Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2016, 8(4):1388-1392

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Survey of Absorbed Dose Rates in air of Buildings Agriculture and Sciences in University of Kufa at Al-Najaf Governorate, Iraq

Allawi Hamed Alasadi, Azhar S. Alaboodi, Lubna A. Alasadi and Ali Abid Abojassim*

Department of Physics, Faculty of Science, University of Kufa, Iraq

ABSTRACT

Indoor and Outdoor absorbed dose rates were measured in select region of AL-Qizweenia Najaf in Iraq. Measurements were perform using a Portable dosimeter Survey (Inspector Alert Model RAP RS1,S.E.international,Inc, USA). The results show that the values of absorbed dose indoor and outdoor were ranged from 696 to 1592.1 nGy/hr and from 565.5 to 1070.1 nGy/hr respectively. The average absorbed dose indoor and outdoor rates were 950.91 nGy/hr and 810.84 nGy/hr of every buildings and laboratories. According to occupancy factor of 0.8 and 0.2, the corresponding average annual effective dose indoor and outdoor rates were calculated to be, 4.66 mSv/yr and 0.99 mSv/yr, successively. The mean annual effective dose outdoor rate is found to be higher than 1mSv/yr which is the recommended dose limit for the public.

Keyword: Absorbed Dose, Dosimeter, Annual effective dose and University of Kufa

INTRODUCTION

Upon the formation of planet earth, as the other planets, many elements of it were radioactive. Humans have therefore been exposed always to radiation from a variety of sources in the environment. The largest proportion of human radiation exposure originates from the natural environment [(2)]. Therefore environmental radioactivity measurements are necessary for to detect the radiation level of background of natural radioactivity sources of earthly and universe origins. The earth component is because of the radioactive nuclides that are present in air, soil, rock, water and building materials in amounts that vary significantly[(3)], and concentrations of these radionuclide's vary from one location to another[(4,5)] and one substance to another following the local geological features and mineralization[(6)].The universal radiation comes from space in form of cosmic rays and their influence to background varies basically with raise and latitude. Moreover, the level of background radiation in a territory is influenced by mad-man sources like those from nuclear activities and incidents[(7,8)].There are several international studies reported for measurement of terrestrial radiation levels to assess the effective dose to the population[(9,10)].The studies were performed both in outdoor and indoor area. The global dose rate value for outdoors is 59 nSv/h with the range of 18-93 nSv/h . the same value for inside dwellings is 84 nSv/h with the range of 20-200 nSv/h. In Asia, the maximum measured outdoor dose rate is found in Malaysia, while the max indoor value is spotted in Iran and Hong Kong. The mean values are 115 and 200 nSv/h, respectively, which indicates the wide use of masonry materials or stone in buildings on these countries[(3)]. Many studies in the gamma field of background radiation were conducted in different cities of Iraq[(11,12,13)]. All these studies showed that the average outdoor dose rate in Nineveh ,AL-Twath and Najaf are greater than the reported mean value by UNSCEAR-2000 [(9)]

For this reason, the aim of this survey was focused on determining the current background radiation in the region of(faculties of Agriculture and Sciences)AL-Qizweenia province and estimate annual effective dose of residents in these area and their risks on human health.

EXPERIMENTAL SECTION

In the present study (20) regions were chosen as fair distribution in faculties of Agriculture and Sciences. The regions were obtained the map sites of the two faculties as shown in figure (1).

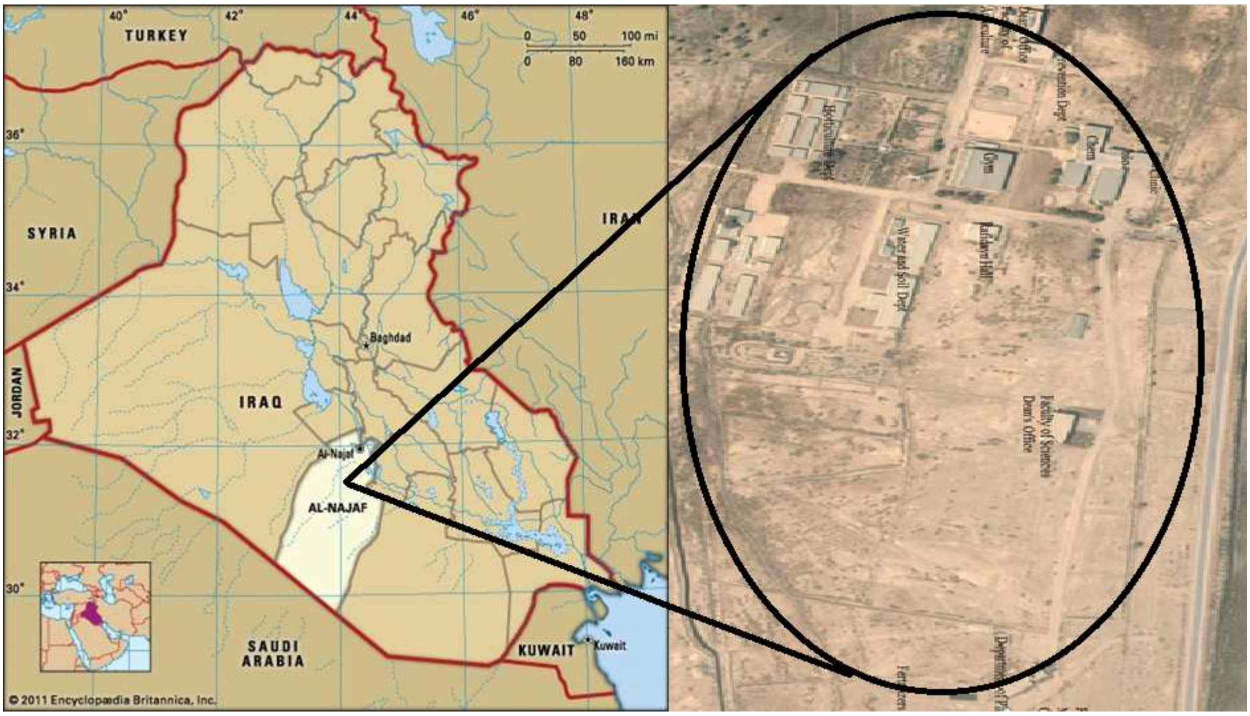

Figure1: Map of the study area

The rate of absorbed dose radiation level in different locations in (faculties of Agriculture and Sciences) is measured by using of a portable Geiger-Muller counter with an rate meter type [G-M survey meter (Inspector Alert Model RAP RS1,S.E.international,Inc, USA)]. The Inspector may be a Geiger-Müller detector change of integrity a large-area forty five millimeter diameter pancake-geometry Geiger-Muller tube with mica window, sensitive to alpha, beta and electromagnetic radiation(γ-rays and X-rays). The big display shows count rates and dose rates in Cpm and mR/hr severally. The G.M detector was calibrated by Germany Secondary Standard Dosimetry Laboratory (GSSDL). The outdoor radiation measurements were performed by placing the detector at least five meter away from each building or wall in order to reduce their effects on the radiation field. The indoor radiation measures were also conducted by putting the detector higher than the ground by one meter in side buildings. Background radiation measurements were performed both indoor and outdoor in Twenty locations five readings were registered at each place and the average was calculated. (north, south, west, east and center) in AL-Qizweenia of Najaf.

The relationship between the absorbed dose rate (D_{air}) and the exposure rate (X) is given by the following equation [14]:

$$D_{air}\left(\frac{Gy}{hr}\right) = 0.0087 \times X\left(\frac{R}{hr}\right) \ldots\ldots\ldots(1)$$

where 0.0087 is a conversion factor produced for one Roentgen exposure.

The values of the outdoor and indoor absorbed dose were calculated using occupancy factors (representing the weighted average for the population of these regions) of 20% and 80%, respectively. The values annual effective dose were determined based on the equivalent dose. "Since radio nuclides decay and cosmic radiation fluency varies slightly in time, the total exposure time of 1 hour was considered in each measurement"[3]. The annual effective dose (AED) was determined as follows[3]:

$$AED\left(\frac{mS}{y}\right) = D_{air} \times T \times OF \times C \ldots\ldots\ldots\ldots..(2)$$

where T is the time converter from hour to year (8760), OF is the Occupancy Factor, that is the fraction of time spent indoor and outdoor, which are 0.8 and 0.2 respectively and C is the conversion coefficient (0.7 Sv/Gy) is absorbed dose in air to the effective dose received by adults.

RESULTS AND DISCUSSION

Results of the measured absorbed doses and the corresponding effective doses at the selected locations are presented in Tables 1. The distribution of the absorbed doses presented in histograms (Figures 2).The measurements showed that the maximum and minimum indoor dose rates were 1592.1 nGy/hr and 696 nGy/hr in location R_{13} and in location R_{10} respectively. The average of indoor dose rates was determined 950.91 nGy/hr. Also the maximum and minimum values of outdoors dose rates were 1070.1 nGy/hr and 565.5 nGy/hr in location R_{17} and in location R_{10} respectively. The average of outdoor dose rates was determined as 810.84 nGy/hr clarifier in Figure 3. Figure 3 shown comparison of Annual effective Dose (indoor and outdoor) with Permissible Limits. The maximum value indoor and outdoor annual effective dose recorded in location R_{13} (laboratory Department of soil science and water resources) and in location R_{17} (Department of horticulture) respectively.

Table 1: Absorbed dose rates in selected locations and the corresponding effective dose rates

Sample Location	Absorbed dose rates inside (nGy/hr)	Absorbed dose rates Outside (nGy/hr)	Annual effective dose Indoor (mSv/y)	Annual effective dose Outdoor (mSv/y)
R_1	957	896.1	4.69	1.1
R_2	1044	791.7	5.12	0.97
R_3	870	965.7	4.27	1.18
R_4	983.1	887.4	4.82	1.09
R_5	1052.7	800.4	5.16	0.98
R_6	730.8	582.9	3.59	0.71
R_7	800.4	704.7	3.93	0.86
R_8	826.5	739.5	4.05	0.91
R_9	809.1	783	3.97	0.96
R_{10}	696	565.5	3.41	0.69
R_{11}	983.1	626.4	4.82	0.77
R_{12}	878.7	661.2	4.31	0.81
R_{13}	1592.1	1052.7	7.81	1.29
R_{14}	1000.5	878.7	4.91	1.08
R_{15}	965.7	817.8	4.74	1.00
R_{16}	922.2	965.7	4.52	1.18
R_{17}	1131	1070.1	5.55	1.31
R_{18}	791.7	748.2	3.88	0.92
R_{19}	1148.4	783	5.63	0.96
R_{20}	835.2	896.1	4.10	1.1
Min	696	565.5	3.41	0.69
Max	1592.1	1070.1	5.63	1.31
Average	950.91	810.84	4.66	0.99

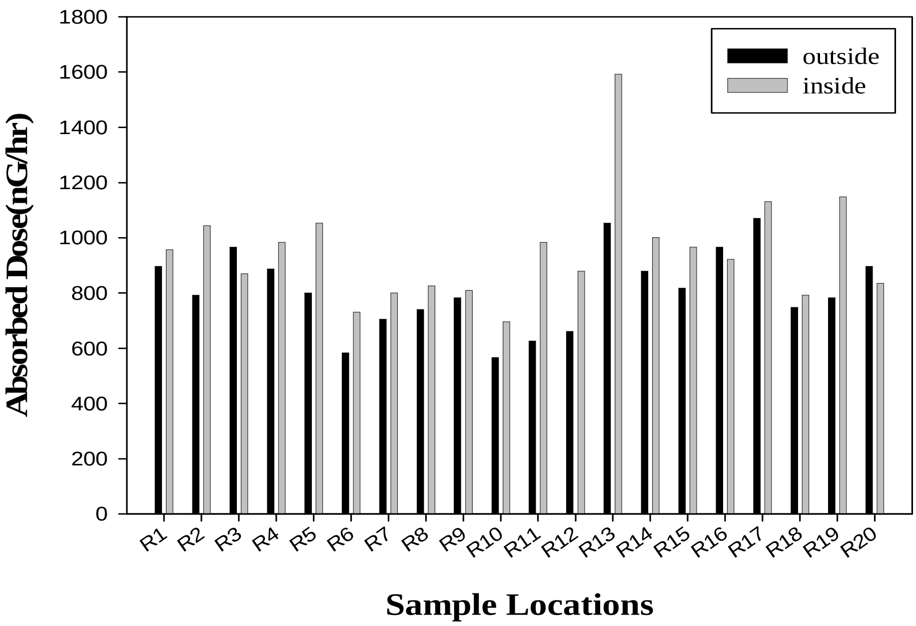

Figure 2: The sample location of the Absorbed dose rates (104 nGy/h) in areas with rock outcrop

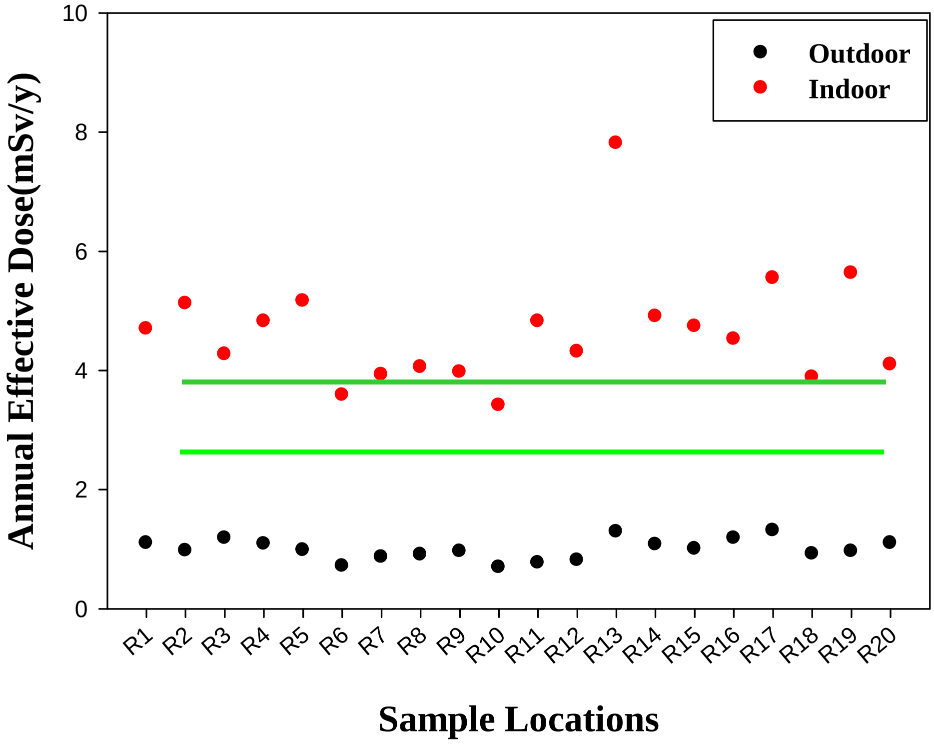

Figure 3: Comparison of Annual effective Dose of Sample Locations with Permissible Limit

CONCLUSION

This study shows that level of the radiation in number of locations of faculty of Agriculture was very high. It's may be because of continuous fertilization of the soil along years. Level of the radiation in the laboratories of Dept. of the soil and water was high too, and it's result to tester materials that be used in this laboratories.

Recommendations

The radiation in this region must be watched and measured every year and decrease of using artificial fertilizers in fertilization of the soil.

REFERENCES

[1] UNSCEAR, (2006). Sources, Effects and Risks of Ionizing Radiations. United Nations, New York

[2] EPD, (2010) Environmental Product Declarations, Radiation S-P-00021 and S-P-00026

[3] M. Gholami ,S. Mirzaei ,A, Jomehzadeh (2011). Gamma background radiation measurement in Lorestan province,Iran) Iran. J. Radial.RES., 9(2):89-93

[4] Diab, H.M. Nouh, S.A, Hamdy, A., EL-Fiki, S.A. (2008). Evaluation of Natural Radioactivity In a Cultivated Area Around A Fertilizer Factory. Journal of Nuclear and Radiation Physics, Vol. 3, No. 1.pp. 53-62.

[5] Jibiri N. N. and Okeyode I.C. (2011). Activity Concentrations of Natural Radionuclides in the Sediments of Ogun River, SouthWestern Nigeria. Radiation Protection Dosimetry. Vol. 147, No. 4, pp. 555–564 . doi:10.1093/rpd/ncq579.

[6] UNSCEAR, (1993). United Nations Scientific Committee on the Effects of Atomic Radiation, (UNSCEAR). Sources, Effects and Risk of Ionizing Radiation. Report to the General Assembly, with Scientific Annexes, United Nations, New York.

[7] Erol Kam and Ahmet Bozkurt (2007) Environmental radioactivity measurement in Kastamonu region of northern Turkey. Applied Radiation and isotops, 65: 440-444.

[8] Ahmet Bozkurt, Nuri YORULMAZ, Erol Kam and et al (2007). Assessment of environmental radioactivity for Sanliurfa region of southeastern Turkey. Radiation Measurement, 42:.1387-1391.

[9] UNSCEAR, (2000). “Sources, effects and risks of ionization radiation”, United Nations Scientific Committee on the Effects of Atomic Radiation, Report to the General assembly, with Annexes, New York.

[10] Sohrabi M, Bolorchi H, Beitollahi S (1996). natural radioactivity of soil sample in the high level radiation areas of Iran. Proceedng of the 4th International Conference on High Levels.Bejjing China, 129-132.
[11] Rabee B. Khader (2010). Measure the background radiation in Some Parts of Nineveh. Journal AL-Rafeadeen Sciences ,Iraq,21:2:92-104. 12 (6)
[12] Al-Mayahi B. ,(2008)., Exposure rate measurements of the natural background radiation in the colleges of science & agriculture- Kufa university ,jour. of Baby. Univ., 15(3): 1-4.
[13] Cember, H. (1983). Introduction to Health Physics, pp. 135-176, Pergamon Press, New York.
[14] ICRP, (2007). International Commission of Radiation Protection, Recommendations of the ICRP Publication103; Ann. ICRP 37 (2–4).