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Growth and Yield of Sesame Genotypes as Influenced by NP Application

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ABSTRACT

Response of four sesame genotypes namely T-89, TS-3, 92001 and 90005 to NP levels of 0-0, 25-25 and 50-50 kg ha^{-1} was studied under field conditions during 1996. The genotype TS-3 gave significantly higher seed yield than the other genotypes due to higher number of capsules per plant, number of seeds per capsule and 1000-seed weight. TS-3 also proved better in oil contents. Yield and yield components were also influenced significantly by NP application. Maximum increase of 113% in seed yield was recorded at NP level of 50-50 kg ha^{-1}. The increase in seed yield with NP application was mainly due to higher number of capsules per plants, number of seeds per capsule and 1000-seed weight. Oil contents were also influenced significantly by NP application being maximum (48.48%) at NP level of 50-50 kg ha^{-1}.

Key Words: Sesame; Genotypes; NP levels; Yield and yield components; Oil contents.

INTRODUCTION

Sesame (*Sesamum indicum* L.) is an important traditional oilseed crop of Pakistan. Its seed contains about 50% edible oil of high quality. The sesame oil does not turn rancid unlike other edible oils because of the presence of antioxidant `Sesamol' (Hatam & Abbasi, 1994). Its oil has high oleic and linoleic oil contents.

Sesame is grown on an area of 96 thousand hectares in Pakistan with total production of 42 thousand metric tonnes giving an average yield of 438 kg ha^{-1} which is much lower than yield obtained in many other countries of the world like Honduras (1200 kg ha^{-1}), Egypt (1172 kg ha^{-1}), Central African Republic (780 kg ha^{-1}) and Saudi Arabia (769 kg ha^{-1}) (Anonymous, 1998).

The use of fertilizers is considered one of the most important factors to increase crop yields on per unit basis. The NP application to sesame has been reported to increase number of capsules per plant, seeds per capsule, 1000-seed weight, biological yield, seed yield, oil contents, plant height, number of primary branches plant^{-1} and protein contents (Malik *et al.,* 1990; Sinharoy *et al.*, 1990; Jadhav *et al.*, 1992; Pawar *et al.*, 1993; Ishwar *et al.*, 1994; Mankar *et al.*, 1995).

Improved and high yielding cultivars of sesame can give 15-40% more yield than local traditional cultivars (Anonymous, 1996). Osman (1993) found that sesame genotypes varied in yield and yield components as well as in response to nitrogen application. Similarly, Wakjira *et al.* (1993) reported that introduced cultivars *viz.*, Adi, Argane and Sarkamo gave higher yield than local cultivars. Sarkamo had maximum number of capsules per plant. Shinde *et al.* (1994) substantiated that new sesame cultivar Padma gave 14, 28 and 34% more seed yields than those of Tapi, TC-25 and Phule Til-1, respectively. Similarly, Chen *et al.* (1994) reported that sesame cultivar Zhong Zhi 9 out yielded the control cultivar Wulinghei by 32.9% but showed yield potential and adaptability similar to cv. Zhong Zhi 7.

The present experiment was conducted to study the growth and yield response of sesame genotypes to NP application and also to find out high yielding variety in Faisalabad conditions.

MATERIALS AND METHODS

The experiment was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad during the year of 1996, on a sandy clay loam soil having 0.042% total nitrogen, 7.8 ppm available phosphorus and 65 ppm available potash. The experiment was laid out in a split plot design with four replications having a net plot size of 2.7m x 6.0m. Three levels of fertilizer application (0-0, 25-25 and 50-50 kg ha^{-1} of N and P respectively) were randomized in main plots and four varieties of sesame (T89, TS-3, 92001 and 90005) were randomized in sub-plots. The whole quantity of nitrogen and phosphorus was side drilled at sowing time. The crop was sown in 45 cm apart rows with a single row hand drill using a seed rate of 2 kg ha^{-1}. In all 4 irrigations were applied during the growth period of the crop. All other agronomic practices were kept normal and uniform for all the treatments. Twenty plants from each plot were selected at random to record average number of capsules per plant and average number of seeds per capsule. From each plot 1000 seeds were counted and weighed to determine the 1000-seed weight. Seed yield obtained from each plot was converted to quintals ha^{-1}. The oil

contents were determined by applying Soxhlet's method (Helrich, 1990). Data collected were analysed statistically using Fisher's analysis of variance technique and LSD test at 0.05 probability level was employed to compare the difference among the treatment means (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

Significant differences were observed among the genotypes for number of capsules plant^{-1} (Table I). The genotypes TS-3 produced the highest number of capsules plant^{-1} (12.60) which were at par with that of genotype 90005. The differences between T-89 and 90005 could not reach to a significant level. These differences can be attributed to differences in genetic constitution of crop plants. Osman *et al.* (1993) had reported significant differences in sesame genotypes. Both levels of fertilizer also significantly increased the number of capsules plant^{-1} over control being maximum (13.62) at 50-50 kg NP ha^{-1} (Table I). Significant effect of NP application on number of capsules plant^{-1} have also been reported by Jadhav *et al.* (1992). The interaction between genotypes and fertilizer levels was not significant.

All the genotypes produced statistically different number of seeds capsule^{-1}. The genotype TS-3 produced significantly more number of seeds capsule^{-1} (36.17) than all other genotypes and was followed by 90005 which have 32.50 number of seeds capsule^{-1}. The genotype T-89 produced significantly the lowest number of seeds capsule^{-1} (30.20) (Table I). These differences can be attributed to differences in the genetic make up of the genotypes. These results are in line with those of Sinharoy *et al.* (1990) who reported significant differences between genotypes for number of seeds capsule^{-1}. The number of seeds capsule^{-1} were also influenced significantly by fertilizer treatments. The plots receiving NP at the rate of 50-50 kg ha^{-1} produced maximum number of seeds capsule^{-1} (39.08). The minimum number of seed capsule^{-1} (22.42) were recorded from plots receiving no NP. Significant differences of NP application on the number of seeds capsule^{-1} were reported by Malik *et al.* (1990). The interaction between the genotypes and fertilizer levels was highly significant. TS-3 produced the highest number of seeds capsule^{-1} when given NP at the rate of 50-50 kg ha^{-1}, while 92001 produced the lowest number seeds capsule^{-1} without fertilizer application.

Genotypes varied significantly from one another regarding 1000-seed weight (Table I). The genotype TS-3 remaining at par with 90005 produced significantly the highest 1000-seed weight (3.49 g) than other genotypes. The differences between genotypes T-89 and 90005 were not significant. The results are in agreement with those of Malik *et al.* (1990). Various NP levels also differed significantly from one another regarding 1000-seed weight. The plots fertilized at the rate of 50-50 kg NP ha^{-1} produced significantly higher seed weight (3.68 g) than other NP levels. Mankar *et al.* (1995) has also reported significant effect of NP application on 1000-seed weight. The interaction between the genotypes and fertilizer levels was not significant.

The genotype TS-3 produced significantly higher seed yield (7.09 q ha^{-1}) than all other genotypes and was followed by 90005, T-89 and 92001 having average yields of 6.88, 6.34 and 4.65 q ha^{-1}, respectively. The higher seed yield of genotype TS-3 was due to higher number of capsule plant^{-1}, number of seeds capsule^{-1} and 1000-seed weight. Wakjira *et al.* (1993) and Shinde *et al.* (1994) have also reported significant difference among the genotypes for seed yield. The differences in seed yield among the various NP levels were also significant. The crop grown with the application of 50-50 kg NP ha^{-1} produced significantly higher seed yield (8.19 q ha^{-1}) than other treatments. The minimum seed yield (3.83 q ha^{-1}) was obtained from plots having no fertilizer application. The application of 50 kg N and 50 kg P had resulted a significant increase in number of capsules

Table I. Response of four sesame genotypes to different levels of NP application

Treatments	No. of capsules plant^{-1}	No. of seeds capsule^{-1}	1000-seed weight(g)	Seed yield (q ha^{-1})	Oil content (%)
Genotypes					
T-89	11.63b	30.20c	3.39b	6.34c	39.50b
TS-3	12.60a	36.17a	3.49a	7.09a	42.67a
92001	10.73c	25.10d	3.26c	4.65d	36.05c
90005	11.98ab	32.50b	3.44ab	6.88b	37.13c
NP levels (kg ha^{-1})					
Control	9.32c	22.42c	3.03c	3.83c	29.14c
25-25	12.26b	31.48b	3.46b	6.69b	48.48a
50-50	13.62a	39.08a	3.68a	8.19a	38.90b
Interaction	NS	**	NS	**	NS

Means sharing same letters are statistically non-significant at 5% probability level; ** = Highly significant; NS = Non-significant

plant^{-1}, number of seeds capsule^{-1} and 1000-seed weight, therefore, it was obvious to have higher seed yield at this level. Significant effects of NP application on seed yield of sesame have been reported by Jadhav *et al.* (1992), Ishwar *et al.* (1994) and Mankar *et al.* (1995). The interaction between the genotypes and fertilizer levels was highly significant. TS-3 produced the highest seed yield when fertilizer was applied @ 50-50 kg NP ha^{-1}, while 92001 produced the lowest seed yield without fertilizer application.

The genotype TS-3 apart from seed yield was found superior in oil contents (42.67%) and the next was T-89 with an oil content of 39.5%. The differences between genotypes 92001 and 90005 were not significant. The application of fertilizer had also influenced the oil content significantly being maximum at NP level of 25-25 kg ha^{-1}. When NP level was increased to 50-50 kg ha^{-1}, the oil contents were decreased significantly and decrease noted was 9.58%. Plots receiving no fertilizer significantly gave the lowest oil content value (29.14%). Significant effect of NP application on oil content have also been reported by Pawar *et al.* (1993). Whereas, Mankar *et al.* (1995) have reported an increase in oil contents upto 75 kg N and 50 kg P_2O_5 ha^{-1}. These differences might have been due to differences in the response of sesame to NP application, differences in soil fertility or differences in climatic conditions. The interaction between the genotypes and fertilizer levels was not significant.

The cultivar TS-3 may be preferred over other cultivars due to higher yield and oil contents and it should be fertilized at NP rate of 50-50 kg ha^{-1}.

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