Evaluation of Environmental Situation on the Vegetation and Strategy of Its Developing in a Reserve of Msallata at Libya

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Abstract

This investigation was concerned with the reserve area at Msallata (Libya). During the study period (two years), 368 of different plant species were collected and classified. They belong to 223 genera and 58 families. It was noticed that of these plants, 309 species, 181 genera and 49 families were belong to the dicotyledones, while the monocotyledons were represented by 54 species, 38 genera and 5 families. As well as, 4 different species of Gymnosperms belong to 3 genera and 3 families were found. It was noticed that there was a new plant species among the flora of Libya was discovered for the first time in this study. The discovered species was Bupleurum gibrataricum which belongs to the family "Apiaceae". Morover, 15 different plant species were collected for the first time from the North Western part of the country. Also, some rare plant species were found such as Globularia alyum within the family "Globuluriaceae and Pacncratium maritimum of the family Amaryllidaceae. Also, Cheilanthes vellea (pteridophyte) was collected for the first time from the North Western part of Libya.
It was noticed that the vegetation contains 80.1% herbs, 16.3% Shrub and 3.6% Trees. The present research show that soil consisted of sand and clay particles with PH ranged from 8.3 to 8.6 and the total salts did not exceed 89.6 ppm and thus the studied soil was not salinity. Also, this soil was poor in organic matter (0.84% on the average). The ecological study revealed that the vegetation was intensive reached to 78% in some localities of the position area. Also, data indicated that the most dominant species was Stipe tenacissima, followed by Pinus halepensis which was widely spread in location A and B in the East side of the reserve and a few ones were found in the South part. It was found that some Shrub plants were widely spread in the reserve such as Cistus parviflorus and Thymus capitatus. Three different plant habits were found namely: Herbs, Shrubs and Trees. The most dominant herbaceous plants were Linum strictum, Coronilla scorpioides , Anagalis arvensis , Valantia hispida , Plantago spp., Ranunuculus aslaticus and Scilla peruviana. It could be concluded that the most common plant species in the flora of the reserve was Stipa tenacissima, so it could be considered its name as Stipe population.

Introduction

Libya is characterized by a wide ground floor, being 1,670,000 km² and most of which are desert, located between linear 9.58–25 East and North latitude 20-33. The number of plant species in Libya is estimated at about 1800 – 2000 plant type, distributed on more than 800 genera and gathered into to 147 families **(Jafriand El-Gadi, L. 1977 – 1987)**. This number is small when compared with the vast area and most of that area is deserts with poor vegetation. Through the establishment of reserves, it could be preservation that exists. Various countries of the world practice the founding of natural reserves of different kinds to avoid the risks of environment destruction and the disappearance of plant and animal species. The number of protected regions in the world reached to more than 35.000 and they cover more than 8% of landmass, which amounts to 13.8 million km². The different Arab countries have also turned to establish of natural reserves but those are still too low if compared to the needs. The names of the reserves differ from one Arab country to another. It is worth mentioning that natural reserves are not only a natural continuation of the protection of environment and natural resources. The purpose of establishing the natural reserves is to preserve the local animal and plant genetic species which has both economical and political dimensions.

They serve as a laboratory and a center for the scientific research in the area of endangered species protection and efforts for their development and preservation in order to restore the natural balance. Protection of flora and fauna within the reserves is a unique and privileged place for a tourist attraction and support to the natural economy (Daabis, 2002). The Libyan authorities have initiated numerous legislations, regulations and rules that aim to protect the environment regardless of the balance.

Numerous offices, science centers and specialized committees have been established. In order to preserve the balance of the environment and protect the nature, Libyan office in charge made a certain number of decisions to support and develop reserves and to increase their numbers. Also, to re-introduce the species that had existed before they disappeared as well as begin the practice of introducing new species after studying them, and learning about their adaptability to local conditions. Because of the above information, the new established reserve of Msallata (Libya) has been chosen as the research subject.

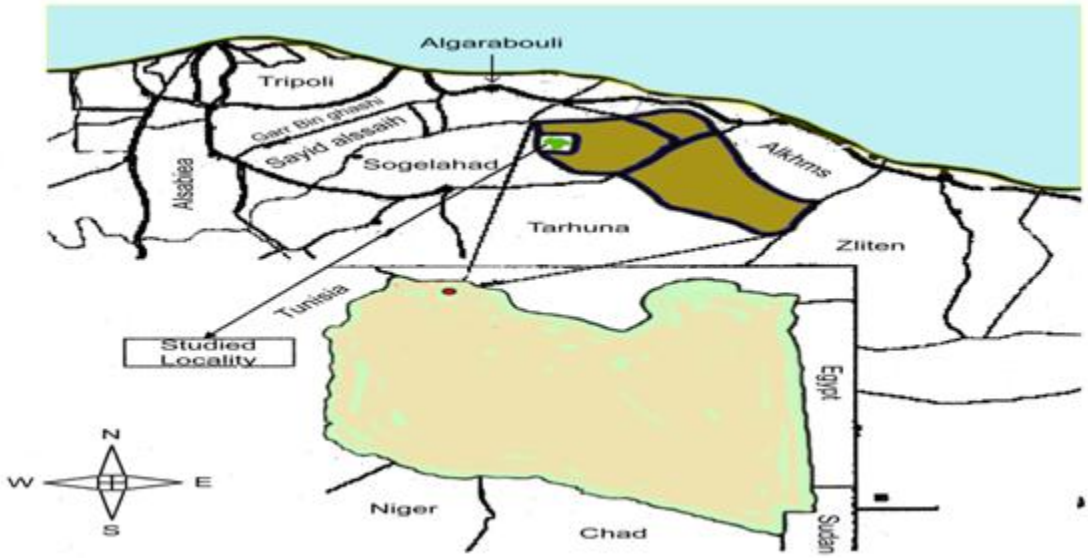
Aims of the research

1- Survey and classify all the present plants in the reserve and determination the rarely and dominant plants. Also, the diagnosis of the non-registered plants in the Libyan encyclopedia.
2- Study the environment of the reserve and this includes study the percentage of vegetation and the density.
3- Determine the composition of vegetation in the reserve by putting a base for the information according to the field trips.

Materials and Methods

The studied locality was determined according to the map of the reserve (Fig.1.A) which divided into five positions (A, B, C, D, E) to facilitate the study (Fig.1.B) whether for classification or environmental survey. This study was carried out through two years (2016–2017)

Fig. (1.A) A map of studied locality in Msallata



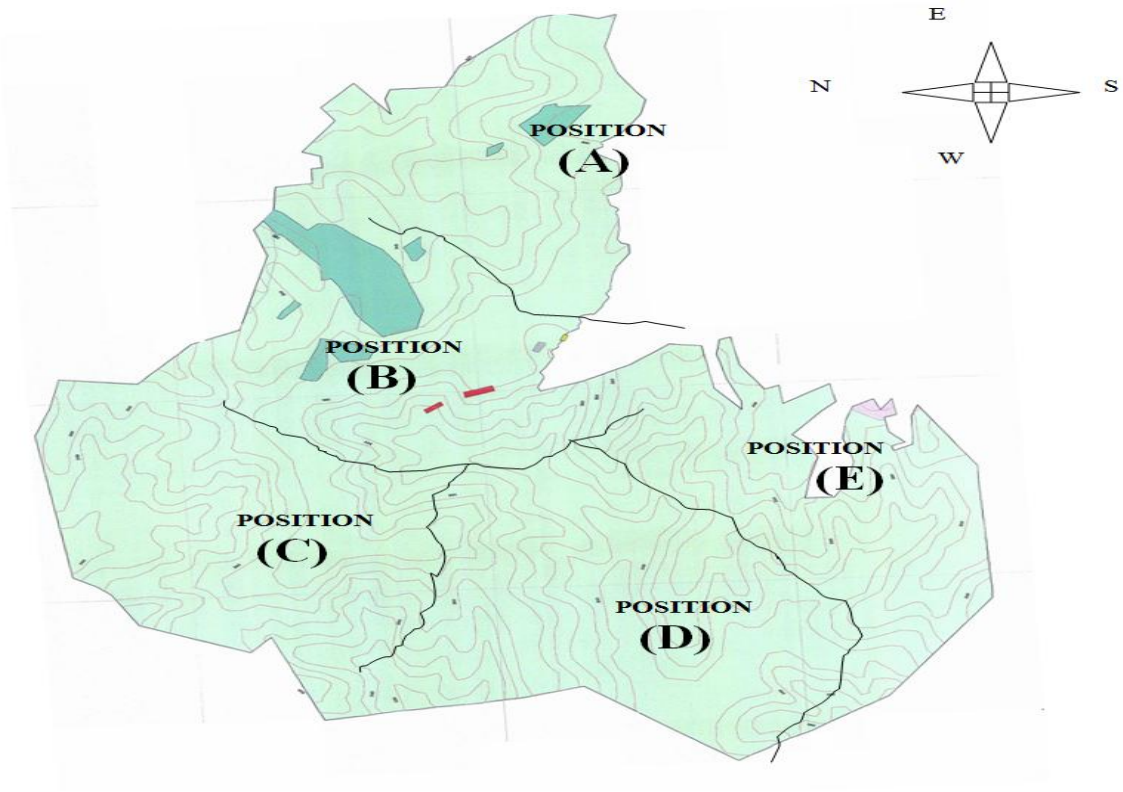
Source: Engineering projects office at Msallata

Classification study

Plant samples collection:

Plant samples were circle collected from the studied locality through a year's seasons and the plastic bags were used to keep the collected samples (All the plant or parts of it) depends on of plant type. The samples were pressed by mineral pressors and the pressors were kept in the sunny place for eliminate the moisture. The samples were inspected many times for a period of 10 days. Then, the samples were installed on specific papers by silicon. The plant samples were identified and classified at the Science Faculty, Tripoli University using a light microscope according to **El-Gadi and El-Toife, 1989 and Boulos, 2002.**

Fig (1.B) The five positions of studied locality



Finally, the samples were kept at the laboratory of Faculty of Arts and Science, El-Margib University at El-Khoms.

Environmental study

Line transects method was employed for the environmental study according to **Shukla and Chandel, 1989**. Fifty lines in each tested position were investigated and all the data were kept in a specific table related to this method (Table 1).

***Table 1: Information of the line Transects method**

Location ( )

Trip No. ( ) Line transects method Date:

Species composition	Line number									
	1	2	3	4	5	6	7	8	9	10
Vegetation (%)										

***Shukla and Chandel, 1989.**

By repeating all the aforementioned procedures, it could be study the following environmental statistical parameters

The vegetation:

This parameter was determined according to **Moore and Chapman, 1989** as follows:

$$\text{Total vegetation for each line} = \frac{\text{The total area of all the species that transected with the line}}{\text{Length of the line}} \text{ X100}$$

$$\text{Total average vegetation of the position} = \frac{\text{Sum .of the vegetation of all plants in all lines}}{\text{Number of used lines}}$$

The density

The density was estimated by the following equation according to **Al- Rowali, 2003.**

$$\text{Density (plant / line)} = \frac{\text{Numbers of plant species in all lines}}{\text{Number of used lines}}$$

$$\text{Relative density} = \frac{\text{Density of plant species}}{\text{Density of all species}} \text{ X 100}$$

Method of soil samples collection:

At 30 cm depth of ground surface, soil samples were collected by an Auager to study soil type (texture), soil PH, percent of total salts and organic matter. The samples were randomly collected from different points of each position and mixed together to be homogenous. Then, the samples were transferred to the laboratory for air drying. One kg of soil was used for determination all the aforementioned parameters in each position.

Determination of soil texture:

The Hydrometer was used to estimate the soil texture through usage of triangle soil texture.

Determination of soil PH:

PH meter was used according to **Black 1965** to determine the soil PH.

Determination of organic matter percentage:

The percentage of organic matter was estimated according to the method of **Jackson 1958**.

Determination of total salts content:

Total salts content was determined using Electrical Conductivity Apparatus as ppm **(Black, 1965).**

Results and Discussion

The results of the present research divided into two parts : the first one dealing with classification study and the second part includes an environmental study.

*1- **Results of classification study:***

This part is concerned with survey of plant species at Msallata reserve. Three hundred and sixty eight of plant species were collected and classified. They belong to 223 genera and 58 families. It was noticed that 181 genera include 309 species of dicotyledones and these represent as 83.9% distributed on 49 families. Also, 38 genera include 54 species of monocotyledones and these represent as 14.8% distributed on 5 families. In addition, three genera include 4 species of Gymnospermae and these represent as 1.09% distributed on 3 families (Table 2).

Table (2): Vegetation at studied locality

Grop		Family	Genus	Species
Pteridophytes		**1**	**1**	**1**
Gymnospermae		**3**	**3**	**4**
Angiospermae	Dicotyledones	**49**	**181**	**309**
	Monocotyledons	**5**	**38**	**54**
Total		**58**	**223**	**368**

Also, results (Fig . 2) show that the most dominant plant species in the studied locality were Grass plants with the rate of 80.1%, while the shrubs represent by 16.3% and the trees at the rate of 3.6%.

The genus "Plantago" was considered the largest distributed species (contains 10 species) followed by Silene (contains 7 species) and each of Euphorbia, Astragalus and Helianthemum contains 6 species (Fig. 3)

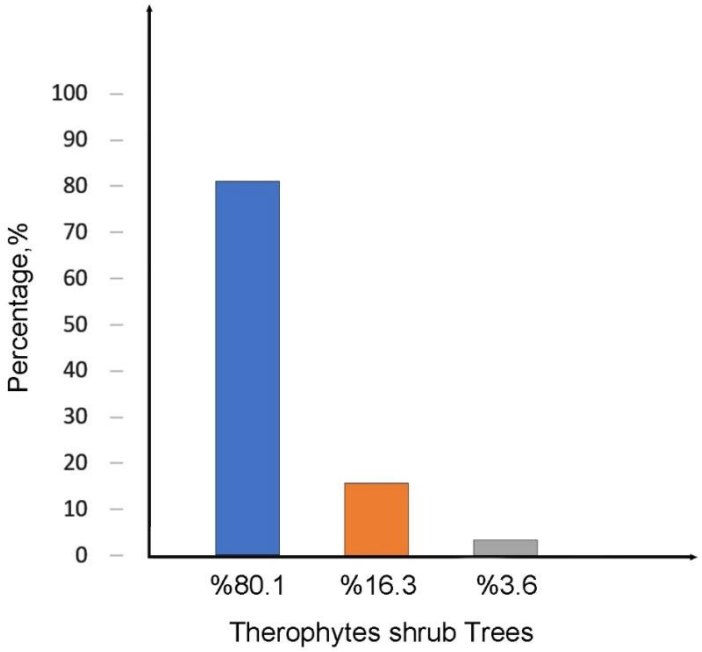


Fig. (2) Percentage of vegetation at studied locality

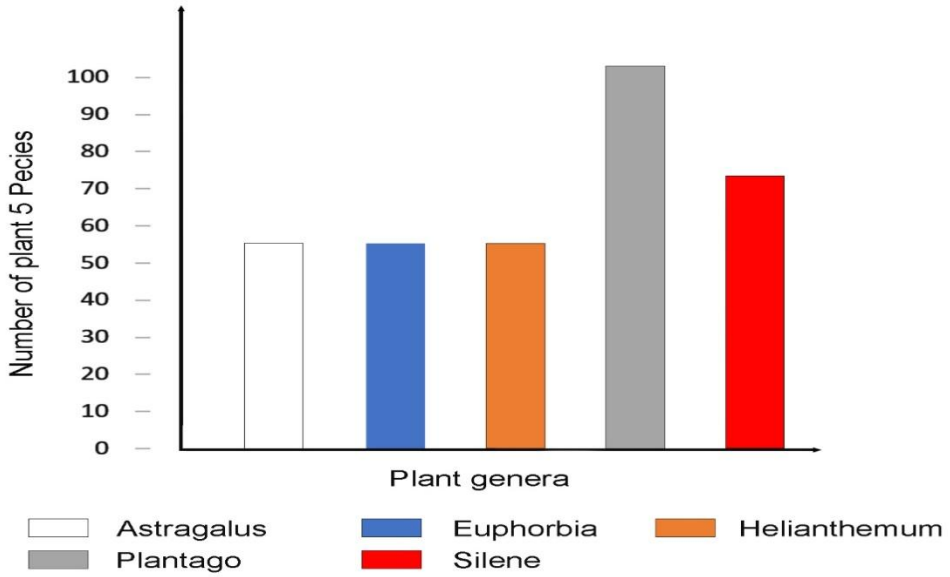


Fig. (3): Numbers of plant species of largest collected plant genera

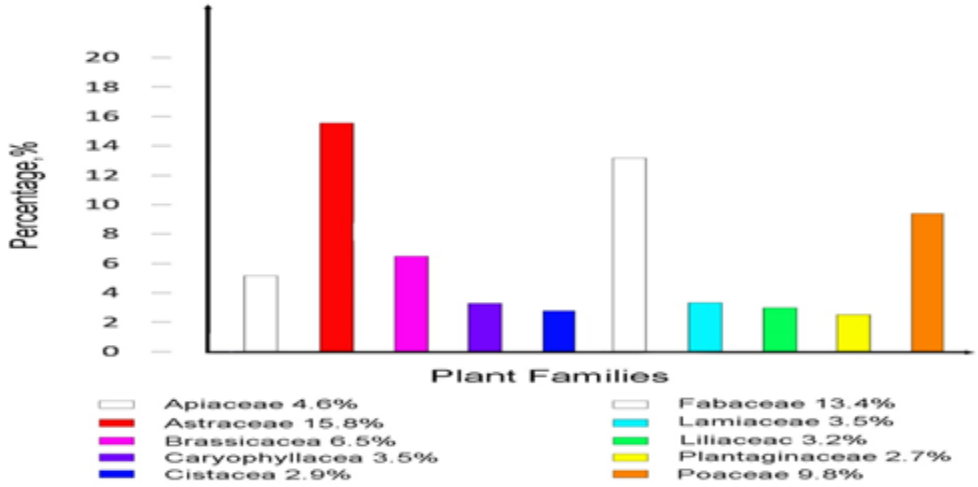
The biological differentiation of the vegetation in the studied locality was appeared through the calculation percentage of each family relative to the total registered number. It was found that the family "Asteraceae" was considered the most dominant at Libya since the number of plant species in that family reached to 58 species with the rate of 15.8% , followed by family "Fabaceae (49 species) at the rate of 4.6% (Fig.4)

Table (3) Number and percentage of plant species of each family

Family	Number of plant species	Percentage of plant species
Anacardiaceae	2	0.54
Apiaceae	17	4.6
Asclepiadaceae	2	0.54
Asteraceae	58	15.8
Alliaceae	4	1.08
Amaryllidaceae	1	0.27
Boraginaceae	8	2.17
Brassicaceae	24	6.5
Caryophyllaceae	13	3.5
Chenopodiaceae	1	0.27
Cistaceae	11	2.9
Convolvulaceae	4	1.08
Crassulaceae	5	1.36
Cuscutaceae	1	0.27
Coridaceae	1	0.27
Capparaceae	1	0.27
Caesalpinaceae	1	0.27
Cupressaceae	1	0.27
Dipsacaceae	2	0.54
Euphorbiaceae	7	1.9
Ephedraceae	2	0.54
Fabaceae	49	13.4

Fumariaceae	3	0.81
Geraniaceae	7	1.9
Globulariaceae	1	0.27
Hypecoaceae	1	0.27
Illecebraceae	4	1.08
Iridaceae	1	0.27
Lamiaceae	13	3.5
Linaceae	2	0.54
Liliaceae	12	3.2
Malvaceae	3	0.81
Mimosaceae	1	0.27
Moraceae	1	0.27
Myrtaceae	1	0.27
Oleaceae	1	0.27
Oxalidaceae	2	0.54
Orchidaceae	2	0.54
Pinuaceae	1	0.27
Papaveraceae	2	0.54
Plantaginaceae	10	2.7
Plumbaginaceae	2	0.54
Polygonaceae	5	1.3
Primulaceae	3	0.81
Poaceae	36	9.8
Ranunculaceae	7	1.9
Resedaceae	1	0.27
Rhamnaceae	2	0.54
Rubiaceae	10	2.7
Rutaceae	1	0.27
Rosaceae	1	0.27
Santalaceae	1	0.27
Scrophulariaceae	5	1.3
Solanaceae	2	0.54
Sinopteridaceae	1	0.27
Urticaceae	2	0.54
Valerianaceae	4	1.08
Zygophyllaceae	2	0.54

Fig (4): Percentage of plant species of the ten largest collected plant families



2- Results of environmental study:

In this part, five positions and fifty lines in each one were evaluated for the composition of vegetation inside the area of reserve. The method of line Transect was used. Data in Table (4) and illustrated in Fig. (5) show That *Pinus halepensis* was grew in the first and second position, while the Therophytes plants were disappeared due to its competition on the sun light. Also , data reveal that the average vegetation was 78.28, 76.46, 78.8, 75.44 and 78.42% in the first second, third, fourth and fifth position, respectively.

Table (4): Comparison between five positions of the studied locality for vegetation and density

Plants that contain more of vegetation			Density	No. of species that appeared under lines	Percentage of vegetation	Studied locality
Therphytes	Shrubs	Trees				
Anagallis arvensis Scilla pervriana Velerrnella chlorodonata Scorzonera unduata	Stipa tenacissima Thymus capitatus Cistus parviflorus Rosmarinus officinlis	Pinus halepensis	16.76-0.02 plant/line	113	78.28%	First Position
Scorzonera unduata Linum strictum Scilla peruvriana	Stipa tenacissima Cistus parviflorus Rosmarinus officinlis Thymus capitatus	Pinus halepensis Acacia cynophylla	14.58-0.04 Plan/line	127	76.46%	Second Position
Linum strictum Valantia hispida Scilla peruvriana Rannuculns asiaticus Bunium fontanesii	Stipa tenacissima Thymus capitatus Genistia acanthoclada Rosmarinus officinlis Cistus parviflorus	-	16.16-0.04 Plant/line	132	78.8%	Third Position
Anagallis arvensis Scilla peruvriana Linum strictum Rannuculns asiaticus	Stipa tenacissima Rosmarinus officinlis Genistia acanthoclada	Rhus tripartita	18.84-0.06 Plant/line	147	75.44%	Fourth Position
Linum strictum Rannuculns asiaticus Coronilla scorpioides Phagnalon rupestre	Stipa tenacissima Thymus capitatus Rosmarinus officinlis	Rhus tripartite Zizphus lotus	20.2-0.04 Plant/line	143	78.42%	Fifth Position

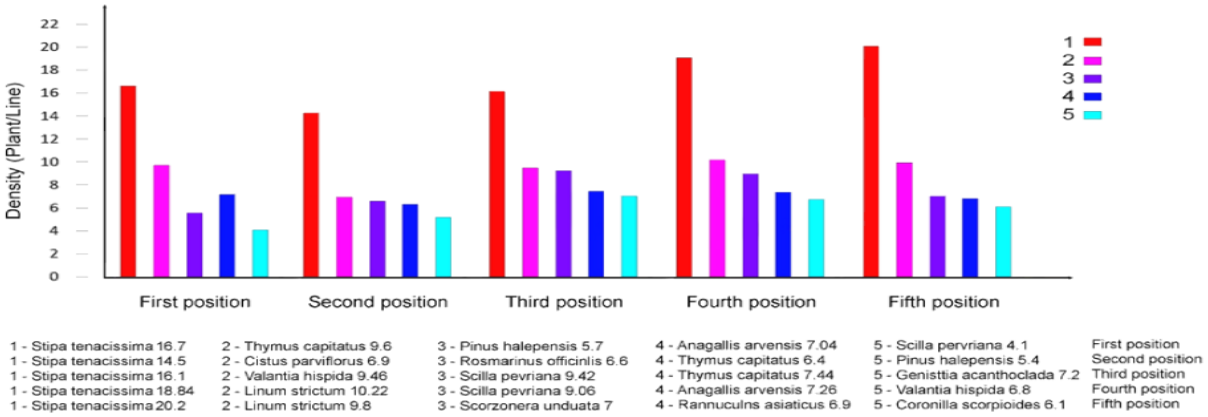


Fig. (5) Plants that have more vegetation and density in the studied locality

The total number of plant species that recorded lower the lines was 156 belong to 40 plant families. It was found that *stipe tencissima*was more dominant in the study locality and its highest density was found in the fifth position (20.2 plant / line) and its lowest value was recorded in the third position (16.1 plant / line). The highest density of among Tree plants was for *Pinus halepensis* in the first and second position since its density reached to 5.7 plant / line and 5.4 plant / line, respectively.

For the Colonist plants, *Thymus capitatus*had 9.6 plant / line in the first position and 6.4 plant / line in the second position. These figures were 6.9, 6.6 plant / line for *Cistus parviflorus* and *Rosmarinus officinalis*, respectively.
It was found that the Therophytes plants had a lower vegetation and density in the first and second position due to present of high plants , while in the third position, the forests trees were declined. The highest vegetation and density was found for Shrubs plants e.g. *Stipe tenacissiona* (16.16 plant / line) , *Thymus capitatus* (7.4 plant / line) and Genistia acanthoclada (7.22 plant / line).

The highest density was found for Therophytes plants in the third position (e.g. *Scilla peruvriana* and Valantia hispida. In the fourth and fifth position , it was found that the trees were decreased or disappeared (e.g. *Pinus halepensis*) since the percentage of vegetation in the fifth position was 78.42%.

In some lines, the percentage of vegetation was reached to 100% *(e.g. Linum strictum)* [10.22. plant / line] in the fourth position and 9.8 plant / line in the fifth position and for *Anagallis arvensis*, being 7.26 plant / line. For *Coronilla scorpioides*, *Valantia hispida* and *Rannuculns asiaticus*, these values were 6.9 plant / line for each one (Fig. 5).

By using ANOVA Table and Least Significant differences (LSD) , it was found that there were a significant differences of plant density between the studied positions

From the obtained data, it could be concluded that the more appeared and dispersal plant families, on the line were Asteraceae, (22 plant species with the rate of 14.1%, Fabaceae (20 plant species with the rate of 12.8% Poaceae (16 plant species with the rate of 10.2%). and Brassicaceae (11 plant species with the rate of 7.05%). From the environmental study it could be concluded, that *Stipe tenacissima* was more dominant in the reverse of Msallata.

Data in Table (5) reveal that the soil texture of the studied locality was sandy clay by 25-30% of locality area and 70-75% stone. High percent of sand and a decrease of silt and clay were noticed in the fourth position and this reflects the vegetation percent was 75.44%. This value was a lower if compared with other positions. Low percent of sand was recorded in the first and second position (78.28 and 78.46%, respectively). This effect of soil texture reflect its influence on the physical and chemical characters of the soil. Also, results indicate that soil PH ranged from 8.3-8.6 (i.e. semi alkaline soil).

The low value of PH was found in the first position (8.3), while the high figure was noticed in the fifth position (8.6). This means that soil PH affects the vegetation. The obtained data were in the agreement with those recorded by **Abdalla and Mohamed**, **(1993).**

Table (5): The chemical and physical properties of the soil of the study area

Locations	Sand %	Silt %	Clay %	Texture	PH	Total salts PPM	O.M %
First A	62.4	29.0	8.6	Sand silt	8.3	96.0	0.740
Second B	61.4	29.5	9.1	Sand silt	8.4	89.6	0.638
Third C	63.4	29.0	7.6	Sand silt	8.4	94.6	0.756
Fourth D	66.4	27.5	6.1	Sand silt	8.5	89.1	0.605
Fifth E	63.4	30.0	6.6	Sand silt	8.6	97.00	0.840

Dealing with total salts, results showed that the soil in the all studied positions was not salt and the percent of this parameter was ranged from 89.1 ppm in the fourth position to 97.0 ppm in the fifth position, since the percent of vegetation was higher in the first, third and fifth position. On the other hand, the low percent was found in the fourth position (equals low percent of vegetation) if compared with other four positions.

It was found that the salt in the soil affects the dispersal of vegetation. Concerning with organic matter, results indicated that this parameter ranged from 0.60 to 0.84% (This means a low content of organic matter in that soil). The obtained data were in the line with those recorded by **Abn Mahmoud and Ramadan, 1993**, who stated that the Libyan soil had low content of organic matter. The high value of this parameter, i.e. 0.84% was found in the fifth position and the percent of vegetation in that position reached to 78.42%, while the low amount of this parameter, i.e. 0.60% was recorded in the fourth position and the percent of vegetation in that position was 75.44%. It could be concluded from the aforementioned data that the soil in the studied locality was a homogenous.

Recommendations

From the present study, it could be concluded the following points:

1- Nothing of any works or activities and / or procedures that destroy or damage and / or deteriorate the natural environment or wild life.
2- Search about other environmental studies that utilize other methods for studying the composition of vegetation.
3- Recommendations for other classified and environmental studies in the different reserve areas at Libya to keep the rarely species or that close to disappear .
4- Follow up the rarely plant species by all the workers in the reserve administration e.g. *Bupleurum gibraharicum / Copporis spinosa* and *Globularia alypum* and keep them from any other abnormal works by local or external training circles for the workers in the reserve to increase their efficacy and scientific experiences

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