



# EVALUATING SOME CHARACTERS OF VEGETATIVE GROWTH AND NATURAL RADIOACTIVITY OF PAPYRUS AND REEDS IN MARSH AL-CHIBAYISH, IRAQ

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## Abstract

This investigation was carried out during season 2017 at 30 march on plants of papyrus and reeds grown in marsh east 30 km at AL- Chibayish, Nassria Governorate in area Ishan Goba at length stem under water 100 - 150 cm. The plants were grown in silt soil. The experiment included the local cultivar plants of papyrus and reeds with three replicates and the replicate 5 plants. Therefore, it is implemented according to Randomized Complete Block Design (RCBD). Also, it is measured natural radioactivity (<sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K) using gamma-ray spectroscopy, statistical analyzed is carried out by Duncan test at the probability level around 5%. Results showed that , leaf area, leaf moisture, number leaves/plant, leaf thickness, number of nods, total chlorophyll and firmness of pulp on plants of stem at length 100 cm from soil more than plants of stem at length 150 cm from soil. There were a significant effect between treatment. The results of specific activity for uranium-232, thorium-232 and potassium-40 were lower than the allowed world limit, so there are no health effect for human according to radiation contents.

**Key word:** papyrus, reeds, natural radioactivity and AL- Chibayish marsh.

## Introduction

The marsh environmental has an extension for natural social constituents which represent the ancient history due to the primitive lifestyle such as reed houses, making boats, fishing and transport in spite of the progress in these fields of life. According to (Klaff, 2005), it specified as a rare environment. As a result, its legacy and history still in their traditional form in the civilization. Therefore, these areas which are not polluted with modern development's elements called a virgin area, and that considered as an effort product of international organizations. They call them "the protected areas in the world", such as virgin woods, rivers which be free of establishments on them, human original units and areas have no damaged around that world and that include Iraqi marches. In summary, it is a region has flooded partially by water during a year and other parts flooded quarterly. It is considered a distinctive geographical character

(Azzam, *et al.*, 2010). Before 2003, the marshes were drained to 10% of their original size (Cutis and Najaha, 2006). Upon the importance of marshes, successive governments beyond 2003 in ordination with international and regional and local organizations to relief and rehabilitate rashes but these efforts never achieved its objectives as to that there are many international and external obstructions (Ahmad, 2012). The location Ishan Goba north AL-Chibayish beside Euphrates river on the south. The out lest of these marshes discharge to Euphrates and Hammar marsh through groups of ways and bridges on AL-Chibayish-Mdaina road, especially between Almdaina and Alfhood. The discharge of these is about 1500m<sup>3</sup>/s during floods. Papyrus is grown completely in marshes throughout AL-Chibayish area Nassria, Iraq. The stems pulp is eaten by people with very good test and the local name of it is "AL-Egeed". People prefer "AL-Egeed" during spring time because it becomes fresh and less firm. There is another plant which is eaten and named "AL- Kareed". It represents

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the flower of the plants and it is taken during May each year. The meathead to prepare it is the flowers and pollens put out upon special screen and under some of water vapors which leads make it firm. This method were used from thousands years ago by AL-Summareen (Wilfred, 1960). Usually, radionuclides which are released through the atmosphere have an affection on plants and open-air vegetable leading to radioactive contamination. Consequently, after nuclear accidents, radionuclides must be detected in leafy vegetable particularly for the ones that have large leafy parts phase because of radionuclides will be mixed with food. That represents by transferring the radionuclides from soil into the corps, animals, or to a river where fish and seafood can take it. However, food is collected from an environment which considered as a source of mushrooms, berries and game meat, which face a problem of carrying radionuclides for a long time. (Abojassim, 2014). The purpose is to study growth plants and natural radioactivity of papyrus and reeds in marsh AL- Chibayish.

### Materials and methods

There are two method used in this study, the agriculture method and radiation method as following:

**The agriculture method:** This study was conducted in area Ishan Goba in Marche distant 30 km east AL-Chibayish, Nassria Governorate during at 30 March 2017 on plants of papyrus (*Typha angustata* L.) and reeds (*Phragmites commons* L.) that grown in silt soil to investigate the effects of immerse stem length (100-150 cm) from soil on vegetative growth parameters. The experiment included the local cultivar plants of papyrus and reeds with four replicates and the replicate 5 plants. Therefore, it is implemented according to Randomized Complete Block Design (RCBD), and the results were statistically analyzed according to Duncan test at the probability level of 5% (Al-Rawi and Khalf Allah, 2000). The leaf aria cm<sup>2</sup>, Percentage of leaf moisture, number leaves/plant, number of nods, leaf thickness mm and length of plant cm according to (Ibrahim, 2010). Firmness was measured with an Effegi penetrometer (Model NI, McCormick Fruit Tech, Yakima, WA) Fitted with an 11.1mm tip. Total chlorophyll mg/100 gm F.W according to (A.O.A.C, 1985).

**The radiation method:** The plants samples were collected from different sites of at AL-Chibayish, Nassria Governorate during January 2017 in order to estimate the specific of Uraium-238, thorium-232 families and potassium-40. The collected sample taken from random at area study. In the advance of nuclear laboratory located in the Physics department at Faculty of Science,

University of Kufa, the samples were crushed and dried. Some of these samples dried in an oven at 100°C for 60 minute in order to guarantee removing all moisture followed by a sieve with the diameter of 500 µm to get a homogeneous powder. polyethylene plastic Marinelli beakers of the constant volume have one liter is used for packing the sample to make sure homogeneity of its geometry around the detector. However, this beaker was stored for one month after sealing by a tape. All these processes is done before counting in order to a secular equilibrium is achieved between 222Rn and its parent 226Ra in uranium chain (Abojassim *et al.*, 2015). After one month each sample was exposed to 5 hour, and all the steps essential for achieving the measurements of radioactivity for soil samples were done by the low background gamma-ray detection system. Gamma-ray spectrometer system contains scintillation detector NaI(Tl) crystal dimension of (3"×3"), provided by (Alpha Spectra, Inc.-12I12/3), connected with a (MCA) (ORTEC –DigiBase) multichannel analyzer reaching of about 4096 channel coupled with Analog to Digital Convertor(ADC) unit through interface. The (MAESTRO-32) software into the PC is used in this work for all spectroscopic measurements and analysis data. An energy calibration for this detector is performed with a collection of standard gamma ray sources (<sup>22</sup>Na, <sup>54</sup>Mn, <sup>137</sup>Cs and <sup>60</sup>Co) from USNRC and State License Expert Quantities, “Gamma Source Set”, Model RSS–8, The calculated resolution is 7.9% for the energy of 661.66 keV of <sup>137</sup>Cs standard source.

For the sample that emits gamma radionuclides, the specific activity (A) is calculated by the following equation (Abojassim *et al.*, 2016; Abojassim *et al.*, 2017):

$$A = \frac{N}{I\epsilon MT}$$

where:  $N$  is the total area under photo peak, is the efficiency of the gamma-ray detector,  $I_y$  is the probability of gamma decay,  $M$  is the weight of the measured sample in kg, finally  $T$  is the life time for collecting the spectrum in seconds.

### Results and discussion

**1- Leaf aria, leaf moisture, number leaves/plant, leaf thickness, total chlorophyll, length of plant and firmness of pulp in plant papyrus.** The data in table 1 indicate that, plant papyrus which grown on stem at length 100 cm from soil led to a significant increase in the leaf aria, leaf moisture, number leaves/plant, leaf thickness, total chlorophyll, length of plant, firmness of pulp compared to plant papyrus grown on stem at length 150 cm from soil.

**Table 1:** Effect of length stem under water from soil on growth plants Papyrus for season 2017.

Papyrus	Leaf area cm <sup>2</sup>	%Leaf moisture	No. leaves / plant	Leaf thickness mm	Total chlorophyll mg / 100g FW	length of plant cm	Firmness pulp 30cm from soil kg/cm <sup>2</sup>
Stem plants at length 100 cm from soil	56.58a	80.73a	9.22a	5.17a	128.45a	210.23a	5.83a
Stem plants at length 150 cm from soil	53.95b	80.52a	7.64b	3.98b	123.21b	200.51b	5.72a

**Table 2:** Effect of length stem under water from soil on growth plants reeds for season 2017.

Reed	Leaf area cm <sup>2</sup>	%Leaf moisture	No. leaves / plant	Number of nods	Total chlorophyll mg / 100g FW	length of plant cm	Firmness 30cm from soil kg/cm <sup>2</sup>
Stem plants at length 100 cm from soil	28.79a	83.61b	7.34a	7.82a	109.32a	418.55a	9.59a
Stem plants at length 150 cm from soil	26.46b	82.27a	6.70b	6.20b	101.85b	400.10b	7.96b

The highest rates (56.58 cm<sup>2</sup>, 80.73 %, 9.22, 5.17 mm, 128.45 mg/1gm FW, 210.23cm and 5.83 kg/cm<sup>2</sup>) in the plant grown on stem at length 100 cm from soil in comparison to the lowest values rates (53.95 cm<sup>2</sup>, 80.52%, 7.64, 3.98 mm, 123.21 mg/1gm FW, 200.51cm and 5.72 kg/cm<sup>2</sup>) in plant grown on stem at length 150 cm from soil, respectively. Increasing leaf area, leaf moisture, number leaves/plant, leaf thickness, total chlorophyll, length of plant, firmness of pulp in plant papyrus grown on stem at length 100 cm from soil due to the fact that parts growth were to be exposed to air more than plants grown at length stem 150 cm from soil and thus encourages the accumulation carbohydrate materials in leaves and this enhanced characterize of vegetative (Abosalam, 2009). Also the quality of water effect on plants growth of marshes (Boyd and Claude, 2000). 2-Leaf area, leaf moisture, number leaves/plant, number of nodes, total chlorophyll, length of plant and firmness of pulp in plant reeds. Concerning the results in table 2, leaf area, leaf moisture, number leaves/plant, number of nodes, total chlorophyll, length of plant and firmness of pulp in plant reeds were significantly affected by length stem plant immersed from soil. It is cleared that plant reeds which grown on stem at length 100 cm from soil increased compared with reeds grown on stem at length 150 cm from soil. The plant reeds which grown on stem at length 100 cm from soil gave the highest parameters they were (28.79 cm<sup>2</sup>, 83.61 %, 7.34, 7.82, 109.32 mg/1gm FW, 418.55cm and 9.59 kg/cm<sup>2</sup>) in comparison to the lowest values (26.46 cm<sup>2</sup>, 82.27%, 6.70, 6.20, 101.85mg/1gm FW, 418.55 cm and 7.96 kg/cm<sup>2</sup>) respectively.

3. The specific activities of radionuclides <sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K were measured in selected plants papyrus samples from different locations at AL- Chibayish,

Nassria Governorate was listed in table 3. The average value of specific activity of <sup>238</sup>U in stem plants at length 100 cm from soil was 24.51±4.40 Bq kg<sup>-1</sup> while in Stem plants at length 150 cm from soil was 30.37±5.45 Bq kg<sup>-1</sup>. The average values of <sup>232</sup>Th in stem plants at length 100 cm from soil and stem plants at length 150 cm from soil were 12.99±2.05 Bq kg<sup>-1</sup> and 20.53±2.87 Bq kg<sup>-1</sup> respectively. But, for <sup>40</sup>K in stem plants at length 100 cm from soil and stem plants at length 150 cm from soil were 279.52±15.79 Bq kg<sup>-1</sup> and 381.77±20.55 Bq kg<sup>-1</sup>.

**Table 3:** Natural radioactivity in plants Papyrus samples

Papyrus	Specific activity		
	<sup>238</sup> U	<sup>232</sup> Th	<sup>40</sup> K
Stem plants at length 100 cm from soil	24.51±4.40	12.99±2.05	279.52±15.79
Stem plants at length 150 cm from soil	30.37±5.45	20.53±2.87	381.77±20.55

4. The specific activities of radionuclides <sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K were measured in selected plants reeds samples from different locations at AL- Chibayish, Nassria Governorate was listed in table 4. The average value of specific activity of <sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K in stem plants at length 100 cm from soil were 21.63±6.24 Bq.kg<sup>-1</sup>, 11.11±2.86 Bq.kg<sup>-1</sup> and 42.75±9.3 Bq.kg<sup>-1</sup> respectively, while in stem plants at length 150 cm from soil were

**Table 4 :** Natural radioactivity in plants reeds samples

Reed	Specific activity		
	<sup>238</sup> U	<sup>232</sup> Th	<sup>40</sup> K
Stem plants at length 100 cm from soil	21.63±6.24	11.11±2.86	42.75±9.3
Stem plants at length 150 cm from soil	28.17±7.27	19.29±3.85	182.40±19.66

28.17±7.27 Bq.kg<sup>-1</sup>, 19.29±3.85 Bq.kg<sup>-1</sup> and 182.40±19.66 Bq.kg<sup>-1</sup> respectively.

The results of specific activity in natural radioactivity for the collected samples under study were lower than the world average according to UNSCEAR 2008 (UNSCEAR, 2008) which are 33 Bq/kg, 45 Bq/kg and 420 Bq/kg for <sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K respectively.

### Conclusion

It can be concluded from this experiment that, characterize of vegetative growth on plants Papyrus and Reed *i.e.* leaf area, leaf moisture, number leaves/plant, leaf thickness, number of nodes, total chlorophyll and firmness of pulp at plants of stem at length 100 cm from soil more gave the best result compared with plants of stem at length 150 cm from soil. The level of naturally occurring radioactivity in same plants samples was evaluated using NaI(Tl) gamma-ray spectrometry. The obtained results revealed that the level of pollution observed calculated in samples under could not pose any radiological threat to the people living near it.

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