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Effect of NPK Applications on the Seed Yield and Oil Content of Three Raya (*Brassica juncea* L.) Cultivars

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Abstract: The investigations to ascertain the effect of varying rates of NPK per hectare (ha^{-1}) on seed yield and oil contents of three Raya cultivars i.e. RL-18 (V_1), Parkash (V_2) and Peela Raya (V_3) were carried out at Agronomic Research Area, University of Agriculture, Faisalabad. Among the four fertilizer levels i.e. F_0 (control), F_1 (75-0-0 NPK kg ha^{-1}), F_2 (175-50-0 NPK kg ha^{-1}) and F_3 (75-50-50 NPK kg ha^{-1}) used, the level F_3 (75-50-50 NPK kg ha^{-1}) influenced significantly all the growth and yield parameters such as number of pods per plant (585.59), number of seeds per pod (13.10), 1000 grain weight (3.70 g), seed yield (1640.10 kg ha^{-1}) and straw yield (8849.40 kg ha^{-1}) in all the three varieties (V_1 , V_2 and V_3). But none of the fertilizer levels (F_0 , F_1 , F_2 and F_3) affected the oil contents in any one of the three (V_1 , V_2 and V_3) varieties.

Key word: Nitrogen, phosphorus, potash, application, seed yield, oil content, Raya and cultivars

Introduction

Pakistan is facing an acute shortage of edible oils. The deficiency of cooking oil has been mounting due to increasing population, declining livestock sector and extremely low yields of conventional oil seed crops in the country. This huge drain on our hard earned foreign exchange resources is a great challenge to the planners and Agric. Scientists (Muhammad, 1988).

Rape and Mustard are the second largest contributor to the indigenous edible oil production after cotton seed which contributes about 30 percent of the total requirement. The use of artificial fertilizers has been the most important technological factor in contributing about 50 percent towards increase in yield (Muhammad, 1988).

Improved varieties is another important input which geared revolution in many oil seed producing countries of the world. The contribution of improved varieties to yield increases has been reported to be 20-30 percent.

Previously interactive studies of *Brassica juncea* cultivars and fertilizer are illucidated as under:

Dahiya *et al.* (1989) found that in case of *Brassica juncea*, the highest seed yields of 1.80-1.85 t ha^{-1} were obtained when 60-40-40 NPK kg ha^{-1} were applied as compared with yield obtained without NPK application. Gill and Naarang (1991) observed that application of fertilizer increased the crop growth and yield of oil seeds. Gupta and Azad (1992) studied the response of N and P on *Brassica* Cv. PLM-514 and obtained the highest seed yield with 100 N kg ha^{-1} and 20 P kg ha^{-1} . Khanday *et al.* (1993) while studying *Brassica juncea* Cv. "KOS-1" found higher seed yield (1.12 t ha^{-1}) and oil contents at 60-30-20 NPK kg ha^{-1} than at 30 N kg ha^{-1} alone.

Punia *et al.* (1993) applied 20, 40 and 60 $\text{kg P}_2\text{O}_5 \text{ ha}^{-1}$ to *Brassica juncea* and found that seed yield was highest (1.69 t ha^{-1}) when 60 $\text{kg P}_2\text{O}_5$ was applied per hectare. Krishna and Reddy (1994) reported that increasing N rates from 0 to 90 kg ha^{-1} linearly increased seed yield and protein contents of *Brassica juncea*. Rajput *et al.* (1994) investigated that seed yield of *Brassica juncea* (Peela Raya) was highest with 100 $\text{kg N} + 75 \text{ kg P}_2\text{O}_5 \text{ ha}^{-1}$. Fu *et al.* (1995) conducted an experiment on oilseed rape grown on waterlogged soil with different levels of N, P and K and concluded that economic amount of fertilizer was 333-69-39 NPK kg ha^{-1} . Dalai *et al.* (1996) reported that application of 75 kg N ha^{-1} produced highest seed yield and protein contents of *Brassica*

juncea Cv. "Pusa Bold". Patel *et al.* (1996) treated *Brassica juncea*, with 0, 10 and 20 t ha^{-1} Farm Yard Manure (FYM) and 75 kg N ha^{-1} . They reported that the seed yield was highest (2.87 t ha^{-1}) with 75 kg N ha^{-1} followed by 2.72 t ha^{-1} with 10 t ha^{-1} FYM.

Materials and Methods

The investigations were conducted at Agronomic Research Area, University of Agriculture, Faisalabad on a sandy clay loam soil having 0.05 percent total N, 250 ppm P_2O_5 and 7.5 ppm K_2O . Randomized Complete Block Design (RCBD) with split arrangements by keeping the varieties in the main plots and fertilizer levels in the subplots respectively. The varieties used were RL-18, Parkash and Peela Raya. Whereas fertilizer levels 0-0-0, 75-0-0, 75-50-0 and 75-50-50 NPK kg ha^{-1} were used. Line to line distance was kept as 60 cm. Thinning was done at 2-4 leaf stage keeping plant to plant distance 15 cm.

All the P and K and $\frac{1}{2}$ N fertilizer doses were applied at sowing time while the remaining $\frac{1}{2}$ N was applied with the first irrigation. Data on growth, yield and oil contents of the crop were collected by using standard procedures and analyzed statistically. Treatment means were compared by using L.S.D. test at 5 percent level of probability (Steel and Torrie, 1984).

Results and Discussion

Table 1 shows that varieties differed significantly from one another in all the growth and yield parameters. Plant population per hectare recorded in variety V_2 was maximum (173893.2) followed by variety V_1 . Whereas minimum plant population was recorded in variety V_3 . Number of pods per plant and number of seeds per pod were maximum in V_2 which was followed by V_1 . Whereas minimum number of pods per plant (418.62) and number of seeds per pod (12.2) were recorded in V_3 , which may be attributed to their difference in their genetic make up. The maximum 1000 grain weight (4.20 g) was obtained in V_3 , which was followed by V_1 (3.30 g). V_2 was lowest in 1000 grain weight (2.60 g).

Grain yield recorded in different varieties showed that the maximum yield was obtained from V_2 (1400.40 t ha^{-1}) but statistically non-significant with V_1 . V_3 was lagging behind. As regard oil contents all the three varieties (V_1 , V_2 and V_3) gave different growth, yield and oil contents of three varieties were affected significantly by the response to application of N, P and K. The

Table 1: Effect of NPK applications on the seed yield and oil contents of three rays (*Brassica juncea* L.) cultivars

Treatments	Plant population/ha	No. of pods/plant	No. of seeds/pod	1000-seed weight (g)	Seed yield (kg/ha)	Straw yield (kg/ha)	Oil contents of seed (%age)			
Cultivars										
V ₁ = RL-18	173437.50b	468.90b	13.60b	3.30b	1351.00ab	7904.30a	39.10NS			
V ₂ = Parkash	173893.20a	607/20a	14.20a	2.60c	1400.40a	7698.90b	39.10			
V ₃ = Peela Raya	173209.60c	418.60c	12.20c	4.20a	1315.40b	7165.30c	39.10			
NPK application (kg/ha)										
	N	P	K							
F ₀	0	0	0	172699.60d	371.76c	12.90c	2.80c	1094.60d	6434.40d	39.08NS
F ₁	75	0	0	173307.38c	499.85d	13.80a	3.40b	1295.10c	7202.20c	38.10
F ₂	75	50	0	173784.72b	536.20ab	13.60a	3.40b	1393.60b	7871.90b	39.10
F ₃	75	50	50	174262.15a	585.59a	13.10b	3.70a	1640.10a	8849.40a	39.10

maximum response was noted when the crop was treated with the high dose of NPK kg ha⁻¹ (75-50-50) Application of 75-50-50 NPK kg ha⁻¹ gave the maximum yield and yield contributing factors except number of seeds per pod. The maximum seed yield of 1640.17 kg ha⁻¹ was recorded in F₃ (75-50-50) whereas the other three treatments also gave statistically different results. The minimum seed yield (1094.61) was recorded in control treatments.

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