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A STUDY ON THE PLANT DIVERSITY IN ABU RAWASH AREA, GIZA, EGYPT

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ABSTRACT

The aim of the current research was to study plant diversity among seven represented habitats namely; field crops, orchards, irrigation canals, Mansuria Canal, deserts, drain station and water bodies in Abu Rawash area, Giza, Egypt. A total of 107 species belonging to 92 genera and 33 families were recorded and identified with regional flora and available checklists. The common families were Poaceae (22%) followed by Compositae (12%) Brassicaceae (7%). Three species were recorded from each of Cyperaceae, Malvaceae and Zygophyllaceae, and two species from each of Amaranthaceae, Apiaceae, Apocynaceae, Plantaginaceae and Salicaceae. In addition, 16 families were monotypic. The annual species represented 53%, perennial herbs were 35% and each of shrubs and trees were 5%; while biennials species were 2%. The chorological ratios showed that the cosmopolitan taxa had the highest contribution (23%), followed by pantropicals (16%) and palaeotropicals (13%). The cluster analysis divided the studied habitats into four groups. Group one included field crops and irrigation canals habitats. The second group contained orchards and Mansuria Canal habitats. The third group included drain station and deserts habitats; while the forth group contained water bodies' habitat. On the whole, orchards and Mansuria Canal habitats showed the highest similarity value (0.543). On the other hand, there was no similarity between species of water bodies' habitat and species of the other habitats except with Mansuria Canal (0.017).

Key words: *Plant diversity, life cycle, life form, chorology, Abu Rawash.*

1. INTRODUCTION

Egypt is characterized by a worm and almost rainless climate. The average annual rainfall over the whole country is only about 10 mm. Egypt's deserts occupy about 95% of its total area (Zahran and El-Amier, 2014). The Western desert covers approximately 700,000 km^2, which is more than two-thirds of the total area of Egypt (Abd El-Ghani and Fawzy, 2006 and Salman *et al.*, 2010). The Western desert consists of sandy plateau with some basins and depressions. It contains salty marshes, lakes, and waste lands (Boulos, 2008). The Precipitation decreases from 150 mm at the coast to zero in the south. It supports plants in areas with water resources such as rainfall and underground (Abd El-Ghani and Fawzy, 2006). Abu Rawash area belongs to Giza Governorate and located at the Western desert between latitude 30° 02' 48" and longitude 31°05' 47". This area is strewn with sand and gravel of Oligocene. It represents one of the structural habitats that characterize the northern parts of Egypt (Kerdany and Cherif, 1990). In the Abu Rawash area, the rocks are mainly composed of limestones and dolomites. Topographically, the elevated upper cretaceous rocks are surrounded by younger tertiary rocks (Mansour, 2004).

The plant diversity in the Western desert of Egypt has been investigated by numerous studies such as; Täckholm & Täckholm (1941); Täckholm and Drar (1950, 1954, 1969); Täckholm (1974),Boulos (1980, 1982a, & b); Bornkamm (1986), Alaily *et al*. (1987), Kehl (1987); Bornkamm and Kehl (1989 & 1990); Kehl and Bornkamm (1993); Boulos (1995, 1999, 2000, 2002, 2005 & 2008); Boulos and Barakat (1998) and Azer (2013). Little information is known about the plant diversity in Abu Rawash area because of its unpredictable rain and the researchers reach the area after a prolonged drought and see old remnants of the vegetation. The aim of this study was to provide a description of the plant diversity and

demonstrate life form and chorological ratios of the collected species among seven studied habitats namely; field crops, orchards, irrigation canals, Mansuria Canal, deserts, drain station and water bodies.

2. MATERIALS AND METHODS

2. 1. The Study Area

Abu Rawash area belongs to Giza Governorate and located between latitude 30° 02' 48" N and longitude 31° 05' 47" E. (Fig. 1). It is located in the Western desert and represents one of the structural habitats that characterize the northern parts of Egypt (Kerdany and Cherif, 1990). The area is composed of chalky limestone and dolomites (Faris & Soliman, 1961). It is characterized by sand and gravel of Oligocene and Miocene age. The area is slightly subjected to tectonic activity during sedimentation of the rocks. Topographically, the elevated upper cretaceous rocks are surrounded by younger rocks (Mansour, 2004). The studied area was represented by seven different habitats namely; field crops, orchards, irrigation canals, Mansuria Canal, deserts, drain station and water bodies. Based on the climatic data, the mean annual temperature and rainfall are 26.25 ^{o}C and 1.25 mm; respectively. Most of the rains fall in winter months (Table 1).

2. 2. Data Collection

Field trips were performed to the study area to cover all the represented habitats from January 2016 to December 2016. Field data of the plant diversity, among seven represented habitats were gathered. The studied species were recorded to represent the plant diversity and covered the represented habitats in Abu Rawash area. The recorded species were arranged alphabetically with their families.

2. 3. Species identification

Species identification was based on Täckholm (1974); Boulos (1995, 1999, 2000, 2002, 2005 & 2009) and updated by Angiosperm Phylogeny Group III (2009) ; Chase and Reveal (2009) and Haston *et al.* (2009). Life forms (Therophytes, Geophytes, Chamaephytes, Hemicryptophytes, Phanerophytes, Nanophanerophytes, Helophytes and Hydrophytes) were identified according to Raunkiaer's system of classification (Raunkiaer 1934). Chorology (Cosmopolitan, Pantropical, Palaeotropical, Mediterranean, Irano-Turanian, Sudano-Zambezian, Euro-Siberian, Saharo-Sindian and cultivated) were cited according to Zohary (1966 & 1987), Wickens (1976) and Feinbrun-Dothan (1978 & 1986). 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. 350 plant specimens were collected and prepared as herbarium sheets.

2. 4. Numerical analysis

Numerical analysis was carried out and based on hierarchical cluster analysis. The retrieved output was used to construct specific ecological relationships among the studied habitats. The substantial numbers (1 = presence and 0 = absence) of the recorded species were used for each selected habitat (Table 2). The data treated as a Pearson correlation in a data matrix to measure degree of similarity using SPSS version 22 (SPSS, 2013). The output was plotted in the form of dendrogram (Fig.4). The dendrogram was based on average linkage (between groups) and rescaled distance cluster combine

3. RESULTS

3. 1. Floristic composition

The study recorded the presence of 107 species, representing 92 genera and 33 families belonged to dicotyledons families (84%) and monocotyledons families (16%) were identified (Fig.2). The most distributed families were Poaceae (22%) followed by Compositae (12%) and Brassicaceae (7%). Moreover, each of Chenopodiaceae, Leguminosae, Polygonaceae, and Solanaceae was 5%. Three species were recorded from each of Cyperaceae, Malvaceae and Zygophyllaceae and two species from each of Amaranthaceae, Apiaceae, Apocynaceae, Plantaginaceae and Salicaceae. Moreover, 16 monotypic families were represented by one species (Fig.3). The recorded species were arranged alphabetically with their families and genera and the presence or absence values in the studied habitats were listed in (Table 2).

3. 2. Life cycle ratios

The life cycle ratios of the studied species outlined in (Fig.5) revealed that the annual species dominated the flora of Abu Rawash area. This represented by 53% followed by perennial herbs (35%). Moreover, each of trees and shrubs was represented by 5%; while biennials species were 2%.

3. 3. Life form ratios

The life forms of the collected taxa revealed that the therophytes species dominated the flora

Table (1): Mean and annual values of temperature (^{o}C) and precipitation (mm) of the study area during years 2015 & 2016 (Based on Central Laboratory for Agricultural Climate data).

Months	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annually
Temperature	17	19	22	27	31	33	33	33	31	28	23	18	(26.25)
Precipitation	4	3	2	0	0	0	0	0	0	0	2	4	(1.25)

Table (2): The life cycle, life form, chorology and data matrix of 107 species distributed among seven studied habitats in Abu Rawash area.

No					Habitat types						
	Taxa	Life cycle	Life form	Chorology	Field crops	Irrigation canal	Orchards	Mansuria Canal	Drain stain	Deserts	Water bodies
1	**Aizoaceae**										
1.1	*Trianthema portulacastrum* L.	A	Th	IT,SS	**1**	**1**	**1**	**0**	**0**	**0**	**0**
2	**Amaranthaceae**										
2.2	*Amaranthus blitum* subsp. *oleraceus* (L.) Costea	A	Th	Cosm	**1**	**1**	**1**	**1**	**0**	**0**	**0**
2.3	*Amaranthus viridis* L.	A	Th	Pal	**1**	**1**	**1**	**1**	**0**	**0**	**0**
3	**Apiaceae**										
3.4	*Ammi majus* L.	A	Th	SZ	**1**	**1**	**0**	**0**	**0**	**0**	**0**
4.5	***Cyclospermum leptophyllum* (Pers.) Sprague**	A	Th	Pal	**1**	**1**	**0**	**0**	**0**	**0**	**0**
4	**Apocynaceae**										
5.6	*Calotropis procera* (Aiton) Dryand.	P	Ph	IT,SS,SZ	**0**	**0**	**0**	**0**	**0**	**1**	**0**
6.7	*Cynanchum acutum* L.	P	Hm	M,IT,SS	**0**	**1**	**1**	**0**	**1**	**1**	**0**
5	**Araceae**										
7.8	*Lemna gibba* L.	P	Hy	M,IT,SS	**0**	**0**	**0**	**0**	**0**	**0**	**1**
6	**Arecaceae**										
8.9	*Phoenix dactylifera* L.	T	Ph	M,IT	**1**	**1**	**1**	**1**	**0**	**1**	**0**
7	**Boraginaceae**										
9.10	*Heliotropium bacciferum* Forssk.	P	Ch	SS	**0**	**0**	**0**	**0**	**0**	**1**	**0**
8	**Brassicaceae**										
10.11	*Brassica tournefortii* Gouan	A	Th	M,IT	**0**	**0**	**0**	**0**	**1**	**1**	**0**
11.12	*Capsella bursa-pastoris* (L.) Medik.	A	Th	Cosm	**1**	**1**	**0**	**0**	**0**	**0**	**0**
12.13	*Eruca vesicaria* (L.) Cav.	A	Th	M	**1**	**0**	**1**	**1**	**0**	**0**	**0**
13.14	*Lepidium sativum* L.	A	Th	Cosm	**1**	**1**	**0**	**0**	**0**	**0**	**0**
14.15	*Raphanus raphanistrum* L.	A	Th	Cosm	**1**	**0**	**1**	**0**	**0**	**0**	**0**
15.16	*Sinapis alba* L.	A	Th	Pan	**0**	**0**	**0**	**0**	**1**	**1**	**0**
16.17	*Sisymbrium irio* L.	A	Th	M,IT,ES	**1**	**0**	**0**	**1**	**1**	**1**	**0**
9	**Ceratophyllaceae**										
17.18	*Ceratophyllum demersum* L.	P	Hy	Cosm	**0**	**0**	**0**	**0**	**0**	**0**	**1**
10	**Chenopodiaceae**										
18.19	*Bassia indica* (Wight) A.J.Scott	A	Th	It,SS	**0**	**0**	**0**	**1**	**1**	**1**	**0**
19.20	*Beta vulgaris* L.	A	Th	SS	**1**	**1**	**0**	**0**	**0**	**0**	**0**
20.21	*Chenopodium album* L.	A	Th	Cosm	**1**	**1**	**1**	**1**	**1**	**0**	**0**
20.22	*Chenopodium murale* L.	A	Th	Cosm	**1**	**1**	**1**	**1**	**1**	**0**	**0**
21.23	*Suaeda vermiculata* Forssk. ex J.F.Gmel.	S	Ch	SZ	**0**	**0**	**0**	**1**	**1**	**1**	**0**
11	**Compositae**										
22.24	*Achillea tenuifolia* Lam.	P	Na	SS	**0**	**0**	**0**	**0**	**0**	**1**	**0**
23.25	*Artemisia judaica* L.	P	Ch	M,SS	**0**	**0**	**0**	**0**	**0**	**1**	**0**
24.26	*Bidens pilose* L.	A	Th	Pan	**0**	**1**	**1**	**1**	**0**	**0**	**0**
25.27	*Cichorium endivia* L. subsp. *divaricatum* (Schousb.) P.D. Sell	A	Th	M,IT	**1**	**1**	**1**	**0**	**0**	**0**	**0**
26.28	*Eclipta prostrata* (L.) L.	A	Th	Pan	**0**	**1**	**0**	**1**	**0**	**0**	**0**
27.29	*Erigeron bonariensis* L.	A	Th	M	**0**	**1**	**1**	**1**	**1**	**0**	**0**

Table (2): Continued I

No					Habitat types						
	Taxa	**Life cycle**	**Life form**	**Chorology**	**Field crops**	**Irrigation canal**	**Orchards**	**Mansuria Canal**	**Drain stain**	**Deserts**	**Water bodies**
28.30	*Lactuca serriola* L.	B	Th	Cosm	**0**	**0**	**1**	**1**	**1**	**1**	**0**
29.31	*Launaea nudicaulis* (L.) Hook.f.	P	Ch	Cosm	**0**	**0**	**0**	**1**	**1**	**1**	**0**
30.32	*Pluchea dioscoridis* (L.) DC.	S	Ch	Cosm	**0**	**0**	**0**	**0**	**1**	**1**	**0**
31.33	*Senecio aegyptius* L.	A	Th	M	**0**	**0**	**0**	**0**	**1**	**1**	**0**
31.34	*Senecio desfontainei* Druce	A	Th	SZ	**0**	**0**	**0**	**0**	**1**	**1**	**0**
32.35	***Sericocarpus linifolius* (L.) "Britton, Sterns & Poggenb."**	A	Th	M,IT	**0**	**0**	**1**	**0**	**0**	**1**	**0**
33.36	*Sonchus oleraceus* (L.) L.	A	Th	Cosm	**1**	**1**	**1**	**1**	**0**	**0**	**0**
12	**Convolvulaceae**										
34.37	*Convolvulus arvensis* L.	P	Ch	Pal	**1**	**1**	**1**	**1**	**1**	**0**	**0**
35.38	*Cuscuta campestris* Yunck.	A	Th	Pan	**1**	**1**	**0**	**0**	**0**	**0**	**0**
36.39	*Ipomoea carnea* Jacq.	S	Ph	Pan	**0**	**0**	**1**	**1**	**0**	**0**	**0**
36.40	*Ipomoea cairica* (L.) Sweet	P	Ch	Pan	**0**	**0**	**1**	**1**	**0**	**0**	**0**
13	**Cyperaceae**										
37.41	*Cyperus alopecuroides* Rottb.	P	Ch	Pan	**0**	**0**	**0**	**1**	**0**	**0**	**0**
37.42	*Cyperus articulatus* L.	P	Ch	Pal	**0**	**0**	**0**	**1**	**0**	**0**	**0**
37.43	*Cyperus rotundus* L.	P	Ge	Pan	**1**	**1**	**1**	**1**	**1**	**0**	**0**
14	**Euphorbiaceae**										
38.44	*Euphorbia heterophylla* L.	A	Th	Cosm	**1**	**1**	**1**	**1**	**0**	**0**	**0**
38.45	*Euphorbia peplus* L.	A	Th	Pan	**1**	**1**	**1**	**1**	**0**	**0**	**0**
38.46	*Euphorbia prostrata* Aiton	A	Th	Cosm	**0**	**1**	**0**	**0**	**0**	**0**	**0**
39.47	*Ricinus communis* L.	S	Ph	M	**0**	**0**	**1**	**1**	**1**	**1**	**0**
15	**Lamiaceae**										
40.48	***Mentha longifolia* subsp. *typhoides* (Briq.) Harley**	P	Ch	Pal	**0**	**1**	**0**	**0**	**0**	**0**	**0**
16	**Leguminosae**										
41.49	*Alhagi graecorum* Boiss.	P	Hm	Pal	**0**	**0**	**1**	**1**	**1**	**1**	**0**
42.50	*Leucaena leucocephala* (Lam.) De Wit	T	Ph	Pal	**0**	**0**	**0**	**1**	**0**	**0**	**0**
43.51	*Melilotus indicus* (L.) All.	A	Th	M,ES,SS	**1**	**0**	**0**	**0**	**1**	**0**	**0**
44.52	*Sesbania sesban* (L.) Merr.	S	Ph	M,IT	**1**	**1**	**1**	**1**	**1**	**1**	**0**
45.53	*Trifolium resupinatum* L.	A	Th	Pal	**1**	**0**	**1**	**1**	**1**	**0**	**0**
17	**Malvaceae**										
46.54	*Corchorus olitorius* L.	A	Th	Pan	**1**	**1**	**1**	**1**	**0**	**0**	**0**
47.55	*Malva parviflora* L.	A	Th	M,IT	**1**	**1**	**1**	**1**	**1**	**0**	**0**
48.56	*Sida spinosa* L.	P	Ch	Cosm	**0**	**0**	**1**	**0**	**0**	**0**	**0**
18	**Nyctaginaceae**										
49.57	*Boerhavia coccinea* Mill.	P	Hm	Cosm	**0**	**0**	**0**	**0**	**1**	**0**	**0**
19	**Onagraceae**										
50.58	***Ludwigia adscendens* subsp. *diffusa* (Forssk.) P.H.Raven**	P	He	M,ES,SS	**0**	**0**	**0**	**0**	**0**	**0**	**1**
20	**Oxalidaceae**										
51.59	*Oxalis corniculata* L.	P	Hm	Pal	**0**	**0**	**1**	**0**	**0**	**0**	**0**
21	**Plantaginaceae**										
52.60	*Plantago lagopus* L.	A	Th	Pan	**0**	**0**	**1**	**0**	**0**	**0**	**0**
52.61	*Plantago major* L.	A	Th	M,IT	**1**	**1**	**1**	**0**	**0**	**0**	**0**

Table (2): Continued II

No	Taxa	Life cycle	Life form	Chorology	Habitat types						
					Field crops	Irrigation canal	Orchards	Mansuria Canal	Drain stain	Deserts	Water bodies
22	**Poaceae**										
53.62	*Arundo donax* L.	P	He	C	**0**	**0**	**0**	**0**	**0**	**1**	**0**
54.63	*Avena sativa* L.	A	Th	C	**0**	**0**	**0**	**0**	**0**	**0**	**0**
54.64	*Avena barbata* Pott ex Link	A	Th	M,IT	**0**	**0**	**0**	**0**	**1**	**1**	**0**
55.65	*Brachiaria mutica* (Forssk.) Stapf	A	Th	Cosm	**1**	**1**	**1**	**0**	**0**	**0**	**0**
56.66	*Bromus catharticus* Vahl	A	Th	Cosm	**0**	**0**	**0**	**1**	**1**	**1**	**0**
57.67	*Cenchrus biflorus* Roxb.	A	Th	SS,SZ	**0**	**0**	**1**	**1**	**0**	**0**	**0**
58.68	*Cynodon dactylon* (L.) Pers.	P	Ge	IT,SS,SZ	**1**	**1**	**1**	**1**	**1**	**1**	**0**
59.69	*Desmostachya bipinnata* (L.) Stapf	P	Ge	SS,SZ	**0**	**0**	**0**	**1**	**0**	**0**	**0**
60.70	*Digitaria sanguinalis* (L.) Scop.	A	Th	Pal	**0**	**1**	**1**	**1**	**1**	**1**	**0**
61.71	*Echinochloa colona* (L.) Link	A	Th	Pan	**1**	**1**	**1**	**1**	**0**	**0**	**0**
61.72	*Echinochloa stagnina* (Retz.) P. Beauv.	P	Ge	Pal	**0**	**1**	**1**	**1**	**0**	**0**	**0**
62.73	*Imperata cylindrica* (L.) Raeusch.	P	Hm	SS,SZ	**0**	**0**	**0**	**1**	**1**	**1**	**0**
63.74	*Leptochloa fusca* (L.) Kunth	P	Ch	SZ	**0**	**1**	**1**	**0**	**0**	**0**	**0**
64.75	*Lolium multiflorum* Lam.	A	Th	Pan	**0**	**1**	**1**	**1**	**1**	**1**	**0**
65.76	*Paspalidium geminatum* (Forssk.) Stapf	P	Ch	Cosm	**0**	**1**	**1**	**1**	**0**	**0**	**0**
66.77	***Pennisetum divisum* (Forrsk.) ex J.F. Gmel.) Henrard**	P	Ch	Pal	**0**	**0**	**0**	**0**	**0**	**1**	**0**
67.78	*Phalaris minor* Retz.	A	Th	Pan	**0**	**0**	**1**	**0**	**0**	**0**	**0**
68.79	*Phragmites australis* (Cav.) Trin. ex Steud.	P	Hm	SS,SZ	**0**	**0**	**0**	**1**	**0**	**1**	**0**
69.80	*Poa annua* L.	A	Th	M,IT,SS	**1**	**0**	**1**	**0**	**0**	**0**	**0**
70.81	*Polypogon monspeliensis* (L.) Desf.	A	Th	M,IT,ES	**0**	**1**	**1**	**1**	**1**	**0**	**0**
71.82	*Saccharum spontaneum* L.	P	Hm	M,SS	**0**	**0**	**1**	**1**	**0**	**0**	**0**
72.83	*Setaria verticillata* (L.) P. Beauv.	A	Th	SZ	**0**	**0**	**1**	**1**	**0**	**0**	**0**
72.84	*Setaria viridis* (L.) P. Beauv.	A	Th	Cosm	**0**	**0**	**1**	**1**	**0**	**0**	**0**
73.85	*Sorghum virgatum* (Hack.) Stapf	B	Th	C	**0**	**0**	**1**	**0**	**0**	**0**	**0**
23	**Polygonaceae**										
74.86	*Calligonum comosum* L'Hér.	P	Ch	IT,SS	**0**	**0**	**0**	**0**	**0**	**1**	**0**
75.87	*Emex spinosa* (L.) Campd.	A	Th	M,IT,SS	**0**	**1**	**1**	**0**	**0**	**0**	**0**
76.88	*Persicaria senegalensis* (Meisn.) Soják	P	Hm	SS	**0**	**0**	**0**	**0**	**0**	**0**	**1**
77.89	*Rumex dentatus* L.	A	Th	Cosm	**0**	**0**	**1**	**0**	**1**	**1**	**0**
77.90	*Rumex vesicarius* L.	A	Th	M,IS,ES	**0**	**0**	**0**	**0**	**0**	**1**	**0**
24	**Pontederiaceae**										
78.91	*Eichhornia crassipes* (Mart.) Solms	P	Hy	Pal	**0**	**0**	**0**	**1**	**0**	**0**	**1**
25	**Portulacaceae**										
79.92	*Portulaca oleracea* L.	A	Th	Cosm	**1**	**0**	**1**	**1**	**1**	**0**	**0**
26	**Potamogetonaceae**										
80.93	*Potamogeton nodosus* Poir.	P	Hy	Cosm	**0**	**0**	**0**	**0**	**0**	**0**	**1**
27	**Primulaceae**										
81.94	*Anagallis arvensis* L.	A	Th	Cosm	**1**	**0**	**0**	**0**	**1**	**0**	**0**
28	**Salicaceae**										
82.95	*Salix mucronata* Thunb.	T	Ph	Pan	**0**	**0**	**0**	**1**	**0**	**0**	**0**
82.96	*Salix tetrasperma* Roxb.	T	Ph	Pal	**0**	**0**	**1**	**1**	**0**	**0**	**0**

Table (2): Continued III

No	Taxa	Life cycle	Life form	Chorology	Habitat types						
					Field crops	Irrigation canal	Orchards	Mansuria Canal	Drain stain	Deserts	Water bodies
29	**Solanaceae**										
83.97	*Datura stramonium* L.	A	Th	Pan	**0**	**0**	**0**	**1**	**1**	**0**	**0**
84.98	*Lycopersicon esculentum* Mill.	A	Th	C	**1**	**0**	**1**	**1**	**0**	**0**	**0**
85.99	*Solanum americanum* Mill.	A	Th	Cosm	**1**	**1**	**1**	**1**	**0**	**0**	**0**
86.100	*Solanum tuberosum* L.	A	Th	Cosm	**1**	**1**	**0**	**0**	**0**	**0**	**0**
87.101	*Withania somnifera* (L.) Dunal	P	Ch	SS,SZ	**0**	**1**	**1**	**1**	**1**	**1**	**0**
30	**Tamaricaceae**										
88.102	*Tamarix senegalensis* DC.	T	Ph	M,ES,SS	**0**	**0**	**0**	**0**	**1**	**1**	**0**
31	**Typhaceae**										
89.103	*Typha domingensis* Pers.	P	Hm	M,IS,ES	**0**	**0**	**0**	**0**	**0**	**1**	**0**
32	**Urticaceae**										
90.104	*Urtica urens* L.	A	Th	Pan	**1**	**0**	**1**	**0**	**0**	**0**	**0**
33	**Zygophyllaceae**										
91.105	*Fagonia mollis* Delile	P	Ch	Cosm	**0**	**0**	**0**	**0**	**0**	**1**	**0**
92.106	*Zygophyllum album* L.f.	P	Ch	IT,SS,SZ	**0**	**0**	**0**	**0**	**0**	**1**	**0**
92.107	*Zygophyllum simplex* L.	A	Th	M,SS	**0**	**0**	**0**	**0**	**0**	**1**	**0**

A= annual, B= biennial, P= perennial herb, S= shrub, T= tree, Th= Therophytes, Hy= Hydrophytes, Hm= Hemicryptophytes, Na= Nanophanerophytes, Ph= Phanerophytes, Ch= Chaemophytes, Ge= Geophytes, He= Helophyte, Cosm=Cosmopolitan, Pan= Pantropical, Pal= Palaeotropical, M= Mediterranean, IT= Irano-Turanian, C= Cultivated, SZ= Sudano-Zambezian, SS= Saharo-Sindian, ES= Euro-Siberian, 1=presence, 0=absence.

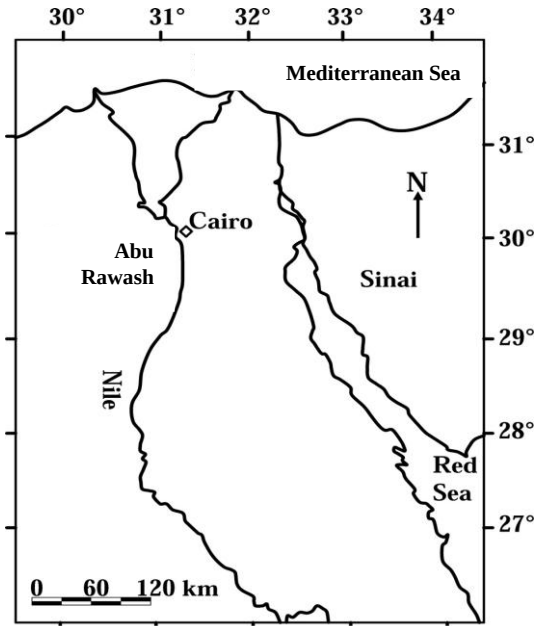

Fig.(1): A map showing the location of Abu Rawash area at Giza Governorate, Egypt.

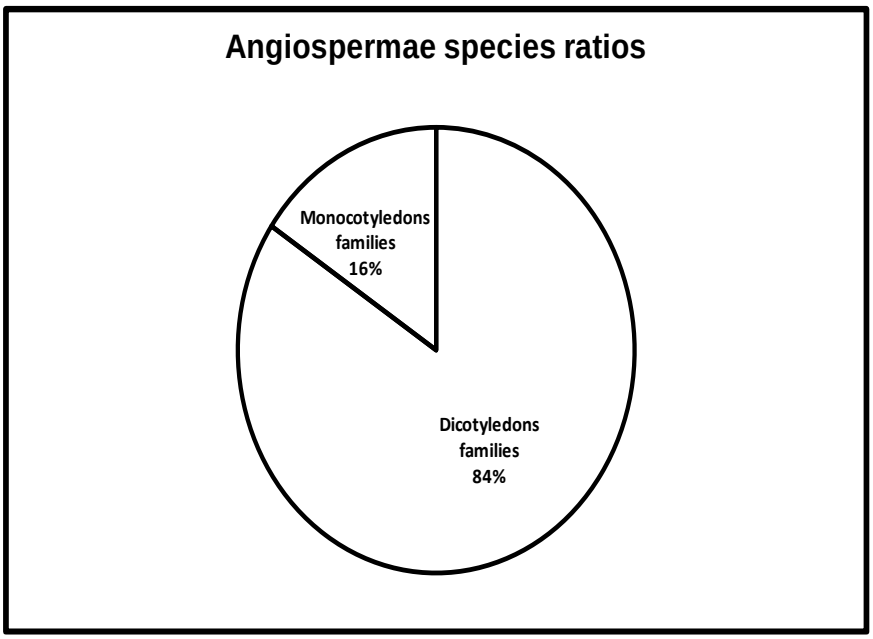

Fig. (2): Spectrum showing the total ratios of dicotyledons and monocotyledons families in Abu Rawash area.

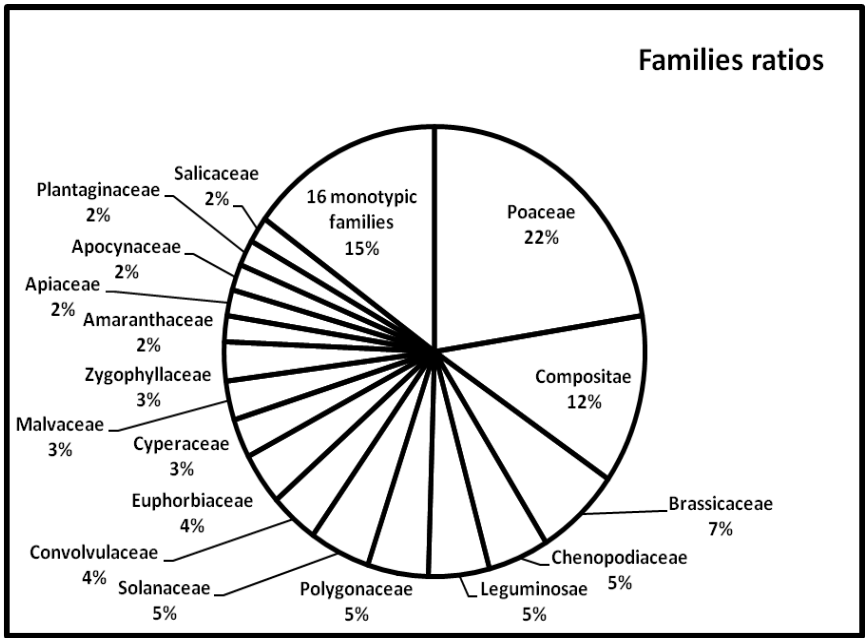

Fig. (3): Spectrum showing the ratios of the recorded families in Abu Rawash area.

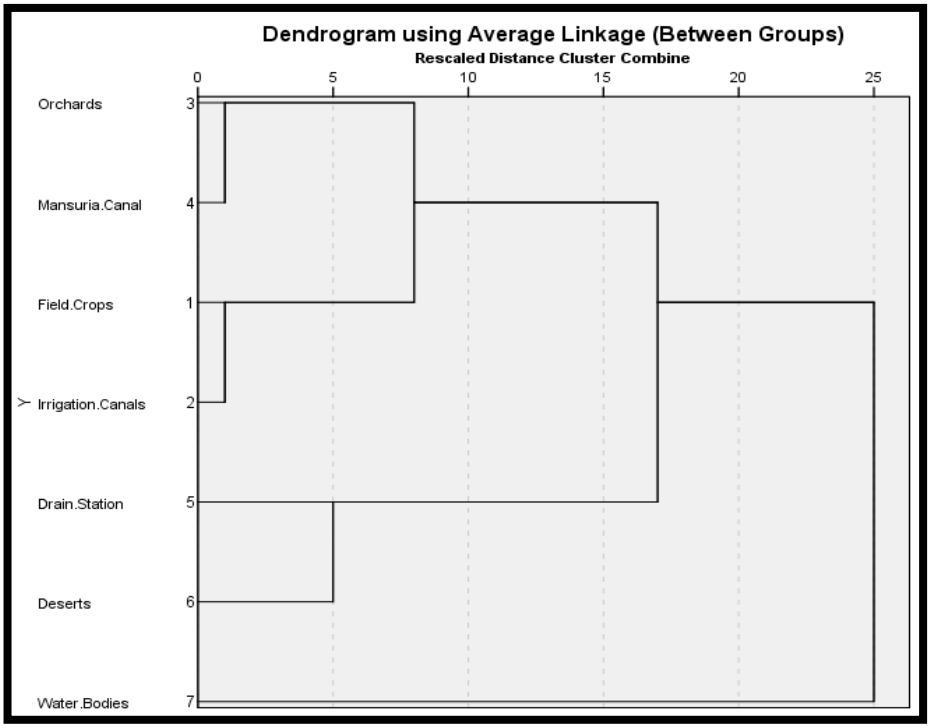

Fig. (4): Dendrogram showing the degree of similarity among the studied habitats in Abu Rawash area.

of Abu Rawash area. This represented 55%, followed by chamaephytes (18%), phanerophytes (7%) and hemicryptophytes (6%). Moreover, each of geophytes, helophytes and hydrophytes represented by 4%; while nanophanerophytes were 2% (Fig. 6).

3. 4. Chorological ratios

3. 4. 1. Mono-regional species ratios:

The mono-regional species ratios of the studied species outlined in Fig. 8 revealed that each of Saharo-Sindian and Sudano-Zambezian regions represented 4% while Mediterranean region was 3% . On the whole, the total ratios of mono-regional species were 11%.

3. 4. 2. Bi-regional species ratios

The bi-regional species dominated by (Mediterranean and Irano-Turanian) regions constituted 6%, followed by Saharo-Sindian and Sudano-Zambezian (5%) and Irano-Turanian and Saharo-Sindian 3% while Mediterranean and Saharo-Sindian) regions were 1%. Moreover, the total ratios of bi-regional species were 15% (Fig. 9).

3. 4. 3. Tri-regional species ratios

In addition the tri-regional species dominated Mediterranean, Irano-Turanian and Euro-Siberian regions constituted 5% followed by Mediterranean, Irano-Turanian and Saharo-Sindian regions (4%) while each of Mediterranean , Euro - Siberian and Saharo-Sindian and Irano-Turanian, Saharo-Sindian and Sudano-Zambezian regions was 3% (Fig.7). On the whole, the total ratios of tri-regional species was 15% (Fig.10).

3. 4. 4. Pluri-regional species

It was obvious that cosmopolitan have the highest ratio (23%) followed by pantropical (16%), palaeotropical (13%) then cultivated species (7%). On the whole, the total ratios of pluri-regional species were (59%) (Fig.11).

3. 5. Habitats species ratios

It was obvious that the annual species constituted the main bulk of the recorded species at the following habitats: field crops, irrigation canals, orchards, drain station and Mansuria Canal. The weed of field crops represented 88.24% followed by irrigation canals (80%), drain station (65.79), orchards (65.22%) and Mansuria Canal (56.25%). On the other hand the perennial species constituted the main ratios at water bodies and deserts habitats, where they represented 100% and 51.28% respectively. The biennial species were represented by 4.35% at orchards habitats. Moreover, each of shrubs and trees were represented by 2.94% at field crops, 3.33% at irrigation canal and 6.25% at Mansuria Canal habitats, while they did not record at water bodies' habitats (Fig. 12).

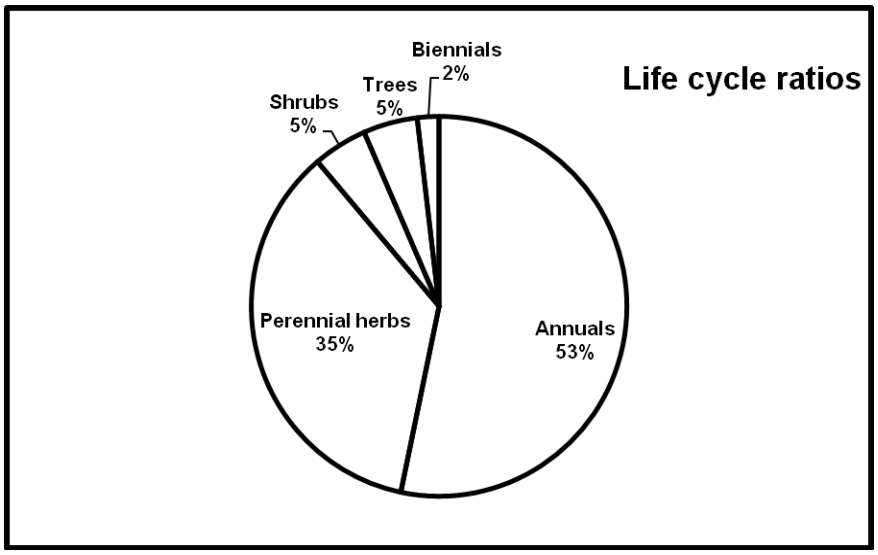

Fig. (5): Spectrum showing the life cycle ratios of the recorded species among the studied habitats in Abu Rawash area.

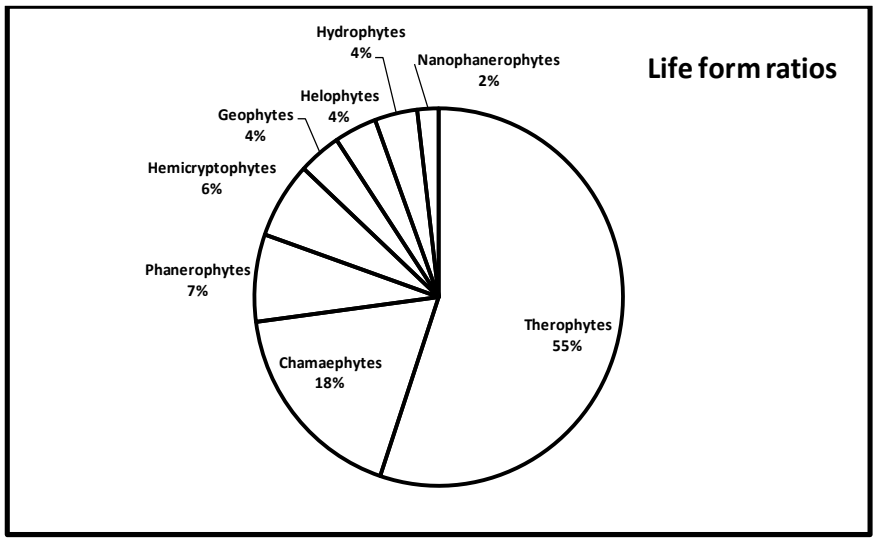

Fig. (6): Spectrum showing the life form ratios of the recorded species among the studied habitats in Abu Rawash area.

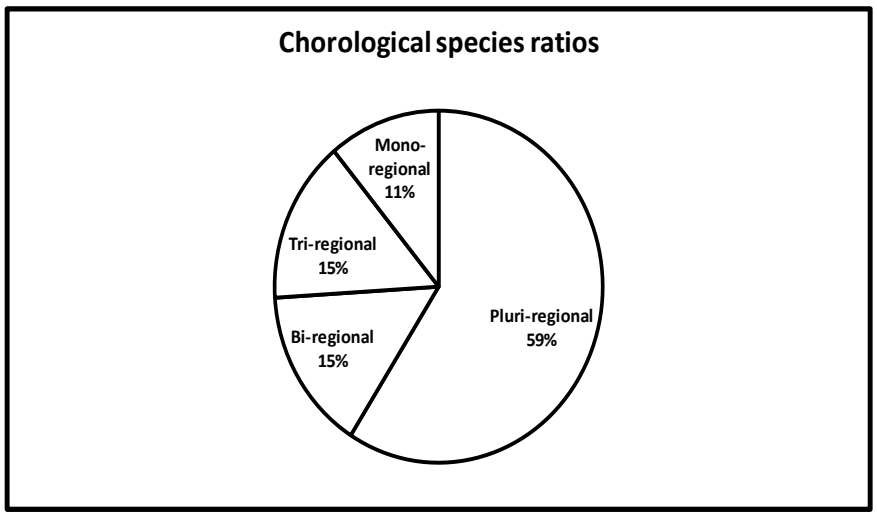

Fig. (7): Spectrum showing the chorological species ratios of the recorded species among the studied habitats in Abu Rawash.

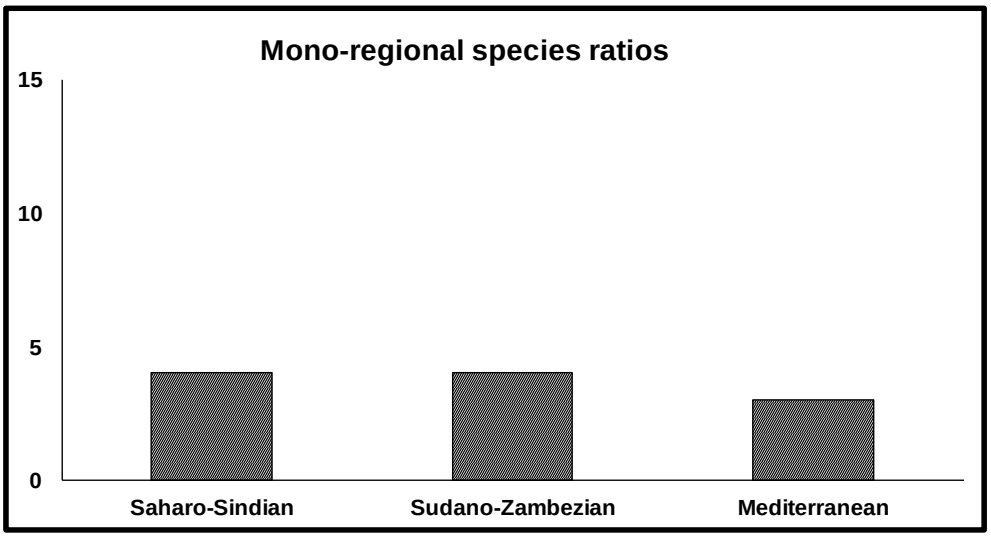

Fig. (8): Histogram showing the mono-regional species ratios of the recorded species among the studied habitats in Abu Rawash area.

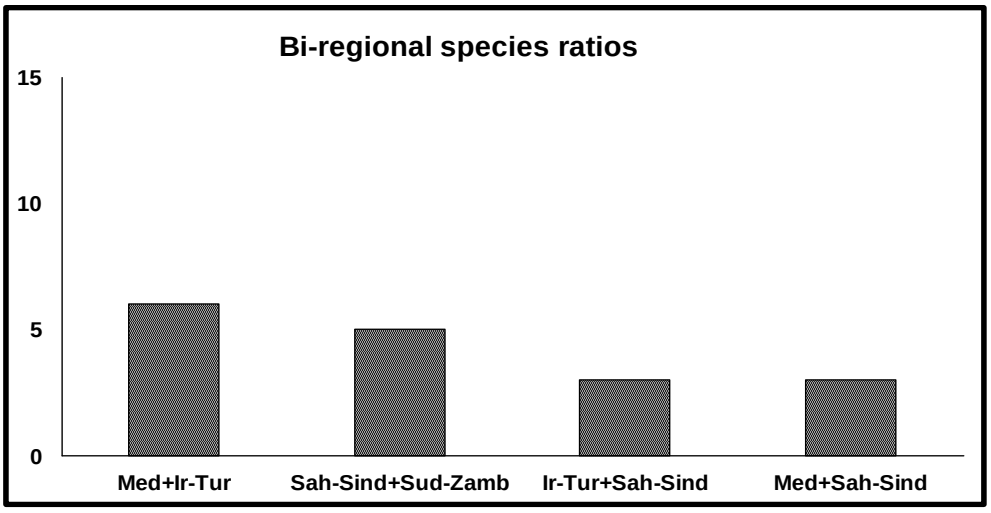

Fig. (9): Histogram showing the bi-regional species ratios of the recorded species among the studied habitats in Abu Rawash area. (Med= Mediterranean, Ir-Tur = Irano-Turanian, Sah-Sind = Saharo-Sindian, Sud-Zamb = Sudano-Zambezian).

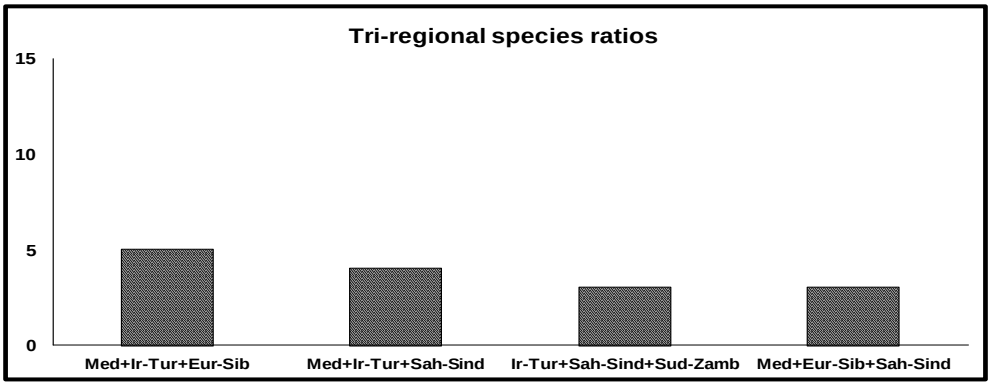

Fig. (10): Histogram showing the tri-regional species ratios of the recorded species among the studied habitats in Abu Rawash area. (Med= Mediterranean, Ir-Tur = Irano-Turanian, Eur-Sib = Euro-Siberian, Sah-Sind = Saharo-Sindian, Sud-Zamb = Sudano-Zambezian).

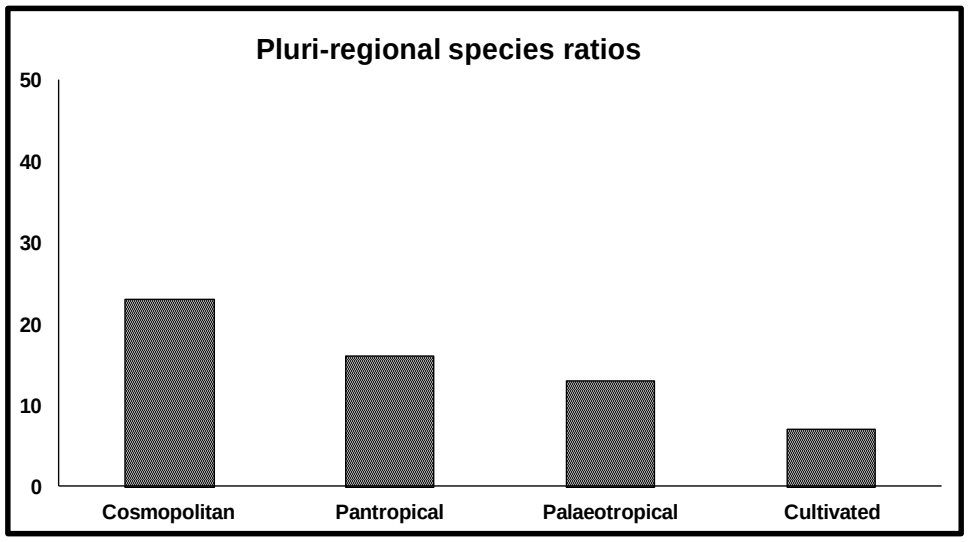

Fig. (11): Histogram showing the pluri-regional species ratios of the recorded species among the studied habitats in Abu Rawash area.

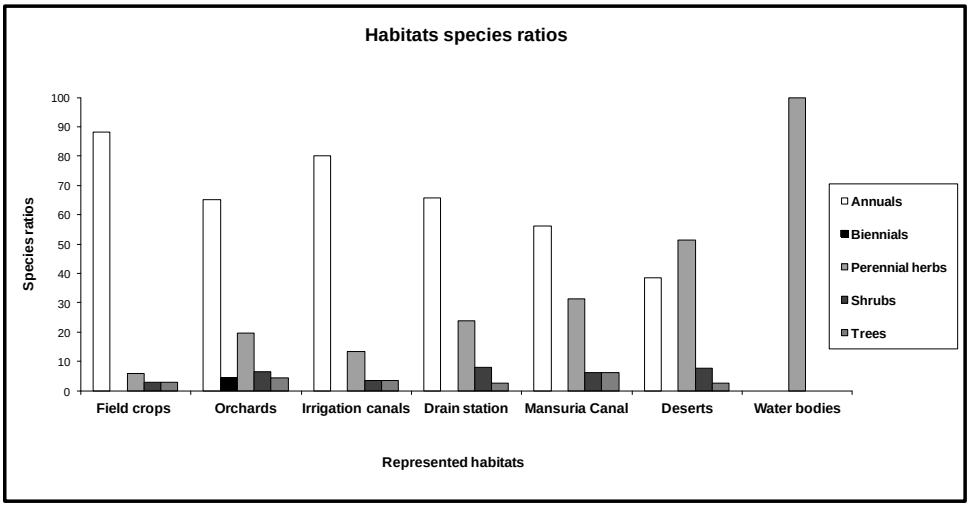

Fig. (12): Histogram showing the habitats species ratios of the recorded species among the studied habitats in Abu Rawash area.

Table (3): Proximity matrix showing the similarity values of species distributed among the studied habitats in Abu Rawash area.

Hapitats	Proximity Matrix						
	Field crops	Irrigation canals	Orchards	Mansuria Canal	Drain station	Deserts	Water bodies
Field crops	1.000						
Irrigation canals	0.529	1.000					
Orchards	0.415	0.477	1.000				
Mansuria Canal	0.304	0.362	0.543	1.000			
Drain station	0.197	0.203	0.264	0.369	1.000		
Deserts	0.056	0.097	0.148	0.213	0.451	1.000	
Water bodies	0.000	0.000	0.000	0.017	0.000	0.000	1.000

3.6.Major similarity among the studied habitats in Abu Rawash area

The data presented in Table (4) and dendrogram Fig.(4), showed that, the recorded species among seven represented habitats were separated into four groups (G1, G2, G3 and G4). Group one included field crops and irrigation canals habitats. The second group contained orchards and Mansuria Canal habitats. The third group included drain station and deserts habitats, while the forth group included water bodies' habitat. Moreover, orchards and Mansuria Canal habitats showed the highest degree of similarity value 0.543 followed by 0.529 between field crops and irrigation canal habitats, and 0.477 and (0.451) between (irrigation canals and orchards and drain station and deserts habitats; respectively.

3. 7. Major dissimilarity among the studied habitats in Abu Rawash area

The data presented in Table (3) and dendrogram Fig. (4) showed that there is no degree of similarity between the species of water bodies habitats and the other habitats namely, field crops, irrigation canals, orchards, orchards, drain station and deserts habitats.

Table (4): Grouping of the studied habitats based on the numerical analysis of 107 species recorded in Abu Rawash area

Studied habitats	Groups
Field crops and irrigation canals	G 1
Orchards and Mansuria Canal	G 2
Drain station and deserts	G 3
Water bodies	G 4

4. DISCUSSION

A total of 107 species belonging to 92 genera and 33 families of the vascular plants were recorded. The recorded plant species represent about 5.02% of the Egyptian flora (Boulos, 1995 and 2009). The three major distributed families were Poaceae, Compositae and Brassicaceae. They comprised 44 taxa (41%) of the total recorded species. These families were reported earlier by Mashaly *et al.*, (2009), Hamed *et al*. (2012), Azer (2013) and Amer *et al.* (2015) as the most frequent families in the studied areas. The families with the highest richness recorded by this study were compatible with the data of Quezel (1978) who reported that, Poaceae, Compositae, Brassicaceae, Chenopodiaceae and Leguminosae are among the most common families in the Mediterranean North African flora. Similar conclusion has been reached by Shaheen (2002) and Abd El-Ghani and Fawzy (2006).

Dominance of the perennial species and limited number of the annual ones at the desert habitats may be attributed to the severe environmental factors mainly aridity and salinity that characterize the study area. Heneidy and Bidak (2001) and Abd El-Ghani *et al.* (2011) reported the short life cycles of annual species probably lead to the frequent occurrence during the favorable seasons which supports the present conclusion. In accordance with this report, the composition of life cycle revealed that, perennial herbs represent majority of recorded species in the desert and water bodies' habitats, whereas annual species are the most common in field crops, orchards, irrigation canals, drain station and Mansuria Canal habitats. Abd El-Ghani and Abd El-Khalik (2006) explained these relationships based on the extensive root systems of the perennial species that are capable of utilizing water stored at different soil depths. These explanations are supported by the present investigation based on the studied species among different habitats. On the other hand, the low number of shrubs and trees, in the current study related to the high intensity of disturbance due to agricultural activities in the field crops and orchards, this fact also reported by Kim *et al*. (2002), Abd El-Ghani *et al* .(2013) and Amer *et al.* (2015).

The dominant life forms in the studied area were therophytes species followed by chamaephytes, phanerophytes then hemicryptophytes. As in the whole Egyptian flora, the therophytes were the most common life form (Hassib, 1951). Similar observation was cited by El-Ghareeb and Rezk (1989). Moreover, Heneidy and Bidak (2001) mentioned that the dominance of therophytes response to the hot dry climate, topographic variation and biotic influence.

The chorological ratios of the recorded taxa showed that cosmopolitan had the highest contribution followed by pantropical then palaeotropical. This current study confirmed by Amer *et al.* (2015). Moreover, the widely distributed species belong to cosmopolitan, pantropical and palaeotropical chorotypes constituted 52% in the studied area. This

indicated that the floristic structure of the study area was affected by human disturbances (Shaltout and El-Fahar, 1991; Abd El-Ghani *et al*., 2011 and Amer *et al.,* 2015). Also the current study was supported by (El-Hadidi, 1993) who concluded that the major percentage of the weed flora of Egypt is represented by cosmopolitan, pantropical and palaeotropical taxa. The presence of species related to different chorotypes categories was related to the position of Egypt at the border line between the Asiatic and African continents (Amer *et al.,* 2015). Also, El-Hadidi, (1993) mentioned that the natural vegetation of Egypt belongs to Saharo–Sindian; Sudano–Zambezian; Mediterranean and Irano–Turanian regions.

5. Conclusions

In this study, the analysis of floristic variations concluded that, the recorded species included 107 represents 92 genera and 33 families. The largest families were Poaceae followed by Compositae and Brassicaceae. Three species were recorded from each of Cyperaceae, Malvaceae and Zygophyllaceae and two species from each of Amaranthaceae, Apiaceae, Apocynaceae, Plantaginaceae and Salicaceae. Moreover, high degree of monotypism was observed. The dominant life cycle species were annuals followed by perennials species. The chorological ratios showed that cosmopolitan taxa had the highest contribution followed by pantropical and palaeotropical. The cluster analysis divided the studied habitats into four groups. In addition to, orchards and Mansuria Canal habitats showed the highest degree of similarity. On the other hand, there was no similarity between species of water bodies' habitat and species of the other habitats except with Mansuria Canal. On the whole, the anthropogenic factors are operating together and reducing the chances of formation of new vegetation structure. This unique area needs an urgent protection.

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دراسة على التنوع النباتى فى منطقة أبورواش ، الجيزة، مصر

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قسم بحوث الفلورة وتصنيف النباتات – معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة – مصر

ملخص

تهدف هذه الدراسة الى القاء الضوء على تنوع النباتات البرية فى سبعة بيئات بمنطقة الدراسة وهي (المحاصيل الحقلية، البساتين، قنوات الرى، ترعة المنصورية، الصحارى، محطة الصرف والمسطحات المائية) في منطقة أبو رواش، الجيزة. تم تسجيل 107 نوعاً نباتياً تتبع 92 جنسا و33 فصيلة نباتية، وقد تم جمع وتعريف هذه الأنواع النباتية بالاستعانة بالمجموعات النباتية الإقليمية والعينات المرجعية المتاحة. سجلت الفصيلة النجيلية أعلى نسبة فى تمثيلها للأنواع النباتية حيث سجلت نسبة 22% ، يليها الفصيلة المركبة 12%، ثم للفصيلة الصليبية 7%. تم تسجيل ثلاثة أنواع نباتية لكل من الفصيلة السعدية، الخبازية والرطريطية ونوعين لكل من فصيلة عرف الديك، الفصيلة الخيمية، الفصيلة الدفلية، فصيلة لسان الحَمَل والفصيلة الصفصافية . كما كشفت الدراسة عن وجود درجة عالية من وحدانية النمط ممثلة فى 16 فصيلة نباتية مثلت بنوع نباتى واحد. بلغت نسبة الأنواع الحولية 53% والأنواع المعمرة 35% بينما كانت نسبة الأشجار 5%، الشجيرات 5% والأنواع ثنائية الحول 2%.

اوضح التوزيع الجغرافى للنباتات التى تم رصدها ان النباتات ذات الانتشار العالمى الواسع ممثلة بنسبـــــة 23% والنباتات ذات الانتشار فى المناطق الاستوائية الجديدة ممثلة بنسبة 16% والنباتات ذات الانتشار فى المناطق الاستوائية القديمة ممثلة بنسبة 13%. اعتمادا على التوزيعات النباتية بين أنواع البيئات السبعة المدروسة، أظهرت التحليلات العنقودية درجة كبيرة من التشابه بين نباتات البيئات المدروسة، حيث قسمت الأنواع حسب هذه التحليلات إلى أربعة مجموعات: شملت المجموعة الأولى نباتات المحاصيل الحقلية ونباتات قنوات الرى. شملت المجموعة الثانية نباتات البساتين ونباتات ترعة المنصورية. شملت المجموعة الثالثة نباتات محطة الصرف الصحى والنباتات الصحراوية وشملت المجموعة الرابعة نباتات المسطحات المائية. اعتمادا على درجة التشابه بين البيئات النباتية المدروسة، لوحظ أن نباتات البساتين و ترعة المنصورية لديهما أعلى قيمة من التشابه (0.543) في حين لم يكن هناك اى درجة من التشابه بين نباتات بيئة المسطحات المائية مع كل البيئات الاخرى عدا بيئة نباتات ترعة المنصورية حيث سجلت قيمة من التشابه قيمته (0.017).

المجلة العلمية لكلية الزراعة – جامعة القاهرة – المجلد (68) العدد الأول (يناير 2017): 89-103 .