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Suitable Method for Weed Management in Cumin *(Cuminum cyminum* L.)

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India occupies prime position in seed spice production and plays very important role in earning foreign exchange through export of seed spices. Among seed spices, cumin occupies first position in terms of value and second in terms of production. In India, cumin is mainly produced in Gujarat and Rajasthan. Initial growth of cumin is slow and it takes time in germination and establishment. Yadav *et al*. (2004) observed *Chenopodium album* L., *C. murale* L., *Rumex dentatus* L., *Asphodelus tenuifolius* L., *Melilotus indica* L. and *Cyperus rotundus* L. as dominant weeds in cumin. Sowing of cumin is mainly done by broadcasting in which manual control of weed is very difficult. Therefore, it is the need of the time to explore suitable alternative cost effective method of weed control in cumin.

A field experiment was carried out in the **rabi** season of 2008-09 on loamy sand soil at Agronomy Instructional Farm of S. D. Agricultural University, Sardarkrushinagar (Gujarat). The soil of experimental field was having pH 7.7 and electrical conductivity 0.14 dS/m, low organic carbon (0.18), low available nitrogen (159.1 kg /ha), medium in available P_2O_5 (38.9 kg /ha) and medium in respect to available K_2O (185.1 kg/ha).

The experiment consisting of 10 weed control treatments viz., pendimethalin 1.0 kg /ha PE, fluchloralin 1.0 kg/ ha PE, glyphosate 0.5 kg/ha at 7 DAS, glyphosate 0.5 kg /ha at 7 DAS + HW, oxadiargyl 50 g/ ha at 7 DAS, oxadiargyl 50 g/ ha at 7 DAS + HW (Oxadiargyl 50 g /ha at 20 DAS, Oxadiargyl 50 g/ ha at 20 DAS+ HW, Weed free) and unweeded control was conducted in a randomized block design with four replications. Full dose of phosphorus (15 kg/ ha) and half dose of nitrogen (15 kg /ha) was applied as basal just prior to sowing in the form of DAP and urea. The remaining half dose of nitrogen (15 kg /ha) was applied in the form of urea at 35 DAS. The seeds of cumin variety GC-4 were treated with ceresan @ 3.0 g per kg seed to protect the crop against fungal diseases. The herbicides were applied by knapsack sprayer fitted with flat fan nozzle using 500 litres of water per hectare. Weeding operation was carried out after 35 DAS as per treatments. In weed free treatment weeds were removed at every 7th day interval to keep it weed free throughout the growing season. Recommended cultural practices were adopted for raising healthy crop. Weed count was recorded at harvest using 0.25 m^2 quadrat placed at two randomly selected spots in each net plot and average values were worked out. Weeds were sun-dried and then dry weight of weeds was recorded when weeds attained constant weight after putting in oven at 65° C and expressed as g/m^2 for each plot. The weed control efficiency (WCE) and weed index (WI) were calculated by using the formula (Kondap and Upadhyay, 1985) and Gill and Kumar (1969), respectively.

Application of oxadiargyl 50 g/ha 20 DAS+HW was found more effective in reducing the weed population and resulted in less dry weight of weeds (20.85 g/m^2), higher weed control efficiency (82%) as well as lowest weed index (1.82 %). Application of oxadiargyl 50 g/ha at 20 DAS was found equally effective in this respect (Table 1). The highest weed population at harvest was recorded in unweeded control. The combined effect of herbicide and HW at 35 DAS gave less dry weight of weeds which was responsible for higher weed control efficiency. Remarkably highest weed index (88%) was recorded under treatment unweeded control, followed by glyphosate 0.5 kg/ha 7 DAS.The higher value of weed index with these treatments was due to higher dry weed biomass and lower weed control efficiency. The findings are in agreement with the results reported by Yadav *et al*. (2004) and Mehriya *et al*. (2007). Critical examination of data (Table 2) revealed that besides weed free treatment, the highest number of umbels per plant (14.0), number of umbellates per umbel (5.70), number of seeds per umbellate (5.05) ,1000-seed weight (4.14 g), seed yield (594 kg/ha) and straw yield (1025 kg/ha) were recorded with application of oxadiargyl 50 g/ha at 20 DAS+HW followed by oxadiargyl 50 g/ha at 20 DAS, oxadiargyl 50 g/ha 7 DAS+HW, pendimethalin 1.0 kg/ha PE and fluchloralin 1.0 kg/ha PE which being statistically at par with each other were significantly higher over rest of the treatments. Higher yield attributes, seed and straw yield under these

Table 1. Effect of different weed management practices on weed density, dry weight of weeds , weed control efficiency and weed index at harvest

Treatments	Density of weeds (No./m²)			Dry weight of weeds (g/m²)	Weed control efficiency (%)	Weed index (%)
	Grassy weeds/ m²	Broad-leaved weeds/m²	Sedges weeds/ m²			
Pendimethalin 1.0 kg/ ha PE	(13.18) 3.68	(12.59) 3.61	(13.78) 3.76	26.9	77	9.1
Fluchloralin 1.0 kg/ ha PE	(13.25) 3.71	(12.94) 3.65	(13.81) 3.77	27.7	76	9.3
Glyphosate 0.5 kg/ha at 7 DAS	(23.41) 4.87	(20.66) 4.60	(20.56) 4.59	55.9	52	40.5
Glyphosate 0.5 kg/ ha 7 DAS+HW	(20.23) 4.55	(21.75) 4.71	(19.45) 4.45	41.8	64	23.1
Oxadiargyl 50 g/ha 7 DAS	(21.36) 4.66	(23.74) 4.92	(19.91) 4.51	43.8	62	25.3
Oxadiargyl 50 g/ha 7 DAS+HW	(12.32) 3.57	(12.45) 3.60	(12.85) 3.65	25.8	78	4.5
Oxadiargyl 50 g/ha 20 DAS	(11.98) 3.52	(12.38) 3.59	(12.41) 3.59	22.7	80	3.3
Oxadiargyl 50 g/ha 20 DAS+HW	(10.87) 3.37	(11.93) 3.53	(11.72) 3.50	20.9	82	1.8
Weed free	(0.00) 0.71	(0.00) 0.71	(0.00) 0.71	0.0	100	0.0
Weedy check	(51.06) 7.12	(51.23) 7.17	(37.10) 6.10	115.9	0.00	87.6
S. Em±	0.21	0.21	0.17	2.7	1.8	2.9
LSD (P=0.05)	0.61	0.61	0.49	7.8	5.3	8.6

Original data given in parentheses were subjected to square root transformation ($\sqrt{x+0.5}$) before analysis.

Table 2. Effect of different weed management practices on yield attributes, yield and harvest index of cumin

Treatments	No. of umbels/ plant	No. of umbellates/ umbel	No. of seeds/ umbellate	1000-seed weight (g)	Seed yield (kg/ha)	Straw yield (kg/ha)	Harvest index (%)
Pendimethalin 1.0 kg/ha PE	13.6	5.5	4.8	4.00	550	980	34.5
Fluchloralin 1.0 kg/ha PE	13.5	5.4	4.7	3.97	549	975	34.3
Glyphosate 0.5 kg/ha at 7 DAS	11.8	4.8	4.0	3.65	360	768	33.2
Glyphosate 0.5 kg/ha 7 DAS+HW	12.8	4.9	4.7	3.72	465	892	33.7
Oxadiargyl 50 g/ha 7 DAS	12.7	4.8	4.6	3.70	452	878	33.3
Oxadiargyl 50 g/ha 7 DAS+HW	13.6	5.5	4.9	4.05	578	989	34.9
Oxadiargyl 50 g/ha 20 DAS	13.8	5.7	5.0	4.10	585	998	35.4
Oxadiargyl 50 g/ha 20 DAS+HW	14.0	5.7	5.1	4.14	594	1025	35.4
Weed free	14.5	5.8	5.1	4.15	605	1085	36.4
Weedy check	7.8	3.9	2.9	3.37	75	189	32.8
S. Em±	0.6	0.6	0.2	0.15	20.52	20.85	39.4
LSD (P=0.05)	1.6	1.6	0.5	0.42	59.53	60.49	NS

NS–Not Significant.

treatments might be due to effective control of weeds which in turn reduced crop-weed competition significantly and consequently resulting in better congenial condition for growth and development of the crop. Application of oxadiargyl 50 g/ha at 7 DAS and glyphosate 0.5 kg/ha at 7 DAS failed to improve the seed yield of cumin. This might be due to the emergence of major flush of weeds after 7 DAS in these treatments. Yadav *et al.* (2004), Yadav *et al.* (2005) and Mehriya *et al.* (2007) also reported that oxadiargyl 50 g/ha applied at 20 DAS significantly improved seed and straw yield of cumin. These findings are also in conformity with those reported by Mali and Suwalka (1987). Thus, it can be inferred that application of oxadiargyl 50 g /ha at 20 DAS+HW could be suitable for ensuring effective weed control and realizing higher seed and straw yield of cumin in semi-arid region.

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