Radiation dosimetry of some rice types consumed in Basrah Governorate/Iraq by using thermoluminescence technique and SAM940-2G

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ORIGINAL PAPER

Radiation dosimetry of some rice types consumed in Basrah Governorate/Iraq by using thermoluminescence technique and SAM940-2G

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Abstract
This research is monitoring and exploring the evaluation of dose levels and determination of the specific activity of natural and artificial radionuclides in different rice types consumed in Basrah/Iraq. This study was the first radiological study focused on the comparison of dose rates and radiation risk indices measured using thermoluminescence technique and SAM940-2G. The activity determination of selected radionuclides was carried out by using SAM940-2G running remote applications and performing quantitative analysis. The specific activity values of U-238, Th-232, K-40 and Cs-137 ranged as (0.051 ± 0.011–0.529 ± 0.003) Bq/kg with an average (0.239 ± 0.161) Bq/kg, (0.006 ± 0.003–1.225 ± 0.002) Bq/kg with an average (0.293 ± 0.398) Bq/kg, (31.763 ± 0.001–437.233 ± 0.0004) Bq/kg with an average (157.807 ± 147.194) Bq/kg and (0.119 ± 0.004–0.784 ± 0.002) Bq/kg with an average (0.444 ± 0.235) Bq/kg, respectively. Several hazard indices have been calculated for all rice samples involved in this study. All results have agreed with those described in previously published studies, and all these obtained results have been identified the radiation to be below the worldwide limit values. Thus, consumed rice brands in Basrah governorate are radiologically safe, in particular R2 sample which is classified as the brand safest from radiation risk.

Keywords Radioactivity · Dosimetry · Thermoluminescence (TL) · SAM940 · Rice · Basrah Governorate

Introduction

Radiation dosimetry, which is defined as the measurement of radiation levels that impact on human health, is vital in the radiation applications and radioisotopes, particularly in Medical Physics (Azorín Nieto 2004; Cember and Johnson 2009). The world population is subjected to the numerous types of radiation sources including artificial radiation (15%) and natural radiation (85%) of which, 11% come from foodstuffs and water drink. This may increase the chance of contamination from radioactive materials (Cember and Johnson 2009). Naturally occurring radioactive material (NORM) which is normally found in environmental samples can be transferred from soil to plants (Yadav et al. 2017). Thus, foodstuffs have been identified which have potassium-40 (^{40}K), uranium-238 (^{238}U) and thorium-232 (^{232}Th) (International Atomic Energy Agency 1989). However, foodstuffs radioactivity can be affected by man-made radiation cesium-137 (^{137}Cs), released through nuclear accidents and processes, is an example of anthropogenic radionuclides (Taskin et al. 2009). The consumption of contaminated foodstuffs produces an internal radiation dose because of natural isotopes. The average of doses to numerous organs of the human body also represents a significant channel for long-term health conditions (Salih 2018). Most people are subjected to these sorts of radiation sources every day and in any place. Rice provides vital daily minerals and energy for inhabitants of Basrah, Iraq and various other countries (Karki et al. 2018). Thus, a great deal of research has been carried out about the radioactivity of rice in different countries over the world (Al-Hassan et al. 2014; Al-Zahrani 2016; Saeed et al. 2011). This research concentrated on rice that is widely consumed by various age groups in Basrah, Iraq.

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