

## **Brinjal (*Solanum melongena* L.) Root Distribution as Influenced by Irrigation and Fertilizer Levels**

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### **Abstract**

A remarkable difference in the root density in soil profile was found among the treatments. The highest root density was pointed out under 80% ET with drip irrigation followed by 120% ET with drip irrigation and furrow irrigation. With all the irrigation treatments the highest root density was found at 0—15 cm depth of soil and it decreased with decreasing soil moisture profile. However, the root density in 80% ET with drip irrigation treatments was spread even below 20 cm depth of soil layer. In this treatment the root distribution was found to be fairly well distributed throughout the depth. This indicates the availability of optimum moisture to the plants.

**Key words :** Brinjal, Drip irrigation, Furrow irrigation, Root distribution.

Root systems of the crop that developed under trickle emitter are often shallow relative to depth of wetted soil (1). The relative shallow root system may result in a great susceptibility to drought stress. Sprinkler irrigated crops afford a large buffer against drought due to more extensive root system situated in a larger volume of moist soil. High water application rates have been suggested as a possible means of increasing the horizontal flow of water from a trickle emitter while decrease in vertical flow. However, large increases in horizontal distribution of water have laid to an increase in surface evaporation and a reduction in yield and irrigation efficiency (2). At the same time, water quantity and reduced frequency of irrigation on fine texture soil may increase the distance of both horizontal and vertical flow from a trickle emitter (3). Reduced frequency of irrigation may decrease irrigation efficiency of coarse textured soil that have high saturated soil water conductivity. Alteration of the size and shape of soil volumes wetted by drip irrigation may increase root growth and water absorption while decreasing water loss from soil evaporation. Hence, an attempt was made to study the root distribution in brinjal crop as influenced by different irrigation and fertilizer levels.

### **Methods**

The experiment was laid out using split plot statistical design with a total of eight treatments comprising five main treatments (irrigation levels) and three sub-treatments (fertilizer levels) and the treatments were replicated thrice to reduce diversity in observation and errors in readings. The treatment details are given as follows. Main treatments : I<sub>1</sub>, water application through drip at 60 per cent crop ET, I<sub>2</sub>, water application through drip at 80 per cent crop ET, I<sub>3</sub>, water application through drip at 100 per cent crop ET, I<sub>4</sub>, water application through drip at 120 per cent crop ET, I<sub>5</sub>, Control treatment (Conventional furrow method of Irrigation). Sub-treatments : F<sub>1</sub>, Fifty per cent of the recommended dose of fertilizer (RDF), F<sub>2</sub>, 75% of the recommended dose of fertilizer (RDF), F<sub>3</sub>, 100% of the recommended dose of fertilizer (RDF).

The experiment was laid out on an area of 32 × 25m, in black soil having uniformity in topography and physical properties. Treatmental plot size was 0.9 × 10 m consisting of 44 plants per plot. A space of 1.0 m between treatments and 1.0 m between replication were kept as buffer to avoid the border effect.

*Depthwise Root Distribution of Brinjal. Depth*

**Table 1.** Depth wise root distribution of brinjal under different irrigation levels.

Irrigation levels	Root density at different soil depth (mg/cc)			
	5 cm	10 cm	15 cm	20 cm
I <sub>1</sub>	19.04	11.28	3.38	1.48
I <sub>2</sub>	14.00	2.40	2.00	1.00
I <sub>3</sub>	20.80	10.00	4.00	3.00
I <sub>4</sub>	18.46	7.21	4.16	2.05
I <sub>5</sub>	26.40	20.00	12.00	6.00

wise root distribution of brinjal was calculated at different depths i. e., 5 cm, 10, 15 and 20 cm in (mg/cc). *Maximum Width and Depth of Brinjal Root Distribution.* Maximum width and depth of brinjal root distribution as influenced by irrigation and fertilizer levels in centimeters.

### Results and Discussion

Depth wise root distribution of brinjal under different irrigation levels is given in Table 1. In all the five irrigation treatments roots developed were mostly in the first 10 cm of the soil particularly, this layer was found having 83.39 per cent of whole roots with 120% ET under drip, 82.65% with furrow, 73.70% with 100% ET under drip 68.75% with 60% ET under drip.

A remarkable difference in the root density in soil profile was found among the treatments. The highest root density was pointed out under 80% ET with drip irrigation followed by 120% with drip irrigation and furrow irrigation. Such a difference can be explained if different distributive characteristics of each system are considered. With all the irrigation treatments the highest root density was found at 0 to 15 cm and it decreased with decreasing soil-moisture profile considered. However, the root density in 80% ET with drip irrigation treatments was spread even below 20 cm depth of soil layer. In this treatment the root distribution was found to be fairly well distributed throughout the depth. This indicates the availability of optimum moisture content in the soil profile under this treatment.

The maximum roots spread along width and depth were also calculated and are given in Table 2. The

**Table 2.** Maximum width and depth of brinjal root distribution as influenced by irrigation and fertilizer levels.

Treatments	Max width (cm)	Max depth (cm)
I <sub>1</sub> F <sub>1</sub>	18.35	17.73
I <sub>1</sub> F <sub>2</sub>	19.01	18.50
I <sub>1</sub> F <sub>3</sub>	20.10	20.00
I <sub>2</sub> F <sub>1</sub>	26.00	25.00
I <sub>2</sub> F <sub>2</sub>	27.50	26.00
I <sub>2</sub> F <sub>3</sub>	29.00	27.50
I <sub>3</sub> F <sub>1</sub>	23.50	33.20
I <sub>3</sub> F <sub>2</sub>	24.00	34.00
I <sub>3</sub> F <sub>3</sub>	25.00	35.00
I <sub>4</sub> F <sub>1</sub>	26.73	31.08
I <sub>4</sub> F <sub>2</sub>	28.60	32.03
I <sub>4</sub> F <sub>3</sub>	30.50	33.00
I <sub>5</sub> F <sub>1</sub>	23.06	23.00
I <sub>5</sub> F <sub>2</sub>	25.00	24.30
I <sub>5</sub> F <sub>3</sub>	26.50	25.00

maximum lateral spread of roots was found in 120% crop ET with drip irrigation (30.5 cm) followed by furrow irrigation (26.50 cm). The lowest spread was found in 60% crop ET with drip irrigation. This might be due to more horizontal spread of soil moisture in case of 120 per cent crop ET with drip (T<sub>4</sub>) and furrow irrigation (T<sub>5</sub>) with the lowest spread in 60% crop ET under drip irrigation (T<sub>1</sub>). The maximum depth of root spread was found in 100% crop ET (35 cm) followed by 120% crop ET (33.00 cm), 80% crop ET (27.50 cm), furrow irrigation (25.00 cm) and 60% crop ET (20.00 cm), respectively.

### Conclusion

A remarkable difference in the root density in soil profile was found among the treatments. The highest root density was pointed out under 80% ET with drip irrigation followed by 120% ET with drip irrigation and furrow irrigation. With all the irrigation treatments the highest root density was found at 0—15 cm depth of soil and it decreased with decreasing soil moisture profile. However, the root density in 80% ET with drip irrigation treatments was spread even below 20 cm depth of soil layer. In this treatment the root distribution was found fairly well distributed throughout the depth. This indicates the availability of optimum moisture to the plants.

**References**

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