Indian J. Agron. **41** (4) : 624--626 (December 1996)

Response of Indian mustard (*Brassica juncea*) varieties to nitrogen, phosphorus and potassium fertilizers

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Received: December 1994

ABSTRACT

A field experiment was conducted during 1988--90 on sandy-clay loam soil to study the response of Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] varieties to NPK levels at Baraut (Meerut). Plant height, number of branches, dry-matter accumulation/plant, number of siliquae/plant, 1,000-seed weight, seed and oil yields/ha increased significantly with the increasing levels of fertilization up to 120 kg N + 60 kg P_2O_5 + 60 kg K_2O/ha. All these growth and yield attributes were significantly higher in 'Varuna' and 'Pusa Bold' than 'Prakash' and 'RH 8113'. The interactions of 'Varuna' and 'Pusa Bold' with higher levels of fertilization gave maximum seed yield/ha and dry-matter accumulation/plant respectively than 'RH 8113' without fertilization gave the minimum.

Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] is one of the most important oilseed crops in sugarcane-based cropping system of western Uttar Pradesh. It is a heavy feeder of nutrients, hence needs great attention to its fertilizer management. The new improved varieties have shown considerable yield variations under different

Table 1. Effect of variety and fertilizer on growth and yield attributes and oil yield of Indian mustard

Treatment	Plant height (cm)		Branches/ plant		Siliquae/ plant		1,000-seed weight (g)		Oil yield (q/ha)	
	1988--89	1989--90	1988--89	1989--90	1988--89	1989--90	1988--89	1989--90	1988--89	1989--90
Variety										
'Varuna'	187.8	189.5	40.2	41.1	348.8	382.1	4.8	4.7	10.1	9.1
'Pusa Bold'	183.0	185.7	39.4	40.4	332.3	344.3	4.7	4.6	9.0	8.5
'Prakash'	182.5	181.8	37.7	36.7	318.9	338.1	4.0	3.9	7.7	7.4
'RH 8113'	177.0	179.2	35.5	37.7	392.7	415.3	3.1	3.2	8.0	7.7
CD (P = 0.05)	2.74	3.24	2.09	3.96	17.98	18.48	0.24	0.21	0.73	0.66
N, P_2O_5, K_2O (kg/ha)										
0, 0, 0	157.3	159.8	24.8	25.3	314.9	332.5	3.4	3.4	5.0	5.4
40, 20, 20	175.9	178.2	35.7	36.2	345.2	356.2	4.2	4.1	8.3	8.0
80, 40, 40	191.3	188.6	43.1	44.1	363.7	375.8	4.4	4.3	10.2	9.4
120, 60, 60	205.7	209.6	49.1	50.2	368.7	385.7	4.5	4.6	10.6	9.7
CD (P = 0.05)	2.74	3.24	2.09	3.96	17.98	18.48	0.24	0.21	0.73	0.66

agroclimatic regions. The information regarding varietal responses to fertilizers is scanty for this region. Therefore the present experiment was conducted to study the response of high-yielding varieties of Indian mustard varieties to NPK fertilizers.

MATERIALS AND METHODS

A field trial was conducted at Baraut (Meerut) during the winter (*rabi*) season of 1988–89 and 1989–90. The soil of the experimental field was sandy clay-loam in texture, with pH 7.6. The organic carbon, total N, available P and available K in soil were 0.59%, 0.052%, 17.6 kg/ha and 204.8 kg/ha respectively. The treatments comprising 4 mustard varieties ('Varuna', 'Pusa Bold', 'Prakash' and 'RH 8113') and 4 levels of fertilizer (no fertilizer, 40 kg N + 20 kg P_2O_5 + 20 kg K_2O, 80 kg N + 40 kg P_2O_5 + 40 kg K_2O and 120 kg N + 60 kg P_2O_5 + 60 kg K_2O/ha) were replicated 4 times in randomized block design. The entire dose of P and K fertilizers was applied at sowing. Half dose of N was applied basal at sowing and the remaining half dose of N at first irrigation. The crop was sown on 18 and 20 October in 1988 and 1989 respectively.

RESULTS AND DISCUSSION

Varietal performance

Variety 'Varuna' with tall and more branched plants recorded significantly higher dry matter/plant, followed by 'Pusa Bold', 'Prakash' and 'RH 8113' (Table 1 and 2). Varieties 'Varuna' and 'Pusa Bold' produced had seeds and more siliquae/plant compared with 'Prakash' and 'RH 8113'. 'Varuna' gave the highest yield, which was significantly higher than other varieties. 'Pusa Bold' also outyielded 'Prakash' and 'RH 8113'. The seed yield is a function of yield attributes which was reflected in the

Table 2. Dry matter/plant and seed yield as affected by variety and fertilizers (mean data of 1988–89 and 1989–90)

Variety	Fertiliser (N-P_2O_5-K_2O kg/ha)									
	0-0-0	40-20-20	80-40-40	120-60-60	Mean	0-0-0	40-20-20	80-40-40	120-60-60	Mean
	Dry matter/plant (g)					Seed yield (q/ha)				
'Varuna'	33.5	46.4	53.0	55.1	47.0	14.9	24.7	27.7	28.6	24.0
'Pusa Bold'	32.4	43.5	49.6	55.0	45.1	13.4	20.5	25.9	27.2	21.8
'Prakash'	31.6	43.3	49.4	52.5	44.2	11.4	18.7	23.5	23.6	19.3
'RH 8113'	27.0	40.1	45.5	48.3	40.2	10.8	18.3	21.5	22.9	18.4
Mean	31.1	43.3	49.4	52.7		12.6	20.5	24.7	25.6	
CD (P = 0.05)	Variety 2.72		Fertilizer 2.72		Interaction 612	Variety 2.24		Fertilizer 2.24		Interaction 4.72

yielding behaviur of the varieties tested.

'Varuna' and 'Pusa Bold' both having better genetic make-up for high yield and oil contents resulted in higher oil yield than the other varieties (Table 1).

Effect of fertilizers

Each successive level of fertilizer significantly increased plant height, branches/plant and dry matter/plant in both the seasons (Tables 1, 2). Plants with better growth developed more siliquae/plant and bolder seeds with increasing levels of fertilizers up to 120 + 60 + 60 kg N + P_2O_5 + K_2O/ha, except 1,000-seed weight in 1988–89 which was at par with 80 + 40 + 40 kg N + P_2O_5 + K_2O/ha. Application of 120 + 60 + 60 and 80 + 40 + 40 kg N + P_2O_5 + K_2O/ha being at par recorded significantly higher seed yield over lower levels of fertilizers (Table 2). Increase in seed yield with increased N, P and K availability by fertilizer application was the result of increased growth and yield attributes. Similar increase by fertilizers on growth attributes (Antil *et al.*, 1985), yield attributes and yield (Khan and Agarwal, 1985) were also observed earlier.

The oil yield significantly increased with the increase in fertilizer levels up to 80 + 40 + 40 kg N + P_2O_5 + K_2O/ha (Table 1). The higher oil yield with fertilizer could be attributed to higher seed yield.

Effect of interaction

Dry matter/plant in 'Pusa Bold' increased significantly with increasing levels of fertilizer up to 120 kg N + 600 kg P_2O_5 + 60 kg K_2O/ha (Table 2).

Variety 'Varuna' at 80 kg N + 40 kg P_2O_5 + 40 kg K_2O/ha gave the same yield as obtained with 120 kg N + 60 kg P_2O_5 + 60 kg K_2O/ha in cv. 'Pusa Bold'. Varieties 'Prakash' and 'RH 8113 gave lower yield than 'Varuna' at both these levels. It might be due to better growth and yield attributes in 'Varuna' by increased fertilization as compared to other varieties.

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