PERFORMANCE OF FOUR VARIETIES OF SESAME *(SESAMUM INDICUM)* AND THEIR RESPONSE TO FERTILIZER

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Abstract. *Cultivation trials were conducted on four sesame* (Sesamum indicum) *varieties to judge their performance and response to fertilizers under Peshawar climatic conditions during the years 1978 and 1979. Varieties S-17 gave higher seed yield as compared to Calinda, Pu 37-40 and Local (black seeded). Application of nitrophos fertilizer containing 20% N and 20% P_2O_5 were added at the rate of 165 kg/ha (i.e. 33: 33 kg NP/ha) gave higher seed yield as compared to super phosphate supplied at the rate of 183 kg/ha (33 kg P_2O_5) and urea at the rate of 72 kg/ha (33 kg N).*

Introduction. Cultivation of sesame *(Sesamum indicum)* is being done in Pakistan as a minor oil-seed crop. The crop is grown as a Kharif crop in all the provinces of Pakistan, covering an area of about 34, 242 hectares (2). Sind is the major sesame producing province, followed by Punjab, Baluchistan and N.W.F.P. Keeping in view the climatic conditions of Peshawar valley, especially low summer rainfall, cultivation trials of crop were carried out at the Pakistan Forest Institute, Peshawar.

Review of Literature. Mandal *et al* (8) stated that S-14 variety sown between 7 & 17th March in Orissa and with the application of 25: 15: 10 kg/ha of N, P and K respectively gave an average yield of 960 kg of seed/ha. Ramirez *et al* (9) reported that Phosphate application in a band 2-4 cm below the seed increased the height of sesame plant better than other placement. Moreover, placement of P upto 6 cm below the seed increased dry weight. Kaushal (7) studied performance of sesame varieties and reported that N-32 was highly responsive to fertilizer and yielded more than 1,000 kg of seeds per hectare with a fertilizer rate of 60: 20: 20 kg/ha of N, P and K respectively. Gill (6) conducted fertilizer trials on various sesame varieties and reported low yield due to attack of diseases. Baluch *et al* (3, 4) carried out botanical collection of 62 cultures and studied their morphological characters and yield. They further selected 18 highly promising cultivars on the basis of plant height, number of branches, number of capsules, seed index, seed to shell percentage and yield of seed per plant. Variety S-17 proved to be the most outstanding, yielding 731 kg of seed per hectare in Hyderabad region. Delgado *et al* (5) worked out the yield components of sesame under different population densities and concluded that number of capsules and seed yield per plant increased in wider spacing. They further stated that number of capsules and

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seed yield per unit area was positively correlated with plant height, number of primary branches, number of capsules per plant, seed yield per plant and number of capsules per unit area. Rheenen (10) discussed problems of growing sesame in Nigeria and recommended ridge planting (91 cm apart) with a spacing of 5 cm from plant to plant; whereas for flat sowing, a spacing of 22 cm in between rows and 10 cm in plants was suggested. Ali, M. and Zafar Alam (1) reported that natural crossing to the extent of 5% occurred in sesame varieties.

Material and Method. Experiments on the introduction and fertilizer trials were carried out on three sesame varieties during the year, 1978 at the Pakistan Forest Institute, Peshawar. Varieties (i.e. Pu 37-40, Calinda and Local (black seeded) were sown with four fertilizer treatments (i.e. O, Urea 72 kg/ha., Nitrophos 165 kg/ha., and Super phosphate 183 kg/ha) in a complete randomised block design with four replications keeping a plot size of 30 m_2. Prior to laying out the trials, 16 soil samples from 0-15 cm depth and 16 soil samples from 16-30 cm depth were taken from the experimental area and analysed for physico-chemical characteristics. Data are given below.

Mechanical composition of the soil.

Soil depth (cms)	% Clay	% Silt	% Sand	(Textural class)
0—15	34.17	39.7	26.00	Silty Clay
16—30	30.00	41.60	26.80	Clay loam

Chemical analysis of the soil.

Soil depth (cms)	TSS	Total nitrogen	PH	Available P_2O_2	Available K_2O	Water soluble Ca (%)	Organic matter (%)
0—15	0.012	0.040	8.1	27.1	444.6	14.21	0.87
16—30	0.011	0.042	8.1	14.1	283.7	14.00	0.93

Urea (46%) @ of 33 kg N/ha.
Nitrophos (20:20) @ of 33:33 kg NP/ha.
Superphosphate (P_2O_5 18%) @ of 33 kg P/ha.

Experimental plots were thoroughly prepared by ploughing and later on levelling the area. 28 gms seed per plot (@ 10 kg/ha) from each variety was sown in rows 30 cm apart, in the 3rd week of July, 1978. Fertilizer (Control, N. P & NP) was applied as a basal dose according to lay out plan at the time of sowing. First irrigation (10 cm) was given to the crop immediately after sowing and three subsequent irrigations (8 cm each) were given to the crop during the month of August, September and October, 1978. The crop was harvested in the first

week of November, dried in the sun for four days and the seed yield in kg per plot was recorded after threshing the plants.

During the year, 1979 another sesame variety i.e. S-17 was introduced thus raising the number of varieties to four and the experiment was laid out in split plot design with three replications having a plot size of 20 m^2, keeping in view the last year's experience to avoid intervarietal crossing (1). Fertilizer variables used were the same as for previous year experiment.

Results and Discussion. The yield data for the years 1978 and 79 are given:

Mean seed yield in kg/plot (30 m^2) recorded in 1978

	Treatment				
Variety	0	N	P	NP	Mean
Calinda	1.9	2.0	2.3	2.6	2.2
Local (black seeded)	1.7	2.3	2.0	2.3	2.0
Pu 37—40	1.9	2.1	2.1	2.5	2.2
Mean	1.8	2.1	2.1	2.4	—

Application of NP fertilizer gave significantly higher seed yield as compared to N & P. Response to N and P was, however, alike and significantly higher (1% level) over control.

Mean seed yield in kg/plot (20 m^2) recorded in 1979.

	Treatment				
Variety	0	N	P	NP	Mean
Calinda	1.4	1.6	1.6	1.6	1.5
S—17	1.4	1.8	2.00	2.1	1.8
Local (black seeded)	1.5	1.4	1.7	1.7	1.6
Mean	1.4	1.6	1.7	1.8	— —

Pu 37—40 Since the variety was very heavily attacked by leaf spot disease *(Cercospora sesami)*, therefore, the results were not accounted for.

S-17 variety (Sind) gave significantly higher yield of seed (1.8 kg/plot) as compared to Calinda variety (1.5 kg/ plot) and Local (black seeded) (1.6 kg/plot), while Calinda and local (black seeded) were mutually non-significant which confirmed the last year's results.

Nitrogen fertilizer (1.6 kg/plot) did not significantly increase the seed yield over control (1.4 kg/plot). Application of P and NP fertilizer, however, gave significant increase in seed yield (1.7 and 1.8 kg/plot) over control. No significant difference was observed between the seed yields of N and P fertilizers and between those of P and NP fertilizers. The seed yield of NP, however, was significantly greater than that of N fertilizer.

Increase in seed yield under various fertilizer treatments (N, P, and NP) were calculated on one hectare basis as compared to control treatment to determine the additional income and cost benefit ratio with the application of different fertilizers as under:

Increased seed yield of sesame and additional income gain by the application of various fertilizers per hectare.

Fertilizer	Yield increased over control	Value of additional yield	Cost of fertilizer	Net benefit	Benefit cost ratio
	Kgs.	Rs.	Rs.	Rs.	Rs.
Urea 72 kg.	81	384	108	276	3.6
Superphosphate 183 kg.	106	503	81	422	6.2
Nitrophos 165 kg.	175	831	215	616	3.9

Though the application of nitrophos fertilizer gave higher income (Rs.616/ha.) but the benefit cost ratio worked out indicated that superphosphate application is beneficial due to the low cost of fertilizer.

Yield of seeds under P-treatment of different varieties was calculated per hectare to determine the expected net income from the crop as under:

Varieties	Seed yield in Kg/ha.	Cultivation cost in rupees	Gross income in rupees	Net income in rupees.
Calinda	780 (Two years mean yield)	2701	3705	1004
Local (black seeded)	772(-do-)	—do—	3667	966
Pu37-40	715(One year mean yield due to failure in 2nd year)	—do—	3396	695
S—17	986 (One year mean yield due to new introduction)	—do—	4683	1982

White seeded varieties are usually preferred in the market and therefore, varieties S-17 and Calinda will be suitable for cultivation in Peshawar. Variety Pu 37-40 was found to be highly susceptible to *Cercospora sesami* in the second year of growth and therefore not suitable for cultivation (11).

Conclusion. Sesame can be grown as a short duration (4 months) Kharif oilseed crop. It can serve as an additional source of income to the farmers if improved varieties such as S-17 and Calinda are cultivated and are also fertilized with Superphosphate.

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