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Regularities in the zinc stabilization in the soil

Tatiana Bauer (1), Tatiana Minkina (1), David Pinskii (2), and Dina Nevidomskaya (1)

(1) Southern Federal University, Rostov-on-Don, Russian Federation (bauertatyana@mail.ru), (2) Institute of Physicochemical and Biological Problems of Soil Science, Russian Academy of Sciences, Russian Federation (pinsky43@mail.ru)

The study of regularities in the Zn stabilization in the soil contaminated with easily and hardly soluble metal compounds in a long term experiment. In a five-year model experiment, Haplic Chernozem were artificially contaminated with Zn acetates, nitrates, sulfates, chlorides, phosphates, and oxides at rates of 300 and 2000 mg kg-1. To estimate the stabilization of added Zn in the soil, the dynamics of its loosely bound compounds (LBCs) composed of exchangeable, complexed, and specifically sorbed compounds, as well as the acid-base soil properties, was studied LBCs represent the most important group of metal compounds from the ecological viewpoint, because they are supplied in plants and groundwaters. These compounds were extracted with 1 N CH3COONH4 at pH 4.8, 1% EDTA, and 1 N HCl. Low contents of Zn LBCs (no more than 13% of total content) unchanging with time were revealed in the uncontaminated soil, which was indicative of the stability of soil processes. The content of Zn LBCs decreased with time in the soils contaminated with easily soluble compounds and increased in the soils contaminated with hardly soluble compounds. In both cases, the contents of Zn LBCs after 5 years of incubation remained higher than in the original uncontaminated soil. The effect of the attendant anions on the content of Zn LBCs was most manifested at the Zn application at 2000 mg kg-1. An inverse process characterized by an increase in the concentration of Zn LBCs with time was observed in the soil contaminated with Zn orthophosphate and oxide. The soil contamination with different Zn compounds results in soil acidification. According to the effect on the decrease in soil pH, the attendant anions form the following series: $SO42- \approx Cl- > NO_3- > Ac- > PO42- > O_2-$, which correlates with the content of Zn LBC. Thus, the stabilization of Zn compounds in the soil is affected by the attendant anions and the interaction time of metal with soil solid phases.

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