Soil characteristics and their impact on Omani garlic plant growth

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Content:

Abstract :

Study comparing soil characteristics and their impact on Omani garlic plant growth

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My research aims to study a comparsion between the characteristics of two types of soil and their impact on Omani garlic plant growth and I asked the following question:

- What is the impact of soil characteristics (acidity, salinity and conductivity) on Omani garlic plant growth?

To answer this question, I decided to study the characteristics of two types of soil on the growth of the Omani garlic plant, where this crop is frequently grown at this time of year . So I applied the soil protocol to study the characteristics of each sample in terms of acidity, salinity, conductivity and water protocol to study the characteristics of the water source in terms of salinity, acidity, conductivity and the protocol of land cover to observe the growth of the garlic plant.

The results indicated that the growth of the plant is influenced by soil characteristics. The garlic plant in area (2) was weak in growth and the size of the bulb was small, while in area (1) the growth of the plant was good and the size of the bulb is large .This is because of the difference in acidity, salinity and soil conductivity in the two areas and since the garlic plant needs neutral or low acidity soil in order to be able to absorb nutrients well from the soil. So, that was available in the area (1) and was not available in the area(2).

Based on the results, the researcher recommends that the farmers need to know the characteristics of the soil before planting any crop, in order to modify its properties in proportion to the appropriate conditions for the growth of the crop to obtain abundant and good production.

Key terminologies:

Garlic plant: (Scientific name: Allium sativum) is a biennial herbaceous vegetable of the garlic genus of the Allium family.

Bulb: It is a modified plant stem that grows underground in which the plant stores its food and through which its life is transmitted from one generation to another.

Research questions:

1- What effect does the characteristics of the soil (acidity, salinity and conductivity) have on the growth of the garlic plant?

Introduction and literature review:

Garlic is an important agricultural crop that farmers in Dhaher Al Fawares village are interested in growing it every year during October to April, where they consider it an essential substance in all the foods they served . In addition to improving the taste of food, it is considered a natural antibiotic against many pathogens and is an excellent source of income for many families due to the increasing demand for it from inside and outside the Sultanate. The size of each are depends on many factors such as the amount of light, the amount of water and soil characteristics.

In this research, I will compare the properties of two types of soil in terms of salinity, acidity and conductivity and their impact on the growth of the garlic plant (bulb size and number of cloves) in two different locations, which are irrigated by the same water source (falaj water).

I searched from various sources to get more information on previous studies on the properties of soil suitable for growing garlic and I found a study entitled (Garlic soil: properties and acidity of the soil) and another study entitled (How to grow garlic and get high productivity per acre) by Dr. Muhammad Fahim, in which he indicated that the soil is suitable for growing garlic should be light and loose, and its acidity should be neutral or slightly acidic (6.5) and it should receive adequate amounts of light and soil salinity should not exceed 1250ppm.

Research methodology:

Research plan:

1. Collect information on the subject of the research from the books available in the Learning Resource Center and from the internet
2. Develop a search plan.
3. Set a timetable for the implementation of the research plan.
4. . Adoption of experimental research to study the effect of soil properties on garlic plant growth.
5. Determine the protocols needed to perform the research.
6. Determine the equipment and tools necessary to perform the work (pH meter and the instrument of measuring salinity and conductivity).
7. Collect data and organize them in tables.
8. Insert data in the program's website
9. Data analysis and representation
10. Conclusions and recommendations.

Timetable of the research plan implementation:

name	task	date
Abrar Saif Khalifa Alfarsi	Collect information on the research subject from various resources.	October 2021
Abrar Saif Khalifa Alfarsi	. Determine the two farms to which we will apply the research tools.	November 2021
Abrar Saif Khalifa Alfarsi	Collecting samples of water and soil to apply different protocols to them	November 2021
Abrar Saif Khalifa Alfarsi	Interview the agricultural engineer in the Department of Agricultural Development in Yanqul	12th January 2022
Abrar Saif Khalifa Alfarsi	Observe the results and write the research paper based on that.	10th February 2022

Survey location

Sultanate of Oman – al Dhahera Governorate – Ibri – Dhaher al Fawares village – (latitude: 23.37, longitude: 56.38) in December and January – cold weather (Temperature: 9- 20 C) – water and land cover protocols used

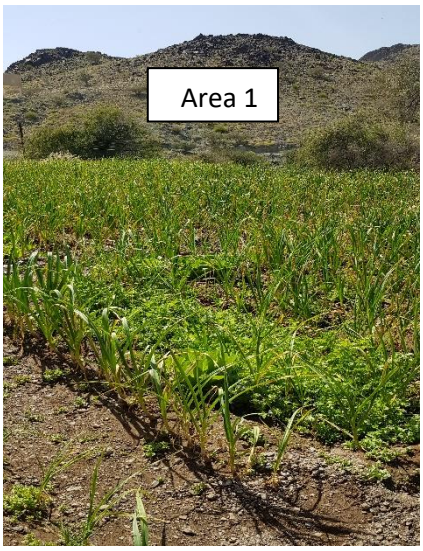
Data collection and analysis:

The research question will be answered as follows:

> Using the soil protocol to determine the acidity of the soil (pH) by using a device (pH meter), a salinity and conductivity meter to measure salinity and conductivity of the soil, a ground cover protocol to observe garlic plant growth, and a water protocol to measure the acidity, salinity and conductivity of the water source used for soil irrigation.

Methods of data collection:

1. Determine two areas that are irrigated with the same water source and the same amount of water and are exposed to the same amount of light (fixed factors) and differ in soil type (independent factor).



2 - Water and soil samples were collected to measure acidity, salinity and conductivity using globe instruments.

3- The two areas were planted with 20 cloves of the same type of garlic for each area .

4 - The same amount of organic fertilizer was added to the soil

(approx 5Kg) .

5- Comparison of garlic plant growth in the two areas after 4 months of planting it in terms of the general appearance of the pant ,the size of the bulb and the number of cloves .

Results:

First: Water properties data (fluorescence water) using GLOBE devices

characteristics	Value
Acidity(pH)	8.9
Salinity(ppm)	352
Conductivity(µS/cm)	498

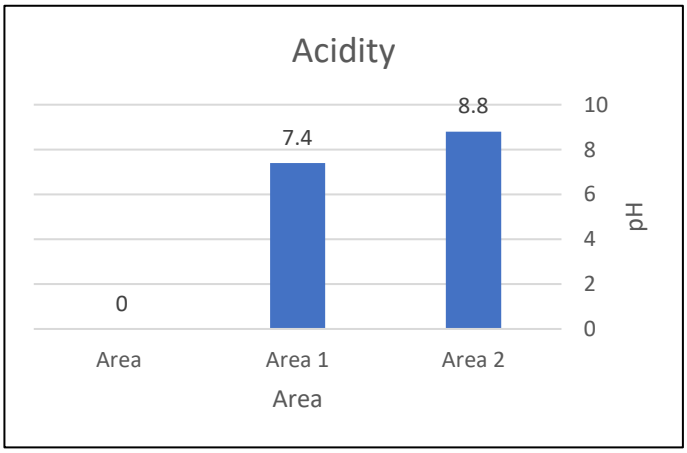
Table 1

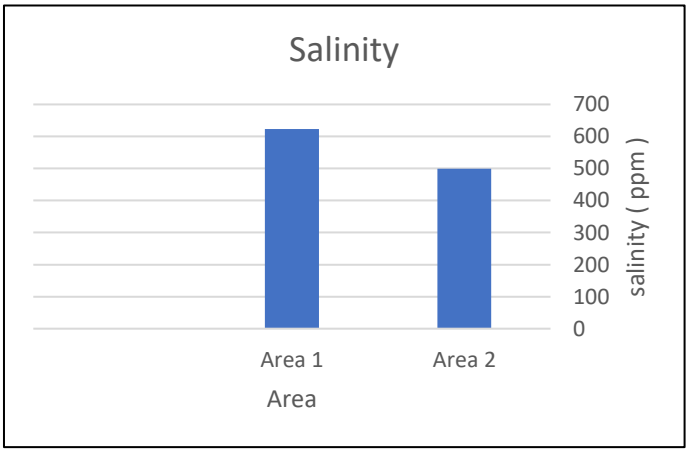
Second: soil

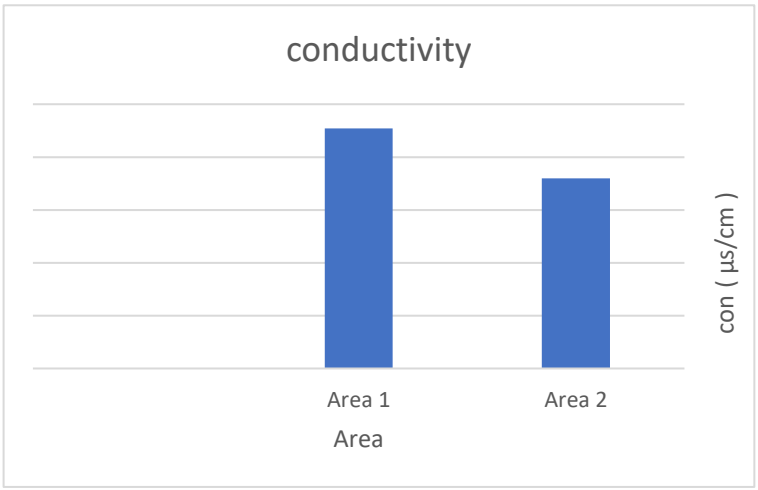
characteristics data in the two regions:

Area / Characteristics	Area(1)	Area(2)
Acidity(pH)	7.4	8.8
Salinity(ppm)	623	499
Conductivity(µS/cm)	908	719

Table 2







Third: Note the growth of the garlic plant after 4 months of planting it in terms of appearance:

Area	(1)	(2)
General appearance	Strong stem,slightly broadstriped leaves,large rootstock and large bulb size.	Weak stem,weak striped leaves, little rootstock and small bulb size.
photo	 	 

Table 3

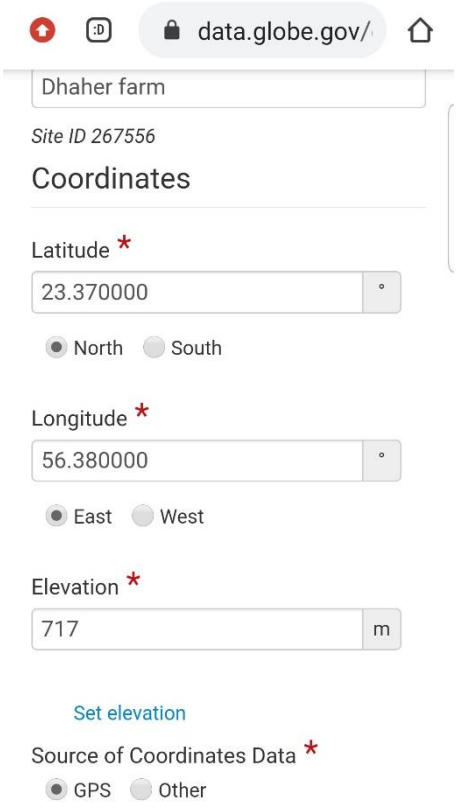
Fourth : follow -up the growth of the garlic plant after 4 months of planting it ,where a random sample was taken from each area to take measurements (10 bulbs).The diameter of the bulb and the No. of cloves were measured.

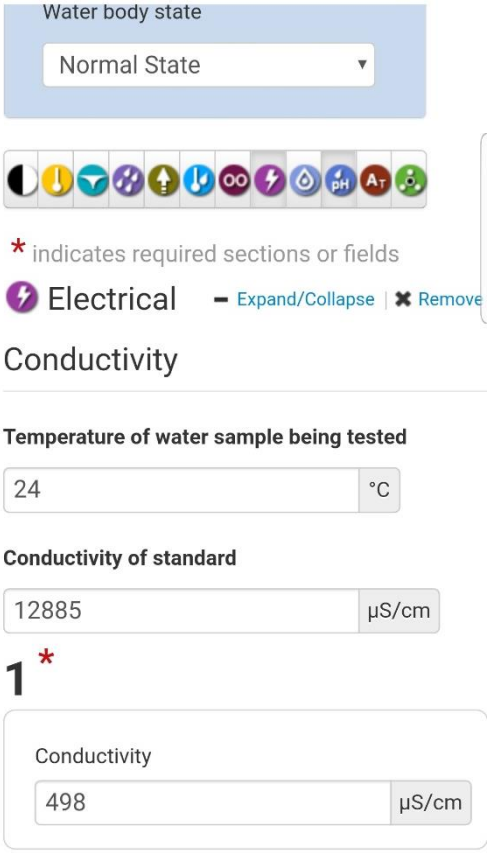
Area (1)		Area (2)		No.
No. of cloves	Bulb diameter(cm)	No. of cloves	Bulb diameter(cm)	
10	19	7	1	1
11	19	5	12	2
10	20	8	14	3
10	18	7	13	4
11	22	7	13	5
9	20	6	12	6
9	18	8	14	7
10	19	5	11	8
11	22	8	13	9
9	18	7	13	10
10	19.5	6.8	12.9	Average

Table 4

		AREA 1	 	AREA 2	pictures

The data have been inserted and sent to the program website (www.globe.gov) through the application (DATA ENTRY).





Results analysis:

According to the data collected, we noticed the following:

- • Plant growth is affected by the characteristics of the soil in which it is grown, where the data in table 2 indicate an increase in the value of pH for the soil of the region (2) where it reached (8.8), which negatively affected the growth of the garlic plant in the region (2) where we observed weak stem and leaves of the plant and the lack of rootstock of plants and the size of the bulb is small in terms the average diameter of the bulb is (12.6 cm) , and the No. of cloves is few in term the average No.of cloves is (6.8) as shown in table 4. This is due to the fact that the increase in the value of pH leads to a lack of absorption and melting of nutrients in the water and thus increases the concentration of salts in the soil, which affects plant growth (Engineer. Walid Husseini). There may be other reasons that we have not involved in this research.

- • While the plants in the region (1) grew better where we observed the good growth of the stem and leaves and the large size of the rootstock and the size of the bulb in terms the average diameter of the bulb is (19.7 cm) , and the No. of cloves is more in term the average No.of cloves is (10) as shown in table 4. This is due to the value of pH for the soil of the region (1) where it reached (7.4) and is suitable for the good growth of garlic plant where it grows better in the soil of acidity neutral or low acidity (Dr. Mohammed Fahim) and as confirmed by this point engineered by the Department of Agricultural Development in Yanqul.

- ϖ Accordingly, we believe that farmers must be educated to know the characteristics of the soil before planting any crop in it and to know the appropriate factors for the growth of this crop. So that they can modify the characteristics of the soil before planting to obtain a good and abundant crop by adding the appropriate type and quantity of fertilizer to adjust the acidity of the soil in proportion to the acidity suitable for the growth of a crop.

Conclusion:

. I thank God Almighty for completing this research, in which the globe protocols (the soil protocol, the land cover protocol and the water protocol) were used to compare the characteristics of the soil in two different areas and their impact on the growth of the garlic plant. The plant varies according to the characteristics of the soil and I knew that this plant needs a soil of low acidity or neutral in order to give good production. These conclusions lead us to educate farmers to know the appropriate soil characteristics for each crop before planting, so that the soil characteristics are modified before planting to ensure a good marketable crop.

If I have the opportunity, next year, God willing, I will study the characteristics of the water source and their impact on the characteristics of the soil.

Thanks and Appreciation:

We would like to thank the school headmistress for her continuous support and cooperation to the globe team. We also thank the specialists from the Department of Agricultural Development- Yanqul for providing us with the information we required and for being ready to educate farmers about the appropriate soil properties for each crop before planting and to modify soil properties accordingly. . And we thank all school teachers including Ms. Hedaya Al Farsi for giving us the opportunity to do this research and supervising us.

Badges selection :

1 – I MAKE AN IMPACT.
2 – I AM A STEM PROFESSINAL.
3 – I AM A DATA SCIENTIST.

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