

Title: Evaluation of Natural Radioactivity in Soil Samples Collected from the Khasa River Banks in Kirkuk, Iraq

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Abstract: The natural radioactivity in soil samples collected from the Khasa River, which flows in the Kirkuk city of Iraq, was studied using a high-purity germanium (HPGe) detector and a spectroscopy system. The activity concentrations (Bq kg^{-1}) of ^{214}Pb , ^{226}Ra , ^{212}Pb , ^{228}Ac , and ^{40}K varied from 10.1 ± 0.6 to 27.5 ± 3.2 , from 23.4 ± 2.8 to 44.1 ± 6.1 , from 13.2 ± 0.7 to 26.4 ± 1.8 , from 12.5 ± 0.9 to 28.1 ± 4.3 , and from 206.5 ± 12.8 to 332.2 ± 7.2 , respectively. The results have been compared to the average worldwide values. The hazard indices have also been calculated. The average of radium equivalent activity (Ra_{eq}) was 81.2 Bq kg^{-1} ; the absorbed gamma dose rate (D) was 42.8 nGy h^{-1} ; the annual effective dose rates (AEDE) outdoor and indoor were 0.05 and $0.2 \text{ mSv year}^{-1}$, respectively; the external hazard (H_{ex}) was 0.2 ; the internal hazard (H_{in}) was 0.3 ; the gamma radiation representative level index (I_{γ}) was 0.5 . Our results for some sites were found to be higher than the worldwide values.

Keywords: Geochemistry, Hydrogeology, Natural Hazards, Nuclear Waste, Radiation Dosimetry, and Protection Water

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