

Effects of Temperature Control in Tropical Protected House on the Growth and Development of Lettuce in NFT Hydroponics

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Abstract

Lettuce is a temperate crop that can be successfully grown in upcountry Sri Lanka: ie. Nuwara Eliya (>1750m MSL) and Bandarawela (>1340m MSL). However, the Lettuce demand is exclusively concentrated in low country areas such as southern tourist belt. Growing Lettuce in low country areas with humid tropical climate under high temperature causes heat-induced crop damages. In this study, the effects of ambient air temperature control on the growth and development of Green-cos, Green-coral and Rocket lettuce varieties were studied in a NFT hydroponic system installed in a low country protected house in Kamburupitiya (<50m MSL). The total growing area of 139 m² in the protected house was divided into two equal sections as one compartment to install temperature control measures to lower the temperature and the other half to be used as the control. A mild pressure fogging system: 12 four way nozzles with 0.5hp water pump and two exhaust fans: 400 W, 620 rmp belt driven were operated as one combined setup to lower the ambient air temperature. The installed system was capable of lowering the average day time temperature by 3°C compared to the control. Lettuce grown under the low temperature compartment reported better morphology and significantly positive sensory properties ($P < 0.05$) to the control. However, the average yield of the Lettuce grown under the low temperature compartment was significantly lower ($P < 0.05$) to the control as (86.6 g < 94.7 g, 82.8 g < 94.5 g, 51.9 g < 63.65 g), respectively for Green-cos Green-coral and Rocket. Moreover, plants grown in both compartments have shown low performance of growth to their previously reported potential yields (250 g, 200 g, and 80 g), respectively for the studied varieties. The Green-cos, which ranked best in sensory attributes with less bolting was found to be the best suitable variety to be grown in the low country in Sri Lanka from the other varieties studied. The study has demonstrated that the importance of optimizing ambient air temperature inside low country tropical protected houses for growing Lettuce to get best out of their potential yield.

Keywords: Hydroponics, Lettuce, NFT, Temperature Control, Tropical Climate

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