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Floristic Composition of Plant Life in Damietta Branch – River Nile: Dakahlia Govern

***Shrouk A. Elagami*[1], *Ahmed El-Zeiny*[2], *El-Sayed F. El-Halawany*[1], *Yasser A. El-Amier*[1]**

[1]*Botany Department, Faculty of Science, Mansoura University, Mansoura, 35516, Egypt*

[2] *Environmental Studies Department, National Authority for Remote Sensing and Space Sciences (NARSS), Cairo 11769, Egypt*

***Correspondence:** shrouk_elagami@outlook.com*

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Abstract: The Nile River irrigates Egypt's agricultural fields nearly continually through a vast network of canals and drains. The goal of this research is to characterize the taxonomic structure of the Damietta branch of the Nile River. All flora species were registered in five plots (each 25 m2) in each stand, and the frequency (IV=100) was calculated. The total number of the documented vegetal taxa in the recent investigation is 64 (28 annual taxa, 1 bi-ennial species, 35 perennial tax), related to 53 genera and 28 families. Poaceae and Asteraceae are the most abundant families being signified cooperatively by 20 taxa or nearly 31.25 % of the whole species verified. These taxa can be categorizied biologically into 4 main categories; 2 sub-merged category, 6 floating category, thirteen emergent category and 53 terrestrial category taxa. It is also obvious that, the life-form spectrum in three drains is mainly represented by therophytes (41.42%), followed by geophytes (17.14%), helophytes (15.71 %), hydrophytes (10 %), hemicryptophytes (8.57%) and nanophanerophytes (4.28 %). The least value of life forms is verified to be chamaephytes, that achieved value of 2.85 %. The floristic investigation of the selected area reveals the following; 13 species (20.31 % of the total documented taxa) are cosmopolitan taxa the same number was recorded in pantropical. Additionally, 38 taxa (nearly 59.39 % of the whole taxa verified) are worldwide species (Pluri-Regional, Bi- Regional, Cultivated and Naturalized, Mediterranean, Sudan Zambian, Palaeotropical, Pantropical and Neotropical).

keywords: Drains, Floristic analysis, Duration, Life form, Chorotype

1.Introduction

Despite occupying below 5% of Egypt's geographical zones, the limited sections of the fertile lands of the River Nile Region (Nile Valley and Nile Delta) form the backbone for the agriculture of most common yields that completely use the stream water of the River Nile. As a result, there is no excess of River Nile water that can be used for any agro-industrial or social interaction in deserts of Egypt's that may rely primarily on their specific regular water sources to develop and create non- traditional yield with less water needs designated from xeric habitat. As a result, Egyptian communities have a long history of utilizing the renewable resources of non-cultivated regions to generate more food for residents, livestock, and industrial development of our local raw materials [1].

The definition and categorizatioon of weed and natural vegetation in the recently retrieved area northwest of the Nile Delta was studied by Aly *et al.* [2]. Shaltout & Sharaf El-Din [3] described the habitation categories and vegetal populations in the Nile Delta. Al-Sodany [4] investigated the vegetation composition of the northern Nile Delta. The floral investigation of waterways, sanitations and lakes of north side of Nile Delta zone was investigated by Al-Sodany [5]. El-Hennawy [6] studied the ecology of aquatic plants in Dakahlia and Damietta Provinces. In the middle Delta area, El-Halawany [7] evaluated the influence of conservation on shoreline and domestic flora in

the Nile-Delta. Serag [8] analyzed the ecosystem and flora assessment of 4 succulent halophytes on the Mediterranean shoreline of Damietta Governorate. The weed vegetation of date palm plantations was studied in the northwest of the Nile-Delta region and the northeast by El-Fahar [9] and El-Halawany [10], respectively. The characterization of twelve types of ruderal habitats in the north western part of the Nile Delta has been studied by El-Kady [11]. El-Halawany *et al.* [12] The commercial prospective of several plants occurring naturally in Egypt's Nile Delta region was investigated. El- Halawany *et al.* [13] studied also the weed communities associated with the principal crops in Damietta Governorate. Masoud [14] studied the ecological features, growth and phytochemical investigation of some selected taxa of family Amaranthaceae in the Nile Delta zone of Egypt.

According to El Ghrably *et al.* [15], the proliferation of aquatic weeds in the Nile Delta's drains and irrigation waterways is being accelerated by ecological factors such as increased contamination from cultivation techniques, industrialized hubs, and anthropogenic activities along waterways and sanitations. The variables that influence the taxanomic conformation and diversity of flora along the sides of Rivers and other bodies of water are still incompletely defined [16]. The following investigation aimed to identify the floral features of Damietta branch –River Nile Dakahlia Governorate.

2.Material and method

2.1. Investigation zone

The Nile Delta begins at Cairo, where the Nile flows northwest for about 20 kilometres before splitting into two branches, the Rosetta branch (242 kilometres long) and the Damietta branch (242 kilometres long) (239 km in length). The Damietta Branch is serving five province of Nile-Delta: Damietta, Dakahlia, El-Gharbia, El-Menofyia and El-Qalyubiya, which located in the area between 30º 10`12``N and 31º 31`48``N and between 31º 07`E and 31º 50`E, as shown in Figure 1. Dakahlia province is situated in the downstream of the River Nile-Damietta branch at 31°02'60.00" N latitude - 31°22'59.99" E longitude to the north east of the Deltaic zone of Egypt [17]. Rainfall, the Nile (Damietta branch), the Mediterranean Sea, northern Lake Manzala, and subterranean water are all sources of water in the study region. As a result, agriculture in Dakahlia Governorate is mostly reliant on Nile water from the Damietta branch, as well as winter rains.

According to the map of the world dispersal of the dry regions [18], The weather features of the Nile Delta are comparable to those in northern Egypt; it is dry to semi-arid, with evaporation rates that are several times higher than annual precipitation. Ayyad [19The Mediterranean coastline region is located in the attenuated desert province, which is distinguished by a brief dry season, annual rainfall, pleasant summers, and moderate winters. As part of the Deltaic Mediterranean coast, Dakahlia Governorate falls under the dry and/or semi-arid meteorological zones of Egypt's northern shoreline.

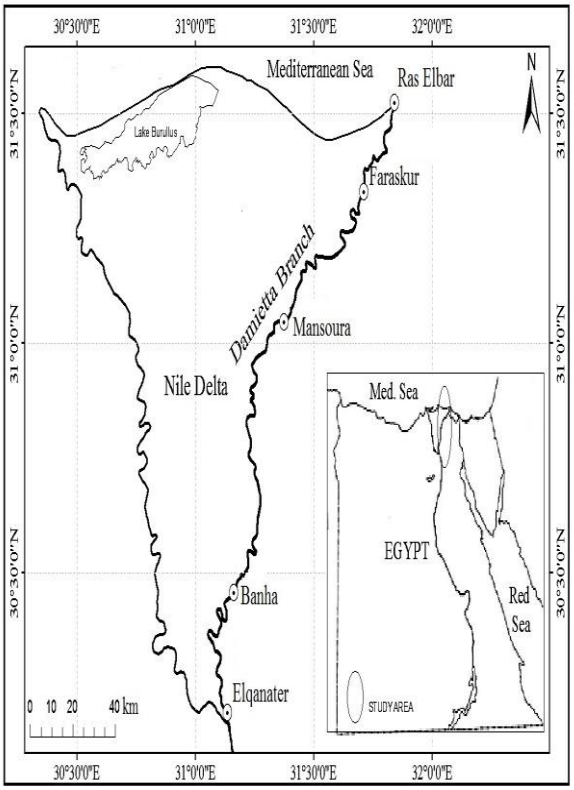

Figure 1. Map of Egypt illustrating the Dakahlia Governorate and the study sites (1-24) along the Nile River (Damietta branch

2.2. Floristic characterization:

2.2.1. Selection of stands for vegetation analysis

A field trip was conducted to Dakahlia governorate during the period 19th March – 5th

May 2019. The sampling stands were selected according to certain distribution to cover all physiographic variations in each habitat and to ensure sampling of wide range of vegetation variation 24 samples (5 × 5m each) from River Nile, Damietta branch in Dakahlia Governorate. The sampling sites have been selected and distributed to represent all physio-graphic variation in each habitat type and to ensure sampling of wide range of vegetational variations.

2.2.2. Estimation of Species Abundance (Importance Value)

In the coastal region, the population and cover for each taxa have been calculated for each identified sampling sites. The number of members of each plant species was counted inside arbitrarily chosen stands to estimate the abundance of every species [20]. On the other hand, the line intercept technique was used to calculate the plant cover of every taxa in the surveyed sampling sites [21]. Each plant species' relative density and cover values were computed and totaled to produce an approximation of its importance value (IV) in each quadrate, with value out of 200. Furthermore, all plant species for each stand were recorded in five plots (each $25m^2$) for the aquatic environment, and the species abundance (frequency) was calculated in one sample stand according to Mueller-Dombois and Ellenberg [22].

2.2.3. Description of the Life-Span, Life-Forms and Floristic Categories of the taxa in the investigation zone

During each visit, vegetal samples were gathered from different sites for definition. All specimens were preserved in the Botany Department's Herbarium at Mansoura University's Faculty of Science. The identification and categorization of life-forms in the present study were according to Raunkięr [23]. The categorization, definition and floral grouping were according to Täckholm [24] and up to date by Boulos [25].

3.Result and discussion

3.1. floral features

3.1. floral Composition and Dispersal of the vegetal Species in the Investigation Zone

The sample stands are distributed on the River Nile -Damietta branch (Dakahlia sector) of Egypt, 24 standpoints (area equals 10×10 m each) have been carefully chosen for sampling flora on the River Nile -Damietta branch (Dakahlia Governorate). The recorded hydrophytes and canal bank species in the sample stands of the study region are recorded in Table (1). Located along the sides of the River Nile-Damietta Branch. The total number of the recorded species is 64. The taxa can be categorized environmentally into 4 main hydrophyte categories, namely: a) two inundated category, b) six floating category, c) thirteen emergent category and d) 53 terrestrial species.

a) The submerged hydrophytes include two species, namely: *Ceratophyllum demersum* and *Myriophyllum spicatum* recorded in 3 sampling locations in Damietta Branch zone, (P =95.83 and 87.50%, respectively).

b) The six floating hydrophytes are: *Eichhornia crassipes* recorded wide range of distribution with (P= 70.83%), on the other hand, the rest species showed limited range of distribution with presence *Lemna gibba* (P= 12.50%), *Lemna minor* (P= 12.50%), *Ludwigia stolonifera* (P= 16.67%), *Pistia stratiotes* and *Potamogeton nodosus* (P= 20.83%, each).

c) The emergent species are 13 taxa. Out of these, *Echinochloa stagnina*, *Persicaria salicifolia* and *Saccharum spontaneum* recorded wide range of distribution with presence (P= 75, 70.83 and 66.67 %, respectively), while *Cyperus alopecuroides*, *Persicaria lapathifolia* and *Alternanthera sessilis* with moderate range of distribution and presence (P= 50, 45.83 and 37.50%, respectively). The rest of the emergent recorded narrow range of distribution with presence values as follow *Cyperus articulates* (P= 20.83%), *Typha domingensis* (P= 16.67%), *Ranunculus sceleratus* (P= 12.50%), *Leersia hexandra* (P= 8.33%), *Cyperus difformis*, *Cyperus papyrus and Echinochloa crus-galli* (P= 4.17%, each).

d) The terrestrial species represent the main bulk of the flora (53 species) in the study area. Where *Phragmites australis* recorded highest presence (P =75%) which indicate its wide range of distribution. Moreover three species

recorded moderate range of distribution; *Chenopodium murale, Pluchea dioscoridis* and *Solanum nigrum* with presence value (P= 45.83, 37.50 and 33.33%, respectively). On the other hand, the rest 49 species recorded narrow range of distribution with presence values; *Arundo donax* (P= 29.17%), *Bidens pilosa* (P= 12.50%), *Conyza bonariensis* (P= 4.17%)…etc.

3.2. Ecologically the taxa can be categorizied into 4 main categories: a) two inundated hydro-phytes, *C. demersum* and *M. spicatum* documented in 3 locations of the Damietta branch investigation area, (P =95.83 and 87.50%, respectively), b) six floating hydrophytes were identified: *E. crassipes* recorded wide range of distribution with (P= 70.83%), *Lemna gibba* (P= 12.50%), *L. minor* (P= 12.50%), *Ludwigia stolonifera* (P= 16.67%), *Pistia stratiotes* and *Potamogeton nodosus* (P= 20.83%, each), c) thirteen emergent hydrophytes, out of these, *Echinochloa stagnina, P. salicifolia* and *Saccharum spontaneum* recorded wide range of distribution with presence (P= 75, 70.83 and 66.67 %, respectively), while *Cyperus alopecuroides, Persicaria lapathifolia* and *Alternanthera sessilis* with moderate range of distribution and presence (P= 50, 45.83 and 37.50%, respectively). The rest of the emergent recorded narrow range of distribution, and d) 53 terrestrial species represent the main bulk of the flora (53 species) in the study area. Where *Phragmites australis* recorded highest presence (P =75%) which indicate its wide range of distribution. Furthermore, *Chenopodium murale, Pluchea dioscoridis* and *Solanum nigrum* were recorded moderate range of distribution (P= 45.83, 37.50 and 33.33%, respectively). additionally, the remaining 49 taxa recorded strictr range of distribution such as *Arundo donax* (P= 29.17%), *Bidens pilosa* (P= 12.50%), *Conyza bonariensis* (P= 4.17%) etc. In the present study, the habitat types that sustain the growth of the plant species are primarily very wet and/or waterway bank environments in the various sites of Egypt-Damietta Branch

3.3. Plant Life-Span

The records of plant species in the River Nile - Damietta branch habitat type of the study region are presented in Table (1) which indicated that, the entire number of taxa species in the present research is 64. These species are classified as shown in Figure (2) into three major groups: 28 annual species (43.75 %), one biennial species (1.56 %) and 35 perennial species (54.69 %) from the previous the results revealed that the major bulk of the documented taxa in the following investigation region is mainly represented by the perennials and partly by the annuals as described in Figure (2). Moreover, *Ceratophllum demersum, Myriophyllum spicatum, Eichhornia crassipes* and *Persicaria salicifolia* have among the perennially reported species with the greatest presence value. Several annual plant species, such as *Amaranthus viridis, Chenopodium murale, Eclipta prostrata, Portulaca oleracea,* and *Sonchus oleraceus*, have a vast environmental spectrum of dispersal and a high presence. These vegetation composition in the following investiagtion were in agreement with those of Shaltout *et al*. [26] on the plant life in the Nile Delta, and Shaltout *et al.* [27] The plant life of the Damietta branch has changed throughout time.

3.4. Plant Life-Forms

Life-forms are described and classified in accordance with the explanation and categorization of life-forms Raunkięr [23], the life-forms of the species documented in the River Nile -Damietta branch following investigation region are clustered related to seven categories as follow: Therophytes, Geophytes, Hemicryptophytes, Chamaephytes, Nanophanerophytes, Helophytes and Parasites (Figure 3). The most documented taxa are Therophytes (41.42%), followed by Geophytes (17.14%), Helophytes (15.71 %), Hydrophytes (10 %), Hemicryptophytes (8.57%) and Nanophanerophytes (4.28 %). The least value of life-forms is verified as Chamaephytes that achieved value of 2.85 %. It is worth to mention that, the life-form spectrum in the investigation zone is mainly represented by therophytes. The group of Chamaephytes is represented by the minimum values among all environmental locations of the investigation zone [28].

According to Raunkięr [23], The wild species' life-forms in this study are divided into seven categories. Therophytes make up the

most of the taxa found (41.42%), followed by geophytes (17.14%), helophytes (15.71 %), hydrophytes (10 %), hemicryptophytes (8.57%) and nanophanerophytes (4.28 %). The least value of life-forms is verified as chamaephytes which achieved value of 2.85 %. In this study, Therophytes are the more common type, which may be ascribed to their brief life cycles, which allow them to withstand environmental volatility, such as the Mediterranean climate, topographical fluctuation, and man and animal intervention [29]. Furthermore, the nature of the study may account for the comparatively high value of cryptophytes of plant species in the current study

Table 1: vegetation conformation of the plant life in River Nile- Damietta branch (Dakahlia Governorate) the study area

Species	Family	Life span	Life form	Floristic category	P%
Hydrophytes **Submerged hydrophytes**					
Ceratophllum demersum L.	Ceratophyllaceae	Per.	Hy	COSM	95.83
Myriophyllum spicatum L.	Haloragaceae	Per	Hy	ME+ER-SR+IR-TR	87.50
Floating hydrophytes					
Eichhornia crassipes (C.Mart.) Solms.	Pontederiaceae	Per.	Hy	NEO	70.83
Ludwigia stolonifera (Guill. et Perr.) Raven	Onagraceae	Per.	He	S-Z	16.67
Lemna gibba L.	Araceae	Per.	Hy	COSM	12.50
Lemna minor L.	Araceae	Per	Hy	COSM	12.50
Pistia stratiotes L.	Araceae	Per	Hy	PAN	20.83
Potamogeton nodosus Poir.	Potamogetonaceae	Per	Hy	ME+IR-TR	20.83
Emergent species					
Alternanthera sessilis (L.)DC.	Amaranthaceae	Per.	He	PAN	37.50
Cyperus alopecuroides Rottb.	Cyperaceae	Per.	He	PAN	50
Cyperus articulatus L.	Cyperaceae	Per.	G, He	PAN	20.83
Cyperus difformis L.	Cyperaceae	Ann.	Th	PAL	4.17
Cyperus papyrus L.	Cyperaceae	Per	G, He	PAL	4.17
Echinochloa crus-galli (L.) Beauv	Poaceae	Ann.	Th	PAN	4.17
Echinochloa stagnina (Retz.) P. Beauv.	Poaceae	Per.	G, He	PAL	75
Leersia hexandra Sw.	Poaceae	Per.	He	PAN	8.33
Persicaria lapathifolia Willd.	Polygonaceae	Per	G	PAL	45.83
Persicaria salicifolia Brouss. ex Willd.	Polygonaceae	Per	G	PAL	70.83
Ranunculus sceleratus L.	Ranunculaceae	Ann	Th	ME+IR-TR+ER-SR	12.50
Saccharum spontaneum L. Mant. Alt	Poaceae	Per	G, He	ME+PAL	66.67
Typha domingensis (Pers.) Poir. ex Steud	Typhaceae	Per	He	PAN	16.67
Terrestrial species					
Alhagi graecorum **Boiss.**	Fabaceae	Per.	H	PAL	12.50
Amaranthus graecizans **L.**	Amaranthaceae	Ann	Th	ME+IR-TR	4.17
Amaranthus lividus **L.**	Amaranthaceae	Ann.	Th	ME+IR-TR	12.50
Amaranthus viridis **L.**	Amaranthaceae	Ann.	Th	ME	20.83
Arundo donax **L.**	Poaceae	Per	G, He	Cult.& Nat.	29.17
Symphyotrichum squamatum **(Asch.) Dandy**	Asteraceae	Per.	Ch	NEO	4.17
Beta vulgaris **L. var.** *cicla*	Chenopodiaceae	Ann.	Th	ME+IR-TR+ER-SR	4.17
Bidens pilosa **L.**	Asteraceae	Ann.	Th	PAN	12.50
Capsella bursa-pastoris **(L.) Medic**	Brassicaceae	Ann.	Th.	COSM	4.17
Chenopodium album **L.**	Chenopodiaceae	Ann.	Th	COSM	12.50
Chenopodium ficifolium **Sm**.	Amaranthaceae	Ann.	Th	ME+ER-SR	4.17
Chenopodium murale **L.**	Amaranthaceae	Ann.	Th	COSM	45.83
Convolvulus arvensis **L.**	Convolvulaceae	Per	H	COSM	20.83
Conyza bonariensis **(L.) Cronquist**	Asteraceae	Ann.	Th	NEO	4.17
Cynanchum acutum **L.**	Asclepiadaceae	Per.	H	ME+IR-TR	8.33

Cynodon dactylon **(L.) Pers.**	Poaceae	Per.	G.	PAN	25
Cyperus rotundus **L.**	Cyperaceae	Per	G	PAN	12.50
Eclipta prostrata **L.**	Asteraceae	Ann.	Th	NEO	20.83
Ethulia conyzoides **L.**	Asteraceae	Ann.	Th	PAL	8.33
Euphorbia peplus **L.**	Euphorbiaceae	Ann.	Th	ME+IR-TR+ER-SR	4.17
Euphorbia terracina **L.**	Euphorbiaceae	Per.	H	ME	4.17
*Imperata cylindrical (***L.)Raeusch.**	Poaceae	Per	H	PAL	4.17
Ipomoea carnea **Jacq.**	Convolvulaceae	Per	G	PAN	25
Lamium amplexicaule **L.**	Lamiaceae	Ann.	Th	ME+IR-TR+ER-SR	4.17
Malva parviflora **L.**	Malvaceae	Ann.	Th	ME+IR-TR	4.17
Panicum repens **L.**	Poaceae	Per.	G	PAN	8.33
Pennisetum setaceum **(L.) R.Br.**	Poaceae	Per.	H	ME+PAL	4.17
Phragmites australis **(Cav.) Trin. ex Steud**	Poaceae	per.	G, He	COSM	75
Phyla nodiflora **(L.) Greene**	Verbenaceae	Per	Ch	PAN	12.50
Pluchea dioscoridis **(L.) DC.**	Asteraceae	Per	Nph	S-Z+SA-SI	37.50
Poa annua **L.**	Poaceae	Ann	Th	COSM	4.17
Portulaca oleracea **L.**	Portulacaceae	Ann	Th	COSM	25
Pseudognaphalium luteoalbum **(L.) Hilliard & B.L.Burtt,**	Asteraceae	Ann	Th	COSM	8.33
Ricinus communis **L.**	Euphorbiaceae.	Per	Nph	Cult. & Nat.	4.17
Rorippa palustris **(L.) Besser**	Brassicaceae	Bi	Th	ME+ER-SR+IR-TR	8.33
Rumex dentatus **L.**	Polygonaceae	Ann	Th	ME+IR-TR+SA-SI	16.67
Senecio aegyptius **L.**	Asteraceae	Ann	Th	ME+IR-TR+ER-SR	4.17
Sisymbrium irio **L.**	Brassicaceae	Ann	Th	ME+IR-TR+ER-SR	4.17
Solanum nigrum **L.**	Solanaceae	Ann	Th	COSM	33.33
Sonchus oleraceus **L.**	Asteraceae	Ann	Th	COSM	25
Stellaria pallida **(Dumort.) Murb.**	Caryophyllaceae	Ann	Th	ME+ER-SR	4.17
Tamarix nilotica **(Ehrenb.) Bunge**	Tamaricaceae	Per	Nph	SA-SI+S-Z	8.33
Urtica urens **L.**	Urticaceae	Ann	Th	ME+IR-TR+ER-SR	16.67

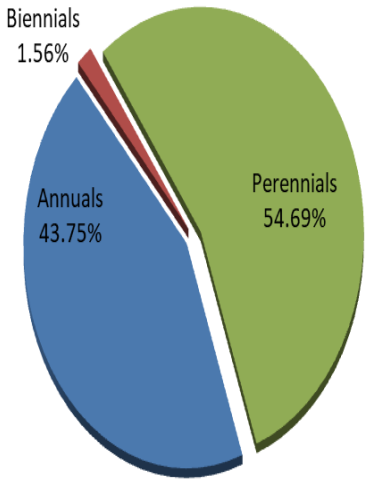

Figure 2: Plantlifespanintheinvestigation region

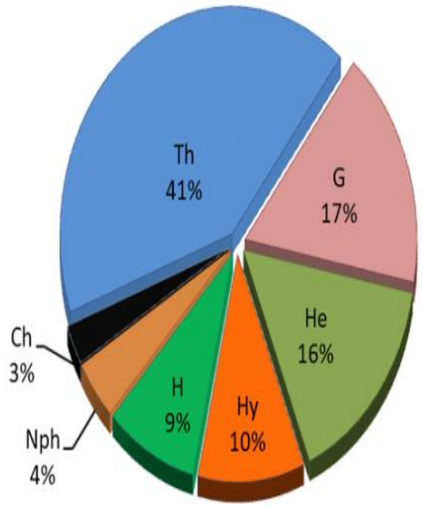

Figure 3: Plant life form spectrum in the investigation region

The Floristic Analysis

The entire number of the listed taxa species charted in the River Nile-Damietta branch (Dakahlia Governorate) is 64 taxa related to 53 genera 28 families. Table (1) illustrated that, the family Poaceae and Asteraceae comprises 11 and 9 species respectively (17.19% & 14.06%) of the entire listed taxa species, followed by family Amaranthaceae 6 specie (9.37%), Cyperaceae 5 species (7.8%), Araceae, Brassicaceae, Euphorbiaceae and Polygonaceae comprise 3 species each (4.68%), Chenopodiaceae and Convolvulaceae comprise 2 species each (3.12%), Asclepiadaceae, Caryophyllaceae, Ceratophyllaceae, Fabaceae, Haloragaceae,

The floristic composition in the current research consisted of 64 taxa (28 annual, one bi-ennial, and 35 per-ennial) from 53 genera and 28 families. Poaceae, Asteraceae, Amaranthaceae, and Cyperaceae are the three most species-rich families (11, 9, 6 and 5 spp., respectively). They represented 48.44 percent of the reported taxa and the main floristic structure in the research region, however just 6.25 percent of the taxa were shared by two families (Chenopodiaceae and Convolvulaceae), and 18 families were mono-specific. These are the most frequent families in the Mediterranean and North African flora [30]. Asteraceae and Poaceae are the world's largest and most widely distributed flowering plant families, respectively, while Poaceae is the fifth-largest plant family, after Asteraceae, Orchidaceae, Fabaceae, and Rubiaceae [30], considered from the most common family in the Flora of Egypt [31]. The most widely spread genera are organized in the subsequent arrangement: Poaceae > Asteraceae > Brassicaceae > Amaranthaceae. Lamiaceae, Malvaceae, Onagraceae, Pontederiaceae, Portulacaceae, Potamogetonaceae, Ranunculaceae, Solanaceae, Tamaricaceae, Typhaceae, Urticaceae and Verbenaceae comprises single species was recorded in each (1.56%).

The vegetation classifications of the plant life in the investigation region are illustrated in Table (2). The maximum mutual vegetational features of family Poaceae are Pantropical (4 taxa), Cosmopolitan, Palaeotropical and Bi-regional (2 species each), while Cultivated and Naturalized are represented by one specie. In Asteraceae, the most common chorotypes are; Neotropical (3 species), Cosmopolitan (2 species), while Pantropical, Palaeotropical, Pluri-regional and Bi-regional elements are denoted by one species each. The most abundant vegetal taxa in Amaranthaceae is Bi-regional (3 species), whereas Cosmopolitan, Mediterranean and Pantropical chorotype is denoted by single species. The floristic elements of family Cyperaceae are Pantropical (3 species each), while Palaeotropical chorotypes are represented by (2 species). The floristic features in Araceae are Cosmopolitan (2 species) and Pantropical element are represented by single species. The abundant vegetation taxa from family Brassicaceae are Pluriregional (2 taxa) and Cosmopolitan elements are presented by single taxa. In Euphorbiaceae, the abundant chorotypes are: Pluri-regional, Cultivated and Naturalized and Mediterranean elements are presented by single taxa for each. The vegetal taxa in Polygonaceae are Palaeotropical (2 taxa) whereas Pluri-regional are presented by one taxa. The vegetal taxa In Chenopodiaceae are Cosmo-politan and Pluri-regional are presented by single taxa for each. Where, the floristic element in Convolvulaceae is Cosmopolitan and Pantropical represented by one species each. The other families (with less than 2 species) contain various types of vegetal taxa that are generally presented by limited numbers taxa

Table (2) reveals also that, 21 taxa or nearly 32.81 % of the whole value of documented taxa are Mediterranean vegetation. These species are either Pluri-regional (10 taxa =12.9 %), Bi-regional (9 taxa =14.52 %) or Mono-regional (2 taxa = 3.23 %). It has been also demonstrated that, 13 taxa or nearly 20.97% of the complete documented taxa comprise Cosmo-politan and so as well the Pantropical. Whereas for the Palaeotropical (8 species =12.90%), Neotropical (4 species =6.45%), Cultivated and Naturalized (2 species =3.23%) and Sudano-Zambezian (3 species =4.84%) which is either Bi-regional (2 species =3.23 %) or Mono-regional (1 species = 1.61 %).

Chorological spectrum of the plotted plants in the investigation zone showed 21 taxa (32.81

% of the complete vegetation) were pluri-, bi- and mono-regional (10, 9 and 2 spp., respectively) Mediterranean element. The Mediterranean chorotype of the studied flora's extensive distribution in the research region reflects the study area's Mediterranean climate, and Mediterranean taxa indicate a more mesic habitat [32]. This outcome approves with most of associated investigation [33]. As illustrated in Table (3) A diverse range of floristic components, including Cosmopolitan, Pantropical, Palaeotropical, Neotropical, Sudano-Zambezian, Cultivated, and Naturalized chorotypes, are represented in the research region by a varied number of species. This may be due to human impact, agricultural history, and the potential of specific floristic components from many neighbouring phyto-graphical zones to infiltrate the studied area [34]

Table 2: The principal vegetation categories of the families in the River Nile- Damietta branch River Nile- Damietta branch (Dakahlia Governorate) study area.

Family	**Genus**	**Species**	**COSM**	**PAN**	**PAL**	**NEO**	**Pluri-regional**	**Bi-regional**	**Cult. & Nat.**	**ME**	**S-Z**
Poaceae	10	11	2	4	2	-	-	2	1	-	-
Asteraceae	9	9	2	1	1	3	1	1	-	-	-
Amaranthaceae	3	6	1	1	-	-	-	3	-	1	-
Cyperaceae	1	5	-	3	2	-	-	-	-	-	-
Araceae	2	3	2	1	-	-	-	-	-	-	-
Brassicaceae	3	3	1	-	-	-	2	-	-	-	-
Euphorbiaceae	2	3	-	-	-	-	1	-	1	1	-
Polygonaceae	2	3	-	-	2	-	1	-	-	-	-
Chenopodiaceae	2	2	1	-	-	-	1	-	-	-	-
Convolvulaceae	2	2	1	1	-	-	-	-	-	-	-
Asclepiadaceae	1	1	-	-	-	-	-	1	-	-	-
Caryophyllaceae	1	1	-	-	-	-	-	1	-	-	-
Ceratophyllaceae	1	1	1	-	-	-	-	-	-	-	-
Fabaceae	1	1	-	-	1	-	-	-	-	-	-
Haloragaceae	1	1	-	-	-	-	1	-	-	-	-
Lamiaceae	1	1	-	-	-	-	1	-	-	-	-
Malvaceae	1	1	-	-	-	-	-	1	-	-	-
Onagraceae	1	1	-	-	-	-	-	-	-	-	1
Pontederiaceae	1	1	-	-	-	1	-	-	-	-	-
Portulacaceae	1	1	1	-	-	-	-	-	-	-	-
Potamogetonaceae	1	1	-	-	-	-	-	1	-	-	-
Ranunculaceae	1	1	-	-	-	-	1	-	-	-	-
Solanaceae	1	1	1	-	-	-	-	-	-	-	-
Tamaricaceae	1	1	-	-	-	-	-	1	-	-	-
Typhaceae	1	1	-	1	-	-	-	-	-	-	-
Urticaceae	1	1	-	-	-	-	1	-	-	-	-
Verbenaceae	1	1	-	1	-	-	-	-	-	-	-
Total	53	64	13	13	8	4	10	11	2	2	1
Percentage			20.31	20.31	12.50	6.25	15.63	17.19	3.13	3.13	1.56

Table 3: Number of taxa and proportion of different vegetal categories of the River Nile- Damietta branch River Nile- Damietta branch (Dakahlia Governorate) study area.

No.	Floristic categories	No.	%	Type
1	COSM	13	20.97	World wide
2	PAN	13	20.97	
3	PAL	8	12.90	
4	NEO	4	6.45	
5	ME+IR-TR+ER-SR	9	11.29	Pluri-regional
6	ME+IR-TR+SA-SI	1	1.61	
7	ME+PAL	2	3.23	Bi-regional
8	ME+IR-TR	5	8.06	
9	ME+ER-SR	2	3.23	
10	SA-SI+S-Z	2	3.23	
11	Cult. & Nat.	2	3.23	Mono-regional
12	ME	2	3.23	
13	S-Z	1	1.61	
Total		64	100	

Conclusion

It may be stated that aquatic plants have been widely used to clean polluted water virtually everywhere in the globe in recent decades. There are 64 flowering plant documented, relate to 53 genera and 28 families. Ecologically, these taxa can be divided into 4 categories: two inundated, 6 floating, 13 emergent, and 53 terrestrial species. The floristic analysis of the investigation zone reveals that, 13 taxa (20.31 % of the complete documented taxa) are cosmopolitan taxa the same number was recorded in pantropical. Moreover, 38 taxa (nearly 59.39 % of the complete documented taxa) are worldwide species (Cosmo-politan, Palaeo-tropical, Pan-tropical and Neo-tropical).

4. References

1. El Shami, A. S. and Merrett, T. G. (1989). Allergy and molecular biology. Pergamon Press.
2. Aly, M. M.; Hassan, M. K. and Souliman, R. M. (1980). Simple and rapid spectrophotometric and titrimetric methods for the determination of ascorbic acid in pharmaceutical preparations. *Journal of Chemical Technology and Biotechnology*, **30(1),** 435-439.
3. Shaltout, K.H. & Sharaf El-din, A. (1988). Habitat types and plant communities along a transect in the Nile Delta region. Feddes Repertorium, **99(3/4):** 153–162.
4. Al-Sodany, Y. M. (1992). Vegetation analysis of the northern part of Nile Delta region, Doctoral dissertation, MSc Thesis, Faculty Science, Tanta University, Tanta, p 122.
5. Al-Sodany, Y. M. (1998). Vegetation analysis of canals, drains and lakes of northern part of Nile Delta Region (Doctoral dissertation, Ph. D. Thesis, Fac. Sci., Tanta Univ., Egypt.
6. El-Hennawy, M. T. (1999). Ecological studies on aquatic hydrophytes in Dakahlia and Damietta, Doctoral dissertation, M. Sc. Thesis, Faculty of Science (New Damietta), Mansoura University
7. El-Halawany, E.F. (2000). Flora and vegetation of date palm orchards in the Nile Delta, Egypt. Proceedings of the 1st International Conference on Biological Sciences, Faculty of Science, Tanta University, Tanta **1**: 266-283.
8. Serag, M. S. (1999). Ecology of four succulent halophytes in the Mediterranean coast of Damietta Egypt. Estuarine, Coastal and Shelf Science, **49:** 29-36.
9. El-Fahar, A. R. (2000, May). Weed communities of Date Palm orchards in northern Egypt. In The first International Conference on Biological Sciences, pp. 7-8.
10. El-Halawany, E.F. (2000). Flora and vegetation of date palm orchards in the Nile Delta, Egypt. Proceedings of the 1st International Conference on Biological

Sciences, Faculty of Science, Tanta University, Tanta 1: 266-283.
11. El-Kady, G. A.; Shoukry, A.; Reda, L. A. and El-Badri, Y. S. (2000). Survey and population dynamics of freshwater snails in newly settled areas of the Sinai Peninsula. *Egyptian Journal of Biology*, **2:** 42-48.
12. El-Halawany, E.F.; Mashaly, I.A. and Omar, G. (2002a). Economic Potentialities of some Plants Growing Naturally in the Nile Delta Region, Egypt. *Egyptian Journal Desert Research*, **52(1):** 21-35.
13. El- Halawany E.F., Mashaly I.A. and Omar G. (2002b). On the ecology of weed communities of the principle crops in Damietta area, Egypt. *Journal of Environmental Sciences, Mansoura University*, **33**: 95-118.
14. Masoud, G. F. (2004). Ecological studies of family Amaranthaceae in Egypt. M.Sc. Thesis, Faculty of Science Mansura University, Egypt. 174pp.
15. El Gharably, Z.; Tolba, A.; Pieterse, A. H. and Druyff, A. H. (1978). Preliminary experiments with grass carp for the control of aquatic weeds in Egypt. Proc. EWRS 5th Symp. On Aquatic Weeds.
16. Nilsson, J. and Thorstensson, A. (1989). Ground reaction forces at different speeds of human walking and running. Acta Physiologica Scandinavica, **136(2):** 217-227.
17. Zahran, M.A. & Willis, A.J. (2003). Plant life in the River Nile in Egypt. Reyadh, Saudi Arabia. Mars Publishing House.
18. UNESCO, U. (1979, October). The Tbilisi Declaration. In Intergovernmental Conference on Environmental Education, Tbilisi: USSR, pp. 14-26.
19. Ayyad, M.A. (1983). Some aspects of land transformation in the Western Mediterranean Desert of Egypt. Advances in Space Research, **2(8):** 19-29.
20. Shukla, R.S. and Chandel, P.S. (1989). A Textbook of Plant Ecology including Ethobotany and Soil science. 10th edition, S. Chand & Company Ltd., New Delhi.
21. Canfield, R.H. (1941). Application of the line interception method in sampling range vegetation. *Journal of Forestry*, **39(4):** 388-394.
22. Mueller-Dombois, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology. John Wiley and Sons, New York, Chichester, Brisbane, Toronto.
23. Raunkięr, C. (1934-1937). Plant life forms: Clarendon Press.
24. Täckholm, V. (1974). Student's Flora of Egypt, (2nd ed. ed.). Cairo, Egypt. : Cairo University Press.
25. Boulos, L. (1999-2005). Flora of Egypt (Alismataceae-Orchidaceae). Vol. **4**.
26. Shaltout, K.; Hassan, L. and Farahat, E. (2005). Vegetation-environment relationships in south Nile Delta. Taeckholmia, **25(1):** 15-46.
27. Shaltout, H.A.; Rose, J.C.; Figueroa, J.P.; Chappell, M.C.; Diz, D.I. & Averill, D.B. (2010). Acute AT1-receptor blockade reverses the hemodynamic and baroreflex impairment in adult sheep exposed to antenatal betamethasone. American *Journal of Physiology-Heart and Circulatory Physiology*, **299(2):** H541-H547.
28. El-Amier, Y. A.; Zahran, M. A. and Al-Mamoori, S. O. (2015). Environmental changes along Damietta branch of the River Nile, Egypt. *Journal of Environmental Sciences, Mansoura University*, **44**: 235-255.
29. Heneidy, S.Z. & Bidak, L.M. (2001). Multipurpose plant species in Bisha, Asir region, southwestern Saudi Arabia. *Journal of King Saud University Science*, **13:** 11-26.
30. Funk, V.A.; Susanna, A.; Stuessy, T. & Bayer, R. (2009). Systematics, evolution, and biogeography of the Compositae. Vienna: IAPT.
31. El-Amier, Y.A. & Abdul-Kader, O.M. (2015). Vegetation and species diversity in the northern sector of Eastern Desert, Egypt. West *African Journal of Applied Ecology*, **23(1):** 75-95.
32. El-Husseini, N.A.H.E.D.; Abd El-Ghani, M.M. and El-Naggar, S.I. (2008). Biogeography and diversity of the Tubiflorae in Egypt. *Polish Botanical Journal*, **53(2):** 105-124.

33. Abd-ElGawad, A.M.; El-Amier, Y.A.; Assaeed, A.M. & Al-Rowaily, S.L. (2020). Interspecific variations in the habitats of *Reichardia tingitana* (L.) Roth leading to changes in its bioactive constituents and allelopathic activity. *Saudi Journal of Biological Sciences*, **27(1):** 489-499.

34. El-Amier, Y.A.; Abdelghany, A.M. and Abed Zaid, A. (2014). Green synthesis and antimicrobial activity of *Senecio glaucus* mediated silver nanoparticles. Research *Journal of Pharmaceutical, Biological and Chemical Sciences*, **5**: 631-64