

## Integrated Weed Management in Transplanted Chilli Under Irrigated Conditions of Arid Zone

R.S. Yadav

Agricultural Research Station, Rajasthan Agricultural University, Mandore, Jodhpur 342 304, India

**Abstract:** An investigation was carried out to evaluate effect of integrated methods of weed control on weeds and their effect on chilli (*Capsicum annum* L.) yield during 1993-94 and 1995-96. Among the weed control treatments, oxyflourfen at 0.2 kg ha<sup>-1</sup> or pendimethalin at 1.0 kg ha<sup>-1</sup> supplement with two hoeings at 30 and 60 days after transplanting (DAT) significantly reduced the dry weight of grassy as well as broad-leaved weeds compared to oxyflourfen at 0.3 kg ha<sup>-1</sup> alone or supplement with one hoeing at 30 DAT. Oxyflourfen (0.2 to 0.3 kg ha<sup>-1</sup>) or pendimethalin (1.0 kg ha<sup>-1</sup>) when integrated with one or two weedings produced significantly higher dry chilli yield compared to herbicide alone (oxyflourfen at 0.3 kg ha<sup>-1</sup>). Highest benefit:cost ratio was also obtained in oxyflourfen at 0.2 kg ha<sup>-1</sup> supplement with two hoeings at 30 and 60 DAT.

**Key words:** Oxyflourfen, pendimethalin, grassy weeds, broad-leaved weeds, hand hoeing.

Chilli (*Capsicum annum* L.) is a long duration crop, usually infested with a large number of broad-leaf and grassy weeds, which emerge simultaneously, but establish earlier than the crop plant. Practice of adopting wide spacing, liberal supply of organic manures, fertilizers and frequent irrigations, contribute to severe weed infestation and their luxurious growth (Singh *et al.*, 1993). The weed infestation may reduce chilli yield by 60-80% (Sharma *et al.*, 1988; Narayana Rao, 1990). Farmers usually control weeds manually, but repeated flushes of weeds make the manual weeding ineffective and costly. Oxyflourfen at 0.3 kg ha<sup>-1</sup> and pendimethalin at 1.0 kg ha<sup>-1</sup> were found effective in controlling weeds and increasing yield of transplanted chilli (Singh *et al.*, 1995). However, the sole dependence on herbicides may lead to dominance of a nonsusceptible weeds and other numerous problems like soil

pollution and persistence. However, the herbicides should not be considered as replacement of mechanical methods, but be used in conjunction with mechanical methods of weed control. Taking into consideration the above points, experiment on weed management in transplanted chilli was carried out in arid region of Rajasthan under irrigated conditions.

### Materials and Methods

The field experiment was carried out at the Agricultural Research Station, Mandore, during 1993-94 and 1995-96. The soil was loamy sand having low organic carbon (0.27%), medium phosphorus (13.6 kg ha<sup>-1</sup>) and high potash (356 kg ha<sup>-1</sup>) with pH 8.3. The experiment was laid out in randomized block design (RBD) with 3 replications. The treatments included pre-transplanting application of oxyflourfen at 0.2 and 0.3 kg ha<sup>-1</sup>, along with one and/or two hoeings

with local hoe at 30 and 60 days after transplanting (DAT); pendimethalin at 1.0 kg ha<sup>-1</sup> combined with one and/or two hoeings at 30 and 60 DAT; two hand hoeing at 30 and 60 DAT; weed free; weed check and a recommended check of oxyflourfen at 0.3 kg ha<sup>-1</sup> alone. Herbicides were applied with a knapsack sprayer using a spray volume of 650 L ha<sup>-1</sup>. Thirty five-day-old seedlings of RCH-1 chilli were transplanted on 2 and 4 August during 1993 and 1995, respectively, at a crop geometry of 45 x 30 cm. A basal dose of 45 kg N and 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> was applied at the time of seed bed preparation and a further 45 kg N was top-dressed 30 DAT just before the irrigation. Irrigations at an interval of 10 days were applied throughout the season. The final picking of chilli fruits was done on 14 and 10 February

during 1994 and 1996, respectively. Weed dry weight was recorded separately for broad-leaf weeds and jointly for grasses using 50 x 50 cm quadrat placed at 3 randomly selected spots in each plot. Weed control efficiency (WCE) was calculated following:

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

where,

W<sub>C</sub> is weight of weeds in weedy check plot, and W<sub>T</sub> is weight of weeds in treated plot.

## Results and Discussion

### Weeds

The dominant weed flora of the experimental field consisted of broad-leaf weeds, viz., wild amaranth (*Amaranthus viridis* L.) and horse purslane (*Trainthema*

Table 1. Dry weight of weeds in transplanted chilli as influenced by weed control treatments (Pooled data of 2 years)

	Weed dry weight (g m <sup>-2</sup> ) at 95 DAT				Weed control efficiency (%)
	Summer grass + crow foot grass	Wild amaranth	Horse purslane	Total weeds	
T <sub>1</sub>	341.4 (18.5)*	266.8 (16.4)	142.5 (11.9)	768.6 (27.7)	—
T <sub>2</sub>	0.0 (0.7)	0.0 (0.7)	0.0 (0.7)	0.0 (0.7)	100.0
T <sub>3</sub>	19.2 (4.4)	26.6 (5.2)	38.7 (6.2)	86.9 (9.3)	88.7
T <sub>4</sub>	137.3 (11.7)	66.7 (8.1)	41.8 (6.5)	254.3 (15.9)	66.9
T <sub>5</sub>	40.8 (6.4)	26.3 (5.2)	20.2 (4.5)	91.7 (9.6)	87.1
T <sub>6</sub>	3.2 (1.9)	3.4 (1.9)	4.6 (2.2)	12.5 (3.6)	98.4
T <sub>7</sub>	62.5 (7.9)	36.9 (6.1)	36.0 (6.0)	153.2 (12.4)	80.1
T <sub>8</sub>	7.3 (2.7)	5.2(2.4)	7.4 (2.8)	21.7 (4.7)	97.1
T <sub>9</sub>	13.4 (3.7)	60.5 (7.9)	38.0 (6.2)	113.4 (10.6)	85.2
T <sub>10</sub>	2.6 (1.7)	8.1 (2.9)	5.2 (2.4)	17.5 (4.2)	97.7
CD (P=0.05)	2.1	1.8	2.4		

T<sub>1</sub>: Weedy check, T<sub>2</sub>: weed free, T<sub>3</sub>: two hand hoeings at 30 and 60 days after transplanting (DAT); T<sub>4</sub>: oxyflourfen at 0.3 kg ha<sup>-1</sup>, T<sub>5</sub>: oxyflourfen at 0.3 kg ha<sup>-1</sup> + one hand hoeing at 30 DAT; T<sub>6</sub>: oxyflourfen at 0.3 kg ha<sup>-1</sup> + two hoeings at 30 and 60 DAT, T<sub>7</sub>: oxyflourfen at 0.2 kg ha<sup>-1</sup> + one hoeing at 30 DAT; T<sub>8</sub>: oxyflourfean at 0.2 kg ha<sup>-1</sup> + two hoeings at 30 and 60 DAT, T<sub>9</sub>: pendimethalin at 1.0 kg ha<sup>-1</sup> + one hoeing at 30 DAT, T<sub>10</sub>: Pendimethalin at 1.0 kg ha<sup>-1</sup> + two hoeings at 30 and 60 DAT.

\* Figures in parenthesis are transformed to x+0.5.

Table 2. Effect of different weed control treatments on growth, yield and economics of chilli

Treatments	Branches/plant (No.)	Fruits/plant (No.)	Final plant population ( $\times 1000 \text{ ha}^{-1}$ )	Dry chilli yield ( $\text{q ha}^{-1}$ )	Net return (Rs. $\text{ha}^{-1}$ )	C:B ratio
T <sub>1</sub>	1.5	37.6	8.6	2.4	-9000	-
T <sub>2</sub>	5.4	70.2	62.3	19.8	22600	1:1.33
T <sub>3</sub>	4.2	69.8	45.6	16.3	17200	1:1.12
T <sub>4</sub>	3.6	62.6	48.2	14.7	13904	1:0.90
T <sub>5</sub>	4.9	68.7	56.0	19.7	23584	1:1.49
T <sub>6</sub>	5.6	70.0	60.4	20.5	24992	1:1.56
T <sub>7</sub>	4.5	67.5	55.3	18.6	21907	1:1.43
T <sub>8</sub>	5.1	69.3	60.2	20.0	24515	1:1.58
T <sub>9</sub>	4.6	67.2	57.5	18.2	20712	1:1.32
T <sub>10</sub>	4.9	69.8	62.6	19.4	22920	1:1.44
CD (P=0.05)	0.8	5.3	7.1	2.1		

Details of treatments are given in Table 1.

Cost of chilli produce Rs. 2000  $\text{q}^{-1}$ ; Stomp (Pendimethalin) @ 432  $\text{L}^{-1}$ . Goal (Oxyflourfen) @ 1230  $\text{L}^{-1}$ ; labor cost Rs. 32  $\text{labor}^{-1} \text{ day}^{-1}$ .

*portulacastrum* L.) and grassy weeds of summer grass (*Digitaria ciliaris* (R) koeler) and crow foot grass (*Dactyloctenium aegyptium* (L.) wild) during both the years. The dry weight of grassy and broad-leaf weeds were significantly reduced by all the weed control treatments compared to weedy check (Table 1). Oxyflourfen ( $0.2 \text{ kg ha}^{-1}$ ) combined with two hoeings at 30 and 60 DAT significantly reduced the dry weight of both grassy and broad-leaf weeds compared to oxyflourfen ( $0.2$  or  $0.3 \text{ kg ha}^{-1}$ ) with one hoeing (T<sub>5</sub>, T<sub>7</sub>). Pendimethalin ( $1.0 \text{ kg ha}^{-1}$ ) + one hoeing controlled grassy weeds as effectively as the oxyflourfen at  $0.2$  or  $0.3 \text{ kg ha}^{-1}$  with two hoeings (T<sub>6</sub>, T<sub>8</sub>), but oxyflourfen ( $0.3 \text{ kg ha}^{-1}$ ) + one hoeing was more effective on broad-leaved weeds compared to pendimethalin (T<sub>9</sub>). Singh *et al.* (1995) also reported similar results. The WCE was maximum (98.4%) in the plots sprayed with oxyflourfen at  $0.3 \text{ kg ha}^{-1}$  and given two supplement hoeings, closely

followed by pendimethalin ( $1.0 \text{ kg ha}^{-1}$ ) with two hoeings (97.7%) or oxyflourfen ( $0.2 \text{ kg ha}^{-1}$ ) with two hoeings (97.1%). Similar results were also reported by Kumar and Thakral (1993).

#### Yield attributes and yield

Presence of weeds adversely affected the final plant population, branches and fruits per plant. All the weed control treatments significantly reduced the plant mortality as compared to weedy check (Table 2). Significantly higher number of plants survived in the herbicidal treatments with one or two hoeings compared to two hoeings or oxyflourfen at  $0.3 \text{ kg ha}^{-1}$  alone. Branches per plant were increased by 55.5 and 41.7%, while fruits per plant increased by 13.6 and 12.5% with the application of oxyflourfen at  $0.3$  or  $0.2 \text{ kg ha}^{-1}$  + two hoeings (T<sub>5</sub>, T<sub>6</sub>), respectively, compared with oxyflourfen at  $0.3 \text{ kg ha}^{-1}$  alone.

All the weed control treatments produced significantly higher dry chilli yield compared with weedy check. Oxyflourfen (0.2 to 0.3 kg ha<sup>-1</sup>) or pendimethalin (1.0 kg ha<sup>-1</sup>), when integrated with manual weedings, produced significantly higher dry chilli yield compared to herbicide alone (oxyflourfen at 0.3 kg ha<sup>-1</sup>). Oxyflourfen at 0.2 kg ha<sup>-1</sup> + two hoeings had chilli yield statistically at par with oxyflourfen (0.3 kg ha<sup>-1</sup>) + two hoeings (T<sub>6</sub>), but had significantly higher yield compared to two hoeings (T<sub>3</sub>) or oxyflourfen 0.3 kg ha<sup>-1</sup> alone (T<sub>4</sub>). Singh *et al.* (1995) also reported similar results. Oxyflourfen (0.2-0.3 kg ha<sup>-1</sup>) with one hoeing produced chilli yield statistically at par with oxyflourfen (0.2-0.3 kg ha<sup>-1</sup>) or pendimethalin (1.0 kg ha<sup>-1</sup>) supplement with two hoeings. Singh *et al.* (1993) also advocated the application of herbicides with one or two manual weedings.

#### Economics

Of the different weed control treatments, the highest net return was obtained in oxyflourfen at 0.3 kg ha<sup>-1</sup> + two hoeings (Rs. 24,992 ha<sup>-1</sup>), closely followed by lower dose of oxyflourfen (0.2 kg ha<sup>-1</sup>) with two hoeings (Rs. 24,515 ha<sup>-1</sup>). However, greatest benefit:cost ratio was obtained in lower dose of oxyflourfen (0.2 kg ha<sup>-1</sup>) with two hoeings, closely followed by oxyflourfen at 0.3 kg ha<sup>-1</sup> + two hoeings (Table 2).

It is concluded from the two year study that integration of herbicide oxyflourfen at

0.2-0.3 kg ha<sup>-1</sup>, with one or two manual weedings, depending upon the cost and availability of labor, was found effective and economically viable method to control weeds in transplanted chilli in arid zone of Rajasthan.

#### References

- Kumar, A. and Thakral, K.K. 1993. Effect of herbicide and nitrogen fertilization on growth and yield of chilli (*Capsicum frutescens* L.). In *Proceedings of International Symposium on Integrated Weed Management for Sustainable Agriculture*, Vol. 3, pp. 206-208. CCS Haryana Agricultural University, Hisar.
- Narayana Rao, K. 1990. Effect of herbicides under different soil regimes on weed control, yield and quality of chillies (*Capsicum annum* L.). In *Abstract of Papers Presented in Biennial Conference of Indian Society of Weed Sciences*, held at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, pp. 140-141.
- Semidey, N., Carabalio, E. and Acin, N. 1989. Broad leaved weed control in peppers with herbicides applied pre-transplant. *Journal of Agriculture of University of Puerto Rico* 73: 67-73.
- Singh, K., Pandita, M.L. and Thakral, K.K. 1993. Integrated weed management in vegetable crops. In *Proceedings of International Symposium on Integrated Weed Management for Sustainable Agriculture*, Vol. 1, pp. 365-368. CCS Haryana Agricultural University, Hisar.
- Singh, R., Jangir, R.P. and Poonia, B.L. 1995. Evaluation of herbicides for control of weeds in chilli (*Capsicum annum*). *Indian Journal of Agricultural Sciences* 65: 723-726.
- Sharma, P.P., Lankroo, G.M. and Arya, P.S. 1988. Chemical weed control in bell pepper (*Capsicum annum* L.). *Vegetable Science* 15: 113-119.