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Effect of Different Weed Management Practices on Yield of Rainfed Sesame (*Sesamum indicum L.*) under Vertisol

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Abstract: ***A field experiment was carried out at Agricultural Research Station, Kovilpatti, Tamil Nadu Agricultural University during rabi season of 2017- 2018 to study the effect of different weed management practices in rainfed sesame. The experiment was laid out in randomized block design with three replications having ten different weed management treatments in rainfed sesame variety SVPR 1 under vertisol. Application of Alachlor @ 1.5 kg a.i. ha^{-1} as pre emergence fbQuizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence recorded significantly lesser weed density, dry weight, weed index and higher weed control efficiency and inturn significantly produced higher seed yield (550 kg ha^{-1}) and stalk yield (2432 kg ha^{-1}). It was followed by the application of Pendimethalin @ 1.0 kg a.i. ha^{-1} as pre emergence fbQuizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence.***

Keywords: Weed management, weed count, yield, Rainfed Sesame

Introduction:

Sesame (*Sesamum indicum* L.) is one of the important oilseed crop of India. The crop has earned a poetic label "Queen of oilseeds" due to its high quality poly-unsaturated stable fatty acids. Globally, India is the largest producer, consumer and exporter of sesame. During 2015-16, the area under sesame crop is 19.81 lakh hectares with a production of 8.87 lakh tonnes. India ranks first in the world with respect to area under sesame cultivation. In Tamil Nadu, sesame was cultivated in 0.66 lakh hectares with a production of 0.36 lakh tonnes and productivity of 596 kg ha^{-1} during 2014-15 (Ministry of Agriculture 2014 - 2015) In India, about 80 M. ha are still under rainfed condition, about 90 per cent of the area is cultivated in pulses, oilseeds and millets. Productivity in irrigated agriculture is also stagnating. Therefore, increase in agriculture production has to come from rainfed area which constitutes about 56 per cent of net cultivated area. Rainfed agriculture faces more constraints *viz.*, moisture, nutrient and weeds. Among them, weeds cause major problem in rainfed agriculture.

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Weeds alone reduce the crop yield up to tune of 70 per cent. Weeds cause enormous stress at the initial growth stages that affects the economic yields of sesame. Amare *et al.* (2009) found a critical period of weed competition in sesame crop between 15 and 30 days after seedlings emergence. So, during that period, the crop is to be maintained in weed free condition in order to realize maximum yield. Application of herbicide as pre emergence, early post emergence and post emergence approach is advantageous because, long and effective control of all weeds during crop season. A suitable, economically viable and ecologically safe combination of chemical with manual weeding would help to achieve control the weeds and reduced the yield loss. Keeping these points in view the present study was undertaken to find out the effect of different weed management practices in rainfed sesame.

Materials and Methods:

Field experiment was conducted at Agricultural Research Station, Kovilpatti, Tamil Nadu Agricultural University during *rabi* 2017- 2018. The investigation was carried out with ten treatments under randomized block design (RBD) with three replications. The test variety was Sesame SVPR 1. The weed management treatments imposed were T_1- PE Pendimethalin @ 1.0 kg a.i. ha^{-1} + One Hand hoeing on 30 DAS, T_2 - PE Alachlor @ 1.5 kg a.i. ha^{-1} + One Hand hoeing on 30 DAS, T_3 - PE Pendimethalin @ 1.0 kg a.i. ha^{-1} + EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS, T_4 - PE Pendimethalin@ 1.0 kg a.i. ha^{-1} + EPOE Imazethapyr @ 50 g a.i. ha^{-1} on 25 DAS, T_5 - PE Alachlor @ 1.5 kg a.i. ha^{-1}+ EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS, T_6 - PE Alachlor @ 1.5 kg a.i. ha^{-1}+ EPOE Imazethapyr @ 75 g a.i. ha^{-1} on 25 DAS, T_7 - Tank Mix of EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} + Imazethapyr @ 50 g a.i. ha^{-1} on 15 DAS, T_8 - Hand hoeing on 15 and 30 DAS, T_9 - Weed free check and T_{10} - Unweeded control. The observations on weed density and weed dry weight was recorded on 45 DAS. Weed control efficiency and weed index was worked out and yield was recorded and illustrated.

Results and Discussion:

Weed flora

The common weed flora of the experimental field consisted of sedges and broadleaved weeds. None of the grassy weeds was noticed in the experimental field. The major sedge weed was *Cyperusrotundus*. Among the broad-leaved weeds *Acalyphaindica, Amaranthusviridis, Commelinadiffusa, Convolvulus arvensis, Corchorusfascicularis, Corchorusolitorius, Digeraarvensis, Euphorbia hirta, Euphorbia microphylla, Phyllanthusmaderaspatensis, Phyllanthusniruri, Trianthemaportulacastrum* were the prominent species.

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Weed density and dry weight

All the weed management practices significantly reduced the weed density and weed dry weight at 45 DAS over unweeded control (Table 1). Apart from weed free check, application of Alachlor @ 1.5 kg a.i. ha^{-1} as pre emergence + Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence recorded a lesser weed density of 5.0 m^{-2} and weed DMP of 4.35 g m^{-2}. The above treatment was on par with application of Pendimethalin @ 1.0 kg a.i. ha^{-1} as pre emergence + Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence . This results were attributed due to the control of weeds at germination phase by the application of pre emergence herbicides and significant reduction at later growth stage as late germinating weeds were controlled by early post emergence application of herbicides. Similar findings were reported by Sheoran*et al.* (2012) and Mruthul*et al*. (2014).The highest weed density and weed dry weight were observed in unweeded control.

Weed control efficiency and weed index

Among the different weed management practices, application ofAlachlor @ 1.5 kg a.i. ha^{-1} as pre emergence + Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence recorded higher weed control efficiency (96.25 per cent) and lower weed index (4.11 per cent). It was followed by application of Pendimethalin @ 1.0 kga.i. ha^{-1} as pre emergence + Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence which accounts weed control efficiency of 95.65 per cent and weed index of 7.51 per cent. It was mainly due to the better control of weeds upto a critical stage and its resulted in lower weed densities, weed biomass and ultimately registered higher WCE. Similar results have been reported by (Chandawat*et al*., 2004). The lowest weed control efficiency 83.70 per cent and higher weed index 34.35 per cent were recorded with the application of Pendimethalin @ 1.0 kg a.i. ha^{-1} pre emergence + Imazethapyr @ 50 g a.i. ha^{-1} on 25 DAS early post emergence. Due to the reduction in seed yield by the reduction in growth and yield components of sesame which is due to heavy weed competition was occurred in this treatment similar to unweeded control for space, light, nutrient etc. Similar results have been reported by Bhadauria*et al*. (2012) and Mruthul*et al*. (2014).

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Yield

Among the weed control treatments, weed free check recorded highest seed (559 kg ha^{-1}) and stalk (2583 kg ha^{-1}) yield. This might be due to maintaining a weed free conditions up to a critical level and recorded higher weed control efficiency which ultimately resulted in better crop growth and yield. It was on par with application of Alachlor @ 1.5 kg a.i. ha^{-1} as pre emergence + Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence recorded the 550kg $ha^{-1}$of seed yield and 2432 kg ha^{-1} of stalk yield. It was followed by application of Pendimethalin @ 1.0 kga.i. ha^{-1} as pre emergence + Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence recorded 517 kg ha^{-1}seed yield as well as stalk yield of 2271 kg ha^{-1}. This might be due to effect of pre and early post emergence herbicides which prevented the crop-weed competition and mainly attributed to better control of weeds up to a critical level through the lesser weed density, dry weight resulting in better availability of nutrients, moisture and light to the crop growth. Similar results have been reported by Mruthul*et al*. (2014) and Yadav (2004).

Conclusion:

It could be concluded thatapplication of Alachlor @ 1.5 kg a.i. ha^{-1} as pre emergence + Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS as early post emergence recorded higher weed control efficiency through lower weed density, dry weight and inturn increased the yield of rainfed sesame.

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Table 1. Effect of different weed management practices on weed growth in rainfed sesame

Treatments	Total weed density (No. m^{-2})	Total dry weight (g m^{-2})	Weed control efficiency (%)	Weed index (%)
T_1-PE Pendimethalin @ 1.0 kg a.i. ha^{-1} + One Hand hoeing on 30 DAS	10.2 (3.19)	8.77 (3.04)	92.43	15.38
T_2-PE Alachlor @ 1.5 kg a.i. ha^{-1} + One Hand hoeing on 30 DAS	9.5 (3.16)	8.17 (2.94)	92.95	13.60
T_3-PE Pendimethalin @ 1.0 kg a.i. ha^{-1} + EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS	5.8 (2.51)	5.05 (2.35)	95.65	7.51
T_4-PE Pendimethalin @ 1.0 kg a.i. ha^{-1} + EPOE Imazethapyr @ 50 g a.i. ha^{-1} on 25 DAS	22.5 (4.74)	18.90 (4.35)	83.70	34.35
T_5-PE Alachlor @ 1.5 kg a.i. ha^{-1}+ EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS	5.0 (2.35)	4.35 (2.20)	96.25	4.11
T_6-PE Alachlor @ 1.5 kg a.i. ha^{-1}+ EPOE Imazethapyr @ 75 g a.i. ha^{-1} on 25 DAS	21.7 (4.66)	18.23 (4.27)	84.28	31.48
T_7-Tank Mix of EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} + Imazethapyr @ 50 g a.i. ha^{-1} on 15 DAS	13.5 (3.67)	11.76 (3.43)	89.86	19.32
T_8-Hand hoeing on 15 and 30 DAS	10.6 (3.26)	9.12 (3.10)	92.14	17.17
T_9-Weed free check	0.0 (0.71)	0.00 (0.71)	100.00	-
T_{10}-Unweeded control	139.7 (11.82)	115.95 (10.77)	-	58.32
SEd	**0.17**	**0.16**	-	-
CD(p=0.05)	**0.36**	**0.31**	-	-

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Table 2. Effect of different weed management practices on seed and stalk yield (kg ha^{-1})in rainfed sesame

Treatments	Seed yield	Stalk Yield
T1- PE Pendimethalin @ 1.0 kg a.i. ha^{-1} + One Hand hoeing on 30 DAS	473	1956
T_2-PE Alachlor @ 1.5 kg a.i. ha^{-1} + One Hand hoeing on 30 DAS	480	2075
T_3-PE Pendimethalin @ 1.0 kg a.i. ha^{-1} + EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS	517	2271
T_4-PE Pendimethalin @ 1.0 kg a.i. ha^{-1} + EPOE Imazethapyr @ 50 g a.i. ha^{-1} on 25 DAS	367	1484
T_5-PE Alachlor @ 1.5 kg a.i. ha^{-1}+ EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} on 25 DAS	550	2432
T_6-PE Alachlor @ 1.5 kg a.i. ha^{-1}+ EPOE Imazethapyr @ 75 g a.i. ha^{-1} on 25 DAS	383	1516
T_7-Tank Mix of EPOE Quizalofop ethyl @ 50 g a.i. ha^{-1} + Imazethapyr @ 50 g a.i. ha^{-1} on 15 DAS	421	1705
T_8-Hand hoeing on 15 and 30 DAS	463	1892
T_9-Weed free check	559	2583
T_{10}-Unweeded control	233	944
SEd	**17.53**	**90.8**
CD(p=0.05)	**35.68**	**183.3**

