

Effect of weed control on productivity of sesame (*Sesamum indicum*)

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ABSTRACT

An experiment was conducted to study the effect of weed control on yield of sesame (*Sesamum indicum* L.) at Tikamgarh, during the rainy (*kharif*) season of 1991 and 1992 on a sandy-clay-loam soil. Vegetative growth was higher in 'Local' variety, whereas yield attributes were higher in improved varieties ('JT 7' and 'JLSC 8'). Seed yield, harvest index, seed oil, oil yield, benefit : cost ratio and net return were significantly higher in improved varieties than those in 'Local' one. Hand-weeding (thrice) gave the maximum growth, yield attributes, seed oil and net return, followed by fluchloralin (ppi) @ 2 litres/ha + 1 hand-weeding. Fluchloralin applied as pre-plant incorporation proved more effective than fluchloralin applied as pre-emergence. Benefit : cost ratio and net return were the maximum when fluchloralin was applied as pre-plant incorporation. Highest net return (Rs 6,131/ha) was recorded from 'JLSC 8' grown with fluchloralin (ppi), followed by 'JLSC 8' with hand-weeding. With 'JT 7' (88 days), fluchloralin (ppi) alone was found sufficient, but for 'JLSC 8' (76 days) fluchloralin + 1 hand-weeding was essential to obtain similar net return, i.e. Rs 5,633/ha to Rs 5,737/ha.

In oilseed crops yield loss due to weed competition varies from 16 to 68% (Varaprasad and Shanti, 1993). The conventional methods of weed control (hoeing or hand-weeding) are very laborious, expensive and inefficient. Moreover, weeding during critical growth stages is not possible due to paucity of farm labour. Chemical weeding is easier, time-saving and economical compared with hand-weeding (Rao and Narayana Rao, 1985). Integrated weed management (manual as well as chemical weeding) is the most efficient and acceptable approach to combat with the weed-control problems (Padmaja *et al.*, 1993). As such information is lacking for Bundelkhand re-

gion where sesame (*Sesamum indicum* L.) is grown in a larger area, present experiment was conducted.

MATERIALS AND METHODS

The experiment was conducted on the progressive farmer's fields of Tikamgarh during the rainy (*kharif*) season of 1991 and 1992 under rainfed condition. The soil of the experimental field was sandy clay-loam (pH 7.6, electrical conductivity 0.57 mmhos/cm, and available N, P₂O₅ and K₂O 202.0, 13.5 and 312.2 kg/ha respectively). The total rains received from June to October were 679.0 and 853.2 mm in 1991 and 1992 respectively. The treatments

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Table 1. Growth and yield-attributes of sesame as affected by varieties and weed-control treatments (pooled data of 2 seasons)

Treatment	Plant height (cm)	Bran-ches/ plant	Leaves/ plant	Podding-length on stem (cm)	Fertile capsules/ plant	Grains/ capsule	1,000-weight (g)	Dry weight/ plant (g)	Weed count/m ² (at maturity)
<i>Variety</i>									
'Local'	107.9	3.8	48.1	64.5	27.0	68.4	2.3	27.1	61.2
'JT 7'	96.7	3.9	43.1	43.3	33.3	70.2	2.6	16.2	62.0
'JLSC 8'	98.0	3.4	42.2	43.0	31.9	70.2	2.5	18.9	63.6
CD (P = 0.05)	1.35	0.14	3.36	0.94	2.43	NS	0.07	1.34	NS
<i>Weed-control method</i>									
Unweeded (control)	97.8	2.3	32.4	46.3	25.8	68.5	2.0	16.5	306.5
Fluchloralin (ppi)	101.3	3.5	39.1	50.5	31.5	69.9	2.5	21.3	32.7
Fluchloralin (pre-em.)	99.4	3.0	37.2	49.6	29.4	69.0	2.3	19.7	42.4
Hand-weeding (25 days*)	98.5	2.8	37.1	46.8	28.9	69.2	2.3	18.3	39.9
Fluchloralin (ppi) + HW (25 days)	103.7	4.6	54.0	52.8	33.0	70.2	2.7	23.0	4.3
Fluchloralin (pre-em.) + HW (25 days*)	101.3	4.1	49.8	52.3	32.3	69.6	2.6	22.1	6.9
HW (25,40,55 days*)	104.0	5.5	61.8	53.6	34.2	70.7	2.8	24.3	3.4
CD (P = 0.05)	1.45	0.85	5.74	1.39	2.30	1.04	0.11	1.12	9.2

*Days after sowing

comprised 3 sesame varieties ('Local', 'JT 7' and 'JLSC 8') in the main plots, and 7 weed-control methods (1, unweeded control; 2, fluchloralin @ 2 litres/ha as pre-plant incorporation (ppi); 3 fluchloralin @ 2 litres/ha at pre-emergence stage; 4, hand-weeding (once at 25 days after sowing); 5, fluchloralin (ppi) + 1 hand-weeding; 6, fluchloralin, (pre-em.) + hand-weeding; 7, 3 hand-weedings (25, 40, 55 days) in the subplots. These were laid out in split-plot design with 3 replications. The varieties were sown in rows 30 cm apart between 7 and 19 July. Uniform dose of 60 kg N/ha, 40 kg P₂O₅/ha and 20 kg K₂O/ha was applied to each treatment. Half dose of N along with full dose of P₂O₅ and K₂O was given basal. The remaining N was top-dressed in 2 equal

splits, at 25 and 40 days. Weed-control practices were followed as per treatments. The crop was harvested between 5 and 14 October. The dominant weeds of the experimental fields were: *Echinochloa* spp., *Commelina benghalensis*, *Digera arvensis*, *Euphorbia* spp., *Phyllanthus niruri*, *Cyperus rotundus* and *Cynodon dactylon* (L.) Pers.

RESULTS AND DISCUSSION

Morphological parameter

The 'Local' variety attained the maximum height, leaves, podding-length whereas 'JLSC 8' among the improved varieties gave lower branches and leaves/plant (Table 1). However, plant height of 'JLSC 8' was higher than of JT-7.

Three hand-weedings (25, 40 and 55

Table 2. Seed and straw yields, harvest index, seed oil, oil yield and net return as affected by varieties and weed-control (pooled data of 2 seasons)

Treatment	Seed yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Seed oil (%)	Oil yield (kg/ha)	Cost : benefit ratio	Net return (Rs/ha)	Crop maturity (days)
<i>Variety</i>								
'Local'	4.70	16.7	21.72	50.33	236	1.22	790	91.2
'JT 7'	7.22	12.6	36.09	52.53	379	2.50	5,224	88.0
'JLSC 8'	7.26	12.4	36.32	51.77	376	2.53	5,281	75.7
CD (P = 0.05)	0.76	1.21	2.0	0.21	40.35	0.23	773	
<i>Weed-control method</i>								
Unweeded (control)	4.53	12.1	27.42	50.57	229	2.11	2,704	87.2
Fluchloralin (ppi)	6.59	14.2	31.35	51.38	339	2.33	4,243	85.0
Fluchloralin (pre-em.)	6.37	13.4	31.88	51.17	326	2.20	4,009	85.3
Hand-weeding (25 days*)	5.88	13.1	29.67	50.95	300	2.13	3,559	86.0
Fluchloralin (ppi) + HW (25 days)	6.93	15.0	32.29	52.09	361	2.01	3,942	84.4
Fluchloralin (pre-em.) + HW (days*)	6.80	14.1	32.90	51.91	353	1.97	3,793	83.8
HW (25,40,55 days*)	7.66	15.4	34.13	52.75	405	1.89	4,107	83.2
CD (P = 0.05)	0.22	0.86	1.73	0.18	11.35	0.07	239	

*Days after sowing

days) recorded the minimum weeds (3.4/m²) and the maximum vegetative growth, followed by fluchloralin + hand-weeding at 25 days. Fluchloralin applied as ppi proved better than applied as pre-emergence as the weed counts were 32.7 and 42.4/m² respectively. However, fluchloralin as ppi or pre-emergence proved significantly superior to that of unweeded control, having 306.5 weeds/m². The vegetative growth parameters were minimum in unweeded treatment due to heavy weed competition with the crop plants.

Yield-attributing parameter

The number of fertile capsules/plant, number of grains/capsule and 1,000-seed

weight were higher in improved varieties than the 'Local' one. However, podding length on stem and dry weight/plant were higher in 'Local' (Table 1). This was due to taller plants and more leaves/plant in 'Local' over improved varieties.

Yield attributes were maximum when hand-weed thrice, followed by fluchloralin (ppi) + 1 hand-weeding. The influence of other treatments was similar to that as obtained in morphological characters. The increased values of yield attributes under various weed-control methods were according to their efficiency to control weeds and reducing crop-weed competition during the critical stages of crop growth. Rao and Narayana Rao (1985) also reported

similar results.

Seed and straw yields

The seed yield and harvest index were significantly higher in improved varieties, whereas straw yield was significantly higher in 'Local' (Table 2). Among the improved varieties, 'JLSC 8' matured earlier by 12 days than 'JT 7'. The higher yield from improved varieties was due to higher yield-attributing characters recorded in these varieties over the 'Local' one. Varietal yield differences were also confirmed by Mahapatra (1984) and Rao *et al.*, (1985).

Application of fluchloralin @ 2 litres/ha (ppi or pre-em.) proved effective in controlling weeds which resulted in significantly higher seed and straw yields over unweeded (control). Fluchloralin followed by 1 hand-weeding (25 days) showed better results than fluchloralin alone. Three hand-weedings (25, 40 and 55 days) gave the highest seed yield (7.66 q/ha)

and straw yield (15.4 q/ha) with harvest index 34.13%. This was followed by integrated approach of weed management [fluchloralin (ppi) + 1 hand-weeding]. The beneficial effect of fluchloralin with and without hand-weeding was also reported by Rao and Narayana Rao (1985) and Padmaja *et al.* (1993). The superiority of fluchloralin (applied as ppi or pre-em.) is supported by the fact that the critical period of weed-competition in sesame is between 15 and 0 days after sowing and yield is reduced up to 49% (Subramanian and Sankaran, 1978). Hence first weeding alone at 25 days without weedicide would be partially effective.

Qualitative and monetary gain

The oil (%) in seed, oil yield, benefit : cost ratio and net return were significantly higher in the improved varieties over the 'Local' one (Table 2). The oil production was higher by 140–143 kg/ha from

Table 3. Interaction effect between varieties and weed-control methods on seed yield and net return (pooled data of 2 seasons)

Treatment	Seed yield (q/ha)			Net return (Rs/ha)		
	'Local'	'JT 7'	'JLSC 8'	'Local'	'JT 7'	'JLSC 8'
Unweeded	3.39	5.14	5.08	652	3,765	3,696
Fluchloralin (ppi)	5.17	7.41	7.19	1,506	5,737	5,486
Fluchloralin (pre-em.)	4.88	7.13	7.11	1,244	5,402	5,381
HW (25 days*)	3.85	6.83	6.98	345	5,078	5,255
Fluchloralin (ppi) + HW (25 days*)	5.13	7.76	7.91	748	5,447	5,633
Fluchloralin (pre-em) + HW (25 days*)	5.10	7.61	7.71	724	5,267	5,387
HW (25, 40, 55 days*)	5.41	8.69	8.90	317	5,874	6,131
CD (P = 0.05)	0.378			414		

*Days after sowing

Market rates: fluchloralin @ Rs 340/litre, HW charges @ Rs 700/ha; sesame seed @ Rs 1,200/q; cost of cultivation @ Rs 2,350–2,465/ha

improved varieties over 'Local' variety. Benefit : cost ratio was higher by more than 2 times and net return by 6.5 times (Rs 5,224–5,281/ha) from improved varieties than from 'Local' variety.

Hand-weeding (thrice) gave the maximum oil (%) in seed as well as oil production. This may be owing to least weed competition and thereby highest nutrient uptake. However, the maximum benefit : cost ratio (2.33) and net monetary gain (Rs 4,243/ha) were obtained from fluchloralin (ppi) alone. When both these methods were combined, *i.e.* fluchloralin (ppi) plus HW (once), the monetary gain, was, however, reduced due to uneconomical hand-weeding.

The interaction between varieties and weed-control methods was significant (Table-3). The highest seed production (8.90 q/ha) and net return (Rs 6,131/ha) was obtained from earlier maturing 'JLSC 8' receiving 3 hand-weedings', followed by 'JLSC 8' receiving fluchloralin + hand-weeding. The highest straw yield (18.7 q/ha) was obtained from 'Local' variety under the 3 hand-weedings. 'JT 7' (88 days) applied with fluchloralin (ppi) alone, gave a net-return up to Rs 5,737/ha, and almost the same net return (Rs 5,633/ha) was obtained from 'JLSC 8' (76 days) applied with

fluchloralin (ppi) + 1 hand-weeding.

Thus 'JT 7' and 'JLSC 8' gave highest net return when grown under is fluchloralin and under fluchloralin + hand-weeding respectively.

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