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Measurement of the Radon Concentration and Annual Effective Dose in *Malva sylvestris* (Khabbaz) Plant Used in Traditional Medicine and Food

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Abstract:

In this study, the radon gas concentration as well as the annual effective dose in leaves of the *Malvasylvestris* (Khabbaz) plant used in the traditional treatment and as food in Iraq, for this, it is necessary to evaluate the concentrations radon gas, which were measured using solid state nuclear track detectors (SSNTDs) CR-39 technique. The ^{222}Rn concentration and annual effective dose in samples were collected from Baghdad city ranged from minimum to maximum value 15.815($\mathrm{Bq/m^3}$), 0.498($mSvy^{-1}$), 54.445($\mathrm{Bq/m^3}$), 1.717($mSvy^{-1}$) respectively, while the values of ^{222}Rn concentration and annual effective dose in a sample collected from Karbala are 15.297($\mathrm{Bq/m^3}$),0.482($mSvy^{-1}$). These values of ^{222}Rn concentration and annual effective dose less were compared with the samples from Baghdad. The annual effective dose lies well within the safe limits as recommended by WHO. So, the uses of *Malvasylvestris* plant are in traditional medicine and as a safe food for human consumption.

Key words: CR-39 detector, *Malvasylvestris* plant, Medicine plants, Radon concentration.

Introduction:

In most countries, there is a common and widespread use of plants in the therapeutic, predating the introduction of antibiotics and other modern drugs (1). Everywhere throughout the world, crude pieces of plants and their concentrates are utilized in the therapeutic items. It is additionally evaluated that 25% of current drugs are gotten from therapeutic plants of which a large portion of them are blooming plants. There are over 250,000 flowering seeds kinds that function as resources for the preparation of recent drugs (2). More than 80% of the world's population still depends on traditional medicines for different diseases, and natural products have been used worldwide for medicinal purposes for thousands of years (1,3). Iraq has a long history in this respect. For thousands of years, the population has a tradition of using herbs and other medicinal plants in the traditional therapy of many diseases, which preceded the use of modern drugs and other antibiotics.

Currently, modern medicine and traditional or alternative medicine are not exclusive, rather complementary to each other (4). Nevertheless, medicines based on plants introduce an elevated activity, safety, and minimum side effects and offer treatment for age-related disorders like memory loss, osteoporosis, immune disorders for which no modernistic medicine is available (2). The World Health Organization (WHO) defines medicinal plants as herbs which have been proven or thought to have medicinal effects. So, the study of the elemental content in plants used for food and medicinal purposes is very necessary because some of these elements are closely related to human health (5). The soil, water, plants, and air are considered as the basic component of our life support system. These environmental sections include a measurable quantity of radioactivity. The particular metabolic character of the plant kind may lead to gathering of radionuclides in their organs, which could further relate to the physico-chemical characteristics of the soil, hence there may be raised risk to human by means of food chai (6). The major sources of elements from the environment to plants are: air, water, and the soil. The radionuclides

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existing in the environment transport to plants by means of absorption from the soil throughout roots, and straight absorption by way of aerial parts of the plants. Presence of radioactivity in plant organs has been reviewed by various researchers (6).

^{222}Rn, a progeny of ^{238}U that is everywhere present in the earth crust, and from the gases, have great mobility to get in geological media. Radon has a fact that it has a major health hazard on human. The Radon progeny is well established as causative agents of lung cancer and other types of cancers (7). Because of its prolonged, ^{222}Rn ($T_{1/2}$= 3.82d) in addition to the emission of 5.48 MeV a-particles during its decay, it is considered as the most important isotope in the environmental surveys. Therefore, Radon and its short-lived decay yields is considered as the principal supply of public exposure from the natural contributing to closely 50% of the universal effective dose to population (8,9). Among the numerous species of plant used in herbal medicine and as food in Iraq, *Malvasylvestris*is a sample of plant growing naturally at the end of winter, especially in uncultivated areas and empty spaces under the shade of trees and helps the raininess to grow this plant. Currently, the consumption of *Malvasylvestris* seeds is widespread, since recent research confirmed the significance of its therapeutic properties, such as antioxidant, anti-inflammatory, anti-ulcerogenic, anticancer, and skin tissue safety (10). *Malvasylvestris* is generally used as a food and medicinal seeds in the countryside. The flowers of this plant are used as a therapy for digestive problems, eczema, cut wound, bronchitis, inflammations, and dermal infected wounds. With regard to the outcomes of wang (2005), anthocyanins from Malvasylvestris can efficiently decrease the overall cholesterol and triglycerides of plasma (11). The aim of this work is to measure the Radon concentrations in *Malvasylvestris* plant known locally as "Khabbaz" growing naturally in Iraq during winter.

Material and Methods:

Sampling Preparation

A total of five *Malvasylvestris* plant samples collected from different areas of Baghdad: University of Baghdad (33.2711°N, 44.3786°E), Kadhimiya (33.37994°N, 44.3441°E), Yusufiyah (33.0747°N, 44.2261°E) and Abu Ghurayb (33.2945°N, 44.0779°E), and from Karbala (32.54537°N, 44.2133°E). These samples were collected randomly from different locations of these cities during winter. The geographical situations of sampling locations were concluded by utilizing a Global Positioning System (GPS) as shown in Fig. 1. All samples were pretreated by washing in water to clean them and to remove all sands. The samples were dried in a microwave at the temperature of 60°C, and milled using a blender to obtain equal size particles using (1micron) mesh to obtain uniform particle size.

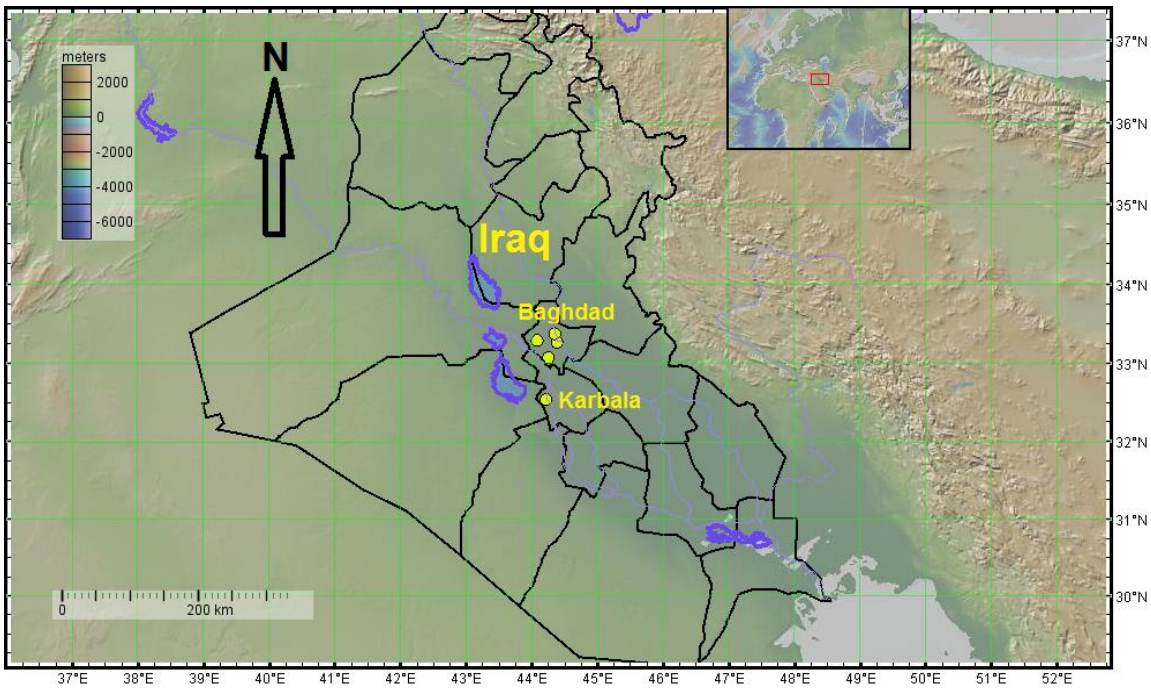

Figure 1. Geological map for the study areas.

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$C_{Rn} = \frac{\rho}{\eta T}$..... 2

where: C_{Rn} is Radon concentration (Bq/m^3), η is the calibration coefficient of CR-39 detector in (tracks cm^{-2} day^{-1}/Bqm^{-3}), and T= exposure time in day.

The annual effective dose H_E is estimated according to the following relation (13):

$H_E(mSvy^{-1}) = C * F * D * T$ … 3

where: C is the concentration of Radon in ((Bq/m^3), F: is the ^{222}Rn indoor equilibrium factor (0.4), T time of exposure (8760 hy^{-1}), D is the dose conversion factor (9 x 10^{-6}mSvy^{-1} (Bqm^{-1})$^{-1}$).

Results and Discussion:

The results of ^{222}Rn concentration in the plant samples under this study are shown in Table 1, obtained by track densities registered on the CR-39 Nuclear Track Detector. From Table 1, it is found that the ^{222}Rn concentrations in plant samples changes from the lowest value 15.815(Bq/m^3) (University of Baghdad) to a maximum value of 54.445(Bq/m^3)(Abu Ghurayb) in Baghdad city and these values are higher than the value obtained from Karbala city which is 15.297(Bq/m^3). The annual effective dose H_E was calculated from eq. 3 and shown in Table 1. It varied from 0.498mSv/y (University of Baghdad), 1.243mSv/y (Yusufiyah), 1.603mSv/y (Kadhimiya) and 1.717mSv/y (Abu Ghurayb) in Baghdad, and 0.482mSv/y, in Karbala. The high value of the annual effective dose in this study was 1.717mSv/y from (Abu Ghurayb) in Baghdad. This value is in the range of the permissible limits recommended by world health organization (WHO) (14) which is equal to 1-3mSv/y. The Radon concentration and annual effective dose of this study were compared with the other studies, we found them similar and close to literature, as shown in Table 2.

Measurement Technique

Each of *Malvasylvestris* samples weighing about 35g placed in the plastic container was 13cm height and 10cm diameter, as shown in Fig. 2. A sheet of CR-39 detector was cut into pieces of dimensions $1cm^2$ and affixed to the bottom of the plastic container cover. The detectors were allowed to expose to Radon and its progeny for 60 days to get a clear view of the effects. Then, CR-39 detectors were taken out from the plastic container, and etched for 6 hours into 6.25N NaOH solutions at 60°C in the laboratory. After etching, detectors were washed with distilled water, and dried. Eventually, the detectors were examined utilizing an optical microscope at a magnification of 400X to count the number of alpha tracks per cm^2 recorded on the plastic detectors.

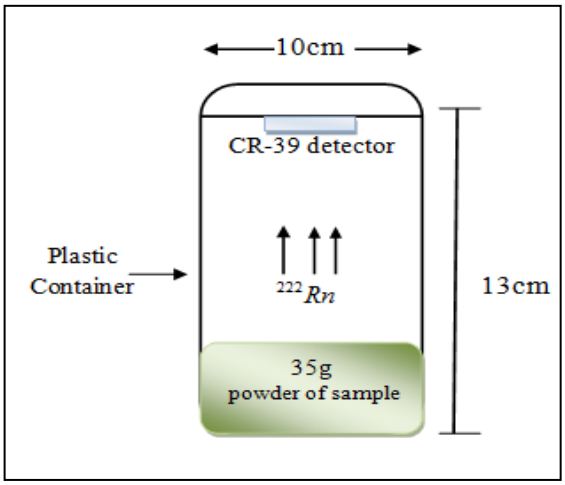

Figure 2. Sealed-cup technique of CR-39

The tracks density is measured by using eq. 1 (12):

$\rho = \frac{N}{A}$ ……. 1

where: ρ is the track density number (tracks/cm^2),N is the median of overall tracks, and A: Area of field view.

The Radon gas concentration was measured using the relation 9:

Table 1. The Radon concentration and annual effective dose H_E in *Malva sylvestris* plant samples

No. of Samples	Locations of Samples		ρ (Track/mm^2)	^{222}Rn (Bq/m^3)	H_E (mSv/y)
1		University of Baghdad	203.3333	15.815	0.498
2	Baghdad	Kadhimiya	653.3333	50.815	1.603
3		Yusufiyah	506.6667	39.408	1.243
4		Abu Ghurayb	700	54.445	1.717
5	Karbala		196.6667	15.297	0.482

Table 2. The ^{222}Rn (Bq/m^3) and H_E(mSvy^{-1}) in Malva sylvestris plant samples the current analysis compared with other studies.

Study area	^{222}Rn (Bq/m^3)	H_E (mSvy^{-1})	References
Iraq(Najaf)	26.5	—	[4]
Morocco	50	0.41	[8]
Iraq(Baghdad)	54.445	1.717	Present study

6. Pooja C, Rishi P. Variation in alpha radioactivity of plants with the use of different fertilizers and radon measurement in fertilized soil samples. JEHSE. 2014; 12:70.
7. Hussein AS. Radon in the Environment Friend or Foe. Proceedings of the 3rd Environmental Physics Conference. Feb. 2008; 19-23, Aswan, Egypt.
8. Oufni L, Manaut N, Taj S, Manaut B. Determination of Radon and Thoron Concentrations in Different Parts of Some Plants Used in Traditional Medicine Using Nuclear Track Detectors. AJEP. 2013; 1(2):34-40.
9. Hesham AY, Gehad MS, El-Farrash AH, Hamza A. Radon exhalation rate for phosphate rocks samples using alpha track detectors. J Radiat Res Appl Sci. 2016; 9(1): 41-46.
10. Gasparetto JC, Martins CA, Hayashi SS, Otuky MF. Pontarolo R. Ethnobotanical and scientific aspects of Malva sylvestris L.: a millennial herbal medicine. J Pharm Pharmacol. 2012; 64(2): 172–189.
11. Seyed MR, Gholamreza Z, Ghader M, Ghader G. Bioactivity of Malva Sylvestris L., a Medicinal Plant from Iran. Iran J Basic Med Sci. 2011; 14(6): 574–579.
12. Ali AA., Afnan AH. Radon Concentrations Measurement in Dwellings of Kufa Technical Institute, Iraq Using LR-115 Nuclear Track Detector. J Nucl Med Radiat Ther. 2012; S:7.
13. United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2000. Sources and effects of ionizing radiations: a report on the effects of atomic radiation to the general assembly with scientific annexes, Annex B, United Nations, New York
14. World Health Organization (WHO) handbook on indoor radon: a public health perspective. 2009.

Conclusions:

The five *Malvasylvestris* plant samples were collected from the various places from Baghdad and Karbala measured the Radon concentration to evaluate any radiation hazards using CR-39 SSNTDs. The annual effective dose lies well within the safe limits as recommended by the WHO (14). The results of this study show that the consumption of the *Malvasylvestris* plant dose not have any risk to the consumers.

Conflicts of Interest: None.

References:

1. Victor M, Raymond LN, Manny M, Thulani CD. Transfer Rates of 238U and 232Th for E. globulus, A. mearnsii, H. filipendula and Hazardous Effects of the Usage of Medicinal Plants From Around Gold Mine Dump Environs. IJESC. 2015; 12 (12): 15782–15793.
2. Lordford TL, Emmanuel OD, Cyril S, Alfred AA. Natural radioactivity levels of some medicinal plants commonly used in Ghana. Springer Plus. 2013; 2 :157.
3. Laith AN, Nada FT, Fouzey HK. Estimation of Natural Radioactivity of Some Medicinal or Herbal Plants Used in Iraq. J Sci Res. 2015; 3 (1): 1-7.
4. Ali AA, Heiyam NH, Abdul hussein AK. Radon levels in different types of Plants with medicinal properties. MJFT. 2016; 1(1): 18-21.
5. Tibor K, Maria H, Edit TB, Janos S. 210-Po,210-Pb, 226-Ra, 232-Th, 40-KConcentration of Medicinal Herbs. J REM. 2015; 4 (2): 40-44.

قياس تركيز الرادون والجرعة الفعالة السنوية في نبات الخباز المستخدم في الطب التقليدي وكغذاء في العراق

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الخلاصة:

في هذه الدراسة تم قياس تركيز غاز الرادون والجرعة الفعالة السنوية في أوراق نبات الخباز المستخدم في الطب التقليدي و . CR-39كغذاء في العراق، لذالك فمن الضروري تقييم تركيز الرادون المشع باستخدام تقنية كاشف الأثر النووي تراوحت قيم تركيز غاز الرادون و الجرعة الفعالة السنوية للعينات التي تم جمعها من بغداد من الحد الادنى إلى الحد الأعلى على التوالي.

$15.815(Bq/m^3), 0.498(mSvy^{-1}), 54{,}445(\mathrm{Bq/m^3}), 1.717(mSvy^{-1})$ بينما كانت قيم تركيز غاز الرادون و الجرعة الفعالة السنوية في عينة تم جمعها من مدينة كربلاء هي اقل من قيم تركيز غاز الرادون والجرعة الفعالة السنوية في عينات مدينة$15.297(\mathrm{Bq/m^3}), 0.482(mSvy^{-1})$ بغداد. الجرعة الفعالة السنوية تقع ضمن الحدود الآمنة التي أوصت بها منظمة الصحة العالمية. لذالك فان استخدام نبات الخباز في الطب التقليدي وكغذاء آمن للاستهلاك البشري.

الكلمات المفتاحية: كاشف CR-39 ، نبات الخباز، النباتات الطبية، تركيز الرادون.