Effect of low-molecular-weight carboxylic acids and selected synthetic chelates on zinc uptake and translocation in two wheat genotypes with different zinc-efficiency

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Abstract

Zinc (Zn) deficiency in human, which results from diets low in bioavailable zinc, could be eliminated by increasing readily plant-available Zn in soil. Root exudates and organic acids released during decomposition of soil organic matter can affect the availability of Zn. Thus, this hydroponic experiment was conducted to investigate the effect of some chelates on Zn uptake and translocation in two wheat genotypes with different zinc-efficiency. Two wheat genotypes (*Triticum aestivum* L. Back Cross Rowshan as zinc-efficient and Kavir as zinc-inefficient) were exposed to two levels of zinc (10 and 100 µM) and six different carboxylic acids (citric, tartaric, oxalic, salicylic, ethylenediamin tetraacetic acid and L-methionine). Results showed that uptake capability of free and complexed species of Zn were completely different. Zn^{2+} activity in nutrient solution had negative correlation with shoot dry weight and positive correlation with shoot zinc concentration in Kavir genotype, while complexed species had opposite results. Back Cross Rowshan genotype showed opposite results in comparison with Kavir genotype. The response of wheat genotypes to different organic acids varied. EDTA treatment caused the lowest shoot zinc concentration in Kavir genotype (18.8 mg/kg), while the Back Cross Rowshan genotype had highest concentration (99.5 mg/kg). Tartaric acid and citric acid caused the lowest root Zn concentration in the Kavir genotype (26.7 and 58.6 mg/kg, respectively), while the highest content was observed in the Back Cross Rowshan genotype (83.2 and 98.1 mg/kg, respectively). Catalase activity had inverse relationship with root Zn concentration in both genotypes. According to the results of this research, different responses of the wheat genotypes to organic acids are related to different mechanisms of zinc-efficiency in genotypes.

Keywords: Organic acids, Root exudates, Back Cross Rowshan genotype, Kavir genotype, Micronutrients.

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