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Soil and Water Research

Contamination of the soil and water environment by heavy metals in the former mining area of Rudňany (Slovakia)

Angelovičová L., Fazekašová D.:

Soil & Water Res., 9 (2014): 18-24

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Contamination of soil and water environment by heavy metals in a former mining area and their effect on the soil characteristics were determined. Soil samples were collected in the village of Rudňany which is, according to environmental regionalization, classified as an environmentally loaded and unhealthy area. Soil samples were collected in 2011 at eight fields situated at different distance from the pollution source. Total contents of heavy metals (Cu, Pb, Zn, Hg), soil reaction (pH), organic carbon (C_{ox}), activity of urease (URE), acid phosphatase (ACP), and alkaline phosphatase (ALP) were determined in soil samples. Water samples were collected in Rudniansky creek, which flows through the village. The contents of heavy metals (Cu, Pb, Zn, Hg) were determined in water samples. High contents of heavy metals in soil and water result from long-term mining and smelting activities predominantly focused on copper and mercury production. Numerous heaps of waste material and tailing ponds are the

main pollutant sources representing a great threat to the environment, as these pollutants can accumulate in plants and enter the food chain. Extremely high and above-limit values of copper and mercury were determined in the sampled soils. According to the index of geoaccumulation, copper has been shown as a serious contaminant in some soil sampling fields, which were determined as strongly contaminated. In terms of the geoaccumulation index, all sampling fields were evaluated as very strongly contaminated by mercury. We found significant positive correlation between zinc, lead, and copper contents in soils, which is a likely sign of the same source of pollution. A nonsignificant but positive relationship between soil reaction and heavy metals and a negative correlation between soil pH and organic carbon were observed. A high degree of soil pollution was reflected in soil biological properties. Activity of soil enzymes significantly decreased with increasing heavy metals content in soils. Rudniansky creek was polluted only by copper and mercury. The highest and above-limit values of these metals were determined at the point where the stream

leaves the village (in a downstream direction).

Keywords:

copper; environmental loads; soil enzymes; soil and water pollution; toxic elements

[[fulltext](#)]

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