Australian Journal of Basic and Applied Sciences, 3(1): 167-176, 2009
ISSN 1991-8178

Vegetation Analysis along Alamain- Wadi El- Natrun Desert Road

Ashraf M. Youssef, Amal A. Morsy, Hosny A. Mossallam and Ahmed H. Abd Al-Latif

Botany Department, Faculty of Science, Ain Shams University, Cairo, Egypt

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 pernnials.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.

Corresponding Author: Ashraf M. Youssef, Botany Department, Faculty of Science, Ain Shams University, Cairo, Egypt

The objectives of the present study are to survey, characterize and analyze the vegetation in the northern western part of Egypt along the Alamain -Wadi-El-Natrun road. The study also assesses the correlation between the environmental factors and some of vegitation 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-Natrun 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).

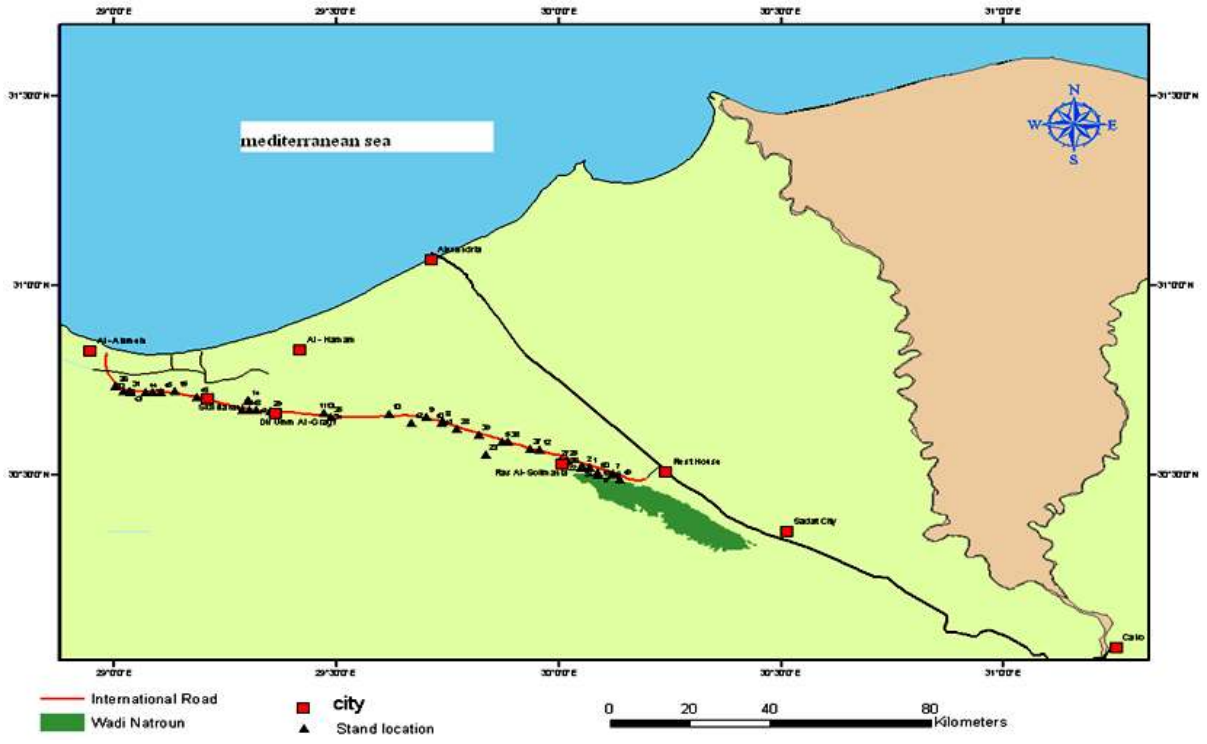

Fig. 1: Map showing Alamain – Wadi-El-Natrun desert road showing the studying stands (▲). Atlas of Egypt (1996).

Description and Geomorphology of the Study Area:

The studied area, desert area along Alamain- Wadi-El-Natrun 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 – Alamain (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-Natrun, 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-Natrun 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 ºC and the coldest winter month (January) has mean temperature above 12.5 ºC. Short rain storms occur mainly in winter. Climatic records show also that; except

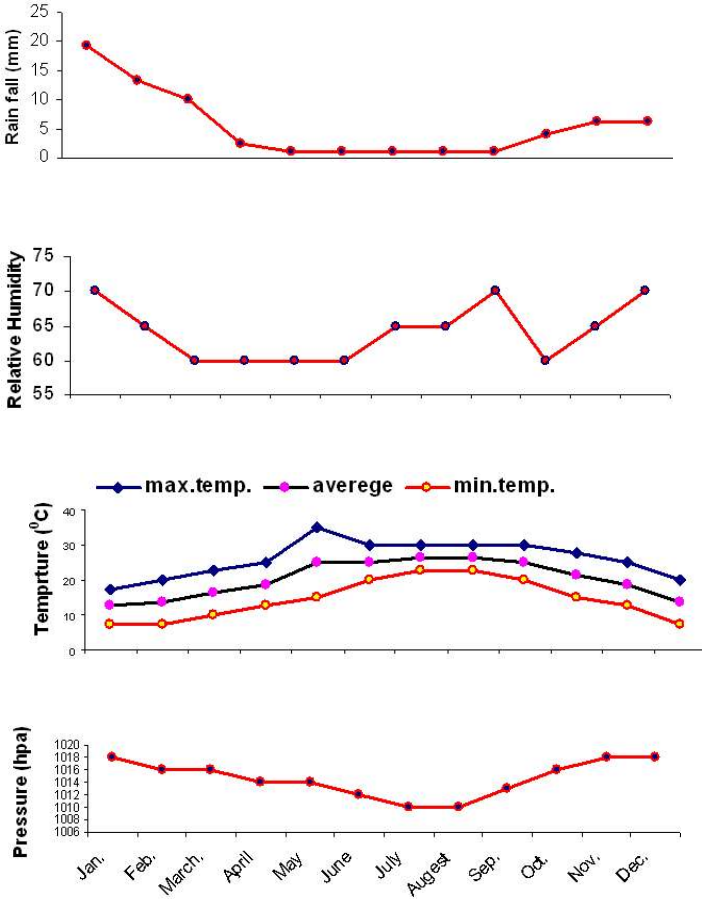

Fig. 2: Climatic records of the meteorological data of three stations: El-Dabbaa, Wadi El-Natrun and Gianaclis (mean values) along the Alamain- Wadi-El-Natrun desert road (Atlas, 1996).

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^2 (20×20m^2), were selected or sampled along 133 km of the desert area along Alamein- Wadi-El-Natrun desert road from Marina (in the North) to Wadi El-Natrun (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); Täkholm (1974); Feinbrun-Dothan (1978 & 1986) and Boulos (1995, 1999 &2000)

RESULTS AND DISCUSSION

The landscape of the desert area stretching along Alamain – Wadi-El-Natrun 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 to129 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 > Caryophllaceae = 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	*Mesembryanthemum nodiflorum L.*	Th	ES,ME ,SA
	Mesembryanthemum crystalinum L.	Th	ES,ME
Apiaceae	*Bupleurum semicompositum L.*	Th	IT,ME,SA,TR
	Coriandrum sativum L.	Th	IT,ME
	Deverra triradiata Hochst.ex Boiss.	Ch	SA
	Pseudorlaya pumila (L.)Koch.	Th	ME ,SA
Amaryllidaceae	*Pancratium maritimum L.*	Ge	ME
	Pancratium sickenbergeri Asch.	Ge	SA
Aricaceae	*Phoenix dactylifera L.*	Ph	SA,SU
Ascelepiadaceae	*Cynanchum acutum L.*	Ph	IT,ME
	Pergularia tomentosa L.	Ch	SA,SU
Astraceae	*Anacyclus monanthos L.*	Th	ME
	Artemisia monosperma Dele.	Ch	ME ,SA
	Artemisia judiaca L.	Ch	SA
	Aster squamatus (Spreng.) Hieron.	Ch	TR
	Atractylis carduus (Forssk.) C.	----	----
	Calendula arvensis L.	Th	IT,ME,SA
	Centaurea calcitrapa L.	Ch	ES,ME
	Centaurea aegyptiaca L.	--	SA
	Centaurea alexandrina Dele.	Th	ME
	Centaurea eryngoides Lam.	H	IT
	Centaurea pumilio L.	Ch	ME
	Cotula arabica L.	----	----
	Conyza bonariensis (L.) Cronquist,Bull.	Th	ME ,SA
	Echinops spinosus L.	H	ME ,SA
	Filago desertorum Pomel.	Th	SA,IT
	Hyoseris radiata L.	--	ME
	Ifloga spicata (Forssk.)Sch.Bip.	Th	ME ,SA
	Launaea capitata (Spring).Dany.	Th	SA,SU
	Launaea nudicaulis (L.) Hook,F.	Ph	IT,SA,SU
	Launaea fragilis (Asso) Pau.	----	----
	Onopordun alexandrinum Boiss.	H	IT,SA
	Otanthos maritimus (L.) Hoffmanns.& Link.	Ch	ME
	Pulicaria undulata (L.) C. A. Mey.	H	----
	Reichardia tingintana (L.) Roth.	Th	IT,SA
	Senesio glaucus L.	Th	IT,SA
	Sonchus asper (L.) Hill	Th	IT,ME
	Sonchus oleraceus L.	Th	COSM
Boraginaceae	*Echium angustifolium Mill.*	Cr	ME
	Echiochilon fruticosum Desf.	Ch	SA
	Moltikiopsis ciliata (Forssk.) I.M.	Ph	ME,SA,SU
Brassicaceae	*Anastatica hierochuntica L.*	Th	SA,SU
	Brassica tournefortii Gouan.	Th	IT,ME,SA
	Cakile maritime Scop.	Th	ES,IT,ME
	Carrichtera anaa (L.) Dc.	Th	SA
	Eruca sativa Mill.	Th	ES,IT,ME,SA
	Farsetia aegyptia Turra.	Ch	SA,SU
	Matthiola arabica Boiss.	H	SA
	Zilla spinosa (L.) Prantle.	Ch	SA
Caryophyllaceae	*Arenaria deflexa Decne.*	Cr	ME
	Gymnocarpus decandrus Forssk.	Ch	SA
	Gypsophila capillaries (Forssk.) C. Chr.	Th	SA
	Herniaria hemistemon J. Gay	Ph	SA
	Polycarpon succulentum (Delile) J. Gay	Th	SA
	Polycarpia repens (Forssk.) Asch.&Schweinf.	----	SA,SU
	Spergularia salina J. & C. Presl	----	ES,IT,ME,TR
	Silene villosa Forssk.	Th	SA
Chenopodiaceae	*Agathophora alopecuroids (Del)Fenzl ex Bunge*	Ch	SA
	Anabasis articulata (Forssk.)Moq.	Ch	IT,SA
	Arthrocnemum marcrostachyum (Moric.)K.	Ch	ME ,SA
	Atriplex halimus L.	Ph	ME,SA
	Atriplex leucoclada Bioss.	Ch	IT,SA
	Beta vulgaris L.	Th	ES,IT,ME

Table 1: Continue

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

Table 1: Continue

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

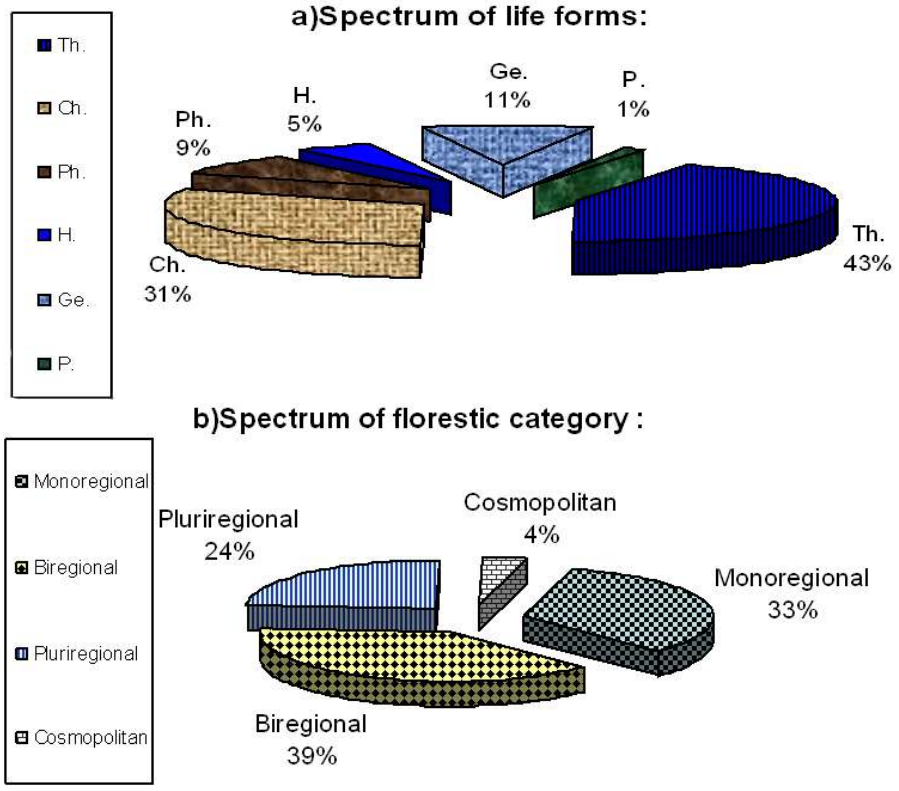

Fig. 3: Spectrum of life forms (a) and floristic categories (b) of the studied species. The life forms are Ch: Chamaephytes, Cr: Cryptophyte, Ge : Geophytes , H : Hemicryptophytes, P: Parasite, Ph: phanerophytes and Th: therophytes and floristic category are : Biregional Cosmopolitan, Monoregiona and 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 0f 49.36 and F values 60 %), *Thymelaea hirsuta* (I.V 0f 48.45 and F values 68 %), *Cornulaca monacantha*, (I.V 0f 44.97 and F values 24 %), *Artemisia monosperma* (I.V 0f 40.62 and F values 56 %), *Noaea mucronata* (I.V 0f 23.61 and F values 44 %), followed by *Haloxylon salicornicum* (I.V 0f 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^2) , 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
Plant species	Absolute density	Relative density	Absolute frequency	Relative frequency	Absolute cover	Relative cover	
Agathophora alopecroides	0.3	0.75	16	3.44	0.01	0.42	4.63
Anabasis articulata	6.92	17.49	60	12.93	0.59	20.2	49.36
Artemisia monosperma	7.91	19.99	56	12.06	0.26	8.55	40.62
Astragalus spinosa	0.96	2.42	12	2.58	0.02	0.67	5.68
Convolvulus lanatus	0.23	0.58	12	2.58	0.003	0.13	3.29
Cornulaca monacantha	10.1	25.53	24	5.17	0.44	18.26	44.97
Deverra triradiata	0.17	0.42	24	5.17	0.01	0.45	6.05
Echinops spinosus	1.73	4.37	32	6.89	0.07	2.29	13.57
Fagonia glutinosa	0.56	1.41	16	3.44	0.04	1.34	6.2
Haloxylon salicornicum	1.02	2.57	44	9.48	0.31	12.25	22.09
Lycium shawii	0.2	0.5	4	0.86	0.04	1.55	2.92
Noaea mucronata	4.38	11	44	9.48	0.51	3.05	23.61
Stipagrostis ciliata	1.32	3.33	36	7.75	0.003	0.11	11.21
Thymelaea hirsuta	3.67	9.27	68	14.65	0.76	30.6	48.45
Zygophyllum album	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, Devverra 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-Natrun desert road..

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

REFERENCES

Abd El-Ghani, M.M. and A.H. Marei, 2005. Soil characteristics and vegetation associates of the endangered Randonia Africana Coss. In arid desert ecosystem of Western Egypt. Int. J. Eco. Environ. Sci., 31(4): 309-19.

Abd El-Ghani, M.M. and W.M. Amer, 2003. Soil-vegetation relationships in a coastal desert plain of southern Sinai, Egypt. J. Arid Environ., 55(4): 607-28.

Abd El-Ghani, M.M., 2000. Vegetation composition of Egyptian inland salt marshes. Botanical Bulletin of Academia Sinica, 41: 305-314.

Abd El-Ghani, M.M., B. Reinhard and D. Frank, 2003. Plant communities in two vegetation transects in the extreme desert of Western Egypt. Phytocoenologia, 33(1): 29-48.

Abd El-Kawy, A.H., 2005. Ecophysiological studies on some desert plants Growing in different habitats along Wadi El Natrun El Alamine Desert Road. M. Sc. Thesis, Bot. Dep. Fac. Sci., Al- Azhar Univ., Cairo, Egypt.

Al-Sodany, Y.M., 2003. Size structure and dynamics of the common shrubs in Omayed, biosphere reserve in the Western Mediterranean coast of Egypt. Ecologia Mediterranean, tome, 29, Fascicule, 1: 39-48.

Appelgren, K. and J. Mattila, 2005. Variation in vegetation communities in shallow bays of the northern Baltic Sea. Aq. Bot., 83(1): 1-13.

Archibold, O.W., 1995. Ecology of World Vegetation. Chapman and Hall, London.

Atlas, 1996 . Climatic Atlas of Egypt: Egyptian Neteorological Authorit-70/95 .

Ayyad, M.A. and H.F. El-Kady, 1982. Effect of protection and controlled grazing on the vegetation of a Mediterranean desert ecosystem in northen Egypt. Vegetatio, 49: 129-139.

Ayyad, M., A. Fakhry and A. Moustafa, 2000. Plant biodiversity in the Saint Catherine area of the Sinai Peninsula, Egypt. Biodiv. Cons., 9(1): 265-81.

Bisigato, A.J. and Bertiller, M.B., 1997. Grazing effects on patchy dry land vegetation in northern Patagonia. J. Arid Environ., 36(4): 557-736.

Boulos, L., 1999. Flora of Egypt: Volume One (Azollaceae-Oxalidaceae): Al-Hadara Publishing, Cairo, Egypt, pp: 419.

Boulos, L., 2000. Flora of Egypt: Volume Two (geraniaceae-Boraginaceae): Al-Hadara Publishing, Cairo, Egypt, 352.

Boulos, L., 2002. Flora of Egypt: Volume Three (Verbinaceae-Compositae): Al-Hadara Publishing, Cairo, Egypt, 373.

Boulos, L., 2005. Flora of Egypt : volume 4 AL Hadara Publishing, Cairo, Egypt.

Braun-Blanquet, J., 1965. Plant Sociology: The Study of Plant Communities. Hafner Publ. Comp., New York.

Dregne, H.E., 1995. Erosion and soil productivity in Australia and New Zealand. Land Degrad . Rehabil., 6: 71-78.

El-Demerdash, M.A., M.A. Ayyad and K.H. Shalotut, 1987. Correlation of the distribution of *Juncus spp*. with the prevailing environmental factors in Egypt. Mans. Sci. Bull., 14(2): 129-156.

El-Ghareeb, R., 1975. A study of the Vegetation- Environmental Complex of Saline and Marshy Habitats on the Northwestern Coast of Egypt. Ph.D. Thesis, Univ. of Alexandria, pp: 199.

Embabi, S.N., 2004. The geomorphology of Egypt, Landforms and Evolution. Vol. 1 The Nile Valley and the Western Desert.

Feinbrun, N.D., 1986. Flora Palaestina. 3&4.The Israel Academy of Sciences and Humanities,Jerusalem.

Halwagy, R., 1962. The incidence of biotic factors in northern Sudan. Oikos., 13: 97-117.

Hassib, M., 1951. Distribution of plant comunities in Egypt. Bulletin of Faculty of Science, Fouad Univ., 29: 59-261.

Jackson, M.L., 1967. Soil Chemical Analysis- Advanced Course. Washington Dep. of Soil Sciences, 488.

Jafari, M., M.A. Zare Chahouki, A. Tavili and H. Azamivand, 2003. Soil-Vegetation relationships in Hoz-e-Soltan Region of Qom Province, Iran. Pak. J. Nut., 2(6): 329-34.

Jafari, M., M.A. Zare Chahouki, A. Tavili, H. Azarnivand and G.H. Zahedi Amiri, 2004. Effective environmental factors in the distribution of vegetation types in Poshtkouh rangelands of Yazd Province (Iran). J. Arid Environ., 56(1): 627-41.

Ji, S., Y. Geng, D. Li and G. Wang, 2009. Plant coverage is more important than species richness in enhancing aboveground biomass in a premature grassland, northern China. Agric. Ecosystem. Environ., 129(1): 491-96.

Kassas, M., 1964. Plant life in deserts. In: Hills, E. S. (Ed.), Arid Land: A Geographical Appraisal. Methuen and Co Ltd., Paris, UNESCO, 145-80.

Kilmer, V.J. and L.T. Alexander, 1949. Methods of makings mechanical analysis of soils. Soil Sci., 7(1): 193-99.

Le Brocque, A.F., K.A. Goodhew and C.A. Zammit, 2009. Overstorey tree density and understorey regrowth effects on plant composition, stand structure and floristic richness in grazed temperate woodlands in eastern Australia. Agric. Ecosystem. Environ., 129(1): 17-27.

Misra, R., 1980. Ecology Workbook. Oxford and IBH Publ. Co., New Delhi, Bombay.

Morsy, A.A., A.M. Youssef, H.A. Mosallam and A.M. Hashem, 2008. Assessment of selected species along Al-Alamein desert road, Egypt. J. Appl. Sci. Res., 4(10): 1276-84.

Mossalam, H.A., 2007. Comparative study on the vegetation of protected and non-protected areas, Sudera, Taif, Saudi Arabia. Int. J. Agri. Biol., 9(2): 202-214.

Richards, L.A., 1954. Diagnosis and Improvement of Saline and Alkali Soils. US Dept. Agri. Handbook, 60.

Raunkiaer, C., 1937. Life forms of plants and statistical plant geography. Arno Press, new York,pp.620.

Shaltout, K.H. and Y.M. Al - Sodany, 2002. Phytoecology of Omayed Biosphere Reserve. MedWetCoast, Global Environemntal Facility (GEF) and Egyhptian Environmental Affairs Agency (EEAA), Cairo (Unpublished Report).

Shaltout, K.H., E.F. EL-Halawany and H.F. El-Kady, 1996. Consequences of protection from grazing on diversity and abundance of the costal lowland vegetation in Eastern Saudi Arabia. Biodivers. Conserv., 5: 27-36.

Täckholm, V., 1974. Student's Flora of Egypt. Cairo Univ., Press, 888.

Wilde, S.A., R.B. Corey, J.G. Lyer and G.K. Voigt, 1979. Soil and Plant Analysis for Tree Culture. Oxford and IBH Pub. Co., New Delhi, Bombay.

Youssef, A.M. and Al-Fredan M.A., 2008. Community composition of major vegetations in the coastal area of Al-Uqair, Saudi Arabia in response to ecological variations. Pak. J. Biol. Sci., 8(4): 713-721.

Youssef, A.M., M.A. Al-Fredan and A.A. Fathi, 2009. Vaiation in plant species composition of Lake Al-Asfar, Al-Hofouf, Saudi Arabia. Int. J. Bot.,(Accepted and in publication).

Zahran, M.A. and A.J. Willis, 1992. The Vegetation of Egypt. Chapman and Hall, London, 424.

Zegeye, H., D. Teketay and E. Kelbessa, 2006. Diversity, regeneration status and socio-economic importance of the vegetation in the island of Lake Ziway, south-central Ethiopia. Flora, 201: 483-98.

Zhang, Y.M., Y.N. Chen and B.R. Pan, 2005. Distribution and floristic of desert plant communities in the lower reaches of Atrium River, southern Xinjiang, People's Republic of China. J. Arid Environ., 63(1): 772-84.

Zohary, M., 1972. In "Flora Palaestina " (Part II : Text), Jerusalem: The Israel Academy of Sciences and Humanities.

Zohary, M., 1973. Geobotanical Foundations of the Middle East. Stuttgart: Gustav Fisher Verlag, Germany.