Faculty of women for Art,
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Thesis Title: *"Assessment of Natural Radioactivity Levels and Rare Earth Elements in Gandula Area at Al –Gabale Al -Akhdar (LIBYA)"*

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Jemila Mussa AlI Abbi

Thesis

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To
Physics Department
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This thesis is dedicated with greatest affection and love to my caring parents my mother, and my father for his endless love and encouragement, and my sibling Mohamed, Ali and Sara for their continuous caring and support.

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ABSTRACT

The aim of this thesis is to evaluate the activity concentrations of naturally occurring in the environment associated with the ^{238}U and ^{232}Th decay chains and the long-lived natural occurring radionuclide^{40}K in environmental samples. The samples were collected from different locations around Gandula region (norh eastran side of Libya) to elevate natural radioactivity. The analysis of the samples was done by using high purity germanium detectors (**HPGe**). The analysis demonstrates that the measured average activity concentrations for the soil samples of ^{226}Ra, ^{238}U, ^{232}Th and ^{40}K were 66.32, 59.52, 56.07 and 517.92 $Bq.Kg^{-1}$,respectivly. While the average activity concentrations for rock samples of ^{226}Ra, ^{238}U, ^{232}Th and ^{40}K were 26.01, 23.39, 25.13 and 100.97 $Bq.Kg^{-1}$, respectively. On the other side the average activity concentrations of plant samples are 106.22, 95.49, 143.22 and 1255.82 $Bq.Kg^{-1}$ for the above elements, respectively. While the average cocentrations for water samples of ^{226}Ra, ^{238}U, ^{232}Th and ^{40}K are 19.24, 16.78, 19.32 and 102.78 $Bq.L^{-1}$ respectively. It was observed that the highest activity concentration values determined among the soil, plant and water samples are higher than the worldwide average as reported by the UNSCEAR 2000. The radium equivalent activity (**Ra_{eq}**) in all samples were determined, we found in soil rock, plant and water samples are ranged between 125.65 to 233.51 $Bq.Kg^{-1}$, 56.50 to 89.29 $Bq.Kg^{-1}$, 244.05 to 754.01 $Bq.Kg^{-1}$ and 44.01 to 60.26 $Bq.Kg^{-1}$, respectively. The values of external hazard index, gamma radiation level index (**$I\gamma$**), I- alpha (**$I\alpha$**) are close tounity for all samples under investegated. The value of the absorbed dose rate, annual effective dose and cancer risk factor in the all samples were also determined.

On the other hand, the chemical analyzes were carried out for all samples using the flame photometer and atomic absorption to estimate the heavy elements in the samples. The element which selected in this study including (Na, Ca and K) beside (Cu, Fe, Zn, Mn and Pb), the contents of the studied major elements in the samples of (soil, rock, plant and water), recorded the high value of Na and Ca in water samples with average concentration of (154.08 and 84.4 ppm), respectively, and the high average concentrations of potassium was recorded in the plant samples (10.83 ppm). On the other side

the high concentrations of **Cu** and **Pb** were recorded in rock samples with average (1.03 and 0.77 ppm). The results also recorded that the high concentrations of iron **(Fe)** and manganese **(Mn)** was in soil samples (65.76 and 2.97 ppm), whereas the average values of, **Zn**were (1.36 ppm) in water samples. The result of **(XRF)** showed that the contents of the metal oxides in soil samples were the following trend: Fe_2O_3> CaO > SiO_2> Al_2O_3>other oxides, whereas the trend order of the (XRF) of rock samples was as following: CaO > Fe_2O_3 > SiO_2> Al_2O_3>other oxides. The trace elements in soil samples showed the concentrations of Ni, Cu, Zn, Sr, Zr and Cr and ranged as following : (0.15-0.27), (0.13-0.85), (0.65-0.81), (0.84-5.16), (2.07-16.32) and (0.58-1.03) ppm,respectively.On the other side the rock samples contain the concentrations of Cu, Zn, Sr, Zr and Cr and ranged as following : (0.71-1.20), (0.39-0.95), (0.16-0.35), (0.68-0.75) and (0.10-0.38) ppm, respectively.

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