

## ABSTRACT

**Title of the Thesis** : “Standardization of different substrates for production of lettuce (*Lactuca sativa* L.) through hydroponic system”

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**Name of University** : Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu.

An investigation entitled “Standardization of different substrates for production of lettuce (*Lactuca sativa*) through hydroponic system” was conducted in the Division of Plant Physiology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. The experiment was conducted during September, 2019 to March, 2020 to standardize different growing media for the hydroponic cultivation of *Lactuca sativa* genotypes. Ten feet long, six feet wide and 8 feet height with 4 inch PVC pipes were used to create hydroponics system of 180 pot holes. Two varieties *Romaine* and *Grand rapid* were taken as experimental material. Seeds of the two varieties collected from PAU, Ludhiana, Punjab and HPKV, Palampur, Himachal Pradesh, were sown inside the laboratory of Division of Plant Physiology with the help of white lights. Seedlings at five leaves stage 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 Randomised Design, consisting of 7 treatments viz, T<sub>0</sub>: Coco peat (100 %), T<sub>1</sub>: Coco peat + Vermicompost (1:1), T<sub>2</sub>: Coco peat + Perlite (1:1), T<sub>3</sub>: Coco peat + vermiculite (1:1), T<sub>4</sub>: Coco peat + perlite + vermiculite (1:1:1), T<sub>5</sub>: Coco peat + perlite + vermiculite + vermicompost (1:1:1:1) and T<sub>6</sub>: Conventional method (soil + Vermicompost). After 1 week of transplanting, data was recorded at three different stages of crop growth (12 DAT, 35 DAT and 50 DAT). The present study was carried out to understand how nutrient film technique affects the production and quality of lettuce vegetable under different growing media.

The experimental results revealed that among both the varieties, treatment T<sub>5</sub> performed better in all the morphological, physiological and biochemical responses. In relation to morphological responses, maximum fresh weight of both varieties at 50 DAT were recorded in treatment T<sub>5</sub> (198.39 and 183.53 g) and T<sub>4</sub> (191.43 and 164.81 g) and minimum were observed in plants treated with T<sub>0</sub> (155.78 and 140.88 g) and T<sub>6</sub> (69.92 and 87.80 g). Maximum height for both varieties was recorded in T<sub>5</sub> (57.93 and 35.10 cm) and lowest in plants treated with treatment T<sub>0</sub> (31.54 and 21.10 cm) and T<sub>6</sub> (21.97 and 19.85 cm). The highest water use efficiency at harvest was noticed in plants grown in hydroponics (0.49 and 0.37 Kg L<sup>-1</sup> FW) as compared to conventional method (0.10 and 0.06 Kg L<sup>-1</sup> FW) for both varieties. The maximum total chlorophyll content (a + b) for both varieties was found in

plants treated with treatment T<sub>5</sub> (76.52 and 67.13mg g<sup>-1</sup> FW) and T<sub>4</sub> (72.04 and 62.43mg g<sup>-1</sup> FW) as compared to T<sub>0</sub> (59.94 and 48.08 mg g<sup>-1</sup> FW) and T<sub>6</sub> (54.27 and 27.57 mg g<sup>-1</sup> FW). The maximum ascorbic acid in leaves of both varieties were found in plants treated with treatment T<sub>5</sub> (52.09 and 24.12 mg 100 g<sup>-1</sup> FW) as well as in T<sub>4</sub> (49.73 and 23.73 mg 100 g<sup>-1</sup> FW) and T<sub>3</sub> (48.10 and 23.47 mg 100 g<sup>-1</sup> FW) as compared to T<sub>0</sub> (42.43 and 20.05 mg 100 g<sup>-1</sup> FW) and T<sub>6</sub> (22.72 and 15.70 mg 100 g<sup>-1</sup> FW). The highest yield per plant for both varieties at harvest stage i.e, 50 DAT were recorded in plants treated with treatment T<sub>5</sub> (312.33 and 328.66 g) as well as in T<sub>4</sub> (302.00 and 294.33 g) and T<sub>3</sub> (268.33 and 256.33 g) and lowest were recorded in T<sub>0</sub> (248.00 and 237.66 g) as well as in T<sub>1</sub> (256.00 and 242.00 g) and T<sub>6</sub> (181.33 and 170.00 g).

The results clearly indicated that treatment T<sub>5</sub>: coco peat + perlite + vermiculite + vermicompost in the ratio of 1:1:1:1 was found the most promising treatment for enhancing the morphological, physiological, biochemical parameters, yield and quality of both varieties of *Lactuca sativa* as compared to other treatments.

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

**Signature of Major Advisor**

**Signature of Student**