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Differential Sensitivity of Chloroplasts in Mesophyll and Bundle Sheath Cells in Maize, an NADP-Malic Enzyme-Type C₄ Plant, to Salinity Stress

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Abstract: The changes in chloroplast ultrastructure and the contents of chlorophyll, Na and K in response to salinity stress were investigated in leaves of maize, an NADP-malic enzyme-type C₄ plant species possessing dimorphic chloroplasts. The seedlings were treated with 0, 1, 2 or 3% NaCl for three or five days under a light or dark condition. In both light and dark conditions, the dry weight of salt-treated plants decreased as NaCl concentration increased. Chlorophyll and K contents of the second leaf blade decreased as NaCl concentration increased under the light condition but not under the dark condition. Na content of the second leaf blade was significantly higher at high NaCl concentrations under both light and dark conditions. However, Na content was much lower under the dark condition than light condition. Higher concentrations (2 and 3%) of NaCl significantly increased the size of plastoglobules, decreased the number and size of starch granules and altered the chloroplast ultrastructure. Under the light condition, mesophyll cell (MC) chloroplasts appeared more sensitive to the damaging effect of salinity than the bundle sheath cell (BSC) chloroplasts. MC chloroplasts became more globular in shape and showed swollen and disorganized thylakoids and reduced thickness of grana by salinity. BSC chloroplasts were less affected by salinity than MC chloroplasts. Although chloroplast size and number and size of starch granules were reduced, there was no structural distortion in the thylakoids of BSC chloroplasts. However, the thickness of grana was increased by

salinity. Under the dark condition, the chloroplast structure was less affected by salinity. Though the envelope of BSC chloroplasts was occasionally damaged, the thylakoids in both MC and BSC chloroplasts were preserved under salinity stress. The present study suggests that the chloroplast damage caused by salinity is light-dependent and MC chloroplasts are more sensitive to salinity than BSC chloroplasts.

Keywords: [Bundle Sheath](#), [C₄ Plant](#), [Chloroplast](#), [Maize](#), [Mesophyll](#), [Salinity](#)

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