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Review Article

Evaluation of Alpha Particles Concentration and Exhalation Rate in Soil Samples in Kifle City/Iraq

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ABSTRACT

Radon concentration was measured by sealing-can technique based on the CR-39 detectors at different locations in Kifl. The disclosure to radon progeny (EP) have been studied. The results show that the radon concentration 2o5 to Bq/m3. The exhalation rates and the radiation exposure from samples of soil collected from different sites at Kifl city. The total average values of radon concentrations in topsoil (ocm depth) were 26oBqm-3. The dissolved in soft tissues (Ds) and the dose rate due to alpha in lung (Dl) were calculated. The results concentration of radon in this work good agreement with radon concentration levels recommended by the (ICRP)" International Commission on Radiological Protection.

Keywords: CR-39, Concentration of Radon, Effective Dose Rate.

INTRODUCTION

Radon is a natural radioactive gas. It does not contain an order that differentiates it and abundant, and radon is nine times thicker than air. It produces two types 22oRn is a characteristic result of ^{232}Th, ^{222}Rn is a net normal ^{238}U [1].

The short half-life of radon 3.85o days that are short time enough to tolerate it to travel ready the soil and enter the atmosphere ^{222}Rn concentrations in soil gas within a few meteors of the surface ground are obviously important in determining radon rates of entry into pore spacese and then into the atmosphere [2]. People and organisms are exposed to radon every day, therefore of the natural radioactive decay of uranium in the rocks and soil that occurs everywhere, in out-of-doors air and buildings in changing concentrations. When exposure to great concentrations of radon and its daughters it through inhalation for a long time lead to obsessive effects such as respiratory employment charges and lung cancer [3]. The measurement of radon concentration in soil gas, in principle, can be used as a method of evaluating the potential for elevataed indoor ^{222}Rn concentrations. ^{222}Rn gas can moves simply out of the outward soil into homes or atmosphere; though the soil is considered to be the source of indoor radon concentration, raw building materials can make a significant contribution to the level of natural radioactivity in closed spaces such as stores and badly houses [4]. Evaluating of radon is important both in the structure of fresh buildings and in obtainable buildings extenuation or remediation.

The main radon inhibition and mitigation strategies motivation different soil depressurization methods. In many suitcases, a mixture of strategies provides the maximum decrease of radon concentrations. Radon is now recognized as the second most important cause of lung cancer after smoking in the general population. When radon gas is exhaled densely ionizing -particles produced by deposited decay crops of radon can interact with biological soft tissue in the lungs leading to DNA damage. Cancer is generally thought to require the rate of at smallest explosion of middle cells that have continuous degree of DNA harm which can significantly growth the loch of cells available for the development of cancer [5].

AREA OF STUDY

Is a town between Najaf and Al Hillah in south-eastern on the Euphrates River in Iraq. The near the town is about 15,000. Kifl is the place of Al-Nukhailah/Mosque (Figure 1).

SELECTION OF SAMPLING SITES

In order to conduct presentations, radon measurement survey. Selected samples from Kifl at depth (15cm).

MATERIALS AND EXPERIMENTAL

Radon concentrations were measured in soil samples at depth 15 cm by CR-39 as a passive technique which is a polymer, nuclear detector, soil samples measured be governed by on the path thickness on the unprotected surface of the CR-39 sensor, the exposure time of the testers and the irradiation tube dimensions."The weightiness of (20 g) of soil was in use from each placed in cup, the tube has CR-39 senser with dimensions of $(1\times1)cm^2$, thick sealed these

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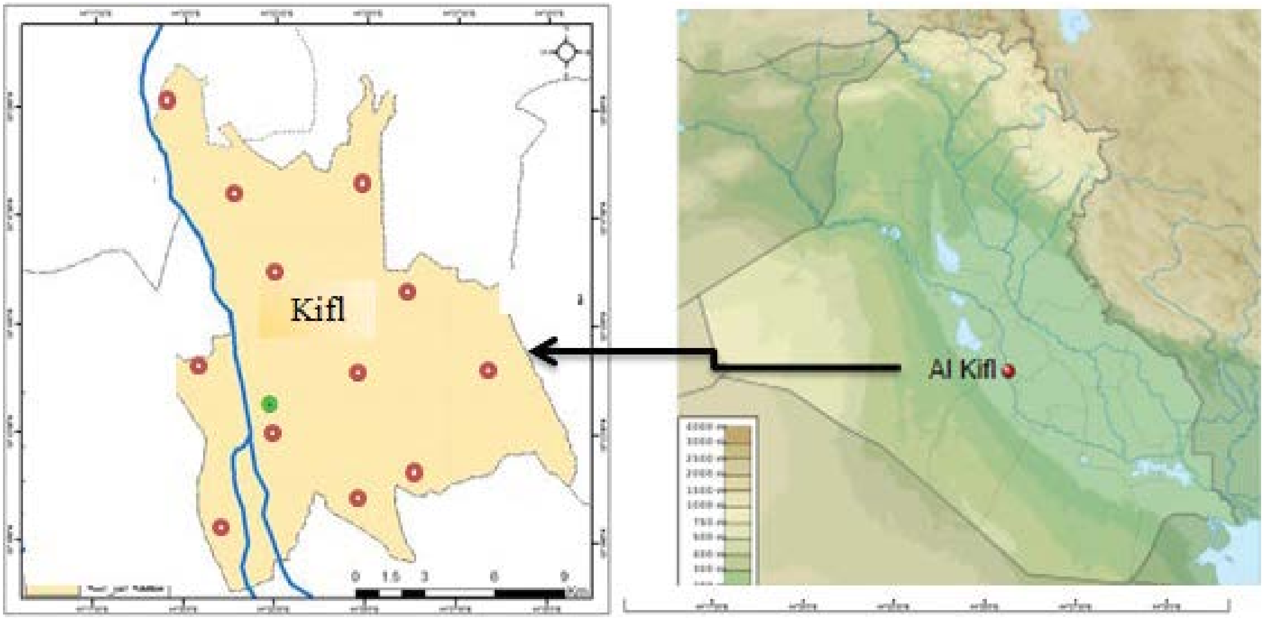

Figure 1: Study of area.

tube of 7 cm mouth diameter, 5 cm bottom diameter and 10.5 cm height the detector was placed at the middle of the underside of the shield and attached with an paste tape. The soil sample kept for one month before analysis to allow secular equilibrium to be made between ^{222}Rn and its parent ^{226}Ra in uranium-series. The background was measured by one empty container and counting the same time for the sample measurements. Were CR-39 etched in 6.250 N, NaOH, at 70±1°C for 6h. The counting of tracks was done manually under an optical microscope. Radon concentration can be determined by counting the tracks in a given area. The tracks within a fixed area were counted and the number of paths per area indomitable the radon concentration of the site".

The calibration factors have been obtained by using the setup described [6]. From track density we found the concentration of radon (C_R) [7]:

$$C_R = \rho / \eta T \quad (1)$$

"$C_{R:}$ is the radon concentration in Bq/m^3, ρ: track density, T exposure time, η:Calibration factors have been calculated (0.22 T.cm^{-2}d^{-1}perBq/m^3). The effective dose equivalent (Ep) is then related to the average radon concentration C_{Rn} by following expression [8]:

$$E_p = t \times n \times F \times \frac{C_{Rn}}{3700x170} \quad (2)$$

"F is the equilibrium factor, that was taken as 0.6, t=8760 h/year, n : occupancy factor of time spending outdoor (0.8), 2.7×10^{-4} is the factor for the conversion of radon concentrate to the WL per Bq m^{-3} [9]. The WLM was then converted into annual effective dose by using dose conversion factors: the radon daughter dose conversion factor [8] for members of the public is 3.88 mSv per WLM (~3.90 ms per WLM)".

"The radon review is main for thoughtful the involvement of the measureable to the radon concentration found in breaks and homes. Exhalation amounts in expressions of space and mass were evaluated from equations (3) and (4) [9]:

$$E_A = \frac{C.V.\lambda}{A[T+\lambda^{-1}(e^{-\lambda t}-1)]} \quad (3)$$

$$E_M = \frac{C.V.\lambda}{M[T+\lambda^{-1}(e^{-\lambda t}-1)]} \quad (4)$$

E_A, E_M are radon area and mass exhalation radon rates by (Bq/m.h); λ is the decay constant for radon (hr^{-1}); C is a integrated radon as measured by CR-39 solid state nuclear track detector (Bq m^{-3}h); T is the time of exposure by (hr), volume V is the actual volume of can (m^3); A is the area of (m^2) and radon decay products were considered separately. Inland is part dissolved in compliant tissues. "Action the solvable businessperson for the salving tissues to be 0.4 and presumptuous that the short-lived decay products decrease in the similar tissue as element gas, for flocculent tissues other than the lungs was derivable and is pan dissolved in compliant tissues. Action the solvable businessperson for the salving tissues to be 0.4 and presumptuous that the short-lived decay products decrease in the similar tissue as element gas, the masses relation for flocculent tissues other than the lungs was derivable ^{222}Ra always cturent-day in the air of the lungs at the absorption in air (C_{Rn}, air) and is part dissolved in compliant tissues . Action the soluble businessperson for the salving soft tissue to be 0.4 and presumptuous that the little-lived decay products decrease in the similar tissue as radon gas, the masses relation for flocculent was derivable [I0].

$$D_s = 0.005 * C_{Rn,surface} \quad (5)$$

"So the dissolved radon in the lungs the volume of the air in the lungs to be "3.2×10^{-3} m^3 "for the and assuming further that the decay products will stopover in the lungs, the dose rate due to α-particles was evaluated as ICRP [11].

$$D_l = 0.04 C_{Rn,surface} \quad (6)$$

RESULTS AND DISCUSSION

Soil is the basic component used in building materials important to find the radon activity concentration to have an assessment of radiation hazard to the soil. The values of radon activity in soil samples at the carefully chosen in the area under study at the top soil of (0 cm) are obtainable in Table 1. The radon concentration in soil samples for topsoil average values of radon concentrations 260 B/q. The obtained values in this study are within that the global average value of outdoor radon activity). Radon concentration was found less than the recommended rangee (200-300 Bq/m^3) suggested by UNSCEAR (2000) lung cancer increases significantly with exposure to greater radon levels. The lung cancer risk

Table 1. Concentration Radon in topsoil samples at poised from the area under study.

No.	S.C	C_{Rn} (Bq/m^3)	E_A(mSv/y)	E_M (mSv/y)	E_p (WLM/y)
1	K1	300	137	4.6	1.23
2	K2	205	103	3.7	1.56
3	K3	294	133	4.2	1.45
4	K4	345	144	4.8	1.52
5	K5	256	121	3.9	1.67
6	K6	234	102	3.4	1.25
7	K7	121	78	3	1.30
8	K8	245	114	4.3	1.42
9	K9	307	136	4.6	1.13
10	K10	295	107	3.6	1.34
11	K11	274	90	3.1	1.31
12	K12	245	89	3.1	1.12
Average		260	112	3.8	1.35

Table 2. The soft tissues (D_S) melted and d0se rate due to α-particle in the lung (D_l) precast from the tops0il tasters in the study area.

No.	S.C	D_S	D_l
1	K1	1.5	12
2	K2	1.02	8.2
3	K3	1.47	11.76
4	K4	1.72	13.8
5	K5	1.28	10.24
6	K6	1.17	9.36
7	K7	0.60	4.84
8	K8	1.22	9.8
9	K9	1.53	12.28
10	K10	1.47	11.8
11	K11	1.37	10.96
Ave		1.3	10.45

increasese16% in1oo Bqm^{-3} (at 2.7o pCiL^{-1} in water) increasae in radon exposure. At top soil sameples.

"For the evaluation of the exposure to ^{222}Rn progeny (E_p) to the inhabitants of the studied area due to the radon and its progeny, the ICRP model 1993 was adopted average value (1.35) kifl city. All operational dose values are less the global scale the relation between radon gas and E_p is good. Calculate The mediocre external exhalation rates (E_A) in samples of soil for 0cm (112 mSv/y), while the total mass exhalation rates (E_M) in testers of soil for topsoil (3.8 mSv/y) the values of radon exhalation rate were found global total value of 57.6oo Bqm^{-2}h^{-1} [4] as it does not posture any health risks due to little radon exhalation rate.

The (D,) softened in soft materials and dose rate as a result of a-radiation in the lung made from the apparent soil samples (Dais to tabulate in Table 2. The avenge dissolved in soft tissues 1.3 nGyh^{-1}. The average dose rate (D,) due to alpha-radiation in the lung formed from the surface soil samples10.45 nGyh^{-1}.The values is found to be within the harmless limits as extolled by ICRP (1993, 1981). The results displayed that these areas are nontoxic from the health risk point of observation as fax as the ^{222}Ra is anxious.

CONCLUSION

"In this work, measurements of radon and their progeny measurements of radon in soil were displayed using a SSNTDs detection technique which has a very low detection limit. According to the results, some remarkable conclusions can be listed. The absorption levels of radon in topsoil tasters in the area under study exposed well within the range re-counted by the ICRP (1993&1987). Furthermore, these values appeare to be harmless from the place of view of health dangers. Therefore, activities of human would not be at danger in these areas. The consequences will afford records and data for dose valuation and more lessons.

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