



ISSN 2278- 4136

ZDB-Number: 2668735-5

IC Journal No: 8192

Volume 2 Issue 1

Online Available at www.phytojournal.com



Journal of Pharmacognosy and Phytochemistry

Herbicidal weed control in Sesame (*Sesamum indicum* L.)

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A field experiment was conducted at 'Til Research farm' College of Agriculture, Tikamgarh during *Kharif* season of 2011-12 and 2012-13 to find out the efficacy of herbicides on weed intensity, dry weight, yield and economics of sesame. The treatments comprised of pre emergence herbicides viz. oxyfluorfen at 250 and 500 g/ha, pendimethalin at 200, 400, 600, 800 and 1000 g/ha, one hand weeding at 15 DAS + one hand hoeing at 30 DAS, two hand weedings and weedy check. The major weed species observed in the experimental area were *Cyperus rotundus*, *Echinochloa crusgalli*, *Digitaria adscendens*, *Euphorbia hirta* and *Phyllanthus niruri*. The relative density of monocots was 75.50% while dicots were to the extent of 22.99% of the total weed population. Hand weeding was found superior to other weed control measures and attained minimum weed density, dry matter and maximum weed control efficiency followed by one hand weeding + one hand hoeing at 15 and 30 DAS during both of the year. Among the herbicides, pre emergence application of oxyfluorfen @ 500 and 250 g/ha produced significantly higher yield over all the rates of application of pendimethalin. The highest net monetary return obtained with two hand weedings whereas the B:C ratio was the highest with the application of oxyfluorfen at 250 g/ha followed by oxyfluorfen at 500 g/ha and pendimethalin at 600 g/ha.

Keyword: Oxyflurfen, Pendimethalin, Hand weeding, Hand hoeing, B:C ratio

1. Introduction

Sesame [*Sesamum indicum* (L.)] is one of the important edible oilseeds cultivated in India. Its oil content generally varies from 46 to 52% and protein between 20-26%. Severe weed competition is one of the major constraints in lower productivity of sesame. Prevalence of high temperature with relative humidity and frequent rainfall during the crop season coupled with slow plant growth particularly, during early growth stages favour luxuriant weed growth since seedling emergence causes about 50-75% reduction in seed yield of sesame (Dungarwal *et al.*, 2003) [1]. Besides the rising cost of labour, which contributes major share of cultivation charges of sesame, need to be replaced by an alternate effective and economical measure, which can help to boost the production per unit area of the crop (Punia

et al., 2001) [5]. Weed control by using herbicides is one of the easier, time saving and economical alternative as compared to manual weeding. Chemical herbicides are applied as an alternative to hand weeding + hoeing and they are selective, cost effective, fairly easy to apply and have persistence that can be managed (Jain *et al.*, 2001). There are many herbicides viz., pendimethalin, alachlor and oxyfluorfen available and presently being used for controlling weeds in sesame. But the information about the efficacy of these herbicides for weed control in *kharif* sown sesame is meager for Bundelkhand region of Madhya Pradesh. Therefore, the present experiment was undertaken to evaluate the efficacy of pre emergence herbicides for weed control in sesame.

Materials and Methods

A field experiment was conducted at 'Til Research farm' College of Agriculture, Tikamgarh during *Kharif* season of 2011-12 and 2012-13 with the objective to find out the efficacy of herbicides on weed density, weed dry weight, yield attributes, yield and economics of sesame. The soil of the experimental area was sandy with neutral in reaction, low in organic carbon (0.90%) available nitrogen (317 kg/ha) and medium in phosphorus (17.96 kg/ha) whereas it was high in potassium content (332.60 kg/ha). The experiment was laid out in "Randomized block design" with ten treatments replicated thrice. The experiment comprised of ten treatments viz, pre emergence herbicides oxyfluorfen (250 and 500 g/ha), pendimethalin (200, 400, 600, 800 and 1000 g/ha), one hand weeding at 15 DAS + one hand hoeing at 30 DAS, two hand weedings at 15 and 30 DAS and weedy check. The sesame variety "JTS-8" was sown with seed rate of 3 kg/ha and fertilized with 60:40:20 kg N, P₂O₅ and K₂O/ha, respectively. Pre emergence herbicides were applied on next day of sowing with knapsack sprayer using flat fan nozzle. The spray volume for pre emergence herbicide application was 500 l/ha.

Results and Discussion

Weed flora

There was predominance of monocot weeds in experimental field as they constituted the higher relative density of 76.50% as compared to dicot weeds which had only 23.50% relative density. In the monocot weeds, the intensity of *Cyperus rotundus* was the highest (48.30%) followed by *Digitaria adscendens* (12.11%) and *Echinochloa crusgalli* (15.55%) whereas among the dicots, *Phyllanthus niruri* was more rampant as it has the maximum relative density (16.30%) followed by *Euphorbia hirta* (5.60%).

Effect on weeds

The weed intensity and biomass were significantly affected by different treatments. The lowest weed intensity and biomass were recorded in the Hand weeding twice (4.32 per

m²). Application of oxyfluorfen @ 250 g/ha and oxyfluorfen @ 500 g/ha recorded lower weed intensity and dry weight of weeds than all the doses of pendimethalin whereas in pendimethalin at 600 to 1000 g/ha registered significantly lower weed intensity than 200 and 400 g/ha. Two hand weedings superseded over all the treatments and attained maximum weed control efficiency (95.10%) followed by one hand weeding + one hand hoeing at 15 and 30 DAS (93.10%), oxyfluorfen at 500 g/ha (89.86%) and oxyfluorfen at 250 g/ha (86.29%) during both of the years.

Effect on crop

Different weed control treatments significantly affected the yield attributes, yield and economics of sesame during both the years. The highest number of capsules per plant and number of seeds per capsule were recorded under hand weeding twice, and was at par with hand weeding + hand hoeing and oxyfluorfen 500 g/ha (Table 1). Both the doses of oxyfluorfen @ 250 and 500 g/ha produced significantly higher number of capsules per plant over all the rate of applications of pendimethalin from 200 to 1000 g/ha. The data on thousand seed weight indicated that all the treatments recorded significantly higher test weight over weedy check except pendimethalin at 200 and 400 g/ha. Among the treatments, heaviest seeds were recorded as a result of hand weeding twice (2.02 g) followed by one hand weeding + one hand hoeing at 15 and 30 DAS (2.01 g) and it was at par with both doses of oxyfluorfen @ 250 and 500 g/ha (1.98 and 1.99 g).

The result of herbicidal weed control treatments on seed yield revealed that it was significantly higher under all the herbicidal treatments (168.17-262.84 kg/ha) compared to weedy check (112.17 kg/ha). Two hand weedings (15 and 30 DAS) gave significantly the highest seed yield (323.33 kg/ha) over all the treatments. The crop plant grew well in weed free environment with the results that yield attributes attained relatively greater values and finally the highest seed yield. Jain *et al.* (2001)

and Mizan *et al.* (2009) also reported the increase in yield of sesame under hand weeding twice. Among the Pendimethalin treatments, application of 200 g/ha and 400 g/ha gave significantly lower seed yield (168.17 and 193.67 kg/ha) than the remaining pendimethalin treatments (220.67-236.34 kg/ha). This was mainly due to competition stress of *Cyperus rotundus* which was not effectively controlled with lower doses of

application of pendimethalin. The higher dose of Pendimethalin @ 600, 800 and 1000 g/ha being effective to control weed population. Oxyfluorfen at both the rates of application gave significantly higher seed yield over pre emergence application of pendimethalin at all the doses. Ghanavel and Anbhazhagan (2006) also reported the effectiveness of oxyfluorfen against weed control in sesame.

Table 1: Effect of weed control treatments on weeds, yield attributes, yield and economics of sesame (pooled data of two years)

Treatments	Mean Weed Intensity (per m ²)	Mean Dry weight (g/m ²)	Weed control efficiency (%)	Capsules/plant	Seeds/capsule	Test weight (g)	Seed yield (kg/ha)	Net monetary return (Rs./ ha)	B:C Ratio
Oxyfluorfen 250 g/ha (PE)	37.00 (6.11)	16.99 (4.17)	86.29	32.63	62.47	1.98	256.00	14683	2.35
Oxyfluorfen 500 g/ha (PE)	31.50 (5.61)	11.27 (3.42)	89.86	35.73	63.70	1.99	262.84	14090	2.16
Pendimethalin 200 g/ha (PE)	182.50 (13.53)	80.57 (8.97)	33.80	23.27	58.40	1.92	168.17	6926	1.70
Pendimethalin 400 g/ha (PE)	173.00 (13.17)	72.29 (8.53)	38.64	24.37	59.47	1.93	193.67	9226	1.91
Pendimethalin 600 g/ha (PE)	160.84 (12.27)	53.045 (7.29)	50.58	26.70	60.00	1.96	220.67	11677	2.13
Pendimethalin 800 g/ha (PE)	141.84 (11.64)	42.96 (6.59)	57.66	26.20	61.07	1.95	224.84	11843	2.12
Pendimethalin 1000 g/ha (PE)	131.67 (11.29)	33.62 (5.84)	62.38	26.50	62.13	1.96	226.34	11743	2.08
One hand weeding at 15 DAS + One hoeing at 30 DAS	23.50 (4.89)	5.305 (2.40)	93.75	36.67	65.33	2.01	280.50	13460	1.92
Two hand weeding at 15 and 30 DAS	18.33 (4.32)	4.23 (2.13)	95.10	38.77	68.12	2.02	323.33	15493	1.92
Control (weedy check)	264.00 (16.26)	125.88 (11.22)	0.00	20.13	53.33	1.88	112.17	1876	1.20
SEM±	(0.27)	(0.28)		1.42	1.78	0.02	3.55		
CD (P=0.05)	(0.79)	(0.79)		4.20	5.27	0.06	10.51		

*values in parenthesis are square root transformed

Economics

All the treatments for weed control had better economics over the weedy check. The highest net monetary return obtained with two hand weedings whereas the B:C ratio was the highest with the application of oxyfluorfen at 250 g/ha

followed by oxyfluorfen at 500 g/ha and pendimethalin at 600 g/ha, however, the lowest net monetary returns (Rs. 1876/ha) and benefit cost ratio was registered under weedy check (1.20).

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