Tropentag, September 11-13, 2024, hybrid conference

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Effects of root zone temperature on nutrient depletion dynamics and growth performance of hydroponically grown tomato

Susanne Werner, Theresa Detering, Folkard Asch

University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), Germany

Abstract

A potential strategy to mitigate climate change induced water scarcity is greenhouse based hydroponic cultivation of crops. One important factor affecting the growth of hydroponically cultivated plants is the root zone temperature (RZT). Earlier studies have shown, that approximately 25 °C constitutes the ideal RZT for tomato (*Solanum lycopersicum*). However, controlling temperature and humidity (VPD) in greenhouses, particularly during the hot months of the year, is difficult, and often results in RZTs higher than optimal. Here, we report on effects of increased RZT under humid and dry air conditions on growth and nutrient uptake of tomatoes.

Under two vapour pressure deficit (VPD) environments, tomato variety "Saluoso" was grown in deep-water hydroponics in a greenhouse experiment. The plants were subjected to contrasting RZT conditions, with temperatures of 24°C and 28°C respectively, during the day. Five destructive samplings were conducted at five-day intervals. For each sampling, fresh and dry fractionated biomass (leaves, stems, roots), total leaf area, plant height, and the Soil Plant Analysis Development (SPAD) were determined. Furthermore, a quantitative analysis of macro- and micronutrient uptake from the nutrient solution was conducted.

Preliminary results suggest that there are no statistically significant differences in total plant biomass production between the two RZT, or VPD. Nutrient solution analysis indicates that while there are no differences between the RZT treatments, combining low VPD with high RZT leads to earlier nitrogen depletion than other combinations. Regardless of RZT, high VPD led to increased leaf area with wider leaves in the later stages. The combination of high RZT and low VPD resulted in the narrowest leaves. The poster will discuss these effects on morphology with regard to nutrient uptake and distribution as affected by RTZ and VPD.

Keywords: Deep water hydroponic, growth, nutrient depletion, root zone temperatur, tomato, vapour pressure deficit

Contact Address: Susanne Werner, University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), 70593 Stuttgart, Germany, e-mail: susanne.werner@uni-hohenheim.de