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Determination of Radioactivity in Soil Samples and Evaluation of Excess Lifetime Cancer Risk in Albania

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The aim of this study was determination of natural (^{226}Ra , ^{232}Th , ^{40}K) and artificial (^{137}Cs) radioactivity levels in thirty soil samples collected from different locations in Albania. The obtained results provides essential information concerning reference baseline concentrations of natural and artificial radioactive isotopes and environmental pollution. The main contributors of natural radioactivity in soil are ^{226}Ra , ^{232}Th and ^{40}K . Artificial radionuclides can be also present such as ^{137}Cs , resulting from fallout from weapons testing or nuclear accidents. For determination of natural and artificial radionuclides concentration in the environment non-destructive measurement technique with High Pure Germanium detectors (HPGe) is used. The soil samples were collected at maximum depth of 10 cm. The average activity concentrations of ^{226}Ra , ^{232}Th , ^{40}K and ^{137}Cs were found to be $22.18 \pm 0.73 \text{ Bq kg}^{-1}$, $23.53 \pm 0.97 \text{ Bq kg}^{-1}$, $325.79 \pm 15.30 \text{ Bq kg}^{-1}$ and $6.29 \pm 0.45 \text{ Bq kg}^{-1}$ in soil samples, respectively. In order to evaluate the radiological hazard of radioactivity the total absorbed dose rate (D), the annual effective dose equivalent (AEDE) and excess lifetime cancer risk (ELCR) have been calculated. The average absorbed dose rate D (nGy h^{-1}) in air at 1 m above ground level due to the ^{226}Ra , ^{232}Th , ^{40}K and ^{137}Cs in the soil samples was 38.23 nGy h^{-1} . The calculated values of annual effective dose (AEDE) for the all soil samples ranged from 3.59 to $94.94 \mu\text{Sv y}^{-1}$ with a mean of $46.89 \mu\text{Sv y}^{-1}$, which is lower than the world average value of $70 \mu\text{Sv y}^{-1}$. The average of excess lifetime cancer risk (ELCR) value was calculated to be 0.16×10^{-3} . Moreover compared to the World's average of 0.29×10^{-3} , the lifetime risk of cancer result lower almost for all localities. Therefore, the all mean values of radiological hazard for all soil samples, were lower than the world average, it is safe for population living or other human activities without any radiological risk.

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