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A STUDY ON VEGETATION DIVERSITY ALONG CAIRO – ISMAILIA DESERT ROAD, EGYPT

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ABSTRACT

The aim of this research was to study vegetation diversity among the following habitats: field crops, orchards, gardens, roadsides, wastelands, salt marshes and deserts along Cairo – Ismailia desert road, Egypt. A total of 112 genera and 132 species belonging to 27 dicotyledons, 5 monocotyledons and 1 chlamydospermae families were recorded and identified with regional floras and available checklists. The common polytypic families were Poaceae 25 species followed by Compositae (21 species), then each of Brassicaceae and Chenopodiaceae was represented by 10 species. 15 families were monotypic. Grasses, subshrubs and sedges were represented by 21%, 3% and 2%, respectively at polytypic families only. Annuals taxa presented the highest contributions (65%) at polytypic families. while, biennials represented only 4% in monotypic families. The cluster analysis divided the studied habitats into five groups. Groups 1, 2 and 5 included the same habitats at monotypic and polytypic families, while, groups 2 and 3 contained different habitats in monotypic and polytypic ones. Field crops and orchards habitats showed the highest degree of similarity ratio 83.3% at monotypic and 60.7% in polytypic families. On the other hand, there was no degree of similarity ratios between species of salt marshes and the following habitats: field crops, orchards and gardens at monotypic families.

Key words: *Vegetation, habit, life span, similarity, Cairo-Ismailia desert road.*

1. INTRODUCTION

Desert vegetation is a characteristic feature in the inland part of the Eastern Desert where the ground water is shallow (Zahran and Willis, 2009 and Zahran and El-Amier, 2014). The Eastern Desert of Egypt occupies the area extending from the Nile Valley eastward to the Gulf of Suez and the Red Sea, which is about 223,000 km^2, about (22.3%) of the total area of Egypt. It is representing by numerous depression wadis running to the Red Sea or the Nile Valley. It consists of high rugged mountains that run parallel to a short distance from the coast (Salama *et al*., 2013). In the Eastern Desert, the natural vegetation occurs in the main stream of the wadis as well as on the slopes of the mountains that receive rainfall with mean annual up to 60 mm (Zahran and Willis, 2009 and Zahran and El-Amier, 2014). The plant life in the Eastern desert was studied botanically by different researchers (Kassas, 1953a, 1953b, 1954; Kassas and El-Abyad, 1962; Kassas and Girgis, 1964, 1965; Salama and Fayed, 1989, 1990; Salama and El-Naggar, 1991; Abd El-Ghani, 1998; Boulos, 2008 and Salama, *et al.*, 2013). Most of the previous studies dealt with the different ecological aspects, with less attention to the floristic features of this desert. The Cairo – Ismailia desert road is located in the northern part of the Eastern desert and extends from Cairo till Ismailia cities (about 128km long). The aim of this study was to provide a description of the vegetation diversity among the studied habitats: field crops, orchards, gardens, roadsides, wastelands, salt marshes and deserts along Cairo – Ismailia desert road.

2. MATERIALS AND METHODS

The study area extended from Cairo till Ismailia cities, about 128km long, and located between (30° 05' 04" N - 30 35° 09" N and 31° 14' 30" E– 32° 15' 49" E) (Fig. 1). Several visits were performed along Cairo–Ismailia desert road from March 2016 till March 2017. Field data were gathered from the following habitats: field crops, orchards, gardens, roadsides, wastelands,

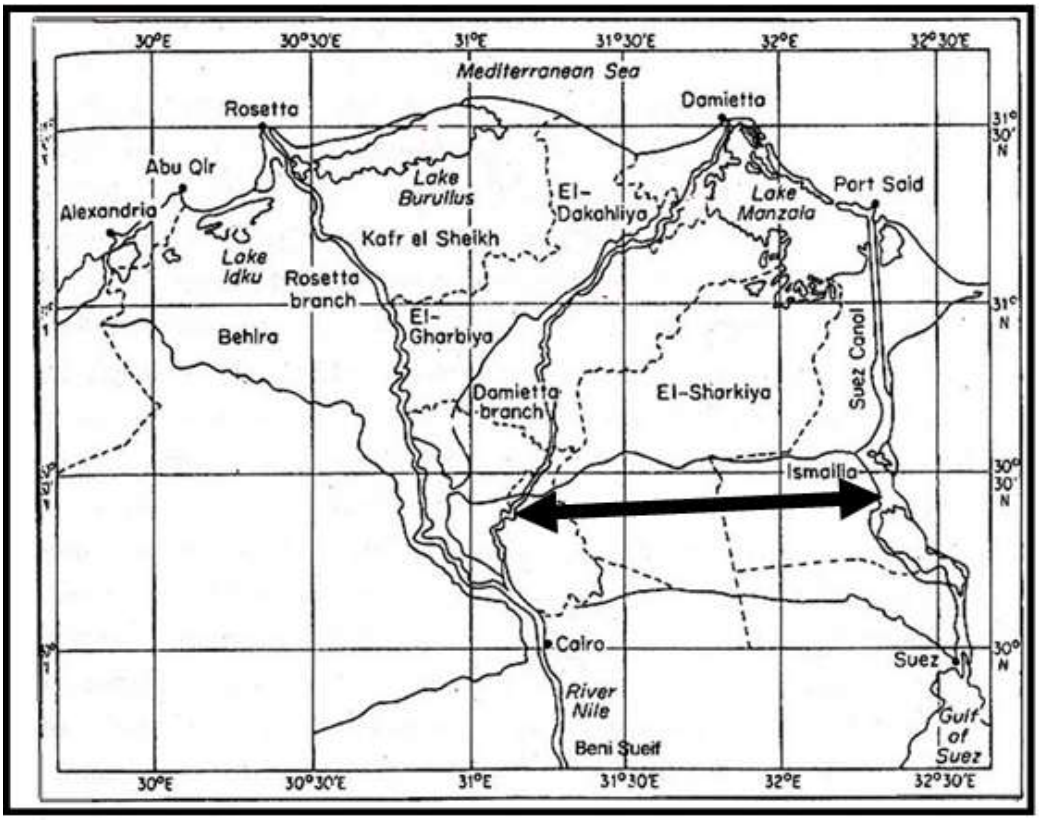

Fig. (1): A map of the location of Cairo – Ismailia desert road, Egypt.

salt marshes and deserts. The collected species were recorded to represent the vegetation diversity among the studied habitats. The recorded species were arranged alphabetically with their families and genera. Voucher specimens were collected and identified at the herbarium of Flora and Phytotaxonomy Research Department (CAIM), Horticultural Research Institute, Agricultural Research Center, Giza, Egypt and arranged alphabetically with their families. Species identification was done according to Täckholm (1974); El-Hadidi, and Fayed (1994/95); Boulos (1995, 1999, 2000, 2002, 2005, 2009) and updated by Angiosperm Phylogeny Group III (2009); Chase and Reveal (2009) and Haston *et al.,* (2009). Numerical analysis of the studied habitats was carried out and based on hierarchical cluster analysis. The retrieved output was used to construct specific ecological relationships among the studied habitats. The data were treated as a binary character using SPSS version 22 (SPSS, 2013). The output was plotted in the form of dendrogram. The dendrogram was based on average linkage (between groups) and rescaled distance cluster combine.

3. RESULTS AND DISCUSSION

3.1. Floristic composition of monotypic and polytypic families

The lists of species were arranged alphabetically with their monotypic and polytypic families and genera**.** The presence or absence values among the studied habitats are listed in (Tables 1 & 2). The current study recorded the presence of 132 species, representing 112 genera **(**Table 3). The most distributed polytypic families were Poaceae and Compositae. Poaceae was represented by 25 species (18.94%) and Compositae by 21 species (15.91%). In addition, both of Brassicaceae and Chenopodiaceae were 10 species (7.58%). In addition, the following families: Zygophyllaceae and Euphorbiaceae were represented by 5 species (3.79%). Moreover, 4 species were recorded from each of Aizoaceae, Amaranthaceae, Convolvulaceae and Solanaceae and 3 species from each of Apiaceae, Malvaceae and Polygonaceae. On the other hand, 15 families were monotypic. The four major distributed families (Poaceae, Compositae, Brassicaceae and Chenopodiaceae) were reported earlier by Mashaly *et al.* (2009); Hamed *et al.* (2012); Azer (2013) and Amer *et al.*(2015)

Table (1): List of monotypic families and data matrix of 15 species distributed among the studied habitats along Cairo-Ismailia desert road.

		Vegetation traits			Studied habitats						
No.	**Families and taxa**	**Division**	**Habit**	**Life span**	**Field crops**	**Orchards**	**Gardens**	**Roadsides**	**Wastelands**	**Deserts**	**Salt marshes**
	Arecaceae	**M**									
1	*Phoenix dactylifera* L.		tree	P	1	1	1	1	1	1	0
	Boraginaceae	**D**									
2	*Heliotropium arbainense* Fresen.		herb	P	0	1	0	0	0	1	0
	Cleomaceae	**D**									
3	*Cleome droserifolia* (Forssk.) Delile		herb	P	0	0	0	0	0	1	0
	Cucurbitaceae	**D**									
4	*Citrullus colocynthis* (L.) Schrad.		herb	P	0	0	0	0	0	1	0
	Ephedraceae	**C**									
5	*Ephedra alata* Decne.		shrub	P	0	0	0	0	0	1	0
	Geraniaceae	**D**									
6	*Erodium laciniatum* (Cav.) Willd.		herb	A	0	0	0	0	0	1	0
	Juncaceae	**M**									
7	*Juncus bufonius* L.		rush	A	0	0	0	0	0	0	1
	Neuradaceae	**D**									
8	*Neurada procumbens* L.		herb	A	0	0	0	0	0	1	0
	Oxalidaceae	**D**									
9	*Oxalis corniculata* L.		herb	P	1	1	0	0	0	0	0
	Portulacaceae	**D**									
10	*Portulaca oleracea* L.		herb	A	1	1	1	1	0	0	0
	Primulaceae	**D**									
11	*Anagallis arvensis* L.		herb	A	1	1	1	0	0	0	0
	Resedaceae	**D**									
12	*Ochradenus baccatus* Delile		shrub	P	0	0	0	0	0	1	0
	Tamaricaceae	**D**									
13	*Tamarix senegalensis* DC.		shrub	P	0	0	0	1	1	1	1
	Typhaceae	**M**									
14	*Typha domingensis* Pers.		herb	P	0	0	0	0	0	0	1
	Urticaceae	**D**									
15	*Urtica urens* L.		herb	A	1	1	0	0	0	0	0

Division: (C= Chlamydospermae**, D=** Dicotyledons, **M=** Monocotyledons**). Life span**: (**A**= Annuals, **P**= Perennials). **Data matrix:** (1= presence, 0 = absence).

as the most frequent families in the studied areas. Similar conclusion has been reached by Shaheen (2002) and Abd El-Ghani and Fawzy (2006).

3.2. Degree of similarity between monotypic and polytypic families

The data presented in (Table 4), showed that field crops and orchard habitats showed the highest degree of similarity ratio 83.3% followed by 66.7% between roadsides and wastelands habitats, while the least ratio 7.7% was recorded between field crops and deserts habitat at the monotypic families. On the other hand, there was no degree of similarity value between salt marshes habitat and the following ones: field crops, orchards and gardens. Regarding, the polytypic families (Table 5) the highest degree of similarity ratio 60.7% was recorded between field crops and orchards habitats, followed by 46.9% between gardens and roadsides habitats.

Table (2): List of polytypic families and data matrix of 117 species distributed among the studied habitats along Cairo-Ismailia desert road.

		Vegetation traits			Studied habitats						
No.	**Families and taxa**	**Division**	**Habit**	**Life span**	**Field crops**	**Orchards**	**Gardens**	**Roadsides**	**Wastelands**	**Deserts**	**Salt marshes**
	Aizoaceae	**D**									
1	*Aizoon canariense* L.		herb	A	0	0	0	1	0	1	0
2	*Mesembryanthemum crystallinum* L.		herb	A	0	0	0	1	0	1	0
3	*Mesembryanthemum forskahlii* Hochst. ex Boiss.		herb	A	0	0	0	1	0	1	0
4	*Trianthema portulacastrum* L.		herb	A	0	0	1	1	1	0	0
	Amaranthaceae	**D**									
5	*Aerva javanica* (Burm.f.) Juss. ex Schult.		subshrub	P	0	0	0	0	0	1	0
6	*Amaranthus blitum* subsp. *oleraceus* (L.) Costea		herb	A	1	1	1	1	0	0	0
7	*Amaranthus hybridus* L.		herb	A	1	0	1	0	0	0	0
8	*Amaranthus viridis* L.		herb	A	1	0	1	0	0	0	0
	Apiaceae	**D**									
9	*Ammi majus* L.		herb	A	1	0	1	0	0	0	0
10	*Ammi visnaga* (L.) Lam.		herb	A	1	0	1	0	0	0	0
11	*Deverra tortuosa* (Desf.) DC.		herb	P	0	0	0	0	0	1	0
	Apocynaceae	**D**									
12	*Calotropis procera* (Aiton) Dryand.		shrub	P	0	0	0	1	1	1	0
13	*Cynanchum acutum* L.		herb	P	0	1	1	1	1	0	0
	Brassicaceae	**D**									
14	*Brassica nigra* (L.) K. Kotch		herb	A	1	1	0	1	0	0	0
15	*Brassica tournefortii* Gouan		herb	A	1	1	0	1	0	0	0
16	*Capsella bursa-pastoris* (L.) Medik.		herb	A	1	1	0	0	0	0	0
17	*Eruca vesicaria* (L.) Cav.		herb	A	1	1	1	1	0	0	0
18	*Farsetia aegyptia* Turra.		herb	P	0	0	0	0	0	1	0
19	*Matthiola longipetala* (Vent.) DC.		herb	A	0	0	0	1	0	1	0
20	*Raphanus raphanistrum* L.		herb	A	1	1	0	0	0	0	0
21	*Sinapis alba* L.		herb	A	0	0	1	1	0	0	0
22	*Sisymbrium irio* L.		herb	A	1	1	1	1	0	0	0
23	*Zilla spinosa* (L.) Prantl		shrub	P	0	1	0	0	0	1	0
	Caryophyllaceae	**D**									
24	*Gypsophila capillaris* (Forssk.) C. Chr.		herb	P	0	0	0	0	0	1	0
25	*Herniaria hirsuta* L.		herb	A	0	0	0	0	0	1	0
	Chenopodiaceae	**D**									
26	*Anabasis articulata* (Forssk.) Moq.		shrub	S	0	0	0	0	0	1	0
27	*Anabasis setifera* Moq.		subshrub	S	0	0	0	0	0	1	0
28	*Atriplex prostrata* subsp. *calotheca* (Rafn) M.A.Gust.		herb	A	0	1	0	0	0	1	1
29	*Bassia indica* (Wight) A.J.Scott		herb	A	0	0	1	1	1	1	0
30	*Bassia muricata* (L.) Asch.		herb	A	0	1	0	0	1	1	0
31	*Beta vulgaris* L.		herb	A	1	1	0	0	0	0	0
32	*Chenopodium album* L.		herb	A	1	1	1	1	1	0	0
33	*Chenopodium murale* L.		herb	A	1	1	1	1	1	0	0
34	*Chenopodium ambrosioides* (L.) Mosyakin & Clemants		herb	B	1	1	1	1	0	0	0
35	*Haloxylon salicornicum* (Moq.) Bunge ex Boiss.		herb	P	0	0	0	0	0	1	0
	Compositae	**D**									
36	*Achillea fragrantissima* (Forssk.) Sch. Bip.		herb	P	0	0	0	0	0	1	0

Table (2): Continued I

		Vegetation traits			Studied habitats						
No.	**Families and taxa**	**Division**	**Habit**	**Life span**	**Field crops**	**Orchards**	**Gardens**	**Roadsides**	**Wastelands**	**Deserts**	**Salt marshes**
37	*Artemisia monosperma* Delile		subshrub	P	0	0	0	0	0	1	0
38	*Bidens pilosa* L.		herb	A	0	1	1	0	0	0	0
39	*Brocchia cinerea* (Delile) Vis.		herb	A							
40	*Centaurea aegyptiaca* L.		herb	B	0	0	0	0	0	1	0
41	*Cichorium endivia* L. subsp. *divaricatum* (Schousb.) P.D. Sell		herb	A	1	0	0	0	1	0	0
42	*Echinops spinosissimus* Turra		herb	P	0	0	0	0	0	1	0
43	*Eclipta prostrata* (L.) L.		herb	A	1	0	0	0	0	0	0
44	*Erigeron bonariensis* L.		herb	A	1	1	0	0	0	0	0
45	*Iphiona mucronata* (Forssk.) Asch. & Schweinf.		herb	P	0	0	0	0	0	1	0
46	*Lactuca serriola* L.		herb	B	0	0	0	0	0	1	0
47	*Laphangium luteoalbum* (L.) Tzvelev		herb	A	0	0	1	1	1	0	0
48	*Launaea mucronata* (Forssk.) Muschl.		herb	B	0	0	0	0	0	1	0
49	*Launaea nudicaulis* (L.) Hook.f.		herb	P	0	1	1	1	0	1	0
50	*Matricaria chamomilla* L.		herb	A	0	0	1	1	0	0	0
51	*Pluchea dioscoridis* (L.) DC.		herb	P	0	0	0	0	1	1	1
52	*Pulicaria undulata* (L.) C.A.Mey.		herb	P	0	0	0	0	0	1	0
53	*Reichardia tingitana* (L.) Roth		herb	A	0	1	0	0	1	1	0
54	*Senecio desfontainei* Druce		herb	A	0	1	1	1	0	1	0
55	*Sericocarpus linifolius* (L.) "Britton, Sterns & Poggenb.		herb	A	0	0	1	0	1	0	0
56	*Sonchus oleraceus* (L.) L.		herb	A	1	1	1	1	1	0	0
	Convolvulaceae										
57	*Convolvulus arvensis* L.	**D**	herb	P	1	1	1	1	1	0	0
58	*Convolvulus lanatus* Vahl		herb	P	0	0	0	0	0	1	0
59	*Ipomoea cairica* (L.) Sweet		herb	P	0	0	0	0	1	0	0
60	*Ipomoea carnea* Jacq.		shrub	P	0	0	0	0	1	0	0
	Cyperaceae	**M**									
61	*Cyperus articulatus* L.		sedge	P	0	0	0	0	0	0	1
62	*Cyperus rotundus* L.		sedge	P	1	1	1	1	1	0	0
	Euphorbiaceae	**D**									
63	*Chrozophora tinctoria* (L.) A.Juss.		herb	A	0	0	0	0	0	1	0
64	*Euphorbia heterophylla* L.		herb	A	0	0	1	1	1	0	0
65	*Euphorbia peplus* L.		herb	A	1	1	1	1	0	0	0
66	*Euphorbia retusa* Forssk.		herb	A	0	0	0	0	0	1	0
67	*Ricinus communis* L.		shrub	S	1	1	0	0	1	0	0
	Leguminosae	**D**									
68	*Alhagi graecorum* Boiss.		herb	P	0	1	0	1	1	0	0
69	*Leucaena leucocephala* (Lam.) De Wit		tree	T	0	0	1	0	1	0	0
70	*Lotus glaber* Mill.		herb	A	0	0	0	1	0	0	0
71	*Medicago polymorpha* L.		herb	A	1	1	1	0	0	0	0
72	*Melilotus indicus* (L.) All.		herb	A	1	1	1	0	0	0	0
73	*Sesbania sesban* (L.) Merr.		shrub	S	1	1	0	0	1	0	0
74	*Trifolium alexandrinum* L.		herb	A	1	1	1	0	1	0	0
75	*Trifolium resupinatum* L.		herb	A	1	1	0	0	1	0	0
	Malvaceae	**D**									
76	*Corchorus olitorius* L.		herb	A	1	1	0	0	1	0	0
77	*Malva parviflora* L.		herb	A	1	1	1	1	1	1	0

Table (2): Continued II

		Vegetation traits			Studied habitats						
No.	**Families and Taxa**	**Division**	**Habit**	**Life span**	**Field crops**	**Orchards**	**Gardens**	**Roadsides**	**Wastelands**	**Deserts**	**Salt marshes**
78	*Sida spinosa* L.		herb	P	0	0	0	0	1	0	0
	Plantaginaceae	**D**									
79	*Plantago ovata* Forssk.		herb	A	0	1	1	0	0	1	0
80	*Plantago major* L.		herb	A	1	1	1	1	0	0	0
	Poaceae	**M**									
81	*Aristida mutabilis* Trin. & Rupr.		grass	A	0	0	0	0	0	1	0
82	*Avena fatua* L.		grass	A	1	0	1	0	0	0	0
83	*Avena sativa* L.		grass	A	1	0	1	0	0	0	0
84	*Cenchrus biflorus* Roxb.		grass	A	0	1	1	1	0	0	0
85	*Cynodon dactylon* (L.) Pers.		grass	P	1	1	1	1	1	1	1
86	*Desmostachya bipinnata* (L.) Stapf.		grass	A	0	1	0	0	1	0	0
87	*Digitaria sanguinalis* (L.) Scop.		grass	A	0	1	1	0	0	0	0
88	*Echinochloa colona* (L.) Link.		grass	A	1	1	0	1	0	0	0
89	*Echinochloa stagnina* (Retz.) P. Beauv.		grass	A	1	0	0	1	0	0	0
90	*Hordeum murinum* L. subsp. *leporinum* (Link) Arcang.		grass	A	0	0	1	1	0	1	0
91	*Imperata cylindrica* (L.) Raeusch.		grass	P	0	0	0	0	1	0	1
92	*Lolium multiflorum* Lam.		grass	A	1	1	1	1	0	0	0
93	*Panicum coloratum* L.		grass	A	1	1	1	0	0	0	0
94	*Panicum turgidum* Forssk.		grass	P	0	0	0	0	0	1	0
95	*Pennisetum divisum* (Forssk. ex J.F.Gmel.) Henrard		grass	P	0	0	0	0	0	1	0
96	*Phalaris minor* Retz.		grass	A	1	1	1	1	0	0	0
97	*Phragmites australis* (Cav.) Trin. ex Steud.		grass	P	0	1	0	0	1	0	1
98	*Poa annua* L.		grass	A	1	1	1	0	0	0	0
99	*Polypogon monspeliensis* (L.) Desf.		grass	A	1	1	0	0	1	0	0
100	*Schismus barbatus* (L.) Thell.		grass	A	0	0	0	0	0	1	0
101	*Setaria verticillata* (L.) P.Beauv.		grass	A	1	1	1	1	0	0	0
102	*Setaria viridis* (L.) P.Beauv.		grass	A	1	1	1	1	0	0	0
103	*Stipa capensis* Thunb.		grass	A	0	0	0	0	0	1	0
104	*Triticum aestivum* L.		grass	A	0	0	0	1	0	0	0
105	*Triticum durum* Desf.		grass	A	0	0	0	1	0	0	0
	Polygonaceae	**D**									
106	*Polygonum aviculare* L.		herb	A	0	0	1	1	1	0	1
107	*Rumex dentatus* L.		herb	A	1	1	1	0	1	0	0
108	*Rumex vesicarius* L.		herb	A	0	0	0	0	0	1	0
	Solanaceae	**D**									
109	*Hyoscyamus muticus* L.		herb	P	0	0	0	1	0	1	0
110	*Lycopersicon esculentum* Mill.		herb	A	1	0	0	1	0	0	0
111	*Solanum americanum* Mill.		herb	A	1	1	0	0	1	0	0
112	*Withania somnifera* (L.) Dunal		herb	P	0	0	0	0	1	0	0
	Zygophyllaceae	**D**									
113	*Fagonia mollis* Delile		herb	P	0	0	0	0	0	1	0
114	*Tribulus terrestris* L.		herb	A	0	0	0	1	1	1	0
115	*Zygophyllum album* L.f.		shrub	P	0	0	0	0	1	1	0
116	*Zygophyllum coccineum* L.		shrub	P	0	0	0	0	1	1	0
117	*Zygophyllum simplex* L.		herb	B	0	0	0	1	1	1	0

Division: (D= Dicotyledons, **M=** Monocotyledons**). Life span:** (**A**= Annuals, **B**= Biennials, **P**= Perennials). **Data matrix**: (1= presence, 0 = absence).

Table (3): List of monotypic and polytypic families with their species numbers and ratios recorded along Cairo – Ismailia desert road.

No.		No. of Genera	No. of Species	Ratio of Species
	MONOTYPIC FAMILIES			
1	Arecaceae	1	1	0.76
2	Boraginaceae	1	1	0.76
3	Cleomaceae	1	1	0.76
4	Cucurbitaceae	1	1	0.76
5	Ephedraceae	1	1	0.76
6	Geraniaceae	1	1	0.76
7	Juncaceae	1	1	0.76
8	Neuradaceae	1	1	0.76
9	Oxalidaceae	1	1	0.76
10	Portulacaceae	1	1	0.76
11	Primulaceae	1	1	0.76
12	Resedaceae	1	1	0.76
13	Tamaricaceae	1	1	0.76
14	Typhaceae	1	1	0.76
15	Urticaeae	1	1	0.76
	POLYTYPIC FAMILIES			
16	Poaceae	21	25	18.94
17	Compositae	20	21	15.91
18	Brassicaceae	9	10	7.58
19	Chenopodiaceae	7	10	7.58
20	Leguminosae	7	8	6.06
21	Zygophyllaceae	4	5	3.79
22	Euphorbiaceae	4	5	3.79
23	Aizoaceae	4	4	3.03
24	Amaranthaceae	3	4	3.03
25	Convolvulaceae	2	4	3.03
26	Solanaceae	4	4	3.03
27	Apiaceae	2	3	2.27
28	Malvaceae	3	3	2.27
29	Polygonaceae	2	3	2.27
30	Apocynaceae	2	2	1.52
31	Caryophyllaceae	2	2	1.52
32	Cyperaceae	1	2	1.52
33	Plantaginaceae	1	2	1.52
	Total	**112**	**132**	**100**

Table (4): Proximity matrix showed similarity value of monotypic families recorded among the studied habitats along Cairo - Ismailia desert road.

Proximity Matrix							
	Matrix File Input						
Habitats	**Field crops**	**Orchards**	**Gardens**	**Roadsides**	**Wastelands**	**Deserts**	**Salt marshes**
Field crops	1.000						
Orchards	0.833	1.000					
Gardens	0.600	0.500	1.000				
Roadsides	0.333	0.286	0.500	1.000			
Wastelands	0.167	0.143	0.250	0.667	1.000		
Deserts	0.077	0.154	0.091	0.200	0.222	1.000	
Salt marshes	**0.000**	**0.000**	**0.000**	0.200	0.250	0.091	1.000

Table (5): Proximity matrix showed similarity value of polytypic families recorded among the studied habitats along Cairo - Ismailia desert road.

Proximity Matrix							
	Matrix File Input						
Habitats	**Field crops**	**Orchards**	**Gardens**	**Roadsides**	**Wastelands**	**Deserts**	**Salt marshes**
Field crops	1.000						
Orchards	0.607	1.000					
Gardens	0.469	0.463	1.000				
Roadsides	0.324	0.361	0.469	1.000			
Wastelands	0.225	0.300	0.243	0.243	1.000		
Deserts	0.022	0.100	0.080	0.173	0.143	1.000	
Salt marshes	**0.019**	**0.055**	**0.038**	0.038	0.119	0.058	1.000

On the other hand, the lowest ratio (1.9%) was recorded between field crops and salt marshes habitats. On the whole, the same degree of similarity ratio 24.3% was noticed between (gardens and wastelands) and (roadsides and wastelands).

3.3. Cluster analysis of monotypic and polytypic families

Based on measured values, the cluster analysis of monotypic and polytypic families classified the studied habitats into five groups namely (G1, G2, G3, G4 and G5). The dendrograms (Figs. 2 & 3) and (Table 6) of monotypic and polytypic families contained the same habitats at the following groups: G1, G4 and G5. Group 1 included field crops and orchards. Group 4 contained desert habitat and group 5 included salt marshes habitat. On the other hand, groups 2 and 3 contained different habitats at monotypic and polytypic families. Group 2 contained gardens habitat at monotypic families, while; it contained gardens and roadsides habitats at polytypic ones. In addition, group 3 included roadsides and wastelands habitat in monotypic families, while, it contained wastelands at polytypic ones.

3.4. Habit ratios of monotypic and polytypic families

The spectrum of habit ratios (Fig. 4), showed that herb species had the highest contributions 66% in monotypic followed by 62% at polytypic families. Shrubs and trees were recorded at monotypic and polytypic families. They

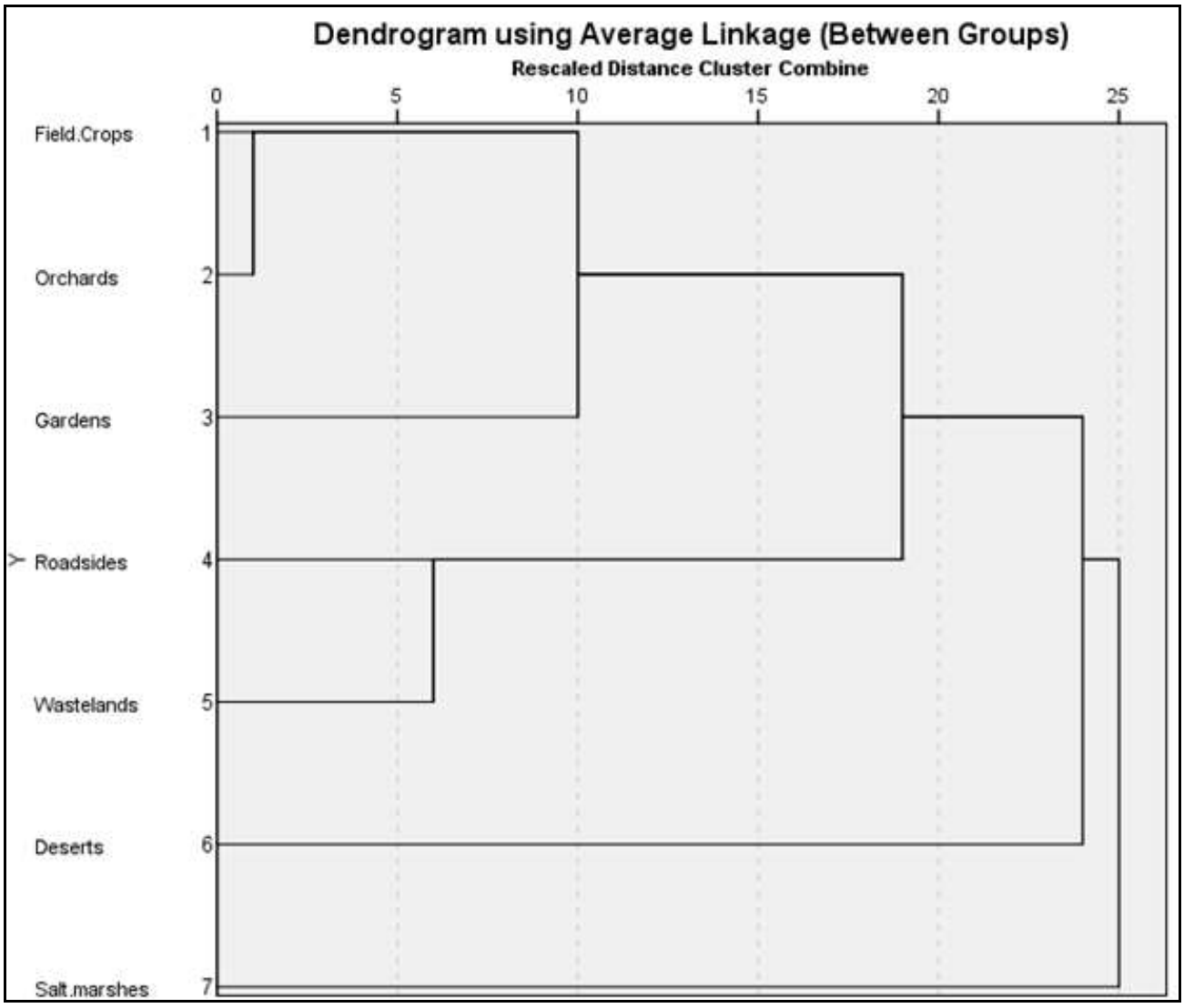

Fig. (2): Dendrogram showed similarity value of monotypic families recorded among the studied habitats along Cairo-Ismailia desert road.

represented by 20% and 7% at monotypic families; while there were 11% and 1% in polytypic. Rushes (*Juncus bufonius* L.) were recorded in monotypic families and represented by 7%. On the other hand, grasses, subshrubs and trees were recorded in polytypic families only. They represented by 21%, 3% and 2%, respectively. The low number of shrubs and trees in the current study related to the high intensity of disturbance due to agricultural activities along Cairo-Ismailia desert road; this fact was also reported by Kim *et al.* (2002), Abd El-Ghani *et al.* (2013) and Amer *et al.* (2015). This indicated that the floristic structure of the studied area was affected by human impact (Shaltout and El-Fahar, 1991; Abd El-Ghani *et al.*, 2011 and Amer *et al*., 2015).

3.5. Life span ratios of monotypic and polytypic families

The spectrums of life span ratios of the studied habitats (Fig. 4) revealed that the perennial species of monotypic families dominated the vegetation diversity among the studied habitats. They represented 53%, followed by annual herbs 47%. On the other hand, the annual species of monotypic families dominated the vegetation among the studied habitats. They represented 65%, followed by perennials 31%. Moreover, biennual species of polytypic families represented 4% and not recorded at the monotypic ones (Fig.4). Shaltout and Sharaf El-Din (1988) reported that the flourishing of annuals species at different habitats is related to their great plasticity under

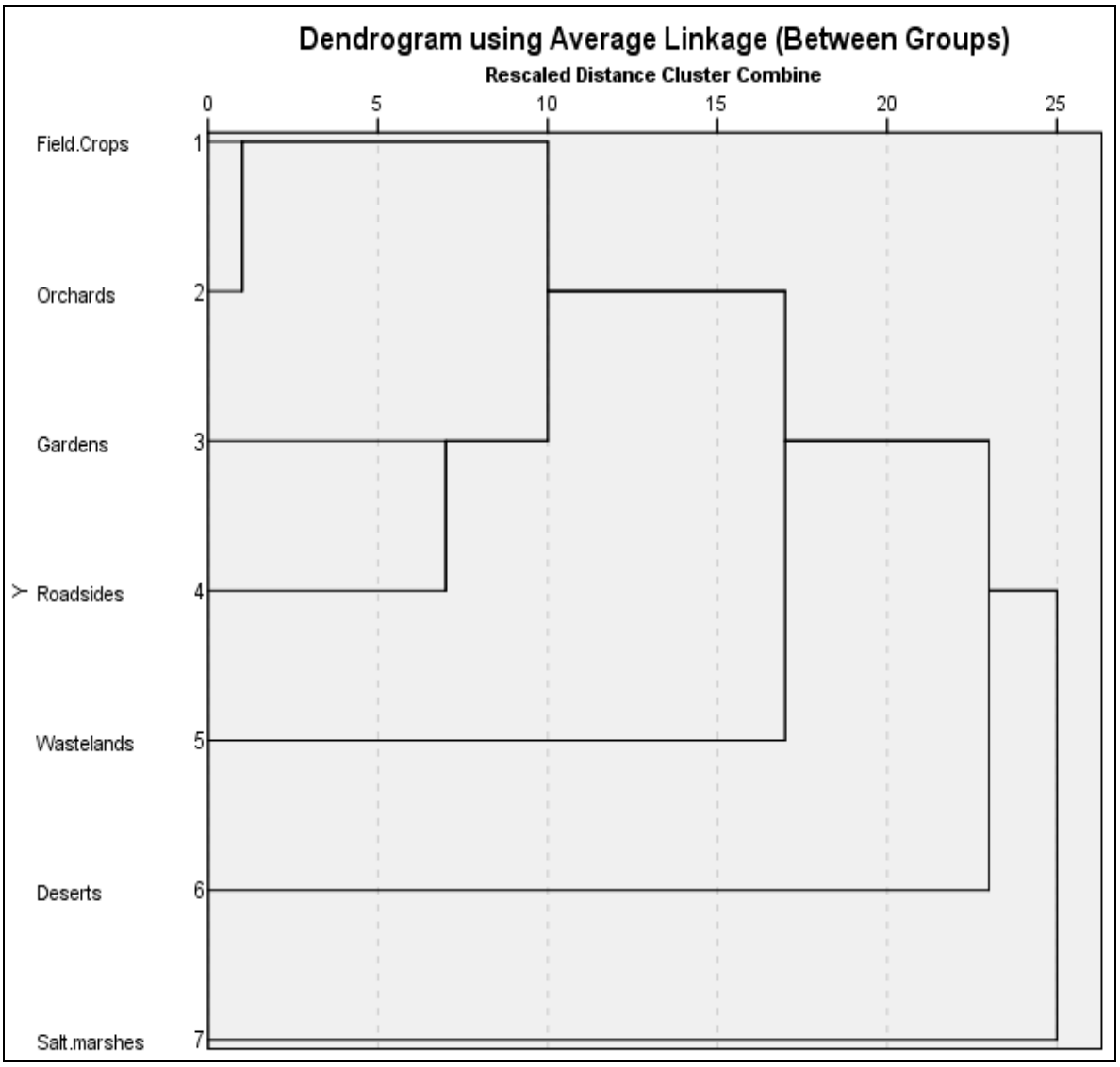

Fig. (3): Dendrogram showed similarity value of polytypic families recorded among the studied habitats along Cairo - Ismailia desert road.

Table (6): Grouping of monotypic and polytypic families among the studied habitats along Cairo- Ismailia desert road.

Group numbers	Monotypic families	Polytypic families
G1	Field crops and Orchards	Field crops and Orchards
G2	**(Gardens)**	**(Gardens and Roadsides)**
G3	**(Roadsides and wastelands)**	**(Wastelands)**
G4	Deserts	Deserts
G5	Salt marshes	Salt marshes

different situations. Abd El-Ghani *et al*. (2013) reported the short life span ratios of annual species lead to the frequent occurrence during the favorable seasons which supports the present investigation. These explanations are supported by the present investigation based on the recorded species among different habitats.

3.6. Angiospermae and Gymnospermae ratios of monotypic and polytypic families

The study recorded the presence of 33 families included 15 monotypic and 18 polytypic families. The monotypic families were 11 dicotyledons (73%), 3 monocotyledons (20%) and 1 chlamydospermae (7%) families. The

polytypic families contained 15 dicotyledons (83%) and 3 monocotyledons (17%) families (Fig. 4). Angiospermae (dicotyledons and monocotyledons families) constituted the highest ratios of distribution at monotypic and polytypic families. On the other hand, Gymnospermae included chlamydospermae (*Ephedra alata* Decne.) was recorded only at monotypic families (Fig. 4).

3.7. Habitat ratios of monotypic and polytypic families

It was obvious that the monotypic and polytypic families constituted the main bulk of the recorded species at salt marshes and roadside habitats; respectively. The highest ratio 83% of monotypic families were recorded at salt marshes followed by 67% at deserts then 61% at filed crop habitats; while the least one 44% was recorded at filed crops habitat. Regarding the polytypic ones, the highest ratio 56% was noticed at roadsides followed by 53% at both gardens and wastelands habitat, while the least one (17%) was noticed in salt marshes (Fig. 5). Similar conclusion was reached by Fawzi, *et al.* (2017).

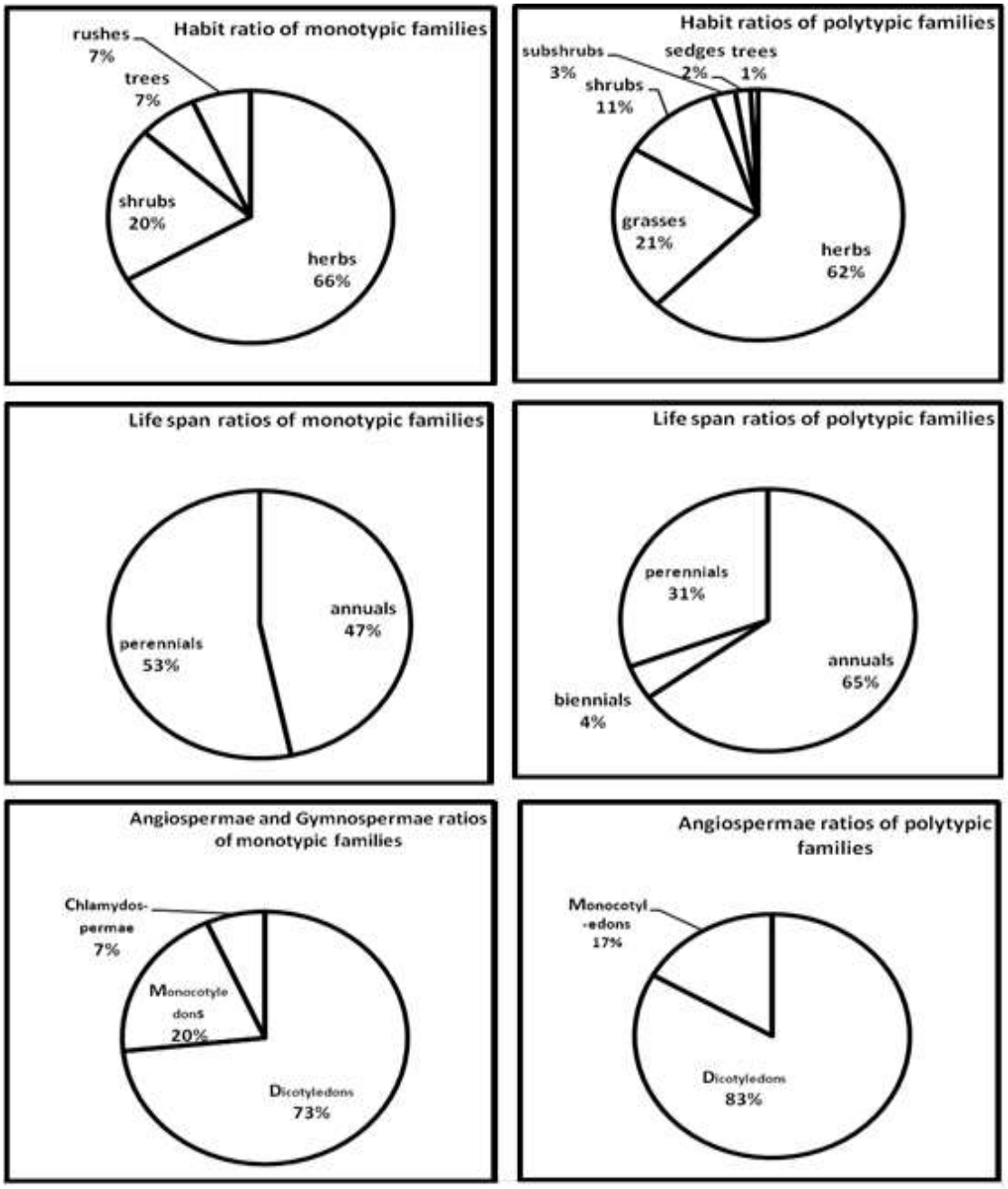

Fig. (4): Spectrum showed ratios of habit, life span and Angiospermae and Gymnospermae of monotypic and polytypic families studied along Cairo-Ismailia desert road.

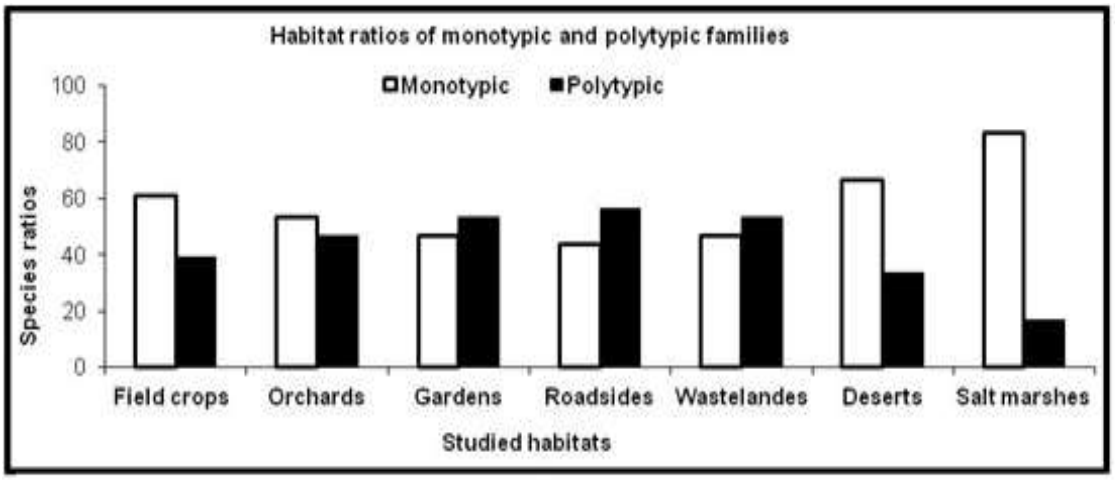

Fig. (5): Histogram showed the habitat ratios of monotypic and polytypic families along Cairo-Ismailia desert road.

Conclusions

In this study, the analysis of vegetation diversity concluded that the largest distributed polytypic families were Poaceae followed by Compositae then Chenopodiaceae and Brassicaceae. In addition 15 families were monotypic. Herbs dominated at monotypic and polytypic families. The dominant life span species were annuals at polytypic habitats followed by perennial species at monotypic ones. The cluster analysis of monotypic and polytypic families divided the studied habitats into five groups. Moreover, field crops and orchard habitats showed the highest degree of similarity ratios at both monotypic and polytypic families. On the other hand, there was no similarity between species of salt marshes habitat and species of field crops, orchards and gardens.

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دراسة على تنوع الكساء الخضرى خلال طريق القاهرة - الاسماعيلية الصحراوى، مصر

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ملخص

يهدف هذا البحث الى دراسة التنوع النباتى بين البيئات التالية: المحاصيل الحقلية، البساتين،الحدائق، حواف الطرق، الأراضى المهملة، المستنقعات الملحية والصحراء خلال طريق القاهرة الاسماعيلية الصحراوى. تم تسجيل 112 جنسا و132 نوعاً نباتياً تتبع 27 فصيلة من ذوات الفلقتين، 5 فصائل نباتية من ذوات الفلقة الواحدة وفصيلة واحدة تتبع معراة البذور وقد تم جمع وتعريف هذه الآنواع النباتية بالاستعانة بالمجموعات النباتات الإقليمية والعينات المرجعية المتاحة. سجلت الفصيلة النجيلية عديدة النمط أعلى عدد فى تمثيلها للأنواع النباتية حيث سجلت 25 نوعا نباتيا بينما سجلت الفصيلة المركبة 21 نوعا، ثم 10 انواع لكل من الفصيلة الصليبية والزربيحية. كما كشفت الدراسة عن وجود درجة عالية من احادية النمط ممثلة فى 15 فصيلة نباتية مثلت بنوع نباتى واحد. بلغت نسبة الأنواع العشبية 21%، الشجيرات 3%، والاحراش 2% فى الفصائل عديدة النمط فقط. مثلت الحوليات باعلى نسبة 65% فى الفصائل عديدة النمط. بينما مثلت الانواع ثنائية الحول بنسبة 4% فى الفصائل وحيدة النمط فقط. أظهرت التحليلات العنقودية درجة كبيرة من التشابه بين نباتات البيئات المدروسة، حيث قسمت الأنواع حسب هذه التحليلات إلى خمسة مجموعات. مثلت المجموعات الاولى، والرابعة، والخامسة بنفس البيئات المدروسة فى الفصائل وحيدة النمط وعديد النمط، بينما اختلفت البيئات المدروسة فى المجموعات الثانية والثالثة فى الفصائل وحيدة النمط وعديدة النمط. لوحظ أن نباتات المحاصيل الحقلية والبساتين لديهما أعلى نسبة من التشابه قيمتة 83% فى الفصائل وحيدة النمط و60.7% فى الفصائل عديدة النمط. في حين لم يكن هناك اى درجة من التشابه بين نباتات بيئة المستنقعات الملحية والبيئات التالية: المحاصيل الحقلية، البساتين والحدائق فى الفصائل وحيدة النمط فقط.

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