Integrated Weed Management in Sesame (*Sesamum indicum* L.)

B.K. Sagarka[1], R.K. Mathukia[2] and D.M. Panara[3]

[1,2,3]*Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh-362001 (Gujarat, India)*

ABSTRACT

A field experiment was conducted during summer seasons of 2010 to 2012 at Junagadh (Gujarat, India) to study the integrated weed management in sesame. Pendimethalin as pre-emergence, while imazethapyr and quizalofop as post-emergence were tested alone and in integration with hand weeding (HW) and interculturing (IC). The results revealed that quizalofop 40 g/ha as post-emergence (20-25 DAS) + HW & IC (45 DAS) and pendimethalin 450 g/ha as pre-emergence + HW & IC (30 DAS) were found equally effective to the weed free check in controlling weeds and improving growth and yield attributes and ultimately seed yield (1213 and 1169 kg/ha) and stalk yield (2015 and 1852 kg/ha) of sesame. These treatments also recorded higher net returns (Rs. 52860 and 50700/ha) and B:C ratio (3.58 and 3.54).

Keywords: Sesame, Pendimethalin, Quizalofop, Imazethapyr, Weed

1. INTRODUCTION

Sesame (*Sesamum indicum* L.) is one of the important edible oilseeds cultivated in India. India is the major producer of this crop in the world and occupies well over 36% of the total acreage and contributes about 25% of the total output. In Gujarat, sesame is cultivated in almost all the districts as a *kharif* and semi-*rabi* crop. Now sesame cultivation has also gained popularity as a summer irrigated crop in the state due to less infestation of pests and diseases as well as higher yield and monetary returns. Initial slow growth of sesame seedlings makes itself poor competitor with more vigorous weeds. Scanty scientific information is available regarding weed management in summer sesame especially for south Saurashtra region of Gujarat, hence, present experiment was undertaken to find out appropriate integrated weed management practice for summer sesame.

2. MATERIALS AND METHODS

A field experiment was conducted at Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat, India) during summer seasons of 2010 to 2012. The soil of the experimental plot was clayey in texture and slightly alkaline in reaction (pH 7.8 and EC 0.34 dS/m) as well as low in available nitrogen (239 kg/ha), available phosphorus (24.4 kg/ha) and medium in available potash (236 kg/ha). The experiment comprising of 12 treatments *viz*.,

pendimethalin 450 g/ha as pre-emergence, pendimethalin 450 g/ha pre-emergence + HW & IC (30 DAS), imazethapyr 75 g/ha as post-emergence (20-25 DAS), imazethapyr 37.5 g/ha as post-emergence (20-25 DAS) + HW & IC (45 DAS), imazethapyr 75 g/ha as post-emergence (20-25 DAS) + HW & IC (45 DAS), quizalofop 40 g/ha as post-emergence (20-25 DAS), quizalofop 20 g/ha as post-emergence (20-25 DAS) + HW & IC (45 DAS), quizalofop 40 g/ha as post-emergence (20-25 DAS) + HW & IC (45 DAS), HW & IC (20 DAS), HW & IC twice (20 and 40 DAS), weed-free check, and weedy check was laid out in randomized block design with three replications.

The sesame variety 'Gujarat Sesame 2' was sown at 45 cm row spacing in third week of February. The crop was fertilized with 50-25-0 kg N-P_2O_5-K_2O/ha as basal at the time of sowing. The pre-emergence herbicides were applied to soil on the next day of sowing, while post-emergence spray was done at 20-25 DAS according to soil moisture condition. The spray volume for pre- and post-emergent herbicide application was 500 L/ha. Interculturing (IC) was carried out in inter-row space through bullock drawn implement simultaneously with hand weeding (HW). The crop was raised as per the recommended package of practices. The weed flora of experimental site mainly comprised of *Cyperus rotundus*, *Echinocloa colona, Cynodon dactylon*, *Digitaria sanguinalis, Digera arvensis*, *Trianthema portulacastrum* and *Physalis minima*.

3. RESULTS AND DISCUSSION

Growth and yield of sesame

An appraisal of data (Table 1) showed that various weed management practices significantly influenced growth and yield attributes of sesame. Significantly the highest plant height, number of branches per plant, number of capsules per plant and test weight were recorded under the weed-free check, however it remained at par with quizalofop 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC, HW & IC twice, quizalofop 20 g/ha as post-emergence + HW & IC and imazethapyr 75 g/ha as post-emergence + HW & IC in respect of plant height, with quizalofop 40 g/ha as post-emergence + HW & IC and pendimethalin 450 g/ha as pre-emergence + HW & IC in respect of number of branches per plant and test weight and with quizalofop 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC, HW & IC twice, and imazethapyr 75 g/ha as post-emergence + HW & IC in respect of number of capsules per plant. Whereas, significantly the lowest values of these growth and yield attributes were registered under the weedy check. Periodical removal of weeds by hand weeding and interculturing or herbicide application supplemented with weeding and interculturing suppressed weeds, which in turn provided better weed free environment to the crop during critical period for growth and development. Baskaran and Solaimalai (2002) also reported similar results.

The data furnished in Table 1 showed that different weed management treatments significantly influenced the seed yield of sesame during individual years and in pooled results. The weed-free

check out yielded by producing significantly the highest seed yield of 1360, 1444, 1329 and 1378 kg/ha during 2010, 2011, 2012 and in pooled results, respectively. The next best treatments in this regard were quizalofop 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC and HW & IC twice. Significantly the lowest seed yield (390, 299, 275 and 321 kg/ha) was observed under the unweeded control during all the three years and in pooled results. The yield increased with weed-free, quizalofop 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC and HW & IC twice over the unweeded control was to the tune of 329, 278, 264 and 243%, respectively.

A perusal of data presented in Table-1 indicated that significantly the highest stalk yield of 2031, 2182, 2207 and 2140 kg/ha was recorded under the weed-free check in 2010, 2011, 2012 and in pooled results, respectively, however it remained at par with quizalofop 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC and HW & IC twice in 2010, with quizalofop 40 g/ha as post-emergence + HW & IC and pendimethalin 450 g/ha as pre-emergence + HW & IC in 2011 and with quizalofop 40 g/ha as post-emergence + HW & IC in 2012 and pooled results. Efficient control of weeds and improved growth and yield attributes under these treatments might have reflected in increased seed and stalk yields. Whereas, significantly the lowest stalk yield of 641, 895, 525 and 687 kg/ha was registered under the weedy check in individual years and pooled results, respectively. These results are in conformity with findings of Punia *et al.* (2001) and Gnanavel and Anbhazhagan (2006).

Weed parameters

The data (Table 2) indicated that different weed management treatments exerted significant effect on dry weight of weeds during 2010, 2011, 2012 and in pooled results. All the weed management treatments including weed-free treatment significantly reduced dry weight of weeds over the unweeded control. During all the individual years and in pooled results, the weed-free recorded significantly the lowest weed dry weight (170, 28, 20 and 73 kg/ha), which was statistically at par with quizalofop 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC and HW & IC twice in 2010, with quizalofop 40 g/ha as post-emergence + HW & IC and pendimethalin 450 g/ha as pre-emergence + HW & IC in 2011 and 2012, and with quizalofop 40 g/ha as post-emergence + HW & IC in pooled results. Whereas, the unweeded control recorded the highest dry weight of weeds (3077, 3423, 3599 and 3367 kg/ha).

Pooled over three years, significantly the lowest weed density (12/m^2) was observed under the weed-free check, followed by quizalofop 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC and HW & IC twice, which have weed density of 37, 47 and 53/m^2, respectively. On the other hand, significantly the highest weed density (163/m^2) was recorded under the weedy check. Mean data of weed control efficiency (WCE) and weed index

(WI) given in Table 2 showed that the weed-free check recorded the highest WCE of 98%, followed by treatments *viz*., quizalofop at 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC and HW & IC twice by recording WCE of 92, 90 and 85%, respectively. Similarly, treatments *viz*., quizalofop 40 g/ha as post-emergence + HW & IC, pendimethalin 450 g/ha as pre-emergence + HW & IC and HW & IC twice recorded lower WI of 12, 15 and 20%, respectively. The results corroborate the findings of Sukhadia *et al.* (2004), and Gnanavel and Anbhazhagan (2006).

Economics

The weed-free check recorded maximum net returns of Rs. 59940/ha, followed by quizalofop 40 g/ha as post-emergence + HW & IC and pendimethalin 450 g/ha as pre-emergence + HW & IC, which gave net returns of Rs. 52860 and 50700/ha, respectiviely. The maximum B:C ratio of 3.58 was accrued with quizalofop 40 g/ha as post-emergence + HW & IC, closely followed by the weed free check and pendimethalin 450 g/ha as pre-emergence + HW & IC by recording B:C ratio of 3.56 and 3.54, respectively. Parasuraman and Rajagopal (1998) also reported analogous results.

4. CONCLUSION

Effective control of weeds in summer sesame along with higher yield and net returns could be achieved by keeping the crop weed free through hand weeding and interculturing as and when required or post-emergent application of quizalofop 40 g/ha at 20-25 DAS + HW & IC at 45 DAS or pre-emergent application of pendimethalin 450 g/ha + HW & IC at 30 DAS under south Saurashtra agro-climatic conditions of Gujarat, India.

REFERENCES

[1] Gnanavel, I. and Anbhazhagan, R. 2006. Integrated weed management in sesame (*Sesamum indicum* L.). *Agricultural Science Digest*, **26**: 67-68.

[2] Sukhadia, N.M.; Ramani, B.B.; Mathukia, R.K. and Khanpara, V.D. 2004. Integrated weed management in *kharif* sesame. *Indian Journal of Weed Science*, **36**: 239-242.

[3] Baskaran, R. and Solaimalai, A. 2002. Growth and yield of rice fallow sesame as influenced by weed management practices. *Sesame & Safflower Newsletter*, **17**: 42-45.

[4] Parasuraman, P. and Rajagopal, A. 1998. Evaluation of irrigation schedule, irrigation layout, organic amendment and weed control for sesame (*Sesamum indicum*) based on economic indices. *Indian Journal of Agronomy*, **43**: 725-728.

[5] Punia, S.S.; Raj, M.; Yadav, A. and Malik, R.K. 2001. Bioefficacy of dinitroaniline herbicides against weeds in sesame (*Sesamum indicum* L.). *Indian Journal of Weed Science*, **33**: 142-146.

Table 1. Effect of integrated weed management on growth, yield attributes and yield of sesame

Treatment	Dose (g/ha)	Plant height (cm)	Branches /plant	Capsules /plant	100-seed weight (g)	Seed yield (kg/ha)				Stalk yield (kg/ha)			
						2010	2011	2012	Pooled	2010	2011	2012	Pooled
Pendimethalin	450	50.6	2.20	36.1	4.93	676	716	538	643	1051	1170	889	1037
Pendimethalin + HW & IC	450	62.5	2.87	48.5	5.70	1139	1210	1157	1169	1774	1898	1883	1852
Imazethapyr	75	53.4	2.40	34.1	4.84	700	778	648	709	1125	1278	1071	1158
Imazethapyr + HW & IC	37.5	46.0	1.93	30.3	4.40	438	512	402	451	710	895	694	766
Imazethapyr + HW & IC	75	58.1	2.73	46.5	5.31	893	951	856	900	1492	1556	1389	1479
Quizalofop	40	56.7	2.47	33.9	5.05	719	821	666	735	1249	1426	1170	1282
Quizalofop + HW & IC	20	58.3	2.60	40.9	5.16	761	843	714	773	1390	1472	1238	1367
Quizalofop + HW & IC	40	62.7	3.13	49.7	5.75	1175	1222	1241	1213	1948	2043	2052	2015
HW & IC		47.3	2.20	31.3	4.63	469	571	508	516	727	1154	1003	962
HW & IC twice		62.5	2.80	47.4	5.31	1049	1167	1086	1101	1717	1864	1762	1781
Weed-free		63.9	3.27	50.4	5.92	1360	1444	1329	1378	2031	2182	2207	2140
Weedy		45.8	1.87	27.8	4.15	390	299	275	321	641	895	525	687
LSD (P=0.05)		5.9	0.35	6.2	0.53	178	201	170	102	317	271	270	160

Table 2. Effect of integrated weed management on weed parameters and economics

Treatment	Dose (g/ha)	Weed dry weight (kg/ha)				Weed density (No./m^2)*		WCE (%)	WI (%)	Net returns (Rs/ha)	B:C
		2010	2011	2012	Pooled						
Pendimethalin	450	1725	2028	1965	1906	9.27	(86)	43	54	20400	2.10
Pendimethalin + HW & IC	450	412	259	331	334	6.84	(47)	90	15	50700	3.54
Imazethapyr	75	1596	1843	1648	1696	8.55	(73)	50	49	23520	2.21
Imazethapyr + HW & IC	37.5	2394	2645	2701	2580	10.80	(117)	23	68	7200	1.36
Imazethapyr + HW & IC	75	1084	1077	1186	1116	7.41	(55)	67	35	33600	2.61
Quizalofop	40	1373	1123	1028	1175	7.76	(61)	65	47	25440	2.34
Quizalofop + HW & IC	20	1206	1660	1685	1517	8.29	(69)	55	45	26880	2.35
Quizalofop + HW & IC	40	280	287	247	271	6.11	(37)	92	12	52860	3.58
HW & IC	-	2006	2407	2633	2349	9.85	(97)	30	63	12240	1.64
HW & IC twice	-	468	503	523	498	7.22	(53)	85	20	46080	3.25
Weed-free	-	170	28	20	73	3.50	(12)	98	0	59940	3.56
Weedy	-	3077	3423	3599	3367	12.77(163)		0	78	1920	1.11
LSD (P=0.05)		394	414	429	229	1.68		-	-	-	-

* The data were subjected to $\sqrt{x+0.5}$ transformation and values in parenthesis are original