

Morphological response of assorted rice genotypes to Salinity in Tanzania

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Abstract

Salinity where salts concentrate on the soil surface causing severe decline of crop yields is a worldwide problem. In Tanzania salinity is one of the major soil degradation challenge affecting over 3.5 million hectares limiting agriculture productivity of various crops including rice. Most of the varieties grown are sensitive to salts and inadequate tolerant cultivars available in the country. A hydroponics mass screening technique using Yoshinda Solution was used to test the 102 genotypes in NaCl- saline treated and non-treated solution at Tanzania Agricultural Research Institute (TARI - Dakawa Centre). Different salt concentrations (4dSm⁻¹, 6dSm⁻¹, 8dSm⁻¹ and 10dSm) were used and the experiment was done in three replications. The genotypic variability for salinity tolerance was observed as less salt injury symptoms, low Na⁺ accumulation and Na⁺/K⁺ ratio in plant tissues and high biomass accumulation (fresh weight and dry weight). Results revealed further that 28 genotypes (28.45%) out of 102 showed tolerance to salinity, at high salinity level of 10dSm⁻¹. Lines namely SR35266-2-18-2-1, SR35250-1-19-1-1, SR23364-128-1762-1-HV-1-1, SR35230-1-12-1-1, SR23364-128-1986-1-HV-1-1, SR34590-HB3433-4-1-1, SR35266-2-7-1-1, PBR1000922-1 and SR34053 (#5-52)-1-4-2-10-3-3 showed high performance under high salt conditions. Others includes SR35266-3-1-5-1, SR34574-2-10-3-1-2-1, SR35278-2-10-1-1, SR35250-2-3-1-1, SR35266-3-2-3-1, SR35266-3-2-4-1, SR23364-133-184-1-HV-1-1, SR34592-HB-1-HV-1 and SR34042F3-22-1-1-5-3 indicated tolerance to salt and had high dry matter as well. All the genotypes had increased levels of Na⁺ and differential performance was observed in some genotypes under saline and non-saline conditions. Among these three lines namely SR35266-2-7-1-1, SR23364-128-1762-1-HV-1-1 and SR34590-HB3433-4-1-1 expressed high dilution ability as the K⁺ and Na⁺ concentrations were lower compared to other genotypes. The study therefore suggests that the lines can be used in the breeding programs to develop varieties with potential to salt tolerance and other traits.

Key words

Salinity, Genotypes, Hydroponics, K⁺ and Na⁺ concentrations