

Effect of nitrogen and phosphorus on yield attributes, seed and oil yield of Indian mustard (*Brassica juncea*)

D. N. ARTHAMWAR, V. B. SHELKE¹ AND B. S. EKSHINGE

Department of Agronomy, Marathwada Agricultural University,
Parbhani, Maharashtra 431 402

Received: October 1994

ABSTRACT

A field experiment was conducted during the winter seasons (*rabi*) of 1989–90 and 1990–91 at Parbhani, to study the effect of N (N_0 , N_{50} and N_{100} ; 0, 50 and 100 kg N/ha) and P (0, 40 and 80 kg P_2O_5 /ha) levels on yield attributes, seed and oil yields, of 4 varieties ('Pusa Bold', 'PR 18', 'T 59' and 'Local') of Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] variety 'Pusa Bold' recorded significantly higher values of yield attributes, seed and oil yields/ha than 'PR 18', 'T 59' and 'Local'. Each higher level of nitrogen significantly improved all the yield attributes. There was linear increase in seed yield/ha due to nitrogen level from 0 to 100 kg N/ha during second year and in pooled; however, during first year 100 and 50 kg N/ha were at par and significantly superior to no nitrogen. Nitrogen levels did not influence the oil content. There was linear increase in oil yield with the increase in N levels from 0 to 100 kg N/ha during second year, but during first year 50 and 100 kg N/ha were at par and superior to no nitrogen. Every increase in the level of phosphorus significantly improved all the yield attributes, seed yield/ha, oil content and oil yield of Indian mustard.

In Maharashtra Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] is not a major oilseed crop, but grown as a mixed crop in winter season (*rabi*). It will be worthwhile to explore the possibility of introducing Indian mustard as a sole crop in Marathwada region of Maharashtra under irrigated conditions. Response of mustard to nitrogen (Antil *et al.*, 1986) and phosphorus (Mudholkar and Ahlawat, 1981) have been reported elsewhere. However, the information on suitable variety and nitrogen and phosphorus fertilizer requirement of Indian mustard under the edapho-ecological conditions of Marathwada is meagre. Therefore the present investigation was carried out to

study the effect of N and P on growth, seed and oil yields of mustard under irrigated conditions.

MATERIALS AND METHODS

The field experiment was conducted in split-plot design with 3 replications during winters of 1989–90 and 1990–91 at Parbhani, Maharashtra. The main-plot treatments comprised 4 varieties ('Pusa Bold', 'PR 18', 'T 59' and 'Local') and 3 nitrogen levels (0, 50 and 100 kg N/ha) and sub plot treatments were 3 phosphorus levels (0, 40 and 80 kg P_2O_5 /ha). The soil of experimental site was clayey in texture, low in nitrogen (217.5 kg/ha), medium in phosphorus (22.4

Table 1. Post-harvest yield attributes of Indian mustard as influenced by variety and fertilizer

Treatment	Weight of silique/plant (g)		Seed weight/ plant (g)		Length of silique (cm)		Number of seeds/silique		1,000-seed weight (g)	
	Y ₁	Y ₂	Y ₁	Y ₂	Y ₁	Y ₂	Y ₁	Y ₂	Y ₁	Y ₂
<i>Variety</i>										
'Pusa Bold'	20.57	14.86	9.83	7.10	5.33	4.75	13.14	12.11	4.02	3.98
'PR 18'	18.21	12.36	7.89	5.76	4.60	4.22	12.34	11.20	3.62	3.61
'T 59'	18.24	13.15	8.73	6.47	4.86	4.67	12.41	11.36	3.82	3.80
'Local'	15.20	11.89	6.83	5.20	3.35	2.85	9.46	7.46	2.61	2.81
CD (P = 0.05)	2.02	0.61	0.93	0.24	0.05	0.05	0.11	0.14	0.05	0.05
<i>N (kg/ha)</i>										
0	16.65	12.12	7.61	5.48	4.16	3.62	11.67	10.37	3.26	3.32
50	18.47	12.97	8.44	5.94	4.49	4.02	11.84	10.55	3.52	3.56
100	20.69	14.10	9.62	6.97	4.96	4.50	11.97	10.68	3.78	3.77
CD (P = 0.05)	1.75	0.53	0.80	0.21	0.05	0.03	0.11	0.12	0.03	0.05
<i>P (kg/ha)</i>										
0	15.28	11.17	7.02	5.18	4.32	3.48	11.27	10.00	3.19	3.29
40	18.75	13.04	8.54	6.20	4.56	4.04	11.92	10.60	3.54	3.58
80	21.64	14.97	10.07	7.10	4.74	4.37	12.32	10.99	3.84	3.78
CD (P = 0.05)	1.05	0.32	0.47	0.14	0.03	0.03	0.09	0.08	0.03	0.03

Y₁, 1989-90; Y₂, 1990-91

kg/ha), high in potassium (836.6 kg/ha) and slightly alkaline in reaction (8.05). Crop was sown by dibbling at 45 cm × 15 cm spacing on 20 October and 7 November in first and second years of experimentation respectively. Half dose of N and full dose of P_2O_5 as per treatment was applied as basal and remaining half of N as per treatment applied 30 days after sowing. Seeds of Indian mustard from net plot produce were analysed for oil content in Nuclear Magnetic Resonance Spectrometer. The oil yield was worked out by multiplying the oil content and the respective grain yield in the treatment.

RESULTS AND DISCUSSION

Effects of variety

Variety 'Pusa Bold' recorded significantly higher values of all the yield at-

tributes (Table 1) and seed yield/ha, followed by 'T 59', 'PR 18' and the lowest by local during both the years (Table 2). The seed yield/ha indicated that increase in yield of 'Pusa Bold' was 11.1, 22.5 and 35.8% than 'PR 18', 'T 59' and 'Local' respectively. Seed yield is a function of yield-contributing characters. Hence increase in seed yield of 'Pusa Bold' might be due to increase in yield attributes compared with other varieties and 'Local'. Tomar and Namdeo (1989) also reported such differential yield behaviour of mustard varieties.

Improved varieties due to their genetic potential for high oil content resulted into higher oil content and oil yield than 'Local' in both the seasons (Table 2). Though the oil content of 'Pusa Bold', 'T 59' and 'PR 18' was similar, the oil yield was the highest

Table 2. Seed yield, oil content and oil yield of Indian mustard as influenced by variety and fertilizer

Treatment	Seed yield (q/ha)			Oil content (%)		Oil yield (q/ha)	
	Y ₁	Y ₂	Pooled	Y ₁	Y ₂	Y ₁	Y ₂
<i>Variety</i>							
'Pusa Bold'	15.44	10.36	11.11	26.92	30.10	4.16	3.12
'PR 18'	12.93	8.41	9.07	26.50	29.76	3.43	2.48
'T 59'	13.25	9.45	10.00	26.87	29.90	3.56	2.80
'Local'	11.65	7.59	8.18	25.48	29.03	3.02	2.27
CD (P = 0.05)	0.93	0.39	0.36	0.64	0.49	0.27	0.12
<i>N (kg/ha)</i>							
0	12.57	7.97	10.27	26.58	29.81	3.35	2.38
50	13.54	8.68	11.11	26.49	29.61	3.64	2.57
100	13.84	10.21	12.02	26.26	29.68	3.64	3.05
CD (P = 0.05)	0.81	0.34	0.63	NS	NS	0.23	0.12
<i>P (kg/ha)</i>							
0	11.55	7.53	9.54	25.90	29.29	3.04	2.20
40	13.56	9.06	11.31	26.31	29.61	3.57	2.70
80	14.84	10.28	12.56	27.03	30.12	4.02	3.10
CD (P = 0.05)	0.39	0.35	0.45	0.39	0.32	0.14	0.06

Y₁ 1989-90; Y₂ 1990-91

with 'Pusa Bold' which might be due to significantly higher seed yield of 'Pusa Bold' than the other varieties.

Effect of N

Each higher level of nitrogen significantly increased all the yield attributes in both the seasons (Table 1). Application of 100 and 50 kg N/ha were at par but significantly superior in seed yield/ha over no nitrogen during 1989–90. However, during 1990–91 and in pooled data, there was linear increase in seed yield/ha with increase in nitrogen level from 0 to 100 kg/ha (Table 2). On the basis of pooled the increase in seed yield due to 50 and 100 kg N/ha was 8.2 and 17.0% over no nitrogen. Increase in the seed yield of Indian mustard due to increasing nitrogen levels may be attributed to the favourable improvement in all the yield attributes with N fertilization. Similar increase in seed yield of Indian mustard due to application of nitrogen up to 100 kg N/ha was observed by Singh and Singh (1985).

Application of N did not influence the oil content, as it is a varietal character. However, oil yield was increased significantly with every increase in nitrogen level during 1990–91 but during 1989–90, the 50 and 100 kg N/ha were at par and significantly superior to no nitrogen (Table 2). These results corroborate to those of Singh and Singh (1985).

Effect of P

Every increase in the level of P resulted in significant increase in yield attributes (Table 1) and seed yield/ha (Table 2). The

increase in seed yield was due to augmenting effect of P application on all yield attributes. Such increase in seed yield of Indian mustard with application of 80 kg P_2O_5 /ha was reported by Mudholkar and Ahlawat (1981).

The oil content and oil yield increased significantly with an increase in level of P (Table 2). The higher oil content in seed could be attributed to the larger formation of lacithin, a form of phospholipid, favoured by P application. Desai (1983) also reported such favourable effect of P on oil content of Indian mustard.

It can be inferred that Pusa Bold ranked first in yield attributes, seed yield, oil content and oil yield. All these parameters were improved with increase in N and P levels under irrigated conditions.

REFERENCES

- Antil, R. S., Vinodkumar and Singh, Mahendra. 1986. Effect of nitrogen on yield and uptake of nitrogen at different growth stages of *raya*. *Indian Journal of Agronomy* 31 (1) : 37–44.
- Desai, S. G. 1983. 'Effect of various levels of N, P and spacing on yield and nutrient uptake by mustard grown on medium black, calcareous soil.' M. Sc. (Agriculture) Thesis, Gujarat Agricultural University, Sardar Krushinagar.
- Mudholkar, N. J. and Ahlawat, I. P. S. 1981. Response of rapeseed to plant density and fertilization. *Indian Journal of Agronomy* 26 (2) : 184–188.
- Singh, T. P. and Singh, H. P. 1985. Yield of toria (*Brassica campestris* L. var. toria Dutch and Full) as affected by fertilizers and plant density, Indian Society of Agronomy pp. 60. (In) *Proceedings of Symposium on Cropping Systems*.
- Tomar, S. and Namdeo, K. N. 1989. Response of mustard varieties to row spacing and nitrogen. *Indian Journal of Agronomy* 34 (4) : 472–473.