MIGRATION OF VARIOUS CHEMICAL COMPOUNDS IN SOIL SOLUTION DURING INDUCTED PHYTOREMEDIATION

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Abstract: The induction of phytoremediation by addition of complex substrates, such as sewage sludge (e.g. from the food industry), allows for better conditions of plant growth, however, it also increases the risk of chemical compounds leaching to the soil solution.

Biogenic compounds occurring in sludge such as nitrogen, organic carbon and phosphorus when migrating with soil solution down the soil profile can lead to underground water contamination. The paper assesses the effect of sewage sludge inducted phytoextraction of Zn, Cd and Pb with the use of Sinapis alba L. (White mustard), Medicago sativa L. (Alfalfa) and Trifolium resupinatum L. (Persian clover) as well as the migration of biogenic compounds (nitrogen, organic carbon and phosporus) in soil solution.

Research was conducted in controlled conditions of a phytotronic chamber in which the lysimetric experiment was carried out in order to monitor the changes of total nitrogen, ammonia, phosphates, organic carbon and pH every 3 weeks during the 112 days of the entire experiment.

Based on the obtained results it was found that there is no risk of underground water contamination by investigated substances present in sewage sludge, because there was no indication of increased ammonia and carbon migration to the deeper parts of the soil profile.

The only exception was the migration of nitrogen compounds other than ammonia (possibly nitrates and nitrites). Due to sewage sludge application the highest concentrations of ammonium nitrogen (211 $mgN\text{-}NH_4\ l^{-1}$), total nitrogen (299 $mg\ N\ l^{-1}$) and organic carbon (200 $mg\ TOC\ l^{-1}$) were noted at a layer of 30 cm (from top of the column/lysimeter) after 3 weeks of the conducted process.

With time a decrease of ammonium nitrogen as well as organic carbon concentration in all columns was noted. There was no indication of phosphates in the soil solution during the entire experiment, which was due to the high cation exchange capacity of the soil matrix.