

**FLORISTIC FEATURES OF THE PLANT LIFE  
OF THE RIVER NILE IN EGYPT**

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**ABSTRACT**

The present work provides a detailed investigation of the floristic features, including distribution of plant species, life-span, life-form spectra and floristic analysis of the plant life in the River Nile system in Egypt. The total number of hydrophytes and canal bank species recorded in the study area is 70, belonging to 55 genera and related to 30 families. *Chenopodiaceae*, *Asteraceae*, *Poaceae* and *Cyperaceae* are the main families represented collectively by about 48.57 % of the total number of recorded species. According to life-form spectra, the recorded species are grouped under five types of life-form: therophytes, cryptophytes, hemicryptophytes, chamaephytes and nanophanerophytes. The majority of these plants are mainly cryptophytes (geophytes, helophytes and hydrophytes) and partly therophytes. The floristic analysis of the study area revealed that, 25 species of the total number of the recorded species are Mediterranean taxa. These taxa are either pluriregional, biregional or monoregional. It has also been found that, 39 species are either Cosmopolitan, Palaeotropical, Pantropical or Neotropical elements. These four floristic elements are obviously comparable in all surveyed water bodies of the study area.

**Key words:** Chorotype, Flora, Habitats, Life form, Plant life, River Nile.

## INTRODUCTION

The vegetation of Egypt may be classified into seven major types: desert vegetation, salt marsh vegetation, mountain vegetation, sand dune vegetation, reed swamp vegetation, fresh- water vegetation and saline water vegetation [Zahran & Willis (1992)]. Reed swamp and aquatic vegetation types are greatly developed in fresh and brackish water habitats in the Nile region [Hassib (1951)]. Studies of aquatic plants have always lagged behind studies of terrestrial plants [Zahran & Willis (2003)]. The aquatic plant community is characterized by its species composition and by features as life- and growth- form, species diversity, etc. Aquatic plants could be beneficial by providing shelter and nourishment to fish, waterfowl and other aquatic organism; by removing toxic compounds from water, by providing source of animal feed; paper pulp, fiber and bioenergy [Shaltout et al., (1994)].

Hess and Hall (1945) classified herbaceous hydrophytes into wetland hydrophytes and aquatic hydrophytes. The wetland types grow in soils saturated with water during a major part of the growing season e.g. *Echinochloa crus-galli*. On the other hand, the aquatic types usually occur in soils covered with water during a major portion of the growing season, these are subdivided into:

- a- Emergent hydrophytes e.g. *Cyperus articulatus*, *Phragmites australis*, *Typha domingensis*, etc.
- b- Floating hydrophytes e.g. *Lemna gibba*, *Pistia stratiotes*, *Eichhornia crassipes*, etc.
- c- Submerged hydrophytes e.g. *Ceratophyllum demersum*, *Najas armata*, *Myriophyllum spicatum*, etc.

In Egypt, the total length of canals and drains is approximately 4700 km [Van der Blik et al., (1982)]. These canals and drains provide habitat for aquatic weeds. Growth is affected by environmental factors, including water transparency, depth of water, physico-chemical properties, water quality, water currents and air temperature. Plant infestation problems in Egyptian irrigation canals have increased since 1965 due to the construction of the Aswan High Dam [Pieterse (1979)]. However, El-Gharably et al. (1982) attributed the increasing spread of aquatic weeds in the irrigation and drainage canals of the Nile Delta to some other ecological factors. *Ceratophyllum demersum* is one of the

most wide spread aquatic plants in Egypt. This plant grows in a wide variety of water bodies e.g. drains, canals, the main Nile branches, and lakes north of Nile Delta [El-Fiky (1974) and Abo El-Lil (1987)]. *Myriophyllum spicatum* was recorded as rare species in upper Egypt [Täckholm (1974)], but nowadays it is widely distributed northward and well established in water courses in the Nile Delta region [Torky (2007)]. *Eichhornia crassipes* (water hyacinth) is actually the most serious aquatic plant pests in the world including Egypt Kassas (1972) and Moursi (1976) [e.g. Guerra (1976); Martin & Nailon (1977) in USA.

The present study aims to recognize the major aquatic habitats associated with the River Nile system in Egypt and to investigate the floristic features, including distribution of plant species, life-span, life-form spectrum and floristic analysis of the plant life in these water bodies. Taxonomic and phytogeographical affinity of its chorological elements will be surveyed.

### Study Area

The study area is mainly located in some selected Governorates of the Nile Delta and Nile Valley subregions of the River Nile system of Egypt. The study area includes many sites (stands) in the following six types of water bodies (Figure 1):

- 1- The River Nile stream from south of Cairo to north of Beny Sweif (Nile Valley).
- 2- Damietta branch of the River Nile.
- 3- Rosetta branch of the River Nile.
- 4- Northern Deltaic lakes: Lake Manzala, Lake Borollus and Lake Idku.
- 5- Drainage canals in five representative Governorates of the Nile Delta subregion namely, Damietta, El-Dakahlyia, Kafr El-Sheikh, El-Gharbia and El-Sharkia.
- 6- Irrigation canals in the same above mentioned Nile Delta Governorates.

The study area lies in Meig's warm coastal deserts [Meig (1973)] in which the warmest summer months has mean temperature less than 30°C, and coldest winter month has mean temperature above 10°C. The relative humidity ranges from 42% in May at Cairo to 81% in July at Rosetta. The annual rainfall decreases from north to south. The main water source in the study area is the Nile water.



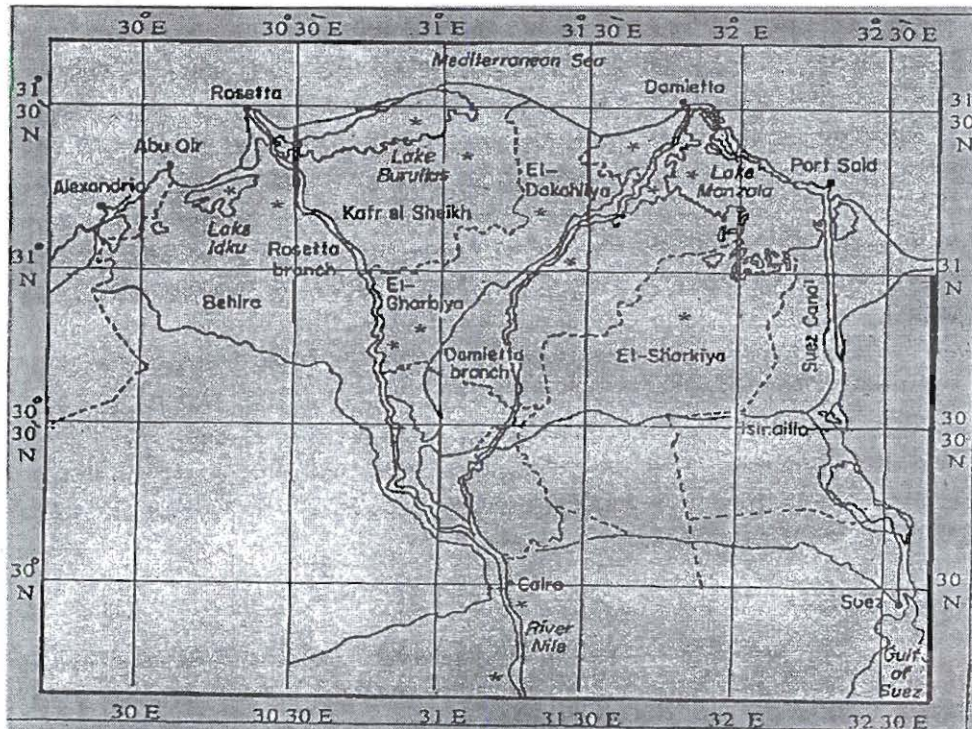


Fig. (1): Location map showing the selected sites (\*) in the different riverain habitats of the study area.

## MATERIALS AND METHODS

After a regular visits to the different sites of the study area, 80 stands were selected for sampling vegetation in the various water bodies recognized in the study area. In each stand, all plant species were recorded in five plots (area = 25 m<sup>2</sup> each). The description and classification of life-forms in the present study follow to **Raunkiaer (1934)**. The classification, identification and floristic categories were according to **Tutin et al. (1964-1980)**; **Davis (1965 -1985)**; **Zohary (1966 & 1972)**; **Tackholm (1974)**; **Meikle (1977 & 1985)**; **Feinbrun-Dothan (1978 & 1986)** and up to date by **Boulos (1999 - 2005)**.

## RESULTS

**1- Floristic Composition and Distribution of the Plant Life in the Study Area**

The records of hydrophytes and canal bank species in the different six water bodies of the study area are summed in terms of presence estimates (P%). Table (1) presents the floristic composition and distribution of plant life in the six water bodies namely, irrigation canals, drainage canals, northern lakes, River Nile stream, Damietta branch and Rosetta branch. The total number of hydrophytes and canal bank species recorded in the study area is 70 species. These species can be classified into four major groups as follows:

- a) Eight floating hydrophytes were recorded in the water bodies of the study area. Four species have wide ecological amplitude, as they were recorded in all six water bodies with 100% presence value. These species include *Eichhornia crassipes*, *Lemna gibba*, *L. minor* and *Ludwigia stolonifera*. The other four floating hydrophytes have very narrow ecological amplitude. Where each species was recorded in only one water body with presence value of 16.67%.
- b) The submerged hydrophytes include six species, *Ceratophyllum demersum* exhibited wide rang of distribution. (P=100 %). While the other five submerged hydrophytes showed narrow ecological amplitude where each species was recorded in only one water body of the study area (P=16.67 % each).
- c) The emergent species comprise 19 taxa. Out of these, eight species are widely distributed (P=100% each), these include *Alternanthera sessilis*, *Cyperus alopecuroides*, *Echinochloa stagnina*, *Phragmites australis*, etc. Two species were recorded in five water bodies (P = 83.33 % each). Two species were recorded in four water bodies (P = 66.67% each), three species were recorded in two water bodies (P = 33.33 % each) and four species were recorded in one water body only (P =16.67 % each).



Table (1). Floristic composition of the different water bodies in the study area.

No.	Species	Life span	Life form	Chorotype	Irrigation canals	Drainage canals	Northern lakes	River Nile stream	Damietta Branch	Rosetta Branch	P	P%
<b>A Floating hydrophytes :</b>												
1	<i>Eichhornia crassipes</i> (Mart.) Solms. Laub	Per	Hy	NEO	+	+	+	+	+	+	6	100
2	<i>Lemna gibba</i> L.	Per	Hy	COSM	+	+	+	+	+	+	6	100
3	<i>Lemna minor</i> L.	Per	Hy	COSM	+	+	+	+	+	+	6	100
4	<i>Ludwigia stolonifera</i> (Guill. & Perr.) Raven	Per	He	S-Z	+	+	+	+	+	+	6	100
5	<i>Marsilea aegyptiaca</i> Willd.	Per	II	PAL	-	-	+	-	-	-	1	16.67
6	<i>Nymphaea lotus</i> L.	Per	Hy	PAL	+	-	-	-	-	-	1	16.67
7	<i>Pistia stratiotes</i> L.	Per	Hy	PAN	+	-	-	-	-	-	1	16.67
8	<i>Potamogeton nodosus</i> Poir.	Per	Hy	ME+IR-TR	+	-	-	-	-	-	1	16.67
<b>B Submerged hydrophytes :</b>												
1	<i>Ceratophyllum demersum</i> L.	Per	Hy	COSM	+	+	+	+	+	+	6	100
2	<i>Elodea Canadensis</i> Michx.	Per	Hy	NEO	-	-	-	-	+	-	1	16.67
3	<i>Myriophyllum spicatum</i> L.	Per	Hy	ER-SR+ME+IR-TR	-	-	-	-	+	-	1	16.67
4	<i>Najas minor</i> All.	Per	Hy	ER-SR+ME+IR-TR	-	-	+	-	-	-	1	16.67
5	<i>Potamogeton crispus</i> L.	Per	Hy	PAN	-	-	+	-	-	-	1	16.67
6	<i>Potamogeton pectinatus</i> L.	Per	Hy	PAN	-	-	+	-	-	-	1	16.67
<b>C Emergent species :</b>												
1	<i>Alternanthera sessilis</i> (L.) DC.	Per	He	PAN	+	+	+	+	+	+	6	100
2	<i>Cyperus alopecuroides</i> Rottb.	Per	He	PAN	+	+	+	+	+	+	6	100
3	<i>Echinochloa stagnina</i> (Reiz.) Beauv.	Per	G, He	PAL	+	+	+	+	+	+	6	100
4	<i>Panicum lapathifolium</i> (L.) Gray	Per	G	PAL	+	+	+	+	+	+	6	100
5	<i>Panicum salicifolium</i> (Willd.) Assenov	Per	G	PAL	+	+	+	+	+	+	6	100
6	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Per	G, He	COSM	+	+	+	+	+	+	6	100
7	<i>Saccharum spontaneum</i> L.	Per	G, He	ME+PAL	+	+	+	+	+	+	6	100
8	<i>Typha domingensis</i> (Pers.) Poir. ex Steud.	Per	He	PAN	+	+	+	+	+	+	6	100
9	<i>Cyperus articulatus</i> L.	Per	G, He	PAL	+	+	+	-	+	+	5	83.33
10	<i>Cyperus difformis</i> L.	Ann	Th	PAL	+	+	-	+	+	+	5	83.33
11	<i>Cyperus laevigatus</i> L.	Per	G, He	PAL	+	-	-	+	+	+	4	66.67

Table (1) . Continued.

12	<i>Ranunculus sceleratus</i> L.	Ann	Th	ME+IR-TR+ER-SR	+	-	+	-	+	+	4	66.67
13	<i>Juncus acutus</i> L.	Per	Ile	ME+IR-TR+ER-SR	+	-	+	-	-	-	2	33.33
14	<i>Panicum repens</i> L.	Per	G	PAN	+	+	-	-	-	-	2	33.33
15	<i>Veronica anagallis-aquatica</i> L.	Per	He	COSM	-	-	+	-	+	-	2	33.33
16	<i>Juncus rigidus</i> Desf.	Per	G, He	ME+SA-SI+IR-TR	-	-	+	-	-	-	1	16.67
17	<i>Juncus subulatus</i> Forssk.	Per	G, Ile	ME+PAL	-	-	+	-	-	-	1	16.67
18	<i>Leersia hexandra</i> Sw.	Per	He	PAN	-	+	-	-	-	-	1	16.67
19	<i>Scirpus maritimus</i> L.	Per	G	COSM	-	+	-	-	-	-	1	16.67
<b>D Terrestrial species:</b>												
1	<i>Amaranthus lividus</i> L.	Ann	Th	ME+IR-TR	+	+	+	+	+	+	6	100
2	<i>Aster squamatus</i> (Spreng.) Hieron.	Per	Ch	NEO	+	+	+	+	+	+	6	100
3	<i>Chenopodium album</i> L.	Ann	Th	COSM	+	+	+	+	+	+	6	100
4	<i>Coryza bonariensis</i> (L.) Cronquist	Ann	Th	NEO	+	+	+	+	+	+	6	100
5	<i>Imperata cylindrica</i> L. Raeusch.	Per	H	PAL	+	+	+	+	+	+	6	100
6	<i>Pluchea dioscoridis</i> (L.) DC.	Per	Nph	S-Z+SA-SI	+	+	+	+	+	+	6	100
7	<i>Rumex dentatus</i> L.	Ann	Th	ME+IR-TR+SA-SI	+	+	+	+	+	+	6	100
8	<i>Tamarix nilotica</i> ( Ehrenb.) Bunge	Per	Nph	SA-SI+S-Z	+	+	+	+	+	+	6	100
9	<i>Chenopodium murale</i> L.	Ann	Th	COSM	+	-	+	+	+	+	5	83.33
10	<i>Cynodon dactylon</i> (L.) Pers.	Per	G	COSM	+	+	-	+	+	+	5	83.33
11	<i>Eclipta alba</i> (L.) Hassk.	Ann	Th	NEO	+	+	-	+	+	+	5	83.33
12	<i>Ethulia coryzoides</i> L.	Ann	Th	PAL	+	+	-	+	+	+	5	83.33
13	<i>Ipomoea carnea</i> Jacq.	Per	Ch	Cult. & Nat.	+	+	-	+	+	+	5	83.33
14	<i>Suaeda pruinosa</i> Lange	Per	Ch	ME	-	+	+	+	+	+	5	83.33
15	<i>Bassia indica</i> (Wight) Scott	Ann	Th	S-Z+IR-TR	+	+	+	+	-	-	4	66.67
16	<i>Cyperus rotundus</i> L.	Per	G	PAN	-	-	+	+	+	+	4	66.67
17	<i>Arundo donax</i> L.	Per	He, G	Cult. & Nat.	-	+	-	+	+	-	3	50
18	<i>Atriplex prosirata</i> DC.	Ann	Th	ME+ER-SR+IR-TR	-	+	+	+	-	-	3	50
19	<i>Coryza aegyptica</i> (L.) Dryand.	Ann	Th	ME	+	-	-	-	+	+	3	50
20	<i>Solanum nigrum</i> L.	Ann	Th	COSM	-	-	-	+	+	+	3	50

Table (1) . Continued.

21	<i>Alhagi graecorum</i> Boiss.	Per	H	PAL	-	-	+	+	-	-	2	33.33
22	<i>Arthrocnemum macrostachyum</i> (Moric.) Koch	Per	Ch	ME+SA-SI	-	+	+	-	-	-	2	33.33
23	<i>Atriplex canescens</i> (Pursh) Nutt.	Per	Nph	NEO	-	+	+	-	-	-	2	33.33
24	<i>Bidens pilosa</i> L.	Ann	Th	PAN	-	-	-	-	+	+	2	33.33
25	<i>Chenopodium ficifolium</i> Sm.	Ann	Th	ME+ER-SR	-	-	+	-	+	-	2	33.33
26	<i>Imula crithmoides</i> L.	Per	Ch	ME+IR-TR+ER-SR	-	+	+	-	-	-	2	33.33
27	<i>Spergularia marina</i> (L.) Griseb.	Bi	Th	ME+ER-SR+IR-TR	+	+	-	-	-	-	2	33.33
28	<i>Cakile maritime</i> Scop. subsp. <i>maritima</i>	Ann	Th	ME+ER-SR	-	-	+	-	-	-	1	16.67
29	<i>Carthamus tenuis</i> (Boiss. & Blanche) Bor.	Ann	Th	ME	-	-	+	-	-	-	1	16.67
30	<i>Halocnemum strobilaceum</i> (Pall.) Bieb.	Per	Ch	ME+IR-TR+SA-SI	-	-	+	-	-	-	1	16.67
31	<i>Hellotropium lasiocarpum</i> Fisch. & Mey.	Ann	Th	ME+IR-TR+ER-SR	-	-	+	-	-	-	1	16.67
32	<i>Mesembryanthemum crystallinum</i> L.	Ann	Th	ME+ER-SR	-	-	+	-	-	-	1	16.67
33	<i>Mesembryanthemum nodiflorum</i> L.	Ann	Th	ME+SA-SI+ER-SR	-	-	+	-	-	-	1	16.67
34	<i>Salsola kali</i> L.	Ann	Th	COSM	-	-	+	-	-	-	1	16.67
35	<i>Senecio glaucus</i> L.	Ann	Th	ME+SA-SI+IR-TR	-	-	+	-	-	-	1	16.67
36	<i>Vigna luteola</i> (Jacq.) Benth.	Per	H	PAL	+	-	-	-	-	-	1	16.67
37	<i>Zygophyllum aegyptium</i> Hosny	Per	Ch	ME	-	-	+	-	-	-	1	16.67
Number of perennials					47	27	28	34	24	27	23	
Number of biennials					1	1	1	-	-	-	-	
Number of annuals					22	11	9	16	11	13	12	
Total number of recorded species					70	39	38	50	35	40	35	

Legend to life-span:

Per : Perennials  
 Bi : Biennials  
 Ann : Annuals

P = Presence

Legend to life-form:

Nph : Nanophanerophytes  
 Ch : Chamaephytes  
 H : Hemicryptophytes  
 G : Geophytes  
 He : Helophytes  
 Hy : Hydrophytes  
 Th : Therophytes

Legend to chorotype:

COSM : Cosmopolitan  
 PAN : Pantropical  
 PAL : Palaeotropical  
 NEO : Neotropical  
 ME : Mediterranean  
 ER-SR : Euro-Siberian  
 SA-SI : Saharo-Sindian  
 Cult. : Cultivated  
 Nat. : Naturalized



d) The terrestrial species represent the main bulk of the flora (37 species) in the study area. These species are either weed flora associating the field crops or canal bank plants of the cultivated lands. Eight cosmopolitan species were recorded in six water bodies (P=100% each) e.g. *Amaranthus lividus*, *Aster squamatus*, *Imperata cylindrica*, *Pluchea dioscoridis*, etc. Six species were recorded in five water bodies (P=83.33% each). Two species were recorded in four water bodies (P=66.67% each). Four species were recorded in three water bodies (P=50 % each). Seven species were recorded in two water bodies (P = 33.33% each). Ten species were recorded in one water body only (P = 16.67 % each).

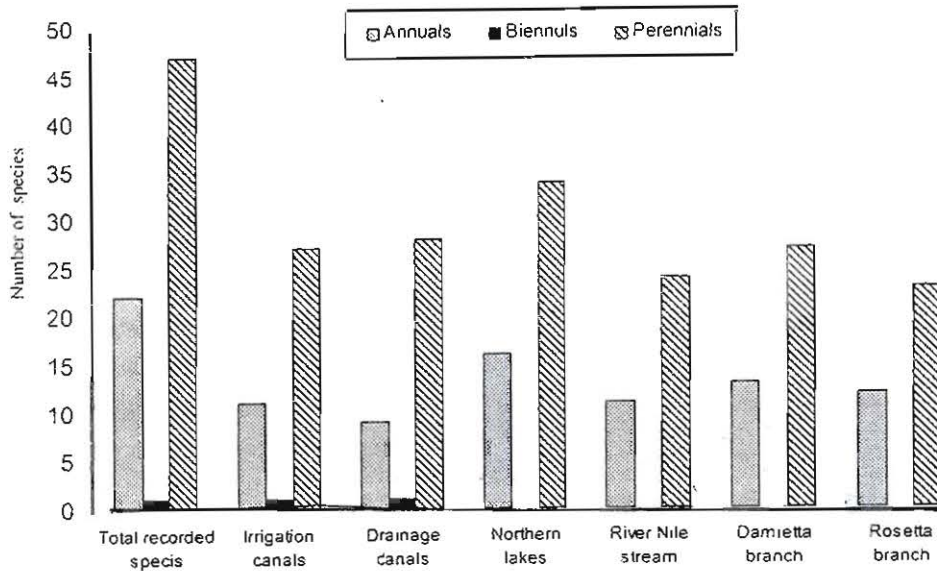
## 2- Plant Life-Span in the Study Area

According to the life-span and as shown in Figure (2), the recorded species (70) that grow in the study area can be classified into three major groups: perennials (47), biennials (one species) and annuals (22 species). Plants of the irrigation canals comprise 39 species: 27 perennials, one biennial species and 11 annuals. In the drainage canals, 38 species were recorded which can be categorized into 28 perennials, one biennial and 9 annuals. The northern lakes are floristically the richest habitat type among all water bodies in the study area, 50 species. These species are mainly represented by perennial species (34) and partly by annual species (16). The River Nile system can be distinguished into three main water bodies as follows:

- a- The River Nile and its banks with 35 species (24 perennials and 11 annuals),
- b- Damietta branch of the River Nile and its banks with 40 species (27 perennials and 13 annuals).
- c- Rosetta branch of the River Nile and its banks with 35 species (23 perennials and 12 annuals).

It is of interest to note that the major bulk of the recorded species in the present study is mainly represented by perennials and partly by annuals. It is also obvious that the northern lakes (Manzala, Burullos and Idku) are floristically the richest aquatic habitat type among all the water bodies, followed by Damietta branch of the River Nile, then by the irrigation canals, drainage canals and finally by the River Nile stream and Rosetta branch. It is also clear that, the terrestrial plants are the most frequent species in the different studied six water bodies, followed by the

emergent species, then by the floating hydrophytes and finally by the submerged hydrophytes.



**Fig. (2): Plant life-span in the study area.**

### 3- Plant Life-Forms in the Study Area

The recorded species of the present study are grouped under five types of life-form as follows: therophytes, cryptophytes, hemicryptophytes, chamaephytes and nanophanerophytes (Figure 3). The majority of plants are mainly cryptophytes (47.14%), which include geophytes, helophytes and hydrophytes and partly therophytes (32.86%). Chamaephytes attain a value of about 10%, hemicryptophytes with a value of 5.71% and nanophanerophytes with a value of 4.29% of the total recorded species.



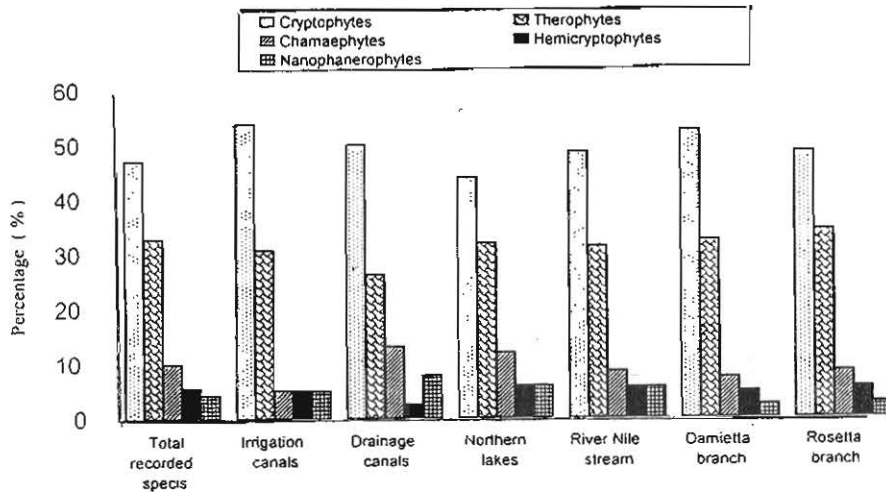


Fig. (3): Plant life-forms in the study area.

It is evident that, the percentages of the life-form spectra vary from one water body to the other (Figure 3). In the irrigation canals, the recorded species (39) can be classified into the following life-forms: cryptophytes (53.85%), therophytes (30.76%), chamaephytes, hemicryptophytes and nanophanerophytes (5.13% each). In the drainage canals, the recorded species (38) can be grouped into the following five types of life form: cryptophytes (50.00%), therophytes (26.32%), chamaephytes (13.16%), nanophaneropytes (7.89%) and hemicryptophytes (2.63%). While in the northern lakes, the life-forms of the recorded species (50) are distinguished into: cryptophytes (44.00%), therophytes (32.00%), chamaephytes (12.00%), nanophanerophytes and hemicryptophytes (6.00% each). In the River Nile stream, the recorded species (35) are classified into the following life-forms: cryptophytes (48.58%), therophytes (31.44%), chamaephytes (8.58%), nanophanerophytes and hemicryptophytes (5.7% each). In Damietta branch, the recorded species (40) are grouped into: cryptophytes (52.5%),

therophytes (32.5%), chamaephytes (7.5%), nanophanerophytes (5%) and hemicryptophytes (2.5%). In Rosetta branch, the life-forms of the recorded species (35) are distinguished into: cryptophytes (48.57%), therophytes (34.29%), chamaephytes (8.57%), nanophanerophytes (5.71%) and hemicryptophytes (2.86%). It is worth to mention that, the life-form spectrum in all water bodies of the study area is mainly represented by cryptophytes and partly by therophytes, chamaephytes and nanophanerophytes. The group of hemicryptophytes is represented by the minimum values among all water bodies of the study area.

#### 4- Floristic Analysis of the Study Area

The total number of the recorded flowering plant species in the present study is 70, belonging to 55 genera and related to 30 families (Table 2). *Chenopodiaceae* (10 species), *Compositae* (10 species), *Gramineae* (8 species) and *Cyperaceae* (6 species) are the main families being represented collectively by 34 species or about 48.57% of the total number of the recorded species. *Juncaceae*, *Polygonaceae* and *Potamogetonaceae* are represented by 3 species each. Each of the remaining families (23) is either represented by two or one species.

Floristically and as shown in Table (2), the most common floristic elements of the *Chenopodiaceae* are Cosmopolitan (3 species), biregional (3 species), pluriregional (2 species), Neotropical and Mediterranean (one species each). In *Compositae*, the most common chorotypes are Neotropical (3 species), pluriregional and Mediterranean (2 species each), Palaeotropical, Pantropical and biregional (one species each). The abundant floristic elements in *Gramineae* are Cosmopolitan, Pantropical and Palaeotropical (2 species each), biregional and Cult. & Nat. (One species each). In *Cyperaceae*, the most common elements are Palaeotropical (3 species), Pantropical (2 species) and Cosmopolitan (one species). While, other families (with less than 5 species) comprise different types of floristic elements which are generally represented by a few number of species.

The floristic analysis of the study area as shown in Table (3) reveals that, 25 species or about 35.71% of the total number of recorded species are Mediterranean taxa. These taxa are either pluriregional (13 species = 18.57%), biregional (8 species = 11.43%) or monoregional (4 species = 5.71%). It has been also found that, 39 species or about 55.71% of the total number of the recorded species are either Cosmopolitan (15.71%), Palaeotropical (17.14%), Pantropical (14.29%) or Neotropical



Table ( 2 ) . The principal floristic categories of the families of the study area.

Family	Genera	Species	COSM	PAN	PAL	NEO	Pluri-regional	Bi-regional	ME→PAL	ME	S - Z	Cult.& Nat.
<i>Alzooaceae</i>	1	2	-	-	-	-	1	1	-	-	-	-
<i>Amaranthaceae</i>	2	2	-	1	-	-	-	1	-	-	-	-
<i>Araceae</i>	1	1	-	1	-	-	-	-	-	-	-	-
<i>Boraginaceae</i>	1	1	-	-	-	-	1	-	-	-	-	-
<i>Caryophyllaceae</i>	1	1	-	-	-	-	1	-	-	-	-	-
<i>Ceratophyllaceae</i>	1	1	1	-	-	-	-	-	-	-	-	-
<i>Chenopodiaceae</i>	7	10	3	-	-	1	2	3	-	1	-	-
<i>Compositae</i>	9	10	-	1	1	3	2	1	-	2	-	-
<i>Convolvulaceae</i>	1	1	-	-	-	-	-	-	-	-	-	1
<i>Cruciferae</i>	1	1	-	-	-	-	-	1	-	-	-	-
<i>Cyperaceae</i>	2	6	1	2	3	-	-	-	-	-	-	-
<i>Gramineae</i>	8	8	2	2	2	-	-	-	1	-	-	1
<i>Haloragidaceae</i>	1	1	-	-	-	-	1	-	-	-	-	-
<i>Hydrocharitaceae</i>	1	1	-	-	-	1	-	-	-	-	-	-
<i>Juncaceae</i>	1	3	-	-	-	-	2	-	1	-	-	-
<i>Leguminosae</i>	2	2	-	-	2	-	-	-	-	-	-	-
<i>Lemnaceae</i>	1	2	2	-	-	-	-	-	-	-	-	-
<i>Marsileaceae</i>	1	1	-	-	1	-	-	-	-	-	-	-
<i>Najadaceae</i>	1	1	-	-	-	-	1	-	-	-	-	-
<i>Nymphaeaceae</i>	1	1	-	-	1	-	-	-	-	-	-	-
<i>Onagraceae</i>	1	1	-	-	-	-	-	-	-	-	1	-
<i>Polygonaceae</i>	2	3	-	-	2	-	1	-	-	-	-	-
<i>Pontederiaceae</i>	1	1	-	-	-	1	-	-	-	-	-	-
<i>Potamogetonaceae</i>	1	3	-	2	-	-	-	1	-	-	-	-
<i>Ranunculaceae</i>	1	1	-	-	-	-	1	-	-	-	-	-
<i>Solanaceae</i>	1	1	1	-	-	-	-	-	-	-	-	-
<i>Scrophulariaceae</i>	1	1	1	-	-	-	-	-	-	-	-	-
<i>Tamaricaceae</i>	1	1	-	-	-	-	-	1	-	-	-	-
<i>Typhaceae</i>	1	1	-	1	-	-	-	-	-	-	-	-
<i>Zygophyllaceae</i>	1	1	-	-	-	-	-	-	-	1	-	-
Total	55	70	11	10	12	6	13	9	2	4	1	2
Percentage ( % )			15.71	14.29	17.14	8.57	18.57	12.86	2.86	5.71	1.43	2.86

Table ( 3 ). Number of species and percentage of various floristic categories of the different water bodies in the study area.

Floristic category	Total area		Water body											
			Irrigation canal		Drainage canal		Northern lakes		River Nile stream		Damietta Branch		Rosetta Branch	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
COSM	11	15.71	7	17.95	7	18.42	8	16	8	22.86	9	22.5	8	22.86
PAN	10	14.29	5	12.82	5	13.16	6	12	4	11.43	5	12.5	5	14.29
PAL	12	17.14	10	25.64	7	18.42	7	14	8	22.86	8	20	8	22.86
NEO	6	8.57	4	10.26	5	13.16	4	8	4	11.43		12.5	4	11.43
ME+IR-TR+ER-SR	8	11.43	3	7.69	3	7.89	6	12	1	2.86	2	5	1	2.86
ME+IR-TR+SA-SI	4	5.71	1	2.56	1	2.63	4	8	1	2.86	1	2.5	1	2.86
ME+SA-SI+ER-SR	1	1.43	-	-	-	-	1	2	-	-	-	-	-	-
ME+IR-TR	2	2.86	2	5.13	1	2.63	1	2	1	2.86	1	2.5	1	2.86
ME+ER-SR	3	4.29	-	-	-	-	3	6	-	-	1	2.5	-	-
ME+PAL	2	2.86	1	2.56	1	2.63	2	4	1	2.86	1	2.5	1	2.86
ME+SA-SI	1	1.43	-	-	1	2.63	1	2	-	-	-	-	-	-
SA-SI+S-Z	2	2.86	2	5.13	2	5.26	2	4	2	5.71	2	5	2	5.71
S-Z+IR-TR	1	1.43	1	2.56	1	2.63	1	2	1	2.86	-	-	-	-
ME	4	5.71	1	2.56	1	2.63	3	6	1	2.86	2	5	2	5.71
S-Z	1	1.43	1	2.56	1	2.63	1	2	1	2.86	1	2.5	1	2.86
Cult. & Nat.	2	2.86	1	2.56	2	5.26	-	-	2	5.71	2	5	1	2.86
Total	70	100	39	100	38	100	50	100	35	100	40	100	35	100

Abbreviation ( see Table 1 )



(8.57 %). The other floristic categories are poorly represented where each chorotype is represented by a few numbers of species (Table 3). In general, the percentages of the Cosmopolitan, Pantropical, Palaeotropical and Neotropical elements are obviously comparable in all surveyed water bodies of the study area. While, the Mediterranean element is highly represented in the northern lakes (21 taxa), followed by the drainage canals, irrigation canals and Damietta branch of the River Nile (8 taxa each), then by Rosetta branch (6 taxa), and finally by the River Nile stream (5 taxa). This indicates that, the chorological analysis of the study area is relatively compatible with the north-southward distribution of the climatic belts in Egypt.

## DISCUSSION

The aquatic weeds decrease the velocity of water especially under heavy infestation. They cause water loss through evapotranspiration and silting. Their abundance has an increasing effect on several water borne vectors such as Belharzia and Malaria. These weeds will increase irrigation costs and hamper fisheries development. These weeds, particularly the emergent weeds, through their extensive rhizomes help in the erosion of the banks as their death and decay may leave small tunnels through which water seepage causes breaches such tunnels may be created by rodents and crabs (Metha and Sharma (1976) and Gopal (1986).

Floristically, the total number of hydrophytes and terrestrial canal bank plants recorded in the present study is 70 species belonging to 55 genera grouped under 30 families. Out of these families, *Asteraceae* and *Chenopodiaceae* (10 species each), *Poaceae* (8 species) and *Cyperaceae* (6 species) are the major families contributing collectively about half (48.71 %) of the total number of recorded species. These species are classified into major four groups: floating hydrophytes (8 species), submerged hydrophytes (6 species), emergent species (19) and terrestrial species (37). On the basis of duration, the recorded species (70) are grouped into three categories: perennials (47 species), biennials (one species) and annuals (22 species). According to the life-form spectra of the recorded species, the majority of plants are cryptophytes (47.14 %) which include geophytes, helophytes and hydrophytes, and partly therophytes (32.86 %). Chamaephytes (10.00 %), hemicryptophytes (5.71%) and nanophanerophytes (2.29 %) constitute a relatively low

representation of life-form spectra. In the present investigation, the floristic structure agrees with the findings of **Quezel (1978)** concerning the floristic structure of the Mediterranean Africa, **El-Sheikh (1989)** on the canal-drain vegetation in the middle Delta region, **Mashaly *et al.* (2001 & 2002)** on the weed vegetation of the cropland and canal bank habitats in the north east Nile Delta region, and **El-Halawany (2002)** on the wetland habitats along side the fish farms in the north Nile Delta region.

Chorologically, Egypt is the meeting point of the floristic elements belonging to at least four phytogeographical regions: the African Sudano-Zambesian, the Asiatic Irano-Turanian, the Afro-Asiatic Sahro-Sindian and the Euro-Afro-Asiatic Mediterranean [**El-Hadidi, (1993)**]. The floristic analysis of the study area revealed that, about 35.71 % of the total number of the recorded species are Mediterranean taxa. These taxa include pluriregional (18.57 %), biregional (11.43 %) or monoregional (5.71 %). It is also indicated that, about 55.71 % of the species are Palaeotropical (17.14 %), Cosmopolitan (15.71 %), Pantropical (14.29 %) or Neotropical (8.57 %). Similar investigations were described by many authors e.g. **Abd El-Ghani and Amer (1990)**; **El-Demerdash *et al.* (1997)**; **Khedr & El-Demerdash (1997)**; **Mashaly *et al.* (2001 & 2002)**; **Mashaly (2001, 2002 & 2003)**; **El-Halawany (2002)**; **Mashaly & Awad (2003 a & b)**; **Maswada (2004)**; **Omar (2006)**; **Mashaly & El-Ameir (2007)**; **Torky (2007)** and **Abd El-Gawad (2008)**.

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## الملاح الفلورية للحياة النباتية فى نهر النيل بمصر

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استهدف هذا البحث دراسة الملاح الفلورية للحياة النباتية فى المجارى المائية المختلفة لنهر النيل بمصر. فقد تم اختيار ٨٠ موقعا فى منطقة الدراسة لتمثل مختلف المجارى المائية ذات الصلة بنهر النيل حيث شملت قنوات الرى والصرف والبحيرات الشمالية (المنزلة - البرلس - ادكو) وفرعى دمياط ورشيد وكذلك مجرى نهر النيل جنوبا حتى محافظة بنى سويف.

فى هذه الدراسة تم تسجيل ٧٠ نوعا من النباتات المائية و نباتات الجسور والتي تنتمى الى ٥٥ جنسا وصنفت تحت ٣٠ فصيلة، حيث اتضح ان الفصيلة الرمرامية (١٠ أنواع) والمركبة (١٠ أنواع) والنجيلية (٨ أنواع) والسعدية (٦ أنواع) هى الفصائل السائدة والتي تمثل معا حوالى ٤٨,٥٧ % من العدد الكلى للنباتات المسجلة. أما تبعا لفترة العمر فقد تم تقسيم نباتات هذه الدراسة الى ثلاث مجموعات هى : ٤٧ نوعا من النباتات المعمرة ، نبات واحد من النباتات ثنائية الحول و٢٢ نوعا من النباتات الحولية. أما على اساس وصف الطرز الحياتية فقد صنفت هذه النباتات تحت خمسة أنواع من هذه الطرز وهى : طرز الحوليات (Therophytes) وطرز المختفيات (Cryptophytes) وطرز شبه المختفيات (Hemicryptophytes) وطرز السطحيات (Chamaephytes) وطرز النباتات الظاهرة الصغيرة (Nanophanerophytes). وقد اتضح ان غالبية هذه النباتات تتبع اساسا طرز المختفيات ( ٤٧,١٤ %) و جزئيا طرز الحوليات (٣٢,٨٦ %). وقد أوضح التحليل الفلورى لهذه الدراسة أن هناك ٢٥ نوعا نباتيا تمثل حوالى ٣٥,٧١ % من النباتات المسجلة تتبع العنصر الفلورى للبحر المتوسط بانواعه الثلاثة سواء كانت أحادية أو ثنائية أو عديدة المناطق. كما وجد أن العنصر العالمى يشتمل على حوالى ١٥,٧١ % والعنصر الاستوائى القديم على ١٧,١٤ % والعنصر الاستوائى على ١٤,٢٩ % والعنصر الاستوائى الحديث على ٨,٥٧ % من المجموع الكلى للنباتات المسجلة فى هذه الدراسة ، حيث ظهر أن العناصر الفلورية الأربعة الأخيرة كانت نسبة تواجدها متقاربة فى جميع الأجسام المائية بمناطق الدراسة ، بينما اظهر عنصر البحر المتوسط أعلى تمثيلا له فى البحيرات الشمالية (٢١ نوعا) يليها كل من قنوات الصرف والرى وفرع دمياط فقد تم تمثيل هذا العنصر بثمانية أنواع نباتية لكل منها ثم جاء بعد ذلك فرع رشيد (٦ أنواع) وأخيرا مجرى نهر النيل نفسه (٥ أنواع)، وهذا يأتى متطابقا مناخيا مع طبيعة أحزمة المناخ المختلفة والموزعة من شمال إلى جنوب مصر.

