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The influence of physico-chemical properties of soils on the bioavailability of 65Zn

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Stability of soils to the effects of man-made origin pollutants is determined by their buffer capaci-ty (the ability to inactivate pollutants in a soil - soil solution - plant system). Soils are character-ized by the same types of stability as the ecosystem as a whole. Increased migration activity of pollutants is a symptom of ecological trouble, due to the soil transformation in an unstable state. Thus, the problem of the stability of soil is one of the fundamental problems of modern science.
The aim of the study was to estimate the buffering capacity of soil as a key factor of their ecological and geochemical stability with respect to a relatively long-lived radionuclides 65Zn (T1/2 = 224 days), representing the radiological hazard in the location of nuclear facilities.
There was proposed a method for scoring the buffering capacity of soils as for 65Zn contamination. It's based on dependence between the main physico-chemical soil properties and accumulation of the radionuclide in the aboveground plant parts (barley kind of "Zazersky-85"). The role of the considered indicators of soil health in the accumulation of radiozinc by plants was defined.
The essence of this technique was to assess the contribution of individual characteristics of the soil condition, which play the most important role in the regulation of mobility (and bioavailability) of radionuclides, using the method of stepwise multiple regression analysis. For this aim representative sampling was compiled (from 20 soil types and varieties belonging to different climatic zones of the European part of the Russian Federation), thus providing a wide range of variation of the studied physical and chemical parameters, and also vegetation model experiments using 65Zn were held. On the basis of the conducted statistical analysis was revealed that the dominant contribution to the variation of the effective trait (accumulation coefficient of 65Zn) make: $CaCO_3$ content, mobile iron (Tamm extract) and pH.
As a result the studied soils were ranked according to the degree of resistance to pollution by 65Zn (ability to restrict migration ability of radionuclide in soil – plant system). It turned out that inactivating ability of soddy-carbonaceous soils (rendzina) more than 8 times higher than the same indicator for soddy-podzolic soils; 5 - 7 times for gray forest soils and chernozems; 1.5 times for the southern chernozems.