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Performance of Mustard Variety RH 749 to Different Planting Method and Nitrogen Levels Along With Plant Protection Measures

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Abstract

The observations of the experiment entitled "Performance of mustard variety RH 749 to different planting methods and nitrogen levels along with plant protection measures" showed that maximum plant height at 30, 60 and 90 DAS was obtained with the application of 150 kg N/ha over other nitrogen levels, whereas, at 30 DAS and at harvest 120 kg nitrogen application was found to be on par with 100 kg nitrogen fertilization. The maximum number of primary branches at 30, 90 DAS and harvest were obtained with the application of 120 kg N/ha over other nitrogen levels. The number of seeds per siliqua increased significantly with increasing levels of nitrogen application. The number of seeds per siliqua was maximum (4.4) at 150 kg nitrogen followed by 100 kg and 80 kg nitrogen fertilization. Nitrogen application significantly increased the biological yield. Highest biological yield (7581 kg/ha) was obtained with the application of 120 kg N/ha over other lower nitrogen doses. Application of 150 kg nitrogen resulted in higher oil content as compared to rest nitrogen levels.

Key words : *Mustard variety, planting method, nitrogen levels, plant protection measures.*

Introduction

Indian agriculture needs to be more knowledge intensive in order to keep pace with increased pressure due to growing population and reduction in land and energy resources. India holds a premier position in oilseed production in the world not only in terms of rich diversity but in terms of area as well**.** In India the oilseed sector occupies a marked position in the agriculture sector after cereals. It shares about 13% of the country's gross cropped area, accounting for 3% of the gross national product and 10% of the value of agriculture product. Mustard is an important *rabi* oilseed crop of India. Among the seven edible oilseeds cultivated in India, mustard occupies about 24.7% area and 48.3% of production. Its area, production and productivity in the country is 5.8 million hectare, 86.93 lakh million tonnes and 1083 kg/ha, respectively. Mustard is predominantly cultivated in Rajasthan (47.26 per cent), Haryana (11.73 per cent), Madhya Pradesh (10.82 per cent), UttarPradesh (9.73 per cent), and West Bengal (6.69) respectively.. In India, Rajasthan is the leading state in mustard cultivation with an area of 2.4 million hectare, an estimated production of 41.09 million tonnes and an average productivity of 1170 kg/ha (1).

India's Mustard seed production in 2018-19 is estimate at around 86.93 lakh MT, which is significantly higher from around 83.22 lakh MT produced in 2017-18, amidst support from the hike in MSP by Rs 200 to Rs 4,200 per quintal. In Uttar Pradesh mustard is the major oilseed crops during winter season occupying an acerage of 639 lakh hectare with production of 739 lack ton and productivity of 1136 kg/ha and (1) (DACNET).

The productivity of Rapeseed-Mustard in Rice-Mustard system is low due to many related problems. The major contributory causes are delayed sowing due to late harvesting of long duration rice varieties and soil wetness and moisture stress at critical stage of the crop as it is generally grown with the residual soil moisture after harvesting of rice and improper irrigation management practices reducing yield severely.

The crop grows well under irrigated as well as rainfed conditions. Being more responsive to fertilizers, it gives better results under irrigated conditions. However, 30-40 % of nutrients applied through fertilizers are utilized by the crops and the remaining more than 60% is lost through various pathways. The development of newer high yielding cultivars in mustard and the changing climate scenario, has made it imperative to assess the potential of these cultivars under varying fertility levels. Development of high yielding mustard varieties is one of the major concerns as the use of improved varieties accounts for 15-20% increase in productivity alone. This may be because of the altered morphology of high yielding varieties resulting into better utilization of water, nutrients and radiation. Adequate supply of nutrients (NPK) increases the seed and oil yields by improving the

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setting pattern of siliquae on branches, number of siliquae/plant and other yield attributes. Recommended fertilizer dose for different zones vary with climate, soil type and the cropping system followed. The balanced fertilization at proper time through an appropriate method of application increases nutrient use efficiency of mustard. Among the various importantnutrients, nitrogen is known to activate most of the metabolic activities and energy transformation. Nitrogen is an integral part of the chlorophyll, which converts light into chemical energy needed for photosynthesis. Improved varieties of Indian mustard have been reported to respond to nitrogen application up to 120 kg/ha (2). Nitrogen also increases the vegetative growth and delays the maturityof plants, and plays a key role with other nutrients in formation of seed protein and oil synthesis. The healthy plant foliage generally contains about 2.5-4 % N depending upon the age of leaves and type of plants. Nitrogen requirement of mustard depends on the initial soil status, climate, topography, soil type, organic matter content and the cropping system in practice, and also on the potential of a particular variety under specific environmental conditions.

Materials and Methods

A field experiment entitled "Performance of mustard variety RH 749 to different planting methods and nitrogen levels along with plant protection measures" was carried out at Virendra Kumar Singh Krishi Vigyan Kendra (K.V.K.) Virendra Nagar (Dhaura) Unnao (Uttar Pradesh) during rabi season of 2019-20. The details of experimental materials used, procedures followed and techniques adopted during the course of present investigation are described in this chapter.

Experimental site : The present experiment was carried out in the Instructional Farm, Virendra Kumar Singh Krishi Vigyan Kendra (K.V.K) Virendra Nagar (Dhaura) Unnao (Uttar Pradesh) during rabi season, 2019-20.

Climate and weather : The rainy season commences in the first fortnight of June and ends by mid of September with an average rainfall of 1094 mm (average of last 10 years). July and August are the months of heavy rainfall. Partial failure of monsoon once in three or four years is of common occurrence in this region. Winter sets in the month of December and continues till the month of February.

January is the coldest month of winter. Summer season commences during the second fortnight of February and ends by middle of June. April and May are the hottest months of summer. Total rainfall received during crop growing season was 0.0 mm. The open pan evaporation was maximum during 9th week (7.8 mm/day). Similarly, bright sun shine was highest in 6th week (9.2 hour/day).

Experimental details : The details of the experimental techniques employed for the investigation on "Performance of mustard variety RH 749 to different planting methods and nitrogen levels along with plant protection measures" are described below :

Treatment details

Details of treatment combinations

Main Plot	Treatment
T_1	Zero Tillage
T_2	Raised bed Planting
T_3	Conventional Tillage
Sub Plot	
N_1	0 kg N
N_2	60 kg N
N_3	90kg N
N_4	120 kg N
N_5	150 kg N

Note : The common fertilizer dose of phosphorus and potash From SSP and MOP at the rate of 50kg P_2O_5 and 30 kg K_2O was applied as basal half dose of nitrogen as per treatment. Remaining half dose of nitrogen was applied after first irrigation.

Details of treatment combination

Method of sowing	Nitrogen level (kg ha^{-1})	Combination
Zero tillage (M_1)	0 Kg N (N_0)	M_1N_0
Zero tillage (M_1)	60 Kg N (N_1)	M_1N_1
Zero tillage (M_1)	90 Kg N (N_2)	M_1N_2
Zero tillage (M_1)	120 Kg N (N_3)	M_1N_3
Zero tillage (M_1)	150 Kg N (N_4)	M_1N_4
Raised bed planting (M_2)	0 Kg N (N_0)	M_2N_0
Raised bed planting (M_2)	60 Kg N (N_1)	M_2N_1
Raised bed planting (M_2)	90 Kg N (N_2)	M_2N_2
Raised bed planting (M_2)	120 Kg N (N_3)	M_2N_3
Raised bed planting (M_2)	150 Kg N (N_4)	M_2N_4
Conventional tillage (M_3)	0 Kg N (N_0)	M_3N_0
Conventional tillage (M_3)	60 Kg N (N_1)	M_3N_1
Conventional tillage (M_3)	90 Kg N (N_2)	M_3N_2
Conventional tillage (M_3)	120 Kg N (N_3)	M_3N_3
Conventional tillage (M_3)	150 Kg N (N_4)	M_3N_4

Statistical analysis : The experimental data recorded during the course of investigation for each parameter were subjected to analysis for variance for Split Plot design with the help of computer as method suggested by Gomez and Gomez.

Results and Discussion

The results of the experiment entitled "Performance of mustard variety RH 749 to different planting methods and

Table-1 : Effect of management practices and levels of nitrogen on plant stand m^{-1} and height of plant at different stages of plant growth on mustard variety RH-749.

Treatments	Plant stand m^{-1}	Plant Height (cm)			
		30 DAS	60 DAS	90 DAS	At harvest
Management Practices					
Zero Tillage	6.25	20.68	84.90	125.20	142.98
Raised bed	6.33	25.13	98.30	183.28	210.70
Conventional	6.08	23.88	92.40	171.15	197.83
SEm (±)	0.10	0.41	1.60	2.83	3.60
CD (P=0.05)	NS	1.62	6.27	11.11	14.15
Nitrogen levels (kg/ha)					
0	6.00	18.67	62.53	135.00	155.20
60	6.33	20.53	77.57	148.90	171.27
90	6.22	25.10	100.47	170.20	195.70
120	6.33	28.60	126.90	185.40	213.17
150	6.44	29.57	132.50	190.50	219.07
SEm (±)	0.12	0.53	2.06	3.65	4.65
CD (P=0.05)	NS	1.55	6.02	10.67	13.58

Table-2 : Effect of management practices and levels of nitrogen on number ofbranches at different stages of plant growth on mustard variety RH-749.

Treatments	Number of branch at different growth stages			
	30 DAS	60 DAS	90 DAS	At harvest
Management Practices				
Zero Tillage	3.43	13.00	13.80	14.08
Raised bed	4.03	16.70	17.70	18.08
Conventional	3.73	15.13	16.08	16.40
SEm (±)	0.08	0.30	0.34	0.31
CD (P=0.05)	0.31	1.18	1.35	1.21
Nitrogen levels (kg/ha)				
0	2.80	10.20	10.83	11.07
60	3.40	15.20	16.10	16.43
90	4.00	16.90	17.93	18.30
120	4.70	17.47	18.57	18.93
150	5.10	17.73	18.83	19.23
SEm (±)	0.15	0.39	0.44	0.40
CD (P=0.05)	0.45	1.13	1.29	1.16

nitrogen levels along with plant protection measures" have been presented in this chapter. The observations recorded with respect to plant growth, yield and yield contributing characters, oil content, nutrient content, nutrient uptake and economics have been presented in respective tables and illustrated graphically wherever found necessary. The results obtained have been logically interpreted with cause and effect relationship in this chapter.

The data pertaining to plant height recorded at different growth stages are given in Table-1. In general, the plant height increased with the advancement in age of the crop and reached its maximum at maturity. Significantly maximum plant height at 30, 60 and 90 DAS was obtained with the application of 150 kg N/ha over other nitrogen levels, whereas, at 30 DAS and at harvest 120 kg nitrogen application was found to be on par with 100 kg nitrogen fertilization. A trend of increasing plant height was observed with increasing nitrogen fertilization at all growth stages.

The data pertaining to number of branches at various stages of crop growth have been presented in Table-2. In general, the number of branches increased with advancement of crop age. Successive increase in number of branches $plant^{-1}$ was recorded with increase in dose of nitrogen fertilization. Significantly maximum number of primary branches at 30, 90 DAS and harvest were obtained with the application of 120 kg N/ha over other nitrogen levels. At 60 DAS, 120 kg nitrogen application remained on par with 150 kg nitrogen.

Table-3 : Effect of management practices and levels of nitrogen on leaf area index at different stages of plant growth on mustard variety RH-729.

Treatments	Leaf area index %			
	30 DAS	60 DAS	90 DAS	At harvest
Management Practices				
Zero Tillage	1.61	4.09	3.89	2.73
Raised bed	1.66	4.38	4.16	2.92
Conventional	1.65	4.26	4.05	2.84
SEm (±)	0.03	0.08	0.08	0.06
CD (P=0.05)	NS	0.31	0.30	0.23
Nitrogen levels (kg.ha)				
0	1.60	3.85	3.66	2.56
60	1.62	4.20	3.99	2.80
90	1.65	4.40	4.19	2.94
120	1.68	4.52	4.30	3.01
150	1.70	4.58	4.36	3.05
SEm (±)	0.04	0.10	0.10	0.08
CD (P=0.05)	NS	0.29	0.29	0.22

Raised bed tillage produced highest number of branches both primary branches and secondary branches as compared to conventional tillage and zero tillage. The number of branches plant^{-1} declined significantly with decreasing the intensity of tillage from conventional tillage to zero tillage (Table-2). This may be because of the reason that better soil characteristics promoting better root growth in turn better shoot growth and higher number of branches. This is in confirmation with the finding of (2, 3, 4).

Application of nitrogen significantly increased the plant height, number of branches/plant. The increase in growth characters might be due to role of nitrogen in the plant body. The chief function of nitrogen in plants is multiplication, cell elongation and tissue differentiation. With adequate supply of nitrogen the plants grow taller, produce more branches and ultimately greater production of number of leaves which increased leaf area index of mustard. These findings are in close conformity with the findings of (3).

Increasing intensity of tillage operations favorably influenced the leaf area index (LAI). Higher leaf area index was obtained under raised tillage (Table-3). At al the stages of growth the LAI was significantly higher in raised tillage as compared to zero tillage which were both significant in their leaf area index. It is possible that raised and conventional tillage though creating better growth conditions might have enhanced tissue differentiation and expansion that resulted in taller plants and production of higher number of leaf/plant with expanded leaves. These results are in conformity with the findings of (4).

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