



REGULAR ARTICLE

EFFECT OF FERTILIZERS ON YIELD CHARACTERISTICS OF MUSTARD (*BRASSICA JUNCEA* L. CZERN & COSS)

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SUMMARY

A factorial randomized field experiment was conducted on mustard (*Brassica juncea* L. Czern & Coss var. Alankar) at Aligarh to study the effect of different combinations of phosphorous and potassium applied as monocalcium superphosphate and muriate of potash respectively (each at the rate of 30, 60, 90 kg P₂O₅ and K₂O ha⁻¹) on yield and yield attributes of mustard. In addition, a uniform dose of urea at the rate of 80 kg N ha⁻¹ was applied. At harvest, various yield characteristics including number of pods plant⁻¹, number of seed pod⁻¹, seed yield and oil yield were studied. The effect of phosphorus alone as well as in combination with potassium was significant. Treatments 60 kg P₂O₅ ha⁻¹ and 60 kg P₂O₅ + 60 kg K₂O ha⁻¹ proved optimum and the increase in seed yield was due to increase in pods plant⁻¹ and seeds pod⁻¹.

Key words: Mustard, Phosphorous, Potassium, Seed yield, Oil yield characteristics

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1. Introduction

Indian agriculture needs to be more knowledge intensive in order to keep pace with the growing population pressure and diminishing land and energy resources. The oil seed group of crops play a significant role in Indian's agrarian economy contributing 22.1 million tones reaped from an area of 25.4 million hectares. Oil seeds hold a sizeable share of the country's gross cropped area (13%) and contribute about 5% of its Gross National Productivity (GNP) and 10 % of the value of all agricultural products. The major constraint limiting the productivity of oilseeds is that they are predominantly raised under energy starved conditions. Since the growth and productivity of any crop species are governed to a great extent by its surrounding environments, hence, type and concentration of fertilizers in growth media exert a considerable influence

on the growth and mineral composition of the crop plants (Kirkby and Mengel, 1967; Kurvits and Kirkby, 1980; Gashaw and Mugwira, 1981; Ansari, 1990; Jeschke *et al.*, 1992; Parvaiz, 1983; Khan *et al.*, 1990 and Joshi *et al.*, 1991). In recent years, attempts have been made by developing new high yield varieties particularly of mustard, which occupy a prominent position among oilseeds. A preliminary field trial by Lone (2000) with four high yielding varieties of this crop indicated superiority of Alankar under the conditions prevailing at Aligarh. The present work deals with the phosphorous and potassium requirements of variety Alankar.

2. Materials and Methods

Mustard (*Brassica juncea* L. Czern and Coss var. Alankar) was sown at the rate of 10 kg ha⁻¹ in sandy loam soil having pH 8.4 and

available nitrogen phosphorous and potassium 170.3 N kg, 50.5 kg P₂O₅ and 90 kg K₂O ha⁻¹ respectively. The experiment was laid in a factorial randomized block design replicated thrice per treatment. Monocalcium super phosphate and muriate of potash (each at the rate of 30, 60, 90 kg P₂O₅ and K₂O ha⁻¹) were applied in all possible combinations. Urea was applied uniformly at the rate of 80 kg N/ha in all plots. The size of each plot was 10 m². At harvest, random samples of five plants were collected from each plot for number of pods plant⁻¹ and number of seeds pod⁻¹. The remaining plants were harvested for assessing the total seed yield and hectoliter weight. Oil was extracted from the seed samples by Soxhlet apparatus for determining oil percentage. Total yield of oil was computed on the basis of seed yield and oil percentage. The results were analysed for variance according to Gomez and Gomez (1984).

3. Results and Discussion

As evident from the data given in tables (1-3), the effect of phosphorous on all the yield parameters studied were significant. The effect of potassium, however, was not so effective presumably because of the high

potassium content of the soil. The interaction effect (P x K) was also significant. Thus application of 60 kg P₂O₅ ha⁻¹ which provided the most significant results, increased the pod number per plant, seed number per pod, hectares-litre weight, seed yield, oil percentage and oil yield by 18.1, 5.2, 0.6, 12.3, 9.4 and 22.9% respectively over 30 kg P₂O₅ ha⁻¹. The increases in above respective parameters by 19.6, 5.9, 1.2, 12.5, 10.0 and 23.8% with 60 kg P₂O₅ + 30 kg K₂O treatment over 30 kg P₂O₅ + 30 kg K₂O treatment was observed. The optimum effect of the application of 60 kg P₂O₅ ha⁻¹ on seed yield was presumably due to maximum pods/plant, seed/pod and hectoliter weight, as these parameters were found to be positively correlated with yield of the crop. The increase in seed yield and oil yield by application of the fertilizers has also been reported by Chundawat *et al.* (1975); Parvaiz *et al.* (1982); Parvaiz *et al.*, (1983); Samiullah *et al.* (1983); Samiullah *et al.* (1984); Khan *et al.*, (1990); Samiullah *et al.* (1991) and Ansari *et al.*, (1996). The findings of this experimental work reveal that mustard variety Alankar can be grown profitably with a basal dose of 60 kg P₂O₅ ha⁻¹ in presence of 80 kg N ha⁻¹ in the potassium rich soils of Aligarh.

Table 1: Effect of combined phosphorous and potassium application on pod number plant⁻¹ and seed number pod⁻¹ in Alankar mustard

Phosphorous (P ₂ O ₅ kg ha ⁻¹)	Pod number plant ⁻¹								Seed number pod ⁻¹			
	Potassium (K ₂ O kg ha ⁻¹)				Potassium (K ₂ O kg ha ⁻¹)				Potassium (K ₂ O kg ha ⁻¹)			
	30	60	90	Mean	30	60	90	Mean	30	60	90	Mean
30	347.3	351.10	349.7	349.2	13.4	13.4	13.5	13.4	13.4	13.4	13.5	13.4
60	415.3	412.7	409.7	412.6	14.2	14.1	14.1	14.1	14.2	14.1	14.1	14.1
90	390.7	396.3	396.3	394.4	13.3	13.7	13.3	13.4	13.3	13.7	13.3	13.4
Mean	384.4	386.7	385.2		13.6	13.7	13.6		13.6	13.7	13.6	
CD at 5%												
Phosphorous (P)	7.3				0.18							
Potassium (K)	NS				NS							
P x K	12.6				0.3							

Table 2: Effect of combined phosphorous and potassium application on hector-liter weight and seed yield in Alankar mustard

Phosphorous (P ₂ O ₅ kg ha ⁻¹)	Hector-liter weight (kg)				Seed yield (kg ha ⁻¹)			
	Potassium (K ₂ O kg ha ⁻¹)				Potassium (K ₂ O kg ha ⁻¹)			
	30	60	90	Mean	30	60	90	Mean
30	68.0	68.3	68.7	68.3	1325.0	1328.0	1325.0	1326.1
60	68.8	68.6	68.7	68.7	1491.0	1487.3	1490.6	1489.6
90	68.2	68.4	68.3	68.3	1470.0	1479.0	1480.0	1476.3
Mean	68.3	68.4	68.5		1428.6	1431.5	1431.9	
CD at 5%								
Phosphorous (P)	0.21				9.03			

Potassium (P)	NS	NS
P x K	0.36	15.64

Table 3: Effect of combined phosphorous and potassium application on oil percentage and oil yield in Alankar mustard

Phosphorous (P ₂ O ₅ kg ha ⁻¹)	Oil percentage (kg ha ⁻¹)				Oil yield (kg ha ⁻¹)			
	Potassium (K ₂ O kg ha ⁻¹)				Potassium (K ₂ O kg ha ⁻¹)			
	30	60	90	Mean	30	60	90	Mean
30	34.0	34.1	34.1	34.1	450.5	452.8	451.0	451.7
60	37.4	37.2	37.2	37.3	557.6	553.3	554.5	555.0
90	37.1	36.9	37.0	37.0	545.7	547.7	547.6	546.2
Mean	36.2	36.1	36.1	36.1	517.8	520.2	518.0	518.0
CD at 5%								
Phosphorous (P)	0.34				5.64			
Potassium (K)	NS				NS			
P x K	0.57				9.76			

References

- Ansari, H. R. (1996). Effect of some phytohormones and NPK on growth and metabolism of mustard. Ph.D. Thesis, Aligarh Muslim University, Aligarh, India.
- Ansari, R. (1990). Growth and chemical composition of barley (*Hordeum vulgare*) cultivars on saline substrate as compared with salt tolerant variety of wheat (*Triticum aestivum*). In: *Plant Nutrition – Physiology and Application*. Pp. 463-467. M.L. Van Bersichem (Ed.). Kluwer Academic Publishers.
- Chundawat, G.S., Shekhawat, G.S., Sharma, R.G. and Singh, S. (1975). Effect of nitrogen, phosphorous and potassium on the yield of mustard in Rajasthan. *Indian Journal of Agronomy* 20: 303-305.
- Gashaw, L. and Mugwira, L.M. (1981). Ammonium-N and nitrate N effects on the growth and mineral composition of *Triticum aestivum* and *rye*. *Agronomy Journal* 73: 45-51.
- Gomez, K.A. and Gomez, A.A. (1984). *Statistical Procedure for Agricultural Research*. Wiley International, Publishers, New York
- Jeschke, W.D., Wolf, O. and Wartung, W. (1992). Effect of NaCl salinity on flows and partitioning of C, N and mineral ions in whole plants of white lupin (*Lupinus albus* L.). *Journal of Experimental Botany* 43: 777-778.
- Joshi, A.J., Ahlawat, R.P.S., Trivedi, S.J. (1991). Effect of nitrogen and sulphur fertilization on growth and yield of

- mustard. *Indian Journal of Agronomy* 36(2): 606-607.
- Khan, N.A., Samiullah, Afaridi, M.M.R.K. and Ansari, S.A. (1990). Response of six mustard varieties to different combinations of nitrogen and phosphorous. *Indian Journal of Agronomy* 35(4): 412-414.
- Kirby, E.A. and Mengel, K. (1967). Ionic balance in different tissues of tomato plant in relation to nitrate, urea or ammonium nutrition. *Plant Physiology* 42: 6-14.
- Kurvitis, A. and Kirkby, E.A. (1980). The uptake of nutrients by sunflower plants (*Helianthus annuus*) growing in continuous flowering culture system, supplied with nitrate or ammonium as nitrogen source. *Zeitschrift fur Pflanzenernahrung Bodenkunde* 143: 140-149.
- Lone, N.A. (2001). Studies on effect of cycocel and ethrel in association with nitrogen on growth and metabolism of mustard under non-irrigated conditions. Ph.D. Thesis, Aligarh Muslim University, Aligarh, India.
- Parvaiz, M.A., Afridi, M.M. and Samiullah, R.K. (1982). Critical growth stage for optimal response of mustard to foliar application of nitrogen, phosphorus and sulphur. *Indian Journal of Plant Nutrition* 1: 43-48.
- Parvaiz, M.A., Afridi, M.M.R.K., Samiullah, Inam, A., Ashfaq, N. and Alvi, M.S. (1983). Effect of phosphorous on the growth and yield characteristics of mustard. *Crop Physiology and Ecology* 8: 36-40.
- Samiullah, Khan, N.A., Ansari, S.A. and Afridi, M.M. (1991). Pyridixine augments growth yield and quality of mustard through efficient utilization of soil applied NP fertilizers. *Acta Agronomica Hungarica* 40: 111-116.
- Samiullah, MNohamma, F. and Afridi, M.M. R.K. (1984). Effect of combined phosphorus and potassium and productivity of mustard. *Indian Journal of Plant Nutrition* 3: 143-146.
- Samiullah, Mohammad, F. and Afridi, M.M. R.K. (1983). Comparative effect of two levels of basal N and P supplemented with foliar spray on yield and quality of six mustard varieties. *Indian Journal of Plant Nutrition* 2: 115-123.