

## ABSTRACT

An investigation entitled "Morphological and Physio-biochemical Characterization of Tomato

Title of Thesis : Morphological and Physio-biochemical Characterization of Tomato (*Solanum lycopersicum* L.) Cultivars Under Soil and Soilless Conditions.

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(*Solanum lycopersicum* L.) Cultivars under Soil and Soilless Conditions" was conducted in the Division of Plant Physiology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. The experiment was conducted during October, 2020 to April, 2021 to standardize different growing media for the hydroponic cultivation of *Solanum lycopersicum* genotypes. Ten feet long, six feet wide and 8 feet height with 4 inch PVC pipes were used to create hydroponics system of 84 pot holes. Two varieties Rani and Abhilash were taken as experimental material and were sown inside the laboratory of Division of Plant Physiology with the help of white lights. After 25 days seedlings were transplanted to the hydroponic system with Nutrient Film Technique (NFT). In this technique, the roots of plants hang down to the bottom of the channel where they came into contact with the shallow film of the nutrient solution and absorbed nutrients from them instead of soil. The experiment was laid out in Factorial Completely Randomized Design, consisting of 5 treatments viz. T<sub>1</sub>: Coco peat (100 %), T<sub>2</sub>: Coco peat+ Perlite (1:1), T<sub>3</sub>: Coco peat + perlite + vermiculite (1:1:1), T<sub>4</sub>: Coco peat + perlite + vermiculite + vermicompost (1:1:1:1) and T<sub>0</sub>: Conventional method (soil + Vermicompost). After 3 week of transplanting, data was recorded at three different stages of crop growth (35DAT, 75 DAT and 95 DAT). The present study was carried out to understand how nutrient film technique affects the production and quality of tomato vegetable under different growing media. The experiment results showed that among both the varieties, treatment T<sub>4</sub> performed better in all the morphological, physiological and biochemical responses. In relation to morphological responses maximum plant height of both varieties at 95 DAT were recorded in treatment T<sub>4</sub> (57.50 cm and 55.60 cm) and T<sub>3</sub> (53.70 cm and 51.70 cm) and minimum were recorded in treatment T<sub>1</sub> (44.60 cm and 41.60 cm) and T<sub>0</sub> (30.63 and 28.20 cm). Maximum number of leaves was recorded in T<sub>4</sub> (110 and 101) and T<sub>3</sub> (93 and 87) and lowest in plants treated with treatment T<sub>1</sub> (72 and 68) and T<sub>0</sub> (64 and 58). The highest water use efficiency at 95 DAT was noticed in plants grown in hydroponics (0.43 and 0.32 kg L<sup>-1</sup>) as compared to conventional method (0.07 and 0.05 kg L<sup>-1</sup>). The maximum total chlorophyll content (a+b) for both varieties was found in plants treated with treatment T<sub>4</sub> (4.89 and 4.61 mg g<sup>-1</sup>FW) and T<sub>3</sub> (4.45 and 4.24 mg g<sup>-1</sup>FW) in comparison to T<sub>1</sub> (3.64 and 3.44 mg g<sup>-1</sup>FW) and T<sub>0</sub> (3.13 and 2.93 mg g<sup>-1</sup>FW). The maximum ascorbic acid content in fruit of both Rani and Abhilash tomato was recorded in treatment T<sub>4</sub> (35.62 and 32.56 mg 100g<sup>-1</sup>) and T<sub>3</sub> (31.28 and 27.88 mg 100g<sup>-1</sup>). The highest yield per plant for both varieties were recorded from the plants grown in T<sub>4</sub> (1.30 and 1.26 kg) and T<sub>3</sub> (1.21 and 1.19 kg) while the minimum yield were recorded from T<sub>1</sub> (1.08 and 1.03 kg) and T<sub>0</sub> (0.94 and 0.88 kg). The benefit- cost B/C ratio was more in T<sub>4</sub> was obtained more from the plants grown in T<sub>4</sub> (1:1.37) and T<sub>3</sub> (1:1.30) while the minimum benefit cost ratio was obtained from the plants grown in T<sub>1</sub> (1:1.27) and T<sub>0</sub> (1:1.19). The results clearly indicate that Treatment T<sub>4</sub> (Cocopeat + perlite + vermiculite+ vermicompost) in the ratio of 1:1:1:1 was found most promising treatment for enhancing the morphological, physiological, biochemical parameters, yield and quality of both varieties of *Solanum lycopersicum* L. as compared to other treatments.

Key words: Hydroponic, Nutrient film technique (NFT), Vermiculite, Water use efficiency (WUE), Ascorbic acid.

**Signature of Major Advisor**

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