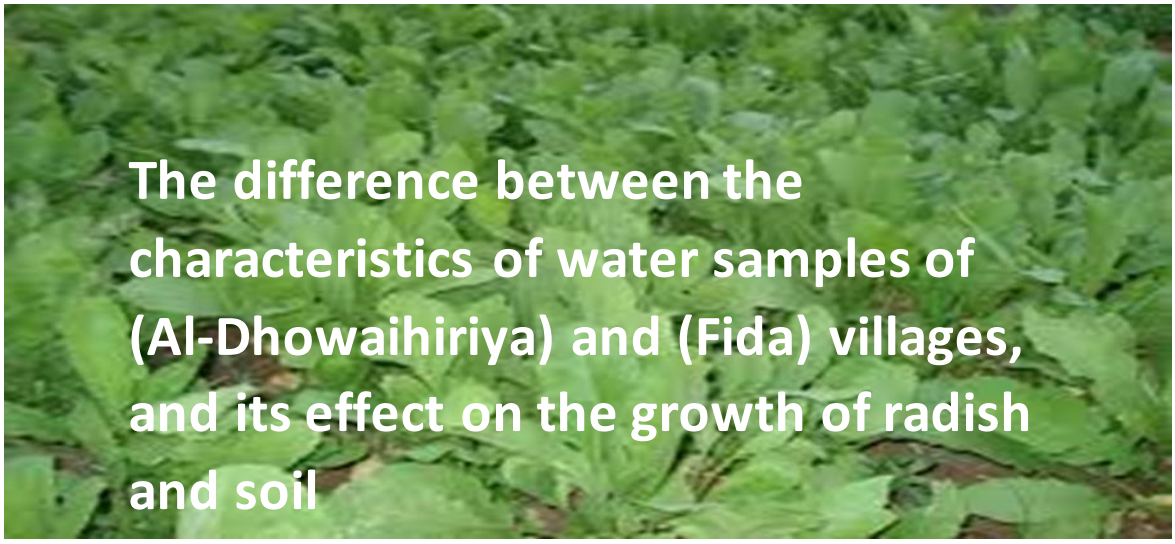
SULTANATE OF OMAN
MINISTRY OF EDUCATION

The GLOBE Program



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School:

Alaia Fida for Basic Education (1-10)

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Table of content

The difference between the characteristics of water samples of (Al-Dhowaihiriya) and (Fida) villages, and its effect on the growth of radish and agricultural soil

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Sultanate of Oman- AL Dhahira Governorate

Abstract:

The research aimed to study the effect of the characteristics of water in two villages that are (AL Dhowaihiriya) and (Fida) on the growth of radish plant in order to answer the following questions:

1- **What is the best water sample to grow radish plant?**
2- **Who do the two water samples effect the characteristics of the growth of radish plant?**
3- **How does the characteristics of soil, which the radish grow on, got affected with the type of water that it is watered with?**

This research was applied in Willayat Dhank. Two samples of water were taken from two different sites and were used to water radish plant, and comparing the growth rates with watering radish with the two samples through the application of the ground cover protocol. In addition, soil and water protocol has also been applied to measure the conductivity, salinity and acidity properties of water and soil samples. They were from different locations, one from the village of (Al-Dhowaihiriya) and the other one is from the village of (Fida). Furthermore, comparing the characteristics of the soil before planting radish and after watering it with the first and second water samples.

The results of the research indicated that the sample of the water of Fida village is more effective than the water sample of the village of Al-Dhowaihiriya. Because the plant which was watered with a sample of (Fida) village water recorded the highest growth rates (6.6 cm, within four

weeks) compared to the rate of growth (5.2 cm) , Within four weeks) of the radish, which is watered by a sample of water from the village of Al-Dhowaihiriya. In addition, fewer values were found in the properties of conductivity, acidity and salinity on soil with the plant watered by a sample of Fida village water compared to the plant watered by a sample of (Al-Dhowaihiriya) village water.

Based on the results of the research:

1- We recommend researchers and specialists to study the water characteristics in the villages of (Al-Dhowaihiriya and Fida)
2- Exploring the reasons that lead to high acidity, salinity and conductivity rates
3- We recommend the Ministry of Agricultural Development to spread awareness about the type of water properties that are appropriate for the growth of each plant.

Key Terms:

Wild radish plant: It is a plant that belongs to the genus of radish and belongs to the Crusader family, its scientific name is (Raphanus Raphanistrum) in Latin.

Watering: It is the process of supplying agricultural areas with water.

Searching Questions:

The current research sought to answer the following questions:

1- What is the best water sample for radish growth?
2- How do the properties of the two samples of water affect the growth of radish plants?
3- How do the characteristics of the soil on which the radish plant grows get affected in comparison to the type of water that is watered with?

Introduction and literature review:

The idea of the research came when applying water protocol we did notice a difference in water properties between water samples of AL Dhowaihiriya

village and Fida Village, which led us to search for this subject and then started studying the characteristics of the two samples.

We started with this research on radish plant. Radish is an edible root vegetable. We can consume white or red radish roots as roots or leaves and works to stimulate appetite for food. It belongs to the cruciferous family, and its scientific name is Raphanus Raphanistrum. The uses of radish root are many, we can use soaked root Shredded radishes in concentrated lemon (48 hours) as a lotion to lighten the skin and remove black spots and freckles. Soaked radish roots with black pepper are used in olive oil as a very effective massage for pain and infections of joints and muscles. Soaked shredded radishes are also used as a lotion for hair to stimulate the scalp, reduce hair loss, and treat it. Radish contains 85% water, protein (minimal), Mineral substances (minimal amount), Starch (small amount), Vitamin C (tiny amount) , Amylclytic enzyme, Phenyl - ethyl isothiocynate which is a pungent scent essential oil , its leaves are rich in Vitamin A and Vitamin C, it contains calcium, iron and chlorophyll salts. (Wikipedia).

Month	Work plan
September - October/ 2019	Formulating the research problem and select tools
November – December/2019	Collection and data analysis
January – February / 2020	Come to conclusion and writing the research
February / 2020	Presenting the research

This plant is grown in the farms of Dhank and other places, and we have chosen this plant because of its rapid ability to grow so we can apply it on this research.

Also, the radish plant is considered one of the sensitive plants to salinity, as it may die if the quality of the water being irrigated has high salinity.

1) Searching methods:

1. Searching plan

a. **Making a timetable for the research plan**

2) Table (1) time table for the research plan

2. **Allocating work roles to research teams such as preparing items and field application**

Table (2) allocating work roles to research teams

Activity	Done by
Formulating the research problem clearly and identifying the needed items then preparing them	Atheer and Athari
Collection and data analysis through applying the planned protocols	Atheer, Athari and Aryam
Come to conclusions by the data that was collected and then formulating abstract and writing the research	Atheer, Athari and Aryam

Specifying and reviewing some sources, which are related to the research like collecting information from learning resources in the school such as scientific encyclopaedia, using information network (internet) to get some essays and documenting them besides the information notes related to protocols from the Globe Program.

3. **Choosing different sites to study and identifying it specifically for data collection.**

Table (3) locations of applying research plan

Activity	Site
Planting radish and noticing its growth	School
Studying characteristics of water samples	Al Dhowaihiriya village / Fida village

Studying soil characteristics	school

4. Identifying activities (protocols) which are appropriate for data collection

Table (4) protocols applied in the research

Activity	Appropriate protocol
Planting radish and noticing its growth	Covering land protocol
Studying characteristics of water samples	Water protocol
Studying soil characteristics	Soil protocol

5. Identifying appropriate items to do the work (acidity meter device, salinity and conductivity measuring device, ruler, cups, arable soil, paper, pen, thermometer and GPS)

6. looking for samples by applying the appropriate protocol activities (land cover, water and soil)

Table (5) the mechanism of applying protocols for data collection

The searching questions	Protocol	Mechanism of application
First Question	Land cover protocol	Taking a sample of water from each site, and then the radish plant of the same type is planted on the same soil and watered with the same amount of water, and these plants are divided into two parts, one is watered by a sample of (Al-Dhowihiria) village water and the other is watered by a sample of(Fida) village water, and note the growth and data registration must be within four weeks
Second Question	Water protocol	Study of water properties (temperature, conductivity, acidity, salinity)

Third Question	**Soil protocol**	**Study of soil properties (conductivity, acidity and salinity)** **On the soil before planting radish and after watering it with the first and second water samples**

7. **Taking samples from the study sites at the appropriate times and according to the specifications agreed by the work team. The worksheets are designed, and radish growth data is recorded every two days in addition to watering them in equal quantities each time.**

8. **Data collection and organization in tables.**

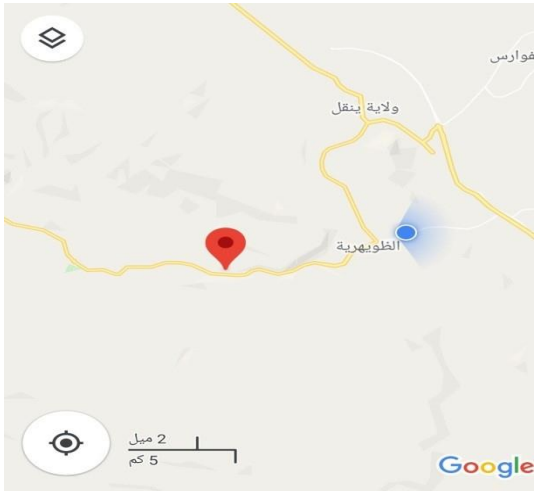
9. **Entering data to the program's website (www.GLOBE.gov)**

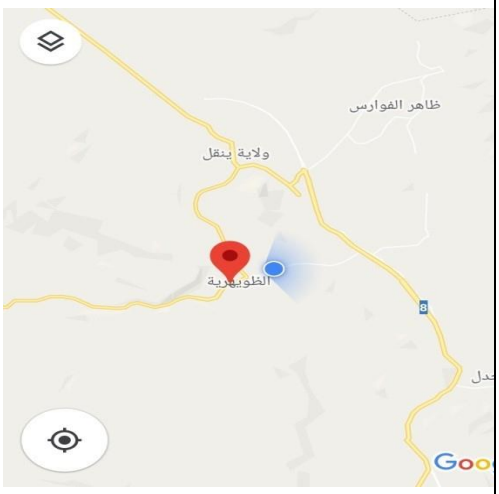
10. **Data analysis and graphical representation.**

11. **Results and recommendations**

3) Study location:

The plan for this research was implemented in Dhank province, in Al Dhahirah Governorate, where radish plants were cultivated in the school and the land cover protocol was implemented. We visited two different sites, the first is in the village of (Al-Dhowaihiriyah) and the second in the village of (Fida). A sample of water was taken from each site and the water protocol was applied. The maps below show the geographical regions.





Location of Fida Village:

Longitude: 23.3

Latitude: 56.2

Height:475

Locatio of AL Dhowaihiriya village:

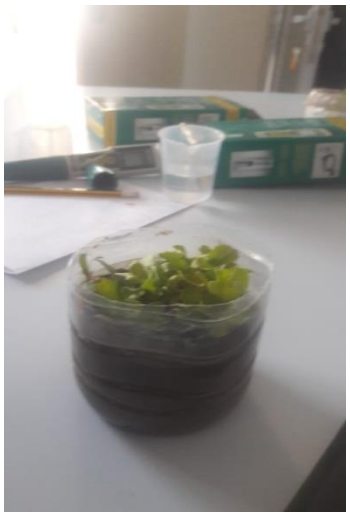
Longitude: 23.31

Latitude: 56.33

Photos 1 and 2 are the geographical location of the site of research application

4) Data collection and analysis:

The data related to the first question was collected by measuring the amount of growth of the stem of the radish plants cultivated according to the type of water that is watered by. The radish plant was chosen from a type with the same characteristics, cultivated in the same type of soil, and watered by the same amount of water (and dividing it into two parts according to the type of water sample used in watering). Then, the amount of growth of each plant was measured and the growth rates achieved by the studied samples were calculated and compared.



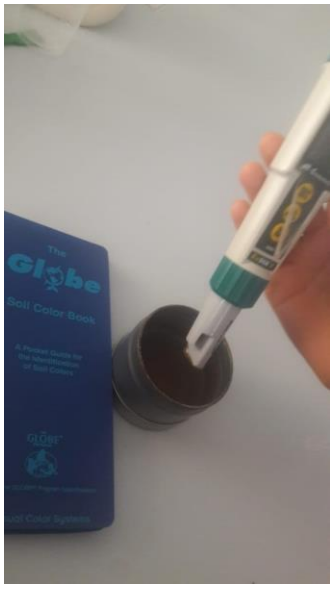
Photos (3) and (4) applying activities to radish plants in school

The answer for the second question, data collection is done by collecting data related to the properties of water (salinity - conductivity - acidity) were collected at the two sites, the first is from (Al-Dhowaihiriyah) village water

sample and the second is from (Fida), village water sample then doing data comparison between the two sites.

Photo (5) applying water protocol

In addition, the answer to the third question of the research, data related to soil properties (general characteristics, acidity, salinity, conductivity). Data was collected in three stages, the first before planting radishes, the second after planting radishes, which is after watering it with (Al-Dhohariya) village water sample and the third after planting radishes and watering with (Fida) village water sample, then comparing the data in the three stages.



Photos (6) and (7) show the application of soil protocol

Results:

The data shown in the following table were found in recording radish growth rates according to the type of water that is watered in an attempt to answer the first question in the research.

Table (6) studied growing radish plant data

Date and Day	Watering using al Dhowaihiriya water sample	Watering using Fida water sample
Saturday	0.5 cm	0.5 cm
Wednesday	1.8 cm	1.6 cm
Sunday	2.4 cm	2.7 cm
Thursday	2.8 cm	3.3 cm
Monday	3.6 cm	4.2 cm
Friday	4.2 cm	5.9 cm
Tuesday	4.9 cm	6.4 cm
Saturday	5.7 cm	7.1 cm
Growth rate	5.2 cm	6.6 cm

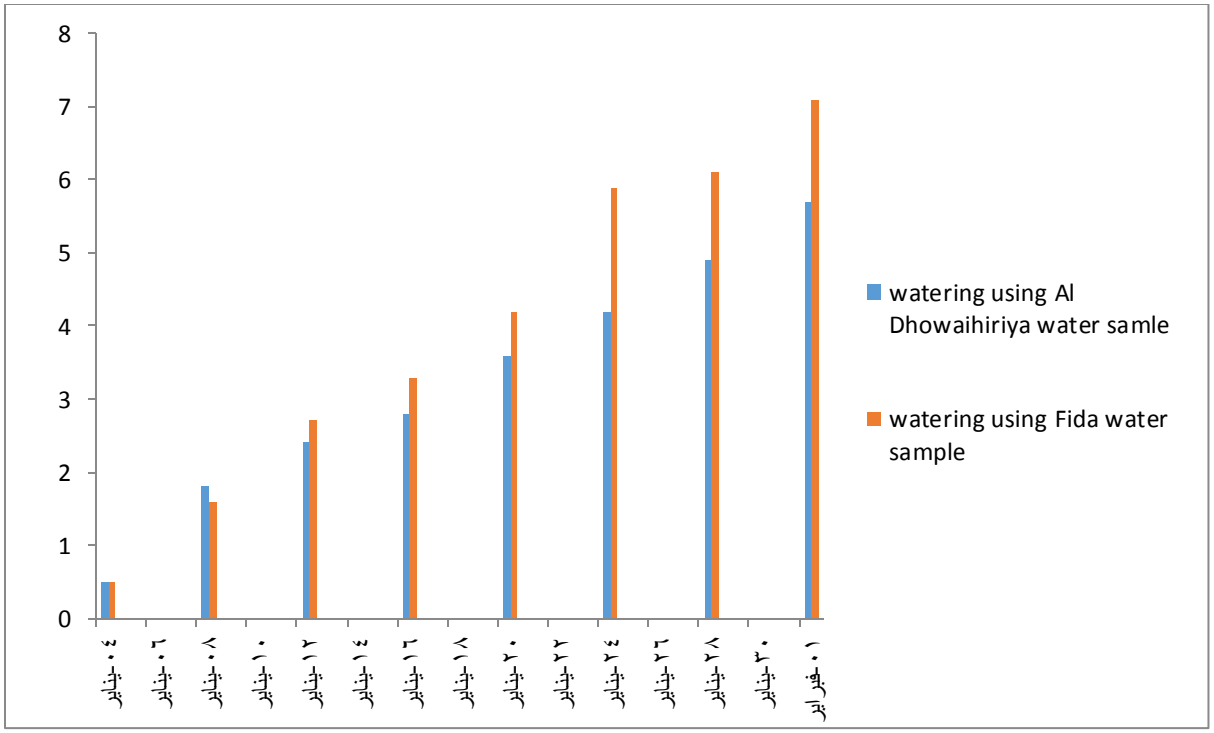
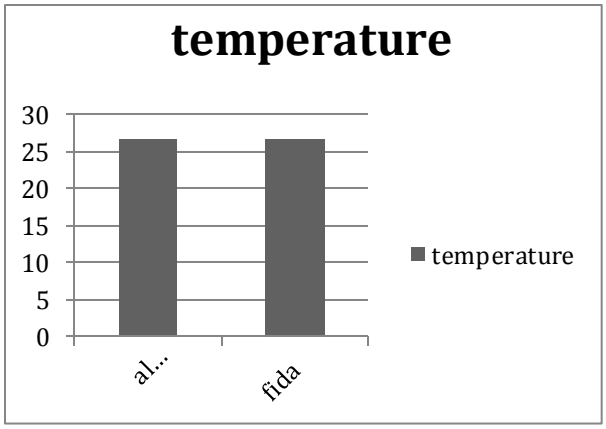
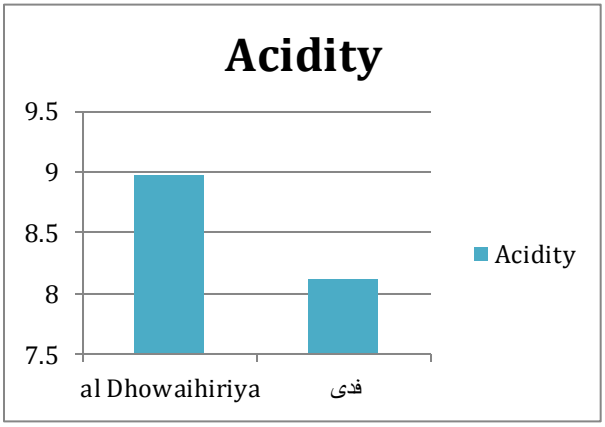


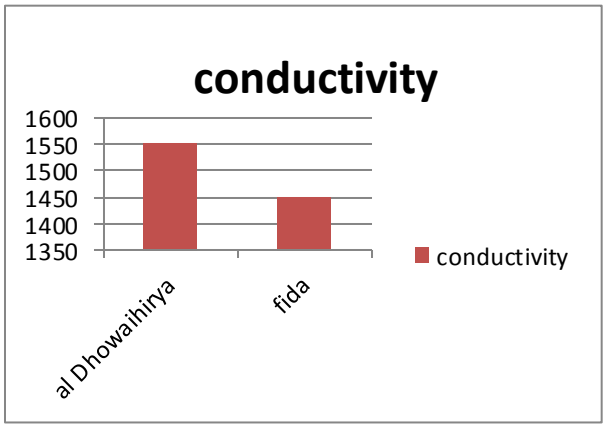
Figure (1) graphical representation of the growth rates of the studied plants

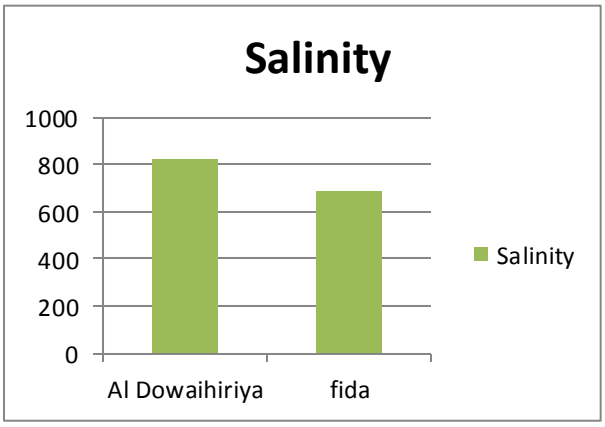
The following table also shows the data on water characteristics of the sample of Al-Dhuharia village water and (Fada) village water sample, which were collected to answer the second question of the research.

Comparison		Al Dhowaihiriya water sample	Fida Water sample
water	Temperature	26.8	26.8
	Acidity	8.98	8.12
	Conductivity	1550	1449
	Salinity	826 ppm	686 ppm







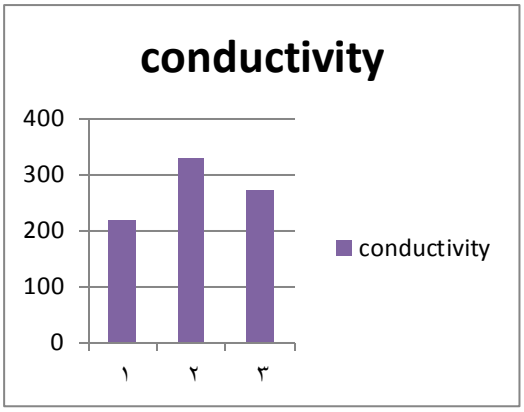


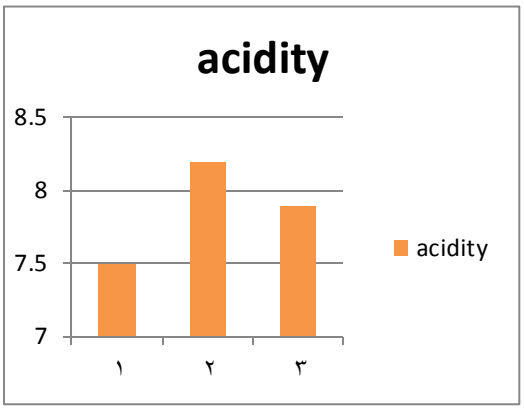
Figures (1), (2), (3) and (4) water characteristics data

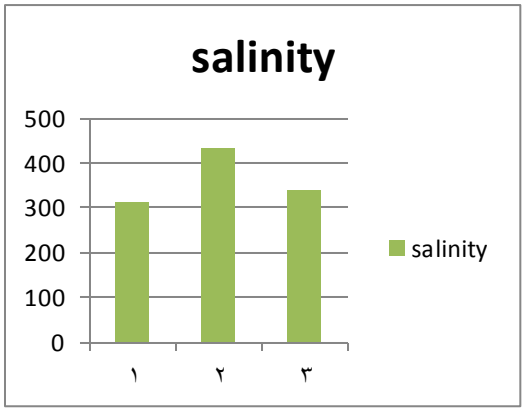
The following table also shows the soil characteristics data for several cases, the first before planting radishes, the second after planting radishes and watering it with the water of the village (Al-Dhowaihiriya) and the third after planting radishes and watering it with the water of the village (Fida), which was collected to answer the third question in the research.

location	Before planting radish	After planting radish and watering it with Al Dhowaihiriya village water sample	After planting radish and watering it with Fida village water sample

Soil	Soil characteristics	Sandy and little stones with no roots	Sand and little stones with roots	Sand and little stones with roots
	Conductivity	220	329	271
	Acidity	7.5	8.2	7.9
	Salinity	312 ppm	342 ppm	433 ppm

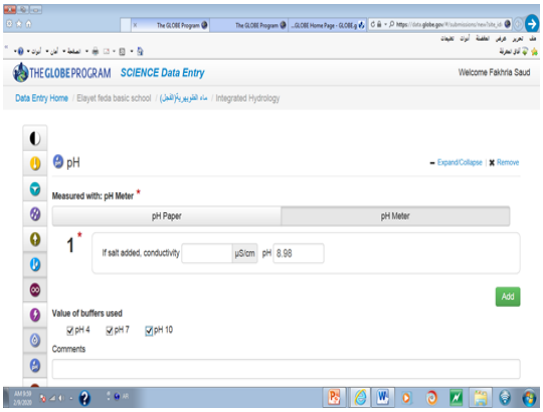


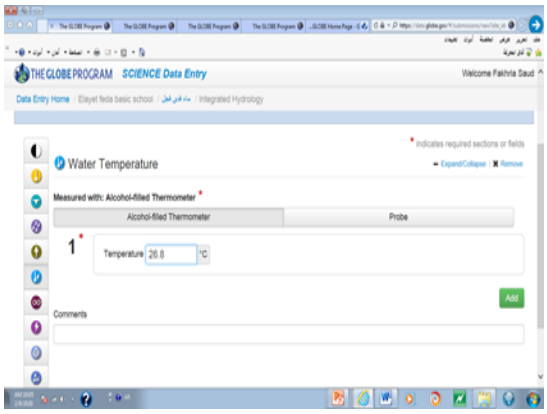


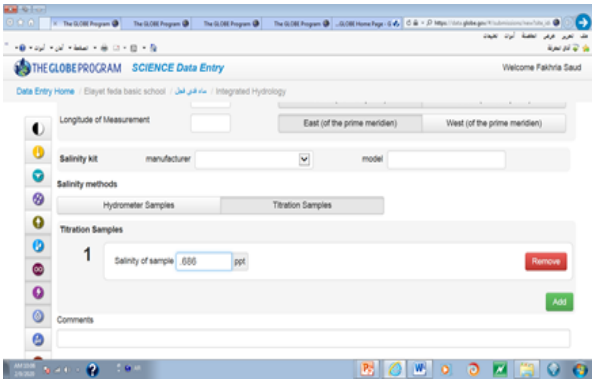


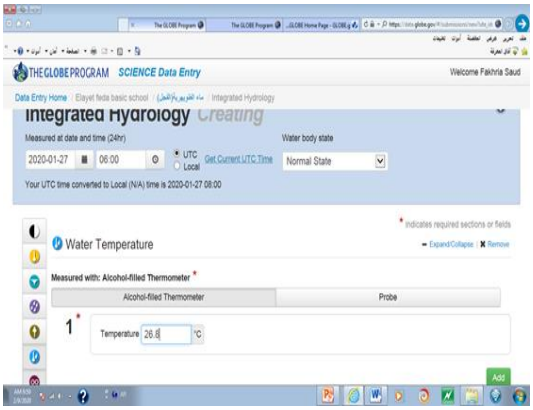
Figures (5) (6) and (7) soil properties data

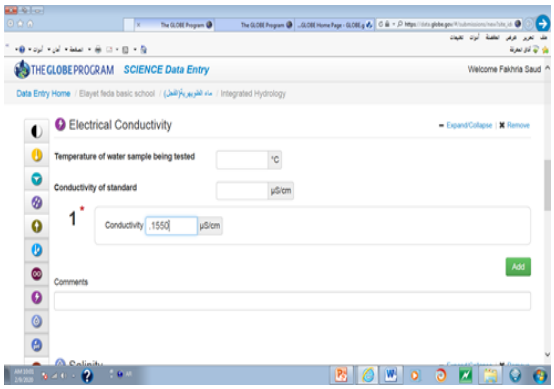
The Data was entered and sent to a site (www.GLOBE.gov) through the application (DATA ENTRY) adding a new site and entering the data collected in the search.

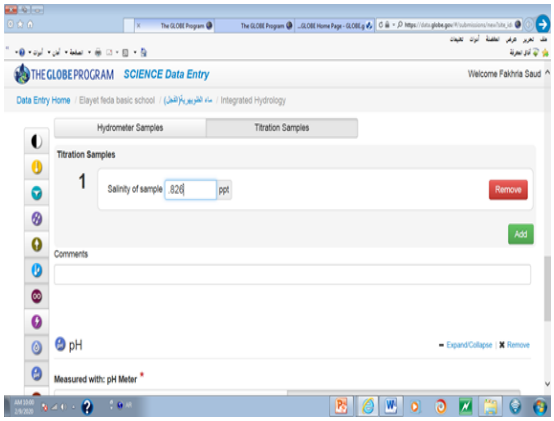


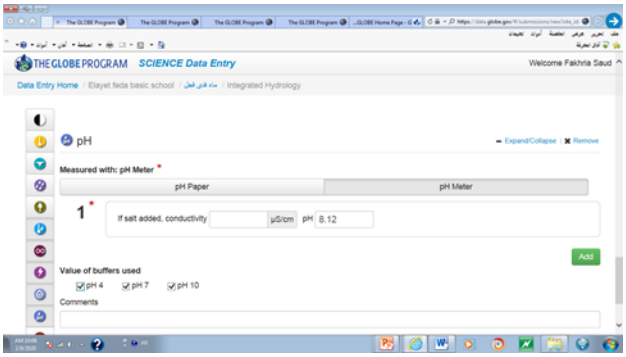












Pictures (8), (9), (10), (11), (12), (13), (14) and (15) Entering data into Globe program site

Discussing the results:

To answer the first question in the paper:

The graph shows (1) the growth of the cultivated radish plant according to the type of water sample watered in it. Where it is clear from the drawing that the plant that was watered with a sample of village water (Fida) recorded a higher growth rate (6.6 cm) as it reached length (7.1 cm) compared to the plant that was watered with a sample of village water (Fida) recorded a lower growth rate (5.2 cm) as it reached length (5.7 cm).

As these data give a good indication of the effectiveness of a village water sample (Fida) that would increase the growth of plants, as radish plants that were watered with a village water sample (Fida) achieved good growth rates that increased their speed compared to those that were watered by a water sample The village of Al-Dhuharia.

To answer the second question of the research:

The results related to the characteristics of the water samples (the village water sample (Al-Dhuhayriyah) and the village water sample (Fada)) show that there is a higher percentage of salinity, conductivity and acidity in the village water sample (Al-Dhuhaireya).

As the presence of less salinity and acidity in a sample of individual water (ransom) compared to the sample of village water (Al-Dhuhayriyya) indicates that the radish plant growth rates will be higher (the less the amount of acidity and salinity of the water, the more the radish plant growth rate) and vice versa.

(It is also not possible to neglect the possibility of other factors that were not the subject of this study.)

To answer the third question of the research:

The resultsrelated to soil properties appear in two different locations in the presence of radish plants, to the presence of a higher percentage of salinity, conductivity and acidity in the soil sample watered by the water of the village (Al-Dhohariyah).

As the decrease in salinity and acidity in the soil sample that is watered by the village water (Fada) compared to the sample that is watered by the village water sample (Al-Dhohariya) indicates that the radish plant growth rates will be higher (the less the acidity and salinity of the soil, the more the radish plant growth rate) vice versa.

(It is also not possible to neglect the possibility of other factors that were not the subject of this study.)

Conclusion

This research sought to study the difference between the sample water of the village (Al-Dhuhariyah) and the sample of the village water (Fada) on the growth of radish plant. The results showed that the growth rates of the radish plant that is watered with a sample of village water (Fida) is higher than the plant watered with a village water sample (Al-Dhuhayriyah), as the research explored the difference in the properties of water between the two samples (a village water sample (Al-Dhuhariyah) and a village water sample (Fida). low conductivity, salinity and acidity levels were discovered among a village water sample (Fida), and we also explored the difference between the soil properties in Three cases: the first (before planting the radish plant), the second (after planting the radish plant and watering it with a water sample from (Al-Dhuhariyya) village, and the second case is (after planting radish and watering with a sample of village water (Fida), and we concluded that the

village water (Fida) is more efficient and effective on the growth of radish plant.

Recommendations:

Based on the results of the research:

1- We recommend researchers and specialists to study the characteristics of the water of the villages (Al-Dhuhariyah) and (Fada).

2- Explore other causes that lead to high acidity, salinity and conductivity

3- We recommend the Ministry of Agricultural Development to spread awareness about the quality of the water properties appropriate for the growth of each plant.

Thanks and appreciation:

Praising all the thanks to God for all the blessings and to our prophet Mohammed (peace be upon him)

We thank most of all, and the appreciation was due to everyone who gave us the fingerprints of advice and assistance and helped us to answer questions and overcome obstacles in carrying out this research. We thank our two supervising teachers, the supervisors of the Globe program.

At school, T. Fakhriya Al-Balushi & T. Jamila Al-Maamari and Principal of the School, T. Moza AL Azizi Which facilitated our ways to visit the research sites and practice the sequential steps necessary to carry out the research. Moreover, thanks go to T. Nadira Al Harthy, the national coordinator of the program, to provide this opportunity and stimulate curiosity for scientific research in order to participate and contribute in relation to the environment in which we live.

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