



Preliminary experiment on induced phytoremediation of soils polluted with copper and lead from copper smelters, Poland

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According to the Polish law, remediation of polluted soils should remove excessive pollutants from soils, which means that remediation strategy based on immobilization of heavy metals does not fulfill legal requirements. Phytoremediation seems to be a promising solution for soil cleaning, but the methods based on hyper-accumulating plants or high-biomass-plants are inefficient. Therefore, induced phytoremediation should be taken into consideration and optimized to obtain the best results of metal plant-uptake without causing intensive metal leaching into groundwater. Presented are the preliminary results of a pot experiment on induced phytoremediation of soils polluted by the emissions from copper smelters Legnica and Glogow (Poland).

Two soils were used in the experiment: silty loam (I) and sandy (II), containing excessive amounts of Cu and Pb: 513 and 180 mg/kg, respectively, in soil I, and 975 and 106 mg/kg in soil II. Two plant species were grown: Indian mustard and common vetch. The growth of plants on soil II was too poor to continue the experiment, and therefore maize was chosen as an alternative plant for that soil. After 42 days, phytoextraction of metals from soils was induced by addition of citric acid and EDTA (0.005 M), divided into two parts, applied within 2 days. Then plants were cut, dried and weighted. Soil was leached with distilled water (150 mL/pot) twice, after 45th and 65th day, to simulate heavy rainfalls, and Cu and Pb concentrations were measured in both leachates. Metal concentrations were also determined in plant material and soils.

Addition of EDTA significantly increased phytoavailability and solubility of both metals, particularly Cu, in soils. Cu uptake by plants increased by 2-14-fold in comparison with control plots. However, the highest Cu concentration in maize biomass was 338

mg/kg and remained far below those considered as typical for hyperaccumulation. EDTA caused intensive Cu and Pb leaching from soils. Cu concentrations in leachates from EDTA plots ranged: 40-540 mg/L. Technical parameters of induced phytoremediation in this experiment were far from optimal. The results proved that the research on induced hyperaccumulation, as a method of Cu and Pb removal from soils, should be continued. Addition of EDTA may effectively mobilize Cu from soils polluted by copper smelters emissions.