

Influence of NPK Levels on Performance of Indian Mustard (*Brassica juncea* L.)

A.L. Jat*, K.P. Prajapati, B.K. Patel, P.J. Patel, J.R. Patel, S.K. Shah and A.G. Desai

Castor-Mustard Research Station, Sardarkrushinagar Dantiwada Agricultural University,
Sardarkrushinagar - 385 506, Gujarat, India

*Corresponding author

ABSTRACT

Keywords

Indian mustard, Nitrogen, Phosphorus, Potassium, Partial factor productivity and production efficiency.

Article Info

Accepted:
21 July 2017
Available Online:
10 September 2017

A field experiment was carried out during *rabi* season of 2015-16 at Castor-Mustard Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar in the north-Gujarat agro-climatic region. The experiment was laid out in factorial randomized block design with replicated thrice. Results revealed that seed yield of Indian mustard was recorded significantly higher with the application of 80 kg N/ha and it was 4.40 and 11.54% higher over application of 100 kg and 60 kg N/ha. Net returns and benefit: cost ratio was recorded maximum with application of 80 kg N/ha and it recorded ₹ 4951/ha and ₹ 11259/ha higher net returns than application of 100 kg and 60 kg N/ha. Other parameter like partial factor productivity of nitrogen was the highest under application of 60 kg N/ha but in respect to partial factor productivity of phosphorus was higher with application of 40 kg P₂O₅/ha.

Introduction

India is the fourth largest oilseed economy in the world. Rapeseed-mustard contributes 28.6% in the total oilseeds production among the seven edible oilseeds cultivated in India and ranks second after groundnut sharing 27.8% in the India's oilseed economy (Singh *et al.*, 2017). Indian mustard (*Brassica juncea* L.) is predominantly cultivated in the states of Rajasthan, Uttar Pradesh, Haryana, Madhya Pradesh and Gujarat and some non-traditional areas of South India including Karnataka, Tamil Nadu, and Andhra Pradesh. The mustard growing regions in India are having vast diversity in the agro climatic conditions and different species of rapeseed-mustard are

grown in some part of the country. Gujarat stands second in yield among the mustard growing states in India. In Gujarat important mustard growing districts in north Gujarat are Banaskantha, Patan, Mahesana, Sabarkantha, Kutchh and Gandhinagar districts covered nearly 95% of total mustard growing area of Gujarat state. Although a number of factors are responsible for low productivity mainly imbalance fertilization. Apart from improved varieties and judicious use of irrigation water without accompanying use of adequate amount of nutrients leads to nutrient mining and imbalance, resulting in now a day we are facing crisis of low soil fertility, hidden

hunger and low factor productivity. Optimum amount and balanced fertilization is critically required for achieving higher yield from improved variety of Indian mustard. Primary nutrients i.e. nitrogen, phosphorus and potassium play a pivotal role in crop yield. Various studies indicated that the increasing levels of nutrient resulted concomitantly increasing yield of mustard. Therefore, this study was initiated to evaluate the various levels of nutrients on the productivity, profitability and quality of Indian mustard.

Materials and Methods

A field experiment was conducted during *rabi* season of 2015-16 at Castor-Mustard Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar (24°12' N latitude, 72°12' E longitude and at an altitude of 154.5 m above mean sea level), Gujarat, India. The soil of the experimental field was loamy sand in texture with pH 7.2, low in available nitrogen, available phosphorus, available potassium and organic carbon. The experiment was laid out in randomized block design with factorial concept comprising three levels of nitrogen, two levels phosphorus and two levels of potassium with replicated thrice. The mustard variety 'GM-3' was sown in the last week of October at a distance of 45 cm x 15 cm by using 3.5 kg/ha seed rate. Full dose of phosphorus and potassium along with half dose of nitrogen fertilizers were drilled just before the sowing in the form of urea, DAP and MOP and remaining half dose of nitrogen was applied after 25-30 DAS in earmarked plots. 40 kg sulphur/ha was also applied uniformly to all plots as basal application. The other crop management practices were followed as per standard package of practices. Various growth parameters, yield attributes and yield were recorded at harvest. Oil content was analyzed by standard procedures of Nuclear Magnetic Resonance Method. The cost of cultivation and net returns were

calculated by taking into account the prevailing cost of inputs and local market price of produce. The standard analysis of variance (Gomez and Gomez, 1984) technique prescribed for the randomized block design was performed to compare the treatment means at 5% level of significance (P=0.05) using least significant difference (LSD).

Results and Discussion

Crop growth, yield and quality

Plant height, number of branches/plant, number of seeds/siliqua and length of siliqua were not influenced significantly due to various levels of nitrogen, phosphorus and potassium except number of primary branches/plant and number of siliquae/plant which were significantly higher with the application of 80 kg N/ha followed by 100 kg N/ha (Table 1). While, number of seeds/siliqua was recorded higher under application of 100 kg N/ha and it's remained statistically at par with application of 80 kg N/ha. The 1000-seed weight remained unaffected due to various levels of NPK. The results are in line with the findings of Singh *et al.*, (2017). The oil content and oil yield was not influenced significantly due to different levels of nitrogen, phosphorus and potassium. However, oil yield was recorded significantly higher with the application of 80 kg N/ha which was closely followed by incorporation of 100 kg N/ha. Significantly higher seed yield was recorded with the application of 80 kg N/ha and it was closely followed by 100 kg N/ha. The corresponding increases in seed yield due to application of 80 kg N/ha to the tune of 4.40 and 11.54% higher over 100 kg and 60 kg N/ha. This could be ascribed due to the more availability of nitrogen at 80 kg/ha must have increased the proportion of nutrient in the crop plant. Beside this, the higher level of nutrient resulted in higher yield attributes and led to increased seed yield of mustard.

Table.1 Effect of NPK levels on growth, yield attributes and quality of Indian mustard

Treatments	Plant height (cm)	No. of branches/plant		No. of siliquae per plant	No of Seeds/siliqua	Length of siliqua (cm)	Test weight (g)	Seed yield (kg/ha)	Oil Content (%)	Oil yield (kg/ha)
		Primary	Secondary							
<i>Nitrogen levels</i>										
N ₁ : 60 kg/ha	185.98	4.70	13.80	360.07	14.05	3.96	4.44	2703	36.21	979
N ₂ : 80 kg/ha	187.85	5.15	14.22	388.57	14.92	4.18	4.22	3015	36.57	1102
N ₃ : 100 kg/ha	188.08	4.83	13.87	382.22	14.95	4.17	4.27	2888	35.59	1028
SEm±	4.14	0.12	0.53	7.75	0.23	0.89	0.14	62.06	0.42	30.9
C D (P=0.05)	NS	0.35	NS	22.75	0.69	NS	NS	182.08	NS	90.5
<i>Phosphorus levels</i>										
P ₁ : 20 kg/ha	186.24	4.83	14.23	365.53	14.56	4.06	4.40	2812	36.27	1020
P ₂ : 40 kg/ha	188.37	4.96	13.69	388.37	14.72	4.15	4.21	2926	35.97	1052
SEm±	5.07	0.15	0.65	6.33	0.19	0.073	0.12	50.67	0.34	37.8
C D (P=0.05)	NS	NS	NS	18.58	NS	NS	NS	NS	NS	NS
<i>Potassium levels</i>										
K ₀ : 0 kg/ha	187.73	4.93	14.08	376.70	14.74	4.08	4.26	2895	36.19	1048
K ₁ : 30 kg/ha	186.88	4.86	13.84	377.20	14.53	4.12	4.35	2843	36.06	1024
SEm±	5.07	0.15	0.65	6.33	0.19	0.073	0.12	50.67	0.34	37.8
C D (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table.2 Effect of NPK levels on economics and partial factor productivity of Indian mustard

Treatments	Net returns (₹/ha)	B: C ratio	Production efficiency (kg/ha/day)	Economic efficiency (₹/ha/day)	Partial factor productivity (kg yield/kg nutrient applied)	
					Nitrogen	Phosphorus
<i>Nitrogen levels</i>						
N ₁ : 60 kg/ha	75128	4.01	19.9	552	45.1	99.0
N ₂ : 80 kg/ha	86387	4.44	22.2	635	37.7	112.6
N ₃ : 100 kg/ha	81436	4.21	21.2	599	28.9	109.0
SEm±	2653.0	0.11	0.53	19.5	0.94	2.73
C D at 5 %	7781.0	0.31	1.55	57.2	2.77	8.00
<i>Phosphorus levels</i>						
P ₁ : 20 kg/ha	79362	4.22	20.7	584	36.2	140.6
P ₂ : 40 kg/ha	82606	4.22	21.5	607	38.2	73.1
SEm±	3249.3	0.13	0.65	23.9	1.16	3.34
C D at 5 %	NS	NS	NS	NS	3.39	9.79
<i>Potassium levels</i>						
K ₀ : 0 kg/ha	82379	4.33	21.3	606	37.4	107.9
K ₁ : 30 kg/ha	79589	4.11	20.9	585	37.0	105.8
SEm±	3249.3	0.13	0.65	23.9	1.16	3.34
C D at 5 %	NS	NS	NS	NS	NS	NS

Similar increase in yield due to increase in levels of fertilizers have also been reported by Ghimire and Bana (2011).

Economics

Net returns (₹ 86387/ha) and benefit: cost ratio (4.44) was recorded higher with application of 80 kg N/ha (Table 2). It gave ₹ 4951/ha and ₹ 11259/ha higher net monetary returns over the 100 kg and 60 kg N/ha. Application of 80 kg N/ha showed mark improvement in seed yields and thus gaining more profit in terms of net returns and benefit: cost ratio over rest of treatments. Phosphorus applied at 40 kg/ha recorded marginally higher monetary returns over its lower dose but it could not reach at the level of significance. While, the value of B: C ratio was obtained equal under different levels of phosphorus because of lower cost involvement with lower dose of phosphorus. The findings are in agreement with that of Daulagupu and Thakuria (2016).

Production and economic efficiency

Different levels of nitrogen have significantly influenced production efficiency and economic efficiency of mustard crop. Data pertaining to production efficiency and economic efficiency are presented in Table 2 revealed that the application of 80 kg N/ha produced the highest production efficiency (22.2 kg/ha/day) and economic efficiency (₹ 635/ha/day) followed by 100 kg N/ha. Application of 80 kg N/ha recorded higher seed yield and monetary returns may be responsible for good productivity and economic returns.

Partial factor productivity

Among the levels of nitrogen and phosphorus influenced significantly partial factor productivity

of N and P (Table 2). However, reverse trend was recorded in respect of partial factor productivity of nitrogen and phosphorus. The lower level of nitrogen recorded higher productivity over the higher dose due to favoured better utilization of nutrients under lower dose of fertilizer and increased partial factor productivity. These results are in agreement with the earlier finding of Sudhalakshmi, 2009.

Thus, on the basis of above study it can be concluded that Indian mustard should be fertilize with 80 kg N/ha and 40 kg P₂O₅ for obtaining higher yield and economic returns.

References

- Daulagupu, K., and Thakuria, K. 2016. Effect of planting geometry and fertilizer levels on yellow sarson (*Brassica rapa* var. *trilocularis*) under rainfed condition. *Journal of Oilseed Brassica* 7(2): 169-173.
- Ghimire, T.B., and Bana, O.P.S. 2011. Effect of fertility levels on mustard (*Brassica juncea*) seed yield, quality and economics under varying poplar (*Populus deltoides*) tree densities. *Indian Journal of Agronomy* 56(4): 346-350.
- Gomez, K.A., Gomez, A.A. 1984. Statistical Procedures for Agricultural Research. John Wiley & Sons, Singapore.
- Singh, Y., Sharma, D.K., Sharma, N.L. and Kumar, V. 2017. Effect of different levels of NPK with combined use of FYM and sulphur on yield, quality and nutrients uptake in Indian mustard (*Brassica juncea* L.). *International Journal of Chemical Studies* 5(2): 300-304.
- Sudhalakshmi, C., 2009. Partial factor productivity of major nutrients on grain and straw of rice hybrids in SRI strategy. *International Journal of Agricultural Sciences* 5(2): 334-336.

How to cite this article:

Jat, A.L., K.P. Prajapati, B.K. Patel, P.J. Patel, J.R. Patel, S.K. Shah and Desai, A.G. 2017. Influence of NPK Levels on Performance of Indian Mustard (*Brassica juncea* L.). *Int.J.Curr.Microbiol.App.Sci*. 6(9): 1986-1990. doi: <https://doi.org/10.20546/ijcmas.2017.609.243>