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Measurement of natural radioactivity levels in the soils of some universities campus of babylon

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Abstracts:

The objective of this study was to investigate the level of radioactivity in the surface soils of Babylon University, Islamic University, Al-Mustaqbal University respectively by measuring the activity concentrations of various radiation emissions. It was measured 50 random deferent sites within Babylon University, and 22 random sites within Islamic University, as well as, 10 sites within Al-Mustaqbal University respectively by distance 30 cm from the surface soil involved all the departments, colleges and infrastructures. The results showed that the measurements were generally close together. For Babylon university, the highest value registered at the location (31) and the lowest value registered at two location: (9),(21). While for the Islamic University, the highest value registered at the location (12), (20) and the lowest value registered at two location: (1),(2).where for Al-Mustaqbal University, the highest value registered at the location (6) and the lowest value registered at location (7). It was noted that the study area is free from radioactive hazards, so the study area is save for human health.

Key words: Radiation, Terrestrial Radiation, Radiation Dose, Surface Soil, Babylon University, Exposure.

Introduction:

In the past decades, scientific researches and scientific journal activities associated with radiation protection focused on the exposure to radiation by humans. The general idea was that, if humans were sufficiently protected, then other living things are also likely to be adequately protected [1]. There are many sources for humans to be exposed to radiation both natural and artificial sources. The radiation from natural sources includes cosmic radiation, external radiation from radionuclides in earth's crust and internal radiation from radionuclides panted or consumed and taken in the body [2]. Humans are always exposed to radiation from outside sources as well as from inside their bodies. Outside sources include space radiation and terrestrial radiation (i.e. Radiation radiated from radionuclides in soil and rocks), while the inside sources include the radionuclides that enter our bodies in the food and water consumed and the air they breathe, no matter what are the source of radiation , it will presented everywhere in the environment [3]. Radionuclides have been found in environment from the ancient time, and the significant natural donors of external exposure from gamma-radiation are the Uranium and Thorium series, together with ^{40}K wherever commonly present in trivial amounts in soil and in the building materials. There is a infinite attentiveness in the study of natural environmental radiation and radioactivity in soil since the residents are exposed to natural radioactivity at changed levels depending on natural radioactive minerals found in that area [4]. According to the United Nations Scientific Committee on the Effects of Atomic Radiation, (UNSCEAR), the world rate dose from natural radiation sources of normal areas is estimated to be 2.4 msv a^{-1}, while that for all human sources, including medical exposure, is about 0.8 msv a^{-1}. Thus 70% of the radiation dose received by human population is from natural radiation sources [5]. Radon (the gas released by uranium and thorium in soil and rocks) and its decay yields result in the greatest dose to humans. Even though the indoor radon concentrations are also the most variable dose components, and it depend on design of the house , the soil type it build with , where in the house the radon is measured. Even granite counter-tops can contribute to the radon levels in a house, but this contribution is typically very small compared to the radon from the soil under the house [6]. The soil is classified to three types which are saline, salinesodic, and alkalietc depending on their physical and chemical composition [7]. Many studies have carried out to determine the levels of radiation in soil [8,9,10].

Material and methods:

Study Area: The study was carried out inside University of Babylon, Islamic University and Al-Mustaqbal University which is outside Hillah city by distance 3.5 km in the north. It is consider suburban area as surrounded by large vegetated areas and generally possesses a flat and sedimentary soil. In addition it has many buildings, parks, and green- moisture zones. The study area is shown in Fig. 1.

Fig. 1: Map of Study Area (Google Earth Image).

Locations and Measurements:

In order to insure accuracy to the measurements of radioactivity within surface soils, several sites of soil's study area have been chosen. On the other hand the measurements were involved all the locations within study area: collages, departments, and the other infrastructures. The measurements have executed around 50 deferent sites, as shown in (Fig.1) to measure the radioactivity without remove the surface soil, with fixed distance about 30 cm. The used device in this study is (Radiation Alert) (Inspector 33290) which has subjected to calibration process, the adapted unit measure of this device is (μSv/hr). The measuring process was done at deferent intervals time during the month of December – January 2016/2017 in the morning duration.

Results and Discussions

There is a great interest in the study of natural environmental radiation and radioactivity in earth crust due to the fact that the population is exposed to natural radioactivity at different levels depending on geological and geographical nature of the earth crust in each region in the world [11]. Furthermore its very imperative to measure the radiation hazards that come up from the use of soil samples that polluted with the radioactive materials [12]. Significant amount of man-made radionuclides ^{157}Cs and ^{90}Sr may also present in the soil and plant as a consequence to the testing of nuclear weapons in the atmosphere, accidents, such as Chernobyl accident, and the routine discharge of radionuclides from nuclear installations [13]. Naturally occurring radionuclides (Uranium and Thorium series, etc.) are suggested contributors to radiation doses received by human beings [14]. The variance in radiation indorsed to the type of the soil and its content from Uranium, Radium, distribution of rocks, and industrial activities [15]. Table.1 illustrates the values of radioactivity levels at the surface layer of soils into study area of Babylon University, as is evident the measurements at all locations are slightly closed. On the other hand, all the measurements are in the permutable levels, as the permutable annual dose of exposure to radiation is 1 mSv and the value of effective radiation dose in human body is about

(0.5 – 0.25) Sv, considering that the entire human body exposed during a short period of time, and the biological impact depends on the dose rate, where its decreases with long time period of exposure [16].

Table1: The measurements of radioactivity levels in Babylon University

No. of Location	Radioactivity Levels µSv /hr	No. of Location	Radioactivity Levels µSv /hr
1	0.017	26	0.014
2	0.016	27	0.008
3	0.012	28	0.013
4	0.005	29	0.009
5	0.009	30	0.011
6	0.009	31	0.020
7	0.006	32	0.009
8	0.005	33	0.015
9	0.004	34	0.014
10	0.012	35	0.011
11	0.009	36	0.009
12	0.018	37	0.013
13	0.014	38	0.014
14	0.007	39	0.014
15	0.014	40	0.009
16	0.011	41	0.007
17	0.016	42	0.017
18	0.012	43	0.006
19	0.006	44	0.017
20	0.009	45	0.009
21	0.004	46	0.018
22	0.007	47	0.013
23	0.005	48	0.014
24	0.013	49	0.014
25	0.007	50	0.014

The filed measurements showed that the highest value was registered at the site (31), while the lowest value registered at tow site: (9) and (21). It was observed that the study area is free from radioactive hazards, so the study area is save for human health. The result shown in Table 2 show the level of the radiation in the Islamic University, as shown in the results the lowest level was at site (1,2) with 0.0013µSv and the highest level was found at site (12, 20) with 0.017 µSv, all the site was lower than then the acceptable level which was 1 µSv, for the Islamic University there was only 22 site because there was a relationship between the number of the sites and the university area.

Table 2: The measurement of the radiation level of the site from the Islamic University

No. of Location	Radioactivity Levels µSv /hr	No. of Location	Radioactivity Levels µSv /hr
1	0.0013	13	0.007
2	0.0013	14	0.013
3	0.007	15	0.012
4	0.013	16	0.011
5	0.014	17	0.008
6	0.011	18	0.012
7	0.007	19	0.004
8	0.011	20	0.017
9	0.013	21	0.007
10	0.005	22	0.007
11	0.015	23	0.005
12	0.017	24	0.007

Table (3) shows the level of radiation measured at the Al-Mustaqbal University, as illustrated in the results the lowest level of radiation was recorded at site (7) which was 0.0011 µSv and the highest level at site (3) was 0.011 µSv as, all the site was below the acceptable limit which was 1 µSv, as, for the Al-Mustaqbal University there was only 10 sites because as mention before there was a relationship between the sites numbers and the university area.

Table 3: the measurements of Radioactivity levels in Al-Mustaqbal University

No. of Location	Radioactivity Levels µSv /hr	No. of Location	Radioactivity Levels µSv /hr
1	0.009	6	0.1022
2	0.009	7	0.0011
3	0.011	8	0.008
4	0.0014	9	0.0115
5	0.0016	10	0.006

When we compare the results obtained from three universities we found that the lowest level recorded at site 7 in Al-Mustaqbal University which was 0.0011 µSv, and the highest level of the radiation recorded at site 31 in Babylon University which was 0.020 µSv, as mention above all the three universities was lower than the acceptable level.

References

[1] **Woodwell, G. M .** Design of the brookhaven experiment on the effects of the effects of ionizing radiation on a terrestrial ecosystems. Radiation Botany 3:pp.125-133. 1963.

[2] **Gür, F.; Baba, A. and Kumru, M. N.** Assessment of the radiological impact of soil in Izmir. International Earth Science Colloquium on the Agean Region, Izmir, Turkey, pp. 89-98. 2001.

[3] **El-mageed, A. I. A.; El-Kamel, A. H.; Abbady, A.; Harb, S.; Youssef, A. M. M. and Saleh, I. I.** Assessment of natural and anthropogenic radioactivity levels in rocks and soils in the environs of Juban town in Yemen. 10th Radiation Physics and Protection Conference, 27-30 November, Nasr City - Cairo, Egypt. 2010.

[4] **Santos Junior, J.; Ferreira Cardoso, J.; Miguel da Silva, C.; Vita Silveira, S. and Santos Amaral, R.** Analysis of the 40_k levels in Soil using gamma spectrometry. Brazilian Archives of Biology and Technology, pp.48221-48288. 2005.

[5] **Radhakrishna, A. P.; Somashekarappa, H. M.; Narayana, Y. and Sidappa, K. A** new natural background radiation area on the southwest cost of India. Health physics. Vol. 65: pp.390-395.1993.

[6] National Council on Radiation Protection and Measurements.2009. Ionizing radiation exposure of the population of the United States. Bethesda, MD: National Council on Radiation Protection and Measurements; NCRP Report No. 160; 2009.

[7] **Brady, N. C.** The nature and properties of soils, Macmillan Publisher, London, 10th Ed., pp.243-246. 1990.

[8] **Alzubaidi, G.; Hamid, F. B. S. and Abdul Rahman, I.** Assessment of Natural Radioactivity Levels and Radiation Hazards in Agricultural and Virgin Soil in the State of Kedah, North of Malaysia.The Scientific World Journal. Hindawi Publishing Corporation. Vol.2016, Article ID 6178103:1-9.2016.

[9] **Faanu, A.; Adukpo, O. K.; Tettey Larbi, L.; Lawluvi, H.; Kpeglo, D. O.; Darko, E. O.; Emi Reynolds, G.; Awudu, R. A.; Kansaana, C.; Amoah, P. A.; Efa, A. O.; Ibrahim, A. D.; Agyeman, B.; Kpodzro, R. and Agyeman, L.** Natural radioactivity levels in soils, rocks and water at a mining concession of erseus gold mine and surrounding towns in Central Region of Ghana. Springer Plus. DOI 10.1186/s40064-016-1716-5, p:1-16. 2016.

[10] **Jassim, A. Z.; Al-Gazaly, H. H. and Abojassim, A. A.** Natural radioactivity levels in soil samples for some locations of Missan Government, Iraq. Journal of Environmental Science and Pollution Research, Vol. 2, No.1,pp: 39–41. 2016.

[11] **Thabayneh, K. M. and Jazzar, M. M.** Natural Radioactivity Levels and Estimation of Radiation Exposure in Environmental Soil Samples from Tulkarem Province-Palestine. Open Journal of Soil Science, Vol. 2, p: 7-16. 2012.

[12] **Veiga,R.; Sanches, N.; Anjos, R. M.; Macario, K.; Bastos,J.; Iguatemy, M.; Aguiar, J. G.; Santos, A. M. A.; Mosquera,B.; Carvalho, C.;Filho, m. B. and Umisedo, N.** K.Measurement of natural radioactivity in Brazilian beach sands. Vol.41, pp:189-196.2006.

[13] United Nations Scientific Committee on the Effects of Atomic Radiation. Sources and Effects of Ionizing Radiation. UNSCEAR Report, New York. 1993.

[14] **E.P.A.**(Environmental Protection Agency). Radiological Laboratory Sample Analysis Guide for Incident Response-Radionuclides in Soil. National Air and Radiation Environmental Laboratory Office of Radiation and Indoor Air. U.S. Environmental Protection Agency. Montgomery. EPA 402-R-12-006. 2012.

[15] **El-Ghossain, M. O. and Abu Saleh, R.** Radiation measurements in soil of Nusierate in the middle of Gaza- Strip using nuclear track detector CR-39 and electrical plus. Al-Aqsa journal, Vol. 10, pp:273-280. 2006

[16] **Al-Aref M. S.** Bio-Physics of Radiation. Ausama House for Puplishing and Distribution. Jourdan. P 236. (In Arabic). 1999.