Measurement of Rn^{222} gas in Juice from Iraqi markets

Measurement of Rn^{222} gas in Juice from Iraqi markets

[1]Entesser Salman, [2]Ghaidaa Jaber, [3]Hayder Neama, [4]Ali Abojassim, [5]B. Almayahi

[1]Department of physics ,Faculty of Basic Education, University of Babylon, Iraq
[3,4]Departmentof Physics, Faculty of Science University of Kufa, Najaf, Iraq
[5]Departmentof Environmente Sciences, Faculty of Science University of Kufa, Najaf, Iraq

Corresponding author Email:ali.alhameedawi@uokufa.edu.iq

Abstract:The aim of this work is to set up a database for Rn222 concentrations in canned liquid juice samples available in Iraqi markets. The range value of Rn222 concentrations resulting from ingestion of liquid juices were from (2.45) mBq/L ,(4.oo) mBq/L with an average (3.1391±o.57) mBq/L. The average of the annual effective doses due to Rn222 concentrations in all samples under study were (1.7±o.3o) nSv/y for children and (2.oo±o.36) nSv/y for adults. Rn222 lower than the recommended limits. Therefore, the canned liquid juice samples available in Iraqi markets are health to consume without any risk due to Rn222 concentrations.

Keyword: Rn^{222} concentrations, alpha spectroscopy, annual effective dose, RAD-7 detector and Juice

1.Introdation

Radiation emitted from natural and human-made, which it is classified according to origin[1]. The radiation sources could be divided in two types, the first is a natural radiation and the second is artificial. The Rn^{222} can be condensed into a clear colorless liquid when reaching its boiling point; then freezes to form a yellow then followed by an orange red color solid. The Rn^{222} is slightly soluble in water; therefore, it can be absorbed by water and to consequently flow through rocks and sands. Its solubility relies on the temperature of water. So, the colder the temperature of water is the greater the Rn^{222} solubility[2]. Aim of study is measure Rn^{222} in juices using RAD-7 system.

2. Materials and methods

Wenty samples of different types of canned liquid juice samples were collected from the local markets in Iraqi for the period from 1/2/2o19 to 1/3/2o19 to measure Rn^{222} .The types of canned liquid juice samples are listed in table1., which it was designated according to sample code, sample name and country origin.

Table 1. Types and origin of liquid juices

Sample	Sample code	Country origin
Henny	J1	Iraq
Shafi	J 2	
Rival	J 3	
Alasdeqa	J 4	
Malak	J 5	
RAND	J 6	
Raya	J 7	

Cristal	J 8	
Machine	J 9	
Basma	J 1o	
Aseel	J 11	
Shater	J 12	
Rani	J 13	Saudi Arabia
Mizu	J 14	
original	J 15	
Pico	J 16	
Frotland	J 17	Iran
Snage	J 18	
Rawabi	J 19	KSA
Mandarin	J 2o	Turkey

After collection of Juices from different Iraqi markets then transferred to the lab. in University of Kufa. The samples kept in plastic container of 25o ml [3,4]. RADH2o Durridge, enabling it to measure Rn222-in-water, with reading in 3o m acquisition data runs

3.Calculation annual effective dose (E_d)

Estimation of E_d (Sv/y) to an individual due to consumption of ^{222}Rn present in the liquid samples under study when used as drinking water done using[5].

$$\boldsymbol{E_d = A_c\, A_i\, C_f}$$

where, A_c is the activity concentration (Bq/l), A_i is the annual intake (l/y) and C_f is the ingested dose conversion (Sv/Bq).

4. Results and discussion

Rn222 in juices are given in Figure (1). It can be seen that Rn^{222} concentrations varied from (2.45) Bq/m3 in juices (S7 sample) to (4.oo)mBq/L in juices (S16 sample) with an average value of (3.1391 mBqL). Since juice composed of water, probably Rn^{222} in the drinkable water could be the main cause of its presence in juices.

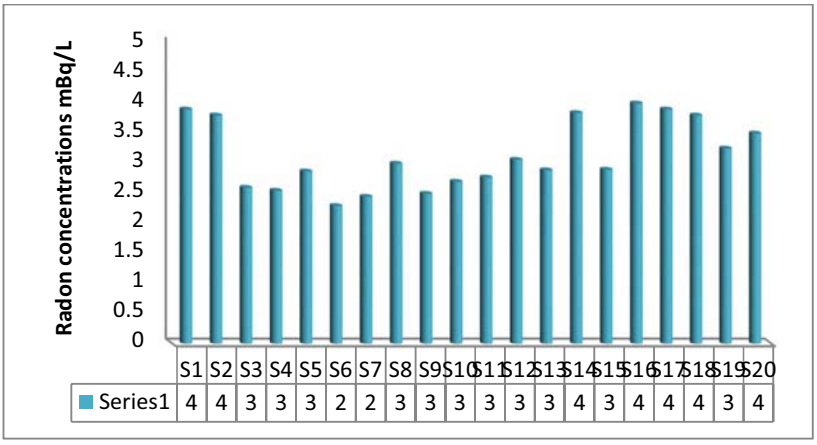

Figure1. Rn222 concentrations

When we compare the results of Rn^{222} in this study at different countries as shown in Figure (2), it is found that the average of the Rn^{222} concentrations in Iraq is lower than other countries Saudi Arabia, Iran, KSA and Turkey.

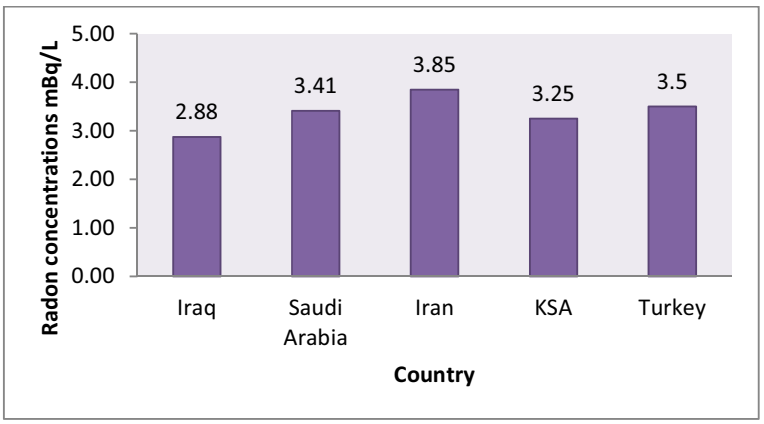

Figure2. Compare the average of Rn222

The data are showed significant value in the dose rate of age. This is due to different dose coefficient and juices consumption rate for different age Figure(6). Results shows that E_d due to Rn^{222} in juices ranged (1.24) to (2.16) nSv/y with an average (1.7±o.3o)) nSv/y for children and (1.47) to (2.42) nSv/y with an average (2.oo±o.36) nSv/y for adults. E_d to children are significantly lower than adults as Figure (3), because of the difference in adults' metabolism and juices. The total E_d of the studied area is found to be less o.1 mSv/y recommended by the EU. Finally, it concluded that Rn^{222} in canned liquid juices samples is very low the concern for public health[16]., especially for consumers who directly use these samples at different age groups.

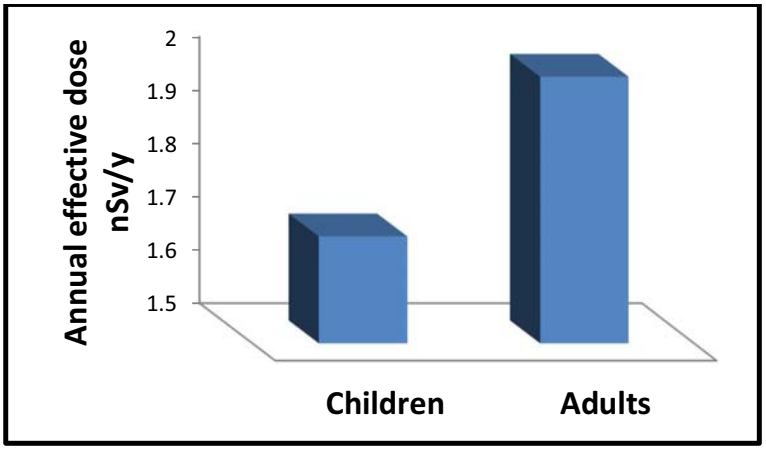

Figure3. Compare the average of E_d

Conclusions

Results of present investigation indicated that the Rn^{222} concentrations in all canned liquid juices samples in present study, were well below the action levels recommended by USEPA, UNSCEAR[16], EU Council and WHo, so all samples are safe for drinking. Rn222 obtained in the canned liquid juices lie below the range reported by all investigators. The estimated age-dependent E_d lower than 1ooo μSv/y. The total E_d received by adults (≥17 y) > childs (2 to 17y).

References

[1] Salman E F, Muttelab M K, and Manii J K 2019 *J. Physics:Conf. Ser.* **1234** pp 1- 14.

[2] Almayahi B A, Tajuddin A A, and Jaafar M S 2o14. *J. Envir. Radio*. **129** (**14**) pp147.

[3] Atef El-Taher, Ali Abid Abojassim, Laith A N, Hussien A B Mraity 2020. *Iran J. Med. Phys.* **17** p15- 2

[4] Durridge R R 2012 . Owner‟ s Manual (Bedford, MA.) USA. *DURRIDGE, RAD7 RADH2o Rn222 in Water Accessory.* o*wner" s Manual (Bedford, MA.)*pp 1- 95.

[5] Shakir A A, Salman E F, Shakir A J, Mohammed M A, Abdulridha W M, and Almayahi B A 2o19. La Pren. Med. Argen. **105** (**6**) pp 1-6.