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Between eustress and distress: Tracing hormesis of salinity in a sweetpotato clonal pool

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Abstract

All biotic and abiotic factors can act as stressors. It is the strength of the factor and the duration of its action that determine whether there is stimulating eustress or destructive distress. One of the most damaging abiotic stresses affecting crop production is soil salinity with its disturbing effects on physiological processes in plants. In contrast, salinity at mild-to-moderate levels has been shown to positively affect biomass accumulation and yield. In sweetpotato, such positive effects of salinity are observable in published data. However, they are not being discussed in a dose-dependent context due to the focus on distress and the tolerance to it. Hormesis, here understood as a biphasic dose-response with a low dose stimulation and a high dose inhibitory effect, is under research when it comes to varietal selection for low stress environments. In order to separate varieties along the hormesis spectrum from eustress to distress, a large number of genotypes need to be tested. We explored the performance of 30 sweetpotato varieties under saline and non-saline drip irrigation at the CIP research station in Maputo, Mozambique in two consecutive dry seasons. Yield components and growth indicators including tuberous root number and weight, vine fresh weight and dry matter were determined at maturity. Additionally, tubers were analysed for beta-carotene, iron, zinc, starch, protein, and sugar content. Salinity effects were compared to the clonal pools' fresh water baseline and varieties clustered into groups according to the salinity impact. In the final analysis, we plan to link the clusters to shared traits. Discriminating salinity effects on individual genotypes as indicative for the position along the hormesis spectrum allows targeted selection of genotypes for stress-specific environments. This can provide a salinity management option which not only allows genotypes to tolerate saline conditions but, by making productive use of them, mitigating negative effects of degraded soils on crop production.

Keywords: Hormesis, salinity, sweetpotato

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