AIN SHAMS UNIVERSITY
FACULTY OF SCIENCE
CHEMISTRY DEPARTMENT

Assessment of Radiological and Chemical Pollutants in the Coastal Marine Environment along Suez and Aqaba Gulfs, Egypt

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Abstract

The present study highlights and evaluate radioactivity levels of ^{238}U, ^{232}Th and ^{40}K, radiological hazard indices, physiochemical characteristics of seawater and concentration of heavy elements in soil, plants, shore sediment samples, and algae samples collected along and around the coastline of Aqaba and Suez Gulfs from 54 sampling points during 2016. Measurements of the activity concentrations of ^{238}U, ^{232}Th and ^{40}K Bq/kg (in dry weight) of the collected samples were carried out using gamma ray spectrometry based on a high-pure germanium coaxial detector (HPGe). Heavy Metals in seawater, shore sediment, and algae samples were determined using ICP-OEs. The mean activities for ^{238}U, ^{232}Th and ^{40}K were found to be within the average international radioactivity levels which are 35, 35,5 and 370 Bq/kg. The results for the measurements of natural radioactivity revealed that the mean average of absorbed dose rate (D), annual effective dose rate ($mSvy^{-1}$), radium equivalent (Ra_{eq}), external and internal hazard indices ($H_{ex,}$ H_{in}) and cancer risk were calculated and compared with the worldwide averages. The recorded and calculated values were lower than the acceptable limits published in the different localities around the world. TF of ^{238}U, ^{232}Th and ^{40}K were calculated for algae samples collected from some sites. The average values of TF were 0.19, 0.13, and 2.65 for ^{238}U, ^{232}Th and ^{40}K, respectively. The TF for ^{40}K was greater than unity, which means that ^{40}K was bio accumulated in algae and available in marine environment.

The investigations of the physicochemical properties of the surface water indicated that there no significant change was observed in the water temperature, TDS, salinity, pH levels and well-oxygenated seawater. The heavy metals concentrations comparison among the two Gulfs reflects that

the northern parts contains the high levels of these metals compared to the southern ones revealing that the northern parts of the two Gulf were more affected by human impacts compared to the southern area. The concentrations of the heavy metals in the northern and southern Suez Gulf followed the following order: Fe > Mn > Zn > Al > B > Co > Ni > Pb > V > Cr > Mo > Cu > Cd. The results indicated that the algae were characterized by having the highest properties of aluminum, lead, nickel and vanadium. The aluminum concentrations in the collected samples were higher than any other elements investigated and it seems that the brown algae had the highest concentration of aluminum. The results suggest that the majority of the Egyptian coast of Aqaba Gulf is not polluted or seriously affected by human activities in spite of rapid recreational and residential developments in the area during the past period compared with Suez Gulf.

Therefore, for Suez Gulf it is highly recommended that the coastal and marine pollution from fertilizer and chemical industries in Suez area should be prevented. Industrial discharges, especially from fertilizers and chemical industries, on a regular basis, should be monitored, to ensure their compliance with local standards, and the criteria set for effluent discharge into the marine environment

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