Journal of Eco-friendly Agriculture 11(2): 191-193, 2016

Weed management in tomato (*Lycopersicon esculentum* Mill.) under agro climatic conditions of Tripura

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ABSTRACT

The experiment conducted at the instructional farm of KVK, West Tripura with an objective to find out a suitable method of weed control in tomato with treatments comprising of T1: HW at 30 DAT, T2: pendimethalin @ 1.5 lit ha^{-1} at 3-5 DAT, T3: pendimethalin @ 1.5 lit ha^{-1} at 3-5 DAT + HW 30 DATT4: and control during 2013-14 showed maximum plant height (78.23cm), maximum number of branch plant^{-1} (6.22) and highest yield (6.69 t ha^{-1}) in T_3 with lowest weed dry biomass 4.30, 10.89, 34.14 and highest weed control efficiency (WCE %) of 84.33, 73.39, 47.54 at 30, 60 and 90 DAT, respectively. It was observed that weed dry matter at all the stages of crop growth period was significantly higher in case of unweeded control due to unchecked growth of weeds.

Key words: Weed control, Tomato, Tripura

Tomato (*Lycopersicon esculentum* Mill.) belonging to the family Solanaceae is one of the widely grown nutritious vegetable consumed next to potato in the world. This being an important source of minerals and antioxidants such as carotenoids, lycopene, vitamins C and E phenolic compounds play a key role in human nutrition to prevent certain cancer and cardiovascular diseases (Adalid *et al.*, 2004). Tomatoes are consumed in a number of ways as sun-dried tomatoes, sauce, juice, soup, ketchup and fresh as salad (Frusciante *et al.*, 2007). In India the total area under its cultivation is 882.0 thousand ha with total production of 187.35 lakh tone. In Tripura the area and production of this crop is 1.58 thousand ha and 39.00 thousand MT, respectively. (NHB database, 2014).

Weeds in tomato reduce yields by competing for space, light, water and nutrients resulting in weakening of the crop stand and reduced harvest efficiency (Abbasi *et al.*, 2013). Govindra *et al.*, (1986) reported that weeds resulted in a 57.0 per cent reduction in tomato yield when compared with weed free conditions. Adigun (2000) reported that unrestricted weed growth throughout the crop life cycle resulted in 92-95 per cent reduction in tomato fruit yield. Shadbolt & Holm (1956) also concluded from their studies that the first four weeks in the early growth period are critical in many vegetable crops, during which the weeds should be removed. This period coinciding with the season of peak labour activity leads to scarcity of labour for weeding. This adds to the high cost of production. Therefore, use of proper weed control method is the prime need to obtain maximum productivity. The choice of any weed control measures therefore, depends largely on its effectiveness and economics. Use of pre-emergent herbicides would make the herbicidal weed control more acceptable to farmers, which will not change the existing agronomic practices but will allow complete control of weeds (Adhikary and Ghosh, 2014). Keeping this in view, the present study to find out a suitable method of weed control in tomato was carried out.

MATERIAL AND METHODS

The field experiment was conducted during *rabi* season of 2013 in the experimental field of KVK, West Tripura located in District Khowai of Tripura at an altitude of 23m mean sea level, latitude 23.84N, longitude 91.27E. Soil of the experimental site was sandy loam, acidic with P^H 5.8, 0.52 per cent organic carbon, low in available nitrogen (217.65 kg ha^{-1}), Medium in available phosphorus (22.82 kg ha^{-1}) and available potash (177.68 kg ha^{-1}). The variety used in this experiment was Trishul. The treatments consisted of T1: HW at 30 DAT, T2: pendimethalin @ 1.5 lit ha^{-1} at 3-5 DAT, T3: pendimethalin @ 1.5 lit ha^{-1} at 3-5 DAT + HW 30 DAT, T4: control. Spraying was done with knapsack sprayer with flood jet deflector WFN 040 nozzle using 500 lit of water ha^{-1}. All the recommended improved package of practices including the plant protection measures was followed in the experiment. Predominant weed biomass, weed control efficiency were recorded at 30, 60 and 90 DAT.

Pendimethalin is applied as pre-emergence (PRE) herbicide or pre-plant incorporated (PPI) for control of grasses and small-seeded dicot weed species (Byrd and York 1987). Among the dinitroanaline herbicides, pendimethalin is among the most water soluble and the least volatile (Wilcut *et al.*, 1988), with microbial decomposition being the main

Table 1: Effect of treatments on Weed

Treatment	Weed dry biomass ($g.m^{-2}$)			Weed control Efficiency (WCE)		
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
Hand weeding at 30 days after treatment (DAT)	28.21	12.11	34.58	0	74.12	44.45
Pendimethalin (@ 1.5 lit ha^{-1} at 3-5 DAT	4.32	17.26	38.02	84.33	60.03	40.60
Pendimethalin (@ 1.5 lit ha^{-1} at 3-5 DAT + HW 30 DAT	4.30	10.89	34.14	84.34	73.39	47.54
Control	26.87	42.46	64.31	0	0	0
$LSD_{0.05}$	1.65	1.21	1.25	-	-	-

method of dissipation (Weber 1990). This makes it more conducive for sustainable crop production and is used world wide. Pendimethalin in susceptible weed species inhibits the mitotic cell division in the developing root systems (Vencill 2002).

The weeds were uprooted from 0.25 m^2 area selected at random each time and were oven dried to a constant weight at 65°C. The dry weight of weeds was expressed as g per 0.25 m^2.

Weed control efficiency (WCE) that denotes the magnitude of weed reduction due to weed control treatment was worked out by using the formula suggested by Mani *et al.* (1973) and expressed in per centage.

WUE (%) = Dry weight of weeds in un weeded control – Dry weight of treatment plot / Dry weight of weeds in un weeded control X 100

The data 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 weighted analysis.

RESULTS AND DISCUSSION

Efficiency of different treatment in controlling the weeds in tomato was found effective in decreasing the weed dry weight and increasing the weed control efficiency. Weed dry matter is a better parameter to measure the competition than the weed number (Murthy, 1982, Chnnappagoudar *et al*, 2013). In the present study, unweeded control recorded significantly higher weed dry matter at all the stages of crop growth period due to unchecked growth of weeds (Table 1). WCE at 30 DAT is almost equal in case of T2 (84.32) and T3 (84.30). But WEC gradually decreased in case of T3. From among the treatment, the lowest weed dry biomass 4.30, 10.89, 34.14 and highest weed control efficiency (WCE) 84.33, 73.39, 47.54 was recorded at 30, 60. 90 DAT in case of pendimethalin (@ 1.5 lit ha-1 at 3-5 DAT + hand weeding. The lower weed dry weight in weed control treatments may be ascribed to less number of weeds, rapid depletion of carbohydrate reserves of weeds through rapid respiration (Dakshinadas, 1962) which may be due to reduced photosynthetic activity (Hilli and Santkemann,1969). The herbicides when used in combination with one or two hand weedings, improves their efficiency 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. (Shivalingappa *et al.*, 2014).

Data presented in Table: 2 revealed that the yield and yield component of tomato is significantly influenced by different weed control methods. The data on plant height, branch per plant, total fruit yield indicated significant difference due to herbicide treatments and crop weed competition. Highest plant height (78.23cm), branch per plant (6.22) and total fruit yield (6.69 t ha^{-1}) is recorded in case of pendimethalin (@ 1.5 lit ha^{-1}): 3-5 DAT + hand weeding at 30 DAT (T3) followed by hand weeding at 30 DAT (T1). However, lowest fruits per plant, individual fruit weight, total fruit yield was recorded in case of unweeded control

Table 2: Effect of different of treatments on yield parameters

Treatment	Plant height (cm)	No. of branches $plant^{-1}$	Fruit Yield (t ha^{-1})
Hand weeding (HW) at 30 days after treatment (DAT)	75.60	5.34	5.70
Pendimethalin (@ 1.5 lit ha^{-1}): 3-5 DAT	73.56	5.13	5.54
Pendimethalin (@ 1.5 lit ha^{-1}): 3-5 DAT + HW 30 DAT	78.23	6.22	6.69
Control	70.12	3.82	3.12
$LSD_{0.05}$	1.75	1.96	2.13

(T4). All treatments reduced weed pressure and increased yield compared with control (Rahman *et. al.*, 2012)]. Minimum plant height in the weedy check plots might be due to the competition of tomato plants with weeds for sunlight. It is a general concept that one kilogram weed biomass in one's field will correspond to a loss of one kilogram of crop yield (Sajjapongse *et. al.*,1983).

The study concludes that application of pendimethalin @ 1.5 lit ha^{-1} as pre-emergence herbicide alongwith one hand weeding at 30 DAT have more significance in the management of weed in tomatos..

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Manuscript received on 30.11.2015

Manuscript accepted for publication on 13.02.2016