Radioactivity concentrations and dose assessment for agricultural soil samples around the Jordanian petroleum refinery in Zarqa, Jordan

Feras Afaneh

Abstract

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. The soil samples were collected from three different agricultural regions (X, Y and Z). The $^{232}$Th activity concentration was found to be too low in all samples. The average activity concentrations 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 45.4±1.3 for $^{238}$U and 313.3±11.1 for $^{40}$K in Z-site. Our findings are within the worldwide average values (UNSCEAR, 2000). The absorbed dose rates were calculated and 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 was estimated to be 41.13 ± 11.64 μSv/y, which is below the world average of 70 μSv/y.

Keywords: natural radioactivity, low radiation, dose assessment, agricultural soil samples, agriculture, petroleum refineries, HPGe detector, Jordan, natural radionuclides