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# ENVIRONMENTAL RADIOCHEMISTRY AND COMPLEX ENVIRONMENTAL GEOCHEMISTRY OF YOUNG LAKE SEDIMENTS AT THE SZEGED FEHÉR-TÓ, HUNGARY

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Our study is focusing on the effects of natural radioactive elements of young lake sediments on living organisms. Besides we searched for the reasons for the enrichment of natural radionuclides and trace contaminants in the sediment of Szeged Fehér-tó Lake.

The Szeged Fehér-tó is well known of intensive fish breeding, and our study area was allocated on two hatcheries of the lake system. Hatcheries have got a complex environmental role, since large areas of them fall under natural protection (Kiskunság National Park), as the territory has got a major ornithological importance. Radioactive elements (members of natural radioactive series) and heavy metals in the sediment might have indirect effects on humans, as well as on birds migrating and feeding in the area.

The aim of the study was to measure the natural γ-radiation, determining the amount of natural radionuclides ($^{238}$U, $^{232}$Th, $^{40}$K), and to determine the total γ-radiation of the area. Besides, main element and trace element compositions, mineral composition and total carbon content were measured in order to determine the causes of radionuclide enrichment in the sediment.

Main and trace element contents were determined with X-ray fluorescence (XRF). Based on the results of these measurements representative samples were chosen for further X-ray diffraction (XRD) analysis. These provided the means for determining the mineral composition of sediments on the area. Results show mineralogical homogeneity. Total organic carbon content (TOC) was measured with Rock-Eval pyrolysis for representative samples of the two hatcheries.

The enrichment or the anomalies in the normal distribution of radionuclides and trace contaminants in the sediment of the lakes cannot be interpreted, unless the distribution of the medium, carrying these elements is known. XRD and TOC measurements were carried out for this reason. Based on the results, element distribution maps and correlation charts were compiled, presenting the relations between main, trace and radioactive elements. The enrichment of radioactive and contaminant elements were understood with the help of these relations.

Analyses have shown that irrespective of the methods of extraction the radionuclide concentration is 5-10 times higher than the average data for saline lakes, however concentrations higher than the natural value by an order of magnitude or more did not occur. The research proved that natural isotopes could be linked to argillic minerals, oxides with good absorption capabilities, and heavy minerals. Main and trace element contents of the lake sediments do not exceed the usual values by an order of magnitude, nevertheless the concentrations of some trace elements (As, Cr, Cu) are close to the contamination threshold, and other trace elements (Mn, Ni) appear in larger quantities, than it was previously expected.

Based on the results of our research we recommend further dosimetric and trace element analyses in the area.