treatments. The mean values of CIE C* (Chroma) of *C. magur* larvae in descending order were in the following order: T₂ (74.27±0.18) T₃ (72.97±) > T₁ (36.50±0.08). It is clear from data that CIE a* colour co-ordinate of *C. magur* is varied in treatments. It was maximum in T₁ (69.24±0.07) and minimum CIE a* being in T₂ (-56.45±0.17) followed by T₃ (-54.55±0.02) with White, Blue and Black colour tubs. CIE b* colour coordinate of *C. magur* varied in different treatments. It was maximum in T₃ (48.46±0.28) Black colour tubs. Whereas, the minimum CIE b* value was found in T₁ (32.08±0.02) and T₂ (48.27±0.08). It is clear from the data presented that CIE h° (hue angle) of *C. magur* varied in treatments. The statistical analysis of variance on CIE h° of *C. magur* indicated significant different (p< 0.05) except T₂ and T₃ between treatments.

FOLIAR KNO₃ AND UREA PHOSPHATE FERTILIZATION IMPROVES GROWTH, YIELD AND BIOACTIVE COMPOUND OF FIELDGROWN CAPE GOOSEBERRY

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Abstract

The effect of spraying potassium nitrate (0.5%, 1.0% & 1.5%) and urea phosphate (0.5%, 1.0% & 1.5%) each at 0.5%, 1.0% and 1.5% on Growth, Yield and Bioactive compound of field grown Cape Gooseberry, were studied. The significant influence of the treatments was observed on plant growth, fruiting behaviour and bioactive compound observation. The maximum plant height (147.54cm), inter nodal distance (18.66cm) and number of branches per plant (17.78) were observed in foliar application of Urea phosphate 1.5%. The maximum number of fruits set per plant (137.67), fruit weight (9.59g), and number of fruits per plant (88.00) were recorded with KNO₃ 1.5% concentration spray. Plant treated with potassium nitrate 1.5% increasing the total soluble solids (15.96°B), total sugar (10.53 %), ascorbic acid (45.80 mg/100g FW) and total flavonoids (3.07 mg RE/100g). The highest level of total phenol (80.03 mg GAE/100g) and total antioxidant capacity (611.00 µMTE/100g) was found in Urea phosphate 1.5% treated plant.

EFFECT OF DIFFERENT DATES OF SOWING ON GROWTH AND YIELD OF PEARL MILLET (*PANNISETUM GLAUCUM* L.) VARIETIES UNDER GWALIOR CONDITION

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Abstract

Pearl Millet is the major source of energy and protein for millions of people. Millet produces high quality grains than any other



cereals under extreme conditions: like unfertile soil, intense heat and prolong drought. An experiment was conducted during the *Kharif* season of 2016 at College of Agriculture, RVSKVV, Gwalior. With the treatment combination of three Date of Sowing (20th, 30th July and 9th August) and five varieties of pearl millet (Big B, Crystal Dhoom, Boss-65, Ankur-045 and 86M86). The experiment was laid out in split plot design with three replications. The result revealed that yield attribute and B:C Ratio (benefit cost ratio) were recorded significantly higher in the variety Crystal Dhoom on first date of sowing (20th July). Variety Crystal Dhoom recorded significantly higher grain yield 1989.70 Kg/ha followed by varieties Boss-65 1162.54 Kg/ha, Ankur-045 1792.75 Kg/ha, 86M86 1675.52 Kg/ha and Big B 1768.18 Kg/ha respectively. The highest Net Return (Rs/ha) 19066 (Rs/ha) was recorded in variety Crystal Dhoom followed by varieties Boss-65, 5713 (Rs/ha), Ankur-045 14550 (Rs/ha) 86M86, 13321 (Rs/ha) Big B gave 15066 (Rs/ha) respectively. Significant variations were observed in different growth and yield parameters among the sowing dates. First sowing date (20th July) statistically showed maximum grain yield 1976.94 Kg/ha followed by second date of sowing (30th July) 1737.82 Kg/ha and third date of sowing (9th August) 1318.45 Kg/ha respectively. Similarly First sowing date (20th July) statistically showed maximum Net Return (Rs/ha) 17941 (Rs/ha) followed by second date of sowing (30th July) 14919 (Rs/ha) and third date of sowing (9th August) 7770 (Rs/ha) respectively.

RESPONSE OF VARIETIES AND DATE OF SOWING ON GROWTH AND YIELD OF PEARL MILLET (*Pennisetum glaucum* L.) UNDER GIRD ZONE

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Abstract

Millets are major food sources for millions of people, especially those who live in hot, dry areas of the world. In India, Pearl millet is the fourth most important cereal crop after rice, wheat and sorghum. A major problem of rain-fed agriculture in semi-arid regions with short rainy seasons is how to determine the optimum sowing date. Sowing at optimum time improves the productivity by providing suitable environment at all the growth stages. An experiment was conducted to study “Response of varieties and date of sowing on growth and yield of pearl millet under Gird zone” at College of Agriculture, RVSKVV, Gwalior during *Kharif* season of 2016. The combination of three Date of Sowing (20th, 30th July and 9th August) and five varieties of pearl millet (Big B, Crystal Dhoom, Boss-65, Ankur-045 and 86M86) were tested in split plot design with three replications. Significant improvement in plant height, no. of tiller m⁻¹, number of leaf m⁻² and yield attributes were recorded with the sowing on 20th July. Delay in sowing is decreasing the yield and yield attributes. The variety crystal dhoom was produced significantly higher leaf number per culm, tiller number m⁻², ear head length (cm), grain number per cob, grain and straw yield, which was followed by Big B, Ankur-045, 86M86 and Boss-65. However, the interaction of date of sowing and varieties was found not significant in all the growth and yield attributes with grain yield.

FRESH WATER PEARL CULTIVATION IN TRIBAL DISTRICT CHHINDWARA (M.P.)

Chanchal Bhargava, Sarita Singh and S.L. Alawa

JNKVV, KVK, Chhindwara, M.P.

Abstract

The Pearl is known as the queen of jewels and has been used for adornment and as a symbol of material wealth throughout human history. Pearls are formed by secretion of nacre from epidermal cells within mollusk mantle tissue. Areas rich in selection of mussels the factors to be considered are the weight of mussels, reproductive phase and health in phytoplankton, which is consumed by the mussels as food, are good for mussel breeding. The P^H and ammonia of fresh water pond value will measure one time in a week in both natural and artificial ponds. In cultured pearl cultivation, a mantle piece from the donor mussels is grafted into the gonad of the recipient mussels, along with a spherical nucleus to provide the required conditions for the formation of pearl. The operation on the pearl mussels is carried out by a skilful surgery. The processes involved are selection of mussels, graft tissue preparation, conditioning, graft tissue and nucleus implantation and post-operative care. For production of round cultured pearls spherical shell-beads are used as nuclei. There are numerous nucleus like design nucleus, tear drop, oval, round and half round called designer pearl. The temperature between 25-28 °C is suitable for surgery. The length of culture duration of this phase would depend on size of nucleus and maturity of pearl. The length of culture duration of this phase would depend on size of nucleus and maturity of pearl.



INNOVATIVE APPROACH IN NUTRI SMART VILLAGE

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JNKVV-Krishi Vigyan Kendra Chhindwara, M.P.

Abstract

A 'Smart village' will provide long-term social, economic, and environmental welfare activity for village community, which will enable and empower enhanced participation in local governance processes, promote entrepreneurship and build more resilient communities. At the same time, a 'Smart village' will ensure proper sanitation facility, good education, better infrastructure, clean drinking water, health facilities, environment protection, resource use efficiency, waste management, renewable energy etc. There is an urgent need for designing and developing 'Smart village', which are independent in providing the services and employment and yet well connected to the rest of the world. The Smart Village concept will be based on the local conditions, infrastructure, available resources in rural area and local demand as well as potential of export of good to urban areas. The present paper examine motivation behind the concept on 'Smart village' is that the technology should acts as a catalyst for development, enabling education and local business opportunities, improving health and welfare, enhancing democratic engagement and overall enhancement of rural village dwellers. In the Indian context, villages are the heart of the nation. So we can achieve socio economic development of the Nation by enlarging the concept of smart villages on improving pattern.

PHYSIOLOGICAL AND BIOCHEMICAL CHANGES DURING STORAGE OF CHICKPEA UNDER DIFFERENT PACKAGING MATERIALS

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Abstract

The present investigation was carried out to study the physiological and biochemical changes during short term storage of chickpea seed in different packaging materials such as cloth bag, jute bag, HDPE bag and Super Grain bag. The storability of chickpea seed under ambient condition revealed that the effectiveness of all four packaging materials was remarkably different. During the storage period, a series of naturally occurring biochemical events gradually reduced seed quality and resulted in viability loss. The radical scavenging mechanism in seeds through the activities of reactive oxygen species (ROS) scavenging enzymes viz. superoxide dismutase (SOD), catalase (CAT) and peroxidase (POX) was studied to understand the defence mechanism against oxidative radicals present in the seeds during storage and to know the effect of different packaging materials on antioxidant enzyme activities. Among all four different kinds of packaging materials, SuperGrain Bag was found effective in maintaining seed quality of chickpea for six months followed by HDPE Bag. The biochemical analysis revealed that seeds stored in Super Grain bag were having significantly higher and slow declining trend of enzymatic activity was observed during all the six months storage followed by HDPE bag. However, the seed viability was found lower in cloth and jute bag, which was also affected the enzymatic activities and more declining trend of superoxide dismutase, peroxidase and catalase in cloth bag was recorded.

DEVELOPMENT OF SUSTAINABLE AGRICULTURE AND INTEGRATED FARMING SYSTEMS IN INDIA

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Abstract

Sustainable Agriculture system is one that can indefinitely meet demands for food & fibre at socially acceptable, economic and environment cost. Farming Techniques is most important for sustainable agriculture, sustainable food production



productivity and in India. Sustainability and food security are the major challenges faced by the world countries for the past several decades. Most of the third world countries are also facing problems of climate change, increasing population, overexploitation of natural resources and resource degradation associated with rapid economic growth. This analysis points emerging issues such as environmental degradation, loss of ecosystem services, non sustainability and threats to food security in the context of global population growth and climate change. Hence there is an urgent need for identifying potential alternative farming techniques to achieve long term sustainability and food security as indicated by several leading workers in the field. The alternative farming strategies that were field tested and perfected over several generations in the past portrayed the following advantages over present day chemical farming are as follows: 1) Eco friendly by protecting and reviving life support systems and ecosystem services 2) Higher Benefit cost ratio, benefiting the farmers as well as the consumers. 3) Reduction in air, water and soil pollution caused by various pesticides and other chemicals. 4) Control and Reduction of Bioaccumulation and Biomagnification. 5) Control of health hazards in humans and livestock. 6) Conservation and sustainable use of on farm natural resources in agroecosystems. Alternative farming techniques- Biodynamic farming- Eco farming- Integrated farming systems Organic farming- Permaculture- Polyculture- Urban and Peri-Urban farming- Zero budget natural farming.

STUDIES ON THE BIO-EFFICACY OF CARBOSULFAN IN COTTON (*GOSSYPIMUM ARBOREUM*)

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Abstract

Experiment was conducted during *Kharif* 2014 and 2015 at research farm of Regional Agriculture Research Station, Khandwa (M.P.) with seven treatments namely, untreated control, carbosulfan 25 EC 250 g a.i., carbosulfan 25 EC 312 g a.i., carbosulfan 25 EC 375 g a.i., fipronil 5% SC, imidacloprid 17.8 % SL and thiamethoxam 25% WG/ha. These seven treatments were tested under randomized block design (RBD) with three replications against aphids and thrips, and also observed the phytotoxicity effect of different chemical treatments on cotton plants as well as record their impact on natural enemies of cotton pests like, *Coccinellid* beetles and *Chrysoperla* populations. Seeds of cotton CV. Bunny Bt (BG II) were sown in both experimental years. All the treatments were sprayed when target insect pests incidence was above Economic Threshold Level (ETL) and second application of spray was applied 15 days after first application. Phytotoxicity assessment in cotton was undertaken with by testing three different doses of carbosulfan 25% EC was applied on crop. Phytotoxicity observations were recorded at 1, 3, 5, 7, 10 and 15 days after application of the chemical. The level of phytotoxicity was estimated by visual assessment. The highest percent control of aphids recorded in treatments carbosulfan 25% EC @ 1500 ml/ha after second application. While similarly significantly lowest thrips incidence was recorded in carbosulfan 25 EC @ 1500 ml/ha after both application. Effect of carbosulfan 25 % EC against natural enemies revealed that there is no significant change observed in the population between the insecticidal treatments and the untreated control. Carbosulfan 25% EC @ 1500 ml/ha has recorded significantly highest yield of 16.80 g/ha (2014) and 18.71 g/ha (2015). It was at par with the treatments of carbosulfan 25% EC @ 1250 ml/ha. There was no phytotoxicity symptoms were observed on cotton plants after application of carbosulfan 25% EC @ 1250 ml/ha (x dose) and 2500 ml/ha (2x dose) at 1, 3, 5, 7, 10 and 15 days after application.

EFFECT OF VARYING PHOSPHORUS LEVELS AND *RHIZOBIUM* INOCULATION ON GROWTH AND YIELD OF COWPEA (*VIGNA UNGUICULATA* L.)

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Abstract

A field experiment was conducted during Summer season of 2019 at Agricultural Farm of IFTM University, Moradabad, to study the effect of different levels of Phosphorus and *Rhizobium* seed inoculation on growth and yield of cowpea. The experiment consisted of eight treatment combinations viz. T₁- Control, T₂- Seed inoculation with *Rhizobium*, T₃- NPK @ 20:40: 40 kg ha⁻¹ + seed inoculation with *Rhizobium*, T₄- NPK @ 20:40:40 kg ha⁻¹, T₅- NPK @ 20:60:40 kg ha⁻¹ + seed



inoculation with *Rhizobium*, T₆- NPK @ 20:60:40 kg ha⁻¹, T₇- NPK @ 20:80:40 kg ha⁻¹ + seed inoculation with *Rhizobium* and T₈- NPK @ 20:80:40 kg ha⁻¹, which were laid out in Randomized Block Design and were replicated thrice. Cowpea variety PL-3 was sown at a spacing of 60×20 cm on a sandy loam soil which was low in organic carbon (0.43 %) and available nitrogen (96.8 kg ha⁻¹) and was medium in available phosphorus (22.5 kg ha⁻¹) and available potassium (225 kg ha⁻¹). The experimental results indicated that, T₅- NPK @ 20:60:40 kg ha⁻¹ + seed inoculation with *Rhizobium*, resulted in highest values of all the growth parameters such as plant height, number of primary branches, dry weight and fresh weight at both 20 DAS and 40 DAS. This treatment has also reported an increased grain yield by 56.24 %, 36.7 %, 14.9 %, 19.0 %, 7.5 %, 2.4 % and 7.4 %, as compared to T₁, T₂, T₃, T₄, T₆, T₇, and T₈, respectively. The cowpea crop fertilized with NPK @ 20:60:40 kg ha⁻¹ + seed inoculation with *Rhizobium* has also resulted in highest net returns (79754.0 Rs/ha) and B: C ratio (3.07) as compared to other treatments in the experiment. This treatment has recorded 68.3 % and 40.4 % higher net returns as compared to control and only seed inoculation with *Rhizobium*, respectively, which clearly indicates the suitability of this treatment in obtaining maximum yield and fetching higher economic returns for the cowpea growers.

RESPONSE OF GREEN GRAM (*VIGNA RADIATA* L.) TO DIFFERENT WEED MANAGEMENT PRACTICES

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Abstract

Green gram is an important pulse crop, which is utilized as feed and raw material for processing. However, yield losses are prominent due to crop weed competition. In lieu of this fact, a field experiment was conducted during *Kharif* season of 2016 at Agricultural Farm of IFTM University, Moradabad, to study the effect of different weed management practices on growth and yield of green gram. The experiment consisted of seven treatments viz. T₁- Control, T₂- Two hand weeding at 15 and 30 DAS, T₃-Pendimethalin 100 % of recommended dose, T₄- One hand weeding at 15 DAS + Pendimethalin 75 % of recommended dose, T₅- Pendimethalin 125 % of recommended dose, T₆- One hand weeding at 15 DAS + Pendimethalin 50 % of recommended dose, T₇-Pendimethalin 150 % of recommended dose, which were laid out in Randomized Block Design and the treatments were replicated four times. Greengram variety *Shahanshah* was sown at a spacing of 30 × 10 cm on a sandy loam soil. The experimental results indicated that, T₂- Two hand weeding at 15 and 30 DAS, resulted in highest values of all the growth parameters such as plant height, number of branches, dry weight, fresh weight and number of nodules at both 30 DAS and 60 DAS. This treatment has also reported highest grain yield (12.02 q ha⁻¹) as compared to T₁ (7.65 q ha⁻¹), T₃ (8.07 q ha⁻¹), T₄ (9.82 q ha⁻¹), T₅ (8.89 q ha⁻¹), T₆ (9.30 q ha⁻¹) and T₇ (7.93 q ha⁻¹). This treatment has also reported significantly lowest number of weed species m⁻² at 30 and 60 DAS (1.0 m⁻² and 1.06 m⁻², respectively) as well as number of weeds m⁻² at 30 DAS (5.6). At 30 DAS, T₂ has also recorded highest weed control efficiency (95.7 %).

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY TOOLS IN AGRICULTURE DEVELOPMENT

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Abstract

Information and communication technology (ICT) is an umbrella that includes any communication device or application, encompassing: radio, television, mobile, and fixed phones, computer and network hardware and software, satellite systems and video conferencing useful for the delivery of information in the form of audio, data, video and image etc. It is highly useful for economic development, job-creation, rural development and poverty alleviation ICT has become the cornerstone of agricultural development in contemporary times. Therefore, I surveyed 6 villages; from each village 20 farmers were selected surrounding the Lucknow district in 2018. Out of the 120 respondents, in terms of sometime used of ICT services like mobile phone 44.17 per cent, followed by TV 40.00 per cent, Radio 39.16 per cent, Social media 38.33 per cent, Internet 37.50 per cent, computer 30.83 per cent respectively. In modern time, maximum useful information tool was found mobile phone among



ICT tools for farmers and agriculture development. Looking at the lack of knowledge and awareness about ICT tools among farmers is the major problem in the implementation of Information and communication technology in rural areas.

EFFECT OF ZINC AND BORON ON GROWTH AND YIELD ON MAIZE (*ZEAMAYS* L.)

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Abstract

Maize is an important cereal crop which is utilized as a human food as well as raw material for processing industries. However, yield losses are prominent due to the improper nutrient management practices. Hence the study was carried out on “Effect of Zinc and Boron on Growth and Yield of Maize (*Zea mays* L.)” during *kharif* season of 2018-19 at the Agriculture farm of IFTM University, Lodhipur Rajput, Moradabad, (U.P.). Ten treatment combinations viz. [T₁- Control, T₂- Zinc 5 kg ha⁻¹ soil application (SA), T₃- Zinc 1 kg ha⁻¹ foliar application (FA), T₄- Zinc 1+1 kg ha⁻¹ two foliar application (2FA), T₅- Zinc 5kg ha⁻¹ soil application (SA) + Zinc 1kg ha⁻¹ foliar application (FA), T₆- Boron 0.5 kg ha⁻¹ soil application (SA), T₇- Boron 0.1 kg ha⁻¹ foliar application (FA), T₈- Boron 0.2kg ha⁻¹ Boron two foliar application (2FA), T₉- Boron 0.5 kg ha⁻¹ soil application (SA) and Boron 0.1kg ha⁻¹ foliar application (FA), T₁₀- Zinc 5kg ha⁻¹ + Boron 0.5kg ha⁻¹ soil application (SA)] were comprised in randomized block design (RBD) with three replications. The treatment T₁₀ was significantly increased all growth attributes viz., plant height (cm), dry weight (g plant⁻¹), days taken to 50 % tasseling, days taken to 50 % silking, crop growth rate (CGR) (g/m²/day), absolute growth rate (AGR) (g/plant/day), as well as on yield and yield attributes such as number of cobs plant⁻¹, number of rows cob⁻¹, number of grains row⁻¹, number of grains cob⁻¹, seed index (g), grain yield (q ha⁻¹), stover yield (q ha⁻¹), biological yield (q ha⁻¹), harvest index (%) and B: C ratio respectively over rest of the treatment. significantly highest plant height (68.8 cm, 245.8 cm, 246.9 cm and 247.2 cm), at all crop growth stage was found in the T₁₀ (Zn 5 kg ha⁻¹ SA + B 0.5 kg ha⁻¹ SA). Maximum dry weight (12.0 g, 96.7 g, 141.3 g and 155.0 g plant⁻¹) was recorded at 30, 60, 90 and harvesting stage. Days taken to 50 % tasseling and silking (55.0 DAS) and (59.0 DAS), Crop growth rate (CGR) (37.2 g/m²/day, 69.3 g/m²/day, 8.0 g/m²/day and 7.3 g/m²/day) at 30, 60, 90 and harvesting stage, Absolute growth rate (AGR) (0.5 g/plant/day, 2.8 g/plant/day, 2.5 g/plant/day, 2.1 g/plant /day) at 30, 60, 90 DAS and harvesting stage. Number of cobs plant⁻¹ had not significant different, significantly maximum number of rows cob⁻¹ (16.3), maximum number of grains row⁻¹ (35.3), maximum number of grains cob⁻¹ (574.9), maximum 100- seed weight (27.4 g), maximum grain yield (5.4 t ha⁻¹), stover yield (6.3 t ha⁻¹) was found at par with T₅, T₈, T₉ and T₁₀, maximum biological yield (11.7 t ha⁻¹) which was found at with T₉, maximum harvest index (46.0 %), and maximum benefit: cost ratio (2.708) was recorded from T₁₀ (Zn 5 kg ha⁻¹ SA + B 0.5 kg ha⁻¹ SA).

EFFECT OF NITROGEN AND SULPHUR FERTILIZATION ON GROWTH AND YIELD OF RICE (*ORYZA SATIVA* L.)

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Abstract

Rice is an important cereal crop which is utilized as a human food as well as feeding and raw material for processing industries. However, yield losses are prominent due to the improper nutrient management practices. Hence the study was carried out on “Effect of Nitrogen and Sulphur Fertilization on Growth and Yield of Rice (*Oryza sativa* L.)” during *kharif* season 2018-19 at the Agricultural farm of IFTM University, Lodhipur Rajput, Moradabad (U.P.). Nine treatments viz. T₁- 50 kg N + 0 kg S ha⁻¹, T₂ - 50 kg N + 30 kg S ha⁻¹, T₃ - 50 kg N + 60 kg S ha⁻¹, T₄- 100 kg N + 0 kg S ha⁻¹, T₅ - 100 kg N + 30 kg S ha⁻¹, T₆ - 100 kg N + 60 kg S ha⁻¹, T₇ - 150 kg N + 0 kg S ha⁻¹, T₈ - 150 kg N + 30 kg S ha⁻¹, T₉- 150 kg N + 60 S ha⁻¹ are comprised in randomized block design (RBD) with three replications. The soil of experimental field was clay loam which was low in organic carbon (0.46 %) and available nitrogen (98.6 kg ha⁻¹) and was medium in available phosphorus (24.7 kg ha⁻¹) and available potassium (223 kg ha⁻¹). The experimental results indicated that, T₉- 150 kg N + 60 S ha⁻¹, resulted in highest values of all the growth parameters such as plant height (cm), no. of tillers per m² area, fresh weight (g plant⁻¹), dry weight (g plant⁻¹), number of effective tillers per m² area, panicle length (cm), number of filled grains panicle⁻¹, number of unfilled



grains panicle⁻¹, fertility (%), 1000- seed weight (g), grain yield (t ha⁻¹), straw yield (t ha⁻¹), biological yield (t ha⁻¹), harvest index (%) and B: C ratio respectively, over rest of the treatments. Application of T₉ - 150 kg N + 60 kg S ha⁻¹ significantly affected the plant height (91.3 cm, 137.1 cm, 148.9 cm and 160.1 cm.) at 30,60, 90 DAT and at harvest stage, no. of tillers⁻¹ m² area (185.87, 198.9, 199.3 and 199.3) at 30, 60, 90 DAT and at harvest stage, fresh weight (81.59g, 248.3g, 297.0g and 305.5g plant⁻¹) at 30, 60, 90 DAT and at harvest stage, dry weight (18.7g, 76.5g, 95.5g and 92.4g plant⁻¹) at 30,60, 90 DAT and at harvest stage, no. of effective tillers m² area (177.0), panicle length (28.5 cm), number of filled grains panicle⁻¹ (227.8), no. of unfilled grains per panicle (10.3). Fertility percentage (95.6%) 1000-seeds weight (34.2 g), grain, stover and biological yield (7.5t, 6.7t, 13.7tha⁻¹) respectively, Harvest index (51.1%) and B: C ratio (2.4) were found significantly superior with treatment T₉ - 150 kg N + 60 kg S ha⁻¹.

FIELD EVALUATION OF OIL AND GRANULAR FORMULATION OF ENTOMOPATHOGENIC FUNGI, *ZOOPHTHORA RADICANS* AGAINST MORTALITY OF RICE LEAF FOLDER, *CNAPHALOCROCIS MEDINALIS*

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Abstract

A field trial was conducted during August 2018 to January 2019 to evaluate the mycological suppression of rice leaf folder in two different formulations like oil based bio-formulation and granular formulation of *Z. radicans* in experimental farm, Department of Agriculture, Annamalai University. The field trial was laid out in a randomized block design (RBD) in oil formulation with seven treatments and granular formulation with five treatments, replicated six times in plot size 5×4 m each, with the variety CR – 1009. The data on effect of various treatments against rice leaf folder indicated that *Z. radicans* + Sunflower oil + Glycerol have comparatively higher reduction of infestation to the tune of 35.25 per cent reduction over control after the first spray. This was followed by *Z. radicans* + Mustard oil + Glycerol, *Z. radicans* + Sunflower oil and *Z. radicans* + Mustard oil (26.33 per cent, 26.13 per cent and 24.24 per cent respectively). During the second spray *Z. radicans* + Sunflower oil + Glycerol recorded the maximum of 69.96 per cent reduction over control. This was followed by *Z. radicans* + Mustard oil + Glycerol and *Z. radicans* + Sunflower oil (59.87 per cent and 57.87 per cent) respectively. Among the different doses of *Z. radicans* granules, 400g *Z. radicans* granules/plot was found effective by recording 25.29 per cent reduction over control. This was followed by dose of 300g/plot treatment. During the second spray, similar trend was noticed wherein the maximum reduction in leaf folder population was noticed in plot which received in dose of 400g/plot treatment (57.23 per cent). Lowest per cent reduction of *C. medinalis* population was noticed on dose of 100g /plot (46.02 per cent reduction over control) Among the different treatment of oil and granular formulation, oil formulation of *Z. radicans* were caused the highest per cent reduction over control when compared to granular formulation of *Z. radicans*.

EVALUATION OF *DIOSCOREA BULBIFERA* AT DIFFERENT LOCATION OF BASTER REGION

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Abstract

An experiment was carried out to evaluate 4 genotypes (TDb 13-1, TDb 13-5, TDb 16-6 and local) of *D. bulbifera* at four different location (L-1: Jagdalpur, L-2: Dantewada, L-3: Kanker, L-4: Narayanpur) of Baster region of Chhattisgarh for yield and its quality attributing traits under All India Coordinated Research Project on Tuber Crops at Jagdalpur, Indira Gandhi Krishi Vishwavidyalaya during Summer-Kharif, 2018. Among the 4 entries of *Dioscorea bulbifera* evaluated during 2018-19 under MLT, entry TDb 13-6 recorded highest yield of bulbils (14.67 t. ha⁻¹) and same entry also showed maximum underground tuber yield and Total yield i.e. 3.14 t. ha⁻¹ and 17.81 t. ha⁻¹ respectively). There were no changes in tuber skin colour and tuber flesh colour. All entries showed dark brown tuber skin colour and light yellow tuber flesh colour. Entry TDb 13-6 recorded for maximum dry matter per cent (41.29%) and maximum starch % (15.12 %). The maximum crude protein per cent was recorded in entry TDb 13-5 (6.28%) and minimum crude protein per cent (3.51%) was recorded on Local. The highest organoleptic score (8.39) was recorded (9-point hedonic scale Amerine *et al.*, 1965) in entry TDb 13-6 followed by



TDb-13-5 (7.40). Performance studies revealed that the genotypes TDb 13-6 was found promising for yield and suitable for cultivation in Baster region of Chhattisgarh.

INFLUENCE OF MODIFIED ATMOSPHERIC STORAGE ON SEED QUALITY IN KABULI CHICKPEA VARIETIES

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Abstract

Storage play very important role in maintaining quality of seed till next sowing season especially in pulses. Among several methods modified atmospheric storage is safe, nontoxic, ecofriendly and cost effective. An experiment was conducted to study influence of modified atmospheric storage in chickpea involving two varieties viz., V₁ (BG1105) and V₂ (MNK-1) and five treatments viz., C₁: Normal air (untreated control), C₂: CO₂ (80 %) + N₂ (20 %) + O₂ (0 %), C₃: CO₂ (75 %) + N₂ (20 %) + O₂ (5 %), C₄: CO₂ (70 %) + N₂ (20 %) + O₂ (10 %) and C₅: Vacuum packing stored in 700 gauge polyethylene bags for 14 months under ambient condition at Seed Unit (NSP), University of Agricultural Sciences, Dharwad. Modified atmospheric conditions had profound influence on seed quality. The results revealed that, seed quality declined progressively with the advancement in storage period. Among the varieties, variety BG1105 (V₁) recorded significantly higher germination (91.40 %), root length (16.96 cm), shoot length (10.87 cm), seedling vigour index (2546) and lower electrical conductivity (1.068 dSm⁻¹), seed infestation (2.06 %) and seed infection (6.90 %) compared to MNK-1 (V₂) (90.10 %, 14.60 cm, 7.57 cm, 2000, 1.255 dSm⁻¹, 5.15 % and 14.95 % respectively). Among the treatments, modified atmospheric gaseous combination of CO₂ (80 %) + N₂ (20 %) + O₂ (0 %) (C₂) recorded significantly higher germination (92.38 %), root length (17.99 cm), shoot length (9.93 cm), seedling vigour index (2581), lower electrical conductivity (0.941 dSm⁻¹), seed infestation (0.00 %) and seed infection (0.00 %) as compared to control C₁ (88.75 %, 13.64 cm, 8.72 cm, 1988, 1.427 dSm⁻¹, 9.38 % and 29.49 %, respectively) at the end of 14 months of storage period.

EFFECT OF ORGANIC SOURCES OF FERTILIZERS ON SEED YIELD AND QUALITY OF KABULI CHICKPEA (*CICER ARIETINUM* L.) VARIETIES

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Abstract

In this era of synthetic world, there has been increased health awareness among people of several developed countries demand and prefer for organic food, fibre and by-product. India has made a spectacular breakthrough in production and consumption of fertilizers during the last four decades. In the present situation consumption of non renewable form of energy i.e. chemical fertilizers will be quite a limiting factor of agricultural production in future. Recently, Karnataka State Seed and Organic Certifying Agency (KSSOCA) has encouraged the grower for certifying the organic seed. Hence an experiment was conducted at University of Agricultural Sciences, Dharwad during rabi of 2015-16 and 2016-17 on organically maintained field for more than ten years to study the effect of organic sources of fertilizers on seed yield and quality in kabuli chickpea varieties. The experiment was laid out in split plot design involving two varieties viz., V₁: BG1105 and V₂: MNK-1, seven organic source of fertilizer namely T₁: Application of 100 % organics equivalent to RDP [50 % Farm yard manure (FYM) and 50 % Vermicompost], T₂: T₁+ Foliar application of Panchagavya @ 3 % at flowering and 15 Days after flowering (DAF), T₃: T₁+ Foliar application of Biodigester @ 10 % at flowering and 15 DAF, T₄: T₁+ Foliar application of Cow urine spray @ 10 % at flowering and 15 DAF, T₅: 50 % organic (FYM 25 % and Vermicompost 25 %) + 50 % inorganic RDF, T₆: 75 % RDF + 25 % organic (FYM 12.5 % and Vermicompost 12.5 %) and T₇: 100 % RDF. Kabuli chickpea varieties and organic fertilizer sources had profound effect on crop growth, yield and quality during both years and pooled data. Among the varieties, at harvest, the results of pooled data revealed that variety V₁ (BG1105) recorded significantly higher plant height (47.61 cm), secondary branches per plant (34.39), seed yield (12.90 q/ha), seed germination (96.60 %) and seedling vigour index (2450) as compared to V₂ (MNK-1) (45.37 cm, 14.77, 10.72 q/ha, 93.60 % and 1857, respectively). Similar effect on crop growth, yield



and quality was found due to organic fertilizer source during both years and pooled data. The results of pooled data revealed that, treatment T₂ recorded significantly higher plant height (50.20 cm), secondary branches (34.02), seed yield (16.25 q/ha), seed germination (98.10 %) and seedling vigour index (2437) as compared to T₇ (43.85 cm, 15.49, 12.16q/ha, 93.50 % and 1925, respectively).

REMEDIATION OF SODIC SOIL WITH GYPSUM AND AMENDMENTS

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Abstract

The field experiment was carried out in *rabi* season of 2016-17 for sodic soil remediation at ADAC & RI, Tiruchirapalli. Treatments are, T₁: Control (without amendments), T₂: 50 per cent Gypsum Requirement (GR) + dhaincha incorporation, T₃: Gypsum @ 25 per cent GR + dhaincha incorporation+ distillery yeast sludge @ 5 t ha⁻¹, T₄: Gypsum @ 50 per cent GR + dhaincha incorporation+ distillery yeast sludge @ 5 t ha⁻¹, T₅: Gypsum @ 25 per cent GR + dhaincha incorporation+ sugarcane trash compost @ 10 t ha⁻¹, T₆: Gypsum @ 50 per cent GR + dhaincha incorporation+ sugarcane trash compost @ 10 t ha⁻¹, T₇: Gypsum @ 25 per cent GR + dhaincha incorporation+ poultry manure@ 5 t ha⁻¹, T₈: Gypsum @ 50 per cent GR + dhaincha incorporation+ poultry manure @ 5 t ha⁻¹, T₉: Gypsum @ 25per cent GR + dhaincha incorporation + pressmud @ 10 t ha⁻¹ and T₁₀: Gypsum @ 50 per cent GR + dhaincha incorporation+ pressmud @ 10 t ha⁻¹. Application of gypsum @ 50% GR + dhaincha incorporation + poultry manure @ 5t / ha lowered pH (8.37), EC (0.58 dS/m) and ESP (14.6) compared with control (pH-9.08, EC - 0.52 dS/m and ESP - 25.6). Post-harvest soil available N, P and K was higher in the application of gypsum @ of 50% GR + dhaincha + poultry manure @ 5 t/ha (N- 271 kg/ha, P- 26.6 kg/ha and K-189 kg/ha). The higher net return of 56,349/- ha with B:C ratio of 2.41 was realised with gypsum @ 50% GR + dhaincha incorporation + poultry manure @ 5 t/ha. The higher net return of 56,349 ha⁻¹ with B:C ratio of 2.41 was realized under the treatment with the application of gypsum @ 50 percent GR+ dhaincha incorporation + poultry manure @ 5 t ha⁻¹ followed by application of gypsum @ 25 percent GR + dhaincha incorporation + poultry manure @ 5 t/ha (net return: 49,871 ha⁻¹; B:C ratio: 2.46).

A CROSS SECTIONAL STUDY ON MENSTRUAL AND PREGNANCY PROBLEMS AMONG RURAL AND SIDDHI TRIBAL MOTHERS : KARNATAKA, INDIA

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Abstract

In true scene certain discomforts, like nausea, back pain, and fatigue are quite common during menstruation and pregnancy. Sometimes it is hard to what is normal but definitely it is fact that any things that cross its average level calls for, urgent precautionary measures and treatments to prevent further risks and prolonged effect on health. Tribals are primitive group, who possesses lack of knowledge on reproductive health and ended up with various kinds of health issues. Presents study mainly focuses on *Siddi* tribal mothers, who were descended from South Africa to India as slaves and stayed here since long time. A cross sectional study was conducted during 2017 on randomly selected 120 mothers (60- tribal and 60 non-tribal mothers) from Uttar Kannada districts of Karantaka state. Personal information and problems during menstruation and pregnancy were elicited by using self- structured questionnaire with reliability 7.82. Results revealed that, majority of the rural mothers (60.0 %) had medium indices on reproductive health whereas majority of *Siddi* tribal mothers (80.0 %) had very low reproductive health index. It was observed that 80-90 per cent of rural mothers had backache, stomachache and headache during menstruation whereas only 20-30 per cent of *Siddi* tribal mothers experienced the same problems and half of them suffered from rashes or itching during menstruation. With respect to complication during pregnancy, it was observed that rural mothers reported more of excessive nausea, vomiting, constipations, edema, gestational diabetes and infection as compare to *Siddi* tribal mothers. Pica and edema were experienced more prevalent in tribal mothers. Results also highlighted that 63.23 per cent of *Siddi* tribalm others consumed alcoholic drinks as a part of their culture. Tribal mothers experienced fewer



problems, though they gained less knowledge on reproductive health. The *Siddi* mothers considered menstruation and pregnancy as natural phenomenon in their life cycle and no special care was taken during their psychological condition. Multidisciplinary educative approaches are needed for better life of rural and tribal mothers.

WEED MANAGEMENT IN OKRA UNDER NORTHERN ZONE OF KARNATAKA

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Abstract

Field experiment was conducted at University of Horticultural Science, Bagalkot, Regional Horticultural Research and Extension Centre, Dharwad, Karnataka. During kharif season of the year 2018. A set of seven treatments, comprising Post-emergence application of Quizalofopethyl 40-50 g/ha at 25 DAS + 10 g urea/L as protected spray at 25 DAS, Pre-emergence application of Metribuzin @ 525 g/ha at 25 DAS, Pre-application of Pendimethalin @ 6 ml/L + Quizalofopethyl 40-50 g/ha at 25 DAS, Pre-application of Pendimethalin @ 6 ml/L + one HW, Pre-emergence application of Pendimethalin @ 6 ml/L, Weed free check (control) was laid out in randomized block design with three replications. All the recommended package of practices were adopted to raise the crop except weed control. All the weed management treatments had significant effect on growth of Okra plants. Treatment (T4) Pre-application of Pendimethalin @ 6 ml/L + one hand weeding recorded highest number of fruits /plant (16.44) and yield /ha. (126.63 q/ha.) followed by treatment (T2) Weed free check (2-3 hand weeding) (first HW at 25 DAS) recorded (16.38) and (123.19q/ha number of fruits/plant and fruit yield per ha.

EFFECT OF TEMPERATURE ON GROWTH, YIELD AND GRAIN QUALITY OF RICE

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Abstract

Rice (*Oryza sativa* L.) is a globally important cereal plant, and as a primary source of food it accounts for 35–75% of the calorie intake of more than 3 billion humans. With the likely growth of world's population toward 10 billion by 2050, the demand for rice will grow faster than for other crops. There are already many challenges to achieving higher productivity of rice. In the future, the new challenges will include climate change and its consequences. The expected climate change includes the rise in the global average surface air temperature. At the end of the twenty-first century, the increases in surface air temperature will probably be around 1.4–5.8 °C, relative to the temperatures of 1980–1999, and with an increase in variability around this mean. Most of the rice is currently cultivated in regions where temperatures are above the optimal for growth (28/22 °C). Any further increase in mean temperature or episodes of high temperatures during sensitive stages may reduce rice yields drastically. In tropical environments, high temperature is already one of the major environmental stresses limiting rice productivity, with relatively higher temperatures causing reductions in grain weight and quality. Developing high-temperature stress-tolerant rice cultivars has become a proposed alternative, but requires a thorough understanding of genetics, biochemical, and physiological processes for identifying and selecting traits, and enhancing tolerance mechanisms in rice cultivars. The effects of high-temperature stress on the continuum of soil–rice plant–atmosphere for different ecologies (with or without submerged conditions) also need detailed investigations. Most agronomic interventions for the management of high-temperature stress aim at early sowing of rice cultivars or selection of early maturing cultivars to avoid high temperatures during grain filling. But these measures may not be adequate as high-temperature stress events are becoming more frequent and severe in the future climate. In this review, the effects of high-temperature stress on rice growth, yield, and quality characters, including various morphological, physiological, and biochemical mechanisms along with the possible use of conventional and molecular breeding methods, and crop growth simulation models and techniques are discussed. The mitigation and adaptation strategies for dealing with high-temperature stress in rice are highlighted. We conclude that there are considerable risks for rice production, stemming from high-temperature stress but benefits from the mitigation or adaptation options through progress in rice research may sustain the production systems of rice in the future warmer world.



EFFECT OF MULCHING AND INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON GROWTH AND YIELD OF BT COTTON

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Abstract

A field experiment was conducted for two years during the rainy season of 2015-16 and 2016-17 at College farm, College of Agriculture, Rajendranagar, Professor Jayashankar Telangana State Agricultural University, Hyderabad in strip-plot design with three replications to study the effect of different land configurations (flat bed sowing, ridge and furrow, broad bed and furrow (BBF) and poly mulch on BBF) and integrated nutrient management treatments (Farmer's practice, 100% RDF of 150:60:60 NPK kg ha⁻¹, 125% RDF, 100% RDF along with 25% N through FYM or press mud) and their integration effect on growth, yield attributes and productivity of Bt cotton. Pooled data of two years indicated that poly mulch on BBF increased the growth, yield attributes and yield (2183 kg ha⁻¹) followed by ridge and furrow method, BBF and flat bed methods. Among the INM practices, application of 100% RDF along with 25% RDN through press mud improved the growth, yield attributes and yield (2103 kg ha⁻¹). Application of 100% RDF along with press mud equivalent to 25% RDN was on par with 100% RDF + 25% RDN through FYM (2042 kg ha⁻¹) and was in turn on par with 125% RDF (1990 kg ha⁻¹) followed by farmer's practice (1785 kg ha⁻¹) and 100% RDF (1676 kg ha⁻¹). Interaction between soil moisture conservation practices and integrated nutrient management practices was found to be significant. Treatment combination involving poly mulch on broad bed and application of 100% RDF along with 25% RDN through press mud (2370 kg ha⁻¹) recorded significantly higher mean seed cotton yield and was comparable with poly mulch on broad bed with application of 100% RDF along with 25% RDN through FYM (2346 kg ha⁻¹) or 125% RDF.

IMPACT OF TRAININGS IMPARTED BY KVKs ON KNOWLEDGE SKILLS PRODUCTIVITY AND PROFITABILITY OF THE FARMERS OF CHHATTISGARH

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Abstract

The present study was conducted in eight selected KVKs of Chhattisgarh state during the year 2017-2018. The data were collected purposively from the 400 beneficiaries' farmers of eight of KVKs situated in three agro-climatic zones of Chhattisgarh state. The investigation aimed to assess the impact of different trainings imparted by the KVKs in selected districts on production, productivity and profitability of different crops and also find out the changes occurred in the knowledge and skills of the farmers due to training imparted by the KVKs. Study revealed that the training imparted on INM, SRI, weed management and seed production of rice crop, resulted in the increased knowledge of farmers up to 90.00 percent. The training imparted regarding cashew production technology resulted in positive change (88.75%) in knowledge of the farmers. Training on vermi-compost and mushroom cultivation results in positive change in knowledge of the respondents up to 78.87 and 72.46 percent respectively. Training imparted on INM in gram, SRI, weed management in rice, cashew production technology, INM in rice and tomato production technology were resulted in improvement in skills up to 85.00, 80.90, 78.75, 76.66 and 75.00 percent respectively. Positive and significant changes in attitude farmers were observed as the impact of training programme conducted on INM in gram (77.50%) followed by SRI (75.00%), INM in rice (72.50%), weed management in rice (68.75%) and cashew production technology which was 67.50 percent. An increment of 50.00 and 33.33 percent in the productivity tomato and brinjal was observed as result of training imparted to farmers. While, training on weed management and SRI of rice resulted in 33.35 and 27.26 percent enhancement in productivity. It was found that, the on IPM was resulted in 25.00 percent more yield of gram. In case of profitability of different crops, the major changes were observed as the result of training on IPM in gram and rice which increased the profit up to 40.00 and 36.00 percent respectively. The training on brinjal production technology, weed management and INM in rice crop increased the profit up to 35.00 and 34.48 and 33.13 percent respectively. Majority of the farmers (87.25%) perceived that the quality of training materials used by the KVK scientists were quite good, followed by the responses that effective teaching aids were used by the KVK scientists and useful information provided by the KVK scientist during the training programme which were 68.25 and 66.25 percent respectively.



STUDY OF GENETIC VARIABILITY FOR FRUIT YIELD AND ITS ATTRIBUTES IN GERMPLASM OF OKRA (*ABELMOSCHUS ESCULENTUS* L. MOENCH)

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Abstract

The field experiment was laid out in Horticulture Research Farm, Department of Horticulture, R.A.K. College of Agriculture Sehore, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, during Kharif season, 2016 on thirty genotypes of okra collected from different area. The different genetic parameters such as genetic variability, heritability and correlation coefficient were calculated as per standard procedures. The result revealed that phenotypic coefficient of variations were high for many characters viz., LAI at 60 DAS (42.92%), LAI at 90 DAS (42.20%), fruit yield per ha (38.50%), fruit yield per plot (37.39%) and number of fruits per plant (37.5%) and fruit yield per plant (30.97%). High genotypic coefficient of variation was recorded for LAI at 90 DAS (40.25%), fruit yield per ha (39.76%), LAI at 60 DAS (39.67%), fruit yield per plot (36.71%), number of fruits per plant (35.62%) and fruit yield per plant (29.85). The highest heritability estimates were recorded for 100 seed weight (97.22%), fruit yield per ha (97.10%), fruit yield per plot (96.38%), fruit yield per plant (92.89%), days to maturity (92.46%), number of fruits per plant (90.95%) and LAI at 90 DAS (90.94%), whereas medium heritability were recorded in number of leaves at 90 DAS (89.90%), fruit length (88.48%), LAI at 60 DAS (85.41%), plant height at 90 DAS (84.78%), fresh fruit weight (77.27%), plant height at 60 DAS (75.92%), number of leaves per plant at 60 DAS (70.87%), fruit diameter (70.43%). Lowest heritability observed in days to 50% flowering (69.36%) and number of seeds per fruit (65.10%). High estimates of heritability coupled with high genetic advance expressed as percent of mean was recorded for fruit yield per plant (75.24%) followed by fruit yield per plot (74.22%).

HEARING IMPAIRED CHILDREN : EMOTIONAL INTELLIGENCE AND CORRELATES

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Abstract

Emotional intelligence is knowing and managing of personal emotions, sympathizing with others and manipulation of communications in order to be satisfied with them. Thus the study was conducted with an objective to assess the emotional intelligence and factors influencing emotional intelligence of hearing impaired children. Sample consisted of 84 school children selected from 8th, 9th, and 10th standard from residential deaf and dumb schools of Dharwad, Sirsi and Belagavi district during the year 2018-19. Bar-On emotional intelligence (youth version) and socio-economic (SES) scale were used for the study. Modified chi-square, t-test and ANOVA were used to analyze the data. The results of the present study revealed that, majority (78.6 %) of hearing impaired children had low and 21.40 per cent had moderate level of emotional intelligence. There was a significant influence of age, ordinal position and socio-economic status on emotional intelligence of hearing impaired children. However there was no significant difference between boys and girls regard to emotional intelligence.

GENETIC VARIABILITY AND ASSOCIATION STUDIES ON BPT 5204 BASED RICE MUTANTS UNDER SALINE STRESS SOIL

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Abstract

Present investigation was carried out with 12 advanced (M₇) mutants developed using gamma rays on two varieties i.e., BPT-5204 and RP Bio-226 along with checks (Gangavati Sona and CSR-22) at Agricultural Research Station Gangavati, Karnataka state, India during kharif 2018. Analysis of variance revealed highly significant differences among the mutant lines



for all morpho-physiological characters under study viz., days to 50 per cent flowering, plant height, panicle length, number of grains per panicle, panicle weight, productive tillers per hill, length of flag leaf and grain yield per plant. Higher magnitude of heritability (broad sense) and genetic advance as percentage of mean were observed for number of grains per panicle, productive tillers per hill, spikelet sterility, test weight, grain yield per plant, grain yield per ha and Na^+/K^+ ratio indicating presence of additive gene action and fixation of genes. Correlation study revealed that grain yield per plant exhibited significant positive association with plant height, panicle length, number of grains per panicle and panicle weight at phenotypic level under saline stress condition. However significant negative association was observed in case of days to fifty per cent flowering. Path analysis revealed that plant height, panicle length, panicle weight and length of flag leaf exhibited direct positive effect on grain yield per plant. Hence, it would be rewarding to lay stress on these characters in selection programme for increasing the yield and to screen for salinity tolerance.

STUDIES ON THE RESPONSE OF DIFFERENT CONCENTRATION OF GROWTH REGULATORS AND ROOTING MEDIA ON ROOTING OF AIR LAYERING OF GUAVA (*PSIDIUM GUAJAVA* L.) CV. GWALIOR 27

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Abstract

Guava (*Psidium guajava* L.), belongs to the family Myrtaceae. Guava is generally propagated by vegetative methods like, inarching, air layering, cutting, budding and grafting. These methods have their own merits and demerits. However, cutting and layering or air- layering are easy methods of propagation of this crop. Auxins particularly IBA and IAA have been reported to induce rooting in many of the plant species with varied success. The growth, establishment and survival of seedling also depend on the quality of a rooting media. The rooting media should be considered an integral part of the propagation system; percentage rooting and the quality of the roots produced are directly influenced by the medium. The experiment was undertaken in the Department of Horticulture, College of Agriculture, RVSKVV Gwalior, (M.P.). To study the effect of different concentration of growth regulators and rooting media on rooting of air layering of guava (*Psidium guajava* L.) cv. Gwalior 27. The experiment was laid out in Randomized Block Design with three replications and 35 treatments combinations including, control, IAA and IBA both each at 10,000 and 15,000 ppm and rooting media soil, soil + vermi compost, soil + cocopeat, soil + leaf mould, soil + vermi compost + cocopeat, soil + vermi compost + leaf mould and soil + cocopeat + leaf mould. The result revealed that the maximum number of primary and secondary roots, length and diameter of primary and secondary root was found in soil + cocopeat + leaf mould rooting media. In case of hormone and its concentration, the maximum number of primary and secondary roots, length and diameter of primary and secondary root was found in 15,000 ppm IBA.

NANOTECHNOLOGY AND ITS ROLES IN AGRICULTURAL PRACTICES

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Abstract

Agriculture is regarded the backbone of most developing countries, with more than 60% of the population dependent on it for their livelihood. The prediction that in 2050 our planet will be populated by over 9 billion people is quite reliable. A large proportion of these livelihoods in developing countries are confronted with daily food shortages due to environmental impacts or political instability, while there is a world food surplus. Nanomaterials (NMs), with a small particle size (10-100 nm diameter), influence fundamental life events of plants that include seed germination, seedling vigor, root initiation, growth and photosynthesis to flowering. Nanotechnology will revolutionize agriculture and food industry by innovation new techniques such as: Precision farming techniques, enhancing the ability of plants to absorb nutrients, more efficient and targeted use of inputs, disease detection and control diseases, withstand environmental pressures and effective systems for processing, storage and packaging. Nanoparticles can serve as 'magic bullets', containing plant growth regulators, herbicides, chemicals



or genes, which target plant parts to release the content. The significant interests of using nanotechnology in agriculture includes specific applications of nanofertilizers and nanopesticides to trail products and nutrients levels to increase the productivity without decontamination of soils, waters, and protection against several insect pest and microbial diseases. Application of nanotechnology in agricultural sciences, especially in seed sciences, there are numbers of metal and metal oxide nanoparticles have been found effective in improving germination and seedling vigour of wide array of crops. Application of multi-walled carbon nanotubes (MWCNTs) and silica nanoparticles (SiO_2) positively influences seed germination of different crop plants.

CROP BIODIVERSITY TO SUSTAIN CLIMATE CHANGE

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Abstract

India is country of diversity in every term, be the culture, language, customs and specially food and so is the crop diversity. The vast ecology that it holds, India has richness in its species diversity which reflected by India eating habits. Modern agriculture has major influence on this culture which is conclusive enough as India started to grow more food with the help of modern high yielding varieties, hybrids with photo insensitivity allowing crops to be grown across India trough out the year. Though the food grain production has increased by and is feeding hugely expanding populations, it is also replacing the vast diversity in agriculture as a whole. It is certain that coming days are to face the shortage of food as increased biotic and Abiotic stress resulting from climate change will cause huge damage, as a result of loss of resistance source in the form of diversity of crops and their valuable germplasm at faster pace by ignoring them for high yielding and market driven few crops and their few varieties and hybrids. The Crop Biodiversity has the answer for the population needs, viz., hunger, nutritional demand and sustainability. Diverse crops and land use also attracts and sustains a variety of pollinators that contribute to the production of over 80% of crops traded on the world market. The fact that modern agriculture is financially lucrative, and feeds large population, intensive agriculture is more attractive which is also threatening as we may forget and lose valuable traditional knowledge and germplasm. India with maximum cultural diversity has direct link with conservation of crop diversity and their germplasm. Traditional knowledge associated with various communities, tribes and conserved people in our country is a tremendous source and can be answer for the fore coming challenges in field of food production. As the indigenous farming communities preserve, conserve and maintain the diversity sacredly in name of traditions, culture. In this regard, Farmers do not control all factors involved including that are related to agricultural policies, incentives and markets or consumption practices, its therefore the government intervention in these field is needed to make it primary action of practicing the conservation, utilization and to benefit from the traditional knowledge/ crop diversity which is prominent from the nook and corners of the country.

GENETIC ENGINEERING TO SPEED UP PLANT BREEDING

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Abstract

The world knows the importance of plant breeding as it is the major contributor towards green revolution and of course the world peace by feeding billons of hungry people across the globe. It is also evident that plant breeding is painstakingly long process and faces low precision due to linkage drag and missed selections. By the advance of bio molecular techniques, more precision of gene expression has been achieved although; it is facing opposition from different socio cultural sects for the reason of foreign gene/DNA inserted through genetic engineering. But still genetic engineering has its option to come up with tools to speed plant breeding process through genome editing or gene editing technology which precisely allows alteration of genes to get rid of barriers or to introduce new traits. Since gene editing has many advantages over classic genetic engineering technology Viz., new gene insertion is random in case of GM technology but gene editing allows precise insertion or alteration of the desired gene, gene editing technology does not introduce foreign DNA as a result conventionally bred plant and gene edited plant are almost same. Some international organisations and unions have put ban on this technology also as it



may threaten to lose biodiversity, but gene editing can be used to transfer gene from crop relative/germplasm with more precision when compared to traditional plant breeding. Major use come in editing genes which code for antinutritional element which render crop inedible like cotton seed oil which has gossypol. Editing of genes in wild plants for acclimatization which makes unviable and perennial wild plants to be domesticated in a faster manner by which gives farmers gets more option of crops to grow and can bring in sustainability and enhanced Agro biodiversity.

PERFORMANCE EVALUATION OF MANUALLY OPERATED RICE HARVESTER

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Abstract

The overall performance of the harvester was evaluated on the basis of harvesting losses, stubble height, field capacity, field efficiency, physiological responses like heart rate, oxygen consumption rate and energy expenditure rate by varying forward speed, different age group and pushing force. The width of cut during the experiments was kept constant with a value of 560 mm as the wheat and rice crop was having row to row spacing of 200 and 200 mm and developed harvester was able to cut two row at a time. The cutting angle were varied to access the feasibility of cutting the crop at below or above 100 mm height from the ground level, so that maximum straw may be obtained. Field capacity was obtained is 69%.

GENETIC IMPROVEMENT IN BRINJAL THROUGH MANIFESTATION OF HETEROSIS

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Abstract

It is presumed that by 2025, India will have 1.4 billion people, majority of whom will have relatively higher living standards. The consumption of vegetables has attained tremendous importance with these changing dimensions of food and nutritional securities. Due to increasing pressure on land through urbanization and industrialization, it is not feasible to increase the area under vegetables commensurate to our requirements; hence, the preciousness of increasing the yield per unit area become more feasible to increase the area under vegetable commensurate to our requirements, hence the preciousness of increasing the yield per unit area becomes much more significant than it has ever been. This is the point at which hybrids carve a niche for themselves over non-hybrids. Development in vegetable production particularly through hybrids, contributes not only to food and nutritional security but also towards poverty alleviation and income generation since it is labour intensive, earns higher returns and involve extra skills. Heterosis is the basis for development of hybrids and synthetic varieties. In fact, hybrids is the best means of utilizing heterosis, as it leads to superiority in adaptation, yield, quality, disease resistance, maturity and general vigour over its parents. In the present study, the extent of heterosis was studied in 28 F₁ hybrids of brinjal. Estimates of heterotic responses showed the perceptible advantage of heterozygosity in increasing the yield. This phenomenon led to identify heterosis breeding as the key methodology for improving genetic yield ceiling in brinjal. On the basis of heterosis studies, it is concluded that the hybrids PB-6 x PR and PB-4 x PR were found promising for earliness in E1 season while, PB-6 x PB-4 and PS x BARI for E2 season. For fruit yield, PB-6 x BARI, SA x PB-4, SA x PR and PB-6 x PB-71 were found promising for the trait in E1 season while for E2 season PPR x PB-71, SA x PR and PB-71 x BARI exploited maximum heterosis.

ROLE OF ALLELOCHEMICALS ON BIOACTIVE COMPOUNDS OF SOME SELECTED MEDICINAL PLANTS

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Abstract

Allelopathy is a form of positive and negative interaction among organisms that is caused by the action of chemical



compounds referred to as allelochemicals. These compounds are produced mainly as a result of the secondary metabolism of plants and microorganisms (bacteria, viruses and fungi) and can influence several processes in ecosystems and agro-ecosystems. An allelopathic effect is mainly referred to as a type of negative interaction, but positive interactions have also been reported, depending on the allelochemical considered, the target plant and the concentration tested. The substances produced by plant secondary metabolism are essential for the interaction of plants with the biotic part of the environment and help to attract pollinators or seed dispersers and also act as a defense against natural enemies and as allelochemicals against potential competitors. In agroecosystems, allelopathy can affect weed management, plant reproduction, species consortia, the mulching effect on crops and the succession and rotation of cultivated species. Additionally, allelochemicals have the potential to be used for herbicide synthesis, enabling the discovery of new mechanisms of action. From a genetic point of view, molecular biology techniques (especially transgeny), or even classical breeding, can hasten the goal of increasing the production of desirable allelochemicals by crops. Genetic studies are extremely useful to understand better the true role of allelochemicals in plant-plant interactions and to evaluate their limitations and effects on the environment. However, the production of these compounds requires energy investment by the plant, which might theoretically limit their biological production. In the context of genetic improvement, the balance between allelopathy and yield potential is a recurring challenge.

SEQUENTIALINTERCROPPING SYSTEM–AN EFFECTIVE PRACTICE TO IMPROVE LAND UTILIZATION AND FARMER’S INCOME

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Abstract

Net sown area of the country is 141.43 million hectares, which is 45.95 % of total geographical area of the country. From the last 50 years there is no increase in the net sown area of the country and there is no possibility to increase. On the other hand, population of India, in 1971 was only 54.82 crores and up to end of the 2018 it was estimated to reach 135 crores and still it is increasing. To meet the food demands of the this ever increasing population, the present day cultivable area and its productivity will not be sufficient. There is need to increase the land utilization by adopting the efficient cropping system practices so that land productivity also increases and which is most beneficial to the farming community as well as to the country. Intercropping is an efficient strategy that can be followed with desirable outcome in the present climate change scenario also. Most previous studies focused on intercropping systems involving two-crop associations. However, there is much scope to improve existing cropping systems by devising and evaluating modifications that allow more effective use of the season. In intercropping of short duration crop with long duration crop showed the possibility of three crop association by introducing the second crop after harvesting of the first intercrop. For example, potato, onion, garlic and cabbage could be cultivated profitably as first intercrops with sugarcane. After harvesting of first intercrop, the possibility of growing some short duration crops such as leafy vegetables, mungbean and dhaincha successfully as second intercrop with sugarcane has been explored. By following like this three crop association sequential intercropping, marginal and small farmers can produce more from their available land. So that land utilization can be improved by using land resource efficiently leads to enhance in the farmer’s income.

IMPACT OF CLIMATE CHANGE IN AGRICULTURAL PRODUCTION AND PRODUCTIVITY

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Abstract

Climate change and variability are concerns of human being. The recurrent droughts and floods threaten seriously the livelihood of billions of people who depend on land for most of their needs. The global economy is adversely being influenced very frequently due to extreme events such as droughts and floods, cold and heat waves, forest fires, landslips etc. The natural calamities like earthquakes, tsunamis and volcanic eruptions, though not related to weather disasters, may change chemical composition of the atmosphere. It will, in turn, lead to weather related disasters. Increase in aerosols (atmospheric pollutants) due to emission of greenhouse gases such as Carbon Dioxide due to burning of fossil fuels, chlorofluorocarbons (CFCs),



hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) etc., Ozone depletion and UV-B filtered radiation, eruption of volcanoes, the “human hand” in deforestation in the form of forest fires and loss of wet lands are causal factors for weather extremes. The loss of forest cover, which normally intercepts rainfall and allows it to be absorbed by the soil, causes precipitation to reach across the land eroding top soil and causes floods and droughts. Paradoxically, lack of trees also exacerbates drought in dry years by making the soil dry more quickly. Among the greenhouse gases, CO₂ is the predominant gas leading to global warming as it traps long wave radiation and emits it back to the earth surface. The global warming is nothing but heating of surface atmosphere due to emission of greenhouse gases, thereby increasing global atmospheric temperature over a long period of time. Such changes in surface air temperature and consequent adverse impact on rainfall over a long period of time are known as climate change. If these parameters show year-to-year variations or cyclic trends, it is known as climate variability.

PERFORMANCE OF DIFFERENT VARIETIES OF PADDY IN SATNA DISTRICT OF MADHYA PRADESH

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Abstract

An experiment was conducted a study on performance of different varieties of paddy in Satna district of Madhya Pradesh at experimental field, DeenDayal Research Institute, Krishi Vigyan Kendra, Majhgawan Satna (M.P.) during kharif season 2016. The treatments comprising of thirteen varieties of paddy *i.e.*, Danteshwari, Indrabarani, JR-201, Kranti, MTU-1001, MTU-1010, Sahbhagi, Purnima, Pusa sugandh-5, WGL-32100, Sambhamasuri, JR-503 and JR-501. There were assigned to randomized block design with three replications. The plot size was maintained 600 sqm/trial. The observation was recorded on number of Tillers/plant, plant height (cm), time of maturity (DAT) and average yield (q/ha). The results showed significant variation in number of Tillers/plant, plant height (cm), time of maturity (DAT) and average yield (q/ha) among all the varieties. The maximum number of Tillers/plant (21) in Sahbhagi, plant height (114 cm) in Kranti, time of maturity (DAT) (129) in Sambhamasuri and average yield (42.40 q/ha) in Sahbhagi. In this trial it was observed that variety Sahbhagi was superior in yield compared to other varieties.

STUDIES ON GENETIC DIVERGENCE AND CHARACTERIZATION OF SESAME GERMPLASM (*SESAMUM INDICUM* L.)

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Abstract

Sesame is one of the most important oilseed crop of tropical and temperate regions. In the present investigation, a set of 50 genotypes comprised of advanced breeding lines developed at RARS, Jagtial were evaluated for morphological characterization and genetic diversity for selection of diverse parents. Various genetic parameters for different yield and yield contributing traits and disease parameter along with the interrelationship of yield and yield traits with seed yield including direct and indirect effects were assessed. The experiment was laid out in a randomized block design with three replications at Regional Agricultural Research Station, Polasa, Jagtial, Karimnagar, during *kharif*, 2018. The fifty genotypes were characterized with twenty morphological characters including both qualitative and quantitative characters. Out of twenty morphological visually assessed DUS descriptors studied, six were found to be monomorphic while eleven were dimorphic and remaining characters are polymorphic. Analysis of variance indicated the existence of significant genotypic differences among the genotypes for yield and its components. Highest GCV, PCV, heritability and genetic advance as per cent of mean were observed for the characters namely number of capsules per plant and seed yield per plant indicating the influence of additive gene action, as such these traits can be improved through simple selection. The genotypes with highest means for these characters can be used in breeding programmes to develop into high yielding cultivars with disease resistance. Correlation studies revealed that seed yield per plant showed positive significant association with harvest index, number of



capsules per plant, capsule length, 1000 seed weight and number of seeds per capsule. While positive direct effect was highest with number of capsules per plant on seed yield followed by days to maturity, height of the plant from first capsule formation. Based on the relative magnitude of D^2 values, the genotypes were distributed into 14 clusters. Out of them, cluster II being the largest with 14 genotypes and with one genotype each in 10 clusters forming the solitary clusters. The highest divergence occurred between cluster VII and XII while the lowest was observed between clusters IV and VII. The parents chosen from different clusters for hybridization to generate promising segregants for seed yield. The data on character means for fourteen clusters indicated that, cluster VII is having highest mean value for days to maturity, number of capsules per plant, capsule length, seed yield per plant and harvest index, cluster XII for days to 50% flowering, plant height, height of the plant from first capsule formation and oil content, cluster I for capsule width and number of seeds per capsule, cluster VIII for number of branches per plant and cluster XIV for 1000 seed weight. The genotypes JCS 3980, Swethathil, GT 10, JCS 4039 and JCS 4053 from these clusters having high mean values may be directly used for adaptation or may be used as parents in future hybridization programme. The study resulted in identification of four moderately resistant lines for phyllody. The lines identified can be used as donors in the resistance breeding programme. By imparting host plant resistance in the genotypes, the cost of cultivation decreases which is a very effective method.

EVALUATION OF DIFFERENT VARIETIES OF WHEAT IN SATNA DISTRICT OF MADHYA PRADESH

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Abstract

An experiment was conducted to study on Evaluation of different varieties of wheat in Satna district of Madhya Pradesh at experimental field, Deen Dayal Research Institute, Krishi Vigyan Kendra, Majhgawan, Satna (M.P.) during Rabi season 2016-17. The treatments comprising of eleven varieties of wheat i.e., HD-2967, CSW-18, HD-2932, JW-3020, HD-2864, JW-3288, GW-273, LOK-1, GW-322, MP-3173 and GW-366. There were assigned to randomized block design with three replications. The plot size was maintained 500 sqm/trial. The observation was recorded on number of Tillers/plant, plant height (cm), number of grain/spike and average yield (q/ha). The results showed significant variation in number of Tillers/plant, plant height (cm), number of grain/spike and average yield (q/ha) among all the varieties. The maximum number of Tillers/plant (8) in CSW-18, HD-2967 and HD-2932, plant height (93 cm) in HD- 2932, number of grain/spike (72) and average yield (46.40 q/ha) in CSW-18. In this trial it was observed that variety CSW-18 was superior in yield compared to other varieties.

CLIMATE CHANGE IMPACT ON CROP PRODUCTION

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Abstract

In today's era climate of earth is changing quickly by the anthropogenic emissions of greenhouse gases and by the conversion of non-agricultural land such as forests into agricultural land. Agriculture is highly dependent on the climate. Changes in temperature, atmospheric carbon dioxide (CO_2), and the frequency and intensity of extreme weather could have significant impacts on crop yields. For any particular crop, the effect of increased temperature will depend on the crop's optimal temperature for growth and reproduction. If the rising temperature exceeds a crop's optimum temperature, yields will decline. Higher CO_2 levels can affect crop yields. Some laboratory experiments imply that elevated CO_2 levels can increase plant growth. However, other factors, such as changing temperatures, ozone, and water and nutrient constraints, may counteract these potential increases in yield. Very extreme temperature and precipitation can check crops from growing. Extreme events, especially floods and droughts, can harm crops and shrink yields. Many weeds, pests, and fungi flourish well under warmer temperatures, wetter climates, and increased CO_2 levels. The ranges and distribution of weeds and pests are likely to boost with climate change. This may cause new troubles to farmers' crops previously unexposed to these species. Though rising CO_2 can stimulate plant growth, it also reduces the nutritional value of most food crops. Rising levels of



atmospheric CO₂ reduce the concentrations of protein and essential minerals in most plant species, including wheat, soybeans, and rice. This direct effect of rising CO₂ on the nutritional value of crops represents a potential threat to human health. Overall, climate change could make it more difficult to grow crops in the same ways and same places as we have done in the past.

STUDY OF GENE ACTION AND COMBINING ABILITY FOR SEED YIELD AND ITS ATTRIBUTING TRAITS IN SESAME (*SESAMUM INDICUM* L.)

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Abstract

The present experiment was carried out using line x tester analysis at the Department of Seed Science and Technology, Sagadividi Farm, J.A.U., Junagadh with fourteen parents and forty hybrids along with a two checks, G.Til-2 and G.Til-3 were evaluated during summer 2016-17. The female G.Til-10 and male AT-319 were good general combiners for seed yield per plant having high concentration of favourable genes as indicated by highly significant and positive *gea* effect. Also AT-341 and AT-265 for days to flowering, days to maturity and height to first capsule were good general combiners. The hybrids Khadkala-S x G.Til-1, AT-307 x AT-285, AT-322 x AT-285, AT-319 x G.Til-10 and AT-341 x G.Til-10 were high yielding along with positive desirable *sca* effect for seed yield per plant. These hybrids also had higher values for height to first capsule, number of branch per plant, number of capsules per plant, number of seeds per capsule, number of capsules per leaf axils and 1000-seed weight could profitably be exploited through heterosis breeding for general cultivation in order to increase the yield potentiality in sesame.

QR CODER AND ITS APPLICATION IN THE LIBRARIES

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Abstract

QR codes square measure 2-D matrix barcodes. Last decade witnessed a gentle growth in industrial and business homeward usage of those QR codes with the appearance of sensible and internet capable mobile phones/devices. However the movement of mistreatment QR codes in Library field remains in its primary stage. This paper explains the potential role of QR Codes in managing and selling of the Library resources to confirm most usage of resources; and in info Dissemination. The article focuses on transient summary of QR codes, use of QR codes in LIS field with examples and conjointly lists out major QR code generators and readers. This paper is a guide to all or any people who wish to implement QR Codes in their Library.

STUDY TO DETECT SEED BORNE MYCO-FLORA ASSOCIATED WITH CHICKPEA (*CICER AERITINUM* L.) SEEDS

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Abstract

Madhya Pradesh is the largest producer of chickpea (*Cicer arietinum* L.) in India. A number of abiotic and biotic factors are responsible for its yield gaps of being below its potential. Therefore an study was conducted during two consecutive years 2015-16 and 2016-17 at Department of Plant Pathology, JNKVV, Jabalpur to detect seed borne myco-flora associated with Chickpea seeds by different methods of seed testing. During the study, total 30 varieties of chickpea viz., JG 130, JG 63, JG 16, JG 315, JG 11, JG 74, JG 322, JG 412, JG 226, JG 6, JG 14, JG 62, JG 218, Pragati, Uday, Vijay, Radhey, KJD 1168 (Alok), Avrodhi, JAKI 9218, BGD 72, BGD 128, BGD 1057, BGD 1058, Digvijay, Samrat, Vihar, GNG 1946, GNG 1845



and K 850 were collected and examined from different location of Madhya Pradesh by standard protocols of Standard blotter paper, 2,4-D blotter, Agar plate, Deep freeze, Paper towel and Seedling symptoms test method. The revealed that, a total of eight genera of fungi viz. *Fusarium oxysporum*, *Rhizoctonia bataticola*, *Alternaria alternata*, *Aspergillus flavus*, *Aspergillus niger*, *Curvularia lunata*, *Rhizopus* spp. and *Penicillium* spp. were reported in different varieties of chickpea. Among them *Aspergillus niger*, *Aspergillus flavus*, *Rhizopus* spp. and *Fusarium oxysporum* were predominant to all seed samples. Amongst the method used for detection of seed borne fungi, the standard blotter paper method is more effective followed by agar plate method, deep freeze method and paper towel method.

EFFECT OF PLAN OF NUTRITION ON GROWTH OF FEMALE BUFFALO CALVES

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Abstract

The present experiment conducted at dairy farm during year 2017-18 at CSAUAT Kanpur .The rate of female buffalo calves is a major problem at dairy farm .Twelve female buffalo calves were selected for digestibility that on nutrition slid sample contain 86.50% DM, 20.10% CP, 2.00 % EE 15.5% CF, 52.70% NFE and 9.50% Ash. The average dry matter intake per 100kg body weight was (5.65, 5.98, 7.28 kg) the digestibility coefficient of DM were recorded (62.37, 66.97, 70.84) and digestibility coefficient of CP (73.67, 74.51, 78.36) and digestibility coefficient of CF (64.29, 65.20, 66.37) and digestibility coefficient of EE (58.11, 61.47, 62.35) and digestibility coefficient of NEE (64.63,65.82, 67.33) and digestibility coefficient of organic matter (65.78, 67.01, 68.74) . The average live weight in female buffalo calves were increased (727.68, 915.15, 959.82) gm per day in group I, II and III respectively. The group IIIrd was shown better performance in respect of growth parameters in other groups Ist, IInd from the present study , it was apparent that the extra concentrate to be added in diet for proper development of growing calves IIIrd group were higher in growth. Digestibility coefficient of DM .CF, EE, NEE, OM, were also higher in group IIIrd.

EFFECT OF FEED SUPPLEMENT ON NUTRIENT UTILIZATION AND MILK PRODUCTION IN CATTLE

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Abstract

The present investigation entitled “Effect of feed supplement on nutrient utilization and milk production in cattle”. was carried out in the department of A.H. and Dairying at dairy fram during year 2017-2018 at C.S.A. University of agriculture and technology Kanpur. The major problem of lower milk production at daiey farm. Tvevle Sahiwal coes were selected for trial. A balanced is one which supplies all the nutrient necessary to nourish the animal properly during twenty four hours period . four cows in each group T₁ was served as control group whereas T₂ and T₃ groups were provided 50 and 75 gm Dugdha Ganga Mineral supplement, respectively. The animals of all the groups were fed according to ICAR feeding standard. Water was provided ad –lib twice daily. The average dry matter consumption per day per animal was recorded 9.17 ± 0.17, 9.18 ± 0.062, and 9.16 ± 0.091, kg in T₁ T₂ and T₃ groups, respectively. The dry matter consumption (gm/day) by the animal all the groups. Singnificance higher (p<0.005) DCP and TDN intake was observed in T₃ group as compared to other groups of Sahiwal cows. The dry matter digestibility were observed 60.16 62.06, and 62.76 in T₁, T₂ and T₃ groups, respectively.. The digestibility coefficient of crude protein was 60.83 61.68, and 63.13 in the observed T₁ T₂ and T₃ respectively.. The digestibility coefficient of either extract in three groups, viz., T₁, T₂ and T₃ were 65.25.66.33 and 67.66 rrespectively. The digestibility coefficient of Crude fiber was 53.66 56.04 and 57.37 in group of T₁ T₂ and T₃, respectively. The digestibility coefficients of Nitrogen free extract were 62.23 64.31 and 66.55 in T₁, T₂ and T₃ group of respectively. The organic matter digestibility were 60.49 61.79 and 63.04 Present in animal of group T₁, T₂ and T₃ respectively. The average weekly milk production lit/day were 41.30 0.192, 44.50 0.118 and 48.49 0.333 in T₁, T₂ and T₃ respectively. The higher milk production were recorded in T₃ groups among the other groups. Digestibility coefficient of DM, .CF, NFE, and Organic matter were also higher in group T₃. It was concluded that the feed supplement (Dugdha Ganga) were found beneficiary for proper milk production and nutrient utilization without any ill effect.



DIFFERENT LEVELS OF NITROGEN ON YIELD, NUTRIENT CONTENT AND UPTAKE OF SOYBEAN IN VERTISOLS

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Abstract

A field experiment was conducted at research farm of Agricultural Research Institute (ARI), Rajendranagar, Hyderabad, Telangana. The experiment was laid out in combination of two factors viz., with and without leaf fall and different levels of chemical fertilizers along with FYM application in RBD, each plot measuring 6.1 m x 4.2 m and three replications. In this experiment ADB-22 (Bhasar) high yielding variety of soybean was used as a test crop. The soil was clayey in texture and moderately alkaline (pH 8.4) in reaction, non-saline in nature (EC 0.16 dS m⁻¹) and medium in organic carbon content (0.67%). The experiment consisted treatments were viz., 75% RDF, 100% RDF, 75% RDF + FYM @ 5 t ha⁻¹, 100% RDF + FYM @ 5 t ha⁻¹ and in addition absolute control was maintained. The amount of added leaf fall was recorded at 20, 40, 60, 80, 100 DAS, harvest, 20 DAH and 40 DAH. Among the intervals negligible leaf fall was noticed at 20 DAS and with progress of growth of crop, highest leaf fall was recorded at 100 DAS thereafter leaf fall was declined. The highest grain yield 2318 kg ha⁻¹ was recorded with application of 100% RDF + FYM @ 5 t ha⁻¹ along with leaf fall incorporation. The N content in soybean seeds ranged from 1.74% in control to 2.70% in 100% RDF + FYM @ 5 t ha⁻¹. The highest total N uptake was 113.44 kg ha⁻¹ in 100% RDF + FYM @ 5 t ha⁻¹ with leaf fall incorporation.

ALTERNATE BEARING OR BIENNIAL BEARING IN MANGO

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Abstract

Mango (*Mangifera indica* L.) is an important member of the family Anacardiaceae in the order Sapindales. It is one of the most important fruit crops in India, having a great cultural, socio-economic and religious significance since ancient times. It has originated from north-eastern India. The flowering phenomenon in mango is a complex one. Normally, it crops heavily in one year (on year) and bears less or no crop the following year (off year). Thus the rhythm of bearing in mango is not strictly 'alternate' but 'irregular' or 'erratic'. Alternate bearing is due to Climatological factors (Rain, high humidity, low temperature making on to off year); Age and size of shoots: Shoots of 8-10 months maturity will be productive; Carbon/Nitrogen ratio: High carbon/moderate N encourages flower bud formation (30-40); Hormonal balance: Higher levels of auxin and inhibitor like substance and lower levels of gibberellins like substances were found to be vital for a flowering shoot. This problem causes great economic loss to the growers with the poor yield or failure of crop during "off year" and the selling produce at low price during "on year" due to fruit glut in the market. When a tree produces heavy crop in one season, it gets exhausted nutritionally and is unable to put forth new flush thereby failing to yield in the following season. Draining out of CHO and N reserves during "on" year is known to lead to a lean crop in the "off" year as they are important for fruit bud initiation i.e. high C/N ratio helps for fruit bud initiation. As per physiological studies in regular and irregular varieties of mango indicated that mesophyll cells in leaves of the regular mango varieties are more uniform and highly efficient in CO₂ utilization.

EFFECT OF PACLOBUTRAZOL ON GROWTH AND FLOWERING OF MANGO

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Abstract

Mango (*Mangifera indica* L.), the world's most luscious fruit has been recognized as the 'king of fruits' in India long back. *Mangifera indica* (MI), also known as mango, aam. It is one of the most popular tropical fruit crop. India ranks first in area and production of mango in the world and exhibits wide variations in growth habit, flowering and fruiting. Orchard efficiency and productivity of mango is affected by problems of biennial bearing, high fruit-drop during initial stages of fruit development and unfavourable environmental conditions resulting in low fruit set. Use of plant growth retardants especially paclobutrazol,



has been found beneficial in combating some of the production-related problems. Paclobutrazol is triazole compound that inhibit gibberellin and sterol biosynthesis. Paclobutrazol is considered as one of the important plant growth retardants which restricts vegetative growth and induces flowering in Mango. The application of paclobutrazol to soil as a drench around the tree trunk (collar drench) is the most effective method, as it ensures proper uptake by the tree. The required quantity is mixed in approximately one litre of water and poured onto the soil around the trunk in a circular band. Beneficial effects of paclobutrazol in mango have been attributed to manipulation in phytohormones, water relations and C:N ratio. Paclobutrazol inhibits gibberellin activity following a check in the conversion of ent-kaurene to ent-kaurenoic acid in the gibberellin biosynthetic pathway.

INFLUENCE OF BOTANICALS ON LONGEVITY OF PIGEON PEA SEEDS

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Abstract

An investigation on “Influence of botanicals on longevity of pigeon pea [*Cajanus cajan* (L.) Millsp.] seeds” under ambient storage conditions” was conducted to assess the influence of botanicals on longevity of pigeon pea during the year 2017-2018. The seeds of pigeon pea variety Pusa 991 was treated with eight botanicals consisting of Neem formulation, Citronella oil, *Trichoderma viridae*, Neem leaf powder, Lantana leaf powder, Kali tulsi leaf powder, Turmeric powder, Mustard oil; chemicals formulation viz., Deltamethrin and Carboxin + Thiram and mixed uniformly with seeds. Treated and untreated lots were packed in Cloth bag and Polythene bag and stored under ambient conditions of storage. The observations were recorded bimonthly on standard germination, seedling length, seedling dry weight, seedling vigour index I & II, seed moisture content and insect infestation. Data were subjected to the statistical analysis and valid conclusions were drawn. The container, botanicals and their iteration showed significant effect on parameters studied. Factors exhibited significant differences during entire period of storage except a few cases. A linear decrease in standard germination, seedling length, seedling dry weight, seedling vigour index I & II were observed. At the end of storage period highest decreases in control and least in treatment turmeric powder treated seed and in interaction of Polybag x Turmeric powder were observed. Highest standard germination (82.6%), seedling length (24.8 cm), seedling dry weight (0.36 mg/10 seedling) and seedling vigour index I and II (2053 and 30.03, respectively) were observed in treatment turmeric powder (2g/kg seed) followed by deltamethrin (0.04 ml/kg seed) at 10 months of storage. Polythene bag showed better performance as compared to cloth bag by scoring highest values for all parameters except insect infestation and moisture content where it was least. Polythene bag and Treatments- deltamethrin @ 0.04 ml/kg seed, Neem formulation @ 0.5 mg/kg seed, Turmeric powder @ 2.0g/kg seed, mustard oil @ 2.0ml/kg seed and carboxin + Thiram @ 3g/kg seed had registered standard germination above MSCS level for 10 months storage period but among these treatment turmeric powder was found to be best followed by deltamethrin. Over all Polythene bag and botanical-turmeric powder either singly or in combination of these may be recommended for safe storage of pigeon pea variety Pusa 991 under ambient storage condition of Kanpur.

GENETIC DIVERSITY AND CHARACTERIZATION OF BLACKGRAM (*VIGNA MUNGO* L. HEPPER) GERMPLASM

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Abstract

Among pulses, blackgram (*Vigna mungo* L. Hepper), occupies a prominent place in India as it is the fourth important pulse crop in India, covering an area of about 3.24 million hectares with the production of 1.96 million tonnes. In Karnataka, blackgram covers an area of about 1.10 lakh hectares with production of 0.53 lakh tonnes and productivity of 506 kg/ha. Genetic improvement of crop yield of any crop primarily depends on extent of genetic diversity present in the population and knowledge of the genetic diversity among the genetic resources is crucial for breeder to better understanding of evolutionary



and genetic relationships among the accessions. An experiment was conducted using 75 accessions of blackgram to study genetic diversity and characterization of germplasm for morphological traits, 2017-18 at UAS Campus, Dharwad. Among the morphological traits good level of variations were observed for terminal leaflet shape, pod pubescence and seed colour. The analysis of variance revealed significant differences among the genotypes for all the studied quantitative characters. Genetic variability analysis revealed high PCV, GCV, heritability and genetic advance as per cent over mean observations were recorded for plant height, clusters/plant, pods/plant, seed yield/plant and test weight which indicated the presence of additive gene action. Mahalanobis D^2 statistic analysis showed considerable genetic diversity and grouped into twelve clusters. Among the clusters, cluster VIII with only one genotype (IPU-91-7) showed high seed yield/plant, number of pods/plant and the genotype was late maturing. Cluster II and VI had early flowering and early maturing genotypes. Clusters III and VII had genotypes with high test weight. The cluster VI and VIII are most diverse in nature and the genotypes constituted in these clusters could be used as parents for hybridization programme.

KINNOW MANDARIN PERFORMANCE UNDER, CHITTORGARH, RAJASTHAN CONDITIONS

Ratan Lal Solanki and Deepa Indoriya

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Abstract

Kinnow is a first generation hybrid between King x Willow leaf and developed by H.B. Frost in 1915. In India, it is first introduced in Punjab. It has performed well and gained commercial significance. In Rajasthan, kinnow mandarin is cultivated in Shri Ganganagar and Hanumangarh districts. Plants are medium to large, erect, symmetrical, dense foliage with a few scattered spines, leaves broadly lanceolate. Fruit medium, oblate, base flattened, deep orange yellow colored on ripening, rind thin, adherent to segments, very juicy, 10-24 seeds, fruit maturity in January. The Chittorgarh district seems to have a good potential for kinnow mandarin production on account of fertile, well-drained soil, good quality of irrigation water and comparatively moderate climate. An investigation on performance of kinnow mandarin was carried out at Instructional Farm of Krishi Vigyan Kendra, Chittorgarh, Rajasthan. The 700 plants were planted during March, 2007-08 with a spacing of 15 feet x 15 feet. The observations were recorded on plant height, plant girth, fruit yield, fruit weight, total soluble solids and ascorbic acid. The kinnow mandarin show luxurious vegetative growth, deep orange color, TSS ranged from 09-11⁰ Brix and ascorbic acid ranged from 18-27 mg/100 ml juice in Chittorgarh condition.

WOMEN EMPOWERMENT : A CASE STUDY OF RURAL WOMAN

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Abstract

Empowerment is the process that creates power in individuals over their own lives, society, and in their communities. People are empowered when they are able to access the opportunities available to them without limitations and restrictions such as in education, profession and lifestyle. Feeling entitled to make your own decisions creates a sense of empowerment. Empowerment includes the action of raising the status of women through education, raising awareness, literacy, and training. Women's empowerment is all about equipping and allowing women to make life-determining decisions through the different problems in society. Economic empowerment increases women's agency, access to formal government programs, mobility outside the home, economic independence, and purchasing power. Policy makers are suggested to support job training to aid in entrance in the formal markets. The UN came out with a set of goals called the Sustainable Development Goals, or SDGs, to help make the world a better place the fifth goal focuses on empowering women and girls to achieve gender equality through equal access to various types of opportunities (health care, education, work, etc.). A case study was under taken for women empowerment of smt. Dhaneshwari Mandavi, member of SHGs saraswati savsa haytasamuh, village kallubanjari, Block Churiya, district Rajnandgaon, started participating in women vocational training programme of vermicomposting, vegetable production, trichoderma production, etc organized by CHRS, Rajnandgaon. Today she had increased her self reliance and self confidence. Due to participation in various training programme there is a change in psychologically, socially, economically, politically, and culturally empowerment. Now working as master trainer and now she is CEO of company named Bambleshawari Mahila Producer Company Limited Fafamar, Churiya, Rajnandgaon



STUDIES ON HETEROSIS FOR VALUE ADDITION IN YELLOW SEEDED AND FLAX TYPE GENOTYPES OF LINSEED, (*LINUM USITATISSIMUM* L.)

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Abstract

Linseed is one of the oldest cultivated oilseed crop in the world and every part of this plant is utilized in some way. It offers us one of the most healthy oil profile and also linen fibers which makes it a dual purpose crop. In linseed, value addition is now being aimed so that the area under this crop may be regained and also the production and productivity may be increased. For this, both oil and fiber quality need to be explored and integrated so that maximum use out of this crop may be taken. Keeping these points in focus, the present investigation was undertaken at Indira Gandhi Krishi Vishwavidyalaya, Raipur to work towards value addition of crop. Yellow seeded linseed offers great advantages towards oil quality and consumer preferences like clearer oil, healthy oil profile and better taste. On the other hand flax type genotypes if explored well will result in achieving the linen advantage from this crop. The experimental material comprised of 40 yellow seeded and 25 flax type genotypes of linseed obtained from AICRP on Linseed, IGKV, Raipur. It is now well recognized that heterosis is very useful in increasing productivity. The magnitude of heterosis provides a basis for genetic diversity and guideline to the choice of desirable parents for developing superior F₁ hybrids so as to exploit hybrid vigour and for building gene pool to be exploited in population improvement. The magnitude of heterosis particularly for yield having paramount importance and if the heterosis is practically and economically feasible, it can help to reach high oil levels. From the results obtained, it was seen that RFT-3 x RFT-6, RFT-6 x YLS-11 and RFT-3 x YLS-3 exhibited significant better parent heterosis for multiple traits including seed yield per plant (g) in linseed. Thus, these crosses can be exploited for enhancement in seed yield along with its contributing traits in further breeding programme. Crosses performing well for single character were also identified. RFT-6 x YLS-3, RFT-6 x YLS-11 and RFT-8 x YLS-6 were found to give heterotic combinations for plant height which is a major trait for fiber in linseed. For seed yield, RFT-6 x RFT-8, RFT-6 x YLS-3 and YLS-3 x YLS-6 were found to be good heterotic parents and thus could be used in breeding programmes for enhancing seed yield.

EFFECT OF SITE SPECIFIC NUTRIENT MANAGEMENT ON GROWTH PARAMETER AND YIELD OF SOYBEAN [*GLYCINE MAX* (L.)]

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Abstract

A field experiment on nutrient omission plot technique (NOPT) on soybean-cotton cropping system was conducted at farmers' fields in village's in Akola district during rainy season of 2014-15. The experiment had 4 treatments, laid out in Randomized Block Design with fifteen replications in fixed plots. Treatments comprised omission of N, P, K and optimum plane of nutrition (30:100:80 kg ha⁻¹ NPK). Yield was estimated in terms of seed and straw yield. Results showed that P was the most limiting factor nutrient and there was a reduction in the seed yield of soybean to the tune of 18.86, 22.57 and 9.13 % due to N, P and K omissions during the year 2014-15 respectively. Growth parameter recorded highest with balanced nutrients application.

PHENOTYPING AND GENOTYPING OF BPT-5204 BASED RICE MUTANTS FOR SALINE STRESS SOILS

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Abstract

Evaluation of saline tolerant BPT-5204 based M₆ generation rice mutants were carried out both in saline stress soil (ECe 8-10 dS/m) and normal soil conditions at Agricultural Research Station, Gangavathi during *kharif* 2017, University of Agricultural



Sciences, Raichur, India. The experiment was carried out in randomized block design, consisting of total 57 mutants of BPT-5204 and Rp-Bio 226 with the seven checks viz., CSR-22(Local check), Rp-Bio-226(control/parent), BPT-5204(parent), Pokkali (National check), IRRI-154 (Salinity sensitive at seedling stage), FL-478(tolerant at seedling) and Swarna Sub 1(sensitive check). Two selected SSR markers viz., RM7075 and RM336 were used to evaluate rice genotypes for salt tolerance. Based on phenotypic performance alone is less reliable and delays the breeding progress. Advance in molecular breeding, the simple sequence repeats or micro-satellite markers are considered the most suitable. The phenotypic evaluation was done based on the standard evaluation system (SES) during seedling stage, Stress Susceptibility Index and physiological observation of Na^+/K^+ ratio in leaf was worked out. Variation between saline tolerance and sensitive were detected. Grain yield per plant and number of productive tillers shown variation in saline tolerant and sensitive mutants. The marker expressed polymorphism and able to distinguish between saline tolerant and sensitive genotypes. The marker showing similar banding pattern with Pokkali were considered as tolerant. In dendrogram two cluster were observed, cluster I consist of Pokkali and mutants and cluster II includes all sensitive checks. Based on phenotypic and genotypic study, 22 mutants were observed as tolerant to salinity, these SSR markers might have homology with salinity tolerance genotypes and consequently the markers could able to identify salt tolerant rice mutants from sensitive parent variety. The selected tolerant mutants will be used in further breeding programme to release as saline tolerant variety or as donar parent for salinity tolerance after confirmation in multilocation location trials.

ISOLATION OF ZINC SOLUBILIZING BACTERIA FROM THE RHIZOSPHERE SOILS OF RICE

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Abstract

Rice (*Oryza Sativa* L.) is one of the important food grains and largest crops grown in the world in terms of both area and production. It is the major food source for most of the Indians. Rice is mostly grown in waterlogged conditions that makes the poor availability of many micronutrients. Among the micronutrients Zinc is primarily needed for the growth and enzymatic activity of the plants. Unavailability of the Zinc for the plant results in the development of Khaira disease symptoms and ultimately reduced yields are noticeable. In India more than 50% of rice growing soils are deficient in zinc. Even though chemical supplements are sufficient enough to combat the problems but the availability is still a problem under waterlogged conditions. Some of the bacteria work out this problem and make it available for the plant at significant levels. In our present study we have isolated zinc solubilizing bacteria from rhizospheric soils of rice growing area surrounding Raichur and Koppal districts of Karnataka, India. Around forty zinc solubilizing bacteria were isolated using TRIS-minimal agar medium (TMA) which is supplemented with 0.1% Zinc oxide. All the isolates were named after zinc solubilization such as MZSB-1 to MZSB-40 respectively. Under *in vitro* conditions all the bacteria were able to grow in the TMA plates and solubilize Zinc. Among all the isolates MZSB-6 and MZSB-8 showed maximum zone of solubilization of 19 and 21 mm respectively.

IN VITRO SCREENING OF ZINC SOLUBILIZING BACTERIA

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Abstract

Zinc (Zn) being an essential micronutrient, it is an important constituent of several enzymes and proteins. Even though it is needed by plants in small quantity it is crucial for the plant development. Most of the Indian soils are lacking in Zinc content



which is a serious issue. Zinc gets fixed in insoluble form just after seven days of soil application under submerged conditions. Thus more than 50% of rice growing soils suffer this problem of zinc deficiency. Stunting, interveinal chlorosis, distorted leaves are common Zinc deficiency symptoms which should never be neglected. Supplying zinc amendments would increase zinc content in the soil, but may not be available to plants due to fixation in the soil colloids. Conversion of unavailable zinc to available zinc form is carried out by several soil microflora under varied conditions. Thus microbial approach hopefully is the most convenient method to overcome this problem. In our present study, screening was carried out for the Zinc solubilizing ability of bacteria isolated from rhizosphere of rice. Forty isolates were screened for their efficiency to produce solubilization zone around the colonies on TRIS-minimal agar plates supplemented with 0.1% ZnO. Out of forty bacterial isolates, two of them produced highest zone of solubilization around the colony which were notified as MZSB-6 and MZSB-8 with a hallow zone of 19mm and 21mm diameter respectively.

CHARACTER ASSOCIATION AND PATH COEFFICIENT ANALYSIS IN SUNFLOWER (*HELIANTHUS ANNUUS* L.)

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Abstract

Vegetable oils and fats constitute an important component of human diet, ranking third after cereal and animal products. Oil forms the basic cooking medium for majority of dishes, especially of Indian cuisine and enhances the taste of these preparations. The per capita recommended oils and fats is 30 g per day but their availability in India is despairingly below this level in rural area (20g per day). This underlines the need for a concerted effort to enhance the oil production. Sunflower (*Helianthus annuus* L.) is one of the important oil seed crops in India after groundnut and rapeseed-mustard. Production of sunflower in India had increased six fold from 1970 to 1990 due to the introduction of high yielding varieties and hybrids. Presently, the area under cultivation in world is 26.24 million hectares with the production of 1.63 MT/ha.

A study was conducted to determine the correlation and path analysis among sunflower genotypes during *Kharif*, 2014. Correlation studies revealed that days to 50 % flowering, plant height, head diameter, volume weight, seed yield per plant and oil content were important selection indices for both oil and seed yield improvement. *Alternaria* leaf spot severity had negative and significant correlation on seed yield per plant, oil content and oil yield per plant. This indicated the importance of resistance breeding for *Alternaria* leaf spot disease. The path analysis revealed that traits namely; days to 50 % flowering, head diameter, oil content, plant height and *Alternaria* leaf spot severity were important selection indices. Though the correlation analysis showed that 100-seed weight and volume weight were important, the path analysis indicated that these traits were less important.

MORPHOLOGICAL AND BIOCHEMICAL CHARACTERIZATION OF THE ISOLATED ZINC SOLUBILIZING BACTERIA

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Abstract

Both morphological in addition to biochemical characterization techniques have been immensely useful and have been carried out in performing the characterization of most of the microorganisms. In the present study, we have characterized forty isolated zinc solubilizing bacteria by virtue of their morphological and biochemical nature. The cell morphology, colony morphology, and Gram reaction were carried out following the standard procedures. We found that the colour of colonies



varied from white, creamish to yellowish. Size of the colonies also varied from pinpointed to large and shape varied between circular and irregular shapes. Among the forty isolates, eleven were observed to be gram-positive while, remaining twenty nine isolates were gram-negative. Twenty four hour old cultures were used for performing these tests. Biochemical characterization revealed that all the forty isolates were positive for starch hydrolysis, catalase, denitrification, casein hydrolysis, gas production, gelatin liquefaction tests and showed negative results for urease activity, methyl red test, and indole tests. Eleven isolates were scored positive for H₂S production and Voges-Proskauer tests while the remaining twenty nine isolates were negative. In accordance with the Bergey's Manual of Systematic Bacteriology the results obtained from morphological and biochemical characterization of the forty zinc solubilizing bacterial isolates were found to belong tentatively to the two genera viz., *Bacillus* and *Pseudomonas*.

ELUCIDATION OF BENEFICIAL CHARACTERS OF ISOLATED ZINC SOLUBILIZING BACTERIA

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Abstract

Various bacteria colonize the roots of plants and promote growth with the aid of direct and indirect mechanisms. Modification of root architecture by PGPR implicates the synthesis of phytohormones and other sequestering substances that lead to enhancement and proliferation of the roots and root hair cells. In our present study, we carried out different tests to elucidate the growth-promoting traits such as production of IAA, phosphate solubilization and production of siderophore as well as organic acids. These tests were undertaken for the ten efficient zinc solubilizing bacterial isolates which were primarily screened for *in vitro* zinc solubilization under plate and broth assay. All the isolates were able to produce IAA and siderophore. A significantly higher concentration of IAA was produced by MZSB-8 (8.21 g ml⁻¹) followed by MZSB-6 (7.92 g ml⁻¹). Siderophore production test revealed that the values fall in the range between 53.33 % and 76.733 %. The isolate MZSB-8 produced significantly higher siderophore 76.73 % followed by MZSB-6 that produced 72.36 %. All the ten bacterial isolates were able to solubilize phosphate on Pikovskaya's media containing tri-calcium phosphate among which, MZSB-8 showed the highest solubilization zone (12.3 mm) followed by MZSB-6 (10.3 mm). The profiles of organic acid production by the bacteria revealed that gluconic acid was the common organic acid produced by most of the isolates used in the study. The other organic acids produced include malic acid, succinic acid, citric acid, oxalic acid, and tartaric acid.

INFLUENCE OF CROP GEOMETRY ON ONION BULB YIELD IN MOHALI DISTRICT OF PUNJAB

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Abstract

Onion is an important and potential vegetable crop grown in S.A.S. Nagar (Mohali) district of Punjab. It is grown in many parts of district during *rabi* season and farmers get good returns from its sale. It was observed that due to improper spacing between the plants, onion production is less than the expectations and it also leads to poor bulb size which greatly hampers its quality. To overcome this problem, an On Farm Trial (OFT) was conducted by K.V.K., S.A.S. Nagar (Mohali) in five farmer's field during 2018-19 to evaluate the effect of crop geometry on onion bulb yield. Farmers were trained on scientific cultivation of crop including method of raising crop, intercultural operations, nutrient management, water management, weed management and proper harvesting, post harvest handling through off campus trainings. Crop was raised following recommended package of practices. The data of OFT revealed that T₃ i.e. Bed planting, Bed size: 67.5 cm & planting distance: 12 × 7.5 cm (KVK Intervention) is found to be having highest yield (i.e. 150 q/acre) with BC ratio of 3.75:1 followed by T₂: Flat planting distance: 15 × 7.5 cm having yield of 110 q/acre along with BC ratio of 2.75:1 and T₁: Flat planting distance: 20 × 10 cm (Farmer's practice) with yield of 90 q/acre along with BC ratio of 2.25:1. By changing the crop geometry (as per T₃) maximum yield along with highest BC ratio was observed in onion thereby giving maximum profit with better bulb quality.



Cultivation of Onion in raised bed was appreciated by farmers as it leads to proper plant growth and easy intercultural operations. Farmers were fully satisfied with the performance of this technology.

ASSESSMENT OF BORON IN SOILS AND IRRIGATION WATER IN THE SELECTED MIDLAND PADDY FIELDS OF KERALA

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Abstract

A paddy field is a flooded parcel of land used for growing rice. Rice is the staple food for a large part of human population across the world. The area chosen for the present study is the selected paddy fields of Chathannoor in Kollam district, Kerala. The concentration of boron, the essential trace element in the soils and irrigation water in the selected midland paddy fields of Kerala was estimated. Paddy field soil samples and irrigation water samples collected were subjected to extraction and estimated the boron content following Azomethine-H method. The results of the study shows that boron content in paddy field soil samples was high in both pre harvest and post harvest seasons. Also observed very high levels of boron in the water used for irrigating the paddy fields of the study area. The increased levels of born can be managed by cultivating boron tolerant rice varieties.

SEASONAL CHANGES IN THE GLYCOGEN CONTENT OF FRESHWATER BIVALVE MOLLUSCS

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Abstract

Glycogen is an essential biochemical for the body providing energy to the body parts as required. Carbohydrate stored in glycogen form in the body of an animal which gives instant energy to the organism. In freshwater bivalve molluscs: *Lamellidens corrianus* glycogen is present in different parts of body organ of which the hepatopancreas (digestive gland) has almost highest amount of glycogen. Though hepatopancreas has highest amount of glycogen it fluctuate seasonally due to the metabolic and reproductive changes in the individual. Experiments were carried out for three season's viz. summer, monsoon and winter; animals were collected from Godavari river at Paithan, Maharashtra. Different body parts like mantle, hepatopancreas, gonad, foot and gills were taken for estimation of glycogen. The variation in the glycogen content of *L. corrianus* from different seasons on 7th and 12th day was estimated. Onset of monsoon is spawning season in which thousands of gamets released by *Lamellidens corrianus* which utilizes the stored glycogen in hepatopancreas.

NEW TRENDS IN FERTIGATION MANAGEMENT

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Abstract

Fertilization and irrigation are the two most important factors in crop production, that strongly affect the yield as well as quality of cultivated crops. Fertigation is the agronomic operation in which fertilizer is dissolved in the irrigation water and delivered to the root zone by the irrigation system. This combination provides the technical capacity for precise mineral nutrition, both spatially and temporally. The main advantages of fertigation are the increased flexibility to split the fertilizer dose according to the uptake rate of the crop, an improved distribution of fertilizer in the root zone, and the possibility of maintaining a low (but constant) nutrient level in the soil solution. As a consequence, the use of fertigation has been found to reduce the run-off of mobile nutrients such as N by up to 70% compared with conventional fertilizer applications. All of the



above aspects positively influence the economic and environmental sustainability of agricultural activities. However, the correct estimation of crop nutrient and water needs is fundamental to obtaining precise plant nutrition and high nutrient use efficiency in fertigated cropping systems. The main goal in efficient fertigation management is to satisfy both the crop needs and to minimize nutrient losses. To attain this goal, it is necessary to accurately estimate three main variables: (i) crop nutrient requirement; (ii) soil nutrient availability; and (iii) nutrient delivery to match crop development. Also, it is logical to envisage that nutrient requirement of plant is not uniform throughout the season and it varies with its growth stage. Different fertigation patterns can be developed by varying the quantities of fertilizer applied at various crop growth stages. It is necessary to evaluate the response of a crop to different fertigation patterns. Precise water as well as nutrients requirement based on scientific study such as crop coefficient curve i.e., K_c values are also to be evaluated. Apart from the above mentioned concepts, crop monitoring techniques and tools, and Decision Support Systems based on simulation models and soil testing approaches are to be intensively studied for precise control fertigation in intensive cropping systems.

ORGANIC CULTIVATION OF IMPROVED TURMERIC VARIETY BY INNOVATIVE FARMER OF MOHALI DISTRICT OF PUNJAB

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Abstract

Mohali district is located in sub mountainous region of Punjab which has the potential of growing Turmeric as major crop during summers. In baseline survey conducted by Krishi Vigyan Kendra S.A.S. Nagar (Mohali) it was observed that the technical knowhow of farmers on advanced organic crop production practices was poor. The important varieties under cultivation in the district were Punjab Haldi-1, Punjab Haldi-2 and local cultivars which have low curcumin content of 2.5-3.0%. KVK trained & adopted farmer Mr Avtar Singh of village Teera adopted improved Turmeric variety "Rajender Sonia" of RAU Bihar having high curcumin content of 7.5-8.4 % in the area. He grows organic turmeric using vermicompost, green manure, FYM, leguminous crops, neem oil, cow urine and pheromone traps. He also uses drip and sprinkler irrigation along with mulching with paddy straw. Krishi Vigyan Kendra S.A.S. Nagar (Mohali) also demonstrated his technology through series of interventions in the form of trainings, frontline demonstrations, on farm trials, exposure visits etc. His innovative practice of growing high curcumin containing variety along with organic production and direct marketing in nearby tricity lead him to fetch around double price of his processed turmeric powder and pickle as compared to market price. With limited land resources he is able to get 20 q turmeric from 1.5 acre land with BC ratio of 3.33:1 in 2014. His yield was 12 q/acre with BC ratio of 3.31:1 in 2015. During 2016 his yield was 13 q/acre with BC ratio of 3.29:1. In year 2017, yield of 14 q/acre was obtained by him with BC ratio of 3.26:1. During 2018 his turmeric yield was 16 q/1.25 acre with BC ratio of 3.28:1. His organic cultivation of improved turmeric variety having high curcumin content and its processing and value addition gives him high net returns in addition to employment to local farmers specially women. He sell his products through direct marketing (more than 400 families enrolled with him). He is a role model for farmers who have limited land resources and enthusiastic for crop diversification.

INFLUENCE OF NITROGEN AND SULPHUR APPLICATION ON YIELD AND QUALITY OF SOYBEAN (*GLYCINE MAX* L.)

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Abstract

A field experiment was conducted to study the effect of different levels of nitrogen and sulphur on yield and quality of soybean with four levels of nitrogen (0, 40, 80, 120 kg N ha⁻¹) and four levels of sulphur (0, 20, 30 and 40 kg S ha⁻¹). The highest mean grain yield of 1997 and 1874 kg ha⁻¹ were recorded with the application of 120 kg N and 40 kg S ha⁻¹, respectively. The oil content and protein content also progressively increased with increasing levels of nitrogen and sulphur. The highest oil and protein content of 18.65 and 40.3 percent were observed with the application of 120 kg N ha⁻¹. Application of 40 kg S ha⁻¹



recorded higher oil and protein contents of 18.38 and 38.74 percent, respectively. Significantly higher net returns (72438 Rs. ha⁻¹) and B:C ratio (3.38) recorded with combined application of nitrogen @ 80 kg ha⁻¹ and sulphur @ 40 kg ha⁻¹ compared to other treatments.

IDENTIFICATION OF PROMISING SESAME GENOTYPES UNDER AICRP TESTING AT RARS, TIRUPATI CENTRE

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Abstract

Higher variability for plant height, capsules/plant and seed yield/plant; and medium variability for days to 50% flowering and days to maturity was recorded. The variability was low for capsule length among the genotypes. The high yield genotypes viz., GT 4, YLM 66, RMT 377, SI-199-2-84 were also found superior for number of capsules/plant and capsule length while JTS-8 with higher seed yield recorded more number of capsules/plant. DS 45 was found to be early in flowering and maturity.

ESTIMATION OF HETEROSIS AND COMBINING ABILITY USING HALF DIALLEL CROSS IN ELITE INBRED LINES OF TOMATO (*LYCOPERSICON ESCULENTUM* L.)

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Abstract

Tomato is one of the most universally popular, nutritious and widely grown vegetable. A 7x7 half diallel cross (without reciprocals) was performed to develop high yielding tomato genotypes. Seven elite tomato genotypes and their twenty one F₁ progeny generated from diallel cross without reciprocal were used to study combining ability, heterosis over mid parent and heterosis over better parent viz. days to 50% flowering, plant height, number of primary branches per plant, number of clusters per plant, number of fruits per plant, fruit length, fruit width, yield per plant, days to first harvest, days to last harvest, pH and total soluble solids. There were highly significant variations among the genotypes for all the characters. The analysis of combining ability suggested that both additive gene actions were involved in the genetic system. Ranking of the parents on GCA performance for twelve characters suggested that the parent M-Local was the best general combiner for days to 50% flowering, plant height, number of clusters per plant, number of fruits per plant, fruit length, yield per plant and pH and that of hybrids on SCA performance suggested that F₁ So-Lalima x PBC was best specific cross combiner for days to 50% flowering, fruit length and yield per plant F₁ Arka Rakshak x M-Local was best specific cross combiner for number of clusters per plant, fruit width and fruit yield. The F₁'s had the highest positive and significant heterosis over mid parent and over better parent for yield per plant. From the study it might be concluded that high yielding tomato genotype(s) could be developed following diallel technique.

FARMING TECHNIQUES FOR SUSTAINABLE FOOD PRODUCTION AND PRODUCTIVITY IN INDIA

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Abstract

Food security is a pressing problem in India and in the world. According to the Food and Agriculture Organization of the UN (FAO), it is estimated that over 190 million people go hungry every day in the country. Evidence for India's food challenge can be found in the fact that the yield per hectare of rice, one of India's principal crop, is 2177kgs per hectare, lagging behind countries such as China and Brazil that have yield rate of 4263 kgs per hectare and 3265 kg/hectare respectively. The cereal yield per hectare in the country is also 2,981 kg/hectare, lagging far behind countries such as China, Japan and the US. The slow growth of agricultural production in India can be attributed to an inefficient rural transport system, lack of awareness



about the treatment of crops, limited access to modern farming technology and the shrinking agricultural land due to urbanization. Add to that, an irregular monsoon and the fact that 63% of agricultural land is dependent on rainfall further increase the difficulties we face. Despite these odds, there is huge potential for India to increase its agricultural productivity to meet the food requirements of its growing population. The good news is that experience in India and other countries shows that the adoption of sustainable farming practices can increase both productivity and reduce ecological harm. Sustainable agriculture techniques enable higher resources efficiency- they help produce greater agricultural output while using lesser land, water and energy, ensuring profitability for the farmer. These essentially include methods that, among other things, protect and enhance the crop and the soil, improve water absorption and use efficient seed treatment. While Indian farmers have traditionally followed these principles, new technology now makes them more effective. For example, for soil enhancement, certified biodegradable mulch films are now available. It conserves the soil properties, eliminates soil contamination, and saves the labor cost that comes with polyethylene mulch film. The other perpetual challenge for India's farms is the availability of water. Many food crops like rice and sugarcane have a high water requirement. In a country like India, where majority of the agricultural land is rain-fed, low rainfall year can wreak havoc for crops and cause a slew of other problems - a surge in crop price and a reduction in access to essential food items. Again, Indian farmers have long experience in water conservation that can now be enhanced through technology. Seed can now be treated with enhancement that helps them improve their root system. This leads to more efficient water absorption. While sustainable agriculture through soil, water and seed management can increase crop yields, an efficient warehousing and distribution system is also necessary to ensure that the output reaches the consumers. Thus, all three aspects - production, storage and distribution- need to be optimized if India is to feed its ever-growing population.

PRICE POLICY HELP TO INDIAN AGRICULTURE DEVELOPMENT

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Abstract

In developing country like India where majority of the population devotes 2/3 of its expenditure on food alone and where majority of the population is engaged in agricultural sector, prices affect both income and consumption of the cultivators. The Govt. of India announces each year procurement/support prices for major agricultural commodities and organizes purchase operations through public agencies. Undoubtedly, violent fluctuations in agricultural prices have harmful results. For instance, a steep decline in the price of particular crop in few years can inflict heavy losses on the growers of that crop. This will not only reduce the income but also dampen the spirit to cultivate the same crop in the coming year. If this happens to be a staple food item of the people, supply will remain below the demand. In order to accelerate the pace of development, the new agricultural policy has set an objective to augment facilities for processing, marketing, storage, irrigation, along with development of horticulture, fisheries, biomass, livestock, sericulture etc. for all round development of agricultural sector. The new policy favoured to make the provision for infrastructural development related to agriculture and thereby to infuse new dynamism through increased volume of public investment. Agricultural policy will take steps to create public investment for building supportive infrastructure for agriculture. Conservation of water and use of alternative and renewable sources of energy for irrigation and other agricultural works have also been encouraged. Such enhancement of infrastructural investment will reduce the regional imbalances and generates more value added exportable surpluses.

HELP TO PROMOTE INDIAN ECONOMY IN WHICH LOWER BANK RATE OF INTEREST

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Abstract

The traditional argument is that the lower the interest rate, the better for businesses as it brings down the cost of capital, making investments more attractive. Any government would love this as the country would then draw higher investments leading to higher growth and more job creation. Governments abhor higher interest rates as, theoretically, these push up project costs and keep investors away. Capital is one of the three main factors of production, which are critical to the growth of



a commercial entity, the other two being land and labour. But capital is only a necessary, not sufficient, condition. Land, unless allocated by the local government, is too costly for investors seeking to set up shop. On labour, even if adequate hands are available for a job, the skill quotient is still low. Training graduates to be job-ready is a form of tax that companies pay. Also to be taken into account is the market environment and demand. If end users are seeing lesser money in hand than earlier. In an environment where the other factors of production are not favourable for an investor, low interest rates by themselves may not prove attractive enough. Any revival of economic activity will be contingent on joint efforts by the government on the fiscal front to stimulate demand, and the RBI, to keep interest rates low.

SCREENING OF BRINJAL GENOTYPES AGAINST MAJOR INSECT PEST COMPLEX OF JHARKHAND SUB ZONE V

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Abstract

Brinjal (*Solanum melongena* L.) is considered as one of the important vegetable crop due to its nutritive value consisting of minerals like iron, Phosphorus and calcium and also vitamins like A,B and C. The crop is subjected to attack by number of insect pest right from nursery stage till crop harvest. Among these the major ones are shoot and fruit borer (*Leucinodes orbonalis* Guenee). This pest is one of the most injurious to brinjal crop. It attacks tender shoots dry up while the flowers and developing fruits fall prematurely and the damaged fruits become unfit for human consumption. Keeping these in view an experiment was conducted on “Screening of brinjal genotypes with infector role against major insect pest complex of Jharkhand sub zone-V”. The objective of this experiment was to find out a suitable resistant/tolerant variety of brinjal for scientific and commercial cultivation in sub zone-V of Jharkhand. An experiment was conducted with three replications and 21 treatments including infector role (Pusa Upkar) under randomized block design in 2016-17, 2017-18 and 2018-19. Plot size was 5.00x1.50 sq.m. and spacing was 50x50cm. Thus 30 plants were planted in a plot. FYM was applied 25 ton ha⁻¹ with 100:50:50 kg NPK ha⁻¹. Seedling was raised in the month of October and transplanting was done in November. All the approved agronomical practices were followed for raising a good crop for screening of 21 varieties of brinjal against brinjal shoot and fruit borer. The pooled analysed data revealed that variety CB-2-1 produced highest marketable yield of brinjal (216.37q/ha) and found resistant along with six other genotypes viz., CB-25, Swarna shree, Swarna pratibha, Lal gulab, Pant samrat and PB-4. Whereas Pusa upkar found highly susceptible and produced the lowest marketable yield (127.56q/ha) and LC-3 was also recorded highly susceptible. Two varieties viz., CH-455 and KS-332 found moderately resistant five genotypes found tolerant and five found susceptible, respectively.

RURAL WOMEN PARTICIPATION IN PROCESSING, VALUE ADDITION, PRESERVATION AND MARKETING OF MUSHROOM IN CHHATTISGARH

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Abstract

A study was conducted in 7 districts of Chhattisgarh namely Ambikapur, Bilaspur, Dhamtari, Durg, Jagdalpur, Rajnandgaon and Raipur covering about 20 blocks to examine the level of “Women participation in processing, preservation and marketing of mushroom”. Mushroom is a good food supplement as they contain all essential minerals and vitamins. It provides increased resistance and immunity against early childhood infections and diseases. Mushroom also enhances food security at times of hunger. Women are having knowledge on wild mushroom (Especially women folk and tribes) and can well adopt to cultivate them in limited spaces. In rural area men control most of the income since old times from farm produce but mushroom can be sold by women and need little capital input, thus attracting more women to this activity. Each operation of mushroom cultivation is a full time enterprise in itself like preparation of bed, spawn production, cultivation, processing, preservation and marketing. Mushrooms are traded worldwide in the processed forms like frozen, canned, pickled, dried, etc. which increases shelf-life and market value. Many novel value-added products can be prepared with mushrooms like soup powder, pickles, chips, paste, ketchup, noodles, pasta, biscuits, nuggets, mushroom-based flavour enhancers, as an additive in beverages and beauty products. It's the need of the hour not only to reduce the losses, but also to enhance the income by value-addition



and boost the mushroom consumption. In India the per capita consumption of mushroom is a 30-40g as compared to 2-3kg in American and European countries. India has a big market of mushroom and increase of per capita consumption even up to 100g will help growers to market over 1.00 lakh ton mushrooms within the country.

The processing of mushroom is much important because it has a highly perishable character. The study revealed that except drying, the respondents were having low level of knowledge about other mushroom processing techniques. It was also found that Raipur, Durg and Rajnandgaon districts were well in terms of knowledge about mushroom processing and its value addition. Amongst the tribal dominated districts like Jagdalpur and Ambikapur, the respondents were less aware about mushroom processing, value addition and preservation practices, especially in wet processing and knowledge about various instruments, machine required for processing. The poor status of knowledge about mushroom processing may be because of limited use of such processing practices as most of the respondents are growing mushroom in small units and its outcome may be just enough for their domestic consumption or for sale in local markets as fresh mushroom. The little amount of surplus mushroom was generally preserved by sun drying and was utilized within a week or two. However, the respondents of some progressive districts like Raipur and Durg were having sufficient knowledge about various processing methods. This may be due to their professionalism or big size of production unit. This clearly shows that respondents having high knowledge were ahead in also adoption of processing technologies.

Regarding marketing of mushroom, data revealed that majority (16.4%) of the total respondents prefer to sell their mushroom in local market where 15.4% grower sold their produce through retailers. Remaining 24.3% respondents reported that they sold their mushroom output in some other market of places. Thus, there exists ample scope of processing, preservation and marketing of mushroom in Chhattisgarh. It can be concluded that mushrooms are easily grown and is a good enterprise for unemployed rural youths and women farmers. The skill in mushroom cultivation is important to acquire before starting mushroom production. As Spawn supplier plays a major role in the distribution of inputs, collection and marketing of the produce, its market is unstructured. Mushrooms are sold in most of the local market without standard packaging & measurement, unspecified quantities, qualities and the price variation. Quality control is very first requirement rather it is a prerequisite to start a venture. Hence there is a strong need to improve the processing technologies and increase value addition. Awareness about various uses and value added products need to be given for increasing the production and consumption of mushrooms as it is nutritious, medicinal and functional food. State Government should come forward in many ways and means for enhance mushroom awareness ie organization of awareness campaign programme, awareness camps to the local level, storytelling, drama, puppet shows and many more.

RURAL WOMEN ENTREPRENEURS IN AGRIBUSINESS—A LONG WAY TO GO

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Abstract

In the field of business and commerce, women are lagging behind as compared to other fields. Women folk have not taken the proper use of the special provisions and facilities available for them in the business field. We find lack of efficient women entrepreneurs. It is the time now to awake the ladies community towards the opportunities available for them to get their talent useful and serve the society, which can be a cause for more rapid growth of the nation. Throughout the world, Women's participation in economic activities is increasing. The role of women entrepreneurship is also increasing. In India too, women are participating in large number in almost all the spheres of economic activity. From village to city, we can see large number of women workers and entrepreneurs contributing towards the national income of the country. There are around seven lakh villages in India and also that more than 70% of our population live in villages of half are women. Rural women represent a sizeable percentage of labor force in our country yet; they have not been brought under the main stream of development. The rural women may be mobilized and may lead to the nation towards the path of progress and prosperity. The rural women by all means can be very effective agents of change for better homes, better society and ultimately for robust economy in the present global scenario. In north America 38 percent & small businesses are owned by women (Brush & Hierarch, 1999) The growth rate in women owned enterprises in some of the developing countries are higher as compared to the developed countries. According to ILO Statistics the growth rate is 24% in Malaysia, 30% in Thailand & 36% in Philippines & 42% in Indonesia.

The growth rate was highest in the Tamil Nadu state of India. It was 18% in 2001. Marketing facility for arranging proper markets for the products of the women's groups is an important component of the programme. This is crucial to sustain the



interest of women's groups in the programme and for their wholehearted participation. Women's employment in agribusiness is increasing because most rural women in developing countries already have experience of working in agriculture. According to a 1999 UN report, women make the most significant contributions to rural economics around the world, they produce 50-90 percent of domestic food crops in Asia and 80-90 percent in many Sub-Saharan African countries. They also bear most responsibility for household food needs. Many agribusiness activities can be based in the home, with work contracted through household. This is particularly important for women who must balance household obligations and financial needs.

MARKER ASSISTED BACKCROSS BREEDING (MABB) FOR DROUGHT TOLERANCE IN BREAD WHEAT (*TRITICUM AESTIVUM* L. EM. THELL.)

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Abstract

Wheat is a main staple crop globally and represents about 30% of the world's cereal area. Worldwide a decline in annual growth rate in wheat production is largely credited by the impact of abiotic stresses including drought and heat due to increasingly variable climate. The changing water-use patterns, the dwindling water-supply for irrigation and unpredictable changes in temperature makes it especially important to develop water-use efficient genotypes for Indian farming systems. Current advances in genetics and genomics, has enabled an integrated breeding physiological and genomics approach to enhance stress tolerance. In the present study, targeting cross which include elite Indian variety HD2733 popular in certain areas of North Western Plains Zone (NWPZ), high yielding and susceptible to drought stress and indigenous line HI1500 resistant to stem rust (black rust), leaf rust (brown rust) as well as for drought condition used as donor parent for transferring global QTLs pertaining to drought tolerance traits. Identification and validation of SSR markers which linked to different physiological and yield related traits like normalized differential vegetative index, canopy temperature, leaf chlorophyll content, thousands kernel weight, harvest index, grain weight per plant was done. The marker assisted backcross breeding method was used for improving drought tolerance in wheat by transferring resistance genes into susceptible variety. Foreground selection with linked markers and background selection to identify potential genotypes was carried out in BC₁F₁, BC₁F₂, BC₂F₁, BC₂F₂, BC₂F₃ and BC₁F₄ populations. Plants having targeted resistance genes and maximum recovery of recurrent parent genotypes were selected for further evaluation based on multi-location phenotyping for total grain yield with respect to best checks and recurrent parent identified five potential varieties for national varietal evaluation programme. These drought stress-tolerant lines could be the future products for release as new improved wheat cultivars.

MARKER ASSISTED BACKCROSS BREEDING (MABB) FOR DROUGHT TOLERANCE IN BREAD WHEAT (*TRITICUM AESTIVUM* L. EM. THELL.)

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Abstract

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enhance stress tolerance. In the present study, targeting cross which include elite Indian variety HD2733 popular in certain areas of North Western Plains Zone (NWPZ), high yielding and susceptible to drought stress and indigenous line HI1500 resistant to stem rust (black rust), leaf rust (brown rust) as well as for drought condition used as donor parent for transferring global QTLs pertaining to drought tolerance traits. Identification and validation of SSR markers which linked to different physiological and yield related traits like normalized differential vegetative index, canopy temperature, leaf chlorophyll content, thousands kernel weight, harvest index, grain weight per plant was done. The marker assisted backcross breeding method was used for improving drought tolerance in wheat by transferring resistance genes into susceptible variety. Foreground selection with linked markers and background selection to identify potential genotypes was carried out in BC₁F₁, BC₁F₂, BC₂F₁, BC₂F₂, BC₂F₃ and BC₁F₄ populations. Plants having targeted resistance genes and maximum recovery of recurrent parent genotypes were selected for further evaluation based on multi-location phenotyping for total grain yield with respect to best checks and recurrent parent identified five potential varieties for national varietal evaluation programme. These drought stress-tolerant lines could be the future products for release as new improved wheat cultivars.

EFFECT OF ORGANICS IN MANGO PRODUCTION

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Abstract

Mango (*Mangifera indica*) is one of the popular commercial fruit crop. Organic farming is a crop production method which encourages sustainable agriculture by enhancing the biological cycles in nature. Organic farming is done to release nutrients to the crops for increased sustainable production in an eco-friendly and pollution-free environment. It is targeted at producing healthy, nutritive, pollution free food maximising the use of on farm resources and minimising the use of off-farm resources. It seeks to avoid the use of chemical nutrients and pesticides. It aims to produce crop with a high nutritional value. The underlying principle of organic crop production is that “healthy crops grow from healthy soil”. Well balanced, biologically enhanced soil forms the basis of organic production. Hence synthetic fertilizers and chemical pesticides and herbicides are not permitted and can be detrimental to biologically active healthy soil. The main difference from conventional system is that inputs are used keeping in view the biological approach to manage the soil fertility. The growing domestic and export market demands for organically grown fruits and vegetables compel us to learn to grow organic mango using the Natural Farming System. Mango growers produce naturally grown mango free from toxic chemical residue, using both herbal organic fertilizers and concentrates with biotechnology and integrated pest management. Working with the natural properties of plants, animals, and the landscape and organic farmers aim to optimize quality in all aspects of agriculture and the environment”.

HIGH DENSITY PLANTING IN MANGO TO PRODUCE GOOD QUALITY FRUIT

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Abstract

Mango (*Mangifera indica* L.) is an important fruit crop in the tropical and subtropical regions of the world. High density planting (HDP) is one of the important methods to achieve high productivity per unit area both in short duration. High density planting (HDP) is defined as planting at a density in excess of that which gives maximum crop yield at maturity if the individual tree grows to its full natural size. High density planting (HDP) is one of the improved production technologies to achieve the objective of enhanced productivity of fruit crops HDP aims to achieve the twin requisites of productivity by – maintaining a balance between vegetative and reproductive load without impairing the plant health In India, HDP has been proved useful in mango production. Although high density orcharding (HDO) has been standardized for the popular cultivars of this crop (e.g., 2.5 x 2.5 m for ‘Amrapali’; Majumder *et al.*, 1982; 6 x 6 m for ‘Mallika’ and 3.0 x 2.5 m for ‘Dashehari’; Ram *et al.*, 1997). HDP helps in increasing the production, Production to productivity and profitability which can be achieved through high density planting. Recently, there is a trend to plant fruit trees at closer spacing leading to high density or meadow orchard. Higher and quality production is achieved from densely planted orchards through judicious canopy management and adoption of suitable tree training systems. Every increasing population of our country warrants more production of fruits to bridge the gap between per capita consumption and recommendation. This can be achieved by increasing the area under fruit



crops and or by increasing the productivity per unit area. HDP is one of the recent and novel concepts of increasing productivity without affecting the quality of fruits.

BIOGAS PRODUCTION FROM MUNICIPAL SOLID WASTES WITH COWDUNG AND VERMICOMPOSTING

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The tremendous increase in population accelerates the amount of municipal solid waste generation. The bulk of this material is either land-filled or burned. This organic waste in less developed countries could therefore form an important source for resource recovery. Batch digestion of the organic fraction of municipal solid wastes (MSW) with cowdung was carried out for seven weeks at room temperature in a digester. Effect of different combination of organic fraction of MSW with cowdung and digestion time on biogas yield was studied. Biomethanation was carried out in five sets of digesters with cowdung alone (A), 25%(B), 50%(C), and 75%(D) replacement of cowdung with MSW and MSW alone €. The maximum gas production was recorded in the digester B and it was 24.27% more than the digester A. the biodigested slurry was subjected to vermicomposting with a newly reported earthworm, *Perionyx ceylanesis*. The manurial value of the vermicompost was significantly increased than the biodigested slurry.

RESPONSE OF FERTIGATION IN ROOT GROWTH AND ROOT NODULE CHARACTERISTICS OF SOYBEAN [*GLYCINE MAX* (L.) MERRILL]

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Abstract

The present investigation entitled “Response of fertigation in root growth and root nodule characteristics of Soybean [*Glycine max* (L.) Merrill]” was carried out at the Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, (C.G.) during *kharif* season 2017. The soil of experimental field was clayey (*Vertisols*) in texture. The experiment was laid out in randomized block design with three replications and eight treatments. The treatment consisted of T₁- 75% RDF through fertigation, T₂- 100% RDF through fertigation, T₃- 125% RDF through fertigation, T₄ - 75% RDF (25 % Basal + 75% through fertigation), T₅-100% RDF (25 % Basal + 75 % through fertigation), T₆ - 125% RDF (25 % Basal + 75 % through fertigation), T₇ -100% RDF through conventional application with drip irrigation and T₈ - No fertilization with conventional irrigation. Soybean variety J.S. 97-52 was sown on 28th, June 2017 at a spacing of 30 cm x 10 cm with seed rate of 65 kg ha⁻¹ and harvesting was done on 13th, Oct 2017. The results of experiment indicated that various parameters like Root length plant⁻¹ (cm), Root volume plant⁻¹ (cc) and stover yield (32.77 q ha⁻¹) were maximum with the application of 125% RDF through fertigation (T₃). However, Number of root nodules plant⁻¹, Oven dry weight of nodules plant⁻¹(mg) and seed yield (26.89 q ha⁻¹) were recorded maximum with the application of 100% RDF through fertigation (T₂) and the minimum Number of root nodules plant⁻¹, Oven dry weight of nodules plant⁻¹(mg), Root length plant⁻¹ (cm), Root volume plant⁻¹ (cc), seed yield and stover yield was recorded under no fertilization with conventional irrigation (T₈). Hence, the judicious and precise application of nutrient through fertigation is more important rather than the higher dose of nutrient application.

CLIMATE CHANGE-LONG TERM RISK TO FOOD SECURITY AND WATER AVAILABILITY

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Abstract

The risk of climate changes on food security and serves the purpose to raise awareness that climate change is already impacting the food security and nutritional security to world's poorest and most vulnerable people. Child malnutrition is predicted to increase by 20 percent by 2050. Population will grow and temperature will rise and rainfall patterns will change



and bring changes in crop yields. Climate change is emerging as a key threat to global and national food security in coming decades. Climate decides crop and cropping pattern of a place while weather decides their productivity. The climate change has resulted in increase in extreme weather events such as droughts and floods, cold and heat waves, cyclones etc. with a large spatial and temporal variation. Climate change will affect food availability, food accessibility, food utilization and food system and stability. Changing climate could also create vicious cycle of disease and hunger. The impacts of climate change on water availability and water quality will affect many sectors, including energy production, human health, agriculture and ecosystem. In many regions food security and rural livelihoods are intrinsically linked to water availability and use. Food security is determined by the options people have to secure access to own agricultural production and exchange opportunities. These opportunities are influenced by access to water. Climate change has the potential to disrupt agriculture production and adversely affect the country's ability to produce food therefore developing a food security strategy that enhances availability through various climate smart agricultural responses and enhanced and diversified livelihood sources are necessary paths for development.

CORRELATION AND PATH ANALYSIS STUDY IN GROUNDNUT GENOTYPES (*ARACHIS HYPOGAEA* L.)

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Abstract

Groundnut (*Arachis hypogaea* L.) is an important food, feed and oilseed crop. It contains 48-50% oil and 26-28% protein, and is a rich source of dietary fiber, minerals, and vitamins. It is grown in nearly 100 countries. Major groundnut producers in the world are: China, India, Nigeria, USA, Indonesia and Sudan. Groundnut is gaining importance as a food crop, on account of high digestible proteins, vitamins, minerals, phytosterols and due to increased consumer preference after value addition. Over 100 countries worldwide grow groundnut. Developing countries constitute 97% of the global area and 94% of the global production of this crop. The production of groundnut is concentrated in Asia and Africa (56% and 40% of the global area and 68% and 25% of the global production, respectively). In India, the area, production and productivity of groundnut during 2018-19 were 48.537 lakh hectares, 69.696 lakh tones and 1436.00 kg/ha, respectively. While in Rajasthan, the area, production and productivity of groundnut during 2018-19 were 6.689 lakh hectares, 16.381 lakh tones and 2449 kg/ha, respectively. There is a need to identify high yielding groundnut genotypes which will be useful and economic to farmers of the area. Hence, keeping in view, the field experiments were conducted at Instructional Farm, CTAE (MPUAT), Udaipur during *Kharif* 2018 and 2019. Among the tested entries viz., UG 217 (4390 kg/ha), followed by UG 216 (4105 kg/ha) were found highest dry pod yielder and recorded significantly superior dry pod yield over the checks. Kernel yield ranged from 1677 to 3103 kg/ha, 100 kernel weight ranged between 39 to 56g, shelling percent ranged from 66-74, days to maturity were ranged between 98 to 101 days, oil percentage ranged from 42 to 47%, days to 50% flowering were ranged between 32 to 42 days and sound mature kernels were ranged from 85 to 93%.

IMPACT OF FOLIAR NUTRITION ON LEAF REDDENING OF BT COTTON UNDER RAINFED CONDITION

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Abstract

A field experiment was conducted on farmers field at Kautha, Tq. Kandhar. Dist. Nanded during *Kharif* 2018-19. The geographical position of the experimental site was 18° 48' 45" N Latitude and 77° 21' 11" E Longitude. The soil of experimental plot was montmorillonitic, Typic Haplusterts, deep black Vertisol to find out the effect of foliar nutrition on leaf reddening of Bt cotton under rainfed condition. The experiment was laid out in Randomized Block Design with eight treatments viz. T₁- Control (N₁₀₀ P₅₀ K₅₀), T₂- 100% RDF + water spray, T₃- 100% RDF + Urea @ 2% foliar spray, T₄- 100% RDF + 19:19:19 @ 1% foliar spray, T₅- 100% RDF + KNO₃ @ 2% foliar spray, T₆- 100% RDF + MgSO₄ @ 1% foliar spray, T₇- 100% RDF + foliar spray of DAP @ 1% + KNO₃ @ 1% + MgSO₄ @ 1% + Micronutrient grade II @ 0.5%, T₈- 100% RDF



+ Foliar spray of 19:19:19 @ 1% + MgSO_4 @ 1% + Micronutrient grade II @ 0.5%. and replicated thrice. The result revealed that application of 100 per cent RDF (100:50:50 kg NPK ha^{-1}) in combination with foliar spray of DAP@ 2% + KNO_3 @ 1% + MgSO_4 @ 1% and micronutrient Grade II @ 0.5% at flowering, boll formation and boll development stage recorded the maximum leaf nutrient content and total chlorophyll content and helpful in minimize the anthocyanin content and leaf reddening index in Bt cotton under rainfed condition,

SOIL SITE SUITABILITY EVALUATION OF POMEGRANATE (*PUNICA GRANATUM* L.) GROWING SOIL OF LATUR DISTRICT MAHARASHTRA

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Abstract

The present investigation carried on topic “studies on Characterization and classification of pomegranate growing of soils Latur district is the south western part of Marathwada region of Maharashtra state. The soil of the study area under pomegranate were very shallow to very deep, Reddish Brown (5 YR 4/4) to dark grayish brown in colour (10 YR 4/2), clay to sandy loam in texture and granular to angular blocky in structure. The bulk density of the studied soils varied from 1.55 to 1.88 Mg m^{-3} . Plant available water capacity (PAWC) varied from 68.34 to 380.52 mm. The saturated hydraulic conductivity of soil varied from 3.27 to 23.71 cm hr^{-1} . Soil reaction under study area was slightly to strongly alkaline in pH ranged from 7.58 to 8.92 nature electrical conductivity of the soil is $< 1.0 \text{ dSm}^{-1}$, organic carbon content very low to high (0.37 to 0.84 percent) and calcareous in nature (4.2 to 15.26 per cent). The maximum CEC was recorded in Typic Haplusterts (53.26 to 69.78 cmol(P+) kg^{-1}) as compared to Typic Haplusteps and Typic Ustorthent. Taxonomically these soils of study area classified into Typic Haplusterts, Typic Haplusteps and Calcic Haplusteps and. The yield of the pomegranates ranged between 10.86 to 27.10 t ha^{-1} in the study area. The highest yield was recorded in soils of Typic Haplusteps (Inceptisols) with soil depth less than 30 cm (P5). The fruit quality was increased with increasing amount of CaCO_3 in these soils. Soil site suitability according to FAO 1983, the suitability of pomegranate on the basis of optimum yield level the soils of Typic Haplusteps were highly suitable whereas Calcic Haplusteps and Typic Ustorthents were moderately suitable and Typic Haplusterts were marginally suitable for pomegranate. This indicated that the Typic Haplusteps (Inceptisol) and Typic Ustorthents (Entisols) soils underlined by loose weathered basalt below 30 cm soil depth were found to be highly suitable (S1) for pomegranate cultivation.

AWARENESS AND LEVEL OF SATISFACTION ABOUT VARIOUS MGNREGA ACTIVITIES IN CHHATTISGARH STATE

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Abstract

It is evidenced that Mahatma Gandhi National Rural Employment Guarantee Act has a strong impact in the areas of Employment generation, Migration of Rural People and livelihood security of the rural poor. To know the impact of MGNREGA in poverty alleviation of rural people in Chhattisgarh plains, the study was conducted among 320 respondents in 32 villages, 16 blocks and 08 Districts of Chhattisgarh plains. The data collected from respondents through personal interview and group discussion were coded, tabulated and subjected to statistical analysis in accordance with the objectives of the study. The results so obtained from analysis of data supported with appropriate justification. Awareness about various MGNREGA provisions. it was found that all the respondents were aware about water conservation, land reclamation and road construction was the first priorities in the MGNREGA activities followed by 98.44 per cent respondents were aware regarding every members of needy house hold may submit application for the registration and 97.5 per cent respondents were aware about payment of wages has to be done on a weekly basis and not beyond a fortnight in any case. In case of physical facilities, shade for children and periods of rest, safe drinking water and first aid box (Medical kit) with adequate material for injuries/emergency treatment should be made available in work site were aware by 96.87 per cent of the respondents. While, 95.00 per cent of the respondents were aware regarding grievance redressal mechanisms for ensuring responsive



implementation process and 90.62 per cent respondents were aware about job card should provide free of cost. Whereas, 89.06 per cent respondents were aware about wages payment has to be mandatorily done through bank or post office in accounts. While, it was observed that cent per cent of respondents were not aware about compensations for delayed payment, followed by 88.12 per cent of respondents were not aware about work is provided within 5 km radius of the village, otherwise extra wages of 10 per cent are payable to meet additional transportation and living expenses. Regarding overall level of satisfaction about MGNREGA, 46.25 per cent of the respondents were satisfied followed by less satisfied (40.63 per cent) and 13.12 per cent of them were fully satisfied with MGNREGA programme. Based on multiple responses of the respondents, 68.43 per cent was reported overall satisfaction regarding MGNREGA programme.

EFFECT OF NUTRIENT MANAGEMENT IN FINGER MILLET IN RED SANDY LOAM SOILS OF NORTH COASTAL ZONE, ANDHRA PRADESH

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Abstract

Field experiments was conducted in finger millet during *kharif*-2018 season at Agricultural Research Station, Vizianagaram, Andhra Pradesh with an objective of yield response of finger millet with graded doses of fertilizers and available soil macro, micro nutrients and uptake of plant nutrients. The experiment was consisting of eleven treatments, with three replications and laid out with Randomized Block Design (RBD). The experimental results indicated that significantly higher grain and straw yields of finger millet were recorded in the treatment with 150% RDF (30.5q/ha and 79.5q/ha respectively) followed by 150%N and P (29.45q/ha and 74.0q/ha respectively). The highest available soil macronutrients and uptake of plant macronutrients were also found in the same treatment. However, the higher benefit: cost ratio (2.49:1) was observed with 150% RDF.

EFFECT OF MICRO-NUTRIENT ON GROWTH, YIELD AND SEED QUALITY PARAMETER OF MUNGBEAN (*VIGNA RADIATA* L. WILCZEK)

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Abstract

An experiment was conducted during summer season 2018-19 at field experiment on the oil seed farm kalyanpur CSAUA&T Kanpur. The objectives were evaluate the effect of Zinc (Zn) and Boron (B) on the yield and seed quality parameter of mungbean (*Vignar adiata* L. Wilczek) and to find out the optimum dose of Zn and B for yield maximization. There were two level of Zinc (0.25 and 0.50) % and boron (0.10 and 0.20)%. The experiment laid out in RBD with three replication. Result showed that the combination T₈ (Zn₂+B₂) produced significantly higher yield (10q/ha). The combination application of Zn and B were observed superior to their single application in this years. Their fore the combination of Zn₂+B₂ (0.50+0.20)% might be considered of suitable dose for mungbean cultivation in U.P.

BIO-EFFICACY AND PHYTO-TOXICITY OF NEW HERBICIDES AGAINST WEEDS IN SOYBEAN

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Abstract

The experiment was comprised of weed management practices viz. T₁- Fomesafen 17.5% w/w ME + Clodinafop 12.5% w/w ME @ 750 g a.i. ha⁻¹ as PoE, T₂- Fomesafen 17.5% w/w ME + Clodinafop 12.5% w/w ME @ 1000 g a.i. ha⁻¹ as PoE, T₃- Fomesafen 17.5% w/w ME + Clodinafop 12.5% w/w ME @ 1250 g a.i. ha⁻¹ as PoE, T₄- Clodinafop 12.5 % w/w M @ 1000 g a.i. ha⁻¹ as PoE, T₅- Fomesafen 17.5%w/w ME @ 1000 g a.i. ha⁻¹ as PoE, T₆- Fomesafen 11.1% w/w + fluzifop- p-butyl 11.1% w/w SL @ 1000 g a.i. ha⁻¹ as PoE, T₇- Imazythapyr @ 300 g a.i. ha⁻¹ as PoE, T₈- Quizalofop ethyl + chlorimuron ethyl @ 400+16 g a.i. ha⁻¹ as PoE, T₉- Hand weeding twice at 20 and 40 DAS and T₁₀- weedy check. Experiment was laid out in



Randomized Block Design with three replications. Result indicated that the T₉- hand weeding twice at 20 and 40 DAS however, it was found effective in enhancing plant height, growth of branches and dry matter production of soybean showed at par with T₃- Fomesafen 17.5% w/w ME + Clodinafop 12.5% w/w ME @ 1250 g a.i. ha⁻¹ as PoE, and T₂- Fomesafen 17.5% w/w ME + Clodinafop 12.5% w/w ME @ 1000 g a.i. ha⁻¹ as PoE. T₉ -hand weeding twice at 20 and 40 DAS was found effective in enhancing number of nodules plant⁻¹, dry weight of nodules and crop growth rate followed by T₃- Fomesafen 17.5% w/w ME + Clodinafop 12.5% w/w ME @ 1250 g a.i. ha⁻¹ as PoE, T₄- Clodinafop 12.5% w/w M @ 1000 g a.i. ha⁻¹ as PoE and T₂- Fomesafen 17.5% w/w ME + Clodinafop 12.5% w/w ME @ 1000 g a.i. ha⁻¹ as PoE.

EVALUATION OF BLADE GEOMETRY OF ROTARY SOIL CUTTING EQUIPMENTS FOR DRY LAND

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Abstract

Mechanization in agriculture is very effective tool to enhance and attain the qualitative and quantitative production. According to the field and crop different type of machineries are available. Voluminous verities of soil working implements are now available for weeding, tillage etc. Appropriate selection of the tools is very significant to offer well condition of soil for crop. Geometry of the blade not only affects the soil but also the fuel consumption and energy requirement. Four type of blade shape were designated of rotary tools for study to analyze their effect on the field viz. C, L, and J shape blades, which are mostly used in rotavator on dry soil. Greater geometry studied in L shape blade, it was facing the poorer stress than the other and result was long life and higher FOS. Mean mass diameter of soil was found minimum after operation of J shape blade this was also help full to mix crop residue in the soil through cutting them in small parts. Sometime cost of operation is also important at that condition C shape blade will be economical because it is consume less fuel, it is also supportive for improved quality of tillage for good germination.

IMPACTS OF CLIMATE CHANGE ON VEGETABLES

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Abstract

Climate change may be a change in the mean of the various climatic parameters such as temperature, precipitation, relative humidity and atmospheric gases composition etc. and in properties over a longer period of time and a larger geographical area. Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity". It means changes in the global environment which results in changed environment for: crop production, flora and fauna, human living, land-water-ecology interactions and quality of land and water. Vegetables are important source of essential nutrients, vitamins, minerals, dietary fiber and phytochemicals. Vegetables are strong antioxidants, reduce the risk of chronic disease by protecting against free radical damage and are the best resource for overcoming micronutrient deficiencies, thus also known as protective food. Vegetables crops are sensitive to climate variability. India is the second largest producer of vegetables after China. The vegetable productivity in India has been increased from 10.47 MT/ ha in 1991-92 to 17.1MT in 2016-2017. Climate change is posing serious negative effect on potato growth in India, including productivity, production and profitability. The increase in extreme weather like reduced precipitation and rise in temperature affects seed production of cabbage adversely. Similarly, weather parameters affect the seed yield and quality of cauliflower. Change in climate result in shift in the geographical distribution, changes in the physiology of host, changes in the rate of development, more rapid development, increased transmission and dispersal, more virulent forms, vulnerability of present day host cultivars. Climate change also influences the ecology and biology of insect pests. Tomato pinworm, *Tuta absoluta* (Meyrick), is one of the major globally destructive, invasive pests, capable of causing up to 100% damage in tomato. Increased population of potato tuber moth in warehouse has been reported. Increased temperature, shorten the life cycles of pest like aphids, diamond back moth, cabbage maggot, onion maggot and colorado potato beetle, therefore produces more generations per year than their usual rate. Climate change also affects natural enemies of crop pests like predators and parasitoids. These natural enemies are tiny and delicate, hence more sensitive to the climatic extremes like heat, cold, wind and rains. Increasing temperatures results in enhanced



mortality, decreased fecundity and sex ratio of parasitoids and decreased effectiveness in controlling pests when pest affected by climate. Precision in climate change prediction with higher resolution on spatial and temporal scale is the prime requirement for linking with agricultural production system to evaluate the impact and suggest suitable options for sustaining agricultural production.

NUTRIENT MANAGEMENT IN SOYBEAN CROP IN VERTISOLS OF MADHYA PRADESH

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Abstract

It has been observed since last few decades the productivity of pulses crops especially in black soils of Madhya Pradesh was found to decline continuously could be because of non adoption or lacking awareness of adequate technology by the farmers. Therefore, the field trials were conducted in Hoshangabad and Narsinghpur district of Madhya Pradesh during 2001 to 2015 in Project on Natural Resources Management for sustainable agriculture production in Vertisols of central India. Results occurred over fourteen years data revealed that the economic (Grain) yield of soybean increased up to 77 percent over farmers practice, whereas straw yield 56 percent (Table-1). Results also showed that a significant increase in uptake of nitrogen, phosphorus, potassium and sulphur in GRD + FYM treatment, whereas the farm yard manure was applied @ 6 tonnes per hectare. The data also clearly indicated that the production levels were more than 50 percent higher when the integrated nutrients application was used.

STUDY ON MUSCULOSKELETAL DISORDERS AMONG LOTUS RHIZOME HARVESTING WORKERS OF CHHATTISGARH

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Abstract

At present the farmers don't use any types of harvesting tools believing that it may damage the rhizomes. The lotus rhizome was under the mud at a depth of about 15-30 cm under 30-40 cm depth of water. The traditional harvesting method consists of farmers feeling for the rhizomes using their toes and then digging them out by their hands. The process of harvesting was very tedious, hazardous and drudgery involve. The test was conducted to know various physical problems and pain on body parts of the labour engaged for harvesting of lotus rhizomes in Dhamtari districts among the farmer producer group in 2018-19. The main aim of this study was to investigate postures adopted by agricultural workers during harvesting of lotus rhizome in muddy field and to analyze the causes of discomfort related to those postures. 20 male workers in age group 20-45 were randomly chosen. They were screened for normal with medical investigation. These subjects were used for the traditional harvesting of lotus rhizome. Musculoskeletal disorders (MSD's) are common among the workers. Analysis of MSD's indicates that the workers engaged in lotus rhizome harvesting had exposed that discomfort level was very severe in neck (95%), clavicle (75%), shoulder (90%), fingers (90%), lower back (80%), thigh (75%), foot (75%) and toes (85%) was high when compared with seven other parts. These discomforts may be due to prolonged standing in muddy field and necessitated bending posture.

GLOBAL CLIMATE CHANGE : SCENARIO AND FOOD SECURITY

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Abstract

India currently produces about 270 million tonnes of food grains and around 230 million tones of cereals to meet the needs of a



population of 1.20 billion. The current situation in India is that cereal production has to be doubled by 2050 in order to meet the needs of the expected population of 1.8 billion, in addition to meeting the needs of livestock and poultry. Our population is increasing every year. However, food grain production is not up to the mark comparatively. Climate change is one of the main reasons for not achieving enough production. In the long run, the climatic change could affect agriculture in several ways such as quantity and quality of crops in terms of productivity, growth rates, photosynthesis and transpiration rates, moisture availability etc. Climate change directly affects food production across the globe. Agriculture is vulnerable to climate change because of its high diverse nature, dependence upon rainfall and rapid degradation of soil which, in fact impacts the global food security. Major factors which are impacting the global food security are rise in green house gases, rise in temperature and variability in rainfall. Climate change is a reality and its impact on agriculture is extravagant. Our main focus is on sustaining crop productivity under this climate change scenario. It can be achieved through Mitigation of GHG effects through new cropping systems and crops that reduce net GHG production by emitting less nitrous oxide, increasing soil organic matter content. Developing heat tolerant cultivars and efficient irrigation systems can mitigate the impact of climate change.

EFFECT OF ABIOTIC FACTORS ON OCCURRENCE OF FRUIT ROT DISEASE ON AMBE BAHAR GUAVA (*PSIDIUM GUAJAVA* L.) CAUSED BY *PHYTOPHTHORA NICOTIANAE* VAR. *PARASITICA* (DASTUR) WATERHOUSE

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Abstract

The present investigation was undertaken at Instructional cum Research Fruit Orchard RVS KVV, College of Horticulture, Mandsaur (MP) during *kharif* 2019. Observations were taken from last week of June to fourth week of September, 2019 on guava variety- Apple colour for per cent Disease Intensity. For the observation five plants were selected randomly from each variety and five branches from each plant by counting healthy and diseased fruits. The disease intensity was recorded by visual observations using 0-4 arbitrary scale developed. Correlation and regression studies were undertaken between Per cent Disease Intensity and weather factors. The minimum disease intensity was noted in 27th SMW (5.50%) when maximum temperature, minimum temperature, relative humidity, rainfall and rainy days were recorded as 35.00 °C · 23.71 °C, 81.57%, 40.46mm and 05 days, respectively. Further disease intensity increased continuously and reached its peak in 35th SMW (60.50%) when maximum temperature, minimum temperature, relative humidity, rainfall and rainy days were recorded as 28.42 °C · 22.00 °C, 92.57%, 44.33 mm and 03 days, respectively. Maximum temperature ($r=-0.67$) and minimum temperature ($r=-0.63$) exhibited significant negative correlation whereas humidity ($r=0.74$) showed significant positive correlation with disease intensity. Maximum temperature, minimum temperature and relative humidity showed significant impact on disease intensity.

ORGANIC FARMING : AN ECOFRIENDLY TO SUSTAINABLE AGRICULTURE

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Abstract

Organic farm products have got more value as compared to inorganic products. People are becoming more conscious for their health and environment. Bio-farming is sustainable and eco-friendly which enables to conserve biodiversity and to protect environment. Organic farming system avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, and livestock feed additives. It mainly relies upon crop rotation, organic manures, bio-pesticides and integrated pest management (IPM). In this paper emphasis has been given to practice in favors of organic farming, biopesticides, and preparation and use of organic manures by different methods in a hygienic manner. Organic farming differs from conventional agricultural production in that it avoids using chemical fertilizers and synthetic pesticides and herbicides. Harvests are consequently smaller than in conventional production. Income losses are compensated by paying farmers organic farming aid, which is a form of supplementary environmental support. One problem is the loss of foods' organic status in some part of the production chain, which means they no longer meet the requirements set for organic production. The audit indicated that less than one-fourth of organic farms are not affected by this problem. The small amount of animal's inorganic production



contributes to the loss of foods' organic status, along with slack demand. Feeds that have been produced organically end up being fed to animals that are in conventional production.

IMPACT OF MAIZE (*ZEAMAYS* L.) GENOTYPES TO ELEVATED CARBON DIOXIDE AND TEMPERATURE REGIMES

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Abstract

Temperature and CO₂ are two of the main environmental factors associated with climate change. It is generally expected that elevated CO₂ will increase crop production. However, other environmental factors such as temperature along with management practices could further modify a crop's response to CO₂. The goal of this study was to determine the interactive effects of elevated CO₂ and above optimum temperature on growth, development and yield of five maize (*Zea mays* L.) genotypes, e.g., HTMR-1, HTMR-2, ARJUN, 900M Gold, and NK 6240. Global climate change can affect yields of agricultural crops are likely to be affected due to rise in CO₂ and temperature, apart from other factors. In this context, the present study aimed at to assess the maize (*Zea mays* L.) genotypes to elevated carbon dioxide and temperature regimes. Series of climates were synthesized by increasing CO₂ levels from 390 to 550 ppm with an increasing the temperature at 20 C. A significant increase in chlorophyll content, reducing and non-reducing sugars was seen in elevated CO₂ treatment but soluble protein was decreased. Whereas, under elevated temperature regimes chlorophyll content, reducing and non-reducing sugars are decreased due to altered C: N ratio. The results indicated that on doubling the CO₂ level of the existing (350 ppm) at existing temperature, a yield of grain in maize was increased. Unlike effect of CO₂, crop yields were decreased with increase in temperature.

INNOVATIVE TECHNOLOGY FOR CROP IMPROVEMENT, BIOTECHNOLOGY AND GENETIC ENGINEERING

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Abstract

Food security for all will be a prominent issue for the next century. Today one billion people of the world are undernourished and more than a third are malnourished. The world's rural poor have much to benefit by the use of agricultural biotechnology. When it was first introduced, biotechnology was predominantly used in medicine to research and produce pharmaceutical and diagnostic products that helps in preventing and curing diseases. However, over the last few decades this technology has found a place in the agricultural industry like never before. Years of research indicate that agricultural biotechnology is a safe and beneficial technology that place a big role in promoting economic and environmental sustainability. Genetically modified crops and food have been the main areas of focus for this technology. Transgenic crops are being generated which can thrive in poor soils, tolerate extreme conditions such as drought and heat, and accumulate much needed minerals and vitamins in edible plant parts. One way to address the ever growing need for more food crops is to nutritionally enhance those crops which are currently considered to be staple for the world's poor. By producing biofortified rice, wheat and corn, the principal grains which feed much of the human race today, with increased mineral and vitamin content, the nutritional status for those who have little variety available in their diet can be improved. Biofortified foods can be produced either through the generation of transgenic plants which possess additional biosynthetic pathways, such as vitamin A-enriched 'Golden Rice' or by altering the general physiology of the plant in such a way that it is able to extract more micro-nutrients from the soil, such as iron-enriched wheat. New vaccines employing biotechnology innovations are changing the process of preventing illnesses, particularly in developing countries. Genetically modified crops have a significant contribution in the development of vaccines. Foods such as fruits, grains and vegetables are engineered to carry antigenic proteins which are extracted from pathogens. When injected into the body, this antigens trigger an immune response and boost the resistance of the body against the pathogens. For example anti-lymphoma vaccine that is obtained from tobacco. Tobacco plants are engineered to carry RNA from malignant B-cells. The extracted protein is injected into the body, an immune response is triggered which destroys the cancers cells.



Membrane transporters are more useful to improve crops for sustainable food production. Transport proteins embedded in the cell membranes are key targets for improving the efficiency with which plants take up and use water and nutrients. Development of specialized plant membrane transporters that can enhance crop yields, increase nutritional value and boost resistance to stresses including pathogens. Promising lines of development include aluminium-tolerant cereals that thrive in acid soil, salt-tolerant varieties that grow in soils affected by salinity or sodium toxicity and plants containing high levels of the iron and zinc micronutrients often scarce in predominantly plant-based diets in developing countries.

RESPONSE OF MAIZE (*ZEA MAYS* L.) GENOTYPES TO CLIMATE CHANGE

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Abstract

Global atmospheric carbon dioxide concentrations are rising (367 ppm in 1999) and are projected to reach between 540 and 970ppm by the end of the 21st century¹³. Recent climate model projections have also suggested that global surface air temperature may increase 1.4–5.8C in association with this doubling of carbon dioxide. The amount of carbon dioxide (CO₂) of the earth's atmosphere is increasing, which has the potential of increasing greenhouse effect and air temperature in the future. Plants respond to environment CO₂ and temperature. Therefore climate change may affect agriculture. The purpose of this paper was to study the morphological response of maize genotypes to elevated carbon dioxide and temperature regimes. Most of the morphological, physiological, biochemical and biophysical parameters indicated better performance under elevated CO₂ regime as compared to elevated temperature regime at all growth stages. This was mainly because of exposure of the crop to elevated temperature regime and the heat stress was documented to have detrimental effects on plant growth and events involved in the growth and development of reproductive organs, such as tassel initiation, time of flowering, pollination, fertilization, and pollen sterility in maize. Various morphological parameters studied indicated that, the genotypes HTMR-1, 900M-GOLD and HTMR-2 performed better under elevated CO₂ and temperature regime. The maximum reduction with respect to these parameters was observed in ARJUN and NK 6240 genotypes.

GREEN TECHNOLOGY FOR SUSTAINABLE AGRICULTURE

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Abstract

The “green technology” is a broad term for more environmentally friendly solutions. GT for that matter can be used as environmental healing technology that reduces environmental damages created by the products and technologies for peoples' conveniences. It is believed that GT promises to augment farm profitability while reducing environmental degradation and conserving natural resources. The wastewater and sewage disposal has been major threat to human health. The liquid waste discharged by domestic residences, commercial properties, industry or agriculture generates potential contaminants and concentrations that to some extent is minimised or recycled in the developed world. It necessitates the adoption of available and affordable technology for renewable energy including sunlight, wind, rain, and geothermal heat, which are naturally replenished. The technologies that are available are solar power, wind power, hydroelectricity/micro hydro, biomass and biofuels for transport. The importance for considering primary energy use (includes both renewable and non-renewable energy contained in raw fuels) is because about 13 per cent of world's primary energy comes from renewable sources, most of which comes from traditional biomass like wood-burning. The understanding of these energies helps us devise policies for sustainable development, which includes environmental sustainability, economic sustainability and socio-political sustainability. The ideal technology should be efficient, practical, cost effective and free from pollution. The sustainability factor should be looked at the ability of agricultural land to maintain acceptable levels of production over a long period of time, without degrading the environment. Some define sustainability as the maintenance of productivity under stress conditions (Gill, 1993). Agricultural sustainability in this context, should seek to maximize food production within constraints of profitability.



THE DANCING EARTH : AN ECOCRITICAL STUDY OF SELECT WRITINGS FROM NORTH-EAST INDIA

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Abstract

Ecocriticism deals largely with the relationship between earth's natural environment and literature. It is an interdisciplinary approach whose scope encompasses written works of authors, poets, playwrights and the like, who are primarily concerned with environmental issues. In simple terms, it concerns with literature that is written about the environment. The North-East region of India, which is inhabited by over two hundred fascinating tribes, is rich in its biodiversity. The waterfalls, sacred groves, living root bridges, crystal clear springs and the diverse flora and fauna have been perpetual sources of inspiration to many poets including Rabindranath Tagore. However, unplanned rapid urbanisation and industrialisation in its quest to be among the developed areas, rampant destruction of forests and the depletion of green covers, have perhaps denigrated its beauty and charm. Further, globalisation and consumerism has gradually turned the eco-friendly tribes into capitalistic societies which has had an acerbic effect on the overall behaviour of the indigenous people towards nature. This man-environment conflict is a poignant theme in most of the poets of North-East India; particularly in those of Tamsula Ao and Kynpham Sing Nongkynrih. The selected readings are not only celebrations of the beauty that the region is blessed with, but also a lamentation of its lost glory; a soulful cry of the indigenous voices against the ruthless destruction of its beauty, thereby, sensitising the readers about conservation. This paper is therefore an attempt to analyse the poems from an ecocritical standpoint and envisage illustrating the role literature can play to spread awareness about conservation.

NUTRIENT UPTAKE AND YIELD OF GREEN GRAM (*VIGNA RADIATA* L.) AS INFLUENCED BY PHOSPHORUS FERTILIZATION, ORGANIC MANURES AND BIOFERTILIZERS

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Abstract

Field experiment was conducted during *kharif*, 2016 to study the effects of phosphorus levels, biofertilizers (Phosphate solubilizing bacteria) and organic manures (vermicompost) on yield, nutrient concentration and their uptake at flowering and harvest of green gram. The experiment was laid out in randomized block design with three replications having 12 treatment combinations *viz.* 3 levels of phosphorus (0, 75 and 100 % RDP) and its integration with PSB (500 g ha⁻¹ seed) and vermicompost (5 t ha⁻¹). Experimental results revealed that grain yield and nutrient uptakes significantly influenced by phosphorus, vermicompost and PSB application. Application of higher dose of phosphorus along with PSB and vermicompost (100 % RDP + Vermicompost + Phosphate solubilizing bacteria) proved to be the best in improving the seed yield (1033.33 kg ha⁻¹). Application of inorganic P fertilizers, organic manures and PSB markedly influenced the nutrient concentration and their uptake. Results showed that application of vermicompost at 5 t ha⁻¹, seed inoculation with PSB and 100% RDP significantly increased the N, P, K and S concentration in grain, haulm and their uptake by greengram.

SCREENING OF RECOMBINANT INBRED LINES FOR STAGNANT FLOODING IN RICE

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Abstract

The present study was conducted at Regional Agricultural Research Station (RARS), Maruteru, West Godavari district of Acharya N.G. Ranga Agricultural University during *Kharif* 2018-19. Phenotypic data were recorded for physiological traits (plant survival %, stem elongation at 30 DAT, stem elongation at 60 DAT, flag leaf length, flag leaf width, kneeing ability), lodging related traits (basal internode length, culm diameter, culm thickness, culm strength, per cent of lodging) and yield



traits (plant height, days to 50 % flowering, ear bearing tillers plant⁻¹, number of grains panicle⁻¹, panicle length, spikelet fertility, 1000 grain weight and grain yield plant⁻¹) for 167 recombinant inbred lines developed by using susceptible parent Indra and resistant donor AC 39416A. The analysis of variance revealed the presence of significant differences among checks, checks vs genotypes for all 19 characters denoting variability among genotypes. The result implies that RILs exhibit superiority over the susceptible parent Indra for the characters studied. Screening of 167 RILs for stagnant flooding at 30–53 cm water depth using augmented randomized block design revealed that 146 RILs were survived. Among them, two RILs (SF 7, SF 75) exhibited 100 % plant survival % and 93 RILs exhibited less than 50 % plant survival. These results indicated that plant survival % is essential to realize considerable yields under stagnant flooding.

ATTENTION TOWARDS SOIL HEALTH

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Abstract

The challenge in agro-ecosystem of soil instability is mainly accelerated by population pressure, poor soil management practices and natural climate change. Proper soil management practices are considered as a better way to enhance agriculture production in sustainable healthy soil without disturbing environmental quality, human and animal health. Soil security is foundation for the current and future productivity and profitability of agriculture. Current agricultural production is attenuated by soil degradation. Future production is highly dependent on the condition of soils. In the last 40 years, 30 percent of the world's arable land has become unproductive and 10 million hectares are lost each year due to erosion. Additionally, accelerated erosion diminishes soil quality, thereby reducing the productivity of natural, agricultural and forest ecosystems. It takes about 700 years to form an inch of topsoil, this alarming rate of erosion in modern times is cause for concern for the future of agriculture. Soil health plays a key role in reducing production costs and risks. Several research papers and books revealed and confirmed that the following soil management practices improve soil health by the adoption of conservation agriculture with reduced tillage, reduced frequency of fallowing, and reduced fertilizer applications via pre-plant soil tests, applying organic amendments, cover crops, green manures which leads to reduced soil bulk density, increased soil porosity, increased soil water holding capacity, increased soil carbon and nitrogen reservoirs and increased microbial indices. Its goal is to equip farmers with the knowledge and tools needed to identify and implement the location specific crops and practices to build healthy soils, reduce risks, and optimize net financial returns from their farming operations.

LONG-TERM EFFECT OF SEWAGE WATER SPREAD ON MICRONUTRIENT AND HEAVY METAL CONTENT IN SOIL OF MARATHWADA REGION

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Abstract

The present investigation was carried out on “Long-Term Effect of Sewage water Spread on micronutrient and Heavy Metal content in Soil of Marathwada region.” For conducting the experiment representative soil samples were collected from sewage drainage near Sorghum Research Station located in Parbhani district of Marathwada region during the year 2018-2019 to determine the heavy metal content and its contamination on soil nutrient status. Fifty representative GPS based soil samples were collected from the selected field from 0-30 cm depth depending upon the area in kharif and rabi season for estimation of nutrients in order to know the heavy metals and soil nutrient contents. The result showed that the physico-chemical properties of survey area were found to be neutral to slightly alkaline in reaction, safe in soluble salt concentration, medium to high in organic carbon content, calcareous in nature. The pH and organic carbon of soil samples were observed more in rabi season than in kharif season, as well as the EC, calcium carbonate and bulk density of soil observed more in kharif season as compared to rabi season. The macro nutrient status of available nitrogen was low to medium in range, available phosphorus also low to medium in range and available potassium was high in range. Positive influence of sewage water on available nutrients was observed. The positive effect of sewage on DTPA extractable iron, copper, manganese, zinc, boron and



molybdenum were observed as compared normal water and recorded higher values in kharif season as compared to rabi season.

FERTILITY CHARACTERIZATION OF CULTIVATED SOILS UNDER DIFFERENT CROPPING SYSTEMS OF LESSER HIMALAYAS

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Abstract

Sustainability of agricultural systems is a major global concern to feed the ever-increasing population and protect the environment. The major increase in productivity is possible only with adequate and balanced supply of essential nutrients to plants. Soil fertility management thus plays a key role in sustaining different production systems. Present investigation aimed at determining available nutrient status in cultivated soils under different cropping sequences in Lesser Himalayan region of Himachal Pradesh. Based on the standard GPS based soil sampling methodology, surface soil samples (0-15 cm) from maize-wheat, paddy-wheat & vegetable-based cropping sequences and at 0-30 cm depth from tea gardens & orchards represent the cultivated *Entisols*, *Inceptisols* and *Alfisols*, were collected. Results revealed that cultivated soils of Lesser Himalayas were loamy sand to clay loam, slightly acidic to slightly alkaline, calcareous to non-calcareous and moderate in base saturation. Available N (kg ha^{-1}), P (kg ha^{-1}), K (kg ha^{-1}), Ca ($\text{cmol(p+)}\text{kg}^{-1}$), Mg ($\text{cmol(p+)}\text{kg}^{-1}$), S (kg ha^{-1}), Cu (mg kg^{-1}), Fe (mg kg^{-1}), Mn (mg kg^{-1}), Zn (mg kg^{-1}) and B (mg kg^{-1}) ranged from 224 to 725, 5.4 to 29.1, 138 to 410, 1.5 to 7.3, 0.52 to 2.4, 11 to 69, 0.21 to 0.53, 4.5 to 29, 1.0 to 4.2, 0.38 to 1.6 and 0.27 to 0.74, respectively. Per cent of total soil samples found deficient in N, P, S, Zn and B were 10, 43, 29, 34 and 49, respectively. Study concluded that soil test-based fertilizer application may be one of the important key to sustain soil productivity.

CORRELATION AND PATH COEFFICIENT ANALYSIS IN KALMEGH (*ANDROGRAPHIS PANICULATA* (BRUM. F.) NEES)

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Abstract

The experiment was conducted in a Randomized Block Design With in 134 accession include 2 checks collected from different district of the Chhattisgarh along with 2 check in AnandKalmegh (Directorate of Medicinal and Aromatic Plant Board) and Simmegha (Central Institute of medicinal and aromatic plants) and evaluated for estimation of coefficient of correlation and path analysis. Correlation study indicated that herbage dry weight had positive and significant association with herbage fresh weight followed by plant height, no. of tertiary branches/plant. Path coefficient analysis showed that highest direct effect on herbage dry weight was exerted by herbage fresh weight followed by no. tertiary branches/plant, plant height, no. of seeds / pod, no. of secondary branches/plant, stem diameter, leaf width, days to 50% flowering, internodes length and petiole length.

A STUDY ON SOCIO-ECONOMIC ATTRIBUTES AND LIVELIHOOD DEPENDENCY OF FOREST FRINGE COMMUNITIES IN SUNDERGARH FOREST DIVISION, ODISHA

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Abstract

Non-timber forest products (NTFPs) provide a range of products which provides resilience to the livelihood strategies of rural people by reducing their vulnerability to risks. The socio-economic attributes like household size, type of family, age group, literacy rate, land holding, possession of livestock determine the social status and economic condition of individuals. These factors affect the decision making of the individuals in the society. A study conducted with forest fringe villages in Sundergarh forest division of Odisha revealed that the average household size was 5.37 with male to female ratio was 1.50: 1.72 and 2.15



numbers of children per family. Most of the respondents (36%) were in the age group of 51 and above due to absence of younger age groups on account of engagement in different livelihood activities outside the village. The adult female literacy (34.0%) was higher compared to male (19.0%) whereas 47% of the population is illiterate. Majority of the population (43%) possess less than 1 acre, whereas 36% possess lands between 1 to 2 acre and 21% having more than 2 acre land. It was revealed from the study that 50% of the population owned livestock with an average 3.70 animals per household. There was significant positive correlation of family size with age and livestock, age with literacy and landholding with livestock. The study also revealed people are involved in different livelihood activities like NTFPs collection (100%), agriculture (89%), shifting cultivation (42%), livestock rearing (85%), wage earning (79%) and others i.e., service and allied activities (5%). The association study revealed significant and positive correlation between Agriculture and shifting cultivation with livestock (0.411*), NTFP with livestock (0.225*). Significant negative correlation was found between NTFP with others (-0.249*), livestock with wages (-0.205*) and wages with others (-0.206*). It was concluded from the study that the family is nuclear type, population with high female and children literacy with 64% of population are landless and small farmers, half of the population rear livestock, collection of NTFP and agriculture are the important activities in terms of labour contribution. The daily wage sector generated the highest employment opportunity, with respect to then number of man days per household per year (32.68%) followed by NTFP (25.06%), agriculture (19.99%) and other sectors.

ASSESS FUTURE FOOD SECURITY IN NORTH EAST INDIA THROUGH REMUNERATIVE LAND USE PLANS : CASE STUDY IN ASPIRATIONAL BAKSA DISTRICT OF ASSAM

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Abstract

The study has been carried out in aspirational district Baksa of Assam state in North East India and worked out the economics of various alternate land use plans. The secondary data on area, production, yields, cost of cultivation and market prices as well as minimum support prices data has been collected and compiled from various published sources and statistical abstracts for the study. Capital budgeting technique was used to analyze the data and compared economics of alternate land use plans. Cost of cultivation in rupees per hectare, net profit in rupees per hectare and benefit cost ratio of various individual crops has been calculated by using capital budgeting technique and then these calculations applied for various alternate land use plans and worked out the economic assessment of alternate land use plans in aspirational districts of different states in India. The results showed that the yields (quintal per hectare) of different alternate land use plans without any management practices found as 24.43 in black gram- wheat system followed by black gram- mustard (12.31), paddy-wheat (40.53) and sesame-wheat (25.55) system with BC ratio 1.10, 1.05, 0.66 and 0.63 respectively. It also showed that the introduction of land resource inventory (LRI) technique enhanced the yields in cropping system as 29.32 q/ha in black gram- wheat system followed by black gram- mustard (14.77), paddy-wheat (48.63) and sesame-wheat (30.67) with BC ratio 2.52, 2.46, 1.99 and 1.96 respectively. Analysis of alternate land use plans with land resource inventory and best management practices together (LRI+BMP) showed that, in all cropping systems, yields increased as 34.20 q/ha in black gram- wheat system followed by black gram- mustard (17.23), paddy-wheat (56.74) and sesame-wheat (35.78) with BC ratio 2.94, 2.87, 2.32 and 2.28 respectively. In this way, to enhance the per capita agricultural income and yield of principal crops in presented aspirational district of India, economic assessment of different alternate land use plans have been worked out so that it reduce the gaps between aspirational and non-aspirational districts and improve the livelihood of farmers.

ISOLATION AND EVALUATION OF ACID TOLERANT RHIZOBACTERIA FROM DIFFERENT PLANT RHIZOSPHERE UNDER LATERITE REGION OF WEST BENGAL

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Abstract

The lateritic soil profiles as developed under prolong leaching are typically suffering from constraints of soil acidity, plenty of sesquioxides, low base saturation, deficiency of organic matters and water erosion. Out of all these constraints, soil acidity is the major constraint limiting the crop growth in red and laterite region. Red and laterite soils occupy an area of about 2800



sq.km in West Bengal which is about 28% of the total geographical area. The red and laterite areas of West Bengal are spread over districts like Birbhum, Bankura, Burdwan, Midnapur, and Purulia. Only 54.7% of the geographical area under red and lateritic soils in West Bengal has been brought under cultivation and kharif rice is the major crop occupying about 75% of the gross cropped area. Efficient strains that are area specific with selective traits to perform well under adverse conditions like soil acidity and biotic stresses need to be developed and evaluated. In the present investigation attempts were made for the enumeration, characterization and application of the most efficient native rhizo-microbial inoculants for accruing benefit to agricultural crop production in the problematic acid soil. In this study, a total number of forty one total bacteria and thirty four *Bacillus sp* were isolated from lateritic regions of West Bengal. Highest number of total bacterial population was observed from rhizosphere of pumpkin (26.0×10^6 cfu/ g of soil) followed by rhizosphere of pointed gourd and paddy (16.0×10^6 cfu/ g of soil). Hierarchical clustering could group 41 isolate of total bacteria into two major groups on the basis of growth at pH 4. Group A contained fifteen isolates with high level of pH tolerance at pH 4. Group B contained moderate and no acid tolerant isolates. Sub-group B1 contained ten isolates with moderate level of acid tolerance at pH 4 and sub-group B2 contained sixteen isolates having no growth at pH 4. It has been observed that 36.6 % isolates of native rhizobacteria were acid tolerant whereas 39% of the isolates were having no tolerance on growth at pH4.

ROLE OF FOOD PROCESSING, VALUE ADDITION AND POST HARVEST TECHNOLOGY IN IMPROVING FOOD AND NUTRITION SECURITY

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Abstract

Food and nutrition security, a major global challenge, relies on the adequate supply of safe, affordable and nutritious fresh and processed foods to all people. The challenge of supplying healthy diets to 9 billion people in 2050 will in part be met through increase in food production. This review describes developments in primary food production systems and the role of food processing on population health and food and nutrition security. For a resource constrained world, it is essential to have a balanced approach to both energy and nutrient content of foods. Food processing and value addition are key steps in the food value chain. This chapter will provide strategies that can be used by industries to enhance the use of environmentally friendly technologies for food processing and enhance value addition. Main concern is the post-harvest loss (PHL) which happens at every stage of the supply chain. Eliminating those losses is a way to increase food availability without requiring additional resources or placing additional burdens on the environment. The causes of PHL, which some estimates suggested could range from 15 to as high as 40 per cent of production are manifold. To provide quality, nutritious, safe food, develop new equipment and determine their efficiency. This has greatly improved the handling and quality of food crops, and contributed significantly to improving nutrition and national development. Improvements have been made in many aspects of postharvest technologies and handling of perishable foods, including harvesting indices, harvesting methods, pre-cooling methods and applications, storage techniques, packing and packaging, quarantine systems, transport systems especially by road and sea, modified and controlled atmospheres, etc. However, there is a persistent problem in most of the world (especially in many developing countries), where significant quantities of perishable foods are lost every year. The problems in developing countries are very complex in nature, and are not only due to technical reasons. India produces nearly (16%) of the world's total food grain production. It is one of the largest producers of agricultural produce. With a population expected to reach to about 590 million people by 2030 in urban India, India has a huge potential domestic demand for processed foods other than the demand from the exports. There are many socio-economic factors that are driving the demand side of the Indian Food Processing Industry.

EFFECT OF NEW HERBICIDES ON WEED MANAGEMENT OF IRRIGATED LINSEED

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Abstract

The experiment was conducted to find out bio efficacy of new herbicides for weed management in irrigated linseed under AICRP on Linseed, College of Agriculture, Nagpur. The results revealed that the weedicide Clodinafop @ 60 g a.i./ha at 2-3



leaf stage of weed shows maximum plant height, number of branches per plant, number of capsules per plant and was significant and at par with Hand weeding twice at 20-25 and 40-45 DAS, however in plant height it was at par with the application of the combination of two herbicides i.e. Metsulfuron methyl @ 4 g.a.i./ha at 2-3 leaf stage of weed and Clodinafop @ 60 g a.i./ha at 2-3 leaf stage of weed. The yield of linseed was significantly influenced by various treatment. Hand weeding twice at 20-25 and 40-45 DAS recorded significantly higher seed yield which was at par with treatment application of Clodinafop @ 60 g a.i./ha at 2-3 leaf stage of weed and application of Clodinafop @ 60 g a.i./ha + Metsulfuron methyl @ 4 g.a.i./ha at 2-3 leaf stage of weed. Weed control efficiency was observed higher in weed free plot. Among the different herbicide tested the weed control efficiency was found maximum in treatment having application of Clodinafop @ 60 g a.i./ha at 2-3 leaf stage of weed followed by treatment having application of Clodinafop @ 60 g a.i./ha + Metsulfuron methyl @ 4 g.a.i./ha at 2-3 leaf stage of weed. It is concluded that foliar application of 75ppm Salicylic acid as growth regulator resulted in significantly superior in yield for enhancing productivity and profitability of Linseed.

EFFECT OF GROWTH REGULATORS ON GROWTH, YIELD AND ECONOMICS OF LINSEED

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AICRP on Linseed, College of Agriculture, Nagpur Dr. PDKV, Akola (M.S.)

Abstract

To find out effect of growth regulators on growth, yield attributes, yield and economics of linseed, the present experiment was conducted under AICRP on Linseed, College of Agriculture. Growth regulator shows significant effect on growth, yield attributes and yield of linseed. Plant height and number of capsules per plant was observed highest and significantly superior after application of 75 ppm salicylic acid followed by application of 400 ppm GA and application of 0.1 % Tebuconazole. Number of branches per plant was found non-significant as influenced by various plant growth regulators. The seed yield of linseed was recorded significantly higher after application of 75 ppm salicylic acid and it was at par with treatment application of 400 ppm GA. Test weight was found similar i.e. 4.6g after application of 75 ppm salicylic acid and 400 ppm GA growth regulators. The gross monetary return, net monetary return and B:C ratio was found maximum in treatment having application 75 ppm salicylic acid. The seed yield was maximum when 400 ppm GA application, but the net monetary return and B:C ratio was resulted in minimum due to the market cost of GA.

PROCESSING OF LOCAL MANGO VARIETY FOR LEATHER PRODUCTION IN ODISHA

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Abstract

Mango is known as the king of fruits? due to its exotic flavour, delicious taste and several other desirable characters. Mango, the national fruit of India is the most popular tropical fruit crop belongs to family Anacardiaceae originated from South Asia, the Indo-Burma region. The majority of mango produces in our country mostly consumed in fresh form and about 1-2% of the production is processed to make products such as juices, nectars, concentrates, jams, jelly, aamchur powders, fruit bars, flakes and dried fruits. To avoid post-harvest losses and increase the shelf life, mango has to be processed into shelf stable product like mango leather. The present investigation entitled "Processing of local mango variety for leather production in Odisha" was carried out during 2019 with the objectives to study the processing of mango pulp for leather production. It consist of three replication and ten treatments such as T₁: Sun Drying (SD), T₂: SD + Sodium benzoate (250 PPM) T₃: SD + Sodium benzoate (250 PPM) + CaCO₃ (350PPM) T₄: SD + Sodium benzoate + CaCO₃ + Xanthan gum (0.5%) T₅: SD + Sodium benzoate + CaCO₃ + Xanthan gum + sugar (20%) T₆: Hot Air Oven Drying (H.A.O.D) T₇: H.A.O.D + Sodium benzoate (250 PPM) T₈: H.A.O.D + Sodium benzoate + CaCO₃ (350PPM) T₉: H.A.O.D + Sodium benzoate + CaCO₃ + Xanthan gum (0.5%) T₁₀: H.A.O.D + Sodium benzoate + CaCO₃ + Xanthan gum + Sugar (20%). The qualitative properties of mango pulp was determined and found to have mean moisture content of 82.35 per cent, mean TSS of 16.00⁰ brix, mean value for ascorbic acid content 25.18 mg/100 g of pulp, mean beta carotene content of 7.23 mg/100 g of pulp , mean total sugar of mango pulp to be 13.65% and mean value for reducing sugar recorded 4.55 %. Among both of the drying method sun drying was recorded the maximum texture score (8.48) and oven drying method was recorded the highest colour score (8.35) in case of T₃ (pulp + Sodium Benzoate+CaCO₃) 60 days after storage.



SOIL HEALTH MANAGEMENT; THE WAY FORWARD FOR SUSTAINABILITY AND DOUBLING FARMER'S INCOME

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Abstract

Whatever post-green revolution technologies used for the improvement of productivity and achieving food security, dependency on chemically synthesized fertilizers contribute a significant share among them. The increasing rate of chemical fertilizers kept reducing the fertility status as well as soil health leading to multi-nutrient deficiencies in major productive tracts in India today. Scientists in India have lots of challenges in near future to feed India's 1.3 billion population, the 2nd largest population of the world. There are several research stations and scientists of different agricultural streams working rigorously to sort out the issues and problems of sustainability and food security but there is always something that lacks is transfer, adoption and dissemination of technologies from scientific communities to farmers field. If critically thought of, some of the major drawbacks which make farming community to follow these research outcomes may be lack of understanding the complexity and integration of resources, lack of awareness about soil health, lack of method and result demonstration at village level, lack of incentives for adoption of new technologies, lack of economic stability and suitability and last but not the least lack of strong policies both for farming as well as scientific communities on the way that is well clarified and transparent to achieve food security in a sustainable way considering the health of soil and agro-ecology. Soil health management should be the prime concern as there is a decreasing trend of soil carbon stock which is the main contributor to soil ecology and nutrient dynamics. Resilient soil and agronomic managements i.e. minimum tillage, crop rotation, organic inputs and INM, minimize mechanization, reduced use of synthetic fertilizers, adoption of good agriculture practices etc. avoiding intensive cultivation, mono-cropping, sticking to traditional management practices and traditional varieties, use of huge amount of chemically synthesized agro-inputs are the only way to improve soil health decreasing the negative impacts of post green-revolution technologies i.e. reduction in partial factor productivity and multi-nutrient deficiency. Some of these resilient management options farmers can practice if research institutions and state agriculture departments should combinedly take responsibility to achieve it. The 21st century world is a world of information technology and we have the option whether we want ecology or we want economy, if we want both then we better move towards the sustainability i.e. sustainability in ecosystem stability, sustainability in soil health management, sustainability in achieving food security.

EVALUATION OF LOW COST SOIL MOISTURE SENSOR BASED AUTOMATED DRIP IRRIGATION SYSTEM

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Abstract

The aim of the experiment was to integrate and setting up of low cost sensor system for monitoring of soil moisture content, to calibrate and validate the sensor system in conjunction with the low cost gravity operated irrigation system and performance evaluation of drip irrigation system using soil moisture sensor. Laboratory tests of the soil samples revealed its texture as clay loam. Field capacity (27%) and Bulk density (1.34 gm cc⁻¹) was obtained. Alfa-mart sensor, TDR and gravimetric method were used to measure soil moisture content. Soil moisture sensor system was calibrated to field capacity of the soil by using of Gravimetric method. Gravity fed drip irrigation system 750 l overhead (total height 3.55 m) tank was used for irrigation. The experiment constituted two treatments Control irrigation and Sensor based treatment. As Control irrigation water is provided based on farmer practice and Sensor based treatment water was provided according to field moisture content. In control irrigation 2 laterals and Sensor based treatment 10 laterals were used. Wetting patterns was measured at 0.25 kg cm⁻² operating pressure. Wetted width and depth of soil after 15, 30, 60 and 90, minutes of water application were recorded. The maximum horizontal wetting front advance was observed to be 4.2, 8.2, 11.2 and 16.4 cm respectively and maximum vertical wetting front advance were recorded as 8.4, 12.4, 20.1 and 22.3 cm respectively from emitters with discharge of 1.3 l h⁻¹ at 0.25 kg



cm⁻². Drip irrigation discharge of 1.03 l h⁻¹ inline emitter was measured at different locations in the field at 10 min interval of different operating head to check out the hydraulic performance of drip irrigation system based on, emission uniformity, emitter flow variation, uniformity coefficient and irrigation efficiencies. Based on the experimental record Emission uniformity (98.80%), Uniformity coefficient (97.94%), Distribution efficiency (97.04%) and Application efficiency (95.62%) were found maximum at operating head 3.35 m to 3.36 m. The growth characters was progressively increased and influenced by different irrigation treatments. In Control irrigation maximum plant height was 98.30 cm, number of branch per plant was 3.50, number of fruit per plant was 15.12, avg. weight of fruit 10.10 gm, avg. length of fruit was 9.30 cm, yield per plant was 209 gram and water use efficiency was 27.68 kg ha⁻¹ mm⁻¹ was obtained. In Sensor based treatment maximum plant height was 115.90 cm, number of branch per plant was 4.90, number of fruit per plant was 15.81, avg. weight of fruit 13.40 gram, avg. length of fruit was 11.20 cm, and yield per plant was 234 gm was obtained. Water use efficiency was found maximum (46.76 kg ha⁻¹ mm⁻¹) under sensor based treatment. After calculating total volume of water 4850 m³ used by Control irrigation and 3116.0 m³ for the production of okra in one ha area. So Sensor based treatment save 1737 m³ of water in one ha area.

EVALUATION OF LIQUID BIOFERTILIZERS IN IRRIGATED RICE IN FARMERS FIELD AT MAHABUBNAGAR DISTRICT OF, SOUTHERN TELANGANA AGROCLIMATIC ZONE OF TELANGANA STATE, INDIA

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Abstract

In the present investigation was carried out as on farm trial in farmers field at Mahabubnagar district, of Southern Telangana Agroclimatic Zone, of Telangana State, India for two years during kharif 2014 to 2015, to evaluate the feasibility of application of liquid bio fertilizers (*Azospirillum* and PSB) in combination with 75% of recommended dose of Nitrogen and phosphorus applied as inorganic fertilizer, in order to reduce the use of chemical/ inorganic nitrogen (N) and phosphorus (P) fertilizers on rice cultivated in lowland ecosystem. The results of both the years indicated that the plant performances were better when 25% less of recommended dose of nitrogen and phosphorus (inorganic/chemical) fertilizer was applied in combination with *Azospirillum* and PSB @ 2 l/ha. Considering the yield attributes, 75% RDNP + *Azospirillum* +PSB performed superior to farmers practice(100% inorganic). The grain yield of rice was enhanced by 3.6% and 2.7% during 2014 and 2015 respectively, to the recommended dose even with 25% less RDF application Results revealed the greater scope of applying liquid biofertilizers (*Azospirillum* and PSB) to supplement chemical NP fertilizer with optimum yield of rice.

HYDRAULIC PERFORMANCE EVALUATION OF GRAVITY OPERATED DRIP IRRIGATION SYSTEM AT DIFFERENT OPERATING HEAD

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Abstract

Laboratory tests of the soil samples revealed its texture as clay loam. Field capacity (27%) and Bulk density (1.34 g cc⁻¹) were obtained. Gravity fed drip irrigation system 750 litres overhead (total height 3.55 m) tank was used for irrigation. The experiment Sensor-based drip irrigation. Sensor-based treatment water was provided according to field moisture content. For Sensor-based drip irrigation has 10 lines of laterals were used. Wetting patterns was measured at 0.25 kg cm⁻² operating pressure. Wetted width and depth of soil after 15, 30, 60 and 90, minutes of water application were recorded. The maximum horizontal wetting front advance was observed to be 4.2, 8.2, 11.2 and 16.4 cm respectively and the maximum vertical wetting front advance was recorded as 8.4, 12.4, 20.1 and 22.3 cm respectively from emitters with a discharge of 1.3 l h⁻¹ at 0.25 kg cm⁻². Drip irrigation discharge of 1.03 l h⁻¹ inline emitter was measured at different locations in the field at 10 min interval of the different operating head to evaluate out the hydraulic performance of drip irrigation system based on, emission uniformity, emitter flow variation, uniformity coefficient, and irrigation efficiencies. Based on the experimental record Emission uniformity (98.80%), Uniformity coefficient (97.94%), Distribution efficiency (97.04%) and Application efficiency (95.62 %) were found maximum at operating head 3.35 m to 3.36 m.



GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE STUDIES FOR GRAIN YIELD AND YIELD ATTRIBUTING TRAITS IN BREAD WHEAT (*TRITICUM AESTIVUM* L. EM. THELL)

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Abstract

The field experiment under present investigation was conducted at Agriculture Research Farm of B.R.D. Post Graduate College (Campus), Deoria (U.P.) during rabi 2015-16 in normal soil, timely sown and irrigated conditions. Total 81 genotypes excluding 3 checks were evaluated for 14 quantitative traits under Augmented Block Design. Genetic variability, heritability and genetic advance were studied in 81 genotypes of bread Wheat (*Triticum aestivum* L. em. Thell) in Uttar Pradesh to estimate variability parameters for high yield and their attributing traits in 81 germplasm lines of Wheat. The highest heritability per cent in broad sense 0.9890 was recorded for days to maturity followed by biological yield per plant (g) (0.8316). The highest genetic advance 7.461 was evaluated for harvest index per cent followed by biological yield per plant (g) (7.0720). The highest genetic advance as per cent over mean was recorded for biological yield per plant (g) (58.6302) followed by grain yield per plant (g) (56.0032). The results indicate that these traits were governed by additive with epistatic effects for the phenotypic expression of the characters. It indicates that these traits were governed by additive genetic effect which is fixable type and consequently desirable selection will reward for improvement for these traits.

SOCIO ECONOMIC EVALUATION OF PADDY STRAW SIZE CUTTER FOR MUSHROOM PRODUCTION

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Abstract

Rice-wheat cropping system is the most prominent in India and India ranks second in paddy production in the world after China. There is some potential to use paddy straw as a medium for growing mushrooms. There is no any suitable machine for cutting paddy straw in different size. The Chaff cutter is a hay or straw cutting machine which is used in uniform chopping of the fodder for livestock or mushroom production. This study will increase the versatility of the machine and will reduce the operational time. The paper proposes the way to build and utilize the low cost machine for paddy straw mushroom production. The machine consisted of main frame and belt drive attachment, blade, shaft and electric motor. Working width of the cutting is 400 mm, capacity is 146 kg/h and prototype unit price is 23490/- approximately. A comparative study was done on capacity of machine and cost of operation. It shows that the newly developed machine saves 69.11% cost as compared to traditional *katti* machine and 57.44 % as compared to chaff cutter for sizing of the paddy straw at desired length. It was also observed that the mycelium growth in case of present developed machine is better than the traditional. Hence the machine is very economical.

QUALITY EVALUATION OF FUNCTIONAL PROPERTIES AND ORGANOLEPTIC PROPERTIES OF MULTI-FLOUR BASED NOODLES

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Abstract

Noodles are one of the main staple foods consumed in East and Southeast Asian countries representing up to 40 percent of total flour consumption. Though some Asian- style noodles are wheat based many other are made from ingredients such as rice flour, potato flour, buck wheat flour, corn flour and bean, yam or soybean flour. Cereals supply the bulk of the food consumed by the human race. They are the cheapest source of food energy and constitute a high percentage of the calorie and



protein intake of people, particularly in the developing countries. Present investigation was carried out to develop multi flour noodles from the multi flours. Multi flours noodles were prepared by blending wheat flour with kidney bean flour, cowpea flour, turnip flour and cauliflower flour in five different ratios of (W_{90}) 90:2.5:2.5:2.5:2.5, (W_{80}) 80:5:5:5:5, (W_{70}) 70:7.5:7.5:7.5:7.5, (W_{60}) 60:10:10:10:10 and (W_{50}) 50:12.5:12.5:12.5:12.5, respectively and packaged in pet jar and low density polyethylene (LDPE) packaging for noodles development. The functional properties swelling capacity, water absorption capacity, oil absorption capacity, emulsion activity, emulsion stability, foam capacity, foam stability, gelatinization temperature, least gelation concentration and bulk density of noodles were evaluated and increased with increase in the incorporation of other flours with wheat flour. But some moderate changes in emulsion activity and emulsion stability. Overall acceptability for multi flour noodles was awarded highest score W_{90} noodles followed by W_{80} , W_{70} , W_{60} and W_{50} . All composite flour noodles in the range of 'like moderately' to 'like very much'.

PERSONAL AND SOCIO-ECONOMIC CHARACTERISTICS OF THE FARM WOMEN IN TIKAMGARH DISTRICT OF MADHYA PRADESH

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Abstract

Rural women perform a variety of roles, of which are of greater economic significance. While men went out hunting in search of food, women started gathering seeds from the native flora and began cultivating those of interest from the point of view of food, feed, fodder, fiber and fuel. Women have played and continue to play a key role in the conservation of basic life support systems such as land, water, flora and fauna. Personal and Socio economic conditions are indicators of life style of rural farming community. Farm women participate in the agricultural activities such as agriculture labour, working in the family, dairying and many agricultural allied activities. That women play a significant and crucial role in agricultural development and allied fields including in the main crop production, livestock production, horticulture, post-harvest operations, agro/ social forestry, fisheries, etc. In order that farm women get a fair deal at the hands of change agents, one of the remedial measures that needs to be undertaken is to induct a sizeable number of well-trained women personnel in training and extension programmes of agricultural development agencies at all levels and more so at the grass-root level. Hence, the present study aimed to determine the socio economic status of the farm women. Hence, the present study focuses on the Personal and socio economic status of the farm women. The present study entitled "Participation of Farm women in Agricultural Activities in Tikamgarh District (M.P.)". The total sample size consists of 120 farm women selected from 6 villages of Tikamgarh block of Tikamgarh district. The study reveals that higher percentage of the farm women were belonged to middle age group, acquired primary school education, belonged to other backward class, belonged to nuclear family, medium family size, having small size of land holding, having medium farming experience, belonged to farming group, having medium annual income, having medium knowledge level, having medium social participation and having medium extension participation.

IMPACT OF INVASIVE SPECIES ON STANDING VEGETATION AND SOIL SEED BANK DYNAMICS IN INDIAN DRY TROPICS URBAN REGION

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Abstract

Alien invasive species become established in natural and semi-natural ecosystems as agents of change and threaten native biological diversity. The tropical regions are rich reservoirs of much of the biodiversity of earth. The Indian dry tropical urban region has often been reported to be highly fragile that has begun to witness the abundance of alien flora, of which American, Asian and Malaysian and European and central Asian species form the major contributions. By the allelopathic activity, these weeds alter the soil environment, cause low productive systems with weak soil micro flora and accelerates their fast spread by fast colonization, fast reproduction or high competitive ability especially at disturbed sites. The sustainability of urbanizing areas is essential to regions, nations and the world as a whole. Soil seed banks in tropical urban region, number or store of viable seeds buried in the soil at a given time, represent a record of the recent vegetation of an area. Soil seed bank acts as a



genetic reservoir that preserves the previous biological conditions that could play an important role in determining the future vegetation of future community. The present study carried out five anthropic sites in Meerut focused on seed bank dynamics of these sites. The subterranean vegetation different in the floristic composition and their density with abundance of invasive weed species reflecting the heterogeneity and ominous dominance of alien weeds.

SOIL FERTILITY STATUS IN NAGARKURNOOL DISTRICT OF TELANGANA STATE

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Abstract

A detailed geo-reference investigation was carried out at Nagarkurnool district of Telangana to study the available nutrient status and to estimate nutrient index values (NIV), which would act as an important tool for soil as well as nutrient management for higher and sustainable crop production. Around 802 soil samples were collected from the study area, analyzed for physico-chemical, chemical properties and estimated for NIV. The results revealed that the soils under investigation were strongly acidic to strongly alkaline in reaction (pH 4.95 to 9.33), non-saline (0.07 to 1.29 dS m⁻¹) and low in organic carbon status (0.24 to 0.44 %). All the samples of investigated area were low in available N, medium (71 %) to high (28 %) in available P and medium (31%) to high (62%) in available K. The available sulphur status was low (44%) in deficient category (<10 mg kg⁻¹), 65% samples were in medium category (10 - 20 mg kg⁻¹) and 22% samples fallen under category of high (>20 mg kg⁻¹). Based on the above study it is concluded that, soil fertility status of Nagarkurnool District considering the concept of nutrient index value of the surveyed area was found in low fertility status for organic carbon & available nitrogen, medium for phosphorus and high for potassium and sulphur. The nutrient index value for Organic Carbon (OC), Nitrogen (N), Phosphorus (P), Potassium (K) and Sulphur (S) were 1.0, 1.0, 2.27, 2.55 and 2.39 respectively against the nutrient index values <1.6 for low, 1.67-2.33 for medium and >2.33 for high fertility status.

EFFECT OF PLANT GEOMETRY AND NUTRIENT MANAGEMENT ON GROWTH, YIELD AND QUALITY OF RED RICE CULTIVARS

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Abstract

A study entitled "Effect of plant geometry and nutrient management on growth, yield and quality of red rice cultivars" was conducted at Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during Kharif 2016 to study the effect of crop geometry and nutrient management on growth, yield, quality and economics of red rice cultivars. The results revealed that red rice variety Mokdo with spacing 20 cm x 10 cm maximum yield attributes, grain yield (46.9 q ha⁻¹), straw yield (85.5 q ha⁻¹) and net realization as compared to other varieties. As regards to nutrient management, soil application of 50 % RDF + 50 % RDN through FYM recorded maximum yield attributes, grain yield (44.2 q ha⁻¹), straw yield (79.9 q ha⁻¹), N, P, K content in grain and straw, and N, P, K uptake by grain and straw as compared to other variety. Maximum zinc and iron content in grain and straw was recorded with variety Mokdo + 20 cm x 10 cm spacing. Soil available K₂O (kg ha⁻¹) and zinc (ppm) were not influenced significantly due to the varieties, plant geometry and nutrient management. However, soil available N, P₂O₅ (kg ha⁻¹) and iron (ppm) was influenced significantly due to varieties, crop geometry and nutrient management. The results reveal that red rice variety Banthaluchai with spacing 15 cm x 10 cm maximum soil available nutrients as compared to other variety. As regard to nutrient management Soil application of 100 % RDN through FYM was recorded significantly maximum soil available nutrient as compared to other nutrient management. The minimum soil available nutrient was recorded with 100 % RDF. Variety Mokdo + 20 cm x 10 cm spacing recorded maximum gross returns (90430 Rs ha⁻¹), net returns (65767 Rs ha⁻¹) and benefit to cost ratio (2.6) followed by variety Mokdo + 15 cm x 10 cm spacing. In case of nutrient management, soil application of 50 % RDF + 50 % RDN through FYM was recorded maximum gross returns (85190 Rs ha⁻¹), net returns (59496 Rs ha⁻¹) and benefit to cost ratio (2.3) followed by application of 100 % RDF.



PERFORMANCE OF ELITE CLONES OF BANANA ON YIELD AND YIELD ATTRIBUTING PARAMETERS IN COASTAL ZONES OF ODISHA

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Abstract

Eleven banana genotypes viz. Champa (AAB), Budubale (Pisang Awak), BCB-3 (AAB), H-531 (Poovan x Pisang Lilin), BCB-1 (AAB), KBS-8 (Dwarf Cavendish-AAA), Bantal (ABB), BCB-2 (ABB), Kovur Bontha (Monthan-ABB), Manjeri Nendran II (AAB) and NRCB-8 (ABB) were evaluated for the physical parameters like pseudostem length (cm), pseudostem girth (cm), number of leaves, leaf length (cm), leaf girth (cm), petiole length (cm) at 6th MAP, 8th MAP, at the time of shooting and harvesting at Horticultural research station (HRS), Orissa University of Agriculture and Technology (OUAT), Bhubaneswar, Odisha during the year 2014-15. The bunch weight (kg), bunch length (cm), bunch girth (cm), number of hands, total number of fingers, finger length (cm), finger circumference (cm), finger weight (g), were recorded and all data collected were statistically analyzed. From the results it was revealed that, among the dessert types the performance of BCB-3 was better as compared to other genotypes with regards to bunch weight (14.77 kg), number of hands (12.87), number of fingers (148.91), finger length (21.07cm), finger weight (101.21g) and yield (31.7 t/ha). The genotype BCB-2 among the culinary types was found to be superior as compared to other genotypes with regards to bunch weight (16.52 kg), number of hands (12.80), number of fingers (125.05), finger length (19.53cm), finger weight (137.48 g) and yield (35.18t/ha). In addition to this, Manjeri Nendran II was also found to be equally superior as regards to yield with NRCB-8 and Bantal.

GROWTH, YIELD AND QUALITY OF OKRA (*ABELMOSCHUS ESCULANTUS* L.) AS INFLUENCED BY DIFFERENT ORGANIC, BIOENHANCERS AND INORGANIC TECHNIQUES

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Abstract

The experiment was carried out to find out the effect of different organic, bioenhancers and inorganic techniques on growth and yield of okra. The treatment combinations involving three levels of organic manure i.e. 20 t FYM ha⁻¹, 10 t vermicompost ha⁻¹ and 10 t goat manure ha⁻¹, three levels of bio-enhancers i.e. Panchgavya (Foliar spray @ 3% at 30, 45, 60 and 90 DAS), Beejamrit (Seed treatment @ 10%) and Jiwamrit (500 lit./ha at each irrigation) and chemical fertilizers in three levels i.e. 0 (control), 100% RDF (100,60,80 NPK kg ha⁻¹) and 50% RDF (50,30,40 NPK kg ha⁻¹) were given in Kashi Pragati variety. Maximum plant height, number of leaves plant⁻¹, number of internodes plant⁻¹, Number of nodes to first flowering, Days to first flowering and Fruit yield plant⁻¹ (g), dry weight of fruit (g), Fiber content in fruit (%), Ascorbic acid content in fruit (mg/g) and Iodine content in fruit (ppm) were observed by application of 10 t Vermicompost ha⁻¹, Panchgavya (Foliar spray @ 3% at 30, 45, 60 and 90 DAS) and 100% RDF (100,60,80 NPK kg ha⁻¹) at all the growth stages.

CONTROL OF INSECTS BY USING DIFFERENT PREDATORS AND PARASITIDS DEPENDING ON THE ENVIRONMENT

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Abstract

In today's time, insect is a serious problem in agriculture. In the future, many chemicals have to control the insect, so that they have an effect, but they cause many harmful effects, such as deteriorating the balance of the environment, damage to people, and it has the opposite effect on many living beings. Therefore, insects can be controlled using different predators and parasitoids depending on the environment. Predators are free living and require several preys to complete the life cycle. They tend to feed on preys smaller than themselves. For example; Coccinellid beetles, anthocorid bugs and predatory mites etc. Coccinellid beetles are commonly called ladybirds. These feed on aphids, scale insect, mealybugs and mites. Anthocorid bugs





deterioration. The effect of priming over artificial aged seeds in the laboratory condition, varieties, ageing and priming were significant for germination percentage, speed of germination, root length, shoot length, seedling fresh weight, seedling dry weight, vigour index-I and vigour index-II. The maximum improvement in the seed quality parameters could be attained by priming treatments. Seed priming improved chickpea performance under both optimal temperature conditions and chilling stress through better germination metabolism and the accumulation of trehalose, which protected from oxidative damage and helped to maintain carbon assimilation and seedling growth.

EVALUATION OF FUNGICIDES FOR THE MANAGEMENT OF RICE FALSE SMUT DISEASE CAUSED BY *USTILAGINOIDEA VIRENS*

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Abstract

False smut has gained importance as one of the important diseases of rice. The pathogen *Ustilaginoideavirens* converts individual grain into powdery mass and causes direct economic and yield loss. In addition, it produces two types of toxins known as Ustiloxins and Ustilaginoidins. The infection of the pathogen starts before the emergence of the panicle and application of fungicide after the appearance of the smut ball in the panicle is generally not very helpful for the management of the disease and it mainly depends on the prophylactic spray of effective fungicide. Though exact mode of infection of the pathogen not yet revealed, it is known that *U. virens* infect the spikelets in the booting stage. Based on this information, nine commercially available fungicides were evaluated at three AICRIP Plant Pathology centers against false smut viz., Ludhiana, Kaul and Titabar (hot spot locations) during the year 2016 and 2017. The spraying was done at booting stage and the number of sprays was limited to 2 at 10 days interval. At Ludhiana and Kaul the trial was conducted under natural disease pressure and at Titabar the disease pressure was created artificially by spraying of chlamydospores collected from naturally occurring false smut balls. The fungicides viz., azoxystrobin 25 SC (1.0ml/l), difenoconazole 25 EC (1.0 ml/l), azoxystrobin 18.2 % + difenoconazole 11.4 % w/w SC (1.0 ml/l), metiram 55% + pyraclostrobin 5% WG (1.5 g/l), penicuron 22.9 % (1.25 ml/l), tebuconazole 250 EC (1.25 ml/l), thiafluzamide 24 % SC (1.0 ml/l), flusilazole 25%+ carbendazim 12.5% (1.0 ml/l) and propiconazole 25 EC (1.0 ml/l) were evaluated. Among them, two sprays of propiconazole 25 EC @ 1.0 ml/l at booting stage at 10 days interval significantly reduced the mean percentage of infected panicles into 8.39% (2016) and 6.65% (2017) compared to control treatment (33.68% in 2016 and 28.78% in 2017) in all the three locations. The overall mean yield increased from 4641 to 5770 kg/ha and 4826 to 5873kg/ha during the year 2016 and 2017, respectively.

A STUDY OF PRESENT STATUS OF RICE SEED MARKETING AND CONSTRAINTS IN BEMETARA DISTRICT OF CHHATTISGARH

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Abstract

The present study seeks to analyze the market structure in rice seed at dealer's level, farmers' preferences in rice seed purchase, promotional measures adopted by seed companies and problem faced by farmers and seed dealers for marketing of rice seed. For fulfillment of the objectives of study Bemetara district of Chhattisgarh, state was selected purposively. Out of four block of district, Saja and Bemetara blocks were undertaken on the basis of more number of hybrid rice seed growers. Among two samples block 5 villages for each in north, south, east, west and centre part of district randomly. From each sample village, five hybrid rice growers were undertaken to interview on Performa design for the study. Out of 21 rice dealers/retailers, 15 rice dealers/retailers were interview for fulfillment of the objectives. The result of study revealed that the value of Gini coefficient was found to be 0.65, which clearly indicates that there was more/sufficient competition among



dealers and market structure was uniformly distributed. The factors influencing the preferences for rice seed purchase were higher yield ranked 1st, good germination was 2nd, dealers availability of credit ranked 3rd, dealers guidance ranked 4th, neighbors or family opinion ranked 5th and brand 6th and price 7th. The study envisaged that farmers were growing more hybrid seed rather than HYV seeds for their rice cultivation, nearly 82 per cent farmers were used hybrid seed and 18 per cent farmers were used higher yield HYV seeds. With regards to preference of particular brand, 79.77 farmers believed for timely availability of seed, 72.5 per cent farmers believed higher yield, 60.28 per cent farmers believes on disease and pest resistance, 58.68 per cent believed longer viability of seed. Study revealed that most of the farmers were unaware about promotion measures used in rice seed marketing such as field demonstration, sample distribution in dealers shop, farmers visit to research plots, slide show, and television. In time, second problems higher price and finally selection of seed. In case of advertisement promotion measures in rice seed marketing reported by farmers that satisfactory level is very poor and should be some more effective measures to aware the farmers. Farmer's impression of carry the purchase of rice seed quality was more important for rice seed marketing. In this case factor influencing farmers' variables, decision to purchase price is more important for purchasing behavior and second is brand. Farmer's meeting and jeep campaigns were the major promotion measures perceived by the farmers in the study area. Problems faced by dealer's level in rice seed marketing were demand by farmers for credit sales, illiterate farmers and inadequate trained personnel for marketing and problems mostly faced by farmers in rice seed purchasing was non availability of seed in time, second problems higher price and finally selection of seed.

MEMBRANE POTENTIAL STUDIES OF MODEL MEMBRANE

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Abstract

The parchment supported Lead tungstate model membrane was prepared by the ion-intracation method. The membrane potential of model membrane bathed in different concentration of uni-univalent electrolytes (KCl, NaCl and LiCl) have been measured. The effective fixed charge densities of the membrane evaluated in contact with these univalent electrolytes using recently developed theories have been found to be low. Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Thermogravimetric Analysis (TGA) and Fourier Transform infrared (FTIR), images have also been presented.

ON FARM TESTING OF DROUGHT TOLERANT GROUND NUT VARIETY DHARANI FOR SCARCE RAIN FALL ZONE OF ANDHRA PRADESH

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Abstract

Ground nut is the second most important edible oil seed crop after rice in terms of acreage and economy. More than 80% the area is under Rainfed situation in Kharif season. Cultivation of ground nut in Rainfed situation in marginal soils of poor fertility and improper management leads to the lower yields compare to national average productivity. The main constraint in this situation is moisture stress at different stages of crop growth with no fixed pattern due to erratic distribution of rainfall. Drought resistant variety like Dharani in low rainfall scarcity zones helps to overcome this problem to some extent. Dharani variety become popular among the farmer and KVK Banavasi conducted various activity like pre-season trainings, trainings, on farm testing demonstrations, fields day, farmers interface meetings about the improved variety of ground nut especially Dharani for drought areas. KVK Banavasi also distributed seed for 40 ha for cluster front line demonstrations to population this improved variety presently 40 ha with 50 beneficiary farmers under CFLD programme at Venkatapuram village to Yemmiganur mandal with this improved Dharani variety. Drought tolerant Dharani ground nut variety compared to local variety demo plot yielded 8% higher and resulted in an extra income of Rs. 17415/- per ha with more B:C ratio of 2.23 in the demo plot.



SURVEY OF CHILLI DISEASES IN MUZAFFARNAGAR

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Abstract

Chilli (*Capsicum annum L.*) is an important vegetable and spice crop in the world. Major disease of chilli viz., Anthracnose, Fruit-rot, Fusarium wilt and Leaf curl noticed in serious proportion as they caused heavy losses in field and vegetable market of Muzaffarnagar District. Considering the seriousness, the present investigation was carried out. Field survey was conducted in Muzaffarnagar district during Kharif-Rabi 2015-16 for Anthracnose, Fruit-Rot, Fusarium wilt and Leaf curl. Among them Leaf Curl was found maximum 51.20 % disease incidence. Market survey was conducted during Kharif, Rabi and Summer 2015-16 at vegetable market of Budhana, Muzaffarnagar, Shahpur Charthawal and Thanabhawan of Muzaffarnagar district. Maximum 10.75 % disease incidence was found in Budhana.

PERFORMANCE OF COCONUT BASED MULTISPECIESCROPPING SYSTEM FOR SUSTAINABLE PRODUCTION IN RED SANDY LOAMS OF COASTAL ECOSYSTEM

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Abstract

The field experiment was conducted on 'Performance of coconut based integrated cropping system for sustainable production in red sandy loams of coastal ecosystem' at Horticultural Research Station, Vijayarai from 2016-2018. The experiment was laid out in randomized block design with eleven cropping systems along with solo crop (Coconut) in two replications. The results revealed that growth parameters of main crop coconut viz., girth (cm), number of leaves on the crown, number of spadices produce per palm per year, mean number of female flowers per spadix, mean number of nuts per palm per year were non significant in coconut based multi species cropping systems whereas significant increase of nuts per palm per year was observed when compared to before cropping systems. The mean data of two years revealed that the highest nut yields were recorded in Coconut + drumstick + turmeric (154.63 nuts/palm/year) whereas under monocrop the nut yields were 86.5 nuts per palm. With respect to biennial intercrops, the highest yield of drumstick (3.82t/ha) was noticed in Coconut + drumstick + turmeric cropping system, banana (2.60 t/ha) in Coconut + Banana + Pineapple cropping system and papaya (10.47 t/ha) in Coconut + Papaya + Zinger cropping system. Regarding the yields of annuals in various cropping system, the highest was recorded in cassava (9.44t/ha) followed by pineapple (4.10t/ha) as against the lowest in zinger (1.10t/ha). The biomass obtained from the cropping systems was recycled back into the system. There was an increase in the soil organic carbon (%), nitrogen, phosphorus and potassium in cropping systems. The economic analysis revealed that the highest net returns were registered in Coconut + banana + pineapple cropping system compared to coconut monocrop.

SOIL HEALTH MANAGEMENT FOR SUSTAINING CROP PRODUCTION

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Abstract

Healthy soil is the foundation for profitable, productive and environmentally sound agricultural system. A healthy soil provides many functions that support plant growth including nutrient cycling, biological control of plant pests and regulation of water and air supply. These functions are influenced by the interrelated physical, chemical and biological properties of soil many of which are sensitive to soil management practices. Best management practices that build soil health and sustain productivity are many and can lead to better ecosystem and societal services. The implementation of such practices should be considered on regional and site specific basis. Site specific adoption of different conservation practices integrated within the overall production system can effectively increase crop productivity. These practices include: Reduce inversion tillage and soil traffic. Increase Organic matter inputs: To maintain or increase soil organic matter levels, inputs of organic matter must meet or exceed the losses of organic matter due to decomposition. Healthy crops can be a valuable source of organic matter and crop residues should be returned to the soil to the extent possible. Incorporation of cover crops or perennial crops and judicious



additions of animal and green manure and compost can also be used to increase or maintain soil organic matter. Use of Cover crops: Cover crops contribute numerous benefits to soil health. They keep the soil covered during the winter and other periods of time when crops are not growing, reducing the risk of erosion. The biomass produced by cover crops is usually returned to the soil, enhancing organic matter levels. Cover crops with taproots can create macropores and alleviate compaction. Fibrous rooted cover crops can promote aggregation and stabilize the soil. Crop rotation : Diverse crop rotations will help break up soilborne pest and disease life cycles thus improving soil and crop health. Managing the nutrients carefully: Planning the timing, application method and quantity of manure, compost and other fertilizers will allow you to meet crop nutrient demands and minimize application of excesses nutrient to the soil.

EXPORT PERFORMANCE OF GROUNDNUT IN INDIA

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Abstract

Groundnut (*Arachis hypogaea*) is one of the world's important oilseed crops. India is the second largest producer of groundnut in the world. India exports groundnut to more than 75 countries. The country has exported 504019.21 MT of groundnuts to the world for the worth of Rs. 3386.30 crores during the year 2017-18. The export of groundnut has been increasing significantly. To know growth and instability in area, production, productivity and export of groundnut the data used is entirely based on secondary source of data from 1988-89 to 2017-18. There is increase in agriculture exports but percentage share of agriculture export to total export was decreasing due to increase in share of manufacturing sector, service sector etc. There is increase in quantity of India's groundnut export to world groundnut export. The growth rate of groundnut area in India is found to be negative and significant during period I (1988-89 to 2002-03), period II (2003-04 to 2017-18) and over all period (1988-89 to 2017-18) of the study. The growth rate of production was non-significant during over all period. The growth rate of productivity was positive and significant during period II and over all period. The growth of export quantity and export value was found to be positive and significant during period I, period II and over all period. There is stable growth in groundnut exports from India. The area of groundnut exhibited less variability in period I and period II, and it was higher in overall period. The production of groundnut exhibited less variability in period I and over all period while it was highest in period II. The variability in productivity was lower in period I and it was higher during period II and overall period. As regard to the export quantity and export value of groundnut the highest variation was observed in over all period. It was found that groundnut has shown higher instability with respect to export quantity and export value.

SUSTAINABLE AGRICULTURAL DEVELOPMENT FOR FOOD AND NUTRITIONAL SECURITY

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Abstract

Sustainable Agriculture is critical for food security throughout the world. At the genetic, species, and farming systems levels, biodiversity provides valuable ecosystems services and functions for agricultural production. There is an urgent need to adopt sustainable agriculture, beyond a focus on genetic resource conservation alone, to implement other biodiversity enhancing methods in farms, such as integrated ecological pest and soil management. Conflicting agricultural politics that promote monocultural industrial farming models and uniform technology packages need to be eliminated. In addition, the protection of intellectual property rights is vital for those who have knowledge of the values and uses of such biodiversity, particularly for indigenous peoples and small farmers. The approaches reviewed in this analysis show effective ways to conserve, use and enhance biodiversity that will encourage sustainable food security. Successful food security and poverty-oriented programmes not only assist poor rural populations to produce more and diversified products but to produce a surplus that can be marketed and thereby generate income for the purposes of improving quality of life through improved diet and nutrition, investment in productive activity, and as collateral for credit to purchase inputs and/or other supplies to enhance agricultural or non-agricultural enterprise. With the above view an attempt is made with this paper to discuss about agricultural biodiversity and Sustainable agriculture.



AN ECONOMIC ANALYSIS OF PAPAYA PRODUCTION AND MARKETING IN BILASPUR DISTRICT OF CHHATTISGARH

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Abstract

Papaya (*Carica papaya*) is third most important fruit crops in India and Chhattisgarh state has six in portion of production in country. Papaya (*Carica papaya*) is the third most important fruit crop in India next to mango & banana. It has a high nutritive and medicinal value. The ripened fruits are a rich source of carbohydrates, minerals (Ca, P and Fe), Vitamin (carotene, thiamine, riboflavin, etc.) The ripe fresh papaya fruit is tasty and used as table fruit. It has a neutral taste that can be considerably improved by addition of flavours, rich fruits to make prepared to serve beverage (RTS), Tutty fruity, pickle, squash, jams and various preserves. Universal papaya production in 2010 was approximate at 11.22 million tonnes, rising at an annual rate of 4.35 percent between 2002 and 2010 (global production in 2010 was 7.26% higher than 2009, and 34.82% higher than 2002). India is the largest producer of papaya globally and covered 1.33 lakh hectares area and its production was 56.393 lakh tonnes (FAOSTAT.2014) its share 44.4 % and 1st rank of production 2013-14. Papaya was cultivated in an area of 12410 hectares and production was 275788 tonnes in Chhattisgarh and forming 12% of the total fruit production in the state. It has sixth in rank with 4.9% shared in India during 2014-15. The study was confined to Bilha block of Bilaspur district. Papaya growers were scattered and they were few in numbers in the villages. So, the snowball sampling technique was adopted for selection of villages and papaya growers. There were 60 papaya growers undertaken from 22 villages. The primary data was collected from the papaya producers with the help of well prepared schedule and questionnaire for year of 2015-16. The costs and returns of papaya cultivation was estimated through standard cost concepts given by the CACP. The cost of cultivation of papaya worked out and noticed to be Rs 136876.26/ha. and it ranges from small farms Rs. 124492.30 /ha. to Rs. 139403.41 /ha. at large farms. The most costly input for cultivation of papaya was planting material which was found to be Rs 29744.72 per ha (21.73). Manure and Fertilizer was the next input in papaya cultivation which accounted 17.69 per cent cost followed by plant protection chemicals 9.76 per cent cost. cost concept at sample households also be computed Overall cost A₁, was estimated to be Rs 101323.51 per ha. Cost C₃ was noted noticed to be Rs. 150563.88 which include 10 per cent of Cost C₂ as accounted of managerial function perform by farmers and same was noted to be increase of 48.60 over cost A₁. The average yield from the sample farms was 758.58 q/ha, average price was 509.07 and cost of production 252.42 per quintal. The overall input-out ratio in papaya cultivation was 1:2.82. Overall disposal of papaya in market was 99.72 per cent per farm.

EFFECT OF DIFFERENT SOWING DATE AND NITROGEN LEVEL ON GROWTH, YIELD AND QUALITY OF BUCKWHEAT (*FAGOPYRUM ESCULENTUM*)

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Abstract

Buckwheat (*Fagopyrum esculentum*) is an old traditional underutilized crop plant belonging to the family Polygonaceae that been used as staple food for local communities in India, Nepal, Bhutan and China predominantly in the hilly and temperate area of Europe and East Asia. Buckwheat is an important food source due to its nutritional properties. Buckwheat is a modern health food because it is rich in essential nutrients protein and mineral. In addition, it is a rich source of antioxidants such as vitamins B₁, B₂, and E, and phenolic compounds such as rutin, quercetin, and proanthocyanidins (condensed tannins). Sowing date as a fundamental element for production is of considerable importance due to its significant effects on plant genotype for exploiting its maximum production potential. Determination of sowing date aims to find the appropriate planting time of cultivar or a group of similar ones so that the existing set of environmental factors can be suitable for the plant germination, establishment and survival. Nutrients are important and crucial elements, which are required for the plant for its growth and development. The translocation of photosynthates from source to sink is very important for the development of economic part. One of plant's basic elements is nitrogen. The average yield of buckwheat is quite low as compared to the potential yield level of other crops. Inappropriate use of nitrogen fertilizers is one of the reasons for such a low yield. Buckwheat response to nitrogen depends on primary nitrogen content of the soil, climatic conditions and nitrogen additives as well as its addition time.



DEVELOPMENT AND TESTING OF SOLAR OPERATED PADDY WINNOWER

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Abstract

Paddy is the principal crop and central plains of Chhattisgarh are known as rice. A large number of farmers thresh paddy crop manually or by trampling it under feet of animals. The production of rice in Chhattisgarh is 6608.83 thousand tonnes. Now-a-day's number of progressive farmers are using pedal-operated or hold on type threshers which do not have a cleaning facility. For cleaning traditional methods such as the natural draft of air and small fans are used. The output was obtaining 40-45 kg/hr from this method, which was a very low and time-consuming process. In power operated the energy consumption is high. So based on this research we have developed a solar operated paddy winnower. This machine is used in those areas where electricity is not available or the cost of electricity is too high. The size of the machine is 70 cm in length, 65 cm in width and 137.5 cm in height (including hopper). The performance of the winnower was evaluated in the field. The average cleaning efficiency of the winnower was found to be 94-96%. The capacity of the machine 320-367 kg/hr. The cost of developed solar operated paddy winnower is Rs.6280/- and the operating cost of the machine is evaluated 53.071 Rs/hr.

IMPACT OF FRONTLINE DEMONSTRATION ON YIELD OF PULSES IN PATNA DISTRICT

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Abstract

Frontline Demonstration (FLDs) is a unique approach to provide a direct interface between researcher and farmers as the scientists are directly involved in planning, execution and monitoring of demonstrations for the technologies developed by them and get direct feedback from the farmers' fields about the crop. Thus, FLDs provide an opportunity to researchers and Extension personnel for understanding the farmer's resources and requirement to fine tune the technologies for easy adaptability at farmers' fields. Pulses in India have long been considered as the poor man's source of protein. Pulses are one of the important segments of State Agriculture after cereals and oilseeds. Bihar is one of the leading pulse growing states in India contributing about 6.50 per cent to the country's pulses production. Tal area of the district is very famous for pulse growing and it is known as Bowl of Pulses. Krishi Vigyan Kendra since its establishment in the district conducting FLDs especially on Pulses. Keeping this in mind, the present study has been taken to analyze the impact of the FLDs on productivity of pulses. FLDs conducted on Pulses by KVK during 2013-14 to 2017-18 have been taken into consideration. Results of the study revealed that total 161 demonstrations carried out in 66 hectare on pulses during the above period. Minimum yield of demonstrated pulses was found 14.34 Q/ha while maximum yield 17.22Q/ha and average yield was 15.96 and it was 18.73 % increase in productivity over control plot.

SOIL HEALTH MANAGEMENT AND PRACTICES: KEY FACTOR FOR CROP PRODUCTIVITY

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Abstract

Soil health plays a key role in reducing production costs and risks. Healthy soil enhances crop resilience to drought, pests and other stresses; and thereby minimizes losses during "bad" years. Therefore, a healthy soil that is well managed can increase soil water infiltration and storage and supply of nutrients to plants, microbial diversity, and soil carbon storage. The main component of soil health management includes addition of organic matter. This soil organic matter is only a small fraction of the topsoil horizon (ranging from 1-5% or greater by dry weight depending on the soil type and other formation factors) even though, it acts as a central soil property that is heavily affected by management practices, which in turn influences soil



physical, biological and chemical functions. The key services for production agriculture are: nutrient provision and cycling, pest and pathogen protection, production of growth factors, water availability and formation of stable aggregates to reduce the risk of soil erosion. However, these functions are sequentially influenced by each other starting with organic matter as the building block for the well linked functions. Higher soil organic matter, biological activity, moisture infiltration and storage in the organic systems resulted in greater yield stability. Indicators of soil health include presence of adequate levels of macro and micronutrients available to plants and soil microbes. This reflects the ability of the soil to mineralize nutrients and a moderate pH (~6.0–7.0) that allows the nutrients to be both held in the soil and available to plants as needed. Good “tilth.” This includes a good structure that resists degradation (e.g., erosion and compaction), provides adequate aeration and rapid water infiltration and accepts, holds, and releases water to plants and groundwater. Low salinity levels and low levels of potentially toxic elements (e.g., boron, manganese, aluminum and heavy metals). High resilience and is able to withstand deleterious events, such as drought and flooding. Promotes good root growth and maintains good biotic habitat that sustains high and diverse populations of beneficial organisms and low populations of pests and pathogens. Soil health management includes the management of physical, chemical and biological properties of the soil. Physical, chemical and biological properties of soil are improved by Organic matter inputs *i.e.*, compost, cover crops, mulching, properly timed irrigation to avoid leaching of nutrients and tillage, soil test based fertilizer application and proper soil amending, supplemental fertilizing when necessary; avoid leaving soils barren. Minimize disease/pest susceptibility by designing appropriate crop rotations and fallow periods, polycultures/non-monoculture production, appropriate preventive and active biocontrol practices. The soil health management practices which are described above concert to improve and maintain the health of agricultural soils, which in turn affects crop performance (yield).

CRISPR/CAS9 GENOME EDITING AS A POWERFUL TOOL FOR CROP IMPROVEMENT

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Abstract

With the advent of next generation sequencing technologies and advances in genome editing approaches, it is now possible to sequence as well as edit genome of any crop with desirable trait. The first generation genome editing tools like zinc finger nucleases (ZFNs) and transcription activator-like effector nucleases (TALENs) were successful in carrying out genome editing but due to their high cost and requirement of protein engineering, these were not much preferred. A recently developed CRISPR/Cas9 (clustered regularly interspaced short palindromic repeats/CRISPR associated protein 9) genome editing approach involves use of same Cas 9 endonuclease with different guide RNA complementary to region of our interest, thus targeting multiple sites in genome. The CRISPR/Cas9 has many applications in crops like resistance against biotic stresses have been developed in Arabidopsis, wheat, cucumber, tomato; resistance against abiotic stresses in maize, tomato, rice, Arabidopsis. Apart from biotic and abiotic stresses, it has been used in improvement of nutrition and other traits in rice, wheat, maize, soybean, cassava.

PHOTOPERIOD IMPOSED DURING EMBRYONIC PERIOD OF THE SILKWORM AND MANIFESTATION OF QUANTITATIVE AND QUALITATIVE TRAITS OF MULTIVOLTINE STRAINS/BREEDS

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Abstract

The present investigation was conducted to understand the influence of longer photoperiod and temperature regimes during the embryonic developmental period of selected multivoltine strains in order to introduce the diapause character under BOD incubator for several generations consequently the expression and manifestation of quantitative and qualitative traits such as hatching percentage, fecundity, larval weight, cocoon weight, pupal weight, shell weight, shell ratio, filament length, filament



weight, denier and renditta etc. were recorded and assessed with statistical analysis and discussed the results obtained. The strains like APM₁, MU₃₀₃ and PM are used in the investigations responded in favour of critical photoperiodic regimes at the early stage of development are sensitive to the external fluctuations and exhibited most readily available resources of energy budget at cellular and sub-cellular levels for differentiation and expression of economic traits of above strains during the experimental observations. It is reflected a strategic improvement in the expression and boosted the quantum of changes compare to the untreated control batches were discussed in the present approach.

EFFECT OF ORGANIC TREATMENTS AND SPACING ON GROWTH AND YIELD PARAMETERS OF KALMEGH (*ANDROGRAPHIS PANICULATA*) VAR. CIM-MEGHA

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Abstract

An experiment was conducted to study “Effect of organic treatments and spacing on growth and herb yield of kalmegh (*Andrographis paniculata*) var. CIM-Megha” was carried out at College of Horticulture, Rajendranagar, Hyderabad during rabi 2017-18. The main objective of the investigation was to find out the effect of organic treatments, spacing, and their interaction on growth and herb yield of kalmegh. The experiment was carried out in FRBD with fifteen treatments (four organic treatments M₁- FYM (30 t/ha) + Arka Microbial Consortium (7.5 l/ha) M₂- Vermicompost (6 t/ha) + Arka Microbial Consortium (7.5 l/ha) M₃- Neem cake (7.5 t/ha) + Arka Microbial Consortium (7.5 l/ha) M₄- Sheep manure (10 t/ha) + Arka Microbial Consortium (7.5 l/ha) and M₅ - control at three different spacings S₁ - 15 x 15 cm, S₂ - 30 x 30 cm and S₃ - 30 x 45 cm) and replicated thrice. Among different organic treatments, M₁- FYM 30 t/ha + AMC 7.5 l/ha recorded maximum plant height (38.7 cm), LAI (1.75), fresh weight of leaves per plant (43.7 g), dry weight of leaves per plant (22.60 g), fresh herb yield per plot (2.15 kg), dry herb yield per plot (1.07 kg), number of capsules per plant (257.4) and seed yield per plot (4.91 g) at harvest. Among different spacings, the spacing S₁ (15 x 15 cm) recorded maximum plant height (40.77 cm), fresh herb yield per plot (2.41 kg), dry herb yield per plot (1.21 kg), number of capsules per plant (278.85) and seed yield per plot (5.83 g) at harvest. LAI (2.60), fresh weight of leaves per plant (57.81 g), dry weight of leaves per plant (27.60 g), at harvest were recorded maximum at S₃. Interaction between organic treatments and spacing significantly influenced growth and yield parameters. The treatment M₁S₁ - FYM 30 t/ha + AMC (7.5 l/ha) with spacing S₁ (15 x 15 cm) recorded maximum plant height (45.64 cm), fresh herb yield per plot (3.12 kg), dry herb yield per plot (1.56 kg), number of capsules per plant (301.52), seed yield per plot (6.80 g). The treatment M₁S₃ - FYM 30 t/ha + AMC (7.5 l/ha) with spacing S₃ (30 x 45 cm) recorded maximum LAI (1.75), fresh weight of leaves per plant (60.63 g), dry weight of leaves per plant (30.26 g) at harvest. The results clearly indicated that application of FYM (30 t/ha) + AMC (7.5 l/ha) at spacing S₁ (15 x 15 cm) recorded highest herb yield followed by Neem cake (7.5 t/ha) + AMC (7.5 l/ha) with spacing S₁ (15 x 15 cm).

EFFECT OF SALINITY ON GERMINATION AND SEEDLING GROWTH IN MUNGBEAN (*VIGNA RADIATA* L. WILCZEK) GENOTYPES

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Abstract

The present investigation was carried out to evaluate the effect of salinity on germination and seedling growth of mungbean. 10 genotypes of greengram evaluated at three levels of salinity viz. 0.0 %, 0.2 % and 0.4 % NaCl. Salinity induced by supplementing 0.0 g, 2 g and 4 g NaCl, respectively to 1000 ml of double distilled water. Seven seeds of each genotype were sown in plastic trays filled with soil. 500 ml of test solution was applied to each plastic tray on alternate day. The temperature was 32.3⁰C in laboratory room with 53 % relative humidity. The experiment was conducted in two sets. In set-I experiment observations were taken on 11th day of sowing. Similarly in set-II the experimental observations were taken on 17th day of sowing. The observations were recorded on germination percentage, shoot length, root length, seedling length, shoot fresh



weight, root fresh weight, root length/ shoot length ratio and seedling vigour index. The genotypes, salinity levels and genotype and salinity level interaction exhibited significant differences for most of the characters in both set-I and set-II. The mean value of all the characters decreased with increased salinity level. In both the sets pooled analysis of variance indicated significant differences among genotypes. Salinity levels as well as the interactions between genotype x salinity levels also indicating differential response of genotypes to salinity for all the traits. Under salinity genotype RMG-1099 more salt tolerant at seedling stage followed by RMG-1101 and MVM-2.

DEVELOPMENT AND PERFORMANCE EVALUATION OF 2-ROW BULLOCK DRAWN SORGHUM HARVESTER

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Abstract

Manual harvesting of sorghum is labour intensive, in-efficient operation and has unavoidable drudgery. Looking to the need a prototype of two row bullock drawn sorghum harvester was developed in department of FMP, MAU, Parbhani. In present research the field performance test was conducted using two types of cutters as impact type cutter and serrated saw type cutters for Test-I and Test-II respectively. The field tests were conducted over an area of 0.153 ha and 0.147 ha area for Test-I and Test-II revealed that the average horse power required of harvester was 0.97 and 0.98 for Test-I and Test-II and the average draft 125.47 kg and 115.56 kg and average speed of 2.10 km/h and 2.31 km/h for Test-I and Test-II respectively. The theoretical field capacity, effective field capacity and field efficiency obtained for continuous operation of harvester was 1.52 ha/day and 1.66 ha/day, 1.13 ha/day and 1.16 ha/day and 74.44 % and 69.25 % for Test-I and Test-II respectively. The percent ground wheel sleep, cutting efficiency and plant damage observed were 11.24 % and 7.10%, 70.24% & 76.05% and 12.18 % and 7.43% for Test-I and Test-II respectively. The percentage saving in total labour required (man-hr/ha), labour cost (Rs/ha), time (hr/ha) and total cost of operation (Rs/ha) found were 21.30 and 20.67, 639 and 617, 7.10 and 6.89 and 266.25 and 258.37 for Test-I and Test-II respectively over traditional method. In field test serrated saw type cutters gives the good performance than impact type cutters. Thus it can be concluded that developed bullock drawn sorghum harvester is suitable for sorghum harvesting.

STUDIES ON COMBINING ABILITY AND GENE ACTION FOR GROWTH AND QUALITY CHARACTERS IN TOMATO (*SOLANUM LYCOPERSICUM* L.)

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Abstract

Tomato (*Solanum lycopersicum* L.) is an important solanaceous vegetable crop widely grown in India for its fleshy fruits. The present investigation was undertaken to study the combining ability of the parents and crosses for yield and yield contributing traits in tomato using twenty one hybrids involving seven lines and three testers in line x tester mating design. The genotypes were evaluated in Randomized Block Design with three replications at college of horticulture, SKLTSHU, Telangana. The present study revealed that none of the parent was best combiner for all the traits indicating differences in genetic variability for different characters among the parents. Line x Tester effect was found significant for all the characters under the study except for days to first flowering and days to last harvest. Combining ability analysis revealed that magnitude of specific combining ability variance was greater than general combining ability variance suggesting the predominance of non-additive gene action for all the characters studied. The gca effects of the parents revealed that EC 620494, EC 654289 and testers Arka Meghali, Pusa Ruby were found to be promising general combiners for growth and quality traits. Based on significant sca effects three hybrids viz., LA 3667 x Arka Vikas, EC631407 x Pusa Ruby and EC654289 X Pusa Ruby were identified as promising for growth and quality characters.



DIRECTION OF TRADE AND CHANGING PATTERN OF INDIAN COFFEE EXPORTS –AN APPLICATION OF MARKOV CHAIN ANALYSIS

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Abstract

Among the plantation crops, coffee contributes significantly to the nation's economy, as India is the third largest producer and exporter in Asia and it exported 2,82,872 tonnes (Rs. 5721 Crore) in 2018-19. Present study made an effort to investigate the direction of trade, trade competitiveness of Indian Coffee by Application of Markov Chain Analysis with secondary data from 2000-01 to 2018-19., further growth and stability in the export of Indian coffee were studied by Compound growth rate and Cuddy Della instability Index respectively. As per statistics top three importers of Indian coffee are Italy (25.16 per cent), Germany (10.51 per cent) and Belgium (5.97 per cent). By using the estimated transitional probabilities, the export of coffee to various destinations was predicted for next three years (2019, 2020 and 2021).

COMMUNICATION BEHAVIOR OF FARMING COMMUNITY WITH RESPECT TO CHEMICAL FERTILIZER AND PESTICIDES

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Abstract

This study was carried out during the year 2018 in kharkhouna and daurala block, Meerut district of Western Uttar Pradesh. To know the communication behavior of farming community with respect to chemical fertilizer and pesticides. The data was collected through personal interview with the help of pre- structure schedule from the farming community. It was observed that the majority of farming community 93.75 per cent always taking information from television, 90.00 per cent through mobile phone from other persons, 61.25 per cent neighbor, 50.00 per cent from friends, 47.50 per cent from Radio, while majority of farming community 43.75 per cent were taking information some time from newspapers, from progressive farmers 37.50 per cent, radio 36.25 per cent, friends 32.50 and neighbor 31.25 per cent. The majority of 100 per cent farming community never taking information from district agriculture officer, district horticulture officer, district plant protection officer and kisansahayak.

A STUDY ON THE CONSTRAINTS IN THE UTILIZATION OF ECO-FRIENDLY AGRICULTURAL PRACTICES IN ERODE DISTRICT FOR SUSTAINABLE AGRICULTURE

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Abstract

An eco-friendly technology may be defined as the use of knowledge and resources in a systematic way to produce desired output without harming the environment. The term "eco-agriculture" was coined by Charles Walters, economist, author, editor, publisher and founder of Acres magazine in 1970 to unify under one umbrella the concepts of 'ecological' and 'economical' in the belief that unless agriculture was ecological it could not be economical. This belief becomes the motto of the magazine: "To be economical agriculture must be ecological." Eco-agriculture is both a conservation strategy and a rural development strategy. A study was conducted in Erode district to study the constraints in the utilization of eco-friendly agricultural practices in Erode District. The findings show that four-fifth of the respondents (80.00 per cent) had suggested that they need guidance and regulated market for marketing of the produce. Marketing is the most important place for selling their eco-friendly produce with reasonable price. Hence, marketing channel and price are needed by the respondents. In addition to that source regulated markets for the procurement and essential for the farmers to sell their quality produces. Introduction of more eco-friendly farming practices suggested by nearly four-fifth (77.50 per cent) of the respondents. They need a quality of crops and increase the market value of the agricultural produce.



A STUDY ON ADOPTION OF ECO-FRIENDLY TECHNOLOGIES AND CONSTRAINTS

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Abstract

Eco-friendly practices are simple, low cost, pollution free techniques and operations that are socially and economically accepted. There is an urgent need to develop farming techniques which are sustainable from environmental, production and socio economic point of view. The means to guarantee sufficient food production in the next decades and beyond is critical because modern agricultural production throughout the world does not appear to be sustainable in the long term. The agricultural community is thus setting its hopes on sustainable agriculture, which will maintain the cycles of input- output and ecosystem balance. A Study was conducted in Salem district to find out the adoption of eco-friendly technologies and its relationship with the profile of the respondents and the constraints in the adoption of eco-friendly technologies. The study reveals that 47.50 per cent were found to possess medium level of adoption and 32.50 per cent were found to possess low level of adoption. The education reveals appositively significant relationship with adoption. The study also reveals that farming experience showed a positive and highly significant relationship with the adoption of the respondents on eco-friendly technologies. Lack of knowledge to identify the bio-agents was the foremost personal constraints expressed by majority of the farmers.

OCCUPATIONAL HEALTH PROBLEMS OF FARM WOMEN

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Abstract

Women workload constitutes an integral part of total workload in India. According to the last three NSSO surveys, the workforce in the country grew from 42.95 crore in 2004-05 to 44.39 crore persons in 2010-11, out of which 33.89 crore are rural workers and 14.68 crore are urban worker. The total number of women workers in 2010, including rural and urban, as per population Census 2011 is 15.0 crore. In the rural areas, it is 12.2 while in urban areas it is 2.8 (<http://articles.economictimes.indiatimes.com>). At present, India is the largest producer of pesticides in Asia and ranks twelfth in the world for the use of pesticides with an annual production of 92,000 tons. A vast majority of the population in India (55.76%) are engaged in agriculture and are therefore exposed to the pesticides used in agriculture. Seed treatment, transplantation, cleaning, drying, storage and vegetable plucking activities are mostly performed by farm women. Farm women are also employed as pesticide applicators during agriculture operations in different parts of the country as well.

NODULATION CHARACTERISTICS OF URDBEAN RHIZOBIA STRAINS IN RELATION TO THEIR NITROGEN FIXING ABILITY

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Abstract

Twelve different Urdbean rhizobia strains were characterized on the basis of their symbiosis parameters like nodulation rating, nodule number, nodule dry weight and nodule N content in an inoculation trial with Urdbean (black gram, *Vigna mungo*) cv KU-96-3 in acidic soil under rainfed conditions. The experiment was conducted at Farm, KVK, Korba, of Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh laid out in RBD with three replications to find out effective acid tolerant black gram- *Rhizobium* isolate(s). The nodulation of Urdbean, particularly the dry weight of nodules per plant increased significantly due to inoculation with strains RhiU3516, Rhi KU34 and Rhi KU40. Significant increase in nodule no. 19.33-47.33/plant, nodule dry weight 28.54-73.25 mg/plant, nodular N-uptake 0.445-1.663 mg/plant at 40 DAS was achieved due to inoculation with strain Rhi U3516 over control. On the basis of correlation studies, it could be observed that the symbiosis parameters of the strains like nodule dry weight ($r=0.865^*$), N uptake by nodule ($r=0.891^*$) showing significant



positive correlation with efficiency ratio of strains and were reliable measures of N₂ fixing ability of the strains. It was observed that RhiU3516, was most effective low pH tolerant *Rhizobium* isolate of black gram crop followed by Rhi KU34 among all isolates tested in terms of nodulation.

EVALUATION OF NEW GENERATION FUNGICIDES AGAINST PADDY SHEATH BLIGHT UNDER *IN VITRO* CONDITIONS

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Abstract

The efficacy of nine fungicides viz., azoxystrobin, hexaconazole, azoxystrobin + difenconazole, azoxystrobin + tebuconazole, etiram + pyroclostrobulin, metiram, pyroclostrobulin, difenconazole, tebuconazole against *R. solani* was conducted under *invitro* conditions at half the dosage, recommended dosage and double dosage. Among the nine fungicides tested maximum (100%) inhibition was noticed in azoxystrobin + tebuconazole, metiram + pyroclostrobulin, hexaconazole, tebuconazole, metiram and pyroclostrobulin at all the tested dosages, followed by difenconazole (68.4%, 81.4% and 82.5%), azoxystrobin + difenconazole (74.8%, 75.5% and 75.60%) and azoxystrobin (22.6%, 56.6 % and 66.0%) at half the dosage, recommended dosage and double dosages, respectively.

IN VITRO EFFICACY OF DIFFERENT CHEMICALS AGAINST RADIAL GROWTH OF *FUSARIUM OXYSPORUM* F.SP *CUBENSE*, AN INCITANT OF PANAMA WILT OF BANANAS

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Abstract

Global banana production is seriously threatened by the re-emergence of a Fusarium Wilt. The disease, caused by the soil-borne fungi *Fusarium oxysporum* f. sp. *Cubense* (Foc) and also known as “Panama disease”. Keeping in view the severity of Panama wilt, Screening of efficacy of fungicides by poison food technique against causal organism. Out of ten fungicides tested *in vitro*, Carbedazim + Mancozeb (0.2%), Thiophanate methyl (0.15%), Tebuconazole (0.1%), Carbendazim (0.1%) and Propiconazol (0.1%) completely checked (100%) the radial growth of *Fusarium oxysporum* f. sp. *Cubense* (Foc) followed by Carboxin + Thiram (0.2%) which checked 90% radial growth. Azoxystrobin was least effective (65.1% reduction) in reducing radial growth of pathogen.

DEVELOPMENT AND TESTING OF PUMPING SYSTEMS POWERED BY KINETIC ENERGY OF WATER

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Abstract

Two different types of pumping system viz. cup type water wheel pumping system (CTWWPS) and spiral tube water wheel pumping system (STWWPS) have been developed. Flowing water pushes the cup, hence, the wheel is rotated and so the pulley of the pump. The speedup from the wheel to pump pulley is 13 times. Hence, with 100 rpm of the wheel, the pump pulley will generate 1300 rpm. Water enters from the inlet side and because of rotation of the wheel, the water moves spirally inside the tube. The water reaches the centre of housing while the succeeding water pushes the preceding to go ahead; this way the water comes out from the housing, which is delivered toward the outlet. Measurement of flowing water in a canal/nallah



was carried out using Parshall flume. It is an accurate measurement of the free flow of water and determines the discharge and velocity of the water. The kinetic energy of water was used to operate the pumping system. The cup type water wheel pumping system was developed with a plate frame of 1.3 m to 0.84 m (length and height), water wheel 0.66 m diameter, axle 0.50 m and centrifugal pump of 1 hp. The spiral tube water wheel pumping system was developed with a frame 0.71 m, spiral water wheel 0.63 m diameter, housing pipe 0.74 m length, and overall height of the pumping system is 0.98m. Testing of cup type water wheel pumping system was analysed for lifting and carrying water. The result shows that the pumping system is useful in lifting and carrying water with the power of flowing water. CTWWPS gave a discharge 0.178 to 0.378 lps at the suction head of 0.56 m to 0.25 m and delivery head of 1.30 m to 0.70 m under 0.23 m to 0.59 m of head over the flume. While the spiral tube gave a discharge of 0.05 to 0.193 lps at 0.30 to 0.46 m of water depth with a flow velocity of 0.54 ms⁻¹ to 0.41 ms⁻¹. The developed system can be used to pump small portion of flowing water from canal/nallah to the nearby pond/open well using the kinetic energy of flowing water only, provided sufficient operating head and velocity is available at a specific site.

VARIATION IN MINERAL NUTRIENTS CONTENT IN GUAVA ACROSS THE GROWTH STAGES OF FRUIT

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Abstract

Guava (*Psidium guajava* L.) is known as poor man's apple or Apple of Tropics, which belongs to family Myrtaceae. Nutrients like nitrogen, phosphorus and potassium play a vital role for enhancing plant vigour and productivity of guava. Therefore, precise nutrients management is indispensable for various growth stages of fruit crop like guava to harvest optimum yield and quality. Therefore, fruits of eight ruling guava varieties (Allahabad Safeda, L-49, Lalit, Shweta, Arka Kiran, Salithong, Kimchu) in Bihar were collected at three different growth stages of fruit (Marble, stone hardening and at harvest) for estimation of primary (NPK) and (Ca and Mg) secondary nutrients to assess the nutrient profiling of NPK Ca and Mg for developing the better fertilization plan to harvest quality guava fruits. Results showed that the nutrient content particularly N, and K were recorded highest at marble stage, while the highest Ca and Mg accumulation was observed at stone hardening stage. However, the highest P and Mg in fruits were noticed at harvesting stage. This type of variations in mineral nutrient content in fruits can be explained by genotypic variability. Hence, it can be concluded that for the improvement of yields and quality requirement of specific mineral and nutrients is required at different growth stages. Therefore, guava growers are advised to apply adequate quantity of NPK, Ca and Mg fertilizers as per the need and stage of the crop.

PROBIOTICS AS BIOCONTROL AGENT IN MANAGEMENT OF POST HARVEST DISEASES OF MANGO

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Abstract

Use of probiotics for the control of post-harvest diseases of mango has opened an avenue in the management of post-harvest plant pathogens and organic farming. Probiotics are defined as the microorganisms which are beneficial in the human health. These are orally administered or given in food supplements and are present in the gastrointestinal tract of human being. The fruit crops like Mango (*Mangifera indica* L.) is the most important horticultural crops in Maharashtra as well as in India. However, the crop is well acclimatized to tropical and subtropical climatic regions. Post harvest losses caused by micro organisms are reported up to 30 to 35% with reduction in quality and quantity of marketable fruits and accounts million dollars in perishable produce every year. Over the years, the plant protection was achieved by using of synthetic chemicals. However, the use of probiotics for control of post harvest diseases has been taken a momentum in recent years to manage the post harvest plant pathogens. The post harvest pathogens like *Colletotrichum gloeosporoides*, *Alternaria alternata*, *Aspergillus niger*, will be checked by post harvest probiotic sprays. The probiotic sprays includes the use of Commercial probiotics (Prowel, Flora and Vbact) and Probiotic isolates, which were isolated and cultured from curd, fermented dosa material, fermented jowar and



bajra flour. The studies upon the use of probiotics in the management of post-harvest diseases of mango suggest that the post-harvest pathogens particularly *Colletotrichum gloeosporoides*, *Alternaria alternata* will be checked by using probiotics under in-vitro conditions. The results clearly demarked the load of inoculum of these post-harvest pathogens after the probiotic spray has lessen on the fruits. The probiotic spray also increased the TSS brix (0.8-3.2) of the fruits and increased the shelf life of the fruits. The efficacy of probiotics against post-harvest pathogens has indicate that they can be used in management of post harvest diseases and can form an integral part of organic farming system.

STUDY ON THE TEMPERATURE INSIDE A SOLAR DRYER AND COMPARING WITH THE ATMOSPHERIC TEMPERATURE

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Abstract

Drying is a standout amongst the most proficient techniques used to safeguard nourishment items for more periods. A sun-based dryer is an encased unit, to protect the sustenance from damage, feathered creatures, insects, and sudden precipitation. The food is dried utilizing sun based warm vitality in a cleaner and more advantageous way. This project has been carried out at Agricultural engineering college and research institute, Kumulur, Trichy, Tamil Nadu, India. The region is situated at 10° 48' 18" North, 78° 41' 7" East coordinates and time zone IST (GMT+5:30). In this region maximum of highest temperature in an average is 28.8°C (approx.) in the month of March to may during a full sunny day. On the other hand maximum of highest temperature in an average inside the drying chamber that have found is 78.6°C (approx.) in the same period of time, which is more than two times than that of the normal temperature and that give us a positive opportunity for using solar dryer for drying low moisture content food products like mango, chilies, tomato, pepper, lean meat, turmeric etc. with no cost. This helps in the value addition of the products which results ultimate benefits to the farmers and also reduces food spoilage. The objective of the using solar dryer is mainly for the welfare of the marginalized and poor farmers those who can't afford hi-tech facilities and equipment's to preserve their agricultural products and to eliminate the unwanted and unpredictable food spoilage due to lack of facilities in that particular region. The main principle of solar dryer is based on greenhouse effect where the solar heat is trapped inside the drying chamber and thus increases the temperature level. It is fully based on a natural phenomenon. No mechanical and the electrical energy are applied. The graphs are drawn between the Solar dryer temperature (SDT°C) and atmospheric temperature (AtmT°C) which was recorded during sunshine hours of three days.

STUDIES ON GENETIC VARIABILITY AND CHARACTER ASSOCIATION IN INDIAN MUSTARD (*BRASSICA JUNCEA* L. CZERN AND CROSS)

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Abstract

The present study research was carried out to determine selection criteria for yield improvement in selected genotypes of Indian mustard (*Brassica juncea* L. Czen and coss.). The forty genotype including 3 checks were sown at Genetics & Plant Breeding Research farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during Rabi 2017-2018 to evaluate the mean and component of variability, correlation, path analysis and genetic divergence for yield and its various yield components. Analysis of variance showed genotypes differ significantly among themselves for all the yield contributing traits, indicating the presence of adequate variability. The highest estimate of PCV and GCV was observed for harvest index 1000- seed weight, where as the highest estimates of heritability coupled with higher genetic advance was observed for harvest index and 1000 seed wt. The correlation coefficient of the seed yield per plant (g) had significant and positive correlation with harvest index at genotypic level. Path coefficient analysis revealed that, the plant highest positive direct effect on seed yield (g) was exhibited by harvest index, days to maturity and biological yield (g) at genotypic and phenotypic level.



ROLE OF MULCHES IN SOIL MOISTURE CONSERVATION

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Abstract

Mulching is a method of covering the soil with a layer of material. It prevents the soil loss by avoiding runoff losses, conserves the soil moisture by reducing evaporation losses, minimizes weed infestation, improves physical, chemical and biological condition of the soil, adds nutrients to the soil, reduces nutrient loss and also enhances the growth and yields of the crops. Mulches can either be organic such as grass clippings, straw, bark chips, and similar materials inorganic such as stones, brick chips, and plastic. Both organic and inorganic mulches have numerous benefits. Organic mulches add nutrients to the soil and there by improves the soil condition. Mulches spread over soil, slow down rainwater run-off, and increase the amount of water that soaks into the soil. And more water in the soil means more water for the crops. Keeps the soil cooler and helps prevent evaporation. This is especially important in hot, dry climates where as inorganic mulches reflect solar radiation and can create a very hot soil environment during summer. Inorganic mulches reduces the soil and water loss, control the weeds. Nowadays plastic mulch is playing very major role in soil moisture conservation. When compared to other mulches plastic mulches are completely impermeable to water; therefore it prevents direct evaporation of moisture from the soil and thus limits the water losses and soil erosion over the surface. Water erosion is completely averted since soil is completely covered from bearing action of rain drops. When compared to organic mulches, it serves for a longer period. The soil underneath the plastic mulch stays loose and well aerated. This increases the amount of oxygen in the soil and aids in microbial activity.

IMPORTANCE OF FERTIGATION AND ADVANTAGES

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Abstract

Fertigation is a modern agro-technique which, provides an excellent opportunity to enhanced yield and minimize environmental pollution by minimizing fertilizer application, increasing fertilizer use efficiency and increasing net returns on the fertilizer invested. Application of water soluble fertilizers with irrigation water to the active root zone is known as fertigation. The application of chemical fertilisers along with irrigation water through micro-irrigation technology has advantages mainly to meet nutritional need as per requirement of crops. Irrigation system is used as the carrier and distributor of the nutrients to the crop. Fertigation has opened a new window for efficient use of water and nutrient supplies in crops and provides a viable option for sustainable crop production and quality produce. Fertigation system is useful in achieving higher input use efficiency, crop yield as well as net returns to the farmer. Advantages are : Improved soil structure due to reduce traffic movement on the surface soil; Effective use in undulating soil: Undulating soil can be used under cultivation using micro irrigation system; Higher resource conservation: Fertigation helps in saving of water, nutrients, energy, labour and time; Helps in effective weed management: Use of plastic mulch along with fertigation through drip system allows effective weed control in widely spaced crops; Eliminates manual application: Manual application requires labour and time and is less efficient compared to the advanced fertigation methods; Higher water and nutrient use efficiency: when compared to that under conventional application of fertilizers to the soil. The availability of nutrients is very high therefore the efficiency is more. By this method, fertilizer use efficiency is increased from 80 to 90 per cent.

NANO FERTILIZERS IN AGRICULTURE

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Abstract

Nanotechnology can work by reducing the size of the smallest structures to the nano scale. Development of slow/controlled release fertilizers, conditional release of pesticides and herbicides, on the basis of nanotechnology has become critically



important for promoting the development of environment friendly and sustainable agriculture. It also provides solutions for various challenges like climate change, sustainable use of natural resources, runoff, accumulation of pesticides and fertilizers which are the hot issues for today's agriculture. New nutrient delivery systems that exploit the porous nanoscale parts of plants could reduce fertilizer loss. Nanotechnology has provided the feasibility of exploiting nanostructured materials as fertilizer carriers or controlled-release vectors for building of so-called "smart fertilizer" as new facilities to enhance nutrient use efficiency and reduce costs of environmental protection. In addition, nanofertilizers will combine nanodevices in order to synchronize the release of fertilizer-N and -P with their uptake by crops, so preventing undesirable nutrient losses to soil, water and air via direct internalization by crops and avoiding the interaction of nutrients with soil, microorganisms, water and air. Fertilizers encapsulated in nanoparticles will increase the uptake of nutrients. In the next generation of nanofertilizers, the release of the fertilizer can be triggered by an environmental condition or simply be time released. Slow release fertilizers have the potential to increase the efficiency of nutrient uptake. Nanofertilizers that utilize natural materials for coating and cementing granules of soluble fertilizer have the advantage of being less expensive to produce than those fertilizers that rely upon manufactured coating materials. Slow/controlled release of fertilizers may also improve soil by decreasing toxic effects associated with over application of fertilizer and observed significant increase in the seedling growth, seed vigour and plant growth.

MAJOR STRATEGIES FOR IMPROVING SOIL HEALTH

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Abstract

Soil degradation, characterized by decline in quality and decrease in ecosystem goods and services, is a major constraint to achieving the required increase in agricultural production. Soil is a non-renewable resource on human time scales with its vulnerability to degradation depending on complex interactions between processes, factors and causes occurring at a range of spatial and temporal scales. Among the major soil degradation processes are accelerated erosion, depletion of the soil organic carbon (SOC) pool and loss in biodiversity, and loss of soil fertility. Soil degradation trends can be reversed by conversion to a restorative land use and adoption of recommended management practices. The goal should be to adopt a holistic and integrated approach to soil resource management. The strategies for improving soil's health are (i) Practice No-Tillage/Strip-Tillage: Reducing tillage to either no-till or strip-till minimizes disruptions to soil aggregates by not breaking them up continuously and forcing the system. (ii) Cover crop roots improve soil aggregation and reduce erosion. Cover crop residue also reduces the impact of raindrops on the soil surface and serves as a habitat and food source for soil microbes. As organisms decompose the residue, nutrients are released back into the soil. (iii) Organic matter, a key soil health component, can increase over a longer period as residue is added back into the system.

ROLE OF NANO FERTILIZERS IN IMPROVING NUTRIENT USE EFFICIENCY

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Abstract

Plants require essential nutrients for normal functioning and growth. Fertilizers have played a pivotal role in enhancing the food grain production in India especially after the introduction of high yielding and fertilizer responsive crop varieties during the green revolution era. These Fertilizers play a pivotal role in improving the productivity across the spectrum of crops. The nutrient use efficiencies of conventional fertilizers hardly exceed 30–35 %, 18–20 %, and 35–40 % for N, P, and K which remained constant for the past several decades. Nano-fertilizers intended to improve the nutrient use efficiencies by exploiting unique properties of nanoparticles. The nano-fertilizers are synthesized by fortifying nutrients singly or in combinations onto the adsorbents with nano-dimension. Nano-fertilizers are known to release nutrients slowly and steadily for more than 30 days which may assist in improving the nutrient use efficiency without any associated ill-effects plant growth directly. Nano fertilizers increases the Nutrient use efficiency (NUE) by 3 times and it also provides stress tolerating ability. Nano-fertilizer



technology is very innovative. However, some of the reports and patents strongly suggest that there is a vast scope for the formulation of nano-fertilizers. When comparing to chemical fertilizers requirement and cost, nano fertilizers are economically cheaper and are required in lesser amount.

EFFECT OF FEEDING *AZOLLA* MEAL ON GROWTH PERFORMANCE IN OSMANABADI KIDS

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Abstract

The present research work was undertaken on eighteen Osmanabadi kids over a period of 90 days to study the “Effect of feeding *Azolla* meal on growth performance in Osmanabadi kids.” On the basis of growth performance parameters such as body size, weight, 3-4 months of age Osmanabadi kids were selected and subdivided into three groups i.e. (T₀), (control) and (T₁), (T₂) as treatment groups with six kids in each group. (T₀) group were fed with concentrate and roughages. Whereas in (T₁) and (T₂) group 15%, and 20% concentrate was replaced by *Azolla* meal. The feeding trial was carried out for 3 months keeping roughages to concentrate ratio 67:33. The results observed on weekly feed intake, Weekly body weight gain, Average daily weight gain, body measurements, respectively. Average feed intake was 479.285, 592.086, 507.505 (g/day) in (T₀), (T₁) and (T₂), respectively. The average weekly feed intake kid was higher in treatments T₁ (592.086 gm) followed by T₂ and T₀ (507.505 and 479.285 gm, respectively) Average weekly body weight gain were recorded as 11.975±0.506, 14.795±0.496, 12.682±0.602 in the groups of (T₀), (T₁) and (T₂), respectively. Average daily body weight gain of Osmanabadi kids were 66.300±0.263, 65.800±0.404, 79.167±0.167 (gm) in (T₀), (T₁) and (T₂) groups, respectively. The mean ratio indicated that, body weight gain was statistically significant. The gain in body measurement (body height, body length and chest girth) showed the non significant effect, although higher values were recorded with increased level of *Azolla* in concentrate mixture.

EFFECT OF SITE SPECIFIC NUTRIENT MANAGEMENT ON GROWTH PARAMETER AND YIELD OF SOYBEAN [*GLYCINE MAX* (L.)]

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Abstract

A field experiment on nutrient omission plot technique (NOPT) on soybean-cotton cropping system was conducted at farmers' fields in village's in Akola district during rainy season of 2014-15. The experiment had 4 treatments, laid out in Randomized Block Design with fifteen replications in fixed plots. Treatments comprised omission of NPK and optimum plane of nutrition (30:100:80 kg ha⁻¹ N-P-K). Yield was estimated in terms of seed and straw yield. Results showed that P was the most limiting factor nutrient and there was a reduction in the seed yield of soybean to the tune of 18.86, 22.57 and 9.13 % due to N, P and K omissions during the year 2014-15 respectively. Growth parameter recorded highest with balanced nutrients application.

CLIMATE CHANGE, RAINFALL PROBABILITY AND VARIABILITY IN TWO DISTRICTS OF ODISHA

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Abstract

Trend and climate change were studied in annual rainfall data for the period of 50 years (1968- 2018) of Keonjhar and 50 years (1968-2018) of Mayurbhanj districts of Odisha. The analysis of weekly rainfall probability was also carried out at both the locations for field operations and crop planning in rainfed agricultural system for improving the farmer's livelihood. Mean



annual rainfall was 1225.6 mm with 35.4% variability for Keonjhar and 1312.2 mm with 29.7% variability for Mayurbhanj. These regions exhibited significant decreasing trend in the total amount of annual rainfall in the last 13 years (2005 to 2018). Also, both locations showed significant long-term decreasing trend in annual rainfall. Climate of both the regions have changed as in the recent 13 years annual rainfall had decreased by 131.2 and 154.6 mm at Keonjhar and Mayurbhanj from their long period average (LPA), respectively. The Initial and conditional rainfall probability analysis at Keonjhar reinforced that Initial probabilities $\{P(W)\}$ of getting 10 mm rainfall per week was 76% during 26th (25 June-1 July) SMW. Thus, the seed bed preparation could be initiated during this week. Initial as well as conditional probability of wet week followed by wet week $\{P(W/W)\}$ of getting 20 mm rainfall was more than 80% during 28th SMW (9-15 July) in Mayurbhanj district. Therefore, this week is most suitable for sowing operation in this district.

INTERACTIVE EFFECT OF TEMPERATURE AND CO₂ ON RESISTANCE OF RICE TO BROWN PLANTHOPPER, *NILAPARVATA LUGENS* (STAL.)

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Abstract

It is predicted that the current atmospheric CO₂ concentration will be doubled and global mean temperature will increase by 1.5-6°C by the end of this century. Although a number of studies have addressed the separate effects of CO₂ and temperature on plant-insect interactions, few have concerned with their combined impacts. The present investigation was carried out to examine the interactive effect of temperature and CO₂ on resistance of rice to brown planthopper, *Nilaparvata lugens* (Stal.) during 2015-2016 by using the Standard Seedling Screening Techniques (SSST) developed by the International Rice Research Institute (IRRI) at Rice Research Centre, ARI, Rajendranagar and Agro Climatic Research Centre, ARI, Rajendranagar. The results revealed that, the interactive effect of temperature and CO₂ did not alter resistance reaction of tested rice cultures except IET 23993 which showed a decreased trend in the resistance.

SCREENING OF SELECTED RICE GENOTYPES FOR THEIR RESISTANCE AGAINST BROWN PLANTHOPPER, *NILAPARVATA LUGENS* (STAL)

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Abstract

The development of biotypes and existence of variability in Brown planthopper population always demands for the identification of new sources of resistance from time to time. However, the presence of desirable quality and yield traits in the genotypes along with source of resistance to BPH will be an added advantage. Screening was carried out with 39 such promising rice genotypes and three checks following standard seed box technique. The test revealed 17 genotypes to be moderately resistant with damage score ranging between 3.6-5.0. Among 17 genotypes, KNM 2305 and RNR 21571 recorded lowest damage score of 3.6. Further investigations on presence of other mechanisms of resistance such as antixenosis, antibiosis and tolerance needs to be studied to identify the best genotype among the 17 genotypes that could be used for developing BPH resistant / tolerant variety with desirable yield and quality traits.

ECONOMIC AND ENVIRONMENTAL SUSTAINABILITY THROUGH CROP RESIDUES RECYCLING IN INDIA

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Abstract

India is one of the main food grain, oilseed, sugarcane and other agricultural products manufacturers. Agricultural crops produce substantial residue quantities, with rises in crop residues from food production also rising. These residues show not only the loss of resources, but also a missed chance to enhance the revenue of a farmer. Researchers around the globe are



exploring the use of crop residues in different fields in areas such as non-woven textile composite procedures, power generation, manufacturing of biogas, animal feed, compost and manures, etc. Increasing trend in relation to bio-energy cogeneration crops, growing demand for animal feedstock and growing trend in organic farming indicate a competitive chance for agricultural crop residue. It should be observed that the use of this residue remaining is often not mutually exclusive, making it more hard to measure its economic value. For instance, straw can be used as a bedding for animals and then as a fertilizer for crops. In perspective of this, the primary purpose of this document was to understand how much crop residue remains unused and how best to use it for alternative environmental stewardship and sustainability purposes. New and Renewable Energy Ministry (MNRE, 2009), Govt. An approximately 500 Mt of crop residues are produced annually by India. A vast bulk of the land is used for farming, cultivating a broad variety of plants in its various agro-ecological areas. With a production of 93.9 million tons (Mt) of wheat, 104.6 metric tons of rice, 21.6 metric tons of maize, 20.7 metric tons of millets, 357.7 metric tons of sugarcane, 8.1 metric tons of fiber crops (jute, mesta, cotton), 17.2 metric tons of pulses and 30.0 metric tons of oilseed crops, it is only natural that a huge volume of crop residues be produced both on-farm and off-farm. It is estimated that the country produces about 500-550 Mt of crop residue annually.

EXAMINE THE RECENT TREND AND EVOLUTION OF AGRICULTURAL MECHANIZATION DEVELOPMENT IN MUNGELI BLOCK OF CHHATTISGARH

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Abstract

Mechanization is a key factor for agricultural development and farmers' well being. India produces wide range of agricultural equipment needed to practice modern intensive farming. India has made remarkable progress in the development of Agricultural Mechanization technology. The country evolved a selective mechanization model using a power-mix based on animate and inanimate power sources. Technology and other innovative improvements, in Particular agricultural mechanization, will have to play an important role in working towards creating a food secure world. In India there are 29 states which are direct or indirect depends upon agriculture. Mechanization in agriculture has enhanced production and productivity of agricultural commodities through timeliness of operation, better management of inputs and improved quality of work and reduction of post-harvest losses. Farmers, whether in the developed or developing economies, mechanize farm operations when the biological sources of energy, e.g., human and animal labor become more costly than the mechanical sources. For collecting information on mechanization, the field survey was conducted in the villages of Mungeli block. For this purpose 8 villages' are selected randomly from Mungeli block. For the survey, the Panchayat Pradhan and farmers were contacted and information about the implements which are being adopted for farming has been collected. Mungeli district has three blocks namely Mungeliblock, Lormi block and Pathariya block. The data was collected from field survey of 30 farmers consisting of small, medium and large farmer by interviewing individually of 8 village. Some implements are so costly but some farmers those who are the upper level farmer has also purchased that implement. Overall it was noted that all implements are available in the study area for farming and it is found that the farmers are aware about the all implements/ modern technology.

EFFICACY OF BIOPESTICIDES AGAINST CUCURBIT FRUIT FLY (*BACTROCERA CUCURBITAE* COQ.) IN BITTER GOURD

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Abstract

Field experiment was conducted during summer, 2018 to evaluate four biopesticides viz. Neem oil @ 2 ml, Neem oil @ 3 ml, Karanj oil @ 4 ml, Nimbecidine @ 2 ml alongwith a standard insecticide Alphamethrin @ 1.5 ml per litre of water against *Bactroceracucurbitae* in bitter gourd variety 'ArkaHarit'. A total of three foliar sprays were given at 10 days interval commenced at the time of fruit setting. The result revealed that all the biopesticides and standard Alphamethrin were significantly reduced fruit infestation over untreated check. All the biopesticides under study were comparable to Alphamethrin in reducing fruit infestation. Among the biopesticides Nimbecidine was found most effective and followed by Neem oil and Karanj oil. These two oil were effective only up to five to six days. Maximum fruit yield (19.6q/ha) and net return



rupees per rupee invested due to use of insecticide was maximum with Nimbecidine (19.03:1) followed by Alphamethrin, Karanj oil and Neem oil.

GROWTH AND PRODUCTIVITY OF GARLIC (*ALLIUM SATIVUM*) AS INFLUENCED BY ORGANIC AND INORGANIC SOURCES IN CHITRAKOOT REGION

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Abstract

The experiment was carried out to find out the effect of different organic and inorganic sources on growth and productivity of garlic. The treatment combinations involving four levels of organic manure i.e. 0 (control), 15 t FYM ha⁻¹, 5 t vermicompost ha⁻¹ and 5 t goat manure ha⁻¹ and inorganic fertilizers in four levels i.e. 0 (control), 100% RDF (100:60:60:45 kg NPKS/ha), 75% RDF (75:45:45:33.75 kg NPKS/ha) and 50% RDF (50:30:30:22.5 kg NPKS/ha) were given in G-50 variety. Maximum Plant height (cm), Number of leaves per plant, Leaf area per plant (cm²), Neck thickness (mm), Number of cloves per bulb, Weight of 20 cloves (g), Days taken to maturity, Polar diameter of bulb (mm), Equatorial diameter of bulb (mm), Fresh weight of bulb (g), Dry weight of bulb (g), Bulb yield (q/ha), Economics (B: C ratio), TSS content of bulb (%), Chlorophyll content in leaves (Spad value) and Volatile oil content in bulb (%) were observed by application of 15 t FYM ha⁻¹ and 100% RDF (100:60:60:45 kg NPKS/ha) at all the growth stages.

ION TRANSPORT STUDIES OF IRON TUNGSTATE MODEL MEMBRANE

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Abstract

The ion transport across parchment-supported Iron tungstate model membrane has been investigated. The parchment supported Iron tungstate membrane was prepared by the method of interaction using different electrolytes (LiCl, NaCl and KCl) have been measured. To characterize the structural and thermal properties of membrane there are different techniques like FTIR, XRD, TGA/DTA, TEM and SEM have been used. The electrochemical observation was done by potentiometer, which shows that the membrane is cation selective. To determine the charge density of membrane Teorell-Meyer-Sievers method is used. The other important parameters like transport number, mobility ratio, charge effectiveness are also calculated by observed potential values.

RESPONSE OF SOME METAL OXIDE NANOPARTICLES ON BIOCHEMICAL PARAMETERS IN BLACK GRAM (*VIGNA MUNGO* L.)

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Abstract

Black gram (*Vigna mungo* L.) is originated in India. It is grown primarily for its protein rich seeds and contains 20-25% protein. nanoparticles (NPs) have unique physiochemical properties, i.e., high surface area, high reactivity, tunable pore size, and particle morphology. Nanoparticles can serve as “magic bullets” containing herbicides, nano-pesticide fertilizers, or genes, which target specific cellular organelles in plant to release their content. Therefore, the present study highlights the key role of nanoparticles in plants. The appropriate elucidation of physiological, biochemical and molecular mechanism of nanoparticles in plant leads to better plant growth and development. The investigation was done the department of Plant Physiology, SHIATS, Allahabad in pot condition in Zayd under CRD Factorial design in the year 2015-16 with two varieties i.e., Koyal and azad Urd-1 and three chemicals i.e., Iron oxide, Copper oxide, Zinc Oxide with six levels of concentration of each chemical i.e., T₁ (control), T₂ (100 ppm), T₃ (200 ppm), T₄ (300 ppm), T₅ (400 ppm), T₆ (500 ppm) respectively. The



effect of nanoparticles are observed by analyzing its quality parameters as well as the biochemical parameters of Black gram. In quality parameters like Leaf monodidehyde (MDA) and Leaf hemoglobin T₅ (400 ppm) of all three chemicals are shown the significant result in both varieties *i.e.*, Koyal and Azad urd-1. In the biochemical parameters like Ascorbate peroxidase (APX) T₆ (500 ppm) concentration of Iron oxide and Copper oxide are found superior and T₅ (400 ppm) concentration of Zinc Oxide is found significant in both of the varieties. The Peroxidase and Hydrogen peroxidase are found significantly higher in T₅ (400 ppm) in all of the three chemicals in both the varieties whereas the Total antioxidant estimation is higher in treatment T₆ (500 ppm) of Iron oxide, Copper oxide and Zinc oxide in both the varieties.

EFFECT OF CLIMATE CHANGE IN AGRICULTURE PRODUCTION AND PRODUCTIVITY

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Abstract

Climate change can disrupt food availability, reduce access to food, and affect food quality. For example, projected increases in temperatures, changes in precipitation patterns, changes in extreme weather events, and reductions in water availability may all result in reduced agricultural productivity. Climate change is likely to contribute substantially to food insecurity in the future, by increasing food prices, and reducing food production. Food may become more expensive as climate change mitigation efforts increase energy prices. Water required for food production may become more scarce due to increased crop water use and drought. Competition for land may increase as certain areas become climatically unsuitable for production. In addition, extreme weather events, associated with climate change may cause sudden reductions in agricultural productivity, leading to rapid price increases. For example, heat waves in the summer of 2010 led to yield losses in key production areas including: Russia, Ukraine and Kazakhstan, and contributed to a dramatic increase in the price of staple foods. These rising prices forced growing numbers of local people into poverty, providing a sobering demonstration of how the influence of climate change can result in food insecurity.

MUSHROOM PRODUCTION : A CASE OF NUTRITIONAL AND LIVELIHOOD SECURITY IN RURAL INDIA

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Abstract

Current era is characterized by greater awareness about quality and, with the demand for the readymade or ready-to-make food products. Value can be added to the mushrooms at the various levels and to varied extent, right from grading to the readymade snacks or the main-course item. Real value-added product in the Indian market is the mushroom soup powder. Technologies for production of some other products like mushroom based biscuits, nuggets, preserve, noodles, papas, candies and readymade mushroom curry in retort pouches have been developed but are yet to be popularized. Mushroom soup - Soups are commonly used as appetizers. Experiments were conducted to prepare good quality ready-to-make mushroom soup powder using quality mushroom powder produced from the button mushroom and oyster mushroom dried in the dehumidifying air cabinet-drier. Mushroom biscuit-very delicious and crunchy mushroom biscuits were prepared at NRCM, Sloan using mushroom powder (both button and oyster) and ingredients viz., maida, sugar, oil, baking powder, ammonium bicarbonate, salt, vanilla, milk powder and glucose. Ammonium carbonate is an aerating agent and it has the advantage that it leaves no residue. Mushroom ketchup- is highly viscous in nature. They also contain more of sugar and less of acid. Ararat (0.2 per cent), acetic acid (1.5 per cent) and other ingredients are mixed in the paste and cooked to bring its TSS to 350 Brix. Then the ketchup is filled in the sterilized bottles or jars. Mushroom chips - The freshly harvested Mushroom are washed, sliced (2 mm) and blanched in 2 per cent brine solution. The mushrooms are dipped overnight in a solution of 0.1 % of citric acid + 1.5 % of NaCl + 0.3 % of red chilli powder. After draining off the solution, the mushrooms are subjected to drying in cabinet dryer at 600 C for 8 h. and sealed after proper labelling



EFFECT OF ORGANIC AND INORGANIC AMENDMENTS ON PHOSPHORUS UPTAKE IN RICE UNDER RED AND LATERITE ZONE OF WEST BENGAL

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Abstract

An experiment was conducted during 2015 Rabi season in a green house, at College of Agriculture, BCKV, Mohanpur, West Bengal to evaluate the influence of organic and inorganic amendments on phosphorus uptake in rice (cv. Shatabdi) in an Alfisol soil. Six different treatments with and without phosphate solubilizing bacteria (PSB) were tried in completely randomized design with 3 replications. Among the treatments, application of Silicon through calcium silicate with Organic manure through FYM (T₅) resulted in higher uptake of P in rice grain as well as rice straw significantly. Inoculation of PSB on rice crop showed a significantly increase the P content in grain and straw than uninoculated ones. Interaction between treatment and PSB showed a positive and significant effect on phosphorus content and uptake of rice. Available P in soil had positive and significant correlation between grain yield and total uptake of P in rice. Multiple regression analysis has positive relation between available phosphorus in soil and growth parameters.

INFLUENCE OF VERMICOMPOST ON PHYSICO-CHEMICAL PROPERTIES OF SOIL IN WHEAT FIELD OF WESTERN UTTAR PRADESH

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Abstract

A field experiment was conducted at SVBPUAT, Meerut during 2005-06 and 2006-07 to evaluate the effect of Vermicompost on physico-chemical properties of soil in wheat field. The Experiment was arranged in randomized block design (RBD) with three replications. There were 10 treatments. The result showed that the application of Vermicompost 3 tonnes ha⁻¹ and 100% NPK of RDF (T₁₀) significantly increase the organic carbon (OC), available nitrogen, phosphorus, and potassium compared with control plot (T₁). The soils treated with Vermicompost had significantly less EC in comparison to control plots. The addition of Vermicompost in soil resulted in decrease of soil pH. The physical properties such as bulk density in soil amended with Vermicompost were improved. The results of this experiment revealed that addition of Vermicompost had significant (P<0.05) and positive effects on the soil chemical, physical properties and yield of wheat crop.

TEACHING AND LEARNING WITH INFORMATION TECHNOLOGY

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Abstract

Teaching and Learning with Technology, also referred to as TLT involves use of core technologies that drive our teaching in classrooms, laboratories and other learning environments to meet the needs of the ever-changing and growing field of information technology at a prolific rate. Today, the use of chalk and duster in our seminar and conference rooms are completely extinct on many campuses and are replaced by interactive boards backed by computers and projectors, downloadable videos and audios, pre-recorded lectures, pre-loaded content on controlled tablet devices etc. In case of absence from the classroom learning situation on medical or any other unavoidable circumstantial situation the students can be benefited with e-learning from their own home, library or anywhere else with the help of their mobile, laptop, tablet etc in a place with internet connectivity. E-learning takes place both inside and outside of the classrooms. E-learning is a subset of educational technology that offers an online teaching and learning experience with the help of internet technology. Today, e-learning tools and technologies span across simple home based learning programs, pre-recorded audio and video study tools,



recorded video lectures, live streaming of classroom teachings, classroom aids and multimedia based learning, mobile learning, MOOC'S personalized online tutoring, e-learning authoring tools and e-published books, online homework help services, online writing assistance, editing services and even online training and certification programs. Hence, today, the knowledge society is the society that knows how to use information for growth and development.

DIVERSITY OF SWEAT BEES (HALICTIDAE) IN AN AGRO-ECOSYSTEM

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Abstract

Halictidae is a cosmopolitan bee family of the order Hymenoptera (superfamily Apoidea) consisting of small (~ 4 mm) to midsize (~ 8 mm) bees which are usually dark-colored and often metallic in appearance and are important pollinators in a habitat. These tiny bees are often the most numerous of all bees yet poorly known. They are commonly referred to as sweat bees. Little attempt is being made to ensure the populations of these wild pollinators in an agro-ecosystem in India. A survey was made with an objective of establishing species composition and abundance of halictid bees using 'sweep-nets' and 'bee pan traps' in an agro-ecosystem at College of Sericulture and Agriculture (UASB), Kurbur Farm, Chintamani. Seven genera of Halictidae were collected. Amongst them, genus *Lasioglossum* (with 6 species) was more speciose, followed by *Halictus* (4 species) and genera, *Hoplonomia*, *Pseudaspis*, *Steganomus*, *Lipotriches* and *Nomioides* were represented by only single species. With respect to the individuals, however, the genus *Halictus* contributed to 57.00 per cent of the total catches followed by the *Lasioglossum* (34.00 per cent). More detailed studies need to be taken up to effectively document and conserve these bees.

BIOLOGY OF ECTO-LARVAL PARASITOID, *GONIOZUS NEPHANTIDIS* (MUESEBECK) (BETHYLIDAE: HYMENOPTERA) ON FACTITIOUS HOST RICE MOTH, *CORCYRA CEPHALONICA* (STANTON)

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Abstract

Biology of *Goniozus nephantidis* (Muesebeck), one of the dominant and effective parasitoid of coconut black-headed caterpillar, *Opisina arenosella* (Walker), was studied under laboratory conditions on Factitious host Rice Moth, *Corcyra cephalonica* (Stainton) during 2018-2019. Biological parameters like, Host acceptance, Oviposition period, Ovisite preference, Clutch size, Fecundity, Sex ratio, Total life cycle of male and female on Factitious host Rice Moth, *Corcyra cephalonica* (Stainton) were recorded. In this experiment, biology of *Goniozus nephantidis* reared individually (Individual rearing method) was compared with parasitoids reared in groups (group rearing method).

EFFECT OF ORGANIC FARMING IN OKRA, TOMATO AND COW PEA IN SEQUENCE UNDER NORTHERN ZONE OF KARNATAKA

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Abstract

Effect of organic farming in okra, tomato and cow pea in sequence under northern zone of Karnataka. The experiment was conducted for during 2016, 2017 and 2018 for growth and yield traits. in randomized complete block design with 3 replications with twelve treatments, three years data were pooled data were analyzed. The results of pooled data of three years experimentation showed that highest yield of tomato (173.30 q/ha), okra (106.82 q/ha) and Cowpea (53.58 q/ha), was recorded by treatment applications of Recommended NPK and with B:C ratio of 1:4.67, 1:1.62 and 1:1.14 respectively



followed by the next best treatment (T_{10}) application of FYM 20 t/ha +VAM+Pseudomonas+Trichoderma+ which recorded the yield of tomato (154.72 q/ha), okra (101.01 q/ha) and Cowpea (49.12 q/ha) with, B:C ratio of 1:4.55, 1:1.75 and 1:1.07 respectively, Benefit-cost ratio show promising results for sequence cropping of vegetables as against planting them sole, Sequence cropping has been identified as a promising system that results in an effective use of land and other resources, It is recommended to use this pattern to improve farmer's income under northern zone of Karnataka.

GENETIC VARIABILITY ANALYSIS FOR PLANT SELECTION IN LINSEED (*LINUMUSITA-TISSIMUM* L.)

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Abstract

The experiment was conducted in *rabi* 2015-2016 at the centre of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agricultural, Technology and Sciences, Allahabad Uttar Pradesh (U.P). The evaluate fourteen genotypes of linseed in randomized block design with three replications. The objective of this work was to assess the magnitude of genetic variability parameters for different quantitative traits in linseed. The genetic variability analysis for plant selection in linseed for ten characters under study *viz.*, seedling vigour, days to 50 percent flowering, plant height, number of branches, number of capsules per plant, days to maturity, number of seeds per capsules, 1000 seed weight, seed yield per plant and seed yield per plot. The mean sum of squares due to genotypes showed significant differences for all the characters suggesting that the genotypes were genetically variable and considerable amount of variability existed among them. The present investigation can be concluded that best genotype was identified as a desirable genotype with highest seed yield, seeds per capsule and capsules per plant. All PCV values were greater than GCV for all traits. Thus, indicating selection based on these characters would be rewarding for yield improvement in linseed.

EVALUATION OF HERBICIDE COMBINATIONS FOR BROAD SPECTRUM WEED CONTROL IN W-DSR

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Abstract

Rice (*Oryza sativa* L.) is the principal source of food for more than half the population of world and for the people of Asia in particular. Transplanting is the common method of rice establishment which requires huge amount of water and is a labour intensive method. Wet direct sown rice (W-DSR) is a viable alternative to transplanted rice. However, weed infestation is one of the major production constraints which is responsible for 65% of yield reduction in direct sown rice. There are several methods of weed control. But chemical method is the most economic one and is becoming more popular in W-DSR as it is more effective, easy to apply, provides selective control, saves labour and cost. Hence, there should be continuous effort to evaluate herbicide combinations for control of broad spectrum weed flora. The present investigation was conducted at ICAR – National Rice Research Institute, Cuttack (Odisha) during the wet season of 2018. The soil of the experimental field was sandy clay loam and neutral (pH 6.8) in reaction having 0.52% soil organic carbon, low nitrogen (215.4 kg ha⁻¹), medium phosphorous (48 kg ha⁻¹) and high potassium (322.7 kg ha⁻¹) content. The experiment was laid out in Randomized Complete Block Design with eleven treatments *viz.* three sequential applications of herbicides (T_1 - Bispyribac-Na @ 30 g ha⁻¹, T_2 - Ethoxysulfuron @ 60 g ha⁻¹, T_3 - Cyhalofop butyl @ 100 g ha⁻¹), four herbicide mixtures (T_4 - Fenoxaprop-p-ethyl + Ethoxysulfuron @ (50+15) g ha⁻¹, T_5 - Fluroxypyr + Cyhalofop butyl @ (125+25) g ha⁻¹, T_6 - Cyhalofop butyl + Penoxsulam @ (100+30) g ha⁻¹ and T_7 - Bispyribac-Na + Ethoxysulfuron @ (25+15) g ha⁻¹), a herbicide mixture check (T_8 - Bensulfuron methyl + Pretilachlor @



(60+600) g ha⁻¹), a herbicide check (T₉- Bispyribac-sodium @ 30 g ha⁻¹), one weed free (T₁₀) and weedy check (T₁₁), replicated thrice. Among the weed control treatments, the weed free registered significantly highest value of growth parameters of rice viz., dry matter accumulation, number of tillers m⁻², leaf area index, crop growth rate, relative crop growth rate and yield attributing characters like effective tillers m⁻², panicle weight, number of grains panicle⁻¹, number of filled grains panicle⁻¹, grain and straw yield. Among different herbicide treatments, Bispyribac-Na fb Ethoxysulfuron controlled the weeds effectively with lowest weed density, dry matter, weed index and having the highest weed control efficiency (91% at harvest). The highest grain yield was recorded in weed free plot (5.18 t ha⁻¹) which was at par with Bispyribac-Na fb Ethoxysulfuron (4.86 t ha⁻¹). Sequential application of Bispyribac-Na fb Ethoxysulfuron showed 16% and 13% yield advantage over the recommended herbicide, Bispyribac-Na and herbicide mixture, Bensulfuron methyl + Pretilachlor, respectively. The yield was negatively correlated to weed density, weed dry matter and weed index. All the herbicide mixtures recorded higher growth and yield parameters compared to sole application of herbicides. The yield reduction due to weed competition in weedy plots was more than 50%.

Thus, the herbicide mixture Bispyribac-Na @ 30 g ha⁻¹ fb Ethoxysulfuron @ 60 g ha⁻¹ is found to be potential option and may be recommended for better weed control in W-DSR.

EFFECT OF SITE SPECIFIC NUTRIENT MANAGEMENT ON RESIDUAL STATUS OF AVAILABLE N,P,K AND ZN OF RICE IN VERTISOL

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Abstract

A field experiment was carried out during the kharif season (June–October) of 2016 at the Research Farm of the Indira Gandhi Agricultural University, Raipur (C.G.), India to study the “Effect of site specific nutrient management on uptake of nutrient of rice in vertisol”. The experiment was laid out in a Randomized block design with three replications and eight treatments namely i.e. RDF(100:60:40:5 NPK and Zn kg ha⁻¹), SSNM based on nutrient expert (120:60:60:5, NPK and Zn kg ha⁻¹), SSNM based on leaf color chart (60:60:60:5, NPK and Zn kg ha⁻¹, rest 50% N based on LCC), SSNM-N, SSNM-P, SSNM-K, Control (N₀, P₀, K₀) and Farmer Fertilizer Practices (N₈₀, P₄₀, K₀). The results was that available nitrogen in soil at harvest stage found- nitrogen 196.67kg ha⁻¹, Total phosphorus 16.52 kg ha⁻¹ and 498.33kg ha⁻¹ potassium was recorded under treatment T₂ SSNM based (NE) similarly the available Zinc content in soil at harvest stage of rice was found higher in treatment T₃- SSNM on LCC (0.8 mg kg⁻¹). Overall concluded that treatment based on nutrient expert (NE) recommendations proved superiority over applied different treatments on yield, nutrients uptake (N,P,K and Zn) involved balance removal as required by rice (cv. Rajeshwari) as well sustaining soil available nutrient status.

AN ECONOMIC ANALYSIS OF SHADE NET CULTIVATION IN CHHATTISGARH PLAINS

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Abstract

An evaluation is presented of a study an economic analysis of shade net cultivation in Mahasamund district of Chhattisgarh the specific objectives of the study were (i) To work out the cost and return of major crops grown in shade net cultivation, (ii) To examine marketing pattern of major crops grown in Shade net cultivation, (iii) To identified the constraints of Shade net cultivation and suggest measures for improvement of the same. The present study was conducted in Mahasamund district of Chhattisgarh. Six shade net owners / farmers were selected for the study. The data valuate to the year 2015- 16. The finding of the study reveals that the average size of holding of the selected households was 5 hectares. On an Average family size was 6, The literacy percent of the selected households were 88.89 percent. Majority of the selected house hold belongs to other backward class. On an average the total cultivated area was 4.75 hectare perfarm. Tube well was the major source of irrigation. Paddy, tomato and chilli were the major crops in the kharif season. Paddy and vegetables were the major crops in the Rabi season. On an average cropping intensity were 166.32 present. The cost of cultivation of tomato was found to be Rs.



120263.43 per hectare. The input–output ratio was 1:0.86. Tomato crop was not profitable in the selected shade net cultivation due to lower price and yield. The cost of cultivation of cabbage, chilli, cauliflower, bitter gourd, and brinjal were found to be Rs.125154.76, Rs.118281.96, Rs.126845.76, Rs.161538.96 and Rs.114405.36 per hectare respectively. The input-output ratio of cabbage, chilli, cauliflower, bitter gourd, and brinjal were found to be. 1:3.41, 1:3.28, 1:4.75, 1:3.68, 1:3.57 respectively. Marketable surplus was more than 99% in all the selected crops. The major constraints were quality of net is not appropriate, lack of knowledge about appropriate technology, high temperature and high labour requirement. Study suggested that the extensive demonstration of improved and high yielding varieties of vegetable crops should be given; definite provisions should be made for timely supply of crucial inputs at reasonable price and inadequate quality to sustain vegetable production on profitable basis.

IMPROVEMENT OF AROMATIC TRADITIONAL LAND RACES OF RICE THROUGH THE USE OF GAMMA RADIATIONS

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Abstract

Chhattisgarh state is very popular for more than 100 traditional aromatic land races of rice. These varieties are very tall and very late maturity due to tall feature they are prone to lodging. Due to this feature yield potential of varieties is much reduced. Physical mutagen (Gamma rays) is successfully utilized to develop the mutant in commercially grown aromatic rice variety with reduced plant height, high grain yield, high tiller, and earliness. With a view of including viable mutations of economic importance in two aromatic popular traditional local rice varieties viz., Dubraj and Jawaphool were undertaken to improve undesirable characters viz., tall plant height and very late maturity duration using 250 and 300Gy doses of γ -rays. Frequency of viable mutations and mutations with economic importance characters varies with treatment as well as genotypes. Radiation dose 300 Gy was found to be most desirable to inducing viable mutations in both genotypes. Frequency of viable mutants was observed more in Dubraj variety as compare to Jawaphool. Twenty three types of viable mutants 18 from Dubraj and 5 from Jawaphool were observed in M_2 generation. These Dubraj mutants were further advanced and classified into 11 (semi-dwarf and mid late maturity), 07 (dwarf, early maturity and increased tillering with high yielding), 2(bushy and broad leaf), 1(grassy leaf), 1 (cytoplasmic male sterile type) and 1(clustered grain) in Dubraj and in Jawaphool 4 were (Semi tall and mid-late maturity) and one was (tall, clustered grain with red kernel colour). In Dubraj 42-50% reduction in plant height was observed as compared with its parent variety. Isolation of three dwarf and semi- dwarf mutants coupled with earliness in Dubraj and 3 semi-tall and mid-late maturing mutants in Jawaphool have assumed great significance in improving traditional aromatic short/medium grain rices.

EFFECT OF DIFFERENT ENVIRONMENTAL CONDITIONS ON PERFORMANCE OF SAPOTA SOFTWOOD GRAFTS WORKED ON INVIGORATED KHIRNI ROOTSTOCK

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Abstract

The experiment entitled “Effect of different environmental conditions on performance of sapota softwood grafts worked on invigorated khirni rootstock.” was carried out at Commercial Fruit Nursery, Nagarjun Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during the year 2016-2017. Experiment was laid out in Factorial Randomized Block Design with eight treatment combinations comprising factor A four different environmental conditions C_1 (Open condition), C_2 (Partial shade condition), C_3 (Partial shade (tree shade) condition), C_4 (Poly house condition) and factor B comprised of two decaping height of invigorated khirni rootstock viz., 10 cm and 15 cm from ground level and these were replicated five times. Among different environmental conditions poly tunnel condition i.e. (C_4) showed better performance in term of minimum days required for bud sprouting, length of scion shoot (cm), length of sprout (cm), branches per graft, leaves per graft, leaf area (cm^2), grafting success (%), final survival of grafts (%), stock scion ratio, saleable grafts (%), average growth rate, fresh and dry weight of grafts (g) as compare to open condition, green shade net condition and partial shade condition. Regarding



decaping height of 15 cm from the ground level on invigorate khirni rootstock seedling showed better performance in term of minimum days required for bud sprouting, length of scion shoot (cm), length of sprout (cm), branches per graft, leaves per graft, leaf area (cm²), grafting success (%), final survival of grafts (%), stock scion ratio, saleable grafts (%), average growth rate, fresh and dry weight of grafts (g) as compare to 10 cm decaping height. Interaction between sapota scion grafted at 15 cm decaping height from ground level on invigorated khirni rootstock seedling and kept in poly tunnel showed better performance among all treatment combination regarding, minimum days required for bud sprouting, length of scion shoot (cm), length of sprout (cm), branches per graft, leaves per graft, leaf area (cm²), grafting success (%), final survival of grafts (%), stock : scion ratio, saleable grafts (%), average growth rate, fresh and dry weight of grafts (g). among remaining treatment combination. It is indicated that, utilization of the invigorated khirni rootstock seedlings which were failed during last year, can be reused by grafting in poly tunnel with decaping height at 15 cm from ground level, for getting maximum grafts success.

CONSTRAINTS FACED BY ORANGE (*CITRUS RETICULATE* BLANCO) GROWERS IN MANAGEMENT OF ORANGE CULTIVATION IN AGAR MALWA DISTRICT OF M.P.

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Abstract

The study was conducted to determine the constraints face by the orange (*Citrus reticulata* Blanco) growers in management of orange cultivation. Data were collected through personal interview. The present study was conducted in agar malwa dist. of the MP. Agar Malwa dist. has 4 blocks among them two blocks Viz. Nalkheda and Susner has been selected randomly for the study. In each selected blocks 10 orange growing villages were selected randomly for the study and 6 respondents were selected in each villages. Thus 60 respondents were selected in each block and total 120 respondent selected for the study. The major constraints faced by the farmers in management of orange cultivation were: Non availability of healthy planting material in this region, Growers take intercrop as primary crop and orange as secondary crop, Lack of timely technical advice respectively. Suggestions as endorsed by the farmers to overcome their constraints in management of orange cultivation were: Need to high-tech nursery for production of disease free planting materials in this region, Conducting training programme by the KVKs and Horticulture dept., Need to improve market facilities respectively.

IN VITRO SCREENING OF CHLORPYRIFOS DEGRADING BACTERIA

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Abstract

Chlorpyrifos is one of the highly toxic agricultural chemicals widely used in plant protection. Excessive use of chemical pesticides has led to the deterioration of soil quality and soil fertility, as most of the pesticide applied is getting accumulated into soils. Thus, pesticide degradation studies have been gaining importance these days. Microbial biodegradation is proven to be most convenient technology wherein, metabolic processes of these microorganisms are capable of using chemical contaminants as an energy source and producing harmless or less toxic products. In the present study, screening was carried out for the chlorpyrifos degrading bacteria under *in vitro* conditions by using chlorpyrifos (Cp) supplemented minimal salt media. We found that among the 100 isolates 25 isolates were effective in chlorpyrifos degradation. Further screening was carried out at different concentrations of chlorpyrifos such as 200ppm, 300ppm, 400ppm and 600ppm to obtain highly efficient bacterial isolates. Growth pattern of the bacteria was observed at successive intervals of 2, 5 and 7 days after inoculation by using spectrophotometer @ 600 nm. Out of 25 bacterial isolates eleven isolates were able to grow at 300ppm of Cp concentration, nine isolates showed optimal growth at 400ppm and seven isolates has shown minimal growth pattern at 600ppm of chlorpyrifos concentration. Among all the isolates CDB-6, 11 and 18 were observed to be effective bioremediating agents for chlorpyrifos degradation.



ISOLATION OF CHLORPYRIFOS DEGRADING BACTERIA FROM THE RHIZOSPHERE SOILS OF RICE

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Abstract

Control of insects in commercially growing crops by using pesticides has become a tradition since decades in order to supplement food for the growing population. Farmers are using the pesticides in excess than recommended that has led the development of resistance by insects and pests. Hence, farmers are applying more and more pesticides to control them. In rice crop farmers are using the chlorpyrifos for the control of variety of pests in order to maintain the quality and quantity of produce in India. Unfortunately, they remain in soils and sediments where they can enter the food chain, or percolate down to the water table. Thus, there is a need to develop safe, convenient and economically feasible methods for pesticides remediation. For this reason, bioremediation have been proven to be most effective. In our present study we have isolated chlorpyrifos degrading bacteria from rhizospheric soils of rice growing area surrounding Raichur district of Karnataka, India. Around 25 chlorpyrifos degrading bacteria were isolated using serial dilution technique followed by selective enrichment culture technique on MSM agar medium supplemented with 200 ppm chlorpyrifos. Isolates were tentatively coded as CDB-1 to CDB-25. Under *in vitro* conditions, all the bacteria were able to grow in the MSM agar plates supplemented with 200 ppm of chlorpyrifos.

IN VITRO STUDIES ON EFFICACY OF DIFFERENT ORGANIC AMENDMENTSON MYCELIA GROWTH OF *FUSARIUM INCARNATUM* THE CAUSAL AGENT OF CROSSANDRA WILT

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Abstract

Laboratory studies are carried out to test the efficacy of seven organic amendments for their inhibitory efficacy against mycelia growth of *F. incarnatum*, the causal agent of crossandra wilt. In the study all the organic amendments recorded inhibition of mycelia growth at all concentrations tested. However, among all the organic amendments, neem cake at 5 and 10 per cent concentration significantly recorded maximum (49.8 and 70.4% respectively) reduction of mycelial growth over control and it was followed by mahua cake (5 and 10%) which recorded 46.2 and 63.8 per cent reduction of mycelial growth over control. The minimum of 46.9 per cent growth reduction over control was observed in FYM (10%) extract which recorded 34.7 and 46.9 per cent reduction of mycelial growth over control.

PERFORMANCE OF DIFFERENT GENOTYPES, FOR YIELD AND YIELD ATTRIBUTES IN TOMATO (*SOLANUM LYCOPERSICUM* L.) GERMPLASM

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Abstract

Research was conducted at experimental farm of College of Horticulture, Department of Vegetable Science, Sri Konda Laxman Telangana State Horticultural University, Rajendranagar, Hyderabad, Telangana during *kharif*, 2017-18. Forty genotypes were evaluated in Randomized Block Design with three replications for thirteen yield and yield attributing characters, which are diverse in origin. The study analysis of variance revealed that there was significant differences between genotypes indicating presence of sufficient variability in all the 13 characters studied. Wide range of variability was observed



for number of fruits per plant (18090.380) followed by average fruit weight (4895.862) and plant height (2918.579) indicating the scope for selection of initial breeding material for further improvement. On the basis of mean performance, five superior genotypes for fruit yield viz., LA-3667 (2.28 kg/plant), Money Maker (2.17 kg/plant), EC-620441 (2.06 kg/plant), EC-620446 (2.05 kg/plant), AVTO-1219 (2.02 kg/plant), may be released as pureline or inbreeding programmes after testing their stability over location and years for commercial cultivation. The genotypes with superior quality traits viz., EC-631349 for ascorbic acid (59.43mg/100gm), EC-514013 for TSS (8.16 °Brix) and Money maker for beta-carotene (2.63mg/100gm) can be included in pedigree selection for further improvement.

NITROGEN MANAGEMENT USING LCC-ITS IMPACT ON GROWTH PARAMETERS AND YIELD OF SHORT DURATION TRANSPLANTED RICE

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Abstract

About 90 % of total rice produced is consumed in Asian countries, but the productivity of rice in India is comparatively very low than other major rice growing countries in the world (6.710 t ha⁻¹ -china). Among all the reasons for lower productivity of rice, inefficient utilisation of nitrogen is considered as an important one. Precise application of nitrogen fertilizer based on plant need and location in the field will greatly help in improving the fertilizer use efficiency in rice which can be achieved by using Leaf Colour Chart. In this regard, a field experiment was conducted during *Kharif*, 2018 to study effect of LCC based nitrogen management on growth, yield and nitrogen use efficiency of short duration transplanted rice variety KNM-118. Treatments included two doses of nitrogen (120 and 150 kg ha⁻¹) applied on basis of two critical LCC values- 3 and 4. In turn N was applied in 3 equal splits incase of 120 kg N ha⁻¹ and with 150 kg N ha⁻¹ it was applied in 3 and 4 splits with half as basal. These LCC based treatments were evaluated against control with no nitrogen, recommended method and Farmers practice with (120-60-40), (180-80-40) RDF respectively applied at fixed time intervals. Results revealed that, N application based on LCC value-4 was more beneficial than LCC-3 in enhancing the growth and yield of rice. LCC-4 at 150 kg N ha⁻¹ (T₉) produced significantly higher plant height (107.9 cm) at maturity, number of tillers (339 m⁻²), leaf area index (2.17), SPAD readings (34.3), dry matter (11,246 kg ha⁻¹) and grain yield (6,533 kg ha⁻¹). With respect to dose of nitrogen 150 kg N ha⁻¹ resulted in more yield than 120 kg N ha⁻¹. The percentage of 'N' saving was to the extent of 16.7 % and recorded 4 % more yield. LCC based N application have resulted in yield advantage to a tune of 7-18 % over recommended practice with saving of 30 kg N ha⁻¹. Highest nitrogen use efficiency (PFP_N) (49.1 Kg grain kg⁻¹ N applied) was recorded with LCC-4 with 120 kg N ha⁻¹. LCC can be better option for farmers in estimating the leaf nitrogen status easily. Also, in addition it prevents farmers from applying excess amounts of nitrogen fertilizer thus saving cost of fertilizers. The results of the study implied that LCC-4 was found to be effective as a decision tool for optimum N application in rice.

IDENTIFICATION OF HIGH YIELDING PEARL MILLET HYBRID [*PENNISETUM GLAUCUM* (L.) FOR ZONE-3 OF KARNATAKA

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Abstract

Pearl Millet also known as bajra is one of the important sources of energy to the large masses of the people in India and sub-Saharan Africa as it contains higher level of micronutrients such as Fe, Zn compared to other cereals viz., maize, wheat, rice, sorghum etc and has balanced amino acid profile. It is also an important fodder crop due to lower hydrocyanic acid level than sorghum, in addition to its use as cattle fodder, it is also used as poultry feed and in biofuel production. India is the largest producer of bajra in the world. It is a C₄ crop with high tillering, protogynous in nature and can be grown in adverse



agro-climatic conditions and poor fertile soils where it is difficult to take up other food crops like maize and sorghum. Due to its highly cross pollinated nature and availability of cytoplasmic-nuclear male-sterile sources, development of high yielding hybrids becomes an important choice in the crop breeding to exploit heterosis and to improve productivity. In this context, high yielding hybrid breeding programme was initiated at All India Co-ordinated Research Project (Millets) at Regional Agricultural Research Station, Vijayapura. Several generations of selection in experimental hybrids and evaluation of parents and cross combinations, new hybrid VPMH-7 was identified in the background of good combiner and an early flowering A₁ cytoplasm based malesterile line ICMA 94555. The new hybrid identified has high yield potential and recorded significantly higher mean yield of 3112 q/ha over national check GHB 558 (2232 q/ha) and found to be on par with private check 86M86 (3004 q/ha) under station trial. Due to its encouraging performance in station trials, it was promoted to multi-location evaluation trial (MLT) in Zone-3 of Karnataka. Under MLT, VPMH-7 recorded 24.5 percent higher yield over GHB-558 across the locations over 3 years. Now, the said hybrid is in pipeline for release for Zone-3 of Karnataka. The special features of the hybrid include its early maturity (80-85 days) and is bold seeded, due to its earliness, suitable for late planting, intercropping and multiple cropping situations under changing climatic scenario.

POST HARVEST TREATMENT OF VEGETABLES WITH CALICIUM CHLORIDE AND SODIUM CHLORIDE

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Abstract

Minimization of postharvest losses from harvest to consumption depends upon the several biological and environmental aspects. Dipping treatments, favour the dispersion of the solution on the surface of the vegetable. Tomatoes and Cucumbers were treated with Calcium Chloride, Sodium Chloride and Lime juice with different steeping time. The effects of these chemical and natural agents on pre- treated vegetables were evaluated by analyzing the TSS, pH, Weight loss and Shelf life. Due to pre-treatment increase in TSS, pH and Weight loss was low in vegetables treated with Calcium Chloride and Sodium Chloride as compared to Control, there was no significant difference between vegetables treated with Lime juice and Control. Shelf life of Tomatoes treated with Calcium Chloride with a steeping time of 10 min was increased from 10 days to 13days, Shelf life of tomatoes treated with Sodium Chloride was increased to 11 days. Shelf life of Cucumbers treated with Calcium Chloride with a steeping time of 5 min was increased from 16 days to 19 days, shelf life of Cucumbers treated with Calcium Chloride with a steeping time of 10 min was increased from 16 days to 22 days. Shelf life of Cucumbers treated with Sodium Chloride with a steeping time of 10 min was increased from 16 days to 19 days.

ACTINOBACTERIA FOR PLANT GROWTH PROMOTION

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Abstract

Actinobacteria are one of the major components of microbial populations present in soil. They belong to an extensive and diverse group of Gram-positive, aerobic, mycelial bacteria that play an important ecological role in soil nutrient cycling. Actinobacteria are known for their economic importance as producers of biologically active substances, such as antibiotics, vitamins, enzymes and also an important source of diverse antimicrobial metabolites. Actinobacteria can produce phytohormones and siderophore as well as solubilize phosphate and promote plant growth. Actinomycetes are a well-known promising group of bacteria for plant growth promotion and protecting plants from several soil borne plant pathogens. Actinomycetes promote plant growth by either aiding resource acquisition (nitrogen, phosphorus and essential minerals) or modifying plant hormone levels or by decreasing the inhibitory effects of various pathogens on plant growth and development in the forms of biocontrol agents. The exudates secreted by plant roots help the plant to cope up with different environmental



conditions and associated with microbial competition hence the survival in soil as well as cell-cell communication via quorum sensing. Indolic compounds are considered as main exudates in the plant growth promotion and 80% of the microorganisms have the ability to synthesize and release auxins. Indole acetic acid (IAA) affects cell division, extension, stimulate seed and tuber germination and also provide resistance to stressful conditions. The introduction of actinomycetes in soil tends to be less violent and cause less impact to the environment than chemical fertilizers, which makes a way of reducing costs as well as increasing yield.

FACTORS INFLUENCING THE USE OF AKPS SERVICES BY THE FARMERS OF TELANGANA

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Abstract

Annpurna Krishi Prasaar Seva (AKPS) is an innovative ICT tool developed and deployed in collaboration with the Digital India Corporation Ltd., (DIC). The services of the AKPS are provided through the KVKs and DAATTCs of the PJTSAU in the state of Telangana. This study was conducted to assess problems encountered by the registered farmers in use of services of AKPs and to elicit their suggestions to overcome. For this purpose an Ex post facto research design was followed and a total of 120 farmers from two districts namely, Khammam and Nalgonda were selected for carrying out the study. Data were collected through a structured interview schedule and focus group meetings with respondents. Descriptive statistics techniques were used to analyze data. The results indicated that respondents rated unreliable network and compatibility of the application with mobile phones as the major constraints followed by time duration of voice messages, difficulty in understanding technical words like chemical names, limited technological skill in operating mobile phone, and affordability were the concerns of the farmers. The respondents of the study suggested to strengthening & extension of network to remote areas followed by less frequent repetition of advisory, inclusion of daily weather information and training on use of electronic gadgets were more helpful in improving the ease and accessibility of the services by the farmers.

APPLICATION OF RNAI INTERFERENCE IN PEST MANAGEMENT

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Abstract

RNA interference (RNAi) is a gene silencing mechanism triggered by providing double-stranded RNA (dsRNA) that when ingested into insects can lead to death or affect the viability of the target pest by regulating the expression of protein-coding genes. RNAi has been widely used to understand the molecular basis of physiological, developmental, behavioural and reproductive processes in insects; to identify genes encoding insecticide target proteins, insecticide detoxification and resistance and understand the mechanism of insecticide-mediated up-regulation of detoxification genes. This technology also has a potential to assist in developing target-specific management methods for insect pests and pathogens that cause diseases in beneficial insects. A successful large-scale field treatment for honeybee viruses (IAPV) and parasites, such as *Varroa* mites and *Nosema* was the proof-of principle that RNAi worked in real-world conditions. Production of dsRNA in bacteria and spraying heat-killed bacteria using the existing methods for the formulation and application of natural Bt may work well in controlling pests such as Colorado potato beetle that attack crops grown on smaller farms and green houses. Availability of reliable methods for knocking down genes in sucking pests will definitely help the adoption of this technology. The potential to tailor the specificity, which is higher than with small insecticide molecules, introduces a novel strategy that is distinct from other pest management strategies. Furthermore, the use of RNAi in crop protection can be achieved by employing plant-incorporated protectants through plant transformation, but also by non-transformative strategies such as spraying of insecticides through in vitro synthesized and formulated dsRNA using existing machinery as direct control agents, resistance factor repressors or developmental disruptors. In plant-mediated or host-induced RNAi (HI-RNAi) approach, a crop plant is



engineered with hair-pin RNAi vector to produce dsRNA against the target gene of insect pest viz., *Diabrotica virgifera* Le Conte, *Helicoverpa armigera* respectively. Because of the mode of action of RNAi and the lack of genomic data for most exposed non-target organisms, it becomes difficult to determine the environmental risks posed by RNAi-based technologies and the benefits provided for the protection of crops. A better understanding of the mechanisms that determine the variability in the sensitivity of insects would accelerate the worldwide release of commercial RNAi-based approaches. Many recent studies have focused on identification and validation of the genes encoding insecticide target proteins, such as acetylcholinesterases, ion channels, *Bacillus thuringiensis* receptors, and other receptors in the nervous system; role of genes encoding cytochrome P450 monooxygenases, carboxylesterases, and glutathione *S*-transferases in insecticide detoxification and resistance; the mechanism of insecticide-mediated up-regulation of detoxification genes in insects.

EMPOWERMENT OF FARM WOMEN THROUGH SUSTAINABLE AGRICULTURE IN INDIA

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Abstract

Women are the backbone of the agricultural workforce but worldwide her hard work has mostly been unpaid. Farm women's role in sustainable agriculture is very important and distinct in different farming systems. Gender role in agriculture is not set in stone; they change continuously. These changes must be fully reflected in the design and implementation of agricultural projects, especially those with research and extension components if we are to close the gap between technology and output. Women do the most tedious and back-breaking tasks in agriculture, animal husbandry and homes. The research efforts at the ICAR institutes have been focussed to relieve her from the drudgery by providing time and labour saving tools. Strategies used for empowerment of women include the development of technology kits and media mix for the dissemination of knowledge; development of software; organizing stimulation programmes conducting outreach programmes through media of mass communication. Eco-friendly agricultural components such as farmyard manure, compost, biogas slurry, poultry manure, oil cakes, vermicompost, green manure, bio-fertilizers, biological agents, herbal solution for insect repellents and crop residues etc. would be better options for women to maintain productivity and environmental quality. Now a day's woman play significant role in Sustainable agriculture. The database on rural women and indigenous knowledge being undertaken by extension component has suggested several pathways for the empowerment of rural women with reference to their participation and decision making role in farming and allied activities as per indicators of qualitative data. These pathways have highlighted on empowerment of knowledge, skill, decision making; economic and social empowerment. The women empowerment not only in words, they are its improvement in planning decision making and implementation

CHARACTERISTICS OF SOILS UNDER NAGPUR MANDARIN

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Abstract

The present investigation entitled "potassium fractionation of mandarin growing soil of Katol tahsil of Nagpur" was conducted on farmer's field at Katoltahsil, Dist. Nagpur during Kharif 2017-18. Seven locations viz., Niravha, Iratni, Botesari, Silli, Savangi, Salaidhaba and Baravha were selected to determine the different fractions of soil potassium and its correlation with soil properties. 35 surface soil samples (5 soil samples each from one location) were taken from 0-20 cm depth over the field of Nagpur mandarin orchards. The results revealed that soil reaction of study area exhibited slightly alkaline in nature. In all locations, there is no much variations in electrical conductivity of soil and these soils are non-saline in nature. The values of soil organic carbon found (4.0–8.9 g kg⁻¹) comes under low to moderately high content. Soils under study area were low to medium in available nitrogen and available phosphorus in soils found to be low to moderately high. All the soils of Katoltahsil were found high to very high in available potassium status. The DTPA extractable micronutrients soils (Zn, Fe, Cu and Mg) in these were observed sufficient except Zn which was found deficit by 48.57 per cent among 35 surface soil samples. The data on exchangeable cations follow order of Ca²⁺ > Mg²⁺ > Na⁺ > K⁺, calcium is a dominant cation followed by Mg, Na and K on exchange complex in all the soils of orchards.



STUDY OF PHYSICO-CHEMICAL, MICROBIAL AND SENSORY CHARACTERISTICS OF CARROT AND ORANGE BLENDED JUICE

Devendra Kumar and Jitendra Kumar

Dr. B.R.A. College of Agricultural Engineering and Technology, Etawah, U.P.

Abstract

Experimental study was conducted to evaluate the qualitative attributes of mixed juice using carrot and orange prepared with the composition of 95:05, 90:10 and 85:15 and the samples were stored at refrigeration temperature (5°C), B.O.D. (25°C) and room temperature (35°C) for 0, 15, 30 and 45 days. The physico-chemical qualities (TSS, pH and vitamin C), microbial growth and sensory quality (color, taste, flavor, texture and overall acceptability) were evaluated. The TSS increased with increase in storage period. The TSS value scored maximum as 13.7, 13.4 and 13.1 for BOD condition after 45 days of storage period. The pH values of the sample composition 95:05, 90:10, and 85:15 after 45 days of storage were observed as 5.17, 5.14 and 5.10 at room temperature and 5.12, 5.05 and 5.01 at B.O.D. incubator condition respectively. It was observed that pH of all the samples were decreased at 15, 30, and 45 days of storage. Decrease in the vitamin C was observed with increase in the level of storage period of carrot and orange composition in the samples. The ascorbic acid values of the samples composition 95:5, 90:10 and 85:15 after 45 days of storage were observed as 26.65, 30.61 and 34.91 mg/100ml at room temperature condition and the ascorbic acid values of the samples composition 95:5, 90:10 and 85:15 after 45 days of storage were observed as 24.33, 27.52 and 30.24 mg/100ml at B.O.D. incubator condition respectively. The microbial growth increases with increase in storage period. The beverage samples stored at refrigeration condition was found superior over other storage condition followed by BOD incubator and room temperature conditions. Sensory panel recommended best sample containing 85:15 ratios of carrot and orange juice as color, taste, flavor and texture points of view with the score of overall acceptability (8.45).

MANAGEMENT OF *BT* COTTON REDDENING IN BLACK COTTON SOILS OF MARATHWADA REGION UNDER RAINFED CONDITION

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Abstract

The field experiment entitled “Assessment and refinement of technologies to overcome *Bt* cotton reddening in black cotton soils of Marathwada region under rainfed condition.” was conducted at All India Coordinated Research Project for Dry land Agriculture, VNMKV, Parbhani to find out the effective nutrient management practice for reducing the reddening in *Bt* cotton in black cotton soils of Marathwada region of Maharashtra State during 2016 to 2018. The sowing was done on 20th July, 2016, 26th June, 2017 and 30th June, 2018 during respective years at spacing 120 cm x 45 cm. The recommended cultural practices and plant protection measures were taken. The recommended dose of fertilizer (120:60:60 kg NPK ha⁻¹) was applied as RDF and rest of the nutrient management practices were applied as per given treatments. The cotton pickings were done on 17.11.2016, 16.12.2016 and 02.02.2017 during 2016-17 and on 11.11.2017, 19.12.2017 and 05.02.2018 during 2017-18 and on 22.11.2018, 18.12.2018 and 07.01.2019 during 2018-19. The experiment was laid out in a Randomized block design with twelve treatments in three replicates. The treatments were T₁: RDF, T₂: RDF + Micronutrient Soil Application (STB) (FeSO₄ 25 kg/ha + ZnSO₄ 20 kg/ha + Borax 5 kg/ha), T₃: RDF + Micronutrient Soil Application (STB) + Foliar Application of MN (2 sprays), T₄: RDF + Micronutrient Soil Application (STB) + Foliar Application of KNO₃ (2 sprays), T₅: RDF + Micronutrient Soil Application (STB) + Foliar Application of Potassium schoenite (2 sprays), T₆: RDF + Micronutrient Soil Application (STB) + Foliar Application of Reddening Recommendation (2 sprays), T₇: RDF 125 % T₈: 125 % RDF + Micronutrient Soil Application (STB) (FeSO₄ 25 kg/ha + ZnSO₄ 20 kg/ha + Borax 5 kg/ha), T₉: 125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of MN (2 sprays), T₁₀: 125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of KNO₃ (2 sprays), T₁₁: 125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of Potassium Schoenite (2 sprays), T₁₂: 125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of Reddening Recommendation (2 sprays). The pooled results showed that the treatment T₁₀ i.e. 125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of KNO₃ (2 sprays) recorded the highest chlorophyll content (3.838 mg/g), lowest leaf reddening scale (0.6) and significantly higher seed cotton yield (2318 kg/ha) which was significantly superior over rest of all the treatments but it was found at par with T₉: 125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of



MN (2 sprays), T₁₁ : 125 % RDF + Micronutrient Soil Application (STB)+ Foliar Application of Potassium Schoenite (2 sprays), T₁₂ : 125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of Reddening Recommendation (2 sprays) and T₄: RDF + Micronutrient Soil Application (STB) + Foliar Application of KNO₃ (2 sprays) and found significantly superior over rest of the treatments. Whereas, significantly higher GMR and NMR were recorded in T₁₀ :125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of KNO₃ (2 sprays). Thus the application of 125 % RDF + Micronutrient Soil Application (STB) + Foliar Application of KNO₃ (2 sprays) reduced the reddening in cotton with higher seed cotton yield and net monetary returns.

STUDY OF PHYSICO-CHEMICAL, MICROBIAL AND SENSORY CHARACTERISTICS CARROT AND ORANGE BLENDED JUICE

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Abstract

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WEED MANAGEMENT IN KHARIF ONION (*ALLIUM CEPA* L.)

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Abstract

Onion is one of the highly export oriented crop and earns a valuable foreign exchange for the country. However, weeds are of great menace as they interfere with production of onion crop and add to the cost of cultivation. It has been reported that bulb yield of onion reduced by 30-60% due to weed infestation. Onions are more susceptible to weeds due to their inherent characteristics such as their slow growth, small stature, shallow roots and lack of dense foliage. Timely hand weeding becomes impracticable during the *kharif* season not only due to frequent rains but also, is tedious and costly in closely spaced crops like onion which may disturb the shallow root system. Keeping in view the above mentioned facts, the present investigation was undertaken to evaluate different herbicides viz., Pendimethalin 30% EC, Oxyfluorfen 23.5% EC and their doses for controlling weeds in *Kharif* onion at Horticulture Research Farm RAK, College of Agriculture, Sehore, (M.P.). The findings indicate that application of T₁₀ (Oxyfluorfen 23.5% EC 1.25 kg a.i./ha (PE)) is the most effective for controlling weed population/0.25 m² and dry weight (g/0.25 m²) during all growth stages. The highest benefit cost ratio was obtained with the treatment T₁₀ (1:6.88). T₂ (3 Hand weeding at 25, 50, and 75 DAT) shown the highest total and marketable bulb yield. On the basis of B:C ratio, application of (T₁₀) proved the best treatment among herbicides, and gave the maximum B:C ratio and net income. Therefore, spraying of pre-emergence herbicides keep the crop in weed free conditions during early stages.



EFFECT OF IBA ON VEGETATIVE PROPAGATION OF MADHUNASHINI (*GYMNEMA SYLVESTRE* R.BR.)

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Abstract

Gymnema sylvestre is commonly known as 'madhunashini' or 'gudmar'. It belongs to the family Apocynaceae. It is a slow growing perennial tropical medicinal plant widely used in traditional system of medicine. Its leaves are used for the extraction of gymnemagenin. Gymnemagenin is used in the treatment of diabetes since 2000 years. Diabetes is one of the fast emerging threats in India and across the globe. *G. sylvestre* is mainly used for diabetes, loss of weight, snakebite, antidote, digestive stimulant, laxative, appetite, suppressant and diuretic. Based on the importance of its medicinal values a huge pressure on its natural habitat for its collection. Hence it needs to be conserve by collection and propagation. It is difficult to establish gymnema through seeds and so an alternative method of propagation by vegetative cuttings. Various environmental factors hinder the growth of cuttings like humidity, age of cuttings and hormonal treatment. The factor implied in this study was the use of IBA. Hence production through cuttings treated with different concentration of IBA is the best method for rooting. An experiment was undertaken at Lambhvel Farm, ICAR-Directorate of Medicinal and Aromatic Plant Research, Anand Gujarat during the year 2018 to study the effect of IBA on softwood, semihard wood and hardwood cuttings of gymnema. The basal portion of the cuttings were dipped in IBA solution for 30 minutes and then further planted in the well prepared beds under the polyhouse conditions. The experiment was laid out in completely randomized design with three replications consist of different concentration of IBA ranging from 100ppm to 3000ppm concentration i.e., 100, 200, 300, 500, 1000, 1500, 2000, 2500, 3000ppm and control. The results revealed that significant differences were observed among the different concentrations of IBA and types of cuttings. Among the IBA treatments and type of cuttings, semi hardwood cuttings treated with 200 ppm IBA showed significant results with highest shoot length (43.40cm), number of sprouts (4.50), root weight (2.07g), foliage weight (2.50g), root length (15.50cm) and number of leaves (34.00) as compared to untreated cuttings. Thus, the present study suggests that cuttings treated with 200 ppm IBA can be used for mass multiplication and production of quality planting material for cultivation of madhunashini.

INFLUENCE OF DIFFERENT PLANTING TIMES ON FLOWERING AND SEED YIELD OF GAILLARDIA LOCAL CULTIVARS UNDER TELANGANA CONDITIONS

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Abstract

Gaillardia is one of the hardiest summer annuals grown in different climatic conditions on variety of soils with a remarkable flowering period. Due to its year round cultivation, attractive flower colour it is often used as a substitute to chrysanthemum or marigold whenever these flowers are in short supply or out of season. A field experiment was carried out was carried out at Floricultural Research Station, Sri Konda Laxman Telangana State Horticultural University, Rajendranagar, Hyderabad during September, 2018 to June, 2019. The experiment was laid out in Factorial Randomized Block Design with two cultivars viz. Local yellow, Local red (with yellow tip) and five different times of planting viz. 1st week of October, 1st week of November, 1st week of December, 1st week of January, 1st week of February replicated thrice. Based upon the results it can be concluded that, both the cultivars of gaillardia namely Local yellow and Local red (with yellow tip) performed good with respect to flower yield and seed yield. Among different planting times, 1st week of January performed good and can be the optimum time of planting for higher flower and seed yield in gaillardia local cultivars followed by 1st week of November and 1st week of December which are on par with each other. 1st week of January recorded with maximum number of flowers per



plant (162.66), flower yield per plant (365.28g/plant), flower yield per hectare (219.08 q/ha), Flower diameter (5.46 cm), seed yield per plant (37.05g/plant), seed yield per plot (0.81Kg/plot) and seed yield per hectare (11.79 q/ha).

NUTRITIONAL DISORDERS IN HEALTHY AND DECLINING SWEET ORANGE ORCHARDS OF MARATHWADA REGION

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Abstract

The present investigation entitled "Nutritional disorders in healthy and declining sweet orange orchards of Marathwada region" was surveyed for collection of representative soil and leaf samples from selected 50 orchards and analyzed for different parameters using standard procedures. The average value of soil pH of the samples showed that, the soils were neutral to alkaline in reaction and electrical conductivity of sweet orange orchards was in safe limit for the crop growth. These soils were calcareous to highly calcareous in nature and low to medium in organic carbon content. The soils are categorized as low, medium and high in available N, P and K content respectively in sweet orange orchard soils of Marathwada region. The exchangeable calcium and magnesium were in high range and sulphur status was found to be low to optimum. These soils were low to medium in available DTPA Fe and Zn whereas, high in DTPA Mn, low to high in DTPA Cu and low to optimum in Mo content. The soil boron content was in safe limit. In general, soils supporting healthy trees contained high concentration of nutrients as compared to declining ones. The leaf nitrogen was found in deficient to optimum amount while, phosphorus was low to high in sweet orange leaf samples. The leaf K content was high in all samples. The Ca and Mg were found in optimum to high range in the samples. The micronutrients viz., zinc and copper were found to be deficient to optimum in the leaves of sweet orange, while leaf iron and manganese were marginal to sufficient in sweet orange leaves of healthy and declining trees.

CHARACTERIZATION OF URDBEAN (*VIGNA MUNGO* L. HEPPER) GENOTYPES THROUGH QUALITY PARAMETERS AND CHEMICAL TESTS

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Abstract

An experiment was carried out at the Seed Testing Laboratory, Department of Seed Science and Technology, Junagadh Agricultural University, Junagadh, to characterize thirty urdbean genotypes based on quality parameters and chemical tests. Among 30 genotypes, seedling vigour index I was high in all thirty genotypes. The seeds were subjected to NaOH bleach test, KOH test and growth response test for differentiating the genotypes. The genotypes were grouped based on Potassium Hydroxide bleach test into orange color (26 genotypes) and dark orange red color (4 genotypes) types. Based on Sodium Hydroxide test, the genotypes were grouped into orange color (19 genotypes) and dark orange red color (11 genotypes) types. Based on growth response test, the genotypes were grouped into very low (4 genotypes), low (5 genotypes), medium (3 genotypes) and high (18 genotypes) types.

ECO FRIENDLY MANAGEMENT OF FUSARIUM WILT (*FUSARIUM OXYSPORUM*) OF CHILLI (*CAPSICUM ANNUUM* L.) BY THE USE OF RHIZOSPHERE ANTAGONISTIC FUNGI

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Abstract

Chilli (*Capsicum annuum* L.) is an important vegetable cum spice crop grown worldwide. Chilli is attacked by a large number of pathogens; out of them *Fusarium* wilt is the most predominant causing 10-80 per cent losses in India. Application of biological controlling strategies for plant protection is one of the key elements of such sustainable agriculture. Increased use of



fungicides has led to direct impact on disease resistance. The need for adopting eco-friendly biological methods as an alternative disease control method. Rhizosphere soils of healthy chilli plants were collected and isolated beneficial rhizosphere antagonists from Kurnool, Kadapa and Guntur districts of A.P. A total of eight fungal antagonists isolated from rhizosphere, were subjected to preliminary screening out of which only 4 isolates have showed good inhibitory effect on radial growth of *Fusarium in vitro*. The efficient isolates obtained after preliminary screening were further evaluated for their antagonistic potential against the *Fusarium* wilt pathogen in terms of percent inhibition over the control. The percent inhibition on the growth of the pathogen by the antagonist over control was calculated for every 24 hrs of inoculation up to seven days. all the four rhizosphere antagonistic fungi inhibited the growth of the wilt pathogens at varying levels at a range of 16.19 to 84.14 per cent after 168hrs of inoculation. RFA 2 showed the highest mycelial (84.14%) inhibition of pathogen followed by RFA 4 (75.84%) and RFA 1(58.09%), whereas the isolate RFA 3 showed the lowest inhibition of 16.19 per cent against *Fusarium*. The RFA 2 and RFA 4 had the fast-mycelial growing capacity compared to the pathogen, they were overgrown and locked the growth of pathogen after 72 hrs. of inoculation.

EFFECT OF DIFFERENT TIMES OF PRUNING ON GROWTH, FLOWERING, YIELD AND QUALITY OF APPLE BER

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Abstract

Its name signifies size and appearance of fruit as green apple. Unlike Indian jujube, it is almost spineless and believed to be introduced from Thailand. In India, it is cultivated in Maharashtra, West Bengal, Andhra Pradesh and some parts of Madhya Pradesh and Chhattisgarh. Unlike the local and hybrid variety, the speciality of the apple ber is the size of the fruit which is bigger; it tastes very sweet, is drought resistant, consumes less water and requires less insecticide and is sustainable in hot temperature too, having a life of 20 years. Pruning of the ber tree is highly desirable practice as fruit is borne in the axils of leaves of young shoots developed during current season. Intensity and time of pruning improves the new growth, bud sprouting, fruit yield and quality of apple ber. The experiment was carried out at Dry land horticulture farm, SKS CARS, Surgi, Rajnandgaon, IGKV during year 2018-19 with the objectives to the effect of different time of pruning on growth, yield and quality of apple ber to find out the optimum time of pruning for obtaining maximum yield and quality of apple ber. The pruning was done on main shoot, subsequent secondary and tertiary shoots top to end on whole plant from 1-1.5 m above the ground level height. The obtained data were analyzed by factorial Randomized Block Design with five different severity treatments viz., D₁- 15th March, D₂- 30th March, D₃- 15th April, D₄- 15th April, and D₅- 15th May were replicated in three blocks. Results revealed that plant growth, plant volume, mean of plant spread, leaf area was significantly maximum in D₂- 30th March pruning. It was also recorded that minimum number of days required for flowering (136 days), highest numbers of flowers per shoot (211.56) and yield & fruit attributes such as highest fruit set(52%), highest numbers of fruits per tree (278), maximum fruit yield (26 kg/plant), fruit diameter (4.8 cm) and maximum fruit weight (80 gm) in 30th March pruning treatment. So it can be concluded from the study the apple ber should be pruned during end of the March month after picking of fruits when the tree start shed their leaves before onset of the new growth. Hence, the early pruning advances bud sprouting and early harvest and increases fruit yield.

INDIGENOUS ORNAMENTAL FISH IN WAKL RIVER SYSTEM OF SOUTHERN RAJASTHAN

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Abstract

The Western Ghats is considered as one of the eight “hottest hotspots” of biological diversity in the world and holds rich freshwater fish diversity. In order to establish a consistent statistics of fish diversity, a knowledge of fish diversity of the particular region is essential not only for the rational management of ichthyofauna of that region but also for their conservation



strategies. Therefore, the present study helps in generation of the baseline data on the availability of ornamental fish in Waki River of Udaipur district of Rajasthan. However much is not known about the status of fish diversity especially the native ornamental fishes of Waki river system of Udaipur (Rajasthan). A total of 15 species belonging to 5 orders, 9 families, 15 genera were identified and documented. The family-wise interpretation revealed that Cyprinidae as the largest family accommodating 6 genera, Mastacembelidae two genera and other 7 families like Balitoridae, Siluridae, Belontiidae, Gobiidae, Ambassidae and Cobitidae represented single member from each. While assessing the potential utilization of the collected fishes, it was realized that 7 species like *Pethiaconchonus*, *Devariomalabaricus*, *Rasboradaniconius*, *Trichogasterlalius*, *Schisturasavona*, *Acanthocobitisbotia*, *Parambassislala*, were of high ornamental value (i.e. 46.66%), 5 species like *Mastacembelusarmatus*, *Macrognathuspancalus*, *Bariliusbendelisis*, *Salmophasiabacaila*, *Glossogobiusgiuris*, were potential ornamental fishes (i.e. 33.33%) and can be exploited for commercial purpose and rest 3 Species (20%) such as *Garragotyla*, *Xenentodoncancila*, *Ompokbimaculatus* are primarily used as food fish which can also be explored for their ornamental qualities. Out of 15 identified species listed above ten were earlier reported by various researchers and five species (i.e. *Parambassislala*, *Devariomalabaricus*, *Trichogasterlalius*, *Acanthocobitisbotia* and *Schisturasavona*) were reported first reported under this study.

STUDY OF ROOT AND STEM ROT PATHOGEN (*RHIZOCTONIASOLANI*) IN DIFFERENT CULTURE MEDIA, HOST RANGE AND EFFECT OF WEATHER PARAMETERS ON DISEASE INCIDENCE

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Abstract

Root and stem rot of cowpea caused by *Rhizoctonia solani* is one of the most important problems for farmers among the coastal regions of Odisha. Keeping this in view, the behavioral study of the pathogen was done by studying its growth pattern in different culture media and host medium. Among five different media, Potato dextrose agar (90.00mm) was found to support the maximum radial growth followed by Sabouraud's dextrose agar medium (87.90mm), Potato dextrose rose Bengal agar (82.40mm), Oat meal agar (76.60mm) and Malt extract agar (70.98mm). In study of meteorological parameters in relation to disease development the maximum incidence was recorded in October at maximum temperature of 32.7⁰C, minimum temperature 22.9⁰C accompanied by night RH 92% and day RH 64%. However, weather parameters under study did not yield any significant effect on disease development. However, the soil factors like sandy loam textured soil and acidic to neutral P^H contributed towards this soil borne disease. Among host range studies, *Rhizoctonia solani* isolated from cowpea could infect rice (*Oryza sativa*), maize (*Zea mays*), tomato (*Solanum lycopersicum*), chilli (*Capsicum annum*), brinjal (*Solanum melongena*), field pea (*Pisum sativum*), cucumber (*Cucumis sataivus*), Bengal gram (*Cicer arietinum*), arhar (*Cajanus cajan*), cotton (*Gossypium hirsutum*), and groundnut (*Arachis hypogea*) in addition to its own host.

PROLONGED OESTRUS IN AI BRED CATTLE–THE CONTRIBUTION FROM THE DELAYED LUTEINIZATION OF PRE OVULATORY FOLLICLES

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Abstract

Increasing incidence of prolonged oestrus has been reported among cross bred cattle bred through artificial insemination (AI). However, there are very few studies exploring the underlying factors and mechanisms of causation even though the condition is an emerging problem with serious consequences on herd fertility. Hence objective of the present investigation was to explore the causative factors for prolonged oestrus especially after the popularization of intensive rearing and artificial breeding. It is evident that the slow elevation of progesterone level consequent to delayed luteinization of pre ovulatory follicle leading to delayed ovulation forms one of the major mechanisms for the manifestation of prolonged oestrus. Further, supra basal elevation of progesterone level reported in prolonged oestrus animals, is the consequence of slow and prolonged luteinization of the follicular cells, rather than becoming the causation for oestrus prolongation. However, more focused



studies are needed to establish the inter relationship between mating process and mechanism of follicular cell luteinization and enhancement of ovulation among spontaneous ovulators.

ASSESSMENT OF FARMER'S KNOWLEDGE LEVEL REGARDING VEGETABLE PRODUCTION TECHNOLOGIES

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Abstract

India is the second largest producer of vegetables next to China in the world accounting for about 12 per cent of world production. Vegetables play a vital role in the maintenance of human health and make the diet nutritive and balanced. The study was conducted in Aul, Rajnagar and Rajkanika blocks of Kendrapada district, Odisha. Both purposive and random sampling procedure was followed for selection of the district, blocks, gram panchayats, villages and the respondents. The total sample size of the study was 120. The response was obtained from each individual respondent in a structured interview schedule which was pretested with 10 per cent samples other than the respondents of the study. Krishi Vigyan Kenda (KVK) is a noble concept developed by Indian Council of Agriculture Research (ICAR) which rests upon a solid base of transfer of technology (ToT) from laboratory to farmer's field. With regards to knowledge level of vegetable growers 77.50 per cent belonged to medium knowledge level category. They had more knowledge in soil and land preparation with highest mean score 2.89. Among 13 socio-economic variables, 9 were positive and significant relationship and rest 4 were negative and non-significant relationship with level of knowledge obtained from correlation study.

EFFICACY OF INSECTICIDES AGAINST WHITEFLY AND MYMV IN MUNGBEAN IN EASTERN UTTAR PRADESH, INDIA

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Abstract

A field experiment was conducted at Research Farm of Baba Raghav Das Post Graduate College, Deoria (U.P.) in a randomized block design with three replications during *Kharif* season of 2018 to study the efficacy of insecticides against whitefly and MYMV mungbean variety RK 62. There were seven treatments viz. dimethoate 30 EC @ 1ml, acetamiprid 20 SP (two doses 0.5g, 1g), thiamethoxam 25 WG (two doses 0.5g, 1g) and neem oil @ 3ml per liter of water including untreated check with three replications. Among the insecticides evaluated against whitefly the application of both the doses of acetamiprid 20 SP @ 0.5g/l and 1g/l was found most effective in which minimum population of whitefly per leaf (0.63) observed. Application of thiamethoxam 25 WG @ 1g/l followed by dimethoate 30 EC @ 1ml/l and thiamethoxam 25 WG @ 0.5g/l were proved next in order of effectiveness in reducing whitefly population recorded 0.64, 0.70 and 0.73 whitefly per leaf, respectively. Application of neem oil @ 3ml/l recorded maximum population of whitefly per leaf (1.03) was least effective among the treatments but was significantly superior to untreated check. The cost benefit ratio under various treatments, dimethoate 30 EC ranked first indicating the maximum return rupees 16.68 per rupee invested followed by acetamiprid 20 SP 1g/l @ (14.82), thiamethoxam 25 WG @ 0.5g/l (12.78), acetamiprid 20 SP @ 0.5g/l (11.98). The minimum cost benefits ratio of 7.28 was recorded in plots treated with neem oil.

EVALUATION OF WATER QUALITY INDEX BY USING PHYSICOCHEMICAL PARAMETERS

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Abstract

Physicochemical analysis of ground water were studied. The study was made to investigate the quality of ground water around



Rath and Jhansi area of U.P., five samples from each area were collected for analysis. The water quality parameter like Total Dissolved Solid (TDS), Total Hardness (TH), Total Alkalinity (TA), pH, Electrical Conductivity, Temperature, Dissolved Oxygen (DO), Bio-chemical Oxygen Demand (BOD) were analyzed. The results show that the ground water of Rath and Jhansi area from each sampling site is within permissible limit according to WHO and ISI standard.

ASSESSMENT OF BARLEY VARIETY UNDER RAINFED MICRO-FARMING SITUATIONS OF AZAMGARH DISTRICT

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Abstract

Adoption of faulty practices by majority of farmers in eastern U.P. under rice-wheat cropping system has resulted in deterioration of soil health and environmental pollutions with hampering food security by producing lower grain yield. However, nutritional security is an important issue in today's context and barley can play pivotal role in ensuring livelihood, food & nutritional security for ever increasing population of the country. Krishi Vigyan Kendra, Kotwa, Azamgarh (U.P.) has planned OFT to test 2 different varieties of barley recommended for Uttar Pradesh that implemented in 0.2 hectare area at 05 progressive farmers' field during *rabi* 2018-19. In general, the soils under study were sandy loam to sandy clay loam in texture with neutral in reaction (6.8 to 8.0 pH). The barley variety DWRB-137, PL426 and old variety (Farmer's practice) was sown in line from mid to end of November. The yield of barley fluctuated in On Farm Trial plots. The maximum yield was reported 36.70 q/ha in DWRB-137 variety and minimum yield was reported 28.30 q/ha in local variety. Findings are clearly indicated that variety DWRB-137 showed its superiority and recorded maximum yield with 30 percent increase over remaining varieties. It also indicates that farmer's income can be double only by adoption of scientific practices as per their need and situations of crop from seeding to harvesting.

PRODUCTION AND MARKETING OF GROUNDNUT IN SURGUJA DISTRICT OF CHHATTISGARH-AN ECONOMIC ANALYSIS

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Abstract

Groundnut (*Arachis hypogaea* L.) is one of the most important oilseed crop in India. It accounts for 25.25 percent area and 32.35 percent production of total oilseed in the country. This crop is a good source of all B group vitamins except B12. In the Chhattisgarh state groundnuts area was 25.61 thousand ha. production is 37.3 metric tones and productivity is 1456 kg/ha. (20013-14). Chhattisgarh state contributes 0.53 percent area and 0.74 percent production and 1379.4 kg/ha. Chhattisgarh state consists of 27 districts. Out of which Surguja district contributes 10.81 percent in area and 9.97 percent production of groundnut. The growth rate of the area, production, and productivity of Chhattisgarh and Surguja district is worked out by using exponential analysis. To calculate the cost of cultivation, marketable surplus, disposal pattern, and marketing cost of groundnut crop. The findings of this study revealed that the average percent of illiteracy was observed in 56.74 percent. The per farm total cultivated area is observed to be 0.71 hectares, 1.82 hectares, 4.34 hectares and at small, medium and large farms, respectively along with 1.89 hectares as an overall sample average. The cropping intensity is calculated 132.36 percent, 146.70 percent and 188.71 percent at small, medium and large farms, respectively. The compound growth rate of this crop in the case of the area is estimated as -4.23 percent and -8.59 percent in the Chhattisgarh state and Surguja district respectively of the total period of 10 years. The compound growth rate for the production (-7.26) and productivity (1.64) is decreased in this district only for the period under study. The Surguja district highest productivity of this crop is estimated 1259 kg and 1343 kg per hectares during the year 2011-13. The sample average cost of cultivation is worked out as Rs. 29673.10 per hectare. The per quintal cost of production varied from is Rs. 1900.45 at large farms, Rs. 2014.39 at medium farms, Rs. 2191.26 at small farms. The sample average yield of groundnut is observed as 14.38 quintal in the study. The marketable surplus of groundnut is observed as 7.87 quintals, 21.15 quintal and 59.49 quintal per farm at small, medium and large farms respectively. Major constraints pertaining to the cultivation of groundnut were lack of resources facilities is generally faced by small category farmers. Lack of implementation of support prices in the villages is the major problem faced by groundnut producers.



RESIDUE MANAGEMENT TECHNOLOGIES FOR CROPS UNDER CHHATTISGARH REGION

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Abstract

Indian agriculture produces about 500-550 million tones of crop residues annually, where cereals and fiber crops contribute 58% and 23% crop residue respectively. Sugarcane, pulses, oilseeds and other crops contribute to the remaining 19 % crop residue. However, a large portion of these crop residues about 90-140 million tonnes annually, is burnt on-farm primarily to clear the fields to facilitate planting of succeeding crops, (NASS, 2012). These crop residues are used as animal feed, soil mulch, manure, thatching for rural homes and fuel for domestic and industrial purposes and thus are of tremendous value to farmers. Burning of agricultural biomass residue, or Crop Residue Burning has been identified as a major health hazard from old days. In addition to causing exposure to extremely high levels of Particulate Matter concentration to people in the immediate vicinity, it is also a major regional source of pollution, contributing between 12 and 60 per cent of PM concentrations as per various source apportionment studies. In addition, it causes loss of vital components such as nitrogen, phosphorus, sulphur and potassium from the topsoil layer, making the land less fertile and unviable for agriculture in the long run. So residue management technologies should have to be introduced for mechanization of farms as well as for prevention of environmental problems and also for healthy environment. By doing this crop residue can be used for beneficial use in low cost and waste can will be use, health problem will be solved, pollution will be control.

EFFECT OF INDOLE 3-BUTYRIC ACID (IBA) ROOTING MEDIA AND THEIR INTERACTION ON ROOT AND GROWTH CHARACTERISTICS OF DRAGON FRUIT (*HYLOCEREUS UNDATUS* HAWORTH)

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Abstract

The present research article was focused on the effect of different concentration of IBA viz., 500, 1000, 1500 ppm, of different rooting media such as soil, sand, soil + sand, soil + cocopeat, sand + cocopeat, soil + sand + cocopeat and the interaction of these media with the combination of rooting characteristics of dragon fruit. The result revealed that the exogenous application of IBA 1500 ppm with media combination of soil + sand + cocopeat (I₃M₆) significantly increased the root characters *i.e.* length of longest roots 31.17 cm and rooting percentage about 89.20. Whereas, growth characters *i.e.* days taken for initiation of sprouts was 17.17 days, survival percentage was 87, sprout length was 16.27, 25.10 and 34.43 cm respectively. The number of sprouts per cuttings was 2.70, 3.20 and 3.97 at 30, 60 and 90 DAP, respectively, over the controlled treatments.

MUSHROOM PRODUCTION : A CASE OF NUTRITIONAL AND LIVELIHOOD SECURITY IN RURAL INDIA

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Abstract

Current era is characterized by greater awareness about quality and, with the demand for the readymade or ready-to-make food products. Value can be added to the mushrooms at the various levels and to varied extent, right from grading to the readymade snacks or the main-course item. Real value-added product in the Indian market is the mushroom soup powder. Technologies for production of some other products like mushroom based biscuits, nuggets, preserve, noodles, papas, candies and readymade mushroom curry in retort pouches have been developed but are yet to be popularized. Mushroom soup - Soups are commonly used as appetizers. Experiments were conducted to prepare good quality ready-to-make mushroom soup powder using quality mushroom powder produced from the button mushroom and oyster mushroom dried in the dehumidifying air cabinet-drier. Mushroom biscuit-Very delicious and crunchy mushroom biscuits were prepared at NRCM, Sloan using



mushroom powder (both button and oyster) and ingredients viz., maida, sugar, oil, baking powder, ammonium bicarbonate, salt, vanilla, milk powder and glucose. Ammonium carbonate is an aerating agent and it has the advantage that it leaves no residue. Mushroom ketchup is highly viscous in nature. They also contain more of sugar and less of acid. Ararat (0.2 per cent), acetic acid (1.5 per cent) and other ingredients are mixed in the paste and cooked to bring its TSS to 350 Brix. Then the ketchup is filled in the sterilized bottles or jars. Mushroom chips - The freshly harvested Mushroom are washed, sliced (2 mm) and blanched in 2 per cent brine solution. The mushrooms are dipped overnight in a solution of 0.1 % of citric acid + 1.5 % of NaCl + 0.3 % of red chilli powder. After draining off the solution, the mushrooms are subjected to drying in cabinet dryer at 600 C for 8 h. and sealed after proper labelling

EFFECT OF SOWING AND IRRIGATION METHODS ON GROWTH, YIELD AND WATER PRODUCTIVITY OF CHICKPEA IN ALLUVIAL SOIL OF MADHYA PRADESH

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Abstract

Chickpea (*Cicer arietinum* L.) is the important pulse crop of India. It grown in more than 50 countries and India ranked first in order. Water is one of the most valuable resources for the survival and civilization. Assured supply of irrigation water is necessary for sustainable agriculture. However, farmers are using water irrationally. Lack of awareness among the farmers about the consequences of irrational use of water and lack of appropriate tools and instruments for regulated and uniform application of the desired quantity of water at the appropriate time are among the major causes of low water-use efficiency at the field level. This has ultimately led to a decline of the water resources. Farmers' practices need to be critically observed and modified taking into view the perceptions, concerns and constraints of the farmers in adopting better irrigation methods. A field experiment was conducted during *rabi* season of 2016 – 17 at Morena. The treatments were S₁–Broad bed and furrow sowing (BBF), S₂–Permanent broad bed and furrow sowing (PBBS), S₃– Conventional sowing (CS), S₄–Ridge furrow sowing (RFS) and S₅–Permanent ridge furrow sowing (PRFS) in main plot as method of sowing and I₀–Rainfed I₁–Irrigation in all furrow I₂– Irrigation in alternate skip furrow I₃–Irrigation in permanent skip furrow in sub plot as method of irrigation with total twenty treatments. The experiment was laid out in split plot design with three replications. Yield and yield attributing characters as well as water use efficiency have been significantly influenced by different treatments. The maximum plant height (50.85 cm), branches/plant (5.9), pods/plant (50.64), grain yield (2695 kg/ha), straw yield (3970 kg/ha) and water use efficiency (17.57 kg/ha/mm) were achieved under permanent broad bed and furrow method of sowing. The next effective sowing method was found broad bed and furrow method. However, lowest value of all the growth and yield attributes were noted under conventional sowing. The irrigation methods also significantly increased the growth and yield parameters, grain and straw yield of chick pea. The highest plant height (55.56 cm), branches/plant (5.7), pods/plant (51.01), 1000 grain weight (271.63 g), grain yield (2694 kg/ha) and straw yield (4189 kg/ha) were registered under irrigation in all furrow, which was found significant superior over remaining methods of irrigation. The lowest values of all the growth and yield contributing characters, grain and straw yield were recorded in I₀ (rainfed) treatment.

DEVELOPMENT OF SUSTAINABLE AGRICULTURE AND INTEGRATED FARMING SYSTEMS IN INDIA

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Abstract

Sustainable Agriculture system is one that can indefinitely meet demands for food & fibre at socially acceptable, economic and environment cost. Farming Techniques is most important for sustainable agriculture, sustainable food production productivity and in India. Sustainability and food security are the major challenges faced by the world countries for the past several decades. Most of the third world countries are also facing problems of climate change, increasing population, overexploitation of natural resources and resource degradation associated with rapid economic growth. This analysis points emerging issues such as environmental degradation, loss of ecosystem services, non sustainability and threats to food security in the context of



global population growth and climate change. Hence there is an urgent need for identifying potential alternative farming techniques to achieve long term sustainability and food security as indicated by several leading workers in the field. The alternative farming strategies that were field tested & perfected over several generations in the past portrayed the following advantages over present day chemical farming are as follows: (i) Eco friendly by protecting and reviving life support systems and ecosystem services. (ii) Higher Benefit cost ratio, benefiting the farmers as well as the consumers. (iii) Reduction in air, water and soil pollution caused by various pesticides and other chemicals. (iv) Control and Reduction of Bioaccumulation and Biomagnification. (v) Control of health hazards in humans and livestock. (vi) Conservation and sustainable use of on farm natural resources in agroecosystems. Alternative farming techniques-Biodynamic farming-Eco farming LEISA-Integrated farming systems Organic farming-Permaculture-Polyculture-Urban and Peri-Urban farming-Zero budget natural farming.

GROWTH AND DEVELOPMENT OF RICE AS INFLUENCED BY WEED CONTROL PRACTICES IN ORGANIC PRODUCTION SYSTEM WITH ECONOMICS

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Abstract

A field experiment on evaluation of weed management practices in scented rice under organic production system was conducted during 2017-18 at All India Coordinated Research Project on Farming System, College of Agriculture, Rewa (M.P.). The experiment design was Randomized Block Design with three replication with seven treatment, growth and development of rice was better in incorporation of mustard oil cake 15 days before sowing @ 5t/ha + 1 hand weeding followed by two hand weeding 20 and 40 days after transplanting and locally available weed mulch + 1 hand pulling. These treatments gave 33.87% to 56.46% higher grain yield as compared to indigenous technical knowledge treatment on weed control practices by farmers as mulching with leaf of mango. Net profit Rs. 62061/ha was maximum in locally available weed mulch + 1 hand pulling followed by Rs. 56695/ha in two hand weeding 20 and 40 days after transplanting. While treatment incorporation of mustard oil cake 15 days before sowing @ 5t/ha + 1 hand weeding was found uneconomical as compared to indigenous technical knowledge treatment on weed control practices by farmers as mulching with leaf of mango in which net profit was reduced by 85.81% as compared to indigenous technical knowledge treatment on weed control practices by farmers as mulching with leaf of mango.

EFFECT OF SEASON AND SCION PRECURING ON SOFTWOOD GRAFTING IN SAPOTA (MANILKARA ACHRAS MILL.)

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Abstract

The experiment entitled “Effect of season and scion precuring on softwood grafting in sapota (*Manilkara achras*, Mill.)” was carried out during 2016-17 at the Horticultural Research Station, Orissa University of Agriculture and Technology, Bhubaneswar. The experiment was laid out in Factorial Randomized Block Design with 12 treatments and 3 replications. The treatments consisted of 2 factors, namely, 4 levels of season and 3 levels of scion precuring. Among different seasons grafting during the month of July followed by August recorded minimum number of days required for first bud sprouting and maximum values in characters like percentage of initial graft success, percentage of final graft success, number of bud sprouts, length of new scion growth, growth in length of rootstock, incremental diameter of scion, number of leaves per graft, length, breadth and area of the largest leaf. Factors like favourable temperature, humidity etc. at the time of grafting and longer duration of favourable conditions of growth may be the contributing factors for such results. Among the precuring durations of scion wood studied, leaves defoliated ten days before softwood grafting recorded minimum number of days taken for first bud sprouting, maximum values of characters such as percentage of initial graft success, percentage of final graft success, number of bud sprouts, length of new scion growth, incremental diameter of scion, number of leaves per graft, length, breadth and area of the largest leaf, which were significantly superior to non precured scions. The main reasons for such results could be



accumulation of carbohydrates, high cambial activity and swelling of buds in the scions defoliated 10 days before grafting. However, characters like incremental length and diameter of rootstock did not seem to be affected significantly by different precuring periods of scion. The interaction between grafting season and scion precuring revealed that grafting on 20th July along with 10 days precured scion sticks recorded minimum number of days for first bud sprouting, maximum values of character such as percentage of initial graft success, percentage of final graft success, length of new scion growth, number of leaves per graft, length, breadth and area of largest leaf which were significantly superior as compared to other treatment combinations.

STUDIES ON PRODUCTION AND REPRODUCTION TRAITS OF SAHIWAL CATTLE

Shive Kumar, B.N. Shahi, R.K. Sharma, S.K. Singh, Shiwanshu Tiwari, Anil Kumar and Brijesh Singh

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Abstract

The indigenous breeds have been evolved through natural selection over the years and they are also known for their special characteristics like disease resistance, adaptability to harsh climatic conditions and ability to sustain on poor quality roughages. Among 43 recognized breeds of indigenous cattle, Sahiwal is a prominent breed of milch group having its breeding tract in Pakistan. The number of animals of this breed in India have dwindled very sharply in last 3-4 decades with some animals on few institutional herds (about 2000 Numbers) and some private breeders in small numbers. However, the breed has sizeable number of animals in the neighboring country, Pakistan where it contributes tremendously in the national milk pool. In order to increase its population and bring about genetic improvement in milk production of local population of Sahiwal, ICAR included Pantnagar as one of the Data Recording Unit (DRU) under All India Coordinated Research Project on Cattle-Sahiwal (DRU) in 2009. Semen of proven bulls from Progeny tested sires of superior genetic merit provided by CIRC (ICAR), Meerut/ NDRI, Karnal is being used to inseminate females of university farm and nearby area. The performance record of Sahiwal cattle maintained at Instructional Dairy Farm at Pantnagar University and local population under the project pertaining from 2014-18 were utilized to estimate means of economically important traits. It was found that the overall average age of first calving, first lactation milk yield, first lactation length, first peak yield, first dry period, first service period, first calving interval, wet average and herd average were 1206.11±10.46 days, 1863.45±138.02kg, 263.37±12.90 days, 11.14±0.62 kg, 154.78±3.07 days, 150.27±4.25 days, 421.06±3.5 days, 6.81±0.55 kg and 4.26±0.23 kg, respectively.

PROBLEMS AND POSSIBILITIES OF LIVESTOCK—ENVIRONMENT INTERACTION

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Abstract

Like any other being on this earth, livestock too have their environment with which they are supposed to be in synergy. This two-way action or reciprocity between livestock and the environment in which they live can be termed as 'Livestock-Environment Interaction'. This interaction can further be categorized into three. When livestock environment are posing each other with detrimental effects then it is termed as 'Undesirable livestock- environment interaction'. Similarly, when they stance neutral effects on each other then the situation is termed as desirable and when there are beneficial effects between these two components then it is called as 'Green or Best Livestock-Environment Interaction'. There have been various reports floating around about the undesirable livestock-environment interaction. Livestock today has become one of the major stressor on environment as they occupy a quarter of land, uses eight per cent of world's water resources and is fifth highest contributor of anthropogenic greenhouse gas emissions. On the other hand, with changing climatic conditions livestock are facing adversities like decline in feed intake, depressed milk production, high mortality among the new born calves, reduced fertility among cattle and buffalo, sunburns, skin cancer and other photosensitive disorder. A balance between these two important components can be made possible by using and propagating different adaptive and mitigating strategies in all the four aspects of livestock rearing i.e breeding, feeding, healthcare and management. Strengthening our indigenous livestock breeds, feed manipulation according to set standards, proper waste management practices are few of them.



EVALUATION OF THE PERFORMANCE OF PROMISING GENOTYPES IN MUSTARD

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Abstract

Multilocation varietal trial was conducted at All India Coordinated Research Project on Mustard, college of Agriculture, Nagpur. Thirteen different genotypes were evaluated at different six locations viz., Nagpur, Akola, Amaravati, Ekarjuna, Sindewahi, and Washim. At Nagpur five genotypes were significantly superior over all checks in which in which genotype ACN – 141 recorded highest seed yield of 1855 kg/ha followed by ACN – 114 recorded 1684 kg/ha. Similar results were found at Amaravati and Ekarjuna. At Akola the genotype ACN – 141 (1703 kg/ha) rank first for seed yield whereas CAN-114 (1632 kg/ha) ranked second for seed yield which were only genotypes significantly superior over best check Bio-902. At Washim the genotype CAN-141 recorded highest seed yield of (1095 kg/ha) followed by CAN-184 (1012 kg /ha). In Sindewahi none of the genotypes were significantly superior over best check. On an average over six locations CAN-141 (1379 kg/ha) ranked first followed by ACN-114 (1252 kg/ha). These genotypes may be either used for development of variety or in crossing programme for isolating the desirable segregants after two to three years multilocations testing.

GENOME EDITING TOOLS FOR CROP IMPROVEMENT

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Abstract

In the current scenario, the most critical challenge faced by the human race is to provide food security for a growing population. By 2050, the human population will reach 10 billion and to feed the world, global food production needs to increase by 60–100%. Besides the growing population rate, extreme weather, reduced agricultural land availability, increasing biotic and abiotic stresses are significant constraints for farming and food production. Development of technologies that can contribute to crop improvement can increase production to some extent. Pre-genomic breeding programs have led to the development of stress-tolerant and high-yielding crop varieties. Breeding programs of the past century have relied on natural and mutant-induced genetic variations to select for favorable genetic combinations. The traditional breeding program that is conducted by mutagenesis using chemical compounds or irradiation, followed by screening for desired mutations, has several drawbacks. Therefore, transgenic breeding programs surfaced towards the end of the 20th century (1990) to overcome such problems. The 21st century is regarded as the post-genomic era and, the availability of genome sequence data for multiple crop plants has revolutionized plant breeding programs. Genomics is rapidly gaining importance in molecular breeding programs. Combinations of genomic tools with conventional breeding techniques have opened new doors in genome-based breeding programs. Further, a systems biology approach in combination with molecular markers, QTLs, eQTLs, lineage maps and sequence data has been very useful for the identification of agronomic traits. However, novel and desired agronomic traits need to be integrated into the appropriate crop plants in order to maximize benefits. The implementation of comprehensive synthetic biology tools, which are popularly known as “genome editing tools”, is required to carry out the task of integrating desired traits into crop genomes.

Genome editing is the process of making precise, targeted sequence changes in the deoxyribonucleic acid of living cells and organisms. Recent advances have made genome editing widely applicable, offering the opportunity to rapidly advance basic and applied biology. Until 2013, the dominant genome editing tools were zinc finger nucleases (ZFNs; Kim et al., 1996) and transcription activator-like effector nucleases (TALENs, Christian et al., 2010). Both are artificial fusion proteins comprising an engineered DNA-binding domain fused to the nonspecific nuclease domain of the restriction enzyme FokI, and they have been used successfully in many organisms including plants. The latest ground-breaking technology for genome editing is based on RNA-guided engineered nucleases, which already hold great promise due to their simplicity, efficiency and versatility. The most widely used system is the type II clustered regularly interspaced short palindromic repeat (CRISPR)/Cas9 (CRISPR-associated) system from *Streptococcus pyogenes*. Genome editing tools are becoming popular molecular tools of choice for functional genomics as well as crop improvement. Many examples exist currently where these editing systems are being harnessed for unprecedented understanding of plant biology and crop yield improvement through rapid and targeted



mutagenesis and associated breeding. Because of their several attractive features such as simplicity, efficiency, high specificity, and amenability to multiplexing, genome editing technologies described here are revolutionizing the way crop breeding is done and paving the way for the next generation breeding.

GLOBAL CLIMATE CHANGE : SCENARIO AND FOOD SECURITY

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Abstract

Climate change is, in theory, a perfect topic for global discussion. It is a growing global problem and concern, calling for concerted efforts by the developed as well as developing countries. The chief factor that is responsible for climate change is the “greenhouse effect”. The extra greenhouse gases (GHG) – India ranking 4th in GHG emission – which we have released – are responsible for the strongest threat namely the “global warming”. Global farming is projected to have far-reaching and intense impacts on conditions affecting agriculture, including temperature, carbon dioxide, glacial runoff, precipitation and the interaction of all these elements. Already the effects are visible, making many people especially those dependent on agriculture, vulnerable. Concerns about the impact of climate change on agriculture connected with environmental problems are among the major developmental issues in India today. The Gangotri glacier is already retreating at a rate of 30 meters a year. As increase in rainfall is stimulated over the eastern region of India but the north-western deserts may see a small decrease in the absolute amount of rainfall. Diseases for human, crops and animals are on the rise. There is risk of continuous fall in productivity and production. Climate change and vulnerability have physical, financial and ethical implications. As increasing emphasis on food security and its regional impacts has come to forefront of the scientific community. In recent times, the crop stimulation models have been used extensively to study the impact of climate change on agricultural production and food security. The output provided by the stimulation models can be used to make appropriate crop management decisions and to provide farmers and others with alternative options for their farming system. It is expected that in the coming decades with the increased use of computers, the use of stimulation models by the farmers and professionals as well as policy and decision makers will increase. In India, substantial work has been done in last decade aimed at understanding nature and magnitude of change in yield of different crops due to projected climate change. The impact of climate change on Indian agriculture and water resources are of great concern to the policy makers and development exerts. Agriculture, in India, to a greater extent is dependent on south – west monsoon. A large part of the net sown area is rainfed, thereby making the agricultural sector in India very sensitive to any change in the pattern of rainfall. Among various food grain crops produced in India, rice and wheat occupy a major share, and any discernible positive or negative change in rice and wheat yields may have a significant impact on food security of the country. The productivity levels of these crops in the coming decades will chiefly depend on changes with respect to sensitive weather parameters viz. temperature, rainfall and solar radiation. In view of the fact that about 65 per cent of the country’s population depends on agricultural sector for their livelihood and that the change in climate would have a direct bearing on the food production, an analysis into the changes, which would impact crop yields and subsequently lead to an instable food security situation, is essential. Since the change in climate has a bearing on food security of the nation, the magnitude of the change and its consequence will be a matter of concern for the scientists, planners and policy makers, especially in view of regulating the food supply and maintaining its reverses for the future.

SCREENING OF REPEAT BREEDING AND ANOESTROUS ANIMALS FOR FACTOR XI DEFICIENCY AND COMPLEX VERTEBRAL MALFORMATION

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Abstract

An experiment was conducted at Molecular and cytogenetic Investigation Laboratory of Bombay Veterinary college with the objective of to screen the animals having repeat breeding and anoestrous for Factor XI Deficiency (FXID) and Complex



Vertebral Malformation (CVM) genetic disorders. The total 100 animals blood samples were collected from Maharashtra state which are having normal body condition but still are repeat breeders and anoestrous. The Bovine FXID caused due to 76bp insertion of the poly adenine which caused formation of premature stop codon of FXI gene. The CVM is caused by substitution of guanine into thymine in SLC35A3 gene. These are the most important recessive hereditary disorders of Holstein Cattle which causes the high economic loss. The screening for FXID and CVM were done with the help of Polymerase Chain Reaction (PCR) and PCR-Restriction Fragment Length Polymorphism (RFLP) Molecular techniques respectively and results were analysed on 2% agarose gel electrophoresis. CVM PCR products were digested with *Pst*I restriction enzyme and results were checked on agarose gel electrophoresis. The studied samples were not having mutant allele for FXID and CVM. The animals of repeat breeding and anoestrous were free from FXID and CVM.

EFFECT OF SEED PRIMING ON VIGOUR INDEX-1 IN MARIGOLD SEEDS

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Abstract

Marigold is one of the important annual flowers grown for commercial purpose all over the world. Non availability of high quality marigold seeds is one of the major constraints in its cultivation. Priming of Marigold seeds plays a very important role in its germination and Vigour index, Hence a laboratory study was carried out to find out the influence of various priming treatments on standard germination and vigour index of French marigold seeds. This study was carried out on marigold seeds of four lines and nine treatments. Seeds treated with 0.5% KNO₃ exhibited significantly higher vigour index -1 (1381.30) than other priming treatments during 0 month storage. In 2, 4, 6, 8 and 10 months storage duration, significantly maximum vigour index -1 was observed in T₄ (1077.46, 843.75, 663.31, 425.72 and 202.14) respectively. Maximum vigour index-1 was recorded in G-4(1205.23) which was followed by G-1 (1041.29) and G-3 (938.48) during 0 month storage. In 2, 4, 6, 8 and 10 months storage duration, significantly maximum vigour index-1 was observed in G-4 (917.27, 755.37, 562.00, 373.73, 175.72) respectively. The highest vigour index-1 was observed in T₄ and G-4 interaction (1658.12) during 0 month storage. In 2, 4, 6, 8 and 10 months storage duration, significantly maximum vigour index-1 was observed in T₄ and G-4 interaction (1262.00, 1016.43, 813.93, 612.10, 301.83) respectively.

GERMPLASM CONSERVATION PREREQUISITE AND APPLICATION

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Abstract

Germplasm is the traditional memo which commands the progress of plants and animals. This biological evidence is passed from generation to generation in an uninterrupted chain of living cells. Unlike other resources, once cell life is lost, the germplasm is lost, therefore for all practical grits, it is stored only in living systems. For convenience germplasm resources can be collected into several levels of worth and management : Varieties and breeds in modern use, Obsolete cultivars and minor breeds, Primitive cultivar/landraces and folk breeds of indigenous agriculture, Wild and weedy/feral taxa and near relatives of useful animals and crops, Special genetic stocks which are the tools of breeders, Extraordinary co-adapted genetic stocks where two or more taxa have an associated correlation (pollinator, nodule forming bacteria, etc.) and Lastly organisms of no apparent immediate usefulness but which are part of the web of life. Germplasm of the last category is best held in natural systems or entire biomes. The remaining more immediately useful plants and animals once held in the now disappearing peasant agriculture are assembled *in situ* or more extensively *ex situ* in gene banks. The realized dangers of genetic erosion in plant genetic resources have prompted political and scientific movements around the world to conserve plant genetic resources over the last 50 yr. More than 7 million plant germplasm accessions are currently conserved in 1750 gene banks worldwide, and about two million accessions are estimated to be unique. The International Treaty on Plant Genetic Resources for Food



and Agriculture was established to conserve and utilize these plant genetic resources. However, long-term maintenance of such a large volume of diverse germplasm remains an interesting task. Many life-threatening issues disturbing gene bank sustainability have emerged. Of note are the exposure of gene banks and the risk of within-gene bank genetic loss through genetic drift and possible selection. Measures are explored with the hope to mitigate variable threats for gene bank sustainability and to secure food supply for humanity for generations to come. The problematic with the easier to manage *ex-situ* banking is that it withdraws seed and semen/ova from observation and evaluation. In my view gene banks are only banks if the fortunes are used, and depositories if their mission is preservation. Unfortunately, germplasm is being lost in some holding institutions and they have become, sadly, germplasm undertakers. If the expense and efficacy of storage are to be proven the breeders are going to have to do a meaningfully better job of evaluating the material held and making this information/material freely and universally available to all, both countrywide and internationally, for crop and animal improvement.

SOIL MICROBES FOR SUSTAINABLE AGRICULTURE

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Abstract

Soil is one of the most essential factors for crop yield and production. We cannot think about production without soil. Various microbes are present in soil which perform numerous metabolic functions and enhance soil fertility and help in recycling of nutrient. Several species such as *Pseudomonas*, *Azospirillum*, *Bacillus* and *Rizobium* have been isolated from the rhizosphere of crops and involve in many activities such as siderophore production, IAA (indole-3-acetic acid), ACC deaminase activity, nitrogen fixation and solubilization of nutrients (P, K, and Zn). The PGPR are more defined soil microbes for plant disease management through induced systemic resistance (ISR). PGPR are also recognized as potential microbes that can protect the plant from various environmental stresses in normal as well as stressed environment. In addition, beneficial soil microbes (BSM) can show tolerance towards adverse environmental conditions such as salt stress, drought stress, weed infestation, nutrient deficiency and heavy metal contamination. However, soil microbes gained much importance not only for their plant growth promoting attributes but also for role in decomposition of organic wastes, detoxification of toxic substances such as pesticides and alleviation of soil stresses.

FARMING TECHNIQUES FOR SUSTAINABLE FOOD PRODUCTION AND PRODUCTIVITY IN INDIA

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Abstract

Farming Techniques is most important for Sustainable Food Production and Productivity in India. Sustainability and food security are the major challenges faced by third world countries for the past several decades. Most of the third world countries are also facing problems of climate change, increasing population, overexploitation of natural resources and resource degradation associated with rapid economic growth. Among the scientific and policy circles there are controversies in using inorganic chemicals and biotechnology for sustaining the agricultural production. There is no critical comprehensive review on sustainability of alternative farming systems and their relative advantages over conventional, chemicalized and hi-tech agriculture for decision making at various levels. This review tries to fulfill the knowledge gap in this vital sector. The first part of the review discusses the current status of agroecosystems, with emphasis on their threats in terms of food security, long term sustainability, impacts on ecosystem services and climate change. We also evaluate the ecological, economic, social and cultural sustainability of inorganic agriculture. This analysis points emerging issues such as environmental degradation, loss of ecosystem services, non-sustainability and threats to food security in the context of global population growth and climate change. Hence there is an urgent need for identifying potential alternative farming strategies to achieve long term sustainability and food security as indicated by several leading workers in the field. For that we review potentials, constraints,



strategies and case studies for ten alternatives farming techniques and four innovative endogenous farming techniques from India. The alternative farming techniques that were field tested and perfected over several generations in the past portrayed the following advantages over chemical farming: (1) eco-friendly by protecting and revving life support systems and ecosystem services, (2) higher cost benefit ratio, benefiting the farmers as well as the consumers, (3) control and reduction of bioaccumulation and biomagnification, (4) reduction in air, water and soil pollution caused by various pesticides and other chemicals, (5) control of health hazards in humans and livestock, and (6) conservation and sustainable use of on-farm biodiversity, including traditional cultivated germplasm and natural resources in agrosystems. Alternative farming techniques-Bio dynamic farming-Ecofarming-HOMA-India-LEISA-Integrated farming systems-No tillage farming-Natural farming-Organic farming-Permaculture-Polyculture-Sustainability-Urban and Peri-Urban farming-Zero budget natural farming

EVALUATION DOLICHOS BEAN (BUSH) AT NORTHERN TRANSITIONAL ZONE OF KARNATAKA

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Abstract

Dolichos bean is one of the important legume vegetable crop mainly grown kitchen gardens for its protenicious pods. Seven entries collected from All India Coordinated Research Project on Vegetable crops, IIVR, Varanasi were evaluated for different traits in bush type Dolichos bean during the year 2018-19. Among the seven entries 2016/DOLBVAR-5 has shown higher plant height with (90.81cm) followed by 2016/DOLBVAR-6 (81.17cm). With respect to pod length 2016/DOLBVAR-4 shown higher value (12.05 cm) followed by 2016/DOLBVAR-5 (11.78 cm) and 2016/DOLBVAR -6 (11.72 cm) respectively. With respect to pod circumference 2016/DOLBVAR-3 has shown higher value with 5.26 cm followed by 2016/DOLBVAR-4 (4.74cm). for early maturity i.e. days the 1st pod harvest 2016/ DOLBVAR-4 with 59 days followed 2016/ DOLBVAR-2 (60 days) were as check Dharwad local matured first on (63 days) after sowing. Among the seven enters 2016/DOLBVAR-6 has shown higher average pod weight with 3.07 g followed by 2016/DOLBVAR- 4 and Dharwad local with 2.92 g for number of the pods/plants. Entry 2016/DOLBVAR-5 has shown higher with (65 fruit/plants) followed by 2016/ DOLBVAR-6 (57 fruit/plants). With respect to yield/plant, 2016/DOLBVAR-4 has shown higher yield with 256.74g/plant followed by 247.66 g/plant. With respect yield, 2016/DOLBVAR-5 has higher yield with 291.85 q/ha. Where as check variety Dharwad local has yielded 221.85 q/ha.

SUGARCANE SEEDPRODUCTION THROUGH THREE TIER SEED PROGRAMME SYSTEM FOR PLAINS OF UTTARAKHAND

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Abstract

Sugarcane is a vegetatively propagated crop. The genetic gains cane be translated to reality with seed replacement through cultivation of new improve released varieties. Farmer's saved seed are contributing 50 to 60 percent seeds in Uttarakhand for raising the sugarcane crop. This is not due to scarcity of resources but also because of use of age-old poor quality sugarcane seed material. It is due to mono-cultured with diseases and insects, causes low yield of crop. Uttarakhand has sugarcane in the district-Haridwar, Udham Singh Nagar, Nainital, and Dehradun having an area of 55700ha, 28656ha, 3333ha and 5249 ha respectively during 2018-19. The total area of 93.0 thousand hectare for sugarcane crop requires approximately 35.0 lakh quintals of certified seed to enhance productivity of cane and profitability of farmers. To meet the requirement of quality seed of foundation, 3.50 lakh quintals of certified seed and also for that certified seed we have required 35.0 thousand quintals of breeder seed of improved varieties which will be required for 100 percent of seed replacement in plains of Uttarakhand. In the above perception, Pantnagar seed production farm and Sugarcane Research Centre, Kashipur has signed breeder seed production with aim to cover sugarcane-growing area with improved varieties for high cane production and recovery of sugar through introduction of quality seed in Uttarakhand. The Pantnagar University has a well-equipped farm area of around 200 hectares particularly for sugarcane to produce nucleus seed and it is being supplied to sugarcane Research Centre,



Kashipurand KVKs, (Haridwar and Dhakrani). Under this programme, every year about 18,000 quintals breeder seed of improved varieties i.e., Co 0118, Co 0238, Co LK 94184, Co Pant 3220, Co Pant 5224, Co 98014 is being produced under technical guidance and supervision of University scientists in farm of University Research Farm as well as out stations. Further, these foundation seeds are supplied by research units for the production of certified seeds on selected farmer's fields. A three tier seed programme system was developed by University for production of healthy seed material and it consisted of three tier viz., production of breeder, foundation and certified seed which is finally distributed to sugarcane growers through cane development department of Uttarakhand. The nucleus/breeder seed are being subjected to MHAT at 54°C and 95-99 percent RH for two and half hours for quality seed production of disease free viz., smut, red rot, wilt mosaic grassy stunt and ratoon stunting disease. This seed multiplication chain increases sugarcane productivity by 22 to 27 percent. Nearly 18,000 quintals certified seed of these varieties were produced during 2017-18, 2018-19 by the Pantnagar University. The programme has been so successful in seven sugar mills zones of Uttarakhand and it is being replicated in KVK of Haridwar and Dhakrani. Government has expressed great interest to strengthen this programme with University.

AGROFORESTRY AND CARBON SEQUESTRATION

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Abstract

Agroforestry has emerged as a strong land use system which supporter crop diversification, cycling of organic matter, soil-water conservation and sequestration of CO₂ in plant and soil. Tree-crop combination provides and making land productive and rising revenue and it also creates green cover for carbon sequestration. By deliberately integrating trees with crop production system, agroforestry systems offer a promising avenue for carbon storage. Trees that provide multiple products and services, the proportion of total photosynthesis that is removed from the system is minimized, there by facilitating storage of more carbon in the agroforestry system as compared to monocropping systems. Carbon sequestration has been suggested as a means to help mitigate the increase in atmospheric carbon dioxide concentration. Agroforestry systems can better sequester carbon in soil and biomass and help to improve soil conditions. The soil organic carbon and net carbon sequestered were greater in the agroforestry system.

EVALUATION FOR VARIABILITY AND GENETIC DIVERSITY SPECTRUM IN INDIAN MUSTARD (BRASSICA JUNCEA L.)

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Abstract

In production of rapeseed-mustard India is the third largest producer after China and Canada. In our country, Indian mustard (*Brassica juncea* L.) has highest acreage and largest contribution in edible oil production among rapeseed-mustard crops. Furthermore, among oilseed crops Indian mustard contributes more than 90% in Indian economy. Assessment of variability and diversity in the germplasm for different yield contributing traits is very much needed to address ever expanding demand for edible oils in our country. Hence, the present investigation was designed to assess variability and diversity for seed yield and its attributing traits in Indian mustard. A total of 145 indigenous accessions of Indian mustard were evaluated in augment block design along with five checks (Kranti, NRCHB 101, CS 56, PM 26, NPJ-112). Checks were replicated in 05 blocks. Each block consisted of 29 genotypes along with five checks. The sowing was done in third week of October, 2018. Row to spacing was kept at 45 cm and plant to plant spacing was maintained at 10-15 cm after thinning out of plants at 15 DAS. Data were collected on five randomly selected plants for seed yield and its attributing traits. Seed yield/plant varied from 2.4-34g with a mean of 17.04g. Oil content was ranged from 34.61-42.26%. Highest CV was noticed for seed yield per plant (39.49%) followed by first basal branching (37.70%). Lowest CV was observed for oil content (4.02%) indicating less variability for the trait. The principal component analysis (PCA) was done to identify important variables contributing towards variations using PAST 3.0 software. In PCA first four components explained 93.91% of total variation. Based on usual Euclidean distance genotypes were grouped in six major clusters using DARwin 6.0 software. Based on the clustering genotypes can be selected for utilization in breeding programme.



ENTREPRENEURSHIP DEVELOPMENT OF LANDLESS AND MARGINAL FARMERS THROUGH TRAINING

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Abstract

An investigation was carried out by the KVK Junagadh during the year of 2016-17 about entrepreneurship development through training on backyard poultry for the landless and marginal farmers of Junagadh district of Gujarat. On the basis of study, it may be concluded that training on disease management of chicks is most important area where training is highly required (with 19 score) followed by improved breeding (with 18 score), feeding management and take care (with 15 score), feed preparation (11 score) and on fifth rank was marketing intelligence (with 09 score). The findings also showed that education, socio-economic status, scientific orientation, land holding, social participation and marketing intelligence having the positive correlation with amount of knowledge gained by participant. The knowledge gained during the three days training was calculated as 114%.

STUDY ON SOME PHENOTYPIC TRAITS OF POONCHI CHICKEN

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Abstract

Backyard poultry production has become very important in India due to increased demand of desi chicken meat and its egg in our society. Proper documentation of native population of chicken is important step in understanding the diversity of poultry in J&K. Poonchi Chicken is not yet considered as a distinct breed, so it is necessary to study the phenotypic traits scientifically. The present investigation was carried out on records of different phenotypic traits belonging to Poonchi chicken obtained directly from the farmer of Poonch and Rajouri district of Jammu & Kashmir. The percentage of plumage colour were found as black 34.3, brown 28.4, golden+brown/black 19.2 and white + black/brown 18.1. The percentage of different comb types among the individual under the study were single 71.67, pea 18.41 and rose/butter 9.92. There were two main comb colours which include red 97.6 and black 2.37 percentage. There were three different colour of shank found which were yellow 77.83, black 13.85 and brown 8.31. The percentage of different eye colour were as brown 43.32, yellow 28.61, black 16.58 and red 11.50. This study may provide the base line information for the phenotypic characterization of this population, so that it can further be defined as a distinct breed.

STEMPHYLLIUM BLIGHT : AN EMERGING THREAT FOR LENTIL CULTIVATION IN INDIA

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Abstract

Lentil is important grain legume grown in 1.56 million hectare with production of 1.56 million tons. The crop is mainly cultivated as rainfed in central and eastern India. The biotic stresses affect the lentil productivity. Average yields of lentil in Indian subcontinent are considered to be relatively low due to narrow genetic base and are vulnerable to a number of stresses. Among many yield limiting factors, the lack of resistance to stemphyllium blight (SB) disease is gaining importance. It is caused by *Stemphyllium botryosum* (Wallr.) which was a minor disease of lentil in south Asia and gradually this has become economically important disease causing up to 80% yield loss. Stemphyllium blight occurs in Bangladesh, Nepal and eastern India. Use of chemical control is not cost effective for resource poor farmers but host plant resistance is the most effective management strategy. Present study aims to decipher the reaction of 100 lentil germplasm at artificial screening and hot spot. Substantial variability was found among germplasm screened. Therefore, the lentil germplasm consisting of indigenous,



exotic accessions and improved cultivars representing Indian and Mediterranean accessions are evaluated for resistance to SB based on a 0 to 9 scale, where 0 = symptomless /immune and 9 = Highly susceptible for SB. Disease severity index ranged from 2.5 % to 86.75% in 2016-17; during 2017-18 it varied from 2.25% to 90.75%. Considerable variation was recorded in the cultivated lentil (*Lens culinaris* sps *culinaris*) comprised of Indian and Mediterranean origin germplasm, varieties and advance breeding lines. The unweighted neighbor-joining (UNJ) dendrogram constructed on the basis of genetic similarity matrix indicated diverse parents (LL 1122 and ILL 7663) these can be utilized for mapping population development. This is the one of the earliest reports of lentil germplasm with resistance to SB in India. Notably IPL 81 (Noori) variety from Indian Institute of Pulses Research (IIPR), Kanpur showed a consistently susceptible reaction with higher PSI values for two years.

PERFORMANANCE OF CARROT GENOTYPES AT NORTHERN TRANSITIONAL ZONE OF KARNATAKA

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Abstract

Carrot is one of the most important temperate vegetable crop, which is rich B-carotene. i.e vitamin A. study was conducted to evaluate the tropical varieties of carrot in northern transitional zone of Karnataka. Experiment was conduct at AICRP (vegetable crops) Regional horticulture Research and extension centre Dharwad (UHSB) in the year 2018. In this study, seven carrot genotypes were evaluated. Out of seven, six were collected from Indian institute of vegetable research, Varanasi. Among the seven entries, local check (Dharwad local) is short dratted, took least duration for maturity among all the entries evaluated with 76 days followed by 2016/CARTVAR (77 days). Average root length was highest in Dharwad local with 22.77cm. Harvest index is highest in the entry 2016/CARTVAR-7 with 48% followed by 2016/CARTVAR-5 (46.54%). Root yield was highest in 2016/CARTVAR-7 with 208.61q/ha followed by 2016/CARTVAR-5(203.76q/ha) where as Dharwad local has yielded 200q/ha.

ASSESSMENT OF EXISTING VALUE CHAIN FOR TURMERIC PRODUCE IN BASTAR PLATEAU OF CHHATTISGARH UNDER NRLM/SRLM PROJECT

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Abstract

Turmeric (*Curcuma longa*) (Family: Zingiberaceae) is used as condiment, dye, drug and cosmetic in addition to its use in religious ceremonies. India is a leading turmeric producer and exporter of turmeric in the world with the country produced of 12.29 lakh tonnes and an area of 2.34 lakh ha. (2013-14). Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra, Assam are some of the important states cultivating turmeric, of which, Andhra Pradesh alone occupies 38.0% of area and 58.5% of production. Though India is a leading producer of turmeric 90% of the total production consumed internally and rest 10% is exported. Total state production of Chhattisgarh is 1,07,106 MT; out of which Balrampur district has highest production of 12306 MT, followed by Surguja District 11044 MT. In Bastar District, turmeric is cultivated by tribal peoples of Bastanar District for self-consumption and they sales rarely in the market during marriage season, although the climate of Bastar district is suitable for the turmeric cultivation. So, Keeping in view the above facts, the current study was carried out in 2015-16 with support of NRLM/CGSRLM with the objective to identify the stage of value chain, where to intervene in ordered to run the business in sustainable way. The villages Sargiguda, Pirmitta, Lalaguda & Turangur of CDB Bastanar; Koyenar, Sedwa of CDB Darbha and Bade Chakwa, Birgali of CDB Lohandiguda of Bastar district were selected purposively to collect the primary data & Deptt. of Agri., Deptt. of Horti., District Business and Industries Centre, Chamber of Commerce and Industries and Agriculture Produce Marketing Committee (APMC), etc. Jagdalpur, Bastar were contacted to collect the secondary data for the present study. Further, it is revealed from the study that the max. Farmers were produced the turmeric traditionally with no use of chemical fertilizers and no change of seed materials. They were obtained average yield of 3.20 tha⁻¹ (raw fingers) which is very low with context to world wide demand of market. The average production cost is Rs.34580/- ha⁻¹. In Bastar, total production is consumed in local market. The farmers were



selling their turmeric produce in the local existing daily and weekly markets with the price of Rs. 20-25/- per Kg as raw fingers, then the produce sold to local traders on the price of Rs. 30-40/- per Kg. The local traders bear the approximately 40 per cent loss of drying and sold it to the consumers on Rs. 60-70/- kg⁻¹ as a dry finger and turmeric powder on Rs. 200-240/- kg⁻¹. The price of the processed turmeric finger and turmeric powder is stable since last three years in Jagdalpur market. The current study revealed that Farmers can be promoted for the commercial scale of production through advance turmeric plantation & establishment of advance processing units for drying, polishing, pulverisation and oil extraction; collective trading of turmeric produce to ensure the market & price and to minimize the risk and high price of market. The study was limited to NRLM/SRLM project implementation area.

EVALUATING THE EFFICIENCY ON GROWTH AND YIELD OF OYSTER MUSHROOM ON DIFFERENT SUBSTRATE

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Abstract

Mushroom cultivation is reported as an economically viable bio-technology process for conversion of various agricultural wastes. This study was conducted with the aim to assess the suitability of selected substrates for oyster mushroom cultivation. Accordingly, five substrates (rice straw, wheat straw, chickpea waste, papaya leaves and banana leaves) were tested for their efficacy in oyster mushroom production. Pure culture of oyster mushroom was obtained from Mushroom laboratory, Department of Plant Pathology, Indira Gandhi Agriculture University, Raipur. The pure culture was inoculated on potato dextrose agar for spawn preparation. Then, the spawn containing wheat was inoculated with the fungal culture for the formation of fruiting bodies on the agricultural wastes. The oyster mushroom cultivation was undertaken under aseptic conditions, and the growth and development of mushroom were monitored daily. Results of the study revealed that oyster mushroom can grow on all the substrate with varying growth performances. The highest biological and economic yield, as well as the highest percentage of biological efficiency of oyster mushroom was obtained from rice straw followed by wheat straw, while the least was from papaya leaves. The study recommends rice straw, followed by wheat straw as suitable substrates for the cultivation of oyster mushroom. It also suggests that there is a need for further investigation on various aspects of oyster mushroom cultivation in Chhattisgarh to promote the industry.

STUDIES ON HAEMATOLOGICAL VARIATIONS IN CATTLE NATURALLY INFECTED WITH BOVINE TROPICAL THEILERIOSIS

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Abstract

Bovine Tropical Theileriosis (BTT) caused by *Theileria annulata* is a tick borne disease affecting dairy animals in India. It causes huge economic losses in terms of reduction in milk production, poor growth rate, reduced milk quality and even mortality. Therefore, haematological changes of the disease were studied in cattle and buffaloes. A total of 10 cross bred cattle naturally infected with *Theileria annulata* infection were selected nearby Pantnagar of district Udham Singh Nagar, Uttarakhand to study the variations in haematological parameters. Haematological examination revealed a significant ($P < 0.05$) decrease in haemoglobin concentration (6.28 ± 0.42 g%), packed cell volume (19.14 ± 1.20 %), total erythrocytic count ($3.98 \pm 0.21 \times 10^6/\mu\text{l}$) and increase in TLC ($9.31 \pm 0.37 \times 10^3/\mu\text{l}$) in infected animals. However, the same in uninfected group were reduced to be 10.29 ± 0.38 g%, 31.19 ± 1.09 %, $6.02 \pm 0.19 \times 10^6/\mu\text{l}$ and $8.37 \pm 0.24 \times 10^3/\mu\text{l}$, respectively. Significant ($P < 0.05$) lymphopenia (51.90 ± 4.30 %) and neutrophilia (36.00 ± 4.89 %) were observed in infected cattle. However, differential leucocytes count revealed 60.90 ± 1.52 % lymphocytes and 34.80 ± 1.58 % neutrophils in control animals. The increase in monocytes (5.50 ± 1.00 %) and eosinophils (6.60 ± 2.50 %) were observed in infected cattle as compared to uninfected control {monocytes (1.80 ± 0.40 %) and eosinophils (2.50 ± 0.57 %)}. A decrease in MCV (48.04 ± 1.81 fl) and MCH (15.73 ± 0.54 pg) were observed in infected group as compared to control (MCV- 51.81 ± 0.77 fl and MCH 17.08 ± 0.26 pg) which



revealed microcytic RBC's and low average quantity of haemoglobin present in single erythrocyte, respectively. However, no change was observed in MCHC (32.78 ± 0.37 g%) in infected group. The results of the present study will be helpful in early diagnosis of BTT and initiate therapeutic management for better outcome of the disease.

STUDIES ON WEED CONTROL IN KODOMILLET

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PC Unit, ICAR-AICRP on Small Millets, UAS, Bangalore-65

Abstract

A field experiment was conducted in Kodo millet during *Kharif* 2018-19 at PC Unit, ICAR-AICRP on Small Millets, UAS, Bangalore. The experiment was designed in RCBD with three replications involving eleven treatments. Treatments comprising pre emergence application of two concentrations of Oxadiargyl 80WP @ 150 & 200g a.i./ha, two concentrations Bensulfuronethyl 0.6G + Pretilachlor 6.0G @ 0.165 & 0.33kg a.i./ha, Butachlor 50EC @ 750g a.i./ha, post emergence application (15-20 DAS) of two concentrations of Bispyribac sodium 10SC @ 10 & 15g a.i./ha, two concentrations of Ethoxysulfuron 15WG @ 12 & 15g a.i./ha, standard practice of two intercultural & one hand weeding and a weedy check. Application of post emergence weedicide Ethoxysulfuron 15WG @ 12g a.i./ha has resulted in higher yield, economics, lesser weed density with higher WCE(%) followed by a pre emergence application of Butachlor 50EC @ 750g a.i./ha.

GENETIC VARIABILITY STUDIES FOR PREHARVEST SPROUTING TOLERANCE, YIELD AND YIELD COMPONENT CHARACTERS IN RICE GENOTYPES (*ORYZA SATIVA L.*)

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Abstract

The present investigation was carried out at ICAR-Indian Institute of Rice Research and PJTSAU, Hyderabad during *kharif*, 2013 to determine the various parameters of genetic variability in 74 rice genotypes for preharvest sprouting tolerance, yield and yield component characters. Analysis of variance showed significant differences for all the 12 characters studied, suggesting the presence of high amount of variation. Relative magnitude of phenotypic coefficients of variation (PCV) was higher than genotypic coefficients of variation (GCV) for all the characters under study indicating environmental influence on the traits. High estimates of PCV and GCV were recorded for days to preharvest sprouting, grain yield per plant, number of filled grains per panicle and number of unfilled grains per panicle. Moderate estimates of PCV and GCV were recorded for plant height, number of tillers per plant, number of productive tillers per plant and test weight. This provides considerable variability and offers scope for genetic improvement through selection. High heritability coupled with high genetic advance as per cent of F1 mean was found for days to preharvest sprouting, grain yield per plant, test weight, number of filled grains per panicle, number of unfilled grains per panicle, number of tillers per plant, number of productive tillers per plant, plant height and days to 50 percent flowering indicating careful selection leads to improvement of traits. Thus provides better opportunities for selecting plant material for these traits in rice breeding program.

PREVALENCE OF BRUCELLOSIS IN DAIRY CATTLE HERDS IN AND AROUND MATHURA, UTTAR PRADESH

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Abstract

Brucellosis is an endemic disease in many parts of the world, causing considerable economic losses in the livestock sector. In addition, Brucellosis is a zoonotic disease transmitted from infected animals by direct contact with blood, fetuses and fetal membranes, uterine secretions, and aborted material or through consumption of infected, raw animal products, of which milk



and milk products are the most important. The disease is a serious problem, particularly in developing countries like India where control and eradication has not been achieved due to lack of awareness and/or inefficient control policies. The core requirement for a successful control program is the continuing collection of disease data from different parts of the country. Among the various serological methods used, milk ring test is the easiest and practical method based on noninvasive sampling, for locating infected dairy animals and surveillance of brucellosis-free herds. Keeping this in view, the present study was conducted to assess the status of the disease at herd level in Vrindavan and Mathura region of Uttar Pradesh, India. For the investigation, 50, 36, 45, 17 and 12 milk samples (N=160) were collected from four major gaushalas of Vrindavan and one gaushala from Mathura. The milk samples were collected aseptically and transported to laboratory on ice for performing the milk ring test following standard protocol. Out of the five herds under screening for presence of anti-brucella antibodies, three were found positive with 8 out of 50, 3 out of 45 and 2 out of 36 samples positive in milk ring test. In conclusion, the findings suggest the presence of the anti-brucella antibodies in the milk samples of dairy herds under investigation and indicate the need for confirmation of each animal for the presence of disease to controlling the spread to other animals and humans as well.

ASSESSMENT OF *MYCOBACTERIUM SPS* SHEDDER IN DAIRY CATTLE HERDS

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Abstract

Infection from *Mycobacterium* sps has variety of clinical presentations in both humans and animals. *Mycobacterium tuberculosis* (MTB) is the most notorious species causing tuberculosis. Also, MTB infections overshadow most the other mycobacterium species known as 'atypical mycobacteria' including *Mycobacterium avium* complex, *Mycobacterium fortuitum* complex, *Mycobacterium kansasii*. Atypical mycobacteria have caused several types of infections including lung abscess, pneumonia, lymphadenitis, skin and soft tissue infection, meningitis and osteomyelitis. Mycobacterial diseases with zoonotic potential, plays a role establishing a considerable impact in maintaining the health of nation in terms of healthy human and animal resource. Complete eradication requires a comprehensive approach from both human and animal health sector and the core requirement for a successful control program is the ongoing collection of disease data from all round the country. Milk is a major source for large scale spread of tuberculosis and to a considerable extent for paratuberculosis to humans. Keeping this in view, for the initial screening of herds, we investigated the shedding of acid fast bacilli (AFB) in milk by microscopic examination of 40, 36, 45, 17 and 12 milk samples (N=150) collected randomly from the milch animals from the dairy herds of five major gaushalas of Vrindavan and Mathura region of Uttar Pradesh, India. Total 5 ml milk was collected aseptically from four quarters of each animal following standard procedure. Collected milk samples were transported on ice to laboratory and centrifuged at 5000 rpm for 5 minutes. The pellet and fat was collected and re-suspended in 2 ml of PBS, of which, 20µl was used to prepare smear on microscopic glass slide and subjected to acid fast staining. Microscopic examination reveals presence of acid fast bacilli in 18 samples from four herds. The samples showing AFB were 9 out of 36, 0 out of 45, 3 out of 17, 1 out of 12 and 5 out of 15 milk samples. In conclusion, the presence of the AFB in the milk being used for feeding calves and human consumption is alarming for both animal and public health and requires further confirmation on large scale to control the further spread to other animals and humans.

PHYLOGENETIC ANALYSIS OF 1D GENE (VP1 PROTEIN) OF FOOT AND MOUTH DISEASE VIRUS SEROTYPE A ISOLATES AND OTHER ISOLATES

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Abstract

FMD virus is a non-enveloped icosahedral virus belonging to genus Aphovirus, family Picornaviridae with a single stranded and positive sense RNA genome of 8.5 Kb. The present study was conducted to sequence the nucleotides of the capsid polypeptide coding gene 1D (VP1-encoding) gene of foot-and-mouth disease (FMD) serotype A virus isolates recovered from outbreak in India to study the molecular alterations associated with genetic diversity in the field isolates. Nucleotide sequences were aligned using Clustal W (DNASTAR) and refined in Clustal X. Phylogenetic and molecular evolutionary analyses were



conducted using Clustal W (DNASTAR). Sequences obtained from two isolates revealed more than 20% homology between them. Further alignment and phylogenetic analysis studies of UPI sequence with published sequences of other FMDV strains confirmed that it was more closer (29%) to FJ755013 and FJ755012 and revealed low level of homology (about 26%) with FJ617249 whereas alignment and phylogenetic analysis of Brl sequence with other published sequence of FMDV strains showed close relation (about 28%) to EF494504 and EF494506, and revealed low level of homology (23%) with AY333431. The alignment report indicated that most of the substitutions were at VP1 positions and these residues have been identified to be critical by neutralization-escape mutants of FMDV serotype A. The nucleotide sequence of the two isolates (UPI and Brl) of FMDV serotype A showed distant relation and a low level of homology to other published sequences of FMDV strains may be due to recombination, geographical differences, mutation and illegitimate recombination. The present study may help in knowing the distribution pattern of virus types in parts of Uttar Pradesh state, validation of quality diagnostics for precise serotyping of FMD virus, antigenic and genetic analysis and in understanding the molecular epidemiology of disease. Such continuous monitoring of the field strains can assist in selection of vaccine strain and evolving a proper control strategy for the disease in the future.

BILATERAL CORNEAL OPACITY IN CROSS BRED CALF CONGENITALLY INFECTED WITH *THEILERIA ANNULATA*

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Abstract

Bovine tropical theileriosis is a tick-borne, parasitic diseases of bovine caused by *Theileria annulata* and characterized by pyrexia and swelling of lymph nodes. The economic losses due to this disease in India has been estimated around 384.3 million US dollar annually. The diseases may be in peracute, acute, sub acute or chronic form mainly depends on the pathogenicity of the parasite and host susceptibility. The present case reports an unusual case of vertically transmitted *Theileria annulata* induced corneal opacity in a three day old Holstein Frisian cross breed cattle calf, which was calved in dairy located in periurban area of Meerut city. The case was presented with history of severe dejection, inappetance, pyrexia since last 3 days and blindness. Clinical examination revealed high temperature (104⁰F) and blindness associated with corneal opacity. Blood sample was collected for laboratory examination. Blood smear revealed the presence of several piroplasm organism and macroshizonts in erythrocytes and lymphocytes respectively. Case was efficiently and safely managed by using single deep Intramuscular injection of Buparvaquone at the rate of 2.5 mg/kg Body weight along with long acting oxytetracycline @ 20 mg/kg body weight every third day and supportive treatment like multivitamins. The combination was well tolerated by the calf with complete recovery with subsidence of corneal opacity within one week.

COMPARATIVE PERFORMANCE OF ANTIGENS FOR DEVELOPING ANTIBODY DETECTION PENSIDE LATERAL FLOW DEVICE FOR PARATUBERCULOSIS

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Abstract

Availability of point of care diagnostic devices will certainly boost the control of animal diseases. Last one decade has seen increased interest in developing penside point of care diagnostic devices for veterinary diseases. Paratuberculosis is an important disease of domestic ruminants leading to huge economic losses. Control is largely dependent on diagnosis followed by culling or segregation practices. Presently plate ELISA based antibody detection is largely used screening procedure. In the present we developed a lateral flow device for detection of antibodies against paratuberculosis bacilli. For developing an



antibody detection test antigen selection is the most important step. Antigen should be specific, highly immune-dominant and should be recognized in all stages of infection. We tested four antigens to coat the detection line of the lateral flow strip. These antigens included mix of five recombinant secretory proteins (RPs) of paratuberculosis bacilli (1693, 2168, 2677, 3547 and 4308), native purified protoplasmic antigen (nPPA) prepared from native strains of paratuberculosis bacilli, commercial purified protoplasmic antigen (cPPA) and cell surface antigens (CSA) extracted using ethanol from native strain. Performance of lateral flow kits prepared using different antigens was tested using reference positive (60) and negative (30) serum samples. In our findings mix of the RPs showed maximum sensitivity of detection (90%) followed by nPPA (70%), cPPA (51.6%) and CSA (26.6%). Negative sera were detected negative by all the antigens. These results are promising towards use of recombinant secretory proteins and further field validation can be initiated.

COMPARATIVE PRESENCE OF BOVINE TUBERCULOSIS AND PARATUBERCULOSIS IN RUMINANT POPULATION OF JAIPUR DISTRICT

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Abstract

Bovine tuberculosis and paratuberculosis are significant health problems of domestic ruminants across the globe. These diseases also have zoonotic implications. Therefore, control of these diseases is priority for governments. Hence, investigation of these infections in the herds will help in initiating and implementing control strategies. In the present study we investigated the presence of these infections in three farms in district Jaipur belonging to goat (90), sheep (114) and cattle (88) using Johnin and Tuberculin skin test. Goat farm was found negative for both infections. In the sheep flock, 8 (7.01%) and 60 (52.6%) were positive for bovine tuberculosis and paratuberculosis, respectively. Four sheep had dual infections. In the cattle farm, 10 (11.3%) and 10 (11.3%) were positive for bovine tuberculosis and paratuberculosis, respectively. Goat farm has no history of these diseases. These goats were maintained by day time grazing and evening concentrate. Goat farm was maintained in hygienic manner. Sheep flock had long history of paratuberculosis, however, first time infection of tuberculosis was reported. This flock had few cases of persistent diarrhea. Cattle farm was a community service shelter for let off cattle. Farm was hygienically maintained. However, farm was sheltering the let off animals thereby; it is difficult to restrict the introduction of diseases in this farm. These diseases were first time reported in this farm; however, related symptoms have been reported by animal handlers. Findings of the present report are alarming and therefore regular disease monitoring programs should be initiated.

ONSITE LOOP-MEDIATED ISOTHERMAL AMPLIFICATION ASSAY FOR THE VISUAL DETECTION OF JOHNE'S DISEASE IN FARM ANIMALS

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Abstract

Johne's disease causes chronic degenerative enteritis in farmed animals and is associated with persistent diarrhea and progressive weight loss leading to death. Rapid identification of JD infected animals is essential to control JD infection effectively. Therefore, this study aimed to optimize a diagnostic assay that is not only specific and sensitive but also a point of care diagnostic. A set of six specific primers was designed to target the sequences of the IS900 element of *Mycobacterium avium* subspecies *paratuberculosis* (MAP) and an onsite loop-mediated isothermal amplification (pLAMP) assay was optimized for rapid detection of JD. The pLAMP assay was conducted in a 63°C heating block for 30 min in a reaction mixture



containing a marker dye of amplification. Then the amplification products were visualized directly for color changes from orange to green or yellow. pLAMP assay was found to 100 times more sensitive than traditional IS900 PCR and detection limit was 10 cfu/ g of feces. Performance of pLAMP assay was evaluated on 1081 field fecal samples belonging to goats (465), sheep (100), cows (300) and buffaloes (216). Along with pLAMP assay, these fecal samples were also subjected to traditional IS900 PCR and qPCR. Highest positivity was observed in cattle (50.0%) followed by goats (48.4%), sheep (47.0%) and buffaloes (42.6%). pLAMP assay had higher sensitivity (514/1081) followed by qPCR (443/1081) and traditional IS900 PCR (181/1081). This pLAMP has potential of rapid and sensitive detection of JD.

MORPHOLOGICAL AND CULTURAL VARIABILITY IN *RHIZOCTONIA SOLANI* FROM DIFFERENT HOST CROPS

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Abstract

Rhizoctoniasolani Kuhn (telomorph) causes pre- and post-emergence damping off of root, root rot, stem rot, sheath blight and foliar blight in wide range of food crops like rice, maize, soybean etc because of its poly-phagous nature and high saprophytic ability. In the present investigation, the cultural and morphological behavior of the field isolate of *Rhizoctonia solani* derived from different rice, little millet, chick pea, soybean and potato growing field of Rewa and adjoining areas was studied. All the five isolates of *R. solani* exhibited cultural variability on different media, temperature etc. All the five isolates of *R. solani* grew well on PDA at 25°C. However, isolated exhibited variability in their radial growth on PDA. It was observed that isolate RS-3 was fastest growing isolate among the five isolates of *R. solani* from different host crops. However, slowest growth rate was recorded in isolate RS-5. Similarly, the bio-mass production on potato dextrose broth varied among the isolates in the form of dry and wet mycelial weight. Maximum moist mycelial weight was recorded in case of the isolate RS-3 (5.42 g) followed by isolate RS-2 (4.86 g). However, minimum moist mycelia weight was recorded in *Rhizoctonia solani* isolate RS-4. All the isolates of *R. solani* grew as regular circular growth on potato dextrose agar medium. However, isolates exhibited variability in colony type, colony colour and sclerotia production not only on PDA but also on three other tested media. All the isolates of *R. solani*, produced cottony, regular fast growing whitish colony with abundant sclerotia on Potato Dextrose Agar (PDA), whereas cottony regular creamy colony with low to medium sclerotia and moderate growth was recorded on Czapek's Dox Agar (CDA). Among the different tested media, PDA maximum supported the growth of *R. solani*. However, Corn meal agar medium least supported the growth of all the five isolates of *R. solani*. Among the different temperature, it was observed that isolates were not able to grow well at low temperature (15°C). However, at 35°C colony radial growth was better than at 15°C. It was observed that all the isolates of *R. solani* grew well at 25°C. Further, all the isolates exhibited maximum growth at pH 6 after 96 hours of incubation period and there after growth decreased with increase in pH. All the ten isolates of *R. solani* were found variable and diversified. However, differences among the growth of isolates were found statistically significant.

EVALUATION OF ESSENTIAL OILS AND CHEMICAL INSECTICIDES ON COCCINELLIDS POPULATION

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Abstract

Rice is the important food crop of the developing world and the staple food of more than half of the world's population. About 90 percent of world rice is produced and consumed in Asia. Insecticides are used widely to control the insect pests of rice because of the easy adoption, effectiveness and immediate control. Indiscriminate and irrational use of chemical insecticides at higher dosages results in resurgence, resistance and residual problems. Therefore, it has now become necessary to search for the alternative means of pest control, which can minimize the use of synthetic pesticides. Natural enemies play an important role to prevent the insect pest outbreak in rice field. It is ecofriendly and play an important role in integrated pest management. Most of the predators in rice fields seem to evacuate the field after application of chemical insecticides, thus their predatory capacity was suppressed and caused a negative impact on the population densities of rice field predators. Essential oils derived



from natural plant products are easy to extract, biodegradable and do not persist in soil and it possesses a wide range of desirable properties for pest management and is regarded as non-toxic to non-target organisms and humans. The field study was carried out to evaluate the safety of essential oils *i.e.*, Camphor oil, Cedar wood oil, Eucalyptus oil, lemongrass oil, neemazal and chemical insecticides *i.e.*, Dinotefuran and Rynaxypyr to coccinellids (Lady bird beetles) in the rice fields brought out that all essential oils were found less toxic to coccinellids population and among them the safest one is Neemazal with highest coccinellids population. The Chemical insecticide Dinotefuran was more fatal to Coccinellids with lowest mean population whereas maximum coccinellids population was found in untreated control

RELATIVE EFFICACY OF ESSENTIAL OILS AND CHEMICAL INSECTICIDES AGAINST RICE YELLOW STEM BORER *SCIRPOPHAGA INCERTULUS* (WALK.) ON RICE

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Abstract

Rice (*Oryza sativa* L.) occupies the prominent place in Indian agriculture and it is regarded as an important food crop supporting food security for 5 percent of the global population. In India, Rice continues to remain as the staple food for more than 65 per cent Indian population. The rice plant is attacked by more than 128 species of insects, 20 of them can cause serious economic loss. Yield losses due to yellow stem borer are estimated 27-34 per cent every year .Yellow stem borer causes 1 percent to 19 percent yield loss in early planted and 38 percent to 80 percent in late transplanted rice crops. The use of synthetic insecticides in agriculture has increased rapidly and has over shadowed the traditional methods used to protect crop damages due to insects. The indiscriminate uses of insecticides have resulted in a number of undesirable side effects such as the development of resistant strain of insects, environmental pollution and health hazards to farmers. Therefore, it has now become necessary to search for the alternative means of pest control, which can minimize the use of synthetic pesticides. Essentials oils remain an important tool to manage certain pest problems on different crops and vegetable plants. Some oils have been tested and recommended for use in crop to suppress a variety of insect pests and they have a multiple mode of action, including larvicidal, repellent and ovicidal activities. In view of this, the present study was undertaken to evaluate the efficacy of essential oils and chemical insecticides against rice yellow stem borer. The treatments are like camphor oil, cedar wood oil, eucalyptus oil, lemongrass oil, neemazal and a chemical insecticides *i.e.*, Dinotefuron and Rynaxypyr were evaluated against stem borer. As per the performance of different treatments, treatment involving Rynaxypyr @ 0.3 ml/l was most effective with overall mean 12.17 percent dead heart and 18.38 percent white ear head. It was closely followed by Neemazal @ 2.0 ml/l overall mean 16.94 percent dead heart and 25.86 percent white ear head.

PATHOGENIC RACE IDENTIFICATION OF *PYRICULARIA ORYZAE* ISOLATES USING DIFFERENT HOST DIFFERENTIALS

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Abstract

Rice (*Oryza sativa* L.) is one of the most important cereals of the world and is consumed by 50% of the world population. Rice blast disease incited by the fungus *Pyricularia oryzae* is considered as a major limiting factor in the global rice production because of its wide distribution and destructiveness under favourable conditions its cause severe yield losses upto 80-100%.The relativity of *P. oryzae* isolates were examined that represent the wide collection of races from Chhattisgarh. In pathological variability studies, isolates were evaluated on eight host differentials along with susceptible check HR-12. High variation of virulence was found in isolates on blast differentials. A total of 14 races were detected among 15 isolates. Based on leaf blast severity, *P. oryzae* isolates were grouped into 14 pathogenic races. The most frequently occurred isolate was IA (10 isolates) followed by IB (2 isolates) and IC, ID, IG (1 isolate).



THE EFFECT OF RELATIVE GROWTH RATE, CROP GROWTH RATE, DATE OF SOWING AND VARIETIES ON DEVELOPMENT AND YIELD OF CHICKPEA

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Abstract

The result showed that the days taken for emergence was almost similar in all the three growing environments. The duration for attaining different phenophases are slightly higher with variety Vaibhav. Finally the duration was longer in cv. Vaibhav followed by both cv. JG-14 and JG-16 in all the growing environments. The plant population varied significantly due to varieties and range from 43.0 to 56.1. Chickpea variety JG-16 ranked first per square meter due to different thermal environments having Variety V₃ (JG-16) 56.1 plants per square meter followed by V₁ (Vaibhav) 43.0 plants per square meter. Plant height was recorded higher with cv. Vaibhav (52.9 cm) followed by cv. JG-14 (51.0 cm) at maturity and both were significantly superior over JG-16 (47.0 cm). The 25 November sown crop recorded significantly higher biomass (880.0 g/m²), followed by (842.1 g/m²) 10 December and (750.3 g/m²) 10 November sown crops. Among different varieties, the JG-16 sown crop recorded significantly higher biomass (932.0 g/m²), followed by (808.9 g/m²) Vaibhav and (731.6 g/m²) JG-14 sown crops. Crop growth rate (g/m²/day) of chick pea variety under different growing environments at maturity stages are seen that 80-100 days after sowing, CGR value are reached its maximum for D₂ and V₁ varieties (30.675 g/m²/day) as compared to other date and variety. Relative growth rate (g/g/day) of chick pea variety under different growing environments at maturity stages are seen that 80-100 days after sowing, RGR value are reached its maximum for D₂ and V₁ varieties (0.049 g/g/day) as compared to other date and variety.

USE OF HAND SPRAYER FOR SPRAYING WETTABLE FUNGICIDES AND INSECTICIDES IN SMALL AREA

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Abstract

The hand sprayer is a small capacity Pneumatic sprayer. It consists of chromium plated brass tank having a capacity of 0.5 to 3 litres (one litre is more common) which is pressurized by a plunger pump. The air pump remains inside the tank. The sprayer has a short delivery tube to which a cone nozzle is attached. In some models the nozzle is attached at the top of the tank with flow spring actuated lever, which regulates the flow of the sprayer liquid. For spraying the tank is usually filled to three-fourths capacity and pressurized by air pump. The compressed air causes the agitation of the spray liquid forces it out, on operation of trigger or shut off type valve usually the chemicals with suspension characteristics cannot be effectively sprayed with this type of sprayer. For spraying wettable powders the sprayer is shaken frequently to prevent setting of the chemical. For operation the spray nozzle is directed to target after charging. It is fitted with mist spray nozzle with gooseneck bend. The pump assembly is made of brass and operated by one person. It is ideal for small nurseries, rose plants, kitchen garden and spraying insecticides and fungicides. Its plus point is that due to prior development of air pressure, pumping process during spraying is minimized. These sprayers come in many shapes and models.

ROLE OF GROWING DEGREE DAYS, PHOTOTHERMAL UNIT, HELIOTHERMAL UNIT, YIELD HARVEST INDEX INDICES UNDER DIFFERENT GROWING ENVIRONMENT OF CHICKPEA

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Abstract

The accumulated growing degree days at maturity stage were highest (1954) for Vaibhav (V₁) under 10th November. Maximum GDD were observed in early sown crop 10th November, as compared to normal sown crop 25th November and late sown crop 10th December. At maturity stages the maximum HTU of (15807) was recorded for varieties Vaibhav sown on 25th



November. Whereas, maximum HTU were recorded for variety JG-14 and JG -16 under 10th November sown crop. Similar is the trend for PTU chick pea varieties under different growing environments. Among different sowing dates, 25 November sown crop exhibited significantly more number of pods/plant (32.3), 100 seeds weight (23.1 g), higher seed yield (1942.4 kg/ha), followed by 10 November pods/plant (32.1) 100 seeds weight (22.4 g), seed yield (1802.5 kg/ha) and 10 December pods/plant (22.5) 100 seeds weight (21.9 g) and seed yield (1241.3 kg/ha). 10 November sown crop exhibited more number of Seed/plant (38.8), higher stover yield (2002.2 kg/ha) followed by 25 November seeds/plant (38.7), stover yield (1828.4) and 10 December pods/plant (28.9), stover yield (1243.1 kg/ha). Among different varieties, JG-16 produced significantly more number of pods/plant (36.6), seeds/plant (45.0), seed yield (1924.3 kg/ha) higher stover yield (1880.3 kg/ha) followed by cv. JG-14 pods/plant (30.5), seed/plant (36.0), seed yield (1465.2 kg/ha), higher stover yield (1490.6 kg/ha) and Vaibhav pods/plant (19.8), seeds/plant (25.2), seed yield (1596.8 kg/ha), higher stover yield (1702.9 kg/ha), JG-14 exhibited higher 100 seed weight (25.2 g) followed by cv. Vaibhav (25.0 g) and both were significantly superior over JG-16 (17.2g). Interaction effect between growing environments and varieties for pods/plant was found significant and cultivar JG-16 exhibited higher number of pods/plant under 25 November (41.3) followed by the same variety sown on 10th November. Higher number of seeds/plant (50.0) on 10th November sown crop followed by crop sown on 10th December. Vaibhav (15.9) counts for least pods/plant and seeds/plant sown on 10th December. Higher number of seeds/plant (21.1) dates. Interaction effect between sowing dates x varieties was found non-significant in test weight, seed yield, stover yield and harvest index.

FRESH WATER PEARL CULTIVATION IN TRIBAL DISTRICT CHHINDWARA (MP)

Chanchal Bhargava, Sarita Singh and S.L. Alawa

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Abstract

The Pearl is known as the queen of jewels and has been used for adornment and as a symbol of material wealth throughout human history. Pearls are formed by secretion of nacre from epidermal cells within mollusk mantle tissue. Areas rich in selection of mussels the factors to be considered are the weight of mussels, reproductive phase and health in phytoplankton, which is consumed by the mussels as food, are good for mussel breeding. The P^H and ammonia of fresh water pond value will measure one time in a week in both natural and artificial ponds. In cultured pearl cultivation, a mantle piece from the donor mussels is grafted into the gonad of the recipient mussels, along with a spherical nucleus to provide the required conditions for the formation of pearl. The operation on the pearl mussels is carried out by a skilful surgery. The processes involved are selection of mussels, graft tissue preparation, conditioning, graft tissue and nucleus implantation and post-operative care. For production of round cultured pearls spherical shell-beads are used as nuclei. There are numerous nucleus like design nucleus, tear drop, oval, round and half round called designer pearl. The temperature between 25-28 °C is suitable for surgery. The length of culture duration of this phase would depend on size of nucleus and maturity of pearl. The length of culture duration of this phase would depend on size of nucleus and maturity of pearl.

ATTENTION TOWARDS SOIL HEALTH

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Abstract

The challenge in agro-ecosystem of soil instability is mainly accelerated by population pressure, poor soil management practices and natural climate change. Proper soil management practices are considered as a better way to enhance agriculture production in sustainable healthy soil without disturbing environmental quality, human and animal health. Soil security is foundation for the current and future productivity and profitability of agriculture. Current agricultural production is attenuated by soil degradation. Future production is highly dependent on the condition of soils. In the last 40 years, 30 percent of the world's arable land has become unproductive and 10 million hectares are lost each year due to erosion. Additionally, accelerated erosion diminishes soil quality, thereby reducing the productivity of natural, agricultural and forest ecosystems. It takes about 700 years to form an inch of topsoil, this alarming rate of erosion in modern times is cause for concern for the future of agriculture. Soil health plays a key role in reducing production costs and risks. Several research papers and books revealed and confirmed that the following soil management practices improve soil health by the adoption of conservation



agriculture with reduced tillage, reduced frequency of fallowing, and reduced fertilizer applications via pre-plant soil tests, applying organic amendments, cover crops, green manures which leads to reduced soil bulk density, increased soil porosity, increased soil water holding capacity, increased soil carbon and nitrogen reservoirs and increased microbial indices. Its goal is to equip farmers with the knowledge and tools needed to identify and implement the location specific crops and practices to build healthy soils, reduce risks, and optimize net financial returns from their farming operations.

STUDIES ON DROUGHT CONDITION IMPACTS ON PLANT MORPHOLOGY, SEED YIELD AND QUALITY ON PRE RELEASED MAIZE HYBRID (*ZEA MAYS* L.)

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Abstract

To study the performance of maize inbreds NEI 92202B (Female) and HS-4 (Male) with three different planting ratios and three different planting geometry. In the present investigation on maize hybrids with three different planting ratios like 3:1, 4:1 and 5:1 and three different planting geometry viz., 60 cm x 20 cm, 75 cm x 20 cm and 90 cm x 20 cm. The experiment was laid out in a two-factorial randomized completely block design with 9 treatments replicated thrice. Among the different planting ratio and planting geometry, higher hybrid seed yield (54.07 q/ ha) was recorded in 5:1 planting ratio with combination of 60 cm x 20 cm planting geometry and other yield contributing parameters viz., cob weight (168.67 g), number of seeds per row (43.67), number of seed rows per cob (15.00) and number of seeds per cob (654) but highest cob length (17.67 cm) was recorded in 4:1 planting ratio with combination of 90 cm x 20 cm spacing and similarly thousand seed weight (223 g) and seed recovery percent (78.99) was recorded maximum in planting ratio of 3:1 with the combination of 90 cm x 20 cm spacing. Whereas the seed quality parameters were non-significant. However, among the different treatments numerically highest root length (22.67 cm) and seedling vigour index (3200) were recorded in planting ratio of 4:1 with the combination of 75 cm x 20 cm of planting geometry.

INDUCED DEFENSE AGAINST *CUCUMBER MOSAIC VIRUS* (CMV) DISEASE IN CHILLI (*CAPSICUM ANNUUM* L.)

Kavyashri V.V.

Abstract

Cucumber Mosaic Virus (CMV), considered as a most important virus disease infecting chilli (*C. annum* L.). Among 111 chilli hybrids/varieties/germplasm evaluated against CMV both under greenhouse and field conditions, AVPP 0906, AVPP 1110, Aparna, Susanjoy, PhuleJyothi and Tumkur local showed highly resistant (HR) reaction with no disease symptoms. CMV inoculated chilli reacted positively for CMV specific antisera through DAS-ELISA and it was confirmed by RT-PCR (~600bp). Different biotic defense inducers viz., red seaweed extract (*Kappaphycus alvarezii* (Doty) Doty ex P.C. Silva), plant extracts (*Mirabilis jalapa* L. and *Bougainvillea spectabilis* Willd.), biocontrol agents (*Trichoderma harzianum* and *Pseudomonas fluorescens*) and synthetic nucleoside, chitosan and virex-H were tested for their efficacy on CMV infection in susceptible chilli variety, Pusajwala. Among them, highest reduction of CMV infection was recorded at 0.1 per cent chitosan (78.28%) sprayed plants followed by 0.4 per cent *K. alvarezii* (72.84%) and 0.25 per cent synthetic nucleoside (72.31%) and found significantly superior over untreated control under greenhouse conditions. CMV inoculated chilli plants primed with chitosan (0.1%) showed enhanced defense enzyme activities i.e., 1.48 fold increase in PO, 1.68 fold in PPO, 1.22 fold in PAL, 1.60 fold in total phenol and 1.33 fold in chlorophyll content and increased accumulation of Phytohormones such as SA (156535.32 ng.g⁻¹FW), ABA (54.78 ng.g⁻¹FW), IBA (2.18 ng.g⁻¹FW), zeatin trans isomer (46.83 ng.g⁻¹FW), GA₃ (9.70 ng.g⁻¹FW), GA₄ (723.31 ng.g⁻¹FW) and GA₇ (0.19 ng.g⁻¹FW) followed by *K. alvarezii*, *P. fluorescens* and synthetic nucleoside compared with untreated control. Significantly less PDI (35.29 %) and AUDPC (1238.33) was recorded in plants treated with Chitosan (0.1%) with increased plant height (49.19cm), number of branches (19.52), number of fruits per plant (187.87), individual fruit weight (2.44g), fresh fruit yield (483.56g plant⁻¹), fresh weight (4.59t.ha⁻¹), dry weight (1.38t.ha⁻¹) during Kharif 2016-17 and Kharif 2017-18 under field conditions.



INFLUENCE OF DIFFERENT PLANTING DATE CLIMATE ON POD AND SEED MORPHOMETRIC CHARACTERISTICS OF SOYBEAN (*GLYCINE MAX* L. MERRILL) CULTIVARS

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Abstract

A field and laboratory studies was conducted during 2015-16 and 2016-17 at ARS, Bidar and seed unit laboratory, UAS, Raichur to find out the cultivars response in terms of seedling vigour and biochemical activities to assess the suitable planting dates for quality seed production. In order to explain the effect of sowing date on soybean (*Glycine max* L. Merrill) seed morphometry characters, two varieties including JS 335 and DSb 21 were sown from November to February. The results of the experiment revealed that the below parameters significantly affected by sowing dates. The highest length of pod (91.25%), width of pod (21.32 cm), area of pod (20.17 cm), diameter of pod (41.49 cm), perimeter of pod (121.23 mg), length of seed (91.25%), width of seed (21.32cm), area of seed (20.17 cm), diameter of seed (41.49 cm) and perimeter of seed (121.23 mg) were recorded for crop sown in Nov 1st fortnight. It was noticed that sowing date significantly affected the seed quality parameters and seeds from early sowings had the higher seed morphometry characters.

STING MORPHOLOGY IN RELATION TO DIFFERENT SELECTED SPECIES OF APOIDEA GROUP

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Abstract

The sting of Aculeata raised questions of curiosity in the minds of entomologists from the past decades. The detailed account of stings is available for only few common species, but the descriptions for most of the genera is lacking. We analyzed Apoidea group to know the evolutionary trend using sting apparatus, total of 15 species representing 9 tribes of Ampulicidae, Sphecidae, Crabronidae, Halictidae, Megachilidae and Apidae. Matrix was developed using different characters and character states from seventh hemitergite, eighth hemitergite, first valvifer, second valvifer, gonostylus, sting shaft and lancets which was processed using Winclada, using the default settings for the ratchet function. The one with predatory behaviour are separated from that of herbivory or pollenivory behaviour i.e., Tenthredinidae (Crabronidae (Sphecidae (Ampulicidae (Megachilidae (Halictidae + Apidae).

EVALUATION OF WORKING COLLECTIONS AND ELITE LINES OF PIGEONPEA [*CAJANUSCAJAN* (L.) MILLSP.] FOR YIELD AND YIELD RELATED TRAITS.

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Abstract

The present investigation was intended to estimate the nature and magnitude of genetic variability, genetic diversity, character association, *Fusarium* wilt and sterility mosaic resistance in 106 pigeonpea genotypes including checks. Genetic variability studies revealed high GCV, PCV, heritability and genetic advance for number of secondary branches and seed yield in case of sixty four and forty two genotypes respectively. In sixty four genotypes the seed yield had positive and highly significant



association with number of pods per plant and number of secondary branches whereas days to 50 per cent flowering had negative and highly significance correlation with seed yield. While in forty two genotypes the seed yield had positive and highly significant association with plant height and number of pods per plant whereas number of seeds per pod had negative and highly significant correlation with seed yield. Path co-efficient analysis revealed that number of pods per plant had the highest positive direct effect on seed yield. While in case of forty two genotypes number of pods per plant had the highest positive direct effect on seed yield. Hence, it would be rewarding to lay stress on these characters in selection programme for increasing the seed yield. Out of sixty four genotypes were screened for *Fusarium* wilt (FW) yielded twenty three resistant genotypes of which, PRIL-B-013, TS-3R, PRIL-B-095 and PRIL-B-079 were consistently resistant and field screening of sterility mosaic disease (SMD) yielded eleven resistant genotypes, of which, PRIL-A-004, PRIL-B-052, PRIL-B-128 and PRIL-B-176 were consistently resistant for SMD and a total of five genotypes viz., PRIL-B-052, PRIL-B-110, PRIL-B-140, PRIL-B-155 and PRIL-B-176 showed multiple disease resistance reaction for both FW and SMD. Hence, these genotypes can be utilized for both FW and SMD resistant breeding.

GENETIC DIVERSITY, CORRELATION AND PATH ANALYSES FOR QUANTITATIVE TRAITS IN EARLY MATURING GENOTYPES OF PIGEONPEA

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Abstract

An investigation was carried out with forty-two early maturing genotypes of pigeonpea to study nature and magnitude of genetic divergence among genotypes. The genotypes were grouped into seven clusters based on Mahalanobis D² analysis with Cluster II containing maximum of 19 genotypes. The inter cluster distance were higher than the intracluster distance shows that there is a large amount of genetic diversity present among the genotypes. Highest intra cluster distance was observed in cluster V (6.56) indicating greater genetic divergence is present among the genotypes. The maximum and minimum divergence was revealed between cluster I with VII (15.91) and cluster VI with VII (7.05) respectively. The number of secondary branches, seed yield *per* plant and days to 50% flowering contributed maximum (80.72%) towards genetic divergence. The correlation and path analysis revealed that strong positive correlation between number of pods *per* plant and seed yield ($r=0.90$), followed by plant height and pod bearing length ($r=0.88$). Cluster III exhibited high mean values for pod bearing length, number of pods *per* plant and seed yield *per* plant. The genotypes of cluster III with I and VII with II are leaving most divergent with a high mean for many characters. Based on inter cluster value and *per se* performance, the genotypes ICPL-2011252 and ICPL-2011255 were desirable for seed yield and number of pods *per* plant. These genotypes can be successfully utilized in hybridization programme(s).

CHARECTERIZATION OF ZEOLITE AND ITS INFLUENCE ON SOIL PROPERTIES, GROWTH AND YIELD OF FINGER MILLET (*ELEUSINECORACANAL.*) IN EASTERN DRYZONE OF KARNATAKA

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Abstract

A field experiment was conducted at Zonal Agricultural Research Station, GKVK, Bengaluru during *kharif*-2017 to characterize the properties of zeolite and to study its influence on soil properties, growth and yield of finger millet. The pH of zeolite recorded 7.41 and it has higher water holding capacity of 89.5%, electrical conductivity was 0.61 dS m⁻¹. The nitrogen, phosphorus and potassium content of zeolite were 0.14, 0.18 and 0.77 per cent, respectively. The cation exchange capacity of zeolite was 184 Cmol (p+) kg⁻¹. The bulk density and particle density of zeolite were 0.54 and 0.64 g cc⁻¹, respectively. Field



experiment consists of 20 treatment combinations comprising five levels of zeolite and four levels of graded fertilizers, laid out in RCBD design with factorial concept replicated thrice on red sandy loam soil having slightly acidic soil pH (5.52). The treatment received zeolite at 50 kg ha⁻¹ recorded significantly higher plant height (15.95, 52.30 70.34 cm at 30, 60, and 90 DAS, respectively), number of tiller per hill (5.34), total dry matter production (40.36 gram per hill), number of fingers per ear (5.98), straw yield (29.21 q ha⁻¹) and grain yield (26.37). Significantly higher plant height was recorded in treatment received 100 per cent RDF (14.87, 46.32 and 66.38 cm, respectively) and 125 per cent RDF (14.89, 47.02 and 66.49 cm, respectively) in 30, 60 and 90 DAS, respectively. Significantly higher grain (26.49 q ha⁻¹) and straw yield (30.49 q ha⁻¹) was recorded in 125% RDF.

MODELLING OF RAINFALL DISTRIBUTION AND VARIABILITY IN YADGIR DISTRICT

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Abstract

The amount of rainfall and its pattern is one of the important factor that effect agricultural system. The analyses of rainfall data for long period provide information about pattern and its variability. The daily rainfall (mm) data pertaining to 16 raingauge stations spread over three taluks of Yadgir district were collected from the AICRP on Agrometeorology, UAS, GKV for the period of 34 years (1980-2013). The average annual rainfall in the district during the study period was found to be 648.36 mm with a coefficient of variation of 34.37 per cent. 80 per cent of the annual rainfall was received from South West monsoon, September month receives highest amount of rainfall in the district. Decreasing trend in rainfall was noticed in all raingauge station of the district which is revealed from Mann Kendall test at 5 per cent level of significance. Fitting of probability distribution viz., Normal, lognormal, Gamma (1P,2P,3P), General extreme value (GEV), Weibull (1P,2P,3P), Gumbel and Pareto were used for rainfall data of different periods of the district and goodness of fit by Kolmogrove-Smirnov test. Weibull (3P) and Weibull (2P) are best fitted distribution for annual and seasonal (SWM) rainfall data. Distributions fitted for weekly (23rd to 39th SMW) rainfall data are Gamma (3P), lognormal and GEV.

THRIPS AND GROUNDNUT BUD NECROSIS VIRUS DISEASE DYNAMICS IN TOMATO

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Abstract

The studies on thrips and *Groundnut bud necrosis virus* disease dynamics in tomato (cv Arka vikas) were carried out during two *kharif* seasons, 2016-2017 in vegetable block at Main Agriculture Research Station, University of Agricultural Sciences Raichur. The results revealed that peak thrips (*Thrips palmi* Karny and *Scirtothrips dorsalis* Hood) incidence was observed during peak flowering stage and disease incidence was gradually increased as crop matures. Correlation with weather parameters revealed that all the weather parameters influenced for both thrips and disease development, there was significant negative correlation was observed between thrips and disease with rainfall, minimum temperature and evening relative humidity.

CHARACTERIZATION OF SOILS AND COMPOSITION OF LEAF AND IRRIGATION WATER OF POMEGRANATE GROWING AREAS OF HOSADURGA (TQ) IN CENTRAL DRY ZONE OF KARNATAKA

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Abstract

An investigation was carried out to study the nutrient status of pomegranate growing soils and composition of leaf, fruit and



quality of irrigation water of Hosadurgataluk in central dry zone of Karnataka. Surface soil samples, leaf, fruit and irrigation water samples were collected from the different age groups (<2 years and >2 years) of pomegranate gardens and were analyzed for various parameters. The results revealed that Soil pH was acidic to alkaline (6.28 to 9.80), low organic carbon, lower soluble salt concentration and low to higher range of major nutrient content. Among the major nutrients content in soil around 20 % of N and 50 % of P₂O₅ recorded lower. Secondary nutrients like Ca, Mg and S were recorded high. Micronutrients viz; Fe 80 %, Zn 50 % and 58 B % were recorded lower. Around 96 % of Fe and 38% of Mn recorded deficient; whereas other nutrients were recorded sufficient in their concentration. The ascorbic acid (11.3-16.2 mg 100 g⁻¹) and TSS (10.6-32.1 °B) contents in fruits were found adequate and major, secondary and micronutrient contents were recorded sufficient. In irrigation water, the quality parameters like pH, EC, RSC, SAR and B were recorded below the threshold level indicated that water was suitable for irrigation. Correlation study indicated that soil and leaf nutrient content has direct relationship with yield variations.

COMPARATIVE STING MORPHOLOGY OF ACULEATE HYMENOPTERA

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Abstract

A detailed investigation on the stinging apparatus was carried out at Dept. of Agricultural Entomology, UAS, Bangalore. About 25 species representing 19 genera belonging to 14 families were studied in detail. Different sclerites such as 7th hemitergite, 8th hemitergite, oblong plate, gonostylus, furcula, sting shaft and lancets were separated and their structures were described. *Apis dorsata* had maximum 11 barbs, while *A. cerana* and *A. florea* had 10 barbs on the lancet and barbs were angled and pointed. Lancets of *Megachileanthracina* and *M. disjuncta* had 8 and 7 small pointed barbs whereas, in *Vespa tropica*, *Polistes stigma* and *Ropalidiamarginata* had 8, 5 and 4 barbs respectively. The barbs were placed on lancets at different intervals. A phylogenetic tree of aculeate hymenoptera based on the sting apparatus yielded clades which are clearly distinguished based on the type of behaviour and niche of individuals. Principle of parsimony was used as the optimality criterion. A matrix was developed using different character states using 42 characters of Aculeata, which was processed using Winclada to run NONA using default settings for ratchet function. The node of Chrysidae and Bethylinidae clearly separated from other nodes. The herbivores/pollenivores *Halictus* sp., *Megachile* spp., *Amegilla* spp. and *Apis* spp. claded after predators belonging to Mutillidae, Scoliidae, Pompilidae, Vespidae, Formicidae, Ampulicidae, Sphecidae and Crabronidae.

EVALUATION OF SOME NEWER ECO-FRIENDLY INSECTICIDES AGAINST MAJOR INSECT PESTS OF RICE UNDER EASTERN UTTAR PRADESH CONDITIONS

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Abstract

An evaluation was conducted on the efficacy of some newer eco-friendly insecticides against major insect pests of rice under Eastern Uttar Pradesh conditions for the two consecutive years (2014 and 2015). There were 10 insecticides evaluated under randomized block design on farmer's field at district Deoria, U.P., India. Insecticides application were taken for two times at 30 DAT and 60 DAT between transplanting stage to flowering stage on local rice cultivar Samba Mahsuri. Cartap hydrochloride was least affected the natural enemies with highest yield, whereas Chlorpyrifos was most affected the natural enemies with second highest yield. There was not significant difference among efficacy of insecticides, Imidacloprid, Thiamethoxam, Indoxacarb, Rynaxypyr and Fipronil. Bt and NPV were observed significant result for initiation at ETL without knock down effect. Combination with Bt var kurstaki 3.5% @ 2 ml/lit and Neem oil @ 2ml/lit was observed significant result regarding eco-friendly approach of pest management concerning spider population 4.5/Sweep compared to chemical insecticides 1.5–3.5/Sweep. Incidence of dead heart and white ear head was recorded minimum in Cartap hydrochloride treated plot compared to control plot.



REVIEW ON BIODIESEL PRODUCTION FROM ALGAE-A RENEWABLE ALTERNATIVE TO FOSSIL FUELS

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Abstract

There are global concerns over depleting fossil fuel reserves and climate change. Increasing energy access and energy security are key actions for reducing poverty thus contributing to the development of economy. Algae are currently the only short-term alternative to fossil fuels for transportation. The so-called first generation biofuels are produced from agricultural feedstock that can also be used as food or for feed purposes. As opposed to land-based biofuels produced from agricultural feedstock, cultivation of algae for biofuel does not necessarily use agricultural land and requires only negligible amounts of freshwater. Since they do not need herbicides and pesticides, algae appear to be a high potential feedstock for biofuel production. On the other hand, microalgae, as opposed to most plants, lack heavy supporting structures and anchorage organs which pose some technical limitations to their harvesting. The real advantage of microalgae over plants lies in their metabolic flexibility, which offers the possibility of modification of their biochemical pathways (e.g. towards protein, carbohydrate or oil synthesis) and cellular composition. Biodiesel production from algal oils has received most attention since algae can contain potentially over 80% total lipids, while rapeseed plants contain about 6% lipids. Algae-based biofuels have an enormous market potential, can displace imports of fossil fuels from other countries and hence reduce country's dependence. It has the potential of becoming one of the new, sustainable technologies which can count on ever increasing consumer support.

POPULATION DYNAMICS OF THRIPS AND MIRIDBUG IN TOMATO

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Abstract

The studies on thrip sandmirid bug population dynamics in tomato (cv Arka vikas) were carried out during two *kharif* seasons, 2016-2017 in vegetable block at Main Agriculture Research Station, University of Agricultural Sciences Raichur. Thrips (*Thrips palmi* Karny and *Scirtothrips dorsalis* Hood) and Zoophytophagous miridbug (*Nesidiocoris tenuis* Reuter) activity was found throughout the cropping period and the population increasing trend was linear with the thrips population, but miridbug population reached peak during later stage of the crop and significant negative correlation was observed between thrips and miridbug population.

INSECTICIDE USAGE AND TYPES OF SPRAY EQUIPMENT PRACTICED BY COTTON GROWERS AGAINST INSECT PESTS OF MAJOR COTTON GROWING DISTRICTS OF KARNATAKA

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Abstract

Survey conducted during 2016-17 and 2017-18 in major cotton growing districts of Karnataka viz., Dharwad, Haveri, Shivamogga, Ballari and Mysuru revealed that as many as 34 insecticides of which six commercially available combination products, nine combinations of insecticides and one plant product were used by farmers for management of insect pests on Bt cotton. The number of insecticides used ranged from 15 (Mysuru) to 25 (Ballari). The highest numbers of insecticides were used in Ballari district alone, along with five commercially available combination products and one neem based botanical



insecticide also used by the farmers. While the Dharwad farmers used 21 different insecticides and Haveri farmers used 23 different insecticides. Sivamogga farmers used 16 different insecticides in Bt cotton ecosystem. The least number of insecticides were used in the Mysuru district of Karnataka. In Dharwad and Shivamogga districts, the total number of sprays ranged from one to two with a spray interval of 15 to 20 days; in Mysuru, it ranged from one to two sprays with 20-30 days spray interval; in Haveri and Ballari, number of sprays ranged from two to three with 15-20 and three to five with 10-15 days interval during both the years. Total number of sprays and spray interval remained almost similar during both the years. But, number of insecticides used was varied between two years. In all major cotton growing districts, imidacloprid and diafenthiuron formulations were the commonly used insecticides. In addition to imidacloprid and diafenthiuron, acephate was the primary choice of insecticide against sucking pests in all districts. Whereas in Ballari district, flonicamide and one combi (acephate + imidachlorid) products were the major insecticides compared to imidacloprid, acephate and other combination formulations against the sucking pest in Bt cotton. For the application of these insecticides, lever-operated knapsack sprayers were the most widely used type of spray equipment except in the irrigated areas like Ballari, where there is scarcity of labourers; petrol operated knapsack power sprayers were extensively used by the farmers as efficient and labour saving equipment.

OCCURRENCE OF NATURAL ENEMIES ON MIRID BUG AND FLOWER BUD MAGGOT IN BT COTTON DURING SURVEY AND SURVEILLANCE

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Abstract

A study on natural enemies during 2016-17 and 2017-18 survey and surveillance indicated that, among the different natural enemies recorded predators like coccinellids (Six-spotted zigzag ladybird), *Menochilus sexmaculatus* (Fabricius) (Coccinellidae: Coleoptera); green lacewings, *Chrysoperla malla* (Banks), *C. zastrowisillemi* (Esben-Petersen) (Neuroptera : Chrysopidae); big eyed bugs, *Geocoris* sp. (Hemiptera : Geocoridae) and spiders namely *Cluboniasp.* (Clubionidae), *Oxyopes javanus* Thorell (Oxyopidae), *Thomisus* sp. (Thomisidae), *Araneus* sp. (Araneidae), *Heteropoda* sp., (Sparassidae) belongs to the order Araneae were recorded in Bt cotton ecosystem. Interestingly a ghost ant, *Tapinoma* sp. (Hymenoptera : Formicidae) was reported for the first time feeding on flower bud maggots in Bt cotton and also hymenopteran parasitoid *Macroglenes* sp. (Pteromalidae) was noticed parasitizing on flower bud maggot during field study.

IMPROVING SOIL TEST METHODS FOR SULPHUR

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Abstract

Sulphur (S) is one of the basic building block of life for both plants and animals. It is fourth essential element required for normal growth and development of plants. But, its deficiency is widespread and around 46% of 142 Mha arable land of India suffer from S deficiency. Estimation of sulphur includes two parts, extraction and determination. Many extractants are currently used to estimate available sulphur. Inorganic sulphate-S and organically bound sulphate S are mobilized by special heat treatment and extraction with 1% NaCl. The 0.15% CaCl₂ extract water soluble sulphate-S and it does not require any pretreatment to remove organic matter. A phosphate solution like Ca(H₂PO₄)₂ · 2H₂O and KH₂PO₄ is preferred in mineral soil as they ensure extraction of solution plus adsorbed-S. Most of the soils in the semiarid tropical regions, which have pH in the neutral to alkaline range, Ca chloride can replace Ca phosphate as an extractant for removing available S in such soils. After extraction, the S estimation done by turbidimetric method following its precipitation as BaSO₄. Availability of the CHNS analyser and ICP-OES has made S analysis simpler and accurate. The sequential fraction procedure for the fractionation of soil S could be successfully utilized in place of independent extraction procedure to reduce labour cost as well as chemical cost. Sulphur availability index (SAI), which helps to identify soils that may be moderately or highly deficient in S and thus aid in decisions related to whether S application for optimum plant growth.



AGRONOMIC EVALUATION OF ZNO NANOPARTICLES APPLICATION IN CONJUNCTION WITH NPK FERTILIZER IN AROMATIC RICE

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Abstract

A field investigation was conducted during *kharif* 2018 at the ICAR-Indian Agricultural Research Institute, New Delhi, to evaluate the effect of ZnO nanoparticles (Nps) application in conjunction with N:P:K fertilizer in aromatic rice. The experiment was laid out in randomized block design with ten treatments with three replications. The treatments, 100% NPK + ZnONps and 75% NPK + ZnON psrecorded highest plant height, LAI and dry matter accumulation at 30, 60 and 90 DAT. The treatments viz. 100% NPK + ZnONps recorded the highest grain yield which was statistically at par with 75% NPK + ZnONps during experimentation. Application of 5 kg Zn/ha-ZnSO₄·7H₂O or ZnO (bulk) in conjunction with 100% NPK resulted in higher grain yield over application of 100% NPK. Total Zn uptake was highest in treatment 100% NPK + ZnONps, which remained significantly higher from rest of the treatments. The concentration of zinc in different parts of rice grain followed the order: bran > hull > white rice kernel. The treatments viz., 100% NPK + ZnO nanoparticles resulted in highest zinc concentration which was at par with 75% NPK + ZnO nanoparticles in hull, bran and white rice kernel. Based on this study it is suggested that higher productivity, profitability can be achieved by applications of ZnO nanoparticles in conjunction with fertilizer. The treatment 75% NPK + ZnONps is the best as it required 25% less NPK.

EFFECT OF SPLICE GRAFTING ON GROWTH AND YIELD PARAMETERS OF TOMATO (*LYCOPERSICON ESCULANTUM*)

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Abstract

This experiment was carried out at ICRISAT, Patancheru campus to determine the feasibility of the vegetable grafting in tomato. In this experiment, two varieties of tomato i.e. PHS 448 and Sahoo- (TO 3251), preferred by the farmers in rayalaseema region were grafted on rootstock *Solanum torvum*. Tomato plants were grafted using splice method of vegetable grafting. Both, grafted and non- grafted plants were transplanted in open field conditions in the month of December, 2018. Growth parameters of the plants are recorded at 30 days interval after transplanting whereas yield parameters were recorded at every harvesting of the fruits. Height of the plants was found maximum in non-grafted plants as compared to grafted plants throughout the cropping period after transplanting. Chlorophyll content (42.6 and 36.3), leaf area (13.2 and 12.9 sq.cm), no. of fruits per plant (42.6 and 36.2 nos.), avg. fruit weight/ plant (62.3 and 57.0 g) and yield per ha (53.1 and 41.1) was recorded maximum in grafted PHS 448 and Sahoo varieties of tomato as compared to non- grafted tomato plants.

DEVELOPMENT AND PERFORMANCE EVALUATION OF SINGLE ROW PULL TYPE PLANTER

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Abstract

Farm Mechanization plays a vital role in reducing the cost of crop production and increase in cropping intensity which mainly depends on the sowing patterns. Almost 70% of farmers in the country are small-scale farmers. To cater the need of small farm holders, a manually operated single row pull type multi – crop planter was developed and evaluated. The planter consists of ground wheel, guard wheel, hopper, seed metering mechanism, handle, seed tube, furrow opener and covering device. All parts of the planter were fabricated from mild steel material, except for the metering mechanism which was made from nylon with cells on its periphery. The seed metering mechanism is directly controlled by drive shaft. The three major crops grown in semi-arid regions like maize, castor and red gram were taken for evaluation. The test was conducted on test rig for different



operating speeds ranging from 2 to 5 kmph. The seed spacing at 2 kmph was found to be 29.88 cm, 22.58 cm and 19.4 cm which is optimum for castor, maize and red gram respectively. The seed damage for castor, red gram and maize were 2.75 %, 0.58 % and 0.41 % respectively. The seed damage was higher due to crushing of seeds between hopper and metering plate at 4 kmph and 5 kmph. Under field conditions, the planter was able to meter seeds at an average depth of 3.86 cm which was favorable as the depth of sowing must be in a range of 3-5 cm. The average seed to seed spacing for castor, red gram and maize were observed to be 28 cm, 18 cm and 21 cm respectively which were approximately same as the spacing assumed while designing the metering plates. The seed rate was found to be 4.716 kg/ha, 2.09 kg/ha and 9.811 kg/ha for castor, red gram and maize respectively. The theoretical and actual field capacities were 0.1272 ha/h and 0.113ha/h respectively with field efficiency of 88.9%. Hence, the planter can meet the requirements of the small-scale farmers by reducing the cost of cultivation and increasing the yields.

VALIDATION OF DIFFERENT HAPLOTYPES OF *ORYZA RUFIPOGON* ACCESSIONS UNDER PHOSPHORUS STARVATION

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Abstract

Oryza rufipogon, a perennial, tufted grass is a wild relative of cultivated rice, *O. sativa*. Phosphorus-starvation tolerance 1 (*PSTOL1*) is naturally present gene in wild germplasm, it is extremely desirable to utilize for yield improvement under phosphorus (P) deficient soil conditions. In present investigation, for the functional evaluation of previously identified 17 different haplotypes of *O. rufipogon* covering 26 accessions were grown under P-deficient soil conditions. Data were collected for different morphological traits including days to 50% flowering, plant height, tiller number, number of panicles /plant and spikelets/panicle. Further, plants were being dried to collect morphological data on dry root and shoot traits. *O. rufipogon* IR104639 (H3) showed the best root weight. Data revealed that IR106506 (H17) showed best root weight, as compared to IR93283 (H11). In terms of spikelets/panicle, IR113651 (H1) and IR106407 (H6) showed least tolerance with 90% and 75% reduction respectively along with 73.5% reduction in panicle number. Overall, IR104639 (H3) indicated the best performance under P-deficient conditions followed by IR106506 (H17) and IR93283 (H11). F₁s were also generated from the crosses made between the selected wild species accessions and elite rice cultivars PR127 and PR121 and are sown in the fields at Punjab Agricultural University, Ludhiana.

TRAINING NEEDS OF FARMERS : A STUDY KASGANJ DISTRICT OF UTTAR PRADESH

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Abstract

Training plays an important role in the advancement of human performance in a given situation. Training improves a person's skill, his power of intelligence and develops in him/her the desired attitudes and values required for his/her work. Training is the process by which an individual's efficiency and effectiveness in the given context of a job can be maximized. Farmer training is directed towards improving their job efficiency in farming. It is essential to identify the training needs of the farmers before organizing trainings for them. Caffarella (2002) noted that a systematic process of farmers' training must include; needs assessment, goal and objectives setting, organizing instructional methods and techniques, monitoring and evaluation. In the present study training needs of farmers of Kasganj district of Uttar Pradesh was assessed. Total 100 farmers from five villages were selected for the study. Interview schedule was used to collect the data. Variables selected for the study were age, educational level, land holding, and training needs. Majority of farmers were of middle age group, having land up to three acres and educated up to intermediate. Under crop production majority of farmers reported that they requires trainings on weed management followed by integrated nutrient management, seed production and post harvest technologies. Under vegetable cultivation most of the farmers reported that trainings on off-season vegetable cultivation are most important for



them followed by low volume and high value crops, nursery management and protective cultivation. Under crop protection integrated methods of pest and disease management was reported as the most important thematic area of training by majority of the farmers followed by bio-control of pests and diseases, and production of bio control agents and bio pesticides. Under animal husbandry sector rank order of perceived training need was as disease management, feed management production of dairy products.

EFFECT OF INORGANIC AND ORGANIC FERTILIZERS ON YIELD AND QUALITY OF GREEN GRAM (*VIGNA RADIATA* L.WILCZEK) UNDER SHIWALIK FOOT HILLS OF JAMMU AND KASHMIR

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Abstract

A field experiment was conducted during summer 2016 and 2017 at SKUAST-Jammu to study the effect of inorganic and organic fertilizers on yield and quality of green gram (*Vigna radiata* L. Wilczek). The experiment consisted of sixteen treatments and was laid out in randomized block design. The results from pooled data of green gram of both the years shows that seed yield, stover yield and per cent protein content in seeds of green gram during both the seasons were significantly influenced by effect of organic and inorganic fertilizers. Significantly highest seed yield (9.90 q/ha) and stover yield (40.93 q/ha) in green gram were recorded with treatment 100% recommended dose of fertilizer which was found statistically at par with treatments 75 % NPK +25 % N through Vermicompost and FYM (1:1), 75 % NPK +25 % N through Vermicompost and 75 % NPK +25 % N through FYM in seed and stover yields respectively where as significantly highest per cent protein content (29.00 per cent) in seeds of green gram were recorded with treatment 100 % N through FYM.

INNOVATIVE TECHNOLOGY FOR CROP IMPROVEMENT, BIOTECHNOLOGY AND GENETIC ENGINEERING

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Abstract

Indian economy is basically an agrarian economy and even now nearly 68 per cent of workforce directly or indirectly depends on agriculture. Thus, it still provides large-scale employment opportunities as being a major contributing factor for this labour-surplus economy. The economic and environmental stocks have affected the entire population depending on agriculture, its intensity is very high in rainfed agricultural regions. Reduction in agricultural incomes of the farmers in rainfed regions has been manifested in the form of suicides. Main aim is to improve the productivity by transferring improved technologies, gain in terms of higher yield and income have not been spectacular due to associated risks like aberrant weather, land degradation and poor socio-economic base of the farmers. India is a global agricultural powerhouse. It is the world's largest producer of milk, pulses, and spices, and has the world's largest cattle herd (buffaloes), as well as the largest area under wheat, rice and cotton. It is the second largest producer of rice, wheat, cotton, sugarcane, farmed fish, sheep & goat meat, fruit, vegetables and tea.

The dependence on agriculture is brought out by the fact that of the 313 million main workers in the country, 166 million (56.6%) has been engaged in "Agricultural and allied activities". Nearly three-quarters of India's families depend on rural incomes. There is no dearth of innovations as in innovations can be adopted at all the fields such as during landpreparation, harvest, post harvest measures, marketing, processing and reaching of the qualitative nutritious food to consumer table. Agriculture is nature driven, we have to be very cautious while applying researches. Indian agriculture has got a vast potential. We have 15 Agro-climatic zones, more than 300 agro-climatic regions and mega biodiversity which ranks among eighth in the World. There are six crop seasons in which all types of crops and livestock can survive successfully. This is considered as the strength due to the varied nature of agriculture in India. There are a lot of innovations in mobile and IT companies which have the potential to make a huge impact on the farm management. To improve the productivity of land, ensuring nutritional



security for mankind and for sustaining the livelihood of the farming community worldwide. An increase in the population will certainly reduce the per capita availability of natural resources and may hinder the equilibrium and sustainability of agricultural systems due to overexploitation of natural resources, which will ultimately lead to more poverty, starvation, malnutrition, and higher food prices. The judicious utilization of natural resources is thus needed and must be addressed immediately. Climate change is emerging as a major threat to the agriculture throughout the world as well. Surface temperatures of the earth have risen significantly. The rise in temperature enhances the rate of respiration, reduces cropping periods, advances ripening, and hastens crop maturity, which adversely affects crop productivity. Several climatic extremes such as droughts, floods, tropical cyclones, heavy precipitation events, hot extremes, and heat waves cause a negative impact on agriculture and are mainly caused and triggered by climate change. In order to optimize the use of resources, hi-tech interventions like precision farming, which comprises temporal and spatial management of resources in horticulture, is essentially required. Infusion of technology for an efficient utilization of resources is intended for deriving higher crop productivity per unit of inputs. Health conscious urban dwellers are switching to organic crops. Demand for healthy and organic food is growing. To cope up with the limitation of land resources and the unpredictability of the weather conditions, scientists and entrepreneurs are developing modern agricultural techniques and technologies. Nutrigenomics is emerging field of science and technology unrevealing interrelationships between nutrients and human genome using modern tools such as Transcriptomics, Metabolomics, Epigenomics and Proteomics. It helps to identify the dietary signals, to elucidate the dietary sensor mechanisms., to characterize the target genes of these sensors, to understand the interaction between these signalling pathways and pro-inflammatory signalling to search for sensitizing genotypes, to find 'signatures' (gene/protein expression and metabolite profiles). Start up companies have proved to be notable innovations to generate more income for the farmers such as Ekgaon, Digital Green, Frontal rain technologies having four key areas of accelerating change which includes Sensors for traceability, food through Genetic tailoring, Robotics and microautomation and engineering including reprogramming unicellular life to make fuels, by-products accessible from organic chemistry and smart devices. New farm management software is available that calculates food rations and milking systems to make farm management as simple as possible. . There are different models for collective marketing by the small and marginal farmers to realise better access to input and output market, and share in the consumer rupee. There is need to optimize these supply chains for both milk and horticulture. Solutions that can preserve the quality, reduce waste, improve traceability, and improve shelf-life efficient aggregation, transportation and storage, are in need. Technology has turned farming into a real business, now farmers have electrified every process, a consumer can place an order directly online, and the product will be transported from the farm to the consumer in time when it's still fresh. Use of information technology for management of farm activities, will increase production efficiency and will improve product quality, conserve energy and protect environment.

HETEROSIS ANALYSIS OF YIELD AND ITS COMPONENTS FOR PARENTS AND F1'S IN *BRASSICA JUNCEA* L.

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Abstract

The present study entitled "Heterosis analysis of yield and its components for parents and F1'S in *Brassica juncea* L." was carried out at the Research and Instructional Farm of S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur (C.G.), Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh) during Rabi 2016-17. Experimental materials comprised 10 F1 from a half diallel cross of five parents was grown in Randomized Complete Block Design with three replications with the objectives to estimate the heterosis is estimated for average, heterobeltiosis and standard genotype results. Days taken to 50% flowering, days taken to 50% maturity, plant height, number of primary branches, number of secondary branches, number of siliquae per plant, number of seeds per siliquae, 1000 seed weight and seed yield per plant exhibited significant ($p = 0.01-0.05$) differences among all the entries. The relative heterosis (Mid) RH-406 x NRCHB -101 (65.75) trait hybrids showed exhibited positive significant followed by RH-119 x DRMRIJ-31 (58.06), RH-749 x RH-406 (35.26), DRMRIJ-31 x NRCHB-101 (29.44), RH-119 x RH-406 (24.72) The heterobeltiosis (Better parent) Out of ten hybrids four hybrids showed positive significant heterobeltiosis RH-119 x DRMRIJ-31 (48.21) followed by RH-406 x NRCHB-101 (44.94), RH-749 x RH-406 (27.53) and RH-749 x RH-119, The heterosis over check (Best parent) for this traits ranged from -32.89 (RH-749 x DRMRIJ-31) to 46.00 (RH-119 x DRMRIJ-31). Out of ten hybrids three hybrids showed exhibited positive



standard heterosis RH-119 x DRMRIJ-31 (46.00) followed by RH-406 x NRCHB-10 (44.94) and RH-749 x RH-406 (27.53). Improved seed yield is a primary objective in a crop breeding program and therefore, positive heterosis for seed yield is of prime importance to develop high yielding genotypes.

EFFECT OF FOLIAR APPLICATION OF DIFFERENT LEVELS OF NUTRIENTS AND NAPHTHALENE ACETIC ACID ON MANGO MALFORMATION

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Abstract

The present investigation was conducted during 2017-18 at Fruit research station, Imaliya, JNKVV Jabalpur. Mango is one of the most important fruit in India but malformation is a serious disease causing severe economic losses every year. The aim of the present study was to see the effect of nutrient and growth regulators on this malady with deferent doses *i.e.*, Urea 2% and 4%, Boron 0.2% and 0.5%, Zinc 0.2 % and 0.5% and NAA 100 ppm and 200 ppm were sprayed at prior to flowering and 50% flowering stage along with control in variety Langra and Amrapali. The earliest flowering was observed with urea 2% in Amrapali followed by 4% urea, minimum percentage of malformation per meter square in NAA @ 200ppm followed by NAA @ 100 ppm, urea 2% and Boron 0.5%. The maximum percentage of healthy panicle was found in NAA @ 200 ppm followed by NAA @ 100 ppm and urea 2%, maximum weight of fresh and dry malformed panicle was found in control and maximum fresh and dry weight of healthy panicle was found with urea 2%, minimum number of malformation per plant was in NAA @ 200 ppm followed by NAA @ 100 ppm, urea 2 % and urea 4%.

EFFECT OF ORGANOLEPTIC AND CHEMICAL COMPOSITION OF MANGO NECTAR DURING STORAGE

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Abstract

The experiment was conducted at Horticulture processing laboratory, Department of Fruit Science, College of Agriculture, IGKV, Raipur during the year 2017-18 to evaluate the best mango varieties for processing. For the study, ten treatments (Amrapali, Amin, Chausa, Dashehari, Kakna (Local), Krishna bhog, Langra, Mallika, Sundari and Totapari) were selected, data with respect to organoleptic and chemical composition of fruits revealed that the nectar prepared from treatment T₁₀ (Totapari) recorded highest organoleptic score with respect to aroma, taste and overall acceptability. Whereas the maximum ascorbic acid was retained in the nectar with treatment T₇ (Langra), the highest acidity with treatment T₁₀ (Totapari), the maximum TSS content was recorded with the treatment T₈ (Mallika) and the maximum pH was found with the treatment T₁ (Amrapali), the treatment T₈ (Mallika) had a higher content of total sugar and reducing sugar in nectar. The non-reducing sugar content was higher in the nectar prepared with the treatment T₄ (Dashehari). During storage of nectar an, the acidity, TSS, total and reducing sugar showed an increasing trend with increasing period of storage (0 to 90 days) under ambient condition. While, there was a decreasing trend of ascorbic acid, pH, non-reducing sugar and organoleptic score during storage period upto 90 days of storage under ambient condition over all totapari preformed the best quality up to 3 month of storage according to the taste testing panel.

EFFECT OF DIFFERENT SOIL MEDIA AND GA₃ ON GROWTH OF MANGO ROOTSTOCK IN RELATION TO SUCCESS OF GRAFTING IN MANGO (*MANGIFERA INDICA* L.)

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Abstract

The present investigation “Effect of Different Soil media and GA₃ on Growth of Mango Rootstock in Relation to Success of Grafting in Mango (*Mangifera indica* L.)” was carried out during the year 2012-2013 at Fruit research station, Department of



Horticulture, J.N.K.V.V., Jabalpur. The treatment consists of 4 levels of GA₃ and 4 different soil media. Thus there were in all 16 combinations of various treatments of GA₃ and soil media and these were replicated 3 times in an Factorial Randomized Block design. Observations were recorded on the basis of five random competitive plants selected from each treatment separately for morphological and physiological parameters were evaluated as per standard procedure. The kernel sowing operation was done in the month of August and grafting operation was done in month of October. The analysis of variance showed significant differences among all the characters studied under different treatments. Application of soil + FYM + silt + Azotobactor + PSB with 100 ppm GA₃ was recorded the significantly superior for earliest germination, maximum number of leaves per seedling and other morphological character of seedling. It was also significantly influenced the early vegetative bud bursting, days taken for 1st sprout and was noted maximum new shoot length, new shoot girth and number of leaves per graft. Physiological parameter significantly enhanced by the treatment of soil + FYM + silt + Azotobactor with 100 ppm. The treatment soil + FYM + silt + Azotobactor + PSB with 100 ppm GA₃ was recorded the highest 96.67% graft success and 73.33% graft survival which was superior over other treatment, interaction effect of both the factor was observed statistically non-significant. While the lowest 76.67% graft success and 43.33% graft survival was observed in soil + FYM + silt with control.

STUDIES ON EFFECT OF NUTRIENTS AND MULCHING ON WATER USE AND WATER USE EFFICIENCY OF BELL PEPPER

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Abstract

The present experiment was conducted at Horticulture farm, Institute of Agriculture, Visva-Bharati, Sriniketan (West Bengal) during *rabi* season 2014-15 to study the effect of different nutrients and mulching on water use and water use efficiency of Bell pepper. The experiment was conducted in Randomized Completely Block Design (RCBD) with nine treatments and three replications. The treatment consisted different doses of N,P,K with different mulches *i.e.* Nitrogen (150Kg ha⁻¹ and 200 Kg ha⁻¹), Phosphorous (80 Kg ha⁻¹ and 120 Kg ha⁻¹) and mulches (Paddy straw and water hyacinth each @ 7t ha⁻¹). Results indicates that the treatment T₆ (200kg N ha⁻¹ + 80kg P₂O₅ha⁻¹ + Paddy straw mulch @ 7 t/ha⁻¹) showed lowest water use (284.73mm) and highest water use efficiency (74.16 kg ha⁻¹mm⁻¹), whereas the highest water use and minimum WUE were observed under control among all the treatments.

PERFORMANCE OF MAIZE-LEGUME BASED INTERCROPPING IN TIKAMGARH DISTRICT OF MADHYA PRADESH

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Abstract

An experiment was conducted on clay loam soils at Research farm of College of Agriculture, Tikamgarh during 2017-18 to find out the performance of maize legume intercropping for Tikamgarh district of Madhya Pradesh. The experiment was laid out in randomized block design with 10 treatments and replicated thrice. The crop growth parameters, yield attributes and yield of maize was significantly registered higher under maize + black gram 2:4 intercropping system followed by maize + soybean 2:4 intercropping system and maize + groundnut 2:4 intercropping system over sole maize. The yield attributes of legumes (soybean, black gram and groundnut) *viz.*, number of pods per plant and number of seeds per pod were appreciably affected when it was intercropped in maize. But, the test weight was not differed significantly due to different intercropping systems. In all intercropping systems studied, the seed yield obtained in sole legumes were significantly higher than cereal-legume intercropping systems. The maximum land equivalent ratio (LER) and maize equivalent yield (2.20 and 6484.80 kg/ha) was obtained in maize + black gram 2:4 intercropping system. The highest gross monetary return (GMR) and net monetary return (NMR) was obtained highest under maize + groundnut (2:4) (₹.108523/ha and ₹.77245/ha) due to high price



of groundnut. The B:C ratio was the highest with maize + groundnut (3.47) in 2:4 intercropping system followed by maize + black gram (3.44) in 2:4 intercropping system. The results of the experiment revealed that groundnut and black gram could be successfully grown as intercrop with maize in 2:4 proportion which gave higher monetary returns than sole crop of maize.

INTERPRETATION OF GEI, GENETIC AND STABILITY PARAMETERS FOR GRAIN YIELD AND COMPONENT TRAITS IN MAIZE HYBRIDS

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Abstract

The systematic study of genotype x environment interaction (GEI) and molecular divergence is of prime importance in enhancing productivity of hybrids and in easy and effective selection of suitable parental lines. In present study, GEI and parental molecular divergence were accomplished with predictable (plant density) and unpredictable (seasons) environments and with SRAP markers. The 45 F₁s direct cross hybrids were tested under two different plant densities (optimum plant density and high plant density) over *kharif* 2013 and *rabi* 2013-14 seasons comprising four environments namely *kharif* normal plant density (E1), *kharif* high plant density (E2), *rabi* normal plant density (E3) and *rabi* high plant density (E4), respectively. The study was performed with different traits namely grain yield per hectare, cob length, cob diameter, no. of kernels per row, no. of rows per cob, 100 kernel weight. The GEI study was performed with AMMI and GGE biplot for effective interaction interpretation with graphical display, and parental divergence study performed with Jacquard's similarity coefficient. Pooled analysis of variance of AMMI model indicated that main effects of genotype and environment, and interaction effect were having the significant difference. Interaction effect was the major source of variation for coblength, cobdiameter, number of rows per cob, 100-kernel weight, while, number of kernels per row, grain yield had almost equal contribution of genotypic main effect and interaction effect out of total variation. Yield being most important trait was having low environmental main effect, therefore, GGE analysis had been done for mega environment analysis with which-won-where pattern biplot display. The environments fell into two separate sectors like E1 and E2 of *kharif* season in one sector and E3 and E4 of *rabi* season in different sector. The hybrids, G7 in E1 and E2; and G9 in E3 and E4 were the winning hybrids in respective sector. Hybrid, G31 was most stable across the environments because of its closest position to origin. The correlations of average stability value (ASV) of grain yield with ASVs of different component traits and molecular divergence of parental lines were not significant. It indicates that no possibility of indirect selection for stable yield with different component traits, and selection of parental lines based on molecular divergence for enhancing the yield stability.

UNDERSTANDING OF GENOTYPE BY ENVIRONMENT INTERACTION OVER GRAIN YIELD AND SPIKE ARCHITECTURE OF WHEAT (*T. AESTIVUM* L.)

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Abstract

Wheat is one of the oldest crops of world's food crops, and is a major source of protein and calorie across the globe. However, it is one of the most suffered cereal crops from the effect of global warming. Unpredictable fluctuation of temperature at the time of flowering and grain filling hampers in the sustaining and enhancing of productivity. Therefore, to elucidate the genotype by environment interaction over the grain yield and spike architecture of wheat was carried out. The twenty five advance wheat lines were tested under early conservation agriculture, normal conservation agriculture and normal conventional tillage over two years for grain yield; and only one year testing for spike architecture. The analysis of variance of AMMI model indicated the significant main effects of genotype and environment and G x E interaction for yield and other components traits except non-significant genotypic and G x E interaction effects of no. of grains per spikelet at close to rachis



of lower spike portion (LCNGS). In yield, contribution of environmental and genotypic main effects out of total variation were 27.97% and 49.22% respectively, while genotype by environment interaction effect was 22.82%. Which-won-where pattern of GGE biplot displayed that test environments fell in three sectors and genotypes in five sectors. The first sector had environments, NCT1, NCT2 and ECA2, second sector had only ECA1 and remaining third sector was having NCA1 and NCA2. The winner genotype in first sector was G14; in second sector no genotype and in third sector winning genotype was G15. Remaining vertex genotypes that are G1 and G12 were not the top-yielding genotypes in any environment. The contribution of environmental main effect of component traits was relatively lower in comparison to genotypic and interaction effects. However, the effect of environment for different components traits varied over the spike architecture indicating the importance of environment for yield enhancement. The genotypic main effects of Individual grain weight (IGW) and no. of grains per spikelet (NGS) at distant to rachis over the spike were lower than genotype by environment interaction effects. Therefore, it indicates the high relative importance of genotype by environment interaction effects over the traits at distant to rachis position. Rest of traits and IGW and NGS at close to rachis position were having the mixed effects of genotypic main and genotype by environment interaction effects. The closet to ideal environment for defining the genotypic response was ECA1 and ECA2, and genotype, G14 with small of PC2 was designated ideal genotype for defining the environmental conditions. Some of the component traits were having the significant correlation with grain yield across the environments and some of the correlations were unique with each specific environments.

EVALUATION OF PHYTOCHEMICALS FOR BIOFORTIFICATION OF WHEAT

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Abstract

WHO considered micronutrient deficiency is the fifth major global challenge to human health listed in Copenhagen Consensus, 2008. Iron (Fe) and zinc (Zn) deficiencies are the most common and wide spread afflicting more than half of the human population. 60% of the world population is suffering from Fe deficiency while over 30% global population is suffering from Zn deficiency. In order to decrease the micronutrients deficiency a number of approaches has been suggested viz., biofortification, genetic engineering and fortification. But the best approach is biofortification as it is more sustainable and Economical. In biofortification first we need to identify the donor parents of wheat from which we can either increases the iron and zinc contents in wheat grains or decrease the phytochemicals which decreases the bioavailability of Fe and Zn. In the present study we have screened the available germ plasm of wheat for antinutritional and nutritional factors which increases the bioavailability of Fe and Zn. Our results suggests that a lot of variation for ascorbic acid , phytic acid, tannic acid contents was observed in wild relatives, hence this variety on can be used in developing new varieties in wheat.

IMPACT OF CLIMATE CHANGE ON MAIZE PRODUCTION

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Abstract

Climate variability has been and continues to be, the principal reason of fluctuations in global food production in countries of the developing world and is of serious concern in the India. Variability in rainfall is causing serious threat to the maize crop. Maize (*Zea mays* L.) is one of the most versatile emerging crop having wider adaptability under varied agro- climatic conditions. In India, maize is the third most important food crop after rice and wheat and climate change is showing negative impact on specially rainfed crop. The change in climate is badly reducing yield and biomass of maize. Climate change urgently needs to be assessed at the level of the household, so that poor and vulnerable people dependent on agriculture can be appropriately targeted in research and development activities whose object is poverty alleviation. However rainwater harvesting, soil conservation, intercropping, growing of short duration ,early maturing maize varieties, crop diversification can mitigate further impacts of climate change and may increase the production of maize.



HOW COMMUNICATION CHARACTERISTICS OF THE COMMUNITY RADIO BROADCASTERS AFFECT THE LISTENERSHIP OF COMMUNITY RADIO PROGRAMMES

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Abstract

In the era of advanced information and communication technologies, community radio broadcasting stands out especially by its programming process which is participatory in nature. The programmes aired on community radio are specifically designed for a community by addressing their real time issues and concerns. The presentation of the information need to be very attractive and interesting for the community members. Communication skills of the community radio functionaries is very crucial to ensure regular listenership of the programmes. Communication skills involving the communication ability and communication quality of the community radio functionaries are very essential from the listeners' perspective. Quality content and designing of the community radio programmes in addition with the effective communication can help in establishing a separate identity for community radios. The present study was conducted to assess the communication skills of the community radio functionaries and the volunteers working with the radio stations in North India. The community radio functionaries and volunteer of sixteen community radio stations operational in North India were interviewed personally by the investigator. It was found that maximum number of the community radio functionaries and volunteer possessed medium level of communication ability and communication quality. The presenters practiced before delivering their programmes over radio to minimize the mistakes and to build their confidence. Due to programming in local language, the presenters felt at ease and were very comfortable in participating in the community radio programmes. The listeners also reported that they listen certain community radio programmes because of the presenters of those programmes as they liked their way of talking over radio. It was also observed that the community broadcasters had their own group of audience who listen to them regularly and provide the feedback regarding the community radio programmes.

EXTRACTION, OPTIMIZATION AND POTENTIAL APPLICATION OF FENUGREEK SEED GEL AS COATING AGENT IN MICROENCAPSULATION OF IRON

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Abstract

Natural coating polymer material is help to possess the application of fenugreek seeds in encapsulation which contained gel after gelatinization has the functional and nutraceutical capability. Microencapsulation of Iron is one of the best method to achieve controlled iron release in coating which help in to fortification of food as it has not only increase the texture, and organoleptic problems but also help to increases the bioavailability of iron. In this work studied fenugreek seeds proximate, yield, solubility, stability, gelatinization property and Prepare iron micro-capsules by using simple extrusion technique as well as investigated encapsulation efficiency. Thus the results revealed that moisture 9.35%, fat 4.62%, protein 15.38%, fiber 11.8%, ash 4.91% and carbohydrate 53.99 % content in fenugreek seeds. Extracted fenugreek seeds gel was better gelling property, gel percentage yield and was not soluble when washed with 90% ethanol but soluble more in hot water rather than cold. The study suggested that gel was better stability at low temperature ($4 \pm 3^\circ\text{C}$) as no changes were observed while with gel at room temperature $28 \pm 3^\circ\text{C}$ also the result proposed good encapsulation efficiency respectively. This study offer added advantages of being fenugreek gel towards the enhancement of bioavailability in the gastrointestinal atmosphere.

IMPACT OF NUTRITIONAL KITCHENGARDEN ON RURAL HOUSEHOLDS OF JODHPUR DISTRICT OF RAJASTHAN

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Abstract

The Nutritional kitchengarden is very profitable enterprise in rural areas of our country, where people are predominantly



vegetarian, have limited income earning opportunities and poor access to markets. The nutritional kitchen garden is very important source of many essential nutrients of balance diet and deficiency of micro nutrient especially of iron, vitamin A and iodine prevailing in the rural area could be met out from vegetables produced from this garden. Keeping into consideration the importance of nutritional garden, Krishi Vigyan Kendra, CAZRI, Jodhpur has carried out 400 front line demonstration on nutritional kitchen garden covering 10 ha area during 2012 to 2018 to improve the availability of vegetable and nutrient in take at household level. The eighteen training programme benefiting 450 participants were conducted on importance and establishment of nutrition kitchen garden in different villages of Jodhpur district with an objective of improving the knowledge of rural women regarding various technological aspects of nutritional kitchen garden. The families of 4-6 members were selected purposively to conduct front line demonstrations. An area of 250 m² was taken to establish kitchen garden for each family. A questionnaire was used to assess the knowledge gain among participants of training programmes regarding various aspects of nutritional kitchen garden. The result of the study showed that, the average per capita availability of vegetable increased from 172 to 278 gm/day/person in the interventional families and an increase of 40 percent in knowledge level of beneficiaries was also observed among beneficiaries of training programmes.

EFFECT OF P AND K APPLICATION ON GROWTH, YIELD ATTRIBUTES, YIELD AND UPTAKE OF NUTRIENTS BY RICE IN BROADCAST *BIASI* SYSTEM

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Abstract

The present investigation entitled “Effect of P and K application on growth, yield attributes, yield and uptake of nutrients by rice in broadcast *biasi* system” was carried out at the Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur during *kharif* season of 2015. The soil of experimental field was sandy loam in texture (*Inceptisols*), neutral in pH and has 0.50% organic carbon, low nitrogen, medium phosphorus and high potassium content. The experiment was laid out in split-split plot design with three P and K application as main plot, two brown manuring as sub plot and four weed management practices as sub-sub plot with three replications. The treatment consisted of three P and K application for study *viz.* N₁- full P and K at 30-35 DAS, N₂-50% P and K at sowing and 50% P and K at 30-35 DAS, and N₃- full P and K at sowing in main plots, B₁- no manuring and B₂- brown manuring in sub plot and W₁- *biasi* operation followed by hand weeding, W₂- pre emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb *biasi* fb hand weeding, W₃- pre emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb post emergence herbicide bispyribac-Na 20 g ha⁻¹ and W₄- early post emergence azimsulfuron 35 g ha⁻¹ fb late post emergence bispyribac-Na 20 g ha⁻¹ in sub-sub plots. Results revealed Application of 50% P and K at sowing and 50% P and K at 30-35 DAS (N₂), brown manuring (B₂) and pre-emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb *biasi* fb hand weeding (W₂) registered significantly highest plant height, total number of tillers, effective tillers, panicle length, panicle weight, number of total and filled grains panicle⁻¹ grain yield, straw yield, gross return and net return as compared to other P and K application, brown manuring and weed management. Weed density and dry matter production by weeds were minimum under 50% P and K at sowing and 50% P and K at 30-35 DAS (N₂), brown manuring (B₂) and pre emergence herbicide pyrazosulfuron 20 g ha⁻¹ followed by *biasi* followed by hand weeding (W₂).

ECONOMICS OF RICE AS INFLUENCED BY P AND K APPLICATION, BROWN MANURING AND WEED MANAGEMENT PRACTICES UNDER BROADCAST *BIASI* SYSTEM.

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Abstract

The experiment was conducted at Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *kharif* season of 2015 to economics of rice as influenced by P and K application, brown manuring and weed management practices under broadcast *biasi* system. The experiment laid out in split-split plot design with three P and K application as main plot, two brown manuring as sub plot and four weed management practices as sub-sub plot with three replications. The treatment consisted of three P and K application for study *viz.* N₁- full P and K at 30–35 DAS, N₂-50% P and



K at sowing and 50% P and K at 30–35 DAS, and N₃- full P and K at sowing in main plots, B₁- no manuring and B₂- brown manuring in sub plot and W₁- biasi operation followed by hand weeding, W₂- pre emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb biasi fb hand weeding, W₃- pre emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb post emergence herbicide bispyribac-Na 20 g ha⁻¹ and W₄- early post emergence azimsulfuron 35 g ha⁻¹ fb late post emergence bispyribac- Na 20 g ha⁻¹ in sub-sub plots. Results revealed that Considering yield and economics under different treatments, 50% P and K at sowing and 50% P and K at 30–35 DAS (N₂) under P and K application, brown manuring (B₂) under brown manuring treatment and pre-emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb biasi fb hand weeding (W₂) under weed management found to be the superior. Interaction among treatment application of P and K, 50% P and K at sowing and 50% P and K at 30–35 DAS (N₂) with brown manuring (B₂) and weed management, pre-emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb biasi fb hand weeding (W₂) gave significantly highest grain yield, gross return, and net return. Maximum gross return (Rs. 81978 ha⁻¹), net return (Rs. 54330 ha⁻¹) and B: C ratio (2.96) was obtained under treatment recommended P and K application, 50% P and K at sowing and 50% P and K at 30–35 DAS (N₂), due to higher grain and straw yield. While lowest gross income (Rs. 69519 ha⁻¹), net income (Rs. 42071 ha⁻¹) and benefit cost ratio (2.53) were recorded under treatment full P and K at 30-35 DAS (N₁). Concerning to brown manuring treatment, application of brown manuring (B₂) gave maximum gross return (Rs. 78372 ha⁻¹) and net return (Rs. 48197 ha⁻¹) in comparison to no manuring (B₁). While maximum benefit cost ratio (2.84) was recorded under no manuring (B₁). As regards to weed management, maximum gross return (Rs. 81645 ha⁻¹) and net return (Rs. 53168 ha⁻¹) were recorded under treatment pre-emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb biasi fb hand weeding (W₂) which was found to be at par with biasi operation fb hand weeding (W₁) while maximum B:C ratio (2.87) was recorded under treatment pre-emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb post emergence herbicide bispyribac-Na 20 g ha⁻¹ (W₃) which was found to be at par with pre-emergence herbicide pyrazosulfuron 20 g ha⁻¹ fb biasi fb hand weeding (W₂) and biasi operation fb hand weeding (W₁).

IMPACT OF ORGANIC MANURES AND INORGANIC FERTILIZERS ON PLANT GROWTH, YIELD, QUALITY OF TOMATO (*LYCOPERSICON ESCULENTUM* L.) C.V PUSA RUBY

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Abstract

Tomato (*Lycopersicon esculentum* L.) is one of the most important vegetable crop belong to solanaceae family being grown all over country. Tomato is a warm season crop. The best fruit colour and quality is obtained at a temperature range of 21- 24 °C. Tomato is the second most important vegetable crop next to potato. It is a good source of vitamin A, vitamin C, Ca, Fe, protein, antioxidant and carotenoids that helps in retarding cancer and degenerative disease. The experiment was conducted college of agriculture Gwalior (MP) during 2018-19 to study the “Impact of organic manures and inorganic fertilizers on plant growth, yield, and quality of tomato (*Solanum lycopersicon* L.) C.V Pusa Ruby. The experiment was conducted in RBD (randomized complete block design) with 13 treatments replicated thrice. Different combination of organic manures i.e. FYM, Poultry manure and vermicompost and inorganic fertilizers. Among 13 treatments under study T 7 (50% RDF + 50%FYM) recorded maximum plant height (134.12 cm), minimum days to first flowering (28.47) , maximum number of flower cluster per plant (7.67), maximum number of fruit per plant (35.72) , maximum average fruit weight (40. 67 g) followed by the treatment T8 (50%RDF + 50%Poultry manure) . It is therefore concluded that T7 combination is the best.

EFFECT OF BIOFERTILIZERS ON GROWTH, YIELD AND QUALITY OF ONION (*ALLIUM CEPA* L.)

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Abstract

Onion (*Allium cepa* L) is one of the most important vegetable crop belong to amaryllidaceae family being grown all over country. A field experiment was conducted during rabi season of 2018 - 2019 on “Effect of biofertilizer on growth, yield and



quality of onion (*Allium cepa* L.). The experiment consisted six combinations of biofertilizer and two chemical fertilizer on onion cv. Agrifound light red. Onion is considered to be a high value cash crop for india and abroad. It is one of the most important vegetable crop and spice crop having various uses in everyday cooking. India is 2 nd largest producer next to china. The treatments were Azotobacter + PSB, Azotobacter + VAM, Azotobacter + Azospirillum, Azospirillum + VAM, Azospirillum + PSB, PSB + VAM, NPK 100 %, NPK 75% and control. The plant height was mazimum (42.46 cm) with the application of Azotobacter + VAM. Number of leaves and bulb diameter were maximum of Azotobacter + Azospirillum, and NPK 100% gave maximum length of bulb (5.56 cm). It is therefore concluded that Azotobacter + Azospirillum combination is the best.

GENETIC IMPROVEMENT IN BRINJAL THROUGH MANIFESTATION OF HETEROSIS

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Abstract

It is presumed that by 2025, India will have 1.4 billion people, majority of whom will have relatively higher living standards. The consumption of vegetables has attained tremendous importance with these changing dimensions of food and nutritional securities. Due to increasing pressure on land through urbanization and industrialization, it is not feasible to increase the area under vegetables commensurate to our requirements; hence, the preciousness of increasing the yield per unit area become more feasible to increase the area under vegetable commensurate to our requirements, hence the preciousness of increasing the yield per unit area becomes much more significant than it has ever been. This is the point at which hybrids carve a niche for themselves over non-hybrids. Development in vegetable production particularly through hybrids, contributes not only to food and nutritional security but also towards poverty alleviation and income generation since it is labour intensive, earns higher returns and involve extra skills. Heterosis is the basis for development of hybrids and synthetic varieties. In fact, hybrids is the best means of utilizing heterosis, as it leads to superiority in adaptation, yield, quality, disease resistance, maturity and general vigour over its parents. In the present study, the extent of heterosis was studied in 28 F₁ hybrids of brinjal. Estimates of heterotic responses showed the perceptible advantage of heterozygosity in increasing the yield. This phenomenon led to identify heterosis breeding as the key methodology for improving genetic yield ceiling in brinjal. On the basis of heterosis studies, it is concluded that the hybrids PB-6 x PR and PB-4 x PR were found promising for earliness in E1 season while, PB-6 x PB-4 and PS x BARI for E2 season. For fruit yield, PB-6 x BARI, SA x PB-4, SA x PR and PB-6 x PB-71 were found promising for the trait in E1 season while for E2 season PPR x PB-71, SA x PR and PB-71 x BARI exploited maximum heterosis.

STUDY OF GENETIC PARAMETERS IN WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

The development of high yielding wheat cultivars is the main objective of any wheat breeding programmes in the world. Identification of better genotypes with desirable traits and their subsequent use in breeding programme can be helpful for successful varietals improvement programme. Improvement in crop depend upon the magnitude of genetic variability in economic characters therefore, the evaluation and utilization of genetic variability in desired direction becomes extremely important. In this regard, it is necessary to survey the available useful variability, hence, the present investigation had been conducted with the objectives t estimate the relative extent of variability, heritability and genetic advance for yield and its components in wheat. Inpresent Investigation, 36 improved genotype of bread wheat were evaluated Under timely sown condition at Research farm of R.M.P. P.G. College, Gurukul Narsan, Haridwar (Uttarakhand) and observation on yield and yield attributing traits were recorded.



The results of ANOVA revealed that the mean sum of squares among the genotypes for all the characters were highly significant indicating the presence of ample amount of variability which can be exploited for selection of characters for crop improvement programme. Heritability in broad sense was observed highest for hundred grain weight followed by days to emergence and length of spike, whereas was lowest for number of grains per spikelet. Genetic Advance as a percent of mean was maximum in case of days to emergence followed by biological yield and awn length and minimum for grains per spikelet. Heritability along with genetic advance becomes more useful tool for the prediction of the method of improvement to be applied, rather than heritability alone. As per results heritability in broad sense was ranging from high to moderate, whereas genetic advance as a percent of mean was ranging from moderate to low, which signified the ineffective of simple selection measures for the improvement of genotypes. Use of inter- and intra-population improvement methods will be more beneficial.

INTERRELATIONSHIP OF YIELD COMPONENTS IN WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

India is one of the major producers of wheat and ranks second after China in area and production. Yield is quantitative character and is governed by many genes having smaller effects i.e., polygenes. Thus, we can say that the yield is the final product of yield components. These components may affect the yield directly or indirectly. Therefore, yield can be maximized by improving the yield components provided there is no unfavourable association. The correlation study can show the magnitude of association between any two characters. thus, the knowledge of character association is essential for simultaneous improvement of yield and yield components. The present investigation was conducted with the objective to estimate the character relationship between yield and yield contributing characters. The experiment was carried out with 35 wheat genotypes planted in randomized block design (RBD) at research farm, R.M.P. P.G. college, Gurukul Narsan, Haridwar (Uttarakhand) under timely sown irrigated conditions. Grain yield showed highly significant positive correlation with biological yield while significant positive correlation with harvest index, grains per spikelet and tillers per plant. Biological yield showed highly significant positive correlation with plant height and tillers per plant. Grain weight per ear exhibited highly significant positive correlation with grains per spike, spikelet per spike and awn length. The finding of present investigation might be use full to the future breeding programmes for developing improved genotype.

PATH ANALYSIS IN WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

It is an important staple food of many countries in the world and occupies a unique position as used for the preparation of a wide range of food stuffs. Its cultivation has been related to the development of the major civilizations all over the world. The correlation analysis gives an idea about the various associations existing between the yield components, but it cannot expend the effect of other characters in execution of association of a component character. Hence, the knowledge of character association along with its partition in direct and indirect effect of component characters is essential for improvement of yield and yield components under any breeding programme. Therefore, the present investigation had been conducted with the objective to estimate the path coefficient to explore inter-character correlation, between the yield components.

The experiment was carried out with 36 wheat genotypes planted in randomized block design (RBD) at research farm, R.M.P. P.G. college, Gurukul Narsan, Haridwar (Uttarakhand) under timely sown irrigated conditions. The data were recorded for 13 characters viz., days to emergence, plant height, number of tillers per plant, spike length(cm), awn length(cm), number of spikelet per spike, number of grains per spikelet, number of grains per spike, grain weight per ear, 100 grain weight, biological yield, harvest index and grain yield per plant. Correlation analysis revealed that grain yield showed highly significant positive



correlation with biological yield while significant positive correlation with tillers per plant. Path coefficient analysis revealed that highly positive direct effect on yield was recorded for number of grains per spike followed by grain yield per plant, spike length, awn length, plant height and 100 grain weight on genotypic basis. Genotypic direct negative effect on yield was recorded for grain weight per ear followed by number of grains per spikelet, number of spikelets per spike, number of tillers per plant, harvest index and days to emergence. The path coefficient analysis helps to understand the casual factor better because it divided total effect of paired traits in to direct and indirect effect via other characters. The finding of present investigation might be use full to the future breeding programmes for developing improved genotype.

GENETIC VARIABILITY STUDIES FOR QUANTITATIVE AND QUALITY TRAITS IN BASMATI RICE (*ORYZA SATIVA* L.)

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Abstract

Among the rice growing countries in the world, India has the largest area under rice crop and ranks second in production next to China. Knowledge on the genetic architecture of genotypes is necessary to formulate efficient breeding methodology. The systematic breeding programme involves the steps like creating genetic variability practicing selection and utilization of selected genotypes to evolve promising varieties. Identification of better genotypes with desirable traits and their subsequent use in breeding programme and establishment of suitable selection criterion can helpful for successful varieties improvement programme. Analysis of variability among the traits contributing to yield of a crop would be of great importance in planning a successful breeding program. Therefore, development of high-yielding varieties requires through knowledge of the existing genetic variation for yield and its components. Therefore, the present investigation had been conducted with the objectives to estimate the relative extent of variability, heritability and genetic advance for different characters among basmati rice genotypes. The present investigation was carried out with 30 Paddy genotypes shown in RBD with three replications and observations were recorded for twenty-two characters. The results of ANOVA revealed that the mean sum of squares among the genotypes for all the characters were highly significant indicating the presence of ample amount of variability which can be exploited for selection of characters for crop improvement programme. The value of PCV and GCV was observed highest in case of flag leaf width. Genetic Advance as a percent of mean was maximum in case of grain yield per plant followed by number of grains per panicle, grain weight per panicle and water absorb by kernel while minimum for hulling percent and days to maturity. On the basis of study, the desirable donors for each character were identified. The most promising donors for grain yield were SKG-2017-19, SKG-2017-64, SKG-2017-40, SKG-2017-06 and SKG-2017-17. These genotypes can be used for further breeding programme to improve the yield potential of the variety.

STUDY OF CHARACTER ASSOCIATION IN RICE (*ORYZA SATIVA* L.)

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Abstract

Correlation coefficient analysis measures the mutual relationship between various plant characters and determines the component characters on which selection can be based for genetic improvement yield. While selecting the suitable plant type, correlation studies would provide reliable information in natural extent and the direction of the selection, especially when the breeder needs to combine high yield potentials with desirable agronomic traits and grain quality characters. Yield is quantitative character and is governed by many genes having smaller effects i.e., polygenes. Thus, we can say that the yield is the final product of yield components. These components may affect the yield directly or indirectly. Therefore, yield can be maximized by improving the yield components provided there is no unfavourable association. The correlation study can show the magnitude of association between any two characters. Thus, the knowledge of character association is essential for simultaneous improvement of yield and yield components. Therefore, the present investigation had been conducted with the



objective to assess the nature and magnitude of character association. The present investigation was carried out with 30 rice genotypes planted in RBD with three replications. All the genotypes were evaluated for twenty-two characters and data was subjected to correlation analysis. Genotypic correlation coefficients between grain yield per plant and other quantitative characters attributing to yield showed that seed yield was significantly and positively associated with days to maturity, number of tillers per plant, number of grains per panicle, grain weight per panicle, and flag leaf length. It showed significant and negative correlation with kernel breadth after cooking, 100 kernel weight after cooking and kernel elongation ratio. These relationships may be helpful in crop improvement, if selection favours high grain yield then the remaining characters which are positively associated will be automatically improved.

GENETIC VARIABILITY, HERITABILITY AND ASSOCIATION STUDIES FOR QUANTITATIVE AND QUALITY TRAITS IN RICE (*ORYZA SATIVA* L.)

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Abstract

Rice (*Oryza sativa* L.) is one of the pivotal staple cereal crops and central to the lives of billions of people around the world. Rice occupies an important place in the Indian agriculture and has been grown under diverse ecological conditions and gets exposed to different environmental stresses like salinity, alkalinity, drought, cold etc. The amount of genetic variability in the natural population is an important asset for a plant breeder for the crop improvement. Usually the characters which are of interest to the plant breeder are complex and are the result of the interaction of a number of components, so it becomes important to understand correlation between yield and its components for making the best use of these relationships in selection. While selecting the suitable plant type, correlation studies would provide reliable information in natural extent and the direction of the selection, especially when the breeder needs to combine high yield potentials with desirable agronomic traits and grain quality characters. Keeping the above facts in mind the present investigation was carried out with the objectives to estimate the relative extent of variability, heritability and genetic advance for different characters among basmati rice genotypes, and to assess the nature and magnitude of inter-character correlation among yield and its components. The present study was undertaken with 30 rice genotypes evaluated for 22 characters in RBD with three replications. ANOVA revealed that the mean sum of squares among the genotypes for all the characters was highly significant. PCV and GCV estimates were found high for almost all the traits of interest except for days to maturity, hulling percent and 100 kernel weight after cooking. The values of PCV and GCV were highest for Grain weight per plant followed by number of grains per panicle and breadth increase ratio after cooking whereas, the values were found lowest for hulling percent. Heritability was for maximum for plant height followed by kernel length after cooking and kernel length before cooking whereas, it was found minimum for hulling percent. Genetic advance as percent of mean was registered highest for number of grains per plant followed by number of grains per panicle and breadth increase ratio after cooking and lowest for hulling percent. Highest significant positive genotypic correlation was found between traits 100 kernel weight and 100 grain weight whereas, highest significant negative genotypic correlation was found between characters water absorbed by 10gm kernel and 100 grain weight. Highest significant positive phenotypic correlation was found between traits 100 kernel weight and 100 grain weight whereas, highest significant negative phenotypic correlation was found between characters grain weight per plant and days to maturity.

CHARACTER ASSOCIATION AND PATH STUDIES IN RICE (*ORYZA SATIVA* L.)

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Abstract

Rice (*Oryza sativa* L.) is one of the pivotal staple cereal crops and occupies an important place in the Indian agriculture. It has been grown under diverse ecological conditions. The characters like yield, which are of interest to the plant breeder are



complex and result of the interaction of a number of components, so it becomes important to understand correlation between yield and its components for making the best use of these relationships in selection. The better way of exploiting genetic correlation and path coefficient with several traits having high heritability is to construct a selection index that combines information on all characters associated with the dependent variable. Efforts are to be taken with a systematic research approach to exploit the yield potential by direct and indirect selection. The use of correlation coefficient and path analysis is to establish the extent of association between yield and yield components and others characters and for fixing up the characters which are having decisive role in influencing the yield. In view of these facts, the present investigation was carried out with the objectives to estimate correlation coefficients to assess the nature and magnitude of inter-character correlation among yield and its components. The present study was undertaken with 30 rice genotypes evaluated for 22 characters in RBD with three replications. Correlation analysis revealed that grain yield showed highly significant and positive correlation with flag leaf length, number of grains per panicle, 100 grain weight, 100 kernel weight, kernel length after cooking and kernel elongation ratio. These relationships may be helpful in crop improvement, if selection favours high grain yield then the remaining characters which are positively associated will be automatically improved. Path coefficient analysis revealed that 100 grain weight, 100 kernel weight after cooking, hulling%, number of grains per panicle and flag leaf length exerted high positive direct effect on grain yield and 100 grain weight, grain weight per panicle had negative direct effect towards grain yield. The path-coefficient analysis helps to understand the causal factor better, because it divides total effects of paired traits into direct and indirect effects via other characters.

IMPACT OF CLIMATE CHANGE ON MAIZE PRODUCTION

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Abstract

Climate variability has been and continues to be, the principal reason of fluctuations in global food production in countries of the developing world and is of serious concern in the India. Variability in rainfall is causing serious threat to the maize crop. Maize (*Zea mays* L.) is one of the most versatile emerging crop having wider adaptability under varied agro- climatic conditions. In India, maize is the third most important food crop after rice and wheat and climate change is showing negative impact on specially rainfed crop. The change in climate is badly reducing yield and biomass of maize. Climate change urgently needs to be assessed at the level of the household, so that poor and vulnerable people dependent on agriculture can be appropriately targeted in research and development activities whose object is poverty alleviation. However rainwater harvesting, soil conservation, intercropping, growing of short duration ,early maturing maize varieties, crop diversification can mitigate further impacts of climate change and may increase the production of maize.

LEVEL OF KNOWLEDGE AND EXTENT OF ADOPTION OF VERMI-COMPOST TECHNOLOGY AMONG THE TRAINEES OF REWA (M.P.)

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Abstract

The present study was conducted in Rewa district of Madhya Pradesh. Rewa block was selected for the present study on the basis of maximum number of training on vermi-compost have been conducted in this block comparison to other blocks. Out of the total trainees, 46.37 per cent had medium knowledge level of vermicompost technology, while 29.09 per cent had high knowledge level and only 24.54 per cent trainees had low knowledge level about the vermicompost technology. The mean score of knowledge obtained by the vermicompost trainees. It is obvious from the table that the mean Score of various packages of practices of vermicompost technology were ranged from 0.80 to 1.72. Therefore, it can be concluded that majority of the trainees material used for covering and Advantages of vermicompost technology (1.72) followed by advantage of vermicompost (1.67), suitable warms for vermicompost using(1.52), selection of place for vermicompost (1.47), vermicompost (1.41), layer sequence type of material used for vermicompost technology (1.10) whereas the least number



trainees knowledge smell and colour present in vermicompost (0.80). The finding was found similar to that of Khan (2004) and Sharma et al (2008). The mean score of adoption obtained by the vermicompost trainees. It is obvious that the mean Score of various packages of practices of vermicompost technology were ranged from 0.81 to 1.78. That out of the total trainees, 45.45 per cent had medium adoption of vermicompost technology, while 30.90 per cent had low and 23.63 per cent had high adoption level of vermicompost technology. Therefore, it can be concluded that majority of the trainees have adoption of use of water in interval (1.78) followed by use of vermicompost (1.7), raw material required (1.62), appropriate size of pit (1.54), type and quantity of worms (1.48), precaution of sunlight, rain wave etc (1.40), method for preparation (1.35), removal of harmful material (1.28), selection of place (1.23) for vermicompost technology, whereas the least number trainees adopted about smell and colour (0.81). The finding finds support from the work of Kanal (2005).

EFFECT PRODUCTION POTENTIAL OF MINOR MILLETS- OILSEEDS CROPS UNDER MANGO (*MANGIFERA INDICA L.*) BASED AGRIHORTICULTURE PRACTICE OF AGROFORESTRY

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Abstract

Agrihorticulture land use is an important component of Agroforestry. Agroforestry is a land use system that involves deliberate retention, introduction, or mixture of trees or other woody perennials in crop/ animals production fields to benefit from the resultant ecological and economic interactions. Agroforestry has a tremendous scope in India as it has achieved self-sufficiency in food production, and its attention is becoming more focused towards ecological problems and shortage of fuel, fodder, forest produce and other outputs as well as unemployment. The study carried out in two year old orchard of Mango with the RBD design, plant to plant distance kept 5 meter to 5 meter. In Kharif season there was four sub treatment of Kodo, Kutki, Ragi and Sawa crops. Applied recommended dose of fertilizers. Data taken on the Plant height (cm), Numbers of tillers/MRL, Numbers of panicles/plant, Length of panicle (cm), Grain Yield (Kg ha^{-1}), 1000 grain weight (gm) and Net monetary return (Rs ha^{-1}). Among the mango based agrihorticulture system Mango+ ragi was recorded the highest plant height (94.10) followed to Mango + sawa, Mango + kutki and Mango + kodo based agrihorticulture system. In sole crop, ragi treatment was recorded the highest plant height (99.53) followed to sawa, kutki and kodo. Among the mango based agrihorticulture system Mango+ kutki was recorded the highest number of tillers/MRL (45.88) followed to Mango + sawa, Mango + kodo and Mango + ragi based agrihorticulture system. In sole crop, kutki treatment recorded the highest number of tillers/MRL (46.34) followed to sawa, kodo and ragi. Number of panicles/plant was recorded the highest in Mango+kutki ((5.40) based agrihorticulture system followed to Mango + kodo, Mango + sawa and Mango + ragi. 1000 grain weight was recorded the highest in Mango + kodo (4.22 gm) Mango + kodo was recorded the higher grain yield ($670.80 \text{ kg ha}^{-1}$) Among the Mango based agrihorticulture system, Mango + kodo was recorded the higher straw yield (1607 kg ha^{-1}) Among the mango based agrihorticulture system, Mango + kutki was recorded the higher monetary return ($\text{Rs.}9858 \text{ ha}^{-1}$) followed by Mango + sawa ($\text{Rs.}7300 \text{ ha}^{-1}$).

EFFECT OF CROP ESTABLISHMENT METHODS AND WEED MANAGEMENT PRACTICES ON GRAIN YIELD AND ECONOMICS OF DIRECT SEEDED RICE

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Abstract

A field experiment was carried out at Student Instructional Farm of Chandra Shekhar Azad University of Agriculture & Technology Kanpur (U.P.) during *kharif* season of 2014-15. To study the “Effect of crop establishment methods and weed management practices on grain yield and economics of direct seeded rice.” The treatments consists of three crop establishment methods viz, [D₁- Dry sowing in line, D₂- Wet sowing in line, D₃- Sprouted seedling broadcasted in puddled condition] in main plots treatments and four weed management practices [W₁- Bispyribac 25g ai. ha^{-1} , W₂- Sesbania + Bispyribac 25g ai. ha^{-1} , W₃- Hand weeding twice (20 & 40 DAS) and W₄- Unweeded Control] as sub plot treatments. The study was made in split plot design with three replications. The higher grain yield (25.98 q ha^{-1}) was recorded with the method where sprouted seedlings



were broadcasted in puddled condition followed by wet sowing in line (25.62 q. ha⁻¹). In case of weed management practices, significantly higher grain yield (26.99 q ha⁻¹) was recorded with brown manuring of Sesbania + Bispyribac 25g ai.ha⁻¹. The higher gross return and net return (Rs 79323.00 ha⁻¹ and 39518.00 ha⁻¹) of direct seeded rice was obtained with the method where sprouted seedlings were broadcasted in puddled condition. However, The dry sowing in sowing method given lowest gross return (Rs 65928.00 ha⁻¹) which was 20.31% lower than sprouted seedling method. Among the weed management practices, higher gross return and net return (Rs 82403.00 ha⁻¹ and 42598.00 ha⁻¹) was obtained from Sesbania + Bispyribac 25g ai.ha⁻¹. The B: C was also found higher in sprouted seedling broadcasting in puddled condition (1.99) as compared to dry sowing in line (1.73) and under weed management practices, higher B: C (2.07) was found with Sesbania + Bispyribac 25g ai.ha⁻¹. Thus may be concluded that sprouted seedling broadcasted in puddled condition followed by wet sowing in line proved to be better with respect to grain yield and profitability. Among the weed management practices, Sesbania + Bispyribac 25g ai.ha⁻¹ was recorded better result with respect of given yield and economics.

ECONOMIC EFFICIENCY OF ORGANIC *VIS-A-VIS* INORGANIC GREENGRAM GROWERS IN BIDAR DISTRICT OF KARNATAKA (INDIA)

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Abstract

The study area to find out the whether technically, allocative and economic efficient or inefficient in greengram production. Supply of essential nutrients through available resources and usage of correct technology is key element to increase crop yield. The result pertaining to this aspect was based on the primary data collected through survey method from organic greengram cultivated 45 farmers and inorganic greengram cultivated 45 farmers in bidar district during 2017-18. The results indicated that technical efficiency mean was 0.59 and 0.68 under the assumption of constant returns to scale (CRS). While, variable returns to scale (VRS) estimated technical efficiency mean of 0.65 and 0.71 for organic and inorganic greengram growers. In terms of allocative efficiency, there was still potential to increasing in output to the tune of 38 per cent and 44 per cent respectively for organic and inorganic greengram growers by optimally allocating given inputs under the assumption of CRS. Under the assumption of VRS, there was 32 per cent and 29 per cent potential for organic and inorganic greengram farms to increase the output by optimally allocating given inputs. The economic efficiency mean ratio was 0.61 and 0.72 for organic and inorganic greengram farms under the assumption of CRS. It implied that, there exists a 39 per cent and 28 per cent. While, economic efficiency mean of 0.68 and 0.74 under assumption of VRS. It implied that, there exists a 32 per cent and 26 per cent potential for increasing organic and inorganic greengram cultivated farms. Therefore organic and inorganic greengram grower farmers need to use existing level of their resources and technology in order to achieve the 100 per cent efficiency.

RESOURCE USE EFFICIENCY OF COTTON CULTIVATION IN YADGIRI DISTRICT OF NORTH EASTERN KARNATAKA REGION (KARNATAKA)

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Abstract

Agricultural sector take part main role in economic development of developing countries. In India, this sector occupies a predominant position in the economy. Application of essential nutrients through available resources is key element to increase crop yield. The result pertaining to this aspect was based on the primary data collected through survey method from cotton cultivated farmers 60 farmers in Yadgiri district during 2015-16. The study revealed that cotton cultivation of small farmers the regression coefficients of the resource variables were found positive for seed (0.06), FYM (0.13), potash (0.12) and PPC (0.27), with regard to negative regression coefficients was observed for nitrogen (-0.27) phosphorous (0.19), and labour usage (-0.08). The significant negative regression coefficient was observed in case of nitrogen and phosphorous indicated that the one per cent changes in its use level would decreases the output of cotton by 0.27 per cent and 0.15 per cent. With regard to



large farmers, the highly significant regression coefficient observed in case of nitrogen indicated that the one per cent change in its use level would decrease the output of cotton by 0.19 per cent, followed by phosphorous 0.05 per cent keeping the use levels of the other variable constant. Whereas regression coefficients of the resource variables for seed (0.09), FYM (0.28), potash (0.08) and labour usage (0.13) were found positive.

CROP INSURED FARMERS PERCEPTION ON CLIMATE CHANGE

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Abstract

Crop insurance is one method by which farmers can stabilize farm income and investment and guard against disastrous effect of losses due to natural hazards or low market prices. Crop insurance not only stabilizes the farm income but also helps the farmers to initiate production activity after a bad agricultural year. Based on this context study was conducted in Belagavi, Dharwad, Haveri and Vijayapura districts of North Karnataka during the year 2017-18. The *Ex-post-facto* research design was used for the study. From each district 60 insured farmers were selected to form a sample of 240 by using purposive sampling technique. The study depicts that 51.25 per cent of the insured farmers belonged to high level of extent of perception on climate variation, followed by medium (29.58%) and low (19.17%). Majority of the insured farmers strongly agree to the statement of late onset of monsoon (65.00%) followed by occurrence of drought (59.17%), changes in time of sowing (56.67%), decrease in average rainfall (52.50%), uneven distribution of rainfall (46.67%), increased pest and diseases (48.75%) and decreased yield (35.83%). More than seventy per cent of the insured farmers disagree to the statement of reduced soil fertility (77.08%) and increased crop weed competition (70.83%). The reasons might be farmers got sensitization on these climate variability conditions as they have direct bearing on the farming. The climatic parameters are in accordance with the general observations of meteorologists of the study area. The extent of climate variation is experienced everywhere and so the results.

EVALUATION OF SHELF LIFE AND MICROBIAL LOAD OF VALUE ADDED PRODUCTS DEVELOPED FROM UNDERUTILIZED TENDER TAMARIND LEAVES (*TAMARINDUS INDICA* L.) POWDER

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Abstract

Tamarind is an underutilized multipurpose tree possessing indispensable properties of which almost every part of tree finds at least some use, either nutritional or medicinal. Tamarind leaves and fruit pulp used in culinary preparation in different countries due to its sourness. It is valued mostly for its fruit especially for the pulp, which is widely used for domestic and industrial purposes. Objective of the study is to evaluate the shelf life and microbial load of products prepared from the tender tamarind leaves powder. The shelf life study and microbial load of the products were conducted for the best accepted products. The products were packed in aluminium foil covers and were kept in ambient temperature at 27°C. The sensory attributes and microbial load of stored products were observed at the interval of initial, 10th, 20th and 30th day, the result revealed that, as the number of days increased, the sensory parameters of all the products were decreased, there was no significant change in all the attributes accept aroma and taste were decreased significantly from (7.65 to 6.45) and (7.95 to 6.65) respectively. Bacterial population of roasted Bengal gram chutney powder-1 at initial, 10th, 20th and 30th day was found to be 2.00, 3.66, 4.00 and 5.33 ×10⁴/g CFU respectively. The microbial population was more in hurigalu-2 when compared to chutney powders. However, the presence of tartaric acid in tamarind leaves in both the chutney powders and in hurigalu act as natural preservatives to reduce the microbial multiplication. The general common acceptance for countable number of colonies plates are 30-300 and 25-250 for bacteria and fungi respectively. Thus the present study had shown that these products could find a place in the domestic market on par with other products and can be promoted for regular consumption.



PERFORMANCE OF PRADHAN MANTRI FASAL BIMAYOJANA IN KARNATAKA STATE

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Abstract

Universally agriculture is perceived to be synonymous with risk and uncertainty. Agricultural insurance is one of the risk management strategy to overcome risk to greater extent. It helps in stabilization of farm production and income of the farming community. In recent times, mechanisms like contract farming and future trading have been established which are expected to provide some insurance against price fluctuations directly or indirectly. Crop insurance not only helps the farmers to withstand the shock from uncertain situation but also acts as incentive to use the resources efficiently and achieve higher level of productivity. The results indicated that, Performance of Pradhan Mantri Fasal Bima Yojana in Karnataka State 21,23,235 farmers covered by covering an area of 30,53,490 hectares. Out of the total number of farmers only 7,36,000 farmers got benefited from the scheme with a claim settlement of 110522.00 thousand rupees. With respect to Restructured Weather Based Crop Insurance Scheme covered 1,06,420 farmers by covering an area of 33,642 hectares. Out of the total number of farmers, 40,431 farmers got benefited from the scheme with a claim settlement of 27629.70 thousand rupees. Compare to districts Haveri district performance was well followed by Dharwad, Belagavi and Vijayapura with respect to both *Pradhan Mantri Fasal BhimaYojana* and *Restructured Weather Based Crop Insurance Scheme*. In Haveri and Dharwad districts majority of farmers are growing state notified crops and borrowing loan from financial institutes, so majority of the farmers covered under these scheme. In Belagavi and Vijayapura districts, majority of the farmers are growing sugarcane, pigeon pea, turmeric etc but these crops are not covered under crop insurance scheme and hence less farmers were covered.

SCREENING OF MAIZE HYBRIDS FOR HEAT STRESS TOLERANCE

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Abstract

Although the demand for maize is significantly rising in South Asia, over 80% of maize growing areas are rain-fed and highly vulnerable to extreme weather events. Therefore, the major challenge is to keep pace with unprecedented increase in maize demand by enhancing the overall productivity and production, and at the same time to adapt and mitigate the climate change effects, especially the rise in temperature. Maize being a C₄ crop, it is most versatile in terms of wide adaptability and high potential productivity, this property can be exploited to increase its area under varying environmental conditions. Evaluating maize hybrids for tolerance to high temperature stress is an essential step towards stabilizing yields. In this regard a field experiment was conducted to evaluate the maize hybrids under heat stress conditions. The experiment was carried out at Agriculture College Farm, Bheemarayanagudi, Karnataka, India. It involved 27 hybrids obtained by crossing nine females and three males in NCD-II mating design during summer (Mid-March-July 2016) along with the local check. The parents of these hybrids were varying for heat stress reactions. The yield ranged from 56.68 to 91.76 g/plant. Among the hybrids evaluated, ZH16866 (91.76 g/plant), ZH16880 (91.36 g/plant), ZH16848 (90.76 g/plant) performed relatively better in terms of yield as compared to the local check 31Y45 (83.38 g/plant). The results indicated that selection of lines with higher grain yield besides possessing heat stress tolerance indicating secondary traits as parents in maize hybrid development programme could enhance the grain yield under heat stress environments.

SEED TREATMENTS TO MANAGE SHOOT FLY (*ATHERIGONA SOCCATARONDANI*) IN RABI SORGHUM

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Abstract

An important cereal crop grown in Asia, Africa, USA, Australia, and Latin America is sorghum, this ranks fourth among the



world cereals in the order of wheat, maize and rice. Because of biotic and abiotic constraints the productivity levels under are quite low (500–800 kg/ha). sorghum shoot fly (*Atherigona soccata* Rondani) is most important pest in Asia, Africa, and the Mediterranean Europe, Among 150 species of insect pests which affects sorghum crop. This is an important seedling pest attacks sorghum crop up to 30 days from sowing. It is reported that the phosphate insecticides, e.g. fenitrothion, monocrotophos and trichlorfon have caused phytotoxicity to sorghum in Australia. The earlier recommendation of endosulfan is banned and hence there is an urgent need to find out alternative to endosulfan. The field trial was conducted on management of shoot fly through seed treatments and also to study their phytotoxicity in *rabi* sorghum 2014-15. The results revealed that, imidacloprid 70 WS (5 g/kg) and on par with chlorpyrifos 20 EC (5 ml/kg) found superior over all treatments by recording 0.73 eggs/plant. Next best treatments were spinosad 45 SC (2 ml/kg) (0.97 eggs/plant), acetamiprid 20 SP (5 g/kg) (1.07 eggs/plant) and fipronil 5 SC (5 ml/kg) (1.17 eggs/plant). imidacloprid 70 WS (5 g/kg) and chlorpyrifos 20 EC (5 ml/kg) recorded significantly least deadhearts (14.83% and 15.17%, respectively) followed by fipronil 5 SC (5 ml/kg) (18.28%). Spinosad 45 SC (2 ml/kg), acetamiprid 20 SP (5 g/kg) and emamectin benzoate 5 SG (5 g/kg) recorded 25.40, 24.06 and 23.71 per cent deadhearts respectively followed by 1 per cent neem oil (25.60%). Flubendiamide 480 SC (4 ml/kg) and untreated control recorded higher damage due to shoot fly (27.80%). Highest net returns among all the treatments was recorded in imidacloprid 70 WS (21357.14 ?/ha) followed by chlorpyrifos 20 EC (5 ml/kg) (19981.75 ?/ha).

POPULATION DYNAMICS OF STRIPED FLEA BEETLE (*PHYLLOTRETA STRIOLATA* FAB.) ON SOME CRUCIFEROUS CROPS IN NORTH KASHMIR

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Abstract

Cruciferous vegetables are increasingly important group of *Rabi* season crops. Despite being a larger producer of cruciferous crops, the productivity of these crops in India is low, due to attack by various generalist and specialist insect pests. Striped flea beetle, *Phyllotreta striolata* (F.) is a serious pest of the cruciferous vegetables in Asia, Europe, North America and Africa. Study on population dynamics of *P. striolata* and various abiotic factors affecting its population revealed that mean catches of *P. striolata* on turnip, radish and cabbage have a positive correlation with temperature and sunshine hours, and a negative correlation with relative humidity and rainfall. During 2015, the maximum population of *P. striolata* on turnip (22.8 beetles/plant) and radish (22.2 beetles/plant) was recorded during the 40th Standard Meteorological Week (SMW), however, during 2016, it was maximum during 39th SMW on both the crops (19.4 beetles/ plant on turnip and 22.2 beetles/ plant on radish). On cabbage, the *P. striolata* population reached its peak level (4.8 beetles/ plant during 2015; 9.2 beetles/ plant during 2016) during 38th SMW. During 2015, highest damage by *P. striolata* was observed on turnip (77.28 per cent during 40th SMW) followed by radish (75.44 per cent in 40th SMW) and cabbage (70.43 per cent during 38th SMW). During 2016, it followed the same trend, with 80.78 and 76.94 per cent damage on turnip and radish during 40th SMW and 74.18 per cent damage on cabbage during 38th SMW. *P. striolata* is a serious pest of cruciferous crops and there is an apprehension of increasing population of this pest under changing climatic conditions.

IMPROVEMENT OF GRAIN NUMBER IN BASMATI RICE THROUGH MARKER ASSISTED SELECTION

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Abstract

Punjab Basmati 3, a semi-dwarf and lodging tolerant version of Basmati rice variety Basmati 386 was developed through marker assisted backcross breeding at Punjab Agricultural University, Ludhiana and released for cultivation in Punjab state in 2013. It is the first Basmati variety showing resistant to bacterial blight (BB) due to the presence of two genes, *xa13* and *Xa21*.



But when compared to commercially grown indica rice varieties, it has very less number of grains per spike. In the present study, using the marker assisted backcrossing a novel QTL *qSPP2.2* controlling spikelet number per panicle identified from *Oryza longistaminata* was transferred into Punjab Basmati 3. To study the transfer of grain number QTL *qSPP2.2*, the BC₂F₂ seeds harvested from the selected plants were sown for phenotypic and genotypic evaluation and 2500 plants were screened with RM6 polymorphic marker nearest to the QTL *qSPP2.2*. Plants showing more than 100 percent increase in grain number and homozygous for the QTL *qSPP2.2* were obtained. The plants were also further analyzed with markers linked to *Xa21*, *xa13*, *BADH1*, *BADH2* and *RM190* for background selection. The identified high yielding lines are under trail and could be further utilized in the breeding programs to improve elite rice cultivars.

ASSOCIATION MAPPING OF IRON, ZINC AND PROTEIN IN COMMON BEAN (*PHASEOLUS VULGARIS* L.)

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Abstract

Association mapping is defined as the nonrandom associations of loci in haplotypes. It is a powerful high-resolution mapping tool for complex quantitative traits. Iron (Fe), zinc (Zn), iodine (I), selenium (Se) are micronutrients which have major impact on human health. According to current reports, more than 50% of population from developing countries is suffering from micronutrient malnutrition. In the present study, common bean genotypes collected from different areas of Jammu and Kashmir, India were evaluated for Fe, Zn and protein contents and to identify the markers associated with these traits. We found significant variation among genotypes for Fe, Zn and protein contents. Genotype R2 was having 7.22 mg 100 g⁻¹ of Fe content, genotype K15 with 1.93 mg 100 g⁻¹ of Zn content and genotype KS6 with 31.6% of protein content. Diversity study was done using both cluster and structure based approach. Further, association mapping analysis using General Linear Method (GLM) approach was done to identify SSRs associated with accumulation of Fe, Zn and protein. A total of 23 SSRs were used and out of these 23 markers, 12 SSRs were identified that significantly ($p < 0.05$) showed association with Fe, Zn and protein contents in common bean. The seven markers associated with Fe were located on chromosome no. 1, 2, 4, 6 and 7; 3 markers associated with Zn were located on chromosome no. 2, 4 and 11 whereas two marker located on chromosome no. 4 and 6 was found associated with protein content. These identified markers could be provided potential opportunity to improve Fe, Zn and protein concentrations in common bean, through molecular breeding.

STUDIES ON SERUM MINERAL PROFILE AND KIDNEY FUNCTION OF BROILER CHICKENS FED DIETS WITH DIFFERENT SUPPLEMENTS

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Abstract

The aim of the study was to investigate the effects of various feed supplements on minerals status and kidney health of broiler chickens. Two hundred fifty two (252) day-old Cobb-400 broiler chicks were randomly distributed into seven groups with 3 replicates of 12 chicks each. The first treatment was designated as control (T₀) in which no supplement was added to the feed, while in treatments T₁; organic mineral mixture (Organomin forte), T₂; organic mineral mixture (Vannamin), T₃; probiotics (Microguard), T₄; enzyme (Brozyme -XPR) and probiotics, T₅; emulsifier (Lipigon) were provided through feed. In T₆ group, 3 per cent less energy was given through feed. The results revealed that serum calcium levels were significantly ($P < 0.05$) increased in supplemented groups as compared to T₀ (control) group in both the periods while phosphorus values were significantly ($P < 0.05$) increased in supplemented groups during starter period. Phosphorus values were significantly ($P < 0.05$) higher in all the supplemented groups except T₆ during finisher period. Urea, Uric acid, BUN and creatinine values were



significantly ($P < 0.05$) decreased in supplemented groups as compared to T_0 (control) group in both the periods. B/C ratios were significantly ($P < 0.05$) decreased in all supplemented groups except T_3 and T_4 in both the periods. Therefore, it can be concluded that dietary supplementation maintained the mineral homeostasis and does not have any adverse effect on kidney function.

STUDY OF HEALTH BEHAVIOR, DIETARY HABITS, PHYSICAL ACTIVITY AND BODY MASS INDEX OF FARM MEN & WOMEN

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Abstract

Healthy lifestyle and high intake of nutritious food can provide good health throughout life to the humans. The poor nutrition and unawareness on the utilization of health facilities during their childhood and reproductive age are the major factors responsible for the high maternal mortality. This study tested by the help of KARDAScan machine to estimate the body composition of selected 25 beneficiaries between the age range 20 to 55. Body fat percent, Visceral Fat, Body Age, RMR, BMI, Skeletal muscle percent analyzed By machine. Rural women have high fat percent and low muscle percent because people are not getting the adequate amount of protein from diet. Though government of India has been taking several efforts to improve the health status of the women, poverty, gender discrimination and illiteracy in the population are the major problems associated with the implementation of appropriate interventions. The present overview focuses the major factors, which influence the health concerns of the women in Beed.

MODIFIED PADDY STRAW MUSHROOM CULTIVATION TECHNIQUES – EXPERIENCES INNOVATIVE FARMERS OF JANJGIR-CHAMPA DISTRICT OF CHHATTISGARH IN THE CONTEXT OF DOUBLING THE FARMERS INCOME

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Abstract

The farmers of Janjgir-Champa district majorly cultivated a Paddy crop and also traditionally cultivated paddy straw mushroom especially in rainy season from month June to September. Also, the farmers are interested to cultivate commercially paddy straw mushroom, but the farmers adopted traditional method to grow paddy straw mushroom. Paddy straw mushroom also called as a 'straw mushroom' is a fungus of the tropics and subtropics and has been cultivated for many years in India. Paddy Straw Mushroom (*Volvoriella volvacea*) being the third most important cultivated mushroom in the world is well known for its pleasant flavour and taste. This mushroom has several advantages like requirement of the tropical or sub tropical climate, fast growth rate, easy cultivation technology and good acceptability at consumer's level. The raw materials required for its cultivation are also available in abundance in district janjgir-chjampa at very nominal rates. The high temperature requirements for its cultivation are also available makes it a good choice for adoption in round the year cultivation of mushrooms. Paddy straw mushroom contains good amount of protein, crude fibers and ash, all make it a healthy diet along with superior composition of various elements and essential amino acids. Although there is a big demand in Janjgir-Champa district and there was no proper method of cultivation since it needs high temperature (28-32 °C) and 85-90% relative humidity in the growing environment. The locally/naturally grown mushroom also called as "Futu" collected from the forest and directly sale in the market by village people. This mushroom nearly similar to paddy straw mushroom but the colour of both mushrooms are quite differ to each other, futu is milky white in colour and paddy straw mushroom black to grey in colour. Mushroom cultivation is one of the enterprises which have the vast potential to double the existing income level of farmers and this enterprise can easily be adopted by any category of farmers irrespective of their land holding size. Farmers need very less investment for paddy straw mushroom cultivation. The present study concluded that the improved technique of mushroom cultivation can be successfully used as compared with locally grown mushroom cultivation technique because by using this modified technique farmers earn more money along with their traditional farming. It developed entrepreneurship



among the village people and generate self employment. The present study showed that by using modified techniques farmers will generate more income year after year with increasing yield of 40% in the year 2016-17, 60% in 2017-18 and 68% in the year 2018-19 respectively. The result is that farmers taking more interest for cultivation of paddy straw mushroom commercially.

GREENPHABLET™ POWERED BY THE GREEN SIM- AN APPLIANCE FOR KNOWLEDGE REVOLUTION IN FARMING COMMUNITY

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Abstract

Agriculture is no more input intensive but knowledge intensive. With raise of ICT devices and tools and also betterment of ICT infrastructure in rural India, it is imperative that ICT is going to play major role in pushing right information to right person at right time using right adoptable channel. We believe ICT can play a role to bridge the technology gap, enhance market access, climate preparedness and manage risks of smallholder agriculture. Green PHABLET™ is a pull and push based financially sustainable Information and Communication Technology (ICT) mediated innovative extension model build on public private partnerships to improve productivity and profitability of smallholder agriculture. It has four components., Pull and Push based ICT enabled knowledge platform integrated with crop specific informed decision support systems; Education through participatory extension video approaches; Business model through public private partnerships for ensuring financial sustainability; Inclusive Market-Oriented Development (IMOD) approach. The GreenPHABLET™ (Phone + Tablet) powered by the Green SIM, is an innovative ICT mediated extension system, working towards bringing best of affordable technologies, knowledge solutions and availability of quality inputs, credit & insurance at smallholder farmers' doorsteps. The following is the impact created by Green PHABLET™ through its above mentioned four modules in different locations partnering with different kind of organizations to understand the dynamics of effectiveness and impact.

GENETIC DIVERSITY ASSESSMENT FOR CANE YIELD AND JUICE QUALITY CHARACTERS IN SUGARCANE

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Abstract

Mahalanobis D² statistic is a powerful tool in quantifying the degree of divergence at genotypic level. The present investigation was conducted with 142 sugarcane genotypes along with five checks and two parental varieties to assess genetic diversity among clones. Based on the distances, all the 149 genotypes were clustered into 18 clusters. The cluster I was the largest with 110 clones falling under this cluster followed by cluster II with 17 clones and cluster IX with 7 clones. Clustering pattern reflected that considerable amount of genetic divergence was present among the clones under study. Cluster IX (34.57) recorded highest intra cluster D² values followed by cluster II (30.91) and cluster I (25.60). Maximum inter cluster D² value was observed between clusters XVI and XVII (222.90) followed by cluster XIV and XVI (186.32). Cane yield recorded maximum cluster mean for cluster XVII (138.62) followed by cluster II (110.97). For CCS yield maximum cluster mean was recorded for cluster XVII (24.14) followed by cluster II (21.26). The study also revealed that number of millable canes exerted the maximum contribution towards genetic divergence followed by germination per cent. PC-2013-14-180 (XVII), PC-2013-14-142 (XIV) and PC-2013-14-509 (XVIII) were identified as potential donors for cane yield characteristics. PC-2013-14-376 belonging to cluster XIII was identified as most promising clone as it has high mean value for nine cane yield as well as juice quality characters namely germination per cent, number of tillers, number of millable canes, brix per cent, polarity per cent, sucrose per cent, purity per cent, CCS per cent and CCS yield. These clones could be utilized as potential donors owing to high values for desired character and these clones are from different cluster having a sufficient level of



inter-cluster divergence. Hence, these donors could be intercrossed as parents for future breeding programmes to generate clones having greater variability and potential for cane yield with higher sucrose content.

IMPACT OF FERTILITY AND PLANTING GEOMETRY AND ON PERFORMANCE OF BROWN TOP MILLET

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ICAR-AICRP on Small Millets

Abstract

A Field experiment was conducted at different locations of AICRP centres on Small Millet i.e., Bengaluru, Dindori, Jagadapur Kolhapur and Vizianagaram, during *Kharif* 2018. The experiment was laid out in split plot design with three replications. Main plot was three levels of fertility i.e., F_1 (75% RDF), F_2 (100% RDF) and F_3 (125% RDF), and subplot was four spacing levels S_1 (22.5 cm X 10 cm), S_2 (30 cm X 10 cm), S_3 (45 cm X 10 cm) and S_4 (60 cm X 10 cm). Recommended dose of fertilizer for other small millets is 40:20:0 kg NPK ha⁻¹ with FYM @ 6.25 t/ha and is been considered as a RDF for Brown top millet in the present investigation. Results over locations showed that plant and yield attributing characters including yield were found significantly superior with the fertility level of F_3 followed by F_2 as compared to other fertility levels. Among varied levels of planting geometry tested, S_1 recorded considerably taller plants coupled with higher fodder yield per ha while, S_4 produced higher number of tillers and grain weight per hill. However, significantly higher grain yield per ha with higher economics was established with S_3 (45 cm X 10 cm).

DEVELOPMENT OF SUITABLE ID M APPROACHES AGAINST ANTHRACNOSE (*C. LINDEMUTHIANUM*) OF FRENCH BEAN (*P. VULGARIS* L.)

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Abstract

Common bean (*Phaseolus vulgaris* L.) is grown and consumed mostly in developing countries in Latin America, Africa, and Asia. Worldwide, it is the most important legume for direct human consumption. The crop is consumed essentially for its dry (mature) beans, shell beans (seeds at physiological maturity), and green pods. It is a key source of dietary protein that complements carbohydrate rich sources such as rice, maize, and cassava. Bean anthracnose caused by *Colletotrichum lindemuthianum* (Sacc. & Magn.) is one of the most important seed borne disease of common bean (*Phaseolus vulgaris* L.) in the world. The disease is predominant in areas that experience cool and wet climate conditions, causing up to 100% yield loss. Besides infecting *Phaseolus vulgaris*, *Colletotrichum lindemuthianum* also attacks other legumes like mung bean (*P. aureus*), cowpea (*Vigna sinensis*), and broad bean (*Vicia faba*). The disease causes symptoms to appear on leaves, stems, pods and seeds. The pathogen can persist in seeds for up to five years, and is also known to overwinter in crop debris. Seed infection is the primary means by which the pathogen spreads. Consequently, the production and the use of certified seeds is one control measure that is effective in dealing with the disease. Fungicidal seed treatment and foliar application as well as cultural and biological methods are very vital for bean anthracnose management. Further information on biology and survival of *C. lindemuthianum* is needed to invent more effective management strategies.

USAGE OF E-JOURNALS AMONG RESEARCH SCHOLARS IN JAIN VISHWA BHARTI INSTITUTE (DEEMED UNIVERSITY) NAGPUR, RAJASTHAN (INDIA): A CASE STUDY

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Abstract

The study describes the use of e-journals by the research scholars of JVBI. The questionnaire supplemented with interview schedule was used to solicit the opinions of the research scholars. 52 responses were gathered and the results are analyzed and



presented here with. The paper examine the purpose, frequency, average time spent per week, place of accessibility, linking patterns, method of reading full text, most preferred formats, reason for using, difficulties of accessing, and most preferred search engine used to access e-journals. Besides extensively covering the usage of e-journals, the paper also examines the utilization and satisfaction levels of users with respect to e-journals. Lastly, some of the valuable suggestions given by research scholars are highlighted.

EPR OF ALKALI HALIDES, HEAVILY DOPED WITH MANGANESE

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Abstract

The present investigation begins with an introduction to EPR and subsequently various interactions responsible to determine the characteristics of EPR signal for a paramagnetic ions doped in a crystal host are briefly explained. Further presented are the results of EPR investigations in two crystal systems of RbCl & KCl_{0.7} Br_{0.3} heavily doped with Mn²⁺ ions. For melt grown RbCl host, the observed EPR signal is an exchange narrowed line; while for solution grown KCl_{0.7} Br_{0.3} host an ordinary sextet is obtained & this involves crucial role of water groups embedded in the lattice.

ARTISTIC TOUCH IN PICTORIAL REPRESENTATION OF MOUNTAIN RANGE IN RHYTHMS BY HARISH SRIVASTAVA

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Abstract

Mr Harish Srivastava is the only contemporary senior artist from Delhi, who have done a lot of work on different colours of mountain range in rhythms for viewers. He have revealed heartily emotions of nature love to public mind. The study of his paintings showed that he has used water and oil colours very successfully and efficiently. He have made mountain range very beautifully in rhythms in all of his paintings. He In most of his paintings he impose the colours in order of chaotic air flow style and seems to be inspire by nature particularly the sky, mountains and sea. He works with limited palette constantly striving to capture the drama of strong light and shades. It seems that his art is an expression and it also show in a big way the vastness of our planet and nature. In this way his work show the beauty and the power of nature. He tried to avoid powering small areas. He captured light and dark tones of same colours in his paintings and it's very important to him. He transform the ordinary things to extraordinary in his paintings and seems that mountains range always hypnotise him. Most of the people do not get the opportunity to see major mountains range of 10,000 feet high above sea level. Where Standing Mountain seems to have magic feelings with ice, wind and white sheet of clear sky. He successfully painted the wonder of mountains in synergistic manners with blue sky on canvas. The study of his paintings revealed that mountains paintings are very attractive, enjoyable and spiritual in quality. His paintings are quite different from others, in various aspects as he used high level of colour combinations in magical mountain paintings not used before by any Indian artists.

SYNTHESIS OF BIOPLASTIC FROM BANANA PEELS

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Abstract

Plastics causing severe environmental pollution because of having non-biodegradable characteristic, plastics can contaminate the packaged food because of the presence of certain substances that are potentially carcinogenic and can move into the packaged food. The aim of present study is the synthesis of bioplastic from banana peels and to aware the society about the use



of bioplastic instead of non-biodegradable plastic to decrease the amount of soil pollution in our environment. The banana peels were blended with glycerol as plasticizer and sodium metabisulphite as antioxidant and preservative and bioplastic sheets were prepared by heating the banana mixture in an oven at 130°C. Properties like tensile strength and thickness can be studied.

ADSORPTION OF IRON METAL FROM ITS AQUEOUS SOLUTIONS BY UNTRAINED (AS CONTROL) AND IRON-TRAINED *ASPERGILLUS NIGER* L. BIOMASS

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Abstract

In this investigation, adsorption of iron metal by both untrained and iron-trained biomass of *Aspergillus niger* was separately investigated. Trained *Aspergillus niger*, with 10 mg biomass doses mixed with 100 ppm metal solution upto 10 minute contact time with pH 5 showed the most appropriate metal concentration, for use in biosorption of Iron effluent. Maximum adsorption capacity of trained *Aspergillus niger* with respect to different concentrations of Iron solution was observed as 85.32%, 735.32%, 64.50%, and 43.62% at 100ppm, 200ppm, 300ppm and 400 ppm respectively as compare to untrained 65.26%, 59.23%, 42.36% and 29.29% respectively. The trained fungal biomass, found overall much better, in metal removal as 85.32% metal removal was observed as compare to untrained *Aspergillus niger*. The adsorption isotherm studies indicate that Langmuir model was more suitable for describing the biosorption of iron with trained *Aspergillus niger* fungal biomass.

BIOFORTIFICATION : A NUTRITIONAL REVOLUTION

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Abstract

According to World Health Organization, Billions of people around the world suffer from ‘micronutrients deficiencies (Chronic micronutrient deficiencies, particularly Zn and Fe)’, with nearly half living in India. Micronutrient deficiency (also known as “hidden hunger” and hereafter denoted as “MiND”) occurs when the intake or absorption of essential vitamins and minerals falls below levels necessary for growth and development in children, and maintenance of physical and mental functionality in adults. This is not just limited to kids in rural India but is also deep-rooted among urban children. It is clearly that MiND is enormous problem. WHO reported that, Babies born with low birth weight: 20.5 million (one in seven), Children under 5 affected by stunting (low height-for-age): 148.9 million (21.9%), Children under 5 affected by wasting (low weight-for-height): 49.5 million (7.3%), Children under 5 who are overweight (high weight-for-height): 40 million (5.9%), School-age children and adolescents who are overweight: 338 million, Adults who are obese: 672 million (13% or 1 in 8 adults). It is also reported that nearly 4% of India’s GDP is estimated to have been lost due to malnutrition. Globally, more than 1.6 billion people are anemic. Today, India has an astounding 190 million undernourished people, the highest in the world. About 47.5 million Indian children under-5 years are stunted again, the most in the world. About 70% of Indian children under 5 are estimated to be iron deficient which impairs mental development and learning capacity, increases weakness and fatigue, and may increase the risk of women dying during childbirth. Similarly about 48% of Indian children under 5 are estimated to be zinc deficient which causes stunting, lowers immunity, and increases risk of diarrheal disease and respiratory infections. Annually, India loses over \$12 billion in GDP to vitamin and MiND (World Bank). In poor countries, where diets often lack diversity and most people rely on a major staple that offer calories but often inadequate nutrients, bio-fortification may therefore present a way to reach populations where supplementation and conventional fortification activities may be difficult to implement and/or limited. Biofortification is emerging as a nutritional revolution to increase micronutrient content in staple food crops which widely consumed by low-income families in developing countries and the focus is on providing sufficient levels of vitamin A, iron, and/or zinc through biofortified crops. In this revolution a program viz. HarvestPlus is playing a major



role to improve nutrition as well as public health by developing & promoting biofortified food crops, and also providing global leadership on biofortification evidence & technology. The HarvestPlus is based on the International Food Policy Research Institute (IFPRI) and collaborates with multiple CGIAR centers and partner organizations. Many principal donors are involved in 'HarvestPlus' program like the UK Government; the Bill & Melinda Gates Foundation; the US Government's Feed the Future initiative; the European Commission; and donors to the CGIAR Research Program on Agriculture for Nutrition and Health. Currently in India, HarvestPlus and its partners working within five states (UP, Bihar, Jharkhand, Maharashtra and Rajasthan) to promote the availability, adoption, and consumption of biofortified pearl millet and wheat. The HarvestPlus work with more than 70 partners drawn from government, business, and civil society and imagining reaching a billion people with biofortified foods by the year 2030.

ROLE OF ZINC AND IRON NANOFERTILIZERS IN SEED PRIMING OF VARIOUS CROPS : *VIGNA MUNGO*, *ABELMOSCHUS ESCULENTUS*, *VIGNA RADIATA* AND *ZEA MAYS*

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Abstract

In the present study both the nanofertilizers of iron and zinc developed through Neem leaves was showed a significant improvement in emergence of seed germination and it was recorded that germination percent showed a significant variances among all the tested cultivars. Effect of primed seed with distilled water was noted highest (99%) in cultivar Black gram (*Vigna mungo*) and followed by Okra (*Abelmoschus esculentus*) 90%, Green gram (*Vigna radiata*) 87%, and Maize (*Zea mays*) 76% after 7th day after sowing. Both the nanofertilizer solutions showed a steep escalation in seed germination percentage of all the tested cultivars and attained 100% seed germination least duration in contrast to control samples. Zinc nanofertilizers showed major effect on the tested cultivars in assessment to iron nanofertilizers. The management of zinc nanofertilizers showed 100% seed germination after four days of sowing in case of Green gram, after five days in Okra and Black gram and after seven days in Maize. While, the treatment of iron nanofertilizers showed 100% of seed germination after five days of sowing in case of Green gram and Black gram, after six days in Okra and Maize. In case of nanofertilizers, zinc showed great impact on the seed germination of all the tested cultivars in comparison to iron.

CONTRIBUTION OF RURAL WOMEN OF INDIA IN AGRICULTURAL

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Abstract

Women in overall do not have a strong attendance in science and technology in the 21st century. This is credited to two broad issues: first, women's perception of their role and utility in society, and second, society's hope of their support. Women are divided between two circles: the organization of the home and family, and the contentment of job household tasks. Women on the over globe play a main role in agriculture. Approximately 70% of Agricultural work depend upon women power not only as food producer but also in processing of basic foods for local level market. Only women produced a greater share of food in developing countries. Rural women play a energetic role in agricultural subdivision production by working with full passion in building of crops properly from the soil groundwork till collecting and food fortification undertakings. In rural areas of India, women donate in the whole processes unified to crop production such as spreading, rearing, removing, and collecting. Rural women in India special in Uttar Pradesh carry out not only farm duties in adding to their mutual local tasks of cooking and keeping the house, besides observing afterward the whole household up-keeping and maintenance. Women are the strength of the rural and national cost-cutting. They involve 41% of the world's agricultural -labor force, which increases to 78% in some republics. They are the authority on the boundary of livestock protection with farming.



BIOLOGICAL INVASION : BY THE ALIEN SPECIES

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Abstract

In many countries, biological invasions are represented by the alien species introduced accidentally or purposefully outside their native geographical distribution ranges. Presently, biological invasion is considered one of the most important components of global environmental change primarily as a result of increased global trade. Massive changes inflicted by humans globally on ecosystems across the globe through a range of processes include the destruction of natural habitats, various forms of pollution and moving species. Invasive alien plants, because of their ability to alter ecological processes, such as carbon and nitrogen cycling, frequency and/or intensity of fire and alteration of the normal disturbance regimes in the native communities have transformed several ecosystems by out competing native species and thus, are rightly regarded as one of the most substantial threats to the health of global biodiversity. The invasions by alien species are also known to impact ecosystem services and human well-being. Thus, in invasion ecology, human-induced stresses are challenging species to adapt to the areas well outside their potential range and to the continuing ecosystem perturbations particularly in dry tropics. Despite the concomitant attention of ecologists and invasion biologists, the empirical understanding of the impacts and mechanisms of exotic plant invasion remains rudimentary and fragmented and further complicated by species and site specific effects. Although much attention has been paid to the study of invasive plants, the mechanisms underlying the success of biological invasions in terms of both aboveground and belowground biomass structure and their relations with environment remain poorly understood.

GREEN SYNTHESIS AND CHARACTERISATION OF SILVER NANOPARTICLES USING AZADIRACHTA INDICA (NEEM) LEAF AQUEOUS EXTRACT

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Abstract

Nanotechnology is mainly concerned with synthesis of nanoparticles of variable sizes, shapes, chemical compositions and controlled dispersity with their potential use for human benefits. Nanotechnology deals with manufacturing, study and manipulation of matter at nano scale in the size range of 1-100 nm which may be called as nanoparticles. Development of green nanotechnology is creating interest of researchers towards eco-friendly biosynthesis of metal nanoparticles. Biomolecules present in plant extracts can be used to reduce metal ions into nanoparticles in a single-step green synthesis process. Neem (*Azadirachta indica* L.) is an aromatic plant belongs to family Meliaceae. Neem is a traditional medicinal plant of India, having good source of bio-reduction and stabilizers. The constituent of neem are alkaloids, glycosides, tannins, saponins and aromatic compounds and also it contains different minerals. Recently, neem leaf extracts have been used in the synthesis of silver nanoparticles and gold nanoparticles. Neem is a source of bio-reduction and stabilizers. Silver is highly toxic to microorganisms such as bacteria and fungi. Silver nanoparticles were synthesized from neem leaves extract and various instrumental techniques were adopted to characterize the synthesized Ag NPs, viz., UV-Vis spectroscopy, FTIR, SEM, and EDX.

CONVERSION OF AGROWASTES INTO SUSTAINABLE PLATFORM CHEMICALS AND ENERGY

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Abstract

Agricultural waste is the material obtained due to crop production or from plant growth. In the past this biomass and agricultural waste were either burnt or naturally converted into organic fertilizer under favorable condition. But now in these



days, biomass produced from agricultural waste are used to generate energy because it carries great potential to convert into beneficial products. Since the biomass is available throughout the world in abundant quantity so it is necessary to use alternate energy resources to fulfill our needs of energy consumption. The effective utilization of agricultural waste is a good option to convert these wastes into such energetic products. For this efforts have been made and many more are under way, it requires guidelines concerning the utilization of agricultural biomass for energy purposes and optimal production. Production of energy from biomass can provide farmers with new prospects and possibilities to diversify agricultural activities. Some of these crops may compete for land and other resources with traditional crops, while other crops may be grown on marginal lands or even ecologically degraded areas and thus have a positive effect on the environment. In view of the circumstances described above, there has been growing interest in studies that present future energy scenarios and conversion of biomass into useful products. Biomass is one of the renewable resources that is found in nature in abundant quantity it may be used as one of the most energy resource and can be converted into more reformed resources. Utilization of agricultural waste is very important concern especially when the world scenario of energy demand gap is being reported. The resolution to mitigate this gap is use of biomass and its other utilization is being investigated so that it can be used as an alternative source of energy production as well as converting the biomass into some commercial products.

EICHHORNIA CRASSIPES L. AS BIOTRAP FOR DYE POLLUTANTS

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Abstract

Water is an essential requisite of life. Due to over exploitation and heavy input of pollutants from domestic and industrial sources, the contamination level of water bodies has been increased. Textile industries utilize substantial volumes of water and chemicals ranging from inorganic compounds, polymers and organic products for wet-processing of textiles. There are more than 8000 chemical products associated with the dyeing process listed in the colour index, including several types of dyes like acidic, reactive, basic, disperse, azo, diazo, anthraquinone and metal-complex dyes. The removal of colour from dye bearing effluents is one of the major problems as they contribute to the major fraction of biological oxygen demand. Lately, biosorption procedure has turned into a financial and eco-accommodating elective treatment innovation in the water and wastewater industry. Plant biomass based biosorption framework is one of the waste water treatment strategies which can be used for the removal of different type of contaminants from water sources. Water hyacinth (*Eichhornia crassipes* L.), a most noticeably terrible obtrusive amphibian weed has been used for different research exercises in the course of the most recent couple of decades. The high absorptive capacity of water hyacinth can be used for the removal of different dyes and colouring agents from water sources and ultimately it also provide a change to manage the over population of the weed itself.

EXTRACTION OF BIOACTIVE COMPOUNDS FROM CHARA SPECIES AND SCREENING AGAINST PLANT FUNGAL PATHOGENS

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Abstract

Green algae secondary metabolites have a various adversarial action that lead to breaking down of microbial development. The present investigation was led to assess the antifungal property controlled by Chara species (green algae) strains were detached from Water tests of different locales of Village Alipura, Saharanpur, Uttar Pradesh, India. Chara strains were removed in Water and prepared the aqueous solution of organic solvents such as Acetone, Methanol, Petroleum spirit, Amyl alcohol, Dimethyl sulfoxide, Liquor ammonia, Diethyl ether, Petroleum benzene, Acetic acid glacial, Petroleum ether for antifungal activity against four pathogenic contagious strains *Cunninghamella elegans*, *Rhizopus mizosporces*, *Mucor*



circinelloides and Absidia sp.. Rough concentrates of each strain show differential antifungal reaction to test living beings. In light of zone of restraint development, it was reasoned that the aqueous extract of Chara powder showed highest zone of inhibition (3.8 ± 0.30 mm) against *Cunninghamella elegans*. In case of *Cunninghamella elegans*, Petroleum spirit extract found most effective solvent in comparison to aqueous as well as other used organic solvents. The inhibition percentage was found maximum upto 69.23%. In case of *Absidia* sp., Petroleum benzene extract found most effective solvent in comparison to aqueous as well as other used organic solvents. The inhibition percentage was found maximum upto 36.12%. In case of *Rhizopus mizosporces*, Methanol extract found most effective solvent in comparison to aqueous as well as other used organic solvents. The inhibition percentage was found maximum upto 55.33%. In case of *Mucor circinelloides*, Petroleum ether extract found most effective solvent in comparison to aqueous as well as other used organic solvents. The inhibition percentage was found maximum upto 56.55%. In case of *Cunninghamella elegans*, Petroleum spirit extract found most effective solvent in comparison to Itraconazole. The *Chara* sp. can be brilliant biocontrol sources for plants pathogenic organisms as they can be effectively refined and more affordable contrasted with manufactured fungicides and they are ecofriendly. The consequences of present examination, obviously shows the nearness of antimicrobial compounds in the *Chara* species. Along these lines, further examinations are important to clarify the parts in charge of antifungal activity against microorganisms.

STUDY OF GENETIC VARIABILITY AND ITS ORGANIZATION IN MAIZE (*ZEAMAYS* L.) INBRED LINES

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Abstract

A study was carried out to estimate genetic variability among 421 maize inbreds for yield and its attributing characters during Summer2012 and Kharif2012 at K-Block, Department of Genetics and Plant Breeding, University of Agricultural Sciences, GKVK, Bengaluru. Aanalysis of variance revealed significant differences among the Maize inbreds for all the traits except for shelling *per cent*. Mean sum of squares due to inbreds $\times$ season differed significantly for days to anthesis, days to silking and anthesis silking interval. Anthesis silking interval (3.43) and grain yield plant⁻¹ (2.17) recorded larger variation as indicated by standardized range. Whereas, shelling *per cent*, days to silking and days to anthesis recorded smaller variation. Character grain yield plant⁻¹ (101.23) registered highest mean value. PCV estimates were highest for anthesis-silking interval (78.84) and grain yield plant⁻¹ (58.39). However, 100 grain weight (5.98), days to silking (9.25) and days to anthesis (9.27) registered lowest estimates. Similarly, a higher estimate of GCV was reported for anthesis-silking interval (65.09) and grain yield plant⁻¹ (44.51). Anthesis-silking interval (110.69) and grain yield plant⁻¹ (69.91) registered high heritability coupled with high estimates of GAM. Based on “K means” model of clustering approach, five distinct clusters were established for 421 maize inbreds. Cluster 5 comprised of maximum number of maize inbreds (104) followed by cluster 1 (47). The trait means values were significant for all the traits studied. Significant trait variances were noticed for all the traits except anthesis-silking interval. Cluster I recorded relatively higher trait variance for majority traits. Across the clusters, grain yield plant⁻¹ registered higher variance values.

ESTIMATION OF GENETIC VARIABILITY IN MAIZE (*ZEAMAYS* L.) INBRED LINES

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Abstract

Information on the nature and magnitude of variability and heritability in a population is one of the prerequisites for successful



breeding program in selecting genotypes with desirable characters. Genetic improvement in traits of economic importance along with maintaining sufficient amount of variability is always the desired objective in maize breeding programs. Therefore, a field experiment was conducted to assess the extent of genetic variability present among 422 maize inbred / breeding lines. Analysis of variance revealed, mean sum of squares for different sources of variation differed significantly for all traits studied indicating the existence of ample variability among the inbreds. Characters, fodder yield /plant at harvest (6145.00; 4279.36), grain yield / plant (2542.08; 1378.94) and no. leaves (1088.99; 1088.32) recorded higher values of phenotypic and genotypic variance, respectively, indicated the presence of sufficient inherent genetic variability for these characters. The genotypic coefficient of variation (GCV) was less than its corresponding estimates of phenotypic coefficient of variation (PCV) for all traits which indicated significant role of environment in the expression of these traits. The characters, ASI (82.41 ; 65.58), no. leaves (236.66 ; 236.60), no. cobs / plant (36.01 ; 23.07), grain yield / plant (47.45 ; 34.95) and fodder yield /plant at harvest (40.90 ; 34.13) recorded highest estimates of PCV and GCV, respectively. Wide difference between PCV and GCV estimates were observed for all the traits. Higher estimates of heritability in broad sense were reported for anthesis (0.87), silking (0.89), no. leaves (1.0), cob length (0.79), cob girth (0.87), test weight (0.71), fodder yield /plant at harvest (0.70), ASI (0.63) and no. kernal rows (0.63). Highest value of genetic advance as per cent of mean was recorded for no. leaves (487.22) followed by Anthesis silking interval (ASI) (107.51). High heritability coupled with low genetic advance was reported for silking, anthesis, ASI, cob length, cob girth, no. kernal rows and test weight indicating non additive gene action. High heritability coupled with high genetic advance was reported for no. leaves, plant height and fodder yield/plant at harvest, indicating additive gene action.

ECONOMIC EVALUATION OF ARAKERE WETLAND ECOSYSTEM OF TUMKUR, KARNATAKA THROUGH CYANOBACTERIAL DYNAMICS

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Abstract

The present paper deals with the Economic evaluation of Arakere wetland ecosystem through the investigation on distribution, periodicity and diversity of Cyanobacteria with respect to variation in the water quality. Highest density was recorded during premonsoon [24700 org/l] and they appeared in less number during post monsoon [11100 org/l]. Total of 24 species were identified under 12 genera .With regard to species diversity genus Oscillatoria is represented by 8 species. Phormidium is by 6 species, Aphanothecae and Microcystis are represented by 4 species each. Spirulina is by 2 species where as Anabaena, Apanocapsa, Arthospira and chroococcus are represented by 2 species each. The genera Merismopaedia and Mixosarcina are by single species each. By considering the species richness and density in different seasons it is concluded that the wetland is highly productive and further, aquaculture can be taken up so that the wetland becomes economically viable and the revenue generated can be used for the better maintenance of the wetland

MOLECULAR SCREENING OF PIGEONPEA GENOTYPES FOR DROUGHT TOLERANCE BY USING RAPD MARKERS

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Abstract

Genetic diversity among thirty pigeonpea genotypes with two treatments, stress and non stress condition in complete randomized design analysed by using 26 RAPD primer. The molecular characterization showed that there was genetic diversity among the 30 pigeonpea genotypes. The drought tolerant genotype GC-11-39, ICPL-87 and JKM-7 showed the similarity forming the same cluster while the moderately tolerant genotype TS-3R and WRP-R-29-4 showed the similarity forming the same cluster. There was genetic similarity among the drought sensitive genotypes NDA-1, RVK-285 and TJT-501 forming the same cluster.



SMARTPHONE-AN DISTRACTING TOOL FOR READERS WITH LANGUAGE FLUENCY PROBLEMS

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Abstract

Reading is one strand of literacy which is complex and multidimensional process. It has different components. Fluency is one of the important paramount component in reading skill and gateway to comprehension Fluency is the ability to read the words on the printed page accurately, effortlessly, or automatically. This action research is an attempt to determine the ways teachers can use smart phones with children having problems in oral reading fluency. This research focuses the present scenario students are increasing techno savvy. The analysis reveals that smartphone is an effective tool in practicing oral reading fluency. It enhances the number of words read per minute and reduces the misidentification and omission of words in oral reading. This is a motivating example that teachers can make use of technology that is smartphones to improve the oral reading fluency of their learners with ease.

STUDIES ON CORRELATION AND PATH COEFFICIENT ANALYSIS IN DOLICHOS BEAN (*LABLAB PURPUREUS* L. (SWEET)) GENOTYPES

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Abstract

Dolichos bean [*Lablab purpureus* L. (Sweet)] is consumed as vegetable in several parts of Asia including India due to its high nutritive value. The present study was carried out in Annamalai University with twenty genotypes of dolichos bean. Among the twenty genotypes of dolichos bean for thirteen yield and yield contributing characters, which are diverse in origin. In dolichos bean pod yield per plant showed positive and significant correlation with number of pod per plant, number racemes per plant, pod length, single pod weight and significant negative correlation with days to first flowering, days to 50% flowering and days to first pod harvest at both phenotypic and genotypic levels. Path analysis revealed that number of pod per plant exhibited high positive direct on pod yield per plant followed by single pod weight at both levels of significance, day to 50% flowering showed moderate positive direct effect on pod yield per plant. The direct negative effects on pod yield were observed by number of racemes per plant, pod length, pod width and protein content.

EFFECT OF GLOBAL-LAND OCEAN TEMPERATURE WARMING ON ESTABLISHMENT RATE OF INSECT SPECIES

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Abstract

Hemospheric temperature will lead to earlier beginnings and prolongation of growing seasons in temperate regions and will have pronounced effects on phenology and life-history adaptation in many species. These changes are not easy to simulate for actual phonologies because of the rudimentary temporal (season) and spatial (regional) resolution of climate model projections. Seasonal and regional climate change signals were downscaled to the hourly temporal scale of a pest phenology model and the spatial scale of pest habitats using a stochastic weather generator operating at daily scale in combination with a re-sampling approach for simulation of hourly weather data. The establishment rates of invasive alien species have been increasing worldwide during the past century. This trend has been widely attributed to increased rate of species introductions associated with increasing international trade but rarely linked to environmental changes such as global warming that can directly or indirectly influence establishment success of newly introduced alien species in their recipient regions. To better understand and manage the bio invasion process, it is crucial to understand the relationship between global warming and establishment rate of invasive alien species, especially for poikilothermic invaders such as insects.



ASSOCIATION ANALYSIS OF YIELD WITH QUALITY TRAITS IN RICE (*ORYZA SATIVA*. L)

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Abstract

Field experiments were carried out at Experimental Farm at Annamalaiagar with a collection of twenty three rice genotypes to study the interrelationship between yield and quality characters. The association analysis indicated that genetic restructuring of plant type with concurrent modification among the genotypes with due important to the environment. They are exposed to ensure increased yield. Most of the quality characters had positive and significant association with yield except grain breadth. The selection criteria for yield based on the quantitative traits should be therefore combined with quality aspects. Such that a balance is obtained between yield and quality component. This would help to enhance breeding efficiency of quality parameters and value based product for industries.

STUDIES ON GENETIC DIVERSITY IN TOMATO GENOTYPES USING RAPD AND SSR MARKERS

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Abstract

Random Amplified Polymorphic DNA and Simple Sequence Repeats analysis was carried out using five SSR markers and ten RAPD markers to assess the genetic diversity of tomato germplasm. Similarity coefficient of 18 genotypes using SSR markers ranged from 0.1 to 0.4. The clustering done using UPGMA was further confirmed by DARWIN (6.0 version). The genotypes Co-1 and Hisar lalit showed highest similarity as revealed by clustering using RAPD markers. Similarity coefficient of 18 genotypes using RAPD markers ranged from 0.56 to 0.78. The lowest genetic distance was (0.56) between genotypes LE - 36 and LE - 24, while, the highest genetic distance was (0.78) between varieties Co-1 and Hisar lalit. The genetic diversity existing among the tomato genotypes i.e., Co-1 and Hisar lalit (based on SSR markers) could be exploited through hybridization to recover the segregates possessing high yield potential with improved fruit quality characteristics. In RAPD and SSR markers detected medium locus polymorphism among the 36 tomato genotypes, indicating that both markers are of great utility for genetic diversity studies of tomatoes which can further be utilized in strengthening tomato breeding programmes.

A STUDY ON THE CONSTRAINTS IN THE UTILIZATION OF ECO-FRIENDLY AGRICULTURAL PRACTICES IN ERODE DISTRICT FOR SUSTAINABLE AGRICULTURE

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Abstract

An eco-friendly technology may be defined as the use of knowledge and resources in a systematic way to produce desired output without harming the environment. The term “eco-agriculture” was coined by Charles Walters, economist, author, editor, publisher and founder of Acres Magazine in 1970 to unify under one umbrella the concepts of ‘ecological’ and ‘economical’ in the belief that unless agriculture was ecological it could not be economical. This belief becomes the motto of the magazine: “To be economical agriculture must be ecological.”Eco-agriculture is both a conservation strategy and a rural development strategy. A study was conducted in Erode district to study the constraints in the utilization of eco-friendly agricultural practices in Erode District. The findings shows that Four-fifth of the respondents (80.00 per cent) had suggested that they need guidance and regulated market for marketing of the produce. Marketing is the most important place for selling their eco-friendly produce with reasonable price. Hence, marketing channel and price are needed by the respondents. In addition to that source regulated markets for the procurement and essential for the farmers to sell their quality produces. Introduction of more eco-friendly farming practices suggested by nearly four-fifth (77.50 per cent) of the respondents. They need a quality of crops and increase the market value of the agricultural produce.



GENETIC DIVERSITY STUDIES FOR DIFFERENTIAL SOIL PHOSPHORUS CONTENT IN RICE (*ORYZA SATIVA* L.)

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Abstract

Rice is a self-pollinated cereal crop belonging to the family Gramineae. Rice Globally, an area of 162.97 Mh, production-495.03 Mt and productivity of 4530 kg ha⁻¹ in 2017-18 (World Agricultural Production, USDA, 2019). India produced 112.91 Mt, Area - 43.80 Mha, average yield of 2578 kg/ha (Indiastat, 2017-18). The area under hybrid rice in India wet season (Kharif 2018) was around 3 m.ha. (6% of the total rice area of 44 m.ha i.e., 2.64 mha). India is the 3rd largest producer and consumer of fertilizers. Overall production of fertilizers during FY18 has been 413 LMT. Phosphorus (P) is one of the most important primary macronutrients which promotes plant growth and plays a vital role in improving crop productivity. Nearly 80% of applied inorganic P is wasted in processes such as fixation with iron/aluminum in acidic soils, calcium/magnesium in alkaline soils and slow diffusion leaving only 20% of it to be utilized by the plant. Thus P fertilizer use must be optimized particularly in India where P fertility of soils is extremely poor. Genetic diversity is one of the criteria of parent selection in the hybridization programme. The availability of transgressive segregant in any breeding program depends upon the diversity between the parents involves. The quantification of genetic diversity through biometrical procedures such as Mahalanobis's D²- statistic which may be an efficient tool in the quantitative estimation of genetic diversity. The divergence analysis has a definite role to play in an efficient choice of divergent parents for hybridization to exploit maximum heterosis. The field experiment was carried out with 55 parental lines, during the kharif 2016 in three different soil P viz., 20, 40 and 60 Kg P₂O₅ ha⁻¹ at P- facility center in ICAR-IIRR Hyderabad. Data on differential soil P were pooled using homogeneity error variance test. Significant Mahalanobis D² test grouped the 55 parental lines into 8 cluster with Cluster I had highest number of genotypes (48) and remaining clusters showing one parental line in each cluster. highest divergence occurred between cluster II and VII (14.49) and minimum inter cluster distance between the clusters V and II (4.63). The highest intra cluster distance was recorded for cluster no. I (4.47) and remaining clusters shows 0.00 showed minimum intra cluster distance. It is observed that 1000 seed weight, days to 50% flowering, plant height, total tiller per plant and spikelet fertility (%) are the important traits contributing nearly 84.30% towards divergence and for discriminating the genotypes.

AWARENESS LEVEL OF SPIRULINA; THE TRADITIONAL FOOD WITH RICH NUTRACEUTICALS VALUES

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Abstract

Spirulina (*Arthrospiraplatensis* and *Arthrospiramaxima*) was a food source for the Aztecs and other Mesoamericans until the 16th century, harvested from Lake Texcoco in Mexico. The French psychologist Pierre Dangeard mentioned about a cake called 'dihe', consumed by Kanembu tribe, who harvest it from Lake Chad in the African nation of Chad. He studied the dihe samples and found it to be a dried puree of the spring form of the blue-green algae from the lake. The dihe is used to make broths for meals, and also sold in markets. During 1964, the botanist Jean Leonard confirmed that dihe is made up of spirulina. Now spirulina can be used as a nutraceuticals ingredient due to its unique combinations of phytonutrients like phycocyanin, carotenoids, xanthophylls, gamma linoleic acids, galactolipids, sulfolipids, chlorophyll and minerals. Spirulina is nature's richest source of protein. Its protein value is six times more than eggs and 20 times more than milk, with protein content of 60-70% on dry weight basis. Every kilogram of Spirulina on dry weight basis is equivalent to 1000kg of assorted vegetables in terms of nutrition. It is a good source of beta-carotene that enhances and protects eye sight. The gamma linoleic acid reduces bad cholesterol in blood, obesity and mental disorders. Spirulina is a good antioxidant, most powerful scavenger of free radicals in the body, thus can prevent diabetes, cancer, emotional fatigue and stress. High content of potassium present in Spirulina controls hypertension and helps in proper functioning of heart muscles and nerves. This paper deals with a detailed analysis into the awareness level of respondents about spirulina cultivation in Cuddalore District of Tamil Nadu.



GENETIC PARAMETERS FOR YELLOW MOSAIC VIRUS RESISTANCE IN BLACKGRAM (*VIGNA MUNGO* (L.) HEPPER)

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Abstract

A study was carried out in blackgram (*Vigna mungo* (L.) Hepper) with 125 F₂ plants of cross LBG 759 × T 9 to estimate mean, range, genotypic and phenotypic coefficients of variation, heritability and genetic advance for eight traits viz. height of the plant, number of branches, number of clusters, days to 50 per cent flowering, number of pods per plant, length of the pod, number of seeds per pod, single plant yield without any replication. Heritability in broad sense and genetic advance as percent of mean was high for number of pods per plant, single plant yield, number of branches per plant, pod length indicating that these traits were controlled by additive genes indicating the availability of sufficient heritable variation that could be made use in the selection programme and can be easily transferred to succeeding generations. The material generated from this cross can be forwarded by single seed-descent method to develop RILS and can be used for mapping YMV resistance gene and validation of identified markers.

FIELD EVALUATION OF OIL AND GRANULAR FORMULATION OF ENTOMOPATHOGENIC FUNGI, *ZOOPHTHORA RADICANS* AGAINST MORTALITY OF RICE LEAF FOLDER, *CNAPHALOCROCIS MEDINALIS*

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Abstract

A field trial was conducted during August 2018 to January 2019 to evaluate the mycological suppression of rice leaf folder in two different formulations like oil based bio-formulation and granular formulation of *Z. radicans* in experimental farm, Department of Agriculture, Annamalai University. The field trial was laid out in a randomized block design (RBD) in oil formulation with seven treatments and granular formulation with five treatments, replicated six times in plot size 5×4 m each, with the variety CR-1009. The data on effect of various treatments against rice leaf folder indicated that *Z. radicans* + Sunflower oil + Glycerol have comparatively higher reduction of infestation to the tune of 35.25 per cent reduction over control after the first spray. This was followed by *Z. radicans* + Mustard oil + Glycerol, *Z. radicans* + Sunflower oil and *Z. radicans* + Mustard oil (26.33 per cent, 26.13 per cent and 24.24 per cent respectively). During the second spray *Z. radicans* + Sunflower oil + Glycerol recorded the maximum of 69.96 per cent reduction over control. This was followed by *Z. radicans* + Mustard oil + Glycerol and *Z. radicans* + Sunflower oil (59.87 per cent and 57.87 per cent) respectively. Among the different doses of *Z. radicans* granules, 400g *Z. radicans* granules/plot was found effective by recording 25.29 per cent reduction over control. This was followed by dose of 300g/plot treatment. During the second spray, similar trend was noticed wherein the maximum reduction in leaf folder population was noticed in plot which received in dose of 400g/plot treatment (57.23 per cent). Lowest per cent reduction of *C. medinalis* population was noticed on dose of 100g /plot (46.02 per cent reduction over control) Among the different treatment of oil and granular formulation, oil formulation of *Z. radicans* were caused the highest per cent reduction over control when compared to granular formulation of *Z. radicans*.

IMPACT OF FOLIAR NUTRITION ON LEAF REDDENING OF BT COTTON UNDER RAINFED CONDITION

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Abstract

A field experiment was conducted on farmers field at Kautha, Tq. Kandhar. Dist. Nanded during Kharif 2018-19. The geographical position of the experimental site was 18° 48' 45" N Latitude and 77° 21' 11" E Longitude. The soil of



experimental plot was montomorillonitic, Tipic Haplusterts, deep black Vertisol to find out the effect of foliar nutrition on leaf reddening of Bt cotton under rainfed condition. The experiment was laid out in Randomized Block Design with eight treatments viz. T₁- Control (N₁₀₀ P₅₀ K₅₀), T₂- 100% RDF + water spray, T₃- 100% RDF + Urea @ 2% foliar spray, T₄- 100% RDF + 19:19:19 @ 1% foliar spray, T₅- 100% RDF + KNO₃ @ 2% foliar spray, T₆- 100% RDF + MgSO₄ @ 1% foliar spray, T₇- 100% RDF + foliar spray of DAP @ 1% + KNO₃ @ 1% + MgSO₄ @ 1% + Micronutrient grade II @ 0.5%, T₈- 100% RDF + Foliar spray of 19:19:19 @ 1% + MgSO₄ @ 1% + Micronutrient grade II @ 0.5%. and replicated thrice. The result revealed that application of 100 per cent RDF (100:50:50 kg NPK ha⁻¹) in combination with foliar spray of DAP @ 2% + KNO₃ @ 1% + MgSO₄ @ 1% and micronutrient Grade II @ 0.5% at flowering, boll formation and boll development stage recorded the maximum leaf nutrient content and total chlorophyll content and helpful in minimize the anthocyanin content and leaf reddening index in Bt cotton under rainfed condition,

STUDIES ON COMBINING ABILITY USING DIALLEL ANALYSIS IN BHENDI (*ABELMOSCHUS ESCULENTUS*(L.)MOENCH.)

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Abstract

An investigation was carried out at the Plant Breeding Farm, Faculty of Agriculture, Annamalai University, Annamalai nagar, during 2014-2016. A full diallel analysis was carried out with six genotypes of bhendi to produce 30 hybrid combinations. The resultant 30 hybrids and their parents were raised in randomized block design with three replications. Observations were recorded on eight characters viz., Days to first flower, Plant height at maturity, Number of branches per plant, Number of nodes per plant, Number of fruits per plant, Fruit length, Single fruit weight and Fruit yield per plant. The analysis of variance for combining ability showed that all the characters including fruit yield per plant were predominantly governed by both additive and non-additive gene action. Among them, the crosses Arka Anamika × Parbhani Kranti, Parbhani Kranti × P-7 showed superior performance for SCA effects and high heterosis per cent for fruit yield per plant and other important component traits. The high mean performance and non-significant SCA effects for fruit yield per plant and its attributing traits indicated that the cross Parbhani Kranti × Arka Anamika could be well suited for recombination breeding.

STUDIES ON GENOME SEQUENCING IN RICE (*ORYZA SATIVA* L.)

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Abstract

Among the ten genotypes viz., IRLON GSR-9, IRLONGSR-5, CSR-2016-IR-18-18, CR-3878-245-2-4-1, CSR-11-143, CARIDhan-7, CSR-2748-441-195, CR-3437-1*200-83, JK-58 and NDRK-11-20, CARI Dhan 7 tolerated simulated stress upto 6dsm⁻¹ of irrigated water. mRNA Genome sequencing analysis was done with the genotypes by treating the soil of the aluminum tray with saline water upto 0 dsm⁻¹ to 6dsm⁻¹. It was found that a total of 1013 genes differentially expressed under simulated stress condition. Out of which 551 genes were up regulated and 462 genes were down regulated. Gene ontology enrichment studies revealed the presence of transcripts involved in some biological processes (response to stress, response to stimulus, oxidation reduction), molecular function terms (cation binding, metal ion binding, oxidoreductase activity) and cellular function terms (like membrane bound organelle, intra-cellular membrane bound organelle) were observed to be enriched in the sample at 6 dsm⁻¹, when compared to the sample at 0 dsm⁻¹. Based on the metabolic pathway analysis, diterpenoid biosynthesis pathway, MAPK signaling pathway, cutin, suberin and wax biosynthesis and were found to be enriched in the saline stressed sample. 9 ion transporter genes, 1 potassium channel, 1 protein phosphatase gene, 2 ROS scavenging-related gene and 4 Stress-regulated genes were identified to be significantly up-regulated. The IAA homologs OsIAA9 were found to be significantly upregulated and OsIAA14 was found to be down-regulated in this present study. Fifteen Functional proteins, one unique stress-responsive protein and a total of 22 transcription factors reported to be expressed during salt-stress were also up-regulated. An AP2-like ethylene-responsive transcription factor PLETHORA 2 was



found to be down-regulated. The results suggested that the CARI Dhan 7 genotype undergoes various saline-tolerant mechanisms and pathways in response to the stress imposed when compared to non stressed seedlings. This genotype could be well be utilized to impart saline tolerance genes during susceptible seedling stage into agronomically superior rice genotypes.

CONSTRAINTS FACED BY THE GROUNDNUT CULTIVATION FARMERS OF RECOMMENDED GROUNDNUT TECHNOLOGY

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Abstract

Groundnut is called as the king of oil seeds. It plays an important role in oil seed economy of India. Groundnut oil is mainly used as cooking oil and also used for manufacturing soaps, cosmetics, shaving creams and lubricants. Groundnut is cultivated both as rainfed and irrigated crop. Increased productivity greatly depends on available technologies and extent of adoption by farmers. Keeping this in view, the study was conducted to analyze the extent of adoption level of groundnut growers. The present study was conducted in Tharamangalam Block of Salem district. Proportionate random sampling procedure was followed to select 120 respondents from six selected villages namely Karukkalvadi, Konagapadi, Desavilakku, Pappampatti, Elavampatti, and Selavadai recommended groundnut practices adoption of the respondents. The data was collected with the help of a well-structured and pre-tested interview schedule and suitable statistical tools to analyse and examination of the data. The findings revealed that the officials of the State Department of Agriculture, researchers and policy makers to plan and to modify the extension programmes so as to eliminate the extent of over all adoption level of groundnut cultivation technologies and in turn to increase the production and income levels of farmers in the salem district.

DEVELOPMENT OF MULTISTRESS TOLERANT STRAIN OF *SPIRULINA PLATENSIS* BY CHEMICAL MUTAGEN

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Abstract

In the present study *Spirulina platensis* isolated from various locations were characterized and their growth parameter and physiochemical constituents were estimated by using Zarrouk's medium. All the growth parameters were higher in Sp2 strain followed by Sp4, CAS10, Sp3 and Sp1. The growth of *S. platensis* Sp2 strain was the highest in terms of the cell population at 30 days. Among the five *S. platensis* strains better cellular growth was observed in Sp2 and Sp4 strains. These two strains were selected for further sugar mill effluent (SME) medium formulation studies. The strain improvement of *S. platensis* wild strain Sp2 was carried out by chemical mutagenesis with Ethyl Methane Sulfonate (EMS) at various time durations was studied. *S. platensis*^MSp2-II exhibited the best growth, biochemical constituents and antioxidant activities with multi stress tolerant ability compared to ^MSp2-I and selected for mass cultivation in sugar mill effluent enriched medium.

EFFECT OF IRRIGATION AND WEED MANAGEMENT PRACTICES ON THE YIELD AND ECONOMICS OF SUGARCANE

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Abstract

Field investigation was carried out at farmers field, Manaveli, Cuddalore (Taluk), Tamil Nadu with sugarcane cv. EID PARRY 1110. The objectives of the study were to compare the conventional and modern irrigation practices and weed management practices on the yield and economics of sugarcane. The main plot treatments were M₁ - Conventional irrigation, M₂ - Sub surface drip irrigation and the sub plot treatments were S₁-Unweeded (Control), S₂ - Hand weeding thrice (30, 60 and 90 DAP), S₃ -



Atrazine alone, S₄ - Atrazine + 2,4-D, S₅ - Atrazine + metribuzin and S₆ - Atrazine + 2,4-D + Metribuzin. The treatments were compared in split plot design with 3 replications and a plot size of 40m². Among the irrigation practices, subsurface irrigation was found to be the best with the maximum values for plant height, number of tillers, LAI, dry matter production, number of millable cane, cane diameter, number of internodes, individual cane weight and cane yield. In respect of weed management treatments, application of atrazine @ 2.0 kg a.i ha⁻¹ was sprayed on 3 DAP + 2,4-D @ 1.0 kg a.i ha⁻¹ was sprayed on 21 DAP and metribuzin @ 1.0 kg a.i ha⁻¹ was sprayed on 21 DAP recorded with least weed count during which in turn favoured a higher plant height, number of tillers, LAI, dry matter production, number of millable cane, cane diameter, number of internodes, individual cane weight and cane yield over unweeded control. Among the treatment combinations, application of atrazine @ 2.0 kg a.i ha⁻¹ was sprayed on 3 DAP, 2,4-D @ 1.0 kg a.i ha⁻¹ was sprayed on 21 DAP + metribuzin @ 1.0 kg a.i ha⁻¹ was sprayed on 21 DAP under subsurface drip irrigation proved its superiority over the other treatments. It recorded higher plant height, number of tillers, LAI, dry matter production, number of millable cane, cane diameter, cane internodes, individual cane weight and cane yield. This treatment combination also resulted in maximum net return of Rs. 3,42,168 and B:C ratio of 4.50.

GLOBAL CLIMATE CHANGE : SCENARIO AND FOOD SECURITY

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Abstract

Global climate change, judging from the debate on the subject, is one of the major concerns of the world today. However, the concern of those closely following the debate is that it has created more panic than concrete strategies to abate and adapt to the global change. It will have an impact on human health, livelihood assets, food production and distribution channels, as well as changing purchasing power and market flows. Great progress has been made in addressing global under nutrition over the past several decades, in part because of large increases in food production from agricultural expansion and intensification. Food systems, however, face continued increases in demand and growing environmental pressures. Most prominently, human-caused climate change will influence the quality and quantity of food we produce and our ability to distribute it equitably. Our capacity to ensure food security and nutritional adequacy in the face of rapidly changing biophysical conditions will be a major determinant of the next century's global burden of disease.

WEED MANAGEMENT PRACTICES FOR ENHANCING PRODUCTIVITY OF ZERO TILLAGE MAIZE UNDER RICE FALLOW CONDITION

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Abstract

A field experiment was conducted at Experimental farm, Faculty of Agriculture, Annamalai University, Annamalai Nagar, to study the effect of weed management practices for enhancing productivity of zero tillage maize under rice fallow condition during winter 2019. The trial was fitted in randomized block design with three replications. The treatments comprised of T₁ - Unweeded control, T₂ - Hand weeding on 15 and 30 DAS, T₃ - Atrazine 0.75 kg ha⁻¹ + Pendimethalin 0.5 kg ha⁻¹ (tankmix) at 3 DAS, T₄ - Atrazine 0.75 kg ha⁻¹ + Pendimethalin 0.5 kg ha⁻¹ (tankmix) at 3 DAS, followed by hand weeding on 30 DAS, T₅ - Atrazine 0.75 kg ha⁻¹ + Glyphosate 0.8 kg ha⁻¹ (tankmix) at 3 DAS, T₆ - Atrazine 0.75 kg ha⁻¹ + Glyphosate 0.8 kg ha⁻¹ (tankmix) at 3 DAS followed by hand weeding on 30 DAS, T₇ - Paraquat 0.6 kg ha⁻¹ immediately after sowing, T₈ - Paraquat 0.6 kg ha⁻¹ immediately after sowing followed by hand weeding on 30 DAS, T₉ - Tempotrione 105g ha⁻¹ + isoxadifen - ethyl 52g ha⁻¹ + stefemero adjuvant 2.5ml per litre at 15 DAS and T₁₀ - Tempotrione 105g ha⁻¹ + isoxadifen - ethyl 52g ha⁻¹ + stefemero adjuvant 2.5ml per litre at 15 DAS followed by hand weeding on 30 DAS. The important weed flora of the experimental field was *Echinochola colonum*, *Panicum flavidum*, *Cynodon dactylon*, *Dactyloctenium aegyptium* and *Leptochola chinesis* among grasses, *Cyperus rotundas* among sedges, *Cleome viscosa*, *Euphorbia hirta*, *Phyllanthus niruri*, among BLW. Among the weed management practices, application of Paraquat 0.6 kg ha⁻¹ immediately after dibbling followed by hand weeding on 30 DAS effectively controlled the weed density, dry weight and thereby reduced the nutrient removal by weeds and favourably increased the growth and yield attributes and yield of maize under rice fallow conditions. Higher gross income, net return and higher BCR ratio were registered with application of Paraquat 0.6 kg ha⁻¹ immediately after dibbling followed by hand weeding on 30 DAS followed by hand weeding on 15 and 30 DAS.



ASSESTMENT OF GENETIC PARAMETERS IN RICE (*ORYZA SATIVA* L.) UNDER NATURAL SALINE ECOSYSTEM

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Abstract

The study was carried out in an effort to assess the extent of genetic divergence, variability, character association and path-coefficient analysis in 40 genotypes of rice for 8 characters viz., days to first flower, plant height, number of tillers per plant, number of panicles per plant, panicle length, number of grains per panicle, thousand grain weight and grain yield per plant. The analysis of variance indicated considerable amount of variability in all genotypes. Based on D² analysis six clusters were formed indicating that there were no association between eco-geographical distribution of genotypes and genetic divergence. Based on the inter and intra cluster distances, the genotypes belonging to clusters II, IV, V and VI could be used for hybridization programme. The characters namely grain yield per plant, number of panicles per plant, number of tillers per plant and number of grains per panicle recorded high PCV and GCV. High heritability coupled with high genetic advance as percent of mean was observed for number of grains per panicle, plant height, thousand grain weight, number of tillers per plant, grain yield per plant and number of panicle per plant. The genetic correlation revealed that grain yield per plant had strong positive and significant association with number of panicles per plant, number of tillers per plant, number of grains per panicle and thousand grain weight. Path coefficient analysis indicated that maximum direct effect on grain yield per plant was through number of panicles per plant, number of grains per panicle and thousand grain weight.

INFLUENCE OF WEATHER PARAMETERS ON PHEROMONE TRAP CATCHES OF *SPODOPTERA LITURA* ON GROUNDNUT

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Abstract

Field experiment was carried out at farmer's field to study influence of weather parameters on pheromone trap catches of *Spodoptera litura* on groundnut during kharif and rabi 2011. The present study revealed that the peak catches of *Spodoptera litura* were observed from 6th to 10th MSW and 39th MSW to 42nd MSW where the population was in the range of 5.46 to 12.2 male moths / tarp / week and 8.5 to 13.20 male moths /trap/week during kharif and rabi 2011, respectively. Results of the correlation studies revealed that maximum temperature, relative humidity and wind speed were exerted negative influence on trap catches while, the minimum temperature and rainfall showed positive correlation with trap catches of *Spodoptera litura*. This could help in devising effective strategies against *Spodoptera litura* and prevent the infestation on groundnut or related economically important agriculture.

VARIABILITY STUDIES AMONG RICE GENOTYPES (*ORYZA SATIVA* L.) UNDER COASTAL SALINE CONDITION

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Abstract

The present investigation was carried out at the Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar during Samba. The study was carried out in an effort to assess the extent of genetic variability in 35 genotypes for 11 character viz., days to first flowering, plant height at maturity, number of tillers per plant, number of panicles per plant, panicle length, number of grains per panicle, 1000 grain weight, grain length, grain breadth, grain L/B ratio and grain yield per plant. The characters namely, grain yield per plant, number of panicles per plant, number of tillers per plant and number of grains per panicle recorded high phenotypic and genotypic coefficient variation. High heritability along with genetic advance as percent of mean was observed for grain length and plant height at maturity



followed by grain breadth, grain L/B ratio, number of grains per panicle, grain yield per plant, 1000 grain weight, number of tillers per plant, number of panicles per plant and panicle length. This may be attributed to additive gene action. Selection for these characters will play both short term and long term benefit.

EFFECT OF SEED TREATMENT WITH ANT AGAINST ON PLANT GROWTH PROMOTION AND DRY ROOT ROT INCIDENCE OF SESAME (POT CULTURE)

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Abstract

Sesame (*Sesamum indicum* L.) is variously named as gingelly, till or tila. The genus sesamum belongs to the family Pedaliaceae or Tubiflora which comprises 16 genera and 60 species. It is considered as the most important oilseed crop grown in tropical and subtropical areas of the world. The results showed that the treatments with different levels of antagonists as soil application differed in their efficacy in reducing the root rot incidence of sesame. Among the treatments with antagonists, the consortium of *Trichoderma viride* (TV₃) and *Pseudomonas fluorescens* (pf₃) treatments @ 5ml / pot recorded the least disease incidence of 20.12 percent incidence of root rot and also recorded the maximum growth parameters of sesame with 7.12, 16.30 cm of plant height and root length and 21.07g of plant biomass soil application of *Pseudomonas fluorescens* and *Trichoderma viride* individually @ 3ml / pot recorded of 26.65, 29.54 percent of root rot incidence respectively. Carbendazim as soil drenching (0.1%) recorded the incidence of 21.30 percent root rot and 74.73 and 15.40 cm of plant height and root length and 19.83 of plant biomass. The untreated control recorded the maximum disease incidence of 68.35 per cent. The treatments with dosage level of 1.5 lit ha⁻¹ was proved to be the least effective as it recorded higher level of disease incidence in all the cases when compared with the other dosage levels tested.

PRODUCTIVITY ENHANCEMENT STRATEGIES THROUGH NUTRIENT MANAGEMENT PRACTICES IN RICE VAR.CO-47.

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Abstract

Field experiment was conducted in the Experimental Farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar during June-October 2018 to evaluate the integrated nutrient management practices for enhancing the growth and yield of low land rice. The variety CO-47 was chosen for the study. The experiment was laid out in Randomized Block Design with three replications. There were altogether eight treatments viz., T₁- Control, T₂- Farmer's practice (RDF), T₃- RDF+ Micronutrient mixture @ 25 kg ha⁻¹, T₄- RDF+ Micronutrient mixture @ 25 kg ha⁻¹ + Soil application of Humic acid @ 25 kg ha⁻¹, T₅- 125% RDF + Micronutrient mixture @ 25 kg ha⁻¹, T₆-125% RDF+ Micronutrient mixture @ 25 kg ha⁻¹ + Soil application of Humic acid @ 25 kg ha⁻¹, T₇- 75% RDF + Micronutrient mixture @ 25 kg ha⁻¹, T₈-75% RDF+ Micronutrient mixture @ 25 kg ha⁻¹ + Soil application of Humic acid @ 25 kg ha⁻¹. Among the treatments, T₆- 125% RDF+ Micronutrient mixture @ 25 kg ha⁻¹ + Soil application of Humic acid @ 25 kg ha⁻¹ favourably influenced the growth characters viz., Plant height (105.89 cm at harvest stage), number of tillers m⁻² (440 at maximum tillering stage), LAI (7.25 at maximum tillering stage), DMP (12600 at harvest stage), and yield attributes viz., number of panicles per m⁻² (354.92) and number of filled grains panicle⁻¹ (90.65). The result revealed that application of 125% RDF+ Micronutrient mixture @ 25 kg ha⁻¹ + Soil application of Humic acid @ 25 kg ha⁻¹ (T₆) significantly recorded the maximum grain yield 5750 kg ha⁻¹ and straw yield 8510 kg ha⁻¹ in rice crop during kuruvai 2018. This treatment also resulted the maximum return per rupee invested (Rs.2.59). This was followed by application of 125 % RDF + Micronutrient mixture (T₅). Growth and yield parameters viz., Plant height (100.01 cm at harvest stage), number of tillers m⁻² (415 at maximum tillering stage), LAI (6.95 at maximum tillering stage), DMP (11600) and yield attributes viz., number of panicles per m⁻² (329.03) and number of filled grains panicle⁻¹ (81.78), grain yield (5410 kg ha⁻¹) and straw yield (8020 kg ha⁻¹). This treatment was on par with T₄. The least values for growth, yield attributes and yield were recorded under the treatment T₁ (RDF). Growth and yield parameters viz., Plant height (57.73 cm at harvest stage), number of tillers m⁻² (212 at maximum tillering stage), LAI (2.96 at maximum tillering stage), DMP (5795 kg ha⁻¹) and yield attributes viz., number of panicles per m⁻² (171.67) and number of filled grains panicle⁻¹ (30.55), grain yield (2625 kg ha⁻¹) and straw yield (4785 kg ha⁻¹). Hence it



may be concluded that 125% RDF+ Micronutrient mixture @ 25 kg ha⁻¹ + Soil application of Humic acid @ 25 kg ha⁻¹ (T₆) hold promise as an appropriate technology for achieving higher growth and yield in rice.

REPELLENCY PROPERTY OF CERTAIN ESSENTIAL OILS AGAINST TWO SPOTTED SPIDER MITE, *TETRANYCHUS URTICAE* (KOCH) ON RED GRAM (*CAJANUS CAJAN* L.)

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Abstract

Red gram, *Cajanus cajan* L. is an important pulse crop of highly economical and stable protein supplement for the people, is widely grown in India. Red gram is cultivated throughout the year both under irrigated and rainfed conditions. It is obvious that the quality and quantity of the red gram was drastically reduced by various insect and non-insect pests. Among these pests, two spotted spider mite, *Tetranychus urticae* (Koch) cause heavy damage to the red gram crop. Study was carried out to evaluate the repellency property of various essential oils and an untreated check was also maintained separately against two spotted spider mite on red gram. Treatments includes the *Eucalyptus* oil, *Ocimum* oil, *Lavendula* oil, *Mentha* oil, *Rosemarinus* oil, *Cymbopogon* oil, *Syzygium* oil and an untreated check were tested for its efficacy. The maximum repellency was recorded in case of *Eucalyptus* oil (82.42%) and *Ocimum* oil (79.26%) followed by *Rosemarinus* oil (76.81%). The *Mentha* oil and *Cymbopogon* oil shows on par results, whereas the *Syzygium* oil (68.14%) recorded a moderate repellency against mite. The least repellency was recorded in *Lavendula* oil (52.87%) against two spotted spider mite after 48 hours of release. Essential oils are ecofriendly, hence leads to an environmentally safer strategy to the world.

STUDIES ON THE EFFECT OF ORGANIC MANURES, BIOSTIMULANTS AND MICRONUTRIENTS ON KEEPING QUALITY AND VASE LIFE OF TUBEROSE (*POLIANTHES TUBEROSA* L.) CV. PRAJWAL

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Abstract

The present investigation entitled “studies on the effect of organic manures, biostimulants and micronutrients on keeping quality and vase life of tuberose (*Polianthes tuberosa* L.) Cv. Prajwal” was carried out in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar during 2017-2018. The different treatments included the combinations of vermicompost, poultry manure, neem cake, humic acid, seaweed extract, zinc and boron in different ratios. The data was analyzed statistically which showed significant effect of organic manures, biostimulants and micronutrients over control values. The maximum values of flowers opened (%), fragrance of the flower, net water uptake (ml) and vase life (days) were observed in 50% RDF @ 100: 100: 100 kg of NPK ha⁻¹ + vermicompost @ 5 t ha⁻¹ + humic acid @ 0.2% + boron @ 1%. These findings lead towards beneficial and commercially feasible for the effective cultivation and vase life of tuberose (*Polianthes tuberosa* L.) cv. prajwal under open field conditions in the coastal ecosystems.

EFFECT OF CERTAIN BIOCONTROL AGAINST PLUS ORGANIC AMENDMENTS ON PLANT GROWTH AND WILT INCIDENCE OF TOMATO

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Abstract

Fusarium wilt of tomato caused by *Fusarium oxysporum* f.sp. *lycopersici* is an important soil borne disease and is a major constraint to tomato production. A study was undertaken to evaluate the efficacy of a consortium of antagonists involving



Trichoderma viride and *Pseudomonas fluorescens* along with an organic amendment for the management of *Fusarial* wilt of tomato. The results revealed that all the organic amendments supported the survival of *T. viride* and *P. fluorescens* when compared to control. However, the final population of *T. viride* and *P. fluorescens* were the highest in FYM amended soil (37.00 and 80.33×10^3 cfu of *T. viride* and *P. fluorescens* respectively) followed by neem cake at 60th day after inoculation. After 60th day the population of both the antagonist slowly declined in all the treatments. The least population of *T. viride* and *P. fluorescens* were observed in pressmud amended soil. In the field trials it was observed that the treatments with antagonists plus organic amendments significantly increased the growth parameters of tomato when compared to control. Among the various treatments, combined application of *T. viride* + *P. fluorescens* + FYM (T_5) recorded the maximum shoot length (30.10cm), root length (16.50cm) and dry plant biomass (125.40) and minimum wilt disease incidence (25.50) while the least values in plant growth parameters and maximum disease incidence (76.83) were observed in untreated control (T_7).

SOIL SITE SUITABILITY EVALUATION OF POMEGRANATE (*PUNICA GRANATUM* L.) GROWING SOIL OF LATUR DISTRICT MAHARASHTRA

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Abstract

The present investigation carried on topic “studies on Characterization and classification of pomegranate growing of soils Latur district is the south western part of Marathwada region of Maharashtra state. The soil of the study area under pomegranate were very shallow to very deep, Reddish Brown (5 YR 4/4) to dark grayish brown in colour (10 YR 4/2), clay to sandy loam in texture and granular to angular blocky in structure. The bulk density of the studied soils varied from 1.55 to 1.88 Mgm^{-3} . Plant available water capacity (PAWC) varied from 68.34 to 380.52 mm. The saturated hydraulic conductivity of soil varied from 3.27 to 23.71 $cm\ hr^{-1}$. Soil reaction under study area was slightly to strongly alkaline in pH ranged from 7.58 to 8.92 nature electrical conductivity of the soil is $< 1.0\ dSm^{-1}$, organic carbon content very low to high (0.37 to 0.84 percent) and calcareous in nature (4.2 to 15.26 per cent). The maximum CEC was recorded in Typic Haplusterts (53.26 to 69.78 $cmol(P+)(kg^{-1})$) as compared to Typic Haplusteps and Typic Ustorthent. Taxonomically these soils of study area classified into *Typic Haplusterts*, *Typic Haplusteps* and *Calcic Haplusteps*. The yield of the pomegranates ranged between 10.86 to 27.10 $t\ ha^{-1}$ in the study area. The highest yield was recorded in soils of Typic Haplusteps (Inceptisols) with soil depth less than 30 cm (P5). The fruit quality was increased with increasing amount of $CaCO_3$ in these soils. Soil site suitability according to FAO 1983, the suitability of pomegranate on the basis of optimum yield level the soils of Typic Haplusteps were highly suitable whereas Calcic Haplusteps and Typic Ustorthents were moderately suitable and Typic Haplusterts were marginally suitable for pomegranate. This indicated that the Typic Haplusteps (Inceptisol) and Typic Ustorthents (Entisols) soils underlined by loose weathered basalt below 30 cm soil depth were found to be highly suitable (S1) for pomegranate cultivation.

INFLUENCE OF FOLIAR NUTRITION ON THE GROWTH AND YIELD PERFORMANCE OF BLACKGRAM UNDER IRRIGATED CONDITION

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Abstract

Pulses play an important role in Indian agriculture. India is a premier pulse growing country. It is the largest producer, consumer and exporter of pulses in the world. To make people more aware of the nutritional value of pulses, of their contribution to sustainability, The United Nations Food and Agricultural Organization had proclaimed 2016 as the ‘International year of Pulses’. Blackgram is one of the important pulse crop grown in all 3 seasons such as kharif, rabi and summer and throughout India. It contains higher amount of protein (24-26%) and is reported to be rich in Potassium (K), Phosphorus (P) and Calcium (Ca) with good amount of Sodium (Na) (Eswara Raghava Kumari *et al.*, 2018). Field experiment was conducted at the Sittling Village, Harur Taluk, Dharmapuri District, Tamilnadu during March-June, 2018 to study the



influence of foliar nutrition on performance of black gram under irrigated condition. The black gram was subjected to foliar spray of organic and inorganic nutrients with plant growth regulators. The results of the experiment revealed that the growth, yield and yield attributes viz., plant height, number of branches plant⁻¹, leaf area index, number of effective root nodules, dry matter production, number of pods plant⁻¹, pod length and number of seeds pod⁻¹ of black gram were favorably influenced by application of RDF + foliar spray of 2% DAP + 40 ppm NAA+ 0.5% chelated micronutrient at 30 and 45 DAS (T₁₁).

THE CHARACTERISTICS OF THE RESPONDENTS WITH THEIR EXTENT OF ADOPTION OF GROUNDNUT CULTIVATION TECHNOLOGIES IN SALEM DISTRICT OF TAMILNADU INDIA

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Abstract

Groundnuts known by often local names such as earthnuts, peanuts, goober peas, monkey nuts, pig nuts, and pygmy nuts. Groundnut rich in protein and high in various vitamins, minerals and plant compounds. Groundnut is called as the king of oil seeds. It plays an important role in oil seed economy of India. Groundnut oil is mainly used as cooking oil and also used for manufacturing soaps, cosmetics, shaving creams and lubricants. Groundnut is cultivated both as rainfed and irrigated crop. Increased productivity greatly depends on available technologies and extent of adoption by farmers. Keeping these in view, this study was conducted to analyse the knowledge and adoption level of groundnut growers. The present study was conducted in Tharamangalam Block of Salem district. Proportionate random sampling procedure was applied to select 120 respondents from six selected villages namely Karukkavadi, Konagapadi, Desavilakku, Pappampatti, Elavampatti, and Selavadai. Fourteen characteristics were selected for studying the profile of respondents. Thirty knowledge items were selected for studying the knowledge level of respondents. Twelve recommended groundnut cultivation practices were selected for studying the extent of adoption. Constraints in the adoption of groundnut cultivation practices were also studied. The data were collected with the help of a well-structured and pre-tested interview schedule and suitable statistical tools were used to analyse the data. The findings will be of use to the officials of the State Department of Agriculture, researchers and policy makers to plan and to modify the extension programmes so as to eliminate these constraints in the adoption of groundnut cultivation technologies and intend to increase the production and income levels of farmers in their region.

INFLUENCE OF INTEGRATED NUTRIENT AND WEED MANAGEMENT PRACTICES ON THE GROWTH AND YIELD OF TRANSPLANTED RICE (*ORYZA SATIVA* L.)

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Abstract

A comprehensive study was made in irrigated rice to optimise the integrated nutrient and weed management practices for augmenting rice productivity, at Annamalai University, Experimental Farm, Annamalai Nagar, Tamil Nadu, India. The nutrient status of the experimental soil was low in available nitrogen (204 Kg ha⁻¹), medium in available phosphorus (21.4 Kg ha⁻¹) and high in available potassium (281 Kg ha⁻¹). The pH and E.C were 7.3 and 0.45 dsm⁻¹ respectively. The experiment was laid out in split plot design with three replications. The details of the treatment in main plots are M₁ – Un weeded control, M₂ – Hand weeding (HW) twice at 20 and 40 DAT (Farmers practice), M₃ – Butachlor 1.25 kg a.i./ha + one hand weeding (25 DAT), M₄ – Pretilachlor 0.75 kg a.i./ha + one hand weeding (25 DAT) and the sub plots S₀ – Absolute control (no organic and inorganics), S₁ – RDF through inorganic fertilizers (150:50:50 kg N, P₂O₅, K₂O), S₂ – 75% recommended dose of N + recommended dose of P and K + 25% N on equivalent basis of composted vermicompost, S₃ – 75% recommended dose of N + recommended dose of P and K + 25% N on equivalent basis of composted pressmud, S₄ – 75% recommended dose of N + recommended dose of P and K + 25% N on equivalent basis of water hyacinth compost. The results of the study evidently proved that application of pre-emergence herbicide of pretilachlor 0.75 kg a.i. ha⁻¹ + one hand weeding at 25 DAT along with application of 75% recommended dose of N + recommended dose of P and K (112.5 : 50 : 50 kg N, P₂O₅ and K₂O ha⁻¹) + 25% N on equivalent basis of vermicompost (1400 kg ha⁻¹) recorded maximum plant height (64.98, 105.98 cm) at tillering and flowering,



LAI at flowering (5.69,5.82), No. of tillers hill-1(21.90,22.30), and DMP (15.18,15.48 Kgha⁻¹) at harvest and also registered highest grain yield of 6528 and 6685 kg ha⁻¹ and straw yield of 10397 and 10569 kg ha⁻¹ in the first and second crop, respectively. The lowest values for plant height LAI at flowering, No. of tillers hill-1, and DMP and yield attributes and yield was observed in the treatment M₁S₀ (unweeded control x no organic/inorganics) at all the stages of observation However, in both the crops treatment M₂ S₀ was statistically on par with M₁S₀ at 20 DAT.

UPSCALE AN INNOVATIVE PLANTING AND EFFECT OF ORGANIC INPUTS ON THE GROWTH AND ROOT YIELD OF INDIAN SARASAPARILLA UNDER COSTAL ECO-SYSTEM AND PROBLEMATIC SOIL

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Abstract

Indian sarasaparilla (*Hemidesmus indicus*) also known in ancient Ayurveda medicine has a great medicinal importance. Since the root portion is the economic part, during harvest damage and wastage cause reduction in yield. Root development and harvesting of roots in the field condition is a major problem, more over harvesting is too expensive. Salinity, heavy clay and water logging is a serious problem in the costal eco-system. Under such conditions, there is a need to explore the possibility of cultivating *Hemidesmus indicus* organically and in an innovative method under commercial scale, which will be helpful in recommending this crop as intercrop and boundary crop in various perennial fruit crops to enhance the farm income. Hence an experiment was conducted in a Controlled Randomized Design with 10 treatments in three replications. Healthy uniform size wild Indian sarasaparilla seedlings were planted in the PVC pipes. The treatment consisted of three organic manures as potting media (farmyard manure, vermicompost and coir pith compost), along with three organic foliar nutrients (panchakavya @ 3%, sea weed extract @ 3% and humic acid @ 0.2 %) were sprayed at monthly intervals. The results of the study revealed that media containing sand: red soil vermicompost + foliar application of seaweed extract @ 3 per cent resulted in improving the growth characters like plant height, intermodal length, number of laterals, leaf area and maximizing the root yield of Indian sarasaparilla without damage and wastage during harvest.

THREAT BY EVOLUTION OF INSECT RESISTANCE TO BT TOXIN AND ITS MANAGEMENT

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Abstract

Crops genetically engineered to produce insecticidal proteins from the bacterium *Bacillus thuringiensis* (Bt) kill some major pests and reduce use of insecticide sprays. However, evolution of pest resistance to Bt proteins decreases these benefits. As of 2005, there were only three reports of insect resistance that “substantially reduced the efficacy of the Bt crops in the field,” according to the release. As of 2016, there were 16 such reports, and in those cases, it took an average of five years for resistance to develop, the study reports. Transgenic Bt crops producing insecticidal crystalline proteins from *Bacillus thuringiensis*, so-called Cry toxins, have proved useful in controlling insect pests. Together with reduction of pesticide application and cost reduction, Bt crops have brought tremendous benefit to both environment and farmers. Expanded use of transgenic crops for insect control will likely include more varieties with combination of two or more Bt toxins, novel Bt toxins such as VIP. Modified Bt toxins have been genetically engineered to kill insect resistance to standard Bt toxins. The strategy for combating resistance by crossing transgenic Bt plants with conventional non-Bt plants and then crossing the resulting first-generation (F₁) hybrid progeny and sowing the second-generation (F₂) seeds. This strategy yields a random mixture within fields of three-quarters of plants that produce Bt toxin and one-quarter that does not. The non-Bt plants in this mixture promote survival of susceptible insects, thereby delaying evolution of resistance. The different strategies to cope with resistance, i.e., expression of several toxins with different modes of action in the same plant, modified Cry toxins active against resistant insects, and the potential use of Cyt toxins or a fragment of cadherin receptor. These approaches should provide the means to assure the successful use of Bt crops for an extended period of time.



CLIMATE CHANGE AND AGRICULTURE

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Abstract

The impacts of climate change are continuously reducing the capacity of natural resources (biodiversity, soil and water) to sustain the food demand of the world's increasing population. Food security and climate change are somewhat interlinked challenges that need to be addressed simultaneously. Increasing resource efficiency in agriculture and building resilience to climate risks are the key actions for undertaking these challenges. This implies a significant transformation of agriculture and food systems, with concerted action and coordinated involvement of all stakeholders on a long-term perspective. The largest known economic impact of climate change is upon agriculture because of the size and sensitivity of the sector. Warming causes the greatest harm to agriculture in developing countries primarily because many farms in the low latitudes already endure climates that are too hot. Even though adaptation will blunt some of the worst predicted outcomes, warming is expected to cause large damages to agriculture in developing countries over the next century. Conversely, agriculture could be a solution for climate change by the widespread adoption of mitigation and adaptation actions. This happens with the help of best management practices such as organic farming, agroforestry practice and manure management etc.

SOIL HEALTH : AN INDICATOR OF SUSTAINABLE MANAGEMENT

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Abstract

The foundation for profitable, productive, and environmentally sound agricultural systems is healthy soil. Proper soil management practices are supposed as a better way to enhance agriculture production in sustainable healthy soil without forgetting environmental quality, human and animal health. Soil is a complex ecosystem where living microorganisms and plant roots bind mineral particles and organic matter together into a dynamic structure that regulates water, air, and nutrients. Soil health refers to the ability of the soil to sustain agricultural productivity and protect environmental resources. A healthy soil performs many functions that support plant growth, including nutrient cycling, biological control of plant pests, and regulation of water and air supply. These functions are influenced by the interrelated physical, chemical, and biological properties of soil, many of which are sensitive to soil management practices. The condition of our soils ultimately determines human health by serving as the major medium for food and fiber production and a primary interface with the environment, influencing the quality of air we breathe and water we drink. Thus, there is a clear linkage between soil quality and human and environmental health. As such, the health of our soil resources is a primary indicator of the sustainability of our land management practices.

IMPROVEMENT OF GRAIN NUMBER IN BASMATI RICE THROUGH MARKER ASSISTED SELECTION

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Abstract

Punjab Basmati 3, a semi-dwarf and lodging tolerant version of Basmati rice variety Basmati 386 was developed through marker assisted backcross breeding at Punjab Agricultural University, Ludhiana and released for cultivation in Punjab state in 2013. It is the first Basmati variety showing resistant to bacterial blight (BB) due to the presence of two genes, *xa13* and *Xa21*. But when compared to commercially grown indica rice varieties, it has very less number of grains per spike. In the present



study, using the marker assisted backcrossing a novel QTL *qSPP2.2* controlling spikelet number per panicle identified from *Oryza longistaminata* was transferred into Punjab Basmati 3. To study the transfer of grain number QTL *qSPP2.2*, the BC₂F₂ seeds harvested from the selected plants were sown for phenotypic and genotypic evaluation and 2500 plants were screened with RM6 polymorphic marker nearest to the QTL *qSPP2.2*. Plants showing more than 100 percent increase in grain number and homozygous for the QTL *qSPP2.2* were obtained. The plants were also further analyzed with markers linked to *Xa21*, *xa13*, *BADH1*, *BADH2* and *RM190* for background selection. The identified high yielding lines are under trail and could be further utilized in the breeding programs to improve elite rice cultivars.

INDIGENOUS TECHNICAL KNOWLEDGE (ITK) AND THEIR ROLE IN SUSTAINABLE AGRICULTURE

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Abstract

Indigenous Technical Knowledge (ITK) has immense potential for innovation. India is a country populated by a number of indigenous communities, most of which have their own set of unique traditional knowledge and technology base. These traditional knowledge and technologies have played a significant role in the overall socio-economic development of the communities. ITK is specifically concerned with actual application of the thinking of the local people in various operations of agriculture and allied areas without affecting the environment. These traditional knowledge is based on experience, often tested over a long period of use, adapted to local culture and environment, dynamic and changing. It is a time-tested agricultural and natural resource management practices, which pave the way for sustainable agriculture. A wide range of diverse sectors including agriculture, animal husbandry, fishing and textile were considered for the purpose of the study as all these sectors are imperative in Indian context. An appropriate association between the traditional and modern knowledge and technology systems has immense potential to benefit the society. This knowledge plays imperative role in many grassroots innovations. Such knowledge is responsible for improvement in many important rural enterprises such as poultry. Despite the wide recognition of indigenous peoples contribution to the world's cultural and biological diversity and sustainable development, many challenges still remain in the area of traditional knowledge and technologies.

SOIL BIOCHEMICAL PROPERTIES AFFECTED BY CROP RESIDUE

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Abstract

To maintain agricultural productivity and environmental integrity, it is crucial that soil quality be improved or maintained. Crop residues are the non-utilized sources of renewable biomass generated in large quantities in agriculture and excess residues are disposed by means of burning because it is considered as cheap and easy method. But burning cause environmental problems including air pollution, emission of greenhouse gases, serious fine dust problems, and even changes of air circulation and monsoon patterns. Tillage and residue management practices are known to potentially affect soil quality in various ways. It influence physical, chemical and biological properties of soil and have a major impact on soil productivity and sustainability. Soil microbial biomass and enzymatic activity are the potential indicators of soil quality owing to their close association with soil biology that rapidly responds to management and environmental induced changes. Incorporation of maize residue was more effective than wheat straw to increase soil enzyme activity which may be attributed to chemical composition of maize straw. Soil enzymatic activities were significantly higher in ZT wheat with rice straw retained (ZTW+R) as compared to CT wheat without rice straw (CTW-R) and ZT wheat without rice straw (ZTW-R) under rice-wheat cropping system. Rice straw incorporation treatments significantly increased the labile carbon fractions in soil than control. Surface retention of crop residues under no tillage system has been reported to greatly enhance the soil enzymatic activity, which was related to increased microbial biomass in the soil. The use of crop residue management practices improves the fertility of soil by improving soil biological environment and could sustain the crop productivity in intensive cropping system.



SOIL HEALTH AND ITS ASSESSMENT FOR SUSTAINABLE AGRICULTURE

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Abstract

Soil health is a fundamental consideration for ensuring agricultural and environmental sustainability and is widely used to describe the general condition or quality of the soil resource. It indicates the capacity of the soil to function as a vital living system to sustain biological productivity, maintain environmental quality and promote plant and animal health. The main challenge of our generation is to manage soils in a sustainable fashion so that they continue to provide for generation needs in the future. The term soil health is often used interchangeably with soil quality. Soil health describes the “potential” and “dynamic” conditions of the soil in a short period, while the soil quality describes the “inner” and “static” conditions of the soil over longer time scales. Soil health assessment encompasses measurement of soil physical, chemical and biological properties, commonly termed as soil health indicators. These indicators are a composite set of measurable physical, chemical and biological attributes which relate to, functional soil processes and can be used to evaluate soil health status. The main approaches for soil health assessment are Principal Component Analysis (PCA) and Indicator Transformation (Scoring). For transformation, generally two techniques are followed: linear scoring and non-linear scoring. Various researchers have used these approaches for assessing soil health in different parts of the world. Thus, management and assessment of soil health has emerged as a key area of concern to realize the potential of soil for sustainable crop production.

SOIL HEALTH MANAGEMENT : A PREREQUISITE FOR SUSTAINABLE AGRICULTURE

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Abstract

The amount of arable land is likely going to remain constant and, as the population steadily grows, producing more crops from existing resources is going to become a necessity. It is only possible by adopting a sustainable production management system. Agricultural sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Conservation of resources critical for agricultural productivity also means taking care of soil and managing soil health in suitable manner. Soil health refers to the ability of the soil to sustain biological activity, diversity, productivity and protect environmental resources. Organic farming can prove to be crucial to maintain soil health as it is based on the management of soil organic matter, which in turn maintains the physical, chemical and biological properties of soil. There are various management practices like conservation tillage, crop rotation, cover crop, green manure, organic manure, INM etc. which increase and maintain a desired level of soil organic matter as well as soil health. A healthy soil provides many functions that support plant growth including nutrient cycling, biological control of plant pests and regulation of water and air supply in sustainable manner.

EFFECT OF LONG TERM ZERO TILLAGE IN WHEAT ON DTPA EXTRACTABLE MICRONUTRIENTS (FE, MN, ZN AND CU) IN MUNGBEAN-WHEAT AND SORGHUM-WHEAT CROPPING SYSTEMS

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Abstract

Zero tillage is a key aspect of conservation agriculture which reduces soil disturbance, improves soil physical, chemical and biological properties for conserving natural resources as well as agricultural production. Therefore, the present study was



carried out to observe the effect of long-term zero tillage in wheat on soil properties. The field experiments were consisted of three tillage practices viz. CT-CT (Conventional tillage in both *kharif* and *rabi* seasons), CT-ZT (Conventional tillage in *kharif* & zero tillage in *rabi* seasons) and ZT-ZT (Zero tillage in both *kharif* and *rabi* seasons) and two cropping systems (sorghum-wheat and mungbean-wheat). The DTPA extractable micronutrients (Fe, Mn, Zn and Cu) were estimated using standard methods. The DTPA extractable Fe (9.26%), Mn (6.40%) and Zn (3.48%) were significantly higher under mungbean-wheat cropping system as compared to sorghum-wheat cropping system but Cu was significantly lower in case of mungbean-wheat cropping system as compared to sorghum-wheat cropping system because Cu bounded and form complexes with organic matter. The DTPA extractable Fe, Mn and Zn were significantly higher under ZT-ZT over CT-ZT and CT-CT tillage practices because of high organic material in terms of plant residues and root biomass under ZT-ZT. However, Cu was significantly lower in ZT-ZT as compared to CT-ZT and CT-CT. The results reveal that long term zero tillage and introduction of legume in cropping system have potential for increasing the status of DTPA extractable micronutrients in soil except Cu.

VALIDATION OF DIFFERENT HAPLOTYPES OF *ORYZA RUFIPOGON* ACCESSIONS UNDER PHOSPHORUS STARVATION

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Abstract

Oryza rufipogon, a perennial, tufted grass is a wild relative of cultivated rice, *O. sativa*. Phosphorus-starvation tolerance 1 (*PSTOL1*) is naturally present gene in wild germplasm, it is extremely desirable to utilize for yield improvement under phosphorus (P) deficient soil conditions. In present investigation, for the functional evaluation of previously identified 17 different haplotypes of *O. rufipogon* covering 26 accessions were grown under P-deficient soil conditions. Data were collected for different morphological traits including days to 50% flowering, plant height, tiller number, number of panicles /plant and spikelets/panicle. Further, plants were being dried to collect morphological data on dry root and shoot traits. *O. rufipogon* IR104639 (H3) showed the best root weight. Data revealed that IR106506 (H17) showed best root weight, as compared to IR93283 (H11). In terms of spikelets/panicle, IR113651 (H1) and IR106407 (H6) showed least tolerance with 90% and 75% reduction respectively along with 73.5% reduction in panicle number. Overall, IR104639 (H3) indicated the best performance under P-deficient conditions followed by IR106506 (H17) and IR93283 (H11). F₁s were also generated from the crosses made between the selected wild species accessions and elite rice cultivars PR127 and PR121 and are sown in the fields at Punjab Agricultural University, Ludhiana.

ORGANIC FARMING FOR SUSTAINABLE AGRICULTURE

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Abstract

Indian economy is one of the fastest growing economies among the developing countries in the world. The agriculture sector in India has made enormous stride in the past 50 years. In the ancient time, agriculture was practiced without the use of artificial chemicals such as fertilizers and pesticides that came during the mid-19th century. This kind of agricultural practice was causing harm to the environment. Scientists and policy planners are, therefore, reassessing agricultural practices which relied more on biological inputs rather than heavy usage of chemical fertilizers and pesticides. Nowadays, organic products are being famous for all people around the world. Due to the great global market demand, production of organic foods has increased rapidly in the past decades. To protect our ecosystem organic farming is well practiced without using harmful chemicals, they are replaced by bio-fertilizers, bio-pesticides etc. this also maintains the soil fertility, use of chemical fertilizers kills the useful soil organisms. With the rapid change in farming practices, organic farming came into existence in the 20th century. Organic farming is one of the several approaches found to meet the objectives of sustainable agriculture. It made use of environment friendly practices by avoiding the use of artificial chemicals and making



use of organic matter to raise crops. Organic food is beneficial to human health and the practice of organic farming keeps the environment clean. Ecological friendly Organic farming is the answer to the problems being faced by agriculture in India today. This form of agriculture conserves our soil and water resources, protects our climate, improves agro-diversity, ensures biodiversity, meets the demand for food and safeguards livelihoods. Overall, organic farming can improve soil physical properties in the long term and provide a strategy for farmers to enhance soil physical quality and agricultural sustainability.

ROLE OF WOOL WASTE AS A SOURCE OF NUTRIENTS FOR CROP PRODUCTION

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Abstract

The economic and environmental sustainability of agricultural systems depends on the careful selection of inputs such as inorganic and organic fertilizers. A number of “waste materials” such as biosolids (sewage sludge), municipal solid waste (MSW) compost, animal manures, and other composted and raw organics have been traditionally used as a nutrient source for agricultural crops and/or as soil conditioners. While there is a significant body of research available on the above organic nutrient sources, there has been limited research on the use of other organic wastes, such as wool waste as nutrient source. Keeping in view, a two year field experiment was carried out at Agricultural Research Station, SKRAU, Bikaner. Where wool waste in conjugation with FYM and inorganic fertilizers was applied as a nutrients source under bottle gourd-onion cropping system. Experiment was layout in split plot design. The results indicated that application of wool waste in conjunction with FYM @ 20 t ha⁻¹ (1:1 ratio) and inorganic fertilizer resulted in significantly higher amount of organic carbon, available nitrogen, phosphorus, potassium, iron, manganese, zinc and copper. Inspite of containing considerable amount of plant nutrients, waste sheep’s wool are mostly deposited in landfills and nutrients contain can no longer be exploited. Thus, landfill is not a desirable option, more environmentally friendly alternative is to use as a fertilizers.

EVALUATION OF SHELF LIFE AND MICROBIAL LOAD OF VALUE ADDED PRODUCTS DEVELOPED FROM UNDERUTILIZED TENDER TAMARIND LEAVES(TAMARINDUS INDICA L.) POWDER

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Abstract

Tamarind is an underutilized multipurpose tree possessing indispensable properties of which almost every part of tree finds at least some use, either nutritional or medicinal. Tamarind leaves and fruit pulp used in culinary preparation in different countries due to its sourness. It is valued mostly for its fruit especially for the pulp, which is widely used for domestic and industrial purposes. Objective of the study is to evaluate the shelf life and microbial load of products prepared from the tender tamarind leaves powder. The shelf life study and microbial load of the products were conducted for the best accepted products. The products were packed in aluminium foil covers and were kept in ambient temperature at 27°C. The sensory attributes and microbial load of stored products were observed at the interval of initial, 10th, 20th and 30th day, the result revealed that, as the number of days increased, the sensory parameters of all the products were decreased, there was no significant change in all the attributes accept aroma and taste were decreased significantly from (7.65 to 6.45) and (7.95 to 6.65) respectively. Bacterial population of roasted Bengal gram chutney powder-1 at initial, 10th, 20th and 30th day was found to be 2.00, 3.66, 4.00 and 5.33 ×10⁴/g CFU respectively. The microbial population was more in hurigalu-2 when compared to chutney powders. However, the presence of tartaric acid in tamarind leaves in both the chutney powders and in hurigalu act as natural preservatives to reduce the microbial multiplication. The general common acceptance for countable number of colonies plates are 30-300 and 25-250 for bacteria and fungi respectively. Thus the present study had shown that these products could find a place in the domestic market on par with other products and can be promoted for regular consumption.



SEED TREATMENTS TO MANAGE SHOOT FLY (*ATHERIGONA SOCCATARONDANI*) IN RABI SORGHUM

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Abstract

An important cereal crop grown in Asia, Africa, USA, Australia, and Latin America is sorghum, this ranks fourth among the world cereals in the order of wheat, maize and rice. Because of biotic and abiotic constraints the productivity levels under are quite low (500–800 kg/ha). sorghum shoot fly (*Atherigona soccata* Rondani) is most important pest in Asia, Africa, and the Mediterranean Europe, Among 150 species of insect pests which affects sorghum crop. This is an important seedling pest attacks sorghum crop up to 30 days from sowing. It is reported that the phosphate insecticides, e.g. fenitrothion, monocrotophos and trichlorfon have caused phytotoxicity to sorghum in Australia. The earlier recommendation of endosulfan is banned and hence there is an urgent need to find out alternative to endosulfan. The field trial was conducted on management of shoot fly through seed treatments and also to study their phytotoxicity in *rabi* sorghum 2014-15. The results revealed that, imidacloprid 70 WS (5 g/kg) and on par with chlorpyrifos 20 EC (5 ml/kg) found superior over all treatments by recording 0.73 eggs/plant. Next best treatments were spinosad 45 SC (2 ml/kg) (0.97 eggs/plant), acetamiprid 20 SP (5 g/kg) (1.07 eggs/plant) and fipronil 5 SC (5 ml/kg) (1.17 eggs/plant). imidacloprid 70 WS (5 g/kg) and chlorpyrifos 20 EC (5 ml/kg) recorded significantly least deadhearts (14.83% and 15.17%, respectively) followed by fipronil 5 SC (5 ml/kg) (18.28%). Spinosad 45 SC (2 ml/kg), acetamiprid 20 SP (5 g/kg) and emamectin benzoate 5 SG (5 g/kg) recorded 25.40, 24.06 and 23.71 per cent deadhearts respectively followed by 1 per cent neem oil (25.60%). Flubendiamide 480 SC (4 ml/kg) and untreated control recorded higher damage due to shoot fly (27.80%). Highest net returns among all the treatments was recorded in imidacloprid 70 WS (21357.14 ₹/ha) followed by chlorpyrifos 20 EC (5 ml/kg) (19981.75 ₹/ha). Sugarcane (*Saccharum officinarum*) is an economically important agro-industrial crop. It is the second largest industry in the agro-processing sector, next to textiles, and represents the principal livelihood of 35 million farmers and 50 million others who are employed in its 571 sugar-related industries. It plays an important role in national economy by contributing 1.9 per cent to GDP. It is cultivated on an area of 5.0 m ha⁻¹ with production of 362 m t and productivity of 71.4 t ha⁻¹. Ever increasing population necessitates shifting from the crops to cropping system approach in crop production. The approach involves sequential as well as intercropping and mixed cropping systems aimed at efficient utilization of natural and synthetic resources of production. The objective of cropping system research in sugarcane is to develop the improved systems that would utilize as much as possible and make efficient use of growth resources. The productivity of system is mainly determined by the efficiency of the system in use of basic resources. This depends not only on the efficiency of individual component crops of the system, but also how well these crops complement each other in time and space. With respect to different intercropping systems viz., onion, green pea, soybean and row spacing (1.2m, 2.4m and 3.6m) in sugarcane, cane equivalent yield (204 t ha⁻¹), highest monetary advantage index (Rs.1, 32, 010 ha⁻¹), net returns (Rs.2, 09,745 ha⁻¹) was obtained with sugarcane at 1.2 m row spacing + drill sown onion compared to other cropping systems. The intercropping of autumn sugarcane with garlic, peas and cabbage did not reduce the cane yield and enhanced the net monetary returns than sole sugarcane. In these intercropping systems, pre emergence application of Oxyfluorfen @ 0.234 kg or Pendimethalin @ 0.75 kg ha⁻¹ provided effective weed management and improved overall profitability.

PRODUCTION APPROACHES FOR HIGHER FARM PROFITABILITY

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Abstract

Agricultural strategy in the country during the planned development era has been to ensure food security and farmers have responded to the nation's needs well and adopted Green Revolution technology. While the country achieved commendable position in food production, farming itself turned non-profitable overtime due to rising costs and uneconomical holdings. Agrarian distress has been a contagion shaking the foundations of the agricultural sector. Indian farmers have contributed to the food security of the country while remaining in perpetual stress so much so that many of them reportedly do not want their



children to continue in farming profession. Increasing income substantially is an essential way to address distress viz., reduced crop diversification, non judicious use of irrigation water, poor nutrient management practices, high and increasing input cost, lack of soil and water conservation practices, non adoption of allied activities, low and unrealisable minimum support price, non-remunerative market price, low share of farmers in final price, poor penetration of crop insurance and absence of market infrastructure. There are several pathways that can lead to step up income of which increasing production through rise in yields, cost reduction, suitable water and nutrient management, stabilizing income through risk coping, mitigation measures, crop diversification, integrated farming system, micro irrigation, soil and moisture conservation practices and farm mechanization are important. Integrated farming system with cropping involving poultry, fish and goat was highly productive (26.32% increase) and profitable (32.34 % increase) alternate system compared to conventional rice-rice system and even dry land situation. In farm mechanization highest paddy yield was obtained under puddled transplanted rice with laser leveled land treatment (5833 kg ha⁻¹) which was statistically at par with direct seeded rice (DSR) with laser leveled land treatment (5682 kg ha⁻¹). The net returns and BC ratio were found more in DSR with laser leveled land (Rs.80, 972 ha⁻¹ and 3.11, respectively) compared to other practices. Among the different rice based cropping systems, rice - potato + wheat - green gram recorded significantly higher rice equivalent yield (215.81 q ha⁻¹), system productivity (59.13 kg rice ha⁻¹ day⁻¹) and benefit cost ratio (1.26) compared to traditional rice – wheat (82.59 q ha⁻¹, 22.63 kg rice ha⁻¹ day⁻¹ and 0.91, respectively) and other cropping systems. It was found on par with rice – potato – green gram cropping system. Single eye bud seedling planting (SEBSP) technique also offers good scope in reducing the water requirement, monetary advantage in term of net returns [202880 ha⁻¹] and benefit cost ratio (2.68) for sugarcane cultivation. SEBSP technique under drip saved the water to the extent of 39 - 55 per cent.

AN OVERVIEW OF CONSORTIUM OF E-RESOURCES IN AGRICULTURAL UNIVERSITY (CERA)

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Abstract

Consortium of libraries is well known for sharing of resources all over the world. Several libraries in the world have formed consortia to share their electronic resources. However, consortium has now become very popular due to digital form of information. With the advent of ICT and its application in library activities, new opportunities opened up for greater cooperation among libraries. At the global level Internet and at the national and local level several library networks came in to existence and databases created for information sharing. In recent years availability of information resources in digital or electronic format has further facilitates exchange of information resources among libraries creating favourable condition for increased resource sharing. Emergence of library consortia is a promising development in this direction. Due to cooperative association of libraries of different types, the concept of consortia has erupted and successfully working among the libraries. A consortium supports resource sharing and provides services to users through programmes in cooperative acquisition, access to electronic resources, and access to physical collections, enhanced inter library loan and document delivery. In India a number of consortia such as, UGC Info-Net, INDEST, CeRA, and FORSA have been developed to share and exchange of digital information. The essence of CeRA is very significant due to the fact that it is a specialised subject based consortium whose basic purpose of enhancing the dissemination and exchange of agricultural information for the betterment of farming sector for the agricultural stakeholders of the country.

PERFORMANCE OF FRUITS AND VEGETABLE PROCESSING SECTORS IN KARNATAKA STATE

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Abstract

Agro-processing can be grouped as cereals and pulses processing, fruits and vegetables processing units and Commercial crops processing units. It is found that 48 per cent of the household expenditure in India is on fruits and vegetable items and the demand for processed/convenience food is constantly increasing. Fruits and vegetables account for nearly 90% of total horticulture production in the country. India is now the second largest producer of fruits and vegetables in the world and is the leader in several horticultural crops, namely mango, banana, papaya, cashew-nuts, areca nut, potato and okra. However the



nature of horticulture crops being such its not easy to make assessment of their production. These crops, especially vegetables are grown in small plots, fields or in the back of the houses, do not have single harvesting in most of the cases which makes their assessment difficult. Many horticulture crops have multiple pickings in a single season. Similarly many fruit trees are scattered, which do not count for assessment. The Fruits and Vegetable Processing industry in India plays a vital role in the national economic development and has potential to meet the local needs and export requirements. In this context there is a need for improving the capacity of the fruit and vegetable processing units to harness backward linkages allied activities in order to efficiently convert part of the output to value added products acceptable to the domestic and international markets. This would generate employment opportunities for different types of skills through food processing, packaging, grading and distribution. Keeping the above aspects in consideration the study was carried out in the state of Karnataka. Fruits and vegetable processing industries has got a considerable growth which signified the importance of agro processing industries. Therefore it has great scope for development in the state. Hence, it must be promoted extensively. Existing investment in this sector are found facing many problems which affect their operation.

PERFORMANCE OF PRODUCTION EFFICIENCY INDICES UNDER SUGARCANE AND SUGARBEET INTERCROPPING SYSTEM

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Abstract

The field experiment was carried out during 2011-12 at Agricultural Research Station (ARS), Madhurakhandi (Dist. Bagalkot), University of Agricultural Sciences, Dharwad to evaluate tropicalsugar beet cultivars (Cauvery, Shubhra, Magnolia and Calixta) with different row proportions (1:1, 1:2 and 1:3) in sugarcane. There were seventeen treatment combinations laid out in randomised complete block design with three replications. On the basis of results obtained from present investigation Intercropping of Sugarcane + sugar beet (irrespective of sugar beet cultivars) in 1:2 and 1:3 RP recorded significantly higher net returns (Rs.205456 to 218446 ha⁻¹ and Rs.193217 to 207339 ha⁻¹ in 1:2 and 1:3 RP, respectively) but B:C was significantly higher in 1:1 RP (3.22 to 3.26). Similarly with respect to production efficiency indices, Sugarcane + sugar beet (irrespective of sugar beet cultivars) in 1:2 and 1:3 RP recorded significantly higher sugarcane equivalent yield (SEY) (120.58 to 126.32 t ha⁻¹ & 118.01 to 124.24 t ha⁻¹ in 1:2 and 1:3 RP, respectively), LER (1.67 & 1.65 in 1:2 and 1:3 RP, respectively), ATER (1.08 & 1.05 to 1.08 in 1:2 and 1:3 RP, respectively) and SPI (182.18 to 203.79 & 181.58 to 201.91 in 1:2 and 1:3 RP, respectively), when compared to 1:1 RP [(SEY:114.58 to 116.27 t ha⁻¹), (LER: 1.40 to 1.42), (ATER:0.99 to 1.01) and (SPI:158.04 to 183.57)].

ROLE OF LIBRARY INFORMATION SERVICES IN THE DIGITAL ERA

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Abstract

Library information services are a key element in libraries since the ancient times. Their vital role is increasingly becoming a measure of the library's contribution to the transformation and development of a society and the nation at large. The use of Information Communication Technologies (ICTs) has caused a transformation in the users' perception from what is being hosted in the library to how and when services are rendered to fulfill their requests. Consequently, libraries are becoming less important for the material they collect or house. Instead, their importance is being measured in respect to the fulfillment of the users' requests. The movement of material from publishers and hosting them for "just in case" some users will need them is being replaced by delivering materials from publishers "just in time" to answer the user's needs. However, this transformation has brought a challenge in the field of library information services of dealing with the ever-increasing complexity of information, differentiating useful information from mis-information, and upholding the rising needs expectations of the users.



ECONOMIC EFFICIENCY OF ORGANIC *VIS-A-VIS* INORGANIC GREENGRAM GROWERS IN BIDAR DISTRICT OF KARNATAKA (INDIA)

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Abstract

The study area to find out the whether technically, allocative and economic efficient or inefficient in greengram production. Supply of essential nutrients through available resources and usage of correct technology is key element to increase crop yield. The result pertaining to this aspect was based on the primary data collected through survey method from organic greengram cultivated 45 farmers and inorganic greengram cultivated 45 farmers in bidar district during 2017-18. The results indicated that technical efficiency mean was 0.59 and 0.68 under the assumption of constant returns to scale (CRS). While, variable returns to scale (VRS) estimated technical efficiency mean of 0.65 and 0.71 for organic and inorganic greengram growers. In terms of allocative efficiency, there was still potential to increasing in output to the tune of 38 per cent and 44 per cent respectively for organic and inorganic greengram growers by optimally allocating given inputs under the assumption of CRS. Under the assumption of VRS, there was 32 per cent and 29 per cent potential for organic and inorganic greengram farms to increase the output by optimally allocating given inputs. The economic efficiency mean ratio was 0.61 and 0.72 for organic and inorganic greengram farms under the assumption of CRS. It implied that, there exists a 39 per cent and 28 per cent. While, economic efficiency mean of 0.68 and 0.74 under assumption of VRS. It implied that, there exists a 32 per cent and 26 per cent potential for increasing organic and inorganic greengram cultivated farms. Therefore organic and inorganic greengram grower farmers need to use existing level of their resources and technology in order to achieve the 100 per cent efficiency.

GENETIC MAPPING OF QTLS GOVERNING GRAIN YIELD ATTRIBUTING TRAITS USING RECOMBINANT INBRED LINES IN RICE (*ORYZA SATIVA* L.)

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Abstract

Grain/seeds yield are vital component of the world's dietary consumption. The majority of human calories and nutrients come from seeds, especially rice. Thus, in the view of limiting food resources, increasing seeds yield potential to enhance crop productivity is one of the prime goals in current plant genomics and breeding research. Grain yield in rice is determined by three major components namely, number of panicles/ plant, number of grains/ panicle and grain weight. Among these, the most reliable trait is grain weight, which is measured as the 1000-grain weight. So far more than 496 QTLs identified for yield and yield related traits on all the 12 chromosomes from different studies. The present study was carried out with the objective of mapping QTLs governing grain yield and yield related parameters in rice using a RIL population generated from the cross Sonasal (a short grain aromatic rice landrace) and Pusa Basmati 1121 (a Basmati rice variety possessing extra-long slender grains) comprising of 352 individuals was generated through single seed descent method. A total of 21 QTL were identified in RIL population for yield characters on the different six chromosomes namely, 1, 2, 3, 7, 8 and 9, respectively, of which seven QTLs were Novels. A major gene *GS3* located on chromosome 3 was found to be associated with the grain yield related traits such as TGW, FG, TGPP and SF highest R^2 explained to an extent of 42.09%, 6.58%, 3.43 and 9.31% respectively. A known QTL *qGL7.1* located on chromosome 7 was found to be associated with panicle length and contribute to 8.55% phenotypic variance. We identified novel QTL for yield traits namely, plant height trait flanked by markers RM11918- RM104 was identified contributing to 22.17% of the total R^2 at LOD 10.83, respectively on the chromosome 1. Also, the new genomic region were identified for the major traits number of tillers, panicle length, filled grain, total grain per panicle and yield per plant contributing to highest phenotypic variance 9.80%, 7.80%, 10.56%, 8.23%, 6.16% and 6.19%, respectively located at different chromosome 1, 3, 8, and 9. Identified of these novels QTLs and linked markers associated with yield and yield related traits will aid marker assisted improvement of grain weight thereby improving the yield in rice varieties.



PHENOTYPIC SCREENING AND VALIDATION OF MOLECULAR MARKERS ASSOCIATED WITH BACTERIAL BLIGHT RESISTANCE GENES IN RICE (*ORYZA SATIVA* L.) GENOTYPES

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Abstract

Rice (*Oryza sativa* L.) is one of the major food crops in world and is affected by number of diseases. Bacterial Leaf Blight (BLB) caused by *Xanthomonas oryzae* pv. *oryzae* is a devastating disease in rice. In the present study, 30 rice genotypes including popular varieties and advanced breeding lines were screened and validated for the presence of bacterial blight resistance genes. The genotypes were phenotypically evaluated for disease reaction by artificial inoculation with *Xoo* strain in two seasons viz., Rabi 2017 and Kharif 2018. In Rabi-2017, only two genotypes viz., GNV-1109 and IRRI-154 out of 30 categorized under resistant class with a mean disease lesion length of 1.29cm and 1.09cm respectively. Genotypes GNV-1109, MTU-1010, IRRI-154, MTU-1001 and Gangakaveri showed resistant reaction during Kharif-2018 with the mean disease lesion length ranging from 0.21cm to 2.72cm. The genotypes GNV-1109 and IRRI-154 have shown resistance reaction across two growing seasons. Validation of molecular markers associated with Bacterial blight resistance genes revealed the presence of all three (*xa5*, *xa13* and *Xa21*) resistance genes in only two genotypes (GNV 14-96-1 and Gangakaveri). Remaining genotypes showed presence of either one or two resistance genes. Some genotypes did not show presence of any of these three resistance genes. Overall, this study will help in choosing the parents for BLB resistance breeding and to characterize the genotypes for the presence of BLB resistance genes.

CHARACTERIZATION, GENETIC ANALYSIS AND DISEASE RESISTANCE IN SOYBEAN

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Abstract

The present investigation entitled “Characterization, Genetic Analysis and Disease Resistance in Soybean” was conducted at Seed Breeding Farm, Department of Plant Breeding and Genetics, College of Agriculture, JNKVV, Jabalpur, during Kharif, 2018. The experimental materials comprised of 46 diverse genotypes of Soybean were sown in Randomized Complete Block design with three replications for Morpho-Physiological characterization. Based on morphological traits, it was used to estimate genetic parameters of variability viz., coefficient of variation, heritability, genetic advance as percentage of mean, genotypic and phenotypic correlation coefficient and path analysis. Soybean genotypes were characterized on the basis of seventeen morphological traits viz., hypocotyl colour, plant growth type, plant growth habit, leaf shape, leaf size, leaf intensity of green colour, flower colour, pod: presence of hairs, pod: colour of hairs, pod: intensity of brown colour, seed size, seed shape, ground colour of testa, seed coat lustre, colouration due to peroxidase activity, hilum colour and seed colour of hilum funicle. From the study of these characters we can easily identify different genotypes on plants as well as seed level. The genotypes were also characterized on the basis of physiological parameters viz., chlorophyll content, leaf area index, net assimilation rate and crop growth rate as these traits are also important yield contributing parameters. The high phenotypic and genotypic coefficient of variation was recorded for number of pods per plant, number of seeds per plant, seed yield per plant, biological yield per plant and harvest index. The study revealed high heritability coupled with high genetic advance for plant height, number of primary branches, number of pods per plant, number of seeds per plant, number of seeds per pod, biological yield per plant, 100 seed weight and harvest Index. On the basis of correlation and path studies, the most important traits identified among the promising genotypes of soybean were biological yield per plant, harvest index, number of pods per plant, number of seeds per pod, days to maturity, days to 50% flowering and number of primary branches per plant. Many parts of the countries soil are experienced as infested with the presence of inoculums of Charcoal rot and *Rhizoctonia* aerial blight diseases. Therefore, it is necessary to have the genotypes capable of withstanding the uncertainty of biotic stresses. Hence, all the 46 genotypes of soybean under study were also screened out to know the resistance and susceptibility against these diseases for sustainable agriculture. The genotypes HARDEE, YOUNG, EC 383165, AMS 59, JS 21-71, JS 21-72, JS 12-01, JS 10-01, JS 12-01, JS 10-02 and JS 10-03 were found to be absolutely resistant against both the diseases and may be utilized as a donor for developing resistant varieties.



EFFICACY OF SELF PROPELLED PADDY TRANSPLANTER COUPLED WITH OR WITHOUT ROOT PRUNING IN RICE (*ORYZA SATIVA L.*)

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Abstract

The present study was an endeavour to investigate the potentiality of self propelled paddy transplanter coupled with or without root pruning in rice (*Oryza sativa L.*). The experimental setup and treatments were conducted at research cum instructional farm of Krishi Vigyan Kendra, Kumhrawand, Jagdalpur (C.G.). The variety of IGKV, (Durgeshwari) was taken for two cropping year i.e 2017-18 and 2018-19. The soil of experimental field was “Inceptisol”, with low nitrogen and moderate phosphorous and potassium availability. The trials viz., T1-Hand transplanting, T2-Transplanter + root pruning and T3-Transplanter + without root pruning was laid out in randomized block design with three replications. The results revealed that trial T3 fetched highest effective tillering (378/m²) and production (52.18q/ha) followed by T2 with effective tillering (362/m²) and production (48.17q/ha) and T1 with effective tillering (359/m²) and production (48.05q/ha). However, the B:C ratio was maximum in T3 (2.32) followed by T2 (2.19) and T1 (1.97). The above findings clearly illustrate that profitability of mechanical transplanting over hand transplanting is more beneficial if the practise of root pruning at seedling stage of rice is done, it will enhance the number of tillers per hill and moreover root pruning may exclude extra soil attached to rice seedling cakes resulted in smooth functioning of transplanting fingers. Thus, owing to the tremendous benefits of mechanical transplanting coupled with root pruning, the present technique can be successfully practised in nursery grown for hand transplanting to increase the productivity and profitability of the farm.

GENOTYPES IDENTIFICATION & PHYSICO-CHEMICAL STUDY OF CUSTARD APPLE FROM DIFFERENT DISTRICT IN MADHYAPRADESH

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Abstract

The present investigation entitled “Diversity in Custard apple genotypes collections from Madhya Pradesh, India” was carried out during 2018-2019 at Fruit Preservation Laboratory, Department of Horticulture, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.). The experimental material for the present investigation was comprised of twenty genotypes of custard apple collected from four districts of Madhya Pradesh. Among 20 promising genotype significantly maximum length of fruit (90.55 mm), width of fruit (91.49 mm), weight of fruit (287.77 g), fruit pulp percent (71.25%) and non reducing sugar percent (8.60%) was observed in genotypes SEO-04 and it was recorded minimum number of seeds fruit⁻¹ (16.95), weight of seeds fruit⁻¹ (5.98 g) and peel weight fruit⁻¹ (42.13 g). Genotype DRH -04 exhibited maximum volume of fruit (266.65 cc). TSS (30.49), acidity per cent (0.22%) and TSS: acidity ratio (141.67) was registered maximum in CHH -03. Genotype DHR -05 was noted maximum total sugar per cent (24.08%) and reducing sugar per cent (18.15%).

RESOURCE USE EFFICIENCY OF COTTON CULTIVATION IN YADGIRI DISTRICT OF NORTH EASTERN KARNATAKA REGION (KARNATAKA)

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Abstract

Agricultural sector take part main role in economic development of developing countries. In India, this sector occupies a



predominant position in the economy. Application of essential nutrients through available resources is key element to increase crop yield. The result pertaining to this aspect was based on the primary data collected through survey method from cotton cultivated farmers 60 farmers in Yadgiri district during 2015-16. The study revealed that cotton cultivation of small farmers the regression coefficients of the resource variables were found positive for seed (0.06), FYM (0.13), potash (0.12) and PPC (0.27), with regard to negative regression coefficients was observed for nitrogen (-0.27) phosphorous (0.19), and labour usage (-0.08). The significant negative regression coefficient was observed in case of nitrogen and phosphorous indicated that the one per cent changes in its use level would decreases the output of cotton by 0.27 per cent and 0.15 per cent. With regard to large farmers, the highly significant regression coefficient observed in case of nitrogen indicated that the one per cent change in its use level would decrease the output of cotton by 0.19 per cent, followed by phosphorous 0.05 per cent keeping the use levels of the other variable constant. Whereas regression coefficients of the resource variables for seed (0.09), FYM (0.28), potash (0.08) and labour usage (0.13) were found positive.

CROP INSURED FARMERS PERCEPTION ON CLIMATE CHANGE

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Abstract

Crop insurance is one method by which farmers can stabilize farm income and investment and guard against disastrous effect of losses due to natural hazards or low market prices. Crop insurance not only stabilizes the farm income but also helps the farmers to initiate production activity after a bad agricultural year. Based on this context study was conducted in Belagavi, Dharwad, Haveri and Vijayapura districts of North Karnataka during the year 2017-18. The *Ex-post-facto* research design was used for the study. From each district 60 insured farmers were selected to form a sample of 240 by using purposive sampling technique. The study depicts that 51.25 per cent of the insured farmers belonged to high level of extent of perception on climate variation, followed by medium (29.58%) and low (19.17%). Majority of the insured farmers strongly agree to the statement of late onset of monsoon (65.00%) followed by occurrence of drought (59.17%), changes in time of sowing (56.67%), decrease in average rainfall (52.50%), uneven distribution of rainfall (46.67%), increased pest and diseases (48.75%) and decreased yield (35.83%). More than seventy per cent of the insured farmers disagree to the statement of reduced soil fertility (77.08%) and increased crop weed competition (70.83%). The reasons might be farmers got sensitization on these climate variability conditions as they have direct bearing on the farming. The climatic parameters are in accordance with the general observations of meteorologists of the study area. The extent of climate variation is experienced everywhere and so the results.

SCREENING OF MAIZE HYBRIDS FOR HEAT STRESS TOLERANCE

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Abstract

Although the demand for maize is significantly rising in South Asia, over 80% of maize growing areas are rain-fed and highly vulnerable to extreme weather events. Therefore, the major challenge is to keep pace with unprecedented increase in maize demand by enhancing the overall productivity and production, and at the same time to adapt and mitigate the climate change effects, especially the rise in temperature. Maize being a C₄ crop, it is most versatile in terms of wide adaptability and high potential productivity, this property can be exploited to increase its area under varying environmental conditions. Evaluating maize hybrids for tolerance to high temperature stress is an essential step towards stabilizing yields. In this regard a field experiment was conducted to evaluate the maize hybrids under heat stress conditions. The experiment was carried out at Agriculture College Farm, Bheemarayanagudi, Karnataka, India. It involved 27 hybrids obtained by crossing nine females and three males in NCD-II mating design during summer (Mid-March – July 2016) along with the local check. The parents of these hybrids were varying for heat stress reactions. The yield ranged from 56.68 to 91.76 g/plant. Among the hybrids evaluated, ZH16866 (91.76 g/plant), ZH16880 (91.36 g/plant), ZH16848 (90.76 g/plant) performed relatively better in terms of yield as compared to the local check 31Y45 (83.38 g/plant). The results indicated that selection of lines with higher grain



yield besides possessing heat stress tolerance indicating secondary traits as parents in maize hybrid development programme could enhance the grain yield under heat stress environments.

FOOD SECURITY THROUGH CLIMATE RESILIENT AGRICULTURE

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Abstract

With the population increasing at the alarming rate food security will be the prime objective at near future. In the quest of achieving this goal the major constraint will be the changing climate. Climate change is the consequence of increased greenhouse gas (GHG), which is estimated to be doubled by the end of this century (IPCC, 2015). Agriculture and land use contribute 30 % of these emissions. Therefore, the main focus of technology demonstration will be in bringing sustainability in the agriculture while keeping the emission of greenhouse gasses by agriculture and land use at minimum. Available technology and methods were reviewed on the context of climate resilience to identify methods which will help to achieve the goal of food security in the future. Drought tolerant (JRH 5, JRH 19 in rice), short duration (HI 1544 in wheat) and thermo-insensitive (JW 3211 in wheat and JG 14 in chickpea) varieties are going to be the prominent option to enhance the resilience of agriculture. Crop diversification, intercropping and integrated farming system will help in minimizing risk in crop production, while ensuring reasonable returns and also improving soil fertility and health. A variety of options exists for the mitigation of GHGs emissions in agriculture. The most prominent options are improved crop and grazing land management (e.g., improved agronomic practices, nutrient use, tillage, and residue management), restoration of organic soils that are drained for crop production, and restoration of degraded lands. Lower but still significant mitigation is possible with improved water and rice management; set-asides, land-use change (e.g., conversion of cropland to grassland) and agroforestry as well as improved livestock and manure management. Emissions from livestock production can be reduced through improved nutrition and better management of manure.

PHYSICO-BIOCHEMICAL AND ORGANOLEPTIC CHARACTERISTICS OF HARITGE INDIAN HEALTH FOOD *SATTU*

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Abstract

Heritage foods in India are an integral and vital part of Indian culture. With a history of some 3000 years or more the Indian civilization has given food a very important place in social and cultural life of the people. Indian traditional food *sattu* is generally made from puffed chickpea and wheat/barley flours. In the present investigation, *sattu* was prepared from chickpea, ragi, and legumes flours in different proportions and subjected to sensory and nutritional evaluation. The results showed that ragi could be well supplemented upto the level of 30 per cent in place of wheat/barley flour for satisfactory sensory quality characteristics. However, at higher level 30-50 %, the colour, taste and texture was inferior of ragi based *sattu* contained higher amount of calcium, non-starchy polysaccharides and methionine as compared to wheat based *sattu*. In present investigation, different kind of *sattu* were made from puffed flour of Bengal gram, Ragi, wheat, soybean and moogdal flour. *Sattu* made from Bengal gram and wheat was used as a control. After mixing with sugar (40%), the product was evaluated for various sensory attributes on 9 point hedonic scale. As shown in table the mean score values for all the sensory quality attributes and overall acceptability were found to vary in the range of 7 to 8.5 in the products in the ratio of 70:30, 70:10:20, 70:20:10 and 60:20:10:10. However, these values were found to decrease in the product made 70:20:10. (7.5). This indicates that higher amount of *ragi* decreased the desired quality characteristics of the product. Thus, it was concluded that *ragi* could be used satisfactorily in place of wheat up to a maximum level of 20 percent without any adverse effect on sensory quality of product. The proximate composition highly *pausitik ragi sattu* revealed that on supplementation of *moogdal*, the quality of product was enhanced in terms of both quality and quantity. The various nutrient contents were ranged from 17.8 to 18.5% protein, 3.8 to 5.3 % fat and 2.4 to 5.4 fiber with an average value of total energy 345 kcal. Among the various kind of *ragi*



sattu highly *paustik ragi sattu* with moog dal could be consider as the best and recommended especially for growing children due to rich calcium 265 mg/100g. Hence, *sattu* made from *ragi* floure could be considered as a good and cheap source of calcium and fiber for young children, pregnant and lactating mothers.

EFFECT ON GROWTH PARAMETERS OF STRAWBERRY GROWN UNDER VERTICAL HYDROPONIC SYSTEM

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Abstract

Strawberry (*Fragaria x ananassa* Duch.) is one of the most popular fruits around the world due to its highly desirable taste and flavour. The increased demand for strawberries throughout the year is met through Hydroponic cultivation. Hydroponics is the technique of growing plants in a water-based, nutrient-rich medium, without the use of soil. This method essentially cuts down the amount of water being used compared to the method in which plants are grown in soil. In some cases, up to 90 percent less water is used in the hydroponics method compared to the traditional soil-based agriculture — a boon for water-starved urban areas. One can plant four times the number of crops in the same space as soil farming. Hydroponic culture Verti-Gro system for growing high value crops has been in commercial practice in countries like United States of America, Japan, Australia and Italy. Hence, it is important to find the most suitable soilless cultivation system for strawberry to maximize the utilization and distribution of light and culture media within the system to enhance production without affecting the fruit quality. Keeping all these benefits and constraints in view, the present investigation was carried out to study the growth, yield and quality of strawberry cultivated in vertical growth system with soilless media in a vertical hydroponic system established by the JNKVV, Krishi Vigyan Kendra, Chhindwara, Madhya Pradesh. Healthy plugs of strawberry were planted in vertical growth system, Significant differences were observed for the growth parameters, viz., number of leaves, flowering and fruiting, No. of fruits, fruit weight, fruit diameter, leaf area, crown diameter and production per plant.

IDENTIFICATION OF SUPERIOR RECOMBINANT INBRED LINES (RILS) FOR HIGH FIBRE STRENGTH AND PRODUCTIVITY IN *DESI* COTTON (*GOSSYPIMUM SPP.*)

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Abstract

Cotton is an important fibre crop of global importance. It is known as the “King of fibres” and in recent times called as “white gold”, and is the most vital crop of commerce to many countries including India. Cultivated cotton (*Gossypium spp.*) is the world’s leading natural fibre crop and it is the cornerstone of textile industries worldwide. In spite of several competition from synthetic fibres cotton continues to enjoy a place of prime importance in textile industry. Off late, rethinking on how far *desi* cotton can be introduced in intensive management situation for sustainable cotton production has started. Though genetic variability in *desi* cotton so far is exploited only in rainfed situations, initial studies on *desi* cotton have indicated that *desi* cotton also respond to protective irrigation and intensification. As *desi* cottons are well suited to rainfed ecosystem and can fulfil the increasing demand for medium staple nature of fibres, it still necessitates to have diploid cottons with improved fibre quality. Keeping these in view, present investigation was carried out with an objective of isolating superior recombinant lines derived from an interspecific cross between Jayadhar (*Herbaceum*) and DLSa17 (*Arboreum*). The recombinant inbred lines (154) derived from the above said cross were phenotyped for various fibre quality and productivity traits. Line 115 and 152 showed highest fibre strength of 23.7g/tex with highest seed cotton yield (1053.3kg/ha), 30mm 2.5% SL, 3.2% g/inch micronaire, 53 per cent uniformity ratio and 6.5 per cent elongation against Jayadhar (16.7g/tex) and DLSa17 (20.6g/tex). Highest lint index (3.4g) was observed in line 64 with 21.7g/tex fibre strength, 31.8 per cent GOT, 7.2g seed index, 28.7% fibre length, 3.8 g/inch micronaire, 52 per cent UR and 6.1 per cent fibre elongation while lint index of checks was 3.02g (Jayadhar) and 2.47g (DLSa17). Seed cotton yield was highest in line 115 (1053.3kg/ha) followed by line 121 (1040kg/ha), line 68 (1025kg/ha) and line 152 (916.7kg/ha) whereas Jayadhar and DLSa17 yielded 612.5 and 717.8kg/ha respectively. The ten superior lines isolated for the present study are further being evaluated for productivity and fibre quality traits.



LABORATORY EVALUATION OF SOME INDIGENOUS PLANT EXTRACTS AS GRAIN PROTECTANT AGAINST RED FLOUR BEETLE, *TRIBOLIUM CASTANEUM* HERBST

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Abstract

Laboratory studies were conducted to evaluate the insecticidal and of two indigenous plant, *Jatropha curcas*, and *Ocimum sanctum* as wheat grain protectants against stored grain insect, i.e., *Tribolium castaneum*. The effects of these plant extracts on per cent mortality was recorded at 1, 3, 6, 12, 24, 48 and 72 hours after treatments and per cent weight loss, in vitro adulticidal activity, per cent weight gain over control and per cent deterrent effect at 3, 6, 9 and 12 months after release of insects were observed. The highest mortality (70.00%) was recorded in Tulsi acetone extract which was followed by treatments with *Jatropha* petroleum ether (56.67%) after seventy two hours after treatment. In terms of weight loss Tulsi acetone extract (7.39%) was the most effective as far as weight loss was concerned and it was followed by treatment of *Jatropha* petroleum ether extract (7.94%) after the completion of twelve months of storage. Highest adulticidal activity was observed in wheat treated with Tulsi acetone extract (44.08%) and it was the most effective one after twelve months of storage. Tulsi acetone extract (43.05%) was again found to show the highest feeding deterrent effect after twelve months of storage of wheat. And it was followed once again by *Jatropha* petroleum ether (40.12%).

EFFECT OF GROWTH REGULATOR ON GROWTH PARAMETERS OF OKRA (*ABELMOSCHUS ESCULENTUS* L.) : CV. UTKAL GAURAV

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Abstract

Okra, lady's finger (*Abelmoschus esculentus* L.), $2n = 2x = 130$ Okra is an important vegetable crop having good demand throughout the year for its tender fruits and consider as one of the major vegetable crops of the tropical and subtropical parts of the world. The experiment was laid out in Randomized Block Design (RBD) with three replications in a plot of 2.5m x 2 m with spacing of 45cm x 30cm. and nine treatments including growth regulators as GA₃ 50 ppm, NAA 50 ppm were spray at 20th, 40th, 60th day after sowing and one control. Effect of foliar spray of growth regulators on different growth parameters in Okra cv. Utkal Gaura, revealed the significant effect of growth regulators on growth parameters at GA₃ @ 50 ppm at 40 DAS where maximum plant height (107.97cm) was recorded, followed by NAA @ 50 ppm at 40 DAS plant height (104.31cm).

IMPACT OF KVK TRAINING PROGRAMMES ON KNOWLEDGE GAIN AMONG WOMEN SELF HELP GROUP MEMBERS IN INCOME GENERATION ACTIVITIES

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Abstract

This study was carried out in adopted villages of KVK to study the impact of KVK training programmes on knowledge gain among women self help group members in income generation activities in Guntur district of AP. Villages were purposively selected for the study, sample comprised of one hundred and twenty trained women self help group members from the selected villages. Data was collected through pretested developed interview schedule from the selected respondents. The study revealed that majority of the respondents in KVK adopted villages had medium level of knowledge followed by high level of knowledge. Majority of the respondents also perceived that KVK trainings had enhanced the skill and self confidence among the members. Majority of them (63.33%) had medium level of knowledge followed by high (33.34%) in fruits and vegetables



value addition. Majority of the trained women (60.00%) were from medium knowledge category in mushroom production. Forty three per cent of the trained (43.34%) women belonged to medium level of knowledge in candle making followed by low level of knowledge (33.33%). Training programme was conducted through demonstrations, participatory approach and lecture method. On the basis of the above findings, it can be concluded that after the training programmes women members had sufficient knowledge on income generation activities, this could result increasing the self employment and employability skills along with enhancing their self-confidence, social recognition and materials possession. But there were some areas of concern like limited credit linkages, limited skills on marketing strategies and self decision making where progress was limited. Therefore, there is a need to plunge on these factors with suitable changes in training curriculum.

ANTIFUNGAL ACTIVITY OF GOAT MILK

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Abstract

The profitable milk include cow, buffalo milk, goat milk used for human consumption, but the consumption of goat milk is very limited. Goat milk contains a higher concentration of fatty acid and lower allergenicity. Goat milk has different microflora of Lactobacillus, Leuconostoc and Enterococcus. It has somehalophile bacteria. Some pathogenic bacteria are present in raw goat milk. Goat milk has the antimicrobial properties, study shows the antifungal activity at some concentration, goat milk inhibit the growth of species of Aspergillus and species of Candida at certain concentration.

FORMATION, IMPLEMENTATION AND FUNCTIONING OF DIFFERENT WOMEN SHGS IN KANPUR DEHAT DISTRICT (U.P.)

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Abstract

The study was conducted in Akbarpur block of Kanpur Dehat district selected purposively. A total number of 100 respondents of women SHGs were selected purposively which were selected from 20 Villages randomly. The structured schedule was developed keeping in view the objectives and variables under the study. The respondents were contacted personally for data collection. The analysis of data was done by using the percentage, mean, standard deviation, and correlation coefficient for drawing the inferences. The data revealed that the out of 8 personal suggestions as perceived by women SHG members viz. ‘Pertinent knowledge should be provide about new innovations through different programmes viz., ’ was ranked I followed by dependency on male should be avoided through programmes’ ranked II, out of 7 social suggestions as perceived by women SHG members viz. ‘ the positive social attitude among women role outside the home in rural society should be buildup’ ranked I followed by “parda system” should be avoided in rural society among women’ ranked II, out of 4 economic suggestions as perceived by women SHG members viz. ‘ financial dependency on male should be avoided through self-reliance’ ranked I, followed by ‘loan facility should be provided through banks of rural women’ ranked II, out of 5 suggestions in group formation as perceived by women SHG members viz. ‘shyness should be avoided among women through education and participation in different social activities’ ranked I, followed by ‘cooperation should be maintained among women SHG members’ ranked II, out of 2 suggestions in functioning of women SHG were reported ‘the leadership Characters among rural women through participation in different organizations should be buildup’ ranked I, followed by ‘working ability should be provided among rural women’ ranked II, out of 4 technological suggestions maximum respondent were reported ‘training programmes should provide related to women SHG’ ranked I, followed by ‘technical knowledge should be provide about women SHG’ ranked II, out of 3 suggestions of government officials were reported ‘government should come with a special policy to create a separate cell for solving problems of women SHG’ ranked I, followed by ‘Government should encourage and support NGOs to attempt and create favorable policy environment for women’ ranked II and out of 3 suggestions in bank



transaction were reported 'should be provide complete information about banking procedures' ranked I, followed by 'rule and regulations should be completely fulfill of women SHG members ' ranked II.

PERFORMANCE OF PRADHAN MANTRI FASAL BIMAYOJANA IN KARNATAKA STATE

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Abstract

Universally agriculture is perceived to be synonymous with risk and uncertainty. Agricultural insurance is one of the risk management strategy to overcome risk to greater extent. It helps in stabilization of farm production and income of the farming community. In recent times, mechanisms like contract farming and future trading have been established which are expected to provide some insurance against price fluctuations directly or indirectly. Crop insurance not only helps the farmers to withstand the shock from uncertain situation but also acts as incentive to use the resources efficiently and achieve higher level of productivity. The results indicated that, Performance of Pradhan Mantri Fasal Bima Yojana in Karnataka State 21,23,235 farmers covered by covering an area of 30,53,490 hectares. Out of the total number of farmers only 7,36,000 farmers got benefited from the scheme with a claim settlement of 110522.00 thousand rupees. With respect to Restructured Weather Based Crop Insurance Scheme covered 1,06,420 farmers by covering an area of 33,642 hectares. Out of the total number of farmers, 40,431 farmers got benefited from the scheme with a claim settlement of 27629.70 thousand rupees. Compare to districts Haveri district performance was well followed by Dharwad, Belagavi and Vijayapura with respect to both Pradhan Mantri Fasal Bima Yojana and Restructured Weather Based Crop Insurance Scheme. In Haveri and Dharwad districts majority of farmers are growing state notified crops and borrowing loan from financial institutes, so majority of the farmers covered under these scheme. In Belagavi and Vijayapura districts, majority of the farmers are growing sugarcane, pigeon pea, turmeric etc but these crops are not covered under crop insurance scheme and hence less farmers were covered.

CROPPING SYSTEM EFFECT ON SOIL FERTILITY UNDER RAINFED SUB-TROPICAL JAMMU

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Abstract

In Jammu region, the soils of *kandi* area are very poor in soil fertility status. In agro-ecosystems with limited availability of nitrogen, pulse crops potentially contribute nitrogen *via* biological nitrogen fixation. For sustainable food production under rainfed conditions, it is pre-requisite to maintain soil fertility by proper crop rotation which may prove to be a promising strategy for increasing crop productivity under sub-tropical Jammu condition. Keeping in view the aforesaid fact, a study was undertaken to evaluate the impacts of different pulse-based cropping systems on residual soil fertility. The two year study (2014-15 and 2015-16) revealed the fact that maximum improvement in organic matter occurred due to the inclusion of soybean (7.14%) followed by mungbean (4.76%) and urdbean (4.76%). N fertility status was found to increase by on an average 11.5% under field pea succeeded moongbean/urdbean cropping system, while as the system comprising til-gobhi sarson or til-mustard recorded a decline in nitrogen content by about 4.7%. As regards the available phosphorus status, it was found that the available P was declined in all the legume-based cropping systems. Maximum reduction occurred due to mungbean ~ mashbean (14.6, 14.2%) and soybean (13.3%). This greater depletion in legumes indicates their greater requirement of P₂O₅ for rhizobium activity. Chickpea is more efficient than other pulses in taking up P from soil, as it secretes more acid which helps in solubilizing Ca-P. The data on available K was found to increase over its initial level on an average by 4.2%. This may be due to release of non-exchangeable K on account of addition of leaf litters and crop roots. Overall improvement in available K status of surface soil might be due to availability of these tap root legume plants to absorb K from deeper soil layers and enrich surface soil by shading nutrient rich leaves which upon decomposition release K on the surface soil. There was an inconsistent pattern of available sulphur under different cropping systems. The findings suggest that the



legume-legume based system (moongbean-field pea, urdbean-field pea, and soybean-field pea) exhibited the better soil fertility improvement than that of the pulse-oilseed as well as oilseed-oilseed based crop system.

CONSTRAINTS IN MANAGEMENT PRACTICES OF OKRA GROWERS IN KANNAUJ DISTRICT OF UTTAR PRADESH

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Abstract

The study was conducted in Chhibramau and Talgram blocks of Kannauj, district (UP.) India selected purposively, because these blocks one more popular for area and production of okra. A total number of okra growers were selected through random sampling from eight selected village's panchayats on the basis of ten respondents from each selected village panchayats. The some structured schedule was developed keeping in view the objectives and variables under study. The respondents were contacted personally for data collection. The constraints results of the study of the respondents were found in various all 8 Social problems, 10 Economic problems and 8 Technical problems in okra cultivation in management practices of okra, that the majority of 87% lack of good seedling social problems, 87.50 lack of Minimum Support Price economic problems and 95% lack highly susceptibility of diseases, insect and pests technical problems about okra growers, than the very low level of 26% lack damage by the rural people social problems, 43.75% lack of storage facility economic problems and 55.00% erotic rainfall and water logging technical problems about okra growers, respectively.

A STUDY ON THE MAIN DRIVE OF RELATIONSHIP POLICIES IN THE FMCG PRODUCTS PURCHASE IN NEW DELHI (NCR)

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Abstract

In 21st century in the business, relationship marketing plying very important role. Relationship marketing maintain with buyers has because a main driver to market. Now day's business is depend on the customers and consumers demand, business growth is totally depend on goods and active customer relationship improving in order to fulfill the customers' needs and give a competitive advantages for the business. Today's competition is very highly especially in the FMGC markets. The objective of this study to analysis the key drive of relationship policies in the FMCG market in Delhi (NCR). A sample size of 150 respondents mainly on customers in FMCG market. Qualitative and quantitative both methods. In data analysis of respondents with statistical tools, percentage and correlation. In conclusion indicate that relationship marketing strategies have a very strong effect on FMCG product purchase with good quality of products. In recommendation that business regularly growing and protect the customers relationship with good quality of product and customers attention.

IDENTIFICATION OF SUITABLE OILSEED CROP FOR RAINFED AREAS OF JAMMU REGION

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Abstract

A field experiment was conducted at Pulse Research Sub Station, Samba of SKUAST-Jammu during the Rabi season 2014-15 and 2015-16 to identity the suitable oilseed crop in rainfed areas of Jammu region. The experiment was conducted in



Randomized block Design with four replications. All the standard package and practices besides the procedures for recording observations were followed in the experiment to raise the crop. Experimental findings revealed that among the different oilseeds crop highest growth parameters viz., plant height and dry matter accumulation were recorded with Gobhi Sarson followed by Mustard. Among the different oilseeds crop highest seed yield (16.78q/ha) and stover yield (53.41q/ha) were recorded with Gobhi Sarson. Highest gross returns (Rs 54184.50/ha), net returns (Rs 37063.43/ha) and B: C ratio (2.16) was also recorded with Gobhi Sarson. Therefore, from the two year study it is concluded that among the different oilseeds crops Gobhi Sarson is the most suitable oilseed crop for rainfed areas of Jammu region.

EFFICACY OF SELECTED INSECTICIDES AGAINST CHILLI THIRPS {*SCIRTOTHRIPS DORSALIS* (HOOD)} ON CHILLI (*CAPSICUM ANNUUM* L.) IN HAPUR, UTTAR PRADESH

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Abstract

The present investigation was carried out to evaluate selected insecticides against chilli thrips (*Scirtothrips dorsalis* Hood) during 2019 at Hapur, Uttar Pradesh. During this experiment there was total eight treatments including control viz. Fipronil 40% + imidacloprid 40%, Diafenthron 40.1% + Acetamiprid 3.9% WP, Fipronil 5%SC + Diafenthiuron 50%WP, Fipronil 5% SC, Acephate 50% + Imidaclopride 1.8% SP, Spiromesifen 240 SC and Acetamiprid 20 SP. The overall efficacy of all two sprays revealed that all the insecticidal treatments were significantly superior to control for minimize the insect population. Average thrips population before insecticidal application varied from 3.12 to 4.00 thrips / 3 leaves. Different insecticides against thrips of chilli were evaluated among all the treatments Spiromesifen 240 SC was found superior which recorded minimum (0.10) mean thrips population per three leaves per plant after two spray and was significantly superior over all other treatments followed by Fipronil 40% + imidacloprid 40% (0.19), Diafenthron 40.1% + Acetamiprid 3.9% WP (0.28), Acetamiprid 20 SP (0.31), Fipronil 5%SC + Diafenthiuron 50%WP (0.33), Acephate 50% + Imidaclopride 1.8% SP (0.41) and Fipronil 5% SC (1.33) as compared to control (6.98).

PHYSICO-BIOCHEMICAL AND ORGANOLEPTIC CHARACTERISTICS OF HARITGE INDIAN HEALTH FOOD *SATTU*

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Abstract

Heritage foods in India are an integral and vital part of Indian culture. With a history of some 3000 years or more the Indian civilization has given food a very important place in social and cultural life of the people. Indian traditional food *sattu* is generally made from puffed chickpea and wheat/barley flours. In the present investigation, *sattu* was prepared from chickpea, ragi, and legumes flours in different proportions and subjected to sensory and nutritional evaluation. The results showed that ragi could be well supplemented upto the level of 30 per cent in place of wheat/barley flour for satisfactory sensory quality characteristics. However, at higher level 30-50 %, the colour, taste and texture was inferior of ragi based *sattu* contained higher amount of calcium, non-starchy polysaccharides and methionine as compared to wheat based *sattu*. In present investigation, different kind of *sattu* were made from puffed flour of Bengal gram, Ragi, wheat, soybean and moogdal flour. *Sattu* made from Bengal gram and wheat was used as a control. After mixing with sugar (40%), the product was evaluated for various sensory attributes on 9 point hedonic scale. As shown in table the mean score values for all the sensory quality attributes and overall acceptability were found to vary in the range of 7 to 8.5 in the products in the ratio of 70:30, 70:10:20, 70:20:10 and 60:20:10:10. However, these values were found to decrease in the product made 70:20:10. (7.5). This indicates that higher amount of ragi decreased the desired quality characteristics of the product. Thus, It was concluded that ragi could be used satisfactory in place of wheat up to a maximum level of 20 percent without any adverse affect on sensory quality of product. The proximate composition highly *pausitik* ragi *sattu* revealed that on supplementation of moogdal, the quality of product was enhanced in terms of both quality and quantity. The various nutrient contents were ranged from 17.8 to 18.5%



protein, 3.8 to 5.3 % fat and 2.4 to 5.4 fiber with an average value of total energy 345 kcal. Among the various kind of *ragi sattu* highly *paustik ragi sattu* with moog dal could be consider as the best and recommended especially for growing children due to rich calcium 265 mg/100g. Hence, *sattu* made from *ragi* floure could be considered as a good and cheap source of calcium and fiber for young children, pregnant and lactating mothers.

ROLE OF DIGESTIVE ENZYMES IN INSECT PEST MANAGEMENT

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Abstract

Increase food production necessitates the development and application of novel biotechnologies to enable the provision of improved crop varieties in a timely and cost-effective way increase food production necessitates the development and application of novel biotechnologies to enable the provision of improved crop varieties in a timely and cost-effective way increase food production necessitates the development and application of novel biotechnologies to enable the provision of improved crop varieties in a timely and cost-effective way The development requires an uninterrupted increase in food production and application of novel biotechnologies to enable the provision of improved crop varieties in a timely and cost-effective way. Plant and herbivore interaction is a natural phenomenon in which plants have defence mechanism that offers protection against many herbivores. Specific inhibitors against the digestive enzymes viz., amylases and proteases, suppress their activity resulting in an overall disturbance in digestion. The major digestive enzymes in the midgut of insects consist of -amylases and proteases that are similar in their hydrolytic nature. In lepidopteran larvae protein digestion mainly relies on serine proteases such as trypsin and chymotrypsin. So, the use of PIs targeting digestive proteases of insect pests is one of the beneficial approaches used in integrated pest management. Proteinase inhibitors (PIs) are natural defense proteins of plants found to be active against gut proteases of various insects. The PIs are known to influence the growth and development of insects by binding tightly and irreversibly to the active site of its digestive gut proteases, which are essential for various metabolic processes such as proteolytic digestion. This mechanism leads to a critical amino acid deficiency and eventually insect death due to overproduction of digestive proteases by diverting the essential amino acids available for the production of other proteins. Also, the development of insect resistant transgenic plants through incorporation of PIs is beneficial as they protect other natural defense proteins of plants from proteolytic degradation during insect invasion. Thus, the introduction of PI genes as compared to other defense genes in transgenic plants would prevent economic losses worldwide due to insect pests.

PARTICLE FILM TECHNOLOGY FOR PEST MANAGEMENT

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Abstract

Recent efforts to control insects mainly focused on toxic minerals or chemical compounds rather than inert mineral particles. Some scientific evidences confer that excessive reliance and indiscriminate use of agrochemicals to manage the agricultural insect pests has resulted in several ill effects such as pest resurgence, pest resistance to pesticides, secondary pest outbreak, pesticide residues and lethal effects on non-target organisms, including humans. Particle film technology successfully used for insect and disease mgt in fruit trees and vegetable crops. It represents a combined knowledge of the benefits of reflected light, mineral barriers, and toxic properties of minerals. Particle films, consisting of small sized minerals (kaolin clay) elements, can affect insect behavior through contact with treated surface or by producing highly reflective surface. Finely divided clay particles adhere to the body of insect pests, remove the cuticular waxes of the insects and death occurs due to desiccation. The desiccating action of dusts was due to their absorbance of or penetration into the insect epicuticle and that this action was independent of their chemical reactive properties. Insect mortalities increased as particle size decreased and as intrinsic



hardness of the materials increased. finally particles caused desiccation mechanism of insects was attributed by either their adsorption of the epicuticular waxes of the cuticle or abrasion of the cuticle. In organic agriculture, adoption of particle film technology provides effective insect control, mitigates stress, and produces high-quality organic fruits and vegetables. Based on the impact of this technology has had in only a few years, significant impact on crop production practices in the future, which could lead to reduced pesticide usage and improved yields.

ALTERNATE METHOD TO INCREASE NITROGEN PERCENTAGE IN RICE FIELDS

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Abstract

Rice is one of the staple food crops for approximately half of the global population. Therefore, rice production must be increased significantly to satisfy the requirements of the growing world population. However, we are facing challenges in increasing rice production under the pressures of decreased arable land area, global climate change, intensified natural disasters, and frequent occurrence of diseases and pests. Nitrogen (N) is one of the essential macro-elements required for plant growth and development. Soil N availability usually limits plant yields in most agricultural cropping systems. Thus, application of N fertilizer has become an important, cost-effective strategy to increase crop yields in intensive agricultural systems worldwide. The present less expensive bio fertilizers Azolla and Blue Green Algae to increase nitrogen in direct way. Azolla is an aquatic floating fern, found in temperate climate suitable for paddy cultivation. The fern appears as a green mat over water and Blue Green Algae cyanobacteria (*Anabaena azollae*) present as a symbiont with this fern in the lower cavities actually fixes atmospheric nitrogen. Its rate of nitrogen fixed is around 25 kg/ha.

EMERGING TECHNOLOGY USED AGAINST POSTHARVEST DISEASES CONTROL

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Abstract

Postharvest diseases caused by microbial pathogens account for millions of dollars in losses of both durable and perishable produce products every year. Moreover, with consumers increasingly demanding minimally processed vegetables and fruits, which can be invaded by human pathogens there is an imperative need for suitable protective measures to provide pathogen-free commodities that are free from, or contain only acceptable levels of, chemical residues. All postharvest diseases of fruit and vegetables are caused by fungi and bacteria. Postharvest diseases are often classified according to how infection is initiated. The so-called quiescent or 'latent' infections are those where the pathogen initiates infection of the host at some point in time usually before harvest, but then enters a period of inactivity or dormancy until the physiological status of the host tissue changes in such a way that infection can proceed. Major group of postharvest diseases are those which arise from infections initiated during and after harvest. Often these infections occur through surface wounds created by mechanical or insect injury. Common postharvest diseases resulting from wound infections include blue and green moulds caused by *Penicillium* spp. and transit rot caused by *Rhizopus stolonifer* etc. Bacteria such as *Erwinia carotovora* (soft rot) are also common wound invaders. Most pathogens causing decay are controlled by various methods such as Physical, Several bioagents, Fungicides, Chitosan biopolymer. Among these methods Chitosan biopolymer has been proven to have various effects on plants, bacteria, viruses, and fungi. In particular, chitosan has increasing interest in plant protection as a natural fungicide and plant defense booster, and meets the interest of many researchers, that used it to prolong the storage of an array of fruit and vegetables worldwide. Found that pre-harvest chitosan sprays effectively inhibited the postharvest decay of fruits caused by *Fungus* during storage at 3 to 13 °C and the decay decreased with increasing chitosan concentrations. It can also be used as coating of Chitosan with fungicides, bio-polymers, fungal bioagents. This review is to provide the different studies which have been done to control post-harvest diseases and to get a full understanding on how chitosan works. This review is to provide the different studies which have been done to control post-harvest diseases and to get a full understanding on how chitosan works.



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WAYS FOR AGRICULTURE WASTE TO WEALTH IN RURAL AREAS

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Abstract

Agriculture is the back bone of India as well as rural areas. Agricultural wastes are non-product outputs of production and processing of agricultural products that may contain material that can benefit man but whose economic values are less than the cost of collection, transportation, and processing for beneficial use. In olden times farmers were depends on traditional cultivation aspects and they having good human resources in agriculture like poultry, live stock, integrated managements etc. I discussed very simple methods ways of agriculture waste to wealth for farmers and health to society.

ASSESSMENT OF GENETIC VARIABILITY IN YIELD OF DIFFERENT GERMPLASMS OF AMARANTHUS (*AMARANTHUS HYPOCHONDRIACUS* L.)

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Abstract

Amaranthus (*Amaranthus hypochondriacus* L.) commonly known as chaulai (Ramdana) that belongs to the family Amaranthaceae. There are two chromosome groups in Amaranthus viz. *A. hypochondriacus* and *A. caudatus* with $2n = 2x = 32$ and *A. Tricolor*, *A. spinosus*, *A. viridis*, *A. cruentus* and *A. Bilatum* contain $2n = 2x = 34$. It is estimated that there are 87 species of Amaranthus are exist in world in which 17 in Europe, 14 in Australia and 56 in America. The Amaranthus is grown for commercial purpose like vegetable in various countries of the world, especially Mexico and Peru for commercial purpose. In India, Amaranthus cultivated in both hills as well as plains covering states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Chattisgarh, Maharastra, Gujarat, Orissa, Karnataka, Kerala and Tamil Nadu. The experimental material comprised of Twenty Nine amaranth diverse genotypes. The crops of different genotypes were raised in an augmented block design. The field parameters were days to 50% flowering, days to maturity, plant height, 10 ml test weight, inflorescence length, number of fingers per plant, finger length and seed yield per plant. The data were analysed statistically to work out, mean performance, genetic variability, heritability, genetic advance, correlation coefficient and path coefficient for field parameters.

SCOPE OF FRONTIER TECHNOLOGY IN AGRICULTURAL WASTE MANAGEMENT IN UTTAR PRADESH

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Abstract

Farm-wastes produced of agriculture after harvest of every crop is of great concern due to environmental pollution, rural sanitation, recycling and utilization. The main purpose of this study is to the present practices related to the various agricultural waste management initiatives taken in Uttar Pradesh. The other purpose is to provide some suggestions and recommendations to improve the waste management practices in Uttar Pradesh by using frontier technology. Frontier Tech is those areas of technology where there's a high enough "Democratization" and consists of artificial Intelligence, software, IoT, bio-informatics, space, energy, robotics and farming. This study is based on different reports related to waste management and recommendations of different organizations for improving the systems and find out the scope for improvement in agricultural



waste management through frontier technology in Uttar Pradesh. The paper attempts to understand the important role played by the frontier technology in agricultural waste management in Uttar Pradesh.

VARIETAL ASSESSMENT OF OAT FOR ACHIEVING HIGHER YIELD OF FODDER

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Abstract

The treatments comprised of three varieties of oat (Kent, JHO 822, JHO 851) as the main plot treatments. The different varieties of oat gave different response towards the growth parameters of oat crop like plant height at 50% flowering stage, dry matter accumulation plant⁻¹ and green fodder yield with the successive growth stages. The results indicate that the variety JHO 822 of oat resulted significantly maximum in most of the growth parameters at 50% flowering stage but it was at par with variety JHO 851. The lowest growth parameters were found with variety Kent during both the years. The variety JHO 822 proved significantly superior to rest of the varieties tried by giving 15.73 g dry matter accumulation plant⁻¹ during first year and during second year, the dry matter accumulation per plant was significantly higher with variety JHO 822 but it was at par with variety JHO 851 which was 15.86 and 15.69 g, respectively. The green fodder yield of oat at harvest was significantly maximum with variety JHO 822 (390.85 & 397.22 q/ha) during both the years respectively than rest of the varieties tried.

IMPACT OF WEATHER VARIABILITY ON YIELD OF WHEAT (*TRITICUM AESTIVUM* L.) GENOTYPES UNDER RAINFED CONDITIONS OF RANICHAURI, UTTARAKHAND

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Abstract

A field experiment was conducted during *rabi* seasons of 2017-18 and 2018-19 at Block B of College of Forestry, VCSGUHF, Ranichauri (30° 18' N, 78° 24' E and 1800 m amsl), Uttarakhand to assess the effect of weather parameters on performance and yield of wheat (*Triticum aestivum* L.). The experiment consisting of three growing environments (i.e. three sowing dates) and three genotypes (VL-892, UP-2572, HD 2967) was laid out in factorial randomized block design with three replications. Sowing dates and varieties influenced the yield attributes and yield of wheat crop. The interaction between sowing date and varieties were found to be non significant during both the years of study.

GENETIC DIVERSITY IN GERMPLASM OF SESAME (*SESAMUM INDICUM* L.)

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Abstract

A study was conducted to determine the genetic diversity among 133 sesame genotypes comprised of mutant breeding lines, indigenous lines, IVT's, AVT's, MLT's, popular varieties and checks for ten characters. Considerable amount of diversity existed among the genotypes for all the ten characters studied. The genotypes were grouped into nineteen distinct clusters upon cluster analysis based on ten traits. Cluster I was the largest and consisted of fifty-four genotypes and with one genotype each in 13 (V, VI, VII, VIII, X, XI, XII, XIII, XV, XVI, XVII, XVIII and XIX) clusters indicating considerable diversity among the 133 genotypes. The study also revealed that cluster XV is having low estimate for phyllody (% incidence) from this



cluster genotype can be used as parent in resistance breeding programme. The genotypes with specific traits could be selected and used in the crossing programme to improve the yield and disease resistance in sesame.

GENETIC DIVERSITY ANALYSIS OF AFRICAN RICE (*ORYZA GLABERRIMA*) GENOTYPES FOR YIELD AND YIELD ATTRIBUTING TRAITS

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Abstract

Thirty-one accessions of *Oryza glaberrima* were evaluated to study the genetic diversity, using Mahalanobis D² and Principal component analysis. The accessions were grouped into four clusters based on D² values with cluster I comprising of 26 accessions followed by cluster II and III. From the inter cluster D² values, the highest divergence was noticed between cluster II and III followed by cluster III and IV. Cluster II had many of the desirable means for several characters. Thus, the accessions EC 861804, EC 861807 of cluster II may be directly utilized as parents in future hybridization programmes to combine desirable characters. Principal component analysis revealed four most informative principal components with Eigen values of 2.547, 1.927, 1.607 and 1.062 respectively, together accounted for 71.429% of the total variance with Eigen value of > 1.0 indicating that identified traits within the axes *i.e.*, panicle length, yield per plant, kernel length and L/B ratio exhibited great influence on the phenotype of the material studied. Thus, the results of present study revealed high level of genetic variation existing in the population along with the traits contributing for this diversity, which can find immense applications in rice improvement programmes.

FOOD AND NUTRITIONAL SECURITY AMONG KHARWAR TRIBE OF BIHAR – FACTS AND RESEARCH INITIATIVES

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Abstract

The world today is concerned over the food and nutrition security of its people, especially for the countries that have medium to low Human Development Index. India is a house of about the 300 tribes around the Country. Although their percentage to total population is the quite low, each tribe has their typical way of living and systems for food and nutrition security. A study was conducted with 300 families of Kharwar tribe of Adhura block, Kaimur district of Bihar. The study examined the food and nutrition security for school-going children of the tribal families. The interview with the family members and the children revealed that tribe children consumed foods collected from forest apart the regular meals consisting of food grains (rice, kodu, madua, maize, red gram, horse gram and lentil) and vegetables grown by the family. The paper presents the 14 different foods the tribes procured from forest, and examined the nutrient intake per day by 24 hour recall for three subsequent days and compared with the recommended daily Allowance for Indian Children. The nutritional status on the school going tribal children based on height-for-age. A significant associated was found between nutritional status and age of children. The comprehension coverage and regular research initiatives are recommended for all tribes of the country for healthy India.

INTERACTION OF FODDER TREES SPECIES ON MORPHO PHYSIOLOGICAL TRAITS ON PRODUCTIVITY OF SOYBEAN IN NORTHERN TRANSITION ZONE OF KARNATAKA

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Abstract

Agroforestry systems have been highlighted in the agricultural environment as an alternative form of sustainable production to meet the growing demand for food and energy with less environmental impact. In order to reach the aim of this study, the ideal



fodder trees species and the productive performance of soybean were evaluated. Maximum DBH was exhibited in the *Moringaolifera* followed by *Leucaenaleucocephala* and *Glyricidiasepium*. Number of branches per tree were significantly higher in *L. leucocephala* followed by *G. sepium*. Productivity of green biomass yield registered maximum in *M. olifera* and *G. sepium* species. Among fodder species, *A. lebbeck* and *L. Leucocephala* were found superior as they present the potential to compose the agroforestry systems due to their canopy structure and leaf architecture provide greater availability of light, moisture and soil nutrient in system. Field crop yield decreased up to 40% as the advances in age of fodder trees as compared to monocropping in system. Chlorophyll content was significantly higher in sole soybean followed by soybean grown with *L. lanceolata* and soybean with *A. lebbeck* as compared to soybean with other fodder tree species. Single Photoelectric Analyzing Diode (SPAD) values and Leaf Area Index were higher in Soybean crop when grown solely followed by soybean + *L. leucocephala*. Soil moisture was higher in soybean with *Bauhinia purpurea* among the other fodder trees species.

INFLUENCE OF ORGANIC WEED MANAGEMENT PRACTICES ON GROWTH AND YIELD OF KHARIF RICE (*ORYZA SATIVA* L.)

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ABSTRACT

Rice (*Oryza sativa* L.) is the most important staple food crop for more than half of the world's population and plays an important role in food security. The present field investigation was carried out during *kharif* 2017 and *kharif*, 2018 seasons in deltaic alluvial soils of Regional Agricultural Research Station, Maruteru, Andhra Pradesh, India to evaluate the impact of organic weed management practices on growth and yield of rice in Godavari delta region under organic production system. The growth parameters viz., plant height, tiller count and panicle weight was not much influenced by different organic weed management practices but panicle count recorded maximum number (250 m⁻²) with incorporation of locally available aquatic weed *Eichhornia* sp.+ one manual weeding. The grain yield and straw yield of *kharif* Rice was responded well with different organic weed management practices. Highest mean grain yield of 4417 kg/ha was recorded with incorporation of locally available aquatic weed *Eichhornia* sp.+ one manual weeding followed by incorporation of location specific green leaf *Sesbania* sp. 4355 kg/ha and out yielded over other treatments. Statistically significant results were reported with grain yield and weed index during both the years of 2017 and 2018. Highest weed index percent (13.65%) was reported with incorporation of locally available aquatic weed *Eichhornia* sp.+ one manual weeding followed by incorporation of location specific green leaf manure *Sesbania* sp. (11.35%) which shows, these treatments has effectively controlled the weed population which inturn facilitate crop to perform good yield without hampering soil health.

GENETIC DIVERGENCE STUDIES IN KHARIF FORAGE SORGHUM (*SORGHUM BICOLOR* L. MOENCH)

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ABSTRACT

Thirty genotypes was undertaken to examine the genetic divergence. All the thirty forage sorghum genotypes were tested in randomized block design with three replications during *Kharif* 2017. Observations were recorded for days to 50% flowering, plant height, leaf length, leaf breadth, leaf area, stem girth, number of leaves per plant, leaf stem ratio, total soluble solids and green fodder yield. Variability studies suggest that all characters like days to 50% flowering, plant height, leaf length, leaf breadth, leaf area, stem girth, number of leaves per plant, leaf stem ratio, total soluble solids and green fodder yield indicated that this variation provides ample scope for the plant breeder in selection of superior genotypes for crop improvement. High heritability coupled with high genetic advance were observed for plant height, leaf area, stem girth, number of leaves per plant and leaf stem ratio. Hence, selection made through these characters would be effective as they are more predominantly controlled by additive gene effects. Green fodder yield exhibited significant stable and positive association with leaf area at



both genotypic and phenotypic level. These traits may be considered as important yield component in sorghum. Plant height displayed high order of direct effect on green fodder yield followed by stem girth, leaf breadth and leaf stem ratio suggested that these characters should be used for selection of desirable genotype after hybridization between the accessions for creating wide spectrum of favorable genetic variability for improvement of green fodder yield in sorghum. Genotype from the same geographical region fell into different clusters and vice-versa. This suggested that selections of parents for hybridization should be on genetic diversity rather than on the geographical areas. The percent contribution of plant height followed by green fodder yield, leaf stem ratio and number of leaves per plant contributed most towards genetic divergence. Genetic divergence study suggested that crosses between the genotypes cluster VI (Pant Chari-8, CSV-16 and Pant Chari-7) and cluster III (CSV-15) and genotypes of cluster IV (CSV-17) for getting better hybrid vigour in F_1 or better hybrids and also for good recombinants in segregating population.

DEVELOPMENT AND VALIDATION OF MOBILE BASED DECISION SUPPORT SYSTEM FOR POSTURAL ASSESSMENT OF AGRICULTURAL ACTIVITIES USING RAPID UPPER LIMB ASSESSMENT (RULA) TECHNIQUE

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Abstract

Agricultural workers, especially rural people suffer from musculoskeletal disorders (MSDs) in different parts of the body, especially low and upper back pain, during different agricultural activities. The causes of MSDs in agriculture is result of heavy burden, repetitive motion, awkward working postures, long time working and use of non-ergonomically designed traditional tools and implements. Ergonomic risk factors involved in working environment can be measured by using various assessment tools to determine the worker's capabilities and limitations. The work-related risks can be measured directly by using some of the scientifically proven postural assessment tools like RULA, REBA etc. Standard assessment worksheets or tables are used to evaluate the working posture during each operations or activities. RULA is a method designed to provide a quick analysis of the demands on a person's upper limb. It provided an objective measure of the MSDs risk caused by tasks where the demands on the upper body are high RULA technique is primarily assessed the upper limb (hand, wrist, elbow, shoulder), but also the neck and low back (due to trunk postures). Mobile Based Decision Support System (MBDSSs) serve the management, operations and planning levels of an organization (usually mid and higher management) and help people make decisions about problems that may be rapidly changing and not easily specified in advance. Several MBDSS have been developed in different agricultural activities but there is no such system available for postural assessment technique of work-related musculoskeletal disorder. It is in this context, the DSS was developed for postural assessment of agricultural activities with Rapid Upper Limb Assessment (RULA) technique. By this posture will be assessed and farmers may be suggested /recommended the correct posture to avoid developing musculoskeletal disorders.

INTERPRETATION OF GEI, GENETIC AND STABILITY PARAMETERS FOR GRAIN YIELD AND COMPONENT TRAITS IN MAIZE HYBRIDS

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Abstract

The systematic study of genotype x environment interaction (GEI) and molecular divergence is of prime importance in enhancing productivity of hybrids and in easy and effective selection of suitable parental lines. In present study, GEI and parental molecular divergence were accomplished with predictable (plant density) and unpredictable (seasons) environments and with SRAP markers. The 45 F_1 s direct cross hybrids were tested under two



different plant densities (optimum plant density and high plant density) over *kharif* 2013 and *rabi* 2013-14 seasons comprising four environments namely *kharif* normal plant density (E1), *kharif* high plant density (E2), *rabi* normal plant density (E3) and *rabi* high plant density (E4), respectively. The study was performed with different traits namely grain yield per hectare, cob length, cob diameter, no. of kernels per row, no. of rows per cob, 100 kernel weight. The GEI study was performed with AMMI and GGE biplot for effective interaction interpretation with graphical display, and parental divergence study performed with Jacquard's similarity coefficient. Pooled analysis of variance of AMMI model indicated that main effects of genotype and environment, and interaction effect were having the significant difference. Interaction effect was the major source of variation for cob length, cob diameter, number of rows per cob, 100-kernel weight, while, number of kernels per row, grain yield had almost equal contribution of genotypic main effect and interaction effect out of total variation. Yield being most important trait was having low environmental main effect, therefore, GGE analysis had been done for mega environment analysis with which-won-where pattern biplot display. The environments fell into two separate sectors like E1 and E2 of *kharif* season in one sector and E3 and E4 of *rabi* season in different sector. The hybrids, G7 in E1 and E2; and G9 in E3 and E4 were the winning hybrids in respective sector. Hybrid, G31 was most stable across the environments because of its closest position to origin. The correlations of average stability value (ASV) of grain yield with ASVs of different component traits and molecular divergence of parental lines were not significant. It indicates that no possibility of indirect selection for stable yield with different component traits, and selection of parental lines based on molecular divergence for enhancing the yield stability.

UNDERSTANDING OF GENOTYPE BY ENVIRONMENT INTERACTION OVER GRAIN YIELD AND SPIKE ARCHITECTURE OF WHEAT (*T. AESTIVUM* L.)

Manjeet Kumar¹, Kiran B Gaikwad¹, Naresh Kumar¹, Rajbir Yadav¹, Naveen Kumar², Jang Bahadur Singh² and PB Singh³

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³Department of Genetics and Plant Breeding, MPUA&T, Udaipur Rajasthan

Abstract

Wheat is one of the oldest crops of world's food crops, and is a major source of protein and calorie across the globe. However, it is one of the most suffered cereal crops from the effect of global warming. Unpredictable fluctuation of temperature at the time of flowering and grain filling hampers in the sustaining and enhancing of productivity. Therefore, to elucidate the genotype by environment interaction over the grain yield and spike architecture of wheat was carried out. The twenty five advance wheat lines were tested under early conservation agriculture, normal conservation agriculture and normal conventional tillage over two years for grain yield; and only one year testing for spike architecture. The analysis of variance of AMMI model indicated the significant main effects of genotype and environment and G x E interaction for yield and other components traits except non-significant genotypic and G x E interaction effects of no. of grains per spikelet at close to rachis of lower spike portion (LCNGS). In yield, contribution of environmental and genotypic main effects out of total variation were 27.97% and 49.22% respectively, while genotype by environment interaction effect was 22.82%. Which-won-where pattern of GGE biplot displayed that test environments fell in three sectors and genotypes in five sectors. The first sector had environments, NCT1, NCT2 and ECA2, second sector had only ECA1 and remaining third sector was having NCA1 and NCA2. The winner genotype in first sector was G14; in second sector no genotype and in third sector winning genotype was G15. Remaining vertex genotypes that are G1 and G12 were not the top-yielding genotypes in any environment. The contribution of environmental main effect of component traits was relatively lower in comparison to genotypic and interaction effects. However, the effect of environment for different components traits varied over the spike architecture indicating the importance of environment for yield enhancement. The genotypic main effects of Individual grain weight (IGW) and no. of grains per spikelet (NGS) at distant to rachis over the spike were lower than genotype by environment interaction effects. Therefore, it indicates the high relative importance of genotype by environment interaction effects over the traits at distant to rachis position. Rest of traits and IGW and NGS at close to rachis position were having the mixed effects of genotypic main and genotype by environment interaction effects. The closest to ideal environment for defining the genotypic response was ECA1 and ECA2, and genotype, G14 with small of PC2 was designated ideal genotype for defining the environmental conditions. Some of the component traits were having the significant correlation with grain yield across the environments and some of the correlations were unique with each specific environments.



DEVELOPMENT AND VALIDATION OF MOBILE BASED DECISION SUPPORT SYSTEM FOR POSTURAL ASSESSMENT OF AGRICULTURAL ACTIVITIES USING RAPID UPPER LIMB ASSESSMENT (RULA) TECHNIQUE

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Abstract

Agricultural workers, especially rural people suffer from musculoskeletal disorders (MSDs) in different parts of the body, especially low and upper back pain, during different agricultural activities. The causes of MSDs in agriculture is result of heavy burden, repetitive motion, awkward working postures, long time working and use of non-ergonomically designed traditional tools and implements. Ergonomic risk factors involved in working environment can be measured by using various assessment tools to determine the worker's capabilities and limitations. The work-related risks can be measured directly by using some of the scientifically proven postural assessment tools like RULA, REBA etc. Standard assessment worksheets or tables are used to evaluate the working posture during each operations or activities.

RULA is a method designed to provide a quick analysis of the demands on a person's upper limb. It provided an objective measure of the MSDs risk caused by tasks where the demands on the upper body are high RULA technique is primarily assessed the upper limb (hand, wrist, elbow, shoulder), but also the neck and low back (due to trunk postures). Mobile Based Decision Support System (MBDSSs) serve the management, operations and planning levels of an organization (usually mid and higher management) and help people make decisions about problems that may be rapidly changing and not easily specified in advance.

Several MBDSS have been developed in different agricultural activities but there is no such system available for postural assessment technique of work-related musculoskeletal disorder. It is in this context, the DSS was developed for postural assessment of agricultural activities with Rapid Upper Limb Assessment (RULA) technique. By this posture will be assessed and farmers may be suggested /recommended the correct posture to avoid developing musculoskeletal disorders.

INTERPRETATION OF GEI, GENETIC AND STABILITY PARAMETERS FOR GRAIN YIELD AND COMPONENT TRAITS IN MAIZE HYBRIDS

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important trait was having low environmental main effect, therefore, GGE analysis had been done for mega environment analysis with which-won-where pattern biplot display. The environments fell into two separate sectors like E1 and E2 of *kharif* season in one sector and E3 and E4 of *rabi* season in different sector. The hybrids, G7 in E1 and E2; and G9 in E3 and E4 were the winning hybrids in respective sector. Hybrid, G31 was most stable across the environments because of its closest position to origin. The correlations of average stability value (ASV) of grain yield with ASVs of different component traits and molecular divergence of parental lines were not significant. It indicates that no possibility of indirect selection for stable yield with different component traits, and selection of parental lines based on molecular divergence for enhancing the yield stability.

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Abstract

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GENETIC DIVERGENCE STUDIES IN KHARIF FORAGE SORGHUM (*SORGHUM BICOLOR* L. MOENCH)

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Abstract

Thirty genotypes was undertaken to examine the genetic divergence. All the thirty forage sorghum genotypes were tested in randomized block design with three replications during *Kharif* 2017. Observations were recorded for days to 50% flowering, plant height, leaf length, leaf breadth, leaf area, stem girth, number of leaves per plant, leaf stem ratio, total soluble solids and green fodder yield. Variability studies suggest that all characters like days to 50% flowering, plant height, leaf length, leaf breadth, leaf area, stem girth, number of leaves per plant, leaf stem ratio, total soluble solids and green fodder yield indicated that this variation provides ample scope for the plant breeder in selection of superior genotypes for crop improvement. High heritability coupled with high genetic advance were observed for plant height, leaf area, stem girth, number of leaves per plant and leaf stem ratio. Hence, selection made through these characters would be effective as they are more predominantly controlled by additive gene effects. Green fodder yield exhibited significant stable and positive association with leaf area at both genotypic and phenotypic level. These traits may be considered as important yield component in sorghum. Plant height displayed high order of direct effect on green fodder yield followed by stem girth, leaf breadth and leaf stem ratio suggested that these characters should be used for selection of desirable genotype after hybridization between the accessions for creating wide spectrum of favorable genetic variability for improvement of green fodder yield in sorghum. Genotype from the same geographical region fell into different clusters and vice-versa. This suggested that selections of parents for hybridization should be on genetic diversity rather than on the geographical areas. The percent contribution of plant height followed by green fodder yield, leaf stem ratio and number of leaves per plant contributed most towards genetic divergence. Genetic divergence study suggested that crosses between the genotypes cluster VI (Pant Chari-8, CSV-16 and Pant Chari-7) and cluster III (CSV-15) and genotypes of cluster IV (CSV-17) for getting better hybrid vigour in F_1 or better hybrids and also for good recombinants in segregating population.

SOIL CARBON SEQUESTRATION IN CROP PRODUCTION

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Abstract

The carbon (C) sequestration potential of global soils are estimated between 0.4 and 1.2 Gt C year⁻¹ or 5–15 % (1Pg = 1×10^5 g). The C emission is rising rapidly by 2.3% every year. If the emissions continue to rise, warming could reach the levels that are dangerous for the society, but it looks like global emissions might now be taking a different turn in the last few years. It is an indicator of soil health and quality and plays a key role to soil sustainability. At the same time, continuing unsustainable agricultural approaches under intensive farming have depleted most of the SOC pool of global agricultural lands. Still, the terrestrial ecosystem has enormous potential to store the atmospheric C for a considerable period of time. Therefore, promoting the cultivation of crops sustainably offers multiple advantages, e.g. augmenting crop and soil productivity, adapting climate change resilience, and high turnover of above- and below-ground biomass into the soil system, thus sequestering atmospheric C and dropping concentration of GHGs from the atmosphere. The continuous vegetation on soil surface ensures good soil health and soil C concentration at variable soil depth as per the specific crop. The C sequestration potential and the amount of organic C returned by crop plants rest on specific plant species, depending on the nature of growth, root morphology and physiology, leaf morphology, climatic conditions, soil texture, structure and aggregation, prevailing cropping system, and agronomic interventions during crop growth period. The above-ground, and below-ground plant biomass, e.g. dead roots, released substances from root exudates, rhizospheric deposition, and plant-promoted microbial biomass C, directly contribute to the SOC buildup. Sustainable crop management practice that ensures the increased nitrogen (N) availability accelerates the C input in the soil ecosystem. Farming practices that improve nitrogen and water use efficiency (NUE and WUE) reduce soil disturbance and erosion, increase plant biomass, and together affect N availability and SOC stock. Conservation tillage together with surface residue retention and legume-based sensible crop rotation reduces soil disturbances, surface runoff, and erosion; increases N availability and SOC sequestration; increases soil sustainability by mixed cropping, intercropping, crop rotation, cover cropping, multiple cropping, and relay cropping; and generates and adds greater amount of qualitative plant biomass into the soil. The N addition, especially from bulky organic manure, green manures, leguminous crops, cover crops, biological N-fixing microbes, and farm and kitchen waste materials, is essential for



agricultural productivity and SOC sequestration. The C sequestration benefits from addition of chemical nitrogenous fertilizers are compensated by the release of carbon dioxide (CO₂) and nitrous oxide (N₂O) during manufacturing, transportation, storage, and application of fertilizers. Therefore, approaching integrated nutrient management (INM) encompassing manures and other C-rich resources sustains soil health and increases N availability and SOC sequestration, maintain/improve soil health, boost crop production and SOC sequestration, and minimize greenhouse gas (GHG) release in the biophere.

ASSESSMENT OF BIODIVERSITY AND MICROCLIMATE DIVERGENCE OF FLEA BEETLES ON CRUCIFEROUS CROPS IN NORTH KASHMIR, INDIA

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Abstract

The biodiversity of flea beetles was worked out in major vegetable growing belts of North Kashmir. The study revealed the presence of six species of flea beetles viz., *Phyllotreta striolata* (Fabricius), *Altica himensis* (Shukla), *Psylliodes tenebrosus* (Jacoby), *Psylliodes* sp. Indet., *Longitarsus* sp. Indet. and *Systema* sp. Indet. on cruciferous crops. Higher values of biodiversity indices were noted for turnip and radish while, only two species on cabbage. Among various species of flea beetles, *P. striolata* was found to be the most predominant species on turnip (77.51%) and radish (79.44%). Higher values of biodiversity indices and relative abundance of flea beetles were reported for Arampora (Sopore), a slightly drier area with extensive cultivation of vegetable crops and lower for Azadgunj (Baramullah), a slightly humid and cooler area. Results showed that per cent damage on turnip, radish and cabbage was maximum (67.64, 65.85 and 51.25%, respectively) at Arampora and minimum (61.63, 61.02 and 46.80%, respectively) at Azadgunj. This reflects local regional patterns, indicating their important role in species divergence at a microsite probably reflecting climatic adaptations. Thus, habitat heterogeneity and microclimate may be considered as important drivers of flea beetle diversity.

INFLUENCE OF ORGANIC WEED MANAGEMENT PRACTICES ON GROWTH AND YIELD OF KHARIF RICE (*ORYZA SATIVA* L.)

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Abstract

Rice (*Oryza sativa* L.) is the most important staple food crop for more than half of the world's population and plays an important role in food security. The present field investigation was carried out during *kharif* 2017 and *kharif*, 2018 seasons in deltaic alluvial soils of Regional Agricultural Research Station, Maruteru, Andhra Pradesh, India to evaluate the impact of organic weed management practices on growth and yield of rice in Godavari delta region under organic production system. The growth parameters viz., plant height, tiller count and panicle weight was not much influenced by different organic weed management practices but panicle count recorded maximum number (250 m⁻²) with incorporation of locally available aquatic weed *Eichhornia* sp.+ one manual weeding. The grain yield and straw yield of *kharif* Rice was responded well with different organic weed management practices. Highest mean grain yield of 4417 kg/ha was recorded with incorporation of locally available aquatic weed *Eichhornia* sp.+ one manual weeding followed by incorporation of location specific green leaf *Sesbania* sp. 4355 kg/ha and out yielded over other treatments. Statistically significant results were reported with grain yield and weed index during both the years of 2017 and 2018. Highest weed index percent (13.65%) was reported with incorporation of locally available aquatic weed *Eichhornia* sp.+ one manual weeding followed by incorporation of location specific green leaf manure *Sesbania* sp. (11.35%) which shows, these treatments has effectively controlled the weed population which inturn facilitate crop to perform good yield without hampering soil health.



FOLIAR APPLICATION OF WATER SOLUBLE NUTRIENT MIXTURES ON GROWTH AND YIELD OF RAINFED PIGEONPEA [*CAJANUS CAJAN* (L.) MILLSP.]

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Abstract

A field experiment was conducted to study the “Foliar application of water soluble nutrient mixtures on rainfed Pigeonpea [*Cajanus cajan* (L.) Millsp.]” under medium black soils at KVK farm Vijayapur during Kharif 2018. The experiment was laid out in Randomized Complete Block Design with fifteen treatments replicated thrice in which water soluble nutrient mixtures viz. Pulse wonder and pulse magic @ 1 per cent sprayed in three different stages viz. Grand growth, flower initiation and pod formation stage. The results revealed that, foliar application of water soluble pulse wonder nutrient mixtures T₆ @ 1 per cent at flower initiation and pod formation stage gave significantly higher number of pods plant⁻¹ (124.27), seed weight plant⁻¹ (60.27 g), grain yield (1574 kg ha⁻¹) and stalk yield (2133 kg/ha) which was on par with treatment pulse magic spray @1 per cent at grand growth, flower initiation and pod formation stage (T₁₄). Significantly higher net return (58,844 Rs.ha⁻¹) and BC ratio (2.93) was also recorded in foliar application of water soluble pulse wonder nutrient mixture spray @1 per cent at flower initiation and pod formation stage followed by pulse magic spray @1 per cent at grand growth, flower initiation and pod formation stage registered net return (54,088 Rs.ha⁻¹) and BC ratio (2.74).

EFFECT OF DIFFERENT N LEVELS WITH AND WITHOUT P AND K ON GROWTH, YIELD AND ACQUISITION OF NUTRIENTS BY MUSTARD (*BRASSICA JUNCEA* L.)

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Department of Soil Science, SVP University of Agriculture & Technology, Meerut (U.P) India

Abstract

A field experiment was conducted during rabi season (2011–12) to find out the “Effect of different N levels with and without P and K on Growth, Yield and Acquisition of Nutrients by mustard (*Brassica juncea* L.) CV. Kranti on crop research centre (CRC) Chirori, Sardar Vallabhbhai Patel Agriculture and Technology University Modipuram, Meerut. The soil of the experimental field is loam in texture. There were twelve treatments comprised three levels of nitrogen (0, 80 and 120 kg ha⁻¹) and one level of phosphorus and potassium (each 50 kg ha⁻¹). The experiment was laid out under randomized block design (RBD) with three replications. Treatments were T₁ (N₀P₀K₀), T₂ (N₀P₅₀K₀), T₃ (N₀P₀K₅₀), T₄ (N₀P₅₀K₅₀), T₅ (N₈₀P₀K₀), T₆ (N₈₀P₅₀K₀), T₇ (N₈₀P₀K₅₀), T₈ (N₈₀P₅₀K₅₀), T₉ (N₁₂₀P₀K₀), T₁₀ (N₁₂₀P₅₀K₀), T₁₁ (N₁₂₀P₀K₅₀) and T₁₂ (N₁₂₀P₅₀K₅₀). There were significant improvement recorded in growth and yield parameters viz. plant height, number of branches, number of siliques per plant, number of seed per siliques & 1000-seed weight and also in physicochemical properties viz. pH, electrical conductivity, organic carbon and available NPK levels of soil under mustard crop at all three growth stages i.e. 30 DAS, 60 DAS and at harvest in the treatment T₁₂ (N₁₂₀P₅₀K₅₀) as compared to other treatments. The plots received N through urea, P through single super phosphate and potassium through mureate of potash. Application of NPK @ 120-50-50 kg ha⁻¹ (N₁₂₀P₅₀K₅₀) gave the highest seed yield (20.78 q ha⁻¹) which increased by 105.74% over control. On the basis of results obtained it can be concluded that the balanced use of N along with P and K was found superior than sole application due to synergetic effect of N with P and K on mustard in terms of growth and yield parameters. Balance dose of NPK can also substitute the physico-chemical properties and availability in soil of N, P and K significantly.



ASSESSMENT AND EFFECT OF NORMAL AND SALINE IRRIGATION WATER ON GROWTH PARAMETES OF MAIZE CULTIVAR JASOURA VILLAGE OF DISTRICT KANNAUJ, U.P.

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Abstract

The field experiment was conducted during the year 2016 and 2017 at village Jasaura district Kannauj, Uttar Pradesh. Plant height at 75 DAS was ranged from 134.17 - 157.33 cm and 133.46 - 158.41 cm. Plant height at harvest was ranged from 174.71 - 204.62 cm and 174.08 - 206.67 cm. Plant girth or diameter was ranged from 5.97 - 7.03 cm and 5.91 - 7.13 cm. The Number of leaves per plant number of leaves per plant was ranged from 15.46 - 16.50 and 15.41 - 16.25. Number of cobs per plant was ranged from 1.00 - 1.08 and 1.00 - 1.04. Number of grain rows per cob was ranged from 13.70 - 15.54 and 13.66 - 15.50. Number of grains per row was ranged from 23.94 - 26.87 and 22.93 - 26.65. Number of grains per cob was ranged from 336.12 - 418.21 and 313.36 - 403.16. Cob length was ranged from 15.26 - 20.11 cm and 14.87 - 20.81 cm. Cob circumference was ranged from 13.87 - 16.10 cm and 13.49 - 15.90 cm. Cob yield was ranged from 61.35 - 87.45 q ha⁻¹ and 57.52 - 91.82 q ha⁻¹. Grain yield was ranged from 43.85 - 70.32 q ha⁻¹ and 40.50 - 73.92 q ha⁻¹. Stover yield was ranged from 116.65 - 142.87 q ha⁻¹ and 114.25 - 143.15 q ha⁻¹. The above mention growth parameters were examined in 2016 and 2017 respectively.

EFFECT OF NORMAL AND SALINE WATER IRRIGATION ON YIELD AND YIELD ATTRIBUTES OF MAIZE CULTIVAR DISTRICT KANNAUJ, UTTAR PRADESH

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Abstract

The field experiment was conducted during the year 2016 and 2017 at village Jasaura district Kannauj, Uttar Pradesh. Grain yield was ranged from 43.85 - 70.32 q ha⁻¹ and 40.50 - 73.92 q ha⁻¹. Stover yield was ranged from 116.65 - 142.87 q ha⁻¹ and 114.25 - 143.15 q ha⁻¹. Biological yield was ranged from 178.00 - 230.57 q ha⁻¹ and 171.82 - 233.57 q ha⁻¹. The weight of 100 seeds was ranged from 20.88 - 28.40 gram and 20.75 - 29.78 gram. Shelling percentage was ranged from 71.15 - 80.22 % and 70.20 - 80.44 %. Harvest Index was ranged from 0.24 - 0.30 % and 0.23 - 0.30 %. Gross returns or output, net return and benefit cost ratio were ranged from Rs. 69766 - 107461, Rs. 3342 - 41037 and 0.05 - 0.62 and Rs. 67849 - 116647, Rs. (-) 1222 - 47576 and (-) 0.02 - 0.69. The highest and lowest growth and reduction on grain and stover yield was achieved from T₁ - (+) 4.87 % to (+) 0.19 % and T₂ - (-) 7.64 % to (-) 2.06 %. All the parameters were obtained from 2016 to 2017 year respectively.

MOLECULAR DIVERSITY ANALYSIS IN MAIZE LINES BY USING SRAP MARKERS

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Abstract

The experiment was undertaken with ten maize inbred lines during Rabi, 2014 at N. E. Borlaug Crop Research Centre, Pantnagar. These parental inbred lines were subjected for molecular diversity using set of eight SRAP markers. Analysis of molecular polymorphisms showed that average number of alleles per marker was 7.24 alleles with a range from 4 to 10 alleles. The PIC values of SRAP markers ranged from 0.450 (K2T3) to 0.891 (K1T4) with mean value of 0.767, in which marker, K2T2 was least informative due to lowest PIC value, while marker, K1T4 was highest informative due to highest PIC value among other markers, therefore this type of marker system could be efficiently used to detect polymorphism in maize. The Jaccard's similarity coefficients between pairs of parental lines were found to vary from 0.13 to 0.80. Cluster diagram based on Jaccard's similarity coefficients and UPGMA algorithm showed that major cluster A was having the only one parent, while



cluster B had nine parents. Genotypes in the same cluster are closer to each other at molecular level compare to genotypes in different groups. Clustering of parental lines indicate the presence of enough genetic diversity among them.

EFFECT OF INTEGRATED NITROGEN MANAGEMENT ON SOIL PROPERTIES, DEHYDROGENASE AND ALKALINE PHOSPHATES ENZYMATIC ACTIVITIES

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Abstract

A field experiment was conducted at Agronomy farm, of S.K.N. College of Agriculture, Jobner (Rajasthan) during *kharif* season 2017 loamy sand soil to study the “Effect of Integrated Nitrogen Management on soil properties in Pearl millet [*Pennisetum glaucum* (L.) R. Br. Emend Stuntz]”. The experiment was laid out according to factorial randomized block design with three replications. The experiment comprised eight treatments of sources of nitrogen (Control, 50% RDN through urea+ 50% RDN through vermicompost, 50% RDN through urea+ 50% RDN through FYM, 75% RDN through urea+ 25% RDN through vermicompost, 75% RDN through urea+ 25% RDN through FYM, 100% RDN through urea, 100% RDN through vermicompost and 100% RDN through FYM) and two treatments of bio fertilizer (without inoculation and with *Azotobacter*) were applied to the pearl millet var. RHB-173. The application of sources of nitrogen the soil organic carbon, available nitrogen, phosphorus, potassium, dehydrogenase activity and alkaline phosphates’ activity were increased significantly with the application of 75% RDN through urea+ 25% RDN through vermicompost. The soil organic carbon, available N, P_2O_5 , K_2O , dehydrogenase activity and alkaline phosphates’ activity were also increased when inoculated with bio fertilizer.

GOVT. INITIATIVES TO DOUBLING THE FARMERS’ INCOME BY 2022

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Abstract

The Government has set a target of doubling of farmers’ income by the year 2022 and constituted the DFI. There are seven sources of income growth namely, improvement in crop productivity; improvement in livestock productivity; resource use efficiency or savings in the cost of production; increase in the cropping intensity; diversification towards high value crops; improvement in real prices received by farmers; and shift from farm to non-farm occupations. Encouraging contract farming through the State Governments by promulgating of Model Contract Farming Act, Up-gradation of Gramin Haats to work as centers of aggregation and for direct purchase of agricultural commodities from the farmers, e-NAM to provide farmers an electronic online trading platform, Distribution of Soil health Cards to farmers so that the use of fertilizers can be rationalized, Increase water efficiency through Pradhan Mantri Krishi Sinchayee Yojana, Better insurance coverage to crops for risk mitigation under Pradhan Mantri Fasal Bima Yojana (PMFBY), providing total interest subvention up to 5 per cent (inclusive of 3 per cent prompt repayment incentive) on short-term crop loans up to ₹3 lakh, thus making loan available to farmers at a reduced rate of 4 per cent per annum and extended the facility of Kisan Credit Card (KCC) for animal husbandry and fisheries related activities as well as Interest Subvention facilities to such categories of farmers."

DISTRIBUTION OF HEAVY METALS AND METALLOID IN DIFFERENT PARTS OF RICE PLANTS GROWN ON SLUDGE AMENDED SOILS

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Abstract

An experiment was carried out on basmati rice (*Oryza sativa*, var. Pusa Basmati 1121) using IARI soil to assess the effect of applied sludge on heavy metals and metalloid content in different parts of rice including grain, husk and straw. The different



dose of sludge was used as treatments 0, 10, 20, 30, 40 and 50 g kg⁻¹. Results indicated that rice grain was found to contain Zn, Cu, Fe, Mn, Cd, Pb, Ni and As in the range of 25.3-38.4 mg kg⁻¹, 3.26-6.53 mg kg⁻¹, 9.28-19.5 mg kg⁻¹, 11.5-19.8 mg kg⁻¹, 8.67-28.6 µg kg⁻¹, 134-595 µg kg⁻¹, 299-1052 µg kg⁻¹ and 39.9-90.7 µg kg⁻¹, respectively. However, the occurrence of heavy metals and metalloid in rice straw and husk were in a ranking order of Fe > Mn > Zn > Cu > Ni > Pb > As > Cd. Risk to human health for intake of metals and metalloid through consumption of rice grown on sludge amended soils was computed in term of hazard quotient (HQ). The value of HQ for As ranged from 0.05 to 0.12 across the various treatments of sludge addition. It can be concluded that risk assessment for intake of metalloid through consumption of rice by human indicated that application of sludge should be restricted up to 20 g kg⁻¹ (equivalent to 40 t ha⁻¹) unfit for rice cultivation.

EXPLOITING THE GENETIC GAIN ON DIVERSE S₂ POPULATIONS DEVELOPED THROUGH RECIPROCAL RECURRENT SELECTION IN MAIZE (*ZEA MAYS*. L)

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Abstract

An investigation was undertaken to assess the genetic gain with respect to grain yield and its component traits in diverse S₂ lines of population A and B at the College of Agriculture, Dharwad during *rabi* 2017-18. In the present study involved test crossing of 48 S₂ lines from population A with same number of lines from population B. The crosses were made between the two populations by following full sib reciprocal recurrent selection (*i.e.* population A as tester for population B and population B as tester for population A). The high yielding Combinations [10 (1) 1 × 27 (3) 7] (109 q/ha), [4 (1) 9 × 16 (3) 13] (107 q/ha), [33 (1) 11 × 25 (1) 14] (102 q/ha), [24 (1) 10 × 2 (3) 8] (96 q/ha) and [23 (2) 1 × 8 (1) 12] (92 q/ha) were found to be moderately resistant to turicum leaf blight. These test cross progenies which showed high combining ability to yield and its related traits. The grain yield improved from 61 q/ha in S₁ to 86 q/ha in S₂. There was 40 per cent increment in the yield with one cycle of selection, thus it indicated that reciprocal recurrent selection is efficient method for improving the populations. Further, S₂ progenies of these crosses can be used as potential hybrids as well as for isolation of good inbred lines.

PROFILE STUDY AND BACKGROUND OF HEAVY METALS DISTRIBUTION IN DIFFERENT SOIL SERIES OF HISAR, HARYANA

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Abstract

Heavy metals are large group of elements with density, generally greater than 5g/cm³. The profile and background level of heavy metal study was conducted in five different soil series (Balsamand, Isarwal, Rawalwas, Barwala, Ladwa) of district Hisar, Haryana. The total lead content was initially increased with depth then further decreased in Balsamand. In Isarwal and Rawalwas it was increased with depth but in Barwala decreased with depth. In Ladwa soil series first increased then decreased. The total chromium content of Balsamand first increased with depth then decreased. In Isarwal and Rawalwas it was decreased with depth. In Barwala and Ladwa series initially decreased then further increased. The total cadmium of Balsamand and Isarwal first increased with depth then decreased. In Isarwal increased and decreased in Barwala. In Ladwa series initially decreased then further increased. The total cobalt was increased with depth in Balsamand, Isarwal and Rawalwas series. In Barwala decreased with depth and in Ladwa increased first then decreased. The total nickel content was increased with depth in Balsamand, Isarwal and Rawalwas series. In Barwala decreased with depth and in Ladwa first increased then further decreased. The background levels of heavy metals (Pb, Cr, Cd, Co and Ni) in Balsamand soil series were 0.02, 0.02, 0.40, 0.01 and 0.02, respectively, Isarwal 0.01, 0.04, 0.08, 0.01 and 0.03, respectively, Rawalwas 0.01, 0.03, 0.08, 0.09, 0.02, respectively, Barwala 0.05, 0.02, 0.01, 0.00 and 0.04, respectively and Ladwa soil series 0.04, 0.05, 0.06, 0.15 and 0.01, respectively. The distribution of total heavy metals content was found non uniform in all soil series. Background levels of heavy metals in all soil series were less than one (<1) showed soils are non-contaminated.



IMPACT OF RECIPROCAL DIFFERENCE ON YIELD AND DISEASE RESISTANCE IN MAIZE DEVELOPED THROUGH FULL-SIB RECIPROCAL RECURRENT SELECTION

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Abstract

The present study involved test crossing of 48 S₂ lines from population A with equal number of lines from population B and the crossing programme was made at All India Coordinated Maize Improvement Project (ACMIP), MARS, Dharwad, during 2017-18. The crosses were made between the two populations by following full sib reciprocal recurrent selection (*i.e.* population A as tester for population B and population B as tester for population A), 100 test crosses from each population were developed and were termed as derived test cross progenies. Test cross progenies derived from population A x population B were referred to as Direct crosses and those from population B x population A were referred to as reciprocal crosses. Both the direct and indirect crosses combine together called full-sibs or a combination. The estimates of reciprocal difference with respect to grain yield only single combination [12 (1) 18 x 34 (2) 25] exhibited significant positive reciprocal difference. The combinations [23 (2) 1 x 8 (1) 12], [4 (1) 9 x 16 (3) 13], [33 (1) 11 x 25 (1) 14], [10 (1) 1 x 27 (3) 7], [24 (1) 10 x 2 (3) 8], [2 (3) 8 x 24 (1) 10], [16 (3) 13 x 4 (1) 9], [27 (3) 7 x 10 (1) 1] and [25 (1) 14 x 33 (1) 11] were found to be moderately resistant to turicum leaf blight coupled with high mean *per se* but there is no significant reciprocal difference. These results showed that there is no much difference between the direct and their reciprocal crosses. It indicated that most of the yield related traits exhibited nuclear segregation, but no or very less cytoplasmic inheritance. Few combinations exhibited significant difference for some traits, it may be due to environmental influence and the sampling error. The ultimate product for yield only single combination exhibited significant. For further confirmation all the combinations need to be evaluate across the environments and locations.

MORPHOLOGICAL AND MOLECULAR CHARACTERIZATION OF *COLLETOTRICHUM GLOEOSPORIOIDES* CAUSING ANTHRACNOSE DISEASE OF PAPAYA AND ITS MANAGEMENT APPROACH

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Abstract

Anthracnose caused by *Colletotrichum gloeosporioides* is considered as one of the most economic vital post-harvest diseases of papaya. Survey was conducted in different local markets and farmer's field of Coimbatore district, Tamil Nadu. The survey report showed that among the ten places surveyed, the highest per cent disease index (PDI) of anthracnose was observed in Cg1 recording maximum PDI of 85.33 which was isolated from CO-2 variety of TNAU papaya orchard. A sum of ten isolates of *C. gloeosporioides* were collected and identified through morphological and molecular method. Morphological characterization of the isolates revealed a wide variation among the isolates with respect to colony colour, topography, margin, pigmentation and zonation. The ITS gene region and the specific primer, MKCgF coupled with ITS-4, which generated amplicons of size 560 bp and 380 bp respectively for *C. gloeosporioides*. In order to formulate eco-friendly management practices, the *in vitro* efficacy of different biocontrol agents, plant extracts and essential oils were tested against the mycelial growth of *C. gloeosporioides*. Among the different biocontrol agents, fourteen isolates of *Bacillus* sp. and seven *Pseudomonas* sp. were isolated from the fructosphere of papaya using serial dilution method and screened against *C. gloeosporioides* pathogen and the results showed that the highest mycelial growth inhibition was recorded in the *Bacillus* sp. (BSP1) (4.78 cm). Based on the *in vitro* efficacy, bio-formulations of selected *Bacillus* sp. (BSP1) and cinnamon oil were developed and tested their efficacy under field conditions and after harvest as fruit dipping. The field experimental results revealed that pre-harvest spray with *Bacillus* sp.(BSP1) (5%) + post-harvest dipping with cinnamon oil (0.1%) recorded the lowest PDI of 3.25 when compared to control (70.36) and also increased the shelf life of 14 days. The field spray and post-harvest dipping with different treatments increased the accumulation of defense related enzymes *viz.*, peroxidase (PO), polyphenol oxidase (PPO) and catalase (CAT) in inoculated fruits. All the enzyme activities were significantly increased when papaya fruits were treated with



pre-harvest spray with *Bacillus* sp. (BSP1) (5%) + post-harvest dipping with 10EC formulated cinnamon oil as compared to control and also improvement in fruit quality parameters viz., total sugars, reducing sugars and non-reducing sugars. Our results in these speak to a novel methodology toward the objective to use combination of biocontrol agent as pre-harvest spray and essential oils as post-harvest fruit dipping against post-harvest anthracnose of papaya without utilization of chemical fungicides.

RESPONSE OF PEARL MILLET [*Pennisetum glaucum* L. (R. BR.)] TO INTEGRATED NITROGEN MANAGEMENT ON YIELD ATTRIBUTES

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Abstract

In the present study, the integrated use of different sources of nitrogen were used to estimate the growth and yield of pearl millet. The field experiment was conducted at Agronomy farm, of S.K.N. College of Agriculture, Jobner (Rajasthan) during *kharif* season 2017 in loamy sand soil. The experiment was laid out according to factorial randomized block design with three replications. The experiment comprised eight treatments of sources of nitrogen (Control, 50% RDN through urea+ 50% RDN through vermicompost, 50% RDN through urea+ 50% RDN through FYM, 75% RDN through urea+ 25% RDN through vermicompost, 75% RDN through urea+ 25% RDN through FYM, 100% RDN through urea, 100% RDN through vermicompost and 100% RDN through FYM) and two treatments of biofertilizer (without inoculation and with *Azotobacter*) were applied to the pearl millet variety RHB-173. The RDN was 60 kg N. The application of sources of nitrogen significantly increased plant height, dry matter accumulation, number of effective tillers, grains per ear, test weight, grain and Stover yield, under 75% RDN through urea+ 25% RDN through vermicompost and seed inoculation with *Azotobacter* significantly increased plant height, dry matter accumulation, number of effective tillers, grains per ear, test weight, grain and stover yield.

INTEGRATED, ECO-FRIENDLY MANAGEMENT APPROACH AGAINST *ALTERNARIA SOLANI* AND EFFECT OF BIOCHEMICAL PARAMETERS ON HOST RESISTANCE

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Abstract

Early blight or fruit rot disease that is caused by *Alternaria solani* (Ell. and Mart.) Jones and Grouet is one of the most destructive diseases of tomato resulting losses upto 78 per cent that mainly occurs in the tropical as well as in subtropical regions. Present study was done to develop an integrated, effective and eco-friendly approach to combat this disease. The efficacy of different plant extracts and bio-agents were evaluated against *A. solani* *in vitro*. Datura was found most effective @15% among the tested plant extracts. Efficacy of different bio-agents i.e. *Trichoderma viride*, *T. harzianum*, *Pseudomonas fluorescens* and *Bacillus subtilis* was evaluated, amongthem *T. harzianum* was foundmost effective*in vitro*. Comparison of biochemical changes in healthy and infected host was done to study effect on host resistance There was decrease in amount of total soluble sugar TSS (reducing and non-reducing sugar) and total chlorophyll content (chlorophyll a and chlorophyll b) and increase in protein and phenol content in infected plants. Efficacy of novel fungicides and cow by products were evaluated against *A. solani* *in vitro* at different concentrations. At 250 ppm, Propiconazole 25%EC was found most effective followed by Mancozeb 50%WP, among the tested fungicides. Among the cow by products, 20% concentration of cow urine was found most effective followed by cow dung and butter milk *in vitro*. Under *in vivo* condition, the efficacy of eight fungicides and cow by products were tested against *A. solani*. Foliar application of Propiconazole @ 0.2% was found highly effective as it gave minimum disease intensity and maximum fruit yield followed by Mancozeb 64% + Thiophenate methyl 12%. 10% concentration of combined effect of seed treatment and foliar application of cow urine was most effective followed by cow dung and butter milk.



ASSESSMENT OF PHYSICO-CHEMICAL, FAUNA AND PRODUCTIVITY IN MICRO-WATER SHEDS AT UDAIPUR AND ITS RELATION TO FISHERIES POTENTIAL

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Abstract

A study was carried out to investigate the suitability of selected micro-water sheds viz. Bhimsagar, Mohamed Falashiya, Har-Ka-Naka, and Baga-Ka-Naka of Udaipur for fish culture. Water quality parameters, primary productivity and zooplankton density were measured on monthly basis during February 2016 and May 2016. The gross primary productivity (GPP), net primary productivity (NPP) and average RQ were ranged in 0.10- 0.61, 0.02- 0.28 and 0.02 to 0.13 gC/m³/hr, respectively. The mean total zooplankton count was found to be higher in Baga-Ka-Naka (13 Nos/L) as compared to Har-Ka-Naka (11 Nos/L), Bhimsagar (11 Nos/L) and Mohamed Falashiya (8 Nos/L). An abundance of zooplankton density in micro-water sheds was in order of copepoda (cyclops) > nauplii > rotifera > cladocera. Abiotic and biotic factors in micro-water sheds are comparable to other natural water bodies and remained congenial for survival and growth of fishes. Based on the results, it can be concluded that micro-water is most suitable for fish culture in tribal villages to provide livelihood and nutritional security.

EFFECT OF SECONDARY METABOLITES ON BAKANAE DISEASE DEVELOPMENT CAUSED BY *FUSARIUM FUJIKUROI*

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Abstract

The cultivation of rice is halted by various biotic and abiotic stresses. Due to climate change and changes in cultivation practices the bakanae disease caused by *Fusarium fujikuroi* Nirenberg has emerged as a serious threat to rice cultivation especially aromatic rice. The disease is identified the various kind of symptoms it produces. The main symptoms of disease are foot rotting, lanky, tall slender culms with pale yellow flag leaves and sterile grains. The pathogen is known to produce various secondary metabolites and mycotoxins like Fusaric acid, gibberellic acid, fumonisins, bikaverins etc which affect the disease development and symptomatology. The present study was done to check the effect of artificial inoculation of the selected metabolites and mycotoxins (Fusaric acid (FA), Gibberellic acid (GA) and Fumonisin B1 (FB1)) on disease incidence and symptom development. The plants of rice variety PB1121 were inoculated with the metabolites alone and in all possible combination with two different concentration (0.25 ppm and 0.1 ppm). The non-inoculated plants and pathogen inoculated plants were used as control. Seed inoculation of fusaric acid reduced the seed germination. Gibberellic acid inoculation increased the seed germination whereas FB1 inoculation had no effect on seed germination. Inoculation of FA caused rotting symptoms whereas elongation symptoms were produced by the plants inoculated with GA. FB1 inoculation did not produced any specific type of symptoms. The co inoculation of FB1 with any of FA or GA resulted in production of rotting or elongation symptoms, respectively. Root length was increased in plants treated with gibberellic acid.

IN VITRO MANAGEMENT OF PHYTOHORMONES FOR MICROPROPAGATION OF SUGARCANE (*SACCHARUM OFFICINARUM* L.) GENOTYPES

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Abstract

Experiment was carried out for rapid micropropagation of two sugarcane genotypes Co-86032 and CoVC-18061. The



multiplication response was under taken with five levels of 6-Benzylaminopurine (0, 0.5, 1, 1.5 and 2 mg/l) and kinetin (0, 0.25, 0.5, 1.0 and 1.5 mg/l) in completely randomized design with 5x5x2 factorial treatment combinations. Analysis of variance (ANOVA) showed that the interaction effects of 6-benzylaminopurine (6-BAP), kinetin and the sugarcane genotypes on number of shoots per explant, shoot length, and chlorophyll content was highly significant ($p < 0.001$), except for number of leaves. Multiplication of the cultures were obtained by using various combinations of 6-BAP and kinetin in MS medium. The optimum multiplication for genotype Co 86032 was obtained when MS media supplemented with 1.0 mg/l 6-BAP and 0.5 mg/l kinetin as this genotype produced 32.5 shoots per explant with 6.32 cm shoot length, 2.83 leaves and chlorophyll content of 20.78 mg/g. best performance of CoVC-18061 with respect to number of shoot per explant (27.75), shoot length (7.03) with number of leaves (2.81) and chlorophyll content (22.83 mg/g) was obtained on MS medium fortified with combination of 1.5 mg/l BAP and 0.5 mg/l kinetin after 30 days of culture transferred to multiplication media.

SPATIAL DISTRIBUTION OF HEAVY METALS IN DIFFERENT SOIL SERIES OF HISAR, HARYANA

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Abstract

Heavy metal contamination in the environment has increased sharply as a result of industrial revolution and excessive population growth, posing major environmental and human health problems worldwide. The study was conducted on spatial distribution of heavy metals in different soil series of district Hisar, Haryana. The surface soil samples were collected using GPS and analyzed for physicochemical properties and available content of heavy metals (Pb, Cr, Cd, Co and Ni). The physicochemical properties of soils were moderately alkaline to strongly alkaline (mean pH 8.0-8.5), mean EC (dS m^{-1}) 0.10-0.17 (non saline), low to medium (0.39-0.51%) organic carbon, sandy to sandy clay loam texture with low to moderate ($8.64\text{-}12.85 \text{ cmol kg}^{-1}$) CEC and calcium carbonate content was $< 5\%$. The mean ranges of available content of heavy metals were 0.56-1.30, 0.03-0.17, 0.01-0.04, 0.00-0.02 and 0.03-0.16 mg kg^{-1} for Pb, Cr, Cd, Co and Ni respectively, which below the permissible limit. The relationship between different physico-chemical properties and heavy metal concentrations in soils were analyzed by Pearson's correlation coefficient which found significant correlations between different quantitative variables such as clay and CEC with pH, EC, OC and silt content; lead with pH, OC, CEC, silt and clay content; chromium the pH, CEC, silt and clay content; cobalt with OC, silt and clay content; nickel with OC, CEC and clay content.

THE RELATIONSHIP BETWEEN EGG WEIGHT CLASS AND HATCHABILITY IN KUROIILER AND CHABRO BREEDS OF POULTRY

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Abstract

Poultry is fastest growing sector of Indian agriculture today. Presently, India ranks 3th in egg production and 5th in broiler production in the world. However, basic information about effect of egg weight on hatchability is required to develop this industry. Therefore, the present study was designed to determine the effect of egg weight on hatchability in large, medium and small sized eggs. The study was conducted at poultry farm of SKN COA, Jobner. Eggs were collected daily and stored at 21 °C temperature. A total of 207 eggs of hatchable backyard strain for each strain were collected for this study. Eggs were grouped into three egg size categories as follows: Small (38-44 g), medium (45-52 g) and large (53-59 g). All experimental eggs were incubated in an automated sanitized electrical incubator at 99.50° F- 99.75° F (37.5 °C) with 60-65% relative humidity and turning hourly. It was observed that medium egg weight class having better hatchability than small and large egg weight classes. For Kuroiler breed, the egg hatchability was significantly highest in medium class (81.15%) followed by small (73.33%) and large (51.11%) egg classes. Similar trend was observed for Chabro breed. It was significantly highest in medium (85.5%) egg class followed by small (75.55%) and large (64.44%) egg classes.



EFFECT OF NITROGEN IN MS MEDIA FOR RAPID *IN VITRO* SHOOT INITIATION OF SUGARCANE (*SACCHARUM OFFICINARUM* L.) GENOTYPES

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Abstract

Sugarcane (*Saccharum* species hybrid), is an important cash crop and is the major source of sugar worldwide. Tissue culture techniques are important tools of crop improvement and rapid multiplication of sugarcane clones. Nitrogen is essential not only for growth, but also for morphogenesis in tissue culture, which is markedly influenced by the availability of nitrogen and the form in which it is presented in the plant. In a laboratory experiment with sugarcane genotypes Co 86032 and CoVC 15-22-05. The efficacy of different sources of nitrogen; namely ammonium sulphate, tri ammonium citrate and supplement for MS (Murashige and Skoog) medium were evaluated. There was no consistent response from genotypes from the different N sources in the medium. The results indicated that the interaction effect of sugarcane genotypes and different nitrogen sources was found significant for various shoot initiation and shoot induction characteristics. Findings showed that the genotype Co 86032 performed best in the medium fortified with supplement for MS for various growth parameters viz., days for explant to turn autotrophic, autotrophic frequency, days for appearance of axillary buds, axillary shoots per explant, length of axillary shoots, days of shoot establishment, shoot length after establishment and shoot induction frequency. Whereas genotypes, CoVC 15-22-05 showed optimum response in the MS medium supplemented with ammonium sulphate.

CHEMICAL COMPOSITION OF SEWAGE-SLUDGE EMANATING FROM DIFFERENT TREATMENT PLANTS OF DELHI AND THEIR PERSPECTIVE USE FOR FERTILIZERS

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Abstract

A survey of sewage-sludge was conducted from four important sewage treatment plants of Delhi viz. Okhla, Coronation pillar, Jasola and Delhi Gate in the month of March, 2015. The treatment capacity of Okhla, Coronation pillar and Delhi Gate are 170, 40 and 2.2 million gallon per day (MGD). Results indicated that N, P, K and S levels were within a relatively narrow range, whereas these statistics demonstrated that Fe, Mn, Pb, Zn, Cu, Ni, As and Cd concentrations were extremely variable. Besides, sewage-sludge is a good source of organic matter. Mean concentrations for sewage-sludges were as follows: C-17.6, N-2.23, P-1.66, K-0.20, S-1.41, Fe-1.13%, Zn-1065, Cu-308, Mn-194, Pb-51.1, Ni-34.3, Cd-5.59 and As-3.34 mg kg⁻¹. Based on population and sludge production estimates, < 1% of the agricultural land would be required for application of sewage sludge good source of plant nutrients as on an average; N, P, K and S content in sludge were 22, 17, 2 and 14 kg t⁻¹, respectively. Two important micronutrient contents i.e. of Zn and Fe in sludge were 1065 g t⁻¹ and 11.3 kg t⁻¹, respectively. The heterogeneous nature of sewage-sludges produced by different cities and the presence of potentially harmful trace metals necessitates knowledge of the chemical composition of each individual sewage-sludge prior to land application.

EFFECT OF EGG WEIGHT CLASS ON THE WEIGHT OF DAY-OLD CHICK IN KUROILER AND CHABRO BREEDS

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Abstract

Production of good-quality chicks is the prime objective of modern hatcheries in the world. One of the main genetic factors that affect the subsequent productivity of layer and broiler chicken is egg weight. Therefore, an investigation was carried out to study the effect of strain and egg weight on chick's weight in large, medium and small sized eggs of chicken strains. The



study was conducted at poultry farm, SKN College of Agriculture, Jobner. A total of 297 eggs were collected and grouped into three egg size categories i.e. Small (38-44 g), medium (45-52 g) and large (53-59 g). For Kuroiler breed of chicken, the chick weight was found significantly higher in medium class (38.5 g) followed by small (34.3 g) and large (38.1 g) egg classes. In the case of Chabro breed, it was significantly higher in medium (40.6 g) egg class followed by small (36.85 g) and large (40.3 g) egg classes. Chabro breed was better performer than Kuroiler breed for all three egg weight classes of eggs. The average weight of day old chick was increased in Chabro breed by 1.7%, 2.03% and 2.15% for small, medium and large classes, respectively over Kuroiler breed.

IN-PLANTA PRODUCTION OF FUNGAL SECONDARY METABOLITES IN RICE INFECTED WITH *FUSARIUM FUJIKUROI* AND THEIR RELATION WITH BAKANAE DISEASE SYMPTOMATOLOGY

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Abstract

Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, New Delhi. The *Fusarium fujikuroi* Nirenberg (sexual stage: *Gibberella fujikuroi* (Sawada) Wollen worth) caused bakanae disease of rice has become a serious threat to cultivation of basmati rice in India and other growing nations. It produces different symptoms including crown or foot rotting, lanky, tall slender elongated culms with pale yellow flag leaves and sterile grains. The pathogen produces various secondary metabolites and mycotoxins like Gibberellic acid, Fusaric acid, Fumonisin, Bikaverin etc which affects the pathogen virulence and type of symptoms produced. The different abiotic factors might play a role in the production of different kind of symptoms and the production of various secondary metabolites by the pathogen. The current study aimed to understand the *in-planta* production of various fungal secondary metabolites in the *Fusarium Fujikuroi* infected plants showing various symptoms. The plants grown under different moisture concentration showing distinct symptoms were selected and the selected secondary metabolites were extracted from both inoculated and control plants and the extracted samples were run in HPLC. The standards of the metabolites were purchased and subjected to HPLC run under same set of parameters. Highest gibberellic acid (486.13 µg/gm) was produced by plants showing elongation symptoms. Fusaric acid (48.04 µg/gm) was produced highest in plants exhibiting rotting symptoms. The Fumonisin B1 was produced in the range of 1.1 µg/gm to 1.55 µg/gm but no correlation was found between FB1 production and symptom development. The moisture level of soil was found to affect the disease severity and symptomatology. The disease severity was found to be inversely correlated with soil moisture level and high moisture lead to production of stem elongation whereas rotting was prevalent in low moisture conditions.

OVERVIEW OF EPIGENETICS IN CROP IMPROVEMENT

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ABSTRACT

The study of epigenetics in plants has a long and rich history, from initial descriptions of non-Mendelian gene behaviors to seminal discoveries of chromatin-modifying proteins and RNAs that mediate gene silencing in most eukaryotes, including humans. All of the major epigenetic mechanisms known to occur in eukaryotes are used by plants, with the responsible pathways elaborated to a degree that is unsurpassed in other taxa. DNA methylation occurs in CG, CHG, and CHH sequence contexts in plant genomes, in patterns that reflect a balance between enzyme activities that install, maintain, or remove methylation. As in other eukaryotes, histone-modifying enzymes influence epigenetic states in plants and these enzymes are encoded by comparatively large gene families, allowing for diversified as well as overlapping functions. RNA-mediated gene silencing is accomplished using multiple distinct pathways to combat viruses, tame transposons, orchestrate development, and help organize the genome. The interplay between DNA methylation, histone modification, and noncoding RNAs provides plants with a multilayered and robust epigenetic circuitry. Epigenetic variations are involved in the control of plant developmental processes and participate in shaping phenotypic plasticity to the environment. Intense breeding has eroded genetic diversity, and epigenetic diversity now emerged as a new source of phenotypic variations to improve adaptation to



changing environments and ensure the yield and quality of crops. Here, we review how the characterization of the stability and heritability of epigenetic variations is required to drive breeding strategies, which can be assisted by process-based models. We propose future directions to hasten the elucidation of complex epigenetic regulatory networks that should help crop modellers to take epigenetic modifications into account and assist breeding strategies for specific agronomical traits. Broadening crop phenotypic diversity is a key issue facing the challenge of sustainable food security and crop adaptation to ongoing climate changes. Chromatin marks and epigenetic regulatory mechanisms are essential to the control of plant developmental processes and in shaping plant phenotypic plasticity, including adaptive responses to environmental stresses. Stability and heritability features of epigenetic marks and knowledge of epigenetic regulatory mechanisms are crucial for breeding applications.

MOLECULAR BREEDING COUPLED WITH SPEED BREEDING FOR CROP IMPROVEMENT

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ABSTRACT

The ever-increasing human population and a changing environment have raised significant concern for global food security. The conventional plant breeding methods exploit already existing genomic variation in plants to develop a new variety in 8 to 10 years, which can decrease the genetic variability of the plant's genome. In order to increase food production in less time, there is a dire need to improve breeding methods. Several molecular breeding methods like marker assisted selection, marker assisted backcross, marker assisted recurrent selection, gene pyramiding and genomic selection are being used to improve various crop traits. Molecular researchers have developed new genome editing tools like CRISPR/Cas9, which opened a new door to a new plant breeding era. Moreover, a newly developed method "Speed Breeding" has revolutionized the agriculture by shortening the crop cycle. It can produce 5-6 generations of cereals in a year.

ISOLATION, CHARACTERIZATION AND EVALUATION OF PLANT GROWTH PROMOTING RHIZOBACTERIA AND THEIR INFLUENCE ON GROWTH PERFORMANCE OF CUMIN (*CUMINUM CYMINUM*)

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ABSTRACT

A total of 152 isolates were isolated from 155 samples (cumin roots and rhizospheric soil) were collected from cumin growing districts of Rajasthan. Those isolates were characterized and evaluated for phosphate solubilization, potassium solubilization and zinc solubilization, antagonistic activity and plant growth promoting traits. In first stage of screening 70 isolates were screened out for P, K and Zn solubilization. The highest, soluble P (326 g ml⁻¹) in pikovskaya's broth, K (48.56 g ml⁻¹) in aleksandrow broth and (Zn 419 g ml⁻¹) in zn solubilizing medium broth were recorded in bacterial isolate DCU-251(*Pseudomonas aeruginosa* strain NRCSSDCU251 Accession no. MN192165), DCU-351(*Pseudomonas aeruginosa* strain NRCSSDCU351 Accession no. MN192167) and DCU-451 (*Pseudomonas aeruginosa* strain NRCSSDCU451 Accession no. MN192168), respectively. The growth inhibition of *Fusarium oxysporum* sp. *cumini* in plate was found in the range of 26.2- 61.2% while, that of in broth medium, ranged from 3.3-79.9 %, the maximum growth inhibition of *Fusarium oxysporum* sp. *cumini* was 61.2% recorded due to isolate DCU-451. Similarly, the growth inhibition of *Alternaria brunsii* in plate was found in the range of 24.2-54.2% while that of in broth medium, ranged from 24.1-81.8 %, the maximum growth inhibition of *Alternaria brunsii* was recorded due to isolate DCU-251. The maximum, IAA (38. µg ml⁻¹) and gibberellic acid (34.5 µg 25ml) production were recorded in isolate DCU-451. The highest, germination percentage (86.66), seedling length (7.83 cm plant⁻¹), seedling fresh weight (145.18 mg plant⁻¹), seedling dry weight (14.03 mg plant⁻¹), seedling vigour Index-I (687.5) and seedling vigour index-II (1211.16) were recorded in seed treatment with isolate DCU-451. Similarly, the highest no. of primary branches, secondary branches, umbels plant⁻¹, umbelletes umbel⁻¹ and Number of seeds



umbellete⁻¹ were also recorded in DCU-451. The maximum, plant height (33.86 cm), seed yield (3.21 g plant⁻¹), straw yield (5.53 g plant⁻¹) N-uptake by seed (87.63 mg plant⁻¹), K-uptake by seed (47.5 mg plant⁻¹), Zn-uptake by seed (219.78 g plant⁻¹) and Zn-uptake by straw (175.52 g plant⁻¹) were recorded due to seed treatment with isolate DCU-451. The maximum P-uptake by straw was 15.34 mg plant⁻¹ followed by 10.70 mg plant⁻¹ recorded with isolate DCU-251 (*Pseudomonas aeruginosa* strain NRCSSDCU251 Accession no. MN192165) and DCU-651 (*Bacillus pacificus* strain NRCSSDCU651 Accession no. MN192170), respectively. The maximum P-uptake by seed was 22.89 mg plant⁻¹ followed by 20.41 mg plant⁻¹ associated with isolate DCU-251 and DCU-262 (*Kosakonia oryzendophytica* strain NRCSSDCU262 Accession no. MN192166), respectively. Keeping in view of experimental findings, it can be concluded that isolate DCU-451 (*Pseudomonas aeruginosa* strain NRCSSDCU451 Accession no. MN192168) can be used as PGPR biofertilizer for cumin crop in order to enhance eco-friendly sustainable production.

INFLUENCE OF COMBINATIONS OF *RHIZOBIUM* AND PHOSPHATE SOLUBILIZING BACTERIA ON NODULATION BEHAVIOR OF KULTHI (*DOLICHOS BIFLORUS*)

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ABSTRACT

This investigation was conducted in the greenhouse of the Department of Agril. Microbiology, IGKV, Raipur, Chhattisgarh, to evaluate effective combinations of *Rhizobium* and PSB isolates which have ability to increasing root nodulation (no. of nodules per plant, root biomass), N uptake by nodules by sand grown kulthi when used as biofertilizer. Plants were allowed to grow up to 45 days under sand culture, data of plant biomass revealed that the highest dry shoot weight was (0.156 gm/plant) associated with combination of Rhz-10+PSB-142 followed by isolate Rhz-10+PSB-184 (0.137 gm/plant). Similarly, highest dry wt. of nodules was observed 1.70 mg/plant due to combinations of Rhz-10+PSB-142 followed by isolate Rhz-10+PSB-118 (1.52 mg/plant), while the highest number of nodules (6.33 per plant) associated with combination of Rhz-10+PSB-142 followed by Rhz- 10+PSB-118 (5.66 per plant). The shoot N accumulation study of the same sand culture experiment indicated that highest shoot N-uptake associated with combination of Rhz- 10+PSB-142 (4.57 mg/plant) followed by Rhz-10+PSB-184 (3.94 mg/ plant). These results could be attributed to the ability of this combine isolates to fixing of atmospheric nitrogen and solubilize phosphorus already present in the soil. However, the combination of isolates Rhz-10+PSB-142 has shown highest increase in most effective parameter i.e. N accumulation by kulthi plant due to effective fixing of atmospheric N and solubilisation of P in the experimental soil.

STUDY ON SOCIO-ECONOMIC PROFILE AND SUGGESTION FOR IMPROVING JOB SATISFACTION OF TEACHERS OF MPUAT, UDAIPUR

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ABSTRACT

This study was an attempt to study the socio-economic profile of teachers and to explore suggestions for improving job satisfaction of teachers of MPUAT, Udaipur. The present study was conducted in purposely selected state agriculture university Maharana Pratap University of Agriculture & Technology, Udaipur. It was planned to have a sample of 160 teachers for this study. Data were collected through tailor made questionnaire. The study discloses that out of 160 teachers most of them 85 (53.13%) teachers belonged to medium age group i.e., 42 – 57 years, 80.00 per cent were male teachers, 97.50 per cent were married, 50.63 per cent teachers were working as Professor, most of the teachers 41.88 per cent having their salary between Rs. 82000 to Rs. 1, 94000, 106 (66.25%) teachers were having medium service experience between 11years to 30 years, 154 teachers were possessing Ph. D. degree, 56.30 per cent teachers belonged to the urban area and 85 (53.10%) teachers were living in nuclear family. The study revealed that the suggestion ‘opportunity of recognition and rewards for every employee of the university’ was given by majority i.e., 31 (19.37%) teachers and it was ranked first. The statement ‘Timely availability of pension fund for retired faculty members’ was given by 28 (17.50%) teachers and was ranked second.



AN OVERVIEW : FUNGAL BIOLOGICAL ENTOMOPATHOGENIC CONTROL OF LOCUST

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ABSTRACT

Locusts are a group of several short-horned grasshoppers with a swarming mechanism in the Acrididae family. India has in the past encountered several plagues of locust, upsurge, and incursion. Nevertheless, desert locust is a solitary process, *Schistocerca gregaria* F. In or around Rajasthan and Gujarat, India, has been reported from time to time. Entomopathogenic fungi are typically present within natural insect populations and are often solely considered as effective microbial control agents in integrated pest management. The use of fungal insect pathogens may have certain advantages over the use of parasitoids and insecticides such as efficiency and environmental safety. Once locusts come into contact, they multiply in the body, and at the same time, they continuously produce crystals of berberine (macrolipid toxin) and calcium oxalate. These substances can cause insect poisoning, change the function of body fluid discovery, disrupt metabolism, and cause death. The fungal structure can penetrate the locust's body wall, enter the locust, use the locust nutrition to reproduce and secrete toxins, and make the locust sick and die within 5–12 days.

INTEGRATED FARMING SYSTEM APPROACH FOR FOOD SECURITY AND ECONOMIC SAFETY

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ABSTRACT

Ensuring higher productivity, profitability, gainful employment and adequate supply of food, feed, fodder and fiber for growing human and livestock population along with maintaining environmental sustainability are major challenges in agricultural production system. The farming system research that began in early eighties derives its tools from rich indigenous knowledge accumulated over the ages for resilience and amalgamated it with the scientific innovation to achieve higher levels of production, while managing the fragile resource base. Owing to risky crop production, major area being dominated by monoculture, the need for diversification in some of the area is clear since the income of farmers which depend solely on the produce of their traditional crop pattern is decreasing due to narrow margin of profitability and changed food consumption habits. So, in order to avoid loss from aberrant weather conditions land is put to alternate uses with components like agroforestry, agri-horticulture, agri-pasture, horti -pasture, dairy, goatery, poultry, fishery etc. The integrated farming system approach recorded higher productivity, profitability and employment generation. Efficient nutrient recycling made the model sustainable and eco-friendly.

RICE-WHEAT CROPS : ESTABLISHMENT TECHNIQUES AND WEED FLORA DIVERSITY

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ABSTRACT

Diverse weed flora and excessive weed pressure is an important issue in the way to sustainable agriculture. Due to intensive cultivation of rice–wheat sequence, the weed flora simplified with grasses. Weeds compete with the main plants for light, water and nutrients and in turn decrease overall land productivity of the system as a whole. Changes in establishment method, technology and weed management practices in dry direct-seeded rice resulted in diverse weed composition. Research has shown that divergent tillage systems affected weed biomass significantly. The number of weeds ha⁻¹ was 54 percent higher in zero tilled (ZT) plots than in conventional tilled (CT) plots and the weed biomass was significantly higher in ZT plots (0.39 t ha⁻¹) than in CT plots (0.27 t ha⁻¹). Under conventional tillage (CT), however, weeds are deeply buried as per tillage and deeply buried weeds are not having enough chances to proliferate better due to lesser water, light and nutrients. The soil



disturbance caused by tillage systems places weed seeds at different depths, which differ in availability of moisture, diurnal temperature fluctuation and light exposure, and activity of predators. All these attributes have the potential to influence the behaviour of weed seed banks. Integrated weed management is the best option to control the new emerging weeds in a more sustainable way.

SEASONAL INCIDENCE OF INSECT PESTS OF FENUGREEK AND SCREENING OF DIFFERENT VARIETIES/GENOTYPE AGAINST *ACYRTHOSIPHONPISUM* (HARRIS)

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ABSTRACT

An investigations on “Management of insect-pests of fenugreek, (*Trigonella foenum graecum*L.) with special reference to aphid *Acyrtosiphonpisum* (Harris)” was conducted at Agriculture Research Station, Bikaner during *Rabi*, 2014-15. The seasonal incidence of *A. pisum* on fenugreek started in third standard meteorological week and reached peak in seventh standard meteorological week during *Rabi*, 2014-15. Significant positive correlation was found between aphid population and maximum temperature, while minimum temperature and rainfall showed non-significant positive correlation. However, average relative humidity had non-significant negative correlation. Out of ten fenugreek varieties/genotypes screened for their relative susceptibility against aphid, none of the variety/ genotype was immune to the aphid attack. RMt-143, UM- 330 and RMt-305 were less susceptible, RMt-361, RMt-351, RMt-1 and UM-202 rated as moderately susceptible. However, RMt-303, RMt-365 and UM-354 emerged highly susceptible. The days to 50 per cent flowering was positively correlated with peak aphid population, whereas, pods per plant, seeds per pod and plant height had negative correlation.

PARTICIPATION AND PROBLEMS OF TRIBAL FARMERS IN EMPLOYMENT GENERATION ACTIVITIES: AN ANALYTICAL STUDY

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ABSTRACT

This study was attempt to get the response regarding extent of employment generated among tribal beneficiaries and constraints faced by the tribal farmers in taking up employment generation activities organized by KVK in Dungarpur district of Rajasthan. A complete list of vocational training beneficiaries of KVK Dungarpur was prepared and 100 respondents were selected randomly in the sample of the study. Findings revealed that majority of respondents i.e. 56.00 percent of total respondents reported participation in training on dairy management to a great extent, whereas, 63.00 per cent respondents reported participation in training on propagation of plant to some extent. It may be concluded that participation in most of the employment generation trainings of KVK was moderate and more efforts are required to encourage their participation in these training which can provide employment to beneficiary farmers in a real meaning. Results found that lack of skill about employment generation activities, timely unavailability of seeds, lack of credit facility, lack of training institution for training of farmers/ farm women, fatalistic attitude towards employment generation activity etc. were important problems perceived by the tribal farmers in taking up employment generation activities.