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A Comparison between the Measurements of Natural Radioactive Materials of Surface Soils in Anbar and Diyala

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ABSTRACT

In the current study, twenty samples of surface soils have taken from several areas from Anbar town and Diyala town. These samples are gathered from the surface of the soil at that time place all of samples away for one month underneath normal center conditions. Now is vital to urge an imaging equilibrating and forestall of radiation of sun. To the dirt samples, before tallying the movement of traditional stuff for the examples. Soils tests are sieve to be clean. 1Kg is taken from every sample, these samples were tried utilizing ORTEC MCB connection detector with tallying time 7200 sec. ORTEC MCB connection indicator is usually utilized for estimating the radiation, of nature radiation of materials. When the time is finished. we tend to notice six radionuclides are showed up Anbar and Diyala soils tests: Bi-214, Ra-226, Tl-208, Bi-212, Pb-212, K-40, these radionuclides included; two radionuclides Bi-214, Ra-226 have an area with the U-238 arrangement, three radionuclides Tl-208, Bi-212, Pb-212 have an area with Th-232series and one in every of them is that the traditional radionuclide K-40. The normal specific exercises of the radionuclides from Anbar tests are additional distinguished than Diyala samples and therefore the outside portion of the character radiation for Anbar soils tests was additional noteworthy than Diyala samples and them are terribly low contrasted and as so much as attainable limit1 $mSv.y^{-1}$ United Nations Scientific Committee on the Effects of Atomic Radiation.

KEYWORDS: Radionuclides; Soils; ORTEC MCB; Natural; Radioactivity; K-40.

INTRODUCTION

Regularly happening radioactive materials is seeing because the best wellsprings of introduction to human success [1]. It has conjointly settled that radiation would possibly build hurt human tissues and different traditional structures [2]. The radiation presentation from standard starting amount radionuclides U-238 and Th-232 and their relatives got wind of the best wellspring of radiation to man. U-238 and Th-232 merge in crystalline shakes, as an example, stones and different essential magmatic by virtue of their vast molecule and that they ordinarily be a part of by exceptional earth elements [3]. The connected prosperity risks of those radionuclides area unit a right away result of their ability to amass in human tissues. consequently, the radionuclides exude gamma pillars equally as high charged particles that area unit fit pain the tissues wherever they're unnatural and furthermore fairly just about organs [4]. The structure materials and their prohibited things contain radionuclides of the two most ordinarily proverbial radioactive strategy expressly, the U-238 and Th-232 arrange relatively as K-40 [5]. Trademark radionuclides in building materials to be specific soil, sand body structure sq., solid sq. and stone build elementary little bit of foundation radiation presentation of the overall people. Radiation introduction because of the structure materials will been apportion outside and interior exposures [6,7]. The surface introduction is accomplished by direct gamma ray anyway at intervals presentation is acknowledged by the inward breath of radioactive dormant gas element Rn-222, a young person result of U-238 and its compendious hand rot things. To survey the tomography perils to human success, it is essential to contemplate the radiation levels

discharged by the structure materials [8]. The radiations which individual's area unit aware of might increase on the off probability that they board homes or structures created utilizing materials whose radiation parts area unit higher than typical foundation radiation level within the area [9]. The tomography consequences of living or operating in structures created utilizing these structure materials is that the development in external presentation of the body visible of gamma emotional radionuclides [10]. The tomography ramifications of living or operating in structures sent victimization these structure materials is that the enlargement in outside introduction of the body as a result of frequently happening radioactive materials area unit seen because the best wellsprings of introduction to human thriving. It is comparably settling that radiation might build hurt human tissues and different characteristic frameworks [11]. The dirt materials and their ready things contain radionuclides of the two most frequently acknowledged radioactive game-plan to be unequivocal, the U-238 and Th-232 approach comparably as potassium-40 typically, suspected has been paid to pretend radionuclides than radionuclides of elementary starting, at any rate it's understood that the duty of phony radionuclides in our condition is actually humbler [12]. Trademark radionuclides in building materials expressly soil, sand, solid sq. and rock build essential section of foundation radiation presentation of the overall plenty. Radiation introduction considering the structure materials will been separated into outer and inner exposures [13]. To gauge the tomography dangers to human flourishing, it's principal to contemplate the radiation levels exuded by the structure materials [14]. The radiations which individual's area unit show to might increment within the event. They board homes or structures created utilizing materials whose radiation dosages area unit higher than traditional foundation radiation level within the region [15]. The tomography outcomes of living or operating in structures sent victimization these structure materials. It is the advance in outside introduction of the body considering results from the assessment can provide vital data and information on radiation levels in soils materials and it will cause energy for extra analysis in a very wide extent of soils materials from all the land region of the state [16]. Ten samples of soils area unit taken from various districts for Al Anbar Governorate or Anbar Province; it is the largest governorate in Al-Iraq by territory. Al-Anbar Governorate is an Al-Iraqi governorate located in western Iraq. Ten samples of soils area unit take from various districts from Diyala town. Fifty-seven kilometers far away from the capital, Baghdad, toward the north.

MATERIALS AND METHODS

The models are taken routinely from every one of the areas referenced beneath. The models were gathered top to bottom underneath the outside of the earth and at various occasions. Models are place in the lab for one month for the radiation equalization of the models [17]. Then the models are clean from the pollutions. After ten selected regions have been identified from Diyala governorate and ten other elected regions from Anbar governorate. Going to those areas and collecting samples from the soil surface, and by using manual digging, a sufficient amount of soil is taken, with an average weight of more than one kilogram, and all samples were taken to the laboratory after a code was placed for each sample that was taken. The models are developed for a period of one months to obtain the radiative balance and to eliminate the effects of natural solar radiation. After one month, the specimens are clean and sift with a fine sieve and the remaining soil was ground using an electric grinder. One kilogram of ground soil is weigh using an electronic scale to weigh the models. Each soil sample is place inside the sodium iodide detector for two continuous hours after we took the radiological background for two hours and the file is saved too. After the file is saving in the laptop connected with the detector, the model is place for two hours, and after completing the time, the model is taken out, the spectrum of radioactive elements is saved, and each element was calculated separately. Then we completed the same previous procedures for the rest of the other models, which need to shield the marker with suitable material as showed up in Figures 1 and 2 [18].

Figure 1. ORTEC MCB CONNECTIONS.

Figure 2. ORTE with carrier and monitor.

Collection of Samples

Twenty samples of soils have taken from many regions from Anbar city and Diyala city, ten samples for both of them, the samples codes have shown in Tables 1and 2.

Table 1. The codes of Anbar soils samples.

Codes	Regions and coordinates
N1	Al- Ramadi 33°25′33″N 43°17′57″E
N2	Al-Falluja 33°21′00″N 43°47′00″E
N3	Al-Qaim 34°23′28″N 40°59′16″E
N4	Karbala 34°23′01″N 41°01′51″E
N5	Al-Baghdadi 33°51′9″N 42°32′51″E / 33.8
N6	Al-Karma 33°23′59″N 43°54′32″E
N7	Al-Nekhyb 32°2′28″N 42°15′17″E
N8	Anha 32°2′28″N 42°15′17″E
N9	Okashat 33°45′N 40°00′E
N10	Al-Habbaniyah 33°23′00″N 43°35′00″E

Two radionuclides Bi-214, Ra-226 with the U-238 arrangement, three radionuclides Tl-208, Bi-212, Pb-212 with Th-232series and one in every of them is that the traditional radionuclide K-40. The energy lines and yield of the radionuclides are shown in Table 3.

Table 2. The codes of Diyala soils samples.

Codes	Regions and coordinates
D1	Baquba 33°44′41″N 44°38′37″E
D2	Jalula 34°16′47″N 45°09′58″E
D3	Saadia 34°11′26″N 45°07′15″E / 34.1
D4	Buhriz 33°42′00″N 44°40′00″E
D5	Al-Mansourieh 34° 4′ 36″ N, 44° 57′ 17″ E
D6	Hibhib 33.7821578°N 44.5077741°E
D7	Baldrouz 33.6602800°N 45.0796378°E
D8	Khan Bani Saad 33.35°N 44.9°E
D9	Al- Muqdadiya 33.9691698°N 44.9305653°E
D10	Khanaqin 34°20′00″N 45°23′00″E

Table 3. The energy lines and yield of the radionuclides.

The Radio Nuclides	Energy kev	Iγ %
Ra-226	186.1	3.2
Pb-212	238.5 300	43.6 3.34
Tl-208	583.02	86
Bi-214	609.3 1120.2	46.1 15
Cs-137	661.6	85
Bi-212	726	6.6
K- 40	1460	10.6

The MCB properties are generally set in a dialog with multiple tabs. The number of tabs and the contents of the tabs are control by the capabilities of both the MCB and the application program. The MCBs have a feature status, which the connections software reads. Only those features supported by the hardware (such as high-voltage polarity) has shown. The application software can suppress or add tabs. Support for the MDA preset depends on the application, the common variations have described as shown in Table 4.

Table 4. General specifications of Canberra system.

System	The Specifications
Type of detector	Ortec Connections -32
Volume of crystal	(2×2) inch
Operating voltage	(-2500) V. Dc
No. of channel	(4096) ch.
Relative efficiency	50 %
Counting time for each sample	(7200) sec
Resolution	(2) KeV
Diameter of crystal	(6) cm
Length of crystal	(12) cm
Distance from the window	(5) mm

RESULTS AND DISCUSSION

From Anbar soils samples, the radionuclides that appeared in samples, after subtracting the background of radiations are show in Table 5.

Table 5. The Specific Activity of Anbar city samples.

Codes	Bi-214 Bq/kg	Ra-226 Bq/kg	Tl-208 Bq/kg	Bi-212 Bq/kg	Pb-212 Bq/kg	K-40 Bq/kg
N1	10.65	14.32	10.25	8.35	12.90	140.65
N2	14.28	15.36	11.85	9.36	10.39	147.25
N3	11.65	16.47	9.65	10.47	14.65	159.36
N4	18.36	16.84	14.74	15.23	9.32	162.36
N5	17.58	14.78	14.21	15.36	8.34	198.35
N6	12.68	12.11	13.25	16.35	8.20	152.88
N7	17.35	16.13	14.20	10.25	9.65	177.36
N8	14.21	17.38	13.25	11.45	12.54	150.36
N9	19.32	14.89	14.95	11.36	10.50	213.35
N10	10.60	12.33	9.85	11.25	12.33	196.50
Average	14.66	15.06	12.62	11.94	10.88	169.84
Min.	10.60	12.11	9.65	8.35	8.20	140.65
Max.	19.32	17.38	14.95	16.35	14.65	213.35

The specific activities of Anbar samples are shown in Figures 3, 4, 5, 6, 7 and 8.

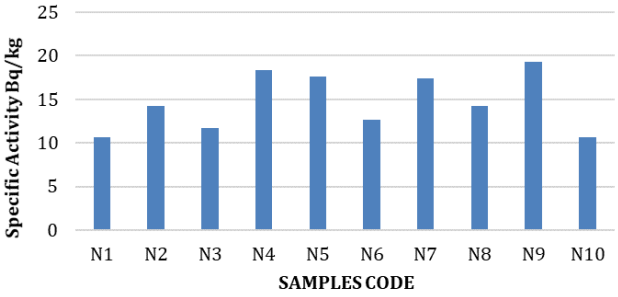

Figure 3. The specific activities of Bi-214.

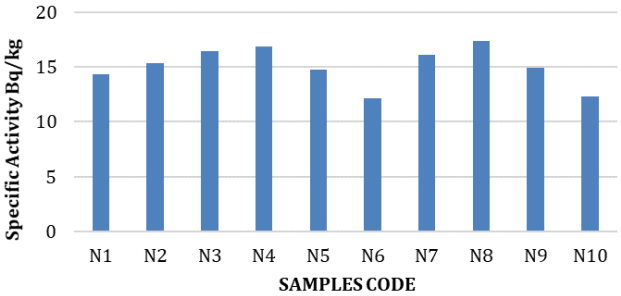

Figure 4. The specific activities of Ra-226.

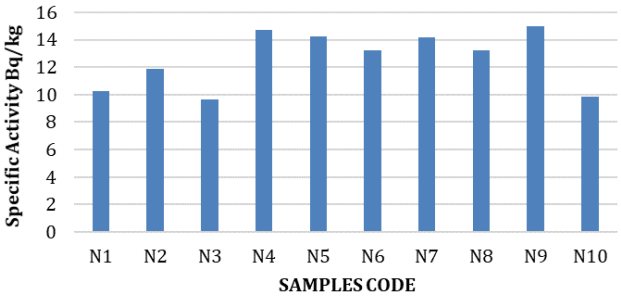

Figure 5. The specific activities of Tl-208.

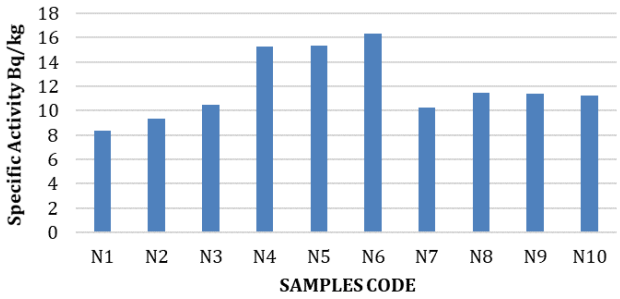

Figure 6. The specific activities of Bi-212.

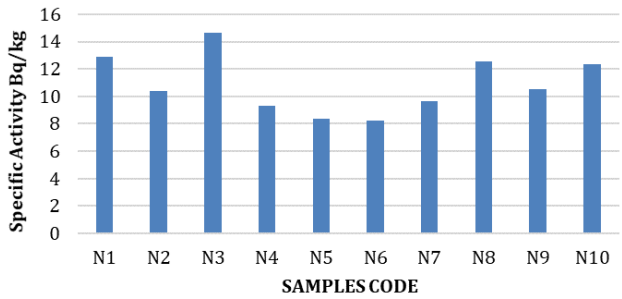

Figure 7. The specific activities of Pb-212.

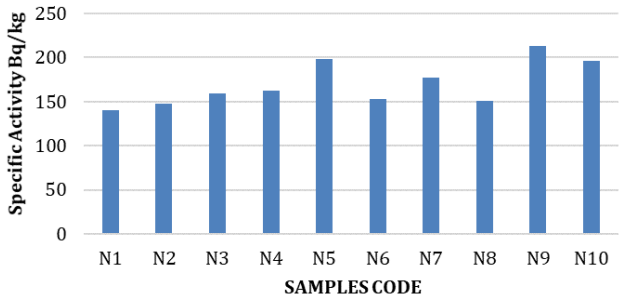

Figure 8. The specific activities of K-40.

For Diyala soils samples, the radionuclides that appeared in samples, after subtracting the background of radiations are show in Table 6.

Table 6. The specific activities of Diyala city samples.

Codes	Bi-214 Bq/kg	Ra-226 Bq/kg	Tl-208 Bq/kg	Bi-212 Bq/kg	Pb-212 Bq/kg	K-40 Bq/kg
D1	4.55	14.36	8.55	4.17	6.77	127.84
D2	5.88	11.39	10.57	3.81	6.42	97.56
D3	7.85	7.65	11.33	6.77	9.67	128.81
D4	7.95	14.27	7.00	7.73	8.72	160.61
D5	5.58	12.35	8.62	5.71	6.21	123.62
D6	9.20	17.55	12.01	7.64	7.10	143.91
D7	10.83	17.36	11.13	7.33	7.53	150.31
D8	11.07	26.39	13.31	9.72	8.42	95.36
D9	11.63	12.25	11.34	4.70	6.44	142.36
D10	4.61	15.60	7.12	3.59	6.45	122.41
Average	7.91	14.91	10.09	6.11	7.37	129.27
Min.	4.55	7.65	7.00	3.59	6.21	95.36
Max.	11.63	26.39	13.31	9.72	9.67	160.61

The specific activities of Diyala samples are shown in Figures 9, 10, 11, 12, 13 and 14.

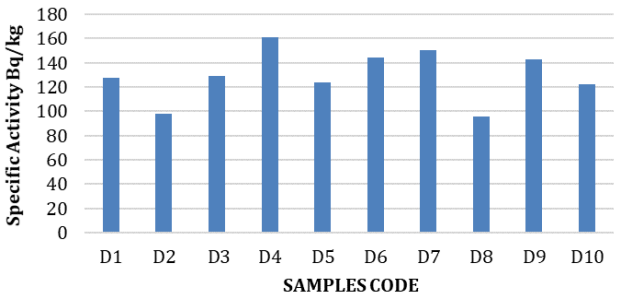

Figure 9. The specific activities of Bi-214.

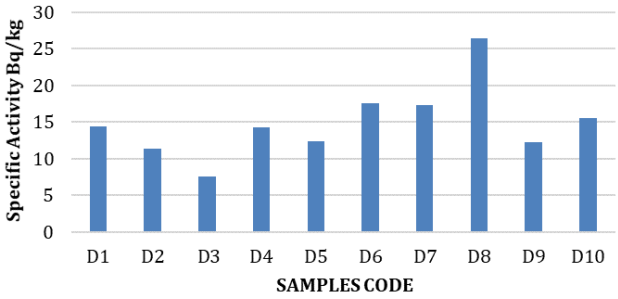

Figure 10. The specific activities of Ra-226.

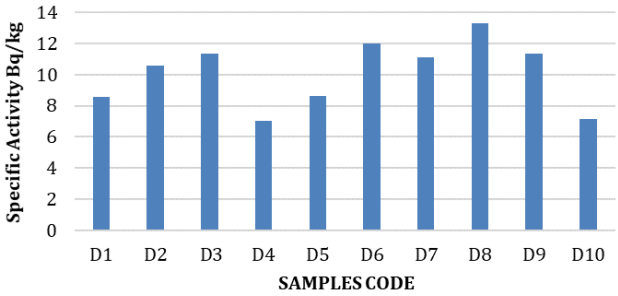

Figure 11. The specific activities of Tl-208.

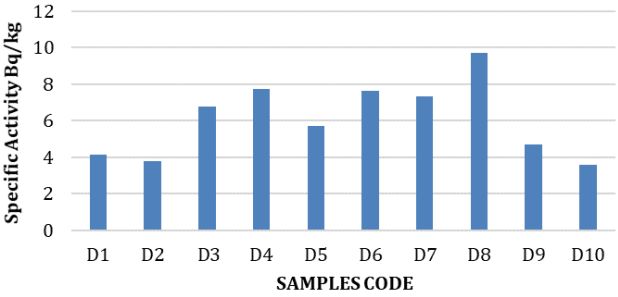

Figure 12. The specific activities of Bi-212.

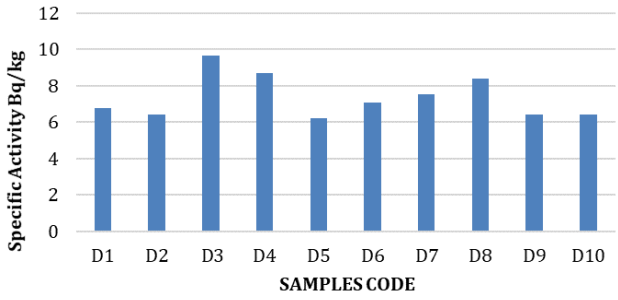

Figure 13. The specific activities of Pb-212.

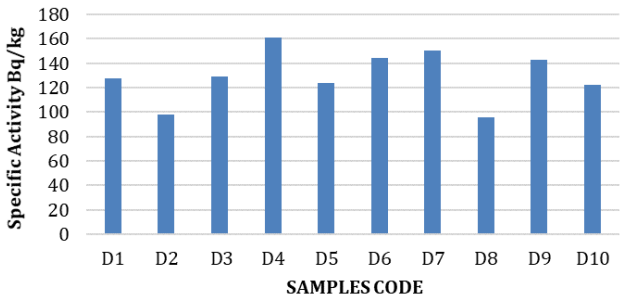

Figure 14. The specific activities of K-40.

The average of specific activities of Anbar city samples is greater than the average of specific activities of Diyala city samples as shown in Figures 15, 16, 17, 18, 19 and 20.

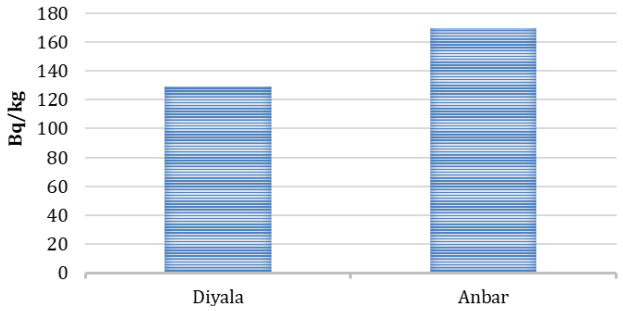

Figure 15. The average of specific activities of Bi-214.

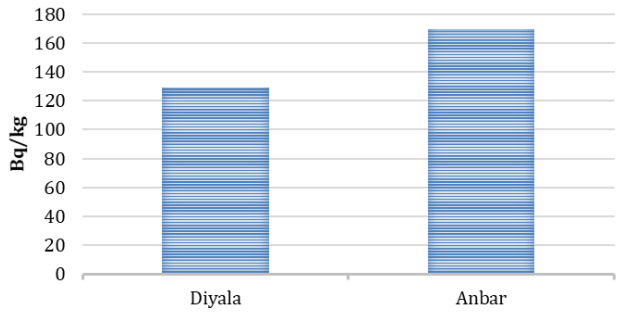

Figure 16. The average of specific activities of Ra-226.

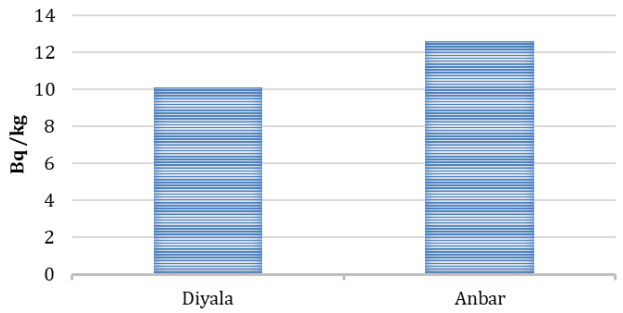

Figure 17. The average of specific activities of Tl-208.

Ten samples have been taken of soils from completely different locales from Al Anbar governorate; it is the most effective governorate in Iraq. Al-Anbar Governorate is associate degree governorate group in western Iraq. It is one amongst the most effective governorates of Iraq,

with a vicinity concerning thirty third (1/3) of the Iraq country region. It covers a zone of 138,500 sq. kilometers, and has rigid lots of one million and 600,000 people (January 12, 2014 estimations).

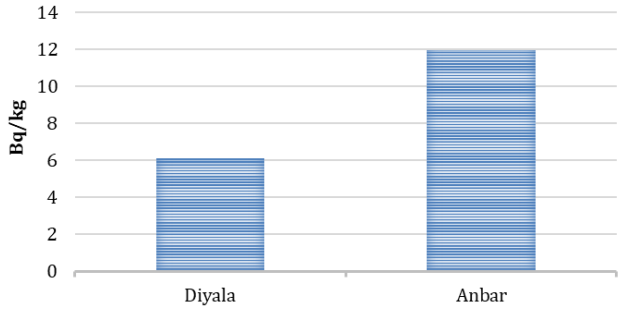

Figure 18. The average of specific activities of Bi-212.

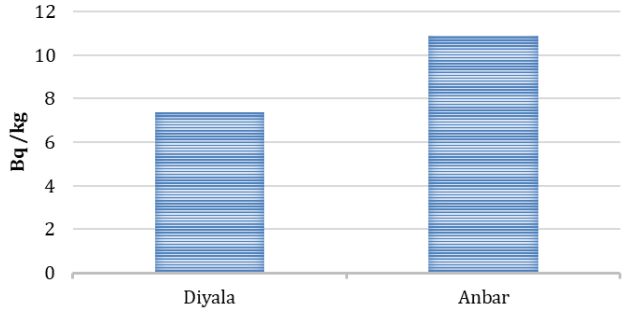

Figure 19. The average of specific activities of Pb-212.

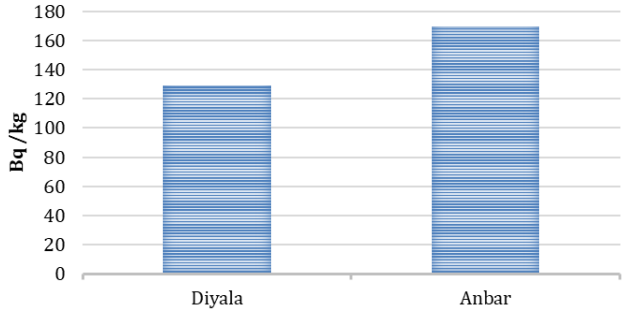

Figure 20. The average of specific activities of K-40.

Generally, the governorate is understood because the al-Dulaim Brigade before 1961. It is delineated toward the north, Nineveh, and the Syrian Arab Republic from the northwest. Jordan from the west. Bagdad governorate from the east. From the south and from the southeast, the governorates of urban center and Najaf. 10 cases of soils square measure take from completely different venue from Diyala town, fifty-seven klicks aloof from the capital, Baghdad, at the north. The Diyala stream that streams into the river is one amongst the districts that square measure outstanding for business enterprise, significantly citrus headway. There is additionally the Ibn Firnas International airdrome. After we to tend to complete all the calculations for the particular activities within of Al-Anbar Governorate soil models, we noticed, through Table No. 5, that very cheap emission is record for a component pb-212 compared with alternative hot parts and its worth was 8.20 Bq/kg. Where it is recording the very best of the emission. In the same series of Al-Anbar Governorate models, we notice part metal element K-40, and amounted to 213.35 Bq/kg, wherever the part metal element is one of the natural parts found within the soil and within the figure as we to tend to, also additionally, further more in addition, like moreover similarly still because the same table we record the min. Typical of specific activities is pb-212 and capable 10.88 Bq/kg. Where the typical of specific activities is K-40 and capable 169.84 Bq/kg. The calculations for the particular activities within Diyala governorate soil models, we noticed, through Table No. 6, that very low emission is record for a component Bi-212 compared with alternative hot parts and its worth was 3.59 Bq/kg. It absolutely is record very best of the emission worth of the hot parts. Within the same series of Diyala Governorate models was for part metal element K-40 and amounted to 160.61 Bq/kg. Wherever the part metal element is one of the natural parts that found within the soil. The figure as we to tend to also additionally furthermore in addition likewise moreover similarly still yet because the same table we record the min. Typical of specific activities is Bi-212 and capable 6.11 Bq/kg of the typical of specific activities is K-40 and capable 129.27 Bq/kg. The complete outside portion for Anbar tests is estimate utilizing the two equations 1 and 2 [19].

$$A_C = \frac{N_{sam}}{P(E) \times \eta(E) \times T_C \times M_{sam}} \quad (1)$$

$$D(\mu\, Sv.h^{-1}) = 0.0007(0.462A_{Ra} + 0.604A_{Th} + 0.0417A_k) + 0.034 \quad (2)$$

$D = 0.506 \times 10^3\ \mu Sv.y^{-1}$

$D = 0.506\ mSv.y^{-1}$

The total external dose for Diyala samples measured using the equations 1 and 2.

$D = 0.387 \times 10^3\ \mu Sv.y^{-1}$

$D = 0.387\ mSv.y^{-1}$

Where:

M_{sam} (kg) is mass of sample, N_{sam} (cps) is the net peak area for the sample in peak range, $P(E)$ is the gamma emission probability, T_C is the counting time in seconds, η (E) is the photo peak efficiency $mSv.y^{-1}$ (mille severt /year), D is a total external dose, A_{Ra} is specific activity of Ra in (Bq/kg), and A_{Th} is a specific activity of Th in (Bq/kg).

CONCLUSIONS

We have a tendency to utilize the ORTEC MCB connection symbol that's the commendable fragile technique for analysis that will yield informative info for 2 or 3 organized radionuclides during a solitary model assessment. The commonplace unequivocal exercises of the radionuclides from Anbar tests square measure additional obvious than the quality categorical exercises of the radionuclides from Diyala tests. The outer section of the character emission for Anbar soils tests was additional basic than the skin piece of the character emission for Diyala tests and people 2 square measure unbelievably low separated and past what several would trust conceivable (1 mSv.y-1) United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR).

The outside piece of the standard emission of Anbar soils was (0.506 $mSv.y^{-1}$), however the outer dosages of Diyala soils tests is (0.387 $mSv.y^{-1}$) and them two square measure terribly low contrasted and as way as doable (1 $mSv.y^{-1}$) [20]. The Anbar soils tests square measure contained plenty of sands, cuts and earth that originates from nature of this town. The Anbar town was a web site of wars, shells born from planes, and the massive guns battery that caused the distance of various risky materials that dirtied somehow the dirt.

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