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Effect of weed management practices on crop growth, weed dry weight, weed count, nitrogen uptake yield attributes and yield of winter season brinjal (Solanum melongena L.) under Chhattisgarh plains

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ABSTRACT : The present experiment was conducted at Research cum Instructional Farm of the Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during winter season of 2009-10 to evaluate the effect of weed management practices on growth and yield of brinjal, weed dynamics as well as nitrogen removal by weeds. The experiment consisted of eleven treatments comprising of hand weeding, mulching, pre-transplanting treatments with alachlor (2.0 kg/ ha), pendimethalin (1.0 kg/ ha), pendimethalin (extra) (0.64 kg/ ha), post-transplanting treatment with glyphosate (1.5 kg/ ha) and unweeded check replicated three times in Randomized Block Design. Application of pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-transplanting + one hand weeding at 40 DAT + pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} at 45 DAT was the best option for weed management in order to obtain higher growth parameters as well as yield. The minimum dry matter and weed growth rate was noted under pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-transplanting + one hand weeding at 40 DAT + pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} at 45 DAT whereas, maximum nitrogen up take was recorded under unweeded check.

Key Words : Brinjal cultivars, Weeds, Weed management, Herbicides, Yield

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Vegetables are one of the important components of Indian horticulture. India is the second largest producer of vegetables after China, with an estimated annual production of about 110.6 million tones from an area of about 5.5 million ha. According to recent estimates, there will be a demand of 151 – 193 million tones of vegetables in India by 2030. Despite the Indian population being largely vegetarian, per capita annual consumption of vegetables in India is only 63 kg as against 220 kg in Korea, 115 kg in China and 105 kg in Japan. India is growing about 10 of the world's vegetables (Sharma *et al.*, 2009).

Brinjal (*Solanum melongena* L.) also known as eggplant belongs to family Solanaceae and is considered to be one of the most important crops among the vegetables the world over. It is adapted in all lands except at higher altitudes and can be grown throughout the year. The area under brinjal cultivation in the world is about 20, 43,788 hectares with a production of about 32.073 mt. In India, it is cultivated in about 5, 66, 000 hectares with a production of 9.596 mt and productivity of 16.9 t ha^{-1} (Anonymous, 2008). Brinjal contributes 9 per cent of the total vegetable production of the country occupying a major share in the Indian diet. It is used as one of the staple vegetables which have high nutritive value. The mature edible fresh fruit contains 97.2 per cent moisture and is nutritionally a fairly good source of vitamin A, C and thiamine (12.4 IU, 12.0 mg and 0.14 mg, respectively per hundred gram of edible portion).

RESEARCH PROCEDURE

The present experiment was conducted at Research cum Instructional Farm of the Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during winter

season of 2009-10 to evaluate the effect of weed management practices on growth and yield of brinjal, weed dynamics, nutrient removal by weeds and also the economics of its cultivation. Brinjal was fertilized with 100 kg ha^{-1} nitrogen in the form of urea, 80 kg ha^{-1} phosphorus in the form of single super phosphate and 60 Kg ha^{-1} potassium in the form of muriate of potash, respectively. Whole quantity of P_2O_5 and K_2O was applied as basal, while N was applied in four splits *i.e.* basal, 30, 60 and 90 DAT. The experiment was laid in a Randomized Block Design with 3 (three) replication having 11 (eleven) treatments. Data were taken on the number of primary branches, number of secondary branches, number of tertiary branches, total number of branches, days to 50 per cent flowering, number of fruits, length of fruits, girth of fruits and harvest index. Weed count, fresh weight of weeds, dry matter of weeds, weed growth rate and nitrogen up take by weeds at harvest.

RESEARCH ANALYSIS AND REASONING

The maximum number of total branches plant $^{-1}$ (31.53) was obtained under pendimethalin (extra) 37.8% CS @ 0.64 kg $^{-1}$ pre-transplanting + one hand weeding at 40 DAT + pendimethalin (extra) 37.8% CS @ 0.64 kg $^{-1}$ at 45 DAT with minimum recorded in unweeded check (18.43) (Table 1). The increase in total branches plant^{-1} due to weed management practices may be attributed to decrease in weed population that might have helped in increasing the number of branches. Moreover, effective weed control increases the capacity of the crops in utilizing soil moisture, light, nutrients and carbon dioxide in building new tissues and may account for improving growth including total number of branches plant^{-1} (Mekki *et al*., 2010). A significant decrease in days to 50 per cent flowering as compared to control was observed with various weed management practices. Significantly maximum days to 50 per cent flowering was recorded under unweeded check (70.93 days) but the treatment was having at par effect with mulch of waste of previous crop at 0 up to 60 DAT, alachlor 50% EC @ 2.0 kg ha^{-1} pre-transplanting and pendimethalin 30% EC @ 1.0 kg ha^{-1} pre-transplanting.

Maximum mean length of fruit (13.00 cm) was obtained

Table 1: Effect of different weed management practices on brinjal

Treatments	Number of primary branches plant^{-1}	Number of secondary branches plant^{-1}	Number of tertiary branches plant^{-1}	Total number of branches plant^{-1}	Days to 50% flowering.	Length of fruits plant^{-1}	Fruit yield (t/ ha)
T_1 Unweeded check	6.30	8.00	4.13	18.43	70.93	6.90	12.20
T_2 Two hand weeding at 30 and 60 DAT	8.23	10.20	6.40	24.83	65.33	9.23	19.28
T_3 Mulch of waste of previous crop at 0 up to 60 DAT	7.00	10.06	5.60	22.66	69.66	7.36	15.92
T_4 Alachlor 50% EC @ 2.0 kg ha $^{-1}$ Pre-transplanting	8.00	10.10	6.06	24.16	66.33	8.50	18.09
T_5 Alachlor 50% EC @ 2.0 kg ha $^{-1}$ Pre-transplanting +One hand weeding at 45 DAT	9.20	12.07	8.53	29.80	63.33	11.93	23.32
T_6 Pendimethalin 30% EC @ 1.0 kg ha $^{-1}$ Pre-transplanting	8.10	10.17	6.10	24.46	66.00	8.70	18.64
T_7 Pendimethalin 30% EC @ 1.0 kg ha $^{-1}$ Pre-transplanting + One hand weeding at 45 DAT	9.80	12.70	8.66	31.16	62.33	12.03	24.31
T_8 Glyphosate 41% SL @ 1.5 kg ha $^{-1}$ Post-transplanting at 30 and 60 DAT	8.30	10.30	6.50	25.10	65.00	9.36	21.15
T_9 Glyphosate 41% SL @ 1.5 kg ha $^{-1}$ Post-transplanting at 30 and 60 DAT + One hand weeding at 15 DAT	9.10	12.00	8.10	29.20	64.00	11.60	23.08
T_{10} Pendimethalin (extra) 37.8% CS @ 0.64 kg ha $^{-1}$ Pre-ransplanting + One hand weeding at 40 DAT	9.00	11.93	7.56	28.50	64.33	11.56	22.28
T_{11} Pendimethalin (extra) 37.8% CS @ 0.64 kg ha $^{-1}$ Pre-transplanting + One hand weeding at 40 DAT + Pendimethalin (extra) 37.8% CS @ 0.64 kg ha $^{-1}$ at 45 DAT	10.00	12.80	8.73	31.53	60.00	13.00	25.18
S.E.±	0.46	0.63	0.62	1.24	1.86	0.50	1.10
C.D. (P=0.05)	1.36	1.86	1.82	3.65	5.49	2.32	3.25

with pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-transplanting + one hand weeding at 40 DAT + pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} at 45 DAT and minimum (6.90) as recorded under control. Increase in fruit length may be due to more efficacy in controlling the weeds by various herbicides and thereby reducing crop weed competition thus, enabling the crops to utilize more nutrition as also reported by Biradar *et al.* (1999) in chilli.. The minimum weed count (12.39) was recorded under pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-transplanting + one hand weeding at 40 DAT + pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} at 45 DAT and maximum (63.27) under unweeded check (Table 2). At harvest also, among the different weed species, the maximum weed count at harvest was recorded for *Parthenium hysterophorus, Alternanthera triandra* followed by *Melilotus alba* whereas, the minimum weed count was under *Euphorbia hirta*. The variability in weed population in different treatments can be attributed to the fact that some herbicides are more effective for weed control than others (Khan *et al.*, 2008). The maximum weed density was noted under unweeded check followed by treatments involving chemical control along with hand weeding. This result is in conformity with the findings of Singh *et al.* (1992). The minimum dry weigth recorede at harvest stage under application of pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-transplanting + one hand weeding at 40 DAT + pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} and maximum dry weight recorded under unweeded check Similarly, application of herbicides which recorded slightly higher density of weeds and their dry weight than that observed under pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-transplanting + one hand weeding at 40 DAT + pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} at 45 DAT may be due to the shorter herbicidal activity of these chemicals, which could not control newly emerged weeds up to longer period (Patel *et al.*, 2006). Similar findings were also reported by Leela (1982), Singh *et al.* (1992), Raghav *et al*. (1987), Nandal and Pandita (1990) and Meena (2004). During 60 DAT up to harvest, there was no positive weed growth rate under any of the weed management treatments as well as control. The findings were consistent with the results of studies carried out Meena (2004) and Olayinka *et al.* (2009).

Weed management practices adopted drastically reduced nitrogen removal by weeds as compared to unweeded check. Maximum nitrogen up take by weeds (14.02 kg N ha^{-1}) was observed under unweeded check whereas minimum removal (1.78 kg N ha^{-1}) was registered under pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-transplanting + one hand weeding at 40 DAT + pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} at 45 DAT (Table 2). The nitrogen uptake under different weed management practices ranged between 1.78 to 14.02 kg ha^{-1}. The weed management practices adopted drastically reduced nitrogen uptake by weeds over unweeded check. Similar results were also reported by Yadav *et al*. (1985) in mungbean, Nandal and Pandita (1990) .

Table 2: Effect of different weed management practices on the weeds in brinjal

Treatments	Weed count	Fresh weight of weeds (g)	Dry matter of weeds (g^{-2})	Weed growth rate (g day^{-1} m^{-2})	Nitrogen up take by weeds at harvest (kg^{-1})
T_1 Unweeded check	63.27	107.33	14.76	1.00	14.02
T_2 Two hand weeding at 30 and 60 DAT	24.29	85.00	6.13	-0.36	2.73
T_3 Mulch of waste of previous crop at 0 up to 60 DAT	38.36	100.00	9.43	-0.51	10.51
T_4 Alachlor 50% EC @ 2.0 kg ha^{-1} pre-transplanting	32.06	95.00	7.43	-0.50	8.61
T_5 Alachlor 50% EC @ 2.0 kg ha^{-1} pre-transplanting +One hand weeding at 45 DAT	14.81	58.00	3.50	-0.31	3.21
T_6 Pendimethalin 30% EC @ 1.0 kg ha^{-1} pre-transplanting	31.79	90.00	6.33	-0.40	4.98
T_7 Pendimethalin 30% EC @1.0 kg ha^{-1}pre-transplanting+One hand weeding at 45 DAT	14.37	57.00	3.40	-0.33	2.11
T_8 Glyphosate 41% SL @ 1.5 kg ha^{-1} post-transplanting at 30 and 60 DAT	20.83	75.00	6.00	-0.34	6.33
T_9 Glyphosate 41% SL@ 1.5 kg ha^{-1} post-transplanting at 30 and 60 DAT + One hand weeding at 15 DAT	17.93	60.00	4.00	-0.32	1.92
T_{10} Pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-ransplanting + One hand weeding at 40 DAT	18.97	61.00	4.86	-0.33	4.84
T_{11} Pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} pre-transplanting + One hand weeding at 40 DAT + Pendimethalin (extra) 37.8% CS @ 0.64 kg ha^{-1} at 45 DAT	12.39	55.00	3.00	-0.31	1.78
S.E.±	–	2.90	0.97	0.05	–
C.D. (P=0.05)	–	8.56	2.87	0.01	–

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