Sultanate of Oman

Ministry of Education

THE EFFECTS OF THE MESQUITE TREE ON OTHER PLANTS IN OMAN

Done By:

Athari Al Balushi

Malath Al Maimani

Reem Al Habsi

Supervised By:

Miss. Ameera Al Balushi

School:

Um Kulthoom Bint A'qba School 2017

Country:

Sultanate of Oman

Table of Contents:

Subject	Page number
Special Thanks	3
Summary	3 - 4
Research issue – Research Questions	5
Hypothesis	5
Research limitation	6
Research Protocols	7-8
Job Contracts that are conducted	9-10
Research Method	11
Data gathering & analysis	11-12
Collection and analysis of past studies	13-14
Results	15
Recommendations	16 - 17
Conclusion	18
References	19

Special Thanks:

We are much obliged to extend our sincere thanks and appreciation to Eng. Nasser Bin Salim Bin Saif Al Wahaibi, the senior soil researcher at the SWRC (Soil & Water Research Centre) in the General Directorate of Agricultural and Animal Research at the Ministry of Agriculture and Fisheries. We would also like to give a special thanks to the School's Administration for all their support, motivation and their assistance to make the data gathering process very convenient. Also, a very special thanks to the local affected farms' owners.

Research Summary:

THE EFFECTS OF THE MESQUITE TREE ON OTHER PLANTS IN OMAN

Done By:
Athari Al Balushi

Malath Al Maimani

Reem Al Habsi

Supervised By:

Miss. Ameera Al Balushi

School:

Um Kulthoom Bint A'qba School 2017

Country:

Sultanate of Oman

The research aims to identify the reasons behind the spread of "Mesquite trees", and their effects on both soil and plants and aims to find solutions to limit their spread. We have come up with a few questions such as: Is there a difference between Mesquite trees and other natural plants? What helps the mesquite trees to spread in such a fast pace? And does the Mesquite plant have such significant effects on other plants?

We have used the Soil protocol and detected a rise in the soil's alkaline level the trees and the rise of the percentage of carbonates. Also, the lack of shrubs and other plants underneath these trees and within the area around it.

Conclusively, the Mesquite trees are resistant to salinity, high temperature and drought. But the mesquite tree tends to secret out a poisonous substance which leads to kill nearby plants, also its spikes causes harm to livestock.

The research recommends that if the Mesquite tree spreads around rather quickly and cannot be easily eradicated; we hope that a plan is put together to prevent the spread of this plant and adapt to live with it in a way that does not harm the environment.

Research issue:

What are the main effects of Mesquite plants on both the soil and the other plants?

Research questions:

1) Is there a difference between Mesquite trees and other natural plants?
2) What helps the mesquite trees to spread in such a fast pace?
3) Does the Mesquite plant have such significant effects on other plants and groundwater?

Hypothesis:

We assume that the spread of the Mesquite plant trees leads to harming the plants in surrounding area and groundwater shortage and may lead to high salinity ratio in the soil as a result.

Research limitations:

Time Limits	Location Limits	Geographical Limits
25/1/2017	Determining the study location	
7/2/2017	Gathering soil samples from “Wadi Al Eyss”.	23"46"30 North 57"37"10 East 10 Altitude
8/2/2017	Implementing the soil protocol	
20/2/2017	Visiting the Agricultural Extension Centre to gather some information regarding the Mesquite plant	
8/3/2017	Visiting the Agricultural Research Centre to search for past studies.	
23/3/2017	Visiting local farms at a close distance from where the Mesquite grow and gather. Also, conducting interviews with the farm owners to identify the effects of the Mesquite on their farms.	

Research Protocols:

- Create a timeline for the research plan.
- Assign job roles to the research team members:

Date	Job	Role assigned to
16/1/2017	Choosing an issue	All team members
22/1/2017	Creating research questions	Malath – Athari – Reem
25/1/2017	Choosing the affected areas	All Team members
7/2/2017	Collecting Samples	Malath – Athari
7/2/2017	Record the data	Reem
8/2/2017	Implementing the soil protocol	Malath – Athari
19/2/2017	Data analysis	Malath - Reem

- Returning to various sources for further research and reviews regarding the research subject such as:
    1) The School's learning Resources Centre.
    2) Local farms.
    3) Agricultural Extension Centre.
    4) Agricultural Research Centre; as we conducted an interview with Eng. Nasser Al Wahaibi, the senior soil researcher at the Soil & Water Research Centre and asked the following questions:

I. Are there any recorded statistics of the number of Mesquite trees in the Sultanate?

Yes, the following table shows those statistics:

no.	State	Target Area (km^2)
1	Sohar	21
2	A'Suwaiq	75
3	Barka	45
4	Salalah (Taaqa)	70
Total		211

II. Do these trees have any effects on the soil?

They don't have any effects on the soil; on the contrary, they actually prevent soil erosion.

III. Do these trees have any effects on the salinity and the acidity of the soil?

No effects; the plant actually adapts well with extreme conditions such as high salinity and extreme droughts.

IV. How do the Mesquite trees have an effect on the water?

The roots of those trees are vertical and can reach up to 20 to 50 meters to find groundwater and it absorbs huge amounts of it; which makes them very hard to be extracted off the ground.

V. What effects do these trees have on the other plants?

Competing vigorously with the other plants and eventually eliminates them.

VI. What kind of efforts made by the Sultanate to control the spread of such trees?

The Sultanate have launched a national campaign which aims to extract all the Mesquite trees, based on the Royal Decree no. 5/2017, which is still in process.

Job Contracts that are conducted:

No.	Region	State/Town	Contracts	Target area/ Number of trees
1	Dhofar	Murbat	2	3 km^2
2	Al Buraimi	Al Buraimi – Mahdhah – A'sunainah	2	5000 trees
3	Musandam	Daba' – Mad'ha – Bakha'	6	10,000 trees
4	Al Wusta	A'duqum (Wadi Madraka)	1	36 hectares
5	Al Wusta	A'duqum (Wadi Saay)	1	1 km^2
6	Al Wusta	M'hout	1	3 km^2
Total			13	

5) Conducting an online research to acquire a few of the past studies that can provide some information related to our topic.

- Implementing the soil protocol.
- Set a hypothesis to identify the effects of the Mesquite tree on the environment.
- Investigate the issues caused by the Mesquite trees.
- Choose the appropriate location to collect the samples from.
- Analysing the soil and water samples that are collected from the target location.
- The following roles are assigned to the students:
    1. Visit the target location to collect the samples.
    2. Implement the Soil Protocol.

3. Visit the local Agricultural Extension Centre.
4. Contact the Office of Environmental Conservation to identify the effects of this plant.
5. Contact the Agricultural Research Centre to collect information regarding the locations of which the trees can be found and the efforts made by the government to eliminate those plants.
6. Visit a local farm to investigate how it is affected by the Mesquite trees.
7. Conduct an awareness campaign with the help of the local municipality.
8. Present a few temporary solutions to reduce the effects of the issue at hand and how to adapt the problem in the meantime.

Research Method:

1- Geographical Location: Sultanate Of Oman – Al Musanna State.
2- Protocols Used:
   i. Soil Protocol:
      - ✓ Measure the acidity using (pH Meter)
      - ✓ Measure the salinity using (salinity stick).
      - ✓ Measure the conductivity by using the (conductivity stick).

Data gathering method:

1- Select the areas where Mesquite plants reproduce.
2- Select the geographical location using a GPS device.
3- Collect soil samples from the area where the Mesquite plants are found.
4- Measure the acidity, salinity and conductivity in the school's laboratory.
5- Analyse the recorded data.

Data gathering and analysis:

Salinity	1211 ppm
Acidity	9.4
Conductivity	1720 us
Rocks found	Yes
Roots found	Yes
Carbonate percentage	A lot
Soil Type	Sandy loam

Sample Data analysis:

1) The soil contains high salinity percentage, but despite that the Mesquite tree grows vastly across the area; and that is because of its ability to cope with high temperature environments, extreme droughts and high salinity percentage.
2) The soil is Alkaline.
3) The trees actually affect the general view in the area by causing the death of some plants in the nearby farms, as well as damaging the fences.
4) The trees also causes drought in the surrounding area which leads to killing nearby plants.
5) It gathers dangerous creatures such as snakes, lizards and other types of insects.
6) Drying seed pods fall immensely underneath the trees.
7) High density of leaves and branches clustered together.

Collection and analysis of past studies:

National Campaign for Mesquite Eradication:

- Through the past years, a record was kept for the number of Mesquite in Oman, and the spread was obvious in different states and regions.
- The Mesquite tree has become such a threat to the biological variation, especially in regions like “Dhofar” where it makes 84% of the local farms.
- An estimate was made regarding the number of Mesquite in Dhofar which was around 2.3 million trees, on a growing average of 5% per year.

Through researching the past studies and researches we have found the following:

A. The plants from the genus (*Prosopis*), commonly known as Mesquite come in many different types, the type we are investigating which is also a type of kind of Mesquite known as *Prosopis juliflora*. The stems of the plant consist of small pins and spikes, the leaves are compounded with about 12 to 20 leaflets which are light green. The flowers have a cylindrical yellow

appearance. The seed pods are striped, straight or curved, some of them are pressed and some are swollen, spongy and not open.

B. The Mesquite tree might not have an effect on the acidity of the soil, however, it can adapt really well to high salinity percentages and can cope with drought.

The advantages of the Mesquite plant	The Disadvantages of the Mesquite plant
One of the best solutions for soil erosion problems; it acts as a shield from the wind and tends to hold the moving sands, and also it protects the animals and populated areas from the vigorous hot seasonal wind (Al Kous).	It competes with the other plants to find groundwater; as its roots can reach up to 50 meters deep and 20 meters horizontally.
The tree was used as protection belt from desertification in countries like Sudan.	It stops the water flow in the valleys (Wadi).
Economical benefits from its products such as: Firewood, small wood logs and the hay produced from its horns, which is used in the rural areas and small villages.	There have been various complaints regarding this tree on how it affects the general health and the cause of allergies.
It helps to humidify the air and purify it from the dust.	The pins and spikes in its structure tend to harm the digestive channel of the livestock.

Results:

1) The Mesquite tree creates a green fence of overlapping parts of wooden trees which causes a reduction in the natural growing plants and the farmed plants. Add to that, it acts as a competitor to every green plant for water, nutrients and air.
2) The Mesquite plant often competes with other plants that have much greater uses such as: Acacia tortilis, Sidr (Ziziphus spina – christi) and other useful plants that can't compete with the Mesquite due to its ability to absorb the water and nutrients from vast distances in the soil and its ability to adapt quickly to extreme conditions.
3) The Mesquite spreads in the Sultanate at a fast pace because of its increasing production of the seeds and its ability for natural regeneration from the stems whilst the seeds remain suitable to plant for many years after. Those seeds usually grow under extreme circumstances of temperature, fertility and humidity.
4) The seeds usually spread through the animals that feed on the plant, and seeds spread with the animals' droppings and therefore grow in different places, and also from the seed pods that are taken by the rainwater flow to various places where they grow new plants. Moreover, people tend to move the soil that contains its seeds to different places for different reasons, and due to how quick it can grow and spread, it compete with the other plants in the most extreme conditions.

Recommendations:

1. The Mesquite trees are identified as harmful trees and have to be extracted and eliminated. The extraction and removal process in Oman is a difficult matter if we take into account the cost of the process as well as the time it will take for all the trees to be extracted, not to mention the biological loss that will result from removing a plant which adapts well to the extreme conditions in the Sultanate.
2. The Mesquite trees might not all be eliminated completely, however, there are a few ideas that can be considered in order to adapt to live with this plant, such as:

- ✓ Launching campaigns to extract those trees.
- ✓ Raise awareness through (Television, leaflets and brochures, lectures, radio, newspaper, social media).
- ✓ the spread of this plant by grind and crushing its seeds.
- ✓ Using some of the seeds for medical treatment (bruises and scars).
- ✓ Local source for firewood.
- ✓ Cultivating the tree and removing most of its branches prior, during and after the flowering season and at the same percentage we reduce the percentage of pollens released in the air.

- ✓ An alternative option is to spray the trees with a chemical compound that causes the flowers to fall before opening and releasing the pollens, which keeps the trees' shade and branched in tacked.
- ✓ Gradually commence with planting replacing trees instead of the extracted ones starting with the populated areas. Also, using the other types of local trees from the same genus which their pollens do not cause any allergies despite the long time they take to grow.
- ✓ And now, a new campaign was launched based on the Royal Decree 5/2017 to exterminate the Mesquite plant.

(Chemical & mechanical combating against the mesquite trees)

Conclusion:

As a conclusion, we are pleased to put our final touches with focus and care on a research that can eliminate the harms of the plant that acts as a threat on the environment in the Sultanate.

What makes our research distinguishing is illustrating and presenting the effects of the Mesquite tree (*Prosopis juliflora),* and focusing on the threats that are caused to the country in general which have not been mentioned in previous studies. Through our research we would like to send a message to all of the responsible authorities and ministries to combat and control those plants and collaborate to make the environment from such harmful plants.

Finally, we would like to advise all individuals; students, researchers and scientists to collaborate with the Ministry of Agriculture and the Ministry of Municipalities to obtain the exact the data and statistics of the plants habitat to help extract and exterminate.

References:

1. Bil'Aidi, Mansoor (March 6th, 2006), the mesquite tree is a plant that is harmful to agriculture but can be exploited (14 October): (http://www.14october.com/news.aspx?newsno=94861).
2. Al-Jazirah Magazine (February 24th, 2004) the gaseous tree, is it a blessing or a curse? (Al- Jazirah Magazine): (http://www.al-jazirah.com/magazine/24022004/huatna9.html)
3. Launching the National Campaign to exterminate the Mesquite trees/ Ministry of Agriculture.