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Weed management in transplanted chilli

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ABSTRACT

An experiment was conducted at Nadia, West Bengal during 2012 and 2013 to evaluate the effect of herbicides for weed control in transplanted chilli. The weed density, dry weed biomass, WCE and yield components of chillies such as number of fruits/plant, fruit length and economic yield were significantly affected in response to weed control treatments. Treatment receiving oxyfluorfen recorded lower weed biomass (6.01 and 17.57 g/m^2) and higher WCE (81.7% and 75.0%) at 30 and 60 DAT, while hand weeding recorded the lowest weed biomass (4.87 and 17.32 g/m^2) and highest WCE (85.5 and 75.4%). Hand weeding resulted in the highest number of fruits/plant (36.11), fruit length (6.75 cm) and yield of chilli (3.46 t/ha).

Key words: Chilli, Hand weeding, Herbicide, Weeds, Weed control efficiency, Yield

Chilli (*Capsicum annuum* L.) is cultivated worldwide. It is an indispensable spice essentially used in every Indian cuisine, due to its pungency, taste, colour and aroma. Chilli fruits are rich sources of vitamin C, A and E. Immediately after transplanting, chilli 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 chilli (Isik *et al.* 2009). Further, wide space provided to the chilli allows fast growth of 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 sink capacity of crop resulting in poor fruit yield. Thus, the extent of reduction in fruit yield of chilli 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). The choice of any weed control measures therefore, depends largely on its effectiveness and economics. 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 situation. Use of pre-emergence herbicides make the weed control more acceptable to farmers, which will not change the existing agronomic practices but will allow for complete control of weeds. Hence, a study on evaluation of herbicides for weed control in transplanted chilli was planned to ascertain the effect of different herbicides on weed control and growth and yield of chilli.

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MATERIALS AND METHODS

The experiment was conducted during two consecutive *Kharif* season of 2012 and 2013 at Horticultural Farm (22°93'E, 88°53'N and 9.75 m altitude) of Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal. The experimental soil was well drained, alluvial in nature and sandy loam in texture, having pH 6.92. The experiment encompassed five treatments consisting of pendimethalin 990 g/ha, oxyfluorfen 200 g/ha, propaquizafop 75 g/ha, hand weeding and weedy check. The experiment was laid out in a randomized block design having four replications. Chilli variety "*Kajari*" was transplanted after 30 days with row to row and plant to plant distances of 50 and 50 cm, respectively. For fertilizers, the urea was used as a source of nitrogen and DAP was used as P source. N was applied in two splits (half at transplanting time and half after 30 days of transplanting) at the rate of 120 kg/ha. Data were recorded on weeds density, dry weeds biomass, weed control efficiency were recorded at 30, 60 DAT. Fruit length, fruits/plant and yield were measured at the time of harvest. Data were subjected to square root transformation ($\sqrt{x+0.5}$) and were subjected to statistical analysis by analysis of variance method. The correlation studies were made to reveal the association among the variables in the investigation (Gomez and Gomez 1984). As the error mean

squares of the individual experiments were homogenous, combined analysis over the years were done through unweighted analysis.

RESULTS AND DISCUSSION

Effect on weeds

The weed control treatments significantly affected weed density/m^2 (Table 1). Higher weeds population was observed in weedy check plots (43.34 and 89.29 weeds/m^2 at 30 and 60 DAT, respectively) whereas hand weeding treatments resulted in lower weed population (7.64 and 10.21/m^2 at 30 and 60 DAT, respectively) followed by oxyfluorfen (8.81 and 14.80/m^2 at 30 and 60 DAT, respectively), pendimethalin (11.32 and 24.55) and propaquizafop (13.14 and 17.57). The higher weeds density in weedy check plots may be attributed to the open soil surface and niches available to weeds for free and aggressive growth. Timely weeding in hand weeded plots might be the possible reason for lower weeds population in these plots. These results are also in accordance with those of Adhikary and Ghosh (2014). Kumar *et al*. (2013) who also found highest number of weeds/m^2 in weedy check plots and lowest in hand weeded treatments.

Weeds dry biomass was significantly reduced by hand weeding and oxyfluorfen treatment (Table 1). Highest dry weed biomass (32.88 and 70.32 g/m^2 at 30 and 60 DAT, respectively) was recorded in weedy check plots whereas lowest dry weed biomass (4.78 and 17.32 g/m^2 at 30 and 60 DAT, respectively) were recorded in hand weeded treatments followed by oxyfluorfen (6.01 and 17.57 g/m^2). Timely eradication of weeds in hand weeding plots could be the possible reason for lower weeds fresh biomass in theses plots (Adhikary *et al*. 2014). Similarly, the inhibition effect of herbicides might have inhibited the weed seeds germination which at the end of the day resulted in less dry weed biomass. Weeds were also effectively controlled in pendimethalin and propaquizafop treated plots. Singh *et al.* (2009) and Rahman *et al*. (2012) also reported that hand weeding is the most effective weed control method. Weed control efficiency (%) differed significantly due to herbicides. At 30 DAT, hand weeding recorded higher weed control efficiency (85.5%), followed by oxyfluorfen 200 g/ha (81.7%). Pendimethalin 990 g/ha (74.7%) and propaquizafop 75 g/ha (74.4%) treatments were next in order. At 60 DAT, hand weeding recorded higher weed control efficiency (75.4%). All the herbicides were next to hand weeding. Moreover, Gul *et al.* (2011) and Shinde *et al.* (2012) revealed that weed dry biomass was significantly lower in hand weeding plots and the herbicide treated plots recorded significantly lower weed dry weight at all growth stages and at harvest compared to unweeded check which was mainly attributed to lower weed population, lower weed dry weight and higher weed control efficiency.

Effect on crop

The number of fruits/ plant were significantly affected by weed control methods (Table 2). The means analyses showed that higher number of fruits/ plant (36.11) was recorded in hand weeding plots, followed by oxyfluorfen treated plot (30.32) and minimum (16.58) was recorded from control plots in which there were no weeding done. The decrease in the number of fruits/plant in weedy check plots might be due to the increased competition for moisture, light and nutrients. Furthermore, the decrease in fruits/plant was proportional to duration of weeds competition. Higher fruits/plant in weed control plots than weedy check might be due to better growth and development of chilli plants and availability of more resources which resulted in more fruit production in chilli plant.

Different weeds control methods caused significant variation in fruit length of chilli. Higher fruit length (6.75 cm) was recorded from hand weeded plots which was followed by oxyfluorfen treated plots (5.89 cm) while minimum (4.54 cm) was recorded from weedy check plots (Table 2). Same results were obtained by Singh *et al.* (2011) who reported increase in fruit length of chillies due to weed control measures.

Table 1. Weed density, dry matter and weed control efficiency as affected by different treatments (pooled data of two seasons)

Treatment	Weed density (no./m^2)		Weed dry biomass (g/m^2)		WCE (%)	
	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT
Pendimethalin 30 EC 990 g/ha	3.37 (11.32)	4.96 (24.55)	2.89 (8.32)	4.57 (20.88)	74.7	70.3
Oxyfluorfen 23.5 EC 200 g/ha	2.97 (8.81)	3.85 (14.80)	2.46 (6.01)	4.19 (17.57)	81.7	75.0
Propaquizafop 10 EC 75 g/ha	3.63 (13.14)	4.19 (17.57)	2.91 (8.42)	4.69 (22.01)	74.4	68.7
Hand weeding	2.77 (7.64)	3.20 (10.21)	2.19 (4.78)	4.16 (17.32)	85.5	75.4
Weedy check	6.58 (43.34)	9.45 (89.29)	5.73 (32.88)	8.38 (70.32)	-	-
LSD (P=0.05)	0.16	0.26	0.15	0.24	-	-

Values given in the parentheses are the original means; Data subjected to square root transformation

Table 2. Yield attributes and yield of chilli as affected by different weed control treatments (pooled data of two seasons)

Treatment	No. of fruits/plant	Fruit length (cm)	Fruit weight/plant (g)	Fruit yield (t/ha)	Weed index
Pendimethalin 30 EC 990 g/ha	27.4	5.4	61.7	2.47	28.6
Oxyfluorfen 23.5 EC 200 g/ha	30.3	5.9	71.6	2.86	17.3
Propaquizafop 10 EC 75 g/ha	25.4	5.2	55.6	2.23	35.5
Hand weeding	36.1	6.7	86.4	3.46	0.00
Weedy check	16.6	4.5	45.6	1.83	47.1
LSD (P=0.05)	6.34	0.3	3.77	0.15	-

Hand weeding registered significantly higher fruit weight (86.39 g/plant) than rest of the treatments. Significant reduction in fruit weight per plant was in order of herbicides, *viz.* oxyfluorfen 200 g/ha (71.57 g) > pendimethalin 990 g/ha (61.68 g) > propaquizafop 75 g/ha (55.64). Weedy check recorded significantly lowest fruit weight/plant (45.63 g). Rajkumara (2009) found similar results on fruit weight of chilli against different control measures.

Fruit yield was significantly affected by different weeds control methods (Table 2). Hand weeding resulted in highest yield (3.46 t/ha) which was followed by oxyfluorfen 200 g/ha (2.86 t/ha) while minimum (1.83 t/ha) was recorded from weedy check plots. Less competition for nutrients and other available resources in hand weeding plots resulted in higher yield of chilli in these plots. Adhikary *et al.* (2014) found that yield increase may be attributed to more favorable soil moisture and nutrient utilization.

Significant differences were observed in weed index due to various weed control treatments (Table 2). Oxyfluorfen 200 g/ha showed its superiority among the herbicides and recorded significantly lower weed index (17.34) than other herbicides tried. Pendimethalin 990 g/ha (28.61) was next best treatment. Propaquizafop 75 g/ha (35.54) was intermediate. The weedy check recorded significantly higher weed index (47.12). These results are of agreement with Khan *et al.* (2012).

Hand weeding was the most effective weed control method in enhancing the growth and yield parameters of chilli. The weed density, weed biomass were drastically reduced as compared to weedy check. Similarly, the number of fruits/plant, fruit length and yield of chilli were also the highest in hand weeding. But hand weeding is time consuming, expensive and tedious though much effective. Hence, chemical weed control appears to hold a great promise for effective, timely and economic weed suppression.

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