

Weed Management in Sesame with Sequential application of pre and post emergence Herbicides

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ABSTRACT

Effect of herbicides on weed suppression and yield of sesame was evaluated at Til Research farm, Tikamgarh during kharif, 2016 in randomized block design with ten treatments consisting of pre emergence herbicide; pendimethalin 750 g/ha, post emergence herbicides; quizalofop-ethyl 40 and 50 g/ha, fenoxaprop ethyl 75 and 100 g/ha, pendimethalin 750 g/ha fb quizalofop 40 and 50 g/ha, pendimethalin 750 g/ha fb fenoxaprop 75 and 100 g/ha, pendimethalin fb one hand weeding at 20 DAS, two hand weeding at 15 and 30 DAS and weedy check. Results revealed that hand weeding twice at 15 and 30 DAS recorded the lowest density and dry weight of total weeds. Pendimethalin fb one hand weeding significantly reduced the intensity and dry weight of total weeds over other herbicidal treatments and weedy check. Pre-emergence application of pendimethalin fb post emergence; quizalofop and fenoxaprop significantly reduced the density and dry weight of weeds over alone application of pendimethalin. The seed yield and NMR was the highest under two hand weeding followed by pendimethalin fb hand weeding at 20 DAS where as it was the least under weedy check.

Key words: Pendimethalin, Quizalofop ethyl, Fenoxaprop, hand weeding, Weeds

Received 22.06.2019

Revised 23.07.2019

Accepted 12.08.2019

CITATION OF THIS ARTICLE

MP Sahu, N Jain, U Bermaiya, V Jain and L Patidar. Weed Management in Sesame with Sequential application of pre and post emergence Herbicides. Int. Arch. App. Sci. Technol; Vol 10 [3] September 2019 : 134-137

INTRODUCTION

Sesame (*Sesamum indicum* L.) is one of the most important oilseed crops next to groundnut, rapeseed and mustard in India. With an annual all season acreage of about 18-20 lakh hectares, India ranks first in both acreage and production (about 8 lakh MT) of sesame in the world. India also happens to be one of the largest exporters of sesame. In Madhya Pradesh, sesame is grown in about 424 thousand ha. The total production of sesame crop was estimated at 1,24,383 MT with an average yield of 293 kg/ha. In Tikamgarh, it is cultivated in an area of 30 thousand hectare with the production of 2820 metric ton and 94 kg/ha productivity [5]. Severe weed competition is one of the major constraints in lower productivity of sesame. 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. The loss of seed yield due to uncontrolled weed growth in sesame has been reported as high as 70% in sandy loam soils [4]. Pre-emergence application of pendimethalin 1000 g/ha is recommended for line sown sesame to control the weeds, but the selectivity of pendimethalin is mainly depends on soil type and depth of sowing of crop. In broadcasted sesame, most of the crop seeds are placed at shallow depth, hence applied pre-emergence herbicides comes in close contact with crop seeds results in phytotoxicity or stand loss of sesame [8]. Therefore, the experiment was carried out to find out the suitable method for weed control in sesame.

MATERIAL AND METHODS

Field experiment was conducted during *kharif* season of 2016-17 at College of Agriculture, JNKVV, Tikamgarh (M.P.). The soil of the experimental field was sandy loam with pH 7.3, available N (225 kg/ha), P₂O₅ (17.70 kg/ha) and K₂O (415.6 kg/ha). The experiment was laid out in "Randomized block design" with twelve treatments replicated thrice. The treatments comprised of pre emergence herbicides viz; pendimethalin at 750 g/ha, post emergence herbicides; quizalofop-ethyl at 40 and 50 g/ha, fenoxaprop ethyl at 75 and 100 g/ha, pendimethalin at 750 g/ha *fb* quizalofop at 40 and 50 g/ha, pendimethalin at 750 g/ha *fb* fenoxaprop at 75 and 100 g/ha, pendimethalin *fb* one hand weeding at 20 DAS and these treatments were compared with two hand weeding at 15 and 30 DAS and weedy check. The sesame variety "TKG-306" was sown with seed rate of 5 kg/ha in rows 30 cm apart with fertilizer dose of 60:40:20 kg N:P₂O₅:K₂O per ha. Pendimethalin was applied as pre-emergence next day of sowing whereas quizalofop-ethyl and Fenoxaprop ethyl were applied at 20 DAS with hand knapsack sprayer fitted with flat fan nozzle at spray volume of 500 l/ha. Individual weed intensity of *Cyperus rotundus*, *Cynodon dactylon*, *Eclipta alba*, *Leucus aspera*, *Mollugo pentaphylla* and total weed intensity and dry weight were recorded at 40 DAS with the help of 1 x 1 m quadrat by throwing randomly at three places in each plot. Weeds were removed and counted species wise. The data pertaining to weed density and weed dry weight recorded at 40 DAS were subjected to square root transformations $\sqrt{x + 0.5}$. The weed control efficiency of various treatments against weedy check was worked out on the basis of weed dry weight. The economics was calculated on the basis of prevailing market rates of agriculture produced and cost of cultivation treatments wise.

RESULTS AND DISCUSSION

Effect on weeds

Weed flora

Sesame crop grown in *kharif* season was infested by wide range of monocot and dicot weeds. There was predominance of monocot weeds in experimental field as they constituted the higher relative density of 65.21% as compared to dicot weeds which had only 34.79 % relative density. In the monocot weeds, the density of *Cyperus rotundus* was the highest (57.52 %) followed by *Cynodon dactylon* (7.96 %) whereas among the dicots, *Eclipta alba* was more rampant as it has the maximum relative density (14.76 %) followed by *Mollugo pentaphylla* (12.56 %) and *Leucus aspera* (7.20 %) at 40 days after sowing. Badkul et al. [1] and Bhadauria et al. [3] also reported the dominance of *Cyperus rotundus* in the field of sesame.

Effect of treatments

Hand weeding at 15 and 30 DAS recorded the lowest population of monocot and dicot weeds followed by pendimethalin *fb* one hand weeding. Pre-emergence application of pendimethalin 750 g/ha *fb* hand weeding at 20 DAS found significantly superior than alone application of pendimethalin and followed application with post emergence herbicides; quizalofop and fenoxaprop. The effectiveness of two hand weedings or pre-emergence application of pendimethalin 0.75 kg/ha + 1 hand weeding in sesame crop was also reported by Parasuraman and Rajagopal (1998). Pre emergence pendimethalin followed by post emergence quizalofop at 40 and 50 g/ha and fenoxaprop at 75 and 100 g/ha proved significantly superior over pendimethalin alone with respect to total weed population and dry weight. Weedy check recorded significantly the highest weed intensity and dry weight of all the weeds (Table 1). Post emergence application of quizalofop at 40 and 50 g/ha and fenoxaprop at 75 and 100 g/ha alone was not effective in reducing the intensity of dicot weeds *Eclipta alba*, *Leucas aspera* and *Mollugo pentaphylla* and registered intensity similar to weedy check. Intensity of grassy weeds; *Cyperus rotundus* and *Cynodon dactylon* were the lowest under twice hand weeding at 15 and 30 DAS followed by pendimethalin *fb* one hand weeding whereas among herbicides, post emergence fenoxaprop at 75 and 100 g/ha and quizalofop at 50 g/ha were at par with pendimethalin followed by fenoxaprop and quizalofop at both the rates of application. However, post emergence application of fenoxaprop at 75 and 100 g/ha and quizalofop at 50 g/ha being grass weed

killers were not reduced the intensity of broadleaved weeds; *Eclipta alba*, *Leucus aspara* and *Mollugo pentaphylla* and registered the intensity of broadleaved weeds at par to weedy check. However, application of pre emergence pendimethalin significantly reduced the intensity of broadleaved weeds over post emergence grass weed killer; quizalofop and fenoxaprop and weedy check. The maximum weed control efficiency was recorded under hand weeding twice (93.72 %) followed by pendimethalin 750 g/ha fb hand weeding at 20 DAS (90.36 %). Among herbicidal treatments, pre emergence application of pendimethalin fb fenoxaprop ethyl at 75 and 100 g/ha and pendimethalin fb quizalofop ethyl at 50 g/ha registered higher weed control efficiency over pendimethalin alone.

Table 1. Effect of different treatments on intensity, dry weight and weed control efficiency at 40 DAS

Treatment	<i>Cyperus rotundus</i>	<i>Cynodon dactylon</i>	<i>Eclipta alba</i>	<i>Leucas aspera</i>	<i>Mollugo pentaphylla</i>	Total weeds	Weed dry weight (g/m ²)	Weed control efficiency (%)
Pendimethalin 750 g/ha as Pre emergence	35.50 (5.99)	4.29 (2.14)	4.61 (2.24)	1.47 (1.40)	3.98 (2.12)	49.86 (7.10)	76.11 (8.75)	31.65
Quizalofop ethyl 40 g/ha at 20 DAS	26.39 (5.18)	2.79 (1.79)	9.68 (3.18)	4.83 (2.30)	8.53 (2.98)	52.22 (7.26)	64.73 (8.08)	41.87
Quizalofop ethyl 50 g/ha at 20 DAS	24.65 (5.01)	2.70 (1.77)	9.63 (3.17)	4.76 (2.29)	8.22 (2.94)	49.96 (7.10)	59.95 (7.78)	46.17
Fenoxaprop ethyl 75 g/ha at 20 DAS	24.40 (4.97)	2.54 (1.70)	9.49 (3.16)	4.72 (2.28)	7.65 (2.85)	48.80 (7.02)	57.30 (7.60)	48.55
Fenoxaprop ethyl 100 g/ha at 20 DAS	23.19 (4.87)	2.43 (1.69)	9.29 (3.12)	4.63 (2.18)	7.58 (2.84)	47.12 (6.89)	53.25 (7.33)	52.18
Pendimethalin 750 g/ha fb Quizalofop ethyl 40 g/ha at 20 DAS	25.67 (5.11)	2.58 (1.71)	4.55 (2.21)	1.59 (1.45)	3.93 (2.10)	38.33 (6.22)	47.48 (6.93)	57.36
Pendimethalin 750 g/ha fb Quizalofop ethyl 50 g/ha at 20 DAS	24.21 (4.94)	2.43 (1.63)	4.49 (2.20)	1.50 (1.41)	3.90 (2.10)	36.54 (6.07)	44.38 (6.70)	60.15
Pendimethalin 750 g/ha fb Fenoxaprop ethyl 75 g/ha at 20 DAS	23.71 (4.92)	2.18 (1.64)	4.44 (2.18)	1.44 (1.39)	3.81 (2.08)	35.58 (6.00)	40.80 (6.43)	63.36
Pendimethalin 750 g/ha fb Fenoxaprop ethyl 100 g/ha at 20 DAS	23.01 (4.85)	2.10 (1.61)	4.38 (2.17)	1.34 (1.36)	3.48 (1.99)	34.32 (5.90)	36.42 (6.08)	67.30
Pendimethalin 750 g/ha fb Hand weeding at 20 DAS	20.11 (4.54)	1.65 (1.47)	3.92 (2.09)	0.87 (1.17)	2.99 (1.86)	29.54 (5.48)	10.74 (3.35)	90.36
Hand weeding at 15 and 30 DAS	14.59 (3.88)	1.62 (1.46)	2.00 (1.58)	0.60 (1.04)	1.69 (1.48)	20.50 (4.58)	6.99 (2.74)	93.72
Weedy check	40.17 (6.35)	5.56 (2.41)	10.31 (3.25)	5.03 (2.34)	8.77 (3.00)	69.84 (8.36)	111.36 (10.45)	0.00
LSD (P=0.05)	(0.64)	(0.47)	(0.60)	(0.44)	(0.36)	(0.59)	(0.98)	14.51

*values in parenthesis are square root transformed

Effect on crop

All the weed control treatments produced significantly more capsules/plant, seeds/capsule, test weight and seed yield over weedy check (Table 1). Two hand weeding at 15 and 30 DAS resulted significantly the highest value in capsules/plant, test weight and seed yield over rest of the treatments. Baskaran and Solaimalai, 2002 also reported the similar results. Among the herbicides, alone application of pre emergence pendimethalin at 750 g/ha, post emergence quizalofop and fenoxaprop produced significantly lower number of capsules per plant, number of seeds per capsule, test weight and seed yield over application of pre emergence pendimethalin followed by post emergence herbicides; quizalofop and fenoxaprop. Pendimethalin followed by hand weeding at 20 DAS produced significantly higher number of capsules/plant, number of seeds/capsule, test weight and seed yield over all the herbicidal treatments except pendimethalin followed by fenoxaprop at 75 and 100 g/ha. The marginal profit of Rs. 8540 per ha was obtained when crop was not

weeded throughout the crop season whereas it was the highest under two hand weeding (Rs. 35099 per ha) followed by pendimethalin 750 g/ha fb one hand weeding (Rs. 30365 per ha) and pendimethalin fb Fenoxaprop ethyl 100 g/ha (Rs. 27811 per ha).

Table 2. Effect of different herbicides on number of capsules per plant, number of seeds per capsule, test weight, seed yield, net monetary return and benefit cost ratio of sesame

Treatment	Number of capsule/plant	Number of seeds/capsule	Test weight (g)	Seed yield (kg/ha)	Net monetary return (Rs./ha)
Pendimethalin 750 g/ha as Pre emergence	18.13	41.93	2.70	290	13962
Quizalofop ethyl 40 g/ha at 20 DAS	18.50	42.67	2.72	308	15556
Quizalofop ethyl 50 g/ha at 20 DAS	18.77	43.13	2.73	324	16867
Fenoxaprop ethyl 75 g/ha at 20 DAS	19.00	43.33	2.75	335	17824
Fenoxaprop ethyl 100 g/ha at 20 DAS	19.33	44.00	2.76	353	19052
Pendimethalin 750 g/ha fb Quizalofop ethyl 40 g/ha at 20 DAS	21.20	47.33	2.78	435	25489
Pendimethalin 750 g/ha fb Quizalofop ethyl 50 g/ha at 20 DAS	21.77	48.00	2.79	443	25975
Pendimethalin 750 g/ha fb Fenoxaprop ethyl 75 g/ha at 20 DAS	22.03	48.67	2.81	454	26934
Pendimethalin 750 g/ha fb Fenoxaprop ethyl 100 g/ha at 20 DAS	22.27	49.33	2.82	468	27811
Pendimethalin 750 g/ha fb Hand weeding at 20 DAS	23.27	51.00	2.87	524	30365
Hand weeding at 15 and 30 DAS	25.17	56.67	2.88	610	35099
Weedy check	16.27	38.67	2.68	212	8580
LSD (P=0.05)	1.74	3.12	0.11	73.30	-

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