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THE DYNAMICS OF ^{137}CS ACCUMULATION BY EDIBLE MUSHROOMS ON THE TERRITORY OF FOREST ENTERPRISES IN ZHYTOMYR REGION

Chernobyl accident led to a significant radioactive contamination of the territory of Ukraine and neighboring countries. The accident also affected the radiation situation in many European countries. Forest plantations performed its natural functions and protected towns and farmlands from further radioactive contamination.

Forest massifs of Zhytomyr region were radioactively contaminated and were included into the impact zone of radioactive releases after the Chernobyl NPP accident. The analysis of radionuclides in forest soils shows the highest level of contamination in the northwestern part of Zhytomyr region which borders Kiev region where the source of accidental releases is located. Significant levels of forest radiation contamination are detected in Narodychi, Ovruch, Slovechno and Luhiny regions. The density values of soil radiation contamination gradually reduce in the west and in the south direction. The most significant reduction occurs in the south direction. Thus, radiation contamination density of forest soil is less than 5 Ci/km^2 on the territories of Baranivka and Emilchino forest enterprises; radiation contamination density of forest soil in Berdichev, Zhytomyr and Korostyshiv region is about 1 Ci/km^2.

Forest food production is critical in terms of permissible levels adherence and the probability of exceeding these levels on the territories with soil ^{137}Cs contamination of about 1 Ci/km^2. Therefore, forest food is given much importance in radiological analysis.

Such factors as: the significant levels of forests radiation contamination, the significant mosaic contamination of the areas in Zhytomyr region and the consumption of forest products (mushrooms, berries) in the diet during a year by a local people, caused an urgent necessity to control external and internal exposure dose of population. The extensive research to determine the dynamics and the intensity of radionuclide accumulation in edible mushrooms in order to control forest products for ^{137}Cs content was carried out. Certain regularities can be observed when analyzing obtained data on radiation contamination of edible mushrooms in 1997, 2002, 2006, 2011 years (Fig. 1).

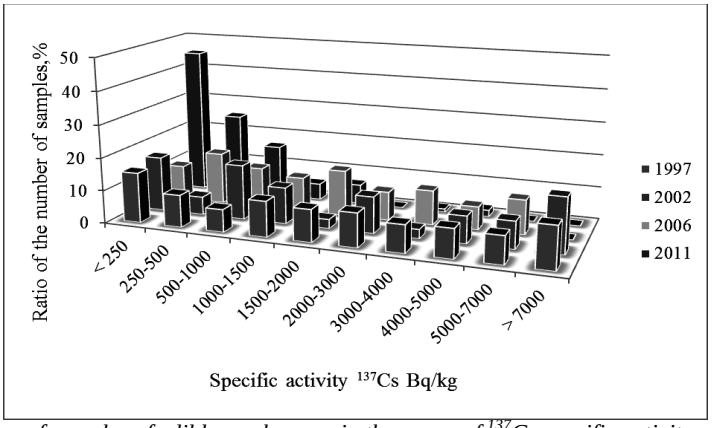

Fig. 1. Frequency distribution of samples of edible mushrooms in the range of ^{137}Cs specific activity according to the radiological control in Zhytomyr region

Generally, 396 samples of mushrooms were analyzed during four years. The number of samples was different every year. The maximum, i.e., 203 of samples were investigated in 1997; and the minimum, i.e., 36 samples were investigated in 2002. As shown in Fig. 1, ^{137}Cs content in the analyzed samples of edible mushrooms has not decreased for years of examination: in 1997 – 25,15 % of analyzed samples had permissible levels of radionuclides (PL-97 – 500 q/kg); in 2002 – 22,2 %, in 2006 – 26,33 %. There was a sharp increase in 2011 – 70% of samples had permissible levels of radionuclides. ^{137}Cs content in fresh mushrooms had the following maximum and minimum values of specific activity in the investigated period: in 1997 – 7690 Bq/kg and 54 Bq/kg; in 2002 – 8743,6 Bq/kg and 71,5 Bq/kg; in 2006 – 5770 Bq/kg and 29 Bq/kg; in 2011 – 3112 Bq/kg and 12 Bq/kg, respectively.

The dynamics of edible mushrooms radiation contamination on the territory of some forest enterprises of Zhytomyr region was investigated in order to define the critical areas for harvesting. As mentioned above, the forests of Zhytomyr region are characterized by a large mosaic of radiation contamination of forest fund. Mosaic character of radiation contamination is not typical only for some state forest enterprises but also for forestry and forest districts inside forestry. A detailed analysis shows considerable fluctuation of ^{137}Cs content in edible mushrooms within separate state forest enterprises of Zhytomyr region (Fig. 2).

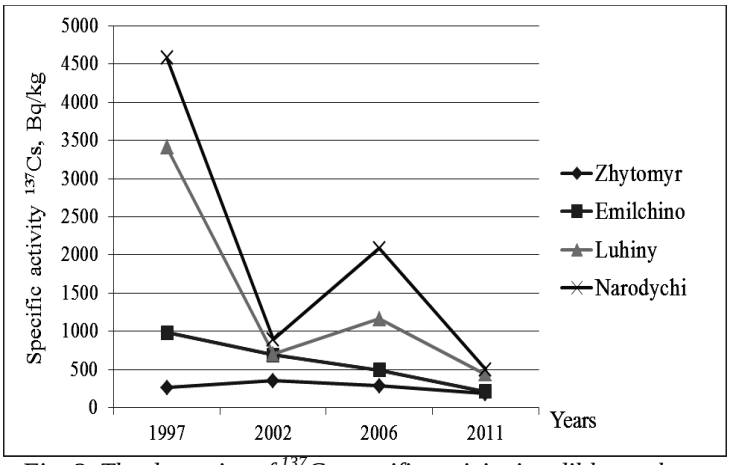

Fig. 2. The dynamics of ^{137}Cs specific activity in edible mushrooms within a state forest enterprise in Zhytomyr region

The obtained data show the following: the radiation contamination of edible mushrooms is on the minimum level in Zhytomyr state forest enterprise; the maximum detected level in 2002 was 335 Bq/kg. The situation is the opposite in Narodychi state forest enterprise. ^{137}Cs specific activity in edible mushrooms exceeded permissible levels; the maximum value in 1997 was 4578,3 Bq/kg and in 2006–2088 Bq/kg. ^{137}Cs specific activity in edible mushrooms in state forest enterprise in Emilchyne region did not exceed 500 Bq/kg only in 2006 and 2011. The maximum values of ^{137}Cs specific activity in mushrooms detected in Luhyny state forest enterprise are: in 1997 – 3410,3 Bq/kg, in 2002 – 700 Bq/kg, in 2006 – 1163,4 Bq/kg and in 2011 it did not exceed 500 Bq/kg. Data indicate that special attention should be paid to radiation control of edible mushrooms.