

Weed management in cumin (*Cuminum cyminum*)

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Received : February 2001

ABSTRACT

Linuron @ 0.5 kg/ha applied as pre-emergence or post-emergence 30 days after sowing and Pendimethalin @ 1.0 kg/ha applied as pre-emergence provided 95.7 to 99.2% weed control and had no adverse effect on cumin (*Cuminum cyminum* L.) crop at any stage. These treatments gave cumin yield comparable to weed-free conditions. Unwedded control caused 94.8% average reduction in cumin yield.

Key words : Cumin, Herbicides, Pre-emergence, Post-emergence, Residual toxicity

India is the major producer of cumin seed spices with total production of 0.65 lakh tonnes and average productivity of 331.7 kg/ha (Government of Rajasthan, 1999). About 55 % of the cumin production comes from Rajasthan. Presence of weeds in cumin fields, not only causes heavy reduction in the productivity but also reduces the quality of cumin seed spice (Chaudhary, 1989) which led to the heavy price reduction in the market. Thus, controlling weeds in cumin fields is imperative. Continuous reduction in the availability of labour and increasing cost of manual weeding compelled farmer's to make demand for pre- and post-emergence herbicides for controlling weeds in the cumin fields. Hence an

experiment was conducted to study weed management in cumin.

MATERIALS AND METHODS

A field experiment was conducted during the winter seasons of 1996–97 and 1997–98 at the Agriculture Research Station, Rajasthan Agricultural University, Keshwana, Jalore. The soil of the experimental field was silt loam in texture with pH 8.2, organic carbon 0.25%, available phosphorus 20 kg P_2O_5 /ha and available potassium 578 kg K_2O /ha.

The experiment consisting 10 treatments (Table 1) was laid out in the randomized block design with 3 replications. Cumin cv. 'RZ 19' was sown on 2 December 1996

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and 17 November 1997 with the row distance of 30 cm and seed rate of 12 kg/ha. The crop was fertilized with nitrogen 30 kg/ha and phosphorus 20 kg/ha as recommended by Pundir and Dhama (1996). Half dose of the nitrogen and full dose of phosphorus were applied as basal through urea and diammonium phosphate and half dose of nitrogen was applied 28 days after sowing (DAS) through urea. Three irrigations were given at 28, 60 and 90 days stages of the crop during both the years. All herbicides were sprayed with the help of foot sprayer fitted with flat-fan nozzle using 500 litres water/ha. Weeds density and dry weight were recorded at 70 days with the help of quadrat of 50 cm × 50 cm size. The cumin crop was harvested on 21 March 1997 and 9 March 1998 respectively. Cumin seeds were separated manually to record the yield. Succeeding crop green gram (*Phaseolus radiatus* L.) cv. 'K 851' was sown on 11 April 1997 to know about residual toxicity of any of the herbicides. There was 1.8 and 1.6 mm rainfall with 1 rainy day during cumin crop seasons of 1996-97 and 1997-98 respectively.

RESULTS AND DISCUSSION

The cumin field was infested with 9 major weed species, viz. *Chenopodium album* L., *Chenopodium murale* L., *Melilotus indica* (L.) All., *Asphodelus tenuifolius* Cav., *Cyperus rotundus* L., *Cirsium arvense* (L.) Scop., *Fumaria parviflora* Lamk., *Tribulus terrestris* L. and *Cynodon dactylon* (L.) Pers. Among them, *C. album*, *C. murale* and *M. indica* were the most pre-dominant weed species with the average density of 55, 20 and 9%

respectively. Highest weed density and dry weight were recorded in unweeded check (Table 1). All herbicides resulted in significant reduction in weed density and dry weight than unweeded check. Linuron 0.5 kg/ha pre-emergence (PE) and post-emergence (PoE) 30 days, Pendimethalin 1.0 kg/ha (PE) and 2 hand-weedings 25 and 45 days after sowing caused least weed count and dry weight being at par among themselves. Oxyfluorfen 0.15 kg/ha (PE) and Isoproturon 1.0 kg/ha (PoE 30 days) also produced weed count and weed dry weight comparable to 2 hand-weedings, but they had phytotoxic effect on cumin crop (Table 2). Fluchloralin 1.0 kg/ha pre-plant incorporation (PPI) and Trifluralin 1.0 kg/ha (PE) resulted significantly higher weed density and dry weight compared to other herbicides which proved their lesser efficacy of controlling weeds during both the years. None of the chemical showed any herbicidal activity against *Cynodon dactylon*, *Cyperus rotundus* and *Tribulus terrestris*.

Cumin yield

Uncontrolled weeds caused 92 and 97.6% yield reduction in the cumin during 1996-97 and 1997-98 crop season respectively (Table 2). It was due to intense weed-crop competition under this treatment. Highest cumin yield was recorded under weed-free treatment during both the years. Linuron 0.5 kg/ha PE and PoE at 30 days and Pendimethalin 0.1 kg/ha (PE) resulted in cumin yield at par with the weed-free treatment. It was due to their better weed-control efficiency (95.7 to 99.2%) and no harmful effect on cumin

Table 1. Effect of weed-control treatments on weed count, dry weight and weed-control efficiency 70 days after sowing

Treatment	Application		Weed count (no./m ²)		Weed dry weight (g/m ²)		Weed-control efficiency (%)	
	Rate (kg/ha)	Time						
			1996-97	1997-98	1996-97	1997-98	1996-97	1997-98
T ₁ Fluchloralin	1.0	PPI	107 (10.29)	231 (15.16)	429 (20.68)	409 (20.09)	73.1	65.8
T ₂ Pendimethalin	1.0	PE	21 (4.63)	61 (7.63)	55 (7.39)	79 (8.72)	96.4	95.8
T ₃ Trifluralin	1.0	PE	345 (18.03)	245 (15.52)	1,190 (34.53)	620 (24.82)	64.2	67.0
T ₄ Linuron	0.5	PE	23 (4.76)	57 (7.45)	77 (8.30)	82 (9.06)	95.7	95.6
T ₅ Linuron	0.5	PoE 30 days	25 (5.02)	0 (1.0)	26 (4.98)	0 (1.0)	98.3	100
T ₆ Oxyfluorfen	0.15	PE	116 (10.41)	124 (11.02)	793 (28.05)	142 (11.87)	83.6	92.4
T ₇ Isoproturon	1.0	PoE 30 days	85 (9.08)	73 (8.53)	239 (15.44)	106 (9.93)	84.4	94.4
T ₈ Hand-weeding		25 and 45 days	34 (5.91)	39 (6.32)	116 (10.40)	72 (8.53)	95.9	95.0
T ₉ Weed-free check			0 (1.0)	0 (1.0)	0 (1.0)	0 (1.0)	100	100
T ₁₀ Unweeded check			895 (28.03)	1,533 (37.34)	1,651 (40.63)	2,068 (45.07)	0	0
CD (P = 0.05)			(5.70)	(6.02)	(10.07)	(6.61)		

Figures in parentheses are square-root transformed values $\sqrt{x + 1.0}$

PPI, Pre-plant incorporation; PE, pre-emergence; PoE, post-emergence

Table 2. Effect of weed-control treatments on cumin growth, yield, economics and yield of succeeding crop

Treatment	Cumin plant weight 70 DAS (g/m ²)		Cumin seed yield (kg/ha)		Common cost (Rs) of raising cumin	Cost (Rs) of chemical/ or hand- weeding	Gross income (Rs)	Net Income (Rs)	Benefit: cost ratio	Greengram yield (kg/ha)
	1996-97	1997-98	1996-97	1997-98						
T ₁	436	259	182.3	107.8	4,362	1,371	5,802	69	0.01	577
T ₂	855	489	514.8	310.3	4,362	1,382	16,502	10,758	1.87	529
T ₃	253	247	90.3	82.3	4,362	990	3,470	-1,882	-0.35	560
T ₄	860	543	545.1	316.7	4,362	660	17,236	12,214	2.43	547
T ₅	812	489	513.9	342.8	4,362	660	17,134	12,112	2.41	573
T ₆	431	381	147.6	240.8	4,362	1,075	7,768	2,331	0.43	569
T ₇	231	138	180.6	62.4	4,362	682	4,860	-184	-0.04	573
T ₈	723	430	507.8	296.9	4,362	2,500	16,668	9,806	1.43	545
T ₉	743	481	587.6	358.2	4,362	5,000	18,918	9,556	1.02	535
T ₁₀	28	145	41.7	8.3			1,000	-3,362	-0.77	538
CD (P=0.05)	290.2	173.6	83.4	72.15					NS	

Details of treatments are given in Table 1

crop at any stage. Hand-weeding at 25 and 45 days also produced cumin spice seed yield, being at par with weed-free treatment but it was more costly. Fluchloralin 1.0 kg/ha (PPI) and Trifluralin 1.0 kg/ha (PE) resulted in significantly less cumin grain yield, due to their lesser weed-control efficiency 69.6 and 65.6% respectively. Oxyfluorfen 0.15 kg/ha (PE) and Isoproturon 1.0 kg/ha (PoE at 30 days) resulted significantly less cumin yield compared with weed-free due to their phytotoxicity on cumin crop as evident from the data on crop dry weight (Table 2).

Succeeding crop

Non-significant difference in the yield of greengram as a succeeding crop showed that none of the herbicides had any residual toxicity to the rotational crop of greengram.

Economic

Maximum gross income was recorded in

the weed-free check treatment (Table 2) but maximum net income and benefit : cost ratio were obtained under the treatments Linuron 0.5 kg/ha (PE), followed by Linuron 0.5 kg/ha (PoE at 30 days) and Pendimethalin 1.0 kg/ha (PE). Rest of the herbicides resulted lesser net income, gross income and benefit : cost ratio. Weed-free check and 2 hand-weedings showed higher gross income but lesser benefit : cost ratio mainly owing to their higher cost of manual weeding.

REFERENCES

- Government of Rajasthan. 1999. *Twenty-five Years of Agricultural Statistics in Rajasthan 1973-74 to 1997-98*. Government of Rajasthan, Jaipur, 37-38.
- Chaudhary, G.R. 1989. Effect of sowing method, nitrogen level and weed control on weed competition, nutrient uptake and quality of cumin. *Indian Journal of Agricultural Sciences* 59(6) : 397-399.
- Pundir, A. and Dhama, A.K. 1996. *Seed Spices Research in Rajasthan*, Rajasthan. pp. 19-26. Rajasthan Agriculture University, Bikaner.