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Quantitative and Qualitative Responses of Hydroponic Tomato Production to Different Levels of Salinity

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ABSTRACT

From economic and nutritional points of view, tomato is, historically, considered one of the most important crops. Without significant yield reduction, most commercial cultivars of tomato crops are sensitive to moderate levels of salinity. However, high levels of salt stress can negatively affect the yield and quality of tomato fruits. Therefore, this study was conducted to evaluate the yield and fruit quality of three tomato cultivars (Forester, Ghandowra-F1, and Feisty-Red) cultivated hydroponically, under three different levels of nutrient solution salinity. Evaluation of tomato fruits was performed based on quantity (number and weight of fruits, and total fruit yield), physical quality (color and firmness), and chemical quality (refractometric index “Brix”, pH, EC, K⁺, Na⁺, and NO₃⁻). Experiments were conducted using three salinity levels of the nutrient solution with electrical conductivity values (dSm⁻¹) of 2.5 (control), 6.0, and 9.5. Results showed that the studied tomato cultivars were significantly influenced by high salinity (9.5 dSm⁻¹) in comparison to the low (2.5 dSm⁻¹) and medium (6.0 dSm⁻¹) levels of salinity. On average, the highest fruit weight per plant of 1944.84 g and total fruit yield of 4.42 kgm⁻² were observed at the low salinity level; however, no significant differences were obtained in the two yield factors (single fruit weight and total fruit yield) for the low and medium salinity levels. On the other hand, a significant reduction in tomato yield (31%) was associated with the high salinity level compared to the yield at low and medium salinity levels. Results of physical quality parameters showed highly significant differences among all salinity levels. On average, the maximum value of color change (1.72) was associated with the medium salinity level, and the maximum value of firmness (9.61 Ncm⁻¹) was recorded at the high salinity level. Salinity levels and tomato cultivars introduced significant differences in chemical quality parameters; however, no significant differences in these parameters were attributed to the low and medium salinity levels. The maximum value of pH was recorded for the combination of medium salinity and Forester cultivar. Moreover, the maximum values of Brix, EC, K⁺, Na⁺, and NO₃⁻ were recorded for the Ghandowra-F1 cultivar at the high salinity level. Unlike the Feisty-Red, the performance of the Forester and Ghandowra-F1 cultivars was found to be acceptable at the tested medium salinity level (6.0 dSm⁻¹).

KEYWORDS

Quality; cultivars; yield; color; firmness; brix

