

Title: Radiometric and petrographic characterization of El-Yatima granite: Evaluating radiological risks and mineralogical features

Author Names: Hesham M.H. Zakaly , Hamdy A. Awad , El Saeed R. Lasheen , Shams A.M. Issa , Reda Elsaman , Mayeen Uddin Khandaker , Hezam Al-awah , Douaa Fathy , Mabrouk Sami

Abstract: The current investigation aims to assess the potential of El-Yatima granitic pluton as a decorative stone by examining its [natural radioactivity](#) and mineralogical elements. Specifically, the study aims to determine the concentrations of [radionuclides](#) ^{40}K , ^{232}Th , and ^{226}Ra , perform petrographic analyses, and evaluate the associated radiological risks to determine the safety and usability of the granite in construction and decoration, as well as to assess the potential of these granitic rocks as a safe and effective decorative stone for various applications. It has a 12 km² surface area of 812 m above sea level. It is situated in the Eastern Central Desert. Its hypidiomorphic texture, medium-to-coarse grain size, and predominant composition of K-feldspars, quartz, and plagioclase are observed, along with minute amounts of [muscovite](#) and [biotite](#). By employing NaI (TI) gamma-ray spectroscopy, the natural [radionuclide](#) concentrations of ^{40}K , ^{232}Th , and ^{226}Ra in El-Yatima granitic rocks were ascertained. Additionally, radiological concerns were identified for the materials that were examined. The average concentrations of [radionuclides](#) ^{40}K , ^{232}Th , and ^{226}Ra are 178 Bqkg⁻¹, 44 Bqkg⁻¹, and 41 Bqkg⁻¹, respectively. The following are the computed values: 117 Bqkg⁻¹, 0.43, 0.32, 53 nGyh⁻¹, average radium equivalent (Raeq), hazard indices (H_{in} and H_{ex}) and dose rate (D), respectively. When compared to levels typically indicated, it was discovered that its values were within the worldwide standard. The study's findings could be a starting point for radiometric data for upcoming surveillance and epidemiological research.

Key words: El-Yatima granitic pluton Natural radioactivity Decorative stone potential Radiological risk assessment Gamma-ray spectroscopy

<https://doi.org/10.1016/j.radphyschem.2024.111992>

<https://www.sciencedirect.com/science/article/abs/pii/S0969806X24004845>