

## Vegetation Analysis along Alamain- Wadi El- Natrun Desert Road

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**Abstract:** This work was conducted along Alamain- Wadi-El Natrun desert road of the western desert in Egypt. The study area extends about 133 km from Marina– Alamain (on the Mediterranean coastal region) in the north to Wadi El-Natrun in the south. The main objective was to investigate the effect of environmental characteristics on the importance value indices and size structure of species and density per hectare. In the two different studied habitats: 1) sandy flat and 2) non-saline depression habitats. The phytosociological study of this road was based on the analysis of vegetation in 50 stands using Braun-Blanquet technique. Out of fifteen perennial species along the study area, three species named *Cornulaca monacantha*, *Artemisia monosperma* and *Anabasis articulata*, had higher species density, respectively. The sandy flat habitat indicated the highest density of *Artemisia monosperma* and *Asphodelus microcarpus* species (1740 and 1567 ind./ha, respectively), while in the non-saline depression habitat, *Fagonia glutinosa* had the lowest population density (125 ind./ha). Data of the present study revealed that annuals had the highest contribution than perennials. Regarding the life forms spectra, therophytes have the highest records of 43%. *Anabasis articulata* recorded the highest (I.V) and frequency values ( 49.3 and 60 percent )

**Key words:** Vegetation, species density, importance value, Alamain, Western Desert, Wadi-El-Natrun

### INTRODUCTION

Vegetation has been widely used to describe habitat characteristics, water quality and make predictions about the presence and composition of the surrounding communities (Appelgren and Mattila, 2005). In Egypt, desert vegetation is the most important and characteristic type of natural plant life. It covers vast area and is formed mainly of xerophytic shrubs and sub-shrubs (Abd El-Ghani *et al.*, 2003). Annual plants represent 50-60% of the desert vegetation during the rainy season (Kassas, 1964).

Change in the existent components of a natural ecosystem, especially plants and soil, leads to gradual variations in the shape, composition and structure of such communities. Therefore, studying the classification and the inter-relation between the different plant communities in response to the environmental factors are demand (Jafari *et al.*, 2003). Inter-relationships between plant communities and environmental factors are complex, reflecting simultaneous changes in factors such as ground-water depth, soil moisture, soil stability and salt content (Zhang *et al.*, 2005). The effects of environmental factors on plant communities have been the subject of many ecological studies. Jafari *et al.* (2004) revealed that the vegetation distribution pattern in rangelands of Yazd Province (Iran) was mainly related to soil texture and moisture contents. Youssef *et al.* (2009) stated that the plant species is generally determined by climate, geomorphology and influenced by soil conditions during their studies on vegetation of the coastal areas in Saudi Arabia. However, Zegeye *et al.* (2006) showed that the interdependency of vegetation type and soil chemical properties lead to a variety of species, vegetation types and distribution of plant communities.

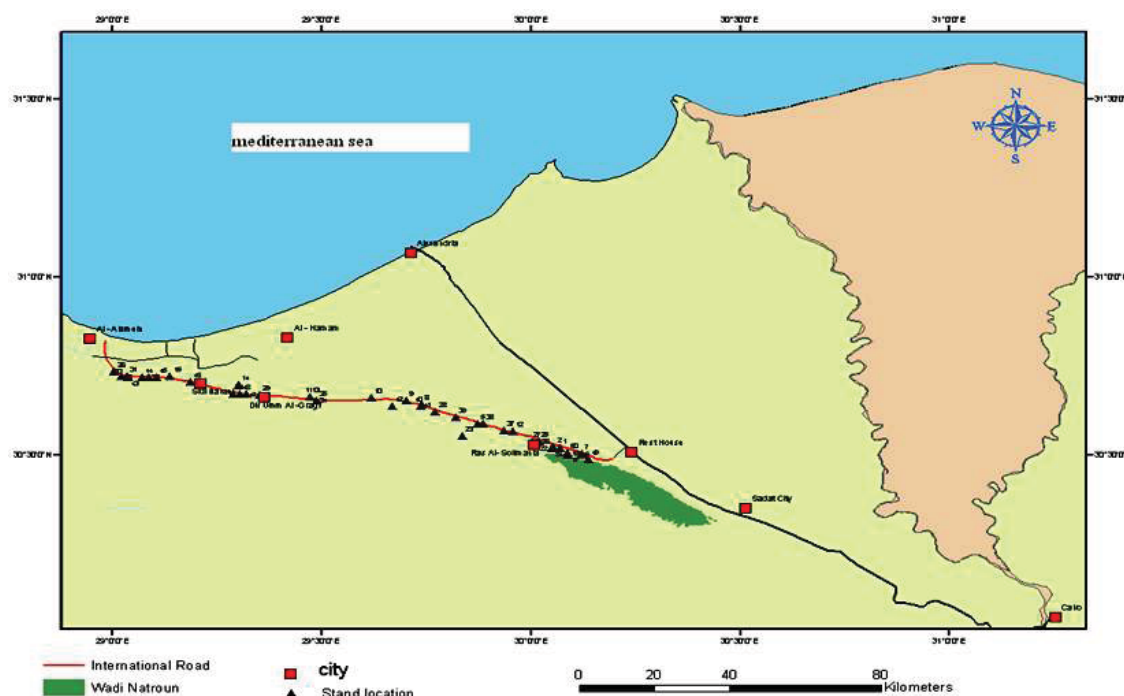
The Western Desert of Egypt extends over more than 1000 km throughout the country and covers approximately two-thirds of the Egyptian territory. One of the most important features is the uniformity of the surface of this area compared with other parts of Northern part of Egypt. The interior plateau is flat; there is nothing but plains or rocks either bare or covered with sand and detrital material (Abd El-Ghani, 2000 and Ayyad *et al.*, 2000). Zahran and Willis (1992) divided the Western Desert into three main regions: 1) the Western Mediterranean coastal belt, 2) the inland oases and depressions and 3) the Gebel Uweinat. The study area lies in the zone of semiarid region and its temperature regime is characterized by mild winters and long dry hot summers. Youssef and Al-Fredan (2008) stated that the occurrence, distribution and composition of plant species form the different ecological groups, are related to the degree of soil salinity and/or heterogeneity of substrate in the stabilized sandy substratum which supported the recorded types of halophytic and/or xerophytic species.

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The objectives of the present study are to survey, characterize and analyze the vegetation in the northern western part of Egypt along the Alamein -Wadi-El-Natron road. The study also assesses the correlation between the environmental factors and some of vegetation the variables in order to determine the distribution of species and communities along the study area.

**Study Area:**

The study area is located in the Libyan portion of the Sahara which is called now the western desert of Egypt (Abd El-Ghani and Marei, 2005), as it occurs west of the river Nile. The sampled stands were distributed along Alamein- Wadi-El-Natron desert road is located between latitude 30°29'74" to 30°43'65" North and 30°08'71" to 29°01'14" East. It extends about 133 km from Marina – Al-alamein (on the Mediterranean coastal region) in the north to Wadi El-Natron in the south (Fig. 1).



**Fig. 1:** Map showing Alamein – Wadi-El-Natron desert road showing the studying stands (▲). Atlas of Egypt (1996).

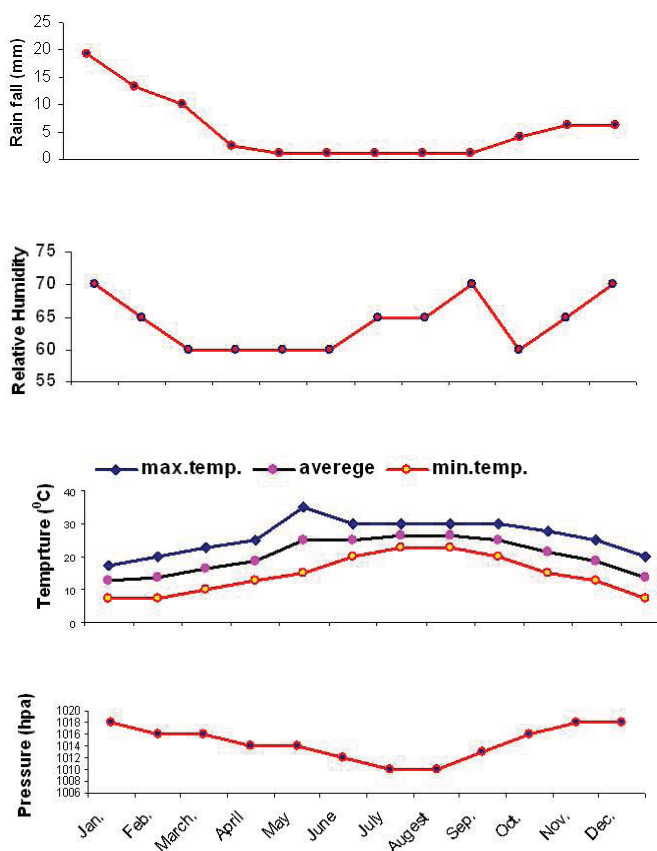
**Description and Geomorphology of the Study Area:**

The studied area, desert area along Alamein- Wadi-El-Natron desert road, is located between latitude 30°29'74" to 30°43'65" North and 30°08'71" to 29°01'14" East. It extends about 133 km from Marina – Alamein (on the Mediterranean coastal region) in the North to Wadi El-Natron in the South. (Fig.1). Except for the narrow Mediterranean coastal belt which is the wettest region of Egypt, the whole western desert (including our studied area) is one of the extremely arid parts of the world, its very great aridity resulted from it's distance position from seas, coupled with the absence of high altitudes which may attracts orographic rains (Except the northern part of the studied area) that named Omayed biosphere. This physiographic similarity of the studied area leads to the distinction of few types of habitats. These habitats are more or less arranged in the same sequence from the northern Mediterranean coast to the south as following: 1) slightly littoral salt marshes which comprise the areas of land near the sea which is subjected to some maritime influences. The substratum of this ecosystem is saline and favors the growth of salt tolerant plants, 2) non-saline depressions and 3) sandy flat. The area of the present work comprises each of the sandy flat and the non-saline habitats.

The western desert is the largest geographic region, covering an area of more than two-thirds of the total area of Egypt. The western desert is the region of plateaus, depressions, sand dunes and plains. It also the region of desert oases, which depend on the underground water of the Nubian aquifers. Except for the southwestern part of the Gilf Kebir and Uweinate, which rises in some places to more than 1000 m.a.s.l., most of the western desert doesn't rise more than 300-400 m.a.s.l., In this context, our study area lying in the northern part of western desert which is dominated by the five main depressions of Siwa, Qattara, Wadi El-Natron, Wadi El-Rayan and Fayum, and by the Miocene (Marmarica) plateau. To the north of Qattara and Siwa a vast Miocene lime stone plateau extends to the costal plain along the Mediterranean costal line, and is locally known as "Marmarica" or "El-Diffa" plateau. This plateau rises 200-250 m.a.s.l., to the east of Qattara, another plateau rising 150-200 m.a.s.l., Extends eastwards to Wadi El-Natron depression. Both plateaus are dotted by numerous small closed basins. A narrow costal plain with a sequence of low carbonate ridges (bars), which roughly parallel to the present coast line, separates this plateau from the Mediterranean coast. This plain opens up at a point to the south of Alamain and widens gradually eastwards until it merges into the sandy plains of the western margins of the Nile Delta. Embabi (2004).

**Climate:**

According to the meteorological data of the three stations: El- Dabbaa, Wadi El-Natron and Gianaclis along the study area. Data from Fig. 2 (Atlas, 1996) showed the records of maximum and minimum temperature (mean values), the ratio of annual precipitation (rainfall), and the relative humidity. The warmest summer month (August) has mean temperature of 26.25 °C and the coldest winter month (January) has mean temperature above 12.5 °C. Short rain storms occur mainly in winter. Climatic records show also that; except



**Fig. 2:** Climatic records of the meteorological data of three stations: El-Dabbaa, Wadi El-Natron and Gianaclis (mean values) along the Alamain- Wadi-El-Natron desert road (Atlas, 1996).

for the narrow Mediterranean coastal belt, which is the wettest region of our study area, the area receives about 5.5 mm precipitation / year. In all stations most of the rain falls recorded during the January, February and March and the summer months are usually rainless. The relative humidity is high along the Mediterranean coast, being 70 % or even more but it decreases landward. Generally, the months with low humidity are those during the blowing of the unfavorable Khamasin winds, mainly in April and May (60 %).

## MATERIALS AND METHODS

Fifty (50) stands each of 400m<sup>2</sup> (20×20m<sup>2</sup>), were selected or sampled along 133 km of the desert area along Alamein- Wadi-El-Natron desert road from Marina (in the North) to Wadi El-Natron (in the south ) in Fig.1. The size of each stand approximates the minimal area of the plant communities. These stands were observed seasonally through-out three years (spring 2004 to spring 2007). During each visit the stands were surveyed and the following data were recorded, list of species determining the dominant species, visual estimate of the total cover and the cover of each species (%) following Braun-Blanquet (1965) dominance abundance scale. For each quadrat group representing a habitat type, the absolute frequency, absolute density, absolute coverage, relative frequency, relative density, relative cover and importance value index (IVI) were adopted and calculated after Misra (1980). Nomenclature of species was according to Täckholm (1974) and Boulos (1999, 2000, 2002, 2005). The life forms were according to Raunkiaer (1937). Species identification and floristic categories were according to Zohary(1972 & 1973); Täckholm (1974); Feinbrun-Dothan (1978 & 1986) and Boulos (1995, 1999 &2000)

## RESULTS AND DISCUSSION

The landscape of the desert area stretching along Alamain – Wadi-El-Natron desert road is plain and slightly undulating. According to data of Atlas (1996), sands of the studied profiles are varying in physical nature and chemical characteristics. Medium to large-sand erosion channels, lighter in color, stretch through the slope plains. They join up in open shallow valleys to form in part, extended open wadies or basins.

### *Vegetation Analysis:*

Recent study (Spring 2004 to Spring 2007) recorded 162 plant species (11 perennials and 151 annuals) belonging to 129 genera and 39 families. About more than half of these species belongs to only 6 families arranged in the following sequence: Asteraceae > Chenopodiaceae > Poaceae > Fabaceae > Caryophyllaceae = Zygophyllaceae, Table (1). On the other hand, most of these species is very common in the western Mediterranean region especially Omayed Biosphere Reserve (Shaltout and Al-Sodany 2002, Al-Sodany 2003).

In the present study, (therophytes) had the highest contribution than perennials. This trend is similar to that of the Egyptian Mediterranean region where the therophytes contribute the highest records than other life forms (Hassib, 1951) and also, resembles the biological spectrum of some Mediterranean territories (Archibold, 1995). Most of the perennial species present are unpalatable. In this context, a large number of studies clearly show that long-term heavy grazing lead to reduction in cover of palatable species and the dominance of the unpalatable chemically defended plant species (Dregne, 1995; Shaltout *et al.*, 1996; Bisigato and Bertiller, 1997).

Regarding the life forms spectra, therophytes have the highest contribution (43%) followed by chamaephytes (31%), phanerophytes (8%), geophytes (11%), hemicryptophytes (5%), cryptophytes (2%), and parasites (1%) Fig(3-a). In the present study, most of the recorded species are annuals (151 species). This in contrary with Halwagy, 1962; Ayyad and El-Kady, 1982 who stated that , in the western Mediterranean desert of Egypt and in northern Sudan, density and cover of palatable perennials increase as a result of protection and controlled grazing. Also, El-Demerdash *et al.* (1987) reported that therophytes were not recorded in his study on the western Egyptian desert which disagrees with our conclusion.

**Table 1:** List of plant species recorded in the study area with their families, life forms and floristic category. The life forms are Ch: Chamaephytes, Cr: Cryptophytes, Ge: Geophytes, H: Hemicryptophytes, P: Parasite, Ph: Phanerophytes and. Th:Therophytes and the floristic category are: Biregional,Cosmopolitan,Monoregiona and Pluriregional.

Family name	Species name	Life form	Floristic category
Aizoaceae	<i>Mesembryanthemum nodiflorum L.</i>	Th	ES,ME ,SA
	<i>Mesembryanthemum crystallinum L.</i>	Th	ES,ME
Apiaceae	<i>Bupleurum semicompositum L.</i>	Th	IT,ME,SA,TR
	<i>Coriandrum sativum L.</i>	Th	IT,ME
	<i>Deverra triradiata Hochst.ex Boiss.</i>	Ch	SA
	<i>Pseudorlaya pumila (L.)Koch.</i>	Th	ME ,SA
Amaryllidaceae	<i>Pancratium maritimum L.</i>	Ge	ME
	<i>Pancratium sickenbergeri Asch.</i>	Ge	SA
Aricaceae	<i>Phoenix dactylifera L.</i>	Ph	SA,SU
Asclepiadaceae	<i>Cynanchum acutum L.</i>	Ph	IT,ME
	<i>Pergularia tomentosa L.</i>	Ch	SA,SU
Astraceae	<i>Anacyclus monanthos L.</i>	Th	ME
	<i>Artemisia monosperma Dele.</i>	Ch	ME ,SA
	<i>Artemisia judiaca L.</i>	Ch	SA
	<i>Aster squamatus (Spreng.) Hieron.</i>	Ch	TR
	<i>Atractylis carduus (Forssk.) C.</i>	----	----
	<i>Calendula arvensis L.</i>	Th	IT,ME,SA
	<i>Centaurea calcitrapa L.</i>	Ch	ES,ME
	<i>Centaurea aegyptiaca L.</i>	--	SA
	<i>Centaurea alexandrina Dele.</i>	Th	ME
	<i>Centaurea eryngoides Lam.</i>	H	IT
	<i>Centaurea pumilio L.</i>	Ch	ME
	<i>Cotula arabica L.</i>	----	----
	<i>Conyza bonariensis (L.) Cronquist,Bull.</i>	Th	ME ,SA
	<i>Echinops spinosus L.</i>	H	ME ,SA
	<i>Filago desertorum Pomel.</i>	Th	SA,IT
	<i>Hyoseris radiata L.</i>	--	ME
	<i>Ifloga spicata (Forssk.)Sch.Bip.</i>	Th	ME ,SA
	<i>Launaea capitata (Spring).Dany.</i>	Th	SA,SU
	<i>Launaea nudicaulis (L.) Hook.F.</i>	Ph	IT,SA,SU
	<i>Launaea fragilis (Asso) Pau.</i>	----	----
	<i>Onopordun alexandrinum Boiss.</i>	H	IT,SA
	<i>Otanthos maritimus (L.) Hoffmanns.&amp; Link.</i>	Ch	ME
<i>Pulicaria undulata (L.) C. A. Mey.</i>	H	----	
<i>Reichardia tingintana (L.) Roth.</i>	Th	IT,SA	
<i>Senesio glaucus L.</i>	Th	IT,SA	
<i>Sonchus asper (L.) Hill</i>	Th	IT,ME	
<i>Sonchus oleraceus L.</i>	Th	COSM	
Boraginaceae	<i>Echium angustifolium Mill.</i>	Cr	ME
	<i>Echiochilon fruticosum Desf.</i>	Ch	SA
	<i>Moltikiopsis ciliata (Forssk.) I.M.</i>	Ph	ME,SA,SU
Brassicaceae	<i>Anastatica hierochuntica L.</i>	Th	SA,SU
	<i>Brassica tournefortii Gouan.</i>	Th	IT,ME,SA
	<i>Cakile maritime Scop.</i>	Th	ES,IT,ME
	<i>Carrichtera anaa (L.) Dc.</i>	Th	SA
	<i>Eruca sativa Mill.</i>	Th	ES,IT,ME,SA
	<i>Farsetia aegyptia Turra.</i>	Ch	SA,SU
	<i>Matthiola arabica Boiss.</i>	H	SA
	<i>Zilla spinosa (L.) Prantle.</i>	Ch	SA
Caryophyllaceae	<i>Arenaria deflexa Decne.</i>	Cr	ME
	<i>Gymnocarpus decandrus Forssk.</i>	Ch	SA
	<i>Gypsophila capillaries (Forssk.) C. Chr.</i>	Th	SA
	<i>Herniaria hemistemon J. Gay</i>	Ph	SA
	<i>Polycarpon succulentum (Delile) J. Gay</i>	Th	SA
	<i>Polycarpha repens (Forssk.) Asch.&amp;Schweinf.</i>	----	SA,SU
	<i>Spergularia salina J. &amp; C. Presl</i>	----	ES,IT,ME,TR
	<i>Silene villosa Forssk.</i>	Th	SA
Chenopodiaceae	<i>Agathophora alopecuroids (Del)Fenzl ex Bunge</i>	Ch	SA
	<i>Anabasis articulata (Forssk.)Moq.</i>	Ch	IT,SA
	<i>Arthrocnemum macrostachyum (Moric.)K.</i>	Ch	ME ,SA
	<i>Atriplex halimus L.</i>	Ph	ME,SA
	<i>Atriplex leucoclada Bioss.</i>	Ch	IT,SA
	<i>Beta vulgaris L.</i>	Th	ES,IT,ME

Table 1: Continue

	<i>Bassia muricata</i> (L.) Asch.	Th	IT,SA
	<i>Bassia arabica</i> (Boiss.)	----	----
	<i>Chenopodium album</i> L.	Th	COSM
	<i>Chenopodium murale</i> L.	Th	COSM
	<i>Cornulaca monacantha</i> Dele,Descr.	Ch	IT,SA,SU
	<i>Halocnemum strobilaceum</i> (Pall.) M.	Ch	ES,IT,ME,SA
	<i>Haloxylon salicornicum</i> (Moq.) Bunge ex Boiss.	Ch	IT,SU
		Th	IT,SU
	<i>Noaea mucronata</i> (Forssk.) Asch.&Schweinf.	Ch	IT,ME
	<i>Salsola longifolia</i> Forssk.	Ch	ME ,SA
	<i>Salsola tetrandra</i> Forssk.	Ch	SA
	<i>Salsola kali</i> L.	Th	COSM
	<i>Suaeda vera</i> Forssk.	Ch	ES,ME ,SA
Cistaceae	<i>Helianthemum kahiricum</i> Dele.	Ch	SA
	<i>Helianthemum lippii</i> (L.) Dum.	Ch	SA,SU
Convolvulaceae	<i>Convolvulus arvensis</i> L.	Th	TR
	<i>Convolvulus lanatus</i> Vahl	Ph	SA
Ephederaceae	<i>Ephedra alata</i> Decne.	Ch	SA
Euphorbiaceae	<i>Euphorbia paralias</i> L.	H	ES,ME
	<i>Euphorbia retusa</i> Forssk.	Th	SA
Fabaceae	<i>Astragalus boeticus</i> L.	Th	ME
	<i>Astragalus schimperi</i> Boiss.	Th	ME
	<i>Astragalus spinosus</i> (Forssk.) Muschl.	-----	IT,SA
	<i>Heliotropium curassavicum</i> L.	----	----
	<i>Hippocrepis areolata</i> Desv.	Th	IT,SA
	<i>Hippocrepis bicantorta</i> Loisel.	Th	SA
	<i>Lotus halophilus</i> Boiss.& Spruner.	Th	ME ,SA
	<i>Lotus polyphyllus</i> E. D. Clarke	----	ME
	<i>Medicago polymorpha</i> L.	Th	ES,IT,ME
	<i>Medicago sativa</i> L.	Th	ES,IT,ME
	<i>Melilotus indicus</i> (L.) All.	Th	IT,ME,SA
	<i>Ononis vaginalis</i> Vahl	Ch	IT,SA
	<i>Trigonella stellata</i> Forssk.	Th	IT,SA
	<i>Trifolium resupinatum</i> L.	Th	ES,IT,ME
	<i>Retama raetam</i> (Forssk.)Webb & Berthel.	Ph	IT,ME,SA
	<i>Retama monosperma</i> (L.) Boiss.	----	----
	<i>Vicia sativa</i> L.	Th	ES,IT,ME
Frankeniaceae	<i>Frankenia revolute</i> Forssk.	H	EU,IT,ME
Fumariaceae	<i>Fumaria densiflora</i> De.	Th	ES,IT,ME
Geraniaceae	<i>Erodium laciniatum</i> (Cav.) Willd.	Th	IT,ME,SA
	<i>Monsonia nivea</i> (Decne.) Webb ,Fragm.	Ch	SA,SU
Glubulariaceae	<i>Glubularia arabica</i> Jaub. & Spach.	Ch	ME ,SA
Juncaceae	<i>Juncus acutus</i> L.	Ge	ES,IT,ME
	<i>Juncus rigidus</i> C.A.Mey.	Ge	ES,IT,ME
Lamiaceae	<i>Salvia aegyptiaca</i> L.	Ch	SA,SU
	<i>Salvia lanigera</i> Poir.	Cr	ME ,SA
Liliaceae	<i>Allium roseum</i> Boiss.	Ge	SA
	<i>Asphodelus microcarbus</i> Salzm. & Vivi.	Ge	ME
	<i>Colchicum ritcii</i> L.	Ge	SA
	<i>Gagea fibrosa</i> (Desf.) A. & H.	Ge	ME ,SA
Malvaceae	<i>Malva parvi-flora</i> L.	Th	IT,ME
Nitrariaceae	<i>Nitraria retusa</i> (Forssk.) Asch.	Ph	SA,SU
Orobanchaceae	<i>Cistanche violacea</i> (Desf.) Beck	P	IT,ME,SA
	<i>Orobanche romosa</i> L.	P	IT,ME
Plantaginaceae	<i>Plantago ovata</i> Forssk.	Th	IT,SA
Plumbaginaceae	<i>Limonium pruinosum</i> (L.) Chaz.	Cr	ME
Polygonaceae	<i>Emex spinosa</i> (L) Cam Pd.	Th	IT,ME
	<i>Rumex vesicarius</i> L.	Th	ME,SA,SU
Poaceae	<i>Aeigilops kotschyii</i> Boiss.	Th	IT,SA
	<i>Aelurops lagopoids</i> (L.) Trin.	Ge	IT,ME,SA
	<i>Cenchrus ciliaris</i> L.	Th	--
	<i>Cutandia memi phitica</i> (Spring.) Benth.	Th	IT,ME,SA
	<i>Cynodon dactylon</i> (L.) Pers	Ge	COSM
	<i>Dactylis glomerata</i> L.	--	ES,IT,ME
	<i>Hordeum leporinum</i> Link.	Th	IT,ME
	<i>Hordeum murinum</i> L.	Th	ES,IT,ME
	<i>Lygeum spartum</i> Loeft. ex L.	Ge	SA

Table 1: Continue

	<i>Panicum turgidum</i> Forssk.	Ge	SA,SU
	<i>Phalaris minor</i> L.	Th	IT,ME
	<i>Phragmites australis</i> (Cav.) Trin.	Ge	IT,ME,SA,TR
	<i>Polygonum monspeliensis</i> (L.) Desf.	Ge	COSM
	<i>Schismus barbatus</i> (Hojer ejusd.L.) Thell.	Th	IT,ME,SA
	<i>Sphenopus divercatus</i> (Gouan) Rchb.	Th	IT,ME,SA
	<i>Sporopolus pungens</i> (Schreb.) Kunth.	Ge	ES,ME
	<i>Stipagrostis ciliate</i> Desf.	-----	SA
	<i>Triticum vulgare</i> L.	Th	ME
Primulaceae	<i>Anagallis arvensis</i> L.	Th	ES,IT,ME
Ranunculaceae	<i>Adonis dentatus</i> Dele.	Th	IT,ME,SA
Resedaceae	<i>Ochradenus baccatus</i> Dele.	Ph	SA,SU
	<i>Reseda alba</i> L.	Th	ES,IT,ME
Rubiaceae	<i>Crucianella maritima</i> L.	Cr	ME
Schrophulariaceae	<i>Kickxia aegyptiaca</i> (L.) Nabelek.	Ch	SA
Solanaceae	<i>Hyoscyamus muticus</i> L.	Ch	SA
	<i>Lycium europium</i> L.	Ph	ME
	<i>Lycium schawii</i> Roem. & Schnlt.	Ch	SA,SU
	<i>Solanum nigrum</i> L.	Ch	SA
Tamaricaceae	<i>Reaumuria hirtella</i> Jaub. & Spach.	Ch	IT,SA
	<i>Tamarix nilotica</i> (Ehrenb.) Bunge	Ph	ME,SA,SU
Thymelaceae	<i>Thymelaea hirsuta</i> (L.) Endl.	Ch	ME ,SA
Zygophyllaceae	<i>Fagonia arabica</i> L.	Ch	SA
	<i>Fagonia bruguieria</i> DC.	Ch	IT,SA
	<i>Fagonia indica</i> Brum.	Ch	SA
	<i>Fagonia mollis</i> Dele.	Ch	SA
	<i>Zygophyllum album</i> L.	Ch	ME ,SA
	<i>Zygophyllum coccineum</i> L.	Ch	SA
	<i>Zygophyllum decumbens</i> Dele.	Ch	SA,SU
	<i>Zygophyllum simplex</i> L.	Ch	SU

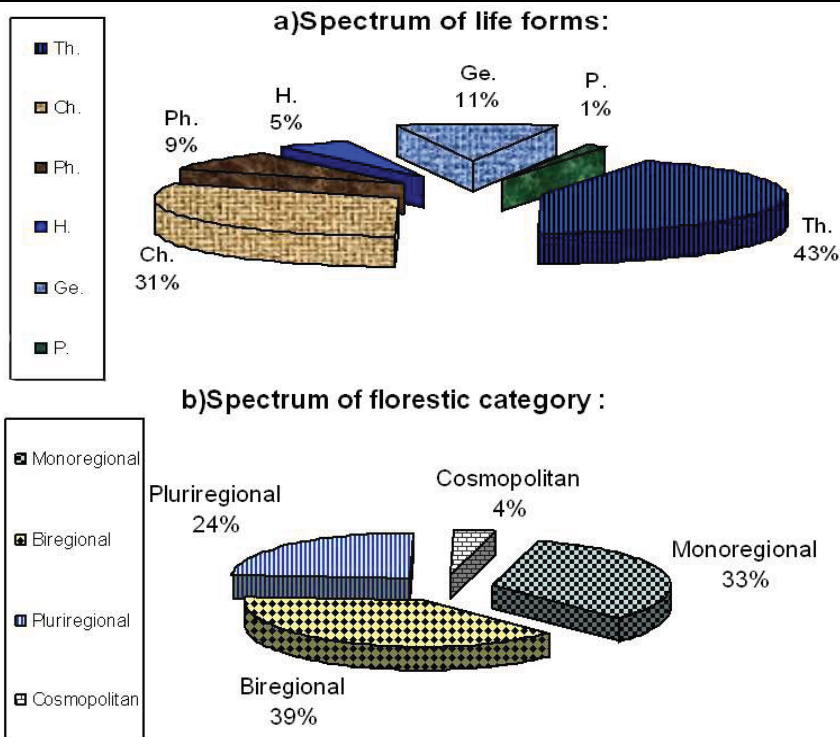


Fig. 3: Spectrum of life forms (a) and floristic categories (b) of the studied species. The life forms are Ch: Chamaephytes, Cr: Cryptophyte, Ge : Geophytes , H : Hemicryptophytes, P: Parasite, Ph: phanerophytes and Th: therophytes and floristic category are : Biregional Cosmopolitan, Monoregiona and Pluriregional.



Considering the global floristic regions, most of species are belongs to the Biregional (39%) (14 Mediterranean+ Saharo-arabian , 13 Saharo-arabian+ Sudano-zambian, 15 Saharo-arabian+ Irano-turanian, 9 Mediterranean+ Irano-turanian and 4 Mediterranean+euro-siberian ) followed by Monoregionl (33%) (31 Saharo-arabian, 16 Mediterranean, 1 Irano-turanian and 1 Sudano-zambian), Pluriregional (24%) (11 Sah-arab+med+iran-tur, 2 Sah-arab+med+eur-sib, 2 Sah-arab+sud-zam+med and 1 Sah-arab+sud-zam+iran-tur) and finally Cosmopolitan ,4% (Fig 3-b).

Baseline values for density, frequency, cover and importance value (I.V) for dominant perennial species summarized as follow: *Anabasis articulata* (I.V.I Of 49.36 and F values 60 %), *Thymelaea hirsuta* (I.V Of 48.45 and F values 68 %), *Cornulaca monacantha*, (I.V Of 44.97 and F values 24 %), *Artemisia monosperma* (I.V Of 40.62 and F values 56 %), *Noaea mucronata* (I.V Of 23.61 and F values 44 %), followed by *Haloxylon salicornicum* (I.V Of 22.09 and F values 44 %), Table (2). The other species recorded in Table (2) are of lower values of IVI indices and F values.

**Table. 2:** Absolute density, frequency and cover (numbers per 100 m<sup>2</sup>) , their relative density,frequency,cover (%) and importance value (I.V) of some plant species along Alamain- Wadi-El Natrun desert road.

I.V.I Index	Density		Frequency		Cover		I.V
	Absolute density	Relative density	Absolute frequency	Relative frequency	Absolute cover	Relative cover	
<i>Agathophora alopecroides</i>	0.3	0.75	16	3.44	0.01	0.42	4.63
<i>Anabasis articulata</i>	6.92	17.49	60	12.93	0.59	20.2	49.36
<i>Artemisia monosperma</i>	7.91	19.99	56	12.06	0.26	8.55	40.62
<i>Astragalus spinosa</i>	0.96	2.42	12	2.58	0.02	0.67	5.68
<i>Convolvulus lanatus</i>	0.23	0.58	12	2.58	0.003	0.13	3.29
<i>Cornulaca monacantha</i>	10.1	25.53	24	5.17	0.44	18.26	44.97
<i>Deverra triradiata</i>	0.17	0.42	24	5.17	0.01	0.45	6.05
<i>Echinops spinosus</i>	1.73	4.37	32	6.89	0.07	2.29	13.57
<i>Fagonia glutinosa</i>	0.56	1.41	16	3.44	0.04	1.34	6.2
<i>Haloxylon salicornicum</i>	1.02	2.57	44	9.48	0.31	12.25	22.09
<i>Lycium shawii</i>	0.2	0.5	4	0.86	0.04	1.55	2.92
<i>Noaea mucronata</i>	4.38	11	44	9.48	0.51	3.05	23.61
<i>Stipagrostis ciliata</i>	1.32	3.33	36	7.75	0.003	0.11	11.21
<i>Thymelaea hirsuta</i>	3.67	9.27	68	14.65	0.76	30.6	48.45
<i>Zygophyllum album</i>	0.09	0.22	16	3.44	0.003	0.1	3.78

Of fifteen perennial species along Alamain- Wadi-El-Natrun desert road, three species named *Cornulaca monacantha*, *Artemisia monosperma* and *Anabasis articulata*, had higher species density respectively. On the other hand, *Lycium shawii*, *Deverra triradiata* and *Zygophyllum album* attained a lower species density.

With regard to the density of individuals the population of *Artemisia monosperma* and *Asphodelus microcarpus* from (sandy flat) had the highest density (1740 and 1567 ind./ha respectively ). With respect to (Non saline depressions), it was found that *Fagonia glutinosa* had the lowest population density (125 ind./ha). On the other hand, the highest densities of *Asphodelus microcarpus* and *Cornulaca monacantha* populations were recorded in habitat 2 (Non saline depressions) (1950 and 1619 ind./ha respectively), while *Agathophora alopecuroids*, *Astragalus spinosa*, *Convolvulus lanatus*, *Haloxylon salicornicum*, *Noaea mucronata* and *Stipagrostis ciliata* were completely absent in habitat 2 (Non saline depressions) Table (3).

In summary, we manipulated the demographic variables of species frequency, cover, density and IV indices within the area of study. We also examined the relationships at different dominant community. Our results showed the importance of species richness and IVI indices for the stability of ecosystem. Results also confirmed the importance of the environmental factors in determining the pattern and composition of the study area. Many researchers have discussed the demographic and floristic characteristics of plant species such as, El-Ghareeb, R., 1975; Shaltout *et al.*, 1996; Abd El-Ghani and Marei, 2005; Abd El-Kawy, 2005; Zhang *et al.*, 2005; Le Brocque *et al.*, 2009 and .Ji *et al.*, 2009.



**Table. 3:** Density per hectare of some species of sandy flat and non saline depression. along Alamain- Wadi-El-Natron desert road..

Plant species	Density / Hectare		Total
	Sandy flat	Non saline depressions	
<i>Agathophora alopecroides</i>	1500	---	1500
<i>Anabasis articulata</i>	614.2	741.6	1355.8
<i>Artemisia monosperma</i>	1740	1141.6	2881.6
<i>Astragalus spinosa</i>	387.5	---	387.5
<i>Asphodelus microcarbus</i>	1566.6	1950	3516.6
<i>Convolvulus lanatus</i>	416.6	---	416.6
<i>Cornulaca monacantha</i>	1137.5	1618.7	2756.2
<i>Echinops spinosus</i>	1150	1100	2250
<i>Fagonia glutinosa</i>	125	375	500
<i>Haloxylon salicornicum</i>	539.2	---	539.2
<i>Lycium shawii</i>	400	950	1350
<i>Noaea mucronata</i>	1008.3	---	1008.3
<i>Stipagrostis ciliata</i>	1712.5	---	1712.5
<i>Thymelaea hirsuta</i>	707.1	550	1257.1

This can provide guidance to distribution patterns of desert vegetation and related major environmental factors in the western desert of Egypt. The description and dynamics of the major dominant plant communities of the area under study will explain in details through the second published part (b) for the same habitats.

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