Oman Sultanate

Ministry of Education

Sumaya School for Post-Basic Education

North Sharqiyah

Biodiversity and natural and chemical properties of al-Nasib and al-Thabti Faljes .

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Sumaya School for Basic Education (10-12)

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Biodiversity and natural and chemical properties of paralysis and stabilization

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Sultanate of Oman–North Sharqiyah Governorate–Ibra Wilayat

Abstract

In this research,we compared the biodiversity and natural and chemical characteristics between the falaq al-Nasib and al-Thabeti falajis,to understand,balance,and protect the environment and ensure its sustainability for future generations.

1- How much are the natural and chemical properties different between Alnasib and Althabti falajes?
2- How much is the difference in biodiversity(algae,fish)between Alnasib and Althabti falajes?
3- How do chemical properties affect in biodiversity in Alnasib and Althabti falajes?

We compared the characteristics of two water samples,one from Falaj Al-Thabeti and the other from Falaj Al-Nasib,by applying the water protocol(temperature,transparency,acidity,salinity,oxygen).We also We collected the fish with net and counted them.We also brought two samples of algae from these two falajes to observe their color and shape,and two samples were placed in two different cups to observe photosynthesis.

The results:water of Falaj al-Nasib has a transparency of(120 cm)but Al-Thabeti Falaj(110 cm)and their temperature respectively(31.3-31.8) and the dissolved oxygen in them(5.5 mg/L)and the acidity of the water of al-Thabiti water(7.9)while the acidity of al-Nasib water is(8.26),but the salinity of al-Thabiti water(2.21 ppt)while the salinity of al-Nasib water is(0.585 ppt).With regard to biodiversity, it turned out that the number of fish in Falaj al-Nasib is higher,and there are green filamentous algae(more bubbles come out of it)some of which are brown in color,while the number of fish is less in Falaj al-Thabiti,and

the filamentous algae are black in color(fewer bubbles come out of them).The researchers concluded that the Falaq al-Nasib has more biodiversity,as there are more fish,as there are green and brown filament algae,and the reason for this is the high transparency of the water,lower acidity,its moderate temperature,its low salinity,and the abundance of dissolved oxygen resulting from the photosynthesis of green algae,which is necessary for the respiration of fish.The researchers recommend Raising community about preserving the aflaj for the sustainability of the ecosystem.

Key Terms

Biodiversity: Variation between organisms from all sources including diversity within species and between species and ecosystems.

Falaj: A channel dug into the ground or on its surface, whether covered or exposed, in which groundwater is transported from its sources to its places of use by the force of gravity.

Al-Nasib and Al-Thabti: Two areas located in the North Sharqiyah Governorate in Ibra State where the two areas of Al-Nasib and Al-Thabeti (study sites) are located 3.4Km apart

Research Questions

1- How much are the natural and chemical properties different between Alnasib and Althabti falajes?
2- How much is the difference in biodiversity(algae, fish)between Alnasib and Althabti falajes?
3- How do chemical properties affect in biodiversity in Alnasib and Althabti falajes?

Introduction and literature review

Biodiversity **is** one of the most important environmental indicators in assessing the health and sustainability of ecosystems, as the diversity of living organisms in an environment reflects the ecological

relationships that bind these organisms to each other and to non-living factors in that environment.

In arid environments such as Oman, the sustainability of agriculture and rural communities largely depends on **traditional irrigation systems known as aflaj**, distinct engineering networks that aim to collect and transport water from underground sources or springs to farmland using only gravity. Aflaj represents a unique ecosystem and technology that supports **local** biodiversity By providing water that supports plant growth and creates suitable environments for a number of living organisms, including native agricultural plants, grasses, pollinating insects, birds, and small animals that depend on the water available in the surrounding canals and oases. At the same time, **the natural and chemical properties** of groundwater and the ecosystem associated with aflaj directly affect water quality, and the distribution of plant and animal biocommunities, making understanding the relationship between water quality and biodiversity vital in environmental studies.

In light of the above, this study sought to compare the natural, chemical and biodiversity characteristics of the Stabil and Stabil Faljis, as they provide an understanding of abiotic environmental factors (such as the chemical and natural properties of water) and how they affect **the biodiversity** in those sites. Such studies also help to identify the relationship between traditional water resources and biodiversity sustainability, supporting planning for sustainable management of natural resources and the preservation of ecosystems of environmental, economic and cultural value.

Research Methods

1. Research Plan

- Setting the research schedule.

First: The Timeline of the Research Plan

Action Plan	The month	Student's Name
Formulate the research problem and gather information about the research topic in different sources	November/2025	Ghaya Almaskariya Hajar AlJufailiya
Instrument Identification (Transparency Tube, Salinity Meter, Dissolved Oxygen Meter, PH Meter, Small Mesh, Gloves, Cups, Higrometer) and materials (algae – water samples from the Falji Al-Nasib and Al-Thabi)	November/2025	Ghaya Almaskariya
Water Sample Collection and Water Protocol Application	November-December/2025	Hajar AlJufailiya
Atmospheric Monitoring of Study Sites (Temperature and Relative Humidity)	December/2025	Hajar AlJufailiya
Noting the final results and writing the research report	January/2026	Ghaya Almaskariya Hajar AlJufailiya

Table (1) Research Plan Timeline

- Search for information related to the research topic from:

❖ The World Information Network (Internet) where studies and articles related to the subject are searched

❖ Notes of the Globe Program Water and Atmospheric Protocol

❖ The book The Geographical Nature of the Sultanate of Oman and a Collection of Previous Studies Related to Algae and Biodiversity.

- Selecting the different sites for the study in preparation for the application process to collect the necessary data for the research.

- Identifying the appropriate devices and tools for carrying out the work (pH meter, GPS, transparency tube, salinity meter, dissolved oxygen meter, gloves , small net, cups, higrometer)
- Determination of substances (algae – water samples from the Falj Al-Nasib and Al-Thabi).
- Applying water protocols to water samples from Falj al-Nasib, al-thabeti, and atmospheric protocols.

How to apply	Protocol	Question
• Bring water samples from the Falcon and Stabilization and measure (salinity, electrical conductivity, temperature, transparency, acidity, dissolved oxygen) • Measuring the air temperature at the Pilgeon site using a digital higrometer.	Water Protocol Atmospheric Protocol	**The first question**
• Collect fish samples from the falajin using a small net in the opposite direction of the falaj flow, count them and then return them to the water. • Bring samples of Faljeen algae to observe and note their shape and color.		**Second question**
• Doing a simple experiment: - Bring two samples of algae from the pilgrims, put them in two different cups, and stabilize the rest of the factors. - Note the amount of bubbles coming out of the algae and write them down.		**Question 3**

Table (2) Mechanism of Application of Protocols for Data Collection

- Data collection and graphical processing
- Data entry related to the application of the water and envelope protocol in situ(www.GLOBE.gov)
- Interview with Ms. Reem Al-Hudaifiyeh, Biology Teacher from Al-Aflaj School for Girls (1-12)
- Reaching conclusions and recommendations

2. Study Site

- The research was carried out in the Sultanate of Oman, North Sharqiyah Governorate, Ibra Governorate, Falaj Al-Thabeti and Falaj Al-Nasib.

- Falaj Al-Thabiti: Latitude: 22.730760 N - Longitude: 58.530112 E

- Falaj Al-Nasib: Latitude: 22.719028N - Longitude: 58.507780 E

- Months (November-December) where temperatures range (11-28) using the water and atmosphere protocol

2 1

Photo (1) Falaj Al-Nasib and (2) Falaj Al-Thabeti

3. **Data Collection and Analysis**

The data related to the first question were collected by bringing water samples from the Nasib and Constanti paralysis and comparing the natural and chemical properties between them by measuring (temperature, transparency, acidity, dissolved oxygen, salinity, conductivity) by applying the water protocol weekly for two months (November-December).

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3

Images (3), (4) and (5) show Water protocol application

The data for the second question were collected to collect fish samples from the falaj using a small net in the opposite direction of the falaj stream, counting and then returning them to the water, and samples of falaj algae were also brought in to observe and note their

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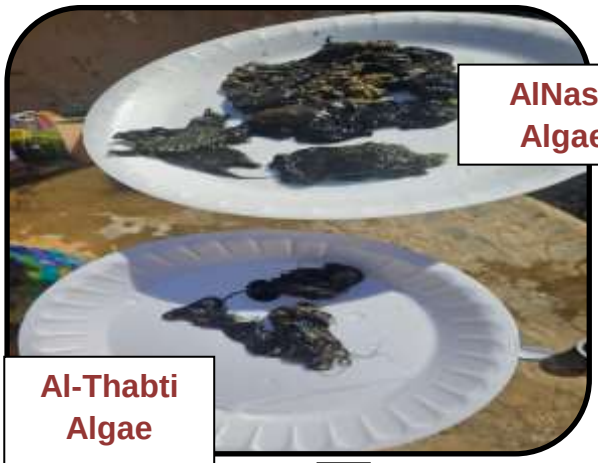
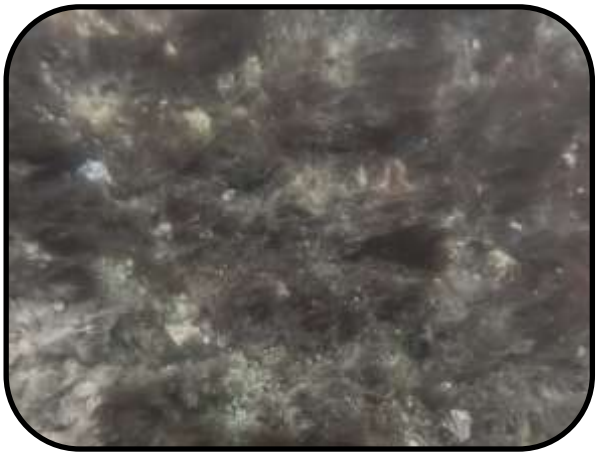
Image(7)Al-Nasib algae



6

Image(6)The shape and colorof the algae



8

Image(8)Al-Thabti algae

The data for the third question were collected by performing a simple experiment, bringing two samples of algae from the both falaj,placing them in two different cups,fixing the rest of the factors,observing the amount of bubbles coming out of the algae and writing them down.

4. Interviews:

An interview was conducted with Ms. Reem bint Khalifa Al-Hudaifiyah (Biology Teacher) at Al-Aflaj School and she reported that collecting fish samples from running water is done using a small net in the opposite direction of the current and then returned to the water.

Results

Results of the first question: The following table shows the average water data collected by measuring transparency,temperature,acidity, salinity,conductivity,and dissolved oxygen.

Falaj al, Thabeti	Falaj Al-Nasib	Feature
110	120	**Transparency (cm)**
31.3	31.8	**Temperature(C)**
7.9	8.26	**Acidity**
2.21	0.585	**Salinity(ppt)**
2496.5	836.6	**Conductivity(µs)**
5.5	5.5	**Dissolved oxygen(mg/L)**

Table (3)

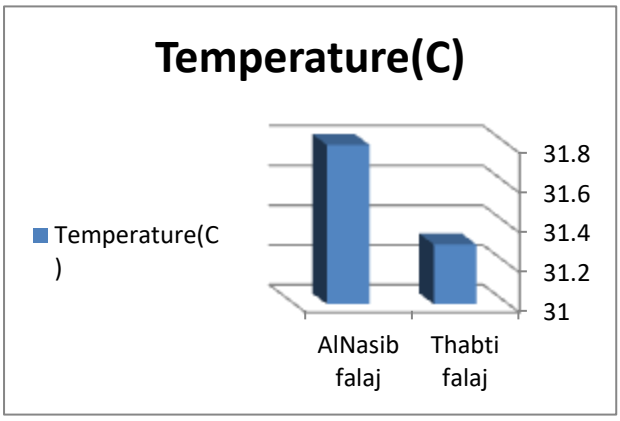


Chart 2

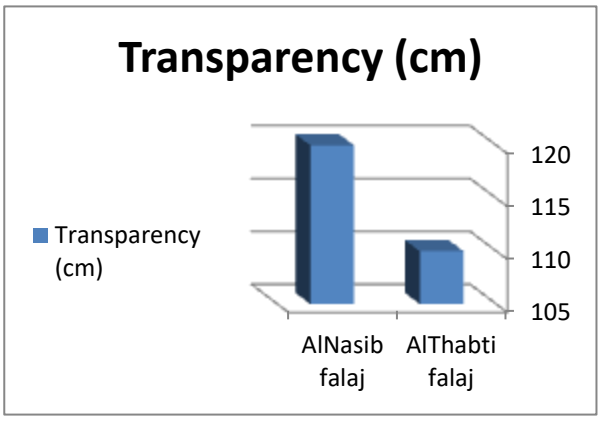


Chart 1

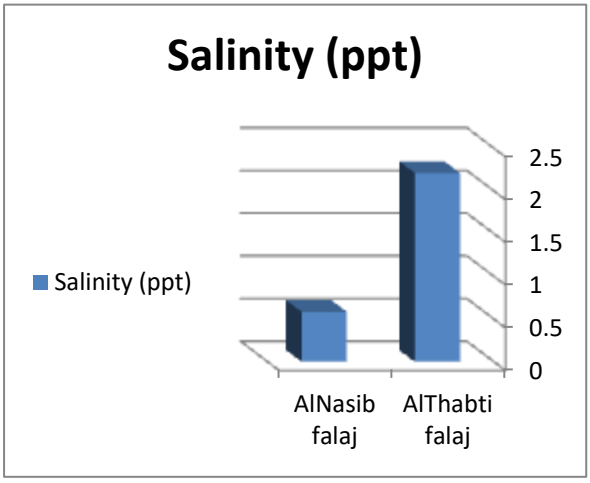


Chart 4

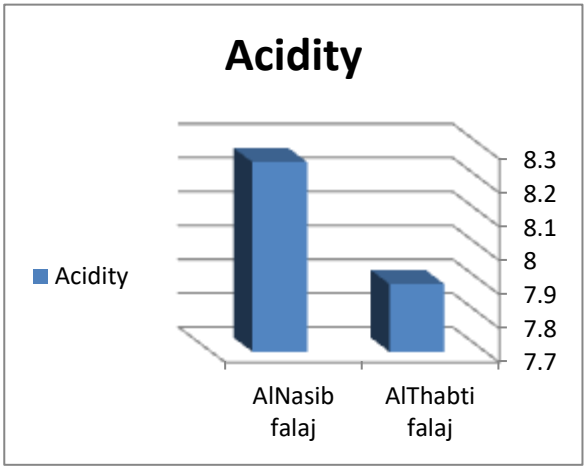


Chart 3

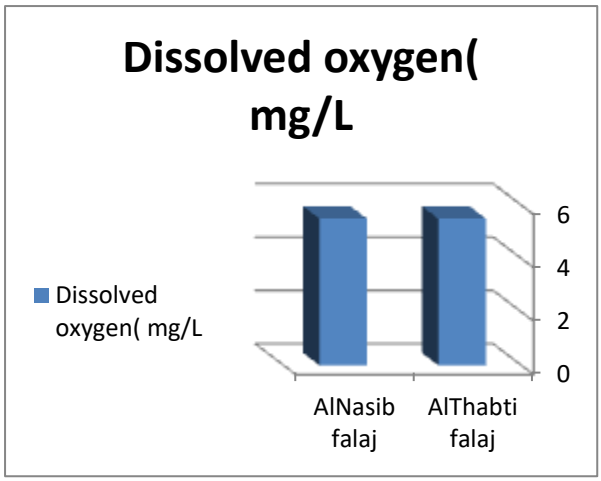


Chart 6

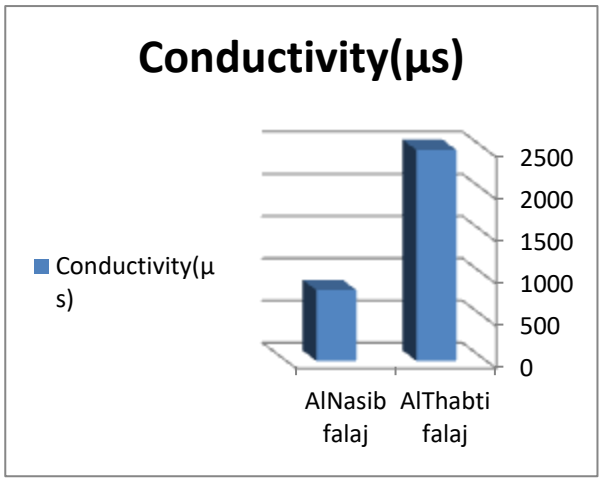


Chart 5

Results of the second question:

Biodiversity Results Regarding the Observance of Algae and Fish in Falji Al-Nasib and Al-Thabeti

Falaj al, Thabeti	Falaj Al-Nasib	
String	String	**Type of algae (shape)**
Black	Dark Green - Brown	**Algae color**
Sample(1): 1 Specimen (2): 2 Sample(3): 1	Sample(1): 5 Specimen (2): 7 Sample(3):10	**Number of Fish**
2	7	**Average number of fish**

Table (4)

Results of the third question:

It became clear from the implementation of the experiment and the observation of the falajin algae that the number of bubbles that came out of the algae of Falaj al-Nasib was more than that of Falaj al-Thabiti.

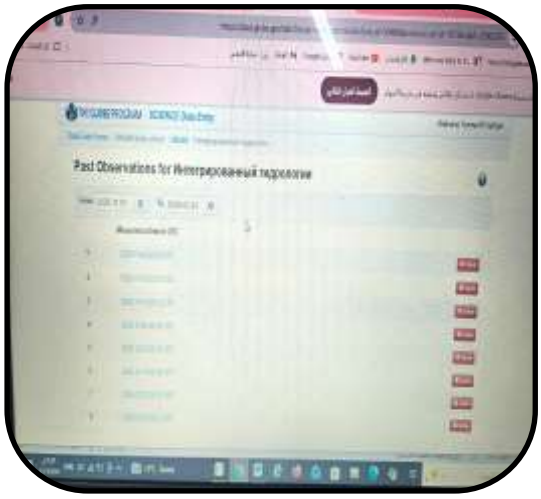
Image(9)Photosynthesis in two Faljes

ENTERING THE DATA OF THE FIXED AND SHARE OF THE PROGRAM (www.GLOBE.gov) THROUGH (DATA ENTRY)

11

10

(9&10)AlNasib Water data



13

12

(12&13)Al-Thabeti Water data

Discussion of the results

To answer the first question in the research:

We went to the site of Falajin Al-Nasib and Al-Thabeti and took samples from them and the water protocol was applied by measuring both transparency, temperature, acidity, conductivity, dissolved oxygen as well as air temperature, and as observed in Table (3) and graphs (from 1 to 6) and appendices, we found that Falaj Al-Nasib water has high transparency, moderate temperature, and a suitable pH (lower acidity and higher alkalinity), salinity and low conductivity compared to Falaj Al-Thabiti, which has less transparency, salinity, very high conductivity, and pH. Less (higher acidity and lower alkalinity)

To answer the second question in the research:

We brought two Samples of algae from(AlNasib-Althabti)falajes.Images (6,7and 8)show the algae of Falaj Al-Naseeb are filamentous and dark green in color,indicating a higher chlorophyll content,which is essential for absorbing light energy in photosynthesis(Ministry of Education, 2021).The algae of Falaj Al-Thabiti are also filamentous, but their color tends towards black.

Fish samples were also collected from both falaj by using a small net and investigated in the opposite direction of the Falaj flow (which Ms. Reem Al-Hudaifieh pointed out during the interview).

To answer the third question in the research:

We carried out a simple scientific experiment,which is to put two samples of both Falajs algae in two different cups and stabilize the rest of the factors(light,mass,amount of water,duration of the experiment) and the result was as clear in image(9)which is the release of bubbles (oxygen gas)more than algae algae,as oxygen necessary for the process of respiration is one of the products of the photosynthesis process (Ministry of Education, 2021).is one of the factors that led to the abundance of fish in this falaj,in addition to the high transparency of the water and the penetration of light into the water more.

The bottom line

This research sought to study the biodiversity and natural and chemical properties of Falaj al-Nasib and al-Thabeti, and it became clear

through this study that Falaj al-Nasib has more biodiversity, as there are more fish, as there are filamentous algae of green and brown color, and the reason for this is due to the high transparency of the water and the penetration of light into the water more (GLOBE Program, 2012), the higher pH (lower acidity), its moderate temperature and low salinity (Al-Watan newspaper, 2016).) and the abundance of dissolved oxygen produced by the photosynthesis of green algae, which is necessary for fish respiration (Ministry of Education, 2021), as for the Thabeti falaj, due to the very high salinity of the water, its lower transparency, the efficiency of algae in photosynthesis, and the lack of dissolved oxygen, the number of fish living in this falaj is less, and accordingly, the researchers recommend to:

1- Expanding the scope of the study to include aquatic microorganisms and invertebrates for their important role in environmental balance and water quality.
2- Raising awareness of the importance of preserving Aflaj water and its associated biodiversity to maintain the sustainability of the Falaj ecosystem.

References

1- Globe Technical Office. (2012). Water Protocol. Water Protocol Memorandum for the GLOBE Teacher Training Program Office of International Educational Programs.
2- GLOBE Program Technical Office (2012). Atmospheric Protocol Memorandum for the GLOBE Teacher Training Program Office of International Educational Programs.
3- Al-Watan newspaper.*Increased salinity harms aquatic life*.Retrieved January 21, 2026, from https://www.al-watan.com/article/20697/SCIENCE/ Increase-Salinity-Harms-Aquatic Biology
4- Al-Hatrooshi, Salem bin Mubarak. (2014).*Physical Geography of the Sultanate of Oman* (First Edition).
5- Ministry of Education. (2021).*Science: Student's Book for Eighth Grade* - First Semester (Experimental Edition).
6- Convention on Biological Diversity. (1992). Convention on Biological Diversity: Text and annexes. United Nations

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1- Ms.Yousra Al-Dawia,the supervising teacher of the Globe Environmental Program, for her role in directing, supervising, and facilitating all that is difficult during the research.
2- Ms.Reem Al-Hudaifieh is a biology teacher at Al-Aflaj School to guide us on how to collect fish samples.

Appendices

Medium	Falaj al, Thabeti								
	december				november				The month
	4	3	2	1	4	3	2	1	The week
	110	110	110	110	110	110	110	110	Transparency cm
	31.5	31.5	31.4	31.0	31.1	31.3	31.5	31.4	Temperature C
	7.91	7.93	7.92	7.91	7.89	7.88	7.90	7.86	Acidity PH
	2.22	2.22	2.23	2.16	2.23	2.21	2.20	2.21	Salinity ppt
	2500	2490	2497	2500	2495	2490	2500	2500	Conductivity sμ
	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	Dissolved Oxygen mg/L

Medium	Falaj Al-Nasib								
	december				november				month
	4	3	2	1	4	3	2	1	week
	120	120	120	120	120	120	120	120	Transparency cm
	31.5	33.4	31.5	31.4	31.8	31.5	31.6	32	Temperature C
	8.25	8.28	8.30	8.30	8.24	8.25	8.24	8.23	Acidity PH
	0.580	0.585	0.588	0.584	0.587	0.588	0.581	0.583	Salinity ppt
	835	830	841	840	834	836	842	835	Conductivity sμ
	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	Dissolved Oxygen mg/L