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SHORT COMMUNICATION

# Weed management in irrigated sesame (*Sesamum indicum* L.)

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**ABSTRACT**

A field experiment was conducted in Kolaram village, P. Velur Taluk, Namakkal district to evolve a suitable weed management programme for irrigated sesame variety CO 1 during summer season (March - June) 2018. The experiment was laid out in Randomized Block Design (RBD), replicated thrice with ten treatments *viz*., unweeded control, hand weeding twice (15 and 30 days after sowing (DAS)), pre emergence application of alachlor 1.5 kg $ha^{-1}$, fluometuron 0.9 kg $ha^{-1}$, post emergence application of propaquizafop 0.05 kg $ha^{-1}$, quizalofop ethyl 0.05 kg $ha^{-1}$ and combinations of pre and post emergence herbicides application. From the results, it is concluded that pre emergence application of alachlor 1.5 kg $ha^{-1}$ on 3 DAS + post emergence application of quizalofop ethyl 0.05 kg $ha^{-1}$ on 21 DAS was an efficient and economically feasible package to manage the weeds and to realize better returns from irrigated sesame.

***Keywords***: Pre emergence herbicide, Post emergence herbicide, Weed management, *Sesamum indicum*

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## 1. INTRODUCTION

Sesame (*Sesamum indicum* L.) is one of the important edible oilseed crops of India. It is recognized by various names like gingelly, till, gergelim, bini seed, ajanoli, simsim *etc*., This crop has earned a poetic label “Queen of Oilseeds” due to its high quality poly-unsaturated stable fatty acids. *Sesamum indicum*, the cultivated type originated in India and ranks first in both area and production but lowest in its productivity in the world level (Bhaduria *et al*., 2012) due to its cultivation in marginal and sub-marginal soils and rainfed situation with poor agronomic management practices. The seed has pronounced antioxidants activity due to the presence of lignans tocopherol and thereby offer higher shelf life and is called as “seeds of mortality”. Sesame oil is really the poor man’s substitute for “ghee”. It has two compounds *viz*., sesamine and sesamolin. Nearly one fourth of world’s sesame production is from India which occupies 38 per cent with an area of 16.67 lakh hectares with a production of 7.47 lakh tonnes and productivity of 448 kg $ha^{-1}$ (Indiastat, 2017). In Tamil Nadu, sesame is extensively grown in Villupuram, Erode, Thanjavur, Karur, Salem and Cuddalore districts with an area of 0.46 lakh hectares with a production of 0.29 lakh tonnes and productivity of 634 kg $ha^{-1}$.

Weed infestation is one of the major factors limiting the yield of sesame, as its seedlings growth is slow during the first four weeks making it a poor competitor at earlier stages of crop growth (Bennett *et al*., 2003). Weeds cause enormous stress at the initial growth stages that affects the economic yields of sesame. (Channappagoudar *et al*., 2008). Losses due to uncontrolled weed growth in sesame have been reported as high as 50 per cent (Dungarwal *et al*., 2006). Though manual weeding is effective and eco-friendly yet they are tedious and time consuming. However, chemical weed management is more favourable and effective as they are quick in action, selective in nature, cost effective and efficient to control weeds during the critical period. But indiscriminate use of chemicals often leads to environmental pollution (Omezzine *et al.*, 2011); in addition many weed species have developed resistance against herbicides. Thus, an integrated weed management could be an important way to increase sesame yield by reducing the initial cost of investment and maintaining environmental integrity. This study was chosen to evaluate the relative efficiency of new herbicides on weed dynamics at different stages of sesame.

## 2. MATERIALS AND METHODS

Field experiment was conducted in Kolaram village, P. Velur Taluk, Namakkal district, which is located at 11º28’0” N latitude and 77º97’0” E longitude with an altitude of +150 M above mean sea level. The soil of the experimental field was sandy loam in texture with 0.72 per cent of organic carbon having pH 8.69 and EC 0.15 dS $m^{-1}$. It was low in nitrogen, medium in phosphorus and high in potassium, respectively. Irrigated sesame CO 1 was sown at 5 kg $ha^{-1}$ with 30×30 cm spacing. The crop was grown with recommended package of practices except weed management. Ten treatments comprising unweeded control, hand weeding twice (15 and 30 DAS), pre emergence application of alachlor 1.5 kg $ha^{-1}$, fluometuron 0.9 kg $ha^{-1}$, post emergence application of propaquizafop 0.05 kg $ha^{-1}$, quizalofop ethyl 0.05 kg $ha^{-1}$ and their combinations were tried in randomized block design with three replications. All the herbicides were applied manually operated knapsack sprayer fitted with floodjet nozzle at a spray volume of 500 litre $ha^{-1}$. Weed count and weed biomass were recorded at 60 DAS. Weed count was subjected to $\sqrt{\mathbf{x+0.5}}$ transformation. Weed control index was calculated by using the formula suggested by Mishra and Tosh (1979).

$$\text{WCI (per cent)} = \frac{\text{Weed biomass in unweeded control plot} - \text{Weed bimass in treated plot}}{\text{Weed biomass in unweeded control plot}}$$

The economics was calculated on the by taking current market prices of inputs while monetary return was obtained by multiplying seed yield with market price of seed.

## 3. RESULT AND DISCUSSION

### 3. 1. Weed observation

The experimental field was infested mainly with *Cynodon dactylon, Echinochola colonum*, *Cyperus rotundus* and *Trianthema portulacastrum*. All the weed control measures, exerted significant influence on the population of these weeds, whereas because of sporadic occurrence, the other weeds were not significantly influenced by the treatments. However, imposed weed treatments, exerts significant influence over the weed count as the floristic composition of the weed flora in each treatment were largely contributed by these weed species. Pre emergence application of alachlor 1.5 kg $ha^{-1}$ on 3 DAS followed by post emergence application of quizalofop ethyl 0.05 kg $ha^{-1}$ on 21 DAS recorded the least weed parameters and superior over the other treatments and was on par with hand weeding twice.

The least total weed population of 23.53 $m^{-2}$, weed biomass of 10.16 g $m^{-2}$ and the highest weed control efficiency of 91.80 per cent were recorded in pre emergence application of alachlor 1.5 kg $ha^{-1}$ on 3 DAS followed by post emergence application of quizalofop ethyl 0.05 kg $ha^{-1}$ on 21 DAS (Figure 1). Unweeded control registered higher weed population with the highest weed parameters. This could be because of the enrichment of soil seed bank by means of farmyard manure application and irrigation water. The excellent performance of alachlor and quizalofop ethyl were due to better control of weeds in sesame.

These results were attributed due to the control of weeds at germination phase by the application of pre emergence herbicide *viz.*, alachlor and significant reduction of late germinating weeds were controlled by post emergence application of herbicide *viz.*, quizalofop ethyl. Similar findings were reported by Mruthul *et al*., (2015) and Sujithra *et al*., (2018). Alachlor is the chloroacetamide herbicide to have a half-life period of 21 days in soil with a higher solubility and made it easily available in the soil solution and absorbed by germinating shoots and by roots. Quizalofop ethyl is a group of arylxyphenoxy propionate herbicide with a half-life period of 60days in soil. It inhibits the bio-synthesis of acetyl CoA carboxylase (ACCase), a key enzyme responsible for synthesis of malonyl CoA, which is a key intermediate for fatty acids and flavonoid biosynthesis in plants. Regarding the post emergence application superior performance of quizalofop ethyl for controlling annual and perennial grassy weeds was observed by Joseph *et al*., (2006). It results in discolouration and disintegration of meristematic tissues just above the node and leaves turn yellow, reddening followed by wilting before they die. These results are in accordance with the findings of Dawale *et al*., (2009). As the reduction in the total weed population rendered the crop with better availability of all the essential nutrients, which in turn helped to achieve higher source sink capacity which positively reflected on seed yield.

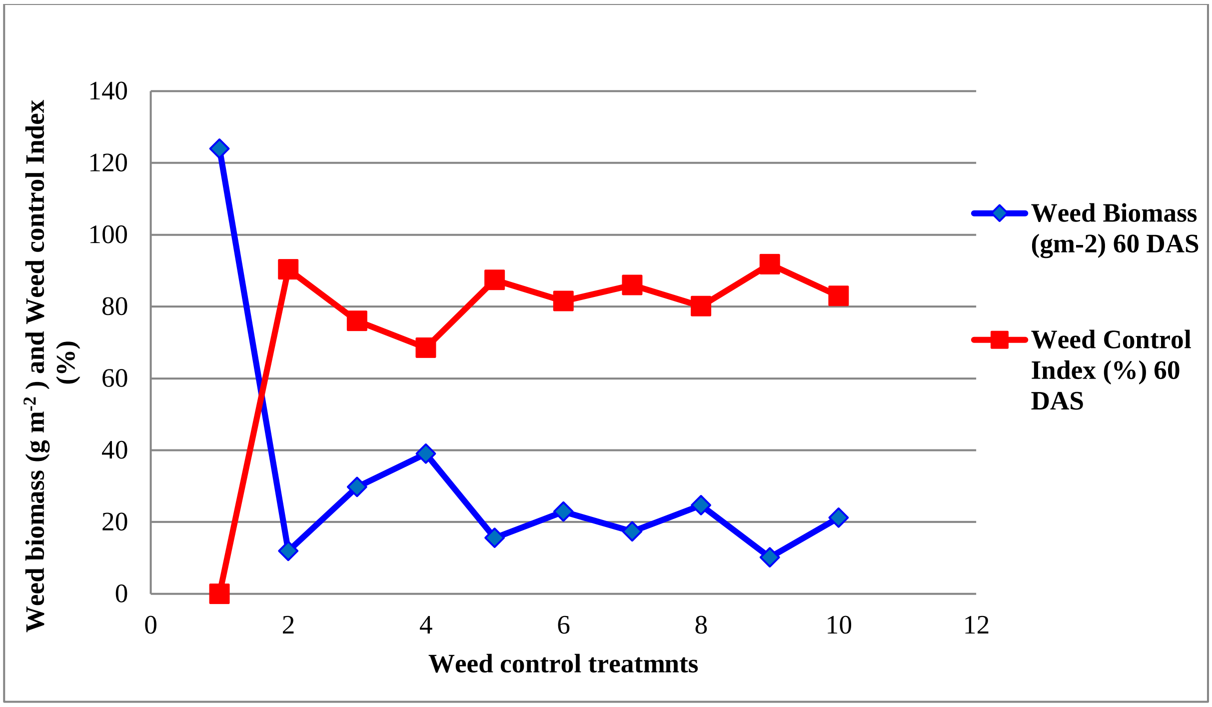


**Figure 1.** Effect of herbicidal treatments on weed biomass and weed control index

### 3. 2. Growth and yield attributes

Among the weed control measures, pre emergence application of alachlor 1.5 kg ha$^{-1}$ on 3 DAS followed by post emergence application of quizalofop ethyl 0.05 kg ha$^{-1}$ on 21 DAS recorded significantly higher plant height, number of branches plant$^{-1}$, capsules plant$^{-1}$, seeds capsule$^{-1}$, seed yield (1002 kg ha$^{-1}$) and stalk yield (3374 kg ha$^{-1}$) (Table 1). Better crop growth and yield attributes of superior treatments were mainly due to maintenance of weed free environment especially from initial as well as critical growth stages of crop would have enhanced the better nutrient and moisture uptake by crop.

This was on par with hand weeding twice at 15 and 30 DAS and obtained a good satisfactory control of weeds in sesame. This result was on line with the findings of Sujitha *et al*., (2018). The least of all parameters were recorded with unweeded control. This may be due to severe weed competition throughout the crop growth.

Unweeded control ($T_1$), hand weeding twice (15 and 30 DAS) ($T_2$), pre emergence application of alachlor 1.5 kg ha$^{-1}$ on 3 DAS ($T_3$), pre emergence application of fluometuron0.9 kg ha$^{-1}$ on 3 DAS ($T_4$), pre emergence application of alachlor 1.5 kg ha$^{-1}$ on 3 DAS + one HW on 30 DAS ($T_5$), pre emergence application of fluometuron 0.9 kg ha$^{-1}$ on 3 DAS + one HW on 30 DAS ($T_6$), pre emergence application of alachlor 1.5 kg ha$^{-1}$ on 3 DAS + post emergence application of propaquizafop 0.05 kg ha$^{-1}$ on 21 DAS ($T_7$), pre emergence application of fluometuron 0.9 kg ha$^{-1}$ on 3 DAS + post emergence application of propaquizafop 0.05 kg ha$^{-1}$ on 21 DAS ($T_8$), pre emergence application of alachlor 1.5 kg ha$^{-1}$ on 3 DAS + post emergence application of quizalofop ethyl 0.05 kg ha$^{-1}$ on 21 DAS ($T_9$) and pre emergence application of fluometuron 0.9 kg ha$^{-1}$ on 3 DAS + post emergence application of quizalofop ethyl 0.05 kg ha$^{-1}$ on 21 DAS ($T_{10}$).

**Table 1.** Effect of weed management practices on growth and yield attributes.

| Treatments | Plant height (cm) | | | No. of branches plant$^{-1}$ | No. of capsules plant$^{-1}$ | No. of seeds capsule$^{-1}$ | Seed yield (kg ha$^{-1}$) | Stalk yield (kg ha$^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| | 30 DAS | 60 DAS | Harvest | | | | | |
| $T_1$ | 24.32 | 68.25 | 85.92 | 7.74 | 69.09 | 49.93 | 467 | 2492 |
| $T_2$ | 39.41 | 100.48 | 125.30 | 13.31 | 148.37 | 68.78 | 971 | 3320 |
| $T_3$ | 29.26 | 78.61 | 98.88 | 9.92 | 102.06 | 55.80 | 664 | 2825 |
| $T_4$ | 26.31 | 73.58 | 92.43 | 8.89 | 88.72 | 52.92 | 573 | 2669 |
| $T_5$ | 37.27 | 95.76 | 119.85 | 12.63 | 139.16 | 65.84 | 907 | 3218 |
| $T_6$ | 32.72 | 86.03 | 107.91 | 11.14 | 120.05 | 60.39 | 772 | 3007 |
| $T_7$ | 36.14 | 93.33 | 116.68 | 12.28 | 138.58 | 64.12 | 880 | 3169 |
| $T_8$ | 31.55 | 83.62 | 104.80 | 10.82 | 115.54 | 58.71 | 745 | 2963 |
| $T_9$ | 40.53 | 102.73 | 128.29 | 13.65 | 152.98 | 70.52 | 1002 | 3374 |
| $T_{10}$ | 33.89 | 88.45 | 111.06 | 11.47 | 124.61 | 62.09 | 798 | 3053 |
| SEd | 0.80 | 2.09 | 2.59 | 0.26 | 2.92 | 0.91 | 19.04 | 71.89 |
| CD (p=0.05) | 1.68 | 4.39 | 5.44 | 0.57 | 6.14 | 1.93 | 40.01 | 151.03 |

## 4. ECONOMICS

The economic parameters for sesame were calculated and presented in Table 2. The highest gross return was registered with pre emergence application of alachlor 1.5 kg ha$^{-1}$ on 3 DAS followed by post emergence application of quizalofop ethyl 0.05 kg ha$^{-1}$ on 21 DAS. The least gross return was registered in unweeded control. The highest benefit cost ratio (3.53) was noticed in pre emergence application of alachlor 1.5 kg ha$^{-1}$ on 3 DAS followed by post emergence application of quizalofop ethyl 0.05 kg ha$^{-1}$ on 21 DAS.

Hand weeding twice (15 and 30 DAS) was on par with best treatment and recorded benefit cost ratio of 3.36. The efficient and economic weed management in irrigated sesame could be achieved by pre emergence application of alachlor 1.5 kg ha$^{-1}$ on 3 DAS followed by post emergence application of quizalofop ethyl 0.05 kg ha$^{-1}$ on 21 DAS. This may be due to better weed control measures, leads to efficient utilization of nutrients, light and moisture thereby enhancing the higher yield. The results are corroborate the findings of Sagarka *et al*., (2015).

**Table 2.** Effect of weed management practices on Economics.

| Treatments | Cost of cultivation (₹. $ha^{-1}$) | Gross income (₹. $ha^{-1}$) | Net income (₹. $ha^{-1}$) | B: C ratio |
|---|---|---|---|---|
| **$T_1$** | 27123 | 49035 | 21912 | 1.81 |
| **$T_2$** | 30301 | 101955 | 71654 | 3.36 |
| **$T_3$** | 27921 | 69720 | 41799 | 2.50 |
| **$T_4$** | 27540 | 60165 | 32625 | 2.18 |
| **$T_5$** | 29385 | 95235 | 65850 | 3.24 |
| **$T_6$** | 28753 | 81060 | 52307 | 2.82 |
| **$T_7$** | 29195 | 92400 | 63205 | 3.16 |
| **$T_8$** | 28597 | 78225 | 49628 | 2.74 |
| **$T_9$** | 29785 | 105210 | 75425 | 3.53 |
| **$T_{10}$** | 29009 | 83790 | 54781 | 2.89 |

*Sesame seed 1 kg price is ₹.105

Unweeded control ($T_1$), hand weeding twice (15 and 30 DAS) ($T_2$), pre emergence application of alachlor 1.5 kg $ha^{-1}$ on 3 DAS ($T_3$), pre emergence application of fluometuron0.9 kg $ha^{-1}$ on 3 DAS ($T_4$), pre emergence application of alachlor 1.5 kg $ha^{-1}$ on 3 DAS + one HW on 30 DAS ($T_5$), pre emergence application of fluometuron 0.9 kg $ha^{-1}$ on 3 DAS + one HW on 30 DAS ($T_6$), pre emergence application of alachlor 1.5 kg $ha^{-1}$ on 3 DAS + post emergence application of propaquizafop 0.05 kg $ha^{-1}$ on 21 DAS ($T_7$), pre emergence application of fluometuron 0.9 kg $ha^{-1}$ on 3 DAS + post emergence application of propaquizafop 0.05 kg $ha^{-1}$ on 21 DAS ($T_8$), pre emergence application of alachlor 1.5 kg $ha^{-1}$ on 3 DAS + post emergence application of quizalofop ethyl 0.05 kg $ha^{-1}$ on 21 DAS ($T_9$) and pre emergence application of fluometuron 0.9 kg $ha^{-1}$ on 3 DAS + post emergence application of quizalofop ethyl 0.05 kg $ha^{-1}$ on 21 DAS ($T_{10}$).

## 5. CONCLUSION

From the present studies, it could be concluded that the efficient and economic weed management in sesame could be achieved by integrating the pre emergence application of alachlor 1.5 kg $ha^{-1}$ on 3 DAS followed by post emergence application of quizalofop ethyl 0.05 kg $ha^{-1}$ on 21 DAS.

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