Effect of different zinc sources on concentration of cadmium and some micronutrients in spinach grown on a calcareous soil

T. Rahimi* and A. M. Ronaghi[1]

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Abstract

Cadmium (Cd) is a heavy metal which is toxic to human, plants and all other organisms. Among heavy metals, Cd mobility and phytoavailability in soils is of great concern due to the fact that even at low concentrations may cause toxicity. Thus its behavior in soils needs further investigation. A greenhouse experiment was carried out to examine the effect of Cd and two zinc (Zn) sources (sulfate and chelate) on spinach growth and some nutrients concentration, in a factorial arrangement based on a completely randomized design. The treatments consisted of three Cd levels (5, 10 and 20 mg/kg soil as cadmium sulfate) and four Zn levels (0, 5, 10 and 20 mg/kg soil either sulfate or chelate) in three replicates. The results indicated that Cd application significantly decreased dry weight of spinach while Zn decreased the adverse effects of Cd. Increasing Cd level increased the concentration of this element in spinach shoot. Both sources of Zn significantly decreased Cd concentration in spinach aerial part. Cadmium application significantly decreased Zn and manganese (Mn) concentration in spinach shoot, but had no significant effect on iron (Fe) concentration. Both Zn sources decreased Mn and Fe concentration in spinach shoot. Based on achieved results of this study, it seems that Zn fertilizers application, especially Zn-sulfate, is useful to reduce the adverse effects of Cd on plants in soils contaminated with Cd.

Keywords: Cadmium, Zinc sulfate, Zinc chelate, Spinach, Soil pollution.

1. Dept. of Soil Sci., College of Agric., Shiraz Univ., Shiraz, Iran.
*: Corresponding Author, Email: tayebe_rahimi@yahoo.com

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