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Influence of integrated weed managementon weed dynamics and productivity of chili

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ABSTRACT

A field experiment was carried out at Vegetable Research Farm, Mahrajpur, Department of Horticulture, JNKVV, Jabalpur (M.P.) to study the efficacy of different herbicides and mulches against weeds in chili, It was recorded that dominant weed flora in the experiment was *Eragrostiscillansis* and *Cyperusrotindus* among monocot weeds, *Chenopodium album*, *Melilotus alba*, *Anagallisaruensis* and *Parthenium hysterophorus* among dicot weeds. Highest weed density of all the weed species, dry weed biomass were recorded in weedy check plots. Pendimethalin @ 1.5 l/ha + black polythene mulch resulted in the highest plant height (75.3 cm), number of primary branches per plant (15.66), number of fruitsper plant (73.33), yield of red ripe fruit (134.7q/ha^{-1}) and yield of dry fruit (22qha-^{1}) followed by Pendimethalin @ 1.5 l/ha + paddy straw mulch. Therefore, pendimethalin @ 1.5 l/ha + black polythene mulch resulted in the most effective treatment in terms of weed suppression and yield enhancement of chili crop.

Key words: Chili, weed management, weed density, weed flora, fruit yield

INTRODUCTION

Chili (*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 (Singh *et al*., 2012b). The practice of adopting wide spacing, liberal supply of organic, manures, fertilizers and frequent irrigations; contribute to severe weed infestation and their luxurious growth (Singh and Pandey, 2014). The weed infestation may reduce economic yield by 60-80% (Singh, 2016). Chili is cultivated worldwide. It is an indispensable spice essentially used in every Indian cuisine, due to its pungency, taste, colour, and aroma. Chili fruits are rich sources of vitamin C, A and E (Singh *et al.*, 2012b). Immediately after transplanting, chili seedlings grow slowly whereas weeds emerge fast and grow rapidly competing with the crop severally for growth resources, viz. nutrients, moisture, sunlight and space during entire vegetative and early reproductive stages of chili (Isik *et al*., 2009).

Further, wide space provided to the chili allows fast growth of a variety of weed species causing a considerable reduction in yield by affecting the growth and yield components. Presence of weeds reduces the photosynthetic efficiency, dry matter production, and its distribution to economical parts and there by reduces the sink capacity of crop resulting in poor fruit yield (Singh and Pandey, 2014). Thus, the extent of reduction in fruit yield of chili has been reported to be in the range of 60-70% depending on the intensity and persistence of weed density in standing crop (Khan *et al*., 2012).

Weed infestation not only reduces the economic yield, but they also impair the quality of fruits due to harboring disease agents and insect pests (Singh *et al*., 2012a). The choice of any weed control measures, therefore, depends largely on its effectiveness and economics (Amador *et al*., 2007). Because of increased cost and non-availability of manual labour for hand weeding, herbicides not only control the weeds timely and effectively but also offer a great scope for minimizing the cost of weed control irrespective of the situation. Use of pre-emergence herbicides makes the weed control more acceptable to farmers, which will not change the existing agronomic practices but will allow for complete control of weeds. This problem assumes added significance due to non availability of adequate laborers during the peak period of operation whereas, post-emergenceherbicides kill weeds and keep the hardy weeds under control by arresting their growth. The research information regarding the appropriate method of weed management in chili under this zone is meager. Keeping in view the importance of losses due to weeds in chili crop, this instant study was designed for the development of an integrated weed control system in chili using organic and inorganic mulches.

MATERIALS AND METHODS

To study the efficacy of different herbicides and mulches against weeds in chili, an experiment was carried out at vegetable research farm, Mahrajpur, Department of Horticulture, JNKVV, Jabalpur (MP) during the *rabi* season. The experiment encompassed sixteen treatments. The experiment was laid out in a completely randomized block design having three replications. Chili variety JM 218 was transplanted after 30 days with row to row and plant to plant distances of 40 and 30 cm, respectively. For fertilizers, the urea was used as a source of nitrogen; SSP was used as a phosphorus source and MOP as potash source. Nitrogen was applied in two splits (half at transplanting time and a half after 30 days after transplanting) at the rate of 80:60:40 kg NPK/ha.

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The whole quantity of P_2O_5, K_2O and FYM were applied at the time of transplanting. Data were recorded on different parameters of weed and crop. Collected data were analyzed statistically according to the procedures relevant to RBD.

RESULTS AND DISCUSSION

Weed Flora:

The dominant weed flora in the experiment was *Eragrostiscillansis* and *Cyperusrotindus* among monocot weeds, *Chenopodium album*, *Melilotusalba*, *Anagallisaruensis* and *Parthenium hysterophorus* among dicot weeds (Table1).

Table 1: Dominant weed flora in the experiment

Group	Weed species	Weed count/ m2	Relative density %
Monocot	*Eragrostiscillansis*	41.64	26.81
Monocot	*Cyperusrotindus*	19.67	12.66
Dicot	*Chenopodium album*	9.34	6.01
Dicot	*Melilotus alba*	6.33	4.08
Dicot	*Parthenium hysterophorus*	6.33	4.08
Dicot	*Anagallisaruensis*	64.67	41.64
	Total	147.98	100

Weed Density (m^{-2})

The weed control treatments significantly affected weed density of different weed species (Table2). Higher weed population was observed in weedy check plots whereas pendimethalin @ 1.5 lit./ha + Black polythene mulching treatments resulted in lower weed population of all the weed species followed by black polythene mulching for all the weed species except *cyperusrotandus*. The higher weeds density in control plots may be attributed to the open soil surface and niches available to weeds for free and aggressive growth.

Timely application of pendimethalin suppresses the germination of weed seeds and cover with black polythene inhibits the growth of weeds might be the possible reason for lower weeds population in these plots. These results are also in accordance with those of Khan *et al.*(2012), and Brault and Stewart (2002) who also reported that block polythene mulch provides superior weed control.

Table 2: Effect of different treatments on weed density/ m^2

Treatments	*Chenopodium album*	*Eragrostiscillansis*	*Parthenium hystrophorus*	*Anagalis arvensis*	*Cyperusrotundus*	*Melilotus alba*	*Spergul aarvensis*
Pendimethalin @ 1.5lit/ha before transplanting	10.6	10.98	15.06	5.98	20.06	10.95	25.05
Alachlor @1.25 l/habefore transplanting	11.96	18.56	30.00	24.00	29.98	28.05	44.66
Fluchloralin @0.75 l/ha before transplanting	14.03	15.95	38.00	9.00	30.03	26.86	38.00
White polythene as mulch after transplanting	5.98	12.01	14.26	3.98	16.95	9.98	21.01
Black polythene as mulch after transplanting	2.99	9.95	8.00	3.03	18.04	4.98	15.98
Paddy straw as mulch after transplanting	8.04	11.00	19.20	3.98	18.01	8.06	26.00
Pendimethalin + white polythene mulch	11.05	10.78	9.07	7.01	13.01	5.93	25.00
Pendimethalin + black polythene mulch	1.03	6.96	3.95	0.00	4.98	1.95	10.00
Pendimethalin + paddy straw mulch	9.96	11.01	14.00	12.04	13.05	6.03	21.00
Alachlor + white polythene mulch	12.97	11.90	10.06	8.07	18.00	13.06	35.00
Alachlor + black polythene mulch	5.95	10.30	9.97	3.03	15.05	13.96	40.00
Alachlor + paddy straw mulch	18.01	13.01	19.21	6.99	24.05	11.00	41.00
Fluchloralin + white polythene mulch	15.00	11.98	19.20	6.00	15.03	12.06	33.00

Fluchloralin + black polythene mulch	5.01	11.01	8.70	7.96	13.03	7.90	23.00
Fluchloralin + paddy straw mulch	8.05	12.06	14.01	8.00	18.01	14.16	25.00
Control plot	241.83	243.33	120.0	41.33	151.0	50.33	454.00
SEm+ -	1.47	2.22	0.73	0.30	0.81	0.37	2.85
CD at 5%	4.27	6.44	2.14	0.88	2.34	1.08	8.25

Dry weed Biomass (gm^{-2})

Weeds dry biomass was significantly suppressed by pendimethalin@1.5 l/ha + black polythene mulching treatment (Table 3). Highest weed biomass was recorded in control plots.

Timely application of pendimethalin suppress the weed seed germination and in black plastic mulch weeds seed might have failed to germinate due to lack of light and rise in temperature under black polythene. Khan *et al.* (2012) and Coolong (2010) has also reported the efficiency of pendimethalin as pre-emergence application in controlling weeds in chili crop. As far as the effect of mulch i.e. black polythene is concerned.

Table 3: Effect of different treatments on dry weight (g) of weed flora/m^2 at 30 DAT

Treatments	*Chenopodium album*	*Eragrostiscillansis*	*Partheniumhystrophorus*	*Anagalisarvensis*	*Cyperusrotundus*	*Melilotus alba*	*Spergulaarvensis*
Pendimethalin @ 1.5lit/ha before transplanting	1.10	0.40	1.58	0.31	2.26	1.13	3.33
Alachlor @1.25 l/habefore transplanting	1.26	0.62	3.39	1.21	3.67	2.81	4.49
Fluchloralin @0.75 l/ha before transplanting	1.43	0.56	3.85	1.00	3.17	2.79	3.88
White polythene as mulch after transplanting	0.63	0.40	1.42	0.46	1.78	1.06	2.13
Black polythene as mulch after transplanting	0.48	0.39	0.94	0.33	1.86	0.56	1.65
Paddy straw as mulch after transplanting	0.43	0.38	1.93	0.45	1.84	0.80	2.63
Pendimethalin + white polythene mulch	0.46	0.38	0.99	0.75	1.32	0.64	2.58
Pendimethalin + black polythene mulch	0.13	0.24	0.48	0.00	0.69	0.28	1.56
Pendimethalin + paddy straw mulch	0.29	0.38	1.47	1.11	1.36	0.64	2.13
Alachlor + white polythene mulch	0.38	0.36	1.48	0.46	1.84	1.36	3.55
Alachlor + black polythene mulch	0.34	0.37	0.95	0.15	1.57	1.40	3.78
Alachlor + paddy straw mulch	0.35	0.38	1.44	0.45	2.44	1.13	3.32
Fluchloralin + white polythene mulch	0.43	0.42	1.93	0.31	1.55	1.15	2.37

Fluchloralin + black polythene mulch	0.19	0.38	0.99	0.55	1.33	0.86	2.59
Fluchloralin + paddy straw mulch	0.28	0.41	1.46	0.48	1.86	1.46	2.62
Control plot	8.31	13.30	1.14	2.86	15.33	5.36	45.92
SEm+-	0.13	0.02	0.67	0.04	0.09	0.11	0.09
CD at 5%	0.38	0.05	1.96	0.12	0.25	0.31	0.26

Weed Control Efficiency

A significant effect of weed control treatments on weed control efficiency was observed (Table4). The highest weed control efficiency was observed in pendimethalin 1.5 l/ha + black polythene mulch and lowest weed control efficiency in the control plot.

Table 4: Weed control efficiency (%)

Treatments	*Chenopodium album*	*Eragrosticil lansis*	*Parthenium hystrophorus*	*Anagalisarve-nsis*	*Cyperusrotundus*	*Melilotus alba*	*Spergulaar vensis*
Pendimethalin @ 1.5lit/ha before transplanting	81.85	89.42	75.05	71.50	84.75	78.99	92.28
Alachlor @1.25 l/ha before transplanting	68.21	57.82	71.52	61.16	76.26	60.19	92.21
Fluchloralin @0.75 l/ha before transplanting	63.57	68.40	71.52	61.16	79.66	63.19	92.27
White polythene as mulch after transplanting	86.36	84.20	82.22	71.50	83.07	73.61	95.36
Black polythene as mulch after transplanting	90.86	89.42	82.22	71.50	88.15	89.41	96.40
Paddy straw as mulch after transplanting	81.86	84.20	85.76	78.54	88.15	84.20	94.33
Pendimethalin + white polythene mulch	90.86	73.62	85.76	78.54	91.50	89.41	94.33
Pendimethalin + black polythene mulch	95.50	100.00	92.83	92.92	94.91	94.79	96.40
Pendimethalin + paddy straw mulch	86.36	68.40	85.76	78.54	88.15	89.41	95.36
Alachlor + white polythene mulch	86.36	89.42	85.76	78.54	88.15	89.41	92.26
Alachlor + black polythene mulch	90.86	94.78	89.29	85.62	89.83	78.99	93.81
Alachlor+ paddy straw mulch	86.36	84.20	89.29	78.54	86.42	78.99	91.76
Fluchloralin + white polythene mulch	81.86	84.20	85.76	78.54	89.83	78.99	92.78
Fluchloralin + black polythene mulch	90.86	89.42	89.29	71.50	91.50	84.20	94.85
Fluchloralin + paddy straw mulch	86.36	84.20	85.76	71.50	88.15	89.41	94.33
Control plot	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Plant Height (cm)

Plant height was significantly affected by weed control treatments (Table 5). The means analysis showed that highest plant height (75.3 cm) was recorded in pendimethalin @1.5 l/ha + black polythene mulching plots, followed by pendimethalin @ 1.5 l/ha + paddy straw mulch plots and minimum (52.8 cm) was recorded from weedy check plots in which there was no weeding done. The lowest plant height in weed check plots might be due to the increased competition for moisture, light, and nutrients.

Number of primary Branches/ plant

The numbers of primary branches per plant were significantly affected by weed control treatments (Table5). The means analysis showed that more number of primary branches per plant (15.66) were recorded in pendimethalin @ 1.5 l/ha + black polythene mulch, followed by pendimethalin @ 1.5 l/ha + paddy straw mulch (13.66) and minimum (6.66) was recorded from weedy check plots in which there was no weeding done. The decrease in a number of primary branches per plant in weedy check plots might be due to the increased competition for moisture, light, and nutrients. Furthermore, the decrease in a number of primary branches per plant was proportional to the duration of weeds competition and growth of the plant.

A higher number of primary branches per plant in weed control plots than weedy check might be due to better growth and development of chilies plants and availability of more resources which resulted in more number of branches per plant in chili plant. The results are in agreement with those of Khan *et al.* (2012) who reported that weed control through mulch has increased the number of branches per plant.

Number of fruits per plant

The number of fruits/plant was significantly affected by weed control treatments (Table 5). The means analysis showed that higher number of fruits per plant (73.3) were recorded in pendimethalin 1.5 l/ha + black polyethene mulch, followed by pendimethalin 1.5 l/ha + paddy straw mulch (69.6) and minimum (36.3) was recorded from weedy check plots in which there was no weeding done. The decrease in the number of fruits per plant in weedy check plots might be due to the increased competition for moisture, light, and nutrients. Furthermore, the decrease in fruits per plant was proportional to the duration of weeds competition. Higher fruits per plant in weed control plots than weedy check might be due to better growth and development of chilies plots and availability of more resources which resulted in more fruit production in chili plant. The results are in agreement with Khan *et al.* (2012) and Rajput *et al.* (2003) reported that weed control through mulch has increased the number of fruits per plant.

Yield (q/ha)

Yield is the outcome of various yield components that were significantly affected by different weed control treatments (Table 5). Statistical analysis of the data indicated that the application of pendimethalin @ 1.5 l/ha + black polythene mulches resulted in highest yield (134.7 q/ha) as well as dry fruit (22 q/ha) which was followed by pendimethalin @ 1.5 l/ha + paddy straw mulch (120 q/ha) dry fruit (19.6 q/ha) while minimum red ripe fruit yield (49.7 q/ha) and dry fruit yield (9.0 q/ha) was recorded from weedy check plots. Our results are confirmed by the findings of Khan *et al.* (2012) and Ashrafuzzaman *et al.* (2011) who found that due to weed control yield increase may be attributed to more favorable soil moisture and nutrient utilization.

Table 5: Effect of different weed control treatment on plant height (cm), no. of branches/plant, no. of fruits/plant, yield of red ripe fruit (q/ha) and dry fruit (q/ha)

Treatments	Plant height (cm)	No. of primary branches/ plant	No. of fruit per plant	Red ripe fruit (q/ha)	Dry fruit (q/ha)
Pendimethalin @ 1.5lit/ha before transplanting	70.10	13.33	50.00	100.6	16.42
Alachlor @1.25 l/habefore transplanting	63.30	9.33	41.33	100.0	16.33
Fluchloralin @0.75 l/ha before transplanting	65.40	9.66	42.66	100.0	16.30
White polythene as mulch after transplanting	65.30	9.33	41.00	117.7	19.11
Black polythene as mulch after transplanting	69.26	10.66	42.33	100.0	16.25
Paddy straw as mulch after transplanting	66.96	9.33	53.00	100.6	16.35
Pendimethalin + white polythene mulch	71.60	13.66	67.00	100.0	15.90
Pendimethalin + black polythene mulch	75.30	15.66	73.33	134.7	22.00
Pendimethalin + paddy straw mulch	73.20	13.66	69.66	120.0	19.60
Alachlor + white polythene mulch	65.20	9.66	41.66	100.0	16.53

Alachlor + black polythene mulch	66.50	9.66	42.33	81.3	13.25
Alachlor + paddy straw mulch	65.80	9.66	43.33	83.6	13.62
Fluchloralin + white polythene mulch	66.30	11.00	44.33	110.6	18.05
Fluchloralin + black polythene mulch	68.10	10.66	44.66	99.7	16.25
Fluchloralin + paddy straw mulch	66.40	10.33	44.00	99.9	16.30
Control plot	52.80	6.66	36.33	49.7	9.00
SEm+-	1.15	0.92	2.70	2.3	1.02
CD at 5%	3.34	2.68	7.84	6.8	2.96

CONCLUSION

Results of this study suggest that combined application of herbicide *i.e.* pendimethalin @ 1.5 l/ha along with black polythene mulches prove superior over other tested treatments. Mulching with paddy straw coupled with pendimethalin @ 1.5 l/ha proved second best option.

REFERENCES

Amador R, Mojarro MD, Davila F and Velasquez V. 2007. Efficacy and economics of weed control for dry chili pepper. *J. crop prot.*26: 677- 682.

Brault D and Stewart KA. 2002. Optical properties of paper and polythene mulches used for weed control in lettuce. *Hort. Sciences* **37** (1): 87-91

Coolong T. 2010 performance of paper mulches using a mechanical plastic layer and water wheat transplanter for the production of summer squash. *Hort. Science* **20**(2): 319-324.

Isik D, Kaya E, Ngouajio M and Mennan H. 2009. Weed suppression in organic pepper (Capsicum annuum L.) with winter cover crops. *Crop Protection* **28**: 356-363.

Khan A, Muhammad S, Hussain Z and Khattak AM. 2012. Effect of different weed control methods on weeds and yield of chillies (*Capsicum annuum* L.). *Pakistan Journal of Weed Science Research* **18**(1): 71-78.

Pandey AK, Singh AK, Kumar A and Singh SK.2013.Effect of drip irrigation, spacing and nitrogen fertigation on productivity of chilli (*Capsicum annuum* L.).*Envi.& Ecol.* **31**(1): 139-142.

Singh AK and Pandey AK. 2014. Dynamics of anthracnose disease of Chilli in responses to water and nitrogen management under drip and flood irrigation. *Journal of AgriSearch* **1**(3):151-156.

Singh AK, Singh D, Singh AK, Gade RM and Sangle UR.2012a. Good Agronomic Practices (GAP) - An efficient and eco-friendly tool for sustainable management of plant diseases under changing climate scenario. *J. Plant Disease Sci.* **7** (1):1-8.

Singh AK, Umrao VK and Sinha MK. 2012b. Perennial chillies germplasm identified and explored from Bihar. *Hort Flora Research Spectrum* **1**(4): 295-299.

Singh AK. 2016. Understanding weed biology to manage wheat field efficiently. *Indian Farming* **66** (6):17-21.

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