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RESEARCH PAPER

Response of sesame (*Sesamum indicum* L.) varieties to sulphur and potassium application under rainfed condition

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Abstract : A field study was conducted during *Kharif*, 2008 and 2009 at K.V.K. Farm Thariaon, Fatehpur (U.P.) to study the response of two improved sesame varieties ('Shekhar' and 'Pragati') to sulphur (zero and 20 kg S/ha) and potassium (0,15, 30 and 45 kg K_2O/ha) levels under rainfed condition. Variety 'Pragati' recorded more number of branches, capsules, dry matter / plant, 1000 seed weight and higher seed yield than the variety 'Shekhar'. Application of 20 kg S/ha produced significantly higher seed yield alongwith the higher values of plant height, branches / plant, dry matter / plant, capsules / plant and 1000 seed weight compared to no sulphur application. Increasing K_2O levels upto 30 kg K_2O/ ha resulted in significantly higher seed yield, yield attributes and growth parameters except 1000 seed weight which was not significantly affected by potassium application.

Key Words : Sesame, Varieties, Sulphur, Potassium, Yield

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INTRODUCTION

Sesame (*Sesamum indicum* L.) in an important edible oil seed crop grown in India. It's seeds are rich in oil (46-52 per cent) and protein (18-20 per cent). Nearly 73 per cent of oil is used for edible purposes. The oil is very stable and does not turn rancid. It has anti-bacterial, anti-viral, anti-fungal and anti- oxidant properties. India ranks first, both in area and production of sesame in the world. Here, it is grown on 17.39 lakh ha area producing 6.0 lakh tonnes seed annually with average productivity of 345 kg/ha (Duhoon, 2001). Uttar Pradesh is one of the major sesame growing stages in India. Uttar Pradesh grows sesame on 1.67 lakh ha area and produces 0.25 lakh tonnes with productivity of only 149 kg/ha. It shows that productivity of sesame in Uttar Pradesh is less than half of national productivity. The reason behind it, is that here sesame is grown mostly during *Kharif* season under rainfed condition on marginal and sub-marginal land without the use of proper fertilizers. Only some amount of nitrogen and phosphorus are applied in few cases. Research evidences showed that sesame crop responds well to potassium and sulphur application also (Lal *et al*., 1995). Such information is not available for alluvial soil of central Uttar Pradesh where sesame is grown on considerable area. Therefore, the present investigation was taken up with different levels of potassium and sulphur in rainfed crop of sesame.

MATERIALS AND METHODS

A field experiment was carried out during *Kharif*, 2008 and 2009 at Krishi Vigyan Kendra Farm, Thariaon, Fatehpur with sesame under rainfed condition. The treatments comprised 16 treatment combinations of 2 varieties (Shekhar and Pragati), 2 sulphur levels (zero and 20 kg S/ha) and 4 levels of potassium (0, 15, 30 and 45 kg K_2O/ha). The combinations of varieties and sulphur were tested in main

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plots, while potassium levels were kept in sub-plots of a split plot design replicated thrice. Experimental soil was clay loam in texture, slightly alkeline in nature (pH 7.8) having 0.38 per cent O.C., 16.7 kg/ha available P_2O_5 , 227 kg/ha available K_2O and 9.8ppm DTPA sulphur. The experiment was conducted at same site during both years. A basal dose of 20 kg nitrogen and 20 kg P_2O_5/ha was applied uniformly to all treatment plots at sowing . In addition, 20 kg N/ha through urea was top dressed in standing crop after one month of sowing. Sulphur as per treatment was applied through gypsum (18% S) at the time of field preparation. Potash was applied through muriate of potash as per treatment, full as basal alongwith phosphorus. Sowing was done in furrows 30 cm apart using 4 kg seed/ha during third week of July. At 20 days after sowing, thining was done to maintain plant spacing 10 cm. Crop was raised under rainfed conditions. To evaluate the treatment effects, data were recorded on growth, yield attributes and seed yield of sesame.

RESULTS AND DISCUSSION

The results of the present study alongwith relevant discussion have been presented under the following heads :

Performance of varieties:

Variety 'Shekhar' produced significantly taller plants than 'Pragati' , but in all other characters viz. branches / plant, dry matter / plant (Table 1), number of capsules / plant and 1000 seed weight (Table 2), variety 'Pragati' proved significantly superior over 'shekhar' during both years. As a result, variety 'Pragati' recorded significantly higher seed yield over 'Shekhar' by the margin of 124 and 116 kg/ha or 22.1 and 19.9 per cent during two years of study.

Effect of sulphur:

Sulphur application increased plant height, branches / plant and dry matter / plant significantly over no sulphur application. Increase in dry matter due to 20 kg S/ ha was 5.04 and 5.88 g/ plant or 21.1 and 23.7 per cent higher over control during two different years. It might be because sulphur is involved in photosynthetic process of plant which has a direct bearing on development and plant growth. Yield attributes *viz.,* capsules / plant and 1000 seed weight were recorded significantly higher with sulphur application over control which resulted in significantly higher seed yield. Sulphur application of 20 kg/ha increased seed yield over without sulphur by the margin of 158 and 156 kg seed / ha or 29.0 and 27.8 per cent during 2008-09 and 2009-10, respectively. Thus the seed yield response at 20 kg S/ha was found 7.9 and 7.8kg seed per kg. applied sulphur in two years of study. The increase in yield of sesame due to sulphur application may be attributed to balanced nutrition and increased growth and yield parameters indicating that sulphur is crucial for achieving higher crop yields. These results corroborate to the findings of Lal *et al*. (1995) and Yadav *et al*. (2008).

Effect of potassium:

Increasing levels of potassium increased the growth parameters (Table 1) and yield attributes of sesame significantly upto the application of 30 kg K_2O/ha in all cases except 1000 seed weight which was not influenced significantly by

Table 1: Effect of varieties, sulphur and potassium application on growth of sesame

Treatments	Plant height (cm)		No. of branches per plant		Dry matter per plant (g)	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Variety						
Shekhar	112.50	114.20	4.78	4.80	24.60	26.46
Pragati	109.50	109.80	5.15	5.20	28.10	29.06
S.E.±	1.19	1.14	0.09	0.11	0.47	0.48
C.D. (P=0.05)	2.90	2.80	0.22	0.28	1.15	1.18
Sulphur (kg/ha)						
0	108.00	108.50	4.61	4.60	23.83	24.82
20	114.00	115.50	5.32	5.40	28.87	30.70
S.E.±	1.55	1.51	0.19	0.20	0.54	0.54
C.D. (P=0.05)	3.80	3.70	0.46	0.49	1.31	1.33
K_2O levels (kg/ha)						
0	102.50	105.00	4.44	4.45	21.30	22.37
15	110.50	111.50	4.82	4.88	26.31	27.51
30	115.10	115.50	5.25	5.29	28.92	30.52
45	115.90	116.00	5.35	5.38	28.87	30.64
S.E.±	1.79	1.84	0.24	0.22	0.64	0.65
C.D. (P=0.05)	3.70	3.80	0.49	0.45	1.32	1.34

Table 2: Effect of varieties, sulphur and potassium levels on yield attributes and yield of sesame

Treatments	No. of capsules per plant		1000-seed weight (g)		Seed yield (kg/ha)	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Variety						
Shekhar	83.0	87.0	2.91	2.92	562	582
Pragati	98.0	105.00	3.04	3.04	686	698
S.E.±	2.4	2.3	0.02	0.02	13	13
C.D. (P=0.05)	5.8	5.6	0.06	0.06	32	32
Sulphur (kg/ha)						
0	78.0	84.0	2.90	2.90	545	562
20	103.0	108.0	3.05	3.06	703	718
S.E.±	3.3	3.3	0.03	0.03	15	14
C.D. (P=0.05)	8.1	8.0	0.08	0.08	36	35
K_2O levels (kg/ha)						
0	65.0	68.0	2.96	2.96	508	517
15	87.0	93.0	2.98	2.98	610	620
30	106.0	112.0	2.98	2.99	688	713
45	104.0	111.0	2.98	2.99	690	710
S.E.±	4.3	4.2	0.03	0.04	14	13
C.D. (P=0.05)	8.8	8.3	NS	NS	29	27

NS = Non- significant

potassium application. Seed yield of sesame was also increased significantly due to increasing levels of potassium upto 30 kg K_2O/ ha during both years. The magnitude of increase in seed yield at 30 kg K_2O/ha compared with no K and 15 kg K_2O/ha was 102 and 103 kg seed/ ha or 20.1 and 19.9 per cent and 180 and 196 kg/ha or 35.4 and 37.9 per cent, respectively during 2008-09 and 2009-10. It was attributed to growth and yield attributes in general and to number of capsules / plant in particular which also increased upto 30 kg K_2O/ha application. The reason may be explained that 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 (Lal *et al*., 1995). These results are in agreement to the finding of Majumdar *et al*. (1988) and Ghosh and Patra (1994). The interaction effect of treatment was not found significantly in any case.

The results of present study may be concluded that application of 20kg S and 30 kg K_2O/ha alongwith recommended dose of N and P fertilizers increased seed yield of sesame over N and P fertilizers alone application under central Uttar Pradesh condition in *Kharif* rainfed crop. Variety 'Pragati' proved to be the higher yielder than 'Shekhar'.

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