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Physiological Responses and Ion Accumulation of Twelve Sweet Potato Clones Subjected to Salinity

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Abstract

Salinity is an increasingly severe threat to coastal agriculture, particularly in the mega deltas of the Asian large rivers. In these systems, agriculture during the dry season often includes tuber crops such as sweet potato that face the threat of salt intrusion either from inherent soil salinity or through irrigation. Sweet potato varieties with a relatively high degree of salt tolerance are urgently needed for the future resilience of such systems. Little research has been done on identifying traits for salinity tolerance in sweet potato. In this study, we subjected 12 contrasting sweet potato clones from the Bangladesh Agricultural Research Institute to varying levels of root zone salinity (0, 50, 100 and 150 mM NaCl) for 21 days in a hydroponic setup. Vines were separated into young, medium, and mature sections and the respective leaves, petioles, and stems were sampled individually. Vine length, leaf number, leaf area, SPAD values, and dry weight were determined and all samples analysed for sodium, potassium, and chloride concentrations.

We present data for the contrasting responses of the twelve clones to salinity and the severity of the stress. Based on salinity induced dry weight reductions we analysed thresholds and slopes of genotypic responses to root zone salinity and identified promising clones. Sodium, potassium and chloride uptake and distribution were analysed in view of tissue age. Salinity, in general, reduced all morphological parameters by 12 %, 30 % and 66 % at 50mM, 100mM, and 150 mM, respectively. Genotypes contrasted strongly in the severity of these reductions. Clones identified as tolerant based on the threshold and slope analyses showed smaller reductions than the sensitive ones. Chlorine uptake was strongly correlated to sodium uptake. In general, sodium was taken up to all parts of the plant, with a tendency to accumulate in older tissues more strongly. Tolerant clones showed increased potassium concentrations in the younger parts of the vine. Based on these results, potential traits for resistance to salinity in sweet potato will be discussed.

Keywords: Cl- and K+ concentrations, dry mater, Na+, salt tolerant, tissue age

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