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Research Paper

Effect of Integrated Weed Management Practices on Weed Indices, Yield and Economics of Ajwain (*Trachyspermum Ammi Sprauge*)

Agronomy

KEYWORDS : Ajwain, integrated, weed, economics

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ABSTRACT

A field experiment was conducted during rabi season of 2012-13 at the college farm of ANGRAU, Rajendranagar, Hyderabad to find out most suitable and economical method of weed control in Ajwain((Trachyspermum ammi sprauge). The experiment was laid in RBD. Based on study, it was revealed that besides Hand weeding at 20, 40 and 60 DAS treatment, significantly highest plant height at all the growth stages, number of branches/plant, yield attributes like number of umbels/plant, number of seeds/umbellate, seed and straw yields of ajwain were recorded with oxyfluorfen @ 0.12 kg a.i ha-1 as PE fb quizalfop -p-ethyl @ 0.05 kg a.i ha-1 as PoE at 20 DAS and closely followed by oxyfluorfen @ 0.12 kg a.i ha-1 as PE fb hand weeding at 40 DAS. Similarly, besides hand weeding 20, 40 and 60 DAS treatment, the lowest dry weight of weed at harvest and weed index as well as highest weed control efficiency was also obtained with oxyfluorfen @ 0.12 kg a.i ha-1 as PE fb quizalfop -p-ethyl @ 0.05 kg a.i ha-1 as PoE at 20 DAS. The highest gross returns (Rs. 1,1,500 ha-1) were obtained when the crop was given hand weeding at 20, 40 and 60 DAS, but the highest benefit: cost ratio of 2.7 was realized due to application of oxyfluorfen @ 0.12 kg a.i ha-1 as PE fb quizalfop -p-ethyl @ 0.05 kg a.i ha-1 as PoE at 20 DAS.

INTRODUCTION:

Ajwain belong to family apiaceae, is said to be a native of Egypt. It is cultivated in the Mediterranean region and in south west Asian countries such as Iraq, Afghnisthan, Pakisthan and India. In India, it is cultivated on commercial scale in the states of Madhya Pradesh, Andra Pradesh, Gujarat, Maharasta, Uttar Pradesh, Rajasthan, Bihar, and West Bengal covering an area of 20,000 hectares. Ramachandraiah *et al.* (1988) reported that the seeds of ajwain have essential oil content in the range of 2.4%. The fruits find its use as an antispasmodic, anti-flatulent, anti-rheumatic, diuretic anti microbial. Ajwain crop is cultivated in *rabi* season. The low productivity of ajwain in India can be ascribed to lack of improved agronomic practices. Among these, weed management is the most important one. Ajwain germination comes at 12-15 days after sowing, so initial slow growth of seed spices leads to severe weed crop competition and reduces growth as well as yield is as high as 91.4%(Mali and Suwalka, 1987). Herbicides are the most effective and economic weed control measures but always use of herbicides is not feasible due to some unavoidable circumstances like unavailability of proper herbicides and cropping system requirement etc. Therefore, it is necessary to explore and test other alternative and economical methods of weed control.

MATERIALS AND METHODS:

In view of the above facts, study on weed management practices was carried out for identifying effective and economically viable weed control methods for harvesting higher seed yield of ajwain. The experiment was carried out at college farm, college of agriculture, Acharya N.G.Ranga Agriculture University, Hyderabad, Andraprdesh during *rabi* season 2012-13. The experiment comprised 13 treatments pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS, oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS, pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS , quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS, propaquizafop @0.05 kg *a.i* ha^{-1} as PoE at 20 DAS, pendimethalin@1.0 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS, oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS , pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @0.05 kg *a.i* ha^{-1} as PoE at 20 DAS, pendimethalin @1.0 kg *a.i* ha^{-1} as PE fb propaquizafop @0.05 kg *a.i* ha^{-1} as PoE at 20 DAS, oxyfluorfen @ 0.12 kg *a.i* ha^{-1}as PE fb propaquizafop @0.05 kg *a.i* ha^{-1} as PoE at 20 DAS , pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb propaquizafop @0.05 kg *a.i* ha^{-1} as PoE at 20 DAS, hand weeding at 20, 40 and 60 DAS and weedy check .

The experiment was laid out in randomized block design with three replications. The soil was sandy clay loam with a pH of 7.8 and 0.21 organic carbon and 226, 18, and 236.7, kg ha^{-1} of available N, P_2O_5 and K_2O kg ha^{-1}, respectively. The weed control practices were applied as per treatments under study. The irrigation and other cultural practices were adopted as per recommendation. The crop evaluated in terms of growth, yield- attributing characters and yield, further economics of ajwain as net-returns and benefit cost ratio.

RESULTS AND DISCUSSION

The results obtained during 2012-13 had similar trends in respect of weed as well as crop parameters.

Weed Parameters

The weed flora associated with experimental crop consisted of grasses *viz*., *Cynodon dactylon, Dactyloctenium aegyptium* and *Celotia argentia*, sedges *viz*., *Cyperus rotundus* and broadleaved weeds *viz*., *Digera arvensis, Trianthema portulacastrum, Commelina benghalensis, Parthenium hysterophorus*, *Euphorbia hirta* and *Hemidismus indica*. Among all weed sps, *Cynodon dactylon*, *Cyperus rotundus* and *Parthenium hysterophorus* were the most dominant ones. Population of broad leaf weeds at the harvesting stage was missing on account of shorter life span than that of ajwain crop. Similar weed species were reported by Senthivel (2001). At 60 DAS, hand weeding at 20, 40 and 60 DAS recorded lower weed dry matter (6.45 g m^{-2}) and it was on par with oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS(3.83), pendimethalin @1.0 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS (3.93), pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS (4.07) and oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS (4.12) and all these were significantly superior to all other treatments. Weedy check significantly recorded higher dry matter of weeds (8.34) than all other treatments. Similar results were also reported by Parihar and Singh (1994). At harvest, hand weeding at 20, 40 and 60 DAS recorded the highest weed control efficiency of 79.78% followed by application of oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as

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PoE at 20 DAS (72.68%), oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS (70.51%). Significantly lower weed control efficiency was recorded with propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS (37.31%) and quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS (44.63%) because of reduced action of post emergency application of herbicides alone. Maximum weed control efficiency recorded in hand weeding is due to continuous removal of weeds upto 60 days after sowing followed by application of different herbicides. These results are in accordance with the results indicated by Sharma and Jain, 2005 and Mehriya (2007). The lowest weed index was recorded with application of oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS (11.77) and oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS (16.97) where as the highest weed index was recorded with weedy check (64.33) shows in Table 1.

Plant growth:

The plant height was significantly higher with hand weeding at 20, 40 and 60 DAS (123cm) than all other treatments but it was on par with application of oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS (117 cm) and oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS (116 cm). The next best treatment to recorded plant height was pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE (113 cm), pendimethalin @ 1.0 kg *a.i* ha^{-1} fb hand weeding at 40 DAS (112 cm) and pendimethalin @ 1.0 kg *a.i* ha^{-1} fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS (107 cm) at harvest shows in Table 2. Similar results were found by Susila and Rajkumar, (2011).

Yield Attributes and Yield

Number of umbels per plant seeds per umbel and seed yield differed significantly due to weed management treatments. Among all the treatments, hand weeding at 20, 40 and 60 DAS recorded higher number of umbels per plant (343) , number of seeds per umbel (218) and seed yield of 1155 kg ha^{-1} which was significantly superior to all other treatments, where as application of oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS recorded 270 umbels plant^{-1} , 203 seeds umbel^{-1} and seed yield of 1065 kg ha^{-1} followed by oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS 243 umbels plant^{-1} , 195 seeds umbel^{-1} and seed yield (959 kg ha^{-1}) on par with oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS while as weedy check recorded (64 umbels plant^{-1} , 73 seeds umbel^{-1} and 412 kg ha^{-1}) the lowest values shows in Table 2. Similar observations increase in number of umbels per plant, and seeds per umbel due to application of pre-emergence herbicide followed by hand weeding were also reported by Mehriya *et al.*, 2007 and Meena and Mehta (2009).

Economics:

The highest gross returns (Rs. 1, 15,500 kg ha^{-1}) were obtained under hand weeding treatment at 20, 40 and 60 DAS but highest net returns (Rs. 67,692 kg ha^{-1}) were obtained with oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS and followed by oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS. The weedy check recorded the lowest gross returns (Rs. 41200 kg ha^{-1}), net returns (Rs. 6132 kg ha^{-1}). The highest benefit cost ratio was higher with application of oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS (2.7) followed by oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS (2.4) than hand weeding at 20,40 and 60 DAS (2.3) shows in Table 3.

Table 1: Effect of different integrated weed control treatments on weed dry matter (g m^{-2}) at 60 DAS, weed control efficiency and weed index and at harvest during *rabi,* 2012-13

S.No	Treatments	Weed dry matter (g m^{-2}) 60 DAS	WCE(%) Harvest	WI(%)
T_1	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS	3.93 (14.48)	57.89	35.93
T_2	Oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS	3.83 (13.73)	70.51	16.97
T_3	Pretilachlor @ 0.5 kg *a.i* ha^{-1}as PE fb hand weeding at 40 DAS	4.07 (15.57)	53.79	45.63
T_4	Quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	6.42 (40.33)	44.63	54.98
T_5	Propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	6.75 (44.68)	37.31	57.14
T_6	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	5.82 (32.97)	55.56	33.16
T_7	Oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	4.12 (16.02)	72.68	11.77
T_8	Pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	5.90 (33.92)	48.28	48.23
T_9	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	6.49 (41.20)	50.65	42.94
T_{10}	Oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	5.19 (25.96)	53.15	36.28
T_{11}	Pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	6.18 (37.20)	48.32	53.59
T_{12}	Hand weeding at 20, 40 and 60 DAS	3.45 (10.93)	79.75	-
T_{13}	Weedy check	8.34 (68.70)	-	64.33
	SEm±	0.23		
	CD(0.05)	0.69		

Table 2: Effect of different integrated weed control treatments on plant height (cm) of ajwain at harvest, number of umbels, seeds per umbel and seed yield of ajwain during *rabi*, 2012-13

S.No	Treatments	Plant ht Harvest	Umbel/ plant	Seed/ Umbel	Seed yield (kg ha^{-1})
T_1	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS	112	150	162	740
T_2	Oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb hand weeding at 40 DAS	116	243	195	959
T_3	Pretilachlor @ 0.5 kg *a.i* ha^{-1}as PE fb hand weeding at 40 DAS	105	113	118	628
T_4	Quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	105	93	89	520
T_5	Propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	104	82	82	495
T_6	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	107	180	180	772
T_7	Oxyfluorfen @0.12 kg *a.i* ha^{-1} as PE fb quizalfop-p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	117	270	203	1065
T_8	Pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	113	106	103	598
T_9	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	108	120	127	659
T_{10}	Oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	109	140	142	736
T_{11}	Pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	103	102	94	536
T_{12}	Hand weeding at 20, 40 and 60 DAS	123	343	218	1155
T_{13}	Weedy check	99	64.3	73.3	412
	SEm±	3.1	6.44	1.81	29
	CD(P=0.05)	8.6	18.9	5.31	84

Table 3: Economics of different integrated weed control treatments in ajwain during *rabi*, 2012-13

S.No	Treatments	Cost of cultivation (Rs. ha^{-1})	Gross returns (Rs. ha^{-1})	Seed Price (Rs kg^{-1})	Net Returns (Rs. ha^{-1})	B:C ratio
T_1	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb Hand weeding at 40 DAS	40950	74000	100	33050	1.8
T_2	Oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb Hand weeding at 40 DAS	40668	95900	100	55232	2.4
T_3	Pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb Hand weeding at 40 DAS	40188	62800	100	22612	1.6
T_4	Quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	37208	52000	100	14792	1.4
T_5	Propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE at 20 DAS	36418	49500	100	13082	1.4
T_6	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE	38090	77200	100	39110	2.0
T_7	Oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl @ 0.05 kg *a.i* ha^{-1} as PoE	38808	106500	100	67692	2.7
T_8	Pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb quizalfop -p-ethyl 0.05 kg *a.i* ha^{-1} as PoE	38328	59800	100	21472	1.6
T_9	Pendimethalin @ 1.0 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE	37300	65900	100	28600	1.8
T_{10}	Oxyfluorfen @ 0.12 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE	38018	73600	100	35582	1.9
T_{11}	Pretilachlor @ 0.5 kg *a.i* ha^{-1} as PE fb propaquizafop @ 0.05 kg *a.i* ha^{-1} as PoE	37538	53600	100	16062	1.4
T_{12}	Hand weeding at 20, 40 and 60 DAS	50068	115500	100	65432	2.3
T_{13}	Weedy check	35068	41200	100	6132	1.2

REFERENCE

Mali,A.L. and Suwalka, 1987. Studies on weed control in fenugreek. Indian Journal of Agronomy. 32: 188-189. Meena, S.S and Mehta. 2009. Integrated weed management in coriander (Coriandrum sativum L.). Indian Journal of Agricultural Science. 79 (10): 824-826. Meena,N.L and Chaudhary, G. R.2007. Effect of oxadiargyl vis-a-vis pendimethalin in controlling weeds in weeds in cumin (Cuminum cyminum L.). In proceedings of National Seminar on Production, Development, Quality and Export of Seed Spices- Issues and Strategies, held during 2-3 February at National Research Center in Seed Spices. Ajmer,Rajasthan. Mehriya, M.L., Yadav, R.S., Jangir, R.P and Poonia, B.L. 2007. Nutrient utilization by cumin (Cuminum cyminum L.) and weeds as influenced by different weed-control methods. Indian Journal of Agronomy. 52: 1-4 Parihar, G.N and Sing, R. 1994. Effect of cultural and herbicidal weed management on the yield of cumin (Cuminum cyminum L.). Annals of Arid Zone. 33 (4): 309-312 Ramachandraiah, S., Azeemiddin, G. and Trirumularao, S.D., 1988. Integrared methods of obtaining essential and fatty olis fro unbelliferour seeds.Indian Perfum., 32:61-68 Senthivel, T. 2001. Chemical weed control in rainfed coriander (Coriandrum sativum L.). Madras Agriculture Journal. 88 (7-9): 532-533. Sharma, O. L and Jain, N. K. 2005. Effect of levels and time of application of herbicides on seed yield of cumin (Cuminum cyminum L.). Indian Journal of Agricultural Science. 75 (12): 812-813. Susila, T and Rajkumar M. 2011. Effect of date of sowing of ajwain Sprague on seed yield southern telengana, Andhra Pradesh. Madras Agricultural Journal. 98 (1-3): 39-40.