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Structure of the Common Plant Population along Alamain- Wadi El- Natrun Desert Road

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Abstract: Vegetation along Alamain- Wadi-El- Natrun desert road is characterized by paucity of trees and shrubs. Aridity and severe impact of human activities, overgrazing, over cutting, severe reclamation and uprooting, are the main causes of the depletion of these important woody resources. Alamain- Wadi-El-Natrun desert road extends about 133 km from Marina– Alamain (on the Mediterranean coastal region) in the north to Wadi El-Natron in the south. The phytosociological study of this road was based on the application of TWINSPAN on 162 species recorded in 50 stands, led to the recognition of 7 vegetation groups at the 4th level of classification**.** The application of DECORANA on the same set of data indicates a reasonable segregation among these groups along the ordination plane of axes 1 and 2**.** The vegetation groups are named after the first and occasionally the second dominant species (the species that have the highest percentage and/or the highest relative cover). These groups are named according to their dominant species as follows: *A- Cornulaca monacantha*, B- *Launaea nudicaulis*, C- *Stipagrostis ciliata*, D- *Cornulaca monacantha - Artemisia monosperma*, E- *Thymelea*, F- *Lycium schawii*, and G- *Echiochilon fruticosum –Noaea mucronata*. These groups are completely dissimilar to that recorded by previous studies on the natural habitats of the same road which may indicate that changes have been occurred in the study area after the construction of this road. Height/diameter ratio for the dominant plant communities was less than unity, which means that the diameters of these species exceed their heights and hence, their individuals tend to expand horizontally rather than vertically. The size and age of the studied plant life forms were negatively skewed correlated, which favors the establishment of seedlings of some species and controls the abundance of species in sand dunes.

Key words: Height/diameter ratio**,** size class, cover, plant communities, Alamain, size-frequency distribution

INTRODUCTION

Plant formations are the largest and most complex units of vegetation and represent the level at which most world map are compiled. The distribution of these complex units is generally determined by climate and influenced by soil conditions. Differences in soil properties produced by the interaction of climate, topography and vegetation over time have a profound effect parent material, on the biological systems and plant communities that they support. The physical and chemical characteristics of a soil are determined by the additions and losses from leaching, seepage and erosion coupled with transfers and transformations within the soil and result in the gradual development of different soil types Archibold (1995).

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. The Western Desert of Egypt extends over more than 1000km 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).

The Western Desert, although considered barren, supports plants in areas with enough water resources (rainfall and/or underground). Zahran and Willis (1992) divided the area into three main regions: 1) the Western Mediterranean coastal belt; 2) the inland oases and depressions; and 3) the Gebel Uweinat. Well-marked drainage systems (Wadis) comparable to those of the Eastern Desert are not found. Despite many floristic, taxonomic and plant ecological investigations that have been carried out in the northern coastal part

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and the oases (Kehl and Bornkamm, 1993), little is known about the vegetation of large parts of the inland desert outside the inhabited oases. Shaltout and Ayyad (1988) studied the size structure and standing crop of Egyptian *Thymelaea hirsuta* populations in the desert area along the coastal western desert. Management and phytosociology of weeds have a great interest all over the world. In Egypt, many studies were carried out on the phytosociology of weeds in different Governorates (El-Ghareeb, 1975; Shaltout, and El-Ghareeb, 1992; and Abd El-Ghani and Amer 2003 and Abd El-Kawy, 2005).

The aim of this study was to analyze the vegetation, identify the plant species composition and describe the size structure and dynamics of 14 common natural populations, in terms of height, diameter, volume and density, in different habitats in desert area along Alamain – Wadi-El-Natrun highway desert road in the western desert of Egypt.

Study Area:

The studied area is located in the Libyan portion of the Sahara which is called now the western desert of Egypt Mitwally (1953**)**, as it occurs west of the river Nile. 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 the studied area, is one of the semi 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 (Fig. 1) 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, 3) and Sandy flat.

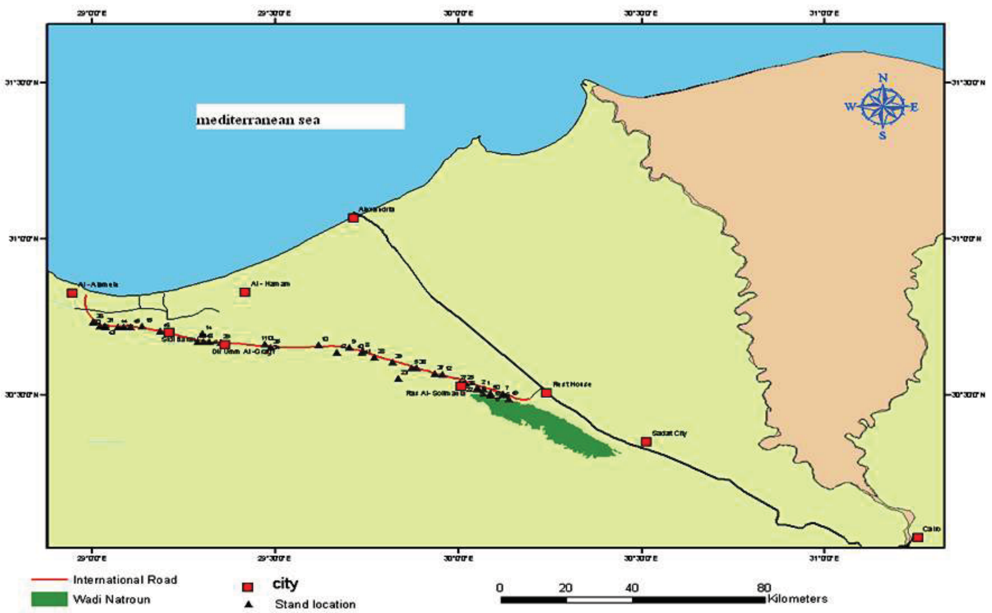


Fig. 1: Map showing Alamain – Wadi-El-Natrun desert road representing the studying stands (▲).(Atlas of Egypt, 1996).

Geomorphology:

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 depends 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, the 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 limestone 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:

Climate of this region belongs to the warm coastal Desert climate Meigs (1973). According to the three meteorological stations: El- Dabbaa, Wadi El-Natron and Gianaclis along the study area 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 for the narrow Mediterranean coastal belt, which is the wettest region of our study, 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

Selection of Stands and Vegetation Sampling:

Fifty stands were distributed in the study area to cover the whole climatic gradient and most of the physiographic variations. In order to avoid local microclimatic and edaphic variations induced by the desert road, stands were located at considerable distances from its sides.

Vegetation was sampled in fifty stands each of $400m^2$ ($20\times20m^2$), were selected or sampled along 133 km of the desert area along Alamain – 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 : Nomenclature of species was according to Täckholm (1974) and Boulos (1999 , 2000 and 2005). The individuals belonging to each species were recorded in each quadrate; the number of individuals of each dominant species and their heights (H) and mean crown diameter (D) were measured. The size index of each individual was calculated as the average of its height and diameter [(H+D)/2]. For the dominant species the measurement is based on (2-4 diameter measurement /ind). The size estimations were then used to classify the dominant species populations into many size classes. the ranges of size classes are Category (1): 1:<20 ; 2: 20-40 ; 3: 40-60 ; 4: 60-80 ; 5: 80-100 and 6 : >100 dm^3 Category(2):(1:<10;2:10-20;3:20-30,4:30-40,5:40-50and 6>50 dm3. Two-way indicator species analysis (TWINSPAN), as a classification technique, and detrended correspondence analysis (DECORANA), as an ordination technique, were applied out to the matrix of cover estimates of 162 species in 50 stands (Hill, 1979 a & b; Hill and Gauch 1980, Gauch and Whittaker 1981 and CAP 2003).

RESULTS AND DISCUSSION

As described in the published data of part-a for the present study, (Youssef *et al*., 2009), the landscape of the desert area stretching along the International Al-alamein Highway desert road is plain and slightly undulating. According to data of soil analysis for the present work, (which published in Youssef *et al*., 2009), sands of the studied profiles are varying in physical nature and chemical characteristics. Soils profiles collected from habitats of the succulent xerophytes are characterized with relatively higher amounts of water contents (free and bound forms) as well as their pH are slightly alkaline. However, the soil profiles of non-succulent xerophytes have shown higher contents of chlorides, sulfates, sodium as well as relatively increase in pH values. Results of the present work suggested that the properties of soil could be the most important factor in the determination of the distribution of different life forms. They also reported that soil characteristics are influencing plant growth, distribution and cover of the plant communities. They also stated that the variations in the soil analyses are due to the difference in the nature and the geomorphologic characters.

Vegetation Analysis:

Recent study (Spring 2s004 to Spring 2007) recorded 162 plant species belonging to129 genera and 39 families. 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, annuals had the highest contribution than perennials. This trend is similar to that of the Egyptian Mediterranean region where the therophytes contribute the highest 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).

The relationships between the individuals heights and diameters of the selected species are simple linear with r values (pearson correlation coefficient) are shown in Fig.(2 and 3). *Lycium shawi* has the highest r value (0.899), Fig.(3), while *Stipagrostis ciliata* and *Convolvulus lanatus* have the lowest values (0.222 and 0.485) respectively, Fig. (2).

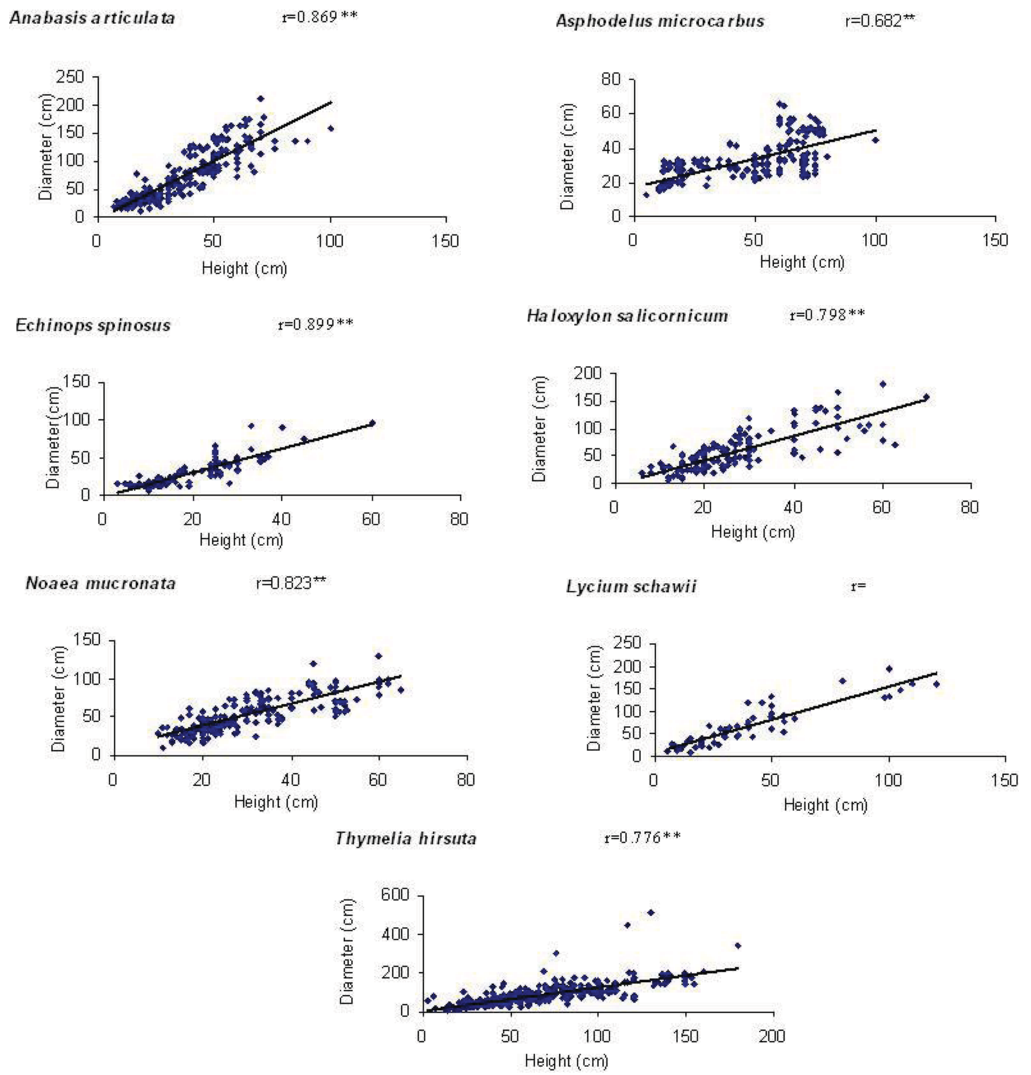


Fig.2: Height-diameter relationships for studied taxa of the desert along Alamain – Wadi-El-Natrun desert road of 7 species (Category one) while the ranges of size classes are: 1:<20 ; 2: 20-40 ; 3: 40-60 ; 4: 60-80 ; 5: 80-100 and 6 : >100 dm^3. , r= pearson correlation coefficient.

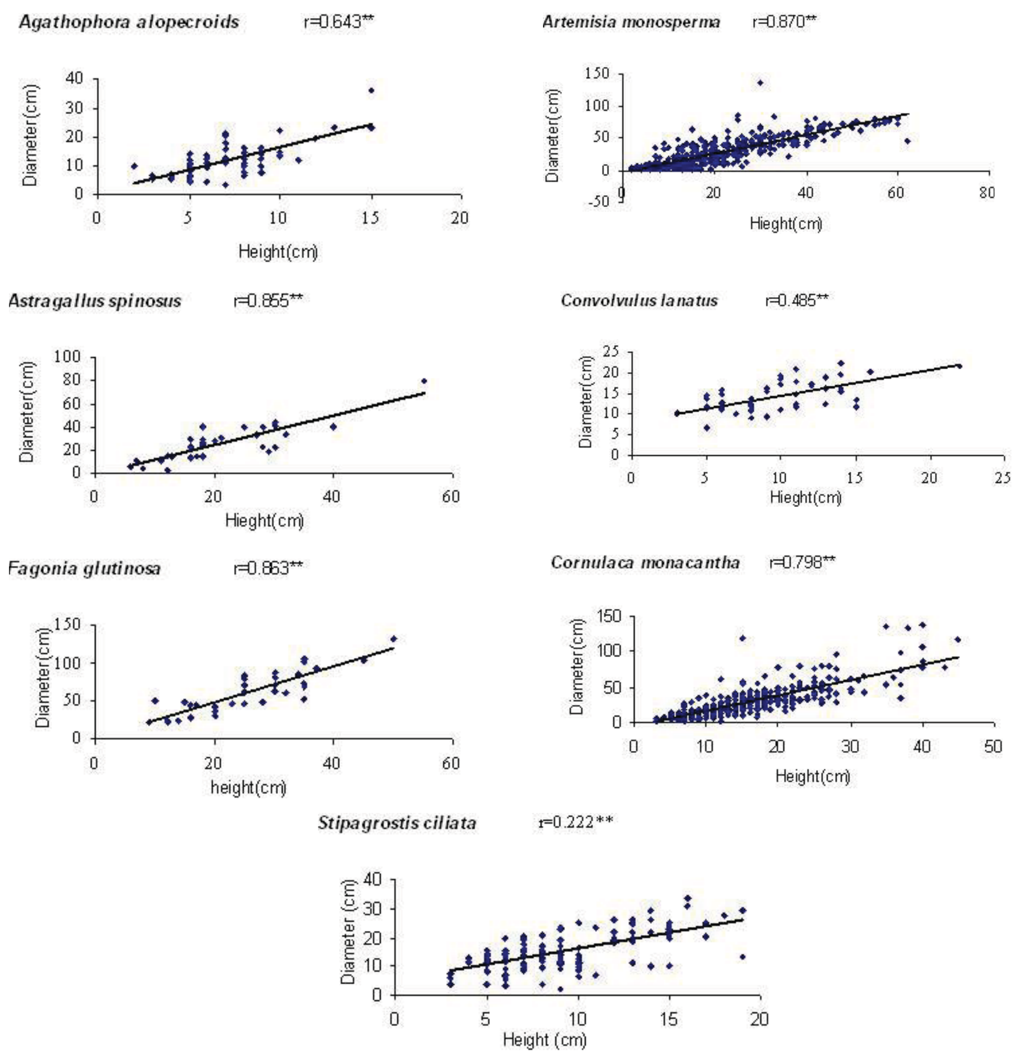


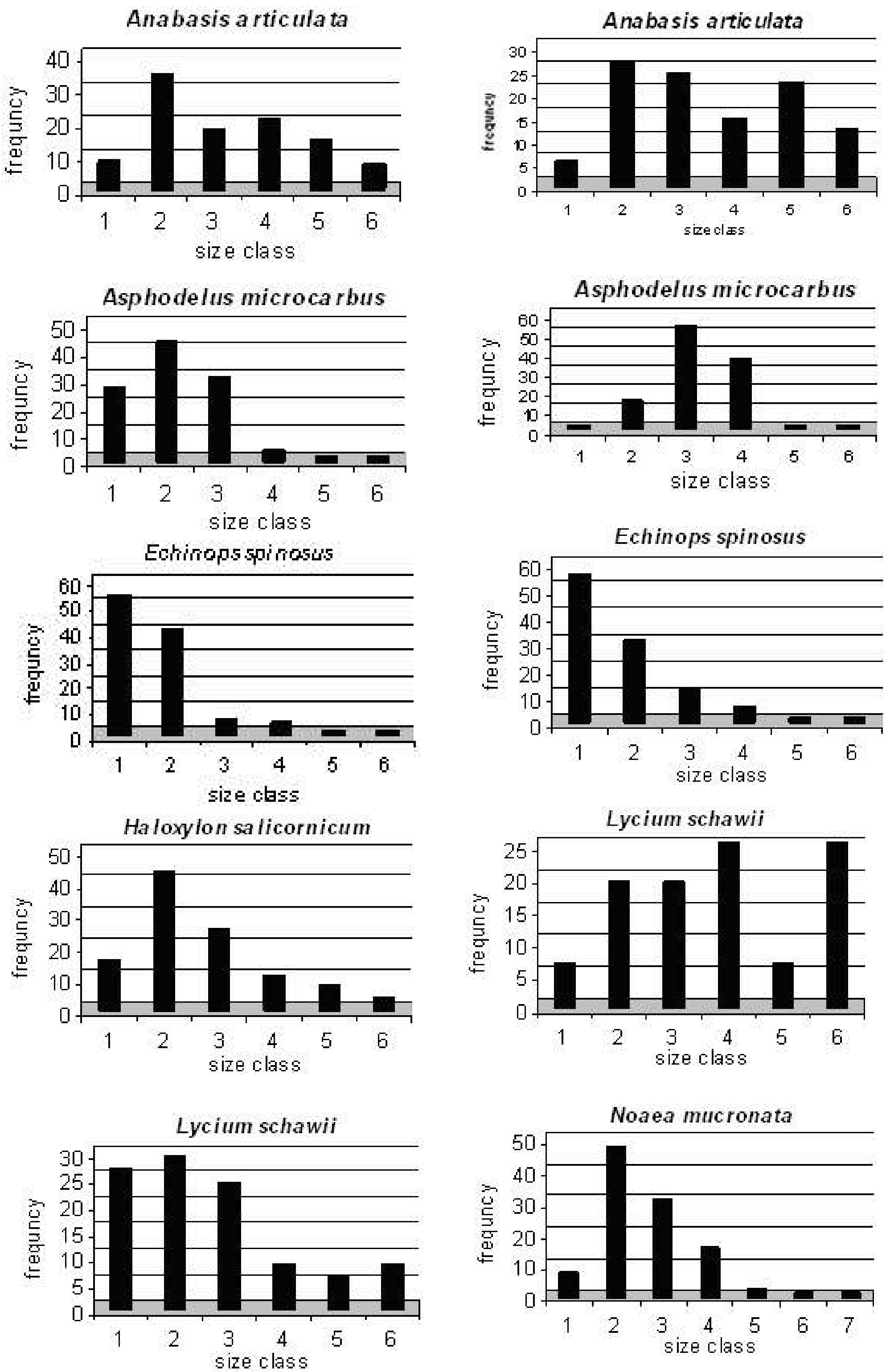
Fig.3: Height-diameter relationships for studied taxa of the desert area along Alamain – Wadi-El-Natrun desert road of 7 species (Category two) while the ranges of size classes are: 1:<10 ; 2: 10-20 ; 3: 20-30 ; 4:30-40 ; 5: 40-50 and 6 : >50 dm^3, r= pearson correlation coefficient.

The mean height to diameter ratio for 14 plant species in both habitats (Sandy flat and Non saline depressions) was shown in Table (2). Generally, the height to diameter ratio was less than unity except for *Asphodelus microcarpus* which slightly exceeds unity. The height to diameter ratio of *Astragullus spinosus* has a unity. This means that the diameters of the majority of these species tend to expand horizontally rather than vertically.

The other parameter of size index and volume of 14 species are shown clearly in Table (6). The size index revealed that the maximum value (3153.1) in *Artemisia monospermous ,* while it gives a minimum value (40.3) in *Fagonia glutinosa*. Contrary, the volume of the above two species gives the *vice versa* (780.7 and 40.3) respectively. Shaltout *et al*., (2003) suggested that the growth form considered as a self-regeneration strategy for the desert trees and shrubs.

The diagrams in Fig. 4 and 5 of the present part of the work, illustrate the size distribution of 14 species. These selected species are approximately distributed among one of the four following size distribution categories:1)- More or less inverse J-shaped distribution (*Echinops spinosus, Artemisia monosperma, Convolvulus lanatus, Cornulaca monacantha, Fagonia glutinosa* and *Stipagrostis ciliata)*, 2)- Positively skewed

Sandy flat Nonsaline depressions



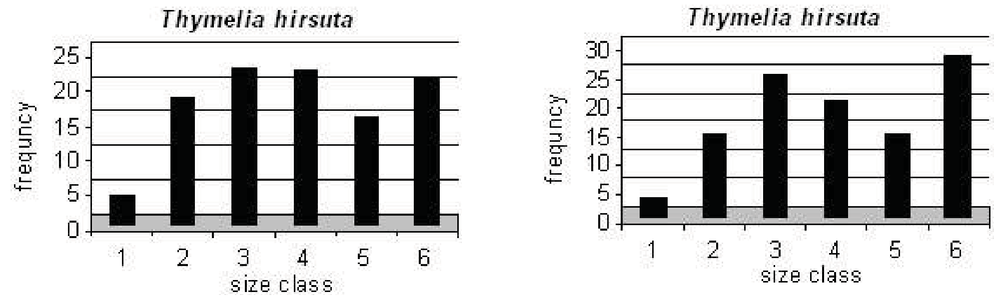
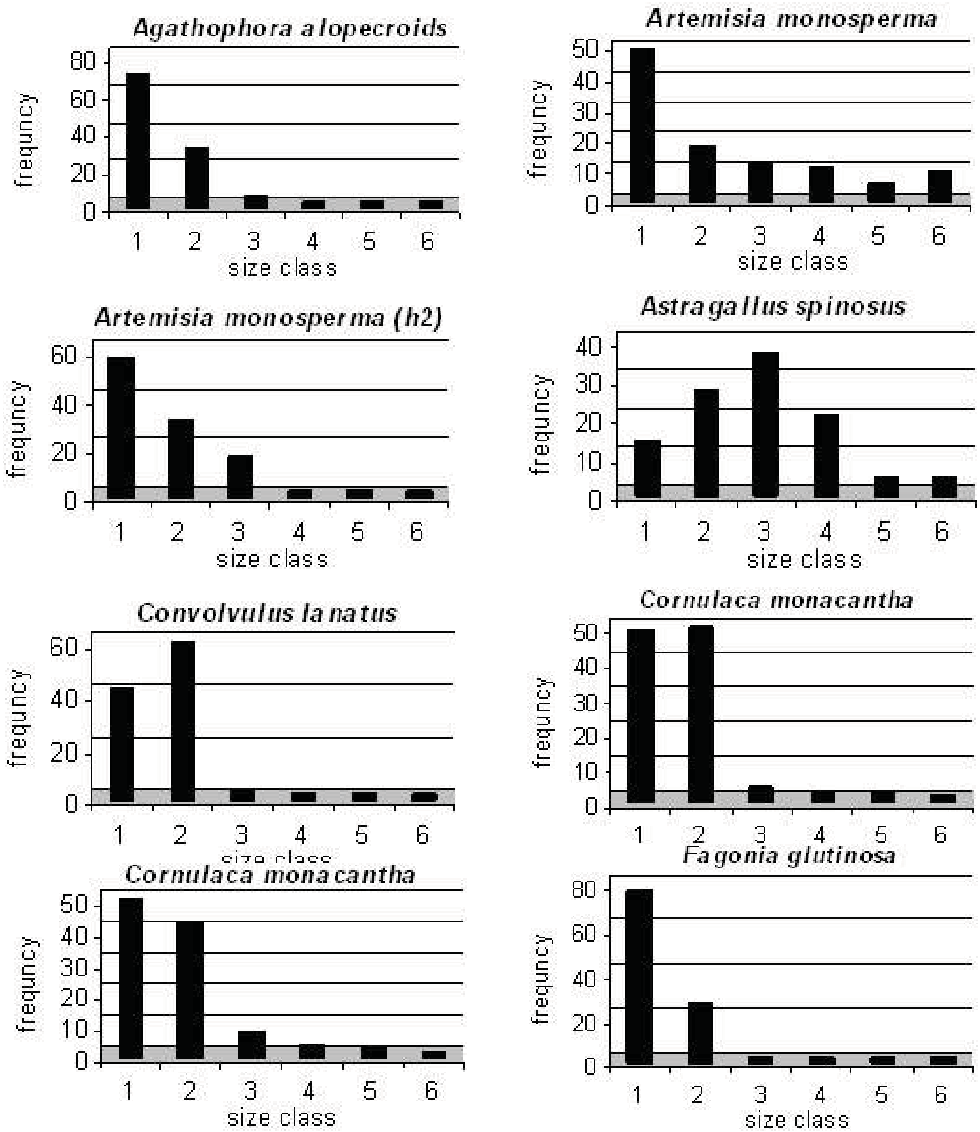
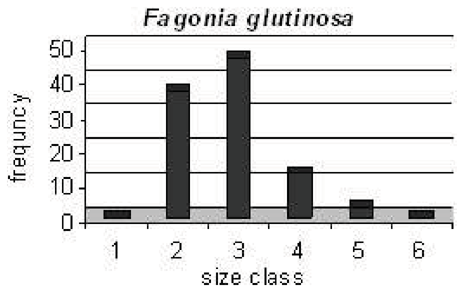


Fig. 4: Size-frequency distribution for the populations of 7 species (category 1) of the desert area along Alamain – Wadi-El-Natrun desert road. The ranges of size classes are : 1:<10; 2;10-20; 3:20-30;4:30-40;5:40-60 and 6:>50 dm3

Sandy flat

Nonsaline depressions





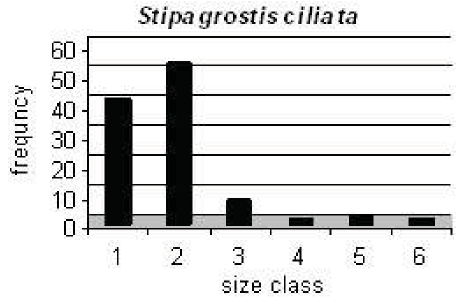


Fig. 5: Size-frequency distribution for the populations of 7 species (category 2) of the desert area along Alamain – Cairo highway desert road. The ranges of size classes are : 1:<20; 2: 20-40 ; 3: 40-60; 4: 60-80 ; 5: 80-100 and 6 : >100 dm3.

distribution towards the small (young) individuals (*Anabasis articulata, Haloxylon salicornicum, Noaea mucronata, Astragallus spinosus* and *Fagonia glutinosa*), 3)- More or less J-shaped distribution (*Thymelea hirsuta* in depression habitats) and 4)- More or less stationary size distribution (*Anabasis articulata* and *Lycium schawii*).

Size differences in plant populations may be caused directly or through differences in growth rates due to age differences, genetic variation, heterogeneity of resources, herbivores and competition (Weiner, 1985 and Zegeye *et al*., 2006). The size and age of some plant life forms (notably trees) may be correlated in a general way, but unless there is an evidence on this point, the interpretation of size as age may lead to simplistic or even inaccurate conclusions (White, 1980 and Caswell, 1986).

The positively skewed size distribution indicated the relative preponderance of small sized individuals of *Anabasis articulata, Haloxylon salicornicum, Noaea mucronata, Astragallus spinosus* and *Fagonia glutinosa*).

Results of the distribution of the present work showed negatively skewed or J shape species as *Echinops spinosus, Artemisia monosperma, Convolvulus lanatus, Cornulaca monacantha, Fagonia glutinosa and Stipagrostis ciliata* are in favor of some species that survive in arid and semi-arid zones which favor the establishment of seedlings of some species (Omar, 1991). Kadmon and Leschner (1995) argued that the stability of the sand was the main factor controlling the abundance of species in sand dunes.

The total number of recorded species in the study area is 162 species belonging to 129 genera and 39 families. The grasses have the highest contributions to the total flora (34 species: 24.3%), followed by the composites (23 species: 16.4%) and legumes (14 species: 10%). Seventeen species in ≥ 50% in total sampled stands: *Schismus barbatus* (85.71%)*, Echinops spinosus* (71.43%)*, Launaea capitata* (71.43%)*, Launaea nudicaulis* (71.43%)*, Senesio desfontenae* (71.43%), *Sonchus oleraceus* (71.43%)*, Stipagrostis ciliata* (71.43%)*, Artemisia monosperma* (57.14%)*, Convolvulus lanatus* (57.14%)*, Cornulaca monacantha* (57.14%)*, Deverra triradiata* (57.14%)*, Emex spinosa* (57.14%)*, Haloxylon salicornicum* (57.14%), *Lotus halophilus* (57.14%)*, Pulicaria undulate* (57.14%)*, Reichardia tingintana* (57.14%)*,* and *Salvia aegyptiaca* (57.14%).

The application of TWINSPAN on the cover estimates of 162 species recorded in 50 stands, led to the recognition of 7 vegetation groups at the 4th level of classification (Fig. 6-A). The application of DECORANA on the same set of data indicates a reasonable segregation among these groups along the ordination plane of axes 1 and 2 (Fig. 6-B). The vegetation groups are named after the first and occasionally the second dominant species (the species that have the highest presence percentage and / or the highest relative cover). These groups are named according to their dominant species as follows (Table 1): *A- Cornulaca monacantha*, B- *Launaea nudicaulis*, C- *Stipagrostis ciliata*, D- *Cornulaca monacantha - Artemisia monosperma*, E- *Thymellaea hirsuta*, F- *Lycium schawii*, and G- *Echiochilon fruticosum –Noaea mucronata*.

Group A:

Cornulaca monacantha: It comprises one stand (2.0% of the total stands) and 3 species. The dominant species is *Cornulaca monacantha*. Other frequent species are: *Fagonia glutinosa* and *Centaurea aegyptiaca*.

Table. 1: Percentage of species cover in the seven vegetation groups identified after the application of DECORANA and TWINSPAN to the vegetation data of the studied 50 stands along Alamain- Wadi-El-Natrun desert road.

Vegetation group	A	B	C	D	E	F	G	P
Number of stands -----------------------------								
Plant species	1	2	3	4	19	15	6	%
Schismus barbatus		1	1	0.5	1.7	2.4	1.8	85.71
Echinops spinosus		0.5	1.7		1.2	1	0.8	71.43
Launaea capitata		2	0.5		1.3	1	2	71.43
Launaea nudicaulis		3	1.3		0.8	0.7	0.5	71.43
Senesio desfontenei		1.5	0.8		1.3	0.5	0.5	71.43
Sonchus oleraceus		1	0.5		1	1	0.7	71.43
Stipagrostis ciliata			2	0.8	1.1	2.2	0.5	71.43
Artemisia monosperma				2.9	1.3	2	2	57.14
Convolvulus lanatus			0.5	1.3	0.8	1		57.14
Cornulaca monacantha	5		0.5	4.3	3.2			57.14
Deverra triradiata				0.5	0.5	0.5	1.7	57.14
Emex spinosa		0.5	0.5		0.5		0.5	57.14
Haloxylon salicornicum				0.5	2	0.9	2	57.14
Lotus halophilus		1			0.5	1.2	1.5	57.14
Pulicaria undulata		0.5	0.5	0.5	0.5			57.14
Reichardia tingintana		1.25	0.75		0.8		1	57.14
Salvia aegyptiaca				0.5	1	0.5	2	57.14
Anabasis articulata					1.2	1.4	2.8	42.86
Centaurea calcitrapa				0.5	1.4	2		42.86
Chenopodium murale		0.5	0.5		0.5			42.86
Cynodon dactylon		2	0.8			4		42.86
Echiochilon fruticosum		0.5			0.5		3	42.86
Erodium laciniatum					0.5	0.75	1.8	42.86
Eruca sativa		0.5	0.5		1			42.86
Filago desertorum					0.9	0.9	2	42.86
Helianthemum lippi					0.5	0.5	1.25	42.86
Moltkiopsis ciliata			0.5		0.6	0.7		42.86
Noaea mucronata					2.2	1.3	3	42.86
Pancratium sickenbergeri					0.5	1.5	0.5	42.86
Panicum turgidum			1	0.5	3			42.86
Plantago ovata					0.9	1.1	2	42.86
Polycarpia repens					1.3	2	0.5	42.86
Salsola kali			0.5	0.5	0.5			42.86
Silene villosa					1	1.6	1	42.86
Thymelaea hirsuta					3.1	2.6	2.3	42.86
Adonis dentatus						0.5	0.5	28.57
Agathophora alopecuroids					1.8	0.8		28.57
Anagallis arvensis		0.8	0.5					28.57
Asphodelus microcarpus						2.5	2.3	28.57
Astragalus spinosa					3	0.5		28.57
Atractylis cardiuus		0.5				0.5		28.57
Bassia indica			1			0.5		28.57
Brassica tournefortii			1.3		1.7			28.57
Calendula arvensis			0.5				0.5	28.57
Centaurea alexandrina					0.5	0.5		28.57
Conyza bonariensis		0.8	0.5					28.57
Coriandrum sativum		0.5	0.5					28.57
Ephedra alata				0.5			0.5	28.57
Fagonia glutinosa	0.5			1.8				28.57
Ifloga spicata			0.5		0.5			28.57
Lycium shawii						3	0.8	28.57
Melilotus indicus		1	0.5					28.57
Phoenix dactyfera			0.5				0.5	28.57
Sporopolus pungens				0.5	0.8			28.57
Triticum vulgare					0.7		1	28.57
Zygophyllum album						0.9	0.5	28.57
Aeigilops kotschyii		0.5						14.29
Aelurops lagopoids			0.5					14.29
Allium roseum						0.5		14.29
Anacyclus monanthos		0.5						14.29
Anastatica hierochuntica						0.5		14.29
Arenaria deflexa					0.5			14.29
Artemisia judiaca						3		14.29

Table 1: Continue

Arthrocnemum marcrostachyum						0.5		14.29
Aster squamatus		1						14.29
Astragalus boeticus						2		14.29
Astragalus schimperi						0.5		14.29
Atriplex halimus						0.5		14.29
Atriplex leucoclada						0.5		14.29
Bassia arabica					0.5			14.29
Bassia muricata					1			14.29
Beta vulgaris					0.5			14.29
Bupleurum semicompositum							0.5	14.29
Cakile maritima						0.5		14.29
Carrichtera annua						0.1		14.29
Cenchrus ciliaris		0.5						14.29
Centaurea aegyptiaca	0.5							14.29
Centaurea eryngoides					0.1			14.29
Centaurea pumili				0.5				14.29
Chenopodium album					0.5			14.29
Cistanche violacea						0.5		14.29
Cleom amblyocarpae					0.5			14.29
Colchicum ritchii						0.5		14.29
Convolvulus arvensis					1.25			14.29
Cotula arabica					2			14.29
Crucianella maritima						0.5		14.29
Cutandia memiphitica		0.5						14.29
Cynanchum acutum					0.5			14.29
Dactylis glomerata		0.5						14.29
Echium angustifolium						0.5		14.29
Euphorbia paralias						0.5		14.29
Euphorbia retusa							0.5	14.29
Fagonia arabica					1			14.29
Fagonia bruguieria			0.5					14.29
Fagonia indica						0.5		14.29
Fagonia mollis					1			14.29
Farsetia aegyptiaca		0.5						14.29
Frankenia revolute						0.5		14.29
Fumaria densiflova		0.5						14.29
Gagea fibrosa						0.5		14.29
Glubularia arabica						0.5		14.29
Gymnocarpus decanderus					0.5			14.29
Gypsophila capillaris					0.5			14.29
Halocnemum strobilaceum							0.5	14.29
Helianthemum kahiricum					0.5			14.29
Heliotropium curassavicum					0.5			14.29
Herniaria hemistemon					0.5			14.29
Hippocrepis areolata		0.5						14.29
Hippocrepis bicantorta		0.5						14.29
Hordeum leporinum							0.5	14.29
Hordeum murinum							0.5	14.29
Hyoscyamus muticus					0.5			14.29
Hyoseris radiata							0.5	14.29
Juncus acutus						0.5		14.29
Juncus rigidus							0.5	14.29
Kickxia aegyptiaca						0.5		14.29
Kochia indica						0.5		14.29
Launaea residifolia						0.5		14.29
Limonium pruinosum				0.5				14.29
Lotus polyphllos						0.5		14.29
Lycium europiun							0.5	14.29
Lygeum spartum						0.5		14.29
Malva parvi-flora					0.5			14.29
Matthiola arabica					0.5			14.29
Medicago polymorpha		0.5						14.29
Medicago sativa		0.8						14.29
Mesembryanthemum crystalinum						0.5		14.29
Mesembryanthemum nodifloum							0.5	14.29
Monsonia nivea					0.5			14.29
Nitraria retusa						0.5		14.29
Ochradenus baccatus							0.5	14.29

Table 1: Continue

Ononis vaginalis		0.5						14.29
Onopordum alexandrinum						0.5		14.29
Orobanche romosa						0.5		14.29
Otanthos maritimus							0.5	14.29
Pancratium maritimum						0.5		14.29
Peganum harmala						0.5		14.29
Pergularia tomentosa							0.5	14.29
Phalaris minor						0.5		14.29
Phragmites australis					0.5			14.29
Polycarpon succulentum					0.8			14.29
Polypogon monspeliensis			0.5					14.29
Pseudorlaya pumila						0.5		14.29
Reaumuria hirtella						0.5		14.29
Reseda alba							0.5	14.29
Retama monosperma					0.5			14.29
Retama raetam					0.5			14.29
Rumex vesicarius					0.5			14.29
Salsola longifolia		0.5						14.29
Salsola tetrandra				0.5				14.29
Salvia lanigera					0.5			14.29
Solanum nigrum			0.5					14.29
Sonchus asper					0.5			14.29
Spergularia salina						0.5		14.29
Sphenopus divaricatus					0.5			14.29
Suaeda vera						0.5		14.29
Tamarix nilotica					0.5			14.29
Trifolium resupinatum		0.5						14.29
Trigonella stellata						0.8		14.29
Vicia sativa			0.5					14.29
Zilla spinosa				0.5				14.29
Zygophyllum coccineum						0.5		14.29
Zygophyllum decumbens						0.5		14.29
Zygophyllum simplex						0.5		14.29
Number of species	3	34	32	19	71	75	46	

Group B:

Launaea nudicaulis: It comprises two stands (4.0% of the total stands) and 34 species. The dominant species is *Launaea nudicaulis*. Other frequent species are: *Schismus barbatus*, *Launaea capitata*, *Sonchus oleraceus*, *Lotus halophilus, Reichardia tingintana*, *Cynodon dactylon* and *Melilotus indicus.*

Group C:

Stipagrostis ciliata: It comprises 3 stands (6.0% of the total stands) and 32 species. The dominant species is *Stipagrostis ciliata*. Other frequent species are: *Echinops spinosus*, *Launaea nudicaulis*, *Panicum turgidum*, *Bassia indica*, *Brassica tournefortii* and *Schismus barbatus.*

Group D:

Cornulaca monacantha - Artemisia monosperma: It comprises 4 stands (8.0% of the total stands) and 19 species. The dominant species are *Cornulaca monacantha* and *Artemisia monosperma*. Other frequent species are: *Convolvulus lanatus*, *Fagonia glutinosa*, and *Stipagrostis ciliata.*

Group E:

*Thymellaea hirsut*a: It comprises 19 stands (38.0% of the total stands) and 71 species. The dominant species is *Thymellaea hirsuta*. Other frequent species are: *Schismus barbatus*, *Echinops spinosus*, *Launaea capitata*, *Senesio desfontenae*, *Stipagrostis ciliata*, *Artemisia monosperma*, *Cornulaca monacantha*, *Haloxylon salicornicum*, *Salvia aegyptiaca*, *Anabasis articulata*, *Centaurea calcitrapa*, *Noaea mucronata*, *Panicum turgidum*, *Polycarpea repens*, *Agathophora alopecuroids*, *Astragalus spinosa*, *Brassica tournefortii*, *Convolvulus arvensis*, and *Cotula arabica*.

Group F:

Lycium schawii: It comprises 15 stand (30.0% of the total stands) and 75 species. The dominant species is *Lycium schawii*. Other frequent species are: *Schismus barbatus*, *Echinops spinosus*, *Launaea capitata*, *Sonchus oleraceus*, *Stipagrostis ciliata*, *Artemisia monosperma*, *Convolvulus lanatus*, *Lotus halophilus*, *Anabasis* *articulata*, *Centaurea calcitrapa*, *Cynodon dactylon, Noaea mucronata*, *Pancratium sickenbergeri*, *Plantago ovata*, *Polycarpia repens*, *Silene villosa*, *Thymellaea hirsuta*, *Asphodelus microcarpus*, *Artemisia judiaca*, *Astragalus boeticus*,

Group G:

Echiochilon fruticosum: It comprises 6 stands (12.0% of the total stands) and 46 species. The dominant species is *Echiochilon fruticosum*. Other frequent species are: *Schismus barbatus*, *Launaea capitata*, *Artemisia monosperma*, *Deverra triradiata*, *Haloxylon salicornicum*, *Lotus halophilus*, *Reichardia tingintana*, *Salvia aegyptiaca*, *Anabasis articulata*, *Erodium laciniatum*, *Filago desertorum*, *Noaea mucronata*, *Plantago ovata*, *Thymellaea hirsuta*, and *Asphodelus microcarpus.*

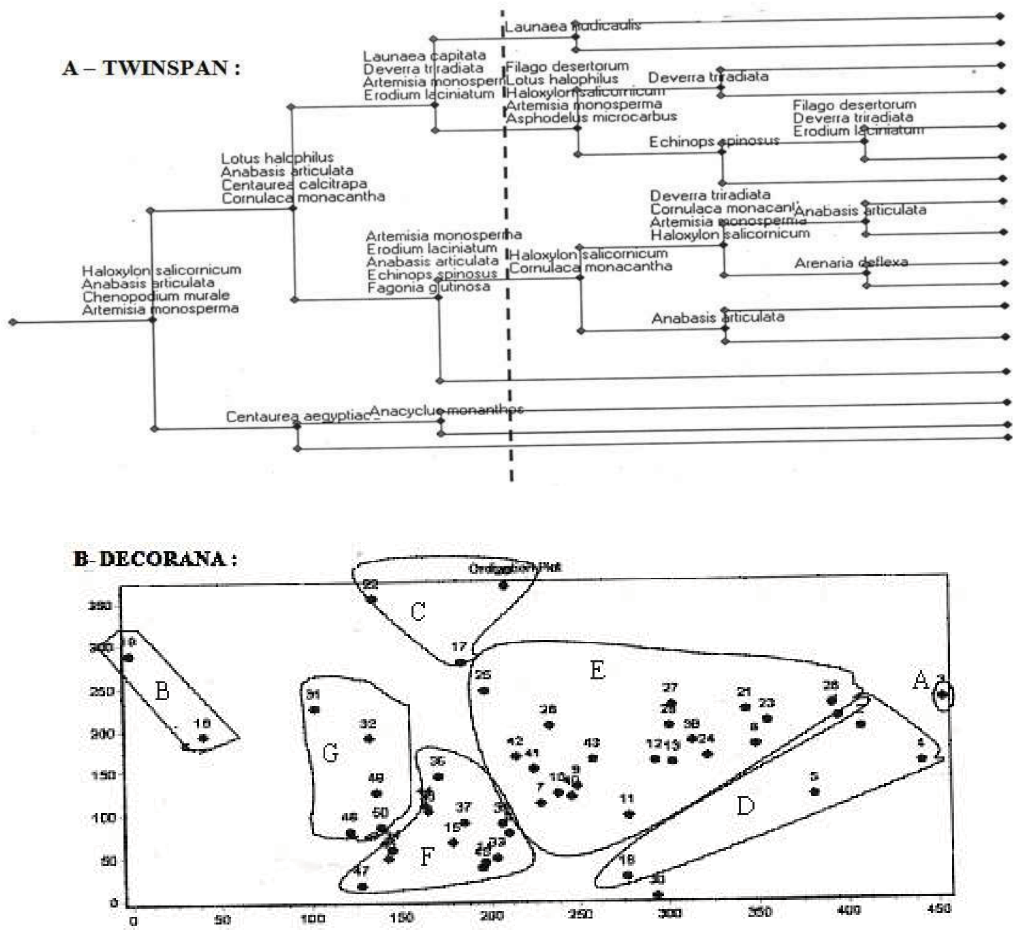


Fig. 6: The relationship between the 7 vegetation groups generated after application of TWINSPAN and their cluster centroids along the first and second axes of DECORANA, 50 stands denotes to the site of the study, along Alamain – Cairo highway desert road.

Seven vegetation groups (communities) were generated after the application of the multivariate analysis Hill (1979 a & b) to the data of 162 species in 50 stands: (A- *Cornulaca monacantha*, B- *Launaea nudicaulis*, C- *Stipagrostis ciliata*, D- *Cornulaca monacantha - Artemisia monosperma*, E- *Thymellaea hirsut*a, F- *Lycium schawii*, and G- *Echiochilon fruticosum –Noaea mucronata*) . All these communities represent the typical desert communities (Al-Sodany and Mosallam, 2006). The 7 vegetation groups in the present study are more or less similar to that recorded by Girgis (1970) and (Zahran and Willis, 1992) on the natural habitats of Cairo-Alex desert road. Five groups were dominated by perennial species (*Cornulaca monacantha*, *Launaea nudicaulis,*

Table. 2: Mean ± standard deviation of some demographic variables of selected species in the studied habitats of desert area along Alamain – Cairo highway desert road

Size class	Sandy flat					Non saline depressions					Total means				
	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume
1	12±2.8	21.2±4.9	0.62±0.3	16.5±2	16.7±6.6	12.7±6.5	19.3±3.7	0.7±0.4	16±3	14.5±7	12.2±3.8	20.7±4.6	0.6±0.3	16.4±2.2	16.2±6.5
2	20.3±4.8	36.2±8.4	0.5±0.2	28.2±5.3	90.2±51	23.8±5	35.8±6.3	0.6±0.15	29.8±4.5	100.2±44.2	21.3±5	36±8	0.6±0.2	28.7±5.1	93±49
3	34.3±6.7	60.5±10	0.6±0.2	47.4±4.2	391±114.6	35.7±5.3	60.8±9.4	0.6±0.14	48.2±5.2	424±146.4	35±6.2	60.6±9.6	0.6±0.2	47.8±4.6	405±128
4	46.7±7.7	91.2±10.4	0.5±0.1	67±5.7	1225±302	49.8±6.7	88.4±12.2	0.5±0.15	69.1±6.1	1233±343.3	47.5±7.5	90.5±10.8	0.5±0.1	69±5.8	1228±309
5	57±9.3	125±9	0.4±0.08	91.3±5.6	2820±527	52±6.3	127±11	0.4±0.06	89.3±6.1	2640±546.4	55±8.4	126±9.7	0.4±0.1	90.4±5.8	2742±536
6	68.6±11.3	160±22.6	0.4±0.1	114±10.4	5530±1624	68.7±11.8	158.7±14.5	0.5±0.2	113.7±9	5469±1284	68.7±11.2	159.4±18.7	0.4±0.1	114±9.5	5501±1436
Total means	36±18.2	71.4±41.8	0.5±0.2	53.6±29.2	1112±1560	40.7±16.8	81.3±45.2	0.6±0.2	61±30.2	1471±1794	37.5±17.9	74.8±43.2	0.5±0.2	56.1±29.7	1235±1649
F-value	-	-	-	-	-	-	-	-	-	-	291.122	889.265	10.07	1397.161	559.875

a- *Anabasis articulata*:

b- *Asphodelus microcarpus*:

Size class	Sandy flat					Non saline depressions					Total means				
	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume
1	12±2.4	18.2±3.2	0.66±0.11	15±2.4	13.2±6.3	__	__	__	__	__	12±2.4	18.2±3.2	0.66±0.11	15±2.4	13.2±6.3
2	29.6±13.9	27.3±3.6	1.14±0.63	28.5±6.2	66.4±26.2	31±7.6	31.3±1.8	1±0.27	31.1±3.6	94.5±21.4	29.7±13.3	27.7±3.6	1.1±0.6	28.7±6	69.5±27.2
3	63.9±8.4	32.7±7	2±0.47	48.3±5.4	224±107.5	61±8.3	39.5±8.8	1.6±0.46	50.2±6.2	315±155	62.6±8.5	35.6±8.5	1.8±0.51	49.1±5.8	263.5±137
4	78.6±13	51±4.5	1.57±0.4	64.7±4.5	630.5±36.6	72.7±5	52.5±4.6	1.3±0.2	62.7±1.5	634±77	73.6+±7	52.5±4.5	1.4±0.23	63±2.2	633±71.8
Total means	36.1±23.4	27.1±8.2	1.2±0.71	31.6±14.6	112.8±133.7	61.1±14.7	43±10.3	1.46±0.42	52.1±11	397±222.8	43.5±24	31.8±11.5	1.3±0.64	37.6±16.5	196±209
F-value	-	-	-	-	-	-	-	-	-	-	465.5	245.4	76.3	838.3	422.1

Cont. Table. 2: c- *Echinops spinosus :*

Size class	Sandy flat					Non saline depressions					Total means				
	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume
1	11.8±2.8	17±4.2	0.71±0.2	14.4±3	12±6.8	10.4±3.7	14.7±3.2	0.73±0.3	12.6±2.6	7.6±5	11.5±3	16.5±4	0.2±0.65	14±3	11±6.7
2	24±5.1	37±6.8	0.65±0.1	30.5±5.6	112.6±57.8	24.6±4	34.2±8	0.77±0.3	29.4±4.3	4.7±43.2	24.2±5	36.4±7	0.1±0.56	30.3±5.3	109.2±55.5
3	30.2±5.6	54.7±6.3	0.56±0.16	42.4±1.5	277.8±31.2	37.8±11.5	63.8±17	0.6±0.1	50.8±13.7	582±548	34.3±10	59.6±13.5	0.16±0.5	47±10.7	441.6±418.8
4	44.5±11.4	88.6±8.4	0.5±0.12	66.6±7.8	1115.3±421.5	-	-	-	-	-	44.5±11.4	88.6±8.4	0.12±0.68	66.6±7.8	1115.3±421.5
Total means	18.4±9	28.7±16.2	0.7±0.2	23.6±12.3	95.6±202.2	19±11.7	28.3±19.5	0.72±0.71	23.6±15.3	124.7±290.5	18.6±9.6	28.6±17	0.17±0.73	23.6±13	102.7±226.2
F-value	----	----	----	----	----	----	---	----	----	-----	186.5	365.8	3.36	358	133.5

d- *Haloxylon salicornicum :*

Size class	Sandy flat					Total means				
	H	D	H/D	Size index	volume	H	D	H/D	Size index	volume
1	13±3.2	19.2±6.8	0.84±0.55	16±3.4	16.1±9.3	13±3.2	19.2±6.8	0.84±0.55	16±3.4	16.1±9.3
2	20.6±4.8	39.1±10.6	0.56±0.2	29.8±6	106.7±59.5	20.6±4.8	39.1±10.6	0.56±0.2	29.8±6	106.7±59.5
3	30±7.2	67.6±10.1	0.45±0.15	48.8±5.3	433±142.7	30±7.2	67.6±10.1	0.45±0.15	48.8±5.3	433±142.7
4	43±12.3	97±12.7	0.45±0.2	70±6.1	1247.7±353.2	43±12.3	97±12.7	0.45±0.2	70±6.1	1247.7±353.2
5	48±6.5	127.3±11	0.38±0.08	87.6±3.6	2421.1±292.4	48±6.5	127.3±11	0.38±0.08	87.6±3.6	2421.1±292.4
6	60±8.1	171.2±11.8	0.35±0.06	115.6±6	5519.4±853.7	60±8.1	171.2±11.8	0.35±0.06	115.6±6	5519.4±853.7
Total means	26.8±13.1	58.1±36.2	0.55±0.3	42.4±23.7	581.3±1051.7	26.8±13.1	58.1±36.2	0.55±0.3	42.4±23.7	581.3±1051.7
F-value	----	----	---	----	----	92.3	340.1	7.73	551.8	823.8

Cont. Table. 2: e - *Lycium shawii :*

Size class	Sandy flat					Non saline depressions					Total means				
	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume
1	11±0	17.3±0	0.63±0.0	14.1±0	10.3±0	10.3±3.6	19±6.4	0.61±0.36	14.6±3.5	12.4±8.1	10.3±3.4	18.7±6.13	0.61±0.35	14.5±3.3	12.2±7.7
2	26.6±7.6	34.4±7.6	0.76±0.06	30.5±7.6	111.5±82.8	22.1±5.4	36.1±9.1	0.65±0.23	29.1±5.8	99.2±64.1	23.1±5.9	35.7±8.6	0.67±0.21	29.4±5.9	101.9±65.2
3	40±0	73.11±6.3	0.54±0.04	56.5±3.1	674.7±116.1	36.7±10.4	59.5±8.4	0.64±0.23	48.1±4.8	402.1±117.4	37.5±9	62.9±9.8	0.61±0.2	50.2±5.7	470.2±166.3
4	50.5±6.1	88.7±6.8	0.57±0.08	69.6±4.5	1254.3245.4	50±10	98.8±18.3	0.52±0.18	74.4±5	1498±278	50.2±7.2	93.1±12.8	0.55±0.12	71.6±5	1358.9±270
5	50±0	133.3±0	0.37±0.0	91.6±0	2791.1±0	48±2.8	115±4.7	0.41±0.04	81.5±0.49	1990±45.8	48.6±2.3	121.1±11	0.4±0.03	84.8±5.9	2257±463.5
6	98.7± 13.1	152±14.6	0.65± 0.12	125.4± 7.6	7164.1± 1336.8	106±12.1	162.2± 33.3	0.67±0.14	134.1± 17.9	8997± 3517	101.8± 12.2	156.4± 22.5	0.66±0.11	129.1± 12.5	7949± 2444.8
Total means	53.6±30	89.7± 47.3	0.61± 0.12	71.7± 37.7	2427.1± 2967.7	32.6±26.3	56.2±43.2	0.61±0.25	44.4±33.8	1060±2554	38.8±28.8	66.1±46.7	0.61±0.22	52.5±36.9	1465±2728
F-value	---	---	---	---	---	---	---	----	---	---	147.1	156.1	0.89	318.7	92.5

f - *Noaea mucronata:*

Size class	Sandy flat					Total means				
	H	D	H/D	Size index	volume	H	D	H/D	Size index	volume
1	14.3±2.7	20.8±5	0.75±0.24	17.5±2.4	19.7±7.1	14.3±2.7	20.8±5	0.75±0.24	17.5±2.4	19.7±7.1
2	21.8±4.4	38.2±8	0.58±0.15	30±5.1	107±51.6	21.8±4.4	38.2±8	0.58±0.15	30±5.1	107±51.6
3	36.3±7.6	62.8±8.7	0.6±0.16	49.6±5.2	454.5±139	36.3±7.6	62.8±8.7	0.6±0.16	49.6±5.2	454.5±139
4	49.8±7	87.4±8	0.57±0.1	68.6±5.4	1209±289.3	49.8±7	87.4±8	0.57±0.1	68.6±5.4	1209±289.3
5	55.6±9.2	115.8±15.5	0.53±0.14	85.7±7.6	2355±679	49.8±7	87.4±8	0.53±0.14	68.6±5.4	1209±289.3
Total means	30.3±12.7	52.7±22.2	0.6±0.15	41.5±16.7	397±468	55.6±9.2	115.8±15.5	0.6±0.15	85.7±7.6	2355±679
F-value	---	---	---	---	---	215.7	389.7	3.96	596.1	506.7

Cont. Table. 2: g -*Thymelaea hirsuta:*

Size class	Sandy flat					Non saline depressions					Total means				
	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume
1	16.5±3.8	15.4±3.1	1.1±0.3	16±3	13.2±6	13.5±2.1	17.1±5	0.8±0.1	15.3±3.5	13.5±9.2	16.1±3.7	15.6±3.2	1±0.32	16±2.8	13.3±6
2	28.6±6.6	36±9.4	0.85±0.3	32.3±5.3	121.5±60.8	27.5±6.7	35.8±10.4	0.82±0.3	31.6±6.8	122.3±71.4	28.4±6.6	36±9.5	0.85±0.3	32.2±5.5	121.6±62
3	44.3±8.4	52±9	0.88±0.27	48.1±5.2	379±142	41.6±9.8	59.8±7.1	0.7±0.2	50.7±5.7	472±146.5	43.8±8.7	53.5±9.2	0.85±0.26	48.6±5.3	397.7±147
4	62±9.1	73.5±11.2	0.87±0.24	67.7±5	1050±272.5	60±12.2	78±15.1	0.81±0.26	69±6	1128±369	61.7±9.7	74.2±12	0.86±0.24	68±5.1	1063.7±290.1
5	83.8±16	98±15.7	0.89±0.3	91±5.4	2479±539	70.6±13.8	107±16.6	0.7±0.24	88.7±5.7	2491±582	81.6±16.1	99.5±16.1	0.86±0.3	90.5±5.4	248.1±52.8
6	111±26	155±60	0.75±0.2	133.5 ±37	10433± 13990	109.6±30	162.1± 60.7	0.73±0.26	136±37.8	11036± 13151	111± 26.8	157.1± 60.4	0.75±0.2	134.1± 37.2	10579± 13743
Total means	64± 33.5	80.5± 52.3	0.86± 0.27	72.2± 40.6	2836.5± 7429.5	65.1± 35.6	93.4± 57.6	0.75± 0.24	79.2± 43.8	3697± 8169	64.2± 33.8	83± 53.4	0.84± 0.27	73.5± 41.2	2993± 7567.7
F-value	---	---	---	---	---	---	----	---	---	---	366.6	212	5.12	413.8	38.8

h - Agathophora alopecroides :

Size class	Sandy flat					Total means				
	H	D	H/D	Size index	volume	H	D	H/D	Size index	volume
1	5.6±1.5	8.7±2.6	0.7±0.33	7.7±1.6	1.5±0.9	5.6±1.5	8.7±2.6	0.7±0.33	7.7±1.6	1.5±0.9
2	9.4±2.3	17±4	0.57±0.15	13.2±2.5	9.3±6.3	9.4±2.3	17±4	0.57±0.15	13.2±2.5	9.3±6.3
3	11±5.6	35.8±0..2	0.3±0.15	23.4±3	44.5±23.4	11±5.6	35.8±0..2	0.3±0.15	23.4±3	44.5±23.4
Total means	6.8±2.6	12±6.5	0.65±0.3	9.4±4.2	5.1±9.3	6.8±2.6	12±6.5	0.65±0.3	9.4±4.2	5.1±9.3
F-value	---	---	---	---	---	27.6	108.6	2.64	105.8	92.05

Cont. Table. 2: i - *Artemisia monosperma :*

Size class	Sandy flat					Non saline depressions					Total means				
	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume
1	6±3.1	3.1±2.3	3.3±3.7	4.5±2.2	0.34±0.55	8.8±3.6	2.3±2.7	9.7±9.3	5.5±2.3	0.37±0.71	6.66±3.4	3±2.4	4.7±6	4.8±2.2	0.35±0.6
2	15.2±4.2	14±4.2	1.2±0.53	14.6±3	53.8±19.6	16.6±4.4	14.3±5.7	1.7±2	15.5±2.4	11.3±7.1	15.5±4.3	14.1±4.6	1.3±1.1	14.8±2.8	10.4±6.4
3	19±5.6	30.3±6.1	0.67±0.26	24.6±3	53.8±19.6	21.1±5.7	30.5±6.3	0.75±0.3	25.8±2.6	60.3±19.1	19.7±5.7	30.4±6.1	0.7±0.3	25±2.8	56±19.6
4	27.5±5.4	40.8±4	0.68±0.17	34.1±2.5	143±30.1	27.8±5.4	41±8.3	0.7±0.22	34.4±3.2	144.8±42.1	28±5.4	41±5.6	0.7±0.2	34.2±2.7	143.6±34
5	33.4±5.2	52.8±4.5	0.64±0.13	43.1±2.7	292.3±55.3	36.7±4.2	52.8±7.1	0.7±0.14	44.7±2.8	321.6±67.6	35±5	52.8±5.7	0.67±0.14	43.8±2.8	305±62
6	47.1±9	71.6±7	0.66±0.12	59.4±5.8	768.4±225.1	45.2±12.2	79.8±34.2	0.7±0.42	62.5±11.7	866.4±516.2	46.9±9.2	72.7±13.4	0.67±0.18	59.8±6.7	781.7±272.7
Total means	16±13.4	20±222.1	2±2.8	18±17.4	100.4±224	19.1±11.7	22.6±22.7	4.4±7.2	20.8±16.3	99.6±204.1	16.7±13	20.6±22.3	2.6±4.5	18.7±17.1	100.2±218.7
F-value	---	---	---	---	---	---	---	---	---	---	650.6	1665.1	22.6	3153.1	780.7

j- *Astragullus spinosus :*

Size class	Sandy flat					Total means				
	H	D	H/D	Size index	volume	H	D	H/D	Size index	volume
1	8.2±2.6	6±3.6	2±1.7	7±1.4	1.00±1.11	8.2±2.6	6±3.6	2±1.7	7±1.4	1.00±1.11
2	14.2±2.8	14.7±3.4	1±0.2	14.4±2.6	10.5±6.5	14.2±2.8	14.7±3.4	1±0.2	14.4±2.6	10.5±6.5
3	21.2±5.1	27.3±5.6	0.83±0.35	24.3±2.4	49.1±17.3	21.2±5.1	27.3±5.6	0.83±0.35	24.3±2.4	49.1±17.3
4	28.6±2.5	38.7±4.3	0.74±0.12	33.6±2.4	136.2±32	28.6±2.5	38.7±4.3	0.74±0.12	33.6±2.4	136.2±32
5	40±0.00	40.3±0.00	1±0	40.1±0.00	204.3±0.00	40±0.00	40.3±0.00	1±0	40.1±0.00	204.3±0.00
6	55±0.00	80±0.00	0.68±0	67.5±0.00	1105±0.00	55±0.00	80±0.00	0.68±0	67.5±0.00	1105±0.00
Total means	20.9±10.4	25.6±15.5	1±0.72	23.2±12.5	88.9±197.1	20.9±10.4	25.6±15.5	1±0.72	23.2±12.5	88.9±197.1
F-value	---	---	----	---	---	38.8	62.5	2.37	157.8	686.4

Cont. Table. 2: k - *Convolvulus lanatus:*

Size class	Sandy flat					Total means				
	H	D	H/D	Size index	volume	H	D	H/D	Size index	volume
1	6.2±1.7	11.1±1.7	0.57±0.2	8.7±1.17	2.4±0.84	6.2±1.7	11.1±1.7	0.57±0.2	8.7±1.17	2.4±0.84
2	11.7±3.2	16±3.2	0.78±0.38	13.8±2.17	9.6±4.7	11.7±3.2	16±3.2	0.78±0.38	13.8±2.17	9.6±4.7
3	22±0.00	21.6±0.00	1±0	21.8±0.00	32.4±0.00	22±0.00	21.6±0.00	1±0	21.8±0.00	32.4±0.00
Total means	9.7±4.2	14.1±3.7	0.7±0.33	12±3.4	7.2±6.2	9.7±4.2	14.1±3.7	0.7±0.33	12±3.4	7.2±6.2
F-value	---	---	---	---	---	34.2	21.7	3.03	60.7	45.0

l- *Cornulaca monacantha*

Size class	Sandy flat					Non saline depressions					Total means				
	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume
1	7.3±2.3	7±3.2	1.5±1.5	7.1±1.5	1.2±0.97	6.4±1.7	9.9±2.6	0.7±0.27	8.2±1.7	2.1±1	6.8±2	8.7±3.2	1±1	7.7±1.7	1.7±1.1
2	12.6±2.7	18±4.2	0.75±0.27	15.3±2.6	13.5±6.7	11.6±3	18.3±4.4	0.67±0.24	15±2.8	13.3±7.4	12±3	18.2±4.3	0.7±0.26	15.1±2.7	13.4±7.1
3	17.3±3.1	31.5±5.2	0.56±0.14	24.4±3.11	55.8±21.8	17.8±3.2	32.2±4.5	0.56±0.13	25±2.7	59.4±19.1	17.6±3.2	32±4.8	0.56±0.13	24.7±3	57.8±20.3
4	22.7±5.2	45.8±6.7	0.51±0.17	34.2±3	147.7±38	22.9±4.5	45.5±4.3	0.51±0.12	34.2±2.4	148±31	22.8±4.8	45.6±5.6	0.51±0.15	34.2±2.6	147.8±34.3
5	28.3±4.7	61.5±4.7	0.45±0.05	45±4.6	343.5±104.6	27.6±6	61.7±6.6	0.45±0.13	44.7±2.6	325.7±57	27.8±5.6	61.7±6.2	0.45±0.11	44.7±3	329±64.1
6	34±10.2	90±18.7	0.37±0.07	62±13.8	963.4±691.6	33.1±8.1	99.5±24.3	0.34±0.11	66.3±13.1	1102±665.5	33.3±8.3	97.3±23	0.35±0.1	65.3±13	1069.4±652.3
Total means	15.5±6.6	27±16.7	0.75±0.66	21.2±11.1	70.5±173	15.7±7.7	30.2±21.6	0.6±0.22	23±14.1	109±280	15.6±7.3	29±19.8	0.66±0.46	22.3±13	93±242.6
F-value	---	---	---	---	---	---	---	---	---	---	269.8	775.5	14.5	1045.1	235.2

Cont. Table 2: m - *Fagonia glutinosa:*

Size class	Sandy flat					Non saline depressions					Total means				
	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume	H	D	H/D	SizeIndex	Volume
2	11.7±2	23.2±1.5	0.5±0.06	17.5±1.7	20.3±6	---	---	---	---	---	11.7±2	23.2±1.5	0.5±0.06	17.5±1.7	20.3±6
3	16±0.00	28.6±0.00	0.55±0	22.3±0.00	41.2±0.00	20±0.00	33.6±4.7	0.6±0.08	26.8±2.3	71.8±20	18.6±2.3	32±4.4	0.58±0.06	25.3±3	61.6±22.5
4	---	---	---	---	---	19.3±5.5	46.3±2.7	0.42±0.12	32.8±2.5	129.3±37.3	19.3±5.5	46.3±2.7	0.42±0.12	32.8±2.5	129.3±37.3
5	---	---	---	---	---	28.6±4.3	62±5.4	0.46±0.11	45.3±1.7	342.4±39	28.6±4.3	62±5.4	0.46±0.11	45.3±1.7	342.4±39
6	---	---	---	---	---	34.3±7	89.3±17.3	0.38±0.06	61.8±11.5	943±617.6	34.3±7	89.3±17.3	0.38±0.06	61.8±11.5	943±617.6
Total Means	12.6±2.6	24.3±2.7	0.51±0.006	18.4±2.6	24.5±10.7	27.7±8.8	67.2±23.8	0.42±0.1	47.5±15.6	520.6±553.5	25.5±9.8	61.1±26.8	0.44±0.1	43.3±17.8	449.7±540.7
F-value	---	---	---	---	---	---	---	---	---	---	18	39.8	3.6	40.3	8.7

n - *Stipagrostis ciliata :*

Size class	Sandy flat					Total means				
	H	D	H/D	Size index	volume	H	D	H/D	Size index	volume
1	6.1±2	9.9±3.1	0.73±0.57	8±1.5	1.9±0.97	6.1±2	9.9±3.1	0.73±0.57	8±1.5	1.9±0.97
2	10.1±3	17±4.4	0.62±0.23	13.5±3	10.3±7.4	10.1±3	17±4.4	0.62±0.23	13.5±3	10.3±7.4
3	15.7±1.9	29.9±5	0.54±0.11	22.8±2.3	44.7±13.2	15.7±1.9	29.9±5	0.54±0.11	22.8±2.3	44.7±13.2
5	88±0.00	8±0.00	11±0	48±0.00	17.6±0.00	88±0.00	8±0.00	11±0	48±0.00	17.6±0.00
Total means	9.4±7.7	15±6.5	0.74±0.97	12.2±5.6	9.3±12	9.4±7.7	15±6.5	0.74±0.97	12.2±5.6	9.3±12
F-value	---	---	---	---	---	354.6	76.9	215.2	174.8	119

Thymelaea hirsuta, Lycium schawii, and the other two groups were dominated by annual species *(Stipagrostis ciliata and Echiochilon fruticosum*). After continuing the human impact (e.g. cleaning, ploughing, etc.) during this study, the situation of vegetation groups must be changed completely. On the other hand, the vegetation group characterized by *Cornulaca monacantha* which inhabits the most of the study areas is comparable to that reported by El-Ghareeb (1975) in the western Mediterranean region.

The dominance of *Thymellaea hirsuta* in seaward in group E may be due to un-palatability to herbivores because of their high salt content, low protein content and high concentrations of phenolic compounds and condensed tannins (Kam *et al*. 1997). Also, El-Kady (1987) observed that *Thymelaea hirsuta* is less palatable when fresh, probably due to chemical factors. Furthermore, *Artemisia monosperma* was dominant in group D. This might be due to the ability of this plant to develop shoot-borne roots and hairs on its seedlings under disturbance. Danin (1996). The seed germination of *Artemisia monosperma* might be enhanced by trampling as its achenes are very sensitive to light. These achenes require a thin cover of sand to germinate (Huang and Gutterman, 1998). Fahn and Culter (1992) showed that *Artemisia monosperma* is resistant to both covering and uncovering by sand.

After continuing the human impact (e.g. cleaning, plunging, etc.), many of the native species are completely eliminated. In addition, desert species lack the possibility to persist after this new land use system. Similar conclusions were made by (Sheded and Shaltout, 1998). The construction of this road leads to pave the formation of new gardens that become a fresh start of new species through transportation of soil from delta region.

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