



Influence of heavy metals on enzymatic activity in lessive soils of Kujawy and Pomorze region (Poland)

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Soil enzymes activity has been proposed as the potential indicators of soil quality because of their sensitivities to various environmental pollutants like heavy metals. Heavy metals are known to reduce microbial and enzyme activity when exceeding toxic concentration in the soil. The use of enzyme activities as a bioindicator of the degree of soil contamination by heavy metals has been proposed earlier. Therefore, the main objective of this study was to determine the influence of total and DTPA extractable heavy metals (Zn, Cu, Mn, Pb, Cd, Cr, Fe) content on the selected soil enzymes involved in the biochemical cycles of phosphorus (alkaline phosphatase, phosphodiesterase) and nitrogen (urease) as well as dehydrogenase activity for the general characterisation of biological activity. Soil samples were collected from surface and subsurface layers of arable fields possible far away from point sources of pollution. The total and DTPA extractable forms were determined on PU-9100X Philips spectrometer. Soil enzymatic activity was assayed colorimetrically and physico-chemical analysis were determined according to standard procedures. Analysed soils samples were acidic to alkaline, with pH in KCl ranging from 4.97 to 7.75. Soil differed widely in organic carbon content ranging from 3.1 to 11.0 g kg⁻¹. The accumulation of most investigated metals in both surface and subsurface layers due to eventually contamination was not observed. The total content of elements do not exceed environmental quality standards for the soil used currently in Poland. However, for some samples elevated concentration of Pb (until 22 mg kg⁻¹) and Cd (until 0.83 mg kg⁻¹) was observed as compared with results obtained for parent material for soils of Poland. Indicative intervals of mean values indicated that investigated samples differed in enzymatic activity widely. Activity of enzymes were relatively low as compared to other types of soils (e.g. black earths) and decreased with the depth what is parallel by decrease in or-

ganic matter. Correlation analysis showed significant correlation coefficients between some enzymes activity and soil pH and organic carbon content. In most investigated samples heavy metals (both total and DTPA forms) did not influenced enzymatic activity. Moreover, in some cases significant and positive correlation coefficients were observed suggesting stimulating role of investigated elements on enzymes (urease x Cu, dehydrogenase x Fe).