

Integrated weed management in chilli (*Capsicum annuum*)

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ABSTRACT

A field experiment was conducted during the rainy season of 1998–99 and 1999–2000 to study the effect of herbicides (alachlor and fluchloralin) alone and in combination with hand-weeding (45 days after transplanting) on weeds and growth and yield of chilli (*Capsicum annuum* L.). The major weed flora recorded in the experiment field comprised *Cyperus rotundus*, *Celosia argentea*, *Launea splinifolia* and *Euphorbia hirta*. All the treatments significantly reduced the weed population and their dry weight. Significantly lowest weed dry weight and maximum weed-control efficiency were recorded with application of fluchloralin 2.0 kg/ha + hand-weeding at 45 days after transplanting. Maximum plant height, length, diameter, weight and yield of fruit were obtained with weed-free treatment, followed by fluchloralin 2.0 kg + hand-weeding at 45 days after transplanting. But highest net returns and maximum returns/rupee invested were noted with fluchloralin 2 kg/ha + hand-weeding at 45 days after transplanting.

Key words : Chilli, Integrated weed management, Fluchloralin, Alachlor, Yield

Among vegetables, chilli is one of the most valuable cash crops grown throughout the country and all the year round for domestic as well as for export purpose. Being a short-duration crop, chilli is very much affected with weed problems. Weeds deplete crops environment of nutrients, water and light thus, yields of chilli is reduced considerably. In addition, weeds cause spread of several diseases and pests. The quality of produce is also reduced by weed infestation (Pandey, 2000). Chemical control of weeds forms an excellent alternative to manual weeding. However, pre-plant incorporation of herbicides may allow the emergence of weeds after some time. Hence the concept of integrated weed management by combining physical methods with herbicides is gaining importance. The present study was, therefore, conducted to find out an effective and economical weed-control method in chilli.

MATERIALS AND METHODS

The field experiment was conducted at the Experimental Farm of Department of Horticulture, M.G.C.G.V., Chitrakoot, Satna, with chilli cv. 'Jawahar Mirch 218'. The soil was sandy loam, having organic carbon 0.48%, low in available N (225 kg/ha) and P (8.9 kg/ha) and medium in potassium (240 kg/ha) with pH 8.4. The experiment was laid out in randomized block design with 3 replications.

There were 10 treatments comprising 2 herbicides, viz alachlor @ 2.0 and 3.0 kg a.i./ha and fluchloralin @ 1.0 and 2.0 kg a.i./ha, applied alone and in combination with 1 hand-weeding 45 days after transplanting along with weed free and weedy check. Alachlor was applied as pre-emergence (2 days after transplanting of seedlings) and fluchloralin as pre-plant incorporation (2 days before transplanting of seedlings). Four hand-weedings (30, 45, 60 and 75 days after transplanting) were done in weed-free treatment. Herbicides were applied with a manually operated foot sprayer using flat-fan nozzle. One light irrigation was given just after transplanting and others were given as and when necessary.

Healthy seedlings (45 days old) of chilli cv. 'Jawahar Mirch 218' were transplanted in the flat beds at distance of 45 cm × 40 cm in third week of September during 1998 and 1999. The recommended cultural practices and plant-protection measures were adopted to raise a healthy crop. Well-rotten FYM @ 20 tonnes/ha was applied uniformly at the time of field preparation. In addition, the crop was fertilized with 100 kg N, 60 kg P₂O₅ and 50 kg K₂O/ha through urea, single superphosphate and muriate of potash respectively. Weed samples were collected from 1 m² quadrat at 25-day interval and at harvest for weed density and weed dry matter. Effect of treatments on yield attributes, yield and comparative

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Table 1. Effect of weed-control measures on weed population, weed dry weight, weed-control efficiency, plant height, yield attributes, yield and economics of chilli (pooled data of 1998-99 and 1999-2000)

Treatment	Weed population at 75 DAT (no./m ²)	Weed dry weight at 75 DAT (g/m ²)	Weed-control efficiency (%)	Plant height (cm)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Fruit yield (q/ha)	Cost of cultivation (Rs/ha)	Net Returns/rupee return (Rs/ha)	invested (Rs)
T ₁ , Alachlor 2.0 kg/ha (PE)	7.67 (2.85)	17.00 (4.16)	64.04	41.25	11.25	0.82	1.93	16.91	10,115	49,058	5.80
T ₂ , Alachlor 3.0 kg/ha (PE)	4.33 (2.19)	16.00 (4.07)	66.19	40.80	11.40	0.83	1.96	17.33	10,565	49,051	5.70
T ₃ , Alachlor 2.0 kg/ha (PE) + HW at 45 DAT	2.33 (1.68)	13.66 (3.70)	71.83	46.85	13.25	0.98	2.35	18.82	11,015	54,843	5.90
T ₄ , Alachlor 3.0 kg/ha (PE) + HW 45 DAT	2.32 (1.62)	13.66 (3.70)	71.83	45.50	12.90	0.96	2.27	18.40	11,465	52,935	5.60
T ₅ , Fluchloralin 1.0 kg/ha (PPI)	12.33 (3.56)	23.33 (4.19)	50.71	46.70	13.20	0.67	2.29	18.63	9,745	55,472	6.60
T ₆ , Fluchloralin 2.0 kg/ha (PPI)	2.67 (1.34)	18.66 (4.38)	60.57	47.65	13.70	1.02	2.37	18.27	10,325	53,608	6.20
T ₇ , Fluchloralin 1.0 kg/ha (PPI) + HW 45 DAT	10.67 (3.31)	22.00 (4.74)	53.51	46.10	13.15	0.97	2.39	18.58	10,645	54,396	6.00
T ₈ , Fluchloralin 2.0 kg/ha (PPI) + HW 45 DAT	2.00 (1.56)	10.00 (3.33)	78.87	48.90	13.80	1.01	2.41	21.60	11,225	64,480	6.70
T ₉ , Weed-free	0 (0.71)	0 (0.71)	100.00	54.35	15.40	1.14	2.71	21.88	14,565	62,015	5.20
T ₁₀ , Weedy check (control)	34.67 (5.92)	47.33 (6.90)	0.0	39.04	11.15	0.81	1.91	15.30	9,165	44,396	4.80
CD (P=0.05)	0.59	0.69		4.03	2.41	0.26	0.29	2.55			

Figures in the parentheses indicate square-root transformation

PE, Pre-emergence; HW, hand-weeding; DAT, days after transplanting; PPI, pre-plant incorporation

economics were also recorded.

RESULTS AND DISCUSSION

Effect on weeds

The pre-dominant weed species infesting the experimental plots were *Cyperus rotundus*, *Argemone maxicana*, *Celosia argentea*, *Digera arvensis*, *Euphorbia hirta*, *Launea splinifolia* and *Cynodon dactylon*. All the weed-control treatments caused significant reduction in weed population and dry weight of weeds compared to weedy check (Table 1). Herbicidal treatments comprising fluchloralin 2.0 kg/ha + hand-weeding at 45 days after transplanting and alachlor 3 kg/ha + hand-weeding 45 days after transplanting significantly reduced the weed population and dry-matter accumulation. Alachlor 2.0 kg/ha + hand-weeding 45 days after transplanting was equally effective in reducing the dry weight of weeds compared to its higher concentration. Maximum weed-control efficiency due to herbicidal treatments was found with fluchloralin 2.0 kg/ha + hand-weeding at 45 days after transplanting, followed by alachlor 2.0 kg/ha + hand-weeding 45 days after transplanting and alachlor 3.0 kg/ha + hand-weeding 45 days after transplanting. In general, all the treatments at higher rates showed more favourable effect in reducing the weed growth over their lower dose. This was due to the fact that herbicides at higher rates gave better control of weeds due to their greater persistence in soil. Excellent effect of fluchloralin had also been observed for combating various species of weeds in cauliflower (Saimbhi *et al.*, 1992), onion (Sandhu *et al.*, 1993; and Sandhu *et al.* 1997).

Effect on yield attributes and yield

Plant height, fruit length, fruit diameter, fruit weight and yield of dry chilli were significantly influenced due to weed-control measures (Table 1). Maximum plant height, fruit length, fruit diameter, weight of fruit and yield were recorded under weed-free treatment, followed by fluchloralin 2.0 kg/ha + hand weeding 45 days after transplanting. Hand-weeding at 45 days after transplanting in combination with herbicides showed improvement in yield and yield attributes. This may be attributed to proper

aeration, reduced crop-weed competition and better utilization of resources by the crop. These results are in accordance with the findings of Sandhu and Randhawa (1978), Patel *et al.* (1986) and Singh (1996) in onion.

Monetary returns

Maximum cost of cultivation was observed with weed-free treatment, while minimum with weedy check (control). Fluchloralin 2.0 kg/ha + hand-weeding at 45 days after transplanting recorded the maximum net returns, followed by weed-free and alachlor 2.0 kg/ha + hand weeding at 45 days after transplanting. Highest returns/rupee invested was also found under fluchloralin 2.0 kg/ha + hand-weeding at 45 days after transplanting and lowest under weedy check. Control of weeds either through herbicide alone or in combination with hand-weeding at 45 days after transplanting registered higher returns/rupee invested compared to weed-free treatment. It was mainly due to higher cost involved in repeated manual weeding to keep field free from weeds.

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