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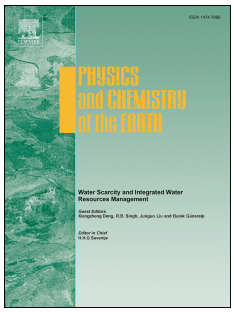

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Impact of salinity and Pb on enzyme activities of a saline soil from the Yellow River delta: A microcosm study

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Abstracts

Soil enzyme activities are sensitive to the changes of soil properties and pollutants. In this study, the influence of salinity and Pb on the soil enzyme (catalase, CAT; invertase, IA; urease, UA) activities regarding the soil aggregate size classes was investigated. We selected a saline soil from the Yellow River delta, and adopted an orthogonal experiment designed with five Pb concentration levels and five salinity levels. The soil was dry sieved into three soil aggregate size classes: >2000 μm, 250-2000 μm, and <250 μm. All three enzyme activities significantly decreased with the increase of soil salinity ($P < 0.05$). Pb had an inhibition effect on IA and UA activities but a significant promoting effect on CAT activity ($P < 0.05$) within the concentration range of 0-400 mg kg^{-1}. When Pb concentration exceeded 400 mg kg^{-1}, with the increase of Pb concentration, there were no significant changes of all the enzyme activities under the inhibition or promotion effects of Pb. The Pb concentration which leads to a significant reduction is between 0-200 mg kg^{-1} for IA activity and 200-400 mg kg^{-1} for UA activity. And the increase of soil salinity led to a higher toxicity of Pb for UA activity. The toxicity range could be a valid reference for the formulation of soil quality standards in estuarine wetlands. We concluded that the effects of Pb on soil enzyme activities depend on the Pb concentration, soil salinity and the enzyme types. IA activity showed a higher actvity in the macro-aggregate (250-2000 μm), while there was no significant difference in CAT and UA activities among three particle size classes. Since the IA activity was sensitive to soil salinity, Pb concentration and soil aggregate size, it could be selected as a representative indicator for soil monitoring in the Yellow River delta.

Key words: Salinity; Pb concentration; Soil enzyme activity; Soil aggregate size classes; Yellow River delta