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Response of Different Levels of Nitrogen and Phosphorus on Yield and Economics of Indian Mustard (*Brassica Juncea* L.) under climatic Conditions of Agra Region

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ABSTRACT

A field experiment was carried out to study the impact of different levels of nitrogen and phosphorus application on yield and economics of mustard. The experimental work was conducted in RBD (factorial) design with three replications. The experiment consisted of 3 levels of nitrogen (40, 80 and 120 kg N/ha) and four levels of phosphorus (0, 20, 40 and 60 kg P_2O_5/ha). The soil of experimental field was sandy loam in texture with a pH 8.20. The soil was low in available nitrogen (182.48 kg/ha), medium in available phosphorus (28.20 kg P_2O_5/ha) and rich in available potash (286.74 kg K_2O/ha). Various levels of nitrogen and phosphorus influenced seed yield significantly. Every increase in the level of nitrogen and phosphorus increased seed yield/ha. More values of seed yield and its contributory characters were observed with the application of N @ 120/kg and P_2O_5 @ 60/kg. Highest net profit of Rs. 48515/ha was recorded with 120 kg N/ha in combination with 60 kg P/ha while maximum B:C ratio (3.02) was noted with the application of 120 kg N/ha along with 20 and 40 kg P_2O_5/ha.

Key Words: Mustard, Nitrogen, Phosphorus, Yield, Economics.

INTRODUCTION

The production of mustard is not being fully exploited because of the lack of proper information of nutritional and water requirement. The important constraints to crop growth are those caused by shortage of plant nutrients. The nutrient requirement of oilseed crops, in general, is very high for almost all the essential mineral nutrients which are to be supplied in adequate quantities (Davari and Mirzakhani, 2009). Mustard is very sensitive to insufficient nitrogen and very responsive to nitrogen fertilization. Insufficient N availability to mustard plants results in low yields and significantly reduced profits compared to a properly fertilized crop (Singh *et al*, 2010). An adequate supply of available phosphorus in soil is associated with increased root growth, which means roots can explore more soil for nutrients and moisture. A deficiency of phosphorus will slow overall plant growth and delay crop maturity. Phosphorus is mobile in the plant, so it is absorbed during early growth and is later redirected for use in seed formation. Higher phosphorus levels increased the yield and N use efficiency (Yapping *et al,* 2015). Thus, A field experiment was conducted on sandy loam soil at RBS Collage Agricultural Research Farm, Bichpuri, Agra during *Rabi* season of 2018-19 with the objectives- 1) To determine the optimum level of nitrogen and phosphorus for obtaining optimum economic yield of mustard, and 2) To evaluate the economic viability of various treatments.

MATERIALS AND METHODS

The treatments included in the experiment were, 3 levels of nitrogen (40, 80 and 120 kg N/ha) and four levels of phosphorus (0,20,40 and 60 kg P_2O_5/ha). Thus, in all 12 treatment combinations were compared in a Randomized Block design(factorial) with three replications. Soil samples were collected from surface (0–15 cm) of the study area. The soil texture was sandy loam with 60.72% sand, 21.12% silt and 18.16% clay. The soil was low in available nitrogen (182.48 kg/ha), medium in available phosphorus (28.20 kg P_2O_5/ha) and rich in available potash (286.74 kg K_2O/ha). The pH of surface soil is 8.2. Full amount of nitrogen and P_2O_5 as per treatment through urea and SSP along with 30 kg K_2O/ha through MOP were applied at the time of sowing as basal dressing. The mustard variety (NRCDR-2) which is well suited for Agra region was sown in furrows 5 cm deep at the distance of 45 cm. with seed rate of 5 kg/ha. The yield and yield attributes were recorded at harvest and analysed statistically. The

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Table1. Yield contributing characters of mustard as influenced by various treatments.

Treatment		No. of siliquae / plant	Length of siliqua (cm)	No. of seeds / siliqua	1000 seed weight(g)
Nitrogen level (kg / ha)					
40	N_1	175.73	4.85	11.41	4.44
80	N_2	189.15	5.14	12.36	5.06
120	N_3	208.50	5.36	13.04	5.62
SEm±		4.01	0.070	0.210	0.140
CD at 5%		11.75	0.21	0.62	0.41
Phosphorus level (kg / ha)					
0	P_0	172.90	4.72	11.38	4.42
20	P_1	185.13	5.00	11.98	4.82
40	P_2	198.12	5.28	12.54	5.28
60	P_3	208.38	5.48	13.17	5.65
SEm±		3.47	0.061	0.182	0.121
CD at 5%		10.18	0.18	0.53	0.36

mean of each parameter was compared statistically using analysis of variance. For various parameters the critical difference among the treatments was worked out.

RESULTS AND DISCUSSION

Nitrogen and phosphorus application induced significant increase in the yield of Indian mustard and its contributory characters. Nitrogen is the most important nutrient element responsible for increasing the yield and quality of crop plants. Mustard (*Brassica juncea* L.) responds favourably to nitrogen fertilization mainly due to its exhaustive nature and deep root system. For the data relating to rates of nitrogen, it was noted that with every increase in level of nitrogen both per plant and per hectare yields were improved. Nitrogen application up to 120 kg/ha recorded significant increase in number of siliquae plant^{-1}, seed siliquae^{-1}, length of siliqua and 1000 seed weight when compared with application of 40 and 80 kg N/ha (Table-1). These yields contributing characters influenced the seed yield plant^{-1}, which, in turn, was responsible for higher seed yield per hectare with increasing levels of nitrogen. The application of 80 and 120 kg N/ha produced significantly higher seed yield/ha by 26.85 and 40.05 per cent, respectively than 40 kg N/ha (Table-2). Similar results were obtained by Singh *et al* (2012), Panotra *et al* (2016), Rajput R K (2017), Rajput *et al* (2018) and Bankoti (2021). As the seed yield plant^{-1} is the combined effect of number of siliquae plant^{-1}, length of siliquae, number of seeds siliqua^{-1} and 1000 seed weight. Almost all yield contributing characters improved appreciably with increasing levels of phosphorus upto 60 kg P_2O_5/ha. The application of phosphorus increased the symbiotic nitrogen fixation power and, in turn, increased number and weight of pods /plant and 1000 grain weight. Thus, these yield attributes might have resulted in significantly higher seed yield plant^{-1} which, in turn, may be responsible for higher seed yield/ha. The seed yield with control, 20, 40 and 60 kg P_2O_5/ha was 11.28, 13.05,14.48 and 15.63 q/ha, respectively. This indicate that seed yield appreciably increased with every increase in the rate of phosphorus application up to 60 kg P_2O_5/ha. These results are in the proximity with the findings obtained by Panotra *et al* (2016). Solanki *et al* (2018), Singh *et al* (2019) and Chauhan *et al* (2020).

The regional adaptability of any agronomic practice in the cultivation of any crop is completely based on maximum economic value of treatments. Based on the cost analysis (Table-3), highest net profit of Rs. 48515/ha was recorded with 120 Kg N/ha applied in combination with 60 kg P_2O_5/ha. The

Table2.Biological Yield, seed and stalk yield of mustard as influenced by various treatments.

Treatment		Biological yield (qha^{-1})	Seed yield (qha^{-1})	Stalk yield (qha^{-1})	Harvest index (%)
Nitrogen level (kg / ha)					
40	N_1	40.24	11.21	29.03	27.86
80	N_2	47.48	14.22	33.26	29.95
120	N_3	50.54	15.70	34.84	31.06
SEm±		1.02	0.42	0.48	0.98
CD at 5%		2.99	1.23	1.41	NS
Phosphorus level (kg /ha)					
0	P_0	40.06	11.28	28.78	28.16
20	P_1	45.03	13.05	31.98	28.98
40	P_2	48.30	14.48	33.82	29.98
60	P_3	50.97	15.63	35.34	30.67
SEm±		0.88	0.364	0.416	0.849
CD at 5%		2.59	1.07	1.22	NS

Table 3. Economics of mustard crop (Rs ha^{-1}) as influenced by levels of nitrogen and phosphorus

Treatment	Gross income (Rs ha^{-1})	Common cost (Rs ha^{-1})	Cost of cultivation (Rs ha^{-1})	Net income (Rs ha^{-1})	B: C ratio
N_1P_0	53010	19450	20015	32995	2.65
N_1P_1	57047	19450	21065	35982	2.71
N_1P_2	60234	19450	22115	38119	2.72
N_1P_3	62801	19450	23165	39636	2.71
N_2P_0	59754	19450	20580	39174	2.90
N_2P_1	63791	19450	21630	42161	2.95
N_2P_2	66978	19450	22680	44298	2.95
N_2P_3	69545	19450	23730	45815	2.93
N_3P_0	63020	19450	21146	41874	2.98
N_3P_1	67057	19450	22196	44861	3.02
N_3P_2	70244	19450	23246	46998	3.02
N_3P_3	72811	19450	24296	48515	3.00

maximum B:C ratio (3.02) was noted with 120 Kg N/ha applied in combination with 20 kg P_2O_5/ha and 40 kg P_2O_5/ha. Additional benefit with each rupee invested in these cases is due to less investment.

REFERENCES

Agricultural Statistics at a Glance (2022) Government of India, Ministry of agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics and Statistics.

Bankoti P, Kumar K and Kumar A (2021). Effect of nitrogen rates on performance of mustard (*Brassica juncea* L.), J Pharmacognosy and Phytochemistry **10**(1): 2847-2850.

Chauhan Y Z, Patel D K, Bhabhor K (2020). Effect of N, P_20_5 and Sulphur on yield, uptake of nutrient and fertility at harvest of mustard. *Int J Current Microbiol Appl Sci* **9**(6):3506-3512.

Davari M R and Mirzakhani M (2009). 'Integrated nutrient management towards sustainable production of oilseeds and pulses'. *Intl J Agri Crop Sci* **1**(1): 24-32.

Panotra N, Kumar A and Singh O P (2016). Impact of Different Levels of Fertilizer on Growth and Yield of Indian Mustard (*Brassica juncea Coss*) under Irrigated Condition of Western UP. *Int J Sci Nature* **7** (4): 802-804.

Rajput R K (2017) Effect of Nitrogen and Sulphur levels on nutrients uptake and yield of Indian mustard (*Brassica juncea* L. Czern & Coss.) *Int Archive of Appl Sci and Technol* **8** (3): 29-31.

Rajput R K, Singh SP, Verma J, Rajput P and Nath S (2018). Effect of different levels of nitrogen and sulphur on growth and yield of Indian mustard (*Brassica juncea* L. Czern and Coss.) in salt affected soil, *J Pharmacog and Phytochem* **7**(1): 1053-1055.

Singh J, Sahay N, Singh H and Bhadauria H S (2012). 'Nitrogen and sulphur requirement of mustard under different crop sequences' *Ann Pl Soil Res* **14**(2): 113-115.

Singh R, Uma, Kumar Tapendra (2019). Effect of nitrogen and phosphorus levels on the growth and yield of mustard (*Brassica juncea* L.), *J Multidisciplinary Advance Res* **8**(2):76-81.

Singh Y, Singh T, Singh U N and Rajput P K (2010). Effect of nutrient management on yield, quality and economics of irrigated Indian mustard (*Brassica juncea*). *Indian J Agric Sci* **80**: 691-94.

Solanki R L, Sharma M, Indoria D (2017). Effect of Sullphur, Phosphorus and Phosphorus solubilising bacteria on Indian mustard (*Brassica juncea*) and micronutrient availability in soil. *J Indian Society of Soil Sci* **66**(4):415-19.

Yaping Xie, Xiaoxia Niu and Junyi Niu(2015) Effect of Phosphorus Fertilizer on Growth, Phosphorus Uptake, Seed Yield, Yield Components, and Phosphorus Use Efficiency of Oilseed Flax. *American J Agron* **108**(3):1257-1266.

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