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The Effect of Zinc on Growth and Shoot Concentrations of Sodium and Potassium in Pepper Plants under Salinity Stress

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Abstract: The effect of increasing concentrations of zinc (Zn) on NaCl toxicity was studied in pepper (Capsicum annuum L. cv. Kahramanmaras-3) plants grown in a growth chamber under controlled conditions. Plants were grown in severely Zn-deficient soil with increasing Zn (0, 2, and 10 mg Zn kg^{-1} soil) and NaCl (0%, 0.5% and 1.5% NaCl in irrigation water) treatments. After 46 days of growth, the plants were harvested and the shoots were analyzed for dry matter production, concentrations of Zn, sodium (Na), potassium (K), and phosphorous (P), and K/Na ratios. The results showed that Zn deficiency in soil significantly reduced shoot growth, particularly under the highest salt treatment. As expected, increasing the application of NaCl reduced shoot dry matter production; however, this decrease was greater in the 2 mg Zn kg^{-1} soil compared to the 10 mg Zn kg^{-1} soil. Increases in Zn application from 2 to 10 mg kg^{-1} soil reduced shoot concentration of Na and elevated K concentration. Consequently, K/Na ratios of plants were highest in the highest Zn application condition. The results of the present study indicated the importance of the Zn nutritional status of plants in improving salt stress tolerance. Possibly, by affecting the structural integrity and controlling the permeability of root cell membranes, adequate Zn nutrition reduces excess uptake of Na by roots in saline conditions. Adequate Zn nutrition is, therefore, important for the maintenance of good growth and yield under saline conditions.

Key Words: Capsicum annuum, salinity stress, zinc deficiency, membrane integrity

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