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Differential Antioxidative Enzymes Activity and Nutrients Dynamics in two Maize (*Zea Mays* L.) Hybrids Against Ni Toxicity

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Abstract

Nickel is among the essential micronutrient heavy metals required by the plants in very minute quantity. However, its excessive amounts cause serious concerns for plants normal functioning and their survival. Nickel as a cationic species competes with other nutrient elements like Ca, Mg, Mn, Fe, Cu and Zn in uptake, absorption and transportation and like other biotic/abiotic stresses cause oxidative stress via generation of reactive oxygen species (ROS) in plants.The present study evaluated the mechanisms of differences of two commercial maize hybrids in growth, physiology and nutrient dynamics exposed to Ni toxicity in hydroponics nutrient solution. Seedlings were raised in plastic trays having quartz sand and subsequently, transferred to Hoagland's nutrient solution at two leaves stage. After three days of transplantation, Ni concentrations of 0, 20 and 40 mg L^{-1} were maintained in the nutrient solution. After 30 days of Ni treatments, seedlings were harvested and different growth, physiological and nutrients concentrations were determined. The results showed that with increasing Ni concentration, the growth of maize hybrids significantly reduced and maize hybrid Pioneer showed significantly higher growth than Syngenta at all levels of Ni. Higher growth in Pioneer is attributed to enhanced activity of antioxidant enzymes (SOD, CAT, GR, APX, POX), lower damage to cellular membranes (i.e. Higher MSI and Lower MDA) and higher tissues nutrients concentration (N, P, K, Ca, Mg, Fe, Mn, Zn, Cu). Furthermore, the maize hybrids showed difference in nutrients translocation from root to shoot which could be one of the factors responsible for differential response of these hybrids against Ni toxicity.

Keywords: Maize hybrids, Nickel, Nutrients, Oxidative stress, Translocation

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