سلطنة عمان
وزارة التربية والتعليم
AL Shifa school

OMAN

The effect of snail living on soil properties

The work of the two students:

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tabel

summary:

This research aims to reach the effect of the snail on the fertility of the soil by applying the program protocols and using devices in proper ways to reach the results and through the research we will answer the following research questions: Does the snail affect the soil properties after living with them for a period of time? How can the soil properties be studied before And after living the snail with it? How can the search to reduce ?climate change problems

To answer the research questions, the Globe Program Programs, which are soil protocol and the study of soil properties before and after the snail lived in them, and from there the results reached the soil properties that change and .become more fertile due to the organic waste of the scalin

Key Terms:

Soil characteristics: They are groups of characteristics that distinguish soils from each other. These characteristics include soil colors, degree of cohesion, permeability, texture (rough or smooth), and the amount of carbonates and nutrients in it (Abdullah, 2010)

Organic waste: It is waste resulting from plants or animals. It is decomposable into simple organic molecules and may be in a solid or liquid state (Al-Barouki, 2012).

Soil Protocol: These are universal steps and parameters for studying the physical and chemical properties of soil using special tools (Robert, 2017).

Introduction and literary reviews:

The earth and climate face several changes over time, and these changes may be a threat and in a negative direction to the life of humanity and living organisms. Natural problems must be classified and solutions must be found in order to keep pace with those changes that .occur in this universe

As changing soil properties on the face of the Earth constitutes a threat to security The food that must be available to maintain living organisms and the continuity of life on this planet, as well as to maintain environmental balance and maintain the proportion of gases naturally in the atmosphere to avoid climate change and global warming .(Siyama, 2015)

The idea of the research was to study the extent of the effect of snails on fertility. Soil is the result of Julnar's passion and love for raising snails. Then her colleague Al Badia was moved after they noticed

tomato seeds growing on soil where snails lived. The program's protocols were applied to study the extent of the snail's effect on the soil and analyze the results.

Research methods (materials and method)

Workplan

Implementing students	Time period	work
Julnar	October	Formulate the research problem and determine the tools
Julnar,Albadia	November	Collect and analyze data and carry out research
Julnar,Albadia	November, December	Draw conclusions, write the report, and submit it

Tabel 1

Research methodology:Use in research the experimental method based on scientific experiment

The search tool:Previous studies and scientific experience

The protocols for research were first determined and the tools and devices that will be used in the protocols were prepared

Materials used:

Electronic scale and temperature meter- Location device-

Salinity and conductivity measuring device - pH meter device -

Soil and water temperature measuring device - Snails -

Tomato seeds- Water sprayer -

Measuring the percentage of sodium bicarbonate in the soil -

Soil collection tools for examination (customized cans, drilling tool, soil collection tool) -

Climatic characteristics

The coastal area of North Batinah, which is characterized by hot and humid weather

and the study site is in the Majis area (Al Shifa School for Basic Education)

GPS

Picture 2

Picture 1

Data collection:A soil sample was taken at a depth of 5 cm and the characteristics of that soil were studied.

Tomato seeds were chosen to investigate soil fertility through their growth.

Then the period of time it took for tomato seeds to grow in the soil on - which the snail lived and the soil on which the snail lived will be compared. The snail did not live on it, and this will lead us to know the most fertile soil and reach results and conclusions.

methods

1-Applying the “Soil Protocol”: Bring soil on which the snail lived and soil on which it did not live and study the characteristics of each.

carbonate	roots	Rocks	fabric	consistency	Secondary color	Main color	depth cm	sample
Lass	Lass	Lass	Lomy sand	fluid	10YR4/3	10YR 4/4	5cm	The soil before the snail lives in it
medem	medem	Lass	Rough sand	fluid	10YR3/3	10YR 3/4	5cm	Soil after snails live on it

Table 2

The previous table shows the characteristics of the soil that was studied. Samples were taken at a depth of 5 cm using special collection boxes and were examined by providing all security and safety precautions and providing the necessary tools to examine the soil in the school laboratory.

2-Plant tomato seeds in both soils

3-Measure the period of time during which tomato seeds grew in both soils to determine which is more fertile.

Picture 3

3- Take soil pH measurements 3 times and find the average .

pH Soil temperature 5 cm depth Type of measurement.

ph				Soil temperature				type
average	3	2	1	average	3	2	1	Samples before the snail lives
7.03	7.00	6.9	7.2	24.3	23	26	24	
average	3	2	1	average	3	2	1	Samples after living the snail
5.93	5.9	6.1	5.8	22.6	21	24	23	

table 3

The previous tables show the characteristics of the soil that was studied. The data was recorded in the table before the snail lived and after the snail lived in the soil. The results showed a slight change in temperature, but a change in soil acidity to the appropriate degree.

Documentation of data entry on the site

Pictuer5

Picture 4

6-(Water Protocol) Studying the characteristics of water and also ensuring that the water source is suitable for the crops by applying the program's tools and devices, noting that the soil in which the snails live must be moist at all times

Sample location:

Al-Shifa School (Majis), Home (Post Office)

Water medium: government water, water type: brackish

Water condition: natural

The transparency tube is greater than the depth of the transparency tube.

Study the pH, conductivity, and density of each sample and find the - average.

ph				conductivity				Dissolved oxygen				Water temperatuer				type
average	3	2	1	average	3	2	1	average	3	2	1	average	3	2	1	sample
6.27	6.66	6.21	5.95	795	785	801	799	7	7	7	7	26	25	27	26	

Table 4

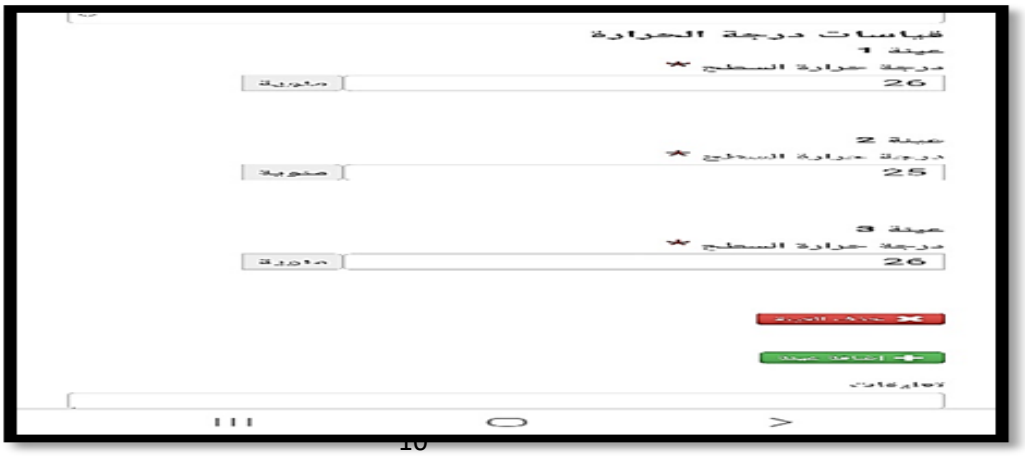
The previous table shows the physical and chemical properties of government water so that it can be verified and its suitability and that it does not affect snails or tomato seedlings.

(Surface Area Protocol)

The temperatures of the soil surface area were taken randomly and the type of cover was determined:

3	2	1	Surface Area
27	29	28	Soil temperatures before snails live on them
26	25	26	Soil temperatures after snails live on them

Table 5



Picture 5

Monitor the growth of snails and give them food and water on a daily basis.

Picture 4

Planting tomato seeds in two soils in which snails lived and those without snails, and watering them regularly and taking care of them.

Collecting information, searching the Internet and asking the program supervisor about how to write scientific research in the correct way and how to use the program's tools, apply protocols in scientific research, and communicate with someone Doctors at Sultan Qaboos University to benefit from some experiences.

Calculate the time period to measure the growth of tomato seeds and take 3 samples so that the results are more accurate, as well as calculate the amount of nitrogen before and after the snails live in it

Use previous studies and experiment

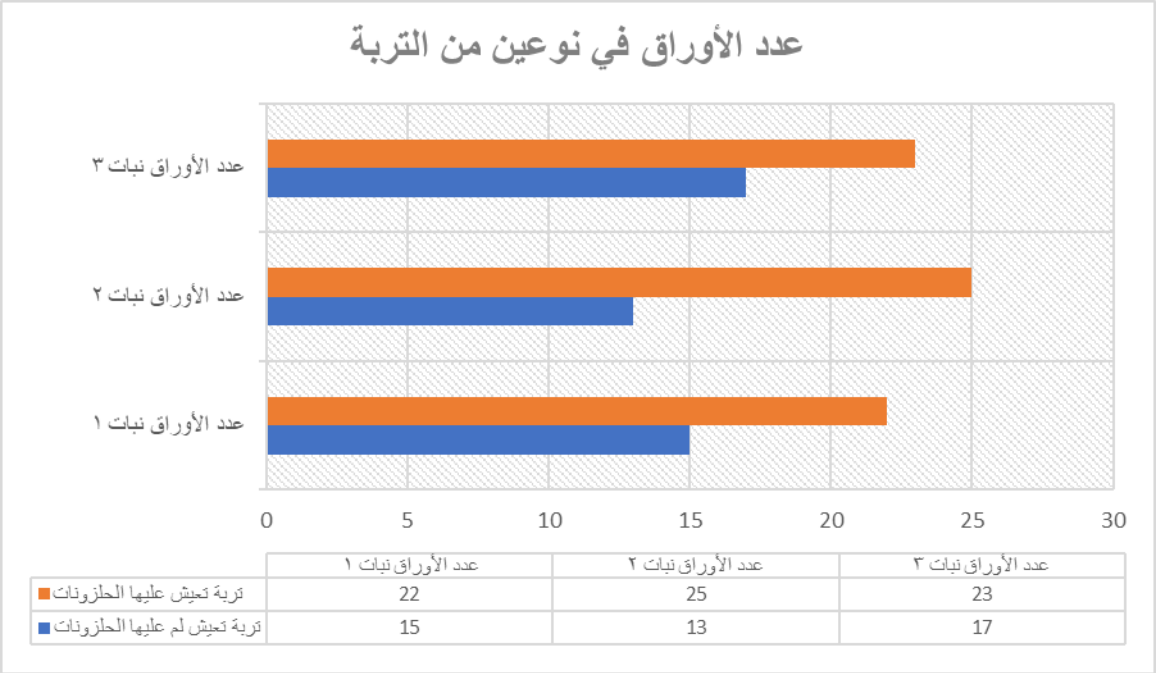
Recording the results and arriving at relationships and observations, then recording the scientific conclusions and translating them into ..graphs and tables

Plant health	Length (cm)	Number leave	Time growth seed	Samp'e plant	Type soil
Healthy green	10	15	40	Plant1	Plant tomatoes in the soil before the snail lives on it
Healthy green	9	13	40	Plant2	
Healthy green	12	17	40	Plant3	
Healthy green	17	22	40	Plant1	Plant tomatoes in the soil after the snail lives on it
Healthy green	15	25	40	Plant2	
Healthy green	20	23	40	Plant3	

Table (6) shows data on the characteristics of the soil before and after placing the snails on which they lived

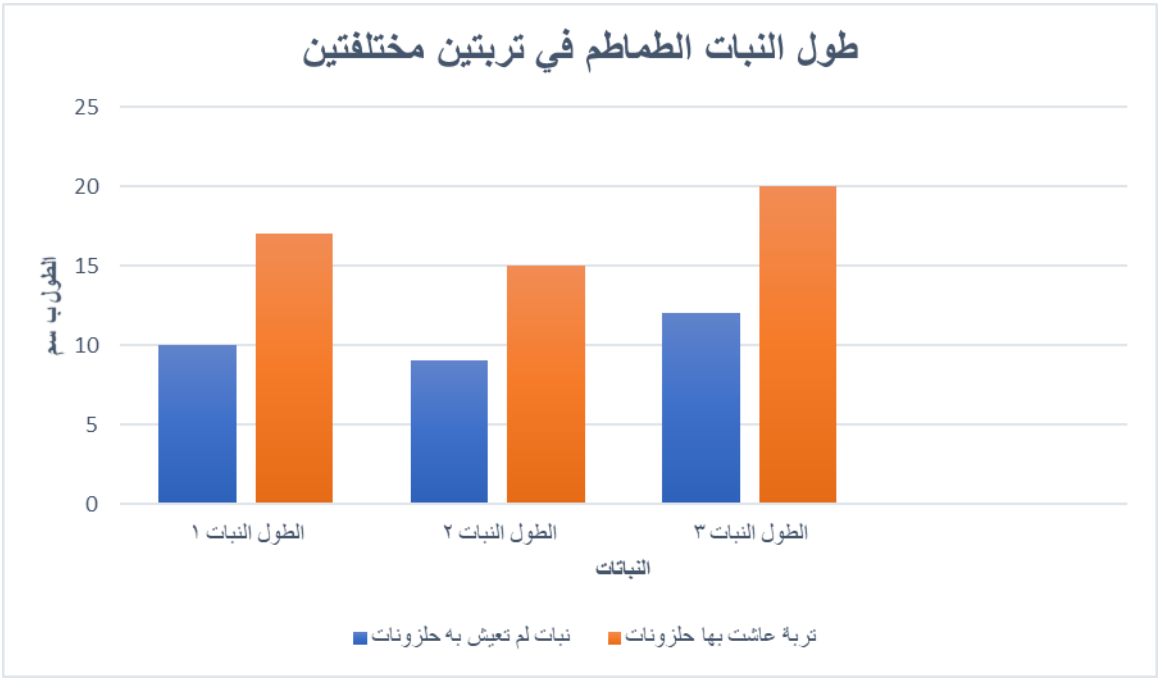
From the previous table it became clear that the soil on which the snails lived had more leaves and was also more tall. This is evidence that the soil is more fertile compared to the plants that were in the soil that they did not live on. The snail

liked that the number of leaves was less and the height was less. As for the health of the plant, all plants showed a healthy green color



	عدد الأوراق نبات ١	عدد الأوراق نبات ٢	عدد الأوراق نبات ٣
تربة تعيش عليها الحلزونات	22	25	23
تربة تعيش لم عليها الحلزونات	15	13	17

Graph 1



Graph 2

After snails lived in the soil	Before snails lived in the soil	TYPE SOIL
0.131	**0.123**	**Amount of nitrogen**

Table 7

results

It is possible to improve the fertility of the soil and make it more suitable for cultivation on it by placing snails to live on it, and then they will produce organic waste, which improves it and speeds up the germination process on it. The research has proven the ability of snails to improve soil fertility, and the results appeared through tomato seeds that grew better in the soil on which they lived. Snails, as well as the .amount of nitrogen, were greater in the soil on which the snails lived

Snails also equalize the percentage of salts in the soil, especially for plants of the Brascia family (radish and cabbage). This is because these crops pull salts from the soil, so the soil becomes poor in salts. This happens because the snail's shell contains Calcium carbonate salts.

Discussion of results:

Organic snail droppings improve the properties of the soil and make it suitable for agriculture. Therefore, we recommend taking advantage of snails and putting them to live on non-fertile lands in order to increase soil fertility, including neutralizing salts in the soil, as well as increasing the percentage of nitrogen and improving the soil acidity rate to make it suitable for agriculture

Possible sources of error

Methods of applying protocols to study properties. It is necessary to repeat 3 times for the readings to be accurate.

Scientific studies:

The results and conclusions in the current study were compatible with the study of desert land development and the resistance to desertification of the learner (Al -Hadi, 2023), where the study emphasized the reclamation of the depressed lands by establishing incubators 'projects to produce snail for use in reviving and preserving .land fertility within the limits of environmental capabilities

Challenges;

That the snails leave the soil area to be fertilized to other areas -

That the conditions are not suitable for snails to live in large areas -

.Study the relationship of snail droppings to improving the soil -

Solutions to these challenges:

Creating barriers for the areas of soil to be improved

Improving soil fertility during the year in conditions suitable for snails to live in

Previous studies were translated and discussed with doctors at Sultan Qaboos University. Praise be to God, some information was obtained .and linked to research and results were reached

Personal experiences:

Learn how to conduct research using scientific experiments, the steps for writing scientific research, and how to link scientific research into the school curriculum. What has increased our passion for scientific subjects, research and investigation of environmental problems, and finding solutions through scientific experiments.

Commercial field: It is possible to benefit from agricultural crops that will increase by increasing fertile soil to provide food security and sell the surplus

When the snails multiply, they can be sold, benefited from and repeated use

Development area;

Developing agricultural production by increasing fertile lands to provide food security and benefit in the economic field by selling the surplus. Conclusion:

This research aims to find out how to improve soil fertility and make it more arable, which will increase green areas and provide food security, by making snails live on it and deposit their organic waste, as well as balancing the percentage of salts and nitrogen, which improves the properties of the soil, accelerates its germination process, and also contributes to the process of reducing Climate changes due to

increased afforestation after the process of improving agricultural lands.

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Appendices.