CATRINA (2011), 6 (1): 47 -58

An Ecological Study on Two Geophytes: *Asparagus stipularis* Forssk. and *Asphodelus aestivus* Brot. in the Mediterranean Coast of Egypt

Mamdouh S. Serag[1], Abdel-Hamid A. Khedr, Amina Z. Abo El-Naga and Reda A. Abo-Moustafa.
Botany Department, Faculty of Science at New Damietta, Damietta Branch, Mansoura Uuniversity.

ABSTRACT

The present study aims to evaluate the distribution pattern of two geophytes namely: *Asparagus stipularis* and *Asphodelus aestivus* along the Mediterranean coast of Egypt. The floristic analysis indicated that the associates with both species are mainly therophytes, chamaephytes and geophytes. Both species are found to grow in slightly alkaline soil and low to medium soil salinity. *A. stipularis* prefers relatively high soil organic carbon, while *A. aestivus* prefers soil with high calcium carbonate content. Species richness showed hum-pbacked curve along the pH and calcium carbonate gradients for both species. Species richness of *A. stipularis* community showed a positive relation to soil salinity and negative relation to organic carbon, whereas no noticeable trends were found in case of *A. aestivus* community. Canonical correspondence analysis (CCA) indicated that calcium carbonate and Ca^{+2} are the most determinant edaphic factors for distribution *A. aestivus*, while organic carbon, Na^{+} and Mg^{+2} are the effective factors for the distribution of *A. stipularis*.

Key Words: *Asparagus*, *Asphodelus*, Geophytes, Mediterranean coast, Soil Variables, Species Richness, Protected Area.

INTRODUCTION

Mediterranean coastline is an area of high bio-diversity, 10% of the world's higher plants can be found in this area, which represents only 1.6% of the Earth's surface (Medail and Qu´ezel, 1999). The northern Mediterranean coast of Egypt is characterized by highly diverse edaphic, topographic, and climatic characteristics and, as a consequence, by different vegetation groups (EL-Ghonemy *et al*., 1978). The coastal belt of the Mediterranean was the richest part of Egypt in flowering plants owing to its relatively high rainfall; most of these species are annuals that flourish during the rainy season.

During the longer dry periods, the characteristic woody shrubs and perennial herbs constitute the scrub vegetation, scattered sparsely in parts and grouped in denser distinct patches (El-Shaer and El-Morsy, 2008; and Zahran and Willis, 2009). Geophytes are plants with underground storage organs appeared as promising raw materials for various economic uses. These geophytes have maximum diversity in Mediterranean-type ecosystems (Rundel, 2004). In present study two geophytes will be studies: *Asparagus stipularis* and *Asphodelus aestivus.*

Asparagus is a large genus. It is a member of the *Asparagaceae* family which newly was divided from family *Lilliaceae*. In Egypt, three *Asparagus* species were recorded; these species are *A. stipularis, A. africanus* and *A. aphyllus* (Täckholm, 1974; and Bolous, 2009). *A. stipularis* recorded as one of Egyptian wild plant with medicinal value. An infusion of the tuberous roots is used to remove renal stones. Young tender shoots are diuretic (Bolous, 1983). Tubers were collected and boiled for kidney illness by Bedouins in Sinai. Also, rural people in western Mediterranean coast and oases used them as diuretic and releasing kidney stones (El-Darier *et al*., 2001).

Asphodelus aestivus is growing in the Mediterranean region; it is common in North Africa and expands extensively usually because of long-term overgrazing (Le Houérou, 1979). In Egypt, it is restricted to Mediterranean coastal land, particularly the western region (Ayyad and Hilmy, 1974). *A. aestivus* is a characteristic plant of the calcareous soils, arable sandy lands and rocky ridge. It is used in folk medicine for treating ectoderm parasites, jaundice and psoriasis (Ljubuncic *et al*., 2005). Glue is produced from the tuberous roots, locally used by shoe-makers and book-binders (Bolous, 1983). Many bioactive compounds had been isolated from *A. aestivus* (El-Seedi, 2007).

The major aim of the present study is to answer the following questions: what are the major controlling soil variables for the occurrence and distribution of these two geophytes, Which soil variables affect the species richness of these plants. The obtained results will be useful for agro practices application of these geophytes for the medicinal purpose.

MATERIALS AND METHODS

Study area

The Mediterranean coastal land of Egypt has a narrow belt that extends from Sallum in the west to Rafah in the east for about 970 km. The present study was carried out at three protectorates along the Mediterranean coast Zaranik, Burullus and Omayed protectorates (Fig. 1). The climate of the study area is almost semi-arid with a short rainy winter season and a long dry summer season. The maximum rainfall received during December and January. The annual rainfall varied between 224 mm at Burullus, 186 mm at Omayed and 101 mm at Zaranik.(Table 1)

Field study

A total of 27 quadrats (10x10 m) were randomly sampled along the study area. Quadrats selection was based its homogeneity in terms of physiography and physiognomy and with minimum human disturbance. *A. stipularis* is growing in the three protectorates Zaranik, Burullus and Omayed, while *A. aestivus* is growing only

* Corresponding Author: mserag@mans.edu.eg

in Omayed protectorate. *A. stipularis* was recorded in 16 stands, six in Zaranik and five in both Burullus and Omayed. *A. aestivus* was recorded in 14 stands in Omayed.

In each quadrat, all associated plant species were recorded and the cover values of perennial species were estimated using the line intercept method (Canfield, 1941). Composite surface soil sample (0 – 25 cm) was collected from each quadrat for soil analysis. Soil samples were collected from the rhizosphere of the target species and put in plastic bags.

Laboratory analyses

Soil samples were air dried and analyzed for calcium carbonate, pH and electric conductivity (EC), Cl^- ion and the organic carbon contents, following the procedures of United States Salinity Laboratory (Anon 1954, Piper, 1947; Jackson, 1962). Concentrations of the cations: Na^+, K^+, Mg^{+2} and Ca^{+2} were determined using a Corning 410 Flame Photometer Model Jenway PFP7 (Rowell, 1994).

Data analysis

Species richness was calculated as the average number of species per stand. The relationship between species richness and the tested soil variables was considered.

Canonical Correspondence Analysis (CCA) that is weighted averaging technique whose performance is best when the species have a unimodal response to the environmental gradients. The program package of CANOCO for windows (ter Braak and Smilauer, 1998) was used for quadrat ordination.

RESULTS

Field observations showed that *A. stipularis* was recorded mainly on the stabilized sand dunes, grown in sand flats, saline depression and inland ridges. *A. stipularis* was found associated with 103 species belonging to 30 families. Furthermore, the geophyte, *A. aestivus*, known as desert species was recorded mainly in non-saline depressions, rocky ridges and inland plateau.Thirty nine species found associated with *A. aestivus* belonging to 21 families. *Chenopodiaceae, Asteraceae* and *Poaceae* were the main families of associated species represented 14.6%, 13.6% and 12.6% for *A. stipularis* and 10.8%, 10.8% and 8% for *A. aestivus*, respectively (Appendix 1).

Life forms of the associated species with *A. stipularis* were mainly therophytes (46%), followed by chamaephytes (25%) and geophytes (17%). *A. aestivus* was associated mainly with chamaephytes (44%), followed by geophytes (19.4 %) and therophytes (16.6%) (Fig.2).

Minimum (0.01%) and maximum (0.8%) values of soil organic carbon content were recorded in Burullus protectorate. The O.C. content of soil supporting *A. aestivus* ranged from 0.04 to 0.43% and from 0.1 to 0.8 % for soil supporting *A. stipularis*. Both species grow in soil with a wide range of $CaCO_3$ percentage; in soil supporting *A. stipularis* it ranged from 0.01 to 92%. The high $CaCO_3$% content for *A. stipularis* stands recorded where *A. aestivus* occurred. $CaCO_3$% content ranged from 5.1% to 98% for soil supporting *A. aestivus* (Table 2). Ca^{+2} content of soil supports A. Aestivus ranged from 2.1 to 5.3 mg/100g while the Mg^{+2} ranged from 0.7 to 6.9mg/100g *A.stipularis* soil Ca^{+2} content ranged from 4.1 to 25mg/100g soil (Table 2).

For *A. aestivus* and *A. stipularis*, the richness of associated species showed a distinct hump- backed curve along the Ph and $CaCO_3$ percentage gradient. There were positive significant correlation between species richness and $CaCO_3$ percentage gradient for *A. stipularis*.The highest richness recorded in pH ranged from 7.6 to 8 for *A. stipularis* and 7.7 for *A. aestivus.* For *A. stipularis* most stands showed $CaCO_3$percentage less than 20% and species richness showed positive relation to salinity and negative relation to O.C. %. While in *A. aestivus* stands, no noticeable trends were found for salinity and O.C. %. *A. stipularis* recorded in sites with more variable organic carbon content (0.1 -0.8 %), than *A. aestivus* (0.04 to 0.43%), and highest richness recorded in stands with O.C. content which ranged from 0.2 to 0.3% for both species (Fig. 3).

The sites dominant with *A. aestivus* are restricted to the bottom left side of the diagram of the Canonical Correspondence Analysis (CCA) (Fig 4). They are markedly distinguishable and having a clear pattern of segregation on the ordination plane. *A. stipularis* sites were found more superimposed and spread all over the ordination plane. Sites shared by both *Asparagus* and *Asphodelus* (sites 3, 5 and 13) are located at the bottom left side of the diagram. From CCA biplot of species-environmental factors (Fig. 5), analysis suggesting that calcium carbonate, Ca^{+2}, organic carbon, Na^+ and Cl^- are the most important factors responsible for the distribution of both *Asparagus* and *Asphodelus* in the study area. The position of *Asparagus* and *Asphodelus,* and the other associated species along the gradient of 9 environmental variables was clear. The length and the direction of an arrow representing a given environmental variable provides an indication on the importance and direction of the gradient and environmental change, for that variable. *Asparagus* scores along the organic carbon arrow (Fig. 5), for example suggests a strong affinity for high O.C. soils. Similar comparisons indicated that *Asphodelus* is found in habitats with high concentration of $CaCO_3$, Cl^- and Ca^{+2}in the soil.

Soil variables are significantly correlated with each other such as EC is significantly correlated with Ca^{+2}. Cl^- ion was significantly correlated with Ca^{+2} and $CaCO_3$. Na^+ was significantly correlated with K^+ and Mg^{+2} ions (Table 3).

Species names:

Aa, *Ammophila arenaria*, Ac, *Atractylis carduus*, Ah, *Seriphidium herba-album*, Ar, *Allium roseum,* Am, *Artemisia monosperma*, An, *Anabasis articulata*, At, *Atriplex halimus,* As, *Astragalus spinosus,*Ca,*Calendula arvensis,* Cm, *Crucianella martima,* Dt, *Deverra tortuosa,* E, *Echinops spinosus,* Ea, *Ephedra alata,* Ec, *Echium sericeum,* Ef, *Echiochilon fruticosum,* En, *Echium angaclifioli,* Ep, *Euphorbia paralias,* Fr, *Frankenia hirsuta,* Gd, *Gymnocarpos decandrus,* He, *Helianthemum sphaerocalyx*, Hs, *Helianthemum stipulatum,* Mb, *Muscari bicolor,* Le, *Lycium europaeum,* Lm, *Limoniastrum monpetalum,* Lc, *Lotus creticus,* Ln, *Launaea nudicaulis,* Lo, *Lotus polphyllos,* Lp, *Limonium pruinosum,* Ls, *Lycium shawii,* Lt, *Limonium tubiflorum,* Ly, *Lygeum spartum,* Mc, *Moltkiopsis cilita*, Nm, *Noaea mucronata,* Pa, *Plantago albicans,* Pe *Polygonium equisetiforme,* Pm, *Prasium majus,* Pn, *Pancratium martimum,* Pr, *Phagnalon rupestre,* Ps, *Pancratium sickenbergeri,* Pt, *Panicum turgidum,* Ra, *Retama raetam,* Rh, *Reaumuria hirtella,* Sa, *Salvia aegyptiaca,* Sl, *Salvia lanigera,* Si, *Silene succulent,* So, *Salsola longifolia,* Sp, *Suaeda pruinosa,* Ss, *Stipagrostis scoparia,* St, *Stipagrostis lanata,* Th, *Thymelaea hirsuta,* Tp, *Teucreum polium,* Za, *Zygophyllum album.*

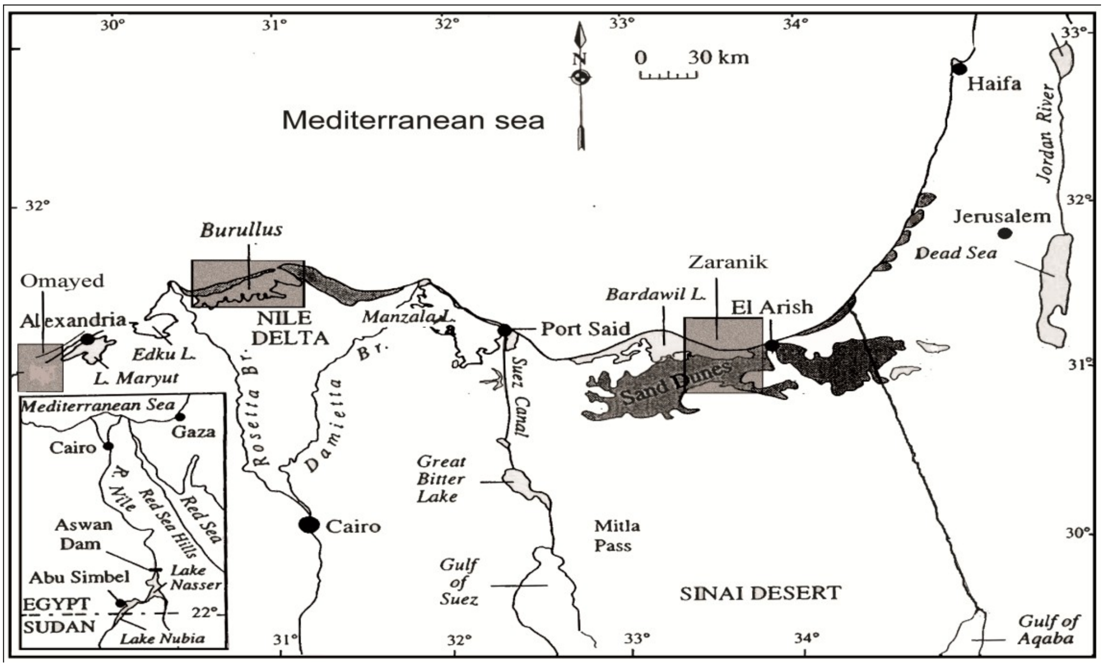

Figure (1): Location map of the northern Mediterranean coast of Egypt showing the studied localities

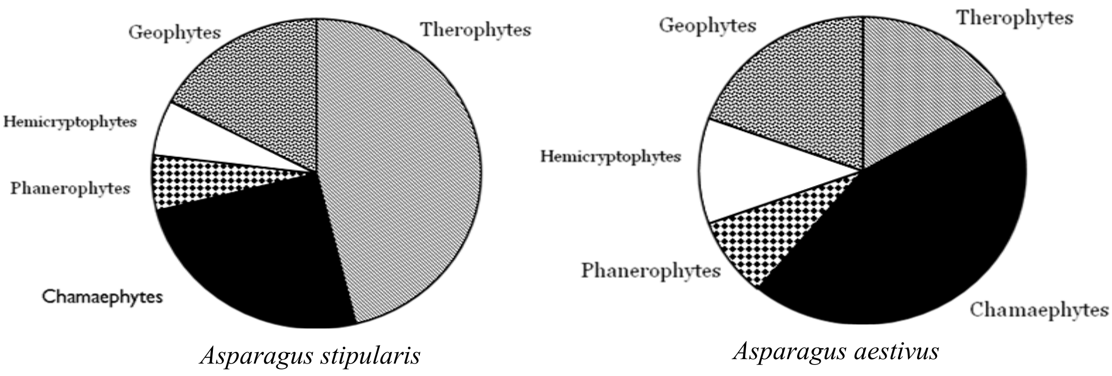

Figure (2): Life form of the associated species with *Asparagus stipularis* and *Asphodelus aestivus.*

Table (1): Mean climatic data for Zaranik, Burullus and Omayed along the Mediterranean coast (1983-1989). R.H. = Relative Humidity. ET= Evapotranspiration.

Protectorate	Temperature (°C)			Rainfall (mm/year)	R. H. (%)			ET (mm/day)		
	Min	Max	Mean		Min	Max	Mea	Min	Max	Mean
Zaranik	13.8	27.7	20.9	186	61.9	78.3	71.0	4.7	9.9	7.1
Burrullus	14.5	26.2	20.9	224	65.0	75.0	68.8	3.6	4.9	4.4
Omayed	14.0	26.3	20.2	101	67.0	73.5	70.7	4.4	6.5	5.8

Table (2): Chemical properties of soil supporting *A. stipularis* and *A. aestivus*.E.C. = Conductivity, O.C. = Organic carbon, ±SD= Standard deviation.

Variables	*Asparagus stipularis*				*Asphodelus aestivus*			
	Min	**Max**	**Mean**	**±SD**	**Min**	**Max**	**Mean**	**±SD**
pH	7.50	8.0	7.78	0.15	7.50	8.10	7.8.0	0.18
EC (mS/cm-1)	0.30	2.5	1.10	0.58	0.70	2.50	1.40	0.58
Cl%	0.50	5.8	2.60	1.70	1.50	6.30	3.70	1.30
$CaCO_3$%	0.01	92	22.8	34.3	5.00	98.0	41.9	39.7
O.C. %	0.10	0.8	0.44	0.19	0.04	0.43	0.26	0.01
Na^+mg/100g soil	1.30	17	7.70	5.10	2.90	17.0	6.40	4.80
K^+ mg/100g soil	1.70	12	3.60	2.90	0.70	7.10	3.00	1.70
Ca^{+2} mg/100g soil	0.10	4.1	1.56	1.23	2.10	5.30	3.27	0.98
Mg^{+2} mg/100g soil	0.20	25	3.60	6.97	0.70	6.90	2.45	1.95

Table (3): Correlation coefficient (*r*) between tested soil variables in the study area E.C. = Conductivity, O.C. = Organic carbon.

Variables	**EC (mS/cm^{-1})**	**Cl%**	**$CaCO_3$%**	**O.C. %**	**Na^+ mg/100g soil**	**K^+ mg/100g soil**	**Ca^{+2} mg/100g soil**	**Mg^{+2} mg/100g soil**
EC (mS/cm^{-1})	10.0							
Cl%	0.36	10.0						
CaCO3%	0.29	0.71***	10.0					
O.C. %	-0.26	-0.04	-0.24	10.0				
Na^+ mg/100g soil	0.19	-0.46	-0.24	0.15	10.0			
K^+ mg/100g soil	0.14	-0.05	0.07	0.26	0.46*	10.0		
Ca^{+2} mg/100g soil	0.68***	0.39*	0.33	-0.53	-0.20	-0.01	10.0	
Mg^{+2} mg/100g soil	0.13	-0.44	-0.21	0.11	0.51**	0.80***	0.07	10.0

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

DISSCUSION

Field study indicated that *A. stipularis* was recorded along the Mediterranean coast, on stabilized sand dunes habitat; also it was recorded in other sandy habitats (coastal dunes and sand flats), saline depression and inland ridges in three studied protectorates. This agrees with El-Bana *et al*. (2002), where *A. stipularis* was recorded in North Sinai in stabilized, partially stabilized and mobile dunes and sand flats. It is also reported by Mashaly (2002) in stabilized sand dunes and salt marshes along the Deltaic Mediterranean coast of Egypt. Zahran and Willis (2009), reported *Asparagus stipularis* as characteristic species on stabilized dunes associated with *Echinops spinosisus, Lycium europaeum Silene succulent*, and *Thymelaea hirsute*, and co-dominant species in plateau habitat of western desert, it was also reported by Heneidy and Bidak (2004) as rare species in rocky ridge habitat. *Asphodelus aestivus* has a widespread distribution along the western section of the Mediterranean coast. It was recorded in non-saline depressions, rocky ridges, inland plateau, coastal dunes and saline depression habitats.

This agrees with Abdel-Razik *et al*. (1984) who recorded *A. aestivus* as indicator species in non-saline depressions and saline, rocky ridges, wadis, sand plains and sand uncultivated deserts (El-Ghonemy *et al*., 1978; and Zahran and Willis 2009). *A. aestivus* is restricted to Mediterranean coastal land especially, the western coast (Ayyad and Hilmy, 1974; and Mossallam *et al*., 2009). The life-form spectra provide information, which may help in assessing the response of vegetation to variations in environmental factors (Ayyad and El-Ghareeb 1982).

In the present study, species richness showed hump-backed curve along the pH and $CaCO_3$ gradient for both species. $CaCO_3$ is an important factor controlling the

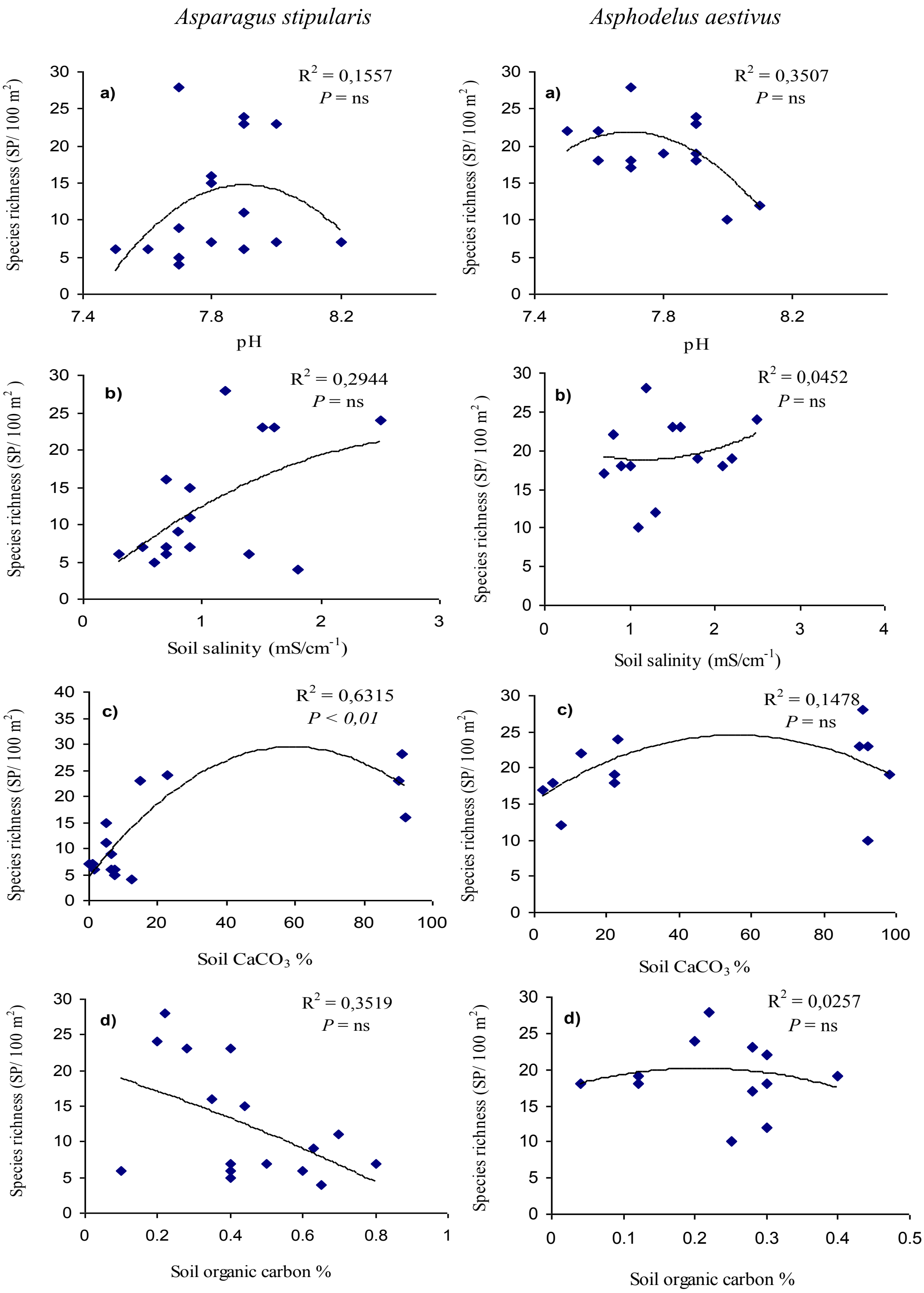

Fig.(3):. Correlation between species richness of *A. stipularis* and *A. aestivus* and some soil variables

community structure (Zahran *et al.*, 1990). In the present study species richness showed a positive relation to soil salinity and negative to O.C. in *A. stipularis* stands. Species richness was negatively correlated with soil organic carbon and soil salinity, but positively correlated with calcium carbonate content. (Khedr and Lovett-Doust, 2000).

Among the 9 environmental variables, the CCA-analysis indicates that Ca^{+2}, $CaCO_3$, Na^+ and Cl^- are the most important factors in affecting the species and stands. *A. stipularis* scores suggest a strong affinity for high O.C. soils content. Similar comparisons make, indicated that *A. aestivus* is found in habitats with highest concentration of $CaCO_3$. Vegetation studies of coastal dunes have shown that $CaCO_3$ is an important factor controlling the community structure (Zahran *et al.*, 1990, Shaltout *et al.*, 1997) and organic carbon content reported as a key element in vegetation

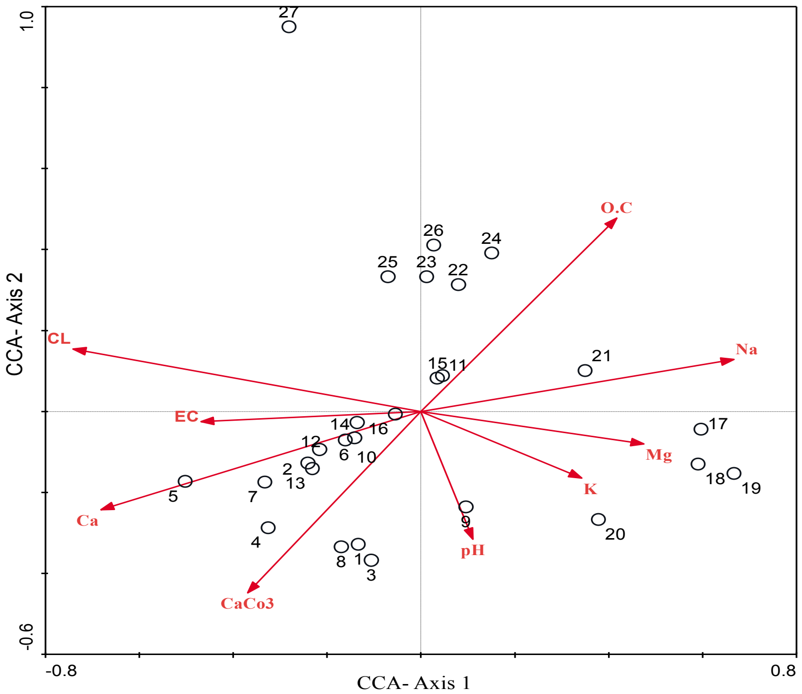

Fig (4):. CCA ordination diagram of the environmental variables represented by arrows and stands represented both *Asphodelus aestivus* and *Asparagus stipularis* are shown by circles.

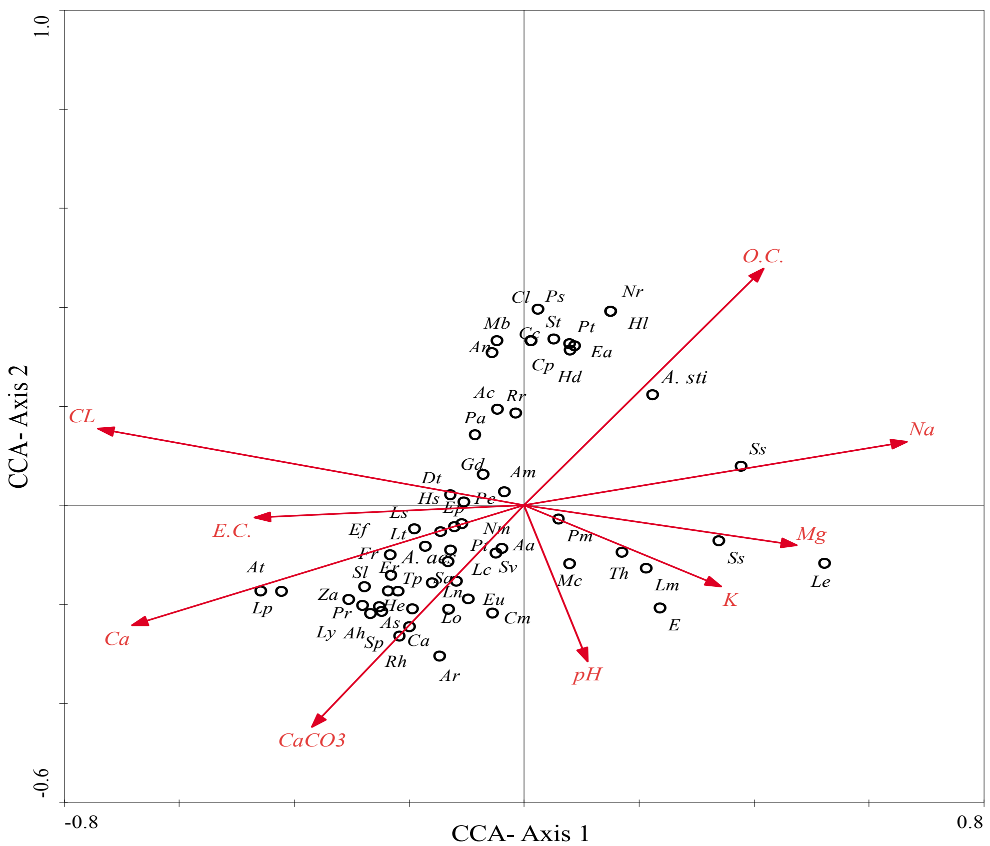

Fig (5): CCA biplot of the indicator and preferential species associated with both *A. stipularis* (*A. sti*) and *A. aestivus* (*A. aes*) and 9 environmental variables (arrows) in 27 stands.

distribution. (Zhang *et al*., 2010, Jafarian Jeloudar *et al*., 2010).

Briefly, field study indicated that therophytes, chamaephyte and geophytes were the main life forms of the associated species with the two target geophytes *A. stipularis* and *A. aestivus*. The major controlling soil variables for the occurrence and distribution of these species are pH, soil salinity, calcium carbonates and organic carbon. The species richness of both species showed a distinct hump-backed curve along the pH and $CaCo_3$ gradients. Results showed positive significant correlation between species richness and $CaCo_3$ gradient for *A. stipularis* and negative correlation with O.C. gradient. Findings of this research help management and planting of these two medicinal species. Determining the effective factors which influence plants distribution can decrease time and cost. It is necessary to study the relationship between other environmental variables (climate and physiographical variables) and management practices (grazing intensity and trampling).

REFERENCES

ABDEL-RAZIK, M., M. ABDEL-AZIZ, AND M. AYYAD. 1984. Multivariatae analysis of vegetational variation in different habitat at Omayed, Egypt. Vegetatio **57**: 167-175.

ANON. 1954. Diagnosis and Improvement of Saline-Alkaline Soils. U.S. Agriculture Handbook No. **60**, Washington, DC.

AYYAD, M.A., AND S. HILMY. 1974. The distribution of *Asphodelus microcarpus* and associated species in the western Mediterranean coastal land of Egypt. Journal of Ecology, **55**: 511–524.

AYYAD, M.A., AND R. EL-GHAREEB. 1982. Salt marsh vegetation of the western Mediterranean desert of Egypt. Vegetatio, **49**: 3–19.

BOLOUS, L. 1983. Medicinal plants of North African reference publications, Inc, Algonac, Michigan.

BOLOUS, L. 2009. Flora of Egypt Checklist . Al Hadara Publishing, Cairo, Egypt.

CANFIELD, R. 1941. Application of the line interception method in sampling range vegetation. J. For. **39**: 288-294.

DANIN, A. 1996. Plants of desert dunes. In: Cloudsley-Thompson J.L. (ed.), Adaptation of Organisms to the Desert. Springer Verlag, Heidelberg.

EL-BANA, M.I., A.A. KHEDR, P. VAN HECKE, AND J. BOGAERT. 2002. Vegetation composition of a threatened hypersaline lake (Lake Bardawil), North Sinai. Plant Ecology **163**: 63–75.

EL-DARIER, S.M. 1994. A study on biodiversity in the western Mediterranean coastal desert of Egypt. Final scientific report, submitted to the United Nations Educational, Scientific and Cultural Organization (UNESCO).

EL-DARIER, S.M., S.A. KAMAL, AND R.S. YOUSSEF. 2001. Diuretic plant ecology and medicine in the western Mediterranean coast of Egypt. The Sciences **1**(4): 258-266.

El GHANI, M.M. 1998. Environmental correlates of species distribution in arid desert ecosystems of eastern Egypt. Journal of Arid Environment. **38**: 297-313.

EL-GHONEMY, A.A., A. WALLACE, E.M. ROMNEY, S. DOWAIDAR, AND A. EL-GAZZAR. 1978. Potentialities of plants with underground storage organs in the Egyptian desert flora. Economic Botany **32**(1): 75-86.

EL-SEEDI, H.R. 2007. Antimicrobial Arylcoumarins from *Asphodelus microcarpus*. Journal of Natural Product **1**: 118 -120.

EL-SHAER, H.M., AND M.H. EL-MORSY. 2008. Potentiality of salt marshes in North Mediterranean coastal area of Egypt. In: Ch. Abdelly, M. Öztürk, M. Ashraf, and C. Grignon [EDS]. Biosaline Agriculture and High Salinity Tolerance. Switzerland: Veriage Birkhäuser Press. 207-219.

HENEIDY, S.Z., AND L.M. BIDAK. 2004. Potential Uses of Plant Species of the Coastal Mediterranean Region, Egypt. Pakistan Journal of Biological Sciences **7**(6): 1010-1023.

JACKSON, M.L. 1962. Soil chemical analysis. Constable and Co., London.

JAFARIAN JELOUDAR, Z., H. ARZANI, M. JAFARI, A. KAVIAN1, G.H. ZAHEDI, AND H. AZARNIVAND. 2010. Vegetation community in relation to the soil characteristics of Rineh rangeland, Iran. Caspian Journal of Environmental Science. **8** (2):141-150

KHEDR, A.A. 1999. Floristic composition and phytogeography in a Mediterranean Deltaic lake (Lake Burollos), Egypt. Ecologia Mediterranea **25**: 1–11.

KHEDR, A.A., AND J. LOVETT-DOUST. 2000. Determinants of floristic diversity and vegetation composition on the islands of Lake Burollos, Egypt. Applied Vegetation Science, **3**: 147-156.

LE HOUÉROU, H.N. 1979. Ressources and potential of the native flora for fodder and sown pastures production in the arid and semi-arid zones of North Afiica. In: J.R. Goodin and D.K. Northington (eds). Arid land plant resources, ICASALS, Texas Tech. Univ., Lubbock, **3**: 84-40.

LJUBUNCIC, P., H. AZAIZEH, I. PORTNAYA, U. COGAN, O. SAID, K. ABU-SALEH, AND A. BOMZON. 2005. Antioxidant activity and cytotoxicity of eight plants used in traditional Arab medicine in Israel. Journal of Ethnopharmacology **99** (1): 43-47.

MASHALY, I.A. 2002. Ecological studies on *Zygophyllum aegyptium* in the Deltaic Mediterranean coast of Egypt. Pakistan Journal of Biological Science **5**(2):152-160.

MEDAIL, F., AND P. QU´EZEL. 1999. Biodiversity hotspots in the Mediterranean Basin: setting global conservation priorities. Conservation Biology **13**(6): 1510–1513.

MOSSALLAM, H.A., A.A. MORSY, A.M. YOUSSEF, AND A.H. ABD AL-LATIF. 2009. Structure of the common plant population along Alamain- Wadi El-Natrun desert road. Australian Journal of Basic and Applied Sciences **3**(1): 177- 193.

PIPER, C.S. 1947. Soil and Plant Analysis, Interscience Publisher Inc. New York.Proceedings of 10th MEDECOS Conference, Rhodes, Greece. Millpress, Rotterdam.

RUNDEL, P.W. 2004. Mediterranean-climate ecosystems: defining their extent and community dominance. In: Arianoutsou M, Papanastasis V, editors. Ecology, conservation and management of mediterranean climate ecosystems – Proceedings 10th MEDECOS Conference, Rhodos. Rotterdam: Millpress.

ROWELL, L.D. 1994. Soil science methods and application. 1st edition. British Libarary Cataloging in Publication Data. Longman Group, United Kingdom. 182.

SHALTOUT, K.H., E.F. EL-HALAWANY, AND M.M. EL-GARAWANY. 1997. Coastal Lowland Vegetation of Eastern Saudi Arabia. Biodiversity and Conversation **6**: 1027-1040.

TÄCKHOLM, V. 1974. Students' Flora of Egypt, 2nd Edition. Cairo University. (Publ.), Cooperative Printing Company, Beirut.

TER BRAAK, C.F., AND SMILAUER. 1998. CANOCO Reference Manual and User's Guide to Canoco for Windows: Software for Canonical Community Ordination (ver. 4). Microcomputer Power, Ithaca.

ZAHRAN, M.A., M.A. EL-DEMERDASH, AND I.A. MASHALY. 1990. Vegetation types of the Deltaic Mediterranean coast of Egypt and their environment. Journal of Vegetation Science, **1**: 305–310.

ZAHRAN, M.A., AND A.J. WILLIS. 2009. The Vegetation of Egypt, 2nd edn. Springer Science and Business Media B.V.

ZHANG, K., H. DANG, S.H. TAN, Z.H. WANG, AND Q. ZHANG. 2010. Vegetation community and soil characteristics of abandoned agricultural land and pine plantation in the Qinling Mountains, China. Forest Ecology and Management. **259**: 2036-2047.

Received: September 9, 2011
Accepted: November 11, 2011

دراسه بيئية على نباتى الأسبرجس و العنصل فى الساحل الشمالى لمصر

أ.د/ ممدوح محمد سالم سراج ـ أ.د/ عبد الحميد عبد الفتاح خضر – د. أمينه زكريا أبو النجا – رضا عبده أبو مصطفى.
قسم النبات – كليه العلوم بدمياط (دمياط الجديدة)- جامعة المنصوره.

الملخص العربى

تم اختيار نباتين من النباتات الطبية الأرضية وهما نباتى الأسبرجس و العنصل حيث أنها من النباتات الصحرواية المهمه طبياً. وقد اظهرت الدراسه الحقلية ان النبات الأول يتواجد بامتداد الساحل الشمالى للبحر المتوسط بمصر(محميات الزرانيق – البرلس – العميد) بينما ينمو النبات الثانى فقط بالجزء الغربى للساحل الشمالى لمصر (محميه العميد).
تهدف الدراسة إلى الوقوف على أهم العوامل البيئية التى تؤثر على تواجد وتوزيع وفرة النباتات. التحليل الفلورى أظهر أن النباتات الحولية و النباتات الأرضية و النباتات الفوق سطحية تعتبر أهم الطرز الظاهرية للأنواع المرافقه للنباتين. بمقارنة الثراء النباتى مع بعض العوامل البيئية وجد أن العلاقة بين كلا النباتين والرقم الهيدروجينى للتربة و محتوى التربة من كربونات الكالسيوم تشابة منحنى على شكل حدوة فرس. بينما هناك علاقة طرديه بين نبات الأسبرجس و ملوحة التربة بمعنى أن الثراء النباتى يزيد مع زياده ملوحة التربة و علاقة عكسية مع محتوى التربة من الكربون العضوى. من نتائج التحليل الأحصائى المتسلسل الذى إستخدم لتحليل العلاقة ما بين الكساء النباتى و بعض عوامل التربة وضح أن محتوى التربة من الكالسيوم كربونات و الكربون العضوى بالأضافة إلى أيونات الكالسيوم و الصوديوم و الكلوريد كانت من أهم العوامل الموثرة فى توزيع الكساء النباتى. تأثر نبات الأسبرجس تأثراً إيجابيا بزياده الكربون العضوى فى التربة بينما تأثر نبات العنصل تاثراً إيجابياً مع زيادة نسبة كربونات الكالسيوم و أيون الكلوريد و الكالسيوم فى التربة. وتعتبر النتائج المتحصل عليها بيانات بيئية مهمة تفيد فى التطبيق الزراعى عند زراعة النباتات الطبية تحت الدراسة حيث أن أن كلا النباتين ينموا فى بيئه تربتها ضعيفة القلويه و قليلة الملوحة، كانت نسبة كربونات الكالسيوم أكثر عوامل التربة تاثيراً فى تواجد و وفرة نبات العنصل حيث أنه تم رصده بتربه غنية بكربونات الكالسيوم بينما ظهر الأسبرجس فى تربة بها نسبة عالية من الكربون العضوى.

Appendix (1): The associated species with *Asparagus stipularis* and *Asphodelus aestivus*. L.F. = Life Form: CH = chamaephyte, G = geophyte, He = hemicryptophyte, Hy = hydrophyte, Ph = phanerophyte, Th = therophyte.

Species	Family	L.F.	*A. stipularis*	*A. aestivus*
Perennials				
Aeluropus lagopoides (L.) Trin.ex Thwaites	Poaceae	G	+	
Aeluropus littoralis (Gouan) Parl.	Poaceae	G	+	
Allium roseum L.	Alliaceae	G	+	+
Ammophila arenaria (L.) Link.	Poaceae	He	+	+
Anabasis articulata (Forssk.) Moq.	Chenopodiaceae	Ch	+	
Argyrolobium uniflorum (Dec.) Jaub. & Spach	Fabaceae	He	+	
Artemisia herba alba Asso.	Asteraceae	Ph	+	+
Artemisia monosperma Del.	Asteraceae	Ch	+	
Arthrocnemum macrostachyum (Moric.) K. Koch	Chenopodiaceae	Ch	+	
Asparagus stipularis Forssk.	Asparagaceae	G	+	+
Asphodelus aestivus Salzm et Vivi	Asphodelaceae	G	+	+
Atractylis carduus (Fossk.) C. Chr.	Asteraceae	Ch	+	+
Atriplex halimus L.	Chenopodiaceae	Ph	+	+
Atriplex portulacoides L.	Chenopodiaceae	Ch	+	
Bolboschoenus glaucus (Lam.)S.G. Smith.	Cyperaceae	G	+	
Calligonum polygonoides L.	Polygonaceae	Ph	+	
Centaurea pumilio L.	Asteraceae	Ch	+	
Cressa cretica L.	Convolvulaceae	He	+	
Cynanchum acutum L.	Asclepiadaceae	Ph	+	
Cynodon dactylon (L.) Pers.	Poaceae	G	+	
Cyperus articulatus L.	Cyperaceae	G	+	
Cyperus laevigatus L.	Cyperaceae	G	+	
Deverra tortousa (Desf.) DC.	Apiaceae	Ch	+	+
Echinochloa stagnina (Retz) P.Beauv.	Poaceae	G	+	
Echinops spinosus Turra	Asteraceae	He	+	+
Echiochelon fruticosum Desf.	Boraginaceae	Ch		+
Elymus farctus (Viv.) Melderis	Poaceae	G		+
Frankenia hirsuta L.	Frankeniaceae	He		+
Gymnocarpos decandrus Forssk.	Caryophyllaceae	Ch	+	+
Halocnemum strobilaceum (Pall.) M. Bieb.	Chenopodiaceae	Ch	+	
Helianthemum stipulatum (Forssk.) C. Chr	Cistaceae	Ch		+
Juncus acutus L.	Juncaceae	G	+	
Juncus rigidus Desf.	Juncaceae	G	+	
Juncus subulatus Forssk.	Juncaceae	G	+	
Limbarda crithmoides (L.) Dumort.	Asteraceae	Ch	+	
Limoniastrum monopetalum (L.) Boiss.	Plumbaginaceae	Ch	+	+
Limonium pruinosum (L.) Chaz.	Plumbaginaceae	He	+	+
Lycium shawii Roem. & Schult.	Solanaceae	Ph	+	+
Launaea nudicaulis (L.) Hook.f	Asteraceae	He		+
Lotus creticus L.	Fabaceae	He		+
Lotus polyphyllos E. D. Clarke	Fabaceae	He		+
.*Lygeum spartum* Loefl. ex L	Poaceae	G		+
Moltkiopsis ciliata (Forssk.) I.M. Johnst.	Boraginaceae	Ch	+	

Nitraria retusa (Forssk.) Asch.	Nitrariaceae	Ch	+	
Noaea mucronata (Forssk.) Asch. & Schweinf.	Boraginaceae	Ch	+	+
Pancratium maritimum L.	Amaryllidaceae	G	+	+
Pancratium sickenbergeri Asch. & Schweinf.	Amaryllidaceae	G	+	
Panicum turgidum Forssk.	Poaceae	Ch	+	
Persicaria salicifolia (Wild) Assenov	Polygonaceae	G	+	
Phragmites australis (Cav.) Trin. ex Steud.	Poaceae	G	+	
Phagnalon rupestre (L.) DC.	Asteraceae	Ch		+
Plantago albicans L.	Plantaginaceae	He	+	+
Polygonum equisetiforme Sm.	Polygonaceae	G		+
Retama raetam (Forssk.) Webb & Berthel.	Fabaceae	Ph	+	
Reaumuria hirtella Jaub& Spach	Tamaricaceae	Ch		+
Salsola tetrandra Forssk.	Chenopodiaceae	Ch	+	
Salsola longifolia Forssk.	Chenopodiaceae	Ch		+
Salicornia europaea L.	Chenopodiaceae	Ch	+	
Sarcocornia fruticosa (L.) A.J. Scott	Chenopodiaceae	Ch	+	
Salvia aegyptiaca L.	Labiatae	He		+
Salvia lanigera Poiret.	Labiatae	Ch		+
Schoenoplectus litoralis (Schrad.) Palla, Bot.	Cyperaceae	G	+	
Symphyotrichum squamatus (Spreng.) Nesom.	Asteraceae	Ch	+	
Suaeda pruinosa Lange	Chenopodiaceae	Ch	+	+
Suaeda vera Forssk. ex J.F. Gmel.	Chenopodiaceae	Ch	+	
Tamarix nilotica (Ehrenb.) Bunge	Tamaricaceae	Ph	+	
Thymelaea hirsuta (L.) Endl.	Thymelaeaceae	Ch	+	+
Zygophyllum aegyptium A. Hosny	Zygophyllaceae	Ch	+	
Zygophyllum album L.	Zygophyllaceae	Ch	+	+
Annuals				
Adonis dentata Del.	Ranunculaceae	Th	+	
Anchusa humilis (Desf) I.M Johnst.	Boraginaceae	Th	+	
Asphodelus viscidulus Boiss.	Asphodelaceae	Th	+	
Astragalus boeticus L.	Fabaceae	Th	+	
Bassia muricata (L.) Asch.	Chenopodiaceae	Th	+	
Brassica tournefortii Gouan	Brassicaceae	Th	+	
Calendula arvensis L.	Asteraceae	Th	+	+
Cistanche phelypaea (L.) Cout.	Orbanchaceae	Th	+	
Cistanche salsa (C.A. Mey.) Beck.	Orbanchaceae	Th	+	
Cornulaca monacantha Del.	Chenopodiaceae	Th	+	
Chenopodium ambrosioides L.	Chenopodiaceae	Th	+	
Chenopodium murale L.	Chenopodiaceae	Th	+	
Chenopodium opulifolium Schrad.ex Koch& Ziz	Chenopodiaceae	Th	+	
Cutandia dichotoma (Forssk.) Trab.	Convolvulaceae	Th	+	
Cutandia memphetica (Spreng.) K. Richt.	Convolvulaceae	Th	+	
Cynomorium coccineum L.	Balanophoraceae	Th	+	
Echinochloa colona (L.) Link	Poaceae	Th	+	
Emex spinosa (L.) Campd.	Polygonaceae	Th		+
Erodium laciniatum (Cav.) Willd.	Geraniaceae	Th	+	+
Filago desertorum Pomel	Asteraceae	Th	+	
Ifloga spicata (Forssk.) Sch.-Bip.	Asteraceae	Th	+	

Launaea capitata (Spreng.) Dandy	Asteraceae	Th	+	
Launaea resedifolia (L.) Kuntze	Asteraceae	Th		+
Lobularia frugilis (Asso) Pau, Bol.	Brassicaceae	Th	+	
Lotus halophilus Boiss. & Spruner	Fabaceae	Th	+	
Malva parviflora L.	Malvaceae	Th	+	
Medicago polymorpha L.	Fabaceae	Th	+	
Mesembryanthemum crystallinum L.	Aizoaceae	Th	+	
Mesembryanthemum nodiflorum L.	Aizoaceae	Th	+	
Neurada procumbens L.	Neuradaceae	Th	+	
Ononis serrata Forssk.	Fabaceae	Th	+	
Parapholis incurva (L.) C. E. Hubb.	Convolvulaceae	Th	+	
Paronychia arabica (L.) DC.	Caryophyllaceae	Th	+	
Poa annua L.	Poaceae	Th	+	
Polypogon monspeliensis (L.) Desf.	Poaceae	Th	+	
Portulaca oleracea L.	Portulacaceae	Th	+	
Ranunculus marginatus d' Urv.	Ranunculaceae	Th	+	
Ranunculus sceleratus L.	Ranunculaceae	Th	+	
Reichardia tingitana (L.) Roth	Asteraceae	Th	+	
Rumex dentatus L.	Polygonaceae	Th	+	
Rumex pictus Forssk.	Polygonaceae	Th	+	
Salsola kali L.	Chenopodiaceae	Th		+
Schismus barbatus (L.) Thell.	Poaceae	Th	+	
Senecio glaucus L.	Asteraceae	Th	+	
Silene villosa Forssk.	Caryophyllaceae	Th	+	
Sinapis arvensis L.	Brassicaceae	Th	+	
Sonchus oleraceus L.	Asteraceae	Th	+	
Spergula fallax Lowe	Caryophyllaceae	Th	+	
Spergularia diandra (Guss.) Boiss.	Caryophyllaceae	Th	+	+
Spergularia marina (L.) Griseb.	Caryophyllaceae	Th	+	
Sphenopus divaricatus (Gouan) Rchb.	Poaceae	Th	+	
Suaeda maritima (L.) Dumort.	Chenopodiaceae	Th	+	