

Kingdom of Saudi Arabia
Ministry of education
Education Department in Al-Makhwah Governorate
Nawan High School

Research Title

Effect of temperature and soil quality on coffee plant cultivation in Nawan



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Date: 2023 AD

Abstract:

The research aims to study the effect of temperature and soil quality on coffee cultivation in Nawan.

Research question:

- 1- Does the temperature affect coffee cultivation in Nawan?
- 2- Does soil quality affect coffee cultivation in Nawan?

Hypothesis:

- 1- Temperature affects coffee cultivation in Nawan.
- 2- Soil quality affects coffee cultivation in Nawan.

Procedures: (experimental method)

- 1- Taking seedlings of the coffee plant and planting them in the soil of Nawan in the month of January 2023 AD and observing them during the months of February and March and watering them with water from the tank in Nawan.
- 2- Taking seedlings of the coffee plant planted in the soil of Fifa in the month of February 2023 AD and observing its growth in the Nawan site and watering it with water from the tank in Nawan.
- 3- Taking seedlings of the coffee plant planted in the soil of Shada in the month of February 2023 AD and observing its growth in the Nawan site and watering it with water from the tank in Nawan.

Results :

There is a relationship between temperature and soil quality (Nawan soil) suitable for growing coffee seedlings.

Conclusions:

Temperature and soil quality affect coffee cultivation in Nawan.

Content list :

The number	The address	page number
1	Abstract	2
2	Research questions and hypotheses	4
3	Materials and method	6
4	Data summary	11
5	Analysis and results	14
6	conclusions	15
7	Discussion	15
8	Thanks and appreciation	16
9	badges	17
10	References	18

Research introduction:

-Arabica coffee is considered one of the most important crops that are cultivated in areas high above sea level, which are characterized by their cold weather, abundant clouds, and above-average humidity, as in the Jazan Mountains, such as Bani Malik, Al-Raith, Al-Ardah, Fifa, Talan, Khasher, and others, whose climate is considered suitable for coffee cultivation. Proven success under the conditions of the region. Arabica coffee is one of the finest and most luxurious types in the world in terms of taste and flavor. More than a thousand meters above sea level.

-The cultivation of "Shadawi coffee" is one of the most important concerns of the people of Jabali Shada, the lower and the higher, in the Tihami sector in the Al-Baha region, as it is distinguished by its quality and good taste to record a distinguishing mark. annually.

- The student (Elaf Muhammad Al-Zahrani) traveled with her father (Muhammad Ali Al-Zahrani) to the Jizan region and noticed the abundance of coffee seedlings and trees. When she asked, the answer was that they are grown in Fifa Governorate, and she asked herself why coffee is not grown in Nawan, and from here she came to us

Research questions and hypotheses:

research question:

- 1-Does the temperature affect coffee cultivation in Nawan?
- 2- Does soil quality affect coffee cultivation in Nawan?

Hypothesis:

- 1- Temperature affects coffee cultivation in Nawan
- 2- Soil quality affects coffee cultivation in Nawan

Variants :

The independent variable: temperature and soil quality.
Dependent variable: coffee plant.

research aims:

To identify the effect of temperature and soil type on coffee plant cultivation in Nawan

research importance :

- 1- Knowing the factors affecting coffee cultivation in Nawan.
- 2- Knowing the suitable soil quality for coffee cultivation in Nawan.

search terms :

- 1- **Soil:** A natural layer consisting of solid materials that contain minerals and organic materials, in addition to containing liquids and gases found on the surface of the earth.
- 2- **The coffee tree:** Coffee is an evergreen tree, with red-colored fruits at maturity, and belongs to the Fabaceae family, and it is the seeds that are roasted to prepare a coffee drink from them, and greencoffee beans are considered the second most sold and used commodities in the world.
- 3- **Air temperature:** a value that expresses the amount of apparent energy actually present in the air, which is measured by several devices; Some of them are mercury and some are electronic.

Previous studies:

Jazan (Saudi Arabia) - Farah al-Maliki, the 90-year-old Saudi grandfather, proudly watched his son and grandson grow Khawlani coffee in the Jizan region in the south of the Kingdom, continuing a profession that his family has passed down from generation to generation for decades.

Al-Maliki, 90, is still working barefoot in pruning the red-beaned coffee trees that produce Arabica coffee, which the authorities finally decided to call "Saudi coffee.

"My father inherited it (coffee cultivation) from his ancestors, and I worked with it and inherited it to my children and they worked with it, and my grandchildren, God willing They will work with it.

"One of the main problems we face is the lack of water," said the grandfather, who retained his vitality and activity despite his age and wore a headscarf around his head.

However, that situation finally changed after the authorities considered 2022 the year of Saudi coffee and launched several initiatives to develop coffee cultivation

Al-Khawlani coffee Muhammad Al-Fifi added that Khawlani coffee trees are the most important agricultural crop, and it represents the identity of the cultural city of Faifa, and it has been cultivated there for hundreds of years and fills many of Fifa's agricultural terraces.

The soil of Fifa is considered a very fertile land and all kinds of cereals can be cultivated in it with rain-fed cultivation (that is, without the need to irrigate them with water) and suffice with rain water, such as wheat, corn and millet. Many fruits such as mangoes, quinces, guavas, papayas, bananas, jackfruit and many tropical fruits are grown in Fifa. In Fifa cultivate cocoa and coconut trees.

search limits :

Objective: The effect of temperature and soil quality on coffee cultivation in Nawan

Time: 2023 AD

Spatial: Nawan study site

Latitude: 19.5441, Longitude: 41.1686

Height above sea level: 109.6 m

Materials and method (procedures):

1- GLOBE devices:

(PH device - digital thermometer - soil color book - water oxygen number device - water nitrate number device - water density tube - water transparency tube - sand shovel)

2- Seedlings:

Coffee plant seedlings in Shada soil - Coffee plant seedlings in Fifa soil -
Coffee plant seedlings in Nawan soil

3- Other tools:

Pen - paper - computer - glasses - ruler to measure the length of the coffee plant

Procedures: (Methodology)

Experience:

1- Taking seedlings of the coffee plant and planting them in the soil of Nawan in the month of January 2023 AD and observing them during the months of February and March and watering them with water from the tank in Nawan

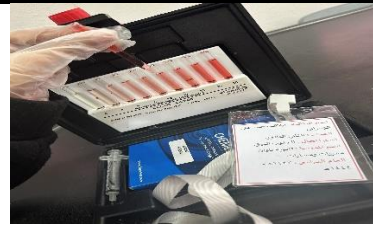


Photo No. (3) Nitrates for water.



Photo No. (2) The oxygen number of water.



Photo No. (1) The pH of water.

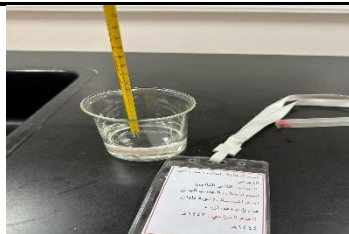


Photo No. (6) Water temperature.



Photo No. (5) The transparency of the water.



Photo No. (4) Density of water.



Photo No. (9) Nawan soil texture.



Photo No. (8) the consistency of Nawan soil.



Photo No. (7) Nawan soil structure.

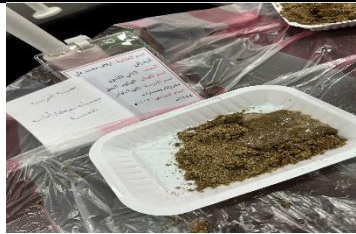


Photo No. (12)
Carbonates in Nawan
soil.

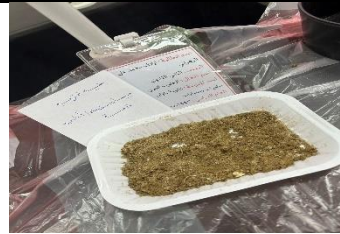


Photo No. (11) Roots in
the soil of Nawan.



Photo No. (10) The rocks
in the soil of Nawan.



Photo No. (14) the color of Nawan
soil.



Photo No. (13) the color of Nawan
soil.



Photo No. (16) The height of the
coffee plant planted in the soil of
Nawan

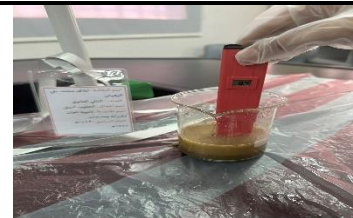


Photo No. (15) Nawan soil acidity

2- Taking seedlings of the coffee plant planted in the soil of Fifa in the month of February 2023 AD and observing its growth in the Nawan site and watering it with water from the tank in Nawan



Photo No. (19) FIFA soil texture.



Photo No. (18) The consistency of FIFA soil.



Photo No. (17) FIFA soil structure.



Photo No. (22) Carbonates in FIFA soil.



Photo No. (21) FIFA soil color.

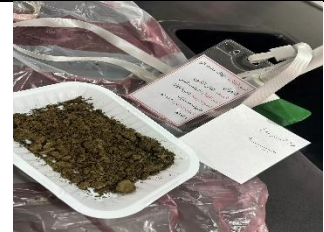


Photo No. (20) Rocks and roots in FIFA soil.



Photo No. (24) coffee seedlings in FIFA soil.



Photo No. (23) FIFA soil acidity.

3- Taking seedlings of the coffee plant planted in the soil of Shada in the month of February 2023 AD and observing its growth in the Nawan site and watering it with water from the tank in Nawan



Photo No. (27) Shada soil texture



Photo No. (26) The consistency of Shada soil



Photo No. (25) Shada soil structure



Photo No. (30) The acidity of the Shada soil



Photo No. (29) Carbonates in Shada soil



Photo No. (28) Rocks and roots in Shada soil



Photo No. (33) The length of coffee seedlings in Shada soil



Photo No. (32) the color of Shada soil



Photo No. (31) the color of Shada soil

4- The effect of sunlight on the three plants



Photo No. (36) coffee seedlings in Shada soil



Photo No. (35) coffee seedlings in Fifa soil



Photo No. (34) The coffee plant grown in the soil of Nawan

Data summary: Analyze the tables

Table No. (1) Nawan website, Shada website, and Fifa website

the site	longitude	latitude	Height above sea level
Nawan website	41,1686	19,5441	109,6 m
Fifa Governorate website	43,1068632	17,2472916	1100,5 m
Shada site	41,31712	19,84461	1999,8m

Table No. (2) Measurements of the height of the coffee plant that was grown in Nawan soil

the month	plant length	number of sheets
January	67 cm	13 leaves
February	67 cm	16 leaves
March	67 cm	18 leaves

Table No. (3) Measurements of the length of coffee seedlings that were grown in Fifa soil

the month	plant length	number of sheets
February	20cm	14leaves
March	22cm	16leaves

Table No. (4) Measurements of the length of coffee seedlings that were planted in Shada soi

the month	plant length	number of sheets
February	54cm	33leaves
March	56cm	35leaves

Table No. (5) Characterization of Nawan soil, Fifa soil, Shada soil

the site	Soil structure	soil color	soil consistency	soil texture	amount of roots	amount of rock	amount carbonates	acidity the soil
Nawan soil	granules/ mono-soil	10YR4/3 10YR3/4	friable (brittle)	Green	a lot	Nothing	a lot	8,4
Fifa soil	granular	10Y3/2	friable (brittle)	Clay	few	few	few	6,6
Shada soil	tinny	10YR3/4 10YR4/4	friable (brittle)	Clay	a lot	few	a lot	8.1

Table No. (6) Measurements of water used to irrigate all plants

Water: reservoir water

Transparency	Water temperature	oxygen number	pH	salinity	nitrate	density
60	32	2	8	6.1	12	1

Table No. (7) Effect of sunlight on the coffee plant in Nawan

	Coffee plant in Nawan soil	Coffee plant in Fifa soil	Coffee plant in Fifa soil
The effect of sunlight (website Nawan)	The appearance of a brown color on some leaves	The appearance of a brown color on some leaves	The appearance of a brown color on some leaves

Table No. (8) Temperatures in Nawan

The chapter	temperature
Summer	35 -40
Winter	20-30

Graph No. (1) shows the temperatures in the summer and winter seasons in Nawan

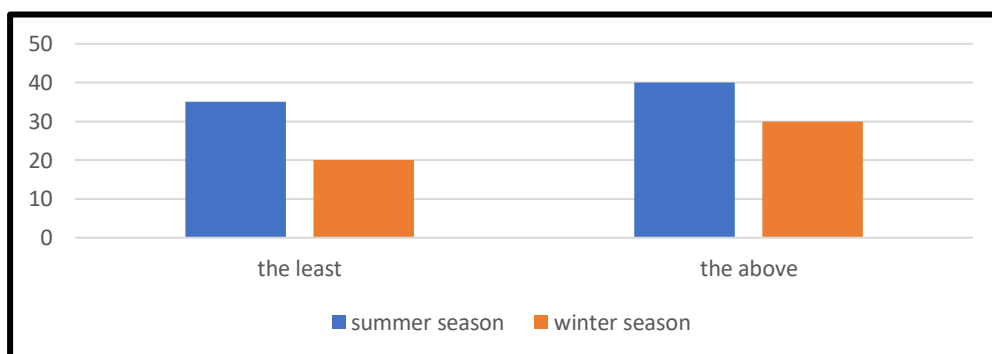
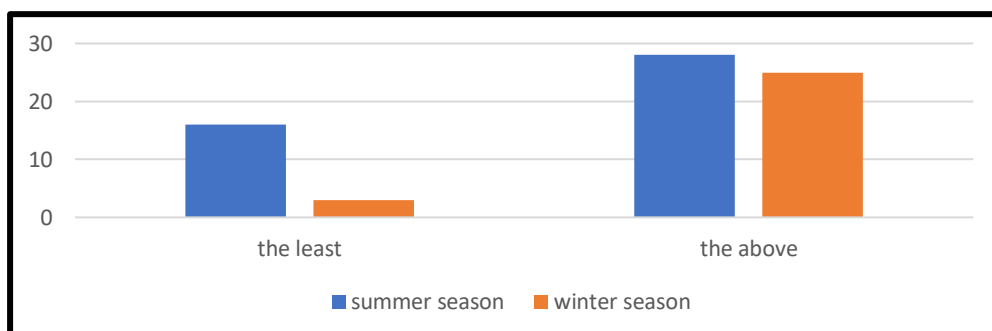


Table No. (9) Temperatures in Fifa and Shada

The chapter	temperature
Summer	16-28
Winter	3-25

Graph No. (2) shows the temperatures in the summer and winter seasons in Fifa and Shada



Analysis and results

From the tables and experiments we have noted

1- In Table No. (1), Faifa and Shada governorate are high above sea level, while Nawan is low above sea level.

2- In Table No. (2), the coffee plant grown in Nawan soil did not affect its height, while the number of leaves increased

3- In Table No. (4,3) the coffee plant in Fifa soil and Shada soil increased the length of the plant within two months and the number of leaves increased.

4- In table No. (5) the soils (Nawan soil, Fifa soil, Shada soil) differed in terms of their structure and colors, and the soil similarities (Nawan soil, Fifa soil, Shada soil) in the consistency of the soil and the similarity of the soil (, Fifa soil, Shada soil) in Soil texture and soil similarities (Nawan soil, Shada soil) in the amount of roots and soil similarity (Fifa soil, Shada soil) in the amount of rocks and soil similarities(Nawan soil, Shada soil) in the amount of carbonates and soil similarity (Nawan soil, Shada soil) In soil acidity (alkaline) (8.4) (8.1), while Fifa soil was acidic (6.6).

5- In Table No. (6) the water used for plant irrigation is (PH = 8) and the amount of nitrates is high.

6- In Table No. (7) there is a similarity in the appearance of a brown color on some leaves.

7- In Table No. (8) the weather of Nawan, the temperature is high in the summer and moderate in the winter

8- In Table No. (9) the weather of Fifa. The temperature is very moderate in the summer and low in the winter

Conclusions

- 1- Increasing the number of papers as in Table No. (2), Table No. (3) and Table No. (4)
- 2- Increasing the length of the plant as in Table No. (3) and Table No. (4)
- 3- Direct exposure to sunlight at the Nawan location of the plant led to the appearance of a brown color on some leaves.
- 4- Soil acidity: (Nawan soil, Shada soil) (alkaline), while Fifa soil was acidic .
- 5- High temperatures in the summer and moderate in the winter (Nawan low area)
- 6- Moderate temperature in summer and low in winter (Viva and Shada are high areas)

Discussion

There are many studies that showed the effect of temperature and soil quality on agriculture, but the aim of this study is to improve coffee cultivation in Nawan and other areas similar to the same conditions.

Improvements and recommendations

- 1- Observing changes in temperature and soil quality for a longer period
- 2- Using fertilizers to identify their effect on the coffee plant.
- 3- Using seeds instead of seedlings and observing their growth.

:Acknowledgments

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Badges

cooperation	Contact a stem specialist	Communication between schools
<p>Cooperation took place between the student, Elaf Muhammad Al-Zahrani, and her father, Muhammad Ali Al-Zahrani</p> <p>1- Bring seedlings of the coffee plant containing Fifa soil</p> <p>2- Bringing seedlings of the coffee plant containing shada soil</p> <p>3- Read books to help in research.</p>	<p>1- The Globe Instructor: Professor: Eida Al-Rashdi specializes in chemistry to guide us.</p> <p>2- Professor: Suzan Al-Ghamdi specializes in chemistry.</p> <p>3- The laboratory attendant, Ms. Alia Al-Zahrani, for assistance and guidance.</p> <p>4- The principal of the school, Ms. Aisha Al-Zailai, to help and encourage us</p>	<p>Communication with Professor: Faiza Bahri from Al-Muttaan School in Sabya, and asking her about the research and the nature of the Fifa Governorate in the Jazan region</p>
data scientist	STEM storytellers	community effect
<p>To answer the research questions, we relied entirely on the data we collected, analyzed, compared it, and then drew conclusions from it.</p>	<p>We shared our experience with many of our colleagues at the school level,</p>	<p>Research in brief studies is a real problem that the local community suffers from, and it tries to answer questions in order to reach specific results</p>

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A poster



https://drive.google.com/file/d/1OYUOXMxpB7uTVab7aaG81EBEUpFhBHQ/u/view?usp=share_link

Search in Arabic



https://drive.google.com/file/d/1eGoYnLTZYgZ_wFUzg4_UYzfn65JuKmSg/view?usp=share_link