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Evaluation Remediation Effect of Different Origin Humic Substances toward Copper Contaminated Soil

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Extended Abstract

Heavy metal contamination of soil may pose hazard risks to ecosystems and human health. Usage of humic substances (HS) for remediation is one of the most harmless ways to fix it. Based on previously obtained results (Pukalchik et al., in press) the main factor determining the remediation effect of humates is not the ability to bind toxicant, but their biological activity. It is of high interest and importance to compare the effectiveness of humates having different organic matter origin. Humates are produced from coal, peat, composts etc. and the organic matter origin mainly determines the details of their molecular structure and final detoxication ability. One of the main criteria for evaluation of remediation efficiency is estimation of influence on soil microbiota. That's why the aim of this study is to evaluate the detoxifying (remediation) ability of a number of humates towards Cu (applied to model soil mixtures).

Experiment was made using model soil mixtures (MSM) contained 20% of kaolin, 10% of peat and 70% of sand (ISO 11268-1). After 5 days the salt $CuSO_4*5H_2O$ was carefully mixed with MSM at concentration from 264 to 528 mg Cu/kg soil. One week later HS from peat (Pe-FlexK), coal (BC-HumK) and lignosulphonate (OW-LhK) were applied at a concentration of 0.1 and 1 g/kg soil in water solution. In this research we estimate different biological parameters, such as: soil enzymes activity (urease, catalase, hydrolases), microbial biomass carbon, respiration rate, structural and functional peculiarities of soil micromycetes community. We have evaluated also the ecotoxicological statuses of polluted soil samples before and after HS treatment using representatives of producers, consumers and reducers as test-organisms. Preliminary results showed significant increases of biological activity in contaminated soil after the HS treatment. Particularly, we observed the increase of the intensity soil respiration rate (more then 30%), and transformation in soil micromycetes community. The activity of soil enzymes shows confident response to the impact (about 30-50%). All obtained data will be used to compute integral environmental index based on "Triad" approach (Chapman, 2002; Dagnino, 2008). This approach implies integration of "triad" ecological data: chemical, biological and toxicological indicators.

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