MODELLING OF ^{137}Cs BEHAVIOUR IN THE SOIL-PLANT SYSTEM FOLLOWING THE APPLICATION OF AMELIORANTS

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A set of countermeasures aimed at reducing ^{137}Cs uptake by plant products includes agrochemical measures based on changes in the soil properties after the application of ameliorants. The dynamic models for studying the effect of the application of potassium fertilizers and dolomite powder on ^{137}Cs accumulation in plants are presented. Conceptual approaches to the development of models are based on the identification of mechanisms governing a complex of physico-chemical processes in soil after the use of ameliorants. The following assumptions were used in the development of models:

- dynamics of ^{137}Cs distribution in each soil layer depends on the sorption processes characterized by different time to achieve quasi-equilibrium (exchangeable uptake and fixation by clay minerals) as well as on vertical migration process;
- change in ^{137}Cs content in soil solution results from the radionuclide sorption on selective and nonselective exchange sites;
- uptake of extra amounts of K^+ and Ca^{2+} in soil solution produces effect on processes of ^{137}Cs exchangeable sorption and initiate specific processes responsible for ^{137}Cs fixation in the crystal lattice of clay minerals;
- Ca^{2+} and K^+ cations have a competing effect on ^{137}Cs uptake by plants from soil solution, which along with the fixation processes, causes lower accumulation of this radionuclide by plants during the application of ameliorants.

The developed models were parameterized for soils of the coniferous forest located in the Bryansk region in area suffered from the radioactive fallout after the Chernobyl accident. Effects of ameliorants and time of their application on ^{137}Cs behaviour in the soil-plant system are assessed. The contribution of soil chemical and biological processes to the decrease in the radionuclide uptake by plants is estimated.