EFFECT OF HERBICIDES ON WEEDS GROWTH AND YIELD OF SUMMER SESAME (*Sesamum indicum* L.)

[1]PATEL, C. P.; *[2]PATEL, D. D.; [3]PATEL, T. U.; [4]JOSHI, M. P. AND [5]PATEL, H. N.

DEPARTMENT OF AGRONOMY
N.M. COLLEGE OF AGRICULTURE
NAVSARI AGRICULTURAL UNIVERSITY
NAVSARI-396 450, GUJARAT, INDIA

***EMAIL: ddpatel@nau.in**

[1]M. Sc. (Agri.) Student, N. M. College of Agriculture, Navsari Agricultural University, Navsari - 396 450
[2]Associate Professor, Agronomy, College of Agriculture, Navsari Agricultural University, Bharuch - 392 012
[3]Assistant Professor, Agronomy, College of Agriculture, Navsari Agricultural University, Bharuch - 392 012
[4]M. Sc. (Agri.) Student, N. M. College of Agriculture, Navsari Agricultural University, Navsari - 396 450
[5]Assistant Professor, Cotton Wilt Research Sub Station, Navsari Agricultural University, Hansot - 393 030

ABSTRACT

An experiment was conducted on heavy black soil at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during the summer 2016. The experiment results revealed that profitable yield of summer sesamum with reducing the weed population and dry weight of weeds can be obtained by two hand weeding and interculturing at 20 and 40 DAS or pre-emergence application of pendimethalin @ 0.75 kg/ha coupled with one hand weeding and interculturing at 30 DAS under south Gujarat conditions.

KEY WORDS: Economics, Herbicide, Sesamum, Weed management, Weed population, Yield

INTRODUCTION

Sesame is an important and ancient oil yielding crop. Oilseeds crops occupy a large area in India. It is mainly grown in tropics and subtropics. In Gujarat, sesame is cultivated in an area of about 1.41 lakh ha and producing about 63,000 MT of seeds and the average productivity of the state is 449 kg/ha (Anonymous, 2014). It is sown throughout the year i.e. during *kharif*, semi *rabi* and summer as a sole as well as mixed or inter crop. Like any other oil seed crop, the significant scope for harnessing the total production of sesame can be achieved by increasing the area or by improving its productivity. Efficient crop management practices which involve selection of high yielding disease and pest resistant varieties along with adoption of proper crop rotation, timely planting, adequate plant stand, balanced plant nutrition, need based plant protection, irrigation and timely weed control all have great influence on productivity of sesame.

Weed is one of the serious bottlenecks in increasing the yield because the slow initial growth of sesame and irrigations provide suitable environment for weed growth. The critical crop weed competition period in sesame is up to 40 DAS (Days after sowing). The crop is very sensitive to weed competition during the first 20-25 days. Therefore, the crop requires effective control of weeds during this period. In modern agriculture, the costly inputs applied for raising the crop are robbed away by the weeds. Integrated approach consisting judicious combination

of two or more than two suitable methods of weed control become essential to sustain the production of sesame. Keeping all these points in view, the present research work entitled "Effect of herbicides on weeds growth and yield of summer sesame (*Sesamum indicum* L.)" was conducted.

MATERIALS AND METHODS

The experiment was conducted at the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during summer season of 2016. Navsari falls under Agro-ecological situation-III of south Gujarat heavy rainfall zone which is characterized by fairly warm summer. The investigation was carried out with sesame variety GT 3. It takes about 90-95 days to mature. The experimental soil was clay in texture, low in available nitrogen (276 kg/ha), medium in available phosphorus (40.30 kg/ha), fairly rich in available potassium (369.80 kg/ha) and slightly alkaline in reaction (pH 7.8). The crop was fertilized with 50-25-0 N-P_2O_5-K_2O kg/ha. Nitrogen was applied in two splits (as basal (50% N) and at 40 DAS (50% N)) and whole phosphorus was applied as basal only. The experiment comprising eleven treatment combinations were laid out in randomized block design and replicated three times. The treatment consisted combinations like W_1 (Pendimethalin @ 0.75 kg/ha as pre emergence), W_2 (Pendimethalin @ 0.75 kg/ha as pre emergence + hand weeding and interculturing at 30 DAS), W_3 (Imazethapyr @ 75 g/ha as post emergence at 20-25 DAS), W_4 (Imazethapyr @ 100 g/ha as post emergence at 20-25 DAS), W_5 (Pendimethalin @ 0.75 kg/ha as pre emergence + Imazethapyr @ 100 g/ha as post emergence at 20-25 DAS), W_6 (Imazethapyr @ 100 g/ha as post emergence at 20 DAS + hand weeding and interculturing at 40 DAS), W_7 (Pendimethalin @ 0.75 kg/ha as pre emergence + Imazethapyr @ 75 g/ha as post emergence at 20-25 DAS), W_8 (Imazethapyr @ 75 g/ha as post emergence at 20 DAS + hand weeding and interculturing at 40 DAS), W_9 (Hand weeding and interculturing twice at 20-40 DAS), W_{10} (Weed free check) and W_{11} (Weedy check). Adequate irrigations were given to the crop as per recommendation by Navsari Agricultural University. The crop was managed as per the standard package of practices. The observations on weed population/m^2, dry weight of weeds/m^2 and yield were taken from the net plot. The data related to each parameter of the experiment were statistically analyzed using MSTATC software. LSD test at 5 per cent probability level was applied when analysis of variance showed significant effect for treatments (Steel and Torrie, 1980). The net realization was calculated by deducting the total cost of cultivation from the gross realization for each treatment. The benefit cost ratio (BCR) was calculated on the basis of the formula given below:

BCR = Net realization (₹ /ha) / Cost of cultivation (₹ /ha)

RESULTS AND DISCUSSION

Influence on weed population and weed dry weight

Weed population (monocot, dicot, sedges and total) count (Table 1) revealed that weed population was considerable reduced by weed management treatments.

The experimental field was infested by number of weed species. Among monocot weeds; *Echinochloacrusgalli* L. Beauv, *Digitariasanguinalis* L. scop, *Sorghum halepense* L. pers, *Cynodondactylon* L. Persand*Bracharia* spp. and among dicot weeds; *Amaranthusviridis* L., *Alternantherasessillis*, *Digeraarvences* Forsk and *Convolvulus arvensis* L. and among sedges; *Cyprus rotandunce* L. where predominantly present during the course of experimentation.

Significantly the highest weed population of monocot, dicot, sedges and total weeds were noted in weedy check (W_{11}). All weed management treatments significantly reduced the population of weeds as compared to weedy check. Weed free check treatment resulted in significantly the lowest weed population followed by treatments W_9 (Hand weeding and interculturing twice at 20-40 DAS) and W_2 (Pendimethalin @ 0.75 kg/ha + hand weeding and interculturing at 30 DAS) in most commonly at all growth stages for all types of weeds (monocot, dicot and sedges) as compared to other treatments because of the effective weed control under these treatments. The results were supported by Sukhadia *et al*. (2004), Kumar and Thakur (2005) and Mathukia *et al.* (2015).

Similarly, significantly the highest dry weight of weeds at 60 DAS and at harvest was observed in W_{11} (weedy check) treatment. Maximum weed population at all the stages was observed under this treatment. Treatment W_9 (Hand weeding and interculturing twice at 20-40 DAS) recorded the minimum dry weight of weeds at 60 DAS and at harvest being statistically at par with treatment W_2 (Pendimethalin @ 0.75 kg/ha + hand weeding and interculturing at 30 DAS). Effective control of weeds resulting from different weed management methods reduced the weed population considerable which might have reflected in reduced dry weight of weeds by these treatments. These results were in accordance with findings of Kumar and Thakur (2005) and Mathukia *et al.* (2015).

Influence on yield and economics of sesamum crop

Effective weed control achieved under different weed control methods improved the growth as well as yield attributing characters in sesamum. This improvement ultimately resulted in high seed yield and stover yield in sesamum. However, the degree of improvement was dependent to the effectiveness of different weed management treatments.

The maximum seed yield (1020.8 kg/ha) was obtained under treatment W_{10} (weed free check) which was statistically at par with treatments W_2 (Pendimethalin @ 0.75 kg/ha + hand weeding and interculturing at 30 DAS) and W_9 (Hand weeding and interculturing twice at 20-40 DAS). Significantly the highest stover yield (1706.9 kg/ha) was obtained in treatment W_{10} (weed free check) which was found statistically at par with W_2 (Pendimethalin @ 0.75 kg/ha + hand weeding and interculturing at 30 DAS), W_5 (Pendimethalin @ 0.75 kg / ha as pre emergence + Imazethapyr @ 100 g / ha as post emergence at 20-25 DAS) and W_9 (Hand weeding and interculturing twice at 20-40) treatments. This might be due to enhancement in growth and better development under comparatively better weed free environment as compared to weedy check, where dense indiscriminate growth of weeds exerted crop weed competition with respect to moisture, nutrient, light and space. Such effects cumulatively resulted in poor growth and development of crop and finally resulted in poor seed and stover yield of sesamum crop. The results were in accordance with those reported by Duary and Hazra (2013), Sasikala *et al.* (2013), Dhaka *et al.* (2015) and Mruthul *et al.* (2015).

The weed control treatment also improved the harvest index. The data (Table 2) showed that higher harvest index (%) was found in W_{10} (weed free check) which was statistically at par with W_2 (Pendimethalin @ 0.75 kg/ha + hand weeding and interculturing at 30 DAS), W_5 (Pendimethalin @ 0.75 kg / ha as pre emergence + Imazethapyr @ 100 g / ha as post emergence at 20-25 DAS), W_6 (Imazethapyr @ 100 g / ha as a post

emergence at 20 DAS + hand weeding and interculturing at 40 DAS), W_7 (Pendimethalin @ 0.75 kg/ha as pre emergence + Imazethapyr @ 75 g / ha as post emergence at 20-25 DAS) and W_9 (Hand weeding and interculturing twice at 20-40 DAS) treatments.

Economics

The highest net realization of ₹ 54758 per hectare was obtained with treatment of hand weeding and interculturing twice at 20-40 DAS (W_9) with BCR of 2.93, followed by treatment of pendimethalin @ 0.75 kg/ha + hand weeding and interculturing at 30 DAS (W_2) with BCR value of 2.87 probably due to comparatively higher yield obtained under these treatments. The findings were in accordance with Mathukia *et al.* (2015) and Mruthul *et al.* (2015).

CONCLUSION

Based on the results of the field experimentation, it seems quite logical to conclude that profitable yield of summer sesamum with reducing the weed population and dry weight of weeds can be obtained by two hand weeding and interculturing at 20 and 40 DAS or by pre-emergence application of pendimethalin @ 0.75 kg/ha coupled with one hand weeding and interculturing at 30 DAS under south Gujarat conditions.

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Table 1: Weed population and dry weight of weeds as influenced by various weed management treatments

Treatments	Weed Population/m^2				Dry Weight of Weeds	
	Monoc	Dicot	Sedges	Total	At 60 DAS (g/m^2)	At harvest (kg/ha)
W_1	7.72 (59.67)	5.13 (25.33)	2.08 (3.33)	9.42 (88.33)	9.02 (80.67)	30.06 (910.00)
W_2	5.58 (30.67)	4.35 (18.33)	2.06 (3.33)	7.24 (52.33)	5.92 (35.00)	24.24 (596.67)
W_3	8.26 67.33)	4.76 (22.33)	2.15 (3.67)	9.69 (93.33)	7.99 (62.92)	32.60 (1066.67)
W_4	8.01 (63.67)	4.27 (19.33)	2.08 (3.33)	9.30 (86.33)	7.78 (60.00)	31.25 (986.67)
W_5	5.72 (32.00)	4.32 (17.67)	2.16 (3.67)	7.35 (53.33)	6.41 (40.42)	24.58 (606.67)
W_6	7.09 (50.33)	4.39 (18.67)	2.06 (3.33)	8.47 (72.33)	5.77 (32.33)	28.46 (826.67)
W_7	6.84 (46.67)	4.23 (17.00)	2.24 (4.00)	8.23 (67.67)	6.63 (43.33)	27.70 (776.67)
W_8	7.25 (52.33)	4.81 (23.00)	1.90 (2.67)	8.82 (78.00)	5.14 (25.67)	29.61 (890.00)
W_9	5.05 (24.67)	3.82 (13.67)	2.14 (3.67)	6.54 (42.00)	3.71 (12.92)	21.86 (480.00)
W_{10}	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
W_{11}	9.45 (88.33)	5.87 (33.67)	3.07 (8.67)	11.47 (130.67)	11.25 (126.25)	38.67 (1496.67)
S.Em. ±	0.50	0.48	0.16	0.59	0.39	2.04
C.D. (P=0.05%)	1.47	1.43	0.50	1.75	1.16	6.02
C.V. %	13.26	19.68	14.10	12.94	10.64	13.40

Note: Data in parenthesis indicates actual values and outside parenthesis indicates ($\sqrt{x+1}$) transformed value.

Table 2: Yield and economics of sesamum as influenced by various weed management treatments

Treatments	Seed Yield (kg/ha)	Stover Yield (kg/ha)	Harvest Index (%)	Gross Realization (₹ /ha)	Net Realization (₹ ./ha)	B: C Ratio
W_1	605.4	1407.0	30.15	45602	29983	1.92
W_2	925.9	1617.9	36.29	69211	51342	2.87
W_3	439.2	1273.6	25.48	33337	18495	1.25
W_4	486.7	1321.1	26.87	36850	21851	1.46
W_5	802.4	1549.8	34.13	60130	43580	2.63
W_6	752.6	1474.4	33.75	56415	39115	2.26
W_7	783.4	1503.3	34.02	58697	42306	2.58
W_8	624.4	1424.2	30.41	47006	29864	1.74
W_9	982.9	1674.8	36.90	73427	54758	2.93
W_{10}	1020.8	1706.9	37.36	76232	50663	1.98
W_{11}	289.65	1201.38	19.16	22346	8277	0.59
S.Em. ±	62.63	67.74	2.09	-	-	-
C.D. (P=0.05%)	184.75	199.83	6.17	-	-	-
C.V. %	15.47	7.99	11.56	-	-	-

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