



Faculty of Science



Abstract

Many places around the world have been known for their highly natural radioactivity content, e.g. Keralla in India, Brazil, and natural reactor at Oklo in Gabon. Hot springs are thought of as places recreation and rehabilitation. This is because of their curative effect for humans. However, most of those hot springs are known to contain higher amounts of natural radioactivity, which might be of certain risk hazard increasing possibility for public, patients and workers.

Hamam Pharon hot spring area was preliminarily investigated during a routine survey on the Sinai Peninsula under the auspices of the Egyptian Scientific Research and Technology Academy. The preliminary studies revealed elevated concentration of the naturally occurring radium-226, thorium-232 and potassium-40 radionuclides.

This study has been carried out for two main objectives. First objective is to determine of Ra, Th and ⁴⁰K activity levels in soil, water, shore sediment, plant and rock at Hamam Pharon site. Second is the dose assessment for the visitors and workers.

The naturally occurring ²²⁶Ra (²³⁸U series) concentration in the samples were determined using gamma emissions 351.9 keV of the ²¹⁴Pb and 609.3 keV, 1120 keV and 1764.5 keV of the ²¹⁴Bi, in equilibrium with their ²²⁶Ra parent. Those for ²³²Th series are 338.4 keV of the ²²⁸Ac, 583 keV of ²⁰⁸Tl and 911.1 keV ²²⁸Ac. The gamma emission used for K is 1460 keV.

The specific activities of ²²⁶Ra (²³⁸U), ²³²Th series and ⁴⁰K (Bq/kg) were measured in soil, water, plant, shore sediment and rock samples using HpGe detector. The direct measurement of uranium in the water and rock samples was determined using the UA-3 uranium analyzer.

The radium-226 show high concentrations in the soil samples ranged from 128 to 6398 Bq/kg, in the shore sediment ranged from 194 to 1121 Bq/kg, and for the water, rock and plant samples the ²²⁶Ra concentration it was within the world average radioactive concentration range.

The ²³²Th series and ⁴⁰K radionuclides concentration are also within the world average radioactive concentration range, Uranium-238 in the water and rock samples show relatively high concentrations ranged from 33.4 to 85.8 and 98.1 and 104.5 Bq/kg respectively. In case of UA-3 uranium analyzer measurements are ranged from 37.2 to 93 Bq/kg.

The absorbed dose was calculated and found to be 0.132 nGy/hr (1.16 uGy/yr) at 1 m above ground. For the case study (the laying position), the absorbed dose was found to be 1.46 nGy/hr (12.83 μGy/yr). The absorbed dose as we show is much less than the recommended values for public (1mGy/yr) and workers. (20mGy/yr) (ICPR. 1990).