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"Competing pathways for equitable food systems transformation: Trade-offs and synergies"

Effect of salt stress on transpiration of some sweet potato genotypes

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Abstract

Regulating transpiration rate under salinity is considered a salt resistant trait in some plants. Little is known about this trait in sweet potato and if plant age may affect this trait. In order to elucidate the relationship between transpiration, plant age when the stress occurs and level of salinity, four contrasting sweet potato (*Ipomoea batatas* L.) genotypes, CIP 189151.8, CIP 188002.1, CIP 106082.1 and CIP 420001 were grown hydroponically in a greenhouse at the University of Hohenheim, Germany. Salt stress (100 mM NaCl) was applied 16, 17, 18, 19, and 20 days after planting. Recording of transpiration data began after seven days of salt stress (22 days) and continued up to 28 days based on 0.5, 1.5, 2.5, and 3.0 kPa vapour pressure deficit (VPD). Dry matter, Na, K, and Cl content were analysed for each individual plant. The ranges of mean transpiration rate across VPDs varied from 0.69 to 2.68 mmol m^{-2} s^{-1} under control and 0.72 to 2.85 mmol m^{-2} s^{-1} under salt stress. Transpiration rate increased linearly significantly with increasing VPD without a clear salt effect in all sweet potato genotypes. Mostly, young, salt-stressed plants showed higher transpiration rates compared to the older stressed plants except CIP 420001. Although transpiration rates did not differ significantly among genotypes, sodium (Na) increased sharply in CIP 189151.8 (very high), CIP 106082.1 (very high), and CIP 420001 (slightly increased), consistent with their older age, while an opposite result was observed in CIP 188002.1. The genotype CIP 188002.1 showed similar transpiration rates with different Na accumulation. In addition, more K was found in the older plants of CIP 188002.1 with higher dry matter. The results indicate that Na uptake in sweet potato is not controlled by transpiration. We conclude that the transpiration rate of sweet potato under salinity is not indicative of salt tolerance mechanisms or Na uptake, but is based on the genotypic potential at which more K and less Na can be obtained. It is therefore suggested that further studies on Na and K uptake, distribution patterns (organ-wise), and the role of Na and K transporter channels in sweet potato plants are needed.

Keywords: Na uptake, Sweet potato, salinity, transpiration, vapor pressure deficit

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