Integrated weed management to enhance productivity in brinjal

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ABSTRACT

Field experiment was carried out at the Regional Research Station, Paiyur, Tamil Nadu to study the weed management practice suitable for the growth and yield of brinjal in northwestern agro-climatic zone of Tamil Nadu. The experiment was laid out in randomized block design (RBD) with twelve treatments replicated three times. The treatments consisted of hand weeding, chemical weeding, mechanical weeding and integrated weed management. The weed density, weed dry weight and economic parameters viz net income and B-C ratio differed significantly among the treatments. The results revealed that pendimethalin (Stomp Xtra) 1.0 kg ai/ha along with hand weeding at 30-45 days after transplanting recorded significantly lesser weed density of broad leaved weeds (6.7/m^2), grasses (5.5/m^2) and sedge (0.8/m^{-2}); lesser weed dry weight of broad leaved weeds (5.6 g), grasses (3.0 g) and sedge (0.10 g) at 30 days after transplanting. Highest net return (Rs 2,29,800/ha) with B-C ratio (5.00) was also noticed with the application of the same treatment. Thus among the various weed management practices, pendimethalin (Stomp Xtra) 1.0 kg ai/ha along with hand weeding at 30-45 days after transplanting was found to be the best weed management practice for brinjal cultivation in northwestern agro-climatic zone of Tamil Nadu to achieve higher productivity in brinjal.

Keywords: Brinjal; weed density; weed dry weight; growth; yield; economics

INTRODUCTION

Brinjal (*Solanum melongena* L) is an important commercial vegetable crop. India is regarded as the center of origin of brinjal. Weeds pose most serious problem in brinjal cultivation because of liberal use of farmyard manure, chemical fertilizers and frequent irrigations that help the weeds to grow vigorously (Sha and Karuppaiah 2005). It has been well established that losses from weeds account for 45 per cent more as compared to insect pests (30%) and diseases (20%) respectively. One year's seeding is seven year's weeding and thus Indian agriculture has been defined as confrontation with weeds (Vidyasagar et al 2018).

In the last four decades, considerable developments have taken place in chemical weed control, thereby, increasing net return by reducing cost of crop production (Sumeetsingh et al 2017). However, much needed information on the right kind of herbicides, time, rate, method of application and residual effects on the succeeding crops are lacking especially with regard to vegetable crops. It is difficult to control weeds manually because of poor efficiency of the labour in summer and rainy season besides heavy cost of manual weeding. There seems to be good scope to make use of selective chemical and cultural control to attain season long control of weeds (Reddy et al 2000). Keeping all these reasons in view, the present investigations were carried out to study the best weed

management practice suitable for brinjal cultivation in northwestern agro-climatic zone of Tamil Nadu.

MATERIAL and METHODS

The experiment was conducted at Regional Research Station, Paiyur, Tamil Nadu. The aim of this study was to find out the best weed management practice suitable for the growth and yield of brinjal (*Solanum melongena* L) in northwestern agro-climatic zone of Tamil Nadu. The experiment was laid out in randomized block design with twelve treatments replicated thrice. The treatments comprised T_1 [Hand weeding (HW) twice at 25 and 45 days after transplanting (DAT)], T_2 [Pre-emergence application of pendimethalin @ 1 kg ai/ha + HW at 30-45 DAT], T_3 (Application of oxyflorfen @ 0.40 kg ai/ha + HW 30-45 DAT), T_4 [Application of pendimethalin (Stomp Xtra) @ 0.75 kg ai/ha + HW 30-45 DAT], T_5 [Application of pendimethalin (Stomp Xtra) 1.0 kg ai/ha + HW at 30-45 DAT], T_6 [Application of pendimethalin (Stomp Xtra) @ 1.25 kg ai/ha + HW 30-45 DAT], T_7 [Mechanical weeding (MW) twice at 25 and 45 DAT], T_8 [Application of pendimethalin @ 1 kg ai/ha + MW at 30-45 DAT], T_9 (Application of oxyflorfen @ 0.40 kg ai/ha + MW at 30-45 DAT), T_{10} [Application of pendimethalin (Stomp Xtra) @ 1 kg ai/ha + MW at 30-45 DAT], T_{11} [Application of pendimethalin (Stomp Xtra) @ 0.75 kg ai/ha + MW at 30-45 DAT] and T_{12} [Application of pendimethalin (Stomp Xtra) @ 1.25 kg ai/ha + MW at 30-45 DAT].

Observations on weed density and dry matter of weeds as influenced by various treatments were recorded. The economics of these weed management practices was also worked out. The data for each parameter were subjected to analysis of variance technique and the means were separated by LSD test (Steel and Torrie 1980).

RESULTS and DISCUSSION

Weed flora

Weed flora of the experimental field consisted of predominantly twelve species of broadleaved weeds, five species of grasses and a sedge weed. Dominant among grassy weeds were *Dactyloctenium aegyptium* Beauv and *Cynodon dactylon* (L) Pers. *Trianthema portulacastrum* L, *Cleome gynandra* L, *Digera arvensis* Forsk and *Parthenium hysterophorus* L were the dominant ones among the broadleaved weeds and *Cyperus rotundus* L was the only sedge present in the experimental field.

Effect of treatments on weed density

The data given in Table 1 show the weed density at 30 and 60 days after transplanting (DAT). At 30 DAT, T_5 [Application of pendimethalin (Stomp Xtra) 1.0 kg ai/ha + HW at 30-45 DAT] recorded significantly least weed density of broadleaved weeds (6.7/m^2) followed by T_6 [Application of pendimethalin (Stomp Xtra) @ 1.25 kg ai/ha + HW 30-45 DAT] (8.7/m^2) and T_4 [Application of pendimethalin (Stomp Xtra) @ 0.75 kg ai/ha + HW 30-45 DAT] (13.7/m^2). Significantly lowest population of grasses was also recorded in T_5 (5.5 m^2) followed by T_6 (8.5 m^2) and T_3 (Application of oxyflorfen @ 0.40 kg ai/ha + HW 30-45 DAT) (9.5 m^2). Lowest population of sedge was observed in T_2 [Pre-emergence application of pendimethalin @ 1 kg ai/ha + HW at 30-45 DAT], T_4, T_5 and T_{11} [Application of pendimethalin (Stomp Xtra) @ 0.75 kg ai/ha + MW at 30-45 DAT] (0.8 m^2 each), all being at par.

At 60 DAT, T_5 resulted in minimum number of broadleaved weeds (4.3 m^2) followed by T_6 (5.3 m^2) and T_4 (10.3 m^2). Like 30 DAT, at 60 DAT, T_5 gave minimum number of grasses (3.3 m^2) followed by T_6 (4.3 m^2) and T_3 (6.3 m^2). Sedge was not observed at 60 DAT.

Effect of treatments on weed dry weight

Data given in Table 2 depict that at 30 DAT, T_5 resulted in minimum dry weight of broadleaved weeds (5.6 g) followed by T_6 (6.7 g) and T_4 (9.4 g). The dry weight of grasses was lowest in T_5 (3.0 g) followed by T_3 (5.5 g), T_6 (5.1 g) and T_{10} [Application of pendimethalin (Stomp Xtra) @ 1 kg ai/ha + MW at 30-45 DAT] (5.4 g), the latter three being at par. Sedge dry weight was minimum in T_2, T_4, T_5, T_8 [Application of pendimethalin @ 1 kg ai/ha + MW at 30-45 DAT] and T_{11} (0.10 g each). At 60 DAT again, T_5 resulted in minimum dry weight of broadleaved weeds (0.7 g) followed by T_6 (1.9 g) and T_4 (3.0 g). The dry grass weight was minimum in T_5 (0.7 g) and T_6 (1.0 g), which were at par. It was followed by T_3 (1.7 g) and T_7 [Mechanical weeding (MW) twice at 25 and 45 DAT] (1.9 g), the two being at par.

The lower weed dry weight under treatments may be attributed to the less number of weeds and

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Table 1. Effect of different weed management practices on weed density in brinjal

Treatment	Weed density/m² at					
	30 DAT			60 DAT		
	BLW	Grasses	Sedge	BLW	Grasses	Sedge
T_1	23.7	17.5	1.7	16.3	9.3	0.0
T_2	22.7	15.5	0.8	11.3	11.3	0.0
T_3	19.7	9.5	2.7	14.3	6.3	0.0
T_4	13.7	13.5	0.8	10.3	10.3	0.0
T_5	6.7	5.5	0.8	4.3	3.3	0.0
T_6	8.7	8.5	1.7	5.3	4.3	0.0
T_7	42.7	21.5	5.7	32.3	11.3	0.0
T_8	37.7	23.5	2.7	26.3	13.3	0.0
T_9	34.7	15.5	4.7	21.3	16.3	0.0
T_{10}	25.7	12.5	1.7	19.3	9.3	0.0
T_{11}	28.7	14.5	0.8	22.3	8.3	0.0
T_{12}	30.7	19.5	3.7	24.3c	12.3	0.0
$CD_{0.05}$	0.077	0.086	0.067	0.108	0.118	-

T_1: Hand weeding (HW) twice at 25 and 45 days after transplanting (DAT), T_2: Pre-emergence application of pendimethalin @ 1 kg ai/ha + HW at 30-45 DAT, T_3: Application of oxyflorfen @ 0.40 kg ai/ha + HW 30-45 DAT, T_4: Application of pendimethalin (Stomp Xtra) @ 0.75 kg ai/ha + HW 30-45 DAT, T_5: Application of pendimethalin (Stomp Xtra) 1.0 kg ai/ha + HW at 30-45 DAT, T_6: Application of pendimethalin (Stomp Xtra) @ 1.25 kg ai/ha + HW 30-45 DAT, T_7: Mechanical weeding (MW) twice at 25 and 45 DAT, T_8: Application of pendimethalin @ 1 kg ai/ha + MW at 30-45 DAT, T_9: Application of oxyflorfen @ 0.40 kg ai/ha + MW at 30-45 DAT, T_{10}: Application of pendimethalin (Stomp Xtra) @ 1 kg ai/ha + MW at 30-45 DAT, T_{11}: Application of pendimethalin (Stomp Xtra) @ 0.75 kg ai/ha + MW at 30-45 DAT, T_{12}: Application of pendimethalin (Stomp Xtra) @ 1.25 kg ai/ha + MW at 30-45 DAT; BLW: Broadleaved weeds

Table 2. Effect of different weed management practices in brinjal on weed dry weight, net income and B-C ratio

Treatment	Weed dry weight (g) at						Net income (Rs/ha)	B:C
	30 DAT			60 DAT				
	BLW	Grasses	Sedge	BLW	Grasses	Sedge		
T_1	15.6	8.1	0.20	6.6	2.7	0.0	1,53,650	3.65
T_2	14.9	7.6	0.10	4.7	4.9	0.0	1,68,500	3.97
T_3	12.6	5.5	0.50	5.5	1.7	0.0	1,88,900	4.33
T_4	9.4	6.4	0.10	3.0	3.9	0.0	2,12,200	4.71
T_5	5.6	3.0	0.10	0.7	0.7	0.0	2,29,800	5.00
T_6	6.7	5.1	0.20	1.9	1.0	0.0	2,13,400	4.70
T_7	29.6	12.8	0.80	16.0	1.9	0.0	56,050	1.98
T_8	25.4	11.7	0.10	11.1	4.0	0.0	65,700	2.16
T_9	22.9	7.4	0.60	11.7	8.2	0.0	1,03,100	2.82
T_{10}	16.6	5.4	0.20	7.0	4.9	0.0	1,46,100	3.56
T_{11}	18.4	7.1	0.10	8.4	4.3	0.0	1,25,450	3.19
T_{12}	18.2	10.6	0.50	11.1	4.7	0.0	1,21,850	3.12
$CD_{0.05}$	0.079	0.579	0.021	0.045	0.420	-	-	-

T_1: Hand weeding (HW) twice at 25 and 45 days after transplanting (DAT), T_2: Pre-emergence application of pendimethalin @ 1 kg ai/ha + HW at 30-45 DAT, T_3: Application of oxyflorfen @ 0.40 kg ai/ha + HW 30-45 DAT, T_4: Application of pendimethalin (Stomp Xtra) @ 0.75 kg ai/ha + HW 30-45 DAT, T_5: Application of pendimethalin (Stomp Xtra) 1.0 kg ai/ha + HW at 30-45 DAT, T_6: Application of pendimethalin (Stomp Xtra) @ 1.25 kg ai/ha + HW 30-45 DAT, T_7: Mechanical weeding (MW) twice at 25 and 45 DAT, T_8: Application of pendimethalin @ 1 kg ai/ha + MW at 30-45 DAT, T_9: Application of oxyflorfen @ 0.40 kg ai/ha + MW at 30-45 DAT, T_{10}: Application of pendimethalin (Stomp Xtra) @ 1 kg ai/ha + MW at 30-45 DAT, T_{11}: Application of pendimethalin (Stomp Xtra) @ 0.75 kg ai/ha + MW at 30-45 DAT, T_{12}: Application of pendimethalin (Stomp Xtra) @ 1.25 kg ai/ha + MW at 30-45 DAT; BLW: Broadleaved weeds

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rapid depletion of carbohydrate reserves of weeds through rapid respiration (Dakshinadas 1962) and could be due to reduced photosynthetic activity (Hilli and Santelmann 1969).

Economics

Highest net income and B-C ratio were realized with the treatment T_5 (Rs 2,29,800 and 5.00) followed by T_6 (Rs 2,13,400 and 4.70) and T_4 (Rs 2,12,200 and 4.71) respectively (Table 2). The treatment of pendimethalin (Stomp Xtra) @ 1.0 kg ai/ha + HW 30-45 DAT realized the highest net return of Rs 2,29,800 per ha and B-C ratio of 5.0.

The herbicides when used in combination with one or two hand weedings, their efficiency gets improved 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 (Bangi et al 2014).

CONCLUSION

Weeds have become a major problem in vegetable nurseries as well as in crops. In rainy season, weeds affect the crops very badly. Chemical treatments integrated with cultural practices are more viable for controlling weeds. In the present study, among the different weed management practices, the treatment pendimethalin (Stomp Xtra) 1.0 kg ai/ha + HW 30-45 DAT was found to be the best weed management practice for cultivation of brinjal variety Dhuruva which realized highest net return (Rs 2,29,800/ ha) and B-C ratio (5.00) in northwestern agro-climatic zone of Tamil Nadu to achieve higher productivity.

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