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Effect of different weed management practices on growth and yield of sesame

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Abstract

The field experiment was conducted in farmer's field, Pattagapatti, Dharmapuri district of Tamil Nadu, India during Summer season, 2020 in order to evaluate the effect of different weed management practices on growth and yield of sesame. The experiment was laid out with eight treatments with three replications. The treatments consist with pre and post emergence application of herbicide along with hand weeding twice and weedy check. Pre emergence herbicides *viz*., Oxadiargyl, Oxyfluorfen, Imazethapyr and post emergence application of propaquizafop and quizalofop ethyl. Among the different treatments tested, the least weed biomass were recorded in weed free check, weed control efficiency of 100 %, weed control index of 100% with highest plant height (136 cm), dry matter production (3576 kg ha^{-1}), number of capsules $plant^{-1}$ (88.42) seed yield (1252 kg ha^{-1}). It was followed by twice hand weeding with the value of 61 g with weed control efficiency of 51.60%, weed control index of 49.80%, plant height (127 cm), dry matter production (3354 kg ha^{-1}), number of capsules $plant^{-1}$ (81) and seed yield (1190 kg ha^{-1}). Next in order of ranking is pre emergence application of Imazethapyr 0.015 kg ha^{-1} at 3 DAS with weed biomass of 72 g with weed control efficiency of 42.66%, weed control index of 40.73%, plant height (118 cm), dry matter production (3133 kg ha^{-1}), number of capsules $plant^{-1}$ (75) and seed yield (1094 kg ha^{-1}).

Key words : Pre emergence application, Weed Biomass, Seed yield.

Sesamum (*Sesamum indicum* L.) is one of the oldest cultivated plants in the world and indigenous oil plant with longest history in India. It is under cultivation in Asia for over 5000 years. Low yield has been attributed to many agronomic factors *viz*., choice of cultivar,

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tillage practices, establishment methods, nutrient management and weed management. Among the various agronomic factors of weed management plays a crucial factor in determine the growth and yield of sesame. The presence of weeds is a major obstacle in sesame production and can negatively influence sesame yield. Initial slow growth of sesame seedlings makes itself poor competitor with more vigorous weeds. The low competitiveness of this crop with weeds is directly linked to its slow initial growth[5]. When weed control is not adopted, especially at initial periods, the sesame yield may be reduced by up to 75% [1]. Though the conventional methods of weed control are very much effective, but due to high wages and non- availability of labour during critical weeding season, use of herbicides could be more time saving, economical and efficient approach to check early crop-weed competition. With weak seedling vigor, limited competitive ability, the use of pre-emergence and post emergence herbicides are essential for successful sesame production. Therefore, the present investigation is planned to find out the suitable pre-emergence herbicide for weed control during early growth stages of sesame[10].

Field experiment was conducted at Pattagapatti, Dharmapuri district of Tamil Nadu. The Experimental farm is situated at 12.1211° N latitude and 78.1582° E longitude with an altitude of 457 m above mean sea level during summer 2020. The soil texture is sandy loam, with a pH of 7.0 and electrical conductivity of 0.29 dSm^{-1} at the experimental site. Nitrogen, phosphorus, and potassium availability were low, medium, and high, respectively, at the experimental site. The experiment was laid out in a randomized block design, having eight treatments and replicated thrice. The following treatments were examined in experiment *viz.,* T_1 - Unweeded control, T_2 - Hand weeding twice (15 and 30 DAS), T_3 – Pre emergence application of Oxadiargyl 40 a.i. kg ha^{-1}, T_4 – Pre emergence application of Oxyfluorfen 0.075 a.i. kg ha^{-1}, T_5 – Pre emergence application of Imazethapyr 0.015 a.i. kg ha^{-1}, T_6 – Post emergence application of Propaquizafop 0.05 a.i. kg ha^{-1}, T_7 – Post emergence application Ouizalofop ethyl 0.05 a.i. kg ha^{-1}, T_8 - Weed free check. For this experiment, the sesame variety TMV - 7 was chosen and it was seeded at a 30 x 30 cm spacing. Nitrogen through urea, phosphorus through single super phosphate and potassium through muriate of potash were applied as per the RDF (35:23:23 kg N, P_2O_5 and K_2O ha^{-1}). Half of N, entire P_2O_5 and K_2O were applied as basal. The remaining half of N was top dressed on 25 DAS. The $MnSO_4$ @ 5 kg ha^{-1} was applied immediately after sowing. A need-based approach to plant protection was taken based on the economic threshold of pests and diseases. The gross and net plot sizes were 5 x 4 m and 4.4 x 3.6 m respectively. The net plot area was used for the determination of crop yields. The crop observation was taken on 30 DAS, 60 DAS and harvest stage. The weed parameters were recorded on 15, 30 and 45 DAS. Five samples in each plot were marked randomly for recording biometric observations. The observations were recorded at different stages of crop growth. The weed observation was taken on 45 DAS. 0.25 m^2 quadrats were randomly positioned at each site to observe weeds.The samples of weeds and crop were air-dried first, then oven-dried at 70°C until they attained a uniform dry weight,

which was then recorded. The mean dry weight was calculated in kg per hectare. The crops were harvested manually at physiological maturity and yield was taken at 14% moisture level. Using Gomez and Gomez's[2] method, biometric data obtained from plant samples and computed data were all statistically examined. The critical difference was determined at a 5% probability level in cases where the F test indicated that the treatment difference was significant.

Weed parameters :

The experimental field comprised the weeds like *Chloris barbata, Digitaria sanguinalis Commelina benghalensis, Cyperus iria, Cyperus rotundus, Cynodon dactylon, Clitoria ternatea, Portulaca oleracea, Eclipta alba, Gomphrena decumbens, Amaranthus spinosus, Tridax procumbens, Euphorbia hirta, Boerhaavia erecta, Croton sparsiflorus, Cleome viscosa, Parthenium hysterophorus, Trianthema portulacastrun* and *Phyllanthus niruri*. Among these, the dominant weed specied *viz*., *Chloris barbata* and *Parthenium hysterophrous* largely contributed for the total weed count.

Among the different treatments tried out, least weed biomass of was recorded in weed free check (T_1). It was followed by Twice hand weeding (15 and 30 DAS) (T_2) with the value of 61.34 g. Next in order of ranking is Pre emergence application of Imazethapyr 0.015 a.i. kg ha^{-1} at 3 DAS (T_5) with 72.43 g on 45 DAS. The highest weed biomass was recorded in Unweeded control with 122.2 g. The unweeded control plot (T_8) registered the highest total weed count at 45 DAS. This may be due to readily taken up by the hypocotyls, mesocotyls and coleoptiles of the emerging shoots and to a lesser extent by the roots of germination weeds. On third day, the weed seeds were in germination stage and when the applied chemicals are absorbed readily by the emerging shoots effectively suppressing the weeds and thus reduced the weed dry matter production in the initial stages of crop growth. Besides, reduced the carbohydrate reserve of weeds thus resulting in lesser weed dry matter production under the aforesaid treatment. The result of current study is also in agreement with earlier finding of Saravanane[9].

The weed control efficiency was recorded in weed free check with 100%. It was followed by hand weeding twice with 51.60%. In herbicide application treatments, Pre emergence application of Imazethapyr 0.015 kg ha^{-1} at 3 DAS recorded 42.66 %. The Unweeded control recorded the zero weed control efficiency. It statically higher number of pre emergence weeds and these were established prior to the sesame crop, which were highly competitive for water and nutrient resulted in poor grain yield and higher weed index. This was reported by Singh and Kumar[10].

Among the different treatments, weed free check recorded the weed control index of 100%. It was followed by hand weeding twice recorded the weed control index of 49.80 %. Among the different herbicides tried out, Pre emergence application of Imazethapyr 0.015 kg ha^{-1} at 3 DAS recorded 40.73 %. The least weed control index was recorded in Unweeded control with zero percentage. This result due to lower vigorous crop-weed

Table-1 Effect of different weed management practices on growth and yield of sesame

Treat-ments	Weed biomass (g/m^2)	Weed control efficiency (%)	Weed control Index (%)	Plant height at harvest (cm)	Dry matter production (kg ha^{-1})	Number of capsules $plant^{-1}$	Seed yield (kg ha^{-1})
T_1	0 (0.71)	100.00	100.00	85.87	1623.32	35.78	663.3
T_2	61.34 (7.86)	51.60	49.80	127.42	3354.16	69.01	1190.07
T_3	108.32 (10.43)	16.49	11.36	94.37	1872.39	48.54	871.00
T_4	88.76 (9.45)	28.51	27.36	106.02	2183.74	56.34	967.00
T_5	72.43 (8.54)	42.66	40.73	118.22	3133.48	63.56	1094.67
T_6	106.45 (10.34)	17.13	12.89	96.41	1942.53	50.03	889.33
T_7	75.12 (8.70)	40.74	38.53	114.60	3045.97	62.14	1057.67
T_8	122.2 (11.08)	0.00	0.00	136.12	3576.13	75.34	1252.48
S.ED	0.21			3.97	103.35	2.86	28.46
C.D	0.45			8.51	221.68	6.14	61.05

competition, the chemical does not contribute with correct time of critical period of crop so this leads to lesser weed control index this findings were reported by Pooja and Saravanane[7]. All the weed parameters shown in table-1.

Crop parameters :

Among the various treatments tested (T_8) weed free check was recorded the highest plant value of 136.12 cm, dry matter production of 3576.1 Kg ha^{-1} at harvest stage. This was followed by twice hand weeding (15 and 30 DAS) (T_2) obtained the value of plant height 127.42 cm, dry matter production of 3354.1 kg ha^{-1} at harvest stage. Next to that herbicide application of (T_5) imazethapyr 0.015 kg a.i. ha^{-1} (Pre emergence) at 3 DAS has recorded the value 118.22 cm of plant height, 3133.4 kg ha^{-1} of dry matter production at harvest stage and this was on par with (T_7) quizalofop ethyl 0.05 kg a.i. ha^{-1} (post emergence) at 21 DAS was recorded the value of 114.6 cm in plant height, 3045.9 kg ha^{-1} of dry matter production at harvest stage. The lowest value of plant height of 85.87 cm, dry matter production of 1623.3 kg ha^{-1} at harvest stage recorded in the treatment (T_1) Unweeded control. This might have due to better control of weeds during early stage of crop growth period and also due to safe behaviour of herbicides against crop plants and phytotoxic effect on weeds. The results are in close conformity with those reported by Kaur *et al.*,[3].

Relating to various treatments, weed free check (T_8) recorded maximum number of capsules plant^{-1} 75.34, twice hand weeding (15 and 30 DAS) (T_2) occupied second position. However, imazethapyr 0.015 kg ha^{-1} (Pre emergence) at 3 DAS (T_5) obtained the value of 63.56 was statistically on par with quizalofop ethyl 0.05 kg a.i. ha^{-1} (Post emergence) at 21 DAS (T_7) obtained the value of 62.14. Similarly, (T_3) fluometuron 0.09 kg a.i. ha^{-1}(Pre emergence) at 3 DAS recorded the value of 48.54 was found statistically on par with (T_6) Propaquaizafop 0.05 kg a.i. ha^{-1} (Post emergence) at 21 DAS recorded the value of 50.03. The lowest Number of capsules plant^{-1} of 35.78 was observed in treatment (T_1) unweeded control.

In seed yield, relating to different weed control treatments, (T_8) weed free check topped the list with 1252.48 Kg ha^{-1}. The second largest seed yield 1190.07 Kg ha^{-1} was registered in twice hand weeding (15 and 30 DAS) (T_2). imazethapyr 0.015 kg a.i. ha^{-1} (Pre emergence) at 3 DAS (T_5) and quizalofop ethyl 0.05 kg ha^{-1} (Post emergence) at 21 DAS (T_7) differed significantly with each other and the values ranging from 1094.67 Kg ha^{-1} and 1057.67 Kg ha^{-1}, respectively. Similarly, fluometuron 0.09 kg ha^{-1} (Pre emergence) at 3 DAS recorded the value of 871 kg ha^{-1} was found statistically on par with (T_6) propaquaizafop 0.05 kg a.i. ha^{-1} (Post emergence) at 21 DAS recorded the value of 889.33 kg ha^{-1}. The lowest seed yield was obtained with treatment (T_1) unweeded control 663.3 Kg ha^{-1}. All crop growth and yield parameters explained in Table-1. This might have happened probably due to better control of both grassy as well as broad-leaved weeds during early crop growth stages, higher weed control efficiency, higher nutrient uptake by the crop and better yield attributes. However significantly the lowest seed and stover yields recorded in weedy situations due to excessive weed infestation[4].

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