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Research Article

EFFICACY OF DIFFERENT HERBICIDES AND MULCHES COMBINATIONS AGAINST WEEDS IN CHILI (*Capsicum annum* L.)

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Abstract: 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 (M.P.) in the *rabi* season of 2010-2011. The experiment was laid out in a completely randomized block design having three replications, and comprising of sixteen treatments. Chili variety "JM-218" was selected for the experiment and sown in a plot size of 3.0 m x 2.0 m. All the treatments significantly affected the parameters of weed density m^{-2}, dry weight biomass, yield components of chilies such as plant height, number of primary branches, number of fruits per plant, red ripe fruit yield and dry fruit yield. 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 fruits per 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 as the most effective treatment in terms of weed suppression and yield enhancement of chili crop.

Keywords: *Chili, Weed management, Fruit yield*

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Introduction

Chili is one of the most important cash crops of India and is cultivation throughout the country. It is extensively cultivated in Asia, Africa, Europe and Central Northern part of America. In India, it occupies an area of 930 thousand hectare with an annual production of 80 thousand tons of dry chili. The yield level of chili is very poor in the state of Madhya Pradesh. The reason of low productivity could be ascribed to a number of factors which can related to production. The weed problem in chili is very serious due to frequent irrigation, which provides congenial condition for weed growth. High reduction in fruit yield of chili was observed due to weed infestation. Hand weeding is a common method of weed control adopted by farmers but comparatively this method is costly and time consuming. This problem assumes added significance due to non availability of adequate laborers during peak period of operation whereas, post emergence herbicides kill weeds and keep the hardy weeds under control by arresting their growth. The research information regarding 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. Mulching stimulates the microbial activity in soil through improvement of soil agro-physical properties [1]. Mulching also minimizes the use of N fertilizer [2], warms the soil [3], improves the soil physical condition [4], and suppresses weed growth [5] and could account for increased yield [6-8].

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) in the *rabi* season of 2010-2011. 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 phosphorus source and MOP as potash source. Nitrogen was applied in two splits (half at transplanting time and half after 30 days after transplanting) at the rate of 80:60:40 kg NPK/ha. 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 Density (m^{-2})

The weed control treatments significantly affected weed density of different weed species [Table-1]. Higher weed population was observed in weedy check plots whereas pendimetholin @ 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 *Cyperus rotandus*. 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 [1].

Dry weed Biomass (gm^{-2})

Weeds dry biomass was significantly suppressed by pendimethalin @1.5 l/ha + black polythene mulching treatment [Table-2]. Highest weed biomass was recorded in control plots.

Table-1 *Effect of different treatments on weed density/ m²*

Treatments	*Chenopodium album*	*Eragrostis cillansis*	*Parthenium hystrophorus*	*Anagalis arvensis*	*Cyperus rotundus*	*Melilotus alba*	*Spergula arvensis*
Pendimethalin @ 1.5lit/ha before transplanting	10.60	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

Table-2 *Effect of different treatments on dry weight of weed flora/m² at 30 DAT*

Treatments	*Chenopodium album*	*Eragrostis cillansis*	*Parthenium hystrophorus*	*Anagalis arvensis*	*Cyperus rotundus*	*Melilotus alba*	*Spergula arvensis*
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

Table-3 *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

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. Same thing reported the efficiency of pendimethalin as pre-emergence application in controlling weeds in chili crop. As far as effect of mulch *i.e.* black polythene is concerned [9, 10].

Plant Height (cm)

Plant height was significantly affected by weed control treatments [Table-3]. 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 [Table-3]. The decrease in 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 number of primary branches per plant was proportional to duration of weeds competition and growth of plant. 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 a greater number of branches per plant in chili plant. The results are in agreement that weed control through mulch has increased the number of branches per plant.

Number of fruits plant-1

The number of fruits/plant was significantly affected by weed control treatments [Table-3]. The means analysis showed that higher numbers of fruits per plant (73.3) were recorded. 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 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 that weed control through mulch has increased the number of fruits per plant [11].

Yield (q/ha)

Yield is the outcome of various yield components that were significantly affected by different weed control treatments [Table-3]. Statistical analysis of the data indicated that the application of pendimethalin @ 1.5 l/ha + black polithin mulches resulted in highest yield (134.7 q/ha) as well as dry fruit (22 q/ha) which was followed by pendimetalin @ 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 that due to weed control yield increase may be attributed to more favorable soil moisture and nutrient utilization[12-14].

Application of research: 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.

Research Category: Weed management

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Study area / Sample Collection: Vegetable Research Station, Mahrajpur

Cultivar / Variety / Breed name: Chili ''JM-218''

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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