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EFFECT OF NP COMBINATIONS ON THE GROWTH, SEED YIELD AND OIL CONTENT OF THREE MUSTARD GENOTYPES

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Experiments to determine the effect of different NP combinations on the growth, seed yield and oil content of three mustard genotypes were conducted at the Latif experimental farm, Sind Agriculture University, Tandojarn on non-saline and non-sodic medium textured soil. The NP levels comprised 0-0,50-15, 75-30, 100-45, 125-60 and 150-75 kg NP ha', while the genotypes were early Raya, P-53/48-2 and 8-9. The results revealed that NP fertilizer increased significantly all the agronomic traits.of ths three genotypes. However, the difference between 150-75 and 125-60 kg NP levels was non-significant for all the traits including seed oil content. Among the genotypes, S-9 gave significantly higher seed yield but seed oil content was the highest in early Raya.
Key words: mustard genotypes, NP combinations

INTRODUCTION

Raya *(Brassica junceai* is an important oil seed crop and contributes to a considerable extent to oil production in Pakistan. The present oil production in the country meets only about 35% of total requirement. The shortage of edible oil in Pakistan started from 1970 which was attributable to increase in consumption because of ever increasing population and stagnant local production. The deficit is increasing day by day as population is increasing @ 2.8% per annum due to which the demand for edible oil is consistently increasing. This necessitates to enhance the productivity of oil seed crops either by increasing area under these crops or by introducing fertilizer responsive high yielding cultivars. Balanced application of major nutrients like Nand P plays a vital role in enhancing the productivity of oil seed crops if managed properly. Reauz et al. (1983) reported that fertilizer containing nitrogen and phosphorus resulted in higher increase in the yield of rapeseed than wheat. Dembinaki et al. (1969) stated that phosphorus dose up to 180 kg ha"!increased yield and oil content in winter rape. Similarly, Bhan and Amar Singh (1976) found that the average seed yield was the highest when 40-80 kg nitrogen, 30-60 kg phosphorus and 40 kg potassium per hectare were applied. Singh et al. (1977) reported that increase in nitrogen rate significantly increased the seed yield, whereas Mudhalker and Ablawat (1981) stated that growth and yield components increased with increasing rate of N (0-80 kg ha') and P (0-80 kg ha'), Anwar et al. (1992) concluded that 100-70 kg NP ha"! was the optimum dose both for yield and protein contents and gave higher benefit-cost ratio (1:4). Jahan et al. (1992) observed that yield responded more to N and S than P and K nutrients. Ali and Rehman (1986) reported that increasing rate of N up to 160 kg ha" consistently increased the growth and yield components. Likewise, Scarisbrick et al. (1980) reported that all the growth and yield components were increased with the increasing rate of nitrogen from 100 to 200 kg ha". Keeping in view the above mentioned controversial statements the present study was designed to determine the impact of various combinations of NP on the growth yield and oil content of three mustard genotypes under the irrigated conditions at Tandojam (Sindh), Pakistan.

MATERIALS AND METHODS

Experiments to evaluate the effect of different NP combinations on growth, yield and oil content of three mustard cultivars were conducted at the Sindh Agriculture University, Tandojam. The experiment was arranged in randomized complete block design replicated four times with factorial arrangement. The NP combinations comprised F! (0.0), F_2 (50-15), Fa (75-30), F_4 (100-45), F_s (125-60) and F_6 (150-75) kg ha". The mustard cultivars were early Raya, P-53/48-2 and S-9.

The row to row and plant to plant distance of 45 x 15 cm was maintained. Full dose of phosphorus with half dose of nitrogen was applied at the time of sowing, whereas the remaining nitrogen was applied in two equal splits each at flowering and grain formation stage. All other agronomic practices were normal and uniform. The oil content was determined by Soxhlet's apparatus. The data collected were statistically analysed on the basis of average of two years data

Table 1. Mean growth, yield traits and oil content of mustard varieties as affected by various combinations of NP fertilizer and their interaction

Plant Height (cm)

NP fertilizer combination (kg/ha)	Varieties			
	Early Raya	P-53/48-2	S-9	Mean for fertilizer
F1 = (0-0) Control	119.40	130.15	145.00	131.52
F2 = (50-15)	123.30	145.50	152.40	139.40
F3 = (75-30)	125.00	145.00	162.30	144.10
F4 = (100-45)	128.15	148.30	165.00	147.15
F5 = (125-60)	130.00	150.00	170.30	150.00
F6 = (150-75)	137.30	158.40	178.30	158.00
Mean for varieties	127.19	146.22	162.17	

Fertilizer (F)	Varieties (V)	F X V
S.E.	3.049	2.156	5.281
Cd1	6.128	4.333	10.615
Cd2	8.171	5.778	14.153

Branches Per Plant

NP fertilizer combination (kg/ha)	Varieties			
	Early Raya	P-53/48-2	S-9	Mean for fertilizer
F1 = (0-0) Control	14.00	12.00	16.00	14.00
F2 = (50-15)	16.40	14.00	18.45	16.28
F3 = (75-30)	17.00	15.20	19.00	17.07
F4 = (100-45)	18.30	16.00	19.56	17.95
F5 = (125-60)	19.20	17.30	20.30	18.83
F6 = (150-75)	17.41	15.34	18.85	

Fertilizer (F)	Varieties (V)	F X V
S.E.	0.119	0.084	0.206
Cd1	0.240	0.169	0,414
Cd2	0.319	0.225	0.552

Pods Per Plant

NP fertilizer combination (kg/ha)	Varieties			
	Early Raya	P-53/48-2	S-9	Mean for fertilizer
F1 = (0-0) Control	290.20	240.20	350.18	293.53
F2 = (50-15)	350.00	300.12	400.20	401.88
F3 = (75-30)	400.15	345.17	460.33	401.88
F4 = (100-45)	430.20	365.20	485.15	426.85
F5 = (125-60)	485.90	399.20	530.30	471.80
F6 = (150-75)	462.69			

Fertilizer (F)	Varieties (V)	F X V
8.E. 4.960	3.507	8.591
Cd1 9.970	6.050	17.268
Cd2 13.293	9.399	23.024

Seeds Per Pod

NP fertilizer combination (kg/ha)	Varieties			
	Early Raya	P-53/48-2	8-9	Mean for fertilizer
F1 = (0-0) Control	7.35	5.45	8.30	7.03
F2 = (50-15)	8.35	7.30	10.00	8.55
F3 = (75-30)	8.90	7.75	10.35	9.00
F4 = (100-45)	9.00	7.90	10.70	9.20
F5 = (125-60)	9.20	8.40	11.00	9.53
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mean for varieties	8.72	7.57	10.25	-

Fertilizer (F)	Varieties (V)	F X V
8.E. 0.114	0.081	0.197
Cd1 0.230	0.162	0.397
Ccl2 0.301	0.217	0.528

Seed Weight Per Plant (g)

NP fertilizer combination (kg/ha)	Varieties			
	Early Raya	P-53/48-2	8-9	Mean for fertilizer
F1 = (0-0) Control	13.15	12.00	15.60	13.58
F2 = (50-15)	17.00	16.50	18.00	17.17
F3 = (75-30)	17.35	17.00	18.50	17.62
F4 = (100-45)	18.00	17.40	19.00	18.13
F5 = (125-60)	18.50	18.00	20.15	18.88
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mean for varieties	17.16	16.55	18.63	-

Fertilizer (F)	Varieties (V)	F X V
8.E.0.224	0.158	0.388
Cd1 0.450	0.318	0.780
Cd2 0.600	0.424	1.040

Seed Index (g)

NP fertilizer combination (kg/ha)	Varieties			
	Early Raya	P-53/48-2	8-9	Mean for fertilizer
F1 = (0-0) Control	2.75	2.00	2.40	2.38
F2 = (50-15)	3.30	2.56	3.00	2.95
F3 = (75-30)	3.39	2.70	3.28	3.12

F4 = (100-45)	3.48	2.98	3.30	3.25
F5 = (125-60)	3.50	3.00	3.37	3.29
F6 = (150-75)	3.53	3.10	3.40	3.34
Mean for varieties	3.33	2.72	3.13	

Fertilizer (F)	Varieties (V)	F X V
S.E.0.035	0.025	0.059
Cd1 0.070	0.050	0.119
Cd2 0.093	0.066	0.159

Seed Yield Per Hectare (kg)

NP fertilizer combination (kg/ha)	Varieties			
	Early Raya	P-53/48-2	S-9	Mean for fertilize
F1 = (0-0) Control	1000.15	700.30	1100.20	933.55
F2 = (50-15)	1320.10	880.50	1600.00	1260.20
F3 = (75-30)	1390.00	900:35	1685.50	1325.28
F4 = (100-45)	1483.15	990.30	1730.00	1401.15
F5 = (125-60)	1500.00	1000.00	1800.00	1433.33
F6 = (150-75)	1515_9.9::4.9	V.9Q}Q	}~gQ.!Q	~5_0.?:.5§_
Mean for varieties	1377.30	928.60	1622.63	

Fertilizer (F)	Varieties (y)	F X V
S.E.35.433	25.055	61,372
Cd1 71,220	50.360	123.357
Cd2 94.960	67.147	164.476

Oil Content (%)

NP fertilizer combination (kg/ha)	Varieties			
	Early Raya	P-53/48-2	S-9	Mean for fertilizer
F1 = (0-0) Control	34.00	33.00	32.10	33.03
F2 = (50-15)	37.80	37.30	36.00	37.03
F3 = (75-30)	38.20	38.00	37.15	37.78
F4 = (100-45)	39.98	39.56	38.85	39.46
F5 = (125-60)	41.00	40.00	39.00	40.00
F6 = (150-75)	4.?:.5.9	jg .?Q :.	1Q.!~	,!1)~8
Mean for varieties	39.08	38.36	37.21	

Fertilizer (F)	Varieties (V)	F X V
S.E.0.900	0.700	1,715
Cd1 1,900	1,407	3,447
Cd2 2.653	1,876	4.596

using Fisher's analysis of variance technique (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Data on growth, yield contributing traits and seed oil content of three mustard genotypes presented in Table

1 revealed that plant height, branches per plant, pods per plant, seeds per pod, seed weight per plant, seed index, seed yield per hectare and seed oil content were affected significantly by NP combinations and their interactions. Maximum growth and yield contributing traits were recorded in variety S-9 except seed index and seed oil content which were higher in early Raya.

The results further indicated that both the growth, yield contributing traits and seed oil content were the maximum at the highest NP level (150-75 kg ha^{-1}) and the minimum in control followed by lower NP combinations. It was also observed that the variety S-9 fertilized @ 150-75 kg NP ha^{-1} showed significantly better performance for all the growth and yield traits except seed index and seed oil content which were higher in early Raya at the same NP combination. These results are in line with those of Ali and Rehman (1986) who reported that increasing rates of N up to 150 and 160 kg ha^{-1} progressively increased all the growth and yield traits. Similarly, Mondal and Ghaffar(1983), Singh and Rathi (1984) and Anwar et al. (1992) reported that higher NP rate (150-70 NP ha^{-1}) produced the maximum seed yield, protein and oil content (40.53%) and that all the traits were increased by fertilizer treatments over control. By contrast Jahan et al. (1992) observed that yield responded more to N,S,P and K nutrients. Almost the same results were reported by Dembinaki et al. (1969), Bhan and Amar Singh (1976) and Joarder (1983). It is concluded that the variety early Raya may be grown for better oil yield and fertilized with 125-60 kg NPlha under the agro-ecological conditions obtaining at Tandojam.

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