



Effect of weed management practices on seed yield and nutrient uptake in sesame

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India is the world's largest producer of sesame accounting nearly 35% of the total production but its productivity is extremely low (368 kg/ha). Weed management appears to be one of the major constraints for such low productivity. Weed competes with crop plants for resources *i.e.* water, light, space and nutrients *etc.* causing reduction in yield and economic return. Sesame being a rainy season and slow growing crop during early stage, provide ample opportunities for weed infestation. NPK efficiency may also be improved by adopting suitable weed management practices. Chemical weed control is time saving, easier, economical and can be adopted timely, particularly where scarcity of agricultural labours exists during important field operations as compared to manual weeding (Brar and Mehra 1989). As the information on these aspects is lacking under the semi arid conditions of northern M.P., a study was carried out on sesame crop to find out most suitable and economical method of weed control for higher production and economic returns.

Field study was carried out during rainy season of 2010 at RVSKVV College of Agriculture, Gwalior. The soil of the experimental field was sandy loam and slightly alkaline (7.97 pH) with 237 kg/ha available N, 23.73 kg/ha P, and 477.22 kg/ha K. Ten treatments comprising trifluralin, pendimethalin each at 0.75 kg/ha, quizalofop 0.05 kg/ha, clodinafop 0.06 kg/ha, integration of each of these herbicides with 1 HW at 30 days after sowing (DAS), weedy check and two hand weeding at 15 and 30 DAS were replicated three times in randomized block design (Table 1).

Sesame variety 'JT-S-8' was sown at 30 cm row spacing on 29th July, 2010 and harvested on 21st October, 2010. Crop was raised as per recommended package of practices except weed control treatments. Trifluralin was incorporated in 2-3 cm top soil before sowing, pendimethalin was sprayed after sowing, while quizalofop-ethyl and clodinafop were sprayed at 20 DAS. All the herbicides were applied with manually operated knapsack sprayer

fitted with flat fan nozzle at spray volume of 600 l/ha. Weed density and dry weight were recorded at 60 DAS with the help of 1x1m quadrat by throwing randomly at three place from each plot. NPK content in seed and stalk of soybean and weeds (60 DAS) were determined by using alkaline permanganate, colorimetrically by Olsen and Flame photometer methods, respectively (Dubey and Arora 2010). The nutrient uptake by seed, stalk and weeds were computed by multiplying the per cent NPK content in plants with their respective dry weight. The economics was calculated on the basis of prevailing market rates of agriculture produce and cost of cultivation treatment wise.

Experimental field was infested with *Digera arvensis* (33.67%) *Echinochloa crusgalli* (21.76%), *Cyperus rotundus* (17.6%), *Commelina bengalensis* (17.34%) and *Phyllanthus niruri* (9.91%). All the weed control treatments played a significant role in reducing weed population and weed dry weight as compared to weedy check at 60 DAS. The maximum weed count and weed dry weight was observed in weedy check plots, whereas the minimum was recorded in 2 hand weeding (15 and 30 DAS) (Table 1). Among the herbicidal treatments, trifluralin at 0.75 kg/ha supplemented with one hand weeding recorded lowest weed population and weed dry weight followed by quizalofop-ethyl 50 g/ha + 1 hand weeding. All the herbicides when combined with one hand weeding at 30 DAS had pronounced effect on weeds as compared to their alone application.

Highest seed and stalk yield (1190 and 4861 kg/ha) of sesame was obtained by two hand weeding at 15 and 30 DAS which was found at par with trifluralin supplemented with one hand weeding, while weedy check yielded lowest seed (451 kg/ha). Integration of trifluralin, pendimethalin, quizalofop and clodinafop with one hand weeding at 30 DAS gave significantly higher seed yield than herbicide application alone. Trifluralin at 0.75 kg/ha supplemented with one hand weeding produced higher seed yield of 1127 kg/ha which was significantly higher by 250% over weedy check and was closely followed by quizalofop 0.05 kg/ha supplemented with one hand weed-

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Table 1. Effect of various weed control treatments on total weed population, weed dry matter, yield, and net income of sesame

Treatment	Total weed population/ m ²	Weed biomass (g/m ²)	Seed yield (kg/ha)	Stalk yield (kg/ha)	Net income (₹/ha)	B:C Ratio
Trifluralin 0.75 kg/ha (PPI)	13.0	72.5	799	4157	27,667	3.73
Pendimethalin 0.75 kg/ha (PE)	18.0	95.0	716	3917	23,349	3.21
Quizalofop-ethyl 50 g/ha PoE at 20 DAS	14.7	78.7	743	4028	24,292	3.22
Clodinofof 60 g/ha PoE	25.1	125.8	639	3856	19,979	2.92
Trifluralin 0.75 kg/ha PPI + one HW 30 DAS	6.2	32.5	1127	4727	41,357	4.55
Pendimethalin 0.75 kg/ha PE + one HW 30 DAS	9.1	48.0	979	4393	34,061	3.82
Quizalofop-ethyl 50 g/ha PoE (20 DAS) + one HW 30 DAS	8.7	40.2	1057	4523	37,334	4.00
Clodinofof 60 g/ha PoE + one HW at 30 DAS	12.6	65.5	820	4250	26,883	3.26
2 HW at 15 and 30 DAS	3.3	18.0	1190	4861	42,391	4.12
Weedy check	78.0	300.0	451	3481	12,527	2.38
LSD (P=0.05)	4.36	8.62	88	359	-	-

PPI- Pre-plant incorporated; PE- Pre-emergence

Table 2. Effect of weed management practices on NPK uptake by weeds, seed and stalk of sesame

Treatment	Weeds (kg/ha)			Seed (kg/ha)			Stover (kg/ha)			Total plant (kg/ha)		
	N	P	K	N	P	K	N	P	K	N	P	K
Trifluralin 0.75 kg/ha (PPI)	12.0	1.7	9.1	23.5	5.6	2.5	22.9	10.8	47.1	46.4	16.5	49.6
Pendimethalin 0.75 kg/ha (PE)	15.4	2.3	11.8	21.2	5.2	2.4	22.3	10.6	45.0	43.5	15.7	47.4
Quizalofop-ethyl 50 g/ha PoE at 20 DAS	12.9	1.9	9.8	21.9	5.3	2.4	22.9	10.5	45.9	44.9	15.7	48.3
Clodinofof 60 g/ha PoE	19.8	2.9	15.3	19.0	4.7	2.2	22.4	10.8	44.7	41.4	15.5	46.9
Trifluralin 0.75 kg/ha PPI + one HW 30 DAS	5.4	0.8	4.6	32.8	7.7	3.1	24.6	10.4	51.5	57.4	18.1	54.7
Pendimethalin 0.75 kg/ha PE + one HW 30 DAS	8.0	1.2	6.4	28.6	6.8	2.6	23.3	10.5	48.8	51.9	17.3	51.4
Quizalofop-ethyl 50 g/ha PoE (20 DAS) + one HW 30 DAS	6.7	0.9	5.5	30.8	7.2	2.9	23.9	9.9	49.7	54.7	17.1	52.7
Clodinofof 60 g/ha PoE + one H.W. at 30 DAS	10.7	1.6	8.2	24.1	5.8	2.5	23.4	11.0	48.0	47.5	16.9	50.6
2 HW at 15 and 30 DAS	3.1	0.4	2.6	34.6	8.1	3.3	25.3	10.7	52.5	59.9	18.8	55.8
Weedy check	45.0	6.9	36.0	13.5	3.4	1.6	20.9	10.4	41.8	34.4	13.8	43.3
LSD (P=0.05)	0.31	0.04	0.25	2.59	0.62	0.27	1.95	NS	NS	3.04	1.02	4.00

ing (1057 kg/ha). This may be attributed to less competitive interaction between crop and weed plants due to lower weed count and weed dry weight.

Significantly higher NPK uptake was noted in all the herbicidal and manual weeded treatments as compared to weedy check. The highest NPK uptake (59.91 kg N, 18.79 kg P and 55.83 kg K) was recorded in two hand weeding at 15 and 30 DAS which was found at par with trifluralin 0.75 kg/ha supplemented with one hand weeding at 30 DAS and significantly superior to those recorded in rest

of treatments (Table 2). Increase in productivity and nutrient content in sesame was responsible for higher nutrients uptake by soybean showing less weed population and dry weight.

Significantly lower NPK depletion were observed in all herbicidal and manually weeded plots as compare to weedy check. Among all weed control measures, the least NPK was removed by weeds in 2 HW at 15 and 30 DAS treatment and this was found significantly superior to all other treatments (Table-2). Heavy weed infestation in

weedy check removed 45.0 kg nitrogen, 6.9 kg phosphorus and 36.0 kg potassium/ha whereas in hand weeding twice the weeds removed only 3.1 kg N, 0.5 kg P and 2.6 kg K/ha. Similar findings were reported for nitrogen uptake in sesame (Singh *et al.* 2001) and for NPK uptake in sunflower (Kumar *et al.* 2007 and Sumathi *et al.* 2009). Among herbicidal treatments, trifluralin 0.75 kg/ha supplemented with one hand weeding removed lowest NPK followed by quizalofop + one hand weeding.

SUMMARY

A field experiment was carried out at Gwalior during *Kharif* season of 2010 to assess the effect of weed management practices to sesame on seed yield and nutrient uptake by crop and weeds and net returns. Two hand weeding at 15 and 30 DAS registered highest yield (1190.22 kg/ha) and net return (₹ 42391/ha) in addition to higher NPK uptake by crop and lower NPK uptake by weed. Among herbicidal treatments application of trifluralin 0.75 kg/ha followed by one hand weeding at 30 DAS was found superior for yield, NPK uptake by plant and net return.

Integration of herbicides *viz.*, trifluralin, pendimethalin, quizalofop ethyl and clodinafop with one hand weeding at 30 DAS was found more effective as compared to their alone use. NPK removed by weeds was highest in weedy check and lowest in two hand weeding followed by trifluralin 0.75 kg/ha integrated with one hand weeding at 30 DAS.

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