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SOIL REDOX RESISTANCE AND MOBILITY OF SOME HEAVY METALS ALONG THE ERODED LOESS SLOPE.

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Soil redox status is one of the most important soil feature which decidedly influences solubility and biotransformations of nutrients and pollutants in the soil [1,3,4]. It makes possible, on the basis of climate data (temperature and precipitation), to elaborate prognosis of transformations and leaking of nutrients and pollutants from soils to surface and subsurface waters.

This feature is a resultant effect of soil microbial activity, carbon availability, temperature, and of the pool of oxidized forms of nitrogen, manganese and iron. Characterized, on the biological basis, it is called soil redox resistance and is defined as the time (in hours and days) needed to decrease soil redox potential (Eh) under flooded conditions, and fixed temperature to 400 mV corresponding the nitrates decomposition (t_{400} index), or to 300 mV corresponding to the reduction of iron (t_{300} index). This feature proposed by Gliński and Stępniewska [2] Allowed to characterize a main of Polish

soils and elaborate maps for mineral arable soils of Poland [5]. They show t_{400} and t_{300} values of soils of whole Poland in the function of various temperatures and soil depth.

The results obtained permitted the determination of the dynamics of Eh in the course of incubation of soil samples flooded with water et 5, 10 and 20ºC and its consequences for the solubility of biogenic elements and heavy metals.

It appeared that loess soils formed from material at the uniform grain size are very sensitive to soil redox potential changes and show extremely small redox resistance in comparison to soils formed from other formations.

The authors are going to show how soil redox resistance expressed by t_{400} and t_{300} indexes can change along the eroded loess slope at different temperatures and their relation to solubility of some heavy metals (Cu, Mn, Fe, Cr, Cd). Soil samples were drawn from various places of the eroded slope and in the laboratory conditions, after flooding with water they were incubated at 5, 10 and 20^{o}C. Eh was measured in the soil supernatant when it reached 400 and 300 mV. During incubation concentration of tested metals were tested in water solutions.

In the places under examination t_{400} values ranged from hours to 5 days and t_{300} from 1 day to 40 days. These changes were caused mainly by temperature and also by the place of soil sampling along the eroded slope and with the depth of soil profile. Concentration of Cu, Mn, Fe, Cr, Cd were very differ in water solutions and was correlated with redox conditions in flooded samples of loess soils.

The results obtained confirmed the role of soil redox resistance as a good characteristics of loess soil sensitivity to temperature changes in solubility of heavy metals and the effect of eroded processes.

Literature

1. Carter C.E. 1980. Redox potential and sugarcane yield relationship. Trans. A.S.A.E. 23, 924-927.
2. Gliński J., Stępniewska Z.1986. An evaluation of soil resistance to reduction processes. Polisj J. Soil Sci. 19, 15-19.
3. Gliński J., Stępniewski W. 1985. Soil Aeration and its Role for Plants. CRC Press Inc. Boca Raton, Florida.
4. Patrick W.H.Jr. 1981. The role of inorganic redox systems in controlling reduction of paddy soils. Proc. Symp. Paddy Soils, Nanijing, China. Science Press Bejing –Springer Verlag, Berlin, 107-115.

5. Stępniewski W., Gliński J., Ostrowski J. 1996. Atlas of the redox properties of arable soils of Poland. IA PAN-IMUZ, Lublin-Falenty.

6. Stępniewska, Z., Stępniewski, W., Glinski J., 2004, Soil redox resistance and its environmental importance. Eurosoil – Freiburg, Germany 4-12 September, Albert-Ludwigs-Universitat Freiburg, Abs.142.