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Effect of drip and micro sprinkler irrigation on growth and yield of tomato (*Lycopersicon esculentum* Mill) crop under clay loam soil

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ABSTRACT : Field experiment was conducted to evaluate the performance of drip emitters and micro sprinklers on tomato crop under clay loam soil. The analysis of the data on growth parameter and yield of tomato crop significantly increased under micro sprinkler irrigation compared to drip and control treatment. The maximum yield of (54,200 kg/ha) was recorded in microsprinkler irrigation compared to drip (53,600 kg/ha) and control (40,000 kg/ha) treatment. The crop showed mean height of 69.53 cm for microsprinkler treatment and least mean height was observed in control treatment.

KEY WORDS : Growth, Yield, Drip, Micro sprinkler, Surface irrigation

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Water is considered as liquid gold. It is a precious commodity and its judicious use is essential for maximizing crop yields. Modern irrigation methods like drip and micro sprinkler irrigation (Micro irrigation) are fast gaining popularity with the farmers due to their easy handling, water saving potential and encouraging yield results in most parts of India, especially in Tamil Nadu. The rate of applying water in a micro irrigation is an important factor which governs moisture distribution in the soil profile. A high rate may cause deep percolation loss where as, a very low rate may contribute to evaporation loss. Keeping the above facts in view, the present study on growth and yield of tomato crop under micro irrigation was studied at Tamil Nadu Agricultural University, Coimbatore.

METHODOLOGY

Field experiment was conducted using micro irrigation on growth and yield of tomato crop under clay loam soil at Tamil Nadu Agricultural University, Coimbatore. This place is situated in North Western agro climatic zone of Tamil Nadu at 11^0 N latitude and 77^0 E longitude and at an altitude of 431 MSL. To study the effect of micro irrigation on growth and yield of tomato crop under clay loam soil. The system was designed with measured paths and lengths of main, sub main and lateral lines from water source to experimental site. To maintain the required operating pressure in the system the main line was connected with the pumping source (bore well) along with a gate valve for regulating water as per the treatment requirement. Average discharge of drip and micro sprinkler were 4 lph and 36 lph, respectively. In the experimental field, tomato of F_1 NS-7531 variety with duration of 120 days was selected for the study. The experiments were laid out in Randomized Block Design with three replications, treatments included in this experiment were irrigation by drip system (T_1), irrigation by micro sprinkler system (T_2), and surface irrigation (T_3). Irrigation was given to all the treatments immediately after transplanting, control plot was irrigated weekly twice. Flow through the sub main and all laterals were controlled by separate valve. During the crop period the climate and weather data were recorded. Irrigation was not given to the crop at the time of rainfall. Biometrical observations plant height, number of leaves and root distribution, were recorded at an interval of 15 days from the date of transplanting, five plants were chosen at randomly in each treatment and tagged. The yield data was recorded as and when the fruits were harvested on attaining maturity and water use efficiency was calculated for each treatment for tomato crop, which is the ratio of the yield of the crop in kg/ha and total water utilized in mm.

$$\text{W.U.E.} = \frac{\text{Y}}{\text{W.U.}}$$

where,

W.U.E. = Water use efficiency in kg/ha/mm
Y = yield of the crops in kg/ha
W.U = Total water used in mm

RESULTS AND DISCUSSION

The height of tomato crop showed a marked difference among different treatments. The treatment difference is presented in Table 1. Initially no significant difference was noticed. On 60th day after transplanting differences were seen. It was seen that on 90th day of transplanting, the treatment T_1 showed highest plant height (94.90cm). It was followed by T_2 (93.80cm) and T_3 treatment (87.25cm).

The analysis of mean data revealed that among the treatments tried, treatment T_1 had maximum plant height over the other treatment. The lowest plant height was found to be in treatment T_3.

It can be seen from Fig. 1, that drip treatment gave lengthy taproot of 19 cm followed by the micro sprinkler (18.20cm) and control (16.30 cm) treatment. Drip irrigation resulted in denser lengthy roots compared to other treatments. The drip treatment had lengthy taproots since moisture distribution was more within the soil. The yield data are presented in Table 2. The yield of tomato crop was highest in micro sprinkler treatment (54,200kg/ha) followed by drip treatment (53,600kg/ha). The least yield (40,000 kg/ha) was recorded in the control treatment.

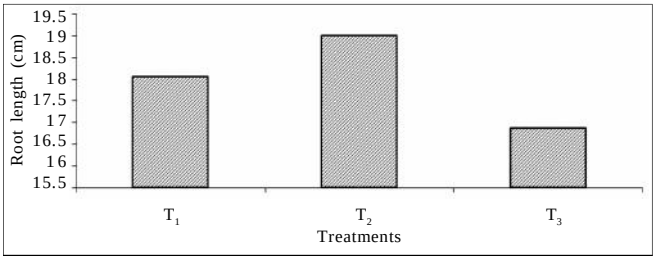

Fig. 1 : Effect of tap root length under different treatments

The total water utilized has been given in Table 2, including effective rainfall for tomato crop. It can be seen that the total water used for tomato crop was higher for control treatment (550mm) followed by micro sprinkler (470mm) and drip (350mm) treatment. The reason for less quantity of water utilized for drip treatment was due to less evaporation losses. The highest water use efficiency of 153.14kg/ha/mm was obtained for drip irrigation treatment compared to micro sprinkler treatment (115.31kg/ha/mm). The lowest water use efficiency (72.72 kg/ha/mm) was obtained for control treatment. (Table 2) Similar increase in water use efficiency were reported by Keshavaiah and Kumarswami (1993), Intrigliolo *et al.* (1994) and Hegin and Lowengart (1995).

It has been found that drip treatment gave more water use efficiency compared to micro sprinkler treatment (Fig. 2). Increased water use efficiency was due to reduced losses in drainage, canopy interception and better water utilization. It was also observed that micro sprinkler irrigation system performed better in terms of yield, plant height and reduced cost compared to drip irrigation system. But water use efficiency was high in drip treatment.

Table 1 : Plant height (cm)

	Days after transplanting						
Treatments	15	30	45	60	75	90	Mean
T_1	34.53	48.72	62.75	84.26	92.03	94.90	69.53
T_2	33.24	46.94	59.42	78.58	89.42	93.80	66.98
T_3	31.59	40.54	57.01	76.59	82.46	87.25	62.57
Mean	33.12	45.40	59.83	79.81	87.97	92.01	79.81
			S.E.±		CD (0.05)		
	Days		0.368		0.749		
	Treatment		0.521		1.060		
	Interaction		0.903		1.836		

Table 2 : Yield and water use efficiency for different treatments in tomato

Treatments	Water applied (mm)	Effective rainfall (mm)	Total water used (mm)	Yield (kg/ha)	Water use efficiency (kg/ha/mm)
T_1	370	100	470	54,200	115.31
T_2	250	100	350	53,600	153.14
T_3	450	100	550	40,000	72.72
Mean				49,266	
		S.E.	754.49		
		C.D. (P=0.05)	2094.94		

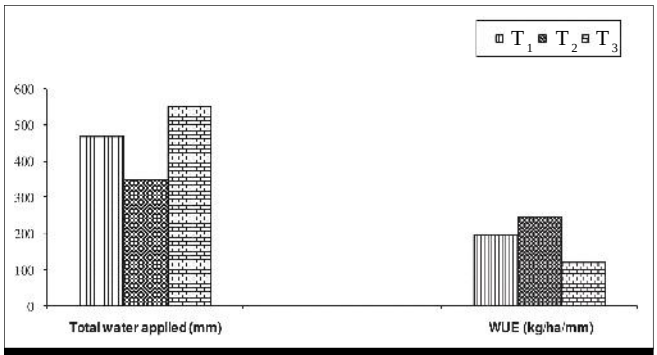

Fig. 2 : Water utilized and water use efficiency for different treatments of tomato field

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