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Estimation of Zn mobility and biological availability in sod-podzolic soil and leached chernozem based on results of soil extraction by various salt solutions and Zn accumulation in barley plants

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Extraction of soils by chemical reagents is widely used as a basis for forecasting the stock of the metal in the soil available to the plants. There are some doubts about how heavy metals uptake from specific soil to certain plant species can be adequately modeled on the results of chemical extraction. Problems of regulation of heavy metals in natural objects and risk assessment of soil contamination must be solved as issues of unification and standardization of existing assessment methods and new methods developing for their use in studies of the mobility of metals in soils and their availability to plants.

Zn is a priority pollutant of the soil. The availability of Zn compounds to plants in two soils of different genesis was compared on the basis of their extraction by neutral salt solutions $Ca(NO_3)_2$, $MgCl_2$, and CH_3COONH_4 and a pot experiment. It was shown that not only the concentration of contaminant in the extractant, but also the proportion of extractable Zn in its total content in the soil increased with increasing contamination of soil. The difference between the estimates of exchangeable Zn obtained by these methods was $\sim$2.5 times for soddy-podzolic soil and 3–6 times for leached chernozem. The relationship between the accumulation of Zn in 14-day-old barley seedlings and the content of its exchangeable form in the soil was near linear, but the parameters of regression equations for two soils differed significantly. Chemical extraction allowed the differentiation of the mobile Zn fraction, but its accumulation by plants from different soils could not be predicted from the extractability of the element by neutral salt solutions without consideration for other soil properties.