

Radioactivity Concentrations and Dose Assessment for Agricultural Soil Samples around the Jordanian Petroleum Refinery in Zarqa/Jordan

The activity concentrations of the natural radionuclides (^{238}U , ^{232}Th , ^{40}K) in the agricultural soils around the Jordanian petroleum refinery in Zarqa city, Jordan were investigated using a high-purity germanium gamma spectrometry system. The soil samples were collected from three different agricultural regions (X, Y and Z) near the Jordanian petroleum refinery. The activity concentrations of ^{232}Th is too low than the average worldwide value. The average activity concentrations of the ^{238}U and ^{40}K radionuclides in Bq/kg were found to be: 40.1 ± 1.6 for ^{238}U and 372.6 ± 11.9 for ^{40}K in X-site, 38.3 ± 1.9 for ^{238}U and 486.4 ± 15.0 for ^{40}K in Y-site, and 5.4 ± 1.3 for ^{238}U and 313.3 ± 11.1 for ^{40}K in Z-site. Comparing these results with the corresponding worldwide average concentration values given in UNSCEAR report (UNSCEAR, 2000), our findings are within the worldwide average values. The measured activity concentrations of the radionuclides in soil were used to calculate the absorbed dose rates in air outdoors. The absorbed dose rates are found to be in the range of 20.86 – 47.62 nGy/h with an overall average value of 34.66 nGy/h. The average outdoor annual effective dose equivalent at the Jordanian petroleum refinery was estimated to be $41.13 \pm 11.64 \mu\text{Sv y}^{-1}$. This value is below the world average of $70 \mu\text{Sv y}^{-1}$ reported by UNSCEAR for an outdoor effective dose. Consequently, the probability of occurrence of any significant radiological health risk to the people living in nearby areas around the Jordanian petroleum refinery is low.