

Abstract:

This research aims to study the economic and biological feasibility of Tecomella undulata (Farfar) tree by analyzing its antibacterial properties, the effect of its aqueous extract on seed germination, and its traditional uses in the local community. The research questions are summarized in: What are the suitable environmental conditions for the growth of Tecomella undulata tree in Al Buraimi Governorate? What is the effect of the aqueous extract of Farfar tree leaves on seed germination? How effective is the extract as an antibacterial agent? What are the traditional uses of Farfar tree? GLOBE (Global Atmosphere, Water, Soil, and Land Cover) program protocols were applied to collect data, in addition to conducting simple laboratory experiments. The experiments included preparing an aqueous extract of the tree leaves and testing it on different types of bacteria, where it showed an inhibitory effect on E. coli at a concentration of (1:80). The effect of the extract on the germination of bean seeds was also tested using Petri dishes, where a concentration of 150 mm proved to be ideal for seed growth. The results indicate that the Farfar tree has promising biological properties, especially in resisting E. coli bacteria, and has a positive effect on seed germination at specific concentrations. In addition, its traditional uses as organic fertilizer, fuel, and building materials have been documented. Based on the results, we recommend that the concerned authorities work on planting the Farfar tree to protect it from extinction. We also recommend conducting further studies to explore its economic and environmental benefits, such as improving soil and as a natural source of antibacterial materials. Community awareness should also be raised on the importance of preserving this tree and benefiting from it in a sustainable manner.

Introduction:

The Sultanate of Oman is characterized by a unique plant diversity, as it includes many wild plants that play a vital role in maintaining the ecological balance and supporting the local economy. Among these plants is the Tecomella undulata (Farfar), a perennial tree known for its ability to withstand harsh climatic conditions, making it a symbol of endurance in arid and semi-arid regions. Farfar trees are widely spread in Oman, especially near valleys, mountain slopes in the northern regions, near aflaj (traditional irrigation systems), and in abandoned agricultural lands in governorates such as North and South Al Sharqiyah, Ad Dakhiliyah, Ad Dhahirah, and North and South Al Batinah (Encyclopedia of Oman, Volume 8).

The Farfar tree has great environmental and economic value, as it contributes to soil stabilization and combating desertification. In addition, it has been used in countries such as India as a medicinal plant to treat various human diseases (Al Wahaibi, 2019). Despite its importance, the Farfar tree is facing the risk of extinction due to climate change and overexploitation, which puts biodiversity and the benefits it provides to local communities at risk.

Conclusion:

The study reached important results about the Farfar tree, as it prefers areas with well-drained sandy soil and dry climate, and its leaf extract contributes to enhancing seed germination, and it also has antibacterial properties at specific concentrations. The Farfar tree with red flowers was discovered, which is an important result that requires further study.

Recommendations:

- * Conduct additional studies to explore the benefits of the Farfar tree in other areas, such as soil improvement and crop protection.
- * Develop more effective extraction methods to benefit from its antioxidant and antimicrobial properties.
- * Work on increasing the cultivation of the Farfar with red flowers to protect it from extinction.
- * Conduct studies to understand the unique characteristics that distinguish the Farfar with red flowers from other species.
- * Apply the research in other areas and use advanced techniques to analyze chemical compounds.
- * Study different parts of the plant and experiment with other extracts.
- * Re-experiment with planting Farfar in Hamasa soil with the addition of nutrients.

"Economic and biological feasibility of the Farfar tree: its effects and uses

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Research questions:

1. What are the environmental conditions suitable for the growth of the Farfar tree in Al Buraimi Governorate?
2. What is the effect of the aqueous extract of the Farfar tree leaves on the germination of the plant seeds?
3. How effective is the aqueous extract as an antibacterial agent?
4. What are the traditional uses of the Farfar tree

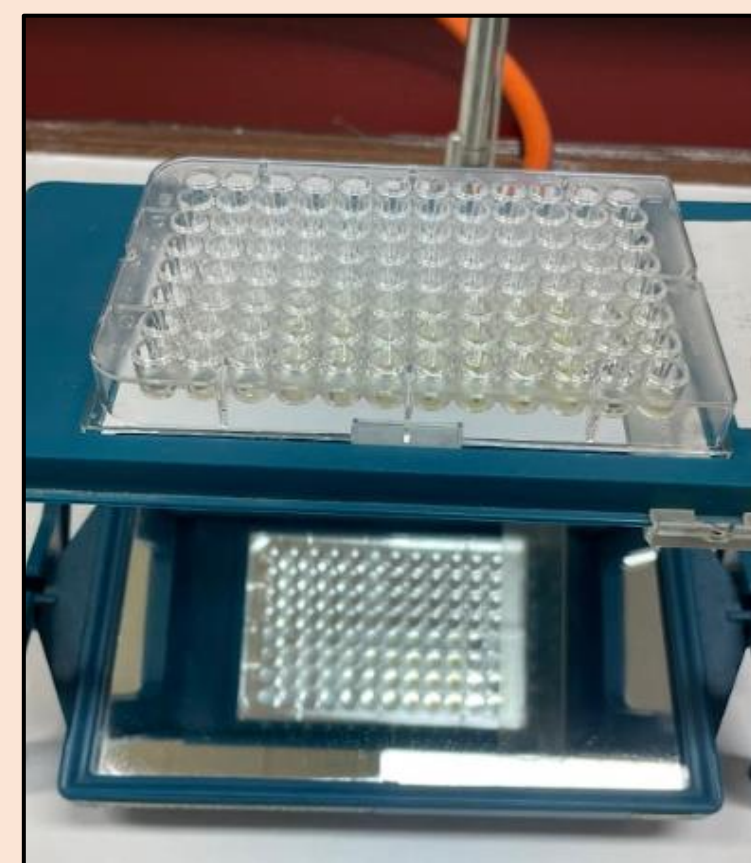
Results:

Table Atmospheric Protocol:

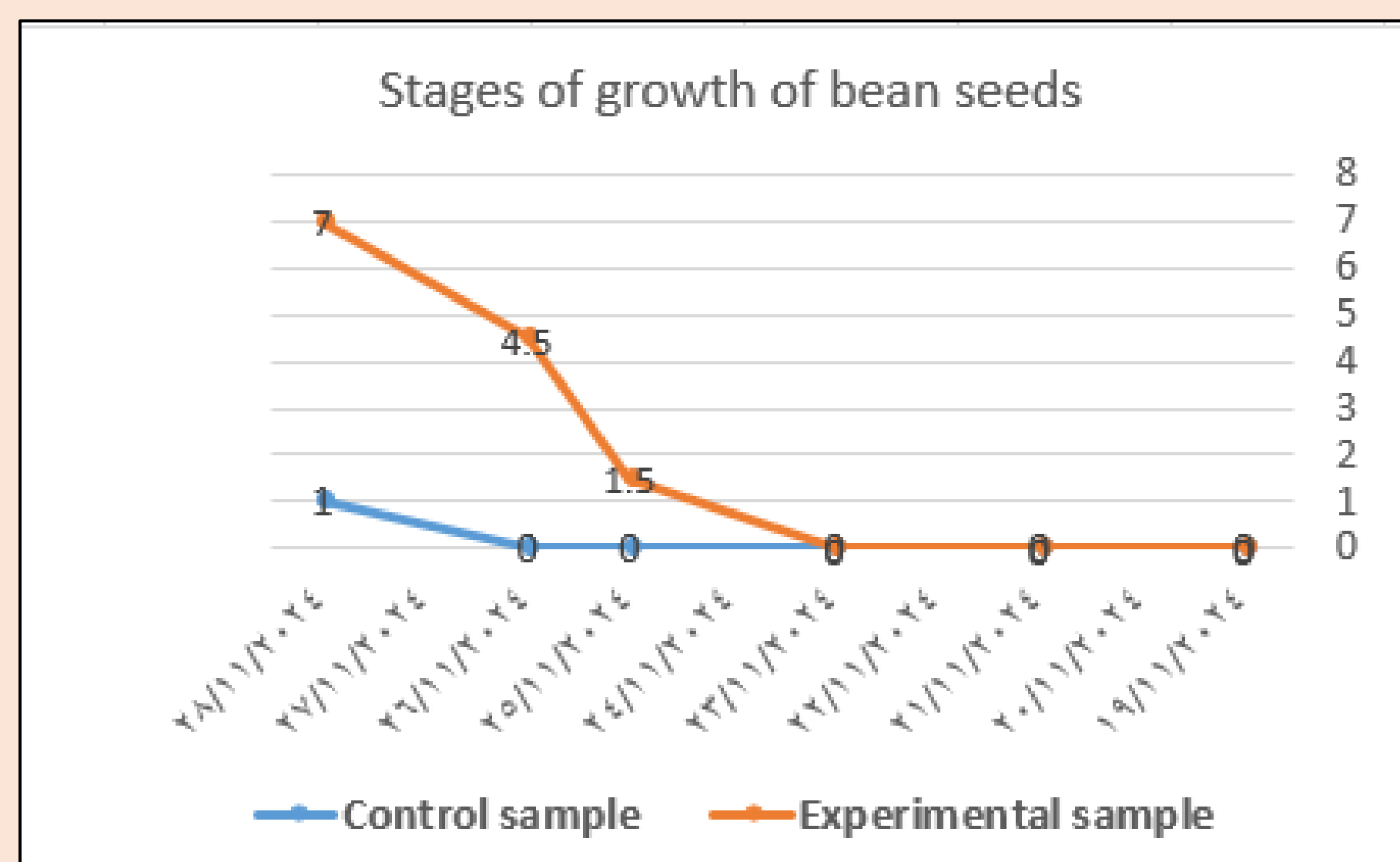
Clouds	Rainfall	Relative Humidity	Temperature	Date	Area
The sky is clear	0	55%	30°C	3/10/2024	Al Nafhat
Cloudy (90-100) Stratus	rain drizzle	36%	22.8°C	18/2/2025	
The sky is clear	0	48%	29.7°C	3/10/2024	Al Khadra
Cloudy (90-100) Stratus	0	36%	24.2°C	18/2/2025	

Soil characteristics in the areas of Nafhat, Al-Khadhra and Hamasa:

Color	Consistency	Texture	Rocks	Roots	Carbonates	Conductivity	Salinity	PH	Area
7.5YR:5/4	fragile	Sandy clay	few	Low	Medium	134	135	8.2	Al Nafhat
10YR:5/4	fragile	Sandy	few	High	Low	334	167	7.4	Al-Khadhra
10YR:4/4	fragile	Sandy clay	none	None	High	135	69.6	8.6	Hamasa



Results of bean seed growth (in petri dishes) in 10 days



Testing the effect of the aqueous extract of farfar as an antibacterial



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Research methods:

First: Research Plan:

1. The team visited the Environment Department in Al Buraimi Governorate and held a meeting with Ms. Fatima Al Jabri to learn about the wild plants in the governorate.
2. Choosing the research topic.
- 3.Collecting information:
 - Searching scientific sources to learn about the Farfar tree.
 - Field observation: Visiting areas where the tree grows to observe its characteristics.
 - Interviews: Conducting an interview with Ms. Fatima Al Jabri from the Environment Department in Al Buraimi Governorate to learn about the locations of the Farfar tree. An interview was also conducted with the grandfather (Salem Al Saadi) to learn about the traditional uses of the tree.
4. Practical experiments:
 - An experiment to plant seedlings of the Farfar tree in three types of soil..
 - Antibacterial properties experiment: Testing the effect of the aqueous extract on different types of bacteria (using Petri dishes) in collaboration with Dr. Aida Al-Badi from the Laboratory Department at Al Buraimi Hospital, and Amna Al-Mandhari from the Central Laboratory at Sultan Qaboos University.
 - Seed germination experiment: Irrigating bean seeds (in Petri dishes) with the aqueous extract compared to irrigation water at a concentration of (150 mm) and monitoring the seed growth.
5. . Apply appropriate protocols (atmosphere, soil, land cover, water).
6. Compare results and write recommendations.
7. Enter data into the program website (www.globe.gov).

Discussion of the results:

First: Distribution of the Farfar tree and the conditions suitable for its growth:

The results of the study showed that the Farfar tree is widely spread in the dry valleys of the Wilayat of Mahdha, while its presence is less in other areas. The dry climatic conditions and moderate humidity, in addition to well-drained sandy soil with a pH ranging between 7-8, are the most suitable for the growth of this tree. It was also found that seedlings planted in the soil of Nafhat and Al-Khadhra grew better compared to those planted in Hamasa, indicating that Hamasa soil is less suitable due to high alkalinity and low nutrients.

A difference was observed in the size and color of tree leaves between regions, as the leaves of wild trees in Nafhat were smaller and gray in color, while the leaves of trees planted in Al-Khadhra were larger and dark green. This difference is attributed to the regular availability of water for the planted trees. A Farfar tree with red flowers was also observed in Nafhat, a new discovery that contradicts previous studies that indicated the absence of this species in Oman.

Second: The effect of the extract of the leaves of the Farfar on the germination of bean seeds:

The results showed that the aqueous extract at a concentration of 150 mm contributed to accelerating the germination of bean seeds compared to the control sample. An improvement was also observed in the growth of plants treated with the extract, with the appearance of longer leaves and roots. These results are consistent with previous studies that indicated that the Farfar extract contains antioxidant and antimicrobial compounds.

Third: The effect of the Farfar extract on the growth of bacteria:

The aqueous extract had no inhibitory effect on the growth of the tested bacteria, except for E. coli bacteria, which showed sensitivity to the extract at a concentration of 1:80. This may be due to the insufficient concentration of the extract used in the experiment.

Fourth: Traditional uses of the Farfar tree:

Farfar flowers are used in the manufacture of necklaces, and the leaves are used as animal feed and fertilizer for crops. The tree trunk is also used in construction, tool manufacturing and fuel.