



Research Article

Long term effect of cropping systems on the chemical fractions of zinc and copper in alluvial soils of north-west India

■ GURPREET SINGH, S. S. DHALIWAL, U. S. SADANA AND BALKARAN SINGH

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MEMBERS OF RESEARCH FORUM :

Corresponding author :

S.S. DHALIWAL, Department of Soil Science, Punjab Agricultural University, LUDHIANA (PUNJAB) INDIA
Email: ssdhaliwal@pau.edu

Co-authors :

GURPREET SINGH AND U.S. SADANA, Department of Soil Science, Punjab Agricultural University, LUDHIANA (PUNJAB) INDIA

BALKARAN SINGH, Department of Agronomy, Punjab Agricultural University, LUDHIANA (PUNJAB) INDIA

Summary

The present research study has been conducted with prime objective to investigate the chemical fractions of Zn and Cu under 10 cropping systems in alluvial soils. Surface (0-15 cm) soil samples were collected from an ongoing field experiment (in progress since 2000) with 10 cropping systems at research farm of Department of Agronomy, PAU, Ludhiana. These soil samples were analyzed for total Zn and Cu and their chemical fractions using atomic absorption spectrophotometer (Varion AAS-FS Model). Among chemical fractions, higher levels of Zn (WSEX, SpAd, MnOX and CFeOX) and Cu (WSEX and OM bound) were reported under maize-potato-mungbean and cotton-gobhi sarson cropping systems respectively. Among fractions, SpAd, held on organic sites, oxide bound and amorphous fractions of Zn and Cu contributed towards plant available (water soluble and exchangeable) fractions.

Key words : Cropping systems, Micronutrients (Zn and Cu), Chemical fractions

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Introduction

The study of various fractions of Zn and Cu present in soil and conditions under which they become available to plants is pre-requisite in assessing their availability to plants. It is important to know the relationship between chemical fractions of micronutrients in the soil and their uptake by the crop. Under continuous cropping system, micronutrients are generally considered to be present in association with soil solution, organic and inorganic solid phases and this association is often referred to as speciation (Behera *et al.*, 2009), thus, forming their various chemical fractions such as water soluble plus exchangeable, specifically absorbed and those associated with free calcium carbonate, oxide surfaces, soil organic matter and minerals. The alternate flooding (reduced stage) in rice and upland (oxidized stage) conditions in wheat effects transformation of Zn and Cu from one chemical form to another (Manchanda *et al.*, 2003). Sekhon *et al.* (2006)

reported that cultivation of rice-wheat continuously for 7 years without any Zn and Cu fertilization did not deplete the amount of micronutrient in various fractions from their original levels. Dhaliwal (2008) reported that green manure and soil applied Mn to rice-wheat system increased the DTPA-extractable, water soluble plus exchangeable and Mn specifically adsorbed on the inorganic sites whereas, Mn held on organic sites and oxide bound surfaces decreased. Nayyar and Chhibba (2000) reported the transformation of Zn and Cu under rice-wheat cropping system, they founded that the prevalence of alternative oxidized and reduced condition cause decline in the content of crystalline oxide and reducible amorphous forms of Zn and Cu leading to their increased availability. According to Han and Banin (2000) saturation moisture regimes, results in Zn and Cu transformation from reducible oxide form into exchangeable and carbonate fraction. Distribution of Zn fractions and their contribution towards