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Effect of Various Herbicides on Growth Yield and Economics of Sesame (*Sesamum indicum* L.)

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Abstract

A field study was conducted during the Kharif season of 2021-2022 in sandy loam soil at the Crop Research Centre, School of Agriculture, ITM University, Gwalior, (M.P.) to find out the impact of pre and post-emergence herbicide applications on sesame growth, yield, and economics (Sesamum indicum L.) and reduction in weed growth. The experiment consisted of twelve treatments with both pre and post-emergence application of herbicides, along with the weed-free and weedy check. Among the herbicide treatments lowest weed density, weed dry weight, and highest weed control efficiency, grain and straw yields, net returns, and B:C ratio were recorded with the Pendimethalin 30%EC fb hand weeding at 40 DAS and remained at par with Metribuzin 70 % WP fb hand weeding at 40 DAS and Oxyfluorfen 23.5% EC fb hand weeding at 40 DAS proved to be effective against weeds and led to high yield, and net return in Sesame.

Key Words: *Sesame, Grain yield, Net return, weed dry weight, weed density, Weed control efficiency*

Introduction

Sesame (*Sesamum indicum* L) which is locally called Til is not only a major and important edible oilseed crop but also has medicinal and religious importance in India. Sesame is also one of the largest cultivated edible oilseed crops in the world and is known for its aroma and nutritional value. It contains low saturated fatty acid (less than15%), natural anti-oxidants like sesamolin, sesamin, and sesamol[7], it also contains about 18% of protein, and 12% of dietary fiber. World sesame seed production is around 4.8 million tons in 10 countries (Myanmar, India, China, Tanzania, Sudan, Ethiopia, etc.) accounting for 80% of total production. Sesame Global's production is about 6.01 million tons from an area of 11.74 million hectares. Madhya Pradesh has a total area of about 3.15 lakh hectares, with a production and productivity of 1,26,053 tonnes and 0.40 tonnes/hectare, respectively sesame is mainly grown during the Kharif/rainy season, which is very much conducive to the growth of weeds that compete with the sesame crop for many of the input factors and ultimately decline the crop yield. The losses of yield due to weeds are more as compared to the losses of yield caused by diseases/pest attacks. During the initial growth stage of sesame, the growth rate is very slow and not capable to compete with the weeds which result in maximum crop-weed infestation[1]. Weeds cause majestic stress at the seedling stage which results in loss of yield[2]. In sesame as high as 50% loss is reported due to unmanageable weed problems. Sesame has a wide weed flora in the Kharif season, The weeds associated with sesame in Madhya Pradesh are grasses Eleusine indica, Setaria glauca, Echinochloacrusgalli, Cynodondactylon, Digitariasanguinalis, Dinebraretroflexa, etc, sedges i.e, Cyperus rotundus and Cyperus iria, along with few

broad-leaved weeds like Cyanotisaxillaris, Ageratum coincides, Phyllanthus niruri, Amaranthus spinosus, Aeschinome indica, Celosia argentia, Portulaca oleracea, Euphorbia hirta, etc. It has been estimated that about 49 to 75% of losses of yield are due to weed competition in sesame crops[4]. Keeping all the above facts in view, the present experiment entitled "Weed Management studies in Sesame (*Sesamum indicum* L.)" was conducted during the Kharif season of 2021 at the Crop Research Centre of ITM University, Gwalior.

Material and methods

A field experiment was conducted during the Kharif season of 2021 at Crop Research Centre, ITM University, Gwalior, Madhya Pradesh, India (26.140° N latitude, 78.196° E longitude, and an altitude of 197 meters above mean sea level). The climate of this region is usually semi-arid, characterized by extremes of temperature during both summers and winters. The average annual precipitation at this tract ranges between 650-700 mm, most of which is contributed by the South-West monsoon from July to September. The Physico-chemical properties of the soil of the experimental field reported sand 54.24 (%), silt 23.56 (%), clay 22.11 (%), textural class sandy loam, soil reaction (pH) 7.35, EC 0.40 dSm1, organic carbon 0.11%, available nitrogen 67.2 kg ha-1, available phosphorus 14.5 kg ha-1 and available potassium 238.4 kg ha-1. The sesame variety Govinda (average duration 90-95 days) was used as an experimental crop. An experiment was laid out in a randomized block design with twelve treatments.

Pendimethalin 1000g\ha PE (next DAS, Oxyfluorfen 100 g\ha PE (next DAS), Metribuzin 350 g\ha PE (next DAS), Pendimethalin 1000 g\ha PE fb Quizalofop ethyl 50 g\ha POE (3-4 leaf weed stage), Oxyfluorfen 100 g\ha PE fb Quizalofop ethyl 50 g\ha POE (3-4 leaf weed stage), Metribuzin 350 g\ha PE fb Quizalofop ethyl 50 g\ha POE (3-4 leaf weed stage, Pendimethalin 1000 g\ha PE fb Hand weeding at 40 DAS, Oxyfluorfen 100 g/ha PE fb Hand weeding at 40 DAS, Metribuzin 350 g/ha PE fb Hand weeding at 40 DAS, Hand weeding at 20&40 DAS along with Weed-free check, and Weedy check, respectively. Treated seed at the rate of 5 kg ha-1 was sown in every treatment using the standard method. Recommended spacing (30 cm × 15 cm) was maintained by gap filling and thinning practices.

Appropriate plant protection measures were followed during the experimental period Periodical observations on weed dry weight, weed density, and weed control efficiency at 60 DAS and plant height, the number of branches, and plant dry matter at 40, and 60 days after sowing (DAS) and at harvest stage. Grain yield and straw yield and also economics were recorded to analyze the influence of different treatments on the growth attributes of the crop using standard techniques. For comparing various treatment means, a one-way Analysis of the variance Table with the replication technique was implemented (Snedecor, and Cochran, 1994). The data were statistically analyzed.

Result and Discussion

The experimental field was infested with grassy, broadleaf weeds and sedges (Table 1). The important weed species at 60 days stage were

Cyperus rotundus (Amaranthus viridis, Euphorbia hirta, Dinebraretroflexa Digtarasangunalis, and other weeds like *Cynodondactylon* and p*arthenium hysterophorus*. However, in Table-1 data on density and dry weight of total weeds & WCE recorded at 60 days stage of crop growth have been given. The incidence of the above weeds differs significantly at different density under different treatments at various stages of observations recorded. The weed control efficiency (WCE) measured how effectively weed density was reduced by using weed control methods over the weedy check. This was significantly influenced by different weed management methods. Among these weed control methods, the highest WCE was recorded with T7-Pendimethalin 30%EC fb hand weeding at 40 DAS (89.2%) weeds found more effective followed by T9Metribuzin 70 % WP fb hand weeding at 40 DAS (88.48) and T8-Oxyfluorfen 23.5% EC fb hand weeding at 40 DAS(87.9): The lowest WCE was recorded in the T12- weedy check treatment. Similar results were also reported by (Chaudhuri and Gosh, 2020).

Table 1 Effect of different weed control treatments on weed density (no. m^{-2}) and weed dry matter (g m^{-2}), and WCE (%) at 60 DAS

Treatments	Weed density of total weeds (no. m^{-2})	Weed dry weight (g m^{-2})	WCE (%)
T1	13.79 (189.59)	12.50 (189.59)	38.88
T2	14.31 (204.40)	12.96 (204.40)	34.27
T3	13.91(192.95)	12.63 (192.95)	37.57
T4	12.08 (145.46)	10.11 (145.75)	60.07
T5	12.26 (149.69)	10.92 (149.46)	53.39
T6	12.18 (147.75)	10.82 (147.75)	54.23
T7	5.53 (30.13)	5.28 (30.13)	89.23
T8	5.94 (34.84)	5.58 (34.84)	87.97
T9	5.85 (33.70)	5.46 (33.70)	88.48
T10	5.63 (31.18)	5.26 (31.18)	89.34
T11	0.71 (0.00)	0.71 (0.00)	100
T12	16.28 (264.39)	15.97 (263.39)	0
S.Em±	0.46	0.42	-
CD @ 5%	1.34	1.22	-
Note: Fig. in parenthesis are the original values, X= $\sqrt{x}$ + 0.5 transformation			

This might be due to the broad-spectrum activity of this pre-emergence herbicide T7-Pendimethalin 30% EC fb hand weeding at 40 DAS on different weed species and their greater efficiency to prevent plant cell division resulting in which weeds died rapidly[3]. The herbicides declined the total weed biomass at 60DAS, and the dense crop canopy may have restricted weed development, as seen by plant height which did not permit weeds to grow effectively due to the smothering effect. Eventually, the sesame crop grew quickly. Irrespective of Weed-free treatment (two hand weedings at 20 &

40 DAS), significantly lower weed density (no. m^{-2}) and weed biomass (g m^{-2}) at 60 DAS were recorded with the application of T7- Pendimethalin 30%EC fb hand weeding at 40 DAS (30.13)- was found more effective and it was at par with the T10-Hand weeding at 20 &40 DAS(31.18) and T11-weed free check and then followed by T9 Metribuzin 70 % WP fb hand weeding at 40 DAS (33.70)- as compared to the rest of the treatments. Significantly higher density and dry matter of weeds were recorded in the weedy check treatment[5]. The yield characteristics, yield, and economics of the sesame were significantly and favorably influenced by different weed control practices (Table 2, and Fig.2). The higher test weight (3.32g) seed yield (817 kg ha^{-1}), and straw yield (2351 kg ha^{-1}) was recorded in T7- Pendimethalin 30% EC fb hand weeding at 40 DAS followed by T9 Metribuzin 70 % WP fb hand weeding at 40 DAS seed yield) 767 kg ha), stover yield (2232 kg ha)and then followed by T8 Oxyfluorfen 23.5% EC fb hand weeding at 40 DAS. A significantly lower yield was recorded with the T12: weedy check (342kg ha^{-1}) due to heavy weed infestation[6]. Among all the herbicide treatments highest net return was recorded with the T7- Pendimethalin 30%EC fb hand weeding at 40 DAS (Rs 90694ha^{-1}) followed by T9: Metribuzin 70 % WP fb hand weeding at 40 DAS (Rs.83987 ha^{-1}) andT8 Oxyfluorfen 23.5% EC fb hand weeding at 40 DAS (Rs. 81600 ha^{-1}). The lowest net return was recorded in the T12: weedy check (Rs 28713 ha^{-1}). The highest benefit-cost ratio was recorded in the T7 Pendimethalin 30% EC fb hand weeding at 40 DAS (INR.2.55 per rupee invested)- followed by T9 Metribuzin 70 % WP fb hand weeding at 40 DAS (INR 2.40 per rupee invested) and then followed by T8: Oxyfluorfen 23.5% EC fb hand weeding at 40 DAS (INR. 2.35 per rupee invested).

Table 2 Effect of treatments on yield attributes, yield, and Economics of black gram

Treatments	Plant height (cm)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest index (%)	Test weight (g)	Net return (Rs/ha)	B: C
T1	92.7	434	1598	21.3	3.02	40227	1.29
T2	90.6	407	1570	20.5	2.95	37538	1.24
T3	91.7	420	1586	20.9	2.99	39117	1.28
T4	111	654	1919	25.4	3.21	69670	2.18
T5	109	599	1885	24.1	3.15	63642	2.05
T6	110	637	1903	25.0	3.18	68121	2.18
T7	129	817	2351	25.7	3.32	90694	2.55
T8	126	748	2206	25.3	3.28	81600	2.35
T9	128	767	2232	25.5	3.29	83987	2.40
T10	128	802	2330	25.6	3.31	86065	2.25
T11	132	841	2371	26.1	3.34	88250	2.14
T12	72.8	342	1401	19.6	2.68	28713	0.98
S.Em±	5.10	29.3	91.0	-	0.15		
CD @ 5%	14.9	86.1	267	-	NS		

Conclusion

Thus, it can be concluded that the Pendimethalin 30%EC fb hand weeding at 40 DAS of weeds resulted in higher seed yield and economics Hence, proved superior with respect to decreasing the density and dry weight of weeds over the rest of the other treatments. It may be regarded as a suitable alternative for sesame higher B-C ratio.

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References

1. Bennett, A.C. and Shaw, D. (2000). Effect of Glycine max cultivars and weed control weed see characteristic. *Weed Science*, 48(4): 431-435.
2. Channappagoudar, B.B., Biradar, N.R., Bharamagoudar, T.D. and Rokhade, C.J. (2008). Physiological studies on weed control efficiency of different herbicides in sunflower. *Karnataka Journal of Agricultural Sciences*, 21(2):165-167.
3. Chaudhuri, A. and Gosh, P. (2020). Effect of different weed management practices on growth and yield of summer sesame (*sesamum indicum.* L), *International Journal of chemical studies*, 8(1):2090-2093.
4. Ghosh, D.C. and Mukhopadhyay, S.K. (1980). Weeds and weed control in sesame Pesticides,14(11):24-29.
5. Jha, A.K. and Soni, M. (2013). Weed management by sowing methods and herbicides in soybean. *Indian Journal of Weed Science*, 45(4):250-252.
6. Mane, S.V., Kanade, V.M., Shendage, G.B., Sarawale, P.P. and Shetye, V.N. (2017). Weed Management in Sesamum (Sesamum indicum L.) Grown under Coastal Region of Maharashtra, *Journal of Indian Society of Coastal Agricultural Research*, 35(1):31-33.
7. Myint, Daisy, Gilani, Syed, Kawase, Makoto and Watanabe, Kazuo (2020). Sustainable Sesame (*Sesamum indicum* L.) Production through Improved Technology: An Overview of Production, Challenges, and Opportunities in Myanmar. Sustainability, 12: 3515.