5th International Conference in Hybrid Mode on

INNOVATIVE AND CURRENT ADVANCES IN AGRICULTURE AND ALLIED SCIENCES

10-16 July 2023

Souvenir & Conference Book (ICAAAS-2023)

Chief Editor : **Dr. S.P. Singh**

Organized By

Society for Scientific Development in Agriculture and Technology
MEERUT (U.P.) INDIA

In Collaboration with

Astha Foundation, Meerut, UP, INDIA
CSAUAT, Kanpur UP, INDIA
HPU, Shimla HP, INDIA
UAS, Raichur Karnataka, INDIA
BAU, Ranchi JH, INDIA
ICAR-CIFE Mumbai Maharashtra, INDIA
AFU, Rampur Chitwan, NEPAL
NPU, Palamu Jharkhand, INDIA
KSNUAHS, Shivamoga Karnataka, INDIA
RK (PG) College Shamli, U.P., INDIA

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Innovative and Current Advances in Agriculture and Allied Sciences

(ICAAAS-2023)

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Society for Scientific Development in Agriculture & Technology

MEERUT (U.P.) INDIA

In Collaboration with

Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (U.P.) INDIA

Himachal Pradesh University, Summer Hill, Shimla (H.P.) INDIA

University of Agricultural Sciences, Raichur, Karnataka, INDIA

Birsa Agricultural University, Ranchi, Jharkhand, INDIA

ICAR-Central Institute of Fisheries Education, Mumbai, Maharashtra, INDIA

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Rashtriya Kisan Post Graduate College, Shamli (U.P.) INDIA

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Published By : ASTHA FOUNDATION, MEERUT

सत्यमेव जयते

नरेन्द्र सिंह तोमर
NARENDRA SINGH TOMAR

कृषि एवं किसान कल्याण,
ग्रामीण विकास और पंचायती राज मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली

MINISTER OF AGRICULTURE & FARMERS WELFARE
RURAL DEVELOPMENT & PANCHAYATI RAJ
GOVERNMENT OF INDIA
KRISHI BHAWAN, NEW DELHI

MESSAGE

It gives me immense pleasure that the **Society for Scientific Development in Agriculture and Technology,** Meerut (U.P.) India is organizing a seven days 5th International Conference in Hybrid Mode on **"Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS-2023)"** in Collaboration with CSAUAT Kanpur U.P., UAS Raichur Karnataka, BAU Ranchi Jharkhand, KSNUAHS Shivamogga Karnataka, HPU Shimla H.P., ICAR-CIFE Mumbai Maharashtra, AFU Rampur Chitwan Nepal, NPU Palamu Jharkhand, RK (PG) College Shamli U.P. and Astha Foundation Meerut (UP) India, during 10-16 July 2023 at Hotel Howard Johnson by Wyndham Bur Dubai, Khalid Bin Al Waleed Rd-Al Raffa-Dubai, UAE.

I hope the issues pertaining to various aspects of science and technology and their dissemination to the end user will be deliberated and discussed by the delegates, at length, during the conference in order to come out with certain adoptable low-cost, location specific recommendations for the benefit of the people at global level.

I convey my best wishes for great success of the conference and complement to organizers.

(Narendra Singh Tomar)

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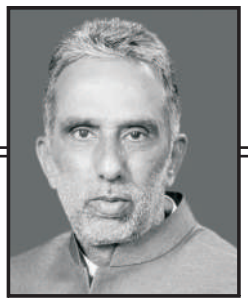
कृष्ण पाल गुर्जर
Krishan Pal Gurjar



सामाजिक न्याय और अधिकारिता राज्य मंत्री
भारत सरकार
MINISTER OF STATE FOR
SOCIAL JUSTICE & EMPOWERMENT
GOVERNMENT OF INDIA

MESSAGE

It is a great to welcome you all to the 5th International Conference in Hybrid Mode on **"Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS-2023)"** which is being held during 10-16 July 2023 at Hotel Howard Johnson by Wyndham Bur Dubai, Khalid Bin Al Waleed Rd-Al Raffa-Dubai, UAE organized by Society for **Scientific Development in Agriculture and Technology, Meerut (U.P.) India** in collaboration with CSAUAT Kanpur U.P., UAS Raichur Karnataka, BAU Ranchi Jharkhand, KSNUAHS Shivamogga Karnataka, HPU Shimla H.P., ICAR-CIFE Mumbai Maharashtra, AFU Rampur Chitwan Nepal, NPU Palamu Jharkhand, RK (PG) College Shamli U.P. and Astha Foundation Meerut (UP) India.

India has undergone a series of ups and down in agriculture production and food security playing havoc in the year of abnormality. Food Security in India can be achieved by playing higher attention to such as climate change, integrated water management, use the advanced agricultural techniques and pricing etc. New technologies will be make it possible for sustainable agriculture.

I express my sincere thanks to the organizers for organize such kinds of International Conference to exchange the idea for the growth of Agriculture and Allied Sciences.

Krishan Pal Gurjar

National Academy of Agricultural Sciences

Prof. Anil Kumar Singh
Prof. Anil Kumar Singh
Vice-President

MESSAGE

It is a matter of great pleasure to know that **Society for Scientific Development in Agriculture and Technology, Meerut (U.P.) India** in collaboration with CSAUAT Kanpur U.P., UAS Raichur Karnataka, BAU Ranchi Jharkhand, KSNUAHS Shivamogga Karnataka, HPU Shimla H.P., ICAR-CIFE Mumbai Maharashtra, AFU Rampur Chitwan Nepal, NPU Palamu Jharkhand, RK (PG) College Shamli U.P. and Astha Foundation Meerut (UP) India are organizing a seven days 5th International Conference in Hybrid Mode on **"Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS-2023)''** during 10-16 July 2023 at Hotel Howard Johnson by Wyndham Bur Dubai, Khalid Bin Al Waleed Rd-Al Raffa-Dubai, UAE.

Agriculture is no longer an activity for substenance only it has to be considered as a commercial enterprise in which profitability and sustainability are both equally vital. Farming has to be technology driven with a clear cut focus on reducing cost of cultivation and enhancing productivity and quality of produce. It has to be knowledge based. Without application of science and technology in agriculture and allied fields, the sustainability would remain uncertain considering the challenges being faced by the Agriculture sector worsen by the climate change impacts. It requires a multi- pronged approach to manage natural resources sustainably, enhanced productivity link the production system to storage, processing & value addition and marketing in order to make the entire system, vibrant and employment oriented. I feel that in this conference, the learned delegates will deliberate on burring issues and challenges facing the farming community with emphasis on small and marginal farmers and come out with tangible suggestions. I hope that the outcome of the Conference will help in developing strategies and an action oriented road map to promote sustainable and profitable agriculture.

I wish the conference a grand success and congratulate the organizers for their judicious planning and hard work in making this kind of academic interface.

(A.K.Singh)

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UNIVERSITY OF AGRICULTURAL SCIENCES, RAICHUR

[ICAR, NAAC accredited and UGC u/s 12(B) & 2(f) approved]

Dr. M. HANUMANTHAPPA
M.Sc.(Agri.), Ph.D., PGDAEM
Vice-Chancellor

Message

It is a matter of great pleasure to know that **Society for Scientific Development in Agriculture and Technology, Meerut** in collaboration with CSAUAT, Kanpur, U.P.; UAS, Raichur, Karnataka; HPU, Shimla, H.P.; BAU, Ranchi, Jharkhand; ICAR-CIFE, Mumbai, Maharashtra; KSNUAHS, Sivamogga, Karnataka;AFU, Rampur Chitwan, Nepal and Astha Foundation, Meerut, U.P., India are organizing a Seven days 5th International Conference in hybrid mode on **"Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS-2023)"** during 10–16July, 2023 at Hotel Howard Johnson by Wyndham Bur Dubai, Khalid Bin Al Waleed Rd-Al Raffa-Dubai, UAE.

We are the country with more than 50 percent of our population still dependent on agriculture. It is a challenging fact that even after one decade of twenty-first century. There are ample evidences available that relatively low productivity in our agriculture is due to suboptimal performance related to management aspects rather than low potential. Therefore, the developing countries like us, having optimal potential in the field of technology and services will take strong steps towards second green revolution. I am extremely confident that the discussion among professionals, exchange of ideas, issue and findings during the event will certainly make a far reaching impact on our agriculture system.

I am sure that this event will open new facets and dimensions to bring solutions of the alarming issues before scientific community working towards food security of India and abroad.

I express my warm greetings on the occasion and extend my best wishes to the organizers.

[M. Hanumanthappa]
Vice chancellor

बिरसा कृषि विश्वविद्यालय
BIRSA AGRICULTURAL UNIVERSITY
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डॉ. ओंकार नाथ सिंह
Dr. Onkar Nath Singh
कुलपति
Vice-Chancellor

Ref. No. : .....

Date : .....

MESSAGE

Innovations can only have the answers to plateauing yield stagnation in crop productivity levels. With Challenges in several fronts as reduced land availability and increased demand for food production, crop production is being intensified through higher fertilizer inputs and cropping. The increase in production has to be achieved under conditions of declining and deteriorating land, soil and water resources and at the same time preserving the environmental quality. It will be indeed difficult to meet these daunting challenges only with the application of conventional techniques and tools, as no headway is being made through these approaches. To address the emerging challenges opportunities have to be identified to meet crop production and productivity targets so that the novel variability can be created and harnessed across the species and kingdoms. It is in this context, the seven days 5th International Conference in Hybrid Mode on **"Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS-2023)"** organized by Society for **Scientific Development in Agriculture and Technology, Meerut (U.P.) India** in collaboration with CSAUAT Kanpur U.P., UAS Raichur Karnataka, BAU Ranchi Jharkhand, KSNUAHS Shivamogga Karnataka, HPU Shimla H.P., ICAR-CIFE Mumbai Maharashtra, AFU Rampur Chitwan Nepal, NPU Palamu Jharkhand, RK (PG) College Shamli U.P. and Astha Foundation Meerut (UP) India, during 10-16 July 2023 at Hotel Howard Johnson by Wyndham Bur Dubai, Khalid Bin Al Waleed Rd-Al Raffa-Dubai, UAE.

The conference will provide a common platform for all the stake holders to share their Innovations/experiences and expertise to better understand the challenges posed by emerging problems in agriculture and to fine-tune future strategies/approaches for addressing such stresses in different areas of agriculture and allied sciences. I convey my greetings and best wishes to organizers and delegates for their joint venture for the success of these seven days International Conference.

(O.N. Singh)

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E-mail : vc@bauranchi.org, Website : www.bauranchi.org

भारतीय कृषि अनुसंधान परिषद
भा.कृ.अनु.प.-केन्द्रीय मात्स्यिकी शिक्षा संस्थान, मुंबई
(वि.अ.आ. अधिनियम धारा-३ के अंतर्गत विशविद्यालय)
ICAR - CENTRAL INSTITUTE OF FISHERIES EDUCATION
(University under Sec.3 of UGC Act)
कृषि एवं किसान कल्याण मंत्रालय, भारत सरकार, Ministry of Agriculture and Farmers Welfare, Govt. of India

डा.रविशंकर सी.एन.
निदेशक / कुलपति
Dr. Ravishankar C.N.
Director / Vice Chancellor

MESSAGE

Innovations can only have the answers to plateauing yield stagnation in crop productivity levels, with challenges in several fronts as reduced land availability and increased demand for food production, crop production is being intensified through higher fertilizer inputs and cropping. The increase in production has to be achieved under conditions of declining and deteriorating land, soil and water resources and at the same time preserving the environmental quality. It will be indeed difficult to meet these daunting challenges only with the application of conventional techniques and tools, as no headway is being made through these approaches. To address the emerging challenges opportunities have to be identified to meet crop production and productivity targets so that the novel variability can be created and harnessed across the species and kingdoms. It is in this context, the of three days VIIth International Conference in hybrid mode on **"Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS-2023)"** organized by **Society for Scientific Development in Agriculture and Technology, Meerut (U.P.) India** in collaboration with Collaboration with CSAUAT Kanpur U.P., UAS Raichur Karnataka, BAU Ranchi Jharkhand, KSNUAHS Shivamogga Karnataka, HPU Shimla H.P., ICAR-CIFE Mumbai Maharashtra, AFU Rampur Chitwan Nepal, NPU Palamu Jharkhand, RK (PG) College Shamli U.P. and Astha Foundation Meerut (UP) India, during 10-16 July 2023 at Hotel Howard Johnson by Wyndham Bur Dubai, Khalid Bin Al Waleed Rd-Al Raffa-Dubai, UAE.

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Ravishankar C. N.

डा. रविशंकर सी.एन./ Dr. Ravishankar C.N.
निदेशक / कुलपति / Director / Vice Chancellor
भा. कृ. अनु. प.-केन्द्रीय मत्सिकी शिक्षा संस्थान
ICAR-Central Institute of Fisheries Education
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Nilamber-Pitamber University

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MESSAGE

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Agriculture is the most important sector of Indian Economy which employs more than half of the population in country. It is also known as the backbone of economy contributing about 16% of total GDP and 10% of total exports in India's economy. There are ample evidences available that relatively low productivity in our agriculture is due to suboptimal performance related to management aspects rather than low potential. Therefore, the developing countries like us, having optimal potential in the field technology and services will have to take strong step towards second green revolution. I am findings during the event will certainly make a far-reaching impact on our agriculture system.

I am sure that this event will open new facets and dimensions to bring solutions of the alarming issue before scientific community working to wards food security.

I express my warm greeting on the occasion and extend my best wishes to the organizers.

(Ram Lakhan Singh)

Astha Foundation®

Dr. S.P. Singh
President

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MESSAGE

Our earth provide the basis for food production. The interaction of different enterprises with different cultures in different climates results in the need for unique approaches to sustainable agricultural systems in each situation. The transition to systems that are both sustainable and sufficiently intense to support the increasing density of human population will be faster or slower depending on the resources available. The renewed recognition of the sustainable resource management for assuring food security and the fundamental role in climate change adaptation and mitigation has triggered numerous projects, initiatives and actions on a global scale. But fertile soils are limited and are increasingly under pressure by competing land uses for cropping, forestry, and pasture/rangeland but also for energy production, settlement and infrastructure, raw materials extraction, etc. Sustaining and feeding the growing population of the world and meeting their needs for biomass (energy), fibre, fodder and other products will be the guiding principles and drivers of future research thrusts on a global scale.

Agriculture in India is highly diversified and crops are grown in diversified environments viz., water logged to rainfed uplands, jhums to deep water, high humid to arid temperatures and flood prone to dry lands. Frequent occurrence of abiotic stresses such as drought and submergence has been identified as the key to the low productivity of rainfed ecosystems. Value addition is the key coupled with rapid technological interventions will upscale the productivity of the small and marginal farmer's of India. It is not recent, significant changes are already happening even in the parched, hungry, degraded lands. The **Astha Foundation and SSDAT,** Meerut, UP, India has played significant role in providing suitable forum for exchange of ideas, encouraging research and disseminating knowledge of sustainable agriculture and allied sciences to researchers.

Climate regulation as well as biodiversity conservation and other cultural services, increasing land use changes are threatening this resource and urgent action is needed to reverse this trend if we want to assure the necessary food production for future generations.

5th International Conference in Hybrid Mode on **''Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS-2023)''** during 10-16 July 2023. The thematic areas chosen for the conference will be very useful for the researchers, development agencies and farmers of the country to understand the practical problems in the agricultural development of our country. Scientists have been at the forefront of our agricultural development in past. They are required to play still more critical role in ensuring sustainable agriculture development. I am sure that conference will address various aspects related to increasing productivity and food & nutritional security. Technologies have helped wipe out malnutrition and hunger and reinvigorating the innovations will spearhead path. I am sure that the outcome of this conference would be very meaningful and will be of immense use for scientists, extension workers and farmers.

S.P. SINGH
Organizing Chairman
ICAAAS-2023

ABOUT ICAAAS

Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS) is a brain child of **Society for Scientific Development in Agriculture and Technology** to bring scientists, researchers, academicians and all stake holders from throughout the globe for the betterment of humanity with the involvement of all the branches of sciences and related field. The five different themes of sessions were planned for the ICAAAS and these themes itself explains the vision of ICAAAS. These themes of sessions are :

1. Innovation in Crop Improvement, Biotechnology, Genetic Engineering, Precision Horticulture, Agroforestry and Impact of Climate Change on Biodiversity and Food Security.
2. Advances in Disease and Pest Management, Livelihood and Sustainable Management Practices, Post-Harvest Technology, Food Processing and Value Addition for Augmenting Farmer's Income.
3. Key Factor for Crop Productivity: Cropping System, Agronomic and Soil Health Management Practices, Farm Mechanization, Indigenous Technical Knowledge and IPR Issues.
4. Recent Advances in Animal Health, Animal Nutrition & Husbandry, Dairy, Poultry and Fisheries Technology.
5. New Frontiers in Physical, Chemical, Mathematical, Biological, Social Sciences, Remote Sensing, Smart Agriculture, Information Technology, Digital Library and Huminities.

The **first ICAAAS** conference was organized in collaboration with Professor Jayashankar Telangana State Agriculture University, Rajendranagar, Hyderabad (Telangana); Society for Scientific Development in Agriculture and Technology (SSDAT), Meerut (U.P.) and Astha Foundation, Meerut. It held during 10-11th December, 2016 at Professor Jayashankar Telangana State Agriculture University, Rajendranagar, Hyderabad (Telangana). During the conference, 29 lead papers were presented along with 630 oral and poster presentation in eleven different themes. It received overwhelming response with the registration of more than 700 participants. All the lead cum invited papers and abstracts of oral and poster presentations were compiled in souvenir and conference book and published with ISBN number. The lead papers in the conference covered almost all the important areas of agriculture and related fields starting from global research initiatives for sustainable agriculture, plant molecular farming status, opportunities and challenges, association mapping in plants, forages as an alternative for diversification of agriculture to backyard poultry farming, strategies for enhancing organic farming profitability, molecular detection of animal diseases, yield gap analysis, newer approaches for weed management and livestock based integrated farming system. Many new emerging topics were also delivered during the conference like nano-fertilizers, bio pest management, genome mapping, heavy metal tolerance and clearance, advancement in food processing technologies etc. Overall it was a great fusion of traditional to latest knowledge for the betterment of society.

The **second ICAAAS** International Conference was organized during 27 January to 01 February, 2020. It was organized by Society for Scientific Development in Agriculture and Technology (SSDAT), Meerut (U.P.) and Astha Foundation, Meerut at Hotel Ramada D'Ma, 1091/388 New Petchburi Road 33, Bangkok 10400 Thailand. This conference was bestowed with 09 lead papers and 90 oral and poster presentations in eleven themes with more than 1000 registrations in the conference. All the lead cum invited papers and abstracts of oral and poster presentations were compiled in souvenir and conference book and published with ISBN number. This conference was poured with the knowledge and experience of scientific stalwarts and focused on the doubling the farmers income: a vision of new government of India. It had invited paper on "doubling farmers income through innovative agricultural and allied technology" and related topics like financial inclusion for developing nations, intellectual property rights on biodiversity conservation, advances in post harvest technologies and their applications, various strategies for the disease control in animals and vaccine developments with new generation diagnostics. Many of the crops like rapeseed, cowpea, maize and millets were on the focus of experts and duly addressed. The issues of breeding management for quality seed production, market security in contract farming, nutritional management of soil for optimum output of crops and better management of natural resources e also discussed by the experts during their deliberations and accordingly recommendations were prepared and submitted to respective agencies.

The **third ICAAAS** International Conference is being organized during 19-21st July, 2021 from the headquarter of Society for Scientific Development in Agriculture and Technology (SSDAT). Considering the post pandemic effect and travel restrictions, it is being organized in collaboration with Astha foundation, Meerut (U.P.); Chandra Shekhar Azad University of Agriculture

& Technology, Kanpur (U.P.); Indira Gandhi Krishi Vishwavidhyalay, Raipur (Chattisgarh); University of Agriculture and Horticulture, Shivamoga (Karnataka), Bihar Agricultural University, Ranchi, Jharkhand and Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan on online mode. In spite of corona pandemic it has received overwhelming response with more than 1000 registrations and presentation of more than 450 oral and posters during three days conference, As usual 11 themes will have lead cum invited papers of experts of national and International reputes in respective themes during the conference. All the lead cum invited papers and abstracts of oral and poster presentations have been compiled in souvenir and conference book and being published with ISBN number. This time it will be also available on online mode at society website www.asthafoundation.in. This conference is going to address the current scenario on farmers bills and doubts of farming community on these bills. Many of the experts including some foreign experts are expected to deliver invited papers in different themes of conference. The presence of stalwarts from the different part of country is going to have excellent deliberations and outcomes to be recommended to responsible agencies for the betterment of farmers and dairy sectors.

The **fourth ICAAAS** International Conference is being organized in hybrid mode at the campus of Himachal Pradesh University (HPU), Shimla during 12-14th June, 2022 in collaboration of Astha Foundation, Meerut Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (U.P.); Bihar Agricultural University, Ranchi, Jharkhand; Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan; Hemvati Nandan Bahuguna University, Srinagar, (UKD); HASD, Mandi (HP) and HFRI, Shimla. This time more than 1000 registrations with 200 offline participation is expected including some foreign experts from Srilanka, Bangladesh and Nepal. It is carrying all 11 themes with some modifications. In spite of corona pandemic it has received overwhelming response with more than 1000 registrations and presentation of more than 415 oral and posters during three days conference, As usual 11 themes will have lead cum invited papers of experts of national and International reputes in respective themes during the conference. All the lead cum invited papers and abstracts of oral and poster presentations have been compiled in souvenir and conference book and being published with ISBN number. This time it will be also available on online mode at society website www.asthafoundation.in. This conference is going to address the current scenario on farmers bills and doubts of farming community on these bills. Many of the experts including some foreign experts are expected to deliver invited papers in different themes of conference.

In the continuation of fourth ICAAAS International Conference, 5th one is being organized in hybrid mode at July 10–16, 2023 at Hotel Howard Johnson by Wyndham Bur Dubai Khalid Bin Al Waleed Rd-Al Raffa-Dubai, UAE during 10-16th July, 2023 in collaboration of Astha Foundation, Meerut Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (U.P.); University of Agricultural Sciences, Raichur, Karnataka; Bihar Agricultural University, Ranchi, Jharkhand; Himachal Pradesh University, Shimla, H.P.; KSNUASH, Shivamogga, Karnataka; ICAR-CIFE, Mumbai, Maharashtra; NPU, Palamu, Jharkhand; AFU, Rampur Chitwan, Nepal and RKPG College, Shamli, U.P.

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INNOVATIVE AND CURRENT ADVANCES IN AGRICULTURE AND ALLIED SCIENCES (ICAAAS-2023)

S.P. Singh[1], Binay Kr. Chakraborty[2], Dilip Kumar Jha[3], Mahendra Singh[4], Gururaj Sunkad[5], B.V. Tembhurne[5], Y.K. Singh[1], P.B. Singh[6], Brijendra Singh[7], Netrapal Malik[1], Sudhir Kumar[1], Manoj Mishra[1], Rohit Rana[8], Harish Pal Bhati[9], Hiranmayee Nayak[10] and Princi[11]

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Agriculture plays a pivotal role in the Indian economy with over 58 per cent of rural households depending on agriculture as their prime means of livelihood. We are the country with more than 50 per cent of our population still dependent on agriculture. Human population of India has increased to 1210.2 million at a growth rate of 1.76 per cent in 2011 over 2001 (1028.7 million) and is estimated to increase further to 1530 million by 2030 (Census of India, 2011). On the other hand, our national food grain production for past 3-4 years is hovering around 234 million tonnes. This means, per capita food grain production is only about 193 kg per year. India is facing the challenge to achieve sustainable food security with shrinking land resources by producing an additional 50 million tonnes of food to meet the requirement of the prognosticated population of 1,000 million in the country.

Present and anticipated global food demands necessitate a significant increase in crop productivity in marginal farmlands. Biotic and abiotic stresses are major limiting factors for plant growth, development and crop productivity. Although every plant has some degree of innate tolerance and/or resistance to such stresses but for a successful crop there is need to improve the resistance levels of these crop plants to keep pace with the future food demands. Before the introduction of fertilizer responsive high yielding varieties (HYVs) in mid sixties, indigenous varieties of wheat, rice and maize were grown as rainfed or partially irrigated and generally with little fertilizer input. The low level of yields resulted in persistent food shortages in the country. Intensive agriculture, which implies harnessing of soil and water resources, genetic potential of plant and other inputs in a large measures, that has taken firm roots in the irrigated areas of India has no doubt succeeded in getting the country out of the "food trap". A 'ship to mouth' existence of the early fifties has been transformed into one of "farm to ship" reality. The country is now boasting of an enviable buffer stock of 50 million tonnes food grains and quantum jumps in productivity and production of wheat and rice. The input intensive modern agriculture, which has succeeded in ushering in an era of self-sufficiency in food grain production, has also brought in several environmental problems.

There are ample evidences available that relatively low productivity in our agriculture is due to suboptimal performance related to management aspects rather than low potential. Therefore, the developing countries like us, having optimal potential in the field of technology and services will take strong steps towards second green revolution. Global climate change with predicted 1.5-3.8°C increases in temperature by 2100 has to cause heat stress to create threats to agricultural production through high temperature and other abiotic stresses are clearly limiting factors for crops cultivated on marginal lands, crop productivity far and wide is often at the mercy of random environmental fluctuation. The unfavourable effects of heat stress can be mitigated by developing crop plants with improved thermo-tolerance using an assortment of genetic approaches. Acquiring thermo-tolerance is a lively progression by which considerable amount of plants resources are diverted to structural and functional maintenance to escape damaged caused by heat stress.

Investing in agriculture is one of the most effective ways of promoting agricultural productivity, reducing poverty and enhancing environmental sustainability. Making the transition to sustainable agriculture will not be possible without significant new investment to protect and enhance the efficiency of natural resource use and to reduce waste at all stages of production, processing and consumption. Fighting rural poverty has become the overriding priority in the new millennium.

Our agricultural scientists and technologists have to work for doubling the productivity of the available land under cultivation. While doing so, utmost care would have to be taken for various environmental and people related aspects leading to sustainable development. In recent years, enormous progress has been made in developing agriculture technology, cultivation and trade throughout the world. India is one of the richest countries in the world known for its biodiversity and natural resources. The green revolution helped in enhancement of crop quality and increases in production to a great extent. With the rapid industrialization and urbanization due to increase in population, the burden on natural resources is increasing apart from the environmental pollution. It is a matter of pride the scientific fraternity is taking initiatives to meet the challenges of degradation of land and water resources, loss of plant diversity due to the climatic changes and environmental pollution through continuous innovation, research and development.

Innovations can only have the answers to plateauing yield stagnation in crop productivity levels. With Challenges in several fronts as reduced land availability and increased demand for food production, crop production is being intensified through higher fertilizer inputs and cropping. The increase in production has to be achieved under conditions of declining and deteriorating land, soil and water resources and at the same time preserving the environmental quality. It will be indeed difficult to meet these daunting challenges only with the application of conventional techniques and tools, as no headway is being made through these approaches. To address the emerging challenges opportunities have to be identified to meet crop production and productivity targets so that the novel variability can be created and harnessed across the species and kingdoms. Agriculture plays an important role to meet food and development needs of the Indian population and also as a source of increasing national economy through trade. New Technologies are anticipated to play a major role in meeting nation's food security and in achieving Sustainable Development Goals of UN7 (for example- Goal 2: End Hunger, Achieve Food Security and Improve Nutrition, and Promote Sustainable Agriculture).

Innovations led development-Innovation-decision definition

Innovations – It is an idea, which is new one supposed to be adopted by the intended clientele. It may not always hold objectivity due to lapse of time since its discovery. According to Rogers (1983, 1995) the innovation – decision process is the process through which an individual or any decision making unit passes from first knowledge of an innovation, to forming an attitude towards the innovation, to a decision to adopt or reject, to implementation and use of the new idea, and to confirmation of this decision. This process consists of a series of actions and choices over time through which an individual or an organization evaluates a new idea and decides whether or not to incorporate the new idea into the ongoing system. This behaviour consists essentially of dealing with the uncertainty that is inherently involved in deciding about a new alternative to those previously in existence. The perceived newness of an innovation, and the uncertainty associated with this newness, is a distinctive aspect of innovation-decision making, compared to other types of decision making.

Innovation – decision process conceptualized to have five stages.

1. Knowledge 2. Persuasion 3. Decision 4. Implementation 5. Confirmation

Re-invention is defined as the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation. Re-invention often is beneficial to the adopters of an innovation. Flexibility in the process of adopting an innovation may reduce mistakes and encourage customization of the innovation to fit it more appropriately to local situations or changing conditions. As a result of reinvention, an innovation may be more appropriate in matching an adopter's pre-existing problems and more responsive to new problems that arise during the innovation-decision process. Recognition of the existence of Re-invention brings into focus a different view of adoption behaviour – instead of simply accepting or rejecting an innovation as a fixed idea, potential adopters on many occasions are active participants in the adoption and diffusion process, to give their own unique meaning to the innovation as it is applied in their local context. Adoption of an innovation is thus a process of social construction.

In a very short span of time, Genome Editing (GEd) Technology has demonstrated its potential applications in a wide range of sectors covering human and animal health, food, agriculture, microbial biotechnology, bio-economy, etc. These potential applications include, but are not limited to, improved crop protection and livestock breeding, improved animal welfare, modification of animal donors for xenotransplantation, products of microbial biotechnology, gene- and cell-based therapies to control diseases and prevent the inheritance of disease traits, control of vector-borne diseases such as Malaria, Dengue, Chikungunya, etc, biofuels, pharmaceuticals, and other high-value chemicals. Like with all new technologies, GEd technologies have dual-use potential and therefore involve both safety & security issues. Biotechnology offers safe and sustainable solutions to many environmental challenges. It is, therefore, envisioned that genome editing holds many promises

to improve environmental quality as well as the quality of life and related services. The genome editing technologies offer solutions to address several issues related to Human & Animal Welfare and Protection of Environment. The Genome Editing Technology offers to increase yield and productivity of agricultural crops to meet constantly increasing demand for food and food security optimally by protecting them from various biotic and abiotic stresses and various other traits. India is a fisheries giant with a total catch of about 3 million metric tons annually placing India among the world's top 10 fishing nations. India's livestock sector is also one of the largest in the world including broad spectrum of native breeds of cattle, buffalo, goats, sheep, swine, equine, camel and poultry with merits of adaptability to climate and nutrition, and resistance to diseases and stress. The national targets for production of livestock and poultry products are 61% for milk, 76% for meat, 91% for fish, and 169% for eggs by the year 2020 over the base year 1999. The production potential in livestock is not realized fully because of constraints related to feeding, breeding, health, etc. Frequent outbreaks of diseases like FMD, BQ, PPR, Brucellosis, Swine fever, and Avian Influenza, etc. continue to reduce productivity and production.

Nutritional genomics is a new and promising science area which can broadly be defined as the application of high throughput genomics (transcriptomics, proteomics, metabolomics/metabonomics) and functional genomic technologies to the study of nutritional sciences and food technology. The combination of genomics and molecular biology has created a new way for scientists to generate plant varieties, one that offers wider functional scope and greater precision than conventional plant breeding methods.

Multiple biotic and abiotic environmental stress factors affect negatively various aspects of plant growth, development, and crop productivity. Plants, as sessile organisms, have developed, in the course of their evolution, efficient strategies of response to avoid, tolerate, or adapt to different types of stress situations. The diverse stress factors that plants have to face often activate similar cell signalling pathways and cellular responses, such as the production of stress proteins, up regulation of the antioxidant machinery, and accumulation of compatible solutes. Stress can be understood as a stimulus or influence that is outside the normal range of homeostatic control in a given organism: if a stress tolerance is exceeded, mechanisms are activated at molecular, biochemical, physiological, and morphological levels; once stress is controlled, a new physiological state is established, and homeostasis is re-established. When the stress is retired, the plant may return to the original state or to a new physiological situation.

Abiotic stresses remain the greatest constraint to crop production. Worldwide, it has been estimated that approximately 70% of yield reduction is the direct result of abiotic stresses. Transgenic approaches are one of the many tools available for modern plant improvement programs. Gene discovery and functional genomics projects have revealed multitudinous mechanisms and gene families, which confer improved productivity and adaptation to abiotic stresses. These gene families can be manipulated into novel combinations, expressed ectopically, or transferred to species in which they do not naturally occur or vary. Hence, the ability to transform the major crop species with genes from any biological source is an extremely powerful tool for molecular plant breeding. Transgenic plants can be used as sources of new cultivars and they are also extremely useful as proof-of-concept tools to dissect and characterize the activity and interplay of gene networks for abiotic stress resistance.

Swaminathan D. (1998) stated that technology, capacity building, and application for sustainable rural development could be more fruitful, if the exercise is undertaken through a partnership effort among the universities, engineering institution, rural and development labs, national institutions, agricultural research centres, NGOs, government departments and industries. The actual partnership may be determined by the local situations. The corporate sector can play an effective role in discharging its social responsibility in this partnership. This role is in addition to its industrial activity in the rural areas. Similarly, the professional and scientific expertise of the professional bodies and scientific academics could be fully utilised for the rural development activity.

This is where the mobile technology which over the year have become the integral part of business world and have multiplied the working efficiency in terms of real time communication, information and data sharing, having virtual presence and reach. The fact that with minimum infrastructure availability at the individual level mobile phones have the capability to connect any individual with the entire world on a click of button makes it a powerful tool to have access to desired information. In the 21st century, Information, Communication and Technology (ICT) are the most powerful 'enabler' to provide a variety of inputs for rapid development of rural areas. The ICT could be effective tools for rural extension by the government and non-governmental organizations to effectively disseminate Information Resource. For the development, Information Resource [IR] is the vital input as that could increase the accessibility of any other resources - like financial, human, physical, technology and etc. The sustainable rural development can make a powerful contribution to fulfil - the poverty reduction,

growth with equity, food security and effective natural resource management. There is a growing emphasis on development of rural economy for enhancing the livelihood of the rural people.

A systematic review of the factors responsible for decrease in availability of the natural resources, loss of bio diversity, increase in environmental pollution, climatic changes, decline in factor productivity and operational holdings and widening gap between rich and poor are threatening our food security and health. In recent years, enormous progress has been made in developing agriculture technologies, cultivation and trade through out the world. Making the transition from sustainable agriculture to sustainable empowerment will not be possible without significant new investment in protecting and enhancing the efficiency of production, processing and marketing personnel to embrace and share a diverse range of basic studies, techniques and experiences. In this context, deliberations in the international conference by eminent and galaxy of speakers of several innovative and current advances in agriculture and allied sciences will open new vistas in addressing all the issues.

ROLE OF BIOREGULATOR FOR THE IMPROVEMENT OF TEMPERATE FRUIT CROPS

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Abstract

Bioregulators can assist orchardists to maximize the genetic potential of their trees and are valuable aids in managing tree growth and structure, manipulating flower bud formation, releasing buds from dormancy, regulating crop load, improving fruit quality and shelf life, preventing pre-harvest fruit drop and altering fruit maturity. The various reasons for poor fruit set in Temperate Fruit crops in the higher altitudes includes low temperature (coldness, rains) during flowering resulting in low bee activity. Plant species that bear fruits often utilize expansion of ovary (carpel) or accessory tissue as a vehicle for seed dispersal. Once the seed (s) mature, the tissue (s) of the fruit follow habitual progression of cell division and cell expansion, promoting growth of the fruit. As with many developmental processes in plants, plant hormones play important role in the synchronization of signals between the developing seed and its surrounding fruit tissue(s) regulating each phase of fruit development. Under adverse climatic condition fruit set can be increased by use of plant growth regulators like auxins, cytokinins and gibberellins and some micronutrients, especially the calcium, boron increases fruit set especially in apple. Sotomayor *et al.,* (2012) revealed the influence of the different growth regulators like gibberellic acid, promalin, naphathalene acetic acid (NAA), thidiazuron, kinetin and brassinolide on the fruit set of almonds on the branches at 50 days after anthesis and reported that promalin achieved increased fruit set. GA3 increase fruit size, improves fruit firmness, increases vitamin-C, TSS, total sugars, sweetness index and overall sensory ratings of "Red Delicious? apples (Hajam, 2017). 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 (ElShazly, 2013). Promalin is a mixture of naturally occurring plant growth regulator Gibberellic acid, which causes cell enlargement and elongation and 6-benzyladenine (6-BA) which promotes cell division.These effects only take place in plant tissues and only during the very early development of the fruitlet. The result is a larger fruit with more cells and larger cells. In addition, the gibberellins help reduce fruit russet and improve overall fruit finish, which makes the fruit looks more appealing and marketable. It improves length and diameter (L:D) ratio of apples. increases fruit set of apples after frost. improves the size of the fruit and its shape through the elongation of the fruit and development of more prominent calyx lobes. It increases lateral bud break and shoot growth, improves branch angles, and provides a better tree framework for early cropping. enhances fruit finish and increases its value in Royal Delicious. Total yield, yield of different grade fruits, fruit size and weight were significantly increased by the application of cytokinin based growth regulator (CPPU) in combination with light summer pruning in Kiwi. CPPU at 10ppm was applied by dipping the fruits for 10 seconds in aqueous solution of the compound at petal fall stage as well as 30 days after petal fall stage. These results are in agreement with the findings of Pramanick *et al.* (2015) who observed significant increase in yield of different grade fruits as a result of CPPU application. The growth stimulating capabilities of CPPU in kiwifruit have been reported by various authors. The action and efficacy of a bioregulator is dependent on a range of factors, including product concentration, time of application, species and cultivar. Environmental conditions can also influence the physiological response of the plant to a PBR. With increasing labour costs impacting production costs, application of bioregulators can be more cost effective than labour intensive cultural methods.

INTRODUCTION

Bioregulators can assist orchardists to maximize the genetic potential of their trees and are valuable aids in managing tree growth and structure, manipulating flower bud formation, releasing buds from dormancy, regulating crop load, improving fruit quality and shelf life, preventing pre-harvest fruit drop and altering fruit maturity. The various reasons for poor fruit set in Temperate Fruit crops in the higher altitudes includes low temperature (coldness, rains) during flowering resulting in low bee activity. Plant species that bear fruits often utilize expansion of ovary (carpel) or accessory tissue as a vehicle for seed dispersal. Once the seed (s) mature, the tissue (s) of the fruit follow habitual progression of cell division and cell expansion, promoting growth of the fruit. As with many developmental processes in plants, plant hormones play important role in the synchronization of signals between the developing seed and its surrounding fruit tissue(s) regulating each phase of fruit development. Under adverse climatic condition fruit set can be increased by use of plant growth regulators like auxins, cytokinins and gibberellins and some micronutrients, especially the calcium, boron increases fruit set especially in apple. Sotomayor *et al.,* (2012) revealed the influence of the different growth regulators like gibberellic acid, promalin, naphathalene

acetic acid (NAA), thidiazuron, kinetin and brassinolide on the fruit set of almonds on the branches at 50 days after anthesis and reported that promalin achieved increased fruit set. GA3 increase fruit size, improves fruit firmness, increases vitamin-C, TSS, total sugars, sweetness index and overall sensory ratings of "Red Delicious? apples (Hajam, 2017). 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 (ElShazly, 2013). Promalin is a mixture of naturally occurring plant growth regulator Gibberellic acid, which causes cell enlargement and elongation and 6-benzyladenine (6-BA) which promotes cell division.These effects only take place in plant tissues and only during the very early development of the fruitlet. The result is a larger fruit with more cells and larger cells.In addition, the gibberellins help reduce fruit russet and improve overall fruit finish, which makes the fruit looks more appealing and marketable. It improves length and diameter (L:D) ratio of apples. increases fruit set of apples after frost. improves the size of the fruit and its shape through the elongation of the fruit and development of more prominent calyx lobes. increases lateral bud break and shoot growth, improves branch angles, and provides a better tree framework for early cropping. enhances fruit finish and increases its value in Royal Delicious. Total yield, yield of different grade fruits, fruit size and weight were significantly increased by the application of cytokinin based growth regulator (CPPU) in combination with light summer pruning in Kiwi. CPPU at 10ppm was applied by dipping the fruits for 10 seconds in aqueous solution of the compound at 10 days after anthesis i.e. petal fall stage. These results are in agreement with the findings of Pramanick *et.al,* 2015 who observed significant increase in yield of different grade fruits as a result of CPPU application. The growth stimulating capabilities of CPPU in kiwifruit have been reported by various authors**.** The action and efficacy of a bioregulator is dependent on a range of factors, including product concentration, time of application, species and cultivar. Environmental conditions can also influence the physiological response of the plant to a Plant bio-regulator. With increasing labour costs impacting production costs, application of bioregulators can be more cost effective than labour intensive cultural methods. Following pollination, fruit set is achieved through a de-repression of growth and an activation of cell division via the action of auxin and/or cytokinin and/or gibberellin. Following fruit set, growth of the fruit is facilitated through a relatively poorly studied period of cell expansion and endore duplication that is likely regulated by similar hormones as in fruit set (McAtetee *et al.,* 2013). Pollination is an essential process for fruit set, fruit growth, fruit quality, and seed set of temperate fruits mostly apple cultivars. Being a temperate the various reasons for poor fruit set in the higher belts includes low temperature (coldness, rains) during flowering resulting in low bee activity (Verma and Jindal., 1985). The productivity of Temperate Fruit crops is obviously quite low and therefore, there is enough scope for its improvement. The leading districts in the state of J&K of India are Baramulla, Shopian, Anantnag and Kulgam with a productivity of about 20.70, 10.13, 8.84 and 8.39 MT/ha respectively (Anonymous, 2018). Low productivity of apple in India can be attributed to various factors like lack of pollinizers and pollinators, non-judicious use of pesticides and fertilizers, faulty pruning and training and climatic adversities particularly low temperature and rainfall during developmental stages of flowering, pollination, fertilization and fruit setting (Verma and Jindal, 1985).Different means can be employed for fruit set, productivity and quality improvement in temperate fruits like proper pollination ratio particularly pollinizers with flower synchronization with main cultivars, pollinators , use of hormones, nutrients or both. Under adverse climatic condition fruit set can be increased by use of plant growth regulators like auxins, cytokinin and gibberellins and some micronutrients, especially the calcium, boron (Lee *et al.,* 2009) increases fruit set especially in apple. Fruit set is the first step in fruit development, production and productivity; it is established during and soon after fertilization. Seed bearing plants have a unique double fertilization event with two pollen nuclei fertilizing the embryo and the endosperm (Dumas *et al.,* 1998; Raghavan, 2003; Hamamura *et al.,* 2012). Promalin enhances fruit size,yield, fruit finish and increases its value in Royal Delicious apple(Pramanick *et.al,* 2022).

DISCUSSION

Fruit set has traditionally been attributed to the action of three hormones, auxin, and/or gibberellin, and/or cytokinin (GA3 and CPPU), nutrients (Ca, Boron, K and N) alone or in combination (Mariotti *et al.,* 2011 and Wani *et al.,* 2017). Plant hormones (also known as phytohormones) are naturally occurring organic substance that influence growth and development in very low concentrations and whose action may beinvolved in places remote from their origin. Hormones determine the formation of flowers, stems, leaves, the shedding of leaves and the development and ripening of fruit. Plants, unlike animals, lack glands that produce and secrete hormones; instead each cell is capable of producing hormones. Hormones are vital to plant growth and lacking them, plants would be mostly a mass of undifferentiated cells (Jain, 2013). Plant Growth Regulators (PGR), on the other hand, include naturally occurring plant growth substances also called phytohormones, as well as synthetic compounds among which are chemicalanalogs, materials that alter hormone levels (hormone-releasing agents or synthesis inhibitors) and materials that alter hormone sensitivity (Hajam *et al.,* 2017). There are mainly five well-established categories of "classical" phytohormones, grouped together based on their structural similarities and on their effects on plant physiology. These five hormones include auxins, gibberellins, cytokinins, ethylene and abscisic acid. The other PGRs such as oligosaccharins,

brassinosteroids, salicylic acid, jasmonates, polyamines, nitric oxide (NO), strigolactones, karrikins etc have been found recently. Their exogenous applications have shown the tremendous effect on fruit crops. In general plant hormones have major two effects and grouped accordingly as (1) Plant growth promoters:- substances which improve the overall health, growth and development of plants and (2) Growth retardants:- the group of chemicals which have common physiological effect of reducing stem growth by inhibiting cell division of sub apical meristem. 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 (Jain, 2013). Application of these hormones alone can trigger fruit development to a certain extent and, in many plant species, application in combination will induce normal fruit growth even in the absence of fertilization i.e parthenocarpy (Gillaspy *et al.,* 1993; Vivian-Smith and Koltunow, 1999), indicating that an interplay between these hormones is necessary for fruit set and fruit growth. In many species, auxin and cytokinin levels in the seed increase during seed formation (Yang et al., 2002). Naturally occurring phytohormones, their chemical analogs, hormone-releasing agents, hormone sensitivity altering agents and hormone synthesis inhibitors collectively form plant growth regulators (Hajam *et al.,* 2017). 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). Fruit quality fulfillment comes to be a paramount concern of the researchers and fruit grower's important goal, particularly regarding optimizing size, increasing firmness, TSS and protection against russeting, sunburn and other physiological disorders. Foliar sprays of PBRs (GA_3 at 20-40 ppm or NAA at 25-50 ppm) enhanced apple yield and fruit quality traits (Osama *et al.,* 2015). GA3 increase fruit size, improves fruit firmness, increases vitamin-C, TSS, total sugars, sweetness index and overall sensory ratings of 'Red Delicious' apples (Hajam, 2017). 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 (ElShazly, 2013). Ethylene serves as a key ripening hormone of climacteric fruits and can influence ripening in many nonclimacteric fruits (Giovannoni *et al.,* 2010). Treatment with high concentrations of ethylene stimulates respiration and increases the levels of fatty acids (FA) and volatiles and at the same time decreases firmness (Banday, 2006; Harb *et al.,* 2008). The combined spray of NAA 10 ppm and ethephon 150 ppm at full bloom can reduce fruit set up to 34 % in apple (Banday, 2006).

Gibberellins are closely related with parthenocarpy in apples: application of gibberellins and the combination of gibberellins with cytokinins can induce parthenocarpic fruiting. Exogenous plant hormone application to unfertilized ovaries might serve as a switch that starts the continuing autonomous development of the fruit and controls the continuity of the flow of assimilates and nutrients required for fruit growth (Bangerth and Schroder, 1994). Gibberellic acid, Auxin (NAA) and cytokinin or in combination enhances fruit set in temperate fruit crops especially apple, pear and cherry during bloom (50%) by compensating the poor pollination due to the unfavourable weather conditions even in the absence of fertilization i.e parthenocarpy (Wani *et al.,* 2017 and Mariotti *et al.,* 2011) shown in table-3 and 4. GA_3 at 250-500 mgL1 during flowering gave a good (20-40 per cent) fruit set in sour cherries (Parnia and Burlani1986). Gibberellic acid intensifies an organ ability to function as a nutrient sink. It also increases the biosynthesis of IAA in plant tissues, delays the formation of separation layer, and thus enhances fruit retention (Wally *et al.,* 1999 and Wani *et al.,* 2017). Cytokinin as CPPU has a promoting effect on fruit set and reducing ABA content, due to the physiological basis of CPPU on fruit setting and fruit retention (Guirguis et al., 2003 and Wani *et al.,* 2017). The increase in fruit size could be attributed directly to the CPPU effects whereas; exogenous application of CPPU acts as early and rapid on cell division in the fruitlet and also on subsequent growth. Thus, the fruit becomes bigger in size due to the increased cells, which are able to attract so much water, minerals and carbohydrates that enable the fruit to expand to large size (Kano, 2003). In "Cox Orange" apple trees application of exogenous hormones GA_3, 2-Chloro-4 Pyridil diphenylurea (CPPU) at full bloom improved fruit set by improving the number of the pollen tubes that actually reach the ovaries of the flowers (Williams and Flook, 2012). Sotomayor *et al.,* (2012) revealed the influence of the different growth regulators like gibberellic acid, promalin, naphathaleneacetic acid (NAA), thidiazuron, kinetin, point-tomatomone and brassinolide on the fruit set of almonds on the branches at 50 days after anthesis and reported that promalin achieved increased fruit set.

Apple seeds, during their development in the fruit, produce a sequence of different types of hormones, the appearance and disappearance of which is linked with successive stages in the development of the endosperm and embryo. The first stage of seed development, characterized by the development of a free nuclear endosperm but very little growth of the embryo, is particularly associated with the presence of cytokinins (Zwat *et al.,* 1963). Cytokinen levels increase after pollination (Matsuo

et al., 2012) and are generally considered to play a critical role in the stimulation of cell division during fruit development (Wismer *et al.,* 1995; Srivastava and Handa, 2005). This stage is terminated 4 to 5 weeks after full bloom by the development of the cellular primary endosperm and the appearance in the seed of two indole auxins (Luckwill, 1957) identified as 3-indoleacetylaspartic acid and ethyl-3- indole acetate (Raussendorf – Bargen, 1962). The second developmental stage is associated with the rapid growth of the embryo, the digestion of the nucellus and primary endosperm and the formation of a secondary endosperm which forms a tight sheath around the fully grown embryo. Luckwill (1969) confirmed the presence during this stage of gibberellins A4 and A7, which first appear 4 to 5 weeks after full bloom and quickly build up to a peak concentration at 9 weeks after bloom, at the time when the embryo has almost reached its final size. Cell expansion is regulated by auxin, gibberlin, and brassinosteroid(Pattison and Catala, 2012). Cell enlargement depends both on cell wall loosening and increase turgor pressure (Cosgrove, 2005) While auxin mostly controls cell division during fruit set, it is thought to play an important role during the growth phase by influencing cell enlargement together with gibberllins (Csukasi *et al.,* 2011). One of the main functions of the relatively high concentration of hormones found in developing seeds may be the mobilization of essential metabolites-particularly carbohydrates and soluble nitrogen-against the competing demands of the growing shoots. It is certainly true that fruits with no seeds or with only a low seed content are not normally able to survive this competition, though they can be made to develop if competing vegetative growth is suppressed (Abbott, 1960) . There is also rather strong circumstantial evidence that gibberellins translocated from the seeds to the bourse may inhibit flower initiation in the bourse bud, thus giving rise to the phenomenon of biennial blossoming (Luckwill, 1969).

Bangerth and Schroder (1994) reported that the gibberellins are closely related with parthenocarpy in apples and also application of gibberellins in the combination with cytokinin induce parthenocarpy. Sadamatsu *et al.,* (2004) reported that the application of gibberllic acid (GA_3) on loquat increased the parthenocarpic fruit set with concentrations 500 and 1000 ppm even under growth in cold stress and it was reported that GA_3 is an important factor in inducing parthenocarpic fruit set in fruit crops. Yahata *et al.,* (2006) conducted an experiment with an objective to induce seedless fruit set and growth in the triploid loquat by applying GA_3, GA4, GA7 or GA4+7 at 200 mg L-1 in combination with for chlorfenuron (CPPU) at 20 mg L-1 to flowers and fruitlets two times, at bloom and 57 days after bloom. The flowers were not emasculated. Treatment solutions of 100 ìL were applied to each flower and fruitlet. Untreated control fruit gradually abscised and final fruit set was 0%. When GA3, GA4, GA7 or GA4+7 in combinations with CPPU were applied, fruit sets at harvest were about 61%, 40%, 74% and 56%, respectively. The harvested fruits were all seedless. These results suggest that GA3+CPPU is more effective than other combinations of GA+CPPU for seedless fruit production in the triploid loquat without decreasing the fruit quality. McCartney and Wargo (2008) studied that the Promalin (6-BA+GA4+7) increases cropping of apples even after a freeze by promoting Parthenocarpic fruit set as compared to untreated control. Watanable *et al.,* (2008 a) revealed that Gibberellins (GA4+7) @ 250 and 500 ppm can stimulate Parthenocarpic fruit development in apples during cold and freeze conditions as compared to untreated control. Watanable *et al.,* (2008 b) studied the effects of plant growth regulators on fruit set and fruit shape of Parthenocarpic apple and found that in „Ohrin?, the application of GA_3 and gibberellin A4+7 (GA4+7) showed a higher fruit retention rate before flowering than after and Parthenocarpic fruits were induced even when uniconazole (UCZ) was sprayed after flowering, but not before flowering. The calyx end was large in GA4+7 and in GA_3 and CPPU singly, and GA_3 and CPPU combined treatments, which increased the percentage of fruit set. These results suggest that gibberellins before flowering trigger Parthenocarpic apple. The use of gibberellins or complex of gibberellins and cytokinins (Promalin), stimulate parthenocarpy in pear as studied by Musacchi (2008). Niu *et al.,* (2014) reported the effect of exogenous application of GA4+7 and N-(2- chloro-4-pyridyl)-N-phenylurea on induced parthenocarpy in Pyrus pyrifolia “Cuiguan” and revealed that parthenocarpy largely depends on the coordination action of hormones produced in unpollinated ovaries, but can be induced by application of exogenous hormones like GA4+7 which induced the highest fruit set as compared to untreated control. Application of phytohormones and nutrients alone or in combination produced significant effect with respect to Parthenocarpic fruit set. Parthenocarpic fruit set in an apple cv. Red Delicious, showed significant increase with increased concentration of GA_3. It was observed that at lower concentration i.e., at T2 (GA_3 @ 250 ppm) Parthenocarpic fruit set of 36.86% was recorded and with further increase in GA_3 concentration Parthenocarpic fruit set was increased to 45.21% as in treatment T3 (GA_3 @ 500 ppm) while as lowest Parthenocarpic fruit set of 5.09% was recorded in control (T1). However, the highest (52.69%) Parthenocarpic fruit set was recorded in combination treatment .GA3 @ 500 ppm+CPPU @ 5 ppm)]. Parthenocarpic fruit set in an apple cv. Red Delicious, showed significant increase with increased concentration of GA_3.

Hossain (2015) in a study found that the application of GA3 @ 50 ppm reduces fruit drop 8% compared to 20% untreated control. Prang et al., (1998) revealed a significant decrease in fruit drop in „Starkrimson? apple trees with GA spray (100 mg/1) or urea spray (0.4%) during full or 50% bloom. Greene (1989) reported that the application of CPPU @100 mg/l during flowering time reduced fruit drop of „Early McIntosh? by 47% compared with the control. He observed that fruits treated with

CPPU were difficult to separate from the spur that was the reason for reduction of pre harvest fruit drop of 'Early McIntosh'.Wally *et al.,* (1999) observed that GA_3 at 50 mg/L at full bloom and three months after first spray were most effective treatments in reducing pre harvest fruit drop in guava and persimmon. Davies and Zalman (2006) studied that the GA_3 significantly increased the total number of fruits, the fruit weight per plant by reducing pre-harvest fruit drop in orange, control branches showed the highest number of fruit dropped (52%), with the least percentage of fruit dropping observed (32%) in GA_3 at 20 mg/L treated branches followed by GA_3 at 50 and 100 mg/L treatments. Chao and Lovatt (2006) reported that the application of GA_3 (150 or 250 mg L-1) at 60% and 90% full bloom, 75% petal fall and 10 days after 75% petal fall resulted in retention of significantly more fruits (kilograms and number per tree) compared to untreated control trees. Wally *et al.,* (1999) studied that the application of GA_3 and CPPU increases fruit set of apple and the best combination was GA3 at 200 ppm+CPPU at 5 ppm (86.28 and 85.86%) through the two studied seasons respectively. They justified the role of GA_3 stating that it intensifies an organ ability to function as a nutrient sink, it also increases the biosynthesis of IAA in plant tissues, delays the formation of separation layer (Wasfy, 1995), thus enhancing fruit retention.

Impact on return bloom (bloom density) in apple

Bloom density = No. of Flower buds/cm2 BCSA

Where, branch cross sectional area (BCSA) = Girth2 /4

Ramirez (2004) reported that the exogenous application of cytokinins to apple spurs at the time of fruit bud initiation increased return bloom in the following spring. Greene (1989) found that CPPU at 10 or 100 mg liter-1 and gibberellin acid or promalin (50or 300 mg liter^{-1}) at full bloom reduced 'McIntosh' return bloom. Greene (1989) also reported that the return bloom of Spur Type Red Delicious apple after application of CPPU @ 5ppm at full bloom was recorded as low as compared to untreated control. McCartney (1994) studied that the application of GA_3 @ 330 ppm applied at full bloom reduced the proportion of flowering spurs of 'Braebum' apples in the following year. GA_3 at l00, 500, or 1000 mg/liter was applied at the beginning of spring (at full bloom) and at the highest concentration, GA_3 reduced flower bud formation in the following spring and produced the lowest yields (Maksymiuk *et al.,* 1986). Trees of Golden Delicious, King of the Pippin and Jonagold were treated with GA_3 (200 mg/liter) applied at full bloom reduced flower induction in the following spring (Trompt, 1982).

Prang *et al.,* (1998) revealed that the GA_3 (250 or 500 ppm) sprayed at full bloom reduced the number of flowers in the following year of both Elstar and Golden Delicious apple cultivars. Moreover, GA_3 (250 mg/liter) at full bloom caused an increase in diffusible IAA during the critical period of flower induction. Unrath and Whitworth (1999) studied that the application of GA3 @ 250 and 500 ppm on "Red chief and Red Delicious"/M.7 apple resulted in reduction in return bloom as compared to untreated control.

Byers *et al.,* (1990) confirmed that GA_3 reduced return bloom in peach when applied at full bloom. In nectarine, Garcia-Pallas *et al.,* (2001) found that flowering was reduced in a linear relationship with concentration of GA_3 (200 mg/L). GA3 has also been shown to reduce flowering of sweet cherry (Prunus avium L.) as compared to control. Dennis *et al.,* (1970) demonstrated decreased levels of flowering in the pome fruit 'Bartlett' pear (*Pyrus communis*) with 20-100 mg/L of GA3 in following spring. In 'Kosui' Japanese pear (*Pyrus pyrifolia* Nakai), application of GA3 at 200 ppm during flowering decreased flower bud formation, while August sprays of the same material increased flowering in coming spring (Ito *et al.,* 2000). The reduction in return bloom in the following spring can be due to the reason that gibberellins cause flower bud inhibition and there is more vegetative growth (Curry and Green, 1993). Also gibberellin delays plastichron i.e. initiation of vegetative bud to flower bud with the result critical node number does not reach at particular period due to which there occurs restriction of reserves, minerals and hence there occurs no flower bud formation. Also GA3 extends plastichron and bud never reaches the receptive stage, thereby indirectly inhibiting flowering (Zahoor and Dhillon, 2011). Bloom density is vital reproductive parameters which are directly related to fruit yield and productivity. Poor fruit set is due to poor pollination in orchards, is one of the factors limiting crop productivity. Pollination problems need attention in the early stages for good production and quality. The preferable solution to this problem is planting of appropriate ratio of pollinizer varieties, and honey bees population for pollination. Under adverse climatic conditions that causes flower drop resulting poor fruit set which in turn decreases productivity .So use of PBRs particularly auxin, and/or gibberellin, and/or cytokinin (GA3 and CPPU), nutrients (Ca, Boron, K and N) alone or in combination promotes fruit set either by Partheno-carpic fruit set or increasing pollen viability and germination. it is concluded that summer pruning i.e. pinching1/5 of new growth and CPPU dipping in 10 ppm (10 ml /l) at petal fall stage and thereafter pinching 1/5 continued till harvest at one month interval improved fruit size, yield, quality and gave higher returns in Kiwi fruit(Pramanick *et.al,* 2015).

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ANTAGONISTIC POTENTIAL AND METABOLIC PROFILING OF *BACILLUS VELEZENSIS* : A PLANT GROWTH PROMOTING MICROORGANISM FOR INHIBITION OF *RHIZOCTONIA BATATICOLA* CAUSING DRY ROOT ROT IN CHICKPEA

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The boosting agricultural productivity relies heavily on the use of chemicals, which are economically unavailable to many farmers, cause negative environmental impacts and also a major constraint to plant growth and yield. Therefore, to increase global agricultural production in a more economically and environmentally sustainable way, there is need to use plant growth-promoting microorganisms (PGPMs). The rhizosphere and endophytic fungal and bacterial community can harbor beneficial organisms known as PGPMs. PGPMs improve plant growth by enhancing the availability of nutrients, by regulation of phytohormones and as phytostimulators. These beneficial microbes can also secrete volatile metabolites, which can induce disease resistance. Thus, there is an urge to understand better and move forward with knowledge that PGPMs hold great promise in promoting productivity through synergistic interactions with host plants and can play role in disease management. The pathogen was isolated from the dry root rot infected portions of chickpea plant and cultured on potato dextrose agar medium using hyphal tip isolation method. 30 rhizospheric bacterial PGPMs were isolated by serial dilution technique on nutrient agar and their cultural characters were recorded. The antagonistic potential of all the 30 PGPMs was tested against the *R. bataticola* by using dual culture technique *in vitro*. Further isolates were tested for their plant growth promoting traits using standard procedures. The efficient isolates were identified and analysed for their diversity using standard molecular tools. For metabolic profiling of potential PGPM, the culture was subjected for extraction of bio-active compounds by solvent extraction method and their chemical characterization was carried out by GC-MS/MS analysis. All thirty isolates were distinct in their cultural characteristics. Among them, nine rhizospheric bacterial PGPMs were considered as potential for inhibition of pathogen in dual culture assay. Among 9 potential PGPMs all isolates produced IAA and ammonium, 5 isolates exhibited phosphate solubilization and HCN production, respectively. The GC-MS/MS analysis of ethyl acetate extract of *B. velezensis* showed 11 bio-active compounds which are reported to process antimicrobial property.

NEW EDUCATION POLICY IN AGRICULTURE AND FISHERIES : POTENTIALS AND PROSPECTS

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Human resource capital is the greatest treasure of any country. India has rich heritage of higher education of about six thousand years. Transforming Indian education system seeking reforms of school, college and university have to build a knowledge-driven society. National Policy on Education (NPE)-1986 (modified in 1992) envisaged Right of children for free and compulsory education. The Act modified in 2009 laid down legal underpinning of achieving universal elementary education with seamless integration numeracy. At the time of Independence, India possessed 17 agriculture colleges, 4 veterinary colleges and 01 agricultural engineering college. As self-sufficiency in food production was the overriding priority of the country, the present National Agricultural Research and Education System (NARES) has evolved covering 75 SAUs (based on Land Grant Pattern) with integrated teaching, research and extension programmes. Out of these, 63 SAUs, 3 central agricultural universities (CAUs) **5** deemed–to-be universities, 4 central universities with agriculture faculty, 106 research institutes, 721 Krishi Vigyan Kendra (KVKs), 69 All-India Coordinated Research Projects (AICRPs. The system is largest and second in the world.

During 1951 India had agriculture production of 51 million tonnes while it increased to 308 million tonnes in 2020-21. As such, India has emerged as major exporter of agri-foods and second largest agrarian economy. The country has moved from Ship-to-Mouth to Right of Food status. This has been only possible by establishment of institutes of higher education which created skilled human resources for generation of technologies and their dissemination through sound government policies and higher receptivity of farmer communities. Reviving of agriculture education and National Agriculture Education Policy (NAEP) must be aligned with National Education Policy (NEP-2020) based on the five pillars-Access, Equity, Quality, Affordability and Accountability to achieve the 2030 Agenda through re-organized Agricultural Higher Education Policy (AHEP) with multidisciplinary research intensive Higher Education Institutes (HEIs) high quality holistic international stakeholders. vocational national and education and entrepreneurial development involving private partnership.

India has emerged as second largest fish producing country in the world with contribution of 7.76% of the global fish production. Known as “sunrise sector”, it has registered annual growth rate of 10.85% since 2014-15. The annual fish production of the country has increased consistently from meagre 0.75 million tonnes (1950-51) to the present 16.282 million tonnes (2020-21) while it was 14.2 million tonnes during 2014-15. It has emerged as powerful sector for income and employment generation (including the subsidiary industries) of 28 million people. Fisheries education and research are being conducted in 31 fisheries colleges and universities and 8 ICAR-Fisheries Institutes. Schemes like (i) Pradhan Mantri Matsya Sampada Yojana (PMMSY), Rs. 20,050 crores with central share Rs. 9,407 crores, state 1.850 crores and beneficiaries Rs. 5,763 crores during 2021-2021 to 2024-2025. The area covered as Inland Fisheries, Marine Fisheries welfare, Aquatic Animal Health, Ornamental fisheries, Seaweed culture and Development in North-East region. (ii) Implementation of Fisheries and Aquaculture Infrastructure Development Fund (FIDF) Rs. 3783 crores have been allocated for fisheries-related infrastructure development in the country. (iii) National Cooperative Development Corporation (NCDC) is also allocating fund and monitoring the projects related to fisheries in the country. For delivering the best output in education, research and technology, our institutions must be transformed into multidisciplinary research-intensive is her Education Institutes (HEIs) for high quality holistic international stakeholders by aligning with Rshtriya Uchchattar Shiksha Abhiyan (RUSA) Scheme, Ministry of Education. Government of India to fulfil the Agenda 2030.

STUDIES ON DIVERSITY, DISTRIBUTION AND RELATIVE ABUNDANCE OF INSECT POLLINATORS ON *BERGENIA CILIATA* (HAW.) STERNB. AND *VINCA MAJOR* (LINNEAUS) IN SHIMLA HILLS, HIMALAYA

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Abstract

Medicinal plants are highly valuable and most of them depend on insect pollinators for their reproduction. Therefore, it is important to study the insect pollinators of medicinal plants. The present study on diversity and distribution reveals a total of 29 insect pollinators collected on two medicinal plants i.e. *Bergenia ciliata* (Haw.) Sternb. and *Vinca major* (Linnaeus) in different localities of Shimla Hills, Himachal Pradesh, India. Of these 29 insect pollinator's species, 8 species has been collected on *Bergenia ciliata* (Haw.) Sternb. belongs to 3 orders i.e. Coleoptera, Hymenoptera and Diptera. Whereas 24 species has been recorded and collected on *Vinca major* (L.) under four orders i.e. Coleoptera, Hymenoptera, Lepidoptera and Diptera. Beside diversity & distribution study has also been conducted on the relative abundance studies of insect pollinators on these two medicinal plants. During this study period it has benn observed that dipterans were the most abundant insect pollinators of *Bergenia ciliata* (Haw.) Sternb. in all the four localities i.e. Dhalli (80%), Kufri (63.41%), IGMC (60.86%) and Fagu (64%), whereas lepidopterans were the most abundant insect pollinators of *Vinca major (Linnaeus)* at Dhalli (60.76%), Summerhill (58.46%), Chauda Maidan (58.95%), IGMC (57.42%), Kasumpti (63.20%) and Chotta Shimla (63.06%).

Key words : *Diversity, distribution, relative abundance, Insect pollinators, Bergenia ciliata, Vinca major.*

Introduction

Bergenia ciliata (Haw.) Sternb. (Saxifragaceae) is a high value medicinal plant of the Himalaya. It is a perennial herb with thick, stout, creeping rhizomes. *B.ciliata* is a threatened species in Nepal (Shrestha & Joshi 1996) due to commercial harvest. *Bergenia* (Haw.) Sternb. is mainly distributed in Asia, involved in East Asia, the southeastern regions of Central Asia and northern regions of South Asia (Chandra Reddy et al. 1998; Zhou et al. 2007). *B.ciliata* is commonly known as Pashanabheda (Pashan means rock and bheda means piercing) or Patharchat and is found in Sirmour, Shimla, Mandi, Kullu, Chamba and Kinnaur districts of Himachal Pradesh. *Bergenia* is one of the most important folk medicinal herbs, in China, it is often used for treating cough, stop bleeding, increasing immunity and so on (Lu & Wang 2003a). In India, the rhizomes of *Bergenia* have been used for centuries in the Ayurvedic formulations to dissolve kidney and bladder stones, abnormal leucorrhea, piles and pulmonary affections (Gehlot *et al.* 1976; Srivastava & Rawat, 2008). Flowering time of *Bergenia ciliata* is March to April, this provides a valuable alternative to foraging pollinators, when resources start declining and become scare successively in winter.

The another most important medicinal plant of Himachal Pradesh is *Vinca major* (L.) the big periwinkle which is an evergreen shrub found in lower Himalayan ranges in Asia. In India, *V. major* (L.) is found in Himalayas near Mussoorie and Shimla, West Bengal and palni hills in Tamil Nadu. *V. major* is commonly grown ornamental plant in temperate gardens for its evergreen foliage, spring flowers and groundcover or vine use. *V. major* belongs to the family Apocynaceae (dogbane family) which is an important family of flowering plants that comprises a number of medicinally useful plants. All periwinkles have many medicinal uses and are used for bleeding, diarrhoea, to heal wounds and as an anti-dote to bites by poisonous animals (Cleene et al. 2003). Flowers of *Vinca* blooms from April to May. They are purple in colour and attract large number of insect pollinators.

Of the multiple roles that insects play, pollinating flowering plants is a process that is of the utmost importance in terrestrial environments and one which provides vital ecosystem services for human well-being. Diversity of pollinators reduces the risk of lack of pollination in absence of one insect species during critical period of crop flowering. Therefore, the present study was carried out on the diversity, distribution and relative abundance of insect pollinators of medicinal plants (*Bergenia ciliata* (Haw.) Sternb. and *Vinca major* (Linnaeus)).

Materials and Methods

The present investigation was carried out on diversity, distribution and relative abundance of various insect pollinators of *Bergenia ciliata* (Haw.) Sternb. and *Vinca major* (L.) in different localities of Shimla Hills, Himachal Pradesh, India. Shimla is

a hilly place situated at an altitude of 2,206 meters and extends between 31 -6 N latitude and 77 -10 E longitude on a transverse spur of northwestern Himalayas. This town has average rainfall of 137.5 to 162.5 cm. In Shimla, during summer season, maximum temperature ranges from 31 C to 33 C and minimum varies between 10 C to 11 C, whereas, in winters maximum temperature lies between 15 C to 18 C and minimum between 0.5 C to 5 . The present studies were conducted during flowering season i.e from April to May, 2019 and experimental sites where these were conducted are Kufri (2,437 m), Fagu (2,374 m), Dhalli (1,979 m), Kasumpti (1,892 m), Chotta Shimla (2,161 m), Chauda maidan (2,092 m), IGMC (1,877 m) and Summerhill (1,984 m). For collection of different insect pollinators aerial netting method was used. Captured insects were killed by using benzene and preserved as dried specimen into air tight wooden insect cabinets containing powdered naphthalene. Identification of insect pollinators was done with the help of different experts from different parts of country. The relative abundance of different insect pollinators on *Bergenia ciliata* (Haw.) Sternb. and *Vinca major* (Linnaeus) were determined in terms of their visit per 500 flowers/10 minutes (Verma & Chauhan 1985). The observation was recorded during 0900-1000, 1200-1300 and 1500-1600 hours of a day and average count at these hours give abundance of insect pollinators for that particular day (Southwood 1978). The relative abundance of different species of pollinators was worked out by using the following formula and expressed in percent.

$$\text{Relative abundance of species} = \frac{\text{Total number of individual of species A}}{\text{Total number of individuals of all species}} \quad 100$$

Similarly family number, family percentage, order number and order percentage were calculated for collected sites under study and the results were interpreted.

Results and Discussion

The present insect pollinator's diversity and distribution studies which were conducted on two medicinal plants revealed that, *Bergenia ciliata* (Haw.) Sternb. and *Vinca major* (L.) were visited by 29 species during entire flowering period, which belongs to 4 order and 10 families. Among these 29 species, 8 species has been collected on *Bergenia ciliata* (Haw.) Sternb., belongs to 3 families and 3 orders. Among these 29 species one species of Coleoptera i.e. *Coccinella septempunctata* of family Coccinellidae, 2 species of Hymenoptera i.e. *Apis cerana* and *Ceratina* sp. of family Apidae and 5 species of Diptera i.e. *Episyrphus balteatus*, *Episyrphus viridaureus*, *Eristalis tenax*, *Melanostoma orientale* and *Rhingia laticincta* of family Syrphidae were observed (Table-1, Fig.-1).

During this study period 24 species of insect pollinators has been recorded and collected on *Vinca major* (L.), belongs to 10 families and 4 orders. Out of these 24 species of insect pollinators, 2 species belongs to Coleoptera (*Coccinella septumpunctata*, *Oenopia sexareata*) of family Coccinellidae, 2 species of Hymenoptera (*Bombus haemorrhoidalis*, *Xylocopa* sp.) of family Apidae, 13 species of Lepidoptera (*Celastrina huegelii*, *Celastrina lavendularis*, *Celastrina* sp., *Lampides boeticus*, *Dodona durga*, *Vanessa indica*, *Aglais cashmirensis*, *Pieris brassicae*, *Pieris canidia*, *Gonepteryx rhamni neplensis*, *Celaenorrhinus leucocera*, *Hyarotis adrastus* and *Macroglossum pyrrhosticta*) of families Lycaenidae, Nymphalidae, Pieridae, Hesperidae and Sphingidae respectively and 7 species of Diptera (*Neoitamus graham*, *Episyrphus balteatus*, *Eristalis himalayensis*, *Eristalis tenax*, *Melanostoma scalare*, *Eumerus aurifrons and Tachina ursina*) of families Asilidae, Syrphidae and Tachinidae respectively (Table-2, Fig.-2).

Present results on pollinator diversity & distribution are in accordance with the earlier observations. For example, Knuth, (1909) observed many pollinators on genus *Vinca* i.e. *Bombylius discolor, B.major, Anthophora pilipes, Apis mellifica, Bombus agrorum, B. hortorum, B. hypnorum, B. pratorum, B. terrester, B. vestalis, Osmia fusca, O. rufa* and thrips. *Apis* sp., *Bombus* sp., *Andrena* sp., *Aglais urticae* and various dipteran species were recorded on *Bergenia* flowers in England by Yeo 1966. Pandey et al. 2019 reported 3 species of Hymenoptera i.e. *Apis cerana*, *Bombus* sp., *Vespula* sp., 3 species of Diptera i.e. *Eristalis tenax*, hoverfly, *Musca domestica* and 2 species of Lepidoptera i.e. *Cynthia cardui*, *Aglais cashmiriensis* on *Bergenia* flowers in East Sikkim. Stevens (2012); Stone (2009); More (2007) also observed bees, hawkmoths and other insects pollinators on *V.major* because of their paired nectaries.

The data pertaining to number of insects visiting *Bergenia ciliata* (Haw.) Sternb. and *Vinca major* (L.) flowers were recorded at regular intervals from 9:00 hour in the morning to 17:00 hour in the evening and average counts at these hours gave abundance of an insect pollinator for that particular day and particular site. Using standard statistical tests their family percentage and order percentage was also determined.

The relative abundance studies which were conducted on insect pollinators of *Bergenia ciliata* (Haw.) Sternb. revealed that *Episyrphus balteatus* was the most abundant insect visitor in four localities i.e. Dhalli (35%), Kufri (17.07%), IGMC (21.73%) and Fagu (24%). Other important dipterans at Dhalli, Kufri, IGMC and Fagu were *Eristalis tenax* (0.75 ± 0.43, 15%, 1 ± 0.7, 9.75%, 0.5 ± 0.5, 8.69% and 1.25 ± 0.82, 20%), *Episyrphus viridaureus* (0.5 ± 0.5, 10%, 1.5 ± 0.86, 14.63%, 0.75 ± 0.82, 13.04% and 0.5 ± 0.5, 8%) and *Melanostoma orientale* (1 ± 0.7, 20%, 1.25 ± 0.82, 12.19%, 1 ± 0.7, 17.39% and 0.75 ± 0.43, 12%) respectively. *Rhingia laticincta* a dipteran (1 ± 0.7, 9.75%) was also found at Kufri. Among hymenopterans, *Apis cerana* (0.25 ± 0.43, 5%, 1.5 ± 0.86, 14.63%, 1 ± 0.7, 17.39 and 0.5 ± 0.5, 8%) and *Ceratina* sp. (0.5 ± 0.5, 10%, 2 ± 0.7, 19.51%, 0.25 ± 0.43, 4.34% and 0.75 ± 0.43, 12%) were also the important pollinators at Dhalli, Kufri, IGMC and Fagu respectively. *Coccinella septumpunctata* (0.25 ± 0.43, 5%, 0.25 ± 0.43, 2.43%, 1 ± 0.7, 17.39% and 1 ± 0.7, 16%) was the only coleopteran pollinator at Dhalli, Kufri, IGMC and Fagu respectively. Based on present studies it is suggested that dipterans were the most abundant insect pollinators of *Bergenia ciliata* (Haw.) Sternb. at Dhalli (80%), IGMC (60.86%), Kufri (63.41%) and Fagu (64%) (Table-1,3).

While studying the relative abundance of insect pollinators on *Vinca major* (L.) it has been reported that *Coccinella septumpunctata*, *Episyrphus balteatus* and *Gonepteryx rhamni neplensis* were the most abundant pollinators of *Vinca major* (Linnaeus) at 6 localities i.e. Dhalli (2.25 ± 0.82, 6.61%, 2.25 ± 0.43, 6.61% and 2.25 ± 0.43, 6.61%), Summerhill (2.5 ± 0.86, 7.69%, 2.5 ± 0.86, 7.69% and 3 ± 1.08, 9.23%), Chauda Maidan (2.25 ± 0.82, 6.71%, 2.75 ± 0.55, 8.20% and 2.5 ± 0.5, 7.46%), IGMC (2.25 ± 0.82, 8.91%, 2.75 ± 0.55, 10.89% and 2.5 ± 0.5, 9.90%), Kasumpti (2 ± 0.7, 7.54%, 2.5 ± 1.11, 9.43% and 1.75 ± 0.82, 6.60%) and Chotta Shimla (2 ± 0.7, 7.20%, 2.5 ± 0.86, 9.00% and 2.75 ± 0.55, 9.90%) respectively. Among them other important insect pollinators i.e. *Celastrina huegelii* (1.75 ± 0.43, 5.14%, 2.25 ± 0.82, 6.92%, 1.75 ± 0.82, 5.22%, 1.5 ± 0.5, 5.94%, 2.25 ± 0.86, 8.49% and 1.25 ± 0.43, 4.50%), *Lampides boeticus* (2 ± 0.7, 5.88%, 1.75 ± 0.82, 5.38%, 2 ± 0.7, 5.97%, 1 ± 0.7, 3.96%, 1.5 ± 0.86, 5.66% and 1.75 ± 0.75, 6.30%) *Dodona durga* (2.25 ± 0.86, 6.61%, 1.75 ± 0.82, 5.38%, 2.25 ± 0.86, 6.71%, 1.25 ± 0.43, 4.95%, 1.25 ± 0.43, 4.71% and 1.5 ± 0.86, 5.40%) and *Pieris brassicae* (1.25 ± 0.82, 3.67%, 1.5 ± 0.5, 4.61%, 2.25 ± 0.82, 6.71%, 1.75 ± 0.43, 6.93%, 1.5 ± 0.86, 8.49% and 1.75 ± 0.43, 6.30%) were also recorded at Dhalli, Summerhill, Chauda maidan, IGMC, Kasumpti and Chotta Shimla respectively. Based on these studies it is suggested that lepidopterans, dipterans and coleopterans were the most abundant insect pollinators of *Vinca major)* (Linnaeus) at Dhalli (60.76%, 26.15% and 8.46%), Summerhill (58.46%, 27.69% and 9.23%), Chauda Maidan (58.95%, 25.37% and 8.95%), IGMC (57.42%, 26.73% and 10.89%), Kasumpti (63.20%, 22.64% and 9.43%) and Chotta Shimla (63.06%, 22.52% and 9.00%) respectively. Whereas hymenopterans were the least abundant pollinator on this medicinal plant in all six localities i.e. Dhalli (4.61%), Summerhill (4.61%), Chauda Maidan (6.71%), IGMC (4.95%), Kasumpti (4.71%) and Chotta Shimla (5.40%) (Table-2,4,5).

Very few studies on relative abundance of these two medicinal plants has been found but reports on other medicinal plants are available which are in accordance with the above studies. Gupta & Thakur (1987) observed pollinators *Apis mellifera* and *Apis cerana indica* on the flowers of *Rubus ellipticus* at Solan, Himachal Pradesh, India. *Apis mellifera* constitue 73% of total insects during the day than *Apis cerana indica*, other hymenopterans, dipterans and lepidopterans. Ghazoul (2006) recorded 2,952 visits of insect pollinators on *Raphanus raphanistrum*. The most common pollinators accounting for 61% of flower visitors were bees with the hoverflies accounting for about 38% of flower visitors. But occasional visits to flowers by butterflies (*Pieris brassicae*) and sphecid or eumenid wasps accounted for the remaining 1%. Sixteen species of solitary bees belonging to 4 families of order Hymenoptera visited *Cassia fistula* flowers was recorded by Mattu and Kumar (2016). Diversity and relative abundance data on *Cassia* bloom showed that *Xylocopa fenestrata* was the most dominant bee pollinator at both Nahan (31.65%) and Arki (27.05%). *Apis* sp. were maximum on *Brassica juncea* (L.), representing 74.52% of the total pollinators as founded by Das and Jha (2018), whereas *A. mellifera* (35.18%) was also dominant sequentially followed by *A. cerana indica* (23.11%), *A. dorsata* (12.00%) and *A. florea* (4.23%). Considerably the dipteran flies also visited the crop (21.25%) of which, the Syrphids were most common.

Conclusions

From the above study it has been recorded that the *Bergenia* and *Vinca* flowers were highly attractive to wide variety of insects. Coleopterans, hymenopterans, dipterans and lepidopterans were the main insect orders which visit these medicinally important plants. Among all the insect pollinators, dipterans especially *Episyrphus balteatus* was the most abundant insect visitor on *Bergenia*. Whereas in *Vinca,* lepidopterans were the dominant flower visitors followed by dipterans, coleopterans and hymenopterans.

Table-1 : Diversity and distribution of different insect pollinators visiting *Bergenia ciliata* (Haw.) Sternb. flowers at different localities of Shimla hills, Himachal Pradesh.

S. No.	Insect species	Dhalli	Kufri	IGMC	Fagu
1.	*Coccinella septempunctata* (Linnaeus)	-	-	+	+
2.	*Apis cerana* (Fabricius)	+	+	-	+
3.	*Ceratina* sp.	+	+	+	+
4.	*Episyrphus balteatus* (De Geer)	+	+	+	+
5.	*Episyrphus viridaureus* (Wiedemann)	+	+	+	+
6.	*Eristalis tenax* (Linnaeus)	+	+	+	+
7.	*Melanostoma orientale* (Wiedemann)	+	+	+	+
8.	*Rhingia laticincta* (Brunetti)	-	+	-	-

Table-2 : Diversity and distribution of different insect pollinators visiting *Vinca major* (Linnaeus) flowers at different localities of Shimla hills, Himachal Pradesh.

S. No.	Insect species	Dhalli	Summer Hill	Chauda Maidan	IGMC	Kasumpti	Chotta Shimla
1.	*Coccinella septumpunctata* (Linnaeus)	+	+	+	+	+	+
2.	*Oenopia sexareata* (Mulsant)	+	+	+	-	-	-
3.	*Bombus haemorrhoidalis* (Smith)	+	+	+	+	+	+
4.	*Xylocopa* sp.	+	+	+	+	+	+
5.	*Celastrina huegelii* (Moore)	+	+	+	+	+	+
6.	*Celastrina lavendularis* (Moore)	+	+	+	+	+	+
7.	*Celastrina* sp.	+	+	+	+	+	+
8.	*Lampides boeticus* (Linnaeus)	+	+	+	+	+	+
9.	*Dodona durga* (Kollar)	+	+	+	+	+	+
10.	*Vanessa indica* (Herbst)	+	+	+	+	+	+
11.	*Aglais cashmirensis* (Kollar)	+	+	+	+	+	+
12.	*Pieris brassicae* (Linnaeus)	+	+	+	+	+	+
13.	*Pieris canidia* (Sparrman)	+	+	+	+	+	+
14.	*Gonepteryx rhamni neplensis* (Doubleday)	+	+	+	+	+	+
15.	*Celaenorrhinus leucocera* (Kollar)	+	+	+	+	+	+
16.	*Hyarotis adrastus* (Cramer)	-	-	-	-	-	+
17.	*Macroglossum pyrrhosticta* (Butler)	+	+	+	+	+	+
18.	*Neoitamus graham* (Joseph and Parui)	-	+	+	+	+	-
19.	*Episyrphus balteatus* (De Geer)	+	+	+	+	+	+
20.	*Eristalis tenax* (Linnaeus)	+	+	+	+	+	+
21.	*Eristalis himalayensis* (Brunetti)	-	-	+	-	-	-
22.	*Melanostoma scalare* (Fabricius)	+	+	+	+	+	+
23.	*Eumerus aurifrons* (Wiedemann)	+	-	-	-	-	-
24.	*Tachina ursina* (Meigen)	-	+	-	-	-	-

Table-3 : Relative abundance of insect pollinators visiting *Bergenia ciliata* (Haw.) Sternb. Flowers from different localities of Shimla Hills.

Locality	Order	Coleoptera	Hymenoptera		Diptera				
Dhalli	Family	Coccinellidae	Apidae		Syrphidae				
	Species	*Coccinella septumpunctata* (Linnaeus)	*Apis cerana* (Fabricius)	*Ceratina* sp.	*Episyrphus balteatus* (De Geer)	*Episyrphus viridaureus* (Wiedemann)	*Eristalis tenax* (Linnaeus)	*Melanostoma orientale* (Wiedemann)	*Rhingia laticincta* (Brunetti)
	Parameters								
	X±SE	0.25±0.43	0.25±0.43	0.5±0.5	1.75±0.82	0.5±0.5	0.75±0.43	1±0.7	
	Percent Population	5	5	10	35	10	15	20	
	Family number	0.25	0.75	0.75	4	4	4	4	
	Family percent	5	15	15	80	80	80	80	
	Order number	0.25	0.75	0.75	4	4	4	4	
	Order Percent	5	15	15	80	80	80	80	
Kufri, Shimla Hills	X±SE	0.25±0.43	1.5±0.86	2±0.7	1.75±0.82	1.5±0.86	1±0.7	1.25±0.82	1±0.7
	Percent Population	2.43	14.63	19.51	17.07	14.63	9.75	12.19	9.75
	Family number	0.25	3.5		6.5	6.5	6.5	6.5	6.5
	Family percent	2.43	34.14		63.41	63.41	63.41	63.41	63.41
	Order number	0.25	3.5		6.5	6.5	6.5	6.5	6.5
	Order Percent	2.43	34.14		63.41	63.41	63.41	63.41	6.5
IGMC, Shimla Hills	X±SE	1±0.7	1±0.7	0.25±0.43	1.25±1.08	0.75±0.82	0.5±0.5	1±0.7	
	Percent Population	17.39	17.39	4.34	21.73	13.04	8.69	17.39	
	Family number	1	1.25	1.25	3.5	3.5	3.5	3.5	
	Family percent	17.39	21.73	21.73	60.86	60.86	60.86	60.86	
	Order number	1	1.25	1.25	3.5	3.5	3.5	3.5	
	Order Percent	17.39	21.73	21.73	60.86	60.86	60.86	60.86	
Fagu, Shimla	X±SE	1±0.7	0.5±0.5	0.75±0.43	1.5±0.75	0.5±0.5	1.25±0.82	0.75±0.43	
	Percent Population	16	8	12	24	8	20	12	
	Family number	1	1.25	1.25	4	4	4	4	
	Family percent	16	20	20	64	64	64	64	
	Order number	1	1.25	1.25	4	4	4	4	
	Order Percent	16	20	20	64	64	64	64	

Table-4 : Relative abundance of different insect pollinators visiting Vinca major (Linnaeus) flowers from different localities of Shimla hills.

Locality	Order	Coleoptera		Hymenoptera		Diptera						
	Family	Coccinellidae		Apidae		Asilidae	Syrphidae					Tachinidae
Dhalli	Species	*Coccinella septumpunctata* (Linnaeus)	*Oenopia sexareata* (Mulsant)	*Bombus haemorrhoidalis* (Smith)	*Xylocopa* sp.	*Neoitamus graham* (Joseph and Parui)	*Episyrphus balteatus* (De Geer)	Eristalis tenax (Linnaeus)	Melanostoma scalare (Fabricius)	*Eristalis himalayensis* (Brunetti)	Eumerus aurifrons (Wiedemann)	*Tachina ursina* (Meigen)
	Parameters											
	N±SE	2.25±0.82	0.5±0.5	0.5±0.5	1±0.7	0.5±0.5	2.25±0.43	1.75±0.82	2.25±0.43		1.75±0.75	
	Percent Population	6.61	1.47	1.47	2.94	0.32	6.61	5.41	6.61		5.14	
	Family Number	2.75	2.75	1.5	1.5	0.5	8	8	8		8	
	Family Percent	8.46	8.46	4.61	4.61	1.53	24.61	24.61	24.61		24.61	
	Order Number	2.75	2.75	1.5	1.5		8.5	8.5	8.5		8.5	
	Order Percent	8.46	8.46	4.61	4.61		26.15	26.15	26.15		26.15	

Summer hill	N±SE	2.5±0.86	0.5±0.5	0.75±0.82	0.75±0.82	1.5±0.86	2.5±0.86	2.5±0.86	2±0.7			0.5±0.5
	Percent Population	7.69	1.53	2.30	2.30	4.61	7.69	7.69	6.15			1.53
	Family Number	3	3	1.5	1.5	1.5	7	7	7			0.5
	Family Percent	9.23	9.23	1.61	4.61	4.61	21.53	21.53	21.53			1.53
	Order Number	3	3	1.5	1.5							9
	Order Percent	9.23	9.23	4.61	4.61							27.69
Chauda Maidan	N±SE	2.25±0.82	0.75±0.43	1.25±0.82	1±0.7	1.5±0.86	2.75±0.55	2±0.86	1.75±0.82	0.5±0.5		
	Percent Population	6.71	2.23	3.73	2.98	4.47	8.20	5.97	5.22	1.49		
	Family Number	3	3	2.25	2.25	1.5	7	7	7	7		
	Family Percent	8.95	8.95	6.71	6.71	4.47	20.89	20.89	20.89	20.89		
	Order Number	3	3	2.25	2.25		8.5	8.5	8.5	8.5		
	Order Percent	8.95	8.95	6.71	6.71		25.37	25.37	25.37	25.37		
IGMC	N±SE	2.25±0.82	0.5±0.5	0.75±0.82	0.5±0.5	0.75±0.82	2.75±0.55	1.5±0.86	1.75±0.82			
	Percent Population	8.91	1.98	2.97	1.98	2.97	10.89	5.94	6.93			
	Family Number	2.75	2.75	1.25	1.25	0.75	6	6	6			
	Family Percent	10.89	10.89	4.95	4.95	2.97	23.76	23.76	23.76			
	Order Number	2.75	2.75	1.25	1.25		6.75	6.75	6.75			
	Order Percent	10.89	10.89	4.95	4.95		26.73	26.73	26.73			
Kasumpti	N±SE	2±0.7	0.5±0.5	0.75±0.43	0.5±0.5	0.5±0.5	2.5±1.11	1.25±0.43	1.75±0.43			
	Percent Population	7.54	1.88	2.83	1.88	1.88	9.43	4.71	6.60			
	Family Number	2.5	2.5	1.25	1.25	0.5	5.5	5.5	5.5			
	Family Percent	9.43	9.43	4.71	4.71	1.88	20.75	20.75	20.75			
	Order Number	2.5	2.5	1.25	1.25		6	6	6			
	Order Percent	9.43	9.43	4.71	4.71		22.64	22.64	22.64			
Chotta Shimla	N±SE	2±0.7	0.5±0.5	0.75±0.82	0.75±0.43	0.5±0.5	2.5±0.86	1.25±0.82	2±0.86			
	Percent Population	7.20	1.80	2.70	2.70	1.80	9.00	4.50	7.20			
	Family Number	2.5	2.5	1.5	1.5	0.5	5.75	5.75	5.75			
	Family Percent	9.00	9.00	5.40	5.40	1.80	20.72	20.72	20.72			
	Order Number	2.5	2.5	1.5	1.5		6.25	6.25	6.25			
	Order Percent	9.00	9.00	5.40	5.40		22.52	22.52	22.52			

Table-5 : Relative abundance of insect pollinators visiting *Vinca major* (Linnaeus) flowers from different localities of Shimla Hills.

Locality	**Order**	**Lepidoptera**												
	Family	**Lycaenidae**					**Nymphalidae**		**Pieridae**			**Hesperiidae**		**Sphingidae**
Dhalli	**Species**	***Celastrina huegelii* (Moore)**	**Celastrina lavendularis (Moore)**	**Celastrina sp.**	**Lampides boeticus (Linnaeus)**	**Dodona durga (Kollar)**	**Vanessa indica (Herbst)**	**Aglais cashmirensis (Kollar)**	**Pieris brassicae (Linnaeus)**	**Pieris canidia (Sparrman)**	***Gonepteryx rhamni neplensis* (Doubleday)**	***Celaenorrhinus leucocera* (Kollar)**	**Hyarotis adrastus (Cramer)**	**Macroglossum pyrrhosticta (Butler)**
	Paremeters													
	N±SE	1.75 ± 0.43	2 ± 0.7	1.75 ± 0.43	2 ± 0.7	2.25 ± 0.86	1 ± 0.7	1.5 ± 0.86	1.25 ± 0.82	0.75 ± 0.43	2.25 ± 0.43	1.75 ± 0.75		1.5 ± 0.86
	Percent Population	5.14	5.88	5.14	5.88	6.61	2.94	4.41	3.67	2.20	6.61	5.41		4.41
	Family Number	9.75	9.75	9.75	9.75	9.75		2.5				1.75		1.5
	Family Percent	30	30	30	30	30		7.69				5.38		4.61
	Order Number													19.75
	Order Percent													60.76

Summer hill	N±SE	2.25±0.82	1.5±0.5	1.25±0.43	1.75±0.82	1.75±0.82	1±0.5	0.75±0.43	1.5±0.5	1±0.7	3±1.08	2±0.7		1.25±0.82
	Percent Population	6.92	5.23	3.84	5.38	5.38	3.07	2.30	4.61	3.07	9.23	6.15		3.84
	Family Number	8.5	8.5	8.5	8.5	8.5	1.75	1.75	5.5	5.5	5.5	2		1.25
	Family Percent	26.15	26.15	26.15	26.15	26.15	5.38	5.38	16.92	16.92	16.92	6.15		3.84
	Order Number													19
	Order Percent													58.46
Chauda Maidan	N±SE	1.75±0.82	1.25±0.43	1.5±0.5	2±0.7	2.25±0.86	1.25±0.82	1.5±0.5	2.25±0.82	0.75±0.43	2.5±0.5	2±0.7		0.75±0.43
	Percent Population	5.22	3.73	4.47	5.97	6.71	3.73	4.47	6.71	2.23	7.46	5.97		2.23
	Family Number	8.75	8.75	8.75	8.75	8.75	2.75	2.75	5.5	5.5	5.5	2		0.75
	Family Percent	26.11	26.11	26.11	26.11	26.11	8.20	8.20	16.41	16.41	16.41	5.97		2.23
	Order Number													19.75
	Order Percent													58.95
IGMC	N±SE	1.5 ± 0.5	1 ± 0.7	0.75 ± 0.43	1 ± 0.7	1.25 ± 0.43	0.5 ± 0.5	0.75 ± 0.43	1.75 ± 0.43	0.5 ± 0.5	2.5 ± 0.5	2 ± 0.7		1±0.7
	Percent Population	5.94	3.96	2.97	3.96	4.95	1.98	2.97	6.93	1.98	9.90	7.92		3.96
	Family Number	5.5	5.5	5.5	5.5	5.5	1.25	1.25	4.75	4.75	4.75	2		1
	Family Percent	21.78	21.78	21.78	21.78	21.78	4.95	4.95	18.81	18.81	18.81	7.92		3.96
	Order Number													14.5
	Order Percent													57.42
Kasumpti	N±SE	2.25 ± 0.86	1.25 ± 0.82	2.25 ± 0.82	1.5 ± 0.86	1.25 ± 0.43	1 ± 0.7	0.75 ± 0.43	1.5 ± 0.86	1 ± 0.7	1.75 ± 0.82	1.25 ± 0.82		1±0.7
	Percent Population	8.49	4.71	5.66	5.66	4.71	3.77	2.83	8.49	3.77	6.60	4.71		3.77
	Family Number	8.5	8.5	8.5	8.5	8.5	1.75	1.75	4.25	4.25	4.25	1.25		1
	Family Percent	32.07	32.07	32.07	32.07	32.07	6.60	6.60	16.03	16.03	16.03	4.71		3.77
	Order Number													16.75
	Order Percent													63.20
Chotta Shimla	N±SE	1.25 ± 0.43	1 ± 0.7	2 ± 0.7	1.75 ± 0.75	1.5 ± 0.86	1 ± 0.7	1.25 ±0.82	1.75 ± 0.43	0.75 ± 0.43	2.75 ± 0.55	1 ± 0.7	0.75 ± 0.43	0.75±0.43
	Percent Population	4.50	3.60	7.20	6.30	5.40	3.60	4.50	6.30	2.70	9.90	3.60	2.70	2.70
	Family Number	7.5	7.5	7.5	7.5	7.5	2.25	2.25	5.25	5.25	5.25	1.75	1.75	0.75
	Family Percent	27.02	27.02	27.02	27.02	27.02	8.10	8.10	18.91	18.91	18.91	6.30	6.30	2.70
	Order Number													17.5
	Order Percent													63.06

Episyrphus balteatus **(De Geer)**

Eristalis tenax **(Linnaeus)**

Fig.-1 : Insect pollinators foraging on *Bergenia ciliata* (Haw.) Sternb. flowers.

Acknowledgeme

Coccinella septempunctata (Linnaeus)

Xylocopa sp.

Vanessa indica (Linnaeus)

Pieris brassicae (Linnaeus)

Gonepteryx rhamni neplensis (Doubleday)

Celaenorrhinus leucocera (Kollar)

Macroglossum pyrrhosticta (Butler)

Eristalis tenax (Linnaeus)

Eristalis himalayensis (Brunetti)

Episyrphus balteatus (De Geer)

Fig.-2 : Insect pollinators foraging on *Vinca major* (Linnaeus) flowers.

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BROILER FARMING - AN ECONOMIC VENTURE FOR RURAL YOUTH

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An uproar in poultry meat production from 0.069 million tons to 4.78 million tons, was observed over 60 years. Despite this accomplishment, Only 3.51 kg of poultry meat is available per person per year in India, far less than the ICMR's recommended of 11 kg of meat per capita per annum. India is poised to play a more active role in the global poultry trade, particularly concerning exports to the Middle East, given the size of its chicken industry, its price competitiveness, and Indian entrepreneurship (Hellin *et a*l., 2015). Among all livestock farming, the return on capital investment is the fastest in broiler farming. Therefore, planning must be done so farmers can profit as much as possible from broiler farming, and the younger generation would be drawn to this industry. The broiler industry can be adopted under various climatic conditions (Singh *et al*., 2010). At present, broiler farming has become an encouraging and enlightened industry with huge potential. It acts as an essential tool for reducing poverty through self-employment and the generation of income for unemployed members of families (Raha, 2007). Over the years, broiler farming has been a good source of revenue for rural farmers due to its short duration cycle, relatively small investment, and quick returns (Bhende, 2006). Hence, the present study reviewed the cost and returns in broiler production. Indian broiler farming is expanding due to the country's high consumer demand and quick turnaround. The production of broilers has significantly expanded over the past years due to the adoption of various technologies. Better management practices and a balanced diet may be adapted to increase output. However, farmers should take care of feed costs according to the market value of broilers. Finally, marketing through proper channels is essential to get sufficient profit for a farmer. So, one can get sufficient profit from a broiler farm by applying scientific techniques to take care of seasonal variation, minimizing additional costs, providing good nutrition, and following profitable marketing channels. The average annual growth rate of broiler industries is 10.9 per cent, producing 4.78 million tons and employing 4.29 million people. India is the world's fourth largest producer of poultry meat, valued at US$ 28.18 billion. Poultry production accounts for roughly 1.0 per cent of total India's GDP and 14 per cent of GDP from the livestock. About 26,000 people can find work annually by increasing per capita intake by one egg and 50 grammes of poultry meat (Kazi, 2003).

The advantages of broiler farming :

The initial investment is lower than layer farming

The rearing period is 5-6 weeks only

More flocks can be housed in one shed

Compared to other livestock, broilers have a high feed conversion efficiency, meaning that less feed is needed for each unit of body weight gain.

A quicker return on investment

The demand for poultry meat is higher than for sheep or goat meat.

Factors affecting growth in broiler production :

Genetic advancements in poultry strains for the production of meat and eggs

Betterment in managemental practices

Provide balance nutrition

Disease control

System of broiler farming

Non-contract broiler farming (NCBF) : In this arrangement, the farmer is responsible for covering all costs, including transportation, overhead farm expenses (labour, energy, water, litter, farm sanitation, etc.), and the purchase of chicks, feed, medications, and vaccines. The farmer must acknowledge production, market, and investment hazards.

Contract broiler farming (CBF)/ integration : In this case, the integrator provides advisory services and inputs such as chicks, feed, medicines and vaccines. The integrator bears the transportation cost, investment (inputs) and marketing risks. The contract farmer provides labour, shed, electricity, water, litter material, and other miscellaneous services or equipment that may be required. The integrators are the sole proprietors of the mobile stock (broiler birds) on the farm since they carry the bulk of the cost (working capital), and the farmer serves as a caretaker who receives a predetermined price as specified in the

contract. The FCR, bird mortality, and other variables are all tied to this payment to the farmer. A farmer is rewarded for surpassing the set standards and penalized if the agreed-on criteria are unmet. The integrator is also relieved of his most significant threat of disease outbreak as his millions of birds are reared at different locations in relatively small numbers by several small farmers. Broiler contract farming may be significantly influenced by price per bird, feed conversion rate, average body weight, average marketing age, mortality rate and rearing housing system. However, the farm size does not influence it (Majid and Hassan, 2014). The system provides several advantages in terms of efficiency in adopting sophisticated technologies and achieving economic benefits even in small-scale farming systems (Sundararajan, 2007). Contract broiler farming created a situation in which the production cost has decreased even though the primary raw materials prices have increased. Integration has provided a way for employment generation.

Management of day-old chicks : Houses, surrounding areas and equipment must be cleaned and disinfected before chicks' arrival. The brooding space should be evenly covered with litter materials (wood shavings, chopped straw, etc.) 8 to 10 cm deep. Before the arrival of the chicks, houses must be pre-heated for at least 24 hours. To achieve consistent temperatures across the brooding area, frequently check pre-placement temps. Ample clean water at room temperature is a must. In the early stages of the chick's growth, water is essential. In the brooder section, provide fresh, dust-free starting crumbs. Make sure the chicks can easily access their food using flat pans, trays, or paper sheeting. Feeders and drinkers shouldn't be placed directly beneath or next to brooders.

Nutrition management : Feed is a significant component of the total cost of broiler production. Formulate broiler rations to balance energy, protein and amino acids, minerals, vitamins and essential fatty acids to support optimum performance. Depending on whether the goal of the business is to maximize live bird profitability or the output of carcass components, the choice of feeding programme will be necessary. The sole objective of feeding poultry is to convert low-quality feeds like cereals grains, oil cakes and other by-products of agriculture and industry into high-quality food like eggs and meat. However, the profitability of poultry farming depends mainly on four factors :

(i) Good stock

(ii) A low-cost balanced feed

(iii) Efficient care and management

(iv) Timely marketing.

The following key points should be noted for feeding management for higher profit from broiler farming :

For a range of production and market situations, a wise choice of the feeding program.

Since feeding alone costs about 60-70% of the total cost of egg and meat production, it is one of the critical factors for successful poultry production.

Provide optimum dietary digestible amino acid levels for growth, efficiency, processing yield and profitability.

Make sure to select high-quality protein sources.

Provide the critical minerals at the proper concentrations and in the right proportions.

Supplementing vitamins and minerals relies on the components of the feed formulated and the environment to be used.

Poor physical feed quality will harm broiler performance.

Use the high-quality crumbled and pelleted feed to get the best results.

Ensure a coarse, homogeneous particle size is attained while feeding the mash.

Reduce the amount of tiny particles (1 mm/0.04 in) to under 10%.

The birds should always have access to drinking water.

Give them supplementary drinkers for a flock's first four days of life.

Monitor the feed-to-water ratio daily to ensure sufficient water intake.

Allow for increased water consumption at high temps.

Adjust drinker heights daily.

Interestingly, reducing nutrient density harms feed cost per kg live weight. Lower-density diets are less cost-effective when stated as a cost per kg of live weight when nutrient density is reduced since it dramatically affects live weight and FCR.

The lowest feed cost does not produce maximum margin : By reducing the nutrient density of the feed, the feed cost per bird can very quickly be reduced. However, this will reduce performance and, when corrected back to equal live weight, will result in an increased cost of production.

The amount of Balanced Protein will significantly influence the margin and profitability of the feed. However, energy must also be considered as Balanced Protein is only one of the two major dietary components. It is essential to appreciate that all modern broilers are responsive to amino acid and energy density. The margin over feed cost must be considered while choosing the best feeding plan. In general, lowering the level of balanced protein lowers the cost of feed per tonne while also impacting productivity and profitability. The effect of reduced dietary energy density was to increase feed intake, illustrating that, to a point, the broiler appears to compensate for lower energy density levels by increasing feed intake. The birds on the good-quality pellets could increase feed intake when energy was reduced, resulting in improved live weights. However, the birds on the poor-quality pellets could not increase intake, and as a result, live weight was reduced when dietary energy was reduced.

Litter management : The litter is generally used in a broiler/ poultry farm as a bedding material, mainly to comfort the birds. During the summer and winter, suitable quality litter serves as a buffer in chicken sheds by acting as an insulator to keep a constant temperature. Litter also act as a cushion; birds can pick up some vitamins and un-identified growth-promoting factors from the litter. It's crucial to manage poultry houses to reduce litter wetness and enhance the quality of the litter. Litter storage conditions (before use), bird nutrition, environmental conditions (humidity and condensation), and equipment (drinkers, foggers and evaporative cooling pads) in houses all can contribute to problems with litter moisture if not appropriately managed. To maintain the ideal pen environment, the ability of the litter material to absorb and release moisture is essential. After thoroughly cleaning and sanitizing of poultry shed, the litter material should be spread over the floor.

During the summer months, the depth of litter should be 3-4 inches and 7-9 inches in winter. Periodically the litter needs stirring, spreading, and levelling should be carried out simultaneously. Remove any damp litter around the waterer and replace it with fresh litter. When the litter gets moist due to humidity in the rainy season, the slaked lime powder may be mixed with 1 kg for a 100 sq. ft. area. Cake formation in a litter is most undesirable, and when there is any cake formation, it should be immediately crushed to make it powder. If that is impossible, the same should be replaced with new litter. The chicken flock will experience problems if the litter material has a higher moisture content.

The ideal moisture content for litter is between 30 and 60%. When the litter is too dry (<30%), dust conditions may persist in the pen as birds move about. In active flocks, this can be a problem of introducing microorganisms into the birds' air. It will overload the birds' respiratory and digestive systems with pathogens. On the other hand, the litter material should not exceed 60% moisture in the poultry pen. High litter moisture promotes the growth of pathogens.

Moreover, wet litter is the primary cause of ammonia emissions from litter. Chickens are sensitive to ammonia, which can cause blindness, decreased growth rate, reduced feed conversion rate and condemnations. High moisture also decreases the bird's comfort in their environment as they seek comfortable dry bedding areas. Higher moisture means higher ammonia production, which can lead to problems with bird health as an increased ammonia intake will increase stress on the birds. Chickens are sensitive to ammonia, which can cause blindness, decreased growth rate, reduced feed conversion rate and condemnations. Ammonia burn on affected bird carcasses will increase trim when birds are processed. Circulation fans should move air within the house to keep litter dry while moving warm air off the ceiling and down to the floor. In addition, heating and ventilating a house will remove moisture since warmed air holds moisture and can be ventilated from a house.

Type of litter material : There are many types of litter material which generally used for raising poultry birds. A good litter material is capable of absorbing moisture quickly as well as giving them some rapidly. Litter material should not be moulded and should be free from toxic substances or fungal contamination. The commonly used litter materials for broilers are paddy husk, sawdust, sugarcane bark, dry leaves, rape seed husk, peanut husk etc. Among these, the paddy husk is the most commonly used litter material in broiler raising. In hilly regions, pine trees (*Pinus roxburghii*) are the dominant flora of hilly forests. The needles of pine trees can act as good litter for raising poultry birds in hilly areas. For building up litter, easy availability of good litter material will be the sole criteria for selecting litter material. Simultaneously cost factors should be considered in the selection of litter material.

Reuse of used litter : Due to the low availability of quality litter material, many poultry farmers try to reuse litter for the subsequent raising of poultry birds. Reusing litter can be beneficial and economical if appropriately managed and has become a standard in the poultry industry. As poultry litter is reused, the chance of nutrient or pathogen contamination in waterways is reduced, which benefits the environment. Used litter can be reused successfully to raise a flock of poultry birds after proper

treatment, known as artificial composing. First, the poultry shed must be depopulated entirely, and equipment, feeder/ waterer, etc., are removed for cleaning and disinfection; after removing the caked-up litter &fallen out feathers, the litter heaped in large piles on the floor of the shed & left it in same condition up to one week. This process promotes to increase in the activity of the anaerobic bacteria & the organic matter starts decomposing & generates heat. The heap's internal temperature is increased to 1400F, sufficient to destroy all disease-causing germs. After one week, the heap should be broken, spread over the floor & should be sufficiently dry.

Effect of general managemental practice : General managemental practices affect the profit of broiler farming. Begum and Alam (2009) reported that per broiler net return is more than 1.4 times higher in scientifically managed farms than in farms that reared broilers without management intervention. Low biosecurity was identified by Sonaiya (2009) as one of the technical variables affecting the productivity and financial success of smallholder family poultry. Bio-secured farms were found to have higher FCR as compared to that non-bio-secured farms. Seasonal variation was also seen in the case of growth and profitability. These are higher in winter than in summer (Ali *et al.,* 2015). Jaim and Islam (2008) concluded that feed consumption and efficiency were lower in technically supported farms than in non-supported farmers. Trained farmers had more broiler farming knowledge and skill than non-trained farmers. Ershad *et al.* (2004) also reported that the market body weight was 1.60±0.17 kg and 1.451.45±0.21 kg per broiler bird for trained and non-trained broiler farmers, respectively, in their study area.

All the broiler farms in Jammu succeeded under a deep litter system. More than 50 per cent of broiler units had grass roofs, forty per cent had cement roofs, and only ten per cent had hut-type roofs. In most cases, chicks were fed thrice daily, whereas mature birds were fed twice daily (Ali *et al.,* 2015).

Health management : The chicks must be vaccinated against all the prevalent diseases like Marek's, Ranikhet, Gumboro, Infectious bronchitis and Fowlpox as per the given schedule. Keep a watch on coccidiosis after three weeks and start mixing coccidiostats in the feed or drinking water. In case of any disease problem, a poultry veterinarian should be consulted immediatlty to prevent mortality. The dead birds should be disposed properly in an incinerator. Follow bio-security measures strictly, which include restricted entry of visitors, minimum movement of personnel from one unit to another; plugging of leakage of water lines and their regular flushing; all-in; all-out system of rearing, proper disposal of old litter/ farm waste and dead birds and keeping premises free from rodents and wild birds. The disease is one major factor contributing to mortality in poultry production. These include bacterial, viral and parasitic diseases. Treatment of these diseases, therefore, is according to the causative agent. Under good management practices, a mortality rate will range between 5 to 10% per year.

Table-1 : Vaccination schedule of broilers.

Sl. No.	Age	Name of the vaccine	Remarks
1.	1 Day	Marek's disease vaccine (F1)	0.2 ml S/C (hatchery)
2.	5 day	Ranikhet disease vaccine	one drop in the eye/nostril
3.	12-14 day	Gumboro disease vaccine	one drop in the eye
4.	21-24 day	Infectious bronchitis vaccine	drinking water
5.	28 day	Ranikhet disease vaccine (La Sota)	drinking water

Disposal of dead birds : A sound system for the disposal of dead birds and farm animals is necessary for sanitation, disease and odour prevention, and environmental protection. To annihilate dead poultry birds, the poultry bird digesters may be used with proper specifications authorized by Livestock sanitary board. Incineration of dead birds and animals may be the quickest and most sanitary disposal method. Wastes can be disposed of as fast as they accumulate, and the resulting stabilized residue does not attract scavengers or insects. Commercial units often have automatic timers and come with either gas or oil burners. Flies in and around poultry houses should be controlled. One of poultry producers' most significant management problems is fly control. Water management and maintenance of sanitation are the factors helpful in controlling flies. These management practices will lead to a decrease in poultry bird disease and mortality. Ultimately income will be increased.

Expenditures in a broiler poultry farm

Non-recurrent expenditures : These expenditures are done only once. Among them are a poultry house, a farmhouse, a storeroom, a bathroom, a farm vehicle, a fence, a refrigerator and a backup generator. It should be understood that not all assets will be required for the project. Some can be hired by other farmers instead of being bought. It would be wiser not to buy a farm vehicle, for instance, if hiring transportation for the project would be less expensive. It is wise to know that costs for the necessary products vary considerably based on geography and the farming season.

Land : Land cost varies mainly depending on the area. So area should be chosen where land and building material costs are minimal. The plot shouldn't be near rivers or streams because doing so could cause poultry faeces during rainstorms to pollute the water. Flood threats may be presented to broiler chickens in chicken runs by rivers and streams. The chicken farm ought to be located distant from people.

Fixed resources : Along with the nonrecurring expenditures, some assets will be purchased or procured irrespective of the no of birds. These are electricity, tube feeder, manual drinking, insurance, and labour. Care should be taken that much investment is not made in this aspect. However, a poultry farm is most important for these reasons.

Labour : The cost of producing broilers is related to labour expenditures (fixed and temporary staff), which comprise 3.61% of the overall cost. But decreasing labour will also affect the performance of the animals. So farmers can use automated machines to decrease production costs and do the work of some labours (Carvalho et al. (2008).

The minimum cost of production versus maximum profit in broiler farming : To minimize feed cost, we must appreciate the effect on margin as we know that feed cost (per bird) increases as nutrient level increases. The margin over feeding costs is improved due to the improved bird performance, which also enhances the revenue from the birds. Minimizing feed costs (shown by the red circle) does not produce the highest margin. Still, it is achieved when the difference between revenue and cost is most remarkable (indicated by the green circle). The producer should strive to feed the birds so that the margin is in the zone with the highest margin, as shown in the figure. Maintaining or boosting dietary nutrient density is required to achieve this.

Marketing of broiler

As broiler bird marketing involves live birds, it is an odd business. The Broiler production is marketed mainly through big farmers, integrators, private wholesalers and retailers. In the interior pockets, the producers are marketing in small retail outlets and catering to the local requirements. While most broiler chickens are eaten in the state, AP occasionally sends surplus broilers to other states depending on supply and demand. An effective marketing structure is essential for the success of the broiler farming industry. Marketing of broilers requires special efforts because of the peculiar characteristics of broilers. If the broilers are not disposed of as soon as they reach marketable weight, the producers, called Integrators, have to incur additional costs in terms of feed. The broilers' demand fluctuates from season to season. Consumer demand for poultry is rising, driven by income growth and change in poultry meat prices concerning other goods. Second, the poultry market in India is evolving structurally. In particular, the introduction of vertical integration in poultry production and marketing has lowered production costs, marketing margins and consumer prices of poultry meat. The most popular marketing strategy used by broiler farmers in northern India was "producer to trader to retailer to consumer" (Dwivedi et al., 2015). Trading of broiler birds is quite erratic, with prices set by the day's supply and demand in a specific market. The broiler prices fluctuate widely, and even short surpluses result in a vast fluctuation in market prices. During religious festivals, the consumption of poultry and other meats is negatively impacted, causing a significant decline in demand. With the bit of scope for the sale of frozen products or inter-regional movement due to the preference for live birds, the seasonal swings in demand are causing high volatility for market prices of broilers.

Marketing channels

Interdependent businesses that make a good or service available for use or consumption are referred to as marketing channels. Thus Marketing Channels refer to the path through which the broiler travels from the integration to the ultimate consumer. The survey reveals that the integrator of the study area uses three alternative channels for marketing their broilers.

Channel I - Broiler Producer - Commission Agent - Wholesaler - Retailer - Consumer.

Channel II - Broiler Producer -Wholesaler - Retailer - Consumer.

Channel III - Broiler Producer - Retailer – Consumer

BROMARK (Broiler Marketing Cooperative Society)

Bromark, a brainchild of the late Padmashri Dr. B.V. Rao, is an all-India Broiler Farmers' Body registered under the Multi-State Cooperative Societies Act 1994. Bromark aims to reduce the gap between producers' and consumer prices and promote chicken meat consumption by advertising its nutritional value. Similar to NECC for eggs, Bromark is publishing farm gate pricing for live broiler kg at all crucial production hubs in the state by analyzing demand and supply trends and working to minimize the exploitation of intermediaries to the greatest extent possible.

Broiler-Feed Price Ratio : The broiler-feed ratio is calculated by dividing the cost of broilers by the cost of feed per pound. As the cost of feed rises compared to the price of broilers, the broiler-feed price ratio falls. Fluctuations in the prices of broilers and feed cause changes in the feed-broiler price ratio. Profits are higher when feed is less expensive in comparison to the cost of broilers. Feed is cheap relative to the price of broilers when the broiler-feed price ratio is high. Determining the time of marketing : In addition to feeding efficiency, broiler feed price ratio, and the number of lots produced per year, other factors influence a producer in his marketing decisions. When selecting when to market, a producer considers the price, mortality, and market demand for broilers. (Back, 1954). Production and market factors comprise the two variables that determine marketing time. The production criteria are the things a producer would think about if he were free to choose on his own when selecting whether to sell his birds

Economics of broiler farm

Investments in broiler farms : Economic research revealed that small farms had the most significant total fixed investments and variable cost per bird, followed by medium and large farms. Small broiler farms have the most tremendous total cost of production per chicken, followed by medium and large farms. Large farms have been found to offer the best net returns per bird above variable costs, and economies of scale are prevalent there. Investment in broiler farming has been determined to be successful in all farm sizes, with big farms showing the most outstanding profitability (Pant et al., 2004; Singh et al., 2010) based on net present value, benefit-cost ratio, and internal rate of return. The pattern of fixed investment per broiler was maximum on small farms (Rs.42.29), followed by medium (Rs 37.79) and large farms (Rs 32.44), with an overall average of Rs 37.51. The total variable cost was 69.16% (Rs.94.87), 68.93% (Rs.83.88) and 71.34% per bird (Rs.80.78) on small, medium and large farms, respectively, with an overall average of 69.75% (Rs.86.51) of the total cost. The critical items of variable costs were feed (62.38%), followed by medicine and vaccine items (2.33%) and miscellaneous items (2.24%). In size-wise analysis, the cost of feed per broiler was found to be 59.62%, 61.87% and 66.27% of the total cost on small, medium and large broiler farms, respectively. The per chick cost of medicines and vaccines increased with the decrease in the farm size. As the farm size grew, the variable cost appeared to have fallen somewhat. Due to economies of scale on big farms, similar trends were observed in the cost of feed per bird, interest in working capital, staff costs, etc. Large farms could purchase the inputs in bulk and at lower prices to further mix various feed ingredients at their farms. (Verma et al., 2014).

Returns from broiler farm

The benefit-cost ratio was observed to be 1.11, and it increases with an increase in flock size, indicating that as flock size increases, the net returns over the invested money on broilers also increase (Shaik and Zala, 2011). According to Khan and Babu (2004), the sale of broilers alone contributed a significant share of 98.86% of small and 98.81% in large farms in the total receipts. The gross returns per kg of live weight were highest on small farms (Rs 150.97), followed by large (Rs 148.91) and medium (Rs 146.67) farms. The income from the sale of broilers was about 97-98 per cent. The average per chick gross return was Rs. 148.83. The returns over variable cost (41.87) were higher than the observed. The benefit-cost ratio per broiler was maximum on large farms (1.31), followed by medium 1.20) and small farms (1.10), respectively, with an overall average of 1.19. The BCR increased with farm size, and the large farms were economically more viable (Verma et al., 2014).

CONCLUSIONS

Based on the facts revealed, it may be concluded that broiler farming has immense production potential and is a profitable and economic venture for the agricultural youth in terms of substantial employment opportunities coupled with economic security. The maximum production potential can be achieved by following the improved broiler farming practices, which will not only improve the production performance of chicken but also increase the socio-economic conditions of the rural youth.

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RECENT INSIGHTS INTO THE BACTERIAL LEAF BLIGHT OF RICE IN INDIA : PATHOTYPING, MOLECULAR DIVERSITY AND MICROBIOME-BASED MANAGEMENT

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Abstract

Rice is an important food and commercial crop in India. It is being cultivated in both irrigated and rainfed ecosystems of the country. Rice production in India is affected by several biotic and abiotic constraints. Several major diseases, such as blast, sheath blight, and bacterial leaf blight (BLB), continue to appear in moderate to severe form in all ecosystems in all seasons. Cultivating resistant varieties is the most effective and economical method of BLB management due to the limited availability/efficacy of antibacterial chemicals against Xoo. For the successful development of resistant cultivars, the information on the virulence profile of the Xoo population and its dynamic in the target location is essential, as BLB resistance in the rice follows the gene-for-gene hypothesis. Virulence in Xoo is very dynamic and requires continuous monitoring over time to identify the virulence structure and distribution changes. The recognition of the pathogenic race of Xoo depends on its ability to induce a combination of a susceptible and resistant reaction on a set of standard differential hosts. The Near-isogenic rice lines (NILs) possessing different major genes for resistance to Xoo were developed by IRRI and used to identify Xoo races. In the present study, virulence profiling was carried out for 11 years, from 2012 to 2022, on a set of differentials consisting of 28 near-isogenic lines (NILs) possessing different BLB resistance genes and their combinations. Each year a freshly isolated pathogen strain from the field was used for artificial inoculation, and the disease on each NIL was measured based on a Standard evaluation scale of 0-9. Results revealed that all the single gene differentials had shown susceptible reactions in all 11 years except *Xa21* (IRBB 21).

Similarly, only one differential with two gene combinations, i.e., IRBB 52 (*Xa*4+*Xa*21), showed resistant reaction consistently over the experimental period in all the years except 2015. Differential with three gene combination (IRBB-58, *Xa*4+*xa*13+*Xa*21) and Improved Sambha Mashuri (*Xa*5+*xa*13+*Xa*21) bearing triple gene combination has shown a resistant reaction in all the experimental years. All four gene combinations (IRBB-60, IRBB-64, IRBB-65) and a five-gene combination (IRBB-66, *Xa*4+*xa*5+*xa*7+*xa*13+*Xa*21) showed moderate resistance to resistance during 2012-2022, where *Xa4+xa5+xa13+Xa21* (IRBB60) combination was the most consistent with respect to resistance reaction from 2012-2022. Our study indicated *Xa21*, *Xa4+Xa21*, *Xa5+xa13+Xa21*, *Xa4+xa5+xa13+Xa21,* and *Xa4+xa5+xa7+xa13+Xa21* are the best gene/combination to be used in the breeding program to develop BLB resistant cultivars for TB command paddy area.

Another study was carried out to analyze the virulence, genetic diversity, and population structure of Xoo isolates collected from different rice ecosystems in Karnataka, India. The taxonomic identity of all 54 isolates was confirmed using a Xoo-specific PCR assay. The virulence assay on twenty-eight near-isogenic differentials identified nine pathotype groups (KPthX-1 to KPthX-9). Among them, KPthX-6 was highly virulent, whereas KPthx-2 was less virulent. Differentials with four and five resistance (R) genes (*Xa*4 + *xa*5 + *xa*13 + *Xa*21, *Xa*4 + *Xa*7 + *xa*13 + *Xa*21, and *Xa*4 + *xa*5 + *Xa*7 + *xa*13 + *Xa*21) were effective against all the pathotypes. In our study, the most virulent, KPthX-6 and KPthX-4, were found avirulent on IRBB-53 (*xa*5 + *xa*13) and IRBB-60 (*Xa*4 + *xa*5 + *xa*13 + *Xa*21) pyramids lines. Our present study revealed that differentials with four and five R genes (*Xa*4 + *xa*5 + *xa*13 + *Xa*21, *Xa*4 + *Xa*7 + *xa*13 + *Xa*21, and *Xa*4 + *xa*5 + *Xa*7 + *xa*13 + *Xa*21) were effective in managing disease against all the pathotypes of Karnataka. Previous workers also reported a high BLB resistance against BLB pathotypes by using three-gene and two-gene pyramided lines in several parts of India. All these genes combination appeared to be good candidates to be deployed in different rice cultivars. This study helps in strategically planning and deploying different *Xa* gene combinations in the genetic background of important Indian rice cultivars. We identified the distribution of nine pathotypes in Karnataka. Previously, seven pathotype groups have been reported in Karnataka. However, we used internationally accepted monogenic and oligogenic differentials. The grouping was carried out separately based on isolate reactions on the monogenic differential, oligogenic differentials, and a monogenic and oligogenic differential combination. Among three types of grouping, reaction on monogenic differential was considered due to the

appearance of contrasting phenotypes such as R and S. Whereas, in the case of oligogenic differentials, phenotype on most of the isolate-differential combination was MR in addition to S and R. MR-phenotype is highly confusing to decide whether the pathotype is either virulent or avirulent on a particular R gene and its combination. Therefore, we have considered the pathotype grouping in this study based on the monogenic differential. Previous studies have also reported the superiority of monogenic differential in resolving the virulence diversity of Xoo isolates. Nine pathotypes identified in this study were distributed across all ecosystems, and no correlation was found between the pathotypes and ecosystems. This could be due to the free exchange of seed material between the ecosystems and the cultivation of similar cultivars in all irrigated ecosystems.

Information on the genetic diversity among the different pathogen isolates is a prerequisite for understanding phylogeny and evolution better. Among the different techniques, the characterization of IS elements, such as *IS1112* and *IS1113,* is widely accepted globally. The *IS1112* is a transposable element found only in the Xoo pathogen and absent in non-pathogenic Xanthomonads. This marker can be used for both detection and the characterization of Xoo simultaneously. Several attempts were made in India to characterize the Xoo population using IS-sequences. However, most of the studies have not included the isolates from Karnataka or included very few isolates. Our study deduced genetic diversity using a universal marker set, JEL-1 and JEL-2, complementary to a conserved repetitive sequence IS1112. The amplicon size and numbers varied from 100 bp to 3 Kbp and 1 to 25. Based on the amplicon counts, Jaccard's co-efficient and phylogenetic analyses were carried out and categorized the 54 isolates into three clusters (I to III). Cluster II contains the maximum number of isolates (27), followed by Cluster I (23 isolates) and Cluster III (one isolate). Based on structure analysis, 54 Xoo isolates were categorized into five subgroups, viz, SG1, SG2, SG3, SG4, and SG5, indicating the existence of five subpopulations. Among them, the maximum isolates (31.48%) were classified as AD. The sub-group included a maximum of nine isolates. We did not observe any correlation between cluster and structure analysis. The present study of evaluating the pathotypes and genetic diversity in the Xoo population in Karnataka is an initial step to understanding the pathogen population structure and would help in a more comprehensive understanding of this pathogen population.

We also attempted to manage the BLB disease utilizing the bacterial microbiome isolated from the BLB-symptomatic leaves. A total of 27 culturable microbiomes were isolated on different media such as Nutrient agar, Kings'B media, Tryptic soya agar, Soyabean casein digest agar from BLB infected and healthy leaves of BPT-5204 (Susceptible), RP-BIO- 226 (Resistant) rice varieties which are under inoculated and uninoculated condition. Morphological characterization of all 27 isolates revealed that isolates are circular in form, flat elevation, smooth margin, and creamy white in color. In biochemical characterization, most of the isolates showed gram-positive, catalase, citrate-positive, oxidase, methyl reduction, and KOH test negative. Molecular characterization based on 16S rDNA amplification followed by sequencing, BLAST analysis of 15 isolates identified as *Bacillus cereus, B. infantis, Streptomyces longisporoflavus, Ochrobactrum intermedium, B. thuringiensis, Ochrobactrum pseudintermedium, B.s drentesis, B. infantis, Niallia circulans, B. subtilis, and Brucella oryzae. In an in-vitro* and *in-planta* assays for their antagonistic effect against Xoo, *A. psuedointermedius* strain R-II-T1, *B. subtillis* strain B-III-T1, and *S. longisporoflavus* strain B-III-T2 were found to be effective in reducing the in-vitro growth of the Xoo as well as in-planta BLB severity.

The genetic diversity might explain solving some of the problems encountered in developing rice cultivars with specific and broad-spectrum resistance against the Xoo population of Karnataka. The major obstacle in deciphering the biology of the Xoo population and its management has been one of the biggest challenges. Understanding the distribution of different pathotypes would help better monitor the spread of Xoo pathogens in other major rice-growing producing areas in Karnataka and India. Our study might help to provide a platform for the characterization of new uncharacterized isolates. Further, a combination of four or five genes in different rice cultivars appeared to be the best strategy for managing the menace caused by this disease. We have also identified four effective strains of antagonistic Bacteria isolated and characterized from the diseased niche and will aid in developing an eco-friendly method of BLB management in combination with disease-resistant cultivars. This report would aid in deploying better strategies and planning the incorporation of different *Xa* gene combinations in important Indian rice cultivars for effective management against this pathogen.

RECENT HAPPENINGS IN EXPLORATION OF ENDOPHYTES AND BIOCONTROL BASED GREEN NANOPARTICLES IN MANAGEMENT OF SOYBEAN DISEASES AND PRODUCTIVITY ENHANCEMENT IN INDIA - AN OVERVIEW

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The major constraints in soybean production are climate, rainfall, edaphic factors, biotic and abiotic stresses. Soil borne fungal pathogens are the major stumbling block in successful cultivation of soybean in recent years in India. Over the years chemical management of the plant diseases has posed a greater threat to the Indian agriculture by the development of new races of the pathogens, pesticidal residues and environmental hazards. In this context, use of biological control is gaining importance to protect the environment and soil health. Endophytes and green nano particles have emerged as a new innovative and sustainable approach to manage the diseases, abiotic stresses and to promote plant growth. The benefits of native endophytes have been recognized over the past ten years from around the world and many interesting research have been undertaken. In India, though there is research on fungal endophytes, the potentiality of endophytes in suppressing soil borne pathogens remained as untapped resources. Hence, with a view of exploiting the native endophytes and their role in suppression of soil borne pathogens of soybean, the present investigation was undertaken. The work green synthesis of nano particles and their effect against anthracnose of soybean is the first report from India. Nanoscience, an emerging technology in the field of phytopathology was explored to manage the anthracnose disease of soybean caused by *Colletotrichum truncatum*. The results are of study are discussed as below. Thirty fungal endophytes were isolated from major soybean growing areas of northern Karnataka and Maharashtra. Out of which eight effective fungal endophytes were obtained by in vitro screening against major soil-borne pathogens viz., *Sclerotium rolfsii*, *Rhizoctonia bataticola* and *Fusarium oxysporum*. The fungal endophytes RF-BV-3 (46.46%), SF-DM-8 (49.15%) were effective against *S. rolfsii,* and the isolate SF-DM-8 (49.32%) was effective against *R. bataticola*. The effective fungal endophytes against *F. oxysporum* were RF-BV-3 (66.61%), SF-BV-3 (59.66%), SF-DM-8 (69.21%), SF-DS-10 (56.49%), LF-HH-5 (66.31%), LF-DM-10 (59.78%), LF-DD-13 (61.15%) and LF-KK-14 (59.78%). Based molecular methods, the effective fungal endophytes were identified as *Daldinia eschscholtzi* (RF-BV-3), *Fusarium solani* (SF-BV-3 & LF-KK-14), *Neofusicoccum parvum* (SF-DM-8), *Diaporthe phaseolorum* (SF-DS-10 & LF-HH-5), *Phomopsis* sp. (LF-DM-10) and *Colletotrichum aenigma* (LF-DD-13). The antagonistic effect of 30 bacterial endophytes of soybean collected from northern Karnataka and parts of Maharashtra against *Sclerotium rolfsii, Rhizoctonia bataticola* and *Fusarium oxysprum* were assayed *in vitro* through dual culture plate technique. The bacterial endophytes RB-KK-6 (40.78 %), SB-BS-6 (50.08 %) and LB-BU-1 (47.02 %) were found effective against *S. rolfsii* and the isolates SB-DG-11 (47.41 %), LB-BiN-8 (41.22 %) were effective against *R. bataticola.* The effective bacterial endophytes against *F. oxysporum* were RB-HS-1 (41.99 %), SB-BiJ-9 (40.07 %), LB-BU-1 (54.20 %) and LB-BV-2 (51.64 %). Based on molecular characterization the effective bacterial endophytes were identified as *Acinetobacter* sp. (RB-HS-1), *Alcaligenes faecalis* (RB-KK-6), *Stenotrophomonas* sp. (SB-BiJ-9), *Bacillus pumilus* (SB- DG-11 & LB-BiN-8), *Paenalcaligenes* sp. (LB-BU-1), *Bacillus cereus* (SB-BS-6) and *Brevibacillus* sp. (LB-BV-2). Among all the endophytes evaluated to assess their antagonistic potentiality and understanding of mechanism of disease suppression, the best inhibition was noticed in *Neofusicoccum parvum* against all the tested pathogens ranging from 69.41 to 82.35 per cent by production of volatile compounds. *Neofusicoccum parvum* and *Daldinia eschscholzii* showed positive results for siderophore production and zinc solubilisation. *Neofusicoccum parvum, Daldinia eschscholzii* and *Colletotrichum aenigma* showed positive results for HCN production test. For chitinase test only *Neofusicoccum parvum* was found to be positive. *Neofusicoccum parvum* and *Colletotrichum aenigma* were recorded positive for phosphate solubilization. The study was conducted to assess the effectiveness of four green synthesized nano formulations viz., chitosan-based zinc nano formulation (ChZnNF), *Pseudomonas fluorescens* based zinc nano formulation (PfZnNF), pomegranate aril-based sulphur nano formulation (PASNF) and pomegranate aril-based silver nano formulation (PAAgNF) at different concentrations under in vitro and glasshouse conditions. Entophytes and green synthesized PAAgNF can be explored as a novel technology in managing soybean diseases and productivity enhancement of soybean in India.

Abstracts

COMPARATIVE PERFORMANCE OF GUAVA GRAFTS AND LAYERS UNDER HDP IN SODIC SOIL

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Abstract

In recent days, several farmers adopt meadow orchard guava cultivation on a commercial scale. Guava is getting popularity in the international trade due to its nutritional content and processed products. However, the greatest handicap in guava plantation is shortage of planting material and indiscriminate multiplication of plants from unreliable sources by nursery men. Large number of low quality guava plants are distributed and planted in the field every year. These trees became a permanent liability to the growers as no amount of fertilization and care can change their genetic qualities. The initial planting material is the basic requirement on which the final crop depends both in quality and quantity. Hence, it is inevitable to standardize suitable method of propagation for rapid multiplication in guava and to study the growth and yield of plant multiplied by different methods of propagation. The experiment was conducted at the Experimental Farm of Horticultural College & Research Institute for Women, Tiruchirappalli to study the comparative performance of grafted and ground layered guava var. Lucknow-49 under HDP in Sodic soil condition. The guava grafts and layers of cv. Lucknow-49 were planted at a spacing of 3 x 1.5 accommodating 2222 plants/ha under HDP system. The performance of the Lucknow 49 variety grafted on its own seedling rootstock and the ground layered Lucknow 49 were studied. The fertilizer dose as recommended by CISH, Lucknow was applied @ 480:240:240g/ plant/year *i.e*., 240:120:120g of N, P_2O_5 and K_2O per season was applied after pruning. The trial was conducted in RBD with thirteen replications. The soil is characterised with a pH of 8.9, EC of 1.4dsm -1 and ESP of 15%. The irrigation water recorded a pH of 8.4 and EC of 1.87 dsm -1 and 12% RSC. Ground layered plants showed maximum plant height (2.4 m), trunk girth (21.5cm), canopy spread (EW-2.8m ; NS-2.2m), weight of pruned branches (31.25kg), fruit weight (135g), number of fruits (92.8) and yield per plant (12.5kg) whereas the grafted plants recorded highest mean fruit weight (158.5g), fruit length (7.5cm) and fruit diameter (8.2cm) with lesser plant height (1.9m), canopy spread (EW-2.1m ; NS-1.8m) and weight of pruned branches (22.5kg). Since the individual fruit weight was high in the grafted plants there was no significant difference in the yield per plant between layered and grafted plants. This shows the significance of accommodating grafted guava plants under HDP for better mechanization and for obtaining quality fruits.

ASSESSMENT OF IDM TECHNOLOGY IN THE MANAGEMENT OF WILT IN CHICKPEA

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Abstract

Chickpea (*Cicer arietinum* L.) is one of the most important pulse crops grown in 10.2 million hectares with an average production of 7.9 million tonns and an average productivity of 995 kg ha^{-1}, of which about 80 per cent is grown in India FAO (2016). It is also known as gram or Bengal gram and is sometimes known as chana. Its seeds are high in protein. It is one of the earliest cultivated legumes: 7500-year-old remains have been found in the Middle East (Bell 2014). Per capita availability of pulses in India was 43.0 gm per day and 14.4 kg per annum and coming to chickpea per capita availability of chickpea was 14.6 gm per day and 5.3 kg per annum. The wilt of Chickpea incited by *Fusarium oxysporum* f. sp. *ciceris* is one of the serious diseases. This pathogen is soil borne and seed borne cause profound losses (20 to 100%) depending upon phase of illness and wilting The spores of fungus enter in the plants passing through the roots. When the spores reach in vascular system they produce certain enzymes that disgrace the cell walls and obstruct the plant's transport system. Discoloration occurs inside tissues from the roots to the aerial parts, yellowing and wilting of the foliage occur and finally there is necrosis.

On farm trial were conducted during winter season 2021-22 at different location of Rewa (MP) to assessed the recommended practice in Seed treatment with Carboxin 37.5% + Thiram 37.5%(3g/kg) + Soil treatment with *T. viride* @ 5 lit/ha multiplied in 100 kg Vermicompost was very effective and more profitable to farmers along with health concerned was found very effective to reduce the wilt infection fallowed by Seed treatment with Carbendazim 12% +Mancozeb 63% WP 2g/kg of seed and soil application of *T. viride* @ 5 lit/ha multiplied in 100 kg FYM (RP-1) and compared with farmers practices (FP) was

found more infection of wilt than recommended practice (RP). Economics and benefit cost ratio of both FP and RP plots were worked out. Wilt in chickpea average PDI was recorded in farmer practice 11.60 while in research practice 1 was 7.15 and in research practice-2 was 3.20 percent. In Chickpea production average net profit was recorded Rs. 50256.00/ha under RP-2 while in RP-1 it was Rs. 38732.50/ha and under FP Rs. 27953.50/ha. The economics of marketable yield in Chickpea average revealed that adoption of IDM treatments was highest Benefit cost ratio was 3.27 under RP-2, while 3.85 under RP-1 and 2.37 was in FP and the chickpea yield recorded highest in RP-2 13.85 q/ha, RP-1 11.40 q/ha and in FP 9.25 q/ha.

MICRONUTRIENT FORTIFICATION IN RICE ANALOGUES FOR RETENTION DURING PROCESSING AND CULINARY OPERATIONS

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Abstract

A study was conducted to optimise the level of enrichment for retention of micronutrients in fortified rice analogues upon Processing and Culinary. Fortified rice analogues were produced by utilisation of rice brokens obtained from the milling industry and fortified with iron, folic acid and Vitamin A. The feasibility of fortifying rice analogues with micronutrients and retention after extrusion and cooking were studied. A cold extruder was used for production of rice analogues having 55 rpm screw speed and feed rate of 1.5 kg/h. The rice analogues were produced by extruding the composite flour containing broken-rice flour, sodium alginate (1%), water (30%) and micronutrient mix through the rice-shaped die at a barrel temperature of 60°C. The level of fortifying nutrient ready mix (FNRM) was statistically optimised based on the retention of nutrients after extrusion and cooking. The retention results for iron was observed to be 73.3 to 91.3 per cent after cooking. In contrast, folic acid and Vitamin A is sensitive to processing and culinary operations were 44.2 to 60.4 and 10.1 to 12.4 per cent, respectively. Statistical optimisation resulted in 150 per cent of FNRM could supply nutrient levels nearing the standards with the desirability of 0.835. The production cost was calculated as Rs. 53.50 per kg whereas, the increase in the price of raw rice mixed with fortified analogues @ 1:50 ratio was about Rs. 1.00 per kg with a benefit-cost ratio of 1.22:1.

ASSESSING THE IMPACT OF LATE SOWING ON YIELD AND MORPHOLOGICAL TRAITS OF LENTIL (*LENS CULINARIS* MEDIK.)

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Abstract

This research paper presents a morphological analysis of yield and yield attributing traits in lentil (*Lens culinaris* Medik.) under late sown conditions. The study was conducted to evaluate the performance of lentil plants under the stress of late sowing and to identify the key morphological characteristics that contribute to yield. The experiment was conducted in a randomized complete block design with three replications. Thirty-six distinct lentil genotypes were used to determine genetic variability, correlation coefficient, path coefficient, and genetic diversity for various morpho-physiological parameters. The investigation was carried out in a late-sown environment. For eleven of the qualities that were examined, a substantial genetic variation was found. All of the qualities under late sowing had much higher PCV values than GCV values, indicating that the environment had a greater effect on the traits. High PCV was seen for the number of secondary branches per plant, the number of pods per plant, the number of full pods per plant, the grain yield per plant, and the biological yield per plant under late-sown conditions. Direct selection can take advantage of the sufficient variety that exists for these qualities. Days to maturity, total pods per plant, full pods per plant, 100-seed weight, biological yield per plant, and harvest index all shown favorable correlations with grain production per plant. We may have an opportunity to increase grain output, even under late-sown

conditions, by developing genotypes with short half-lives that can withstand end-of-season heat stress. Therefore, traits like total number of pods per plant, filled pods per plant, 100-seed weight, and biological yield per plant that show high variability, heritability, and a significant positive association with grain yield can be used as selection indices to improve yield in late sown conditions for lentil genotypes. Overall, this research provides valuable insights into the morphology of lentil plants and their response to late sowing.

STUDY ON IN VITRO EFFICACY OF *CURCUMA LONGA* AGAINST *STAPHYLOCOCCUS AUREUS* ISOLATED FROM BUFFALOES WITH MASTITIS

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Abstract

The present study was conducted by screening of 180 buffaloes. Milk samples of mastitic buffaloes were collected from Sultanpur district of Uttar Pradesh. Animals were selected on the basis of California Mastitis Test (CMT) and White Side Test (WST). Prevalence of mastitis with reference to predisposing factors and udder biometry was established. The overall prevalence of sub clinical mastitis (SCM) in buffaloes was 49.44%, which was recorded in Sultanpur district. Amongst different villages the prevalence of mastitis was highest at Alamau (56.67%) of Baldirai block following other villages of Kadipur block Aalapur (53.33%), Ahiparanpur (50%) of Dostpur block, Asaipur and Dobhiara villages had equal prevalence (46.67%) and lowest in Alahdadpur(43.33%). Highest prevalence was recorded in Baldirai block (56.67%) followed by Kadipur block (50%) and Dostpur block(46.67%). Antibiotic sensitivity test was performed against isolates of S. aureus with antibiotics namely, Enrofloxacin, Gentamicin, Ceftriaxone, Amikacin, Aztreonam, Cefpodoxime, Ceftazidime, Cefotaxime and Chloramphenicol and zones of inhibition was measured. Antibiotic sensitivity test revealed highest efficacy for Enrofloxacin against S. aureus with inhibition zone of (21.2±2.44). Antibiotics Ceftriaxone, Aztreonam, Cefpodoxime and Ceftazidime were found ineffective and had no zone of inhibition, which indicates that the isolates were resistant against these antibiotics. Sixty two animals were found positive against subclinical mastitis and were randomly divided into four groups of ten animals each and therapeutic efficacy of Enrofloxacin and Amoxicillin+Cloxacillin and herbal preparation were compared. Amongst the four groups, Group III(Enrofloxacin and Herbal supplements) animals showed highest recovery rate i.e., 100%. Group I (Enrofloxacin) and Group IV (Amoxycillin+cloxacilline and Herbal supplements) followed next in recovery rate with 90%. Group II (Amoxycillin and cloxacilline) showed least recovery rate with 80%. The in-vitro efficacy of *Curcuma longa* extract of Aqueous (H), Methanolic (M) and Hydro-methanolic (HM) were studied by disc diffusion sensitivity test and it was observed that the methanolic M-250 concentration disc extract exhibited maximum inhibition zone against *S. aureus* (10.1±2.92). The hydro methanolic extract failed to yield any zone of inhibition against *S. aureus* at all concentration. Determination of minimum inhibitory concentration (MIC) and the minimum bactericidal concentration (MBC) was also done. MIC and MBC best result were found in methaniolic extract of turmeric as compare to others..

MICROENCAPSULATION OF SPICE OLEORESIN BLENDS USING DIFFERENT WALL MATERIALS : EFFECT ON PHYSICO-CHEMICAL PROPERTIES

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Abstract

Spices are indispensable in culinary applications due to their flavour and pungency. Among the existing forms of spices, the powder form is the most used. Oleoresins are the liquid extracts of spices, they impart complete flavour and aroma of their respective spices. But their viscous nature limits their application in culinary purposes. So, microencapsulation helps in developing oleoresin in the powder form and makes them more convenient to use. The aim of the present study was to investigate the effect of various wall materials on encapsulation of spice oleoresin blend (turmeric, chilli, and coriander) and

its stability. Microencapsulation of spice oleoresin blend was carried out by spray drying using different combinations of wall materials such as maltodextrin (MD), gum arabic (GA) and sodium caseinate (SC). Microencapsulates were analyzed for its physico-chemical properties such as encapsulation efficiency, moisture content, solubility, particle morphology, hygroscopicity, colour value, cohesiveness, flowability, wettability, water absorption index, dispersibility, bulk density and tapped density. HPLC analysis was carried out to study the retention of active compounds such as curcumin and capsaicin present in the developed oleoresin blend. Linalool, was the major volatile compound found in oleoresin blend as determined by GCMS analysis. Hygroscopicity was found to be low for wall material contained GA and MD, when compared to other combinations such as MD:SC and MD:GA:SC. Also, GA:MD was the best in terms of yield (45.92±0.85%) and encapsulation efficiency (77.14± 2.05%). Similarly, other physical parameters like solubility, particle morphology and flowability were also better for this combination. Results suggested that a combination of gum Arabic and maltodextrin could protect oleoresin and improve its stability.

ROOT MORPHOLOGICAL STUDIES IN ASSOCIATION WITH WATER STRESS IN RICE (*ORYZA SATIVA* L.)

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Abstract

Plant selections with desirable root characters have been a major objective in breeding drought resistant variety of rice. The rice root system consists of three types of roots; main root, L-type and S-type lateral root (LR). These component roots are morphologically and histologically different, which is termed as heterorhizy. Root system hydraulic architecture is related to the unique features of component roots and each component root contributes in different degrees to water uptake of the whole root system. Root pattern studies have shown significant relationship with drought in order to understand the effects of deep rooting pattern to withstand water stress, we assessed the root growth angle as a parameter following basket method. The Backcross inbred lines (BILs) of ADT (R) 45*1/Apo and ADT (R) 45*1/Wayrarem with drought QTLs *viz.,* qDTY1.1, qDTY3.1, qDTY4.1 and qDTY12.1 were evaluated for various root traits. Out of 20 BILs and three parental lines studied four BILs showed high values for root growth at deep angle 65-90 and yield under drought stress. Based on association studies among the root traits positive and significant correlation was observed between yield and root traits *viz.,* root dry weight, root growth at deep angle 65-90 (RA4), ratio of deep rooting and root length. Clustering of BILs and parents have grouped deep rooting BILs and drought tolerant donors into one cluster and drought susceptible ADT (R) 45 into a separate cluster

ENCRUSTATION FOR ENHANCEMENT OF SEED QUALITY AND FIELD PERFORMANCE IN CAROM (*TRACHYSPERMUM AMMI* L.)

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Abstract

Seed encrustation is one of the important seed quality enhancement techniques adopted in small seeded crops to over come the problem of slow, asynchronous and poor seedling establishment. The encrusting adds more weight to the seeds of Carom which benefits in seed separation and does not require post emergence thinning.It will Improves the plantability of a small seed which achieve greater singulation during sowing. Therefore attempt has been made to study the Effect of seed encrustation with different chemicals (insecticides, fungicides and nutrients) on enhancement of seed quality and field performance in Carom.. The field experiment was carried out in Regional Research Agriculture Research Station, Vijayapur

during *rabi* 2022-23.The experiment comprised of eleven treatment viz:T_1- Carboxin 37.5% + Thiram 37.5% DS(Vitavax power) @ 2 g/kg of seed., T2 Cyantraniliprole + Thimethaxam (Forentza Duo) @ 4ml/kg of seed ,T3 Zinc + Boron @ 2 g each/ kg of seed. ,T4 Trichoderma harzianum @10 g/kg of seed ,T5 (T1+T2) Carboxin 37.5% + Thiram 37.5% DS 2 g/kg of seed + Cyantraniliprole + Thimethaxam @ 4ml/kg of seed. T6 (T1+T3) (Carboxin 37.5% + Thiram 37.5% DS 2 g/kg of seed + Zinc & Boron @ 2 g/ kg of seed., T7 (T2+T3) Cyantraniliprole + Thimethaxam @ 4 ml/kg of seed + Zinc & Boron @ 2 g/ kg of seed T_8 (T3+T4) Zinc + Boron @ 2 g each/ kg of seed + Trichoderma harzianum @10 g/kg of seeds ,T_9 Seeds + sand (1:1) ,T_{10} Seed + vermicompost (1:1) and T_{11} Control. The encrusted seeds were subjected to laboratory test and field performance . The observations were recorded on seed quality, growth, seed yield and its attributes. The seed encrustation improves seed quality among the various treatments Zinc + Boron @ 2 g each/ kg of seed followed by Carboxin 37.5% + Thiram 37.5% DS 2 g/kg of seed + Zinc & Boron @ 2 g/ kg of seed and minimum was seen in control. Whereas the field performance of seed encrustation of Zinc + Boron @ 2 g each/ kg of seed + Trichoderma harzianum @10 g/kg of seeds recorded early flowering ,maturity, higher yield attributing parameters, seed yield(999 kg/ha) followed by Zinc + Boron @ 2 g each/ kg of seed Carboxin 37.5% + Thiram 37.5% DS 2 g/kg of seed + Cyantraniliprole + Thimethaxam @ 4ml/kg of seed and minimum was seen in control.

IMPORTANCE OF FINGER MILLET FOR FOOD AND NUTRITIONAL SECURITY

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Abstract

Finger millet is gaining the status as an ingredient in the production of function food. It promotes eating enriched food that is closed to their natural state rather than taking dietary supplements. It is highly suitable as cereal grain in human diet. It has high nutritive values; it is non-glutinous, non-acidic and easy to digest. Finger millet is over the years there has been rapid decline both in production and consumption of millets. Chemical composition of finger millet revealed that total carbohydrate content of finger millet has been reported to be in the range of 72 to 79.5%. Finger millet has nearly 7% protein but large variations in protein content from 5.6 to 12.70% have been reported by various studies. Total ash content is higher in finger millet than in commonly consumed cereal grains. The ash content has been found to be nearly 1.7 to 4.13% in finger millet. Calcium content of 36 genotypes of finger millet ranged from 162 to 487 mg %. Singh and Srivastava (2006) reported the iron content of 16 finger millet varieties ranged from 3.61 mg/100g to 5.42 mg%. Finger millet is the richest source of calcium and iron. Calcium deficiency leading to bone and teeth disorder, iron deficiency leading to anemia can be overcome by introducing finger millet in our daily diet. Maximum utilization of the nutrient potential of the millet is limited by the presence of phytates, phenols, tannins and enzyme inhibitors but their effect can be reduced by using processing techniques like popping, roasting, malting and fermentation. The use of these techniques not only decreases the content of antinutrients but increases the bioavailability of certain minerals like calcium and iron. Composite flours made by using finger millet can be used for preparation of various nutrient dense recepies which can be effectively used for supplementary feeding programs.

DEVELOPMENT OF INTERSPECIFIC BC_2F_2 POPULATION RESISTANT TO POWDERY MILDEW AND ANTHRACNOSE IN CHILLI

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Abstract

Chilli (*Capsicum annuum* L.) is one of the most important commercial crops, grown in almost all parts of the world as well as in India. Anthracnose (*Colletotrichum capsici*) and powdery mildew (*Leveiliula taurica*) are the major diseases of chilli. Chemical method of managing anthracnose and powdery mildew diseases is not sustainable and is also associated with health hazards and environmental pollution. The resistant source of powdery mildew is available in *C. annuum*. However, both powdery mildew and anthracnose disease resistant source is found in *C. baccatum* species. Use of bridge species and or embryo rescue are only the techniques to transfer the anthracnose resistant gene from *C. baccatum* to *C. annuum* due to cross incompatibility between these 2 species. Therefore, the crossing programme was initiated to transfer resistant gene from *C.*

baccutum to *C. annuum* using conventional methods. The large number of direct as well as reciprocal single crosses were attempted to enhance the cross compatibility between *C. annuum* and *C. baccatum*. The male sterility as well as non male sterility based hybrids belongs to C. annuum x *C. annuum* also used as female parent to develop the three way crosses. It was found that the interspecific cross was compatible when male sterility based hybrid UARChH42 (*C. annuum* x *C. annuum*) used as female and PBC80 (*C. baccatum*) as male parent during 2020-21. The population of interspecific hybrid so produced was completely sterile as well as partial fertile. Large number of back crosses (BC1F1) were attempting using newly developed partial fertile plants as female and male sterility based hybrid UARChH42 as male parent during kharif 2020-21. We could able to get single fruit having 2 seeds with filled embryo and 2 seeds without embryo during *kharif* 2021-22. Both the seeds filled with embryo were germinated and grown into well developed plants. Among the two plants one was sterile and another was partial fertile. Partial fertile plant was cross compatible when sterility based F1 hybrid used as male parent. However, sterile plant was incompatible. 36 seeds were harvested from 15 successfully crossed BC2F1 fruits and raised in portrays filled with cocopeat during 2022-23 and 26 seedlings were developed. Out of 26 seedlings only 4 seedlings developed into a normal plants. Out of 4 plants developed in BC2F1 population, one plant was completely fertile, 2 were partial fertile and one was sterile. Among the 4 plants 3 plants were cross compatible with each other as well as any othger genotypes belongs to *C. annuum* as well as *C. baccatum*. We developed large number of cross combinations (BC3F1) as well as selfed progenies using completely fertile and partial fertile plants. The resistance to anthracnose and powdery mildew was confirmed using infector fruit attached and infected plant attached methods respectively. The confirmation of anthracnose as well as powdery mildew resistance using molecular marker is under progress. The newly developed fertile plant resistance to anthracnose as well as powdery mildew shall be further utilized for commercial cultivation after confirmation of homozygosity and conducting multilocational trials. As all the three types of plants were cross compatible with *capsicum annuum* species it is now possible to produce resistant high yielding hybrids/varieties for both anthracnose as well as powdery mildew diseases.

AN ALGORITHMIC APPROACH TO COMPUTE *KCD* INDICES OF GENERALIZED TRANSFORMATION GRAPHS AND THEIR COMPLEMENTS.

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Abstract

This article focuses on the study of *KCD* indices for generalized transformation graphs and their complements. In this study, the expressions for *KCD* indices of and are obtained. Further the results are verified by an algorithmic approach.

ATTRACTIVENESS OF INDIGENOUS EXTRACTS ON ABUNDANCE AND DIVERSITY OF POLLINATORS AND HONEY BEE VISITATION IN SUNFLOWER

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Abstract

The field experiments were carried out during monsoon and autumn 2020-21 to identify the influence of native attractants on the diversity of sunflower pollinators, bee visitation, and yields of sunflowers at ARS, Gangavthi, and MARS, Raichur. The results revealed that the number of species recorded was higher in Gangavathi, with 16, compared to Raichur (14 species) during both seasons, implying the higher richness in Gangavathi. The evenness index is higher in both sites implying less evenly distributed pollinators. Shannon- Wiener Index values of 2.23 and 2.21 were recorded in Gangavathi plots during the monsoon and autumn seasons, respectively, and 2.11 for Raichur plots during both seasons, implying that thus sunflower field of Gangavathi is more diverse compared to Raichur. A higher number of visitors were recorded in plots sprayed with basil oil which is on par with a commercial attractant, i.e., profuze sprayed plots, followed by citronella oil, mint oil, lemon grass oil,

sugar solution in both ARS, Gangavathi, and MARS, Raichur sunflower plots at first and second spray during monsoon and autumn seasons. Yields of sunflowers followed a similar trend as that of bee visitation.

PROFILING OF ANTIOXIDANTS IN RAW, BOILED, AND MICROWAVE POTATOES

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Abstract

Polyphenolic compounds are secondary plant metabolites that make up the majority of phytochemicals that promote health. These compounds have significant antioxidant, antiglycemic, antiviral, anti-carcinogenic, anti-inflammatory, and anti-allergic and antimicrobial properties. Antioxidants can also protect lipids, proteins, and nucleic acids from oxidative damage caused by superoxide, hydroxyl, peroxyl, and alkoxyl free radicals. Potato (*Solanum tuberosum* L.) is a cost-effective food because it provides a cheap source of available energy for people of all ages. It is a staple component of many human cultures' diets and a source of many essential nutrients. It is available all year and can be cooked in a variety of ways (e.g., boiling, baking, and frying) before consumption. Potato is a cost-effective food because it provides a cheap source of available energy for people of all ages. It is a staple component of many human cultures' diets and a source of many essential nutrients. It is available all year and can be cooked in a variety of ways (e.g., boiling, baking, and frying) before consumption. Seven varieties viz., K. Bahar, K. Neelkantha, K. Lohit, K. Lalit, K. Pukhraj, K. Surya, K. Mohan were procured from ICAR-CPRIC, Modipuram. Results indicated that maximum ascorbic acid 18.65mg/100g FW was found in variety K. Neelkantha followed by K. Surya 17.64mg/100g FW. After processing or boiling K. Bahar gave maximum anti-oxidant of the order of 29.23mg/100g FW. The next was K. Neelkantha 23.79mg/100g FW. Minimum ascorbic acid was found in K. Mohan variety 10.82mg/100g FW. In oven-cooked potato K. Lohit indicated 41.43mg/100g FW. Different varieties behaved differently during boiling and micro-wave oven potato.

AGRICULTURE SCHEMES IN UTTAR PRADESH

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Abstract

Agriculture is a crucial sector in the economy of Uttar Pradesh, contributing significantly to the state's Gross Domestic Product (GDP). Due to the predominance of agriculture in the state, the government has come up with various schemes to enhance productivity and promote the welfare of farmers. The state government, in collaboration with the central government, has launched several plans to increase agricultural output, improve farmers' lives, and mitigate the challenges of climate change. This essay examines some of the schemes that the government of Uttar Pradesh has instituted towards better agricultural practices. One of the significant initiatives that the Uttar Pradesh government has undertaken is the Pradhan Mantri Fasal Bima Yojana (PMFBY). This scheme aims to provide farmers with insurance cover and secure crops from natural calamities, pest attacks, and other unforeseen hazards. The crop insurance is an essential aspect of agriculture in the state since many farmers are small-scale and face difficulties in accessing credit and managing the risks. The scheme is a flagship program of the central government, and the state administration has taken up the responsibility for its implementation. Another critical scheme by the Uttar Pradesh government is the Kisan Credit Card (KCC) scheme. The program aims to provide credit facilities to farmers for various agricultural activities from sowing to harvesting. The KCC scheme offers affordable interest rates, timely disbursement of loans, and easy repayment options, which are beneficial to farmers. The program also helps farmers access other insurance schemes and government subsidies, thereby boosting their income.

In addition, the state government has instituted the Mukhyamantri Krishak Durghatna Kalyan Yojana (MKDKKY). This plan provides compensation to farmers in cases of accidents and untoward incidents such as falling off trees or getting bitten by snakes. Under this scheme, the beneficiaries receive financial assistance for hospitalization, disability, or death. The scheme has helped many farmers, particularly those who are prone to hazards while working in the field. Moreover, the government

has launched the Deen Dayal Upadhyay Swarojgar Yojana (DDUGJY) scheme, which aims to offer electricity to rural areas to increase productivity. The scheme emphasizes the provision of uninterrupted power supply to farms and non-agricultural enterprises, such as small and medium enterprises, to boost the economy in rural regions. Power supply is essential for irrigation, food processing, and other related activities that are necessary for high agricultural productivity.

Besides these four schemes, the government of Uttar Pradesh has also instituted the Integrated Pest Management (IPM) scheme. The IPM scheme aims to reduce the excessive use of pesticides by training farmers on how to manage pests and diseases using environmentally friendly methods. The scheme promotes science-based crop protection techniques and encourages farmers to use natural predators and bio-pesticides. The program has the potential to increase farmers' income while reducing the effects of prolonged usage of pesticides on the environment. In conclusion, the government of Uttar Pradesh has made substantial investments in agricultural schemes that aim at improving farming practices, generating income for farmers, and reducing the risks associated with agricultural activities. The PMFBY, KCC, MKDKKY, DDUGJY, and IPM schemes are critical initiatives that have helped farmers in Uttar Pradesh mitigate challenges such as natural calamities, crop losses, and unproductive land. These schemes have also served to encourage farmers to adopt modern farming practices that enhance productivity and promote welfare in the state. The state government's efforts to promote sustainable agriculture are commendable, and it is imperative that the initiatives are sustained and expanded in the future.

EFFECT OF ULTRAVIOLET RADIATION ON THE DEVELOPMENT OF EGG PARASITOID, *TRICHOGRAMMA CHILONIS* ISHII (HYMENOPTERA: TRICHOGRAMMATIDAE)

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Abstract

An experiment was conducted in Bio-control Laboratory, Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University., Navsari (Gujarat) to determine the effect of ultraviolet radiation of exposure time period for 30, 45, 60, 90, Chilled in deep freezer for 2 hours (-5ºC) and untreated control on host egg hatching of *Corcyra cephalonica* (Stainton) and egg parasitism and adult emergence of egg parasitoid, *Trichogramma chilonis* Ishii. The pooled data on the hatching percentage of Corcyra eggs revealed that exposure time of 45 minutes exhibited zero hatching percentage. Further, the maximum egg parasitism of *Trichogramma chilonis* at F_0 generation was 90.13 per cent, adult emergence at F_0 generation was 86.63%, egg parasitization at F_1 generation was 85.63% and adults emergence at F_1 generation was 73.00% in the treatment of Corcyra eggs exposed for 45 minutes period. The results revealed that the exposure time of 45 minutes [treatment applied @ 42 cm height from the target site with 30 W UV lamp] found suitable to irradiate the eggs of factitious host, *C. cephalonica* by enhancing parasitoids effectiveness without any detrimental effect of the ultraviolet radiation on *Trichogramma* for the mass production.

PERFORMANCE OF COTTON + GROUND NUT INTERCROPPING SYSTEM UNDER NATURAL, ORGANIC AND INTEGRATED CROP MANAGEMENT SYSTEM

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Abstract

A field experiment was carried out in Cotton + Ground nut intercropping system at northern transitional zone of Karnataka (Zone-8) on medium deep black soil from 2019-20 to 2022-23 for three years on permanent site to study the impact of natural Farming (NF), Organic Farming (OF) and Integrated crop management (ICM) practices on productivity, economics and soil health. The results showed that, ICM recorded significantly higher seed cotton (917 kg ha^{-1}), groundnut (1841 kg/ha) and cotton equivalent yield (CEY) were significantly higher in ICM (2455 kg/ha) than NF (2202 kg/ha) and OF (2067 kg/ha). The cotton, groundnut and CEY were higher by 9.1, 8.6 and 6.1 per cent in NF over OF. The pooled results showed lower cost of

cultivation under NF (Rs. 73007 ha^{-1}) and higher were under ICM (Rs. 95964 ha^{-1}) and OF (Rs. 104397 ha^{-1}). About 24 and 30 per cent total costs and 37 and 42 per cent material costs were saved under NF over ICM and OF respectively. Without premium prices, the higher net return was obtained under ICM (Rs. 95449 ha^{-1}) and Natural Farming (Rs. 94966 ha^{-1}). The least net return was obtained under OF (Rs. 50,483 ha^{-1}). Whereas, with premium price the net return was higher under NF (Rs. 126741 ha^{-1}), which was 33 per cent higher than ICM and 52 per cent higher than OF. Higher organic carbon content, available P and micro nutrients were recorded in OF (0.62 %) than NF (0.55 %) and it was on par with ICM (0.59 %). But, the available nitrogen (210 kg ha^{-1}) and potassium (438 kg ha^{-1}) were higher under ICM than other practices. Soil micro flora (Bacteria, fungi, actinomycetes, N_2 fixers and PSM's) and enzymatic activities (Dehydrogenase, Phosphatase and Urease) in cotton and groundnut rhizosphere were significantly higher in organic and natural farming practices than other treatments at flowering stage of both the crops. Hence, cultivation of Cotton +Ground nut inter cropping system is profitable and the soil health is improved under natural farming practices.

FINANCIAL RATIOS AND RETURNS TO SCALE FOR LAYER AND BROILER FARMERS IN SOKOTO STATE, NIGERIA

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Abstract

This study was conducted in Sokoto State, Nigeria and aimed at computing the financial ratios and returns to scale for layer and broiler farmers with a view to finding the overall economic performance of these enterprises in the study area in order to boost production through awareness of existing opportunities. This is due to inability to bridge the gap between demand and supply of poultry egg and meat to adequately feed the ever-increasing population of Nigeria with the right proportion of calories and protein which remains a recognized developmental problem. A number of studies have shown that the industry is continually characterized by low production levels. Therefore, the imminent need to increase national productivity and achieve sustainable diversification becomes paramount. The main objective was to assess, on a comparative basis, the productivity of layer and broiler enterprises in the study area. The specific objectives were to compute the financial ratios involved in the two enterprises and assess the returns on investment associated with production in the two enterprises. The study was based on data obtained from a cross-section of 270 poultry farmers comprising of 135 each of layer and broiler farmers using a structured questionnaire for data collection. Financial ratios including Investment Turnover, Rate of Return and Operating ratio were used for data analysis. The rate of return on investment of 0.78 and 0.51 were obtained by layer and broiler farmers, respectively with operating ratio of 0.55 and 0.59, respectively. The investment turnover of layer and broiler farmers was 0.80 and 0.50, respectively. These results established the fact that poultry farming involving layers and broilers is a viable venture in the study area.

RARE CASE OF POST ICTAL BLINDNESS IN A LABRADOR DOG SUFFERING FROM STATUS EPILEPSY

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Abstract

The present study reports an unusual complication of Post ictus bilateral visual loss for transient period associated with status epilepticus in a four year Labrador dog presented to Veterinary clinical complex, SVPUAT, Meerut. The case was presented with history of seizure for last two year and was undergoing treatment with oral phenobarbitone therapy. At the time of presentation, dog was in continous state of seizures for last 35 minutes therefore, the case was tentatively diagnosed as status epilepticus and antiepileptic therapy was initiated using intravenous diazepam bolus @1.0 mg/kg body weight. Seizures were non responsive therefore second bolus of intravenous diazepam was administered @ 2.0 mg/kg body weight in combination to

intravenous mannitol @1.0 mg/kg body weight. Seizures were responsive to high dose intravenous diazepam therapy @ 2.0 mg/kg Body weight and were further managed with combination of phenobarbitone and valproic acid. The dog was observed on the second day showing state of delirium and walking in to obstacles. Ocular examination reveals no ocular abnormality. Menace test and obstacle test suggest loss of vision but pupillary light reflex were intact. Examination of CSF reveals normal appearance and normal cell count. Based on history and clinical evidences, the condition was tentatively diagnosed as post ictal blindness which resolves within 48 hours. The Drugs were well tolerated by the dog with complete recovery with subsidence of post ictus blindness within 48 hours.

ECO-FRIENDLY ALTERNATIVES FOR THE MANAGEMENT APHIDS (*APHIS CRACCIVORA* KOCH) IN VEGETABLE COWPEA

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Abstract

Yard longbean (*Vigna unguiculata* subsp. *Sesquipedalis* (L.) Verdcourt) is a major vegetable crop extensively cultivated in Kerala. The crop can be grown throughout the year for vegetable purposes. A major pest issue that farmers face is the attack of cowpea aphids (*Aphis craccivora* Koch), except for the monsoon season. The nymph and adults will suck the sap from tender plant parts like buds, flowers, leaves, and immature pods. It will have a negative impact on plant health, pod size, production, appearance, and economic returns. The objective of the programme is to identify the most effective botanicals, mineral oils, or combinations against cowpea aphids. The treatments are Neem oil 2%, Mineral oil 2%, Neem oil 2% + Mineral oil 2%, Neem oil 3%, Neem oil +Mineral oil 3%, Azadirachtin 0.03% (5 ml/lit), KAU Neem garlic soap RTU (10 g/lit), and Absolute Control (water spray). The plants were artificially inoculated with aphids for uniform distribution. The pre-count of the aphid-infected parts of all treatments was statistically on par, coming under a scale of 7 and 9 (Egho and Emusairue, 2010), where the population is more than 100 no.s/colony. In all treatments, after spraying, mortality increased up to 3 DAS, and after three days, a slight population buildup was observed in all treatments except neem oil 3% + mineral oil 3%. The study found that neem oil (3%) + HMO (3%) were significantly superior to all other treatments for controlling aphid populations, while phytotoxicity was also observed. The second-best treatments are HMO 2% alone, and its combination with neem oil 2%. Hence, in economic and eco-friendly aspects, HMO 2% is the best, and the aphid population was reduced from a score of 8.33 (>101 aphids) to 3 (5–20 aphids) in 3 DAS.

SSRS ANALYSIS TO CARRY OUT THE KEY MOLECULAR EVALUATIONS IN WINGED PRICKLY ASH: MEDICINAL VALUE RICH PLANT

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Abstract

Winged prickly ash is an ethno-medicinal important evergreen, an aromatic and spiny shrub of the Himalayan regions in India that belongs to the family Rutaceae. Genetic diverseness and population structure can be determined by using agronomic traits, morphological, biochemical and molecular marker analysis. But as growth and environmental conditions greatly influence the morphological and agronomic characteristics so in the past few years DNA markers such as SSR, RAPD, ISSR, SRAP and DAMD, have been developed as a potent tool for studying the genetic homogeneity and variability among plant species. In all molecular markers utilized for molecular studies, simple sequence repeats (SSRs) have become the exemplary markers of choice for compilation, characterization and exchange of genetic information of plant species about polymorphism, reproducibility and other informative characteristics It is needed to promote Winged prickly ash germplasm resources investigation in order to protect and utilize it in efficient way with proper knowledge about their genetic relationships. Among Winged prickly ash germplasms, studies have revealed high levels of genetic diversity. However, still there is a considerable knowledge gap concerning the level of genetic relationships within genus. As far little work had been done to analyse per cent genetic variation within population of Winged prickly ash in Himachal Pradesh and keeping in view the above-mentioned

aspects the present work is decided to characterize the germplasm collected from various agroclimatic zones of Himachal Pradesh at the molecular level concerning morphological and biochemical variation.

DETECTION OF SPECIFIC ENDOSYMBIONTS OF MEALYBUGS INFESTING CASSAVA (*MANIHOT ESCULENTA* CRANTZ) USING DIAGNOSTIC PCR AND SANGER SEQUENCING

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Abstract

Cassava is one of the most produced food materials and constitutes the major energy source for about 800 million people worldwide. Mealybugs have been reported to be the main concern in cassava production for the past few years in all the major tuber cultivated ecosystems of India. Endosymbiotic bacteria found in mealybugs have been observed to interact and provide specific advantages to the host and they can be one of the reasons for the pests' insecticidal resistance. In the present study, endosymbiotic bacteria were isolated from cassava mealybugs, allowed to grow in media after insecticidal treatments, and after observing colony morphology, distinct bacterial colonies were sub-cultured and selected for further molecular identification procedures. PCR analysis was carried out for bacteria using 16S rRNA primer, with an annealing temperature of 49?, and yielded fragments at 1500 bp. Based on the sequencing report, the observations were that the culturable endosymbionts *Pseudomonas oryzihabitans, Staphylococcus* sp. which are resistant to the insecticide thiamethoxam are present in *Paracoccus marginatus,* and malathion resistant *Paenibacillus alvei, Ralstonia* sp., and thiamethoxam resistant *Clostridium lundense* are present in *Ferrisia virgata*. The sequences were submitted to NCBI, and the accession numbers obtained were OP572218, OP572193, OP572215, OP572194, and OP572097, respectively. Also, through diagnostic PCR using specific bacterial primers, the presence of *Wolbachia* is confirmed in mealybug *F. virgata* at a fragment length of 650 bp.

ROLE OF JOINT FOREST MANAGEMENT (JFM) IN IMPROVING THE LIVING STANDARD OF RURAL PEOPLE, KEONJHAR FOREST DISTRICT, ODISHA

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Abstract

Joint Forest Management (JFM) could be described as management of the state forest lands jointly by the state and the local community with joint sharing of benefits. Share money of Forest Protection Committee (FPC) from sale proceeds of forest felling in JFM are sometimes used by FPC to create the community assets like social and physical assets which improves the livelihoods of the rural people. The objectives of this paper were to analyze the socio-economic status and livelihood dependency of Joint Forest Management based villages in Telkoi and Banspal Block of Keonjhar district of Odisha. A total of 100 respondents were chosen randomly from two blocks and ten villages to participate in the experiment. Pre-structured questionnaires, personal interviews, secondary information and group discussions with villagers were used to collect data and statistically analysis done. In the research area, it was found that majority of respondents were between the ages of 18 to 40 (44%) indicating that young people of most of the families were involved in NTFPs collection and tribal involvement was highest since they live in close proximity to the forest and rely on the forest for their survival and livelihood. Agriculture is the most important activity followed by NTFPs collection and livestock rearing for their livelihood as majority of the people owned their own farm land and during off season they depends on the forest and worked as labour in JFM activities as well. Factors influencing the share on NTFP income were determined by correlation and regression analysis. Agriculture (Rs 12749.18) contributed the most to the overall income of the respondents followed by NTFPs collecting (Rs 8370.50) > labour (Rs 4038.63) > family occupation (Rs 1390.34) > livestock rearing (Rs 1917.12) and other sector (Rs 3814.10). The percentage contribution of various NTFPs to net return are Sal (*Shorea robusta)* leaves generated 30.37 % followed by siali (*Bauhinia vahlii*) leaves (21.74 %), cane culms (*Calamus* sps.) (19.02 %), mahua (*Madhuca longifolia)* (2.26 %), honey (4.52 %), sal seeds (4.58 %), mushroom (2.15 %), amla (*Phyllanthus emblica*) (2.98 %), harida (*Terminalia chebula*) (1.88 %),

bahada *(T. belllerica)* (1.00 %), tamarind (*Tamarindus indica*) (6.28%) and char (*Buchanania lanzan*) (3.22%). Livelihood is significantly and positively correlated with annual income (0.319**) and employment status (0.533**). Regression analysis showed that annual income was mainly affected by socio-economic variables like livelihood. The R Square value i.e. 0.456 of the model summery represented that overall contribution of socio economic variable to the annual income is 45.60% which concluded that various factors i.e. illiteracy, exhaustive work, lack of support from Govt. and awareness prevented them to participate in JFM programme.

PHYSICO-CHEMICAL PROPERTIES OF BROWNTOP MILLET COOKIES

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Abstract

The present research work on physico-chemical properties of browntop millet (*Brachiariaramosa*) cookies was undertaken to explore the utilization of underutilized neglected but highly nutrient-rich browntop millet in the bakery and food sector. Cookies were made by using 100 per cent browntop millet flour. The physico-chemical properties of both handmade and machine made browntop millet cookies are evaluated. Four different types of cookies were prepared namely butter, coconut, choco chip and breakfast. Results revealed that among all the browntop millet cookies, handmade browntop millet cookies took more time for creaming, dough mixing and baking compared to machine-made browntop millet cookies. There was a significant difference among all the cookies for physical parameters like weight (9.99 to 13.21 g), height (3.35 to 4.61 cm), thickness (1.14 to 1.47 cm), diameter (3.35 to 4.61 cm), bulk density (0.69 to 0.75 g/cm 3) spread ratio (2.41 to 3.90), hardness (2897.29 to 6608.84 g) and fracturability (2138.18 to 5840.41 mm). The moisture, fat, protein, ash, crude fiber, carbohydrates, total energy, total dietary fibre, insoluble fibre, soluble fibre, Ca, Cu, Fe, Zn and Mn content of the cookies ranged from 3.06 to 3.50 (%), 30.05 to 36.22 (%), 13.04 to 14.89 (%), 1.27 to 2.56 (%), 1.01 to 2.52 (%), 44.27 to 50.13 (%), 529 to 563 (kcal), 8.77 to 9.45 g, 7.29 to 7.76 g, 1.48 to 1.69 g, 32.30-41.72 mg, 1.41-1.64 mg, 1.67-1.80 mg, 1.97-2.15 mg and 2.70-3.03 mg respectively. Antioxidant properties like tannins (19.88-21.64 g/100g), total phenolic content (46.55-53.97 µmol GAE/g) and DPPH activity (60.00-65.85 g/100g). There was no significant difference found in the nutritional, mineral and antioxidant properties of handmade and machine-made browntop millet cookies.

STANDARDIZATION OF ORGANIC MANURES FOR DRAGON FRUIT (*SELENICEREUS UNDATUS* (HAW.) D.R.HUNT) IN CENTRAL DRY ZONE OF KARNATAKA

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Abstract

An experiment was conducted to know the influence of organic manures on growth, flowering, yield, quality and economics of dragon fruit cultivation at Bhuttanatti village, Hiriyur taluk of Chitradurga district in during 2018-19. The experiment was laid out in Randomized Complete Block Design Factorial with twenty seven treatments involving different combination of organic manures with three replications. The treatment consist of three organic manures and three levels Farm yard manure (0, 15, 30 kg/pillar), vermicompost (0, 2, 4 kg/pillar), poultry manure (0, 250, 500 g/pillar). Among different levels of farm yard manure (FYM), vermicompost and poultry manure, application of 30 kg farm yard manure, 4 kg of vermicompost and 500 g poultry manure per pillar had beneficial effect on growth, flowering, yield and quality parameters. Significantly maximum plant canopy spread (7.55 m2) chlorophyll 'a' (1.78 mg/g), chlorophyll b (0.12 mg/g), total chlorophyll (1.90 mg/g), number of fruits (23.20/pillar), fruit length (12.36 cm), pulp weight (321.00 g), peel thickness (1.75 mm), fruit yield (10.04 kg/pillar), fruit yield per hectare (11.04 t/ha) and ascorbic acid content (7.70 mg/100 g). However, The highest net return of Rs. 8,88,276 per hectare and benefit cost ratio of (5.12) was obtained by the combined application of FYM @30 kg, vermicompost @ 4 kg and poultry manure @ 500g per pillar under central dry zone of Karnataka.

EFFECT OF DEMONSTRATION OF INTEGRATED CROP MANAGEMENT PRACTICES ON YIELD AND QUALITY OF ROSE

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Abstract

Rose is cultivated as both cutflower and loose flower and there are hundreds of varieties being cultivated worldwide. In Dharmapuri district rose is cultivated for loose flower under open field conditions and being marketed to Bengaluru market which is nearby big sink for farm produce of Dharmapuri district. The hybrid 'Five star' is the highly adopted one and almost 90 percent of rose area is under this hybrid. It flower size is about 2.5 - 3.0 cm is diameter and is of bright red coloured petals. Though it was very much preferred by the farmers the major constraint faced is the reduction in yield and quality due to thrips infestation and powdery mildew incidence. Front line demonstration were conducted by Krishi Vigyan Kendra of Dharmapuri district to improve the yield and quality of rose in 20 farmers' fields in Palacode block of Dharmapuri district. The technologies demonstrated were soil application of *Pseudomonas fluorescens* and *Trichoderma viride* @ 2.5 kg/ha, integrated nutrient management including foliar application of micronutrients, use of blue sticky traps for thrips management @ 12 / ha, neem soap spray @ 10 g/L and pruning. Fungicides are recommended for powdery mildew on need basis. The growth and yield parameters were recorded in the demonstrations and control plots (Farmers' practice). The results of the demonstrations showed that the yield per harvest increased from 32.79 kg/ha in control plots to 35.83 kg/ha in demonstrations. The thrips infestation reduced from 13.37 % to 9.25 % in the demonstrations. Similarly there was significant reduction in powdery mildew incidence in demonstration plots (32.95 %) compared to the control plots (27.62 %). Since the incidence of powdery mildew and thrips infestation reduced the percentage of first grade flowers increased in the demonstration plots (82.64 %) which was significantly lesser in control plots (61.85 %). The yield per hectare was highest in demonstration plots (53.51 t/ha) compared to the control plots (50.19 t/ha). The BCR increased from 3.1 control plots to 3.6 in demonstration plots. This was due to the increase in yield as well as reduction in cost towards plat protection.

AUGMENTING FARMERS' INCOME THROUGH FOOD PROCESSING AND VALUE ADDITION

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Abstract

The present research review analyses and discuss about the potential of food processing and value addition in enhancing farmers' income. Food processing sector has the potential to enhance farmer's income in India by adding significant value to the agricultural and horticultural produce. By engaging farmers in processing activities, providing better storage and transportation and creating market linkages, it is possible to generate avenues for enhancing income for the farmers. The post-harvest/in transit wastage account for approximately 40 per cent of the total food wastage in India compared to 28 per cent globally and result in significant erosion of farmer income. The impact is more so in high-value crops, such as fruits and vegetables, keeping farmers away from reaping benefits. Well-developed storage (e.g. cold storage) and transportation facilities help farmers reduce these losses by preserving food for extended period of time. Farmers engaged in the production of low-value crops can add value and increase household income through primary and secondary processing creating higher value products. This is a proven method globally. By including more farmers and expanding the product range, near-farm processing activities can be very fruitful for a large number of farmers. The Government of India has approved more than 63 near-farm agri-processing clusters under its Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters (SAMPADA Yojana). Farmers can be directly connected to food manufacturers (secondary/ tertiary processors) and sell their produce (fresh/ primary production) to large food manufacturers. The future market potential of food processing is likely to generate greater demand for crop produce, creating a new market for processable varieties for farmers. Food

processing companies can enter into end-to-end arrangements for direct engagement with farmers, including their education leading to the enhancement of farmers' knowledge of advancing technologies, cultivation of processable crops and manufacturing of higher value-added product lines.

ARTIFICIAL INTELLIGENCE IN NUTRIENT DEFICIENCY DETECTION

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Abstract

In the modern era and developing world technologies play a vital role in all sectors. Agriculture is one of the major sector on which the whole human survival is depended, but still we are using traditional methods in agricultural practices. Nutrient is a vital factor that strongly determines the growth rate, productivity and fertilization. plants require essential nutrients for normal functioning and growth. Deficiencies in any essential nutrient significantly affect and cause a severe loss in agriculture. Identifying nutrient deficiency in crops is still difficult for farmers. We are still using ancient methods to identify nutrient deficiency in crops which consume more time, labour and cost. Artificial intelligence is one of the most recent technology/tools for nutrient deficiency detection in crops. Spectral sensing has become a versatile tool for evaluating nutrient status and determining fertilizer demand. Visual alterations in the plant's colour and morphology can be detected using the appropriate technology. Hyperspectral imaging, 3D laser scanning and remote sensing technologies are very essential for measurng the crops in large areas. This technology monitors the crop life time and generates the report to detect the irregularities in the plants. This Artificial intelligence helps the farmers in easy and early detection of deficiency symptoms in the plants so that enables the farmers to take action to prevent crop damage. Apart from that it saves the time and energy of the famers. Though it is having several advantages, the lack of knowledge and experience on AI technologies among the farmers and researchers is the major limitation, however creating more awareness regarding AI technologies among the farmers will make the artificial intelligence as the game changing tool for the modern agriculture.

EFFECT OF OSMOPROTECTANTS FOR ENHANCING BT. COTTON PRODUCTIVITY UNDER RAINFED CONDITIONS

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Abstract

Cotton (*Gossypium* spp.) popularly known as "the white gold" is an important commercial fiber crop grown under divers agro-climatic conditions around the world. It provides fiber and raw material for textile industry along with cotton seed and plays a vital role in economy of the country. The effect of different Osmoprotectants in plant tolerance to drought stress is significant because they regulate multitude of metabolic processes. The present study was conducted as a part of AICRP objective at Agricultural Research Station, Dharwad farm during the year 2020-21, 2021-22 to investigate the influence of foliar application of different Osmoprotectants on morpho-physiological parameters for enhancing the productivity in Bt. Cotton under rainfed condition. The experiment consisted of eight treatments Viz., 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 80 and 100 DAS recorded significantly highest plant height, monopodia, sympodia, number of bolls per plant, total dry matter production and boll weight per plant under rainfed condition. Also, 2% KNO3 application recorded highest Photosynthetic rate (29.5 μ mol CO_2 m^2 S^{-1}), compared to control (26.1 μ mol CO_2 m^2 S^{-1}) and seed cotton yield (2310 kg/ha) as compared to other treatments and control (1960.1 Kg/ha) and it was on par with Glycine Betaine @ 100 ppm single spray at 50% flowering (2015.7 Kg/ha). This study confirms that the osmoprotectants play an important role in enhancing the biochemical, biophysical yield and yield attributing parameters of the Bt cotton. It shows that the foliar spray of KNO3 @ 2% at 80 and 100 DAS gives us the better result when compared to other treatments. So, it is optimize to use KNO3 2% at 80 and 100 DAS to enhance productivity in Bt cotton under rainfed condition.

EFFECT OF BLENDED FORM OF TOTAL MIXED RATION (TMR) FEEDING ON INTAKE AND UTILIZATION OF NUTRIENTS IN LACTATING CROSSBRED COW

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Abstract

Effect of Blended form of total mixed ration (TMR) feeding on intake and utilization of nutrients in lactating crossbred cow. Under this experiment twelve crossbred lactating cows were selected and tied separately under good housing conditions. The experimental animals were grouped into two based on feeding system viz. T1 (Blended forms of TMR based diet) and T2 (non Blended form of TMR based diet. The Blended form of TMR feeding means the feeding of chaffed green and dry fodder along with water soaked concentrate mixture together to the experimental animals. However, under non Blended form of TMR feeding means, the feeding of chaffed green and dry fodder along with water soaked concentrate mixture separately to the experimental animals. The nutritionally balanced Total Mixed Ration (TMR) was prepared as per feeding standard. The prepared Total Mixed Ration (TMR) was fed two times (morning and evening) to the experimental animals. Lactating crossbred cows were milched two times (morning and evening).The duration of the experiment was 60 days including 15 days preliminary feeding trial. The results of TMR intake was 36.0 kg per day per animal in T1. However, it was just 25.50 kg (and it was around 32.67% less compared to T1) day per animal in T2 due to selective eating of food by the animals. Similarly milk yield and fat% in milk was recorded higher in T1 (11.50 kg and 4.20%) as against T2 (8.45 kg and 3.70%). The total profit was obtained from milk was Rs 460/- per day in T1 and Rs 338/- per day in T2 group. And this profit was around 26.52% higher by adopting blended form of TMR based feeding system as against non blended form of TMR.

MUSHROOM CULTIVATION - RAISED AS NEW ARENA IN LOCKDOWN PERIOD IN KARNATAKA

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Abstract

There was change in job opportunity and job scenario during the lockdown period. This resulted in the socioeconomic changes in particular. ICAR-Krishi Vigyan Kendra Gangavathi Koppal district Karnataka mainly concentrated on the solving the farmer's problem through, demonstrations, training, kisan ghoshtis, Radio/TV programmes etc. As a scientist in the horticulture field I gave a television programme on mushroom cultivation to Doordarshan on 25.2.2019. This programme was uploaded to YouTube by Doordarshan. From February 2019 to February 2020 I answered nearly 150 calls in 12 months duration. During the lockdown period within 2 months duration I received nearly 100 calls regarding mushroom cultivation. In this 20 % were who lost their jobs, 34 % were homemakers, and 46 % were rural youth. The 20 % job lost people were from the urban areas like Bengaluru, Hubli, Hasan and Mysore, Chikkamangaluru, Koppal, Hassan Kalaburgi districts of Karnataka. The callers found this mushroom cultivation would be one of the best self-employment opportunity and chance to develop as entrepreneurs. On the other hand rural youth were not in dream of government job and they also wanted to build their small mushroom unit in the village which intern open up job opportunity to other in the village.

INSTITUTIONAL INTERVENTIONS IN UPLIFTMENT OF FARM WOMEN: ROLE OF KRISHI GYAN KENDRA (KVKS) IN INDIA

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Abstract

Rural women are imperative instrument for rural development. They play a catalytic role towards rural transformation in the line of economical and societal changes. In India, women make up about 33% of cultivators and about 47% percent of

agricultural laborers. About 45% of women involves in growing oil seeds and 39 % in vegetable production. Though women contributes for farm productivity, in all agricultural activities there is an average gender wage disparity, with women earning only 70 percent of men's wage. According to FAO estimates 2017, given equal resources, women could contribute much more for farm productivity Though female farmers account for 43% of the agricultural workforce, they own only about 1% of the agricultural land, worldwide. In India, the typical work of the female agricultural laborer or cultivator is limited to less skilled jobs, such as sowing, transplanting, weeding and harvesting. The limited autonomy to education, family decision making, credit, health care are the stumbling blocks in path ahead of gender mainstreaming. For upliftment of women in Agricultural domain, more of forward linkages and additional income generation avenues are needed apart from the production interventions. The technology hubs such as Krishi Vigyan Kendra (KVKs) could bridge the knowledge gaps and fortify efforts in achieving financial complacency.

CLIMATE RESILIENT AND SMART AGRICULTURE

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Abstract

Climate change is the major problem at present and Agriculture is one of the sector which is directly affected by the changing scenarios of climate change. Due to climate change various complications occurring such as drought, flood, temperature fluctuations and they are showing significant impact on the yield of different crops and impacts on farm incomes in the range of 15-18 %. Climate resilient agriculture (CRA) is a sustainable approach for converting and reorienting agricultural systems to support food security under the new realities of climate change through different adaptation and mitigation mechanisms. Agricultural systems are extremely vulnerable to climate change, given their sensitivity to variations in different threats like temperature, precipitation and incidence of natural events and disasters such as droughts and floods. Threats can be reduced by increasing the adaptive capacity of farmers as well as increasing resilience and resource use efficiency in agricultural production systems. Adoption of smart practices and technologies for climate resilient agriculture are suggested to adopt in different parts of country. Organic farming, Integrated nutrient Management, Sustainable agriculture, Resource management technologies like Crop residue management along with zero and minimum tillage practices, water harvesting structures and micro irrigation effectively mitigate the green house gas emissions in to atmosphere and improve the soil organic carbon pool. These climate smart practices are integrating farmers with related institutes, technologies, planning, financial packages, and policies. Hence, it becomes essential to adopt Climate-Resilient Agriculture (CRA) measures at cooperative scale to address the adverse effects of climate change on agriculture.

HYDROPONICS: ITS ADVANTAGES AND LIMITATIONS

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Abstract

The growing media generally used for plants is soil. It provides water, nutrients, air and anchorage. As the soil have certain limitations of soil borne micro-organisms, poor drainage, unfavourable soil and soil erosion. Further, cultivation in open conditions has the disadvantages of large requirement of labour, land and water. Thus the above limitations of soil can be overcome by soil-less culture i.e., hydroponics and aeroponics. The earliest modern reference to hydroponics was made by William Frederick Gericke. In India, Hydroponics was introduced in year 1946 by an English scientist, W. J. Shalto Duglas and he established a laboratory in Kalimpong area, West Bengal. The term Hydroponics was derived from the Greek words 'hydro' means water and 'ponos' means labour. It is a method of cultivation of plants in nutrient-enriched water, with or without the mechanical support of an inert medium such as sand, gravel, or perlite. A wide variety of crops such as lettuces, spinach, kale, tomatoes, peppers, cucumbers, radishes, strawberries etc can be grown satisfactorily with hydroponics system. Hydroponic systems have a number of advantages and disadvantages compared with cultivation in soil. The principal advantage is the saving of labour by automatic watering and fertilizing. Hydroponic systems can be set up indoors in places such as in densely populated areas. Climate is not a factor, and hydroponic systems use dramatically less water compared with

conventionally grown plants. The plants also have less root and nutrient competition than those grown in soil, and they have significantly fewer pests, so individuals can be planted more closely together. The disadvantages are high installation costs and the need to test the solution frequently. There is a steep learning curve to hydroponics, and small errors can affect the whole crop. The equipment failure or power outage, can kill the plants within a few hours.

EVIDENCE FOR THE IMPACTS OF AGROFORESTRY ON SOIL BIOLOGICAL PROPERTIES

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Abstract

Agroforestry plays a vital role in the Indian economy by way of tangible and intangible benefits. In fact, agroforestry has a high potential for simultaneously satisfying three important objectives *viz.,* protecting and stabilizing the ecosystems; producing a high level of output of economic goods; and improving income and basic materials to the rural population. Agroforestry has helped in the rehabilitation of degraded lands on one hand and has increased farm productivity on the other. It has traditionally been a way of life and livelihood in India for centuries. Soil health is a key indicator of natural capital, that reflects the capacity of soil to respond to agricultural management by maintaining both agricultural production and the provision of ecosystem services. The integration of trees into agricultural landscapes has the potential to generate a number of improvements in the soil as a habitat for soil organisms and also for crop growth. Soil improvements by trees can also occur by increased supply and availability of nutrients for crops and soil biota. This mechanism can also recycle fertilizer applied by farmers, thus improving nutrient use efficiency and the returns as a result of fertilizer application. Therefore, a study was carried out with the aim to examine soil physical-chemical properties under the existing agroforestry systems of AAU – HRS, Kahikuchi, Guwahati – 17 leading to higher productivity and profitability with treatments comprised of T1 – Sole Acacia mangium, T2 – Sole Jackfruit, T3 – Sole Gmelina arborea, T4 – Acacia mangium-based AF system, T5 - Jackfruit-based AF system, and T6 - Gmelina arborea-based AF system with repetition of four and RBD as the statistical design. Soil sampling was done from a depth of 0 – 10 cm and 10 – 20 cm to analyze biological properties including Microbial Biomass Carbon (MBC), Basal Respiration (BRS), Metabolic quotient (q co_2) and Microbial quotient (q mic) in 0-10 cm depth. Sampling was done from two depths viz. 0-10 cm and 10 – 20 cm by following standard protocols.. Significantly increased biological activities were associated with surface soil as compared to sub-surface soil in AF- based systems as compared to the sole AF systems. Differences between the agroforestry systems in regard to soil biological properties are improved mostly in AF – based systems than the sole AF systems.

BREEDING FOR HIGH PROLIFICACY IN BABY CORN

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Abstract

Maize (*Zea mays* L. ssp. *mays*) is grown globally as a staple crop. To meet diverse human needs, maize has gradually transitioned from a simple source of food and feed to a cash crop and source of industrial materials. Specialty corns, such as sweet corn, high-oil corn, quality protein maize, popcorn and baby corn have been developed for their unique nutritional profiles and multiple uses. Baby corn consists of immature ears harvested at the onset of silking that are a rich source of nutrients such as dietary fiber, sugars, vitamins, minerals, and amino acids. Baby corn has a high market value due to its high nutritional value, taste, and potential to earn foreign exchange through the export of fresh/canned baby corn and its processed products. The availability of hybrids specifically bred and released for baby corn cultivation is limited in the market. Compared with regular maize, greater ear number is favoured for baby corn cultivars to generate more ears. Ear number per plant is of interest as a model trait because it is highly correlated with baby corn yield. Earliness and prolificacy are desirable

traits for baby corn. Prolificacy assumes significance for development of high-yielding baby corn hybrids. By keeping this view the present investigation was carried out to develop and identify superior cross combinations possessing heterosis for earliness and high prolificacy traits.

PROBLEMS, SUPPORT SYSTEM AND STRESS AMONG SINGLE PARENTS OF NORTH KARNATAKA

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Abstract

Single parenting is situation in which one of the two individuals either mother or father is solely responsible for the upbringing of their children. A single parent faces multiple responsibilities which results in parenting stress. Keeping in view of single parents the study was conducted with an objective to know the problems, support system and stress among single parents. The data was collected from eight villages from four talukas of seven districts. The sample comprised of 420 single mothers selected randomly from each villages. The criterion for selecting single mothers was they should have at least one child age ranged from 6 to 18 years. The data was collected through personal interview method, parenting stress scale and SES scale. The results indicated that majority of the single mothers expressed death of the spouse (75%) was the main reason for singlehood followed by divorce (15.5%) and separation (9.5%). Single mothers expressed that parents, relatives and children were the major support system; finance and educational needs of children were considered to be major problem faced by single parents. Majority of single parents (61%) had medium level of parental stress and factors such as age and SES had significant influence of parental stress. Hence, single mothers requir intervention in reducing their stress level and for better management of quality life.

PHYSIOLOGY OF GERMINATING RICE (*ORYZA SATIVA L.*) GENOTYPES UNDER SALT STRESS DURING EARLY STAGES OF GROWTH

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Abstract

The present investigation was carried out to screen different genotypes of rice (*Oryza sativa L.*) during seedling growth stage and to identify some useful physiological parameters for selection of the tolerant and susceptible rice genotypes against salt stress. The salt solution was prepared by using NaCl : $CaCl_2$: Na_2SO_4 in the ratio of 7:2:1 (W/V) and its electrical conductivity of different salinity levels were maintained on direct reading conductivity meter. Rice seeds were sterilized by soaking in 0.1% $HgCl_2$ for four minutes thoroughly washed with de-ionized water and germinated in petri-dishes with blotting paper at 25 ± 2^{o}C. Screening of 50 rice genotypes was done on the basis of germination per cent, Germination Relative Index (GRI), Vigour Index (VI) & Mobilization efficiency (ME). Out of these four rice genotypes belonging to two groups viz. tolerant and susceptible were subjected to different salt stress condition 0.0, 12.0, 16.0 dSm^{-1} . The impact of salt stress on 7-day -old seedling of rice genotypes were evaluated on the basis of certain physiological and biochemical parameters under laboratory condition.

Salt stress of paddy was examined on seed germination and seedling growth of four (Pusa 2-21, Saket-4, Kamini & Sugandha) rice genotypes, the salt solution reduced seed germination and seedling growth of rice seeds. On the value of per cent reduction in seed germination, GRI, ME and VI the inhibitory effect of different salt stress was maximum in the susceptible genotypes (Kamini & Sugandha) followed by tolerant genotypes (Pusa 2-21 & Saket -4). On a average, the germination & mobilization efficiency percentage, germination relative index, vigour index of tolerant genotypes was 83.07, 336.05, 4087.35 & 49.91 significantly higher than that of susceptible genotypes 724.43, 240.78, 3315.12 & 41.94, respectively. Salt stress of paddy showed inhibitory effect on reducing sugar, non-reducing sugar, total sugar, peroxidase, soluble protein content, catalase activity and stimulatory effect on starch content, total free amnio acid, protease activity, proline content of rice seedlings.

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON YIELD AND ECONOMICS OF RABI SWEET CORN

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Abstract

This study was conducted to determine the effect of organic and inorganic sources of nutrients and different combinations of them on yield and economins of rabi sweet corn. Experiment was laid with 8 treatments and three replications in alfisols of Hyderabad. Organic nutrient sources like poultry manure, vermi compost and farm yard manure, Inorganic nutrient sources like urea, DAP, MOP, SSP were used for this study. The results of this study revealed that the maximum cob yield (11000 kg ha^{-1}) and stover yield (12791 kg ha^{-1}) was obtained with the application of 75% RDF + poultry manure @2. 5t ha^{-1} and it was on par with the application of entire dose of recommended NPK through fertilizers (T_1) followed by 75% of the recommended dose through fertilizers along with vermicompost @ 2.5 t ha^{-1} (T_4) and 75% recommended dose through fertilizers along with FYM @ 5 t ha^{-1} (T_2), 50% RDF + poultry manure @ 2.5t ha^{-1} (T_7). These are on par with each other and significantly superior to other treatments. There was an increase of 50% more yield in best treatments T_6 and T_1(100% RDF) when compared to that of control which recorded the lowest green cob yield (5815kg ha^{-1}) Where the highest (2.24) benefit cost ratio (BC ratio) was recorded in the treatment applied with 75% RDF+Vermi compost @2. 5t ha^{-1} followed by 50% RDF+Vermi compost @2. 5t ha^{-1} (2.18).

ASSESSMENT OF CORRELATION, PATH COEFFICIENT AND MOLECULAR LEVEL DIVERSITY IN RIDGE GUARD

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Abstract

The study was conducted for the assessment of molecular level diversity for preservation of genetic assets, recognition of best germplasm resources and the selection of superior cultivars for hybridization purpose. Seven genetically diverse genotypes of ridge gourd *viz*. Mulbagal Local, Pusa Nasdar, DMRG 25, DMRG 1, Anjali Long, Jaipur Long, JRG 3 and their 21 F_1's obtained by the way of diallel mating system without reciprocals were used in the experiment. The highly significant positive association recorded for vine length, number of leaves, leaf area, number of female flowers per vine, number of fruits per vine and average fruit weight. High positive direct effect was observed for number of fruits per vine and average fruit weight which are important contributing traits for yield that helps in accelerating ridge gourd improvement programme. The 22 primers showed polymorphism between the test genotypes (48%). The primers OPB 02 and OPB 06 were found as more informative in the present set of genotypes based on PIC and MI values. The dendrogram was obtained from the binary data deduced from the DNA profiles of the samples analyzed and at 0.9 coefficients of similarity three major clusters were formed. Cluster I consists of one genotype followed by Cluster II and Cluster III. Among the parents Anjali Long was found to be highly diverse.

PERFORMANCE AND NUTRIENT USE EFFICIENCY OF PADDY FOR THE SPLIT APPLICATION OF SLOW RELEASING NITROGENOUS COMPLEX FERTILIZERS

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Abstract

The effect of the split application of conventional and slow-release nitrogenous complex fertilizers (NCFs) on the growth,

yield and nutrient use efficiency (NUE) of paddy was investigated. A field experiment was conducted with eight treatments as follows: T_1- Check (Normal DAP with only N in 2 splits), T_2- DAP (Normal DAP with NPK in 3 splits), ANP (Normal ANP with NPK in 3 splits), T_3- ANP (Normal ANP with NPK in 3 slits), T_4- ANP+S (Normal ANP with NPK in 3 splits + basal S), T_5- APS (Normal APS with NPK in 3 splits), T_6- SAPS 100 (Slow release APS at 100 % RDF with NPK in 3 splits), T_7- SAPS 90 (Slow release APS at 90 % RDF with NPK in 3 splits) and T_8- SAPS 80 (Slow release APS at 80 % RDF with NPK in 3 splits). The results indicated that the split application of slow-release NCFs (T_6, T_7 and T_8) enhanced the growth and yield of paddy. Application of SAPS 100 resulted in higher plant height, number of tillers per hill, panicle length, number of grains per panicle, grain and straw yield of paddy than the application of conventional NCF (T_1). Compared with treatment T_1 (Normal DAP with only N in 2 splits), the application of slow-release NCFs in three splits (T_6, T_7 and T_8) resulted in higher NUE of paddy. Treatment T_8 recorded in 32.30 % higher cumulative productivity factor of NPK in paddy than treatment T_3 (Normal ANP with NPK in 3 slits). Split application of slow-release fertilizers reduces nutrient losses from the soil and maintains the optimum nutrient concentration in the soil. Thus, slow-release fertilizer application in split enhances plant growth and yield by improving the NUE.

SOIL TEST BASED FERTILIZER RECOMMENDATIONS FOR ENHANCING FARMERS' INCOME – AN EXTENSION STRATEGY FOR IMPROVED LIVELIHOODS IN NARSIMHULAPALLE (ADOPTED VILLAGE) BY BABU JAGJIVAN RAM AGRICULTURAL COLLEGE, SIRCILLA, PJTSAU, TELANGANA STATE

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Abstract

Adoption of a village and dissemination of the University (Professor Jayashankar Telangana State Agricultural University)-based applicable technologies for improving the livelihood of the farmers are two mandatory extension activities, apart from academics of the Babu Jagjivan Ram Agricultural College, Sircilla of Rajanna Sircilla district, Telangana state. Consequently, in the adopted village, Narsimhulapalle of Thangallapalli Mandal, a baseline survey, participatory rural appraisal (PRA), group discussions and frequent interactions were carried out in the village for preparation of an appropriate action plan. The prevailing farming conditions and demographic data were documented along with socio-economic status and data on the livelihoods of villagers was collected from primary and secondary sources. Foremost intervention done for enhancing the farm productivity and reducing the cost of cultivation for farmers was promoting the soil test-based fertilizer recommendation by soil sampling, analysis and distribution of soil health reports to the villagers. About 115 samples from the fields of all the farmers of the village were collected and tested for various soil available nutrients. The result obtained was given to the farmers as a soil health report and awareness was provided to the farmers about the need to apply fertilizers based on soil's available status of nutrients for good yield and environmental safety, besides, decreasing the cost of cultivation. Soil fertility profiling of the soils of entire village was done and the fertility maps were displayed at the Gram Panchayat.

EFFECT OF PARENTING PRACTICES ON PROBLEM BEHAVIOR AMONG RURAL AND URBAN ANGANWADI CHILDREN OF DHARWAD DISTRICT OF KARNATAKA

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Abstract

Children who are securely attached to their parents are provided a solid foundation for healthy development while young children who are not securely attached may develop behavioral problems. In order to investigate the effect of parenting practices on problem behavior among anganwadi children, a study was conducted on rural and urban locality of Dharwad district of Karnataka. A multi stage random sampling method was employed where three talukas out of five were randomly selected from Karnataka's Dharwad district and from these selected talukas, two villages each were selected. A total of ten

anganwadi's from five villages with 213 children and from six urban anganwadi's from three cities of the selected talukas with 121 children formed the sample. The occurrence of problem behavior was studied on 334 young children while the effect of parenting practices on problem behavior was carried out on a sub sample of 206 children nominated by teachers and peers.

The occurrence of problem behavior was assessed by administering the Child Behavior Checklist, revealed that, 47.0 percent of anganwadi children were in the borderline and 13.8 percent were in the clinical range for problem behavior. To assess the parenting practices, the Parenting Relationship Questionnaire was administered on parents. As per the results, the significant association was observed between parental attachment and involvement among parents of both rural and urban localities where majority of rural parents exhibited average attachment and involvement than urban parents. Significant association was found between rural parents' disciplinary practices with anganwadi child's problem behavior but not with parental attachment, involvement, confidence and relational frustration while among urban parents, parental involvement was significantly associated with problem behavior of their children but not with parents' disciplinary practices, parental attachment, confidence and relational frustration. Hence, the parental attachment and involvement can be utilized as a mitigating factor for management of problem behavior among young children. The parent counseling sessions and awareness programmes can help parents to manage their child's negative behavior and also to establish a strong bonding with their children.

FRUIT CHARACTERISTICS AND SEED VARIABILITY IN HALF-SIB PROGENY OF *MORUS ALBA* L. IN KASHMIR HIMALAYA

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Abstract

Seed source variation is an important tool in tree improvement programs that involve the selection of superior trees for seed collection and subsequent propagation. The genetic diversity within and among populations of trees can affect the growth and performance of their progeny, making seed source selection an important consideration for tree breeding and reforestation projects. The genetic variation among different seed sources can influence the germination rate, growth rate, and morphological characteristics of the seedlings. Therefore, "Fruit characteristics and seed variability in half-sib progeny of *Morus alba* L." was initiated to identify potential germplasm for improving the species productivity. Experimental results revealed that the trees showed considerable phenotypic and morphological variability. Significant variation was observed in fruit parameters (fruit length, fruit width, stalk length, fruit weight, fruit colour, shape and taste) and seed germination parameters (germination percent, mean daily germination, peak value, germination energy, germination value and seed weight). The study indicated that fruits and seeds collected from Khoverpora-Anantnag district recorded the maximum values for various parameters with the highest (6.60) average number of bunches in each bearing branch and maximum (3.65) average number of berries in each bunch, fruit length (3.98cm), fruit width (2.69cm), stalk length (4.58cm) and fruit weight (9.37g). In addition to this, the same source recorded the highest values for germination percentage (94%), mean daily germination (4.43), peak value (11.60), germination energy (85.50), germination value (51.45) and seed weight (2.52 g) followed by Khudwani-Kulgam district. Therefore, selection of genetically diverse seed sources of *Morus alba* and evaluation of their potential could be one of the futuristic strategies to identify superior source for improving the growth and productivity.

IMPORTANCE OF WEATHER FORECASTING IN MODERN AGRICULTURE

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Abstract

Agriculture and farming are mainly dependent on seasons and weather. Previously we did not have a better understanding of weather forecasting and farmers were still doing their job based on predictions. Though sometimes they occur loss due to false predictions of weather. Now that the technology is developed and special weather forecasting mechanisms are available, the farmers can get all the updates are on a smartphone. Education towards that is, of course, an important thing but most of the farmer population at this stage knows the basics which make it easy for them to use the features. Occurrences of erratic weather are beyond human control. It is possible, however, to adapt to or mitigate the effects of adverse weather if a forecast of

the expected weather can be obtained in time. Forecasts should ideally be used for small areas. Some aspects of weather forecasts for agriculture are quite distinct from synoptic weather forecasts. While clear weather is required for sowing operations, it must be preceded by seed zone soil moisture storage. Crop weather factors mean that crops and cropping practices vary across areas within the same season. In the case of well-organized weather systems, the desired areal delineation of forecasts can be realized. The area to which the weather forecasts will be applied must be unambiguously stated.

Weather forecasting is a prediction on conditions of atmosphere depending on location and time. Every area will have their different predictions related to the condition of weather which makes pretty easy for the farmers to know how and what to do when. The relationship between weather and agriculture has, therefore, necessitated the need for accurate prediction of the weather; to enable farmers to make an informed decision that will not bring losses to them. Temperature, sunlight, and rainfall have major effects on the crops. For livestock, temperatures and adequate water and food are essential. The consequences of unseasonal changes in temperature and their potential negative effects on host plants and pests are very well known. Unseasonably high temperatures may lead to lower plant productivity and more pests on the farm. Applying pest and disease control is important to protect the farm and crops from the insects. Weather forecast helps the farmers to know when to apply the pests and chemicals to avoid the crop wastage. By some estimates, up to 40 percent of the world's food supply is already lost due to pests. Reduction in pests and applied chemicals is important to ensure global food security; reduced application of inputs and decreased greenhouse emissions. Climate-smart pest management is a cross-sectoral approach that aims to highly reduce pest induced crop losses. And the method along with the forecast should be applied everywhere to ignore the wastage.

NUTRIGENETIC HYBRIDS INVESTIGATION FOR NUTRIGENETIC PARAMETERS DURING SPRING SEASON UNDER SUBTROPICAL CONDITION OF JAMMU (J&K)

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Abstract

The present investigation for screening and evaluation of nutrigenetic traits of bivoltine silkworm hybrids was done for two years during spring season (2021 & 2022). During spring (2021), the consumption index was very less in hybrids *viz*., CSR50×BHR3 & RSJ14×B.con4 (0.26) followed by CSR50×B.con1 & CSR50×B.con4 (0.27) and RSJ14×B.con1 (0.29) compared to other hybrids. The efficiency conversion for ingesta to cocoon was highest in the hybrids *viz*., $FC_1 \times FC_2$ (30.05) followed by RSJ14×B.con4 (29.53), CSR50×BHR3 (29.04), CSR50×B.con4 (28.94), CSR50×B.con1 (28.29) and RSJ14×B.con1 (26.62) whereas efficiency conversion for ingesta to shell was highest in the hybrids *viz*., $FC_1 \times FC_2$ (21.13) followed by RSJ14×B.con4 (19.30) followed by CSR50×BHR3 (19.20), CSR50×B.con4 (18.90), CSR50×B.con1 (18.71) and RSJ14×B.con1 (17.60). The ingesta per gram of the cocoon is very less compared to other hybrids *viz*., $FC_1 \times FC_2$ (3.33) followed by RSJ14×B.con4 (3.39) followed by CSR50×BHR3 (3.44), CSR50×B.con4 (3.46), CSR50×B.con1(3.54) and RSJ14×B.con1 (3.76) whereas the ingesta per gram of the shell is very less compared to other hybrids *viz*., $FC_1 \times FC_2$ (4.73) followed by RSJ14×B.con4 (5.18) followed by CSR50×BHR3 (5.21), CSR50×B.con4 (5.29), CSR50×B.con1 (5.35) and RSJ14×B.con1 (5.68). During spring (2022), the consumption index was very less in hybrids *viz*., CSR50×B.con1 & RSJ14×B.con4 (0.56), CSR50×B.con4, CSR50×BHR2 and CSR50×NB_4D_2 (0.57) compared to other hybrids. The efficiency conversion for ingesta to cocoon was highest in the hybrids *viz*., CSR50×B.con1 (9.03), CSR50×B.con4 (8.57), CSR50×BHR2 (8.49), CSR50×NB_4D_2 (8.39) and CSR50×BHR3 (8.05) and efficiency conversion for ingesta to shell was highest in the hybrids *viz*., CSR50×B.con1 (4.56), CSR50×B.con4 & CSR50×BHR3 (4.29), CSR50×BHR2 (4.16) and CSR50×NB_4D_2 (4.15). The ingesta per gram of the cocoon was very less compared to other hybrids *viz*., CSR50×B.con1 (11.07), CSR50×B.con4 (11.66), CSR50×BHR2 (11.77), CSR50×NB_4D_2 (11.92) and CSR50×BHR3 (12.42) and the ingesta per gram of the shell was very less compared to other hybrids *viz*., CSR50×B.con1 (21.92), CSR50×BHR3 (23.29), CSR50×B.con4 (23.33), CSR50×BHR2 (24.07) and CSR50×NB_4D_2 (24.11). Based on the overall nutrigenetic traits utilized as index, five bivoltine silkworm hybrids *viz*., CSR50×BHR3, RSJ14×B.con4, CSR50×B.con1, CSR50×B.con4 & RSJ14×B.con1 during spring (2021) and CSR50×B.con1, RSJ14×B.con4, CSR50×B.con4, CSR50×BHR2 & CSR50×NB_4D_2 during spring (2022) respectively were identified as having the potential for nutrition efficiency conversion and can be utilized for further study as on station trial at different institutes. The data from the present study advances our knowledge for the development of nutritionally efficient silkworm hybrids and their effective commercial utilization in the sericulture industry.

SYNTHESIS, CHARACTERIZATION AND BIOAVAILABILITY OF NANO-ENCAPSULATED IRON AND ZINC PARTICLES FOR FOOD FORTIFICATION

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Abstract

Micronutrient deficiencies are a global public health and socioeconomic issue. Due to their distinct physicochemical characteristics, iron and zinc particles have garnered a great deal of interest in a variety of study fields, including biomedical engineering, nutrition science and applied science. The aim of this research to optimize natural polymer coated nanoparticle that can be used as a carrier for food fortification. For application in fortification, Fe/Zn-loaded nanoparticles coated with natural polymer were produced and examined in this work for their point size, shape, FTIR, encapsulation efficacy (EE), hemolysis, biocompatibility and bioavailability. After this, the MTT assay was utilised to test the cytotoxicity of the synthesised nanoparticles in fibroblast cell lines. The results of the tests on cell viability and hemolysis showed that the synthesised nanoparticles are not harmful up to 200-350 g/mL. These biocompatible nanoparticles could potentially be used for in-vivo applications as well as food fortification. According to research, synthesis nanoparticles are typically between 90 and 800 nm in size. The nanoparticles' shape is also regular, smooth, and spherical without any aggregation phenomenon. Zn/Fe was peaked in natural polymer coated nanoparticles, according to FTIR certification. Zn/Fe exhibited an encapsulation efficiency of 75–90% and a yield of 65-74%. It is evident from the findings of the haemolysis, bioaccessibility, and cell viability studies that these nanoparticles are biocompatible and appropriate for use in biomedical applications.

PERFORMANCE OF INTEGRATED WEED MANAGEMENT ON GROWTH, PRODUCTIVITY, PROFITABILITY AND NUTRIENT UPTAKE OF IRRIGATED INDIAN MUSTARD CROP (*BRASSICA JUNCEA* L.)

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Abstract

The trial was drawn with the aiming impact on growth, yield, nutrient uptake and economics of mustard crop in gird zone by using of integrated weed management practices in *Rabi* season during 2021-2022 at agronomy research farm, college of agriculture, Gwalior, RVSKVV in Randomized Plot Design with ten treatments replicate thrice on sandy clay loam soil. Studied traits included plant height, number of branches/plant, number of leaves /plant, no. of siliquae/plant, no. of seeds/plant, test weight, biological yield, seed yield, Nitrogen, Phosphorus and Potassium uptake kg/ha by mustard crop, Net income and B:C. It could be concluded that from one year experimental result the application of Pendimethalin 30 EC, 750 g a.i./ha PE + HW at 45 DAS was registered highest growth characterstics, yield contributing characterstics, yield of seed (2027 kg/ha) and stover (5502 kg/ha), nutrient (N,P&K 46.55,11.23&12.15 kg/ha) uptake of crop and Net return (81935 Rs/ha) and B:C.(3.7). The treatment of Pendimethalin 30 EC, 750 g a.i./ha PE + HW at 45 DAS increased seed yield of mustard 119% and 11% to weedy check and Two hand weeding at 30 and 60 DAS, Respectively.

PRINCIPAL COMPONENT ANALYSIS FOR PERFORMANCE TRAITS IN LAYER CHICKEN

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Abstract

Principal component analysis is a mathematical procedure that transforms a number of possibly correlated variables into smaller number of uncorrelated variables. The study was conducted with an aim to determine the principal component for performance traits in layer chicken. The present study comprised of three genetic groups (Punjab Red, Desi cross 1 and Desi cross 2). The economic traits *viz*. age at sexual maturity (ASM), body weight at sexual maturity (BWSM), weekly body weight

(BW) from 0 day to 20 week, and 40 week, weight of the first egg (FEW), egg production (EP) and egg weight (EW) at 40 week, and egg production and egg weight at 52 week were recorded during the entire period of experiment. The total number of traits (25) and population size (450) were analyzed in layer chicken by using Varimax Rotated Principal Components with Kaiser Normalization. The application of correlation matrix was used to obtain the primary data required for PCA which yielded positive and highly significant phenotypic correlations among most of the traits except body weight at 40 week. A total of three principal components were identified which had total variance of 75.52%. First principal component which had significant impact on BW10-20 week and BWSM, explained a total variation of 38.89%. Having a high loads on BW1-9 week was the second principal component that explained a total variance of 27.07%. A total variance of 9.56% was observed by the third principal component, which had high loads on ASM, EP-40 week and EP-52 week. The findings of the present study indicated that it could be applied in breeding programmes to select crossbred layer birds and also for prediction of performance traits.

EFFECT OF CLIMATE CHANGE ON WATER REQUIREMENTS OF CROPS AND ADAPTIVE WATER STRATEGIES IN KRISHNA UPPER BASIN

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Abstract

Climate change effects the irrigation demand of crops and supply by water resources which are highly dependent on pattern of rainfall and temperature. Any imbalance between the demand and supply of soil moisture may lead to adverse effect on crop yield and productivity. It is very essential to focus on water management plans and adaptation strategies to minimize the adverse effect of climate change on crop production. The present study was carried out in Krishna Upper subbasin of Krishna basin with an aim of study the impact of climate change on crop water and irrigation water requirement of crops grown in that region and adaptation strategies to cope with the climate change. It is projected that the net irrigation requirement of crops during *kharif* season is expected to decrease in future because of expected increase in monsoon rainfall. Crop water requirement and net irrigation requirement of crops during *rabi* and summer season is expected to increase for all the sub basins based on climate change scenarios of CNRM climate model. Adaptation strategies includes creation of additional storage for water resources, altering the sowing dates and deficit irrigation strategies. It is found that sub basin wise additional volume of water need to be increased to match with the irrigation requirements in future. Early sowing of crops by 10 days in *rabi* season may save the crops from additional irrigation requirement and match with the baseline periods. Deficit irrigation strategies during non-sensitive stages of crops with 0.9 ETc, 0.8 ETc and 0.7 ETc and full irrigation during sensitive stages for all the sub basins can be adopted to manage irrigation sources in the study area in future.

GENETIC VARIABILITY ANALYSIS 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

2021-22 were 57.454 lakh hectares, 101.064 lakh tones and 1759 kg ha^{-1}, respectively. While in Rajasthan, the area, production and productivity of groundnut during 2021-22 were 7.979 lakh hectares, 17.006 lakh tones and 2131 kg ha^{-1}, 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 during *Kharif*, 2021 and 2022 at Instructional Farm, CTAE (MPUAT), Udaipur.

Among the tested entries viz., UG 258 gave maximum mean dry pod yield (3009 Kg/ha) followed by other entries and significantly superior over all the checks viz. TG 37 A (2350 kg ha^{-1}), JL 501 (2261 kg ha^{-1}) and GG 7 (1975 kg ha^{-1}). Kernel yield were ranged from 1240-2021 kg ha^{-1}. The shelling out-turns of different entries ranged from 63-76%, sound mature kernels were ranged from 90-97 percent, 100-kernel weight ranged between 34-46g. The days to maturity ranged from 98-108 days.

EFFECT OF SULPHUR AND BIO-FERTILIZERS ON PRODUCTIVITY OF FENUGREEK (*TRIGONELLA FOENUM-GRAECUM* L.)

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Abstract

A field experiment entitled "Effect of Sulphur and Bio-fertilizers on Productivity of Fenugreek (*Trigonella foenum-graecum* L.)" was conducted at Instructional Farm of Agronomy, Department of Agronomy, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan during the *rabi* season of 2021-22 to study the effect of varying levels of sulphur and biofertilizers inoculations on productivity of crop. The experiment was conducted in Factorial RBD with four levels of sulphur *viz*., 10, 20, 30, 40 kg ha^{-1} and four combinations of biofertilizers *viz*., control, *Rhizobium*, *Rhizobium* + PSB , NPK consortia thereby making 16 treatment combinations replicated thrice. Fenugreek crop variety PRM-45 was used as test crop. The results revealed that application of 40 kg sulphur ha^{-1} registered significantly higher growth characters *i.e.,* plant height, dry matter at successive growth stages, number of primary and secondary branches, number of effective nodules and their weight plant^{-1}. The fenugreek raised with 40 kg sulphur ha^{-1} significantly improved yield attributes *i.e.,* Pods plant^{-1}, pod length, seeds pod^{-1} and test weight thereby enhanced seed, haulm and biological yield by over application of 30 kg sulphur ha^{-1} by 6.5, 7.3, 7.1, 20 kg sulphur ha^{-1} by 14.8, 16.1, 15.7 and 10 kg sulphur ha^{-1} by 31.2, 29.0, 29.6 per cent, respectively. The crop under the influence of 40 kg sulphur ha^{-1} fetched highest net return of Rs. 102180 ha^{-1} and B-C ratio of 3.31 over rest of sulphur levels. Results further revealed that inoculation of fenugreek seed with NPK consortia recorded maximum plant height, dry matter, number of effective nodules and their fresh weight, primary and secondary branches plant^{-1} with the inoculation of NPK consortia which remained at par with dual inoculation of *Rhizobium* + PSB. Inoculation of fenugreek seed with NPK consortia proved significantly higher pods plant^{-1}, pod length, seeds pod^{-1} and test weight with concomitant increase in seed and haulm yield by 16.4 and 21.0 per cent over control which was found at par with dual inoculation of *Rhizobium* + PSB with 16.4 and 21.0 per cent increase in both yield respectively. The maximum net return of Rs.96029 ha^{-1} and the higher B-C ratio of 3.19 was also recorded when seeds were inoculated with NPK consortia.

IDENTIFICATION OF NOVEL SOURCES OF HOST PLANT RESISTANCE TO INVASIVE PEST FALL ARMYWORM *SPODOPTERA FRUGIPERDA* (J. E. SMITH) AND PINK STEM BORER *SESAMIA INFERENS* WALKER IN MAIZE

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Abstract

Fall armyworm (FAW), *Spodoptera frugiperda* (J.E. Smith) and pink stem borer (PSB) *Sesamia inferens* Walker are the major

pests of maize that pose serious threat to production and productivity of the crop and income of smallholder farmers. Host Plant Resistance to insects is one of the most important components of IPM as it is compatible with other IPM strategies and also environmentally friendly. The specific objective of the present study is to identify the potential sources of resistance to FAW and PSB under artificial infestation in diverse maize genotypes. A total of 144 maize genotypes were screened against fall armyworm and pink stem borer during Rabi 2022-23 under artificial infestation. The screening technique for FAW was standardized under artificial infestation suited to Indian conditions, with a description of leaf damage rating (LDR) in a 1-9 scale. Twenty FAW neonate larvae/plant were released at the V_5 stage while ten PSB neonate larvae/plant were released into the whorl of the plant at 12 days after germination, respectively. Significant differences in the LDR scores were observed among the genotypes against FAW and PSB damage. Based on the LDR rating, five genotypes *viz.,* CML 59 (3.89), CML 60 (3.57), CML 67 (3.25), CML 336 (4.14) and CML 337 (3.96) were found promising against FAW whereas MIL 1-11 (2.83) and CML 60 (4.00) were found promising against PSB. These identified potential genotypes can be utilized in the breeding programmes to improve the levels of resistance to FAW and PSB.

IMPACT OF MASS MEDIA COMMUNICATION IN ADAPTATION OF ADVANCED PRODUCTION TECHNOLOGIES IN BANANA BASED ON LAND HOLDING AND FARM EXPERIENCE

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Abstract

An attempt has been made to study the overall gratification on the functions of the media for Transfer of technology (ToT) on banana cultivation. After converting the qualitative information into a quantitative one using a five point scale, the average scores were obtained from the respondents on various factors to determine the overall gratification on the functions of the media for ToT on banana cultivation made as a dependent variable like Newspapers, Magazines, Radio, Television, New media. The independent variable which affects the profile characters such as banana cultivation area and farm experience was studied from the major banana cultivating blocks of Thottiaym, Lalgudi, Andanallur, Manachanallur and Tiruverambur in Tiruchirappalli district of Tamil Nadu. This study reviled that the percentage of high level satisfaction on the functions of media for getting transfer of technology on banana cultivation was the highest 86.4 % among the banana farmers in 11-15 acres and the same was lowest 70.3 % with respect to the banana cultivation of 2-5 acres farmers. The percentage of the low level satisfaction was the highest 11.5 % with respect to the banana cultivation of below 1 acre farmers and the same was lowest 4.5 % with respect to the banana cultivation of 11 -15 acres. The farmers having moderate experience 1-15 years were adopting maximum usage of mass media and central/ state agricultural institutes' information on banana cultivation than the highly experienced 16 – 35 years farmers.

ESTIMATION OF TREE BIOMASS, AND CARBON STOCK ACROSS PROTECTED FOREST ECOSYSTEMS OF NORTH-WESTERN SIWALIKS, INDIA

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Abstract

The Siwalik Hills constitute one of the lower Himalayas' most fragile and degraded ecosystems. These ecosystems are under tremendous stress because of factors such as weak geologic formations, undulating land topography, excessive deforestation, and severe soil erosion. The present study is part of an integrated study on the nutrient dynamics of protected forest ecosystems in a changing environment. We estimated biomass and carbon stocks across contrasting forest ecosystems. Across each study site, five rectangular sampling plots of 0.1 ha each (31.6 x 31.6 m) covering various aspects and vegetation types were used to gather quantitative data. A non-destructive approach was adopted to estimate tree biomass and carbon stocks for each forest type. The stand density ranged between 256.6 trees per ha and 741.6 trees per ha, being lowest in *Cedrus deodara*

forest and highest in *Quercus semecarpifolia-Abies* forest. The temperate *Cedrus deodara* forest was found to have the highest total biomass density (TBD) (646.7 Mg ha^{-1}) and total carbon density (TCD) (297.5 Mg C ha^{-1}), while the minimum in the *Quercus leucotrichophora*-dominated forest was 235.2 Mg ha^{-1} and 105.8 Mg C ha^{-1}, respectively. The study indicated that mature coniferous forests at higher altitudes have significant carbon storage. However, the lower subtropical broadleaved forests in north-western Siwaliks require due attention for carbon management programmes.

FINGER MILLET (*ELEUSINE CORACANA*) PRODUCTIVITY AS INFLUENCED UNDER DIFFERENT ORGANIC NUTRIENT MANAGEMENT TECHNIQUES IN SEMI-ARID REGIONS OF INDIA

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Abstract

Finger millet as a model nutraceutical crop and also an important staple food crop of many semi-arid and tropical regions of the world. Finger millet is considered as hardy millet due to its resistance to both abiotic and biotic stresses ensuring food security in these areas even during harsh environment. Although finger millet is excellent source of nutritious cereal millet limited studies were conducted for organic production of finger millet for increasing productivity. Therefore, a field study was conducted on a sandy loam soil in Karnataka, India, during 2018-2023 (Five years) *Kharif* seasons to assess the performance of finger millet productivity as influenced under different organic nutrient management techniques.

In the present investigation, application of recommended dose of Farm yard manure (7.5 t/ha) along with 100 per cent Nitrogen equivalent vermicompost were applied commonly to all treatments as a basal dose. But, along with basal supply of nutrients drenching (foliar applicaton) with different liquid organic manures like Jeevamrutha, Cow urine, Bio digester liquid manure (BDLM) and with vermiwash at different doses individually and in combinations at different crop growth stages viz. 25, 50 and 75 days after transplanting were applied to finger millet. The results revealed that among different nutrient management techniques, application of jeevamrutha @ 200 lit/ha recorded significantly higher grain yield (29 q/ha), straw yield (53 q/ha) and was onpar with jeevamrutha + Vermiwash @100 lit/ha each. Both treatments were significantly superior over all other treatments. While, significantly lower productivity of organic finger millet was recorded in control treatment (without liquid manure application).

RECENT INSIGHTS INTO THE COMPLEX ETIOLOGY OF BACTERIAL LEAF BLIGHT OF RICE IN INDIA: ETIOLOGY, PATHOTYPING, MOLECULAR DIVERSITY AND MICROBIOME-BASED MANAGEMENT

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Abstract

Rice is an important food and commercial crop in India. It is being cultivated in both irrigated and rainfed ecosystems of the country. Rice production in India is affected by several biotic and abiotic constraints. Several major diseases, such as blast, sheath blight, and bacterial leaf blight (BLB), continue to appear in moderate to severe form in all ecosystems in all seasons. The BLB disease of rice is becoming more complex with respect to its associated etiological agents and the pathotype profile of the predominant bacterial pathogen, i.e., *Xanthomonas oryzae* pv. *oryzae* (Xoo). To unravel the etiological complexity, about 60 BLB-infected samples were collected from different locations of the TBP region. About 19 isolates were recovered

from the symptomatic leaf samples, and pathogenicity was proved on the TN-1 cultivar. A negative result in the PCR assays using Xoo-specific primers indicated the absence of Xoo, and analysis of the 16s rDNA sequence homology suggested that 19 isolates belonged to *Sphingomonas pseudosanguinis* (11), *S. yabuuchiae* (3), *S. panni* (3), *S. melonis* (1), and *S. sanguinis* (1). Therefore, the etiological agent of BLB is also *Sphingomonasi* spp, along with Xoo in India. A study was carried out to analyze the virulence, genetic diversity, and population structure of 54 Xoo isolates collected from different rice ecosystems in Karnataka, India. The taxonomic identity of all 54 isolates was confirmed using a Xoo-specific PCR assay. The virulence assay on a set of twenty-eight near-isogenic differentials identified nine pathotype groups (KPthX-1 to KPthX-9). Among them, KPthX-6 was highly virulent, whereas KPthx-2 was less virulent. Differentials with four and five resistance (R) genes (*Xa*4 + *xa*5 + *xa*13 + *Xa*21, *Xa*4 + *Xa*7 + *xa*13 + *Xa*21, and *Xa*4 + *xa*5 + *Xa*7 + *xa*13 + *Xa*21) were effective against all the pathotypes. Further, genetic diversity was deduced using a universal marker set, JEL-1 and JEL-2, complementary to a conserved repetitive sequence IS1112. The amplicon size and numbers varied from 100 bp to 3 Kbp and 1 to 25. Based on the amplicon counts, Jaccard's co-efficient and phylogenetic analyses were carried out and categorized the 54 isolates into three clusters (I to III). Cluster II contains the maximum number of isolates (27), followed by Cluster I (23 isolates) and Cluster III (one isolate).. We also attempted to manage the BLB disease utilizing the bacterial microbiome isolated from the BLB-symptomatic leaves. Both *in-vitro* and *in-planta* assays indicated that *Achromobacter psuedointermedius* strain R-II-T1, *Bacillus subtillis* strain B-III-T1, and *Streptomyces longisporoflavus* strain B-III-T2 were found to be effective in reducing the in-vitro growth of the Xoo as well as in-planta BLB severity. Our study indicated the etiological complexity of the BLB disease in India, the molecular-virulence diversity among the Xoo population, and the potential of the bacterial microbiome for managing the BLB in the field.

PROTEIN RICH TRADITIONAL RICE VARIETIES OF TAMIL NADU AND ITS NUTRITIONAL VALUES

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Abstract

Tamil Nadu, the land of rich biodiversity, is a treasure of rice landraces. The Thanjavur District lies at the Cauvery Delta Zone. It is known as the Granary of "Southern India" and "Rice Bowl" of Tamil Nadu. It is the main rice producing region in the state. The traditional variety has been eroded and lost its characteristics. Now, the importance of traditional rice varieties has become increasingly prominent. This study on the nutraceutical properties of these specific rice varieties was made to understand their health benefits. Amongst the identified traditional rice varieties, *Mappillai samba, Karukurvai, Norungan,* Poongar and Sivappukavuni with red pericarp grown widely between the farmers in Tamil Nadu were taken and analyzed for its protein, grain quality and nutraceutical properties. The selected traditional rice varieties are red rice with red pericarp, and the bran colour ranges from dark red to light red. Though the colourwere restricted to the bran layer, a tingle of red remains even after milling. The study recommends that these rice varieties be nominally polished for consumption during the milling process. Protein content ranges from 12.48% *(Norungan*) to 11.0% (*SivappuKavuni*). Zinc and iron content of the red rice varieties are two to three times higher than white rice. The iron content ranged from 10 µg/g (Poongar) to 15.7 µg/g (*Sivappukavuni*) and the zinc content ranged from 19.9 µg/g (*Mappillai samba*) to 27.6 µg/g (*Karukuruvai)*. Protein influence viscosity curves higher the protein content the peak viscosity, breakdown viscosity and final viscosity of the starch decreased. The resistance content in rice also varies depending on the physical and chemical properties, *viz*., grain shape, thickness and grain elongation ratio. The results revealed that bold type grains possessed high amylose content and Resistant starch (RS) content when compared to slender types. RS content varied from 4.8 to 6.4 percent. The *Karukruvai* has the highest RS content of 7.0%, followed by *Sivappukavuni, Norungan and Mappillai samba* with 6.4, 6.1 and 5.1 per cent, respectively. The lowest value of RS content recorded in *Poongar* is 4.8%. RS lowers the glycemic index (GI) of food because of the slow release of glucose. Therefore, the traditional rice land races being more nutritious also has varied medicinal properties and are only used in the local pockets and areas. So, the nutritional value of traditional rice varieties with its inherent medicinal values with low GI rice with good nutritional composition may encourage farmers as well as consumers for their high demand and economic benefit.

VIRAL DETECTION THROUGH NGS IN *ANDROGRAPHIS PANICULATA*

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Abstract

Andrographis paniculata, often known as King of Bitters or kalmegh, is an annual herbaceous plant. It is endemic to peninsular India and Sri Lanka, and it is also found in many parts of Southeast Asia. There are around 40 species in the genus *Andrographis,* which belongs to the Acanthaceae family. It is also known as King of Bitters in English, Mahatita in Hindi, and Kalmegh in Bengali. The plant's aerial portions and roots have long been utilized in traditional medicine in China, India, Thailand, and other Southeast Asian nations to cure a variety of ailments. It has been shown to have a broad range of pharmacological characteristics. This abstract focused on viral analysis using NGS sequencing. Next-generation sequencing (NGS) is a powerful tool for analyzing DNA and RNA sequences. By fragmenting the genetic material into many small pieces, adding adapters, and sequencing the libraries, NGS can generate vast amounts of data quickly and accurately. This technology has numerous applications in various fields, including medicine, genomics, and evolutionary biology. In the context of viral analysis, NGS can be used to identify and characterize viral strains, detect mutations, and track the spread of viral outbreaks. By sequencing the viral genome, researchers can gain insights into its biology and identify potential targets for therapeutic interventions. Overall, NGS has revolutionized the field of genomics and has become an essential tool in many areas of research. Its ability to generate massive amounts of data quickly and accurately has opened up new avenues for understanding the complexity of biological systems, including viruses.

PERFORMANCE OF SALT TOLERANT PADDY VARIETY (GGV-05-01) THROUGH FRONT LINE DEMONSTRATION APPROACH IN KOPPAL DISTRICT

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Abstract

Frontline demonstrations (FLDs) on paddy were conducted in ten farmers fields to demonstrate production potential and economic benefits of salt tolerant variety GGV-05-01 was compared with farmer practice (BPT-5204). FLDs were conducted during *kharif* season of 2019-20 and 2020-2021 by ICAR-Krishi Vigyan Kendra, Koppal (Gangavathi), Karnataka state. The demonstrated plots were recorded 18.73 per cent higher grain yield than farmer's practices. The extension gap, technology gap and technology index were 13.55 q ha-1, 4.08 q ha-1 and 4.53 per cent, respectively. Further, higher gross return (Rs. 1,32,885 ha-1), higher net return (Rs. 84,073 ha-1) and higher B:C ratio (2.83) was observed in demonstrated plot as compared to farmers practice. Higher yield and returns were due to reduced cost of cultivation, higher grain yield, and higher net returns in the demonstrated plots over the farmer's practice. Thus the productivity of paddy could be increased by adopting feasible and sustainable management practices with a suitable salt tolerant paddy variety in Koppal district.

IMPACT OF SKILL DEVELOPMENT ON SOCIO ECONOMIC STATUS AND SELF ESTEEM OF RURAL WOMEN

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Abstract

Women's empowerment has been pointed out as an indispensible condition to reduce poverty in developing countries of the world. They constitute nearly fifty percent of our population. Majority of women are unskilled and low bargaining power. Since independence, the Government of India has emphasized the need for women's development and empower them through implementation of various programmes and schemes all over the country. Livelihood enhancement refers to self-earning capacity, for if a woman can earn money by herself, she will have the ability to spend money by herself, help other family members, freedom of choice, a sense of self-confidence and self-efficacy, ability to educate her children and reshape her own life. Hence the study was carried out with the objective of training the rural women in the skill of tailoring, comparing the

socio-economic status and self esteem of rural women prior to and after skill development. One hundred and ten rural women from Hitnalli and Arkeri village were trained in the skill of tailoring under the entrepreneurship development programme. The duration of training for each batch was 15 days. The criteria for selection of the trainees was that they should have basic knowledge of pedaling the machine. Further their skills were enhanced through teaching new designs and techniques in tailoring. Socio-economic status of the respondents was collected using the scale developed by Aggarwal and Self esteem was measured using the scale developed by Rosenberg (1965). Pre and Post test was conducted. The results revealed that the number of respondents in upper middle socio-economic status increased by 28 percent and in high level SES by 7 percent. Further there was decrease in the percentage of respondents in lower middle SES by 24 percent and poor SES by 11 percent. The number of respondents having medium level of self esteem increased by 27 percent and respondents having high self esteem increased by 11 percent. Further there was reduction by 38 percent in the number of respondents having low level of self esteem. Thus it is concluded that the skill development training on tailoring has helped the rural women improve their financial status, self esteem, decision making power, social status and respect in the family and society.

MATHEMATICAL MODELLING OF THIN LAYER DRYING KINETICS OF SAFED MUSALI (*CHLOROPHYTUM BORIVILIANUM*) IN SOLAR DRYER INTEGRATED WITH PHASE CHANGE MATERIAL

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Abstract

Safed musali (*Chlorophytum borivilianum*) were dried in solar cabinet dryer and thin layer drying kinetics were investigated in terms of moisture content, moisture ratio, drying rate, drying time. Solar dryer integrated with phase change material i. e. paraffin were employed to study drying behaviour and compared with traditional open solar drying method. Primarily drying of safed musali occurred at falling rate period. The mathematical models of thin-layer solar drying of medicinal plant safed musali were studied and verified with experimental data. Seven different mathematical drying models were compared according to statistical parameters, i.e. coefficient of determination (R^2), chi-square ( ) and root mean square error (RMSE). The best model describing the thin layer drying characteristics of safed musali was set on the basis of the highest R^2 values and the lowest RMSE values. The different thin layer drying models were applied for variation of moisture ratio with respect to drying time and was experimentally investigated in a sun drying and solar dryer. The objective of the study was the verification of models already developed and determined best ranked thin layer drying model for safed musali. The Page model and Henderson & Pabis model could satisfactorily describe the drying curve for sun and solar cabinet drying of safed musali with coefficient of determination of 0.998 and 0.995 respectively. These results are useful for drying safed musali for commercial scale to optimize the drying process and achieve best quality of dried product.

VALUE ADDED PRODUCTS FROM BER

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Abstract

Ber (*Zizyphus mauritiana* Lamk) belongs to the *Rhamnaceae* family and is also called as jujube. It grows in arid and semi-arid regions of India and there are 125 varieties of ber in India. The cultivated horticultural varieties grown are *Gola*, *Umran*, *Mundia*, *Kaithli*, *Umran*, *Mehrun*, *Parbani*, *Elaichi* and *Sanam* in India. Although known for its rich taste and high nutritional value, ber is an underutilised fruit and is available only for a short period of time. Value addition is a great way to increase the shelf life of the product along with adding economic value to it. Advantages of value addition is to improve the profitability of farmers, reduces the glut in market during peak season of produce, produce that can convert into value added product increasing the profit, empower the farmers and other weaker sections of society especially women through gainful employment opportunities. The seasonal and perishable nature of Ber leads to the various value-added products like Ber

candy, Ber jam, Ber wine, dehydrated and sundried ber, Ber beverages, Ber pickle are used for keeping best quality of this fruit. The medicinal properties like neurological properties, antinephritic effect, cardio-vascular activity, antifungal, antidiabetic, anti-allergic, antiulcer, anti-inflammatory, anti-oxidants and anti-bacterial activities have been used since ancient times for curing various illnesses. The shelf-life of ber fruit is extremely short and the rapid perishability of the fruits is a problem. At ambient temperature the shelf-life of ber is only 2-4 days. Due to surplus of fruits in local markets during peak season, a substantial quantity goes into waste, resulting in heavy postharvest losses. If proper efforts are made to increase the production supplemented with value addition of ber fruit such as wine production with proper handling with respect to pre-harvest, harvesting and postharvest treatments, packaging, transportation, storage, postharvest pathology and processing.

INCREASED INCOME TO FARMERS THROUGH TECHNOLOGICAL INTERVENTIONS

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Abstract

The study was conducted in Davanagere district of Karnataka state in India. The district consist of 2 agro-climatic zones namely; Central Dry Zone (Jagalur, Harihar and Davanagere blocks) and Southern Transitional Zone (Channagiri, Honnali and Nyamati blocks). Fifty five farmers from these two zones were selected with whom technological interventions were carried out during 2016 and 2021 by ICAR-Taralabalu Krishi Vigyan Kendra, Davanagere. Thus total sample size of the study was 110 farmers, the data was collected during 2021 in comparison with 2016 with respect to yield and income of crops including entrepreneurship. The sector wise increase in income revealed that 539.35 percent in farm and non-farm enterprises followed by 223.83 percent from horticulture sector, 180.42 percent from livestock, 100.00 percent fisheries and only 38.22 percent increase from agriculture sector. All the above mentioned 5 sector contributed 197.98 percent increase in income of the farmers compared between 2016 and 2021. Saturday Organic Bazaar started by Krishi Vigyan Kendra, Davanagere where organically produced products are sold directly to the consumers, Increased in area of arecanut along with constant increased prices, frontline demonstrations on integrated crop management in horticulture crops and introduction of new varieties in onion, beans helped in increased income in horticulture sector, Introduction of fresh water fish breeds like *Amur Common Carp, Jayanti Rohu, GIFT Tilapia and pangasius* coupled with demonstration on good management practices in dairy practices are major interventions contributed for increased income to the farmers. Stagnant yield levels and marginal increase in prices of agricultural crops are the major reasons for only 38.22 percent increase in income of agriculture sector. This clearly indicates that technological interventions play major role in increasing income to the farmers.

PREVALENCE, ANTIOBIOTYPING AND MOLECULAR CHARACTERIZATION OF *ESCHERICHIA* SPP. ASSOCIATED WITH BOVINE DIARRHEA IN MEERUT, UTTAR PRADESH

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Abstract

Diarrhea in the production animals is a major threat to the industry because of the losses due to death of the animals, poor growth, low production and cost involved in treatment. *Escherichia* sp. is a gram-negative coliform bacterium that commonly lives in the intestines of humans and animals as commensal. *Escherichia* sp. is considered as opportunistic pathogen that potentially could cause diarrhea. Understanding distribution of bovine diarrhea causing pathogen *Escherichia* spp. can contribute to the treatment decision and the control. Fecal samples collected from 47 dairy cattle from Livestock Research Centre, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut and villages of Meerut and adjoining area, Uttar Pradesh were examined to study the frequency of *Escherichia* spp and to determine the associated risk factors, resistance of isolated strains to various antimicrobial agents. Approximately 68.09 % of the faecal samples were positive for *Escherichia* spp. Herd size and age group were found to be significantly associated ($p<0.05$) with the occurrence of these pathogens. A high level of resistance was observed against metronidazole followed by oxytetracycline. In contrast, enrofloxacin followed by ceftriaxone were effective against *Escherichia* spp. The high prevalence of AMR in India is a very important concern for strategy programs to control bovine diarrhea caused by *Escherichia* spp.

ANALYSIS ON IMPACT OF REGULAR PHYSICAL FITNESS AND YOGA CLASSES ON SELECTED PHYSICAL FITNESS AND PHYSIOLOGICAL PARAMETERS OF MALE COLLEGIATE STUDENTS OF UAS RAICHUR

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Abstract

The present study aims to find out the impact of regular physical fitness and yoga classes on selected physical fitness and physiological parameters of male collegiate students of University of Agricultural Sciences, Raichur campus. To achieve the purpose of the study pre-test data on selected physical fitness and physiological parameters of collegiate students were taken 3 months prior to the regular physical fitness and yoga classes and post-test data were taken in vice-versa. Total 84 participants completed testing at two (pre and post) stages, the results have shown significant changes between two stages of tests were found for abdominal strength, shoulder strength, explosive strength, flexibility and agility performances. Further, significance changes in the body mass index composition measures were observed.

SURGICAL MANAGEMENT OF NASAL SCHISTOSOMIASIS IN CROSS-BREED CATTLE

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Abstract

Nasal schistosomiasis is a snail-borne trematode infection of man, domestic animals, and wild animals in different parts of Asia and Africa. In India, nasal schistosomiasis is prevalent in cattle, buffalo, sheep, and goats. It is caused by blood fluke S. *nasale.* The freshwater snail Indoplanorbis *exustus* acts as an intermediate host. It is a chronic proliferative disease of the anterior nasal passage of cattle and causes granulomas and snoring disease. Affected cattle show rhinitis, profuse mucopurulent nasal discharge and or epistaxis, dyspnea, and snoring. A clinical case of chronic schistosomiasis in cattle reported to the Department of Veterinary Surgery and Radiology, Bihar Veterinary College Patna was unresponsive to treatment with anthiomaline. Surgical management was planned to save the life of the animal. The animal was sedated with inj. butorphanol @ dose rate of 0.1 mg/kg body weight and inj. midazolam @ 0.2 mg/ kg body weight. Local anesthesia was achieved by the local spray of the nasal cavity with 4% lignocaine and infraorbital nerve block with 2% lignocaine. With the electrocautery, granulomas in both nasal cavities were removed and bleeding was controlled with topical application of epinephrine. Postoperatively broad-spectrum antibiotic amoxicillin and cloxacillin at the dose rate of 10 mg/ kg body weight intramuscularly for 3 days and analgesic agent Inj. Meloxicam with paracetamol was given at the dose rate of 0.2 mg/ kg body weight intramuscularly for three days to prevent secondary infection and achieve analgesia**.** It can be concluded that surgical removal can be successfully performed in chronic nasal schistosomiasis granulomas which are unresponsive to the traditional treatment with anthiomaline.

EFFECT OF PHYSICAL FITNESS TRAINING PHASES ON SELECTED PHYSICAL AND PHYSIOLOGICAL PARAMETERS OF MALE COLLEGIATE ATHLETES

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Abstract

The present study investigated the effect of phases of physical fitness training on physical and physiological parameters in male inter-collegiate athletes. 26 participants completed testing at two time points: (i) preparatory phase (2 months prior to inter-collegiate athletic competition) and (ii) competition phase (1-2 weeks from an inter-collegiate athletic competition). No

significant changes between training phases were found for explosive strength, flexibility and vital capacity. There is a significance difference was found in the speed, agility and endurance test performances. Further, no changes for body mass index composition measures were observed. Despite modifications in the physical fitness training, it appears that explosive strength, flexibility, vital capacity measures and body composition status remain relatively stable between two training phases in male athletes.

POPULATION DYNAMICS OF MAJOR INSECT PESTS AND THEIR CORRELATION WITH ABIOTIC FACTORS IN PIGEONPEA [*CAJANUS CAJAN* (L.) MILLSP.]

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Abstract

The pigeonpea is a significant pulse-cum-grain legume crop among pulses, infested by about 200 species of insect pests from 61 families and 8 orders at different growth phases, beginning with the seedling stage and continuing through harvest and storage. Among which gram pod borer [*Helicoverpa armigera* (Hubner)], tur pod fly [*Melanagromyza obtusa* (Malloch)], tur pod bug [*Clavigralla gibbosa* (Spinola)] and plume moth [*Exelastis atomosa* (Walsingham)] are the most damaging pests, causing the plant's reproductive organs significant harm. The present investigations was carried out at Agriculture Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi during *Kharif* 2020–21. Pest activity began with the beginning of pod development and persisted, albeit at various intensities, throughout the crop's reproductive cycle. The first incidence of tur pod fly (*M. obtusa*) was observed in the 2nd standard week, whose maggot population highest in 11th standard week (8.07 maggots/plant). The presence of tur pod bug (*C. gibbosa*) was noticed for the first time in 2nd standard week, which reached its peak (6.13 bugs/plant) in 12th standard week. gram pod borer (*H. armigera)* initially appeared in the 3rd standard week, with the maximum population (4.40 larvae/plant) in the 12th standard week. The plume moth (*E. atomosa*) first appeared in the 4th standard week and the maximum larval population (2.20 larvae/plant) was found in the 12th standard week respectively. The correlation between weather factors and population of pod pest complex (*M. obtusa*, *C. gibbosa, H. armigera* and *E. atomosa*) in 2020-21, revealed a positive correlation with maximum temperature, minimum temperature, and sunshine hours, but a negative correlation with morning & evening relative humidity and rainfall. It may be presumed that incidence of these pests in pigeonpea increases with the progression of crop age and the real damage to the monetary produce takes place after the blooming of the crop.

BIO-EFFICACY OF BOTANICAL EXTRACTS OF *TERMINALIA CHEBULA AND TERMINALIA BELLERICA* AS DEFENSE INDUCERS OF BARLEY AGAINST SPOT BLOTCH

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Abstract

The present study was aimed to evaluate the antifungal potential of botanical extracts of *Terminalia chebula and Terminalia bellerica* against the spot blotch disease (*Bipolaris sorokiniana* (sacc.) shoemaker of barley. Aqueous and 50% ethanolic extracts of fruits, bark and leaves of both species were prepared and used as botanical sprays on the host to impart resistance against this devastating pathogen. In vitro tests showed that 50% concentration of fruit extracts in both solvents recorded more than 70% inhibition of fungal mycelium. Under in vivo conditions, the foliar spray of the promising doses of botanicals prior to inoculation induces resistance in barley by increasing secondary metabolite content and antioxidative enzyme activity throughout the period of study. The higher accumulation of phenols, flavonoids and total soluble proteins in the botanically treated plants contributes effectively to imparting resistance to infected plants in contrast to controlled treatments. The malondialdehyde content was significantly lower in plants treated with botanicals as compared to controls. The activity of enzymes i.e., superoxide dismutase, peroxidase and phenylalanine ammonia lyase was significantly higher in all plants sprayed with botanical extracts as compared to controlled treatments. The fruit treatments of both species have a significant accumulation of non-enzymatic metabolites as compared to other treatments. In addition, botanical

treatments dramatically reduce the per cent disease severity of barley plants as compared to the untreated control and thus elevate the per cent increase in yield. Considering the environmentally safe options, it is concluded that the fruit botanical extracts can be used as foliar spray treatments for eco-friendly management of spot blotch of barley in integrated disease management programmes.

IMPACT OF THERMAL PROCESSING ON BIOACTIVE COMPOUNDS AND MORPHOLOGICAL PROPERTIES OF SIX DIFFERENT INDIAN CULTIVARS OF WHEAT BRAN

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Abstract

In the current study, different thermally treated wheat bran cultivars, including HUW-234, PBW-373, WH-1105, PBW-502, and PBW-343, were examined for dietary fiber, bioactive compounds and X-RD diffraction peaks. The findings indicated that thermally treated wheat bran contains soluble dietary fiber, insoluble dietary fiber, and total dietary fiber in the ranges of 1.11–2.23%, 35.34–41.16%, and 37.35–43.39%, respectively. As comparison to the native wheat bran, thermal stabilization significantly ($p<0.05$) improved the content of gallic acid, *p*-hydroxybenzoic acid and ferulic acid. This study found that microwave treatment is thought to be the most effective way to increase dietary fiber content and bioactive compounds. Rising crystanillity in XRD diffraction was observed during microwave treatment. In future stabilized wheat bran may be used in the creation of functionally enhanced meals that help in prevention of numerous chronic diseases.

INCIDENCE OF UROLITHIASIS, AMONG PATIENTS VISITING UROLOGY DEPARTMENT AT GOVERNMENT HOSPITAL

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Abstract

Urolithiasis is the most common painful disorder of urinary tract. Hence the increased threat is attributable to genetic and environmental factors such as variations in geographical conditions in terms of regional stones belt, hot climate and sunlight exposure. Because of high temperature and excessive exposure to sunshine, the prevalence of urolithiasis was much higher in south asia and southeast asia, such as in India and Malaysia. Department of urology, Prince Bijoy Singh Memorial (PBM), associated group of Hospitals, S. P. Medical College Bikaner was visited by the investigator after obtaining a formal permission from the authorities of hospital administration. As per available hospital records, information was simultaneously assembled regarding overall number of patients visited department of urology and treated for various diseases of urinary system and year wise numbers of registered OPD and IPD patients of urinary stones profile were noted and incidence of urolithiasis was estimated from the period of 2010 to 2018. Every year out of all registered patients, 4,149 to 5,371 were treated for various diseases of urinary system. Incidence of urolithiasis ranged between 517 and 889 in number (12.46-19.96%) per year, indicating increment in prevalence for all IPD patients each with the succeeding year.

A COMPARATIVE STUDY OF BIOCHEMICAL PROPERTIES OF TAMARIND GERMPLASM COLLECTED FROM RANCHI, JHARKHAND

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Abstract

Tamarind (*Tamarindus indica* L.) is an economically important tree, grown across India. The fruit pulp is the richest source of tartaric acid and find application in various Indian cuisines as flavouring agent. The taste of ripen tamarind pulp is attributed to various components and combination thereof which further decide the quality of products made after processing tamarind

pulp. Considering this some of the important parameters responsible for unique flavour of tamarind viz. total soluble solid, titratable acidity, total sugar, and reducing sugar is determined for 28 accessions conserved in field genebank. The total soluble solids were determined by using portable hand refractometer and the reading recorded were expressed in Brix. Acidity of tamarind pulp was calculated by titrating the diluted pulp against the standard N/10 NaOH solution using phenolphthalein as an indicator. Total sugar and reducing sugar were determined as per "Lane and Eynon" titration method as described by Ranganna (2003). Where as pH was determined using pH meter. Significant difference for these traits were recorded for 28 accessions of tamarind. Titratable acidity ranged from 7.79% (IC-594345) to 21.16% (IC-594321) with an average value of 14.46 %. Reducing sugar ranged from 6.48 (IC-594323) -15.15% (IC-209883) with an average value of 10.81 and total sugar ranged from 13.89 (IC-594343) -40% (IC-209890) with an average value of 21.23. Whereas TSS ranged from 19.33 (IC-594336) to 29.37 (IC-594337) ?Brix. pH ranged from 2.5 (IC-285280, IC-312361)-2.9 (IC-594329) with an average value of 2.67. further, A comparative study for these parameters were also made with the Thailand sweet tamarind, a table purpose variety. Some of the accessions were at par with sweet type for TSS and TA however Thailand type showed substantially high value for total sugar and reducing sugar content which may be responsible for its excessive sweetness. Further germplasm augmentation and genetic improvement is needed to develop a sweet type tamarind variety.

A NEW SORGHUM VARIETY 'NJ 2667' FOR FEED AND FODDER SECURITY IN ANDHRA PRADESH

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Abstract

An improved dual purpose sorghum variety NJ 2667 was developed from cross (NTJ-3 X IVT814) followed by continuous evaluation and selection at Regional Agricultural Research Station (RARS), Nandyal, Acharya N.G. Agricultural University during year 2014-15 to 2021-22. After found promising in preliminary evaluation trial in rabi 2017-18 and advanced evaluation trial 2018-19, it was tested in multilocation trial from rabi 2019-20 to rabi 2021-22. It was found superior for grain yield with average increment of 23% over the years and locations against check NTJ 5. It was also found superior for dry fodder yield with average increment of 115% over the years at RARS, Nandyal against checks NTJ 5. Further this variety exhibited desirable characteristics like good height with long and broad leaves, long to medium peduncle with medium long semi compact panicle, short glume length with pearly white grains. Moderately resistance to disease and lower infestation of shoot fly and stem borer than checks. It exhibited more or less similarity in quality parameters as compared to check varieties. Therefore, it may be considered for recommendation as dual purpose sorghum for kharif and rabi season in Andhra Pradesh.

CHARACTERIZATION OF ENDOPHYTIC MICROORGANISMS OF RICE (*ORYZA SATIVA* L.) AS PLANT GROWTH PROMOTING AND BIOCONTROL AGENTS FOR BLAST DISEASE CONTROL

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Abstract

One hundred twenty-five endophytic microorganisms isolated from roots, stem and leaves of four major rice cultivars of paddy (C1039, SR3, SR4 and SR5) grown in temperate region were assessed both for plant growth promotion and managing rice blast disease. *Aspergillus flavus* and *Enterobacter cloacae* were found best for growth promotion triats viz., phosphorous solubilization, ammonia production, auxin and gibberellic acid production and nitrogen fixation. The dual culture tests revealed that five fungal (varying from 89-70%) and five bacterial (72-61%) endophytes showed the highest potential of antagonistic activity against blast pathogen and were selected for further studies. The selected isolates were studied for the effect of volatile compounds against blast pathogen. The highest inhibition was shown by *Aspergillus flavus* (78%), followed

by *Trichoderma afroharzianum* (68%) *Bacillus licheniformis* (66%) and *Stenotrophomonas rhizophila* (62%). The highest chitinase (13.76 µg/mL) and siderophore (56.64 %), production was observed by *Aspergillus flavus*, and highest HCN production was shown by *Stenotrophomonas maltophilia* (36.15µM mL^{-1}). All the ten isolates were characterized by cultural, morphological and molecular means and were identified as *Trichoderma afroharzianum* (f11 and f17), *Trichoderma harzianum* (f12), *Penicillium rubens* (f13), *Aspergillus flavus* (f18), *Stenotrophomonas rhizophila* (b7), Stenotrophomonas maltophilia (b9), Bacillus cereus (b17), Enterobacter cloacae (b55) and *Bacillus licheniformis* (b18). Under greenhouse conditions, highest disease control was shown by isolate *Bacillus licheniformis* and *Aspergillus flavus* with an inhibition of 79%, followed by *Stenotrophomonas rhizophila* (77%) and *Trichoderma afroharzianum* (73%). The overall results of this study showed that *Bacillus licheniformis* and *Stenotrophomonas rhizophila* along with other endophytes has a great potential to be commercialized as a biostimulant and biocontrol agent to manage rice blast disease effectively.

TRAIT-BASED ANALYSIS OF GENOTYPE PERFORMANCE IN HYBRID RICE TRIALS : IMPLICATIONS FOR YIELD IMPROVEMENT

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Abstract

The present investigation aims to the study of variability and associations among various traits in a hybrid rice trial. The study evaluated 14 genotypes for traits such as days to 50% flowering, plant height, panicle length, number of productive tillers per plant, test weight and grain yield. Correlation analysis and principal component analysis (PCA) were performed to assess the relationships between these traits and identify patterns of variability. The results showed significant variations in days to 50% flowering among the tested rice varieties and hybrids, indicating diverse maturity periods and adaptation to specific ecological conditions. Plant height and panicle length also exhibited considerable variability among the genotypes. Correlation analysis revealed positive associations between days to 50% flowering and plant height, as well as panicle length. However, a negative correlation was observed between days to 50% flowering and grain yield. PCA further elucidated the contributions of each trait to the overall variation. The biplot diagram provided a visual representation of the trait-genotype relationships, allowing the identification of superior performing genotypes for specific traits. Hybrids such as NDLRH 150, 27P63 and 23P31 showed desirable performances in terms of grain yield, panicle length and test weight, respectively. These findings contribute to the understanding of genetic variability in hybrid rice and offer insights for the selection of cultivars with desirable traits. The results highlight the importance of considering multiple traits in breeding programs to develop high-performing genotypes tailored to specific ecological conditions. The outcomes of this study can inform future breeding strategies aimed to develop rice hybrids.

MULTISTAGE SUGARCANE YIELD PREDICTION USING MACHINE LEARNING ALGORITHMS

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Abstract

Sugarcane is one of the leading commercial crops grown in India. The prevailing weather during the various crop-growth stages significantly impacts sugarcane productivity and the quality of its juice. Hence the objective of this study was to predict the yield of sugarcane during different growth periods using machine learning techniques *viz.,* random forest (RF), support vector machine (SVM), stepwise multiple linear regression (SMLR) and artificial neural network (ANN). The performance of different yield forecasting models was assessed based on the coefficient of determination (R^2), root mean square error (RMSE), normalized root mean square error (nRMSE), model efficiency (EF), and Pearson correlation coefficient (r) for calibration data with RMSE and nRMSE for validation data. Results showed that with lower nRMSE, MAPE and higher EF in calibrated data and lower nRMSE for validated data compared to other models, ANN predicted sugarcane yield more accurately. The performance of models across the forecasts was ranked based on the model efficiency as ANN > RF > SVM >

SMLR. This study demonstrated that the ANN model may be used to predict yields at different growing stages of sugarcane accurately.

EVALUATION OF SOME EXOTIC CULTIVARS OF APPLE UNDER HIGH DENSITY PLANTATION IN KASHMIR CONDITIONS

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Abstract

As the apple trees in J&K State are grown on seedling stocks, each of such trees requires for normal growth and development about 22.5 sq. m area. But by use of dwarfing root stock (M9) lesser space of 6 sq. m or 3 sq. m will be required per unit area. Our growers mostly have adopted one commercial variety i.e, Red Delicious, which will affect economic returns due to monoculture. By the introduction of some exotic varieties on M9 rootstock, namely Gala Must, Jonica, Red Chief, Red Fuji, Florina, Imperial Gala, Summered and Red Delicious we can increase the varietal base. In order to recommend to the grower's the best variety with different maturity periods, the present study was undertaken in the research farm of department of horticulture (Pattan) and results depicted that Summerred matures earlier on 29th July followed by Gala Must (18th August) as compared to Red Delicious which is late maturing (25th September). Maximum flower clusters per branch were recorded on lateral branches (15.0 in Imperial Gala) and minimum on apical branches (9.0 in Gala Must and Red Delicious). Fruit/leaf ratio varied significantly among varieties with maximum fruit/leaf ratio of 35.16 in Florina and lowest in Summerred (28.0). Maximum flower clusters per branch were recorded on lateral branches (15.0 in Imperial Gala) and minimum on apical branches (9.0 in Gala Must and Red Delicious). Highest yield efficiency was noted in Imperial Gala (1.98 Kg/cm^2) followed by Gala Must (1.39 Kg/cm^2).

EVALUATION OF SAFFRON (*CROCUS SATIVUS* L.) GERMPLASM AGAINST *FUSARIUM OXYSPORUM* CAUSING CORM ROT DISEASE UNDER TEMPERATE CONDITIONS OF KASHMIR"

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Abstract

Saffron (*Crocus sativus* L.) world's most expensive spice and also an important spice cash crop of Kashmir. There are more than 200000 people who are directly or indirectly involved with the saffron trade. The crop covers an area of 5000 acres (2023 ha) in Jammu and Kashmir. Saffron is especially grown in uplands and Karewa areas of Kashmir valley especially Pampore and adjoining areas. The other place where saffron is grown in district Budgam, Pulwama and Anantnag of Kashmir valley and Kishtwar district in Jammu Division. Saffron almost covers about 4% of total cultivated areas of Kashmir valley and provides about 6% of total agricultural income (Mir,1992).The yield of saffron dwindle year after year due to certain abiotic and biotic causes.. The average productivity in Jammu and Kashmir reached to 2.7 kilogram as against 3.29 kg/ha in 1997 (Zargar,2002). The decline in production continues though the newer areas are being are brought under its cultivation. The intensive cultivation and mono-culturing in saffron growing belts of valley together with the continual use of diseased corms resulted in frequent occurrence of saffron corm rot diseases incited by pathogen like *Fusarium oxysporum* & *Fusarium solani* and takes considerable proportion of the produce every year. In 1992, Dhar reported that corm rot disease incidence of 6.7 - 15.2 per cent and concluded that none of the saffron growing areas in Kashmir was free from corm rot disease. Keeping in the

view, an attempt was made to identify sources of resistance to the disease in available germplasm under temperate climatic conditions of Kashmir valley. Fifty-five genotypes/ lines of saffron were screened for resistance to *Fusarium oxysporum* during two consecutive years. The data s indicated that disease incidence and disease intensity ranged from 2.50 to 81.50 per cent and 0.25 to 72.25 %, respectively. The highest mean disease incidence(81.50%) was recorded in genotype SDM-102 and while lowest mean disease incidence (2.5%) was recorded in 0.75Kr genotype. Among the screened germplasms, 'Highly Resistant' genotypes are 0.5Kr, 0.75Kr, SMD-1, SMD-3 SMD-27, SMD-146, SD-147, SD-224 SD-45, SD-52, SD-68,While 'Highly Susceptible' genotypes were SMD-102 and SMD-103.

MANAGEMENT PRACTICES FOR IMPROVING SOIL FERTILITY

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Abstract

During 1950-60s farming was used to be done by using organic manures and inputs only. Later on due to increased population and huge demand for food, India started importing food from other countries which became burden to the country economically. In order to overcome this problem, Green revolution was started in the country in which High Yielding Varieties were used. These varieties should be provided with chemical fertilizers to give their potential yields. So farmers started using chemical fertilizers for crops which now increased rapidly to an extent that started deteriorating soil health. If the same trend continues soil fertility and productivity will lost completely and it becomes very difficult to grow crops anymore. So there is need to improve soil fertility by doing certain management practices. Summer ploughing across the slope not only improves aeration, reduces erosion and increase infiltration but also destroys eggs, larvae and pupae of pests and fungus in the field. Soil testing helps to know the nutrient status of soil. Usage of organic fertilizers and pesticides by replacing inorganic fertilizers and pesticides can avoid negative impacts of artificial fertilizers and pesticides that are contaminating the soil and deteriorating the soil health. Growing cover crops acts as a shield to the field and prevents soil erosion, pests, weeds and too much exposure of sun to soil by covering the entire field. By growing cover crops soil quality, water and fertility will also be improved. Growing same crop every season/ year will take the nutrients and other resourced from the same zone which causes nutrient depletion in the zone. It not only depletes nutrients but also increase pests and diseases and they find the host continuously and also develop resistant weeds. Crop rotation should be done with shallow rooted crop followed by deep rooted crop; cereal followed by pulse etc., Intercropping is another management practice to improve soil fertility. Intercropping pulse with cereal/millet is beneficial as pulses requires less nutrients whereas, the later require more. So intercrops should be chosen in a way that they should complement each other. Proper tillage practices reduce erosion, reduce pests and diseases and improves water holding capacity of soil.

MAJOR FRUIT TREE BASED AGRIHORTI SYSTEMS OF COASTAL ECOSYSTEM

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Abstract

Performance of four short duration legume inter crops (Arhar, Groundnut, Blackgram and Cowpea) was studied in agrihorticultural system involving three major fruit tree species (Mango, Jackfruit and Cashew).The crops were grown in the alleies of tree row in the first fortnight of July. The experiment was conducted from June 2019 to September 2022. The experiment was laid out in Factorial randomized block design (FRBD) including 12 numbers of treatment. The Jackfruit recorded the highest plant height (7.85 m) followed by Cashew (5.68 m) and Mango (4.41 m) in general and all the fruit trees recorded highest tree height with Cowpea followed by Black gram as an intercrops at 66 months after planting. Among the intercrops Arhar produced the highest net return of Rs 53,380 Rs 43,660 and Rs 32,720 /ha/yr with Benefit Cost Ratio 3.13 2.75 and 2.31 with three fruit trees i.e. Mango, Jackfruit and Cashew respectively. Partial shade had absolutely no effect on the growth and economic yield of these intercrops as the tree canopy during the period was very less. Analysis of soil after one

month after harvest of inter crops *viz*. Arhar, Clusterbean, Blackgram and Cowpea grown with the fruit tree species in agrihorti system indicated highest values of available N (266.8 kg ha^{-1}) and K2O (158.7 kg ha^{-1}) with cowpea and higher values of available P2O5 (36.5 kg ha^{-1}) with Arhar irrespective of fruit trees. Organic carbon percentage in this system varied from 0.61 in Mango & Jackfruit with Cowpea intercrop to 0.51 in Mango & Cashew with Cluster bean. The maximum carbon sequestration (6,218 kg ha^{-1}) was observed in Jackfruit with Cowpea followed by Cashew + Cowpea (4958 kg ha^{-1}).

VARIABILITY OF ACTUAL EVAPOTRANSPIRATION UNDER NORTHEASTERN AGROCLIMATIC CONDITIONS OF KARNATAKA

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Abstract

The North Eastern agro-climatic Dry Zone of Karnataka has been prevailed with Semi-arid agro-climatic conditions and larger tracts of moderate (50-100cm) to deep clay soils (100 to > 150 cm) on flatter slopes and are capable of supporting long duration pigeon pea and Cotton crops (160-180 days) amidst recurring vagaries of monsoon. The evapotranspiration rate, an elusive water balancing component poses challenges in its quantification due to the complex process that influenced by environmental heat cycle, aerodynamic and antecedent soil moisture status of soil-atmosphere interface. The investigation on hydrological balance of representative micro-watersheds (4D2D8D2a. & 4D2D8D2b) was undertaken to evaluate daily actual evapotranspiration (AET) from continuous surface and profile soil moisture during period 2017-2019 and compared with the corresponding Potential evapotranspiration (PET) that estimated using FAO-modified Penman Monteith model incorporated with measured daily net radiation (Rn). Under the prevailing erratic monsoonal rainfall pattern (593.00 mm average and 30-54 rainy days), the estimated average annual AET (367-451 mm) during the study period (2017-2019) would be far below the average annual PET (1848-2130 mm) due to limitation on availability of water receivable through rainfall (272 -956 mm). Attempt has been made to estimate the AET (Kristensen and Jensen, 1975) using parameters surface and profile soil moisture constants, crop growth indicator (LAI) and rainfall. The application of results of daily pair of measured and estimated AET values are significantly encouraging (R^2 =0.75 to 0.85) for its application at cadastral scale.

AN INNOVATIVE FARMERS-FRIENDLY AND LOW-WATER BUDGET DEVICE FOR INCUBATION OF FISH EGGS AND REARING OF LARVAE

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Abstract

One of the major problem faced during coldwater fish hatcheries management is continous supply of clean oxygenated water in adequate quantity. Moreover, extended spells of low water temperature causes prolonged incubation and fry rearing period resulting high operational cost.To overcome these problems, a simple re-circulatory closed incubation cum rearing unit has been designed at ICAR-Directorate of Coldwater Fisheries Research, Bhimtal, which is farmers friendly, indigenously made and can be assemled any where with locally available materials at a very low cost. In this device, nigligible water quantity is required in comprasion to incubation and rearing systems used in flow through hatcheries. This closed re-circulatory device is very simple in design and make, consisting of a glass tank or FRP tank of desirable water holding capacity. This is equipped with under-gravel filter made of PVC pipe, operated by a power head water pump having pumping capacity of 1500 L/hr. About 8-10 cm thick layer of coarse gravel having 4-6 mm size were spread over the pipe filter. This acted as a biological as well as mechanical filter to eliminate toxic ammonia and nitrite from the system continuously. A 300 watt immersion glass heater with thermostat was installed to maintain desired ambient and uniform water temperature during hatching and rearing period resulting reduced incubation period and accelerated growth of fry. Water quality parameters were analyzed and found optimum. It was also found that fungal attack on developing embryos and fry were minimum and a uniform hatching rate and healthy fry were obtained in this device. During an experiment on incubating and rearing of *Labio dyocheilus* eggs and fry, it was estimated that hatching and rearing of 100000 spawn only required 1000 L of water in comparison to the requirement of

300000 L in a circular hatchery. This device has been successfully tested for egg incubation and fry rearing of the fish species like Chocolate Mahseer (*Neolissochilus hexagonolepis*), Hill-trout (*Barilius bendelisis*) and Dark Mahseer *(Naziritor chelynoides).* This closed-water circulation system has demonstrated promising results under laboratory conditions.

EVALUATION OF MAIZE (*ZEA MAYS* L.) COMPOSITES FOR GRAIN YIELD UNDER TEMPERATE CONDITIONS

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Abstract

Maize (*Zea mays* L.) is the third most important cereal crop after wheat and rice. Improving maize production is considered to be one of the most important strategies for food security in the developing countries. The farmers in Kandi areas usually grow their own saved seed which comprises of composites and landraces due to which maize production in the area suffers due to low productivity. Considering this scenario, a number of hybrids were developed in order to improve yield and productivity in order to enhance their income. Hence, evaluating the performance of composites maize genotypes in terms of yield in specific agro ecology is very crucial for horizontal expansion. The study was aimed to conduct the evaluation of 12 maize composites to determine their grain yields. The composites were ranked according to their superiority in yield over check.

EDIBLE COATING FOR SHELF LIFE EXTENSION OF FIG FRUITS USING BANANA LEAF POWDER

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Abstract

The present investigation was undertaken to evaluate the effect of banana leaf powder on the post-harvest quality characteristics of fig fruits. Banana leaf produces important secondary metabolites like terpenoids, flavonoids, polyphenols, chlorophylls, betalains etc. Polyphenols which is present in banana leaf powder especially polyphenol oxidase, which is used for the treatment of Parkinson's disorder, weight loss supplement, it also maintains the blood sugar levels and controls blood pressure. Coating is a method of increasing the storage life in fig fruit. The effects of dried banana leaf powder (0, 0.3, 0.6, 0.9, 1.2 and 1.5% concentrations) on shelf life of fig fruit was carried out. The effect of coating of banana leaf powder on the fig fruit with respect to moisture, ash, carbohydrates, crude fibre, TSS, pH, weight loss, TPC, colour (L^*, a^*,b^*) and firmness were studied. The results showed that coating of banana leaf powder on fig fruit with 1.2 concentration showed the best results with reduced total plate count, increase in TSS, and increase in pH, decrease in crude fibre, and decrease in weight loss with the increase in storage period compared with the control which was on par with the 1.5% concentration.

FIRST REPORT OF THREE NEW GENETIC GROUPS OF *BEMISIA TABACI* IN INDIA

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Abstract

Whitefly, *Bemisia tabaci* is one of the polyphagous pests transmitting >100 plant viruses belonging to begomivruses whose transmission efficiencies have been reported to be varying. Therefore, it is essential to determine the distribution of various genetic groups of *B. tabaci* and their transmission efficiencies with respect to begomoviruses. A series of extensive surveys during 2019-21 were conducted to monitor and collect *B. tabaci* populations across the country. A total 1225 whitefly samples were collected manually into cryvials containing alcohol from 20 different states of the country using standard protocol

covering fourteen different host plants. Total genomic DNA was isolated from individual specimens using Qiagen's DNEasy blood and tissue kit. Further, PCR amplification, purification, cycle sequencing and partial CO-I gene sequencing has been done to understand population genetic structure and the distribution of genetic groups *B. tabaci* in India. A total of >321 mt COI gene sequences were generated, edited and analysed using standard analytic latest version of MEGA software and compared with references sequences to identify genetic groups. Genetic group names were assigned based on the similarity with the reference sequences reported across world. A total of 11 distinct genetic groups, Asia 1, Asia I India, Asia II-1, Asia II-3, Asia II-5, Asia II-6, Asia II-7, Asia II-8, Asia II-11, Asia III, MEAM-1 of which Asia II-3, Asia II-6 & Asia III were new to India reported for the first time. We report three new genetic groups, Asia II-3, Asia II-6 and Asia III for the first time in India. Asia I mostly recorded in central and northern states while Asia III was recorded exclusively in Chhattisgarh and Andhra Pradesh. Asia II-7 is widely distributed in South and Central India. These studies will help farmers and other stakeholders to effectively manage whitefly and whitefly borne begomoviruses for increased crop production.

PINK STEM BORER *SESAMIA INFERENS* (NOCUTIDAE: LEPIDOPTERA) AN EMERGING PEST OF RICE IN CAUVERY DELTA

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Abstract

Rice (*Oryza sativa* L.) is one of the three major staple food crops in the world forming the staple diet for nearly half the world's population. India has a long history for cultivation of rice. In India, Tamil Nadu is one of the leading rice producing state cultivating rice from ancient period as the state is endowed with all the favourable climatic conditions. Insects have larger population size and shorter generation cycles, fecundity, adaptation to the environment, selection behaviour and habitat readily reacts to the changing climate. These environmental changes alter the life stages of insects which in turn cause quick changes in their richness, abundance and distribution. This turns out to be the important reason for the sudden emergence of insect pests influenced by temperature fluctuations. In India, stem borer incidence was recorded in 21 states and from the status of incidence, even though YSB is the dominant species recorded, recently Pink Stem borer is emerging as a major pest in northern India and also in southern parts of India. Since PSB is polyphagous in nature, the alternate hosts encourage the pest to develop, multiply and survive during dry season. In India, it is reported in Andhra Pradesh, Karnataka, Tamil Nadu, Madhya Pradesh, Maharashtra, Orissa, West Bengal, Bihar, Assam, Uttar Pradesh, Delhi and Punjab as a serious pest of cereal crops. The incidence of PSB in rice during *Rabi*, 2021 in Tiruchirappalli was studied. The distribution pattern of pink stem borer larvae and pupae showed that during the vegetative stage, the preference of larvae feeding was on tillers (40.00%) whereas during reproductive stage of the crop, the larval preference 70.0 per cent and 40.0 per cent in both culms and chaffy panicle respectively. The distribution of PSB larvae with other stem borer species larvae during the reproductive phase was dominant (3 nos./tiller). The occurrence of PSB larvae alone was found to be 84.35 per cent the most common phenomenon at fields nearing harvest. The larvae is able to feed even under dry and less water containing culms while the species complex of PSB+YSB was maximum (45.76%) during the cropping period. Coexistence of PSB with other species was more in the kharif season.

RESPONSE OF SOYBEAN TO VARIED LEVELS AND METHODS OF MOLYBDENUM APPLICATION ON GROWTH AND YIELD

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Abstract

World agriculture research is revolving around sustainable food production with environmental stability. Indian agriculture is facing challenges from multiple fronts *viz.,* climate change, multi-nutrient deficiency and lower factor productivity *etc*. Although, India is leader in food grains production, imports the highest edible oil in the world (14.01 MT). Soybean is a duel crop grown for oil and protein, thus a potential crop for food and nutritional security also improves soil fertility by fixing

atmospheric nitrogen (50-300 kg ha^{-1}). The major constraint for lower productivity of soybean is unbalanced nutrition and is cultivated on less fertile soils with minimal resources. Response of soybean in India is significant when supplied required nutrients exhibiting higher yields. Molybdenum (Mo) is an essential ultra-micro plant-nutrient required for growth and development and increasing yield. The quality of soybean is known to improve with Mo application through enzyme-mediated oxidation-reduction reactions, especially in the reduction of nitrates to ammonia before amino acids and protein synthesis and nodule formation. Thus, a field experiment was conducted at AHRS, Bavikere, Shivamogga, Karnataka, during *Kharif* seasons of 2021 and 2022 to assess the effect of Mo on Soybean. The ten treatments comprised seed treatment with Mo @ 2, 4 and 6 g kg^{-1} of seeds, foliar application of Mo at 0.025, 0.05, 0.1%, and soil application of Mo @ 500, 1000 and 1500 g ha^{-1}, and control (Zero Mo). The results revealed, significantly higher dry-matter (27.5 g/plant) and higher number of root nodules (63.6). Yield traits (pods (61.5) and seeds per-pod (3.45)) and significantly higher seed (1766.4 kg/ha) and haulm yield (2818.0 kg/ha) was also noted in seed treatment of Mo @ 6g kg^{-1} (T_3). It also resulted in higher oil (20.6) and protein content (41.1). The same treatment has given higher net returns (44,922.4 Rs. /ha)) and BC ratio (2.4).

EXPLORING PERCEPTION OF RURAL FARMERS TOWARDS DEVELOPMENT OF AGRI-TOURISM IN SOUTH GUJARAT

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Abstract

The purpose of this paper is to explore perception of rural farmers towards development of agri-tourism in South Gujarat. Agri-Tourism is the latest concept in the Indian Tourism industry which could provide additional income generating activities to existing agriculture sector and could help the farmers to fetch better remuneration and improve their standard of living. Gujarat is leading state in tourism with ample opportunity for future growth. The main objectives of the study were to assess the awareness and perception level of rural farmers and their constraints related to agri tourism. 100 farmers from two districts of South Gujarat were selected purposively. Data were collected with structured questionnaire and analysed using descriptive analysis. Results showed that the majority of farmers were aware of the concept of agri-tourism and they got awareness through sources like newspapers, television, radio, fellow farmers, agri department officials. The respondents generally agreed that the existence of agri tourism in their area brings in many benefits to locals as a whole. However, farmers in the rural areas considered that only the experienced indirect benefits. The farmers in the study area considered having enough capital for infrastructure, operation and marketing, obtaining finance, meeting state and municipal regulations, obtaining required permits or licenses, liability issues etc. as the major constraints related to agri-tourism business in the study area. In this regard, the support of the local government and entrepreneurs are required for the development of agri-tourism business in the study area because the small communities need assistance in knowledge and expertise regarding aspects like financing, planning and management, marketing etc. to prosper in this business.

UNVEILING THE ANTIOXIDANT POTENTIAL OF KENDU (*DIOSPYROS MELANOXYLON* ROXB.) INFUSED PROBIOTIC FUNCTIONAL KULFI

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Abstract

Kendu (*Diospyros melanoxylon* Roxb.) fruit, a member of the Ebenaceae family and Diospyros species, has remained largely untapped in terms of its potential. This fruit is indigenous to India and Sri Lanka and can also be found in the Philippines, Japan, China, Thailand, and other Asian countries. Probiotics, which are beneficial bacteria supplemented through food, have a positive impact on the host by improving intestinal balance. Kulfi, an indigenous frozen dessert resembling ice cream or milk ice, is traditionally prepared by freezing sweetened milk, usually with 20-25% additional sugar, and reducing it to about half of its original volume. It is then infused with malai (cream) and crushed nuts. This research aimed to develop a

probiotic-functional kulfi using *Diospyros melanoxylon* (Kendu). The control kulfi, labeled as K0, do not contain any probiotic culture or kendu powder. The experimental treatments involved varying proportions of kendu powder (5%, 10% and 15%), and probiotic culture (1% *Lactobacillus acidophilus*) with sugar (15%), Through sensory evaluation, it was determined that the treatment labeled as T3 received higher scores and was considered the optimized product. In terms of overall acceptability, treatment T3 scored 8.50 compared to the control T0 with a score of 7.05. Physicochemical analysis revealed that the probiotic-functional kulfi samples contained carbohydrate, protein, and fat within the ranges of 23.02% to 28.78%, 3.84% to 4.95%, and 11.01% to 12.44%, respectively. Among all the samples, the one with 18% sugar, 4% kendu powder, and 1% Lactobacillus acidophilus culture was considered the best, exhibiting higher protein content and lower fat content compared to the control kulfi sample. Inoculating probiotic culture and use of kendu powder in kulfi had a significant effect on DPPH (%) and TPC (%) content.

INFLUENCE OF ETHREL ON RIPENING AND LYCOPENE CONTENT IN TOMATO (*SOLANUM LYCOPERSICUM* CV. ARKA ABHED)

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Abstract

Tomato is an important crop from the health point of view. Ethrel has been used to advance maturity leading to early ripening. The quality of tomato yields or products can be well characterised by their lycopene content. Colour is a most important quality factor in consumer perception of food products. The aim of the present study is 1. to evaluate the effect of two different Ethrel concentration on ripening rate. 2. to estimate lycopene content at different maturity stages. Ethrel was applied at two concentrations viz; 1500 & 3000 ppm. The experimental result indicates that, Ethrel enhances the maturity in tomato leading to early ripening by 3 days. But the lycopene content remained same in spite of the different Ethrel treatments. The range in the average lycopene content fall between 2.12 to 10.89 mg $100g^{-1}$ fresh weight.

STUDIES ON PLANTING SYSTEMS AND NUTRITION ON GROWTH, YIELD AND QUALITY OF TISSUE CULTURE BANANA (*MUSA PARADISIACA* L.) CV. GRAND NINE UNDER TRANSITIONAL ZONE OF KARNATAKA

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Abstract

The field experiment was carried out to study the effect of planting systems and nutrition on growth yield and quality of tissue culture banana(*Musa paradisiaca L*) cv. Grand Naine under transitional zone of Karnataka in the experimental plot of College of Agriculture, Shivamogga, keladi Shivappa Nayaka University of Agricultural and Horticultural Science, Shivamogga, Karnataka, during the year 220-21. The different doses of nutrients along with different planting systems were tried during this study. The results revealed that the plants provide with 75% recommended dose of nutrients along with two suckers per hill (T_5) recorded the maximum plant height (178.88 cm), pseudostem girth (64.75 cm) at the time of shooting, whereas, plants provided with 100% recommended dose of nutrients along with single sucker per hill (T_{10}) recorded the maximum leaf area (8.74 m) and number of functional leaves (13.96) and minimum light interception (68.74%) at the time of shooting. The early shooting (227.75 days) and early maturation of bunches (103.22 days) was observed in the plants supplied with 100% recommended dose of nutrients with single sucker per hill (T_{10}). The percent light interception was found to be higher (86.68%) in high density planting systems in comparison with conventional planting system (68.74%) at all stage of crop growth. The maximum banana yield of 152.94 t/ha and benefit cost ratio of 1:3.01 was obtained in plants of double suckers per hill along with 75% recommended dose of nutrients (T_5). Among the different treatments, application of 75% recommended dose of nutrients along with double suckers per hill (T_5) was found to be profitable under transitional zone of Karnataka.

ELECTROSTATIC FIELD : A NOVEL SEED QUALITY ENHANCEMENT TECHNIQUE TO AUGMENT SEED QUALITY OF LOW VIGOUR ONION SEEDS.

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Abstract

Onion (*Allium cepa* L.) is an important vegetable rich in medicinal properties. Quick seed quality loss is usually observed due to its peculiar seed structure and harsh post-harvest handling and storage. Of the many seed quality enhancement techniques, physical seed treatment especially electrostatic field occupies top rank due to its simplicity, cost effectiveness and echo friendliness. Present laboratory experiment was carried out at department of Dept. of Seed Science & Technology, College of Agriculture, UAS, Dharwad, during 2022. The low vigour onion seeds (cv. *Arka Kalyan*) were subjected to an electrostatic field equipment for three power capacity at three different exposer periods along with untreated control. The results were analysed in factorial CRD. The observations on seed quality attributes like seed germination (%), root-shoot length, seedling vigour index, seedling dry weight and electrical conductivity of seed leachate were recorded along with estimation of á amylase and superoxide dismutase enzymes. The experimental results revealed that seed germination was improved from 70.5% to 79.7% at lower power of 3KV and decreased as power of exposure enhanced to 5 KV (70.25%). Further seed germination was highest at 90 seconds exposure but it was on par with 60 seconds. Seedling vigour index was also maximum at 3KV power (1418) along with 60 second exposure. Seedling dry weight also followed the same trend but EC was lowest 3KV and 4KV at 60 and 90 seconds exposure respectively. The enzyme activity was also enhanced due to seed treatment recording highest at 3KV and 60 seconds exposure. Ultimately it is concluded that lower power 3KV along with lesser period of 30 or 60 seconds was found to be best to improve at least 9% of seed germination of low-quality onion seeds. The enzymatic activities influenced by electrostatic field followed the similar trend as observed in seed quality traits showing increase with lower intensity and period. Hence this novel technique being the most effective method requires very less time and can be used as a part of seed processing due to its cost effectivity.

EFFECT OF RHIZOME SIZE AND NURSERY ON GROWTH AND YIELD IN TURMERIC UNDER EASTERN GHAT REGION OF ANDHRA PRADESH

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Abstract

Turmeric (*Curcuma longa* L.) is one of the important spice and also condiment crops grown in India since times immemorial. Turmeric is vegetatively propagated through rhizomes and requires 2000-2500 kg of rhizomes to plant in a hectare. As seed material cost is very high, there is a need to reduce the cost of seed material by adopting alternative planting material and selecting optimum size rhizome or rhizome cuttings. As rhizome is cut and used for the preparation of planting material, the diseased rhizome can be eliminated. So, it helps to produce uniform stand, quality and disease free turmeric seedlings. The results of the present study revealed significant variation for all the characters studied. Differential response was noticed with respect to plant height among the treatments. The maximum plant height were recorded in mother rhizomes (75-90 g) directly planting in the field (T9) (136.84 cm) followed by T7 (131.29 cm) and these two were on par with one another, whereas the shortest plant height was recorded in single node cutting (5 - 6 g) directly planting in field (86.13 cm) followed by mother rhizome pieces (10-12 g) directly planting in the field Mother rhizome pieces (10-12 g) (96.29 cm). Experimental data revealed that the maximum fresh rhizome yield per hectare was recorded in mother rhizomes (75-90 g) directly planting in the field (29.64 t/ha) followed by primary full length rhizome (20-25 g) planted directly in the field (25.54 t/ha) and these two were on par with one another. Among the transplanted seedlings, one month old seedling raised by using two node cutting (8 - 9 g) had shown the maximum yield (23.68 t/ha) and on par with Primary full length rhizome (20-25 g) planting directly in the field. Based on these experimental results it is concluded that farmers can cultivate the turmeric with two node raised seedlings with 350 kg of turmeric seed per acre instead of 1000 kg per acre in traditional practice.

PROCESSING OF CASSAVA TUBER STARCH IN APPLICATION OF LAUNDRY

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Abstract

Tuber crops attain third most important food crops after cereals and legumes**.** In recent days, the tuber starch is used as raw material for several industrial bases, which become more important due to their versatility. In this study mainly three tubers were selected such as cassava, sweet potato and colocasia and based on physico-functional properties water absorption capacity was significantly higher in cassava starch (0.83g/g) followed by sweet potato (0.68 g/g) and colocasia starch having lower water absorption capacity *i.e.,* 0.61 g/g. Granule size was significantly higher in sweet potato starch with a mean score 21.37ìm followed by colocasia starch (16.81ìm) and cassava starch was lower with a mean score 13.50 ìm. Among the selected tubers, cassava starch being having lesser granule size, it increases compact ability and flowability of starch on surface and it helps for smooth application on surface, the cassava starch is used for stiffening the cloth and to enhance the appearance and shining of the fabric therefore the cassava tuber starch was used for the laundry application. High viscous starch solution provides smooth finishing to the fabric. The present study indicates that significantly high viscosity was observed with boiling temperature at 100^0C in both 4 and 5^{th} spindle ranging from 113.03-83.06 cP was used for application to the fabric. The treated fabric attained much varied values in all mechanical properties than the control fabric samples. Among control and treated fabrics, treated with starch fabric recorded maximum tearing strength for both warp and weft *i.e.,* 1610 kg and 1600 kg respectively. For consumer acceptability of the cassava starch cost, quality, appearance and easy to use and overall acceptability parameters were selected. In all the parameters consumer accepted cassava starch as a good for laundry application.

INFLUENCE OF ORGANICS ON QUALITY ATTRIBUTES OF SAFFLOWER (*CARTHAMUS TINCTORIUS* L.) SEEDS

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Abstract

Safflower (*Carthamus tinctorius* L.) is one of the oldest oilseed crops commercially grown for edible oil extracted from seeds. Seed priming is one of the useful approach for improving seed germination and seedling growth in crop plants. The objective of this study was to evaluate the effect of different organics through seed priming on seed germination and quality of safflower. The experiment was laid out in Completely Randomized Design with sixteen organic treatments. The results revealed that, the seed priming with Beejamrutha (100 %) for 12 h (T_6) recorded significantly highest seed quality parameters *viz*., seed germination per cent (96.97), shoot length (11.49 cm), root length (13.36 cm), seedling length (24.85 cm), seedling dry weight (230.30 mg), seedling vigour index I and II (24010 and 22334) compared to control (83.44 %, 8.64 cm, 8.86 cm, 17.50 cm, 109.97 mg, 1462 and 9184, respectively).

BIOFORTIFICATION : A TOOL TO OVERCOME HUNGER AND MALNUTRITION

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Abstract

Micronutrient deficiencies have long-lasting effects on growth, immune function, and cognitive development. As a result, this "hidden hunger" has an adverse effect on economic development, human health, and efforts to reduce poverty. The United

Nations 2nd Sustainable Development Goal (UN-SDG2) was set to eradicate extreme hunger and malnutrition whilst promoting food security. More than 2 billion people in the world are affected by the deficiency of key micronutrients such as Fe and Zn. These micronutrients play a vital role in the functions of the human body; thus, insufficient intake has prominently negative biological effects on human health. The term nutritional security refers to the intake of food enriched with essential nutrients in an adequate amount. In developing countries, the largest proportion of the daily diet comprises mainly of staple crops. This introduced the need for growing ultra-nourishing food to achieve nutritional security. Various ways such as medical supplementation, dietary diversification, and food fortification are available. It has been demonstrated that Biofortification is an effective, affordable and scalable strategy to alleviate malnutrition. The term Biofortification coined by Steve Babe in 2001.Micronutrient deficiencies affect approximately 3 billion people worldwide. Malnutrition hinders the development of human potential and social and economic development in developing countries. WHO emphasizes nutrient supplementation and food fortification to address the malnutrition. CGIAR has placed a greater emphasis on Biofortification through the Harvest Plus challenge programme, and improved micronutrient content of the staple crops (rice, wheat, maize, beans, cassava, pearl millet, and sweet potato) through breeding and biotechnological approaches.

BIOSYNTHESIS OF NICKEL NANO PARTICLES AND THEIR IMPACT ON BIOMETHANATION OF CATTLE DUNG IN PROTOTYPE DIGESTERS

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Abstract

Nanotechnology has been evolved to be an attractive option in engineering andenvironmental science. Nanosize additives give biostimulating effect on the activity ofmethanogens at the time of beginning of the anaerobic digestion as well as during thehydraulic retention time (HRT)throughout the performance and reduce the lag phase. Nickel nanoparticles were synthesized using tulsi leaves and characterized and their effect with different concentrations on biomethanation of cattle dung at different total soild contents in prototype batch type digesters of 10 litres capacity was investigated. The sizes of nanoparticles were determined by using zetasizer which was found to be 23.50nm. UV-Visible spectra of nickel nanoparticles showed well defined surface plasmo resonance band centered at wavelengths of 324 nm and absorbance of 0.437. The XRD study confirmed that, the biosynthesized nickel nanoparticles were face centered cubic in nature with crystalline structure. The volatile content of cattle dung added with nanoparticles at different concentrations ranged from 40 to 76.30%. The C:N ratio of the cattle dung along with nanoparticles at different concentrations ranged from 22.1:1 to 42.8:1. The daily biogas production varied between 2600 to 3350 mL day^{-1} and for control it was found to be 2010 mL. The cumulative biogas production for all twenty treatments ranged from 45259.9 mL (45.26 L) to 55200 mL (55.20 L) and for control treatment it was found to be 38360 mL (38.36L). The cumulative methane production for all twenty treatments ranged from 26315 mL (26.32 L) to 32476 mL (32.48 L) and for control treatment it was found to be 18163.25 mL (18.16L). The digestion period was found in the range of 38 to 47 days and for control treatment, the period of digestion ended on 44th day. The optimized operational parameters for experimental study were H/D ratio of 1:1.25 with a nanoparticles concentration of 2.5 mg $L^{-1}$and total solid content of 11% at which the biogas production was 38% higher with 71% increase in methane production was recroded as compared to control treatment of cattle dung alone without addition of nanoparticles.

EFFICACY OF PLANT GROWTH REGULATORS ON FORAGE YIELD AND QUALITY OF MAIZE-OAT CROPPING SYSTEM

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Abstract

A field experiment was initiated at Dry land Agricultural Research Station, Rangreth, SKUAST-K during *kharif* 2021 to find out the efficacy of plant growth regulators on forage yield and quality of maize-oat system and also to work out the economic

feasibility of plant growth regulators. The experiment consisted of eleven treatments viz; T1; Triacontanol @ 10ppm, T2; Triacontanol @ 20 ppm, T3: Mepiquat @ 200 ppm, T4; Mepiquat @ 300 ppm, T5; Salicylic acid @ 100 ppm, T6 ; Salicylic acid @ 200 ppm, T7;NAA @20 ppm, T8; fenoxyprop @4 g a.i /ha, T9; GA_3 @ 200 ppm, T10; GA_3 @400 ppm, T11; Water spray and was laid down in complete randomized block design with three replications. Data on forage maize indicated the application of Triacontanol @ 20 ppm produced the highest yield (466.1 q/ha) which was at par with triacontanol @ 10 ppm and was followed by Mepiquat chloride at 300 ppm but the crude protein yield was found highest (7.6) with the application of salicylic acid @ 100 ppm. Economic analysis indicated that the maximum benefit:cost ratio (3.25) was recorded with NAA @ 20 ppm. In case of oat, the maximum green fodder yield (487.8 q/ha) and dry fodder yield (82.4 q/ha)was observed where triacontanol was sprayed @ 20 ppm whereas crude protein yield was found highest with triacontanol @ 10 ppm. Economic analysis showed the maximum returns (2.5) where NAA was sprayed at 20 ppm.

TO STUDY ABOUT PROMOTING GENDER EQUITY FOR WOMEN AND GIRLS IN RURAL AREAS IN MADHYA PRADESH

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Abstract

Empowering and investing in women and girls is good for women and good for the earth. It significantly increases productivity and a more rapid COVID-19 recovery. It reduces hunger and malnutrition and improves rural livelihoods, for everyone not just for women. Gender equity is associated with higher income per capita and faster economic growth. And women leaders can help to spread new norms, often persuading others to follow the rules or be vigilant towards unsustainable behaviors. But historically, women have had unequal access and decision-making regarding natural resources, with their contributions undervalued and marginalized especially in the developing world. Women are the hardest hit by natural disasters and pandemics. Worse yet, climate change exacerbates gender inequality and inequity. Solving the world's environmental challenges requires confronting the widespread inequities facing women and girls. Women in rural economics make up close to 50% of the world agricultural labor force and produce nearly half of the world's food yet they are represent less than 20% of the world landholder's and for less have access to enhance. Women held 28% Of managerial position globally in 2022.But in countries where omen have higher political participation.

STUDY OF INTEGRATED NUTRIENT MANAGEMENT IN FRENCH BEAN

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Abstract

The experiment was carried out at Department of Horticulture, JNKVV, Jabalpur during rabi season 2021-22 to Study of Integrated Nutrient Management in French bean in Jabalpur condition with eight treatments combinations viz. T_1 (100% NPK Through inorganic source), T_2 (75% NPK through inorganic + 25% N through FYM), T_3 (75% NPK through inorganic + 25% N through Vermicompost), T_4 (50% NPK through inorganic + 50% N through FYM), T_5 (50% NPK through inorganic + 50% N through Vermicompost), T_6 (25% NPK through inorganic + 75% N through FYM), T_7 (25% NPK through inorganic + 75% N through Vermicompost) and T_8 (Control (no fertilizer). The experiment was laid out in Randomized Block Design with three replications. Results is revealed that the maximum significant fresh pod yield q/ha (163.39 q/ha), plant height (cm) (27.07 cm), pod length (14.23 cm), pod width (0.98 cm) and average fresh pod weight (5.46 g) were recorded in T_5 (50% NPK through inorganic + 50% N through Vermicompost), whereas treatment T_4 also gave the good response to all the characters in term of fresh pod yield q/ha (161.12 q/ha), plant height (26.10 cm), pod length (13.99 cm), pod width (0.87 cm) and average fresh pod weight (5.07 g). However, a minimum day to first pod harvest was recorded in T_3 (75% NPK through inorganic + 25% N through Vermicompost). It can be concluded that the use of 50% NPK through inorganic + 50% N through Vermicompost create the favourable environment to the crop for growth and development of French bean to produce the significant maximum marketable fresh pod yield.

GENOMICS IN CHICKPEA BREEDING

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Abstract

Chickpea is broadly affected by both biotic and abiotic stresses that adversely contributed to the yield and different quality parameters of chickpea yield. There is wide biotechnological platform to avoid or to make tolerant against biotic and abiotic stresses. The early maturity helps in escaping terminal drought and heat stresses and the adaptation of chickpea to short-season environments. Ascochyta blight is a major challenge to chickpea productivity in areas cool and wet conditions. On the other side pod borer is the major problem associated with chickpea yield. There is very limited variability is available at present time for pod borer resistant cultivars. The use of genomics technologies in chickpea breeding programs has been limited, since available genomic resources were not adequate and limited polymorphism was observed in the cultivated chickpea for the available molecular markers. Remarkable progress has been made in India for the development of genetic and genomic resources in recent years and integration of genomic technologies in chickpea breeding. MAS is currently being used for improving drought tolerance and combining resistance to diseases.

STUDY OF TECHNOLOGY INFORMATION AND COMMUNICATION BY USE OF ICTS

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Abstract

Information and Communication Technologies ICTs are a diverse set of technological tools and resources to create, disseminat e, store, bring value-addition and manage information. The ICT sector consists of segments as diverse as telecommunications, television and radio broadcasting, computer hardware, software and services and electronic media, for example, the internet an d electronic mail.ICTs are emerging as a powerful tool for gender empowerment in a developing country like India. There has been a rapid growth in the ICT sector since the late 1980s and the use of ICT has dramatically expanded since the 1990s. Acco rding to the World Bank, teledensity in India had reached 4.6% of the population by 2021.This gender digital divide in India is characterised by low levels of access to technologies. Poverty, lack of computer literacy and language barriers are among the f actors impeding access to ICT infrastructure, especially in developing countries. This paper looks at the avenues created by IC T-enabled networking processes for women's empowerment. It discusses the main challenges and obstacles faced by women, suggests practical strategies to address those challenges and goes on to suggest ways to improve the conditions leading to wom en's empowerment. The paper also analyses a case study from India and examines how women's 'power within' has been enha nced through their access to and control of Information and Communication by use of ICTs.

RESPONSIBLE INNOVATION IN PLANT BREEDING TECHNIQUE FOR HYBRID POTATO

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Abstract

As the third global food crop, the potato (*Solanum tuberosum* L.) is highly important for food security and income generation in many regions of the world. However, compared with other major food crops, improvement of potato yield through breeding approaches has been slow. In this context, hybrid diploid potato breeding is considered as promising technique which significantly accelerates the process of crop improvement. By fixing and combining desirable traits in diploid potato inbred lines, a hybrid breeding strategy provides new opportunities to improve yield, tuber quality, disease and pest resistance as well as rapidly respond to diverse market needs. As an emerging innovation, hybrid potato breeding raises high expectations about faster variety development and clean true potato seed as a new source of planting material. Hybrid breeding could, therefore,

substantially contribute to global food security and other major sustainable development goals. However, its success will not only depend on the performance of hybrid potato in the field, but also on a range of complex and dynamic system conditions. An important and recurrent theme in our work is the dynamics innovation in plant breeding and promises to respond to the global challenges of food security. The prospect of hybrid diploid potato breeding as a game-changing development that can help adapt potatoes to various soils, climates, agro-ecologies, and make them resistant against pests, diseases, heat and drought. Indeed, the promises of hybrid potato breeding clearly resonate with a more general debate about the role of plant breeding in responding to the global challenges of food security.

QUINOA - A RISING SUPER FOOD

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Abstract

Quinoa is herbaceous annual flowering plant of Amaranth family having edible seeds. The seeds are rich in protein, fibre and minerals. That's why it is called a super food. Popularly using for mal-nutritional children. Many thousand year ago it was used as fodder feed. More than 70 countries are doing cultivation of it. Quinoa plants do best in sandy, well-drained soils with a low nutrient content. The genome of quinoa was sequenced in 2017 by researchers, through traditional selective breeding and, potentially, genetic engineering, the plant is being modified to have higher crop yield, improved tolerance to heat and biotic stress, and greater sweetness through saponin inhibition. Raw, uncooked quinoa contains 13% water, 64% carbohydrates, 14% protein, and 6% fat. Quinoa seeds are gluten-gluten-free. Traditionally, quinoa grain is harvested by hand. Harvest needs to be precisely timed to avoid high seed losses from shattering. In 2019, world production of quinoa was 161,415 tonnes.

ASSESSMENT OF IPM TECHNOLOGY IN THE MANAGEMENT OF HOPPERS IN RICE

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Abstract

Rice (*Oryza sativa* L.) is one of the most important cereals crop of the world particularly in Asian countries and forms staple diet for more than 50 per cent of the population. The rice is produced in warm and humid environment, which is also very much congenial for proliferation of insect pests. Rice is the staple food of at least half of the world's population and is grown in approximately 148 million ha of land globally. Nearly 90 per cent of this area falls in the Asian region. Two species of plant hopper infest rice. These are the brown plant hopper (BPH), *Nilaparvata lugens* (Stal); and the white backed plant hopper (WBPH), *Sogatella furcifera* (Horvath). The BPH not only directly damages the rice crop by sap sucking but also transmits viral diseases of rice such as grassy stunt and rugged stunt. The WBPH, though not a virus disease vector, occurs widely and can become sufficiently numerous to kill plants by hopper burn. Both the nymphs and adults remain at the ground level and suck the plant sap. It is a typical vascular feeder primarily sucking phloem sap leading to hopper burn. At early infestation, circular yellow patches appear which soon turn brownish due to the drying up of the plants. The patches of infestation then may spread out and cover the entire field. The grain setting is also affected to a great extent. During sustained feeding, it excretes a large amount of honeydew. On farm trial were conducted during winter season 2022-23 at different location of Rewa (MP) in variety MTU-1010 to assess the recommended practice in 1. Deep summer ploughing 2. Alley planting with 30 cm gap after 2.5 to 3 meter planting with spacing of 20 x 15 cm 3. Application of Chlorantraniliprole 0.3G @10kg/ha in nursery 5-7 days before uprooting of seedlings 4. Installation of pheromone traps @ 8/ ha for monitoring of insect 5. Installation of Light Trap @ 1/ha for monitoring purpose 6. Need based application of insecticides/fungicides (RP-2) was very effective and more profitable to farmers along with health concerned was found very effective to reduce the BPH & WBPH insect population fallowed by 1. Deep summer ploughing 2. Seed treatment with Carbendazim 12% + Mancozeb 63% WP @ 2g/kg seed 3. Seedling root dip in Profenophos @ 2ml/litre of water for 12 hours before transplanting 4. Installation of pheromone trap @ 8/ ha for monitoring of yellow stem borer 5. Application of Cartap hydrochloride 4G @ 25 kg/ha at 25

DAT 6. Need based application of insecticides/ fungicides (RP-1) and compared with farmers practices (FP) was found more infestation of insect than recommended practice (RP). Economics and benefit cost ratio of both FP and RP plots were worked out. Hoppers in Rice average no. of insects/hill was recorded in farmer practice 20.60 while in research practice 1 was 9.10 and in research practice-2 was 6.80. In Rice production average net profit was recorded Rs. 59124.00/ha under RP-2 while in RP-1 it was Rs. 50399.00/ha and under FP Rs. 35765.00/ha. The economics of marketable yield in Rice average revealed that adoption of IPM treatments was highest Benefit cost ratio was 2.74 under RP-2, while 2.63 under RP-1 and 2.23 was in FP and the chickpea yield recorded highest in RP-2 45.60 q/ha, RP-1 39.85 q/ha and in FP 31.25 q/ha.

HETEROSIS FOR YIELD AND MOSAIC RESISTANCE IN VEGETABLE COWPEA (*VIGNA UNGUICULATA* SUBSP. *SESQUIPEDALIS* (L.) VERDCOURT)

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Abstract

Cowpea (*V. unguiculata*) is an important dual-purpose legume crop grown in the tropics and subtropics. In Kerala, the trailing vegetable cowpea (*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdcourt) has emerged as a remunerative and preferred vegetable crop cultivated for its tender pods. Viral diseases are a significant constraint to yield in vegetable cowpea, especially in the tropical region. In recent years, a high incidence of mosaic disease has been noticed in most of the promising cultivars in Kerala. The present study investigated the scope of heterosis for selected traits utilising cowpea accessions having mosaic resistance in the breeding programme. Fifteen F_1 hybrids derived from a cross involving five high yielding yard long bean varieties as lines and three mosaic-resistant cowpea accessions as testers were evaluated for 19 yield characters along with their parents and a standard check (Lola) in a randomised block design with three replications in Rabi 2022 at Pepper Research Station, Panniyur, Kerala, to study the heterosis over mid, better, and standard parents. Disease scoring was done to identify mosaic resistance of the crosses at 45 days after planting based on the 0-5 scale developed by Bos (1982) for numerical scoring of black eye cowpea mosaic virus (BlCMV). Significant desirable heterosis was observed for all the characters studied except pod length and girth. The crosses KAU Deepika x Manjari and KAU Mithra x Manjari exhibited significant positive heterosis over mid, better, and standard parent for pod yield and high relative heterosis and standard heterosis for pods per plant. Besides the heterotic potential, the hybrid KAU Mithra x Manjari, KAU Deepika x Manjari and Githika x Manjari were resistant to mosaic disease.

CLIMATE CHANGE : FOOD INSECURITY AND BIODIVERSITY LOSS – ISSUES, CHALLENGES AND MITIGATION STRATEGIES

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Abstract

The effects of climate change on the environment caused by the anthropogenic origin such as greenhouse gases accumulation on the earth's climate has complex effects on all scales where complex interactions triggered by extreme events associated with climate change impacts trophic chains with cascade effects, like irreversible transformation of habitats, rapid species extinction, and changes in entire communities involving key species. CC affects species, ecosystem composition and function directly (increasing temperature, precipitation changes, water temperature and sea level) and indirectly (changes intensity and frequency of wildfires). Different distribution of meteorological events associated with temperature rise modifies growth rate and reduces survival of plants and animals, especially for tropical assemblages and habitat and range-restricted species like mountaintop and polar species in response to climate change asserting strong selective pressure on natural populations expressively altering biodiversity, agricultural production, and food security changing future climatic variables globally with morphological, physiological, and behavioral modifications in species. The increasing global temperature is expected to have major effects in tropical areas for terrestrial ectotherms because they are close to the optimum of temperature and small changes may have a deleterious consequence on a great number of species, whereas some positive responses of biodiversity to climate change in non-tropical regions in natural habitats therefore, protecting biodiversity is given priority. Mitigating food

waste, compensating food-insecure people conserving biodiversity, effective genetic resources use, and traditional ecological knowledge could decrease further biodiversity loss, and meet food insecurity under climate change scenarios. However, achieving food security under such scenario requires and recommend strong policies, releasing high-yielding stress resistant varieties, developing climate resilient irrigation structures, and agriculture along with degraded land restoration, land use changes, bio-energy use, sustainable forest management, and community and sustainable agriculture based biodiversity friendly conservation practices to mitigate climate change impacts to achieve food security and biodiversity loss.

GENETIC VARIABILITY AND GXE INTERACTION STUDIES FOR AGRO-MORPHOLOGICAL AND PHYSIO-BIOCHEMICAL TRAITS IN MUNGBEAN [*VIGNA RADIATA* (L.) WILCZEK]

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Abstract

Mungbean is an ancient pulse crop widely cultivated under different agro-ecological situations in India. It is the potential source of protein, essential minerals and vitamin-B (vitamin-C in sprouting grains). Genotype and its interaction with the prevailing environment is the basic factor determining the final yield. The genotype x environment interaction is particularly important in the expression of quantitative characters, which are controlled by polygenes and are greatly modified by environmental influences. Thus, in order to have unbiased estimates of various genetic components, it is imperative that the experiment must be repeated over different environments. The evaluation of genotype x environment interaction gives an idea of the stability or buffering ability of the population under study. Genotype x environment interaction is of common occurrence and often creates manifold difficulties in interpreting results and thus hampers the progress of breeding programme aiming at the further genetic improvement of crop plants. Hence, the knowledge of magnitude and nature of genotype x environment interaction is very useful to a breeder for proper understanding and assessment of his material. So it is necessary to screen and identify phenotypically stable genotypes which could perform more or less uniformly under different conditions. The current study aimed to identify the high potential stable genotype and appropriate sowing time for mungbean cultivation in hot arid zone of Rajasthan. A field experiment was conducted with 35 mungbean genotypes over four environments created by four different dates of sowing in RBD with three replications at SKRAU, Bikaner during summer-2019 and *Kharif*-2019 using the model of Eberhart and Russell (1966). Stability parameters revealed that genotype IC-39269 exhibited stable performance for number of seeds per pod, biological yield per plant and harvest index across the environments; whereas, IPM 02-3, MH 2-15 and RMG-344 exhibited stable performance for seed yield under favourable environment i.e. *Kharif* season; and genotype IC 103059 for stressed environment i.e. summer season.

EFFECT OF SULPHUR DIOXIDE ENRICHMENT ON GROWTH ATTRIBUTES AND ITS BIOCHEMICAL BASIS IN TOMATO

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Abstract

While the science is currently focussing on increasing the bio-yield and organic agriculture, it is equally important to research existence of genetic variability in our crops to important environmental challenges such as air pollution induced climate change. We hypothesise that a genetic variability exists among crops in respect of their SO_2 tolerance. An experiment was conducted with three varieties of Tomato (*Solanum lycoperscium*), var. H-414, H-445 and H-226 developed by IARI, New Delhi to assess their SO_2 response under ambient (7 -25µg SO2 m^{-3}) and enriched SO_2 level of ambient +?10-15µg SO2 m^{-3}). The plants were exposed to different SO_2 conditions for one hour daily on seven consecutive days at a fixed time of the day in specially fabricated closed chambers. While the number of leaves and leaf surface area decreased marginally initially in H-414, the numbers increased by 40-45% overtime under elevated SO2 when compared with ambient condition. The three varieties of tomato showed similar necrotic leaf area percentage at all stages of observation following SO_2 exposure. Data on

shoot biomass suggests that the variety H-414 is most affected by increase in SO_2 concentration in the air environment. Variety H-445 was found to utilize the SO_2-Sulphur as a mineral nutrient to support plant growth. The chlorophyll in varieties H-414 and H-445 decreased by approximately 8% and 4% respectively, but H-226 was hugely impacted, registering a decrease by 48% in SO_2 enriched environment. An assessment of crop utilization of SO_2-S as a nutrient source suggests that the variety H-445 was the most potent, H-414 slightly able to absorb and H-226 was the least efficient. In conclusion, the SO_2 enrichment of air environment under tomato cultivation was found to contribute towards plants S-requirement in variety H-445 and promoted its vegetative growth. This variety was thus most tolerant to air-SO_2 pollution.

EFFECT OF ENZYME SUPPLEMENTATION ON PRODUCTION PERFORMANCE IN MURRAH BUFFALO

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Abstract

The use of exogenous enzymes in ruminant diets has been shown to improve feed utilization and animal performance. Enzymes can break down dietary fiber, which can increase the availability of nutrients for the animal. This can lead to increased growth, milk production, and feed efficiency. A number of studies have investigated the effect of enzymes on buffalo performance. In one study, supplementation with enzymes increased average daily gain and total body weight gain in buffalo calves. The enzyme-supplemented calves also had better feed conversion ratios than the control calves. Another study found that supplementation with enzymes increased milk yield and milk fat content in dairy buffaloes. The enzyme-supplemented buffaloes also had higher blood protein levels than the control buffaloes. The results of these studies suggest that enzyme supplementation can be a valuable tool for improving buffalo performance. Enzymes can help to increase the availability of nutrients for the animal, which can lead to improved growth, milk production, and feed efficiency. However, it is important to note that the effects of enzymes can vary depending on the type of enzyme, the dose, and the animal's diet. It is also important to consult with a veterinarian before using enzymes to ensure that they are safe and effective for the animal. Overall, the use of exogenous enzymes in buffalo diets has the potential to improve animal performance. More research is needed to determine the optimal dose and type of enzyme for different buffalo production systems. However, the results of the studies that have been conducted so far suggest that enzymes can be a valuable tool for improving buffalo performance.

TRICHODERMA HARZIANUM MEDIATED BIOSYNTHESIS OF SILVER AND COPPER MYCONANOPARTICLES AND ITS EVALUATION AGAINST EARLY BLIGHT OF TOMATO

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Abstract

In the last few years, myconanotechnology or the use of fungi for the synthesis of nanoparticles has emerged as an important eco-friendly technology for the management of plant diseases. The present study was focused on the biological synthesis of silver nanoparticles (AgNPs) and copper nanoparticles (CuNPs) from *Trichoderma harzianum* extract using silver nitrate and copper sulphate as precursors. The synthesized nanoparticles were characterized by UV-Vis spectroscopy, particle size analyzer; scanning electron microscopy; atomic force microscopy; X-ray diffractometer, and Fourier transform infrared spectroscopy to study its optical absorption, mean particle size, surface topology, topography, chemical composition and to identify the potential biomolecule assisting in the reduction of copper and silver ions. The synthesized myconanoparticles were tested against *Alternaria solani*, the causal organism of early blight of tomato under *in vitro* and *in vivo* conditions. In poison food technique, AgNPs @ 170 ppm and CuNPs @ 2000 ppm showed mycelial growth inhibition of 57.08 per cent and

58.21 per cent, respectively. Under glasshouse conditions, the same concentrations of AgNPs and CuNPs recorded per cent disease reduction of 28.31 and 13.21, respectively. The percent inhibition of fungal growth increased with the increase in the concentration of nanoparticles. The identified concentrations of AgNPs and CuNPs also showed higher seed germination percentage, seedling length, and vigour index compared to the other treatments used. The results indicated that the AgNPs and CuNPs could be used as an alternate method for the management of early blight of tomato and improve crop growth.

EFFECT OF EFFICIENT CHLORPYRIFOS DEGRADING BACTERIA ON THE SOIL ENZYMATIC ACTIVITY

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Abstract

Application of excess amount of pesticide to the soil substantially decreases the native soil biological activity which in turn reduces the soil enzymatic activity. Chlorpyrifos is known for its acute toxicity which is reported to hinder soil fertility. The use of pesticide degraders is a cost-effective approach to overcome this problem. Thus, the present study is aimed at studying the effect of the chlorpyrifos degrading bacteria on the soil enzymes *viz.* dehydrogenase and phosphatase under elevated pesticide environment. The soil was pre-inoculated with 0.05% chlorpyrifos; pre-treated paddy seedlings with bio-inoculants were transplanted. The data showed that the activity of the dehydrogenase enzyme was lowest in 90th day; recorded highest on 60th DAT. Dehydrogenase activity at 30th, 60th and 90th day after transplanting in T_9 (CP + CDB-6 + CDB-11 + CDB-18) recorded was 31.3, 54.0 and 44.7 µg TPF g^{-1} of soil d^{-1}, respectively. T_2 (Chlorpyrifos as sole treatment) recorded lowest activity of 14.6 µg TPF g^{-1} of soil d^{-1} compared to control (18.6 µg TPF g^{-1} d^{-1}) in the 30th day. Whereas the phosphatase activity in terms of concentration of p-nitrophenyl (PNP) in each sample was calculated by a standard curve of p-nitrophenol in water and was expressed as mole of p-nitrophenol released per gram of dry soil per hour. Phosphatase activity on 30th day in T_9 recorded was 31.4 µg PNP g^{-1} h^{-1} of soil. T_2 recorded 15.9 µg PNP g^{-1} h^{-1} of soil, which was the lowest among all. The activity increased in all the treatments up to 60th day and then reduced slightly on 90th day.

EFFECT OF EFFICIENT CHLORPYRIFOS DEGRADING BACTERIA ON THE SOIL MICROBIAL POPULATION

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Abstract

Applying excess pesticide to the soil significantly reduces the biological activity of the native soil, which in turn reduces the microbial population of the soil. The acute toxicity of chlorpyrifos is known to inhibit fertility in the soil. Thus, an eco-friendly technology to overcome this problem is the use of pesticide degraders. Thus, the present study is aimed at evaluating the effect of the chlorpyrifos degrading bacteria on the population of soil microflora. The soil was pre-inoculated with 0.05% chlorpyrifos; paddy seedlings treated with bio-inoculants were transplanted into pots. The results revealed that on 30 days after inoculation the soils treated with bacterial inoculants exhibited a growing microbial population compared to the one treated with only chlorpyrifos. On the 60th day, the same pattern was observed. The combination of inoculants (T_9) led to maximum population growth compared to single inoculants. At 30th, 60th and 90th day after transplanting, the bacterial population in T_9 recorded was 43.3 × 10^6, 84.6 × 10^6 and 70.7 × 10^6 CFU g^{-1} of soil, respectively; the fungal population recorded was 17.3 × 10^3, 24.3 × 10^3 and 21.0 × 10^3 CFU g^{-1} of soil, respectively; population of actinomycetes recorded at 30th,

60th and 90th day was 30.4 × 10^4, 45.5 × 10^4 and 40.4 × 10^4 CFU g^{-1} of soil, respectively. Chlorpyrifos applied soils as a sole treatment led to a lower population compared to the control in all three microflorae *i.e.* bacteria, fungi, and actinomycetes.

SOIL AND WATER CONSERVATION IN AGRICULTURE

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Abstract

Conservation of soil and water resources is important for sustainability of agriculture and environment. Soil and water resources are under immense pressure due to ever increasing population thereby ensuing growing demand for food, fiber and shelter. Soil and water resources are being deteriorated due to different anthropogenic and natural factors. Soil erosion is one of the several major deteriorative processes which results in deterioration of the soil. Soil erosion is removal of soil due to movement of water or air. Soil erosion may lead to the significant loss of soil productivity and thus may lead to the desertification under sever conditions. Water and wind are the major agencies which are responsible of soil erosion. Deforestation, over-grazing, mismanagement of cultivated soils, intensive cultivation and intensive urbanization are major factors triggering the soil erosion. For sustainable agriculture and environment, it is pertinent for the protection of soil resources against erosion. Different control measures should be adopted to protect the soil resources against erosion. The concept of soil conservation cannot be materialized without conserving and efficient use of water resources. It is therefore pre-requisite that soil conservation practices should be adopted. Soil conservation practice include soil management, crop management, engineering, range management and forestry operation. The proper use of soil and water resources is necessary to ensure the future well-being of humans and of the environment.

IMPORTANCE OF ITK IN AGRICULTURE FIELD

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Abstract

India has a rich tradition of indigenous technical knowledge (ITK) in agriculture, which encompasses a wide range of traditional practices, techniques, and knowledge systems that have been developed and passed down through generations. ITK in agriculture is deeply rooted in the cultural and ecological contexts of different regions of India. India has a long history of organic farming practices that rely on natural fertilizers, such as cow dung and compost, and traditional pest control methods, including the use of neem and other plant-based extracts. Indigenous farmers have preserved and practiced these techniques, which are now gaining recognition for their environmental sustainability.Many indigenous communities in India have practiced agroforestry for centuries. They integrate trees with agricultural crops, allowing for increased biodiversity, soil fertility, and water conservation. Mixed cropping, where multiple crops are grown together in the same field, is also a common practice, which helps maximize productivity and minimize risks.Indigenous communities have developed innovative water harvesting and conservation techniques to tackle water scarcity. Traditional methods like building check dams, underground tanks (tanka), and farm ponds help capture and store rainwater, ensuring its availability during dry periods. Indigenous farmers have long engaged in seed conservation and exchange practices, preserving traditional crop varieties that are adapted to local conditions. Seed banks and community-based seed systems play a crucial role in maintaining agrobiodiversity and providing farmers with resilient and locally adapted seeds.Indigenous communities in India have developed effective pest and disease management techniques based on natural remedies. For instance, the use of botanical extracts, biopesticides, and cultural practices like crop rotation and intercropping help control pests and diseases without relying heavily on synthetic chemicals. Traditional irrigation systems, such as step wells, canals, and terraced fields, have been used in India for centuries. These systems efficiently distribute water to agricultural fields, promote groundwater recharge, and minimize soil erosion. Indigenous farmers have traditionally cultivated a diverse range of crops suited to their local agro-climatic conditions. They follow a crop calendar based on indigenous knowledge to determine the optimal timing for sowing, harvesting, and other agricultural activities.Many indigenous communities in India have developed sustainable and agroecological farming systems

that promote biodiversity and harmony with nature. Practices such as mixed cropping, intercropping, crop rotation, and agroforestry are common in ITK systems. These practices help maintain soil fertility, prevent pest and disease outbreaks, and promote resilience in the face of climate variability. Indigenous technical knowledge in agriculture is valuable not only for its ecological sustainability but also for its potential to address modern challenges such as climate change, resource conservation, and food security. Recognizing and integrating ITK with modern agricultural practices can lead to more resilient and sustainable farming systems in India.

IN VIVO EFFICACY OF CHLORPYRIFOS DEGRADING BACTERIA

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Abstract

The ecological fate of the pesticides is related to both abiotic and biotic processes including volatilization, photooxidation, chemical oxidation, bioaccumulation and transformation by the microbes. Bioremediation is the conversion or degradation into non-hazardous or lower-hazardous chemical products of contaminants. Several chemicals have been managed to remove using degrading microorganisms from soil and aquatic environments. This study was conducted to assess the biodegradation efficiency of bacterial isolates with an outlook to reduce the concentration of chlorpyrifos in the rhizosphere soils. The soil was pre-inoculated with 0.05% chlorpyrifos; pre-treated paddy seedlings with bioinoculants were transplanted. On 30th day of chlorpyrifos application, the rhizosphere soil from the pots were collected and the residual chlorpyrifos content was estimated using GCMS-MS/MS. The data indicated that comparatively higher degradation of 98.46 % was found in T_4 (Chlorpyrifos + CDB-11) followed by T_9, that showed degradation of 95.92 %. Close results were observed in treatments T_3 (Chlorpyrifos + CDB-6) and T_5 (Chlorpyrifos + CDB-18) which recorded 93.13 % and 94.11 % of degradation. The pots with sole treatment of chlorpyrifos (T_2) recorded 50.77 % reduction. Surprisingly, inoculation of individual isolate emerged as efficient as compared to mixed cultures.

A CRITICAL STUDY ON THE PRESENT STATUS AND SCOPE OF NATURAL FARMING IN INDIA

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Abstract

"The ultimate goal of farming is not the growing of crops, but the cultivation and perfection of human beings" India has moved from food deficiency to food surplus mainly on account of the Green Revolution (GR). Food production in the country reached 303.34 million tonnes during 2020-21 from 51 million tonnes in 1950-51. Farming has become further challenging due to the rapidly changing climate and its impact on agriculture. Green House Gases (GHGs) emission from agriculture is increasing due to unsustainable management of crops and livestock. Currently, agriculture contributes about 14% of total GHG emissions. Against this backdrop, globally several models have emerged as alternative options. Among many models, of late, natural farming has recorded some success. The state governments such as Andhra Pradesh, Himachal Pradesh, Gujarat, Karnataka, Odisha etc., have encouraged the farmers to adapt to natural farming through several programmatic interventions. The Government of India has also introduced a Bhartiya Prakritik Krishi Paddhati (BPKP) as a sub-scheme of Paramparagat Krishi Vikas Yojana (PKVY) during 2020-21. Realizing the need for strengthening sustainable agriculture, natural farming has been promoted as a mass movement. Study results show that there is an increasing trend in area and number of farmers shifting from chemical to natural farming. Currently, It is estimated that a total of 6.2 lakh farmers from Andhra Pradesh in 2.88 lakh ha; 1.81 lakh farmers from Gujarat in 0.8 lakh ha and 1.6 lakh farmers from Himachal Pradesh in 0.13 lakh ha were practising natural farming up to March 2022. However, NF started in Odisha recently and Sikkim is a 100% organic state there is an increasing interest among farmers in Sikkim to adapt to NF. The states like Karnataka and Uttar Pradesh have proposed to

pilot the natural farming in an area of 2000 ha in each agro-climatic zone in the state and 0.98 lakh ha, respectively in coming years.

IMPORTANCE OF FINGER MILLET FOR FOOD AND NUTRITIONAL SECURITY

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Abstract

Finger millet is gaining the status as an ingredient in the production of function food. It promotes eating enriched food that is closed to their natural state rather than taking dietary supplements. It is highly suitable as cereal grain in human diet. It has high nutritive values; it is non-glutinous, non-acidic and easy to digest. Finger millet is over the years there has been rapid decline both in production and consumption of millets. Chemical composition of finger millet revealed that total carbohydrate content of finger millet has been reported to be in the range of 72 to 79.5%. Finger millet has nearly 7% protein but large variations in protein content from 5.6 to 12.70% have been reported by various studies. Total ash content is higher in finger millet than in commonly consumed cereal grains. The ash content has been found to be nearly 1.7 to 4.13% in finger millet. Calcium content of 36 genotypes of finger millet ranged from 162 to 487 mg %. Singh and Srivastava (2006) reported the iron content of 16 finger millet varieties ranged from 3.61 mg/100g to 5.42 mg%. Finger millet is the richest source of calcium and iron. Calcium deficiency leading to bone and teeth disorder, iron deficiency leading to anemia can be overcome by introducing finger millet in our daily diet. Maximum utilization of the nutrient potential of the millet is limited by the presence of phytates, phenols, tannins and enzyme inhibitors but their effect can be reduced by using processing techniques like popping, roasting, malting and fermentation. The use of these techniques not only decreases the content of antinutrients but increases the bioavailability of certain minerals like calcium and iron. Composite flours made by using finger millet can be used for preparation of various nutrient dense recepies which can be effectively used for supplementary feeding programs.

ASSESSMENT OF TILLAGE AND CROP ESTABLISHMENT TECHNIQUES FOR PRODUCTIVITY OF WHEAT CULTIVATION UNDER NORTHERN PART OF MADHYA PRADESH

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Abstract

A field experiment was conducted during the consecutive rabi seasons of 2018 and 2019 on sandy clay loam at Research Farm, College of agriculture, RVSKVV, Gwalior (M.P.) to study the evaluation of tillage and crop establishment techniques for improving productivity of wheat.Variety (V3) MP3336 were resulted in significantly higher grain yield, straw yield and biological yield, which was statistically at par with variety (V1) GW-322 over variety RVW-4106. On the basis of resources conservation technique, maximum grain yield, straw yield and biological yieldwas observed with Furrow irrigated raised bed (S1) which was at par with Zero tillage (S4) in

wheat.

ECONOMIC FEASIBILITY OF TILLAGE AND CROP ESTABLISHMENT TECHNIQUES OF WHEAT CULTIVATION OF MADHYA PRADESH

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Abstract

An experiment in split plot design with 16 treatments was conducted during the consecutive rabi seasons of 2018-19 and 2019-20 replicated thrice and sandy clay loam at Research Farm, College of agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) to study the economic feasibility of tillage and crop establishment techniques of wheat

cultivation. Result revealed that Variety (V 3) MP3336 were recorded maximum net return and B:C ratio was recorded and minimum net return and B: C ratio with RVW-4106 variety of rabi season wheat.

INNOVATIVE APPROACH FOR THE MANAGEMENT OF CITRUS LEAF MINER, *PHYLLOCNISTIS CITRELLA* (GRACILLARIDAE : LEPIDOPTERA)

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Abstract

The rampant use of chemical fertilizers and pesticides has led to several problems *viz*, environmental pollution, loss in soil fertility, decrease in crop yields, pesticide resistance, resurgence, residues and various health hazards. The adverse effects of chemical farming have generated interest in organic farming, where it involves the use of fertilizers of organic origin by using farm and urban wastes, and natural plant based safer pesticides. Under this circumstance, alternative method of augmenting fertilizer and pesticides assumes a paramount importance. Earthworms contribute in different degrees for the mixing of organic and inorganic components of soil besides imparting good health to the crops by increasing the tolerance level against insect pests and diseases. *In-situ* vermiculturing is one such method which involves conversion of organic waste into vermicompost by the action of earthworms right in the field near the vicinity of the growing plants. The field experiment was carried out using Randomized Block Design to study the effect of *in-situ* vermiculturing along with foliar application of synthetic insecticides and biorationals against citrus leaf miner. The results indicated that *in-situ* vermiculturing with earthworms, *Eudrilus eugeniae* @ 200 per plant along with foliar spray of spinosad 45 SC (0.75 live mines/shoot) and flonicamid 50 WG (0.85) were found significantly effective in controlling citrus leaf miner on acid lime. The *in-situ* vermiculturing with *E. eugeniae* @ 200 earthworms per plant along with foliar spray of neem based insecticide (2.44) and bio digester solution (10%) (2.46) were found to be moderately effective against citrus leaf miner. The cumulative effect of *in-situ* vermiculturing and foliar spray resulted in better control of citrus leaf miner. This kind of approach is novel one where modification of physiology of plant *via* supplying organic forms of nutrients will boost tolerance of plants and external application of insecticides and biorationals will add for overall control of citrus leaf miner. It can be considered as innovative approach for management of citrus leaf miner on acid lime.

UTILIZING AGRICULTURE RESIDUES AS A PROMISING SOURCE FOR CELLULASE PRODUCTION

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Abstract

A huge quantity of agricultural and domestic waste are generated throughout the year, which is disposed of by burning. These residues represent a commercially, renewable and abundant resource, rich in carbon, nitrogen, and minerals. These residues can significantly boost bioprocess economics and reduce the production cost of enzyme production by serving as low-value alternatives to costly medium components utilized for fermentation. Submerged fermentation was carried out using various agro-domestic wastes with the best cellulase-producing strain isolated from the soil. For process optimization, physical and mechanical parameters like pH, and temperature were adjusted and for medium optimization shake flask experiments were performed with different concentrations of agriculture waste. Rice husk, wheat straw, pearl millet straw, moong straw, sugarcane bagasse, oat straw, maize straw, peels of potato, orange and pomegranate used as carbon sources and pea, gram, Soybean cake, yeast extract and peptone as nitrogen sources. In this study, maximum Cellulase activity was observed on moong straw and soybean cake. The optimal pH and temperature for enzyme production were 5.0 and 35°C respectively. These comparative studies were conducted in shake flasks. With the use of such wastes, a significant improvement in the activities of the enzymes cellulase was obtained along with concomitant reductions in medium costs.

ASSESSING SPIKELET FERTILITY FOR SELECTING ELITE RESTORER LINES IN RICE HYBRIDIZATION PROGRAMS

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Abstract

The objective of this experiment was to identify potential maintainers and restorers in rice through the utilization of four Cytoplasmic Male Sterility (CMS) lines, namely IR58025A, APMS 3A, APMS 11A, and APMS 14A, crossed with 15 selected genotypes during the *kharif* 2021. Subsequently, the resulting 60 test crosses were subjected to evaluation during the *kharif* 2022. The main focus was on analysing the spikelet fertility, which serves as an indicator of restorability, as it varies based on the male parent utilized in the crosses. The investigation revealed a significant variation in spikelet fertility among the test crosses, with fertility percentages ranging from a mere 1.2% in the cross RGL 7016 X IR58025A to an impressive 97.4% in the cross KRISHNA X APMS 14A. These findings clearly demonstrate the influence of the male parent on the restorability of fertility in the hybrid combinations. Out of the 60 test crosses studied, two genotypes exhibited high spikelet fertility, surpassing the 75% threshold, thus indicating their potential as strong restorers. Additionally, 15 genotypes demonstrated partial fertility, ranging from 50.1% to 75%, suggesting intermediate levels of restorability. Moreover, 35 genotypes were classified as partial maintainers, displaying spikelet fertility ranging from 0.1% to 50%. Remarkably, none of the genotypes under investigation were found to be completely sterile, as all exhibited some level of fertility. Further analysis was conducted to assess the single plant yields of the identified restorers with spikelet fertility exceeding 80%. These genotypes displayed promising performance in terms of individual plant productivity. Consequently, these specific cross combinations have been selected for further utilization in hybrid rice breeding programs, aiming to develop improved rice varieties with desirable agronomic traits. These findings contribute valuable insights into the restorability of fertility and provide a foundation for future breeding endeavours focused on developing high-yielding hybrid rice cultivars.

SPIRITUAL INTELLIGENCE AMONG FEMALE NURSING STUDENTS

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Abstract

Spiritual intelligence which involves skills and capacities within a person that contributes to spiritual competency. Spiritual intelligence is a clear image of human intelligence, that enlarges the human capabilities to get attached with high power and hardship of life. The present study was conducted to know the Spiritual intelligence among female Nursing students. The sample comprised of 30 final year B.Sc nursing students in the age group of 21 – 23 years were selected from two Nursing colleges of Hubli city. Spiritual intelligence of Nursing students was assessed by using Roqan Spiritual intelligence test (2006) .The results revealed that majority of nursing students had average spiritual intelligence and factors such as age, type of family and Socio economic status had significant influence on spiritual intelligence, indicating that higher the age group of nursing students (22 – 23 years) belonged to nuclear family and middle SES had better Spiritual intelligence as compared to others.

BIOEFFICACY TRIALS OF BOTANICALS AND HORTICULTURAL MINERAL OIL AGAINST TWO- TAILED MEALYBUG *FERRISIA VIRGATA* COCKRELL IN BLACK PEPPER

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Abstract

Bioefficacy trials of neem-based botanicals and mineral oils against the stem mealy bug *Ferrisia virgata* Cockerell on black pepper-rooted cuttings were conducted at Pepper Research Station, Panniyur, Kannur. Stem mealybug (*F. virgata)*, an insect vector of Piper yellow mottle virus (PYMoV), causes mottle disease in black pepper. The pest is severe in the summer,

and the pest load will transfer to the nursery during planting material collection. To manage this pest, the bioefficacy of eco-friendly alternatives was evaluated in this study. The treatments are: neem oil 2%, HMO 2%, neem oil 2% + HMO 2%, neem oil 3%, neem oil + HMO 3%, Azadirachtin 0.03 % (5 ml/lit), Raksha (KAU neem garlic soap RTU 0.6%), and Absolute Control (water spray) were evaluated against *F. virgata*. The pre-count of the mealybug population was statistically on par. There was no significant difference observed in all treatments at 1 DAS. Except in Treatments 9 (control) and 7 (Azadirachtin 0.03%), depletion of the mealy coating was observed, of which a noticeable reduction was observed in Treatment 8 (KAU neem garlic soap RTU 0.6%). Among the treatments, the bioefficacy of Raksha (0.6%) was significantly superior to all other treatments at 2DAS, 3DAS, and 4DAS. Where the initial population was reduced from 35.33 to 28 mealybugs per plant in 4 DAS. The study found that population buildup in the absolute control increased daily, significantly different from all other treatments at 2DAS, 3DAS, 4DAS, and 7DAS. Raksha (KAU neem garlic soap- RTU 0.6%) is a better option for controlling mealybug populations at the initial level of infestation, and it can be incorporated as an IPM schedule in black pepper. Apart from pest mortality, it will reduce the rate of population buildup, and repeated application will improve mortality and reduce population buildup.

VARIABILITY AND CORRELATION STUDIES IN WHEAT FOR RELATIVE WATER CONTENT, YIELD, AND YIELD CONTRIBUTING TRAITS UNDER RAINFED CONDITIONS

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Abstract

This study evaluated 19 advanced wheat breeding lines and six varieties (UP 2572, VL 953, PBW 660, PBW 664, WH1142, and C306) for variability and correlation in rainfed conditions. The 2021–2022 crop season served as the basis for the study in Pantnagar. An alpha lattice experimental design was used to collect data on relative water content (RWC), number of spikes per plant, number of grains per spike, thousand-grain weight, and grain yield. The findings demonstrated high variation in RWC, a crucial physiological characteristic associated with drought tolerance, as well as significant variability in yield and yield-related variables. Identifying genotypes with greater grain yields and the features linked to them is crucial for increasing wheat productivity in rain-fed conditions. Grain yield and RWC were shown to be significantly positively correlated, indicating that genotypes with greater RWC had superior grain yields under rainfed conditions. Furthermore, there were strong correlations between traits related to yield, such as the number of spikes per plant, the number of grains per spike, and the thousand grain weight. These connections assist us in comprehending how traits are related to each other and can direct breeding efforts intended to boost overall yield. Breeding initiatives that strive to create high-yielding, drought-tolerant wheat varieties suitable for rainfed agriculture can benefit from the identified genotypes with remarkable RWC and yield-related characteristics.

OXIDATIVE STRESS RESPONSES OF *POTENTILLA FRUTICOSA* TO HIGH ALTITUDES BY INTENSIFYING ANTIOXIDANTS AND SECONDARY METABOLITES CONTENT

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Abstract

Most endemic plant species have limited altitudinal ranges. At higher altitudes, they are subjected to various environmental stresses. However, these plants use unique defense mechanisms at high altitudes as a convenient survival strategy. The changes in antioxidant defense system and accumulation of different secondary metabolites (SMs) were investigated as depending on altitude in *Potentilla fruticosa* naturally growing in district Rajouri and Poonch of Jammu and Kashmir. Leaves were collected from different sites between 950 and 1800 m above sea level to assess the biochemical and physiological variations in response to high altitudes. At higher altitudes, the soil pH and micronutrient soil content decreased, which can be attributed to lower mineralization processes at lower ph. Total phenols, flavonoids, and tannins increased in response to different altitudes. Secondary metabolites progressively increased. There was an increase in photosynthetic pigments, between

same species grown at a different altitude. *Potentilla fruticosa* can adapt to high-altitude habitats by various physiological mechanisms, which can provide a theoretical basis for the future conservation.

ROOT SYSTEM ARCHITECTURE STUDIES IN OKRA (*ABELMOSCHUS ESCULENTUS (*L.) MOENCH) SEEDLINGS UNDER SALINITY STRESS

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Abstract

Okra is botanically known as *Abelmoschus esculentus* (L.) Moench belonging to the family Malvaceae. It is cultivated throughout India in an area of about 5.21 lakh hectares and with a productivity of 12.51 tonnes/ ha. The productivity is affected by various biotic and abiotic factors. Among the abiotic factors, soil salinity is one of the important limitation affecting the vegetable productivity. There are many works focusing on the selection of saline tolerant varieties. But most of the research focus on the shoot and yield parameters and role of the root system is yet to be explored. With this background, a study was conducted to explore the root system architecture of the Okra seedlings under saline conditions. Seeds of TNAU Bhendi hybrid CO 4 were sown in pots of size 10 x 10" filled with river sand to reduce the heterogeneity of the growing medium. Experiment was conducted in randomized block design with three replications. Sodium chloride concentrations of 0, 50, 75, 100, 125 and 150 mmol/l were prepared in half strength Hoagland's nutrient solution. Hoagland's solutions were added at three days interval for three weeks. After three weeks the seedlings were pricked out from the growing media and data related to root traits *viz.* tap root length, secondary root length, number of secondary roots, root dry weight was collected. It revealed that the tap root length significantly reduced with the increased salinity. The lowest root length (2.35 cm) was observed in the highest salinity level of 150 mmol/l and highest was reported in the untreated control (8.17 cm). The number of secondary roots also showed similar trend as that of the length of the tap root. The length of secondary roots was noticed at the 150 mmol/l salinity level (1.29 cm) induced which was the highest in the control (5.73 cm). The number of secondary roots (0 – 12) and the root dry weight (1.04 - 4.11 mg) also found to decrease with increased salinity stress. There are almost no secondary roots in highest salinity level of treatment imposed. The negative relationship between taproot length and the salinity level showed that the seedlings with comparatively more seedling taproot length may be an important parameter in the selection of Okra genotypes though this is a preliminary study.

IMPACT OF CLIMATE SMART PRODUCTION TECHNOLOGIES AND PRACTICES IN SOYBEAN (*GLYCINE MAX* L.) THROUGH FRONTLINE DEMONSTRATIONS IN DHAR DISTRICT OF MADHYA PRADESH

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Abstract

A study was carried out to analysis the yield gaps and economics in soybean (*Glycine max* L.) through frontline demonstrations by Krishi Vigyan Kendra, Dhar, Madhya Pradesh at tribal farmers' fields of Dhar district for productivity enhancement and livelihood security. The highest yield (1770 kg/ha) of soybean was recorded in recommended practice whereas the minimum yield (1244 kg/ha) was recorded in farmers' practice under rainfed conditions during the year 2020-21. An increase of 42.52% in yield with demonstration over farmer's practice was recorded. The technological gap (430 kg/ha), extension gap (526 kg/ha) and technological index (19.54%) was recorded under frontline demonstrations. The maximum average gross monetary returns (Rs. 79668/ha), net monetary returns (Rs. 49038/ha and profitability (2.60) was recorded under demonstration over farmer's practice gross monetary returns (Rs. 55980/ha), net monetary returns (Rs. 31530/ha and profitability (2.29) during 2020-21. The maximum yield was recorded in demonstration plots over local check due to adoption of innovative knowledge and full package of practices.

HEN AGE RELATION WITH EMBRYONIC MORTALITY AND HATCHABILITY TRAITS IN PUNJAB RED

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Abstract

In poultry, efficiency of production and profitability depends largely on traits like fertility and hatchability. The present study was conducted on Punjab red breed of chicken categorized into five age groups with 5 weeks duration *viz.* group I (28-32 weeks), group II (33-37 weeks), group III (38-42 weeks), group IV (43-47 weeks) and group V (48-52 weeks) at Hatchery Unit, Directorate of Livestock Farms, GADVASU, Ludhiana. About 2916 eggs, along the five age groups, were examined for fertility, hatchability and embryonic mortality traits to study the effect of age of the breeder flock on these traits. The embryonic death were categorized into three distinct stages: early embryonic mortality (7 days), mid embryonic mortality (8-17 days) and late embryonic mortality (18-21days). Various malpositions and malformations leading to embryonic mortality were also studied. The study concludes the significant ($p<0.05$) effect of breeder age on all the traits except for mid embryonic mortality. The fertility and hatchability (out of fertile eggs and total egg set) were found to show an increasing trend up to the peak production periods of first three age groups, followed by decrease in the values due to increased embryonic mortality in the later groups. Late embryonic mortality recorded higher deaths than early embryonic mortality, revealing a biphasic pattern of embryonic deaths over the incubation period. Among the various types of malpositions, foot over head was found to have higher frequency but non-significant effect of breeder age. Of the total embryonic mortality, malformations were found to be only 1 per cent having no effect of the breeder age.

CLIMATE-RESILIENT ADAPTATION STRATEGIES IN POTATO PRODUCTION AND MAJOR FACTORS INFLUENCING IT IN KARNATAKA, INDIA

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Abstract

The World is already experiencing climate change and it has profound effects on both agriculture and horticulture. Hence present study attempts to identify climate resilient adaptation strategies in potato production and factors influencing it in Karnataka, India. For the study Kolar and Hassan districts were considered based on their vulnerability status and potato crop was selected for the analysis. Primary data for the study were collected from 160 sample respondents through well structure, pre-tested interview schedule during 2021-22. To achieve the proposed objectives, descriptive statistics and binary logistic regression was employed. The study identified six major climate-resilient adaptation strategies adopted by the respondents in potato cultivation such as early sowing, more than the recommended dose of pesticide application, preventive plant protection measures (in advance), improving water captures, drying of seed tubers before sowing and adapting heat/drought resistant varieties. Among six strategies, majority (92.50 % of Kolar and 72.50 % of Hassan) of the respondents adopted improving water captures as a major adaptation strategy. Binary regression revealed that education, family size, organizational participation, farming experience, access to weather alerts, and awareness of climate change had positive and significant impact on adaptation behavior of the sample respondents.

CURRENT STATUS OF PHYTOSANITARY INSPECTION UNDER INDIAN CONTEXT

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Abstract

The present study was undertaken to review the current status of phytosanitary inspection under Indian context. During the transportation of plant commodities, *i.e.*, import and export by different countries at the national and international level, often new pest species enter a particular area causing a new pest problem. To prevent the entry of new pest species, intensive

monitoring is done during each transportation of plant commodities by a particular country. This process of intensive monitoring is called plant quarantine. During the intensive monitoring on plant quarantine stations, plant commodities are gone under routine test, fumigation and suspected plant commodities are destroyed if required. After that, the plant commodities have been provided phytosanitary certificate by the plant quarantine station before being sent to the place of further transportation. The plant quarantine is governed by a particular country through their respective legislation. The plant quarantine in India is governed by plant quarantine law (DIP Act, 1914 and PQ order, 2003 of DIP Act, 1914). The Government of India operates phytosanitary certificate, plant quarantine stations and pests of quarantine importance by Directorate of Plant Protection, Quarantine and Storage (DPPQS), Faridabad, Haryana. The phytosanitary certificate is provided by the plant quarantine station before sending the plant materials further to the desired place by the concerned government agency. The plant quarantine begins with phytosanitary certificate which is based on phytosanitary inspection. The phytosanitary inspection is one of the crucial stages under plant quarantine. Any kind of lose the phytosanitary inspection will be losing the trust of phytosanitary certificate. The import and export industry of plant commodities has been increased during the recent years. It provides job opportunities to professionals as phytosanitary experts to collaborate government agency for the encouragement of this import and export industry.

EFFECT OF DIFFERENT SOWING DATES ON OCCURRENCE OF MAIZE STEM BORER, *CHILO PARTELLUS* (SWINHOE) IN *KHARIF* MAIZE

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Abstract

The present investigation was conducted on Agronomy Farm, Rajasthan College of Agriculture, MPUAT, Udaipur during *Kharif* 2018 with the objective of seasonal incidence of maize stem borer, effect of different sowing dates on its incidence and their correlations with the environmental factors. During the crop season in *Kharif* 2018, the maximum leaf injury (8.30 mean LIR) by *Chilo partellus* was recorded in the second week of August at 30th days after sowing. The dead heart incidence first appeared during last week of July and reached to its peak (3.00 per cent) during second week of August at 30th days after sowing. The pest showed significant negative correlation with mean relative humidity but non-significant with mean atmospheric temperature and total rainfall. During crop season, the effect of six dates of sowing was observed on the basis of seasonal mean the maximum larval population was recorded in the second date of sowing (6th August), while minimum larval was found in the last date of sowing (3rd September) in both varieties. However, in the first date of sowing *C. partellus* larval population showed a significant positive correlation with mean atmospheric temperature in both the varieties. In the last date of sowing *C. partellus* larval population showed a significant positive correlation with total rainfall in maize variety Pratap Hybrid Maize-3. While, in the first and last date of sowing *C. partellus* larval population showed a significant positive correlation with total rainfall in maize variety Pratap QPM. *C. partellus* larval population showed a significant positive correlation in different dates of sowing. The overall results indicate that the per cent infestation of maize stem borer can be minimized by sowing the crop in mid-July.

IMPACT OF CLIMATIC VARIABLES ON POTATO YIELD IN MAJOR POTATO GROWING DISTRICTS OF KARNATAKA

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Abstract

Climatic factors had a greater impact on the crop productivity. In the present study, an attempt was made to examine the impact of climatic factors on potato yield in major potato growing districts of Karnataka. For the study Kolar, Hassan and Chikkamagaluru districts were selected as these districts contributes around 70 per cent to the states' total potato production (2020-21) and climatic factors such as relative humidity (%), minimum temperature (^{o}C), maximum temperature (^{o}C) and rainfall (mm) were considered as these variables are very much essential for potato production. Secondary data on potato yield

and climatic factors was collected from various sources including the Directorate of Economics and Statistics, Government of Karnataka, and NASA power for the period 1980-81 to 2020-21 (40 years). The Coefficient of variation (CV) is used to measure variation in climatic variables for the study period; Multiple Linear Regression (MLR) was employed to assess the impact of various climatic factors on potato yield. The results of MLR show that, in Karnataka, rainfall (-0.0095) is negative and significantly influences the potato yield. As far as concerned with major potato growing districts, minimum temperature (6.7091) had positive and significant impact on potato yield in Kolar district, and maximum temperature (3.8401) is positively related to yield in Hassan district. Relative humidity (-3.6260) had negative and; rainfall (0.0096) had positively influences the potato yield in Chikkamagalauru district. Given these impacts of climatic variables, it is proposed that policymakers should support research into the development of climate-resilient potato varieties and adaptation strategies to mitigate the adverse impact of climate change on potato production in the study area.

RESPONSE OF CHRYSANTHEMUM (*CHRYSANTHEMUM MORIFOLIUM* RAMAT.) TO THE INOCULATION OF BIO-INOCULANTS AT GRADED LEVELS OF POTASSIUM FOR GROWTH, FLOWERING, YIELD AND QUALITY UNDER PROTECTED CONDITION

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Abstract

An experiment was conducted to investigate the response of Chrysanthemum (*Chrysanthemum morifolium* Ramat.) to the inoculation of bio-inoculants at graded levels of potassium for growth, flowering, yield and quality under protected condition at the department of Horticulture, College of Agriculture, and Shivamogga during 2022. Ten treatments were replicated thrice in Randomized Complete Block Design. The treatments comprised of T1- 100% RDF, T2- 100% NPK + KSB, T3- 100% NPK + KSF, T4- 100% NPK+ KSB+ KSF, T5-100% N & P+ 75% K+ KSB, T6- 100% N & P+ 75% K + KSF, T7- 100% N & P+ 75% K + KSB+ KSF, T8-100% N & P+ 125% K+ KSB, T9- 100% N&P+ 125% K + KSF and T10- 100% N&P+ 125% K+ KSB+ KSF. The results were recorded significantly the highest plant height (60.04 cm), stem girth (6.57 mm), intermodal length (2.80 cm), leaf area (5254.66 cm2/plant), minimum number of days for first flowering (64.43), 50 *per cent* flowering (94.33), maximum duration of flowering (71.67), individual flower weight (6.36 g), flower diameter (6.69 cm), shelf life (7.17 days), vase life (12.00 days), maximum number of flowers per plant (96.65) and flower yield per m2 (4.15 kg) and per poly house (2324 kg/560 m2) in the T7 - 100% N & P+ 75% K + KSB+ KSF compared to all other treatments studied including check T1.

MORINGA-THE MIRACLE TREE : A BOON FOR AGROFORESTRY

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Abstract

Moringa oleifera (Lam.) is one of the important species of the family Moringaceae, which is indigenous to the sub-Himalayan part of northwest India. Moringa is a fast-growing tree with a softwood trunk reaching a height of up to 12m. From an area of 38000 ha, it provides annual production of 2.30 million tonnes. Andhra Pradesh ranks 1st in both area and production followed by Karnataka and Tamil Nadu. *Moringa oleifera* propagation is achieved either by sowing or cutting. This research focuses on different perspectives of moringa like its nutritive capability, genetic variability, and diversity, morphological/phenotypic variability, media effects on its growth, and extracts composition. Several bioactive compounds were found in the leaves of *Moringa oleifera* such as vitamins, carotenoids, polyphenols, phenolic acids, flavonoids, alkaloids, glucosinolates, isothiocyanates, tannins, saponins, oxalates, and phytates. A study reported that 8g of dried leaves powder will satisfy a child within the age of 13 years with 14% protein, 40 % calcium, 23 % iron, and 19 to 47% oil known commercially as ben oil (Mechanical screw press yielded 90.5%, while the solvent extraction method yielded 181% of vegetable oil). In India, accessions collected from Thiruvananthapuram are the best with remarkably high fruit length, girth, weight, and yield

followed by central and southern Kerala. Medium containing weathered sawdust and sawdust plus poultry manure gave the highest total percentage emergence and was comparatively favorable with the topsoil medium. Moringa-based agroforestry showed that the profitability is four times higher and more attractive than other land-use systems. Alley cropping with this tree decreases soil acidity. It can be concluded that Moringa could combat malnutrition by alternative to buying costly nutrients for improving nutritional status cheaply.

INTEGRATED NUTRIENT MANAGEMENT FOR SUSTAINABLE AGRICULTURE

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Abstract

Integrated nutrient management (INM) is not a new concept. It is an age-old practice when almost all the nutrient needs were met through organic sources to supply secondary and micronutrients besides primary nutrients. The basic concept of INM is the maintenance and improvement of soil fertility through integrating various nutrient resources along with fertilizers for sustaining crop productivity on long-term basis. The concept includes key areas like, maintenance/adjustment of soil fertility, optimum plant nutrient supply, sustaining desired level of productivity, optimization of benefits from all possible sources of nutrients and addressing environmental concerns. This may be achieved through combined use of all possible sources of nutrients and their scientific management for optimum growth, yield and quality of different crops and cropping systems. This concept of nutrient management assumed greater significance in recent years because of two reasons. First, the need for continued increase in agricultural production and productivity requires growing application of nutrients and the present level of fertiliser production in India is not enough to meet the entire plant nutrient requirement. The impending demand-supply gap of about 10 million tonnes of plant nutrients is likely to widen further in view of steep hike in the prices of P&K fertilisers and raw materials. Second, a large number of experiments on INM, particularly long-term experiments (LTEs) conducted in India or elsewhere reveal that neither the fertilisers nor the organic sources in isolation can achieve sustained production under intensive cropping. Even the so called balanced use of fertilisers will not be able to sustain high productivity due to emergence of secondary or micronutrient deficiencies over time. The interactive advantages of combining organic and inorganic sources of nutrients in INM have proved superior to the sole use of these sources.

AN EXTRA LONG SLENDER HIGH YIELDING RICE VARIETY 'VL *DHAN* 70' FOR CULTIVATION UNDER ORGANIC CONDITION OF UTTARAKHAND HILLS

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Abstract

The new variety VL *Dhan* 70 is an irrigated transplanted medium duration rice variety suitable for cultivation under organic condition of Uttarakhand hills. This has been released by the State Seed Sub-Committee (SSSC), Uttarakhand and notified by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops, New Delhi vide S.O. 4065(E) dated 31st August, 2022. It is an extra long slender (kernel length 7.60mm & LB ratio 3.52) rice variety which has been developed by crossing of VL Dhan 85/VOHP 3102 at ICAR-*Vivekananda Parvatiya Krishi Anusandhan Sansthan*(VPKAS), Almora. This variety is resistant against major diseases like leaf and neck blast (score 1-3), brown leaf spot (score 3-4), and grain discoloration (score 0-1) and also found tolerance against stem borer and leaf folder (score 0-3). It also possess very good quality traits like 79% hulling, 68% milling, 54% head rice recovery, intermediate amylose content of 20.72% and 9.12% protein. It has plant height 100-110cm and matures in 125-130 days. During three years of testing under organic conditions in SVT, this variety has an average yield of 3,944 kg/ha and has shown significant yield advantage of 11.35 per cent over the best check Pant Dhan 12, 13.92 per cent over Pant Dhan 26 and 15.71 per cent over Vivek Dhan 62 in Uttarakhand hills. This variety is replacement of 15 years old variety VL Dhan 65 (2007 notified) under organic condition. This variety possesses semi-erect, semi-dwarf and non-lodging plant type, green basal leaf sheath colour, erect to semi erect flag leaf, semi-erect, semi-straight and well exerted panicle, awless grains and straw apiculus colour.

This variety has also been found responsive and shown superiority over the check varieties at both lower and normal nitrogen fertility level. This will help in yield stabilization of hill farmers and fulfill the requirement of varietal diversification of rice growers as well as demand of fine grain rice by youth of hills.

STUDIES ON ANTIBACTERIAL, ANTIOXIDANT ACTIVITIES AND PHYTOCHEMICAL CONSTITUENTS OF *PHLOMIS BRACTEOSA* ROYLE EX BENTH.

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Abstract

Aerial part of *Phlomis bracteosa* Royle ex Benth. was analyzed for antibacterial, antioxidant activities, and for their phytochemical constituents. Antibacterial activity of acetone and methanol extracts of aerial part of *Phlomis bracteosa* was evaluated by using MIC method against five human pathogenic bacteria (*Staphylococcus aureus, Listeria monocytogenes, Bacillus cereus* and *Escherichia coli*) and antioxidant activity by DPPH free radical scavenging assay and Reducing power method. Also, phytochemical constituents were analyzed by preliminary and GC-MS methods. Acetone extract showed higher antibacterial activity against all the selected bacteria except *E. coli*. In case of antioxidant activity, acetone extract showed better IC_{50} and EC_{50} values than methanol extract. GCMS chromatograms gave 34 and 25 peaks for acetone and methanol extracts, respectively.

RESIDUAL AND CUMULATIVE EFFECT OF ORGANICS AND INORGANIC P ON SOYBEAN (*GLYCINE MAX*) ONION (ALLIUM CEPA) PRODUCTION SYSTEM IN A HIGH P ALFISOL

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Abstract

A field experiment was conducted during kharif (soybean) and rabi (onion) seasons in a sandy clay loam, at college farm, College of Agriculture, Rajendranagar, Hyderabad to study the response to P levels (0, 30 and 60 kg P_2O_5 ha^{-1}) either alone or in combination with PSB @ 5 kg ha^{-1} , biochar @ 5 t ha^{-1} , humic acid @ 20 kg ha^{-1} and citric acid @ 10 mM concentration to study the direct, residual and cumulative effects of the treatments imposed on yield of soybean(direct) and onion (Residual and Cumulative). The mean seed yield of the soybean with biochar was 2077 kg ha^{-1} , which was significantly higher against the control seed yield of 1329 kg ha^{-1} , PSB seed yield of 1287 kg ha^{-1} and citric acid yield of 1463 kg ha^{-1} . Among the organics, biochar application lead to a statistically significant positive effect on both biomass and yield. Biochar resulted in a significant increase in mean onion yield to 22.1 t ha^{-1} against 15.8 t ha^{-1} when organics were not supplemented, the yield response being 39.9 per cent across inorganic P and mode of effect. In onion, among organics, biochar application led to a statistically significant positive effect on both biomass and yield. Biochar resulted in a significant increase in mean onion yield to 22.1 t ha^{-1} against 15.8 t ha^{-1} when organics were not supplemented, the yield response being 39.9 per cent across inorganic P and mode of effect. Cumulative effect was found to show significant influence resulting in a mean yield of 21 t ha^{-1} which was higher by 22.1 per cent as against 17.2 t ha^{-1} due to the residual effect.

CHALLENGES IN PAPAYA CULTIVATION

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Abstract

Papaya (*Carica papaya* L.) belongs to the family Caricaceae and is a highly nutritive crop, rich in vitamins and minerals, especially vitamin A (2020 IU) and ascorbic acid (40-60mg/100g), including dietary fiber. It has attained the status of a commercially and industrially important tropical fruit crop in India over the past decade. India is the largest producer and

consumer of papaya covering an area of 1.44 lakh ha, producing 57.80 MT/ ha, and has vast export potential. India, though ranks first in area and production of papaya, still lot of challenges which curtail the production which needs to be addressed. Its cultivation is challenged by various factors such as Papaya Ring Spot Virus, Papaya mealy bug, root rot incidence, variations in seed propagation, malformation of fruits and lack of fruit set due to weather fluctuations, poor shelf life of fruits etc. To combat these problems, several technologies have been standardized like vegetative propagation through grafting, protocol for tissue cultured plants, balanced fertilizer application, integrated water and nutrient management practices, use of bio-fertilizers and bio control agents, adoption of precision farming practices viz., raised bed cultivation, fertigation, plastic mulching, micro nutrient foliar spray, besides management practices for Papaya Ring Spot Virus disease and nematodes.

VERMICULTURE : A VIABLE SOLUTION FOR SUSTAINABLE AGRICULTURE

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Abstract

Organic wastes are evolving into a significant environmental issue. The immense economic growth, industrialisation and urbanisation over the last few decades have resulted in massive amounts of organic waste generation and build-up, which is causing havoc on the ecosystem. Another globally significant concern is the use of high cost agrochemicals due to rising food demand, which has increased food output at the expense of the environment and human health all over the world. The growing global population has led in increased consumption of products and services, which has resulted in a significant increase in organic waste generated by households, industry and agriculture. Since they contain a range of harmful microbes, a large portion of the organic wastes are extremely infectious. When organic waste is dumped in open spaces, it causes major environmental problems such the build-up of heavy metals in the soil and the nutrient and leach induced pollution of ground and surface waters. These organic wastes when applied directly to agricultural fields cause soil environment related problem including phytotoxicity. However, if handled properly these organic wastes can be used for vermicomposting, it is an effective recycling technology that improves the quality of the products which is disinfected, detoxified and highly nutritive. It is a low cost, eco-biotechnological process of waste managements in which earthworms are used to cooperate with microorganisms in order to convert biodegradable wastes into organic fertilizer. Composting and vermicomposting are well-known practises for biological stabilisation of solid organic wastes by transforming them into a safer and more stabilised material that can be used as a source of nutrients and soil conditioner in agricultural applications. As a result, vermiculture not only manages solid waste but also produces great nutrients. Vermicomposting is beneficial for organic agriculture sustainability and ecosystem balance.

ESTIMATES OF VARIANCE FOR STABILITY ANALYSIS IN OKRA INBREDS (*ABELMOSCHUS ESCULENTUS* (L.) MOENCH) BY R-PROGRAMMING

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Abstract

The study was conducted to examine influence of two different environmental conditions (E1: Recommended dose of NPK (100:60:50 kg/ha) and E2: Biofertilizers (*Azotobacter* + PSB) + 50% N&P + Recom. K) over stability of forty okra genotypes for seed yield and contributing characters. The investigation was carried out in the Department of Vegetable Science, CCSHAU, Hisar under RBD experimental layout with three replications over two *Kharif* seasons in 2020 and 2021. The genotype x environment (G x E) interaction is an estimate of the varying response of genotype to variations in the environment. This interaction can reduce the progress of selection and hinder the identification of stable genotypes. The pooled analysis of variance over four environments reported that the mean sum of square due to environment was significant when tested against pooled error which indicated that, environments were effective in influencing the performance of the

genotypes. The difference among genotype revealed significant variation for all the traits across the environment. This indicated high genetic variability among genotypes which interacted differentially to different environments. The environments+(genotypes x environments) interaction was observed to be significant for all the traits and further partitioning of environments+(genotypes x environments) component of variation revealed that the environments (linear) components of variation to be significant for all the characters. This indicated that variation among environments was linear which signifies unit change in environmental index for each unit change in the environmental conditions. However, linear component was significantly higher than the non-linear portion of the G x E interaction. the pooled deviation was significant for all the characters except days to 50% flowering, and fruit diameter which suggested that the deviation from linear regression also contributed substantially towards the difference in stability of genotypes. Thus, both linear and non-linear components contributed significantly to the genotypes x environments interaction.

EFFECT OF FERTIGATION AND MULCHING ON GROWTH AND YIELD OF PINEAPPLE CV. SIMHACHALAM

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Abstract

The effect of fertigation levels with and without plastic mulching on the vegetative growth of pineapple variety 'Simhachalam' was studied in plant and ratoon crops at experimental research farm of Odisha University of Agriculture and Technology, Bhubaneswar during 2016-19. Different levels of the recommended fertilizers with and without mulching were tried along with a control. In both the plant and ratoon crops, fertigation with full fertilizers and black plastic mulch resulted in maximum values in plant height (99.4 cm), number of leaves (53.09), plant spread of N-S orientation (89.90cm), plant spread E-W orientation (83.50 cm), D leaf length (60.95 cm, 84.50cm), width (3.74cm, 4.53cm) and area (206.43 cm2, 448.16 cm2) both at crop establishment and flower induction stages respectively. Chlorophyll contents were not affected by the treatments. However, chlorophyll a, chlorophyll b and total chlorophyll content were observed highest under mulch and full fertilizer doses in form of fertigation with 1.29 mg/g, 1.43 mg/g and 2.44 mg/g, respectively. At flower induction stage the same treatment also recorded highest nitrogen content (1.95%) and potassium content (2.53%) in leaves. The yield per plot (34.84 kg) was also recorded highest in the treatment applied with 100% RDF fertigation with mulch.

COST : BENEFIT ANALYSIS OF BOTANICALS AGAINST LEAF SPOT OF MUNGBEAN (*VIGNA RADIATA* L.) CAUSED BY *CERCOSPORA CANESCENS*

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Abstract

The present experiment was conducted under *in vivo* conditions to observe the effect of botanicals against *Cercospora canescens.* Six treatments with three replications were taken in Randomised Block Design. To manage the disease an investigation was carried out in the research laboratory of Department of Plant Pathology, SHIATS-DU, Allahabad where the efficacy of different plant extracts *viz.* Neem (*Azadirachta indica*), Dhatura (*Datura stramonium*) Garlic (*Allium sativum*) Arjun (*Terminalia arjuna*), Aswagandha (*Withania somnifera*) and Alovera (*Aloe barbadensis*) @ 10% against *Cercospora canescens* were evaluated. *Azadirachta indica* was found to be the most effective treatment and recorded minimum disease intensity (25.69%), maximum no. of pod per plant, maximum weight of pod (g) and yield (q/ha) followed by *Terminalia arjuna,* Alovera leaf, *Withania somnifera, Datura stramonium* and *Allium sativum.* The cost of each treatment including material and labour were calculated and the revenue of each derived using the value of the marketable yield of mungbean. The cost: benefit ratios of sprayed treatments were derived by comparing the cost of each plant protection regime against the additional market value of the treatment yield above that obtained in the control treatment. With the exception of plots sprayed with botanical, the cost of plant protection using attack was higher than any of the botanicals in both seasons. The highest cost: benefit ratio of 1: 2.23 was observed for plots sprayed with extract of neem leaf @ 10% as compared to untreated control

(1:1.14) followed by Arjun leaf @ 10% (1:2.13), Alovera leaf @ 10 (1:2.08), Aswagandha leaf @ 10% (1:1.85), Dhatura leaf @ 10% (1:1.80) and Garlic clove @ 10% (1: 1.51). Botanical agents differed markedly in levels of disease control and cost: benefit but some were comparable to that from conventional fungicides use whilst being produced easily from locally available plant materials and are likely to be safer to use for smallholder farmers and consumers in developing countries.

EFFECT OF INTEGRATED USE OF ORGANIC AND INORGANIC SOURCES OF NUTRIENTS ON NUTRIENT CONTENT AND UPTAKE OF SWEET CORN

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Abstract

A field experiment was conducted to study the effect of integrated use of organic and inorganic sources of nutrients on growth and nutrient content of sweet corn in Alfisols of Hyderabad. The exerimental plot was laid out with 8 treatments with 3 replications. The results revealed that the highest nitrogen content and uptake (1.10 %, 141.47 kg ha^{-1} was observed with the application of 75% RDF + poultry manure @2. 5t ha^{-1} and it was on par with the application of entire dose of recommended NPK through fertilizers followed by 75% of the recommended dose through fertilizers along withvermicompost @ 2.5 t ha^{-1} and 75% recommended dose through fertilizers along with FYM @ 5 t ha^{-1}, 50% RDF + poultry manure @ 2.5t ha^{-1}. These are on par with each other and significantly superior to other treatments. However the uptake of nitrogen 64.37 kg ha^{-1} was recorded lowest with the control. Similar trend was observed at 30 DAS, 60 DAS. The highest Phosphorus and Potassium contents and uptakes were observed as (0.31 %, 39.20 kg ha^{-1}), (1.17 %, 149.5 kg ha^{-1}) respectively at harvest in the same treatment which was applied with 75% RDF + poultry manure @2. 5t ha^{-1} . Similar trend was observed for Phosphorus and Potassium at 30 DAS, 60 DAS. The highest green cob yield was also observed with the integrated nutrient management practices but it was on par with the treatment applied with inorganic fertilisers ie., 100 % recommended dose of fertilisers.

ISOLATION, PURIFICATION, IDENTIFICATION AND PATHOGENICITY OF *SCLEROTINIA SCLEROTIORUM* (LIB.) DE BARY CAUSED SCLEROTINIA ROT OF CHICKPEA

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Abstract

Sclerotinia sclerotiorum (Lib.) de Barry is a soil-borne plant pathogen, capable of infecting more than five hundred host plant species worldwide and plays a crucial role in reducing the yield of economically important crops. Sclerotinia rot also known as stem rot, caused by *Sclerotinia sclerotiorum* is a serious disease of chickpea. We conducted an experiment in which, a series of fungal isolation, purification, identification and pathogenicity from the infected plant parts. The plant show typical symptoms like drooping of petioles and leaflets and in advance stage scattered sclerotial bodies. The infected isolates may be seen on the affected tissues after re-inoculation and produced mycelia growth and sclerotia both plants and culture plates. On re-isolation it was found that the fungus was identical to the original isolate. It was observed that the infection was much higher in inoculated plants as compared to control.

MATERNAL INVOLVEMENT AND ATTITUDE TOWARDS PRE-SCHOOL EDUCATION

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Abstract

A study on "Maternal involvement and attitude towards preschool education" was conducted in Dharwad taluka during 2010-11. Mothers of preschool children (200), residing in rural and urban area of Dharwad taluka were selected for the study. The results of the present investigation revealed that majority of the mothers from rural (75.0%) and urban (56.0%) area had

medium level of involvement and 44 percent of mothers from urban and 25 percent mothers from rural area had high level of involvement with their children. Mothers from both urban and rural (75.0% and 85.0%) area had average attitude towards preschool education and none of mothers from both the locality had unfavourable and highly unfavourable attitude towards preschool education. Maternal involvement with their children and attitude towards preschool education did not vary according to age, gender and ordinal position of the child. Maternal involvement and their attitude towards preschool education was positively and significantly related. Hence as the mother's involvement with their children increased, their attitude towards preschool education also increased.

EFFICACY OF BIOAGENTS AGAINST SCLEROTINIA ROT OF CHICKPEA INCITED BY *SCLEROTINIA SCLEROTIORUM*

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Abstract

Sclerotinia sclerotiorum (Lib.) de Barry is a soil-borne plant pathogen, capable of infecting more than 500 host plants worldwide. It is a major pathogen that plays a crucial role in reducing the yield of economically important crops. Sclerotinia rot also known as stem rot or white mold, caused by *Sclerotinia sclerotiorum* is a serious disease of chickpea. The antagonistic potential of four bioagents i.e. *Trichoderma harzianum* (Th-BKN), *Trichoderma viride* (Tv-BKN), *Pseudomonas fluorescens* (Pf-BKN) and *Bacillus subtilis* (Bs- BKN) were isolated from chickpea rhizospheric soil. The fungal bioagents were tested for their antagonistic potential against the pathogen *in vitro* by modified dual culture technique on potato dextrose agar (PDA) medium. While bacterial antagonists tested for their antagonistic potential against the pathogen *in vitro* by paper disc inoculation technique on Nutrient Agar (NA) and Pseudomonas Agar Fluorescens (PAF) media. Each treatment was replicated four times, incubated at 23±10ºC, data on the antagonistic activity of different bioagents were recorded and percent inhibition was calculated for each antagonist. The fungal antagonists *T. harzianum* (Th-BKN) resulted in maximum growth inhibition of the pathogen (70.48%) and bacterial antagonists, *Pseudomonas fluorescens* (Pf-BKN) (37.56%) was more effective than the *Bacillus subtilis* (Bs- BKN).

EFFECT OF DIFFERENT GROWING ENVIRONMENTS ON MICROCLIMATE PROFILES AND PAR INTERCEPTION IN *BT* COTTON

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Abstract

Plants' microclimate has a crucial role to play in regulating and affecting their physiological reactions as well as their energy exchange activities. In this context, field experiment was laid out at Research Farm, Department of Agricultural Meteorology, CCS HAU, Hisar, during the *Kharif* season 2020 with *Bt* cotton hybrid RCH 773 BGII sown at three times (19th April (D1), 8th May (D2) and 28th May (D3)) and three sub plot treatments as plant spacings (67.5 cm x 60 cm, 100 cm x 45 cm and 100 cm x 60 cm) in split plot design and replicated by three times. The results revealed that at 0800 hours in morning an inverse trend (*i.e.* increase in temperature with height inside the crop canopy) of temperature profiles was observed while during 1800 hours in evening temperature profiles were found to be lapse in nature (*i.e.* temperature decrement with height in the crop canopy). Temperature profiles during noon hours (1400 hours) remained to be isothermal (*i.e.* almost same temperature with height in the crop canopy). Late sown crop on 28th May (D_3) and wider spacing 100 × 60 cm resulted in high diurnal range of temperature as compared to early sown (19th April and 8th May) and narrow spaced cotton crop (100 × 45 cm and 67.5 × 60 cm) which reduced the crop growing period and resulted the seed cotton yield to be declined with delayed sowing and opposite trend was found in case of relative humidity. Accumulated Intercepted photosynthetically active radiation (IPAR) increased with crop growth with its peak value at 135 DAS in all the treatments during the entire growing period and found maximum in early sown 19th April and narrow spaced 67.5 x 60 cm *Bt* cotton crop.

STUDIES ON DIVERSITY, DISTRIBUTION AND RELATIVE ABUNDANCE OF INSECT POLLINATORS ON *BERGENIA CILIATA* (HAW.) STERNB. AND *VINCA MAJOR* (LINNEAUS) IN SHIMLA HILLS, HIMALAYA

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Abstract

Medicinal plants are highly valuable and most of them depend on insect pollinators for their reproduction. Therefore, it is important to study the insect pollinators for the conservation of medicinal plants in the Himalayan regions. The present study on diversity and distribution reveals a total of 29 insect pollinators collected on two medicinal plants i.e. *Bergenia ciliata* (Haw.) Sternb. and *Vinca major* (Linnaeus) in different localities of Shimla Hills, Himalayas. Of these 29 insect pollinator's species, 8 species has been collected on *Bergenia ciliata* (Haw.) Sternb. belongs to 3 orders i.e. Coleoptera, Hymenoptera and Diptera.Whereas 24 species has been recorded and collected on *Vinca major* (L.) under four orders i.e. Coleoptera, Hymenoptera, Lepidoptera and Diptera. Beside diversity & distribution study has also been conducted on the relative abundance of insect pollinators on these two medicinal plants. During this study period it has been observed that dipterans were the most abundant insect pollinators of *Bergenia ciliata* (Haw.) Sternb. in all the four localities i.e. Dhalli (80%), Kufri (63.41%), IGMC (60.86%) and Fagu (64%), whereas lepidopterans were the most abundant insect pollinators of *Vinca major (Linnaeus)* at Dhalli (60.76%), Summerhill (58.46%), Chauda Maidan (58.95%), IGMC (57.42%), Kasumpti (63.20%) and Chotta Shimla (63.06%).

STUDIES ON LIVER ENZYMES AND OXIDATIVE STRESS IN DYSTOCIA AFFECTED DOES

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Abstract

The present research work was undertaken to evaluate the liver enzymes activity, oxidant and antioxidant profile in does affected with dystocia and compared with normal kidded does. A total of 18 does comprised of 12 dystocia affected and 6 normal kidded does were studied. These dystocic does were further divided in maternal dystocia Group 1(n=6) and fetal dystocia Group 2 (n=6) while normal kidded does of Group 3(n=6) were served as a control group. Blood samples were collected just prior to relive the dystocia/kidding, just after relive the dystocia/kidding, on the day 7th and 11th of obstetrical manuvarium/day of kidding. Plasma was harvested by centrifugation of blood samples and liver enzymes (AST, ALT, and AKP), oxidant profile LPO in terms of MDA, and reduced glutathione (GR) as an antioxidant was estimated. The results indicated that the enzymes AST varied significantly ($P<0.05$) between the groups as well as various periods, ALT varied significantly ($P<0.05$) with in the groups while AKP varied significantly ($P<0.05$) for various periods. On analyzing the data of LPO (in terms of MDA) statistical ($P<0.05$) difference was obtained between different groups without any significant variations in periods and glutathione reductase (GR) varied significantly ($P<0.05$) between the groups as well as periods.

AGROFORESTRY FOR SUSTAINABLE RURAL LIVELIHOOD

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Abstract

Adequate and sustainable access to income and resources such as adequate access to food, drinking water, health facilities and education to meet basic needs is a lifeline. Maintaining a livelihood is a major challenge facing policymakers and decision-makers in the current situation. In this context land-use measures that maintain livelihood security and reduce climate and climate change are needed (Basu, 2018). Agroforestry can play a key role in bringing about the desired level of diversity, agricultural productivity and sustainability. Agroforestry has the potential to provide food security and help reduce poverty

and its contribution to environmental protection *i.e.* soil conservation, carbon intake is very important. Traditional farming and management such as agro-forestry may offer livelihood options by simultaneously producing food, fodder and firewood and minimizing the impact of climate change. Agroforestry contributes to sustainable rural livelihoods provinces where the predominant means of livelihoods is rural subsistence farming and agriculture.

PERFORMANCE OF INTEGRATED WEED MANAGEMENT ON GROWTH, PRODUCTIVITY, PROFITABILITY AND NUTRIENT UPTAKE OF IRRIGATED INDIAN MUSTARD CROP (*BRASSICA JUNCEA* L.)

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Abstract

The trial was drawn with the aiming impact on growth, yield, nutrient uptake and economics of mustard crop in gird zone by using of integrated weed management practices in *Rabi* season during 2021-2022 at agronomy research farm, college of agriculture, Gwalior, RVSKVV in Randomized Plot Design with ten treatments replicate thrice on sandy clay loam soil. Studied traits included plant height, number of branches/plant, number of leaves /plant, no. of siliquae/plant, no. of seeds/plant, test weight, biological yield, seed yield, Nitrogen, Phosphorus and Potassium uptake kg/ha by mustard crop, Net income and B:C. It could be concluded that from one year experimental result the application of Pendimethalin 30 EC, 750 g a.i./ha PE + HW at 45 DAS was registered highest growth characterstics, yield contributing characterstics, yield of seed (2027 kg/ha) and stover (5502 kg/ha), nutrient (N,P&K 46.55,11.23&12.15 kg/ha) uptake of crop and Net return (81935 Rs/ha) and B:C.(3.7). The treatment of Pendimethalin 30 EC, 750 g a.i./ha PE + HW at 45 DAS increased seed yield of mustard 119% and 11% to weedy check and Two hand weeding at 30 and 60 DAS, Respectively.

POTENTIAL OF PRECISION HORTICULTURE FOR URBAN AGRICULTURE AND VERTICAL FARMING

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Abstract

Precision horticulture has significant potential for urban agriculture and vertical farming due to its ability to optimize resource use, reduce waste, and increase productivity in limited spaces. The potential of precision horticulture in urban agriculture and vertical farming by analyzing current trends and advancements in the field. The use of precision horticulture technologies such as hydroponics, aeroponics, and aquaponics to maximize crop yields and quality in controlled environments. It also discusses the role of precision horticulture in addressing food security challenges in urban areas, reducing transportation costs and carbon footprint, and improving public health by providing fresh, nutritious, and locally grown produce. Furthermore, emphasizes the importance of interdisciplinary collaboration between horticulture, architecture, and engineering to design and develop effective systems for urban agriculture and vertical farming.

FORECASTING OF WATER TABLE FLUCTUATION USING ARTIFICIAL NEURAL NETWORK AND SENSITIVITY ANALYSIS OF ALGORITHM FOR PRIYADARSHANI WATERSHED

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Abstract

Groundwater is a vital resource that supports various human activities, including agriculture, industry, and domestic use. It

also plays a crucial role in maintaining healthy ecosystems and preserving biodiversity. ANNs are able to learn complex non-linear relationships between input and output variables from data, without requiring explicit knowledge of physical parameters or equations. To develop an artificial neural network (ANN) model, data sets are required for training, validation, and testing the ANN networks. In this study, various data sets such as observed rainfall data, infiltration data, water level, permeability data, temperature data, and solar data have been used to train and validate the ANN model. To optimize the ANN model, the Levenberg-Marquardt (LM) algorithm and the Neuro Solutions software were used. LM is widely used for groundwater fluctuations for short period of time. The observed data for LM showed maximum R value 0.9717 for well 2 (2-9-1) with rainfall and permeability as input parameters and minimum R value 0.717 for well 1 (2-9-1) with rainfall and permeability as input parameters and the average R value from all the well predicted from Levenberg- Marquardt is 0.834. Considering sensitivity analysis for all the nine wells of LM the correlation of predicted data and observed data had good correlation by using Levenberg-Marquardt algorithm.

SMART AGRICULTURE IN ADDRESSING CLIMATE CHANGE CHALLENGES AND MITIGATING GREENHOUSE GAS EMISSIONS

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Abstract

Smart agriculture has the potential to address climate change challenges and mitigate greenhouse gas emissions by promoting sustainable farming practices and reducing the environmental impact of agriculture. The role of precision agriculture technologies such as precision planting, precision irrigation, and precision fertilization in reducing greenhouse gas emissions and increasing carbon sequestration. It also discusses the use of renewable energy sources such as solar panels and wind turbines in powering smart agriculture operations, as well as the role of precision livestock farming in reducing methane emissions from animal husbandry. Furthermore, emphasizes the importance of policy support, financial incentives, and public awareness to promote the adoption of smart agriculture practices and ensure their positive impact on climate change mitigation.

ENHANCING SOCIO-EMOTIONAL ADJUSTMENT OF GIRLS ATTAINING MENARCHE AT AN EARLY AGE

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Abstract

Menarche is the first occurrence of menstruation. A lack of menstrual knowledge has been identified across countries as a challenge to positive menstrual experiences. A lack of understanding of menstruation and strategies for hygienic menstrual practices are likely to perpetuate distress over subsequent menses and may contribute to negative effects on health and education. Hence this study on enhancing socio-emotional adjustment of girls attaining menarche at an early age was carried out in three villages i.e Honaganahalli, Savanalli and Hitnalli of Vijayapur taluk, Karnataka. To assess the age at menarche of rural girls and to identify the girls who have attained menarche at an early age. The objectives of the study were to assess the knowledge regarding pubertal changes and their socio-emotional adjustment and to study the impact of educational intervention on socio-emotional adjustment of girls. Questionnaire was prepared and baseline survey was carried out in the selected villages. Social and emotional adjustment was assessed using Bell's adjustment inventory. Fifty girls who attained their menarche at an early age were identified. Results revealed that 68 percent of them were unaware of the age of onset of menstrual cycle, 82 percent were unaware of the scientific background for the onset of menstrual cycle and 78 percent of them were unaware of the nutritious food to be consumed during menstrual cycle. It was found that 68 percent of the respondents had average social adjustment and an equal percentage i.e. 16 percent each had good and poor social adjustment. Further 54 percent of the respondents had poor emotional adjustment followed by 38 percent who had average emotional adjustment and only 8 percent of them had good emotional adjustment. Educational intervention was carried out in collaboration with Family Planning Association of India. Post-test revealed improvement in knowledge and an increase in social adjustment by 18 per

cent and emotional adjustment by 30 per cent. The percentage of respondents whose social and emotional adjustment was poor had reduced by 12 and 40 per cent respectively.

THE FUTURE OF SMART AGRICULTURE AND ITS POTENTIAL FOR TRANSFORMING THE GLOBAL FOOD SYSTEM

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Abstract

Smart agriculture, also known as precision agriculture, has the potential to transform the global food system by increasing productivity, reducing waste, and promoting sustainability. The role of emerging technologies such as blockchain, artificial intelligence, and the Internet of Things (IoT) in enhancing the efficiency and effectiveness of smart agriculture. It also discusses the potential of smart agriculture in addressing food security challenges, reducing the environmental impact of agriculture, and improving the livelihoods of farmers. Furthermore, the emphasizes the importance of interdisciplinary collaboration, public-private partnerships, and policy support in promoting the adoption and scaling up of smart agriculture practices. The concludes by discussing the challenges and opportunities of smart agriculture in transforming the global food system and achieving sustainable development goals.

EFFECT OF INTERVENTION ON SELF-CARE LEVELS OF WOMEN

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Abstract

Self-care is the ability to take care of one's own physical, psychological, emotional and social wellness and wellbeing. Self-care allows individuals to have a healthier, happier and more fulfilled life by assisting in reducing anxiety, depression and burnt-out, in improving coping abilities, inner satisfaction, strong interpersonal relationships and in finding a sense of purpose in life. The present study aimed to enhance self-care levels among women in Adilabad and Komarambheem Asifabad districts of Telangana State. Quasi experimental research design was used and a sample 0f 120 women including 60 rural and 60 tribal participants aged between 25-50 years were drawn by using purposive random sampling method. The findings of the study revealed that the percentage of women in low-level self-care category drastically reduced from 58% to 8%. Simultaneously women in the moderate self-care category enhanced from 29 % to 38% and high category from 13 % to 54%. This clearly indicates that both rural and tribal women with low self-care were upgraded to high followed by moderate levels of self-care. It denotes that the women's capacity to practice physical, psychological, emotional and social care had been improved by the self-care intervention. The results and conclusions drawn from this study may not be generalizable to other populations or regions without further research. Therefore, future studies should consider expanding the scope to include diverse populations, geographical locations, and age groups to establish broader applicability and generalizability of the findings.

THE ROLE OF ARTIFICIAL INTELLIGENCE IN PRECISION HORTICULTURE FOR DECISION MAKING AND CROP PREDICTION

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Abstract

Artificial intelligence (AI) is revolutionizing precision horticulture by enabling decision-making and crop prediction based on

real-time data analysis. The role of AI in precision horticulture by analyzing its potential benefits and challenges in improving crop yield, resource efficiency, and sustainability. The use of AI algorithms in monitoring and analyzing data from sensors, drones, and other sources to optimize crop management practices such as irrigation, fertilization, and pest control. It also discusses the potential of AI for crop prediction, yield estimation, and quality assessment, as well as the challenges related to data collection, processing, and interpretation. Finally, emphasizes the importance of interdisciplinary collaboration between agronomy, engineering, and computer science to develop effective AI models and tools for precision horticulture.

A STUDY ON SENSORY ACCEPTABILITY AND NUTRITIONAL VALUE OF THE FORMULATED BARLEY UPMA PREMIX

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Abstract

Barley is one of the best source of soluble and insoluble fiber which helps in decreasing the risk of chronic disease. Barley is a rich source of â Glucan, iron and it is gluten free hence, it is also beneficial for diseases like hypercholestromia, diabetes and celiac. Four treatments each of 100gm were prepared for upma premix using malted barley flour, semolina, mix vegetables and curry leaf herb. Sensory evaluation of all the four treatments of prepared cheela premix was done by using 9 point hedonic scale. The experiment was replicated five times and the data obtained during the investigation were statistically analyzed by using analysis of variance (ANOVA).Barley was taken as a main ingredient for the formulation of the product as barley is used in human nutrition to improve nutritional health benefit. Four treatments were prepared for upma premix using malted barley flour, semolina, mix vegetables and curry leaf herb. The treatment T2 scored highest for color and appearance, body and texture, taste and flavor and over all acceptability with score (8.34), (8.44), (8.66) and (8.62) respectively. The proximate analysis of the premix resulted in a high increase in fiber, Glucan, iron, Vit C, â carotene, calcium and energy content. The malted barley flour was proved to be nutritious and organoleptically acceptable.

EFFECT OF SOWING DATES, FERTILIZER'S APPLICATION AND GENOTYPES ON GROWTH & YIELD ATTRIBUTES IN IRRIGATED CORIANDER UNDER MALWA PLATEAU OF MADHYA PRADESH

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Abstract

Present investigation was carried out to find out the effect of different sowing dates on plant growth and seed yield and yield attributing traits of irrigated winter season coriander genotypes. Experiment was conducted at experimental farm of KVK, Mandsaur (M.P.) during Rabi season 2018-19 and 2019-20. The treatments comprised of three different sowing dates viz., October 20, 2018 & 2019 (D_1), October 31, 2018 & 2019 (D_2) and November 10, 2018-19 (D_3) two fertilizer levels viz., F_1 - 60:35:35:20 N:P:K:S ha^{-1}, F_2- 80:55:50:35 N:P:K:S ha^{-1} and three genotypes viz., Ajmer Coriander^{-1} (V_1), Ajmer Coriander^{-2} (V_2) and Pant Haritima as a check (V_3). The experiment was laid out in Randomized Block Design with factorial concept in three replications. Observations with respect to seed germination, plant height (cm), No. of primary and secondary branches, Days taken to 50% flowering were recorded for growth parameters whereas, No. of umbels, No. of umbellate, No. of Seeds Umbel^{-1}, Test Weight (g), Seed yield (kg ha-1) for seed yield and yield attributes in each treatment were recorded. Results revealed that parameters like minimum days to germination initiation (8.17), minimum days to complete germination (10.86), plant height at harvest (127.93 cm) were recorded in the plants grown on 20th October date of sowing. Similarly, maximum number of primary branches (8.50), secondary branches (26.73), number of umbel plant^{-1} (40.01), number of umbellate umbel^{-1} (6.81), seed yield plant^{-1} (12.22 g) and seed yield (1532 kg ha^{-1}) was also recorded with 31st October date of sowing.

Irrespective of different sowing dates and genotypes, the fertilizer levels of NPKS 80:55:50:35 (F_2) recorded significantly more umbels (37.13) plant^{-1}, seeds (31.25) umbel^{-1}, seed yield (1544kg ha^{-1}) and 1000 seed weight (11.06g) as compared to F_1 fertilizer level. The maximum gross return and net return was recorded in the crop sown on 31st October (122533, 86373) followed by 20th October (115253, 79053). The trend was observed similar during both the years. The maximum B:C ratio was recorded in the crop sown on 31st October (3.39) followed by 20th October (3.22).

EFFECT OF CLIMATE CHANGE ON LIVESTOCK : CONSEQUENCES, ADAPTATION, AND MITIGATION

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Abstract

Livestock products are an essential agricultural commodity for global food security. Global demand for animal products is predicted to quadruple by 2050, owing mostly to an increase in the global quality of living. Meanwhile, climate change poses a threat to livestock production due to its impact on feed crop and forage quality, water availability, animal and milk production, livestock diseases, animal reproduction, and biodiversity. This review examines the worldwide consequences of climate change on livestock production, the contribution of livestock production to climate change, and particular climate change adaptation and mitigation measures in the livestock industry. Climate variability will limit livestock production because animal water consumption is expected to increase by a factor of three, demand for agricultural lands will increase due to the need for 70% growth in production, and food security concerns will arise because approximately one-third of the global cereal harvest is used for livestock feed. Meanwhile, the livestock industry accounts for 14.5% of global greenhouse gas (GHG) emissions, contributing to further climate change. As a result, the livestock industry will play an important role in reducing GHG emissions and enhancing global food security. As a result, there is a need for: a) analyses linked to the application of adaptation and mitigation strategies customised to the area and livestock production system in use, and b) policies that support the transition to sustainable livestock production.

INCREASED INCOME TO FARM WOMEN THROUGH INTEGRATED FARMING SYSTEMS

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Abstract

ICAR- Taralabalu Krishi Vigyan Kendra has taken up Technological interventions with specific objective to increase income of farmers. The interventions in integrated farming system mode were taken between 2016 and 2020. The data regarding increased production and net income was documented in 2021. One such farm woman is Smt. Yashodamma Malleshappa from Rameshwara village of Nyamathi Taluk of Davanagere district in Karnataka. The 47 year old woman farmer is a graduate having cultivable land of 6.6 ha,. The main crops are Maize, Groundnut, Onion, Bengal gram and Arecanut. The problems faced by this woman farmer were the use of local varieties, improper water and nutrient management and low yield due to pest and diseases. Krishi Vigyan Kendra has taken up Frontline demonstrations under integrated crop management in Maize, Groundnut, Onion. The Maize production was increased from 63.75 q/ha. (2016-17) to 70.31 q/ha. (2020-21). The specific interventions taken up here were integrated nutrient management including use of micro nutrients and weed management. In case of Groundnut the farm woman used to get local varieties from other villages which used to give low yield. ICAR-Taralabalu Krishi Vigyan Kendra introduced new variety G2-52 and the yield increased from 19 q. to 22 q. per ha. The pest and disease problems and nutrient management interventions were addressed through regular field visits and advisories. New variety of Bengalgram JAKI-9218 was introduced in place of local variety and the production was increased from 13.1 q. to 15.5 q. per ha. The specific interventions are seed treatment with *trichoderma* and *rhizobium,* use of chickpea magic, installation of pheromone traps and integrated nutrient and pest and disease management. Use of local varieties of onion seed was the major problem faced by the farm woman. Krishi Vigyan Kendra introduced high yielding variety Bhima super of onion along with use of vegetable special. The yield was increased from 190 q. to 225 q. per ha. The woman farmer was following the traditional ways of arecanut management. With the introduction of Velvet beans as intercrop and green manure crop, farm advisories in integrated nutrient management and pest disease management and more specifically water

management in the rainfed situation resulted in increased yield from 15.9 q/ha to 22.9 q/ha. Scientific animal nutrition management advisories in dairy, increased milk production from 2,440 litre to 3,050 litre per lactation. The overall interventions of Krishi Vigyan Kendra in an integrated mode increased the net income of Smt. Yashodamma , the farm woman to an extent of 107%. (The net income increased from Rs, 10,35,630-00 to Rs.21,46,400-00 between 2016 and 2020). Smt. Yashodamma is an active participant in nutrigarden demonstrations and adopter of new technologies in agriculture sector. Her willingness to share the learnings with fellow woman farmers makes her a special farmer. The achievements of our woman farmer Smt. Yashodamma is an inspiration to fellow farmers.

IMPACT OF CLIMATE VARIABILITY ON FARM WOMEN

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Abstract

Significant social, physical, political, and environmental aspects of low-middle income nations, like India, make all residents, but particularly women, vulnerable to climate change. With growing rural to urban migration by men, there is 'feminization' of agriculture sector, with increasing number of women in multiple roles as cultivators, entrepreneurs, and labourers. A number of studies in the field of agriculture have shown that women are likely to be more impacted by climate change than men, particularly in underdeveloped nations where women are heavily involved in the agriculture. According to a study, the effects of climate change on women are severe because they directly affect their livelihoods. These women are suffering horribly from the multifaceted environmental and agricultural crises brought on by climate change. Gender is a key factor in determining how to handle the effects of climate change, particularly on women. Due to their social vulnerability and frequent financial disadvantage, women are more prone to encounter growing disparities of different magnitudes. .However, the type and extent of the effects of climate change that women in agriculture experience depend on the labor-intensive tasks they play in sowing, weeding, and harvesting. According to a study, CSA (Climate-smart agriculture) choices could help female farmers overcome some of the challenges they experience in agriculture while helping them adapt to the changing environment. Further research is required in these hotspots on the uptake and impact of these on various socioeconomic aspects and local conditions.

SURGICAL MANAGEMENT OF PERVIOUS URACHUS IN TWO NEW CALVES

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Abstract

Pervious urachus is the most common congenital condition of the urinary bladder commonly observed in foals, but also infrequently reported in calves. The urinary bladder communicates with allantois through urachus in parental life which becomes atrophied and its lumen gets obliterated after parturition. Failure of complete obliteration of the urachal lumen throughout its length results in the development of pervious urachus. The condition is usually accompanied by omphalitis, omphalophlebitis, urachitis, and uroperitoneum and needs immediate treatment. Two clinical cases of pervious urachus were reported to the Department of Veterinary Surgery, Bihar Veterinary College, Patna with a history of dribbling of urine from the umbilicus region. Careful clinical examination revealed frequent leakage of urine through the umbilicus along with mild to moderate omphalitis. The animal was alert and active with normal physiological parameters. Catheterization of the umbilical opening revealed the presence of a tubular tunnel along with leakage of urine. Ultrasonographic examination confirmed the presence of the catheter within the urinary bladder. On the basis of clinical and ultrasonographic examination cases were confirmed as pervious urachus and decided surgical management. The surgical site was prepared aseptically and animals were controlled in dorsal recumbency. The surgery was performed under spinal anaesthesia and local infiltration with 2% lignocaine. A 10 cm long elliptical incision was made around the umbilicus and the incision was extended caudally along the ventral midline region towards the pubis. The peritoneal cavity was approached through the incision of linea-alba. The cord of the pervious urachus was identified and the stalk of the pervious urachus was double ligated with the help of vicryl no. 1/0 near the bladder and the cord was resected distal to the ligation. Muscle and skin were sutured by using standard technique.

Post-operatively both animals were treated with Ceftriaxone (10 mg /kg body weight I/M for 7 days) and Meloxicam (0.2 mg/kg /kg body weight I/M for 3 days). The owner was also advised to do regular dressing at the incision site. The animal recovered uneventfully after 10 days without any severe complications. The skin suture was removed on the 10th day. It can be concluded that pervious urachus in calves can be successfully managed with surgery under local anaesthesia in field conditions.

EXACT CURRENT-VOLTAGE CHARACTERISTIC OF INSULATOR

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Abstract

The carrier mobility plays an important role in the single injection current theory over a wide range of problems under different trap conditions. The present study is considered the influence of thermal free carrier the magnitude of current flow and complete current-voltage characteristic of a trap free insulator working under sublinear non-constant mobility regime. Such regimes are present in a low mobility insulator where the carrier mobility is controlled by the mechanism other than scattering. It provides the increase in the concentration of free carriers which gives the average mobility depending on the carrier concentration. It gives the value of carrier mobility as the function of carrier density. The present study is devoted for the investigation of current injection and thermal noise behavior in single injection solid state diode containing thermally generated tree carriers operating under sublinear carrier density dependent mobility regime where the contribution of current flow by the diffusion is neglected with compare to the drift current. The thermal noise is highly suppressed by the space charge present in the insulator. It may be understood clearly that the contribution of thermal noise is maximum by the thermally generated free carriers. Therefore, there is a much difference between the current injection problems of perfect trap-free insulator and insulator with thermal free carriers.

AGRICULTURAL REMOTE SENSING

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Abstract

When farmers observe their fields or pastures to assess their condition without physically touching them, it is a form of remote sensing. Remotely sensed images taken from satellites and aircraft provide a means to assess field conditions without physically touching them from a point of view high above the field. Agricultural remote sensing is not new and dates back to the 1950s, but recent technological advances have made the benefits of remote sensing accessible to most agricultural producers. Remotely sensed images can be used to identify nutrient deficiencies, diseases, water deficiency or surplus, weed infestations, insect damage, hail damage, wind damage, herbicide damage, and plant populations. Information from remote sensing can be used as base maps in variable rate applications of fertilizers and pesticides. Information from remotely sensed images allows farmers to treat only affected areas of a field. Problems within a field may be identified remotely before they can be visually identified. Farmers use remote sensing to identify prime grazing areas, overgrazed areas or areas of weed infestations. Lending institutions use remote sensing data to evaluate the relative values of land by comparing archived images with those of surrounding fields.

There are several types of remote sensing systems used in agriculture but the most common is a passive system that senses the electromagnetic energy reflected from plants. The sun is the most common source of energy for passive systems. Passive system sensors can be mounted on satellites, manned or unmanned aircraft, or directly on farm equipment. There are several factors to consider when choosing a remote sensing system for a particular application, including spatial resolution, spectral resolution, radiometric resolution, and temporal resolution. When electromagnetic energy from the sun strikes plants, three things can happen. Depending upon the wavelength of the energy and characteristics of individual plants, the energy will be reflected, absorbed, or transmitted. Reflected energy bounces off leaves and is readily identified by human eyes as the green color of plants. A plant looks green because the chlorophyll in the leaves absorbs much of the energy in the visible wavelengths and the green color is reflected. Sunlight that is not reflected or absorbed is transmitted through the leaves to the

ground. Interactions between reflected, absorbed, and transmitted energy can be detected by remote sensing. The differences in leaf colors, textures, shapes or even how the leaves are attached to plants, determine how much energy will be reflected, absorbed or transmitted. The relationship between reflected, absorbed and transmitted energy is used to determine spectral signatures of individual plants. Spectral signatures are unique to plant species. Remote sensing is used to identify stressed areas in fields by first establishing the spectral signatures of healthy plants. The spectral signatures of stressed plants appear altered from those of healthy plants. Interpreting the reflectance values at various wavelengths of energy can be used to assess crop health. The comparison of the reflectance values at different wavelengths, called a vegetative index, is commonly used to determine plant vigor. The most common vegetative index is the normalized difference vegetative index (NDVI). NDVI compares the reflectance values of the red and NIR regions of the electromagnetic spectrum. The NDVI value of each area on an image helps identify areas of varying levels of plant vigor within fields.

FORAGING BEHAVIOR OF STINGLESS BEE, *TETRAGONULA IRIDIPENNIS* AND INDIAN HONEY BEE, *APIS CERANA* UNDER POLYHOUSE

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Abstract

The growth of protected cultivation in the world has driven crops from open field to protected environments, but this condition creates a physical barrier which prevents the access of natural pollinators to flowers. The promising pollinators are honey bees. The present investigations was carried out to know the activity of stingless bee, *Tetragonula iridipennis* Smith and Indian honey bee, *Apis cerana* Fabricius in pollination of gherkin crop cultivated under two separate polyhouses located in Devar seed farm, Ranebennur taluk, Haveri district, Karnataka of southern India during summer 2021-22. At the time of flower initiation five stingless bee colonies and one Indian honey bee were introduced inside polyhouse A and polyhouse B, respectively. The comparative study on foraging behavior of stingless bee and Indian bee, revealed that stingless bees were late foragers (08:00 AM) compared to Indian honey bee (06:00 AM) while, maximum activity observed between 11:00 AM to 12:00 noon (11.45 bees/m^2/10 min) and 09:00 to 10:00 AM (20.18 bees/m^2/5 min) in stingless bee and Indian honey bee, respectively. Flower handling time was maximum in stingless bees (28.55 s/flower and 9.92 s/flower) than in Indian honey bees (19.95 s/flower and 7.69 s/flower) for both female and male flowers. The flower sex type selection index of stingless bee and Indian honey bee on gherkin flower was 0.48 and 0.78, respectively, indicating strong preference for male flower. The stingless bee (15.40%) had a high pollen carrying capacity compared to the Indian honey bee (10.02%). Indian honey bee quickly visit the flowers spending less time on each flower due to larger colony demand. In case of stingless bees, high floral handling time highly correlated with better pollen transfer. Thus, stingless bees are good candidates for future alternatives in commercial pollination, as these bees are particularly suited to provide pollination services in protected cultivation.

STABILITY AND ANTIBACTERIAL ACTIVITY DURING STORAGE OF COLOR EXTRACTS IN THE FLOWER OF *TAGETUS ERECTA*

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Abstract

The flower of Marigold (*Tagetes erecta*) Red petals and Yellow petals have been used for production of food supplements. In this study, various concentrations (100%, and 75%) of acetone and ethanol in water were used as solvent in the extraction of *T. erecta* flowers. Extracts from several plants are able to control microorganisms related to skin, dental caries, and food spoilage, including Gram- negative and Gram-positive bacteria. The present study is based on the evaluation of antimicrobial activity of the extract of the flowers to identify the chemical constituents responsible and also focuses on the examination and description of carotenoids, phenolic compounds, and heavy metals. The moisture content was 82.50 % in red petals and 83.12% in the yellow petals of *T. erecta*. The red flower and yellow flower extract of tagetes obtained by 100% alcoholic and acetonic showed the highest total carotenoids 251 mg/100g fresh weight and 218 mg/100g fresh weight stored at elevated

45°C/0 days. The red and yellow flower extract of tagetes was obtained by 75% alcoholic and acetonic showed the highest TPC content 36.08 to 38.98 and also the highest extraction yield was obtained by using 75% hydro-alcoholic and hydro-acetonic. GC-MS was used for the identification and quantification of the secondary metabolites in *T. erecta* flowers. Farther Heavy metal such as Cu, Mn, Zn, Fe and Mg were estimated by HPLC-ICP-MS in same flowers. Result indicates that these flowers color extract has a strong antimicrobial activity against mentioned microorganisms of MBFA (MIC: 120 - 562 µg/mL). The *T. erecta* flower can be used in dietary applications, beneficial for the agricultural and commercial sectors involved in the production of natural colorants for the health benefits.

LIVING MULCH AND ITS EFFECT ON WEED MANAGEMENT AND PRODUCTION OF FRENCH BEAN

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Abstract

Weed interference is a major constraint in vegetable cultivation. Living mulch as an alternative weed control strategy has been established to be environmentally safe but has not been widely used in vegetable cultivation. The aim of this study was to investigate the efficacy of a few selected crop species as living mulch (LM) with vegetable crops, exploiting their potential to suppress weeds by filling the ecological niches otherwise occupied by weeds. A field experiment was conducted for two years at Horticultural Research Station Kahikuchi Guwahati during the winter season of 2019-20 and 2020-21 to investigate the potential of live mulch for weed control and its subsequent effects on yield using an improved variety of French bean. The treatments were French bean interplanted with living mulch of Field pea (M1), living mulch of Berseem (M2), living mulch of Faba bean (M3), Conventional weed management (M4), weedy check (M5). The treatments were arranged in randomized block design, each replicated three times. Weed Dry Weight (WDW) and Weed Control Efficiency, WCE (%) were calculated following standardized methods. The weed spectrum showed broad leaves as the most dominant, followed by grasses and sedges. The results showed that the highest weed infestation was recorded in weedy check (Control) which accounted for the highest WDW (75 gm^{-2}). The conventional weed management, LM of berseem, faba bean, field pea, and conventional weed management have significantly reduced weed density and biomass, thus providing efficiency by 60.74, 58.74, 49.70, and 30.41 percent respectively. In addition, the conventional method and living mulch of berseem have improved French bean yield by 1.06, 0.89 t ha^{-1}. Among the live mulch used French bean and berseem interplant suppressed weed. Hence, apart from the conventional method of weed management berseem is an ideal weed suppressant and can be inter-planted as a living mulch crop in French bean cultivation.

FERMENTATION OF MILCH ANIMALS (COW, BUFFALO, GOAT AND SHEEP) MILK USING DRIED RED CHILLI PEDICEL AND CONVERSION INTO OTHER FERMENTED DAIRY PRODUCTS (BUTTERMILK, LASSI, SHRIKHAND AND SHRIKHANDWADI)

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Abstract

Curd is a fermented dairy product obtained lactic acid fermentation of milk. There are many stories about using plant and others natural resources as dairy fermentation starters. In recent years, there has been increasing interest in lactic acid bacteria isolated from plant sources due to their diverse metabolic profile, unique flavor forming activities and potential for use in starters. The pedicel of chilli (Capsicum Spp.) are generally removed and used as a waste during food processing. The use of this pedicel considered as waste in the curding of milk. Also it will provide an easy access to healthy starter culture in curd making. Various sources were used for curdling like red chilli, green chilli, red and green chilli extract and later on pedicel of red and green chilli. Curdling of milk through use of chili pedicel and same time validation of chilli stalk level for dahi/curd making. In the initial phase part of the project to efficacy red chilli pedicel aided in cow, buffalo, sheep and goat milk for the fermentation of curd. After that product was be checked for chemical physical, sensory, microbiological and textural

characteristics. After that same dahi/ was used for conversion into other fermented dairy products like shirkhand, lassi, buttermilk and shrikhand wadi were prepared and compared with fermented products made using fermentation by lactic acid bacteria using 9-point headonic scale and products were found at par with control samples. Products were checked for microbiloigical evaluation, Coliform and Yeast and mold count were found nil and SPC counts were at par as control. Among all above good result with respect to flavour, body and texture, colour and apprearance and overall acceptability were compared with control and results with dried red chilli pedicle were found good among all.

MATHEMATICAL MODELLING, ARTIFICIAL NEURAL NETWORK AND PHYSICOCHEMICAL QUALITY OF ONION PUREE : A COMPARATIVE STUDY OF REFRACTANCE WINDOW DRYING AND CONVECTIVE DRYING

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Abstract

Onions are prone to microbial growth due to their high moisture content. To increase their storage life, drying is a common postharvest treatment used to reduce the moisture content. In this study, onions were peeled, washed, quartered, and then subjected to hot water blanching and pureeing. The resulting puree was dried using two different methods: Refractance window drying (RWD) at a water temperature of 70°C, and convective drying (CD) at 50°C. The puree was spread on prefabricated trays at varying thicknesses of 2mm, 4mm, and 6mm. Regardless of the drying method used, the moisture ratio (MR) decreased as the puree thickness decreased, while the drying time and effective moisture diffusivity increased. The Lewis model and Wang and Singh model exhibited the highest R^2 values and the lowest standard error of estimation (SEE) values for RWD and CD, respectively. Additionally, an MLF-ANN model with a back-propagation algorithm was employed to predict the MR of the onion puree during RWD and CD. The ANN model with 12 neurons in the hidden layer demonstrated high accuracy in predicting the MR for RWD, while the model with 18 neurons performed well for CD. The study also revealed that the thickness of the puree and the drying method significantly influenced the physicochemical quality of the resulting onion powder, including colour characteristics, pyruvic acid content, total phenolic content, and hygroscopicity. RWD was found to be superior to CD as a drying method. Furthermore, regardless of the drying method, the puree with a thickness of 2mm yielded the best quality dried onion powder in terms of physicochemical attributes and required the shortest drying time.

UNDERSTANDING CONSUMER PERCEPTIONS ON QUALITY ATTRIBUTES OF POTATO VARIETIES TOWARDS PREDICTION OF VARIETAL PREFERENCE

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Abstract

Consumer preferences are the main driving force behind developing appropriate varieties and technologies. Still, the consumer perceptions are rarely explored in depth with scientific methods and considered seriously in agriculture. While making a purchasing decision, consumers' perception of different quality attributes plays a significant role. This study analyses the perception pattern for fresh potatoes in West Bengal, India, by collecting data from Hooghly District through a survey of 100 consumer households belonging to different social strata following a holistic and multidimensional approach. Consumer perception was assessed through an analysis of the direction and intensity of their attitudes towards the selected three varieties (i.e. Chandramukhi, Jyoti and Super-6) with respect to fifteen different quality attributes. Semantic differential scale, Principal Component Analysis and Expectancy Value Model were applied. The findings from this study revealed that the majority of the consumer desire attributes like good boiling quality, sandy texture and good taste to be present in their preferred potato varieties, and they mostly associate these attributes with the variety, Chandramukhi. Six factors were identified from the quality attributes: Storage qualities, texture related characteristics, price related factors, physical

appearance, cooking qualities and peeling qualities. The present study findings have wider connotations for breeders, extension personnel, traders, policymakers, producers, and other stakeholders.

DEVELOPMENT AND VALIDATION OF INTERPERSONAL RELATIONSHIP SCALE (IRS) FOR LATE ADOLESCENCE

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Abstract

Building and validating an interpersonal relationship scale for late adolescence is the study's main goal. A few questions on particular interpersonal relationship components made up the Interpersonal Relationship Scale. Interpersonal Relationship Scale will be assessed by subject matter experts to determine its content validity, and after that, the tool's reliability will be determined through a pilot research. Using a simple random sampling procedure, 60 late adolescents—30 males and 30 girls—between the ages of 19 and 21 will be chosen from colleges at the Maharana Pratap University of Agriculture and Technology, Udaipur. The split-half method will be used to determine whether the tool is reliable. The results of the reliability and validity tests indicated that the IRS is a reliable tool for evaluating interpersonal relationships in late adolescence.

VACUUM IMPREGNATION OF NUTMEG RIND CANDY : A RESPONSE SURFACE APPROACH

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Abstract

The optimization of vacuum impregnated nutmeg rind candy was executed using face centered center composite design by response surface methodology. The processing parameters were standardized with syrup temperature between (50 -70°C), syrup concentration between (60-80°Brix) and duration of vacuum treatment between (10-20 min) as independent variables and water loss, sugar gain, chewiness and lightness as dependent variables. A second order polynomial model was used to describe and predict the response quality in terms of water loss, sugar gain, chewiness and lightness with R^2 of 0.9383, 0.9849, 0.9740 and 0.9767 respectively. The optimal conditions of vacuum impregnated nutmeg rind candy were 66.81°C for syrup temperature, 71.58 °Brix for syrup concentration and 11.59 min for the duration of vacuum treatment. The water loss, sugar gain, chewiness and lightness values of the optimized candy were found to be 50.00%, 12.23%, 9N and 22.17 respectively with a with a desirability value of 0.891. The experimental observation satisfied the predicted model within the acceptable range of the responses.

GENETIC VARIABILITY STUDIES IN CASTOR (*RICINUS COMMUNIS* L.)

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Abstract

The present study was carried out at Main Agricultural Research Station, Raichur during *Rabi* 2020 to assess variability for yield and it's components among 16 castor genotypes along with checks at College of Agriculture, Bheemarayanagudi. ANOVA revealed significant difference for all the characters that are studied. High phenotypic and genetic coefficient of variance was exhibited by plant height, effective length of main spike, number of capsules on primary spike, 100 seed weight and seed yield per plant. High heritability coupled with genetic advance per cent mean was observed for plant height, effective length of main spike, number of capsules on primary spike, 100 seed weight and seed yield per plant.

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH AND YIELD OF RADISH *(RAPHANUS SATIVUS L.)*

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Abstract

A field experiment entitled "Effect of Integrated Nutrient Management on growth and yield of radish *(Raphanus sativus L.)*" was conducted at Agriculture Research Farm, CBG Agriculture PG College, BKT during Rabi season 2021-22 to find out the most economic fertilizer schedule for Radish yield and quality. The seven treatment conformed of Control (T_0), FYM @ 20 t ha^{-1} (T_1), Poultry manure @ 2.85 t ha^{-1} (T_2), Vermicompost @ 4 t ha^{-1} (T_3), FYM @10 t ha^{-1} +Poultry manure@ 1.42 t ha^{-1} (T_4), FYM @ 10 t ha^{-1} + Vermicompost @ 2 t ha^{-1} (T_5), FYM @6.66 t ha^{-1} + Vermicompost @ 1.33 t ha^{-1} + Poultry manure@ 0.95 t ha^{-1} (T_6) was tested in randomised block design with 3 replication resulted revealed that application of FYM @6.66 t ha^{-1} + Vermicompost @ 1.33 t ha^{-1} + Poultry manure@ 0.95 t ha^{-1} recorded significantly higher growth vize; No. of leaves/plant, leaf area/plant (cm^2), root length (cm), girth of root (cm) and length of leaves (cm) and yield attributes vize ; weight of root (g), length of root (cm), girth of root (cm), leaf length (cm), leaf area (cm^2) fresh weight of leaves (g) and dry matter content of leaf (g/plant) over rest of the nutrients management practices. However, crop received a combination of FYM @10 t ha^{-1} +Poultry manure@ 1.42 t ha^{-1} improved the all growth as well as yield attributes significantly as compared to rest of the treatments except combination of FYM @6.66 t ha^{-1} + Vermicompost @ 1.33 t ha^{-1} + Poultry manure@ 0.95 t ha^{-1}.Combination of 3 manures vize FYM @6.66 t ha^{-1} + Vermicompost @ 1.33 t ha^{-1} + Poultry manure@ 0.95 t ha^{-1} produced significantly higher yield of roots, yield of leaves and higher total soluble solid (Brix) followed by combnation of 2 manures i. e FYM @10 t ha^{-1} +Poultry manure@ 1.42 t ha^{-1}. Poor growth, yield attributes yield and quality was observed with no fertilize treatment combination of 3 manures also recorded the highest net income (Rs.199474/ha) and benefit : cost ratio (3.94) which was followed by combination of 2 manures i. e FYM @10 t ha^{-1} +Poultry manure@ 1.42 t ha^{-1}.

MULTIPLE NATURAL SPAWNING OF *CHAGUNIUS CHAGUNIO* (HAMILTON-BUCHANAN, 1822) A COLDWATER CYPRINID IN CAPTIVE CONDITIONS.

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Abstract

Chagunius chagunio, a Ccoldwater cyprinid commonly known as "Chaguni" is one of the economically important indigenous fish of Himalayan region. An attempt was made to standardize the breeding protocol of this species under captivity in aquarium condition. Wild stock was collected from Bhimtal lake .12 numbers of brood stock in ratio of 1:2 (F:M) with average weight of 40-60 g, respectively were maintained in glass aquarium at ICAR DCFR Bhimtal.. The aquarium tank has dimension of 110x90x95 cm with water holding capacity of about 750 liters. The aquarium tank was equipped with an under-gravel biological filtration system to maintain ammonia free crystal-clear Water temperature was maintained with immersion thermostat glass heaters within a range of 18-22^{0}C. Broodstock was fed with wet feed containing 30-40% protein. Male and female both attained gonadal maturity in confined aquarium condition. In males, nauptial tubercles were heavily developed on snout and check region. The first natural spawning was observed in the month of June followed by successive natural spawning by same brood stock. in aquarium several times without using any hormone. Males dig the spawning nest on the gravel surface. During spawning female deposit the eggs in the gravel nest pits that subsequently fertilized by the male. Incubation and hatching take place in the gravel pits. Free swimming hatchlings come out from the pits after 5-6 days depending on the environmental water. Fertilized eggs were transparent, with a mean diameter of 1.61±0.16 mm. Incubation period was recorded 96-146 hours at 22-24^{0}C. Average length and weight of larva, having completely absorbed yolk sac were 8.4±0.18mm. Spawning behavior and breeding habits of this species were also recorded. The present study is the first report of successful natural spawning and breeding of *C. chagunio* in aquarium without using any synthetic hormone. Successful natural spawning breeding and rearing of seed in aquarium conditions will pave the path of species diversification in coldwater aquaculture.

STUDIES ON PRODUCTIVITY AND PROFITABILITY OF INTERCROPPING WITH PIGEONPEA

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Abstract

An experiment was carried out during two consecutive *Kharif* seasons of 2016-2017 and 2017-18 at Soil Conservation and Water Management Farm, C.S. Azad University of Agriculture and Technology, Kanpur. The main objective was to work out the yields of main crop of pigeonpea, black gram and sesame and their economic in term of net profit. The soil of the experimental field was sandy loam, having pH 7.8, organic carbon 0.32%, available P_2O_5 17.3 kg/ha and available K_2O 181.2 kg/ha therefore, the fertility status was medium. The five treatments of companion cropping i.e. pigeonpea sole, black sole, sesame sole, pigeonpea + black gram (1+1) additive series and pigeonpea + sesame (1+1) additive series. The total productivity of pigeon pea + black gram was highest (23.53 q/ha) in comparison to pigeonpea + sesame (20.30 q/ha) and pigeonpea alone (17.34 q/ha). The pooled data display that maximum cost of cultivation Rs. 57876.00/ha observed under pigeonpea + black gram companion cropping followed by pigeonpea + sesame (Rs. 56191/ha). The highest gross return Rs. 134024/ha, net return Rs. 76148/ha and BCR 1:2.32 were also observed with pigeonpea + black gram (1+1) additive series followed by pigeonpea + sesame (1+1) additive series, while pigeonpea alone gave net return Rs. 50387/ha and BCR 1:2.01.

IOT AND REMOTE SENSING BASED SMART AGRICULTURE

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Abstract

Agriculture plays vital role in the development of agricultural country. In India about 70% of population depends upon farming and one third of the nation's capital comes from farming. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is smart agriculture or Precision agriculture is a crucial way to achieve greater yields by utilizing the natural deposits in a diverse environment. Smart agriculture provides solutions for agricultural intelligence and automation. Human resources for agriculture development is becoming less due to migration of young people to big cities and land use for agriculture cultivation is being used for rapid development. As a result, most of the agriculture activities need to be automated to fulfil the food demand. The automation in image analysis with computer vision and deep learning models, IoT, and related technologies will be the potential solution to solve the above agricultural and food demand issues. Smart agriculture uses specific sensors and software to ensure that the crops receive exactly what they need to optimize productivity and sustainability. Smart Agriculture includes retrieving real data about the conditions of soil, crops and weather from the sensors deployed in the fields. High-resolution images of crops are obtained from satellite or air-borne platforms (manned or unmanned), which are further processed to extract information used to provide future decisions. This paper will explore the latest trends in remote sensor networks and IoT agriculture applications and highlight the issues and challenges particularly in network and open- source software for smart agriculture.

APPLICATION OF LAYERED DOUBLE HYDROXIDES FOR ANIONIC NUTRIENT MANAGEMENT IN SOIL

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Abstract

Layered double hydroxides (LDH) are hydrotalcite-type clay consisting of stacked positive layers of brucite like hydroxides that are separated and neutralized by exchangeable anions in inter-lamellar galleries. They are represented by the empirical formula $M^{2+}_{1-x} M^{3+}_{x} (OH)_2 . A^{n-}_{x/n} . mH_2O$, where M^{2+} and M^{3+} are divalent and trivalent cations, A^{n-} is the interlayer anion and x and m are fraction constants. Layered double hydroxides have a small size (200-300 nm), high charge density, surface area

(50-200 m^2 g^{-1}) and zero point charge (10-12), and they exhibit colloidal properties. Positively charged surface provides high anion exchange capacity to these minerals, which range between 200 - 450 cmol (-) kg^{-1}. Various direct (co-precipitation, hydrothermal synthesis, salt oxide method and sol-gel synthesis) and indirect (ion exchange and structural reconstruction method) synthetic techniques are available to prepare LDH. Intercalation with anionic nutrients is an option for improving nutrient use efficiency through slow release. A ten-fold increase in release time of phosphate from [Mg-Al-PO_4] LDH, when compared to soluble phosphate sources. An increase in the residence time of boron was achieved in a leaching experiment in sandy soil by Mg_2Al-B LDH as against H_3BO_3. After 20 days of incubation, 100 and 66.5 per cent of soluble boron and intercalated boron were retrieved in the leachate respectively, which represents subsequent boron availability in soil for plant uptake. Layered double hydroxides can serve as matrices for the slow release of nutrients, however extensive studies are required for field level application strategies considering dose, method, time of application, and factors affecting activity in soil for more effective utilization.

THERAPEUTIC ATTRIBUTES AND VALUE ADDITION OF KODO MILLET

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Abstract

Kodo millet (*Paspalum scrobiculatum*) a miraculous crop full of such qualities which can be grown even in less water commonly known by different names in India as koda, kodra, harka and varagu. Kodo millet is a drought tolerated annual plant cultivated in many countries around the world like India, Nepal, Vietnam, Philippines and Indonesia. It is a powerhouse of nutrients and excellent substitute to rice and wheat that's why called poor man's rice or famine food. The grain contains 11% protein, 66.6 gram carbohydrate, 3.6 gram fat, 10 gram fibre and containing high amount of antioxidant polyphenols. Kodo millet contain various therapeutic properties and health benefits like it is a gluten free grain functioning as a antidiabetic, help to reduce obesity, controlling bad cholesterol, manage blood pressure, hypoglycaemia, strengthening nervous system and preventing the chronic health conditions as well as lifestyle disease. The higher potassium content of kodo millet help to reduce abdominal cramps during menstrual cycle .The value added food products are becoming more popular nowadays. Value addition of kodo millet incorporated products like kodo millet khoa burfi, kodo millet yogurt, Dosa, biscuits, enhance the nutritional, functional properties, adding varieties and make the convenient and healthy food.

GENERATION MEAN ANALYSIS : UNTANGLING THE PREDOMINANT GENE ACTION FOR GRAIN IRON, ZINC, YIELD, AND YIELD CONTRIBUTING TRAITS IN PEARL MILLET

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Abstract

Pearl millet is a major staple globally and a biofortifying crop with increased grain iron and zinc complements ongoing efforts to combat micronutrient malnutrition. Limited information was available on the nature and magnitude of grain iron and zinc gene effects. So, generation mean analysis was done using six crosses, WGI 100 × ICMB 13222, HFeIT 17/2 × PPMI 1229(15458), ICMB 13222 × PPMI 1229 (15458), HFeIT 17/2 × WGI 100, ICFD 14-R-61 × WGI 100 and ICFD 14-R-61 × PPMI 1229 (15458). Six generations, P1, P2, F1, F2, B1, and B2, were generated for each of these crosses which were evaluated during the *south-west monsoon season, 2021,* and the *south-west monsoon season, 2022* at ICAR-Indian Agricultural Research Institute, New Delhi. The mean sum of squares due to generations was significant for all the traits studied across the environment. Generation mean studies revealed the presence of both additive and dominant gene interactions in the inheritance of agronomic traits. Duplicative epistasis was observed for plant height, number of productive tillers, spike girth, iron and zinc content. Days to 50% flowering, days to maturity, and 1000-seed weight showed the complementary type, whereas, spike length and seed yield per spike showed both duplicate and complementary type. Dominant gene action contributed to the inheritance of days to 50% flowering, days to maturity, and the number of productive tillers, meanwhile, plant height, spike length 1000-seed weight, seed yield per spike, iron and zinc represented both additive

and non-additive types of gene action. Spike girth showed the additive type of genetic effect. This information can be utilized in developing pearl millet lines with high-grain Fe and Zn.

ANTIOXIDANT PEPTIDE FROM SPIRULINA (*SPIRULINA PLATENSIS*): PREPARATION AND CHARACTERIZATION

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Abstract

Spirulina (*Spirulina platensis*) is rich in protein, vitamins, minerals and essential fatty acids. Additionally, it has plenty of antioxidants. Hydrolysates of spirulina protein have been shown to have strong antioxidant activity, as well as a range of potentially beneficial health effects. The aim of the present investigation was to utilize the protein present in spirulina by enzyme hydrolysis and characterization of spirulina protein hydrolysate (SPH). Crude spirulina was used to prepare the hydrolysate using 1.0% (w/w) papain enzyme and it was spray dried. The physical, functional and antioxidant properties of SPH were carried out. The protein content in the derived protein hydrolysate was 62.42%. The antioxidant activity of hydrolysate was 78.24% as measured by the DPPH assay. *L*, a*, b** value of SPH was 38.57, -10.18, 11.39, respectively. Flow properties of SPH were found to be very good. Antioxidant and functional properties revealed that SPH can be used as a functional ingredient in food products.

INNOVATIVE AND CURRENT ADVANCES IN AGRICULTURE AND ALLIED SCIENCES

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Abstract

In recent years, the global challenges of population growth, climate change, and diminishing resources have intensified the need for innovative approaches to crop improvement and agricultural practices. This abstract explores key areas of innovation in agriculture, including crop improvement, biotechnology, genetic engineering, precision horticulture, agroforestry, and the impact of climate change on biodiversity and food security.Crop improvement has been a cornerstone of agricultural advancements throughout history. Traditional breeding techniques have been used to develop high-yielding varieties, disease resistance, and stress tolerance. However, recent breakthroughs in biotechnology and genetic engineering have revolutionized crop improvement. Genetic modification has allowed scientists to introduce specific traits into crops, enhancing their productivity, nutritional content, and resistance to pests and diseases. These innovations hold promise for addressing food security challenges and reducing the environmental footprint of agriculture. Precision horticulture, an emerging field, integrates technology and data-driven approaches to optimize crop production. Techniques such as remote sensing, geographic information systems (GIS), and precision irrigation enable farmers to monitor and manage crops with precision, minimizing resource wastage and maximizing productivity. This approach improves the efficiency of agricultural practices and contributes to sustainable food production. Agroforestry, the integration of trees with crops and livestock, is gaining recognition for its multiple benefits. This practice enhances soil fertility, conserves water, mitigates climate change impacts, and provides diversified income sources for farmers. By integrating trees into agricultural landscapes, agroforestry systems contribute to biodiversity conservation, carbon sequestration, and sustainable livelihoods.The impact of climate change on biodiversity and food security is a pressing concern. Rising temperatures, changing precipitation patterns, and extreme weather events pose significant challenges to agricultural productivity and biodiversity conservation. Adapting to climate change requires the development of climate-resilient crop varieties, efficient water management techniques, and sustainable land-use practices. Additionally, preserving and restoring natural ecosystems is crucial for maintaining biodiversity and ecosystem services essential for agriculture.In conclusion, innovation in crop improvement, biotechnology, genetic engineering, precision horticulture, and agroforestry offers promising solutions to address the challenges of food security and biodiversity conservation. However, the impact of climate change necessitates a holistic approach that integrates sustainable

practices, innovative technologies, and policy support. By embracing these innovations and implementing sustainable agricultural practices, we can strive towards a more resilient and food-secure future while preserving biodiversity and mitigating the effects of climate change.

RESPONSE OF SOYBEAN TO SULPHUR AND BORON NUTRITION ON GROWTH, YIELD AND QUALITY

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Abstract

Sustainability, food security and environmental stability is the main priority of world agriculture research current. Indian agriculture is facing challenges from multiple fronts *viz.,* climate change, multi-nutrient deficiency and lower factor productivity *etc*. Although, India is leader in food grains production, imports the highest edible oil in the world (14.01 MT). Soybean is a duel crop grown for oil and protein, thus a potential crop for food and nutritional security also improves soil fertility by fixing atmospheric nitrogen (50-300 kg ha^{-1}). Major constraint for lower productivity of soybean is unbalanced nutrition and cultivation on low fertile soils. Boron has a key role in physiology of crop, provides energy to growing parts, nodule development, improve flowering, seed setting and grain yield. Sulphur increases the 1000-seed weight and helps in improving quality protein, application at reproductive stage improve the oil content in soybean. A field experiment was conducted at Agricultural and Horticultural Research Station, Bavikere, Shivamogga, Karnataka, during *Kharif* seasons of 2021 and 2022. The treatments comprised of Combination of Soil application of Boron @ 3, 4 and 5 kg/ha along with foliar application of K_2SO_4 @ 0.25, 0.5 and 0.75% at 45 DAS. The results revealed application of RDF along with soil application of 5 kg Borax/ha + 0.75% K_2SO_4 foliar spray at 45 DAS (T_{10}) significantly accumulated dry-matter (22.07 g/plant), produced higher number of pods (52.2), seeds per pod (3.6) and test weight (13.2g). Highest seed (1866.1 kg/ha) and haulm yield (2642.1 kg/ha) and protein (39.2%) and oil content (20.06%) was also recorded by T_{10}. The treatment also recorded highest net returns and BC ratio (2.38) compared to control and remained on par with T_7 (2.33) (RDF + soil application of 4 kg Borax/ha + 0.75% K_2SO_4 foliar spray at 45 DAS).

BIOINFORMATICS TREND IN PLANT BIOLOGY

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Abstract

In recent years, there have been significant advancements in Plant biology and Genomic technologies, resulting in a vast amount of biological data. This abundance of genomic information has created a demand for tools that can effectively manage, store, analyse, visualize, model, and predict large data sets. The field of bioinformatics pioneered by M.B. Dayhoff in 1965 and term was coined by Ben Hesper and Paulian Hogeweg in 1970 is a rapidly expanding scientific discipline that integrates biology, computer science, and mathematics. Its purpose is to gather, store, analyze, and interpret biological data using computational tools and databases, ultimately generating valuable knowledge to enhance our understanding of living systems with their biological information. With the progress of sequencing technologies and the rise in sequencing projects, bioinformatics has made significant strides in the field of biology by providing access to genomic information. In plant sciences, bioinformatics is increasingly important for the identification, characterization and expression of genes and proteins involved in plant diversity, as well as the analysis of plant molecular structures. It also aids researchers in identifying and utilizing genetic variations and sequences between different plant species to develop new varieties for medicinal and agricultural purpose. Additionally, bioinformatics plays a role in constructing phylogenetic trees to comprehend the evolutionary patterns of genes or plant species, and in optimizing genetic engineering strategies through redesigning. As sequencing technologies are growing and more sequencing projects expanding day by day best example is artificial intelligence uses, Bioinformatics will continue to make significant contributions to biology. Its impact extends beyond plant biology and biotechnology, ultimately benefiting humanity's future.

AN OVERVIEW ON : ROLE AND CHALLENGES OF WOMEN IN LIVESTOCK SECTOR OF INDIA

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Abstract

Livestock is the most important sector in the economy of ours country India where, approximately 70 percent population is engaged in agriculture and allied activities. It is the main source of income for rural families particularly to marginal farmers and land less labourers. These families involve their women and children in the rearing of livestock. Generally, role of women in rural livestock rearing can never be ignored. Women take care of feeding the livestock, with start of fodder collection, watering, cleaning the abodes and even in providing traditional cure from diseases. They are further involved in milking and value addition of milk through house hold level milk processing. Women have a significant role in the development of livestock sector in India. Since livestock plays major part in agriculture sector, its role can be enlarged by allowing women to participate commercially in this field. In this regard, their services must be recognized. Women have less access to technology, extension services and less women farmer's organizations; hence efforts are needed to increase the capacity of women in terms of skills to meet their strategic needs and to document systematically their inputs and outputs with respect to livestock sector. The decision making, self-esteem, social support, access to knowledge, credit facility, livestock services, market accessibility and asset ownership are the important pillars for the women empowerment in livestock sector. Exclusive trainings for women farmers should be organized to remove their knowledge gaps regarding specific animal husbandry activities.

INFLUENCE OF ORGANICS ON SEED YIELD AND OIL CONTENT (%) IN SAFFLOWER (*CARTHAMUS TINCTORIUS* L.)

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Absract

A field experiment was conducted at Agriculture Research Station, Hagari during *Rabi* 2019-20 to know the influence of organics on seed yield and quality in safflower. The experiment constituted of ten treatments and laid out in randomized block design with three replications. Among the treatments, T_5 (T_2-(Seed soaked in beejamrutha for 12 h) + Foliar spray with panchagavya @ 3%) at 50, 70 and 90 DAS recorded significantly highest plant height (67.56, 92.05 and 95.33 cm), more number of primary and secondary branches (6.83, 10.78, 12.13 and 8.46, 10.69, 15.25) at 60 DAS, 90 DAS and at harvest, more number of capitulum per plant (21.62), number of seeds per capitulum (23.18), seed yield per plant (22.35 g), seed yield (1529 kg / ha), stalk yield (2441 kg / ha) and Oil yield (459 kg / ha)

DIFFERENT TRANSPLANTING DATES, SPACING AND NUMBER OF SEEDLINGS HAVE AN IMPACT ON THE PRODUCTIVITY AND PROFITABILITY OF HYBRID RICE

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Abstract

Field experiment was conducted to evaluate the effect of different transplanting dates, seedling rates and spacings on yield and economics of hybrid in Selaqui, Dehradun (Uttarakhand), at the Crop Research Farm, Department of Agronomy, Maya College of Agriculture and Technology, during the 2016 kharif season. Experiment comprised 18 treatments, including 3 transplanting dates (15 July, 27 July, and 09 August), 2 seedling rates (1 seedling hill^{-1} and 2 seedling hill $^{-1}$) and 3 spacings (20

X 10 cm, 20 X 15 cm and 20 X 20 cm). The experiment was replicated three times and using a randomized block design. The test crop was rice of the "Arize 6444 variety". Results revealed that hybrid rice transplanted at 15 July with 20 x 20 cm spacing and 2 seedlings hill^{-1} proved to be the best for obtaining maximum grain (64.33 q ha^{-1}), straw (80.67 q ha^{-1}) and biological yield [145.00 q ha^{-1}) and returns (gross (? 93330 ha^{-1}), net returns (? 42514 ha^{-1}) and B:C ratio (1.83)].

ANTIMICROBIAL AND ANTIFUNGAL ACTIVITIES OF CU(II)-POTASSIUM PROPAN-1,3-DIOL DI XANTHATE

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Abstract

Cu(II)-Potassium Propan-1,3-Diol Di Xanthate is a copper(II) complex of potassium propane-1,3-diol di xanthate (PPDDX). It has been shown to have antimicrobial and antifungal activities against a variety of bacteria and fungi. The antimicrobial activity of PPDDX was evaluated using the disc diffusion method. The complex was found to inhibit the growth of *Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae* and *Staphylococcus aureus* at concentrations of 100, 200, and 400 g/mL respectively. The antifungal activity of PPDDX was evaluated using the broth dilution method. The complex was found to inhibit the growth of Aspergillus niger, Aspergillus flavus and Candida albicans at concentrations of 10, 20, and 40 g/mL respectively. The mechanism of action of PPDDX is not fully understood. However, it is thought to disrupt the cell membrane of bacteria and fungi, leading to cell death. PPDDX is also thought to interfere with the synthesis of proteins and DNA in bacteria and fungi. PPDDX is a promising new antimicrobial and antifungal agent. It is safe, effective and has a low toxicity profile. PPDDX could be used to treat a variety of infections, including those caused by multidrug-resistant bacteria and fungi. In addition to its antimicrobial and antifungal activities, PPDDX has also been shown to have anti-inflammatory and antioxidant properties. These properties may contribute to its efficacy in treating a variety of diseases, including cancer, cardiovascular disease, and neurodegenerative diseases. Further research is needed to fully understand the potential benefits of PPDDX. However, the available evidence suggests that it is a promising new agent for the treatment of a variety of diseases.

INTEGRATED NUTRIENT MANAGEMENT IN JAMUN (*SYZYGIUM CUMINII* L.)

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Abstract

Jamun (*Syzygium cumini* L.) is a nutritious, evergreen tropical fruit which is use for both fresh consumption and processing into beverage like jam, jelly, wine, vinegar and squash. Jamun fruit is a good source of carbohydrate, protein, mineral, sugar and iron. Jamun is adapted to a wide range of soils. High yield potential and better root and plant growth development deep sandy loam and well drained soil is good for jamun cultivation. In view of increasing of population, decreasing land holdings and water, climate change and high demand of high quantity of fresh yield. The present productivity is 12.36 tones/hectare of fruit needs to be raised to 40.0 tones/ha by use of N; P_2O_5; K_2O with other organic input. Use of Fertilizer and manure are high cost available thus, efficiently nutrient management not only help in increase the fruit yield but also sustained the fruit production and protect the environment from the various hazards occurring due to misuse of costly fertilizers. Nutrient is refers to all compound that are required by plant as a source for growth, for the energy, for production, without plant not complete their life cycle. For optimum harvest high quality yield and protection of natural resource base for integrated nutrient management in fruit production has become important because it is correlated to the soil and water. Jamun tree require annual dose of 20 kg well rotted Farm Yard Manure during the pre bearing period and 50 kg FYM apply in bearing orchard. Full bearing orchard should apply 500 g neem cake, 50g N, 25g P_2O_5 and 50g K_2O during the month of January-February is necessary for achieve good quality production.

ALLELE MINING FOR CROP IMPROVEMENT

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Abstract

An allele is an alternative form of a gene found at a specific locus on a chromosome. The term "allele" or "allele morph," which was coined by William Bateson, is used to refer to various forms of a gene that are discovered as diverse phenotypes. A change in DNA sequence in coding or regulatory regions caused by insertion or deletion (In/Del), duplication, translocation, inversion, or single nucleotide polymorphisms (SNPs) mutations results in the formation of new alleles. A true allele mining involves the consideration of variations in both expressed as well as non-expressed regions of the gene. It includes 5'UTR, promoter, introns, exons, 3'UTR, and splice sites. Allele mining is a research field aimed at identifying allelic variation of suitable alleles of a candidate gene controlling key agronomic traits that has potential for crop improvement. Allele mining helps in the development of climate-resilient, high-yielding, and nutrient-rich varieties. TILLING are reverse genetics tools used for allele mining, which allows the rapid and inexpensive detection of induced point mutations in populations of physically or chemically mutagenized individuals. Eco-TILLING was proposed by Comai which uncovers natural alleles at a locus contrary to induced mutations. Coddle, Primer 3, Primer 3 Plus, and BLAST are important bioinformatics tools for gene-specific primer design. Next-generation sequencing techniques (tilling by sequencing) will improve the accuracy and efficiency of the allocation of a phenotype to novel natural or targeted mutant alleles from an allelic series.

ECONOMIC EMPOWERMENT OF RURAL WOMEN THROUGH SELF HELP GROUPS (SHG) NAGALAND, INDIA

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Abstract

A study was carried out on December 2020 with an objective to understand the economic empowerment of rural women through SHG in Kuhuboto block of Dimapur district, Nagaland. A total of 120 respondents from 6 villages and 24 SHGs were selected based on random selection where 4 SHGs from each village and 5 members from each group were considered as respondents. Structured interview schedule was prepared and descriptive research design was used for the study. The study concluded that, majority (96.6%) were engaged in making home-made food products as their income generating activities (IGA); majority (95.8%) had received training on IGA; majority (47.5%) were economically empowered falling under the medium category. Age and knowledge level had positive and significant association with economic empowerment through SHG.

INCIDENCE OF BLACK POINT DISEASE ON WHEAT AND EFFECT ON SEED HEALTH

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Abstract

The experiment was carried out during carried out at Department of Plant Pathology, RCP College, Kishanpur, Roorkee during 2021-22. Fresh seed samples of the wheat varieties, collected from the farmers' fields at post-harvest stage from the areas of four districts of middle Uttarakhand viz., Sahaspur, Roorkee, Haridwar and Dehradun revealed significant differences of incidence of black point of wheat for each of the GW 496, GW 366 and Lok 1 varieties in respect to area. Among the varieties, overall GW 366 revealed the highest mean incidence of black point disease (14.31 %) followed by Lok 1 (9.50 %) and GW 496 (7.25 %).The black point disease adversely influenced the seed health status of wheat seeds. The infected category of

seeds showed lower seed germination (94 %), shoot length (4.65 cm), root length (10.60 cm), seedling vigour index (1696.88) as compared to healthy category of seeds. However, higher seed weight (58.06 g) over healthy category of seeds (50.22 g) was observed.

ASSESSMENT OF INSECT PEST MANAGEMENT COMPONENTS IN ONION- AN STUDY OF FRONT-LINE DEMONSTRATIONS

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Abstract

The front-line demonstration of onion variety Red-3 was conducted to evaluate the pest management components in comparison with farmer's practices at Huvinahadagali, Harapanahalli taluks of Vijayanagara Dist., Karnataka. ten demonstrations with area extent of one acre were carried out by cultivating variety, Red-3 under irrigated situation for two years during 2021-22 and 2022-23. Crop was cultivated with recommend package of practices like seed treatment with bio fertilizers, NPK, application of FYM @ 2 ton/ ha, proper hand weeding and timely irrigation. The pest and disease management carried out by spraying of imidacloprid 17.8 SL @ 0.3 ml/lit and thiamethoxam 25 WG @ 0.3 g/l against the sucking pests, emamectin benzoate 5 SG @ 0.2 g/l against leaf eating caterpillar and Mancozeb@ 2.0 gm/l against the alternaria blight. The results of the ten demonstrations revealed that, the average bulb yield of 28.25 t/ha was recorded in demonstration block compared to farmers practice (23.65 t/ha). The percent increase in yield of demonstration plots compared to farmers practice was 16.28 with the B:C ratio of 1:2.85. The quality keeping quality and bulb colour also studied and compared with the farmers produce and it was also found good as compared to farmers practice.

EVALUATION OF BIO-AGENTS AGAINST THE INSECT PESTS IN CHILLI

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Abstract

Chili, *Capsicum frutescence* (Solanaceae), is a widely grown vegetable and commercial spice crop in most tropical and sub-tropical countries. Besides the traditional use of chilies as vegetables, spices, sauces and pickles, the green chili fruits are a good source of vitamin A and C. Many factors are responsible for the low productivity of chili. Among these, damage due to insect infestation is an important one. Insect-pests continuously change their trend and become a barrier to the growth and cultivation of chili. Over 35 species of arthropods attack chili plants and the most significant pests are mite, thrips, aphids and whitefly (Pradeep and Korat, 2018). Because the front line demonstration was conducted to know the efficacy of bioagents for the management of chilli insect pests at farmers field in five locations of Hadagli taluka of Vijayanagara district Karnataka. With all agronomic prctices the demonstrations were conducted. The results were found that, the lower pest load with highest fruit yield of 20.52 quintal per hectare was recorded in demonstration plots compared to farmers practices (17.40 q/ha). With respect to the per cent increase in the yield the maximum of 17.40 per cent increase was observed with the B: V ratio of 1:2.12.

EFFECT OF TRAINING ON *ASPERGILLUS FUMIGATUS* FUNGI TO ENHANCE THEIR ABILITY TO ABSORB COPPER METAL IONS FROM INDUSTRIAL EFFLUENTS

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Abstract

In most parts of the globe, water has been taken for granted for centuries, leading to its usage that is both haphazard and unplanned. Effluents from factories are a major source of pollution in both water and soil. Dye, metals, phenols, and sewage

are just some of the pollutants that have been found in these effluents. Inorganic pollutants, such as heavy metals, accumulate in the food chain and remain in the ecosystem even when certain organic pollutants break down in the environment. This study set out to identify soil fungi with a high biosorptive efficiency for zinc in both single-metal and multi-metal solutions due to their resistance or tolerance to heavy metals. Effluents containing a variety of heavy metals may benefit from the use of these strains in the development of biosorption-based treatment facilities. The researchers exposed many species of fungi to copper concentrations (in ppm) in an altered medium culture that increased from 50 ppm to 2500 ppm. A. fumigatus biomass biosorbed between 45.67 and 79.55 percent of copper from 100 ppm aqueous solutions, 30.67 and 65.80 percent from 200 ppm solutions, and 24.49 and 43.62 percent from 100 ppm aqueous solutions (at 300 ppm). Next, we put the strains through biosorption assays to see how well they did with binary and ternary solutions. The trained biomass absorbed a much higher quantity of metals (AFUCuT) than the untrained biomass did (AFUCuT) (t = 3.52; 4.02). This demonstrates that enhancing the biosorption of one metal by introducing a fungus species may also improve the system's capacity to adsorb other metals. In conclusion, it is possible that strains developed by selective breeding of a fungal species for a certain metal would outperform the original strains in both single- and multimetal systems.

QUALITATIVE ASSESSMENT OF BLACK RICE UNDER ORGANIC ECOSYSTEM OF NORTH EAST INDIA

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Abstract

An agronomic investigation was carried out at Instructional-cum-Research Farm of Assam Agricultural University, Jorhat, Assam, during *kharif* season of 2019-2020 and 2020-2021 to assess the quality parameters of black rice under organic ecosystem of north east India. The topography of experimental field was uniform and fairly levelled. The farm is located at 26° 47'N latitude and 94° 12'E longitudes at an elevation of about 86.6 m above mean sea level. The experiment was laid out in a Randomized Block Design (RBD) with three replications. The soil of experimental plot was brownish to yellowish brown color with fair drainage and sandy loam in texture with acidic in pH, low in available nitrogen, phosphorous but medium in available potassium. The experimental data recorded during both successive years revealed that there were no significant results observed in relation to length, breadth, L/B ratio, Brown rice recovery (%), Milled rice recovery (%) and Head rice recovery (%) of grain of black rice. However, the results also showed the significant Protein content (7.96 and 7.98 %), with application of RDK through azolla incorporation + mustard oil cake @ 20 kg ha^{-1}) (T_6). Amylose content (6.48 and 6.68 %.), and micronutrient content *i.e.* Cu (0.54 and 0.59 mg/100 g), Mn (3.72 and 3.75 mg/100 g), Fe (3.42 and 3.57 mg/100 g), and Zn (5.36 and 5.42 mg/100 g). Were found highest with application of RDK through banana pseudo stem vermicompost + mustard oil cake @ 20 kg ha^{-1}) (T_8) during 2019-2020 and 2020-2021, respectively.

SURGICAL REPAIR OF CONGENITAL RECTO-VAGINAL FISTULA WITH ATRESIA ANI IN A COW CALF

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Abstract

Atresia is a congenital condition in which an orifice or passage of the normal body opening or tubular structure is closed or absent. Intestinal atresia has been reported as a common congenital defect in domestic mammals. Recto-vaginal fistula is another congenital abnormality usually observed along with atresia ani which leads to direct communication between the rectum and the vagina in female calves. The abdominal straining in efforts to void the feces may lead to the rupture of the

rectum, forming a recto-vaginal fistula, which allows the passage of fecal matter through the vulvar opening. The defect causes urofecal mixing and the vulva serves as a common orifice for both digestive and urogenital tracts. A six-month-old female cow-calf affected with recto-vaginal fistula along with atresia ani was presented to the Veterinary Teaching Hospital, Bihar Veterinary College, Patna. The case was previously operated twice for Atresia ani locally as per the owner. However, the opening closed during the cicatrization and unfortunately, both attempts remained futile. The defects were surgically corrected under epidural anaesthesia and infiltration of local anesthesia at the approximated site of the anus. The blind rectal pouch was incised to suture it with the skin by using black braided silk no. 1. The Recto-vaginal fistula was obliterated with Vicryl no. 1 after freshening the edges. A course of Post-operative antibiotics (Enrofloxacin) and analgesic (Meloxicam) were administered I/M for a period of 5 days and 3 days respectively. The daily antiseptic dressing was done. The sutures were removed on the 14th postoperative day. The correction of the condition, its management, and successful recovery without recurrence for a follow-up of 2 months is reported.

EXPORT PERFORMANCE OF POMEGRANATE IN INDIA: AN AGRIBUSINESS APPROACH

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Abstract

Pomegranate (*Punica granatum*) is a tropical fruit that has gained significant recognition in recent years due to its numerous health benefits and unique flavour profile. India has emerged as a prominent player in the global pomegranate market, with its export performance witnessing a steady growth trajectory. The export performance of pomegranate in India has witnessed remarkable growth, driven by its cultivation practices, commitment to quality, and expanding market reach. With its increasing popularity among health-conscious consumers and growing demand for exotic fruits, Indian pomegranates have carved a niche for themselves in the international market. The sustained efforts by farmers, government bodies, and industry stakeholders are likely to further strengthen India's position as a leading exporter of pomegranates in the years to come. The study entitled Export Performance of Pomegranate in India was undertaken to know growth and instability in area, production, productivity and export of pomegranate, competitiveness of pomegranate export and the share of major pomegranate exporting countries of world trade. The nature of data used for the study is entirely based on secondary source of data from 1988-89 to 2020-21. The growth in area, production, productivity and export of pomegranate was measured by Compound Growth Rate, Coefficient of Variation and Coppock's Instability Index were used for working out the instability in area, production, productivity and export of pomegranate. The Nominal Protection Coefficient was used to assess the pomegranate's export competitiveness. Hirschman's index was used to calculate the biggest pomegranate exporting nations' percentage of global trade. Agriculture exports increased (from 3443.09 to 282789), but their proportion to overall exports shrank (18.69 to 14.03) as a result of rising manufacturing and service sector shares, among other factors. Pomegranate exports from India are increasing in volume to the global market.

EVALUATION OF INTEGRATED PEST MANAGEMENT STRATEGY IN HADAGALI JASMINE (*JASMINUM AURICULATUM*) ECOSYSTEM

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Abstract

A study on evaluation of integrated pest management strategy in Hadagali jasmine (*jasminum auriculatum*) ecosystem was undertaken during the years 2021-22 and 2022-23. The Hadagali jasmine is a geographically identified species of floriculture crop. Popularly growing in Hadagali, Hagaribommanahalli Talukas of Vijayanagara District of Karnataka in an area of more than 500 hectares. It is having its uniqueness in its colour and fragrance and one of the important remunerative crops for the floriculturists of this locality. In recent past years the yield has become reduced due to the menace of insect pest such as red spider mite, eriphyid mite, bud worm and flower thrips. Therefore, a study was undertaken to asses the integrated pest management technologies in comparison with the farmers practice through front line demonstrations to combat the major pest complex in jasmine. Five demonstrations with an area of one acre each were carried out under irrigated situation with all

recommend package of practices like use of bio fertilizers, application of FYM, recommended dose of NPK and proper weeding etc. IPM demonstration was included the application of neem cake at 200 kg/ac at after 15 days of pruning, set of acaricides, insecticides and bio-agents were imposed for the management of pest complex in jasmine. The results of the demonstrations revealed that, the lower number of pests like mites, budworm and thrips were recorded in IPM blocks with flower yield of 53.63 quintal per hectare compared to farmers practice (47.02 q/ha). The per cent increase in yield was 14.03 with the B;C ratio of 1: 3.65.

ADOPTION OF PRECISION AGRICULTURE TECHNOLOGIES: A PATHWAY TO SUSTAINABLE AND EFFICIENT FARMING

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Abstract

Precision agriculture technologies have emerged as a promising solution to enhance agricultural productivity, reduce resource waste, and promote sustainable farming practices. The adoption of precision agriculture technologies is primarily motivated by the potential for increased efficiency and productivity. By utilizing precise data on soil conditions, crop health, and weather patterns, farmers can make informed decisions regarding the optimal allocation of resources. These technologies enable targeted interventions, such as variable rate application of fertilizers and pesticides, leading to improved yields, reduced costs, and increased profitability. Technological advancements and falling prices have made precision agriculture more accessible and cost-effective. The availability of affordable sensors, drones, and other hardware, coupled with advancements in data analytics and connectivity, has reduced barriers to entry. User-friendly software platforms and mobile applications have also facilitated the interpretation and utilization of the generated data, making precision agriculture technologies more user-friendly and attractive to farmers. The adoption of precision agriculture technologies extends beyond economic benefits. These technologies promote sustainable farming practices by minimizing resource waste and environmental impact. Through precise resource management, farmers can reduce the use of fertilizers, pesticides, and water, leading to improved soil and water quality. Early detection of crop diseases and pests enables timely interventions, reducing crop losses and enhancing sustainability. Despite the advantages, the adoption of precision agriculture technologies faces certain challenges. Limited awareness and knowledge among farmers regarding these technologies can hinder adoption rates. Educational programs and training initiatives are crucial to bridge this knowledge gap and promote technology literacy. Additionally, the initial investment costs associated with purchasing equipment and implementing precision agriculture systems can pose financial challenges, particularly for small-scale farmers. Government support, subsidies, and collaborations among stakeholders are essential to make these technologies accessible to all farmers.

EXPORT PERFORMANCE OF MANGO IN INDIA: AN AGRIBUSINESS ANALYSIS

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Abstract

Mango (*Mangifera indica*), often hailed as the "King of Fruits," holds a special place in the hearts and orchards of India. This abstract provides an overview of the mango industry in India, highlighting its historical significance, diverse cultivars, cultivation practices, economic impact, and export potential. Mango cultivation in India dates back thousands of years, with the country being home to a vast array of mango cultivars, each distinguished by its taste, aroma, and texture. The climatic diversity and fertile soils across India contribute to the successful growth of mango orchards in various regions, making it one of the leading mango-producing countries in the world. India boasts a rich assortment of mango varieties, including the famous Alphonso, Dasheri, Kesar and Langra, among others. The status of fresh mangoes in respect of its export from India was studied for the period from the year 2008-09 to 2019-20 concerning significant export destinations. Status was examined by estimating mean, compound growth rate (CGR), instability, and diversification. Ray method was used to estimate the

instability and diversification status was examined with the help of the Simpson Index of Diversification. Compound Growth Rate (CGR) was calculated using the functional form that fit the export data the best. In terms of quantity and value, the top export destinations for fresh mangoes from India during the study period were the United Arab Emirates, Bangladesh, Pakistan, the United Kingdom, Nepal, and Saudi Arabia. Regarding quantity and value, this export sector's average increase was 0.97 and 1.79 percent, respectively. High growth and moderate instability were seen together. On the whole, a moderate amount of instability was seen. The degree of diversification varied greatly between the years 2008–09 and 2019–20.

IDENTIFICATION OF CONSTRAINTS IN DIRECT BENEFIT TRANSFER (DBT) SCHEME IN FERTILIZER MARKETING SYSTEM IN NAMAKKAL DISTRICT

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Abstract

The Government has introduced Direct Benefit Transfer (DBT) system in fertilizers marketing system in October 2016. Under the fertilizer DBT system, 100 per cent subsidy on various fertilizer grades is released to the fertilizer companies on the basis of actual sales made by the retailers to the beneficiaries. Sale of all subsidized fertilizers to farmers/buyers is made through Point of Sale (PoS) devices installed at each retailer shop and the beneficiaries were identified through Aadhaar Card, Kisan credit card, Voter Identity Card etc. A study was undertaken in 2022 in Namakkal district of Tamil Nadu. The study area was selected purposively and the 120 farmers and 40 Retailers were selected using a simple random sampling method. The study was conducted with the help of a personal interview schedule aided by well-structured and a pre-tested questionnaire. Garrett's Ranking technique was employed for the allotment of ranking to various constraints. The present study was undertaken to identify the constraints faced by retailers in Direct Benefit Transfer scheme in Namakkal district of Tamil Nadu. The findings showed that Constraints such as Farmer doesn't bring Aadhaar card, Poor network, Server issue, Management of queue, Blockage of capital for manufacturer, Subsidy directly to the farmers, Soil health card linkage, Identify the real beneficiaries in the study period. The study suggested that frequently asked questions should be prepared and user manual should be made and distributed to retailers and farmers. Arranging district level workshops with retailers in non-implemented areas. Constitute "DBT working group" at district level. Meetings should be organized for retailers and farmers for spreading awareness.

EFFECT OF MULTINUTRIENT FORMULATIONS ON SECONDARY NUTRIENTS UPTAKE BY TOMATO

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Abstract

Tomato is the world's third largest vegetable and having wide usage in Indian culinary. Secondary and micronutrients are having considerable influence on nutrients uptake by tomato. Hence, an attempt was made to formulate new multinutrient formulation for enhancing the performance of tomato crop. Four multi nutrient liquid formulations with different composition containing secondary and micro nutrients were prepared. Field experiment was conducted to evaluate the new formulations with 10 treatments replicated thrice in Randomised Block Design (RBD). Different spray concentrations (1% and 2%) and number of sprays (twice and thrice) were evaluated in comparison with the existing recommendation. Plant and fruit samples were collected at harvest stage, dry weight recorded and analysed for secondary content. Uptake of secondary nutrients by tomato plants and fruits were calculated. Uptake of Ca, Mg and S by tomato crop at harvest stage ranged from 147 to 207, 32.6 to 46.8 and 36.3 to 51.8 kg ha^{-1} respectively. Uptake of Ca, Mg and S by tomato fruits ranged from 11.7 to 17.6, 23.4 to 34.3 and 11.0 to 16.2 kg ha^{-1} respectively. Significantly highest uptake of Ca, Mg and S by tomato crop and fruits was recorded in Formulation III Foliar Spray 1% thrice at 30, 60 and 90 days after planting (DAP) followed by Formulation IV Foliar Spray

1% thrice at 30, 60 and 90 DAP (T_6) which were on par. Lowest values of Ca, Mg and S uptake by tomato crop and fruits were observed in control which received NPK alone. Results showed increased secondary nutrients uptake with new multinutrient formulations.

ASSESSMENT OF PHYSICAL AND BIOLOGICAL PARAMETER OF SOME SELECTED SPRINGS OF TEHRI GARHWAL

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Abstract

Springs provide a substantial source of high-quality, perennial freshwater supplies for isolated populations while also supporting the Himalayas' diverse biodiversity and ecosystems. The Himalayas, sometimes known as the "water towers of Asia" or "the third pole," are the origins of ten major Asian rivers and have the highest concentration of snow and glaciers outside of the two poles (Lu et al., 2005; Qiu, 2008). These natural assets support 240 million people in the region, while 1.5 billion people downstream rely directly on the region for water, food, and electricity. Water springs also influence the nature of fauna (vegetation and trees) near them. Flowing water is usually captured by water-holding trees such as Oak (*Quercus leucotrichophora, Q. serrata*, Q. floribunda), which regulate the flow rate of water discharged from aquifers at higher elevations. The current study conducted for the assessment of physical and biological parameters such as pH, EC, longitude, latitude, isotope variation and discharge of some water springs was determined. The elevation of the study springs was found from 1650 msl to 2000 msl. and otherThe flow rate of maun, Jagdhar and Ranichauri springs was found 54.82 ml/sec 22.73 and 34.13ml/sec respectively. The various species of vegetative cover *i.e. Eupatorium adennophorum, Arundinaria fulcata, Rubenia pseudoacacia, Cupressuss torulosa* etc. was found in the study area. Spring rejuvenation can enhance water access and livelihoods and help achieve several sustainable development goals (SDGs). Spring rejuvenation programs can be successful in small scale rural community-owned lands.

HERITABILITY OF LONGEVITY, PRODUCTIVE HERD LIFE AND SELECTIVE VALUES AND ITS COMPONENTS

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Abstract

The female calves data was collected from herd history sheet, stock register, calves register and sales registers, maintained at Instructional Dairy Farm of G.B. Pant University of Agricultural and technology, Pantnagar (U.K.). The data of 1000 cross-breed cows were taken from 1985 to 2014. The heritability estimated by Paternal half sib correlation method. Result showed that heritability of Longevity, Productive Herd Life (PHL), Total calf born, Total normal calf, Total abnormal calf, Total female calf, Selective value and CGR as 0.22±0.080, 0.21±0.081, 0.20±0.080, 0.31±0.093, 0.10±0.069, 0.13±0.064, 0.16±0.073 and 0.16±0.073, respectively. The heritability estimate of longevity, productive herd life (PHL), total calf born and total normal calf in crossbred cows was medium in magnitude and indicated that the trait had sufficient additive genetic variance for selection to act upon to alter the of genetic makeup in cows the herd. This value of heritability total abnormal calf, total female calf, selective value and CGR was low, indicated that no additive genetic variance for the traits existed and the variations in the trait were due to environmental reasons so selection could not be used effectively to improve this traits. Therefore, longevity, productive herd life and selective values have sufficient additive genetic variance among the daughters of different sires and the same can be improved through selection. Other components of selective values can be improved by upgrading the environment.

Our Conference Memory

About the Conference Chairman

CONFERENCE CHAIRMAN

Dr. S.P. Singh, born in Village Jevri, Post Rajbun, District Meerut (U.P.), in 1970 and Graduated in Agriculture with Honors from G.M.V., Rampur Maniharan, Saharanpur (U.P.). He did his Post Graduation in Agricultural Botany, Institute of Advance Studies, Meerut University Campus, Meerut and Doctorate in the same discipline (Ag. Bot.) from C.S.J.M. University, Kanpur. Presently, he is working as Scientist (Plant Breeding) at C.S.A. University of Agriculture and Technology, Zonal Agriculture Research Station, Kalai, Aligarh (U.P.). Dr. Singh is a fellow of SRDA, and member of many other professional Societies, having 21 years of experience in Research and Extension Education Works. He authored many books such as Plant Breeding, Agriculture at a Glance, Hand Book of Agriculture (Hindi), Crop Physiology (Hindi & English), College Botany, Environmental Science & Agroecology, Concepts of Ecology etc. He is well recognized Scientist and having more than 300 publications in reputed National and International Journals. Dr. S.P. Singh is also Editor-in-Chief, Progressive Research-An International Journal & Frontiers in Crop Improvement (both Journals are NAAS recognized), Secretary, Society for Scientific Development in Agriculture & Technology and also Chief Managing Director, Astha Foundation, Meerut, working in the field of Science & Education.

He has been awarded as Best Editor and Writer Award-2006, Young Scientist Award-2007, Dr. M.S. Swaminathan Young Scientist Award-2009, Distinguished Scientist Award-2014, Scientific Initiator Award-2014 from Directorate of Rice Research, Hyderabad, Science Leader Award-2015 From RVSKVV, Gwalior, Outstanding Scientist in Agriculture Award-2016, Outstanding Achievement Award-2016, Excellence in Research Award-2017, Innovative Scientist of the Year Award-2017 Outstanding Scientist in Agriculture Award-2018 Before this International conference, Dr. S.P. Singh has already organized five conference at different corner of country, first conference was National symposium on "Achieving Millennium Development Goal : Problems & Prospects" at Bundelkhand University, Jhansi (UP) during October 25-26, 2009 under the umbrella of SSDAT, Meerut, Dr. Singh has been acted as an Organizing Secretary. The second was National conference on Emerging Problems and Recent Advances in Applied Sciences : Basic to molecular Approaches (EPRAAS-2014) during February 08-09, 2014 at Ch. Charan Singh University, Meerut (UP) again by SSDAT, Meerut in which Dr. S.P. Singh has played his role as an Organizing Chairman. The Third, Conference was Organized by SSDAT, Meerut and Astha Foundation, Meerut at Directorate of Rice Research, Hyderabad on Emerging Challenges and opportunities in Biotic and Abiotic Stress Management (ECOBASM-2014) during December 13-14, 2014. Fourth Conference organized by Astha Foundation, Meerut & SSDAT, Meerut at RVSKVV, Gwalior on Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2015). Fifth Conference was jointly organized by SSDAT, Meerut & Astha Foundation, Meerut at PJTSAU, Rajendranagar, Hyderabad, Telangana State on Innovative and Current Advances in Agriculture & Allied Sciences (ICAAAS-2016) during December 10-11, 2016. Sixth Conference organized by Astha Foundation, Meerut in collaboration with SSDAT, Meerut, MPUAT, Udaipur; CSAUAT, Kanpur; UAS, Raichur at MPUAT, Udaipur, Rajasthan on Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2017). Seventh Conference organized by Astha Foundation, Meerut in collaboration with SSDAT, Meerut, CSAUAT, Kanpur; IGKV, Raipur; BAU, Sabour; MPKV, Rahuri; RARI, Durgapura, Jaipur; Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2018). Eight Conference organized by Astha Foundation, Meerut in collaboration with SSDAT, Meerut, CSAUAT, Kanpur; IGKV, Raipur; BAU, Sabour; MPKV, Rahuri; UAHS, Shivamogga, Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2019). Ninth Conference organized by SSDAT, Meerut in collaboration with Astha Foundation, Meerut, Innovative and Current Advances in Agriculture & Allied Sciences (ICAAAS-2020) at Bangkok, Thailand. Tenth International Web Conference organized by Astha Foundation, Meerut in collaboration with SSDAT, Meerut, CSAUAT, Kanpur; IGKV, Raipur; BAU, Sabour; MPKV, Rahuri; BAU Rachi and UAHS, Shivamogga on Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2020). Eleventh International Web Conference organized by SSDAT, Meerut in collaboration with Astha Foundation, Meerut, CSAUAT, Kanpur; IGKV, Raipur; MPKV, Rahuri; BAU Rachi and UAHS, Shivamogga on Innovative and Current Advances in Agriculture & Allied Sciences (ICAAAS-2021). Twelth International Web Conference organized by Astha Foundation, Meerut in collaboration with SSDAT, Meerut, CSAUAT, Kanpur; IGKV, Raipur; BAU, Sabour; MPKV, Rahuri; BAU Ranchi and UAHS, Shivamogga on Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2021). Thirteen International Conference in Hybrid Mode organized by SSDAT, Meerut in collaboration with Astha Foundation, Meerut, CSAUAT, Kanpur; HPU, Shimla; BAU Ranchi, HFRI, Shimla and HNBGU, Srinagar on Innovative and Current Advances in Agriculture & Allied Sciences (ICAAAS-2022). Fourteen International Conference organized by Astha Foundation, Meerut in collaboration with SSDAT, Meerut, CSAUAT, Kanpur; BAU Ranchi; RLBCAU, Jhansi; SKRAU, Bikaner; ICAR-CIFE, Mumbai; AFU, Rampur, Chitwan, Nepal; NPU, Palamu and RK (P.G.) College, Shamli on Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2022).

Glimpse of SSDAT & Astha Foundation's Conferences

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