



**Sultanate of Oman Ministry of Education and
Education**

Al Dhahirah Governorate

Allaya Feda School for Basic Education (1-10)

**A study of the reasons for the non-growth
of the henna plant (*LAWSONIA INERMIS*)
in Al-Saada neighborhood at the same rate
as it grows in Al-Dhawairiyah district**

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A study of the reasons for the non-growth of the henna plant (LAWSONIA INERMIS) in Al-Saada neighborhood at the same rate as it grows in Al-Dhawairiya

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:Summary

The aim of this research is to study the reasons for the non-growth of the henna plant (lawsonia inermis) in the Al-Saada neighborhood at the same rate as it grows in the Al-Zoairiyah neighborhood, by answering the following questions:

1 -What is the best organ for growing the henna plant?

2 -How do the properties of water affect the growth of the henna plant?

3- How do soil properties affect the growth of the henna plant?

This research was applied in the state of Dhank, where two samples of water and soil were taken from two different sites and used to grow the henna plant, and the growth rates compared to the site of its planting were compared, using the land cover protocol, and the water and soil protocol was applied to measure the characteristics of the conductivity, salinity and acidity of the soil and water samples. , From different locations, one from (Al-Zuwayriyah neighborhood) and the other from (Al-Saada neighborhood) and compare them. The results of the research indicated that a sample of water and soil (Al-Zuwayriyah neighborhood) is more effective than water and soil (Al-Saada neighborhood), as the plant that was planted in (Al-Zuwayriyah neighborhood) recorded the highest growth rate (10cm during four weeks) compared to the growth rate (5cm during four weeks) for a plant. Henna, which was planted (in the neighborhood of happiness). Also,

lower values of conductivity, salinity and acidity characteristics were evident on the soils that were planted in (Al-Zwairiyah neighborhood) compared to a sample. Water (Hay al-Saada), and based on the results of this research: 1- We recommend researchers and specialists to study the characteristics of water and soil (Hay al-Sa'adah) and (Al-Zuwayriyah neighborhood), 2- Exploring the causes that lead to high levels of salinity, acidity and conductivity, 3- We recommend The Ministry of Agricultural Development raises awareness of soil quality and suitable soil for the growth of each plant.

Key terms:

Wild henna plant: Henna (also called henna, yarn, parchment, parchment, and argan) (scientific name: *Lawsonia inermis*) is a plant of the family of the myeloid that belongs to the order of Asiat.

Watering (irrigation): also known as irrigation engineering or agricultural drainage, it is the process that the grower performs when supplying the soil with water needed for the type of plant.

Research questions:

The current research sought to answer the following questions:

- 1 -What is the best organ for growing the henna plant?
- 2 -How do the properties of water affect the growth of the henna plant?
- 3- How do soil properties affect the growth of the henna plant?

Introduction and literature review:

The idea of the research came when we applied the protocol of land cover where we noticed a difference between the growth rate of the henna plant in (Al-Zuwayriyah

neighborhood) and (Al-Saada neighborhood), which prompted us to explore and curiosity about this topic, and then we began to study the characteristics of both plants.

We began to apply this research to the henna plant, a shrub of the herbaceous family, annual or perennial, aged for about three years and may extend to ten, evergreen, prolific, reaching a length of three meters. Green in color and turns brown upon maturity, henna leaves contain various glycosidic substances, the most important of which is the main substance known as lawson) Its chemical molecule is 2-hydrox-1, 4- naphthoquinone or 1,4-naphthoquinone and this substance is responsible for the biological effect medically, as well as responsible for the pigment and blackish-brown color and its percentage in the leaves is about 88% for the henna type Limermis compared to the two varieties with white and red-violet flowers. And the percentage of glycoside in the leaves of each of them is 5, 0% 6, 0%, respectively, and henna consists of the following compounds: Pigments of type 41 Naphthoquinone and include 1% Lawson (2-hydroxy41 naphthoquinone) hydroxylitide derivatives such as 4-glucosyl and Xy-21 Dihydroxy is also coumarin, xanthenes, flavonoids, 5-10% tannin, gallic acid, A small amount of steroids such as sitosterol and flowers contain a volatile oil that has a good and strong aroma, and its most important component is Fobita Ionone (A, B, Ionone. And the amount of active substances, especially Lawson (and the pigment) in henna leaves increases as the plant ages and modern leaves. They contain smaller quantities of these substances than their elderly counterparts. This plant is grown in Dhank State farms and other states. We chose the henna plant because of its rapid growth ability to apply the research. The henna plant prefers to grow in rocky and sandy soils, with good drainage, and is also adapted to heavy soils and fertile clay soils. **It is a non-salt tolerant plant.** Henna is exposed to infect with a small number of pests. It is also suitable for cultivation as a fence, although pruning removes the fragrant scented flowers; However, henna needs to be trimmed to make it more cohesive

search methods:

1 -Research plan

1- Setting the timetable for the research plan:

Table (1) Schedule of the research plan

the month	work plan
January 2021	-Formulating the research problem. - Identify tools
January 2021	- Collecting and analyzing data
February / March 2021	- Draw conclusions - Research writing
March 2021	- Submit the research

2- Distribution of work roles among the research team, represented in the preparation of tools and field application

Table (2) the distribution of roles among the work team

the work	Female students performing
Clearly formulating the research problem, identifying the required tools and preparing them	Fatima and Sarah
Collecting and analyzing data by applying the planned protocols	Fatima, Sarah and Athari
Reaching conclusions through the data collected, and then formulating the abstract and writing the research	Fatima, Sarah and Athari

Identify and review some sources related to the topic of research, such as collecting information from school learning sources such as scientific encyclopedias, and using the Internet to obtain and document some articles, in addition to protocol notes from the GLOBE program.

Table (3) sites for implementing the research plan:

location	the work
(Al-Zwaihriya District)	Cultivation of the henna plant and noting the effectiveness of its growth
(Al-Saada neighborhood)	Cultivation of the henna plant and noting the effectiveness of its growth
The school	Study the properties of water samples
The school	Study the properties of soil samples

4- Determine the appropriate activities (protocols) to be applied to collect data

Table (4) the protocols applied in the research

the work	Appropriate protocol
Cultivation of the henna plant and noting the effectiveness of its growth	Land Cover Protocol
Study the properties of water samples	Hydration protocol
Study the properties of soil samples	Soil Protocol

5 - Determine the appropriate tools to carry out the work (acidity meter - salinity and conductivity meter - cups - soil from the two sites and water samples from the two sites - paper - pen - GPS - metric tape)

6 - Applying research to samples by applying appropriate protocol activities (land cover, water and soil)

Table (5) Mechanism for applying protocols to data collection

research question	Protocol	Application mechanism
The first question	Land Cover Protocol	Cultivation of the henna plant in two different sites, each site with its soil and type of water, and watering it in the same period and at the same rate of water, observing the growth and recording the data
second question	Hydration protocol	Study of water properties (salinity - conductivity - acidity)
The third question	Soil Protocol	Study of soil properties (salinity - conductivity - acidity)

7 -Taking samples from the study sites at appropriate times and according to the specifications agreed upon by the work team. Where worksheets were designed, recording the growth data of henna every two days, in addition to watering it in equal quantities every time.

8 -Collecting data and organizing them into tables

9 -Entering data on the program website (www.GLOBE.gov)

10 -Data analysis and representation graphically

11- Reaching conclusions and recommendations

2- Study location:

The plan of this research was implemented in Dhank State, Dhahirah Governorate, in the months of January and February, when the weather was moderate, as two samples of the henna plant were planted, one in (Al-Zuwayriyah neighborhood) and the other in the (Al-Saada neighborhood) and the application of the land cover protocol, and the two sites were visited and two

samples were taken From soil and application of protocol to soil and two samples of water and application of water protocol. The maps below illustrate geographical areas.



Images (1) and (2) the geographical area of the search application

Location coordinates (A) 0 (Al-Saada neighborhood)

Longitude: 23.3

Latitude: 56.29 meters

Location coordinates (b) 0 (Al-Zwairiyah district)

Longitude: 23.2

Latitude: 56.3 meters

3 -Data collection and analysis:

The data related to the first question was collected by measuring the amount of growth of the planted stalk of the planted henna plant according to the type of soil and the water with which it is watered, as the henna plant was chosen from a type that carries the same characteristics, planted in different sites, and watered with the same amount of water (while dividing it into two parts) According to the type of water sample used for watering) and then measuring the amount of growth of each plant according to the calculation and comparison of the growth rates achieved by the studied samples.



Pictures (3) and (4) of the application of activities on the henna plant in the two sites

As for the answer to the second question, data related to the water characteristics (salinity - conductivity - acidity) were collected at the two sites, the first being a water sample (Al-Zawiyah neighborhood) and the second water sample (Al-Saadah neighborhood), and then comparing data between the two sites.



Picture (5) application of the water protocol

As for the answer to the third question of the research, data related to soil characteristics (salinity - conductivity - acidity) were collected at the two sites, the first is a soil sample (Al-Zawiyah neighborhood and the second is a soil sample (Al-Saada neighborhood)), and then data is compared between the two sites.



Pictures (6) and (7) application of the soil protocol

Results:

The data shown in the following table were obtained in recording the growth rates of the henna plant according to the type of water in which it was watered and the soil in which it was grown in attempts to answer the first question in the research.

Table (6) the studied growth data of the henna plant

day and date	Henna plant(Neighborhood Al-Saada)	Henna plant (in Al-Zwairiyah district)
Sunday 24/1/2021	71cm	71cm
Thursday 28/1/2021	71.5cm	72cm
Monday 1/2/2021	72.4cm	73cm
Thursday 4/2/2021	73.1cm	75cm
Monday 8/2/2021	73.6cm	77cm
Friday 12/2/2021	74.5cm	79cm
Wednesday 17/2/2021	75.2cm	80cm
Saturday 20/2/2021	76cm	81cm
growth rate	5cm	10cm

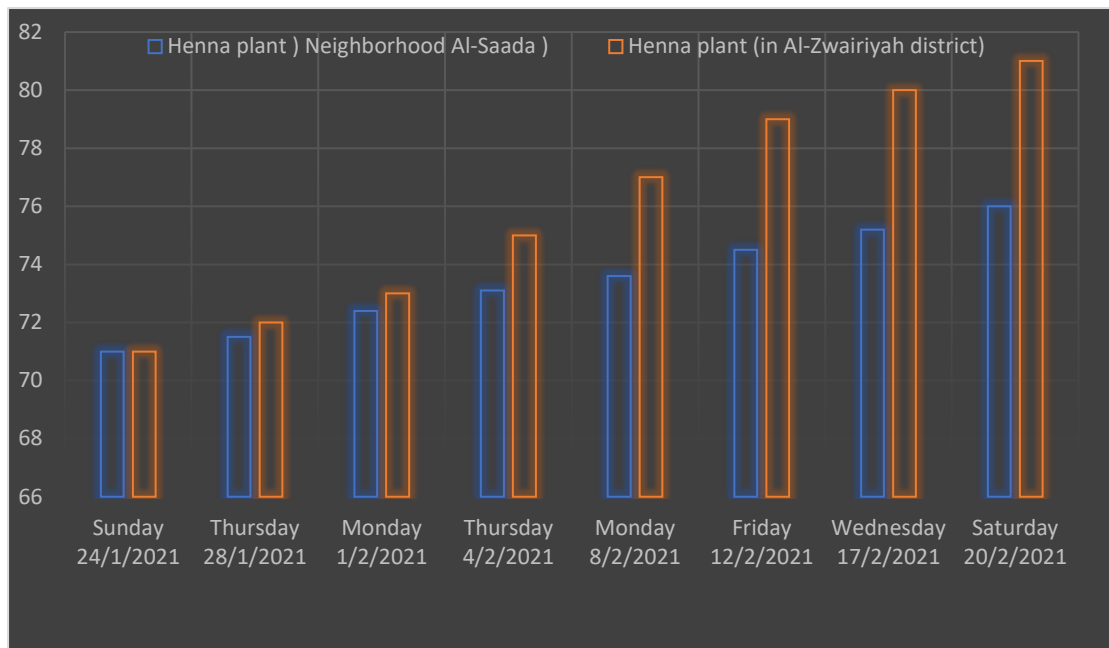


Figure (1) a graphical representation of the growth rates of the studied plants

The following table also shows data on the characteristics of the two water samples for the two sites in order to answer the second question in the research

The face of comparison		(Al-Zwairiyah District)	(Al-Saada neighborhood)
Hydration protocol	conductivity	588	166
	Acidity	6.8	7.5
	Salinity	10.4 ppm	11.0 ppm

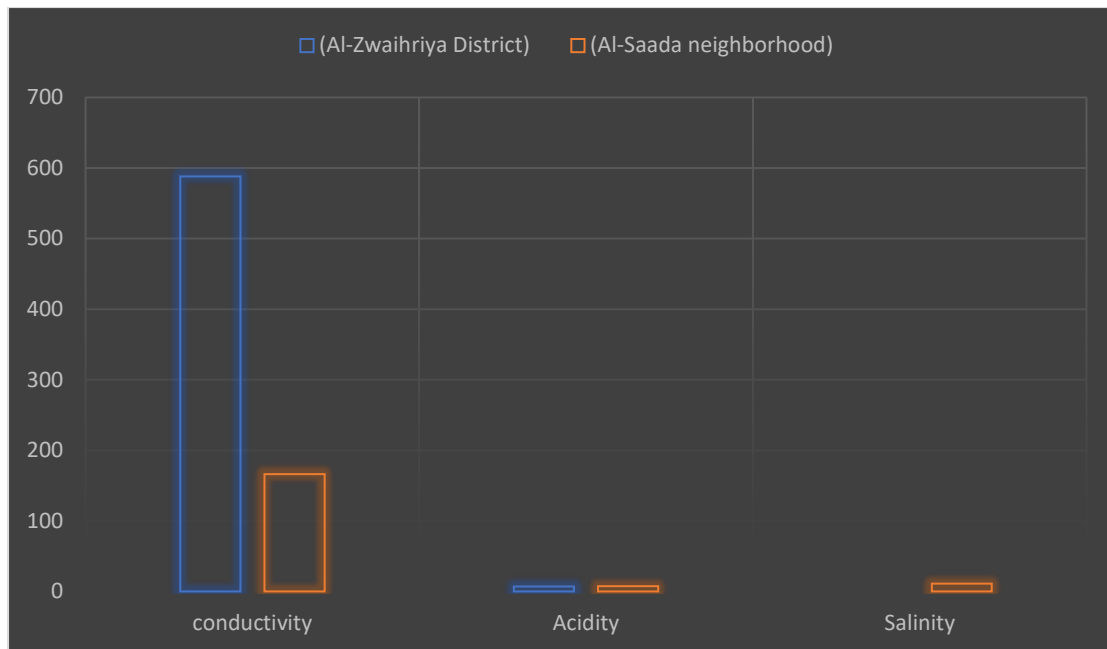


Figure (2) shows the water features for the two sites

The following table also shows the characteristics of the two soil samples for the two sites in order to answer the third question in the research

The face of comparison		(Al-Zwaihriya District)	(Al-Saada neighborhood)
Soil Protocol	Soil properties	Fewer stones and sand, with fewer roots and less carbonate	Few sand and stones with more roots and more carbonation
	conductivity	9,0	4,9
	Acidity	7,5	8,3
	Salinity	7,8ppm	8,4ppm

Table (8) the soil characteristics of the two sites (soil protocol)

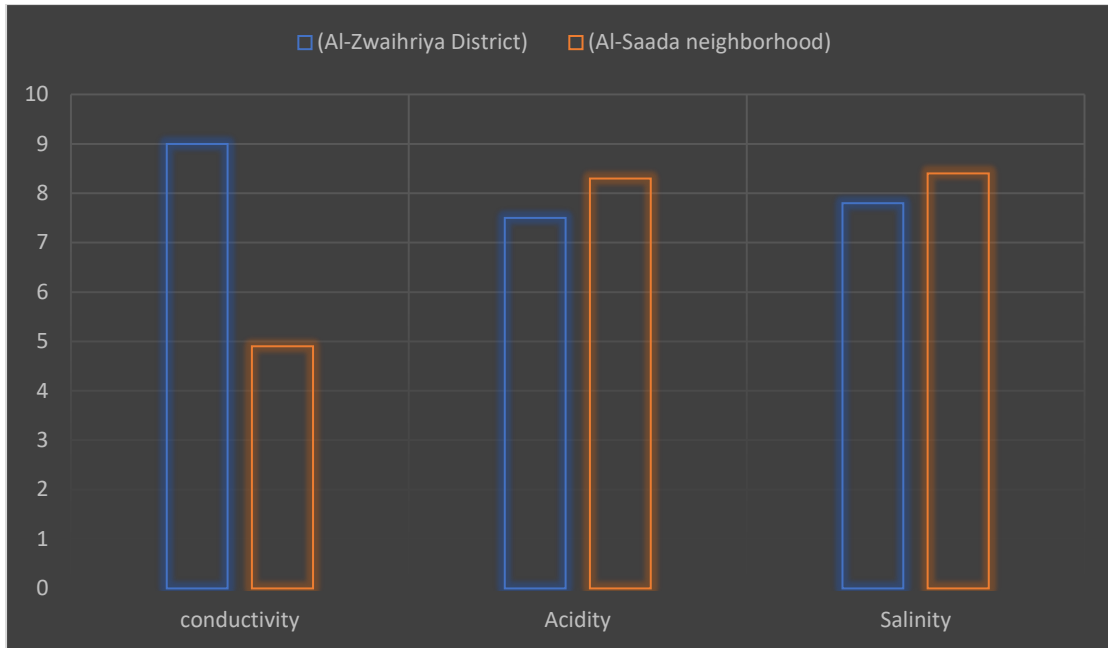


Figure (3) shows the properties of the two soil samples for the two sites

The data was entered and sent to (www.GLOBE.gov) via the application (DATA ENTRY), where a new business site was added and the data collected was entered into the search.

The screenshot shows the GLOBE DATA ENTRY application interface. The left panel displays the 'Electrical Conductivity' section with fields for 'temperature of water sample being tested' (°C), 'conductivity of standard' (µS/cm), and a 'Conductivity' input field set to 588 µS/cm. Below this is a list of 'Comments' and a 'Salinity' section. The right panel shows site information including 'High Tide' and 'Low Tide' buttons, 'Site Longitude 56.29', and 'Site Elevation 520 M'. It also includes directional buttons for 'North (of the equator)', 'South (of the equator)', 'East (of the prime meridian)', and 'West (of the prime meridian)', along with 'manufacturer' and 'model' dropdown menus. At the bottom, there are tabs for 'Water Samples' and 'Titration Samples', and a 'sample' input field set to 104 ppt with a 'Remove' button.

Discussing the results:

To answer the first research question:

The graph (Figure 1) shows the growth of the cultivated henna plant according to the type of water sample in which it is irrigated and the type of soil in which it is grown. As it is evident through the drawing that the cultivated plant (in Al-Dhawairiyah neighborhood) recorded a higher growth rate (10 cm), reaching a length of (81 cm) compared to the cultivated plant (Al-Saada neighborhood), a lower growth rate (5 cm), as its length reached (77 cm). As these data give a good indication of the effectiveness of soil and water (Al-Dhawairiyah neighborhood), which would increase the growth of plants, as the henna plants that were planted in Al-Zuwairiya district achieved good growth rates that increased in speed compared to those planted in (Al-Saada neighborhood).

To answer the second research question:

The results related to the characteristics of the water samples (Al-Dhawairiyah neighborhood water sample) and (Al-Saada neighborhood water sample) show a higher percentage of salinity and acidity in the (Al-Saada neighborhood) water sample.

Whereas, the presence of a lower amount of salinity and acidity in a water sample (Hay Al-Zawaheriyah) compared to a water sample (Hay Al-Saada) indicates that the growth rates of the henna plant will be higher (the less acidity and salinity the higher the growth rate of the plants) and vice versa.

(It is also not possible to neglect the possibility of the existence of other factors that were not the focus of this research).

To answer the third research question:

The results of soil characteristics in two different locations in the presence of the henna plant show that there is a higher percentage of salinity and acidity in the soil sample (Hay Al-Saada).

Whereas, the decrease in salinity and acidity in the soil sample (Hay Al Zawairiyah) compared to the soil sample (Hay Al Saada) indicates that the growth rates of the henna plant will be higher (the less acidity and salinity, the higher the growth rate of the plants) and vice versa.

(It is also not possible to neglect the possibility of the existence of other factors that were not the focus of this research).

Conclusion:

This research sought to study the reasons why the henna plant (*Lawsonia inermis*) did not grow in the Al Saada neighborhood at the same rate as it grew in the Al Zoairiyah district, as the results showed that the growth rates of the cultivated henna plant (in Al Zoairiyah district) is higher than the cultivated plant (Al Saada neighborhood). The research also explored the difference in The characteristics of water between the two samples: a water sample (Hay al-Zawairiyah) and a water sample (Hay al-Sa'dah), and a lower rate of salinity and acidity was explored for a water sample (Hay al-Zuwayriyah), and we also explored the difference between the soil properties in two samples, (Hay al-Zuwayriyah soil sample) and (Hay al-Saada soil sample), and we concluded that (Hay Al-Zawairiyah) is more efficient and effective for the growth of the henna plant.

Recommendations:

- 1 - We recommend researchers and specialists to study the water and soil characteristics of (Al-Sa'adah neighborhood) and (Al-Dhawairiyah neighborhood).
- 2 - Exploring the causes that lead to high levels of salinity, acidity and conductivity.
- 3- We recommend the Ministry of Agricultural Development to spread awareness about the quality of water and soil properties suitable for the growth of each plant.

Thanks and appreciation:

Praise be to God, and may blessings and peace be upon his purest prophets, Muhammad, may God bless him and his instrument and peace, and after

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