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ANALYSIS OF RADIONUCLIDES CONTENT IN SOIL SAMPLES FROM AREA OF ALEKSANDROVAČKA ŽUPA, SERBIA

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Naturally occurring radionuclide (uranium, actinium and thorium series and ⁴⁰K) are widespread in the environment. In addition, significant amount of ¹³⁷Cs may also be present in the soil as a result of accidents, such as Chernobyl accident. Thus, monitoring of radionuclides content in soil is of great importance. Aleksandrovac is small town in the western part of central Serbia and Župa is identified as the administrative territory of Aleksandrovac municipality. Nature of Aleksandrovačka Župa is under the long-lasting influence of anthropogenic factors, and therefore dominates altered natural landscape. Activity concentration of ²²⁶Ra, ²³²Th, ⁴⁰K and ¹³⁷Cs in 26 soil samples collected from different location in the territory of Aleksandrovačka Župa were determined and presented. All soil samples were milled and sealed in 0.5 l Marinelli beakers, and stored for six weeks in order to reach radioactive equilibrium between ²²⁶Ra and its descendants. All samples were measured by means of coaxial semiconductor HPGe detector (ORTEC GEM-30, 37% relative efficiency and 1.8 keV resolution for ⁶⁰Co at 1332 keV line). The detector was calibrated using the standards in the same geometry spiked with common mixture of gamma-ray emitters certified by Czech Metrological Institute. The activity concentrations of radionuclides ⁴⁰K and ¹³⁷Cs in soil samples were determined directly by analyzing full-energy peaks of their principal energies at 1460.83 keV and 661.66 keV, respectively. The activity of ⁴⁰K was corrected for the contribution of ²²⁸Ac (1459.14 keV). The activity of ²²⁶Ra was determined by analyzing full-energy peak at 186.21 keV, corrected for the contribution of ²³⁵U (185.72 keV) evaluated via ²³⁵U photo-peak at 143.77 keV and additionally approved by analyzing activity concentrations of its descendants (²¹⁴Bi and ²¹⁴Pb). Furthermore, the activity concentration of ²³²Th was determined by using the evaluated activity of its descendants (²²⁸Ac, ²¹²Bi, ²¹²Pb, and ²⁰⁸Tl). All obtained activity concentrations were corrected for the coincidence summing effect, applying the calculation method of Debertain and Schötzig (1990).

Table1. The ranges and average values with standard uncertainty (s) of obtained activity concentrations in soil samples

Soil samples	²²⁶ Ra [Bq/kg]	²³² Th [Bq/kg]	⁴⁰ K [Bq/kg]	¹³⁷ Cs [Bq/kg]
range	12.8 - 50.0	23.5 - 62.4	315.3 - 860.3	0.2 - 32.1
average ± s	30.5 ± 5.4	45.7 ± 2.3	527.6 ± 26.6	7.8 ± 0.5

Measured soil samples have activity concentrations of ²³²Th and ⁴⁰K slightly higher than the World's average (30 Bq/kg and 400 Bq/kg) respectively, while activity concentration of ²²⁶Ra is lower than the World's average (35 Bq/kg) (UNSCEAR 2000). The obtained activity concentrations of ¹³⁷Cs in analyzed soil samples are comparable with values previously reported.