

Effect of Zinc-Lysine on Growth, Photosynthesis, Oxidative Stress and Antioxidant System and Chromium Uptake in Rice under Cr Stress

Authors : Shafaqat Ali, Afzal Hussain, Muhammad Rizwan, Longhua Wu

Abstract : Chromium (Cr) is one of the widespread and toxic trace elements present in the agricultural land. Chromium can enter into the food chain mainly through agricultural crops grown on Cr-contaminated soils such as rice (*Oryza sativa* L.). The current study was done to evaluate the effects of increasing concentrations foliar applied zinc (Zn) chelated with lysine (Zn-lys) (0, 10, 20, and 30 mg L⁻¹) on rice biomass, photosynthesis, oxidative stress, key antioxidant enzyme activities and Cr uptake under increasing levels of Cr in the soil (0, 100, 500 mg kg⁻¹). Cr-induced toxicity reduced the height of plants, biomass, chlorophyll contents, gas exchange parameters, and antioxidant enzyme activities while increased the Cr concentrations and oxidative stress (malondialdehyde, electrolyte leakage, and H₂O₂) in shoots and roots than control plants. Foliar application of Zn-lys increased the plant growth, photosynthesis, Zn concentrations, and enzyme activities in rice seedlings. In addition, Zn-lys reduced the Cr concentrations and oxidative stress compared to the respective Cr treatments alone. The present results indicate that foliar Zn-lys stimulates the antioxidant defense system in rice, increase the rice growth while reduced the Cr concentrations in plants by promoting the Zn uptake and photosynthesis. Taken together, foliar spray of Zn-lys chelate can efficiently be employed for improving plant growth and Zn contents while reducing Cr concentration in rice grown in Cr-contaminated and Zn-deficient soils.

Keywords : antioxidants, chromium, zinc-lysine, oxidative stress, photosynthesis, tolerance

Conference Title : ICPNSES 2018 : International Conference on Plant Nutrition, Soil and Environmental Science

Conference Location : Venice, Italy

Conference Dates : November 14-15, 2018