ROLE OF OSMOTIC ADJUSTMENT AND ABSCISIC ACID IN THE SALT RESISTANCE OF NEWLY DEVELOPED MAIZE (*ZEA MAYS* L.) HYBRIDS

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Salinity is a major constraint to increasing crop yields in many parts of the world. Increased salt concentrations in the soil solution influence plants in two sequential phases. In the first phase, an osmotically induced water stress is imposed on plants by the lowered availability of water in the external solution. In the second phase, toxicity effects arise from the gradually accumulating salts in plant tissues. Maize (*Zea mays* L.) is considered a salt-sensitive species. However, a group of maize hybrids developed recently have shown the capability of partial resistance to salt stress. The objective of this study was to elucidate the physiological basis of salt resistance of these newly-developed maize hybrids during the first phase of salt stress.

Four maize hybrids (cv. Pioneer 3906 and newly developed hybrids SR03, SR12 and SR13) were grown in aerated nutrient solutions at 1 mM Na^+ (control) and 100 mM Na^+ (salt stress) under controlled environmental chambers at Giessen, Germany. Stress was imposed in 25 mM incremental steps and plants were harvested after 2 d at 100 mM Na^+. At 100 mM Na^+, area of the 4th leaf, which developed under salt stress, did not change significantly in SR03 and SR12 whereas significant reductions were observed in cv. Pioneer 3906 and SR13. Shoot turgor and growth were maintained in SR03 and SR12 at 100 mM Na^+ through significant increases in osmolality of shoot sap. Concentrations of assimilates (glucose, fructose, and sucrose) in the shoot sap were significantly greater under salt stress in SR03 (63%) and SR12 (44%). However, greater assimilate supply was not responsible for their salt resistance as there were no significant reductions even in the other two genotypes.

Concentrations of free abscisic acid (ABA) and ABA-glucose esters (ABA-GE) in the growing region of the 4th leaf increased significantly (59% - 253%) under salt stress in all genotypes. Leaf area at 100 mM Na^+, expressed as a percentage of that at 1 mM, showed significant positive relationships with free ABA ($R^2 = 0.78$) and the sum of free ABA and ABA-GE ($R^2 = 0.86$). Thus, the highest ABA+ABA-GE concentration was shown in SR03 which showed the highest salt resistance in terms of leaf growth. Results of this study indicate that a combination of partial osmotic adjustment and a growth-promoting function regulated by ABA is responsible for salt resistance in the first phase of salt stress. Genotypic variation in these mechanisms expressed due to salt stress can be utilized to breed salt-resistant genotypes in maize.

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