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RESPONSE OF YIELD AND ITS ATTRIBUTING TRAITS FOR VARIOUS NITROGEN REGIMES IN INDIAN MUSTARD [*BRASSICA JUNCEA* (L.) CZERN. AND COSS.]

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ABSTRACT

The research endeavor to study the effect of nitrogen levels on yield and its attributing traits including both quantitative and qualitative characters was undertaken by utilizing eleven diverse commercial Indian mustard (*Brassica juncea* L.) cultivars and forty-five hybrids raised in alpha lattice design with two replications under three nitrogen levels viz., control; 75 kg Nitrogen /ha and 150 kg Nitrogen /ha. at the experimental farm of Lovely Professional University, Jalandhar Punjab. The traits viz., days to flower initiation, 50 percent flowering and maturity; plant height; number of secondary branches; test weight; seed yield; harvest index; oil content; seed & chaff nitrogen and Seed & Chaff Nitrogen uptake increased with the increase in nitrogen levels. On the other hand, the number of seeds per siliqua decreased with the increase in Nitrogen level. Some traits viz. Number of Primary branches & Siliqua on main shoot; length of main shoot and biological yield were found unaffected and didn't depicted a clear trend at Nitrogen levels under study.

Keywords: *Brassica juncea*, Nitrogen effects, Nitrogen uptake

INTRODUCTION

The Indian mustard (*Brassica juncea* (L.) Czern. & Coss.) is one of the important oilseeds crop of the Indian subcontinent and occupy a pivotal role in oil seeds economy of India. The rapeseed-mustard group crops occupied an area of 6.23 mha in 2018-19 crop season out of which Indian mustard accounted for 75-80% area. The total production of India for rapeseed mustard crops was 72.42 mt in 2018-19. Globally, India accounts for 19.8% and 9.8% of the total acreage and production (DRMR). The Indian mustard has a high nutrient requirement for all the essential nutrients including Nitrogen which is to be supplied in appropriate quantity at appropriate time. Nitrogen being an important macro nutrient has major contribution in vegetative growth and yield including seed oil content. Nitrogen (N) is the most important nutrient, and being a constituent of protoplasm and protein, it is involved in several metabolic processes that strongly influence growth, productivity and quality of crops (Reddy and Reddy 1998, Kumar *et al.,* 2000). The study of the responses of the yield attributing traits towards different nitrogen regimes can bring more understanding for exploiting the full genetic potential of the crop.

MATERIAL AND METHODS

The present investigation was carried out at the research farm of School of Agriculture, LPU Jalandhar, Punjab**.** Fifty-six diverse genotypes including commercial varieties and the hybrids generated through their crossing were evaluated in alpha lattice design with two replications under three nitrogen levels viz., control; 75 kg Nitrogen / ha and 150 kg Nitrogen /ha. The entire nitrogen was given as basal dose along with the recommended P_2O_5 : K_2O dose of 40 : 40 kg / ha. The data for fourteen quantitative traits including seed yield per plant was recorded at appropriate stage of the plant separately under all three different nitrogen levels. The estimates of the five qualitative traits including oil content were obtained and recorded in the laboratory respectively using Foss-tecator near-infrared reflectance spectroscopy (FT-NIRS) product analyzer and modified micro-Kjeldahl method proposed by Subbiah and Asija (1956). The Student's T test was applied on the mean values so obtained under different Nitrogen levels for the test of significance.

RESULTS AND DISCUSSIONS

The days to Flower Initiation decreased in 75 Kg Nitrogen per ha condition and seem to increase in 150 Kg Nitrogen per ha condition when compared with mean of control. Kumar and Kumar (2008) observed decrease in number of flowering days when higher dose of nitrogen was applied. However the difference in both cases was found non-significant on application of Student's T- Test. The days to fifty percent flowering increased in both 75 Kg and 150 Kg Nitrogen per ha condition. Kumar and Kumar (2008) found similar results in their studies. However the increase in only 150 Kg Nitrogen per ha condition was found significant on comparing the mean in respective condition with control. The increase in duration of days to maturity was observed in both 75 Kg and 150 Kg Nitrogen per ha condition. However, the increase was found significant only in case of 150 Kg Nitrogen per ha condition over control on comparing means of different genotypes.

The plant height increased over the control in 75 Kg and 150 Kg Nitrogen per ha condition. Dongarkar *et al.,* (2005) also found that increase in quantity of nitrogen resulted in increase of height of Indian mustard. Here also, the significant increase in Plant Height was only observed

Table 1. List of the genotypes including commercial varieties and hybrids

Jumka	JUMKA X ZEM-1	PUSA MUSTARD-28 X GUJARAT MUSTARD-3	ZEM-1 X NRCHB-101
RNG-73	JUMKA X DRMR-1	PUSA MUSTARD-28 X ZEM-1	ZEM-1 X RH-30
PUSA MUSTARD-28	JUMKA X NRCHB-101	PUSA MUSTARD-28 X DRMR-1	ZEM-1 X TM-4
GUJARAT MUSTARD-3	JUMKA X RH-30	PUSAMUSTARD-28 X NRCHB-101	ZEM-1 X KBS-3
ZEM-1	JUMKA X TM-4	PUSA MUSTARD- 28 X RH-30	DRMR-1 X NRCHB -101
DRMR-1	JUMKA X KBS-3	PUSA MUSTARD- 28 X TM-4	DRMR-1 X RH-30
NRCHB-101	RNG-73 X PUSA MUSTAD-28	PUSA MUSTARD-28 X KBS-3	DRMR-1 X TM-4
RH-30	RNG-73 X GUJARAT MUSTARD-3	GUJARAT MUSTARD-3 X ZEM-1	DRMR-1 X KBS-3
TM-4	RNG- 73 x Zem-1	GUJARAT MUSTARD-3 X NRCHB-101	NRCHB-101 X RH-30
KBS-3	RNG-73 X DRMR-1	GUJARAT MUSTARD-3 X DRMR-1	NRCHB-101 X TM-4
Varuna	RNG-73 X NRCHB-101	GUJARAT MUSTARD-3 X RH-30	NRCHB-101 X KBS-3
JUMKA X RNG-73	RNG-73 X RH-30	GUJARAT MUSTARD-3 X TM-4	RH-30 X TM-4
JUMKA X PUSA MUSTARD-28	RNG-73X TM-4	GUJARAT MUSTARD-3 X KBS-3	RH-30 X KBS-3
JUMKA X GUJARAT MUSTAD-3	RNG-73 X KBS-3	ZEM-1 X DRMR-1	TM-4 X KBS-3

Table 2(a) Comparison of means for various traits under different Nitrogen levels

Conditions	**Characters**					
	Days to Flower Initiation	**Days to 50% Flowering**	**Days to Maturity**	**Plant Height**	**No of Primary Branches Per Plant**	**No of Secondary Branches per Plant**
Control	56.34	75.83	135.3	174.29	7.47	28.63
75 Kg/ha	55.97	76.28	135.27	176.8	7.61	30.11*
150 Kg/ha	56.59	77.02*	136.5*	178.28*	7.26	30.08*
Overall Mean	56.3	76.38	135.69	176.46	7.45	29.61
SE	0.18	0.35	0.41	1.16	0.1	0.49

*significant at 5% probability level

Table 2(b) Comparison of means for various traits under different Nitrogen levels

Conditions	**Characters**					
	Length of Main Shoot	**No of Siliqua on Main Shoot**	**Siliqua Length**	**Seeds Per Siliqua**	**1000 Seed Weight**	**Seed Yield Per Plant**
Control	55.76	37.97	6.3	17.13	4.33	25.83
75 Kg/ha	55.16	39.87	6.53*	15.96	4.65	26.49
150 Kg/ha	56.98	37.81	6.33	14.26*	4.78*	26.8*
Overall Mean	55.97	38.55	6.39	15.78	4.59	26.37
SE	0.54	0.66	0.07	0.83	0.13	0.29

*significant at 5% probability level

Table 2(c) Comparison of means for various traits under different Nitrogen levels

Conditions	Characters						
	Biological Yield Per Plant	**Harvest Index**	**Oil Content**	**Seed Nitrogen**	**Chaff Nitrogen**	**Seed Nitrogen Uptake**	**Chaff Nitrogen Uptake**
Control	175.54	14.86	37.83	1.317	0.559	0.34	0.837
75 Kg/ha	176.73	15.23	38.01	1.346	0.567	0.357	0.852
150 Kg/ha	172.09	15.83*	38.22*	1.374*	0.569*	0.368*	0.827
Overall Mean	174.79	15.31	38.02	1.346	0.565	0.355	0.839
SE	1.39	0.28	0.11	0.016	0.003	0.008	0.007

*significant at 5% probability level

in 150 Kg Nitrogen per ha condition on comparing the mean with control using Student's T- Test. A non significant variation was observed in both Nitrogen doses for number of primary branches per plant on comparing mean in each condition with mean of control. A significant level of increase in the number of secondary branches per plant was observed in both 75 Kg and 150 Kg Nitrogen per ha condition and hence the trait was found effected by change in Nitrogen levels. Thakur *et al.,* (2005) in their investigation found increase in number of secondary branches with higher nitrogen dose up to 120 kg /ha. No clear trend was observed for the relation between the increased Nitrogen level and the length of Main Shoot. The variation so observed between mean of the both Nitrogen level conditions i.e. 75 Kg and 150 Kg Nitrogen per ha were found non significant.

The number of siliqua on main shoot did not seem to be effected by Nitrogen levels as inferred from non significant variation for the trait on comparing with control. The siliqua length seems to increase with the level of Nitrogen. Singh *et al.,* (2002) observed increase in siliqua length with the higher nitrogen dose of 120 kg/ha. However, the trait was significantly different with control only in case of 75 Kg Nitrogen per ha condition. In case of 150 Kg Nitrogen per ha condition, the siliqua length was found at par with the control which may be due to imbalanced use of fertilizer. The number of seeds per siliqua appeared to decrease in Nitrogen dose condition over control. A significant level of decrease only in case of 150 Kg Nitrogen per ha condition. In other case i.e. 75 Kg Nitrogen per ha condition, the increase was found non significant. Singh *et al.,* (2002) also observed similar results.

The 1000 Seed weight increased with the increase in level of Nitrogen. Singh and Brar (1999) also observed increase in 1000 seed weight with dose upto 100 kg/ha. However a significant increase was only found in case of 150 Kg Nitrogen per ha level in present investigation. An increase was found for seed yield per plant with increase in Nitrogen level. Deekshitulu *et al.,* (1998) also observed same trend who found increase in seed yield with successive increase of nitrogen level up to 150 kg/ha**.** Application of Student's T- Test between the mean in Nitrogen dose conditions and control revealed that the increase was non significant in case of 75 Kg Nitrogen per ha condition and significant for 150 Kg Nitrogen per ha condition. No clear trend was observed on comparing the values in all of the conditions for the biological yield per plant. The value of Harvest Index tends to increase with the level of Nitrogen application. The increase was significant only in 150 Kg Nitrogen per ha condition.

The oil content increased with increase in Nitrogen levels. Here again the increase was significant only for 150 Kg Nitrogen per ha condition. Arora *et al.,* (1994) observed that significant increase of nitrogen level upto 100 kg / ha resulted in increases oil content. The Seed Nitrogen, Chaff Nitrogen and Seed Nitrogen uptake increased with increase in Nitrogen level, possibly due to increase in Nitrogen uptake. On comparing the mean observed for various genotypes for each Nitrogen condition along with mean of control, the significant level of variation was only observed in case of 150 Kg Nitrogen per ha condition Yadav *et al.,* (1995) found similar results. A non significant variation was observed for the Stover Nitrogen uptake. In case of 75 Kg Nitrogen per ha condition, the trait exhibited a non significant increase. However, a non significant decrease was observed in case of 150 Kg Nitrogen per ha condition due to reduction in biological yield possibly caused by nutrient imbalance.

CONCLUSION

The Seed Nitrogen uptake and the Stover Nitrogen uptake seem to significantly increase in general with increase in nitrogen levels. The other traits viz., days to flower initiation, days to 50 percent flowering, days to maturity, plant height, number of secondary branches per plant, siliqua length, 1000-seed weight, seed yield per plant, harvest index, oil content, seed nitrogen and chaff nitrogen were found to increase with increase in nitrogen level. However, the variation was non-significant in majority of cases. A declining trend was observed for number of seeds per siliqua on increase of nitrogen levels. The traits viz., number of primary branches per plant, length of main shoot, number of siliqua on main shoot and biological yield seems to be unaffected across the nitrogen levels

under study.

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