Progressive Research 5 (Special) : 373-376 (Dec. 2010) *Society for Sci. Dev. in Agric. and Tech.*

EFFECT OF HERBICIDES ON WEED CONTROL EFFICIENCY AND YIELD ATTRIBUTES IN CHILLI (*CAPSICUM ANNUUM* L.) CV K-2

Sha K. and P. Karuppaiah

Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamilnadu-608002

ABSTRACT

A field Experiment was conducted at Department of Horticulture, Annamalai university during 2005 to study the effect of herbicides on weed control efficiency and yield attributes in chilli the experiment consisting of 10 treatments comprising 4 herbicides (alachlor at 1.0 and 1.5 kg ha^{-1}, fluchloralin at 1.0 and 1.5 kg ha^{-1}, pendimethalin at 1.0 and 1.5 kg ha^{-1}, glyphosate at 1.0 and 1.5 kg a.i. ha^{-1} compared with weed free check, unweeded control. results revealed that the application of fluchloralin and glyphosate at 1.5 kg ha^{-1} were found to be phytotoxic while pendimethalin at 1.0 and 1.5 kg ha^{-1} was found not phytotoxic to the chilli the total number and total dry weight of weeds were found to be maximum in unweeded control and weed control treatments decreased these parameters but pendimethalin at 1.5 kg ha^{-1} were the lowest. wce (%) was highest with the pendimethalin at 1.5 kg ha^{-1}. the yield parameters viz., number of fruits, fruit weight, and fruit yield decreased significantly in unweeded control while weed control index was higher. the fruit yield was significantly higher with application of pendimethalin at 1.5 kg ha^{-1}.

Key words : *Herbicide, leaf area, chilli , WCE, yield.*

Chilli (*Capsicum annuum* l.) is an important commercial vegetable crop. it belongs to the family solanaceae. chilli). It is one of the most common, popular and principal vegetable crops grown in india and other parts of world. india is the centre of origin of chilli crop. Weeds are the most serious problem in chilli cultivation because of liberal use of farmyard manure, chemical fertilizers and frequent irrigations that help the weeds to grow vigorously. it has been well established that losses from weeds accounts for 45 per cent more than when compared to insect, pest and diseases about 30 and 20 per cent, respectively in most of the vegetable crops, the early growth period is the most critical stage at which stresses of any kind affects the economic yields. weed competition is one of the important stress during this period. besides, this period coincides with the season of peak labour activity leading to scarcity of labour for weeding. this adds to the already high costs of production. so proper weed control method, therefore, is the prime need and very much essential to give herbicide usage its share to obtain maximum productivity. the herbicides when used in combination with one or two hand weedings, improves their efficiency and the pre-emergent herbicides are beneficial to keep the crop weed free in the early stages. during later stages, hand weeding helps to reduce the cost of weeding and keep the weed population below the economic threshold level throughout the crop growth period. keeping all this in view, the present study was carried out the effect of herbicides on weed control efficiency, and yield attributes in chilli

MATERIALS AND METHODS

Field experiment on integrated weed management was carried out in the experimental farm.Department of Horticulture, Faculty of Agriculture, Annamalai University during 2005 to study the efficacy of weed management yield and quality of chilli (*Capsicum annuum*) this experiment was laid out in randomized block design. the 10 treatments were involving four different herbicides with two different rates of application (1.0 and 1.5 kg active ingredient per hector) were applied as three pre-emergent herbicide and and one post emergent herbicide having one hand weeding after 30 days of transplanting. the details of all the treatments are comprised T_1: alachlor @ 1.0 kg a.i. ha-1 + 1 hw at 30 DAT, T_2: alachlor @ 1.5 kg ha^{-1} + 1 hw at 30 DAT, T_3: fluchloralin @ 1.0 kg ha^{-1} + 1 hw at 30 DAT, T_4: fluchloralin @ 1.5 kg. ha^{-1} + 1 hw at 30 DAT, T_5: pendimethalin @ 1.0 kg ha^{-1} + 1 hw at 30 DAT ,T_6: pendimethalin @ 1.5 kg ha^{-1} + 1 hw at 30 DAT ,T_7: glyphosate @ 1.0 kg ha^{-1} + 1 hw at 30 DAT, T_8: glyphosate @ 1.5 kg ha^{-1} + 1 hw at 30 DAT T_9: weed free check + 1hw at 30 DAT, T_{10}: unweeded control weeding with hand hoe was done as a due representation of the local practice by the farmers of this region and it was done on 30 days after planting (DAT), based on the

Table-1 : Effect of chemical weed management on chilli (*Capsicum annuum* L.) cv-K-2.

Treatments	Weed population 120 DAT	weed DMP 120 DAT	weed control index 120 DAT	Plant height 120 DAT	Number of branches 120 DAT	Total chlorophyll content (mg/g)	Crop dry matter production (kg/ha)
T_1 : Alachlor @ 1.0 kg a.i./ha + 1 hw at 30 DAT	8.67 (74.84)	689.13	34.89 (32.73)	86.83	33.05	7.14	2618.26
T_2 : Alachlor @ 1.5 kg/ha + 1 hw at 30 DAT	7.06 (58.28)	302.52	41.42 (43.78)	95.67	35.84	8.07	2832.41
T_3 : Fluchloralin @ 1.0 kg/ha + 1 hw at 30 DAT	8.05 (64.39)	648.23	39.87 (41.11)	91.42	34.58	7.78	2760.13
T_4 : Fluchloralin @ 1.5 kg./ha + 1 hw at 30 DAT	6.13 (37.18)	370.27	53.30 (64.30)	119.42	38.56	8.72	2987.64
T_5 : Pendimethalin @ 1.0 kg/ha + 1 hw at 30 DAT	8.42 (70.42)	652.52	37.83 (37.63)	88.97	33.29	7.43	2689.40
T_6 : Pendimethalin @ 1.5 kg/ha + 1 hw at 30 DAT	7.20 (51.40)	562.41	43.98 (48.23)	96.36	36.10	8.19	2847.53
T_7 : Glyphosate @ 1.0 kg/ha + 1 hw at 30 DAT	11.56 (133.18)	865.10	21.87 (21.86)	83.79	29.82	6.68	2407.30
T_8 : Glyphosate @ 1.5 kg/ha + 1 hw at 30 DAT	10.94 (119.24)	780.61	31.58 (27.44)	84.36	30.18	6.73	2419.56
T_9 : Weed free check + 1 hw at 30 DAT	9.41 (88.19)	750.12	32.88 (29.48)	84.70	30.44	6.88	2437.11
T_{10} : Unweeded control	12.79 (163.24)	1024.17	-	73.18	23.34	5.49	1748.27
SED	2.45	5.37	1.28	1.04	0.59	0.11	4.63
CD (p=0.05)	4.94	10.74	2.56	2.08	1.18	0.05	9.27

Table-2 : Effect of chemical weed management on chilli (*Capsicum annuum* L.) cv-K-2.

Treatments	No.of flower plant-1	No.of fruits plant-1	Fruit volume (cm3)	Dry fuit yield g/plant	Dry fruit yield kg/ ha	Ascorbic acid content Mg/g	Capsaicin content %
T_1 : Alachlor @ 1.0 kg a.i./ha + 1 hw at 30 DAT	99.82	66.42	4.86	259.03	1942.78	133.14	71.66
T_2 : Alachlor @ 1.5 kg/ha + 1 hw at 30 DAT	110.78	78.64	5.13	306.69	2300.22	145.61	81.27
T3 : Fluchloralin @ 1.0 kg/ha + 1 hw at 30 DAT	107.29	75.21	5.04	293.31	2199.89	140.37	78.14
T_4 : Fluchloralin @ 1.5 kg/ha + 1 hw at 30 DAT	119.41	99.68	5.32	344.64	2584.82	154.63	88.47
T_5 : Pendimethalin @ 1.0 kg/ha + 1 hw at 30 DAT	103.62	70.87	4.95	276.39	2072.94	136.43	74.89
T_6 : Pendimethalin @ 1.5 kg/ha + 1 hw at 30 DAT	111.69	80.72	5.17	314.80	2361.06	147.02	83.85
T_7 : Glyphosate @ 1.0 kg/ha + 1 hw at 30 DAT	94.78	60.44	4.69	235.71	1767.87	125.63	67.49
T_8 : Glyphosate @ 1.5 kg/ha + 1 hw at 30 DAT	95.64	61.53	4.74	239.96	1799.75	126.71	68.22
T_9 : Weed free check + 1hw at 30 DAT	96.37	62.07	4.78	242.07	1815.54	127.68	68.37
T_{10} : Unweeded control	67.38	41.15	4.16	144.02	1080.15	93.16	59.33
SED	1.65	1.62	0.03	3.15	2.82	1.60	1.09
CD (p=0.05)	3.29	3.24	0.06	6.31	5.64	3.20	2.19

treatment. for hand weeding alone treatment, the two hand hoeings were done on 30 and DAT. for the treatments receiving hand weeding along with herbicide, the hand hoeing was done on 30 DAT. The pre-emergence herbicide application *viz.,* alachlor, pendimethalin and pre-planting herbicide fluchloralin were sprayed with 500 litres/ha of water through knapsack sprayer fitted with floodset nozzle. the herbicide fluchloralin was applied and incorporated in the plots before planting by spraying on dry soil immediately followed by irrigation, alachlor and pendimethalin was sprayed on third day after transplanting over a wet soil with adequate soil moisture as per the specified doses.

Weed count : Weed counts were recorded on 60, 90 and 120 DAT from four quadrates of 0.25 m 0.25 m area fixed permanently in each plot later, the DAT were computed to get the weed count m^{-2}.weed dry matter production (DMP) (kg/ha) the weeds is sample quadrates were collected from each plot separately at the time of harvest. these weeds after cleaning were dried in shade and hot air oven at 80 5 c for 48 hours and the dmp was recorded in g m^{-2} and later computed to kg ha^{-1}. weed control index (per cent) weed control index was worked out to evaluate the comparative efficacy of various weed control treatments tested for weed control in chilli crop. weed control index for each

treatment plot was estimated by using the formula suggested by Mishra And Tosh (1979).

$$\text{Weed control index (WCI)} = \frac{A - B}{A} \quad 100$$

where,

a = weed biomass of weedy check plot

b = weed biomass of treated plots for which wci is to be calculated

Nutrient removal by weeds : The weed samples collected at the time of harvesting from the net plot were used for the analysis of N, P and K removal as per the procedure and expressed in kg ha-$^{1.}$ observations were recorded on five competitive plants excluding border plants in each replication in each genotype for plant height (cm), number of branches per plant, days to 50% flowering, number of fruits per plant, fruit length (cm), fruit weight (g) and yield per plant (g). the DAT obtained in respect of all the characters has been subjected to statistical analysis by using IRRI STATt software was used for the statistical analysis of DAT.

RESULTS AND DISCUSSION

The chemical weed management system is basically an integration of effective, dependable and workable weed management practices that can be used economically by the producers as a part of sound farm management system. integration of cultural, mechanical and other weed control practices offers better management of all types of weeds. among the different chemical weed management practices, integration of manual, chemical and accomplished by is a process which is highly useful and beneficial in the production system of tropical vegetables Ajaikumar and Thakral. 1993 the results indicated that the integration of fluchloralin 1.5 kg ha-1 along with one hand weeding on 30 DAT performed the best followed by fluchloralin hand weeding an on 30 DAT. the best performance of integrated weed management over the hand weeding might be due to the herbicidal action on killing the weed propagules to avoid their further establishment along with removal of fresh enrichment of weeds by hand weeding on 30 DAT In chilli, the growth parameter like plant height was directly influence the economic yield. the importance of this growth attribute in chilli has been emphasized by Kajod Mal (2005). in the present study, the unweeded treatment recorded the minimum plant height which could be due to weed competition for nutrients and moisture with the main crop plants thus reducing the crop growth. similar finding was also reported by Nandal and Pandita (1988).

With regarding the weed management treatments on growth characters such as number of primary and secondary branches per plant, number of leaves per plant of chilli, all the treatments significantly improved the growth characters over the unwedded check. among the different treatments, fluchloralin 1.5 kg ha^{-1} one hand weeding on 30 DAT was found to be the best followed by two hand weeding on 30 DAT.In these treatments, the effective control of weeds reduced the competition for nutrition and moisture which ultimately brought about increased plant growth as reported by Raghav *et al*. (1987). Similar results on the increased plant growth characters due to integrated weed management were reported by Rapparini and Campagna. 1996 in tomato and Nandal and Pandita. 1998.

In chilli the number of flowers per plant, number of fruits per plant, fruit set percentage and yield per plant were influenced by different weed management treatments the yield characters of chilli were observed to be the maximum in (fluchloralin 1.5 kg ha^{-1} + one hand weeding on 30 DAT) followed by T_4 fluchloralin 1.0 kg+one hand weeding on 30 and reduced yield in case of the control plot may be attributed due to reduced plant growth because of the competition of weeds with crop for nutrient and moisture. the dry weight of weeds correlated with most of the growth and yield parameters of chilli similar findings on increased yield due to weed control have been reported by Suso 1998 in chilli

Ascorbic acid is an important quality constituent in chilli the ascorbic acid content did not show any appreciable variation due to application of organic manures and also by growth regulators. however, it is interesting that ascorbic acid content could be increased due to the better weed management practices. ascorbic acid content showed significant variation due to the combined application fluchloralin 1.5 kg ha^{-1} along with one hand weeding on 30 DAT.

The amount of capsaicin is one of the important quality parameter in chilli, which responsible for the pungency. in the present experiment, the higher level

of capsaicin was recorded when the plants were provided with combination of fluchloralin 1.5 kg ha^{-1} one hand weeding on 30 DAT the capsaicin content of chilli was significantly influenced by nutrients (Yaduraj and Ahuja 1999). Similar variation of capsaicin content was reported by Kajod Mal *et al*. (2005). weed management treatments also influenced significantly the physiological characters such as total chlorophyll content, net photosynthetic rate and crop dry matter production. among the different weed management practices, the treatment T_4 (fluchloralin 1.5 kg ha^{-1} one hand weeding on 30 DAT) recorded the highest total chlorophyll content, net photosynthetic rate and crop dry matter production. higher chlorophyll content might be due to better utilization of nitrogen and magnesium which indirectly influenced the photosynthetic activity resulting in better production of assimilates and improved plant growth and yield.In the present study also higher chlorophyll content and photosynthetic rate were observed in the superior treatments than the unweeded control. this may be due to the competition of weeds with the crop on the nutrient uptake as reported by Sharma and Singh 2008 which could ultimately alter the chlorophyll content and photosynthetic rate. here, it is understandable that the weeds are reducing the photosynthetic rate of the chilli just by competing for the nutrients, light, water and space and by the way reduced the growth and yield. this may be the reason for the better growth, crop dry matter production and yield of crop under superior treatment.

The number of flowers per plant, number of fruits per plant, fruit set percentage and yield per plant were influenced by different weed management treatments the yield characters of chilli were observed to be the maximum in T_4 (fluchloralin 1.5 kg ha^{-1} + one hand weeding on 30 DAT) followed by T_6 (fluchloralin 1.0 + one hand weeding on 30 DAT reduced yield in case of the control plot may be attributed due to reduced plant growth because of the competition of weeds with crop for nutrient and moisture. the dry weight of weeds correlated with most of the growth and yield parameters of chilli similar findings on increased yield due to weed control have been reported by Ajaikumar, and Thakral. 1993in chilli.

REFERENCES

1. Ajaikumar, and T.K. Thakral. 1993. Effect of herbicides and nitrogen fertilization on growth and yield of chilli. In: Proc. Int. Symp., Indian Soc. Weed Sci., Hisar, Nov. 18-20. Vol. III.
2. Kajod Mal, R.L. Yadav and R. Paliwal. 2005. Effect of chemical weed control and nitrogen levels in cauliflower. *Indian J. Hort., 62(3):* 257-259.
3. Kunti, Gaurav Sharma* and A.P. Singh 2008 Weed management practices on growth and yield of winter season brinjal under Chhattisgarh plain conditions *Indian Journal of Weed Science 44(1):* 18–20.
4. Nandal, T.R. and M.L. Pandita. 1998. Chemical weed control in brinjal. *Indian J. Weed Sci., 20(3) :* 55-59.
5. Raghav, M., A.B. Abidi, A. Singh and S. Shrivastava. 1987. Chemical weed control in onion. *Sci. and Culture, 53:* 53-55.
6. Rapparini, G. and G. Campagna. 1996. Chemical weed control in direct-sown and transplanted tomatoes. Inform. *Agrario., 58 :* 83-93.
7. Sharma, A.B., R.K. Patel and J.P. Tiwari. 1983. Chemical weed control in garlic. *Indian Weed Sci., 15(1) :* 17-22.
8. Suso, M.L., A. Parda, L. Lorente Fernandez. 1998. Pre-emergence herbicide trials in paprika pepper. International 6th Symp. Mediterranean ELNRS-P, 13-15.
9. Yaduraj, N.T. and K.N. Ahuja. 1999. Weed control in onion (*Allium cepa* L.) through herbicides. *Indian J. Weed Sci., 3(3&4):* 253-254.