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Morphological responses of selected african nightshade lines to salt stress

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Abstract

African nightshades (*Solanum* spp.), valuable yet underutilised indigenous vegetables, hold significant potential for improving nutrition and livelihoods in sub-Saharan Africa. However, salinity stress increasingly threatens their productivity, particularly in coastal regions affected by seawater intrusion and climate change. This study aimed to quantify changes in traits of African nightshade lines under salt stress. Thirteen lines from four species were grown in a hydroponic system under three salt (NaCl) concentrations (0, 60, and 120 mM) in a sreenhouse in a randomised complete block design with five replicates.

There were significant interactions observed between salt treatment and line observed for shoot length ($p < 0.001$), dry weight ($p < 0.001$), and leaf area ($p < 0.01$), suggesting differences in salt tolerance among lines. Moreover, salt treatment significantly affected shoot length ($p < 0.001$) and dry weight ($p < 0.001$) but not root length ($p > 0.05$) and leaf area ($p > 0.05$). To identify salt tolerant lines from the 13 lines tested, Stress Tolerance Index (STI) was calculated based on dry weight and the lines subsequently ranked. At 120 mM the lines Nduruma, Olevorosi, SS05, and TH15 showed high tolerance, while IP03, TH11, MW27, and SS52 ranked while the susceptible lines included TH04, SS40, IP06, SS04.2, and TH13. Principal Component Analysis (PCA) and cluster analysis based on STI and Stress Susceptibility Index (SSI) of all traits measured grouped the lines into three clusters with some concordance with the ranking where Cluster 1 (tolerant) included SS05, Olevorosi, SS52, Nduruma, IP03, and MW27; Cluster 2 (moderately tolerant) included TH15 and TH11; and Cluster 3 (susceptible) comprised SS04.2, TH04, TH13, IP06, and SS40. Nduruma, Olevorosi, and TH15 were the most salt-tolerant lines, while TH04, and TH13 were the most susceptible.

This study reveals that African nightshade show varied responses to salt stress indicating the need for further screening for salt-tolerant lines and research into salinity response mechanisms to support sustainable agriculture.

Keywords: Climate resilience, indigenous vegetables, morphological traits, salinity stress, salt-tolerant lines, stress susceptibility index, stress tolerance index

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