Indian Journal of Agricultural Sciences 65 (7) : 509–11, July 1995

Effect of nitrogen and potassium on growth and seed yield of sesame (*Sesamum indicum*)

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Received: 11 November 1994

Sesame (*Sesamum indicum* L.), a drought-tolerant oilseed crop, can be grown successfully in the early summer (March–May) season in Bangladesh under rainfed condition. However, prolonged drought sometimes induces root growth at the expense of shoot growth. Application of potassium in the grey terrace soil where K is not easily available might encourage root growth. Majumder *et al.* (1987, 1988) reported significant effect of 60 kg N/ha and 49.8 kg K/ha on growth and seed yield of sesame in a lateritic soil of West Bengal. Lee *et al.* (1985) and Seo *et al.* (1986) reported from Korea that seed production of sesame needed judicious amount of NPK fertilizers. However, the extent these levels are applicable under Bangladesh condition was not known. Hence the present experiment was conducted to study the effect of different levels of N and K on seed yield and yield components including leaf-area index and the root and shoot growth of sesame.

The experiment was conducted during early summer season of 1991 and 1992 at Joydebpur (23.5°N, 86°E). The soil was a silt loam with *p*H 5.6 (Aeric Haplaquept). It had organic matter 0.7%; Ca, Mg and K 10.7, 1.96 and 0.24 meq/100 ml respectively; and N, P and S 35, 15 and 14 µg/g respectively. N was below and K was above the critical level, but this type of soil suffers from transient K deficiency during drought spell. The land was continuously cropped and the previous crop was wheat (*Triticum aestivum* L. emend. Fiori & Paol.) in both the seasons. The treatments comprised 4 levels of N (0, 40, 80 and 120 kg/ha from urea), 3 levels of K (0, 33.2 and 66.4 kg/ha from muriate of potash) with constant 34.9 kg P/ha from a triple superphosphate and 20 kg S/ha from gypsum. The experiment was laid out in a 4 x 3 factorial randomized complete block design with 3 replications. The unit plot size was 2 m x 2.4 m with 0.5 m bunds between plots and 1.0 m between replications. The seeds were sown in 30 cm wide rows @ 8 kg/ha on 27 March 1991 and 31 March 1992. The plants were thinned to a plant-to-plant distance of 10 cm, and all the weeds were removed. After plant establishment the crop received sufficient moisture from monsoon rain. No severe moisture stress affecting plant growth was noticed.

Beginning from 30 days after sowing, 10 plants along with roots were dug out periodically from each plot at 15-day intervals up to 90 days after sowing. The plants were washed and the root, shoot and leaves were saved. Leaf area was noted by leaf area-meter

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(Model LI-COR 100). Dry weights of roots and shoots were recorded after drying for 48 hr at 75°C. At maturity, yield components were recorded on 10 random plants but the seed yield at 10% moisture was recorded from the whole plot, leaving 2 border rows. Plants were harvested when the leaves were shed and 80% pods appeared mature. After drying, the plants were threshed by beating on the ground. Data thus recorded were pooled for 2 years and analysed statistically.

The dry matter of roots increased up to 75 days after sowing and then declined at all the fertilizer levels. It was maximum at 80 kg N/ha (Table 1). An increase in K level increased it linearly (Table 1). The dry matter of shoots also increased with time. It was maximum at 90 days with 120 kg N/ha and 66.4 kg K/ha (Table 1). The result confirms the findings of Seo *et al.* (1986), Majumder *et al.* (1988) and Samui *et al.* (1990). The maximum leaf-area index (2.07) was achieved with 80 kg N/ha at 75 days after sowing. Potassium @ 66.4 kg/ha gave leaf-area index 1.91, which was not significantly different with that at 33.2 kg/ha (1.81).

None of the treatments influenced the plants/m^2 (Table 2). Nitrogen @ 80 kg/ha and K @ 66.4 kg/ha gave maximum number of pods/m^2 and the former also gave the highest number of seeds/pod (Table 2). Potassium increased the seeds/pod only slightly, and there was no significant difference between 33.2 and 66.4 kg K/ha. Majumder *et al.* (1987, 1988) also reported similar increase in the number of pods/plant and seeds/pod. Nitrogen @ 80 kg/ha gave the highest seed yield (Table 2). Though K showed a response at 66.4 kg/ha, there was no significant difference between 33.2 and 66.4 kg K/ha (Table 2). The result confirms the findings of Aulakh *et al.* (1985), Lee *et al.* (1985) and Majumder *et al.* (1988). Highest harvest index was achieved with 80 kg N/ha and 66.4 kg K/ha (Table 2). Nitrogen application beyond 80 kg/ha depressed it significantly due to an increase in

Table 1 Effect of N and K on dry weights of root and shoot of sesame at different days after sowing (mean data of 2 years)

Treatment	Dry weight of root (g/m^2) at			Dry weight of shoot (g/m^2) at		
	60 days*	75 days	90 days	60 days	75 days	90 days
N (kg/ha)						
0	14.89	18.42	17.32	122.84	206.00	240.86
40	16.39	19.42	18.42	128.54	268.87	258.74
80	17.32	20.01	20.32	147.39	270.64	300.93
120	16.25	19.55	18.25	160.64	274.19	321.68
LSD (P = 0.05)	1.131	NS	2.075	16.00	16.11	13.94
K (kg/ha)						
0	14.96	17.90	17.52	129.24	237.33	271.30
33.2	15.85	20.02	19.25	145.86	254.85	281.65
66.4	17.05	20.15	19.66	144.06	266.07	287.54
LSD (P = 0.05)	1.013	2.158	1.269	14.10	14.97	12.48
CV (%)	5.8	8.1	7.8	7.9	7.8	8.4

*Days after sowing

Table 2 Effect of N and K on yield components, seed yield and harvest index of sesame (mean data of 2 years)

Treatment	Plants/ m^2	Pods/ m^2	Seeds/ pod	1 000-seed weight (g)	Seed yield (tonne/ha)	Harvest index
N (kg/ha)						
0	22.5	748	70.6	2.40	0.75	0.24
40	22.0	819	74.4	2.44	0.91	0.25
80	22.5	872	76.2	2.49	0.97	0.29
120	21.5	864	73.3	2.42	0.95	0.24
LSD (P = 0.05)	*NS*	*61.3*	*1.19*	*NS*	*0.149*	*0.014*
K (kg/ha)						
0	21.5	763	72.6	2.41	0.79	0.23
33.2	22.0	849	74.8	2.44	0.91	0.25
66.4	22.0	861	75.1	2.45	0.99	0.26
LSD (P = 0.05)	*NS*	*48.8*	*1.0*	*NS*	*0.125*	*0.012*
CV (%)	3.0	6.2	6.7	2.4	7.1	9.0

vegetative growth and depression in yield components.

It was concluded that N and K are important for both root and shoot growth of rainfed sesame. Depending on the soil, application of 80 kg N/ha and 33.2 kg K/ha, together with 34.9 kg P/ha and 20 kg S/ha, should be sufficient for a good seed yield of sesame in Bangladesh.

ACKNOWLEDGMENTS

We gratefully acknowledge the revision, constructive criticisms and valuable suggestions of Dr J S Rowarth and Dr M P Rolston, Senior Scientists, AgResearch, Lincoln, New Zealand.

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