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Effect of Cultural and Herbicidal Weed Management on the Yield of Cumin (*Cuminum cyminum* L.)

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Abstract Pre-emergence application of pendimethalin at 1.0 kg ha^{-1} with one hand weeding at 30 days after sowing demonstrated satisfactory weed control on sandy loam soil and recorded 56.76 per cent higher seed yield (892 kg ha^{-1}) and higher benefit:cost ratio (22.42:1) than conventional two manual weedings (569 kg ha^{-1}). Application of 1.0 kg ha^{-1} pendimethalin alone gave seed yield of 819 kg ha^{-1}. The lowest weed dry weight production was recorded under this treatment.

Key words Cumin, weeds, herbicide, weed control efficiency

Cumin (*Cuminum cyminum* L.) is a short statured crop with slow initial growth which makes it incapable of offering competition to aggressive weeds. The weed infestation may lead to reduction in seed yield up to the extent of 80% (Bhati 1993). Although hand weeding control the weeds effectively, yet it is tidious, labour consuming and expensive. Besides, a common weed (*Plantago pumila* Willd), locally called *jiri,* is difficult to distinguish from cumin plants before flowering (Chandola *et al.* 1970). Use of 1.0 kg ha^{-1} fluchloralin was found effective in cumin for control of weeds (Mehta & Bhadoriya 1982). Alternative herbicides are also needed in controlling the weeds, hence the present study was planned to test the efficacy of various herbicides alone and with one hand weeding in cumin.

Materials and Methods

Field study was conducted at Agricultural Research Station, Mandor-Jodhpur during winter seasons of 1984-85, 1985-86 and 1986-87. The soil was sandy loam (15.5% clay, 12.3% silt, 72.2.% sand), low in organic carbon (0.28%), medium in phosphorus (12.5 kg P ha^{-1}) and high in potash (351 kg K ha^{-1}) with a pH of 8.1. The treatments comprised of application of 0.5 and 1.0 kg ha^{-1} a.i. of any of fluchloralin (Pre-planting), pendimethalin and oxadiazon (Preemergence) either alone or with one hand weeding at 30 days after sowing (DAS). In addition, a weedy check and two hand weedings at 30 and 45 DAS were also tried. The treatments were replicated 3 times in a randomized block design. Dry sowing of cumin Cv. MC 43 was done and then irrigation was applied to ensure good germination. Weed control efficiency (WCE) was calculated by following :

$$WCE = [(W_C - W_T)/W_c] \times 100$$

where, W_C is weight of weeds in weedy check plot, W_T is weight of weeds in treated plot.

Results and Discussion

The dominant weed flora of the experiment plots was *Chenopodium album* L., *Chenopodium murale* L. and *Rumex ratifolia* L.

The dry weight of *Chenopodium* and total weeds were significantly reduced by all the weed control treatments compared with weedy check (Table 1). *Rumex* was also significantly controlled by all the treatments except at the lower dose of each herbicide. Pendimethalin (1.0 kg ha^{-1}) with one hand weeding (HW) at 30 DAS significantly reduced the dry weight of *Chenopodium* compared with two hand weedings at 30 and 45 DAS and all the treatments containing fluchloralin and pendimethalin at 0.5 kg ha^{-1}. Significantly lower dry weight of total weeds was obtained by use of pendimethalin (1.0 kg ha^{-1}) and hand weeding as compared to all the treatments except those of oxadiazon (1.0 kg ha^{-1})

Table 1 *Effect of weed control treatments on weed dry weight (3 year mean) and weed control efficiency (WCE) in cumin*

Treatments	Weed dry weight (g m^{-2}) at harvest			WCE (%)
	Chenopodium	Rumex	Total weeds	
Weedy check	371	158	529	–
Hand weeding at 30 & 45 DAS	166	02	168	68.0
Fluchloralin 0.5 kg ha^{-1} (Pre-plant)	251	121	372	29.7
Fluchloralin 0.5 kg ha^{-1} + HW* (Pre-plant)	216	11	227	57.1
Fluchloralin 1.0 kg ha^{-1} (Pre-plant)	203	90	293	25.1
Fluchloralin 1.0 kg ha^{-1} + HW	173	28	201	62.0
Pendimethalin 0.5 kg ha^{-1} (Pre-em.)	137	97	244	53.9
Pendimethalin 0.5 kg ha^{-1} + HW	104	28	132	75.0
Pendimethalin 1.0 kg ha^{-1} (Pre-em.)	82	36	118	77.7
Pendimethalin 1.0 kg ha^{-1} + HW	41	11	52	90.2
Oxadiazon 0.5 kg ha^{-1} (Pre-em.)	100	137	237	55.2
Oxadiazon 0.5 kg ha^{-1} + HW	101	46	147	72.2
Oxadiazon 1.0 kg ha^{-1} (Pre-em.)	99	90	189	64.3
Oxadiazon 1.0 kg ha^{-1} + HW	58	19	77	85.4
Cd 5%	74	66	92	–

* HW = One hand weeding at 30 DAS

with hand weeding, pendimentalin (1.0 kg ha^{-1}) and pendimethalin (0.5 kg ha^{-1}) with hand weeding. The WCE was maximum (90.2%) in the plots sprayed with pendimethalin (1.0 kg ha^{-1}) and given one hand weeding, followed by oxadiazon (1.0 kg ha^{-1}) with hand weeding.

Presence of weeds adversely affected the final plant population, umbles per plant as well as 1000-seed weight. All the weed control treatments significantly improved the plant mortality as compared to weedy check (Table 2). Maximum and significantly higher number of plants (6,83,000 ha^{-1}) survived in the treatment of oxadiazon (1.0 kg ha^{-1}) with hand weeding compared to all other treatments except pendimethalin at 0.5 and 1.0 kg ha^{-1} with hand weeding. The treatments where hand weeding was superimposed with herbicides, significantly increased the plant stand survival as compared to herbicide alone except fluchloralin (0.5 kg ha^{-1}). This may be attributed to minimum crop weed competition in these treatments. Umbels per plant were reduced by 34.8 and 59.8%, test weight by 43.0 and 48.2% in the unweeded plots compared with two hand weeding and application of pendimethalin (1.0 kg ha^{-1}) with hand weeding, respectively. Similar trends were obtained by Choudhary & Gupta (1991).

All the weed control treatments produced significantly higher mean seed yield of cumin compared with weedy check. Maximum and significantly higher seed yield was obtained by application of pendimethalin (1.0 kg ha^{-1}) followed by one hand weeding compared with all other weed control treatments because of effective control of weeds and consequently higher number of umbels per plant and 1000-seed weight. Of the herbicides hitherto used, fluchloralin was found

Table 2 *Effect of weed control treatments on yield attributes and seed yield of cumin (3 year mean)*

Treatments	Final plant population (X 000ha^{-1})	Seed yield (kg ha^{-1})				Umbles plant^{-1} (No.)	1000 seed (g)	Benefit : cost ratio
		1984-85	1985-86	1986-87	pooled			
Weedy check	62	101	002	012	038	11.2	3.44	–
Hand weeding 30 & 45 DAS	451	715	512	481	569	15.1	4.92	14.05:1
Fluchloralin 0.5 kg ha^{-1} (Pre-plant)	403	353	007	287	216	13.1	4.10	5.37:1
Fluchloralin 0.5 kg ha^{-1} + HW	451	911	335	479	575	16.1	4.62	14.35:1
Fluchloralin 1.0 kg ha^{-1} (Pre-plant)	416	735	006	358	366	14.2	4.28	9.04:1
Fluchloralin 1.0 kg ha^{-1} + HW	553	871	453	486	603	16.6	4.61	14.82:1
Pendimethalin 0.5 kg ha^{-1} (Pre-em.)	331	952	495	273	573	14.9	4.70	14.76:1
Pendimethalin 0.5 kg ha^{-1} + HW	581	1187	700	515	801	16.1	5.02	20.30:1
Pendimethalin 1.0 kg ha^{-1} (Pre-em.)	461	1234	743	479	819	15.2	5.05	20.96:1
Pendimethalin 1.0 kg ha^{-1} + HW	601	1160	922	594	892	17.9	5.10	22.42:1
Oxadiazon 0.5 kg ha^{-1} (Pre-em.)	323	839	510	204	518	14.1	4.80	13.31:1
Oxadiazon 0.5 kg ha^{-1} + HW	461	1044	657	430	710	16.0	5.01	17.91:1
Oxadiazon 1.0 kg ha^{-1} (Pre-em.)	377	1172	758	316	749	15.6	5.10	18.99:1
Oxadiazon 1.0 kg ha^{-1} + HW	683	856	982	533	790	16.6	5.14	19.74:1
CD 5%	126	112	56	70	72	2.4	0.45	–

inferior to pre-emergent pendimethalin and oxadiazon at both the doses. Both pendimethalin and oxadiazon at 1.0 kg ha^{-1} gave significantly higher seed yield compared to two hand weedings because pre-emergent herbicides reduced the weeds just after the sowing, however, weeds remained with the crop up to 30 DAS in hand weeded plots. Of the different weed control treatments, the highest benefit : cost ratio was obtained in pendimethalin at 1.0 kg ha^{-1} + hand weeding (22.42 :1), followed by pendimethalin at 1.0 kg ha^{-1} (20.96:1) and pendimethalin at 0.5 kg ha^{-1} + hand weeding (20.30:1). Fluchloralin at 0.5 kg ha^{-1} was the least effective herbicide which gave lowest benefit:cost ratio (5.37:1).

References

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