*Plant Archives* Vol. 19, Supplement 2, 2019 pp. 869-873 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

# EFFECT OF RADIATION ON BURNING SOIL IN THE AL-ROHBAN REGION ON WHEAT SEEDLINGS

**Samah Oudah Al-Rammahi**
Faculty of Agriculture, University of Kufa, Iraq
samahnuclearph@gmail.com

## Abstract

The physical analyses for this experiment carried out in Radiation Protection (RPC) Center, Ministry of Environment. Detected average values of concentrations (Bi-214, Ra-226, Ac-228, Th-202, K-40 and Cs-137) were (47.93, 81.87, 5.03, 1.63, 126.3 and 3.5 Bq/Kg) respectively. The mean values of isotopes in this study were in agreement with the lowest certified International Atomic Energy values. A biology experiment was conducted at Faculty of Agriculture labs. Kufa University, during March 2015. The aim of this study was to explore the effect of distance and depth, of Al-Rohban soil (located 30 km away from Najaf city center, which had suffer from unknown burning incident) on wheat seedling growth rate. Soil samples from surface and 10 cm depth were taken from distances of 50 and 100m from a burned place or area, the study includes the following parameter; germination percentage, seed leaf and rootlet growth rate, and wheat seedling dry and fresh weight. The result were indicated that was an increase in seed leaf and rootlet growth rate of soil samples were taken 100 m away from the burning place while the growth rate of samples taken from soil surface was zero.

***Keywords*** : Radiation, burning soil, wheat seedlings, germination

## Introduction

Al-Rohban region is located at the west of Najaf center, Al-Najaf province, Iraq. The place surrounded by a residential area. Fires occurred a while ago for unknown reason, 200 km west of Baghdad. Unknown fires occurred, some attributed to volcanic activity, or fires of long-buried timber and tree branches that may have caught fire inside. The eruption of the volcanoes in this region is a far cry from the truth. The volcanic range is limited to the Red Sea, the Dead Sea and neighboring areas such as Yemen, Jordan and Saudi Arabia, especially in the areas bordering the eastern edge of the Red Sea. The volcanic areas because the field of forces affecting the regions of Iraq are the forces of polarization, but the resulting volcanoes field of power is the result of the forces of tension cause the opening of the crust and the exit of the splendor. What happened in the area of Al-Rohban a simple crack along the crack of Abu-Jir-Euphrates is an active crack and extends to long gases, which resulted in the release of hydrocarbon gases from deep oil reservoirs, these gases are easy to ignite and caused the burning of organic matter and hydrocarbons, which have already emerged from this crack in previous times and overlapped with the soil. And the importance of the holy city of Najaf, it is necessary to know the region and study and knowledge of radioactivity of its components (Hazama & Shizuma 2009). For this purpose, many studies have been conducted to study the nature of this area and study the pollution in them.

Estimated some chemical elements in the groundwater of southern of Iraq (Al-Gburi *et al*., 2017). The results of the research indicate that most of the groundwater in the region is not suitable for the region, also the values of soluble solids, salinity, total precipitation and chlorides in their water were not valid. In 2018 (Anon, 2017) measured the concentrations of natural radioactivity nuclei for elements of the Uranium series (Bismuth Bi-314 and Radium-Ra-226), Thorium series (Actinium Ac-228, Thorium Th-232), Potassium K-40 for Cs 137. For a different soil from Al-Rohban area in Najaf Governorate – Iraq (Ali Abid Abojassim Al-Hamidawi, 2015).

Majeed & Hasan (2018) conducted a radioactive survey of the soil of the Al-Ansar district in Najaf, Iraq, where the measurements of the natural radionuclide concentrations of elements of the Uranium series, the Thorium series, the Potassium-40 K and the S-137 Cs were studied for different soil samples District. The results showed that the results were in line with the minimum standards adopted by the International Atomic Energy Agency (IAEA) and that radiation was not the main cause of the cancer infections that emerged in this region after the Gulf War (Majeed & Hasan, 2018).

Babcock (2010) measured the radioactive contamination of the soil affected by uranium mining by measuring the natural radiological activity of K-40, Th-232, U-238 radionuclides in the surface layer of soil surrounding the Uranium mine in Najaf Governorate. The study showed that the studied area is not safe from the point of view of radiological risk. Researcher Ali A. Al-Hamidawi measured the Rn-222 radon concentrations in some houses in the holy city of Najaf-Iraq during the summer using previously inactive, the results indicate that it is within the internationally allowed level of indoor air (Hasan *et al*., 2011).

The purpose of this study is to identify the nature of the soil of this area and its suitability for agriculture as well as the knowledge of the radioactivity of its components for the purpose of testing the validity of the soil to cultivate important economic species. *Triticum aestivum* L (wheat) was chosen for its economic importance as it is considered one of the most important grain crops in the world. Cereals are very important in Arab agriculture because they are related to the food security issue of the peoples of the region.

Most of the grain crops consumed by the Arab population are available as a result of the prevailing consumption pattern. Radiation pollution, on the other hand, means the presence of radioactive elements that may be of a terrestrial nature or result from nuclear accidents, tests, military operations or other reasons (Khaleel *et al*., 2016). Radionuclides are transported to the ground and vegetation or some life processes cause them to emerge outside the soil and can be transmitted through the food chain to the human body and are transmitted directly to humans by environmental factors that cause serious environmental problems (Awadh & Ahmed, 2013)

## Materials and Methods

**(1) Preparation and measurement of the samples:**

The soil samples were collected from the site of the Al-Rohban 'area in Najaf province, 30 km from the center of Najaf province to the northwest of the village of Rahimah, about 15 km from the ruins of the monks' palace. The samples were been transferred to the Radiation Protection Center laboratories - Ministry of Environment. The soil models were analyzed in the same standard conditions for the measurement system in terms of handling the models, the standard source and the shape of the form the time to measure the model was one hour for each model after the radiation background was measured for the same conditions.

The gamma spectra analysis system, which is characterized by high accuracy and efficiency, was used to differentiate and distinguish between elements. The analysis process was carried out on two types:

**First:** Qualitative analysis depends on the determination of the number and type of radionuclides.

**Second:** Quantitative analysis based on the calculation of radionuclide concentrations measured from the measurement system of the 3x3 crystal (3x3), the efficiency of the system 30%, the separation capacity of 2KeV at 1332 KeV for the Co-60 The standard source Eu-152 for calibrating the system using the engineering form of the Marnelli vessel, noting that the detector is surrounded by a preservative shield to reduce the radiation background (Mansour, 2011).

**(2) Collection and preparation of tested grain samples**

The Maxibak wheat grain was collected and processed from local markets, brought to the laboratory for isolation and cleaning of impurities. Then washed with distilled water (Altaee *et al*., 2018)

**(3) Selection of soil models**

Soil samples were taken from the site of the experiment 100 and 50 m from the fire center. Surface samples were taken at a depth of 10 cm for both dimensions. The comparison treatment was taken from outside the area of the monks from agricultural land on the way back to Najaf governorate. I transferred all the samples to the laboratory and sifted with a diameter sieve (2 mm). Then sterilized and left for 24 hours to get rid of moisture, and then placed in plastic pots with diameter (6.5 cm) and height (9 cm). 10 grains of the type of wheat used in the experiment were planted, and the water was taped when needed. The experiment lasted for 15 days and three replicates per concentration. The following criteria were measured:

- Calculation of germination percentage the number of grains grown on the tenth day of agriculture was recorded and converted to the percentage of germination according to equation (Song & Song, 2014).

$$\text{percentage of germination} = \frac{\text{number of seeds germinated}}{\text{total number of seeds}} \times 100$$

- Measurement of the lengths of the embryo and the root of the wheat germ after 15 days of cultivation and the length of the fetus was measured from the point of contact with the root to the end of five randomly selected plants.
- Measuring the soft weight and dry weight of the embryo and the root.

## Results and Discussion

**Physical Experiment**

Table (1) shows that the results obtained through spectra and reports resulting from the use of the measurement system supplied by Genie 2000 program containing the specific quality of the measured isotopes Bq / Kg to show the extent to which the models contain natural radiation activity affecting the surrounding environment. After matching with IAEA reports and local studies, there was no radioactive contamination and concentrations of the Ra-226 = 124.7 Bq / Kg of R2 soil form (soil 50 m from the fire center depth of 10 cm) Values are relatively high compared to the environmental radioactivity concentrations of the Najaf governorate plan for 2010, with the highest concentration of the Ra-226 Radium at 23.3 Bq / Kg. This increase is due to the geological nature of this area or due to the negative effects of military operations Which has passed through the southern, western and central regions of past decades. And what resulted from exposure to the Allied bombing of conventional and prohibited weapons and those coated with depleted Uranium Alloy during the Gulf war's where Iraqi soil received many of the shields that were burned and contaminated with Uranium (Al-Azzawi, 2016).

Either in terms of Cs-137 may be the result of radioactive contamination of environmental precipitates due to nuclear accidents in the world and are very low values. Pb-214 was also highly valuable in soils R1, R2 (soil 50 m from the fire / surface area and soil 50 m from the fire center depth of 10 cm) and 17.2 and 65.1 Bq / kg, respectively. Of agricultural soil pollution standards (Khan *et al*., 2013)

**The results of the biologic experiment showed the following:**

The results showed, as in Figure (1), the effect of the interaction between the depth and the selected dimension of the tested soils, where the cultivation of the grains exceeded 10 cm above the surface soil. Where the percentage of germination of the seeds grown in the soil from 100 meters to 10 cm depth reached 60% and significantly higher than the percentage of germination of the cultivated grains in the soil taken from 50 meters and 10 cm depth and the comparison treatment where they reached 43% and 30%, respectively

**Table 1 :** The concentration of isotopes in the soil AL-Rohban region in the AL-Najaf province

| Sample type and weight | Specific efficacy Bq/Kg | | | | | | Sample number |
|---|---|---|---|---|---|---|---|
| | chain U/Ra | | chain Th | | K-40 Bq/Kg | Cs-137 Bq/Kg | |
| | Bi-214 or *Pb-214 Bq/Kg | U/Ra Isotopes Bq/Kg | Ac-228 or Tl-208** Bq/Kg | Th Isotopes Bq/Kg | | | |
| Little fossilized soil 0.713Kg | 17.2 | Ra-226=31.04 | 4.2 | Pb-212=1.3 | 102.8 | 6.1 | R1 Soil surface 50 m away from the fire center |
| High humidity soil 1Kg | 65.1 | Ra-226=124.7 | 2.9 | B.D.L | 59.4 | 1.2 | R2 Soil of 10 cm depth, 50 m from the fire center |
| soil 1Kg | 5.8 | Ra-226=9.02 | 5.3 | Pb-212=4.09 | 189.6 | 9.5 | R3 Soil surface 100 m away from the fire center |
| Clay soil 1Kg | 6.8 | Ra-226=8.7 | 4.8 | Pb-212=2.2 | 95.3 | 1.6 | R4 Soil of 10 cm depth, 100 m from the fire center |

* Uranium equivalent – 238 ** Thorium equivalent- 232 B.D.L. (Below Detection limit)

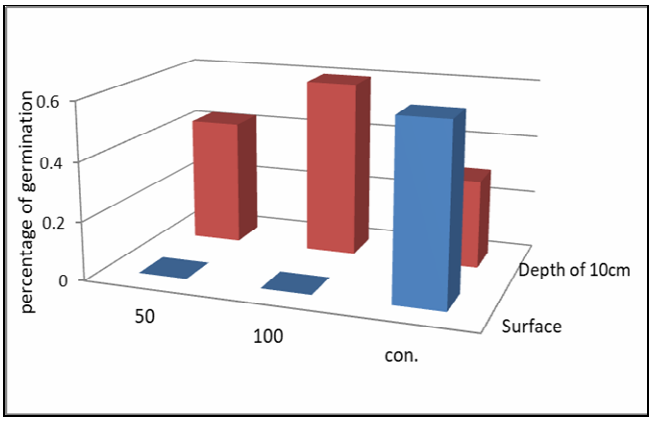


**Fig. 1 :**The effect of overlap in the percentage rate of wheat grain germination

While the rate of germination in the surface soil was 0% and for both the 50 and 100 m respectively, compared with the comparison treatment with 60% germination rate.

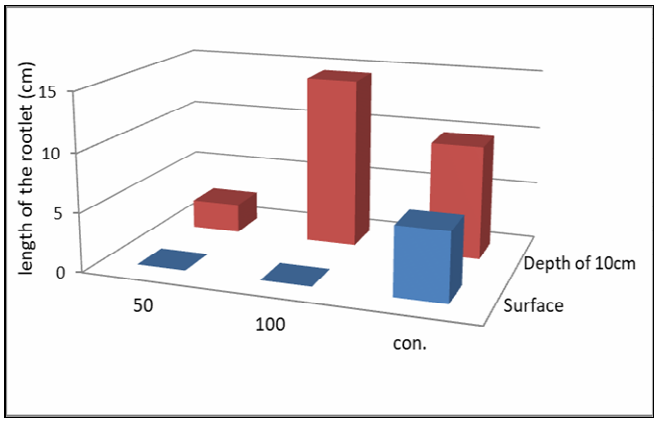


**Fig. 3 :** The effect of interference of the soils on the length of the root (cm) of the wheat grain initiatives is shown

Figure (4) shows the effect of soil tested in the soft weight of the broiler. The comparison treatment in the soft weight ratio was higher at 0.12 g while 0.059 and 0.083 g in the soil from 50 to 100 m and 10 cm respectively.

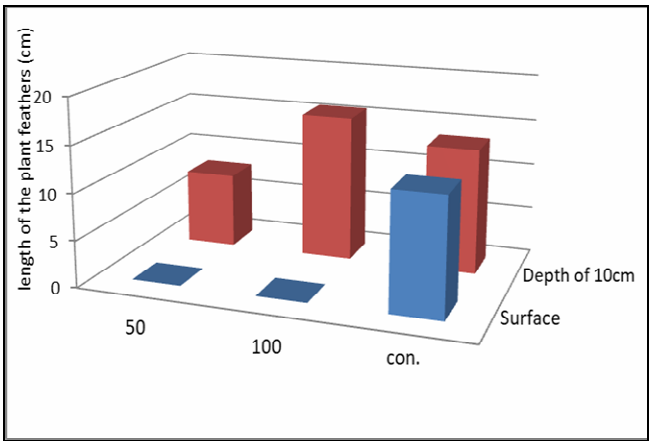


**Fig. 2 :** A significant increase in the length of the grains of wheat grown in the soil type taken from 100 meters and 10 cm deep, reaching 15.8 cm compared to the comparison treatment of 13.5 cm

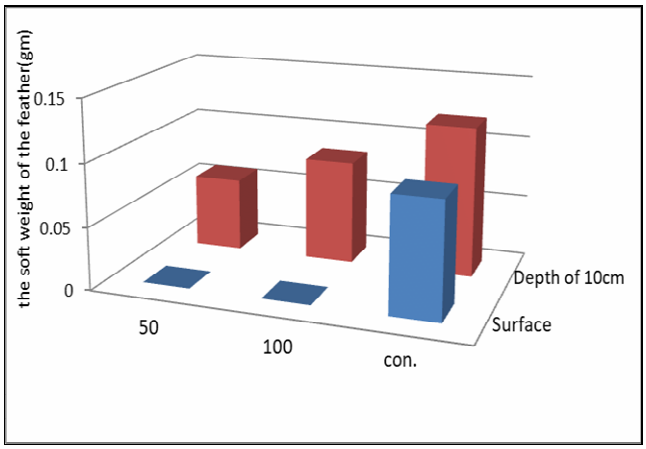


**Fig. 4 :** The effect of soil softness (g) on the soil of wheat seedlings

While the dry weight of the broccoli was significantly increased in the soil of the comparison treatment of the surface soil and the soil depth of 10 cm, where it reached 0.5 and 0.4 g respectively, compared to the dry weight of the soil in soil after 100 m depth of 10 cm and 50 m depth of 10 cm with 0.12 and 0.07 g respectively As in figure (5)

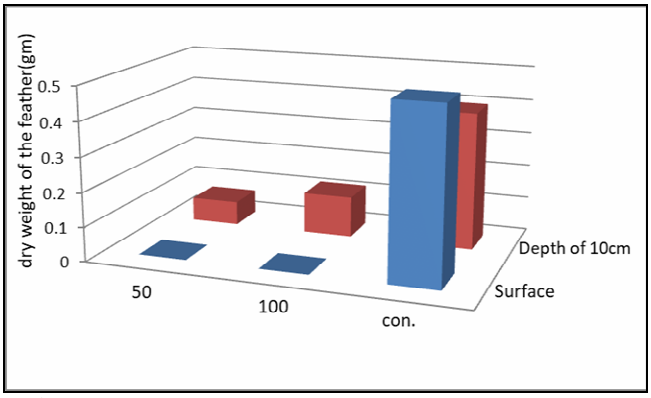


**Fig. 5 :** The effect of soil-type soil wetting on wheatgrass.

Figure 6 also shows the effect of the interaction of the soil type tested in the soft weight of the seed. The average weight of the seed increased by 0.063 g in the soil after 100 m and the depth of 10 cm while the weight of the wart was 0.12 and 0.32 g in the comparison treatment. Surface soils are 10 cm deep respectively.

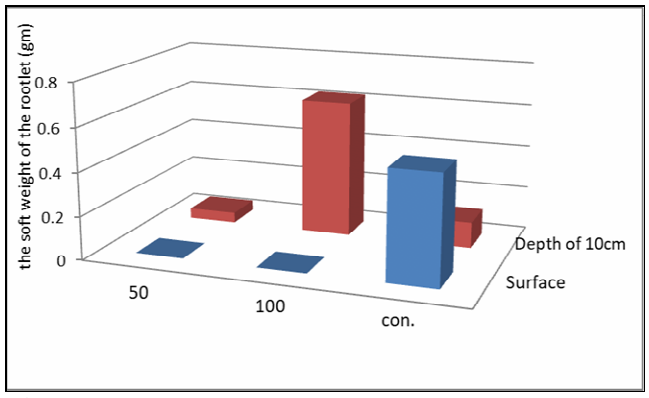


**Fig. 6 :** The effect of the soil-softening of the soil on the soft weight of the wheat seed shooter

Figure 7 also shows an increase in the dry weight of the growing wheat germ in soil after 100 m and depth of 10 cm for the control treatment and soil after 50 m and depth of 10 cm, at 0.093 g while the comparison treatment was 0.058 g and 0.042 g.

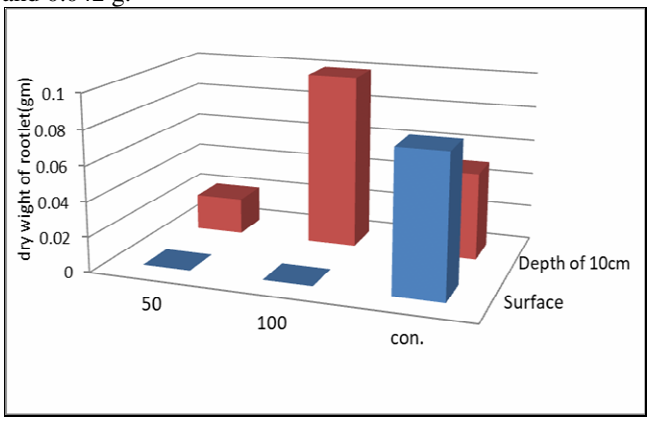


**Fig. 7 :** The effect of soil-type soil interference on the dry weight of the wheat seed shooter.

Previous results show that surface soils contain the minimum values of radioisotopes, which were the reason for the prevention of surface growth. The physical measurement of radioisotope isotopes shows that the soil contains the Ra-226 Radium isotopes and lead that holds the surface layer of the soil and prevents the use of in addition to isotopes that behave in the behavior of major or minor elements, which inhibit or encourage the growth of plants such as alkaline cesium 137 Cs, it is similar to Potassium metabolism, which is absorbed by the plant and moves through the plant tissues to radiate inside the tissues. The effect was evident in seedling growing in soil 100 meters and 10 cm deep. Radium also acts as an influence within living tissue of the organism and the same pathway acts as Calcium metabolism but disrupts and then destroys DNA.

The radiation of gamma from photons is characterized by its high capacity so it has very small wavelengths. Although there is no electrical charge associated with these radiations, it can influence the material within large distances and when the living tissue is exposed to radiation, the ionization inside it is sufficient to sabotage the fabric until its death. End and ionization continues along the path of radiation within the tissue.

## References

Al-Azzawi, S.N. (2016). The deterioration of environmental and life quality parameters in Iraq since the 2003 American occupation of Iraq. *International Journal of Contemporary Iraqi Studies*, 10(1): 53–72.

Al-Gburi, H.F.A.; Al-Tawash, B.S. and Al-Lafta, H.S. (2017). Environmental assessment of Al-Hammar Marsh, Southern Iraq. Heliyon, 3(2).

Ali Abid Abojassim Al-Hamidawi (2015). Evaluation of Natural Radioactivity in Dust Storms Samples from Al-Najaf//Iraq. Journal of Physical Science and Application, 5(2).

Altaee, A.I.; Sijam, K. and Rashid, T.S. (2018). Determination of Antibacterial Compounds of Punica Granatum Peel Extract By Tlc Direct Bio-Autography and Gcms Analysis Determination of Antibacterial Compounds of Punica Granatum Peel Extract By Tlc Direct Bio-Autography and Gcms Analysis, 379–384.

Anon (2017). The Study of Radioactivity in Soil Samples from Al-Salaam Neighborhood in Al-Najaf Al-Ashraf Governorate, Iraq. International Journal of Science and Research (IJSR), 6(7): 2203–2206.

Awadh, S.M. and Ahmed, R.M. (2013). Hydrochemistry and pollution probability of selected sites along the Euphrates River, Western Iraq. Arabian Journal of Geosciences, 6(7): 2501–2518.

Babcock, K.L. (2010). Reclamation of Salt Affected Soils in Iraq. Soil Science Society of America Journal, 28(5): p.vi.

Hasan, A.K.; Subber, A.R.H. and Shaltakh, A.R. (2011). Measurement of Radon Concentration in Soil Gas using RAD7 in the Environs of Al-Najaf Al-Ashraf City-Iraq. Advances in Applied Science Research, 2(5): 273–278.

Hazama, R. and Shizuma, K. (2009). Environmental Assessment of natural radioactivity in soil samples from the LUSI Mud Volcano, Indonesia. Environment Asia, 2(2): 45–49.

Khaleel, A.I. *et al*. (2016). Phytochemical Determination and Antibacterial Activity of & lt; i> Punica granatum & lt; /i> Peel Extracts against Plant Pathogenic Bacteria. American Journal of Plant Sciences, 7(1): 159–166.

Khan, S.A.; Ali, A. and Baig, M.N. (2013). The linkage between agricultural practices and environmental degradation. Journal of Environmental Treatment Techniques, 1(1): 19–22.

Majeed, H.N. and Hasan, A.K. (2018). Natural Radioactivity Measurement in Soil Samples From The New Kufa University Location, Iraq. Journal of Advances in Physics, 3(2): 232–240.

Mansour, S.A. (2011). Chemical pollutants threatening food safety and security: An overview. NATO Science for Peace and Security Series A: Chemistry and Biology, 73–117.

Song, G. and Song, E.-X. (2014). Selection of soil constitutive models for numerical simulation of foundation pit excavation. Gongcheng Lixue/ Engineering Mechanics, 31(5).