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Globe environment program
Shahda intermediate and high secondary school

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In the Name of God the Merciful

وزارة التعليم
Ministry of Education

Study of Vegetation in Desert and Coastal Environment in Jazan Region

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Problem / plant cover vanishing in the western coast at shadah intermediate and high secondary school.

Hypothesis / the reason of the vanishing of the plant cover in the coastal province is the desertification phenomenon:

Research importance:

Owing to what Shadah and the neighboring coastal villages in Gazan province, suffer from the increasing desertification day after day especially with the obvious sand creeping for any visible and which became like a ghost threatening those villages and the agricultural lands, houses and the infrastructure, such as paved roads which is covered by huge sand.
We have made this research by the help of God first and last and then with the protocol studies of Globe program and devices and measurement tools.

Desertification concept:

• It is the impairment or the deterioration of the biological production ability for the earth which leads to creating desert circumstances. Or in another phrase, the deterioration of the land producing fertility, which for grazing or farms that depend on rain irrigation, or irrigated farms, which became less productive to a great extend. Or it may lose its fertility. 1 Hassan 1987 page 2

•Desertification is known as an operation to find new environmental system which walk toward the desert. In another meaning , another extension for the desert circumstances toward the semi dried province or semi wet. 2 dr Mohammed 1982 page 5.

•Desertification is known also as a well known phenomenon, (the desert creeping), or the tyranny of drought over agricultural lands or that is suitable for agriculture and it is a waste land and the cause is the long drought from one side, and the human irresponsible activity from the other one. 3 dr mMohammed1985 page 25

The effects of desertification:

• Low or loss of crops in the irrigated agricultural lands or tha is irrigated by rain water.
•Deterioration of plant cover in pasture and the exhaustion of food especially for cattle.
•Disappearance of forests result from the use of wood as source of energy.
• Reduction of groundwater and surface water and high rate of evaporation and the increasing of its salinity.
•The creeping of sand which plunge the lands that are useful for agriculture.
•The cause of an economic instability in the affected areas and the increase of the struggle about the sources and water and the increase of irrigation to other areas.
•The loss in biodiversity especially in the areas that are considered as centers for the kinds of main crops in the world such as wheat, barley and corn.

Causes of desertification:

The defect in the natural environmental system is considered on e of the most important causes of desertification, and the reasons could be as follows:

First/ natural reasons:

•The lessening of rain water in the last few years and the succession of drought . In the area we could see an obvious reduction which for the last years it was recorded very low rates which was 14 mm.

•The poorness of the plant cover lessens the evaporation and hence it lessens the fall of rain. It also leads to the soil drift and lessens its fertility.

•Drift of soil according to the season wind and shifting from its position to other positions.

Second / human reasons:

•The inhabitant pressure on the environment and it can be represented as follows:

•The attack of humans on the natural plants and pulling them. Dr Hassan 1981 page 2 - this is by cutting Arak tree for wood purposes from the its root mistakenly.

•The unfair grazing especially in the coastal area. Which leads to the loss of Arak plants, salam and samar and other desert plants.

•The bad use of the natural resources, like:

•Exhaustion of the groundwater and the soil.

•Decontamination of the ground water and surface water, and the soil share in the in the phenomenon of desertification.

•Unfair and undisciplined grazing cause the removal of plant cover and consequently the chance is adapted for the creeping desert.

Vanishing phenomenon of plant cover Study in the west coast.

The west coast consist of three different environments:

•A coastal environmental prevailed by salty coarse sand soil. It becomes higher whenever approaching the sea. Therefore small amount of plants grow here which can bear the soil.

•Desert environment, it is a soft sand soil full of dunes which removed most of the plants in the area.

•Mangrove environment, and this is a salty soil plunged by the sea water. The mangrove plants grow there. The climate in this area is dry because of the small amount of rain every year. Its rate is 14mm, according to Globe previous studies. From here we have started our research to know the reasons of why did the plant cover vanished in the coast area.

Kind of study:

The study included three different sites of the coastal province and to be studied scientifically to reach solutions.

Location of positions study:

Global positioning system.

The device which is used is a (GPS).

•Coastal environment (the beach). N 17.19 .78- E 42.40.52

•Desert environment. N 17.17.38- E 42.42.48

•Mangrove environment. N 17.21.45 - E 42.35.58

Coastal environment

1

Desert environment

2

Mangrove environment

3

Site study specialties:

The first site: It is an extension to a coastal environment, the rate of plant cover on it, is 65% representing plant community which is dominated by Arak (salvadora persica community).
See table # 7, which explain the feature quantity for the plant compounds in the site.
See table 8, which explains descriptive features for plant compounds in the site.
The second site: it is an extension of desert environment, the rate of plant cover on it, is 75 % , which represents the predominant Arak plant community, and there are other types like Sidir, Samar and dry herbage.
Salvadora Persica, Acasia Tortilis, Comiphora Gileadensis
See table # 9 which explains quality, quantity for plant compounds in the site.
See table # 10, which explains the descriptive qualities for plant compounds in the site.
Third site: It is an extension for mangrove environment and it was only studied from the descriptive side. The plant cover makes 100% from mangrove plant, and there are no other plants.
Avice mia Marina Community.

The time spent of this research:

- Field studies and data collection, from 1- 17/6/1434H
- Practical studies (experiment) 17- 28/6/1434H

Used materials in the study:

•Protocol search:

•Soil air temperature measurement device (digital hygrometer USA)

•Device *ph* for Hydrogen base n the soil .

•Tools for measuring soil field capacity. (field capacity glass bar- electric balance - electric oven)

•Tools for studying water content in the soil. (a bottle to keep the sample- electric balance - electric oven)

•Soil electric conductivity measurement device.

•Measurement tools for melting salts in the soil.

Plant compound study

This is done through a square system.

Statistic list.

This system depends on specifying numbers of squares in the environmental study and specifies the kinds and count the individual of each kind and the following hereunder is carried out in each square of the squares. After analyzing the results of the counting, we can count diversity as follows:

$$\text{Density} = \frac{\text{Number of individual of plant kind in all squares}}{\text{Plant kind density X 100}}$$

$$\text{Frequency} = \frac{\text{The number of squares which plant kind contains}}{\text{Square total number}}$$

Quantity study for the plant compounds.

$$\text{Abundance} = \frac{\text{The number of individual plant in the total squares}}{\text{The number of the squares containing the pant}}$$

$$\text{Relative density} = \frac{\text{Kind of density}}{\text{Total density}} \times 100$$

$$\text{Relative hesitance} = \frac{\text{Kind hesitance}}{\text{Total hesitance}} \times 100$$

Quantity study for plant compounds.

$$\text{Relative abundance} = \frac{\text{Kind abundance}}{\text{Total abundance}} \times 100$$

You can determine plant cover from the descriptive card and relative cover.

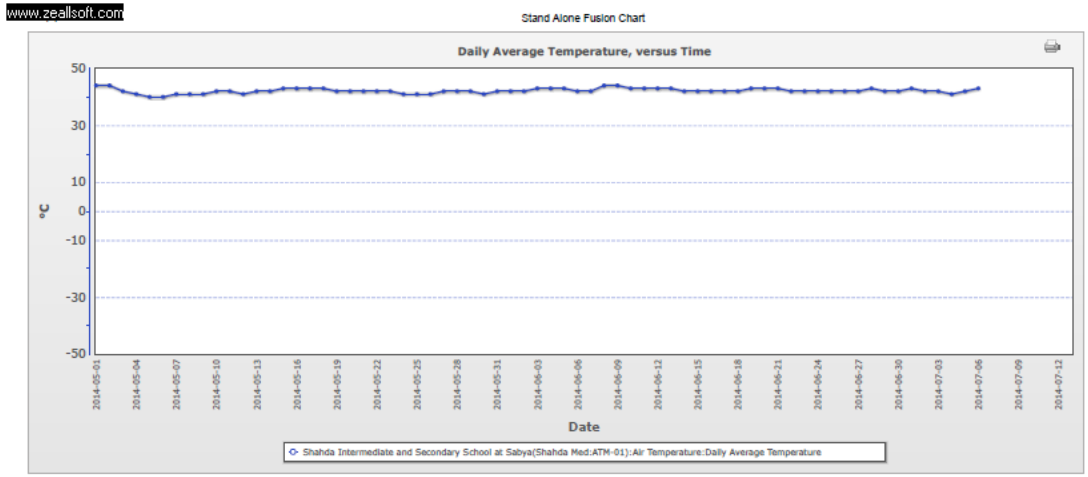
Importance = relative density + relative hesitance + relative abundance + plant cover.

Variation study about the air temperature rate for three positions of the year 2014

Used devices for measurement, digital hygrometer - USA.

Results

Shape (1) rate change in air temperature during the months of 2014.
From Globe site program for the school.
See the sketch



Results discussion:

From the diagram above the temperature highness during the last months of the year 2014 which increases the desertification and the creeping sand toward the neighboring habitant lands and the agricultural lands.

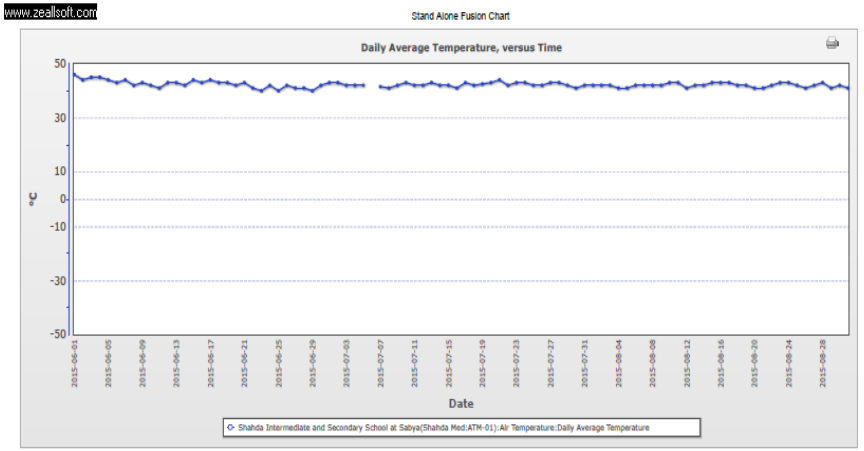
Air temperature rate variation study for the three sites 2013.

Used devices for measurement (7) dr Nadi 2009 page 9

Digital hygrometer USA

Results:

Shape #2, Variation in air temperature rate during the months of 2015 . From global site program for the school.



Results discussion:

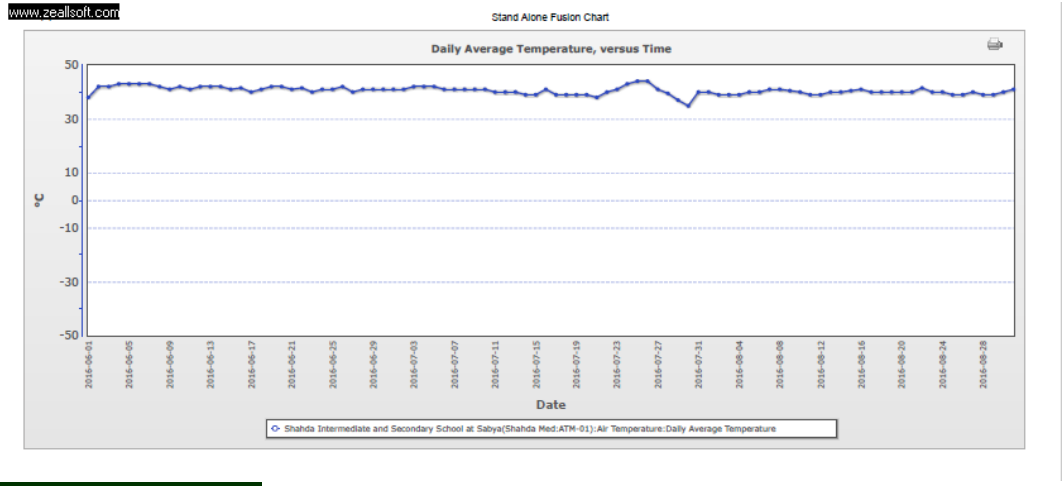
It appear from the diagram stated above, the highness of temperature during the previous months of the year 2015, that leads to the increase of desertification and the creeping sand toward the neighboring inhabitant lands and agricultural lands too.

Air temperature rate variation study for the three sites February 2013.

Used devices for measurement (7) dr Nadi 2009 page 9
Digital hygrometer USA

Results:

Shape #3, Variation in air temperature rate from 2016 From global site program for the school



Results discussion:

It appear from the diagram stated above, the highness of temperature during the previous months of the year 2016, for the month of February .

Comparison of air temperature rate variation between this year and the last year.

From previous diagram we notice the temperature in april 2014 which it was 38 degrees, for the maximum and 43 degrees for the minimum. In the same month of 2016, it was recorded the lowest degree 42 and the maximum one is 51 degrees.

Specification of soil water content:(8)dr Nadi 2009 page 14

Used items:

Samples from the soil – bottles with lids- delicate balance- electric oven.

Work steps:

1- Take samples of the soil from the three sites.•

•2- Put it in a bottle and cover it with its lid.

•3- Weigh 100 cubic centimeter of sample and then 1 put it in an electric oven at a degree of 1005 for 24 hours.

4- Weigh the sample after drying3

Counting methods:

Specifying soil water content = the elementary weight 1 – dry weight 2 X 100

Results: table # 1 soil water content quantity for the site.

M	Soil type	Primary weight (g)	Dry weight (G)	Water content (%)
1	Coastal soils	10	9,0	10,0
2	Soil mangrove environment	10	5,6	44,0
3	Soil desert environment	10	9,5	5,0

Result discussion :

The water content for the mangrove soil is the highest. It is because of twice a day sea tide which the water plunges the plant. Then the water contents for the coastal soil, and the lowest water content soil is the desert one.

Soil field capacity determination experiment. 9 dr Nadi 2009 page 20

Field capacity:

It is the ability of the soil to keep the water, and it is also known as the quantity of water in the soil, that is saturated with water after abundant water is filtered by earth gravity effect

The required tools:

A glass field capacity rod – delicate balance- electric oven – digging instrument.

1- bFill the glass field capacity rod with the coastal soil.•

2- Add water to the soil until it is saturated, and leave it to hang for 24 hours. Till the abundant water goes. 2- Take a sample of the soil from the rod and determine its wet weight 1 10 gm.

3- Dry the soil sample in an electric oven at a degree of 100 for 24 hours and determine it wet weight.2

4- repeat the same previous steps using the soil from the mangrove and desert.

Counting method:

$$\text{Field capacity} = \frac{\text{The weight of the missing water by dryness}}{\text{The dry soil weight}} \times 100$$

Results

Table # 2 soil field capacity, soil study

M	Soil type	Primary weight (g)	Dry weight (G)	Field Capacity)
1	Coastal soils	10	8,5	17,65
2	Soil mangrove environment	10	5,5	81,80
3	Soil desert environment	10	7,0	42,85

Result discussion:

We conclude from the above table that the mangrove soil field is the highest. Because it contains an analyzed organic materials. The coastal field capacity is less than the desert soil owing to the course sand which from the coastal soil, but the desert soil is form soft sand.

Soil hydrogen base determination experiment.

Required tools:

Device (ph) for hydrogen base measurement – delicate balance – a glass – distilled water – filtration paper – sucker – glassy rod.

Work steps:

- Weigh 10 gm from the coastal environment soil and put it in the a glass of 500 cubic centimeter.
- Add 100 cm cubic of distilled water.
- Shake well the sample of the soil in the water with the glassy rod to get the hangs of the soil (mud).
- Distill the soil sample using distilled paper.
- Put ph device in the mud and then take your reading after 30 seconds.

Table # 3 hydrogen base for the three sites soil.

M	Soil type	PH)
1	Coastal soils	8,25
2	Soil mangrove environment	6,86
3	Soil desert environment	7,28

Result discussion:

We conclude from the above table that the coastal soil (sabkha) has a astrong hydrogen base , because of the probability of carbons.

- The mangrove environment soil has a weak base of hydrogen, and its color tends to be gray. And its smell of sculpture. Because of the strong active bacteria, which makes the shoora plant analyzed quickly. Therefore it is a soil full of organic materials.

Soil salinity study in the two ways:11 Dr Nadi 2009 page 24.

Electric conductivity measurement experiment.

Shifting electricity

The electrical conductivity for the soil water solution increases according to the increase of the ionic salts .

Required items:

Electrical conductivity measurement device

A glass capacity 500 cubic centimeter – distilled water – filtered paper- delicate balance , sucker- rod for mixing

Work steps:

- Weigh 10 gm of coastal environment soil sample in the a glass of 500 cm^3 capacity.
- Add 100 cm3 of distilled water.
- Mix well the sample of the soil with the glassy rod. To get the mud of the soil.
- Filter the sample of the soil with the filtration paper. Then determine the hanging part with the electrical conductier for the soil.
- Repeat soil the previous steps for the mangrove soil and the desert soil.

The results:

Table # 4 the electrical conductivity to the three sites.

site	Soil type	Electrical conductivity
1	Coastal soil	0.85
2	Mangrove soil	7.5
3	Desert soil	0.02

Result discussion:

From the above table we conclude that the mangrove environment soil has the highest electrical conductivity. Owing to containing a great quantity of melting mineral items. The coastal environment soil has less electrical conductivity from the mangrove soil and that is the site high above the sea level. Regarding the desert soil, its electrical conductivity is weak.

Soil melted salts rate determination experiment. (12) dr Nadi 2009 page 24

Material required:

Device for determining the melted salts – glass – delicate balance – distilled water – filtration paper – sucker – glassy rod for mixing.

Work steps:

- Weigh 10 gm of coastal environment soil sample in the a glass of 500 cm_3 capacity.
- Add 100 cm3 of distilled water.
- Mix well the sample of the soil with the glassy rod. To get the mud of the soil.
- Filter the sample of the soil with the filtration paper. Then determine the hanging part with the electrical conductier for the soil.
- Repeat soil the previous steps for the mangrove soil and the desert soil.

Table No. (5)Ratios of dissolved salts in the soil of three sites

site	Soil type	Whole melted salts parts / millions ppm
1	Coastal soil	0.550
2	Mangrove soil	4.83
3	Desert soil	0.125

Results discussion:

From the above table the summary is that the mangrove environment soil has a high concentrated mineral melted salts which is about 15 times the amount of the whole mineral melted salts in the coastal environment soil. It is about 40 times of the whole mineral melted salts in the desert environment soil. The soil of the coastal environment has a high concentrated melted salts owing to the closeness of the sea level.

Desert environment soil has a small amount of melted salts.

Soil temperature measurement experiment (mid day = 12 o'clock.)

Used tools:

Soil temperature measurement device (falky- everet- USA)

Work steps:

- Specifying soil temperature at the depth of 10 cm for the coastal soil at mid day.
- We repeat the same to the soil of the mangrove and desert soil and we compare the results.

Table number (6) explains soil temperature for the three sites.

Environment	Soil temperature
Desert environment	45.0
Coastal environment	35.0
Mangrove environment	29.5

Result discussion:

We can conclude from the above table a big difference on the soil temperature recorded at a lo cm depth at mid day for three types of soils for site study. The desert environment has the highest temperature it is full of dunes. The coastal environment soil has somehow a high temperature because it is full of salts and its salinity increases when we approach the sea and its land is muddy (sabkha). For the mangrove environment it has a low temperature because it is plunged by the sea water.

The study of plant communities in the three sites selected for the study:

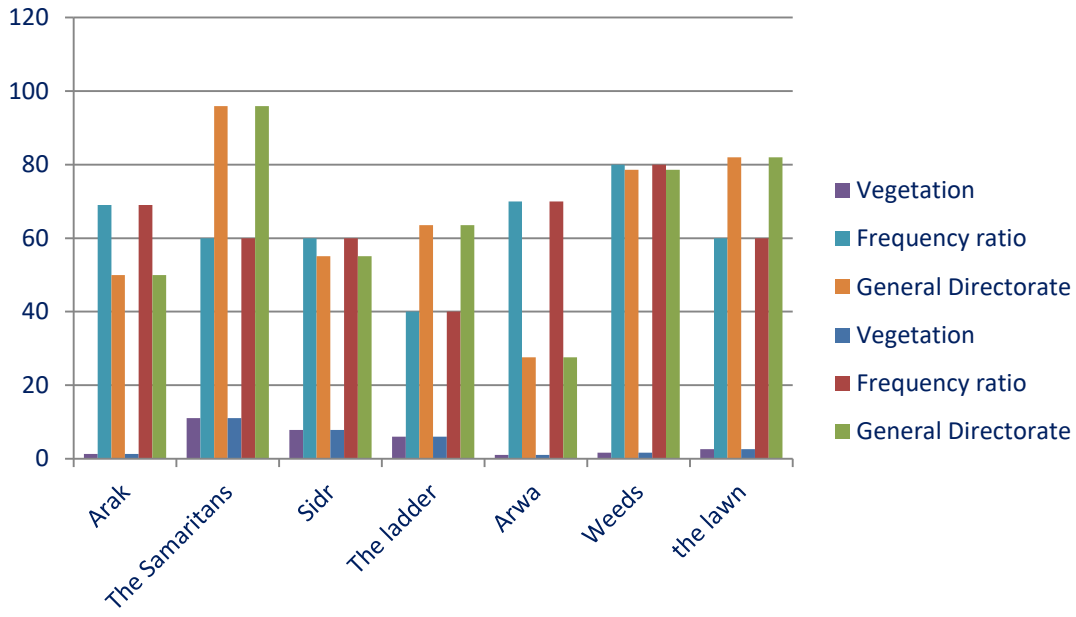
Table 7 - Qty qualities of the second site near the coast and it prevails plant arak :
. Site1 Dry Saline Soil Positioning (GPS N 17°.19.78 – E 42°.40.52.

Type Name	Number of squares										Density	Frequency	Cover	Relative Density	The relative Alnrdd	The relative cover	Important value
	1	2	3	4	5	6	7	8	9	10							
Senna holocersia	1	2	1	-	-	2	-	-	1	-	1,5	30	7,12	1	7,84	2,5	6,86
Aerva juvanica	-	-	-	-	3	2	-	1	-	1	3,5	40	5,41	1,32	4,48	1	6,80
Salvadora persica	5	3		2	4	5	6	2	4	3	60	21.10	3.74	3.36	4	70.43	60
Ziziphus spini- Christi	-	2	-	-	2	-	-	1	-	-	3,5	20	7,43	1	2,24	1,25	4,49
Acacia tortilis	-	2	-	5	-	-	4	2	3	-	1,14	40	6,81	2,64	4,48	1,13	8,25
Acacia ehrenbergiana	4	—	2	8	10	–	–	3	4	3	2	70	5,63	5,7	7.84	1	13.91

* Discussion of Results

After studying the site turned out to that arak clan plant is prevalent and there are other plants such as lotus, peace and hills and Alaray the other, but the vegetation is missing, where there are only some dry

Diagram showing vegetation status at (a)



It is noted in Figure 1 that the density of the vegetation of the cactus plant was the highest in site A, 95.92%, and the seder plant by 55.1%, unlike the other species produced at this site, ranging from 49.94. This is due to the dominance of this site

The study of plant communities in the three sites selected for the study:

Table 8: shows the descriptive qualities of coastal plants for the second site:
Positioning (GPS N 17°.19.78 – E 42°.40.52 Site1 Dry Saline Soil
Phenotypic characteristics of the species in the desert region: Khodary (gr) Dry (dr) flowered (fl) fruitful (fr) his gestures (sel).
Life form: tree (tr) shrub (shr) herb Muammar (P.her) the grass around me (A her)
Sovereignty: Bags (dom) facilities rule (co.d) the common (com) AC (FRU) rare (rare)

Type Name	Phenotypic					Life form				Sovereignty				
	gr	dr	fi	fr	sel	tr	shr	p.her	A he	dom	Co.d	com	fru	rare
Senna holocersia	√		√				√			√				
Salvadora persica	√			√			√			√				
Ziziphus spini- Christi	√			√			√					√		
Acacia tortilis	√		√				√						√	
Acacia ehrenbergiana	√						√						√	
Aerva juvanica	√		√						√		√			

The study of plant communities in the three sites selected for the study:

Table 9 - qualities Quantity plants desert environment:

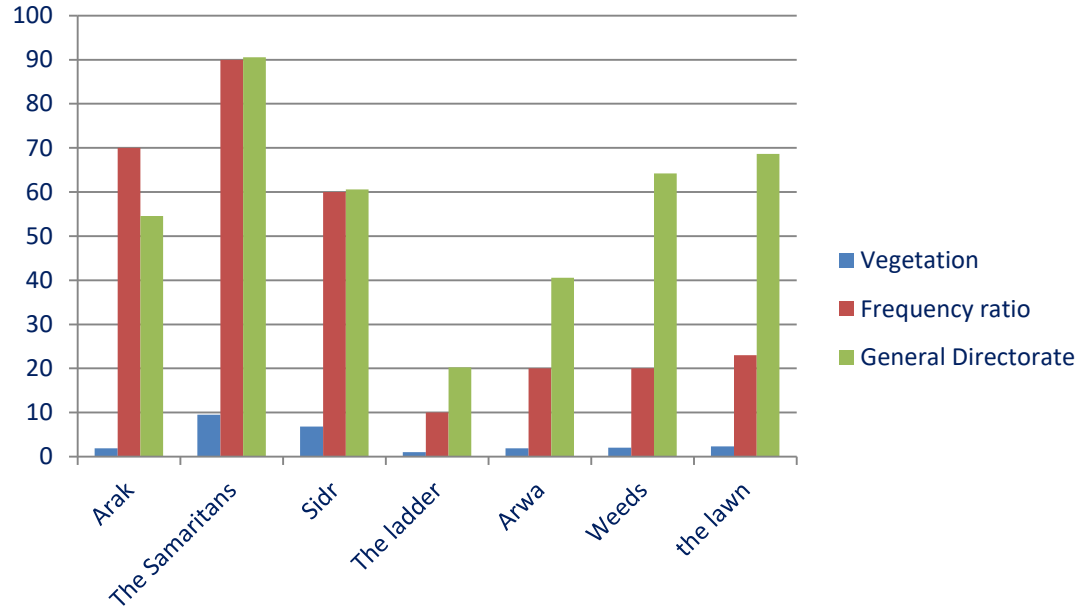
Positioning (**GPS / N17°.17.38 – E 42°.42.48** . Site1 Dry Saline Soil

Type Name	Number of squares										Density	Frequency	Cover	Relative Density	The relative Alnrdd	The relative cover	Important value
	1	2	3	4	5	6	7	8	9	10							
Senna holocersia	1	2	1	-	-	2	_	-	1	-	1,5	30	7,12	1	7,84	2,5	6,86
Aerva juvanica	-	-	-	-	3	2	_	1	-	1	3,5	40	5,41	1,32	4,48	1	6,80
Salvadora persica	5	3		2	4	5	6	2	4	3	60	21.10	3.74	3.36	4	70.43	60
Ziziphus spini- Christi	-	2	-	-	2	-	-	1	-	-	3,5	20	7,43	1	2,24	1,25	4,49
Acacia tortilis	-	2	-	5	-	-	4	2	3	-	1,14	40	6,81	2,64	4,48	1,13	8,25
Acacia ehrenbergiana	4	—	2	8	10	–	–	3	4	3	2	70	5,63	5,7	7.84	1	13.91

* Discussion of Results

After studying the site turned out to that arak clan plant is prevalent and there are other plants such as lotus, peace and hills and Alaray the other, but the vegetation is missing, where there are only some dry grass

Diagram showing vegetation status at (B)



It is noted in Figure (2) that the density of the vegetation of the cactus plant was the highest in site B, reaching 9.55%, unlike the other species produced at this site, ranging from 1.22- 6.55.

The study of plant communities in the three sites selected for the study:

Table (10): shows the descriptive characteristics of desert plants for the first site:
Positioning (**GPS / N17°.17.38 – E 42°.42.48** . Site1 Dry Saline Soil
Phenotypic characteristics of the species in the desert region: Khodary (gr) Dry (dr) flowered (fl) fruitful (fr) his gestures (sel).
Life form: tree (tr) shrub (shr) herb Muammar (P.her) the grass around me (A her)
Sovereignty: Bags (dom) facilities rule (co.d) the common (com) AC (FRU) rare (rare

Type Name	Phenotypic					Life form				Sovereignty				
	gr	dr	fi	fr	sel	tr	shr	p.her	A he	dom	Co.d	com	fru	rare
Senna holocersia	√		√				√			√				
Salvadora persica	√			√			√			√				
Ziziphus spini- Christi	√			√			√					√		
Acacia tortilis	√		√				√						√	
Acacia ehrenbergiana	√						√						√	
Aerva juvanica	√		√						√		√			

CONCLUSION::

Through the study of these three sites, we find that:

1- The mangrove environment not affected by desertification because its proximity to the sea water Which inundation and we find Rate abundance of mangrove plant 100% .

2- The desertification phenomenon in the coastal environment Nearby the sea 2 km in this environment no vegetation because of increment sand dunes and a little rain and Increased salts Mineral .

3- The phenomenon of desertification in the desert environment and these Is agricultural soil but There is no vegetation and Increases the danger of this phenomenon every day even on the houses, farms and paved roads .

Recommendations:

1- Maintaining the renewable natural resources (soil, water, vegetation, domesticated livestock and land) to take preventive and remedial measures appropriate and sustainable management.

2- To grow new crops more suited to the environmental conditions.

3- sand dune stabilization and work on the formation and intensification of appropriate vegetation cover prevents erosion or soil erosion.

4- Use a method of deferred grazing in some areas for period of time to allow the vegetation to recover vitality

5- control the desertification movement through land degradation due to salinity and sand encroachment and low amounts of water quantity and quality.

6- spreading environmental awareness among people, especially farmers and livestock owners and herders.

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