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Vegetation cover composition and seed bank study of beach sand dunes in Karkurah coastal area, east of Libya.

Estudio de la composición de la cubierta vegetal y del banco de semillas de las dunas de arena de la playa en la zona costera de Karkurah, al este de Libia.

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ABSTRACT

The present work was carried out in the coastal sand dunes along the beach of Karkurah area, about 100 km south west of Benghazi, during (January to August 2008), in order to study the relationships between vegetation and environmental factors. Vegetation and soil were sampled in 40 quadrats representing the physiographic variation and different habitat types in the study area. The chemical and physical characteristics of soils were determined for 8 samples and there were significant differences in soil variables like *p*H, Mg, Na, k, soil texture. Density, constancy and mean cover for each 26 perennial species were calculated. 75 plant species identified, belonging to 34 families, and 68 genera, and deposited at Botany department herbarium, Faculty of science, University of Benghazi. The constancy of perennial species showed the dominance for *Retama raetam*, *Nitraria retusa*, *Ammophila australis*, *Lycium schweinfurtii, Ononis natrix*. The life form determined, and the most common Therophytes constituted (48%), Chamaephytes (29.3%), Phanerophytes (13.3%) and Cryptophytes (9.3%). Species richness was calculated as average number of species per number of quadrats, and the value was (1733/40) = (43.3), The Simpson index value was (0.85). Total number of seeds in all quadrats was (5536 seeds/m²), the highest number was (323 seeds/m²) in the quadrat which was located on stabilized sand dunes, while the lowest number of seeds was (53 seeds/m²) quadrat was located on dunes facing the sea. The enhanced anthropogenic pressure was in form of quarrying activities , collection of medicinal plants, agriculture, and over grazing are imposing a serious threat to the diversity in the area in the near future.

Keywords: Sand dunes, Libyan vegetation cover, seed bank, Libyan coastal zone, *Retama raetam*

RESUMEN

El presente trabajo se llevó a cabo en las dunas de arena costeras a lo largo de la playa de la zona de Karkurah, a unos 100 km al suroeste de Bengasi, durante (enero a agosto de 2008), con el fin de estudiar las relaciones entre la vegetación y los factores ambientales. Se muestrearon la vegetación y el suelo en 40 cuadrantes que representan la variación fisiográfica y los diferentes tipos de hábitat en el área de estudio. Las características químicas y físicas de los suelos se determinaron para 8 muestras y hubo diferencias significativas en las variables del suelo como pH, Mg, Na, k, textura del suelo. Se calculó la densidad, constancia y cobertura media para cada 26 especies perennes. 75 especies de plantas identificadas, pertenecientes a 34 familias y 68 géneros, y depositadas en el herbario del Departamento de Botánica de la Facultad de Ciencias de la Universidad de Bengasi. La constancia de especies perennes mostró el predominio de *Retama raetam, Nitraria retusa, Ammophila australis, Lycium schweinfurtii, Ononis natrix*. Se determinó la forma de vida, y las terófitas más comunes fueron (48%), chamaefitas (29,3%), fanerófitas (13,3%) y criptofitas (9,3%). La riqueza de especies se calculó como el número promedio de especies por número de cuadrantes, y el valor fue (1733/40) = (43,3), el valor del índice de Simpson fue (0,85). El número total de semillas en todos los cuadrantes fue (5536 semillas / m²), el número más alto fue (323 semillas / m²) en el cuadrante que se ubicó en dunas de arena estabilizadas, mientras que el menor número de semillas fue (53 semillas / m²) cuadrante estaba ubicado sobre dunas frente al mar. La mayor presión antropogénica se produjo en forma de actividades de extracción, recolección de plantas medicinales, agricultura y pastoreo excesivo que imponen una seria amenaza a la diversidad en el área en el futuro cercano.

Palabras clave: dunas de arena, cubierta vegetal libio, banco de semillas, zona costera libia, *Retama raetam*

INTRODUCTION

Libya has a total area of about 1.76 million km². It is bordered by Mediterranean Sea at the north, by Sudan, Chad and Niger at the south, by Egypt at the east, by Algeria and Tunisia and in the west. Libya characterizes by land geographic variation, represented by coastal plains that vary in width, the northern mountains include the Jabal al Akhdar (Green mountain) in the east and Jabal Nafusah in the west, the internal depressions that cover the center of Libya, the oases, the southern and western mountains. These variation lead to variation and diversity of Libyan vegetation cover. The desert climate (hot and dry) is dominant in the Libyan land except for the northern coastal strip which is characterized by a mediterranean climate, the temperature in the northern areas ranges between 5°c in winter and to about 35°c in summer , and the, rainfall in the coastal area ranges between 100 mm. and 350 mm. per year (Saeed, *et all.*, 2019).

The Libyan coast extends from Musaid in the east at the Libyan and Egyptian borders to Ra´s Ajdir in the west at the Libyan and Tunisian borders, with a distance of more than 1,900 km. Sand dunes, wherever there are huge amounts of wind-borne sand, with the right place to accumulate, are made up around or between vegetation covers. Sand dunes play an important role in the evolutionary dynamics of the ecosystem of many desert and coastal systems (El-Bana *et al.,* 2003) and rate of sand transmission varies depending on the wind speed affected by the local topography of the area. The coastal dune system can be divided into areas that reflect its location along the beach and the type, age and height of the vegetation cover (Cakan, *et al.,* 2011).

The vegetation cover proves the dunes through distinctive capabilities such as regrowth after burial in sand (Del Vecchio *et al.,*2015), these plants act as geomorphological barriers that play an important role in the development of typical sand dunes. The variation in efficiency of the accumulation of sand among plant species leads to a variation in the morphological properties of sand dunes. These plant species have the ability to resist marine spray and burial with sand through their formation of radical systems that greatly help to build sand grains and stabilize the developing sand dunes (Houle, 2002). With development of these sand dunes there are opportunities for some capable plant species to invade these dunes, which have some adaptations such as the formation of waxy leaves, thick, succulent and formation of some moisture growths adjacent to the surface of sand to preserve the sand surface. Both vegetation and wind can affect the topography of the sand zone (Durán and Moore, 2013). The coastal dune system is a dynamic system that forms a link between the sea and land, characterized by the gradual movement of soil or sand deposits, salinity or marine spray. This gradient is responsible on the biological zonation in areas parallel to the coastal line (Araujo, *et al.,* 2002). There are evidences show that zonation can be caused by burial process, because distribution of plants is linked to sand sedimentation (Botha and Porat, 2007). Plant species that cannot withstand with increasing of burial by sand are excluded, leading to the formation of areas covered by sedimentation tolerant plant species.

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Succession of sand dunes vegetation cover occurs in a sequence that begins with plant communities adjacent to the beach through unsteady sand dunes and then fixed sand dunes covered with grass (Provoost, *et al.,* 2011). Sequencing of succession stages that occur on sand dunes can be identified by estimating total vegetation coverage, plant height, coverage of the dominant plant species (Dech and Maun, 2005). Some studies have observed that the size of fixed sand dunes is linked to the life forms of plants and the smallest dunes are often occupied by grasses (Nordstrom, *et al.,* 2009).

Biodiversity has become an important measure of ecosystem assessment, and studying species diversity along the succession gradient is important to understand the mechanics of re-coverage by succession on unsteady sand dunes in many dry and degraded lands (El-Bana et a., 2007). The accumulation of sand, salt spray and plant chemistry of the habitat affects the quality of the micro-climate of seeds and seedlings, which vary along a short topographic gradient (Jones, *et al.,*2008). Burial by sand can reduce the rate of seed germination or inhibit growth of short seedlings and small plants (Maun , 2007).

This study aimed to analyze coastal sand dunes vegetation cover, flora identification and seed bank study during different seasons in Karkurah, east of Libya.

MATERIAL AND METHODS

Study site: The study area is located on beach coastal zone north west of Benghazi at 100 km distance, ׳15 °20 ׳ ،00 °20 Longitude and 31´ 30°, 31´ 15° latitude. Geological studies have suggested that the coastline at Karkurah is a narrow bay characterized by its abundant and sandy nature, with the emergence of many sand dunes covered with dwarf shrubs close to the seashore .

Figure 1: Map of the study area.

Soli analysis: Soil samples were collected from four sites: seafront sand dunes, sandy dunes in front of the beach, fixed sand dunes and saline marches, at depth of 0 – 10 cm, during winter spring and summer seasons. Samples collected in plastic bags, number of sample and collection site were recorded on each bag, chemical and physical characters of soil samples were analyzed in soli lab analysis of Benghazi.

Floristic composition: Plant specimens collected during their flowering periods for classification, from different sites in the study area. The specimens were pressed after collection immediately by using woody press and papers, papers were changed every day until drying. After drying, the specimens were fixed on herbarium sheets, notes like botanical name, family, local name, habitat, locality, collectors, collection number and date of collection were recorded on the herbarium sheets. Freezing at – 30 °C for 24h was done for the specimens to kill any insects or any microorganisms. The taxonomic identification was done according to flora of Libya (El- Gadi and Jafri,1976- 1989) and flora of Egypt (Boulos 1999 – 2005) and deposited in Cyrenaica herbarium, Botany department, University of Benghazi.

Vegetation cover analysis: Vegetation sampling was carried out from January to August 2008 according to the modified quadrate method of Braun Blaunquet, (1951). Forty (5 x 5m) quadrated were performed on a transect established along the study site with length of 1475m, from the seashore until the salt marches. Quadrates were chosen based on the vegetation cover zonation. Height above sea level was measured for each quadrate by GPS instrument. Perennial and annual species were recorded, but the perennial species formed the permanent frame of the vegetation. Percentage of vegetation cover for each species in each quadrate was measured. The constancy was calculated for each species by counting the quadrate that contained on the species. Plants life forms were classified according to Raunkiaer, (1934).

Diversity index: From quadrate data, species richness was calculated as ratio total number of species in all quadrates. Simpson index was calculated according to the next equation:

$$D=1- \Sigma[(n/N)^2]$$

N is total number of species , n is number of individuals of each species

Seed bank study: Four soil samples at depth 0 – 10 cm from small iron quadrate with $0.25m^2$ total area were collected from inside each quadrate. Pooled together to form one composite sample. In the lab, soil samples were spread over paper sheets, dried by air, passed through 4mm sieve, then packed the rough part to separate big seeds. The smoother part treated by chemicals to separate small seeds. 200 g of soil sample were added to 20g of calcium carbonates dissolved in 1L of distil water, the mixture filtered by funnel covered by filter paper and dried by air. The big seeds were kept in petri dishes and counted directly, while the small seeds were counted under binuclear microscope, the total number of seeds was calculated for each quadrate.

Statistical analysis: One way of variance statistical analysis was used to test differences of means of seeds number between the quadrates by SPSS software.

RESULT AND DISCUSSION

Soil analysis: The tables (1) show results of eight soil samples analysis were selected from four different locations of the study area (sea-facing sand dunes, beach front sand dunes, fixed sand dunes, saline marches). The soil texture in all samples was dominated by sandy nature, with the proportion of sand (88% - 97%) in the samples collected from the first three sites, higher than proportions of both silt and clay.

The soil was generally alkaline but varied by the location of the samples, with PH values ranging from (8.54) in collected samples from the sand dunes facing the sea (mobile sand dune) to (10.56) in the samples collected from salt marches. The electrical conductivity showed a wide range of heterogeneity between different locations, with the highest values (47.8,13.13) micromoz/cm in samples collected from the salt marches, and the lowest two values (0.41.0.22) in the samples collected from fixed sand dunes. The two highest values of total dissolved salts (TDS) were (14471, 6769) in samples collected from salt marches and the lowest value was (121) in samples collected from sand dunes facing the sea.

Extractable cations concentrations (sodium, potassium, calcium) and sodium adsorption coefficient were higher in samples collected from the sea -facing sand dunes, salt marches, beach front sand dunes, but less in samples collected from fixed sand dunes.

Life form of study area flora

Life forms ranged from annual to perennial plant species (Fig. 2), with dominance of therophytes annual species which represented by 36 species (48%), then chamaephytes with 22 species (29.9%), then phanerophytes tall perennial plants with 10 species (13.3%) and cryptophytes subterranean plants with 7 species (9.3%).

Flora composition and identification: Seventy-five plant species samples were collected from the study area during flowering periods for about a year, belonging to 34 families and only one gymnosperm species. 74 angiosperm species represented to 58 dicotyledons species and 16 monocotyledons species. Poaceae, Asteraceae, Chenopodiaceae Apiaceae, Brassicaceae, Fabaceae were the largest plant families in the study area and they form (13.3%, 9.3%, 8%, 6.7%, 5.3%), respectively and these results were consistent with Abbas, *et al.,* (2008). Grasses formed only (16%) of the collected species, while the dominance was for the woody perennials shrubs and under shrubs by (44%) and this was agreeing with Abd El- Ghani, *et al.,* (2003). Contained (62%) of the genera only one plant species, which indicates to the diversity of species and the diversity of morphological traits, but the lack of relative abundance. This diversity ranges from more general characteristics such as (monoecious, dioecious, monocotyledons, dicotyledons, annuals, perennials) to more specialized traits such as the formation of thorns, hairs, smooth surface, fused petals, separate petals. The plant species in the study rea were distinguished by the morphological adaptations such as; pillow shape, long root system, rhizomes formation that have the ability to penetrate sand quickly, thick, waxy and succulent leaves, the formation of thorns and bristles, the pale color of the plant surface. Some species extend their flowering period to the summer, such as *Silene succulenta*.

Table 1: Physical and chemical characters of soil collected at depth 0 – 10 cm from study area.

Soil Characters	Sample number and collection sites							
	Sand dunes facing the sea		Sand dunes in front of the beach		Fixed sand dunes		Salt marches	
	1	2	3	4	5	6	7	8
Sand %	97	96	88	96	97	93	87	84
Silt %	1	1	7	2	1	4	6	9
Clay %	2	3	5	2	2	3	7	7
SO_4 mg/L	27	42	10	10	13	17	122	197
Cl mg/L	709	1064	1144	1118	78	23	4078	1720
HCO_3 mg/L	52	82	49	89	85	92	61	119
Ca mg/L	90	220	220	28	28	30	441	3206
Mg mg/L	28	88	49	20	4	2	73	243
K mg/L	21	38	24	5	16	6	53	305
Na mg/L	345	460	420	13	35	16	2047	8740
Sodium Adsorption coefficient	8.02	6.62	6.66	6.64	1.65	0.76	23.76	40.05
Electric Conductivity μmhos/cm	2.56	4.16	3.68	0.186	0.412	0.22	13.13	47.8
*p*H	8.8	8.6	8.5	9.2	9.0	8.7	8.9	10.6
Total dissolved solids (TDS) mg/L	1463	1825	1892	1210	217	140	6769	14471

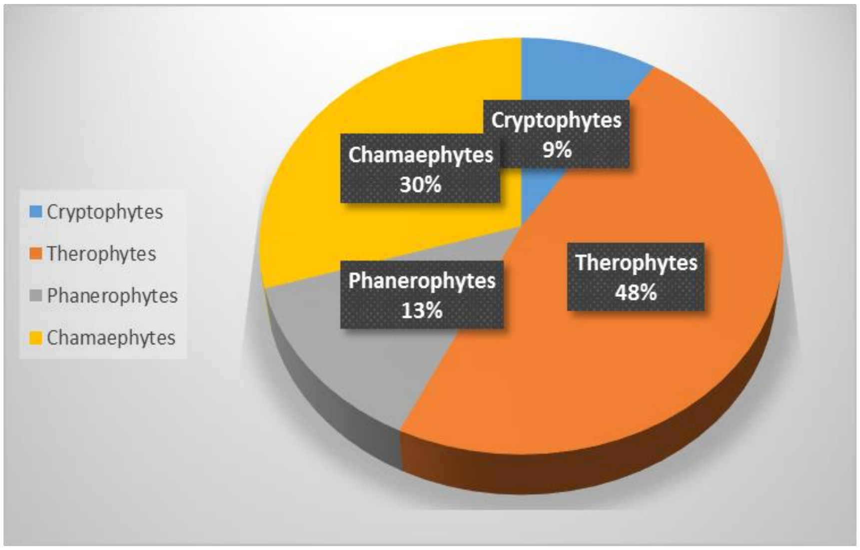

Figure 2: Floral life forms percentage

Vegetation cover analysis: The current study shows differences in the local distribution of the vegetation from the seashore at (2m) to the salt marsh at (1m) above sea level. Based on the plant coverage values for 26 perennial plant species in the study area, the largest value was (28.8%) for *Retama raetam*, followed by *Nitraria retusa* (20%), *Ammophila australis* (14.5%), *Lycium schweinfurtii* (10.3%), *Ononis natrix* (9.95%). *Retama raetam* is a large, smooth, desert bush, containing evergreen stems modified to protect the lower parts of the plant from sunlight (Mittler, *et al.,* 2001). *Retama raetam* ripens at the end of spring or early summer and most of its fresh ripe fruits fall with the beginning of summer (June). This species reigns in the Mediterranean coastal plains, whether with fixed or unstable sand. It shows thin needle leaves in the winter and stripped of leaves in the summer. Through the study noted that the period of *Retama raetam* blooming was during December to April, but this conflicted with Izhaki, *et al.,* (1997) who stated that its flowering takes place from February to March. Pnueli, *et al.,* (2002) mentioned that *Retama raetam* is a C3 drought- tolerant plant has a mechanism for seed and bud dormancy with help of some specialized proteins that support it to withstand at prolonged periods of drought and heat.

Ammophila australis is distributed in coastal sand dunes successfully as this plant works to install and build growing dunes by sand collection and linking them together with the fibrous rhizome system. It is widely known as an example of plants with desert adaptations that make it lives in conditions more than other plant species. However, its seedlings die soon after a short period of germination, and according to (Yang et al., 2012) the main causes of seedlings death are drought and excessive burial of sand. It was found through the study that *Ammophila australis* dominates the mobile sand dunes and the bare dunes, and this is agreeing with Preston, *et al.,* (2002), Carling and Swart (2007) and explains its limited distribution in the study area.

Several plant species, through the study, showed differences in their spatial distribution. It turns out that both *Nitraria retusa* (20%) and *Zygophyllum album* (4.5%) occupy the sand dunes facing the sea, while *Juncus acutus* (6%) *Juncus maritimum* (4%) occupy Salt depressions and salt marshes, which explains the low coverage rate for these species in the study area. *Thymelaea hirsuta* plant settles the non-saline sand flats and unstable sand dunes of the study area, and it is a common species in the Mediterranean coastal regions, this is agreeing with what mentioned in El-Bana, *et al.,* (2002a). The root system of both *Thymelaea hirsuta* and *Pituranthos tortuousus* are of little depth in dry, rocky soil with little moisture, and in previously cultivated areas with barley. *Echichilon fruticossum* was found in abundance of sandy sand surfaces with an average coverage (6.5%), and *Inula crithmoides* (4%), *Phragmites australis* (2%), *Salsola vermiculata* (3.5%) were abundant on salt marshes. The species *Lotus polyphyllos* (1.5%) *Silene succelenta* (0.5%) *Euphorbia paralias* (4.2%) was associated with those facing the sea.

Phoenix dactylifera (6.3%) was cultivated a long time ago and became a natural cover in the study area through regrowth and stability. Annuals and short-lived perennials prevailed in the study area and the percentages of life forms differed according to the habitats of plant species. According to what El-Bana, et al., (2002b) mentioned that short-lived plants have the ability to resist high levels of salinity, soil moisture and the wide range of temperature variation. The presence of high levels of annuals and subterranean plants on the sand dunes may be related to their ability to resist drought, sand accumulation and grazing. The study area was characterized by a high diversity of vegetation cover, including shrubs with photosynthetic stem *(Retama raetam)*, desert dwarfing shrub (*Zygophyllum album*), evergreen shrubs *(Thymelaea hirsuta)*, spiny branched shrubs *(Lycium schweinfurthii, Nitraria retusa*), shrubs with stored roots for water and nutrients, and perennial weeds *(Ammophila australis, Saccharum ravennea, Juncus acutus, Juncus maritimum).*

It has been observed that the activity of annuals was highest during the rainy season, and they are abundant between the interstitial distances of sand dunes and perennial plants.The most common annual species in the study area were *Lotus cytisoides* and *Senecio gallicus*. *Cakile aegyptica*, *centaurea dimorpha*.

Low water content, low nutrient availability, unstable sand dunes, sea spray, soil salinity and runoff operations, all these conditions are not desirable for many stages of life for plant species, especially the seedlings formation stage, which leads to the effect on the composition of the plant community and may be the main reason of the lack plant density in the areas adjacent to the sea shore. Species richness in all quadrates was estimated as (1733 species /40) = 43.3, and Simpson index value was 0.85.

Seed bank estimation: Seed density was calculated in all quadrates and the total number of seeds was (5536 seeds / m²). The seed bank ranged from (53 - 323 seeds / m²) compared to the total number of individuals (2653). The total seed density of quadrates varied between different locations, which may be attributed to the morphological differences of sand dunes locations. The highest number of seeds was (323 seeds / m²) in quadrate 27, which was located on fixed sand dunes at (7 m) of sea level and at a distance (600 m) from the seashore, and the number of individuals was (26) belonging to only one species which was (*Retama raetam*). While the lowest number of seeds was (53 seeds / m²) in quadrate 5, which was located on the dunes facing the sea at (5 m) of sea level and at a distance (300 m) from the seashore and the number of individuals was 23 belonging to 4 species.

It was observed that the seed density increased in the summer while it decreased in the winter and with the beginning of spring. That may be attributed to the germination of seeds of annuals in winter, these results were in agreement with both Moroccan, (2006) and El-Mugassbi, (1999).

There was a significant difference in the number of seeds between quadrates ($P < 0.05$) with mean of (138 seeds / m²). It was observed that the percentage of small seeds is higher than large seeds, and this may be due to grazing or water run-over or by influencing of wind intensity (El-Barasi and Mohamed. 2007). The highest number of individuals was (245) in the quadrate (23) belonging to (12) species while the number of seeds (70 seed/m²), this square is located at (6 m) of sea level and at a distance (450 m) from the seashore.

The highest seed density was for *Retama raetam*, *Lotus polyphyllos, Helianthemum lavandifolium*, *Zygophyllum album*, *senecio gallicus, Erodium sp.* and *Pituranthos tortuousus* with the knowledge that these species were the most dominant species in the study area. They are able to spread in dry and semi-dry environments, due to their ability to resist degradation and most of them are unpalatable to animals (Al-Maghraby, 2006).

Seed germination rate of *Retama raetam* is very low. According to Mittler et al., (2001) R. raetam uses an acclimation strategy of ‘partial plant dormancy’ in order to survive the dry season. The seeds of the *Erodium* sp have long beak-like appendages that enable them to spread easily by wind and grazing.

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Table 2: Species number, individual number, total vegetation cover percentage, seed bank and the height on sea level of each quadrate.

Quadrate site	Quadrate number	Number of species	Number of individuals	Total vegetation cover percentage %	Seed bank / m^2	Height on sea level (m)
Sand dunes facing the see (0 – 100 m) from seashore	1	3	31	42	63	6.00
	2	4	60	26	67	7.00
	3	3	14	38	79	6.00
	4	10	89	29	97	5.00
Sand dunes in front of the beach (100-500 m) from seashore	5	4	23	22	53	5.00
	6	5	12	29	100	7.00
	7	5	20	35	140	8.33
	8	2	36	21	106	6.00
	9	3	29	33	162	8.33
	10	4	35	49	104	8.33
	11	7	84	37	139	12.0
	12	8	190	53	142	2.00
	13	3	19	27	114	2.00
	14	4	13	48	99	4.33
	15	9	90	32	75	7.00
	16	4	115	30	141	5.00
	17	3	99	38	281	17.0
	18	3	12	37	232	18.3
	19	7	62	31	143	3.00
	20	4	37	39	108	3.00
	21	9	201	45	103	3.00
	22	7	39	35	75	7.00
	23	12	245	29	70	6.00
	24	10	71	36	235	10.3
	25	9	109	38	146	5.00
Fixed sand dunes and salt marches (500-1400 m) from seashore	26	2	9	44	120	8.33
	27	1	26	82	323	7.00
	28	9	121	61	220	5.00
	29	2	136	16	300	7.00
	30	7	234	24	160	7.00
	31	1	55	17	137	7.00
	32	1	1	82	133	7.00
	33	2	23	36	108	5.00
	34	2	37	50	94	7.00
	35	2	13	40	127	6.00
	36	2	64	29	123	1.00
	37	2	9	39.5	115	1.00
	38	4	89	41	165	6.00
	39	4	97	33	240	1.00
	40	3	14	26	85	1.00

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Table 3: List of plant species collected from the study area, * indicates to cultured specis

I-Gymnospermae	*Senecio gallicus chiax in vill.*
Ephedraceae	- Resedaceae
Ephedra alata Decn	*Reseda alba* L
Π- Angiospermae:	- Vitaceae
A- Monocotyledonae	**Vitis vinifera* L
- Arcaceae	- Aizoaceae
Phoenix dactylifera L	*Aizoon hispanicum* L
- **Poaceae**	*Mesembryanthemum crystallinum* L
Ammophila australis (mabille) porta et Rigo	- Solanaceae
Lolium loliaceum (Bory & chaub) Hand Mazz.	*Lycium schweinfurthii* Dammer
Desmazeria philistaea (Bioss.) H.scholz	- Rubiaceae
Cutandia memphitica (spreng) Richter	*Crucianella maritima* L
Avena barbata pott	- Thymelaceae
Phragmites australis (Cav.) Trin	*Thymelaea hirsuta* (L.) Endl
Bromus rigidus Roth	- Cistaceae
Hordeum murinum L	*Helianthemum lavandifolium*
Lophochloa pumila (Desf.) Bor	- Euphorbiaceae
Parapholis incurva (L.) C.E.Hubbard	*Euphorbia paralias* L
- **Cyperaceae**	*Euphorbia peplus L*
Cyperus kalli (forsk.) murb	Mercurialis annua L.
- **Liliaceae**	- Malvaceae
Asparagus stipularis Forsk	**Acacia cyanophylla lindley*
- **Amaryllidaceae**	- Santalaceae
Pancratium maritimum L	*Thesium humile* vahl
- **Juncaceae**	- Moraceae
Juncus acutus L	**Ficus carica* L
Juncus maritimus lam	- Chenopodiaceae
B – DICOTYLEDONAE	*Arthrocnemum macrostachyum* (moric) moris
- **Fabaceae**	*Atriplex stylosa* Viv
Retama raetam (forsk.) webb	*Salsola vermiculata* L
Lotus cytisoides L.	*Chenopodium murale* L
Lotus polyphyllus Clarke	*Suaeda vermiculata* forsk
Ononis natrix L.	- Geraniaceae
- **Boraginaceae**	*Erodium gruinum* (L.)L'Her
Echiochilon fruticosum Desf	*Erodium hirtum* (Forsk) willd

Echium sabulicola pommel nouv. mat

- **Apiaceae**

Pituranthos tortuousus (Desf.)

Malabaila suaveolens (Delile) coss

Bupleurum geradii All

Pseudorlaya pumila (L.) grande

Torilis nodosa (L.)Gaertn

Eryngium maritimum L

- **Brassicaceae**

Brassica tournefortii Gouan

Biscutella didyma L.

Mathiola longipetala (vent) Dc

Cakile aegyptica (L.) willd

Eruca sativa mill

- **Asteraceae**

Centaurea dimorpha Viv

Echinops galglensis Schweinf

Helichrysum stoechas (L.)Moench

Inula crithmoides L

Launaea resedifolia (L.) O.kuntze

Phagnalon rupestre (L.) Dc

Erodium laciniatum (cav.) willd

- Caryophyllaceae

Silene succulenta forsk

Silene villosa forsk

- Zygophyllaceae

Nitraria retusa (forsk) aschers

Zygophyllum album L

- Valerianaceae

Valerianella petrovichii

- Dipsacaceae

Scabiosa arenaria Forskal

- Cuscutaceae

Cuscuta planiflora Ten.

- Illecebraceae

Paronychia Arabica (linn.) Dc

- Hypecoaceae

Hypecoum pendulum L

- Tamaricaceae

Tamarix aphylla (L.) karst

According to Mashaly, (2001) the soil consistency and soil reactors (pH values) and the adsorption factor of sodium and extractable cations (Calcium, Potassium) and electrical conductivity are among the most important soil factors controlling the distribution and richness of vegetation. A significant heterogeneity of soil salinity and soil pH was observed between the samples, it was found that the salinity was close to the salt marsh, and the largest value of total soluble salts was (14471 mg /l & 6769 mg / l) for the samples collected from the salt marsh (quadrates 39 & 40). The difference between saline plants could be explained by the salinity rate in this study, for example, *Inula crithmoides, Phragmites australis, Suaeda vermiculata, Salsola vermiculata, juncus sp.* they were recorded at the highest levels of conductivity, sodium concentration, and pH. On the other hand, *Nitraria retusa, Zygophyllum album, Lotus polyphyllos* were found in areas with relatively high salinity and pH.

A disorder of natural vegetation was observed, soil erosion with human activities led to a change in the shape of sand dunes, removal of natural vegetation covers and cultivation of other species, which led to the formation of bare areas, and most of these plants were buried with sand. Overgrazing of livestock can lead to a decrease in the abundance of palatable species and an increase in species capable of withstanding grazing pressure. (Navarro *et al.,* 2006).

Despite the presence of elements that stabilize sand dunes like *Ammophila australis* and *Retama raetam*, the zone from a period of time is, subjected to increased anthropogenic pressure in form of the spread of resorts along the beaches, accompanied by the removing and transporting sands for use in construction operations in the cities and neighboring zones, collection if medicinal herbs and trampling. These activities threat the biodiversity and interferes with the process of ecological succession (El Rabiai and Al tira,2015), especially where these ecosystems have limited carrying capacities, and limited abilities to absorb changes. These practices exceed their carrying capacity of their dynamic balance that gives their apparent stability will be upset.

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