Indian J. Agron. **40** (2) : 333–335 (June 1995)

Effect of nitrogen, potassium and sulphur on seed yield, nutrient uptake, quality and economics of summer sesame (*Sesamum indicum*)

NAGESHWAR LAL, S. K. SARAWGI, R. S. TRIPATHI AND M. C. BHAMBRI

Indira Gandhi Krishi Vishwa Vidyalaya, Raipur, Madhya Pradesh 492 012

Received: November 1993

Summer sesame (*Sesamum indicum* L.) has recently been introduced in vast area of Chhattisgarh plains where the irrigation facilities and other technologies have been provided. However, proper and balanced fertilizer schedule is important amongst the various the technologies for high production of the crop. Since very little information is available on sesame particularly in Alfisols soils of Chhattishgarh region of Madhya Pradesh, an effort was made to study the effect of nitrogen, potassium and sulphur on yield, uptake, quality and economics of sesame.

The experiment was conducted during Summer 1991 at Raipur. Soil was silty clay-loam having pH 7.1 and low in available N and medium in available P and K. The experiment was laid out in split-plot design with 3 replications. The treatments comprised 3 levels of N (40, 80 and 120 kg N/ha) in main plot and combinations of 4 levels of K (0, 30, 60 and 90 kg K_2O/ha) and 2 levels of S (0 and 10 kg/ha) in subplots. A common dose of 60 kg/ha was applied through diammonium phosphate. A basal dose of 60% N, if required, was applied through urea to the treatments of 80 and 120 kg N/ha. The full dose of K and S, as per treatments, was applied through muriate of potash and 98% elemental sulphur respectively. Remaining part of N was top-dressed at 35 days after sowing through urea. The sesame crop, in rice–chickpea–sesame cropping system was sown on 8 March. The test variety was 'Selection 5' ('Roma'). The N, P, K and S, and oil contents were determined using microkjeldahl's, vanadomolybdophosphoric acid yellow colour method, flame photometer, turbidimetric method and soxhlet apparatus respectively. Agronomic efficiency (AE) was calculated as :

$$AE = \frac{\text{Yield of produce in treatment} - \text{yield of produced in lower dose}}{\text{Nutrient applied}}$$

The seed yield of sesame increased significantly with increasing levels of N from 40 to 80 or 120 kg/ha, which were at par (Table 1). Similar results were also reported by Majumdar *et al.* (1988) and Deshmukh *et al.* (1990). Seed yield increased significantly with increasing levels of K up to 60 kg/ha, which was at par with 90 kg/ha. A good supply of K leads to increase in photosynthesis, which is actively concerned in the process of sugar formation and translocation of starch as well as photosynthates. Sulphur application @ 10 kg/ha resulted in significantly higher seed and oil yields compared with the control. Since sulphur is an integral part of acyl-coenzyme *A* that helps synthesis of more fatty acids. Similar results were also reported by Singh *et al.* (1987).

Oil content and oil yield were not much

Table 1. Seed yield, oil content, oil yield, agronomic efficiency, economics, nutrient concentration and uptake of sesame as influenced by nitrogen, potassium and sulphur levels

Treatment	Seed yield (kg/ha)	Oil content (%)	Oil yield (kg/ha)	Agronomic efficiency	Net return (Rs/ha)	Benefit : cost ratio	Concentration (%)				Uptake (kg/ha)			
							N	P	K	S	N	P	K	S
Nitrogen (kg/ha)														
40	1,388	42.72	661.4		9,133	1.92	0.78	0.29	0.59	0.16	44.9	13.5	24.2	7.28
80	1,688	43.95	740.5	7.50	11,919	2.40	0.86	0.30	0.60	0.16	45.2	15.8	28.7	7.66
120	1,817	43.53	791.2	5.36	13,002	2.52	1.02	0.31	0.73	0.13	46.2	17.8	40.1	8.60
LSD (P = 0.05)	234.6	NS	NS	NC	NC	NC	0.06	NS	0.06	NS	NS	1.4	3.2	0.60
Potassium (kg/ha)														
0	1,500	44.65	666.7		10,136	2.09	0.83	0.29	0.50	0.13	42.6	15.3	26.6	6.94
30	1,599	46.00	732.7	3.30	11,061	2.25	0.89	0.29	0.58	0.15	45.1	15.4	30.2	7.49
60	1,750	43.71	764.7	4.20	12,514	2.51	0.94	0.30	0.61	0.15	46.2	15.9	32.2	8.10
90	1,675	45.91	760.1	1.94	11,696	2.31	0.89	0.34	0.68	0.17	48.0	17.3	35.1	8.86
LSD (P = 0.05)	123.2	NS	56.2	NC	NC	NC	0.04	0.03	0.08	NS	NS	1.0	1.9	0.60
Sulphur (kg/ha)														
0	1,586	44.27	698.2		12,300	2.48	0.84	0.31	0.61	0.13	42.5	15.8	30.2	7.65
10	1,676	45.86	763.9	9.00	11,403	2.13	0.94	0.30	0.67	0.17	48.5	15.6	31.7	8.04
LSD (P = 0.05)	87.1	NS	39.8	NC	NC	NC	0.07	NS	0.06	0.03	3.0	NS	1.4	NS

NS, Not significant; NC, not calculated

influenced by N. However, oil content in seed decreased with increasing levels of N. With higher application of N there was greater accumulation of protein that hinders the availability of carbohydrates for polymerisation into fatty acids and thus leading to lower oil content into seed. Total oil yield (kg/ha), net return (Rs/ha) and benefit : cost ratio were substantially increased with increasing levels of nitrogen. Agronomic efficiency was high in low levels of N compared with higher levels of N when it was estimated from 40 kg/ha. Application of K resulted in significantly higher oil yield, which was at par with the control. Maximum agronomic efficiency, net return and benefit : cost ratio were observed with 60 kg K/ha. Maximum oil content and net return were also observed with S; however, higher benefit : cost ratio was observed with no S.

Concentration of N and K in plant increased significantly with increasing levels of N; however, P and S concentrations could not influenced by N levels. Total uptake P, K and S by the crop were increased significantly with increasing levels of N (Table 1). The increase may be attributed to the fact that N is regulator for utilization of P, K and the other nutrients and increase the action-exchange capacity of plant roots and make them more efficient in absorbing nutrients. Similarly, N, P and K concentrations in plant increased significantly with increasing levels of K. However, S application helped in significant increase of N and K concentrations in the plant only. Total uptake of all the nutrients, except N, was increased significantly with increasing levels of K; however, application of S @ 10 kg/ha significantly influenced the N and K uptake only.

REFERENCES

Deshmukh, V. A., Chavan, D. A. and Dugave, G. T. 1990. Response of sesame (*Sesamum indicum* L.) to nitrogen and phosphate. *Indian Journal of Agronomy* **35** (3) : 314.

Majumdar, S. K., Barik, K. C., Bera, P. S. and Ghosh, D. C. 198. Growth and yield of sesame (*Sesamum indicum* L.) as influenced by N and potassium nutrition. *Fertiliser News* **33** (3) : 41–43.

Singh, Vijay, Chauhan, Y. S. and Tripathi, N. K. 1987. Comparative efficacy of level of nitrogen and sulphur in production and biochemical value of till (*Sesamum indicum* L.) var. C-6. *Research and Development Reporter* **4** (2) : 213–217.