



# Response of Sesame to Different Weed Management Practices in Maharashtra, India

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

The experiment was conducted at Agricultural Research Station, Jalgaon, Maharashtra during *Kharif* season of 2018 to 2020 to study the effect of pre and post emergence herbicide on growth and yield of sesame. The experiment was laid out in a Randomized Block Design (RBD), replicated thrice with eight treatments viz., T<sub>1</sub> Weedy check, T<sub>2</sub> Weed free, T<sub>3</sub> Pendimethalin 30EC (pre-emergence)@0.50kg a.i./ha., T<sub>4</sub> Quizlofop-ethyl 5 % EC (post emergence) 50g a.i./ha.at 20 DAS., T<sub>5</sub> Sodium Acifluorfen16.5% + Clodinafop-propargyl 8% (premix) @ 100 g.a.i./ha.at 20 DAS., T<sub>6</sub> Pendimethalin 30EC (pre-emergence)@ 0. 50 kg a.i./ha.+ Hand weeding at 20DAS., T<sub>7</sub> Pendimethalin 30EC (pre-emergence)@0. 50 kg a.i./ha.+ Quizlofop-ethyl 5 % EC (post emergence) 50g a.i./ha.at 20 DAS., T<sub>8</sub> Pendimethalin 30EC (pre-emergence) @ 0. 50 kg a.i./ha.+ Sodium Acifluorfen16.5% +Clodinafop-propargyl 8% (premix) @ 100 g.a.i./ha. at 20 DAS.From the pooled results,it is concluded that pre and post emergence herbicide for chemical weed management in sesame, the seed yield were found to be significant.The practice of the treatment

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T<sub>2</sub> (weed free) crop produced the significantly highest seed yield 607 Kg./ha, Net Monetary Returns Rs. 42730/- and B:C Ratio 2.93, over rest of treatment, followed by 523 kg/ha seed yield, Rs. 35873/- Net Monetary Returns and 2.77 B:C ratio by the treatment i.e. pre-emergence application of Pendamethalin 30 EC @ 0.50 kg a.i./ha + Hand weeding at 20 DAS was an efficient and economically feasible package to manage the weeds and realize better returns.

**Keywords:** Clodinafop-propargyl; sesame; sodium acifluorfen; pendimethalin; quizalofop ethyl; weed control.

## 1. INTRODUCTION

“Sesame (*Sesamum indicum* L.) is the most conventional oilseed crop which is known as the ‘Queen of oil seeds’ due to its high oil content (50% - 60%). 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). Inadequate weed management appears to be one of the major constraints for such low productivity of sesame” [1]. Heavy weed infestation is one of the key factors limiting the output among the various production limitations for sesame. Babiker et al. [2] reported that “unrestricted weed growth reduced sesame seed yield by 30 per cent and keeping the sesame crop weed free for 2, 4, 6 and 8 weeks after planting increased the seed yield by 8, 37, 40 and 43 per cent respectively. The critical period of weed control in sesame appeared to be between 2 and 6 weeks after planting”. Zuhair et al. [3] found that “insufficient weed control during the early growth period of sesame caused 35 to 70 per cent yield reduction and they added that the critical period of weed control in sesame is 2 to 3 weeks after crop emergence”. “The period from 15 and 30 DAS is the most critical period of crop weed competition in sesame” [4]. “In oil seed crops, yield loss due to weed competition varied from 16 to 68 %” [5]. “The estimation of the weed seed bank is an additional method for gaining insight into the potential future weed infestation and controlling the weed menace, but it is a laborious and time-consuming endeavor” [6,7]. Therefore, integrated weed management i.e. manual as well as chemical weeding is most efficient and acceptable approach to combat with the weed control problems. Hence, present study was under taken.

## 2. MATERIALS AND METHODS

A Field experiment was conducted at Agriculture Research Station, Jalgaon of Mahatma Phule Krishi Vidyapeeth, Rahuri

during *kharif* season of 2018,2019 and 2020. The soil of the experimental site was deep black soil having pH of 8.00 with 221.0 kg/ha available N, 22.60 kg/ ha available P<sub>2</sub>O<sub>5</sub> and 710 kg /ha available K<sub>2</sub>O. There were eight treatment viz. T<sub>1</sub> Weedy check, T<sub>2</sub> Weed free, T<sub>3</sub> Pendimethalin 30EC (pre-emergence) @ 0.50 kg a.i./ha, T<sub>4</sub> Quizlofop-ethyl 5 % EC (post emergence) 50g a.i./ha at 20 DAS, T<sub>5</sub> Sodium Acifluorfen 16.5% + Clodinafop-propargyl 8% (premix) @ 100 g.a.i./ha at 20 DAS., T<sub>6</sub> Pendimethalin 30EC (pre-emergence) @0.50kg a.i./ha+Hand weeding at 20DAS., T<sub>7</sub> Pendimethalin 30EC (pre-emergence) @ 0.50 kg a.i./ha+ Quizlofop-ethyl 5 % EC (post emergence) 50g a.i./ha at 20 DAS, T<sub>8</sub> Pendimethalin 30 EC (pre-emergence) @ 0.50 kg a.i./ha + Sodium Acifluorfen 16.5% + Clodinafop-propargyl 8% (premix) @ 100 g.a.i. at 20 DAS in randomized block design with three replications. Sesame variety *JLT-408* was sown 01/07/2018, 04/07/2019 and 01/07/2020 respectively, with a spacing of 45 x 10 cm in a 4.10 x 3.60 m plot. “The recommended dose of 50 kg N/ha and 20 kg S/ha The half of the dose of nitrogen given along with entire dose of sulphur was applied as basal at the time of sowing and the remaining half of the dose of nitrogen was top dressed at 30 DAS through urea and Ammonium sulphate. Pre emergence herbicide was applied one day after sowing of the sesame crop and post emergence herbicides were applied at 20 days after sowing”. Zuhair et al. [3] “Weed density of narrow, broad leaved weeds and sedges was taken at 15 and 30 days after application of herbicides. Weed density and weed dry weight were recorded with the help of 0.5 x 0.5 m quadrat by throwing randomly at three places in each plot. Weeds were removed and counted species wise. After drying in hot air oven (60 +1°C for 24 hours), weed dry weight was recorded and reported as per square meter. Weed control efficiency was also calculated” as suggested by Maity and Mukherjee [8]. “B:C ratio was worked out by considering prevailing market price for sesame and the price for

different inputs and farm operations were considered for cost of cultivation. Constant results were obtained during three years of the study for all the parameters and therefore, pooled analysis for three years was carried out and results are presented" [8].

### 3. RESULTS AND DISCUSSION

The predominant weeds species observed in the experimental plots were *Parthenium hysteroporus*, *Digitaria marginata*, *Cyperus rotundus*, *Amaranthus viridis*, *Commelina benghalensis*, *Spillanthus acmella*, *Parthenium hysteroporus*, *Ageratum conyzoides*, *Eleusine indica*, *Euphorbia spp.* etc. There was a mixed weed flora in equal proportions of all three types of weeds viz., Grasses, BLW and sedges.

#### 3.1 Effect on Weeds

The data on effect of pre and post emergence herbicide treatments on weed dynamics i.e. weed density, weed dry weight, weed index and weed control efficiency seed yield and economics of sesame were given in Table 1. The maximum weed density of 145/m<sup>2</sup> and dry weight of 287 g/m<sup>2</sup> were recorded in weedy check (T<sub>1</sub>). Weed density and dry weight gradually reduced with the application of different herbicides. But the lowest weed density of 35/m<sup>2</sup> and dry weight 96 g/m<sup>2</sup> were incurred in weed free plots (T<sub>2</sub>) due to clean cultivation of crop. Narkhede [9] also observed that "cultural practices i.e. two hand weeding and hoeing in sesame significantly gave higher seed yield than rest of the integrated weed management practices". Among the different herbicidal treatments, the lowest weed density of 37/m<sup>2</sup> and dry weight 126 g/m<sup>2</sup> were recorded by pre-emergence application of Pendimethalin 30 EC @ 0.50 kg a.i./ha + Hand weeding at 20 DAS followed by pre-emergence application of Pendimethalin 30 EC @ 0.50 kg a.i./ha (R) + Post-emergence application Quizalofop-ethyl 50 g a.i./ha at 20 DAS. These results are in conformity with the findings of Yadav S.S. [10]. The maximum weed index of 68.33 % was recorded in weedy check plots (T<sub>1</sub>) which gradually reduced due to the different herbicidal treatments and became minimum (16.33%) in T<sub>6</sub> [Pendimethalin 30 EC (Pre-emergence) @ 0.50

kg a.i./ha + Hand weeding at 20 DAS] followed by 20.67 % in T<sub>8</sub> [Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha + Sodium Acifluorfen 16.5% + Clodinafop-Propargyl 8% EC (premix) @ 100 g a.i./ha at 20 DAS]. Whereas, the maximum weed control efficiency (100%) was recorded in weed free treatment (T<sub>2</sub>). It did not differ very much in various herbicidal treatments, however, it was found maximum 91.62 % when pre-emergence application of Pendimethalin 30 EC @ 0.50 kg a.i./ha + Hand weeding at 20 DAS (T<sub>6</sub>) followed by 87.43% in T<sub>7</sub>-pre-emergence application of Pendimethalin 30 EC @ 0.50 kg a.i./ha (R) + Post-emergence application Quizalofop-ethyl 50 g a.i./ha at 20 DAS. Therefore, pre-emergence followed by one-handed weeding performed better than other treatments in terms of weed count, weed dry weight, and weed control efficiency. This might be explained by the fact that pre-emergence herbicides eradicate all weed seed types and reduce weed infestation in the early stages of crop development. Similar results were also obtained by Aruna et al. [11]. who reported that "Pre emergence application of pendimethalin @ 0.75 kg /ha. followed by post emergence application of quizalofop ethyl @ 0.05 kg /ha. at 20 DAS was found to be the better option to control the weeds in broadcasted sesame. Annual grasses can easily be controlled in sesame with quizalofop-P without significant sesame injury".

#### 3.2 Economics

"All the weed control treatment gave higher monetary returns compared to weedy check because of reduced crop weed competition. Saharia and Bayon [12] recorded that in sesame integrated control resulted in an increased in net return (4396/ha) as compare to no weeding". "The maximum seed yield of 627 kg/ha, Net monetary returns Rs.33430 /ha and higher B:C ratio 2.93. The efficient and economic weed management in sesame could be achieved by Pre-emergence application of pendimethalin 30 EC @ 0.50 kg a.i./ha + Hand weeding at 20 DAS which gives seed yield 542 kg/ha. Net monetary returns Rs.27780 /ha and B:C ratio 2.77. This may be due to better weed control measures, leads to efficient utilization of nutrients, light and moisture thereby enhancing the higher yield" [13,14].

**Table 1. Effect of pre and post emergence herbicide on weed dynamics, seed yield and economics of Sesame**

Sr. No	Treatment	Weed density/m <sup>2</sup>	Weed dry wt. (g/m <sup>2</sup> )	WI (%)	WCE (%)	Seed yield (kg/ha)	NMR (Rs./ha)	B:C ratio
T <sub>1</sub>	Weedy check	145	287	68.33	00	196	2540	1.42
T <sub>2</sub>	Weed free	35	96	-	100	627	33430	2.93
T <sub>3</sub>	Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha	65	237	31.48	81.33	485	23550	2.60
T <sub>4</sub>	Quizalofop-ethyl (Post-emergence) 50 g a.i./ha at 20 DAS	69	248	29.10	83.67	491	23890	2.67
T <sub>5</sub>	Sodium Acifluorfen 16.5% + Clodinafop-Propargyl 8% EC (premix) @ 100 g a.i./ha at 20 DAS	75	274	28.80	83.13	487	23430	2.67
T <sub>6</sub>	Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha + Hand weeding at 20 DAS	37	126	16.33	91.62	542	27780	2.77
T <sub>7</sub>	Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha + Quizalofop-ethyl (Post-emergence) 50 g a.i./ha at 20 DAS	64	233	23.10	87.43	498	23220	2.60
T <sub>8</sub>	Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha + Sodium Acifluorfen 16.5% + Clodinafop-Propargyl 8% EC (premix) @ 100 g a.i./ha at 20 DAS	68	246	20.67	87.43	502	24280	2.67
	<b>SEm±</b>	-	-	-	-	28.79	-	0.10
	<b>CD (P=0.05)</b>	-	-	-	-	86.56	-	0.31
	<b>CV %</b>	-	-	-	-	10.56	-	-

**Table 2. Effect of pre and post emergence herbicide no. of branches, no. of capsules and plant height of sesame**

Treatment	No.of branches /plant	No.of capsules/plant	plant height
T <sub>1</sub> -Weedy check	3.12	52	80
T <sub>2</sub> -Weed free	3.65	88	123
T <sub>3</sub> -Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha (R)	3.20	78	95
T <sub>4</sub> -Quizalofop-ethyl (Post-emergence) 50 g a.i./ha at 20 DAS	3.18	72	102
T <sub>5</sub> -Sodium Acifluorfen 16.5% + Clodinafop-Propargyl 8% EC (premix) @ 100 g a.i./ha at 20 DAS	3.14	69	101
T <sub>6</sub> -Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha (R) + Hand weeding at 20 DAS	3.40	80	114
T <sub>7</sub> -Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha (R) + Quizalofop-ethyl (Post-emergence) 50 g a.i./ha at 20 DAS	3.28	77	109
T <sub>8</sub> -Pendimethalin 30 EC (Pre-emergence) @ 0.50 kg a.i./ha (R) + Sodium Acifluorfen 16.5% + Clodinafop-Propargyl 8% EC (premix) @ 100 g a.i./ha at 20 DAS	3.22	70	107
SEm±	-	-	-
CD (P=0.05)	-	-	-
CV %	-	-	-

#### 4. CONCLUSION

In the present study, it was observed that pre-emergence application of pendimethalin 30 EC @ 0.50 kg a.i./ha + Hand weeding at 20 DAS are found economically profitable for management of weeds in sesame and to increase the productivity.

#### DISCLAIMER

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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