

Floristic features of Damietta area in the north east Nile Delta, Egypt.

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Floristic features of three habitat types in the Damietta Governorate namely: field crops, orchards and canal banks are described. The study habitats include 171 species related to 128 genera, grouped under 44 families with Gramineae attaining 36 species (21.05%), Compositae 21 species (12.28%) and Chenopodiaceae 15 species (8.77%), these are the main families. The recorded species comprise 98 annual species (57.31%), 8 biennial species (4.68%) and 65 perennial species (38.01%). The annual species are classified under three categories as follows: a) all year active annuals (14 species), b) winter-spring active annuals (64 species) and c) summer-autumn active annuals (20 species).

According to the life-form spectrum the recorded species are classified into: therophytes (60.23%), cryptophytes (22.22%), chamaephytes (7.60%), hemicryptophytes (7.02%), nanophanerophytes (1.75%) and parasites (1.17%).

The floristic analysis of the study area reveals that, the Mediterranean elements (mono, bi - pluriregional) include 81 taxa (47.36%), Cosmopolitan element 28 species (16.37%), Palaeotropical 22 species (12.68%) and Pantropical 21 species (12.28%). These represent the major chorotypes. The other floristic categories are poorly represented. This indicates that, the study area is obviously belong to the Mediterranean Territory with the entrance of other elements to the area.

Key words: Chorology, Damietta, Egypt, flora, habitats, life forms.

Introduction

The terms weed, weed flora and weed vegetation are commonly used in the literature concerned with Egyptian flora. The Egyptian weed flora is characteristic to man-made habitats such as cultivated fields, gardens, palm groves, orchards, lawns, roads, road sides, canal banks, canal, channels, ditches, drains, etc. (Kosinova, 1974a).

Earlier works on the weed flora in field crops, orchards, canals and canal banks in Nile Delta are few, among which to mention Simpson (1932), Imam and Kosinova (1972) and Kosinova (1974, 1975). Works during the last decade include those of, Abd El-Ghani and Amer (1990) who studied the weed assemblages in broad bean fields in Monofiya Governorate, Shaltout and El-Fahar (1991) who studied the diversity and phenology of weed communities in the Nile Delta. Zaki and Mashaly (1992) studied the seasonal aspects of the flora of the field crops in Mansoura District. The species richness and phenology of vegetation along irrigation canals and drains in the Nile Delta were studied by Shaltout *et al.* (1994). Shalaby (1995) described the floristic features in field crops and canal banks in Kafr El-Sheikh Governorate. El-Demerdash *et al.* (1997) studied the weed flora associated with field crops and orchards in Dakahleya Governorate. El-Kady *et al.* (1999), describes the variation in the weed flora associated with twelve common orchards in the middle Delta region. The weed flora of Date palm orchards were studied in the northwest of the Nile Delta by El-Fahar

(2000) and El-Halawany (2000) respectively. Sheded and Turki (2000) studied the weed flora associated with field crops and orchards in Menofiya governorate. The present investigation aims at studying the floristic composition in the area of Damietta Province to analyse its flora and to detect the taxonomic, geographic and chorological significance of its components.

Study Area

Damietta district is located in the extreme part of the Damietta branch of the Nile, north east Nile Delta (Fig. 1). The total agriculture area of this district is 115892 feddans. Out of this area, 109356 feddans is cultivated with field crops and 6536 feddans is cultivated with orchards. The study area is influenced by the Mediterranean climatic conditions. According to Ayyad *et al.* (1983), this area lies in the attenuated arid province characterized by a short dry period, with warm summer (20-34.5°C), mild winter (10-20°C) with an aridity index (P/ETP) less than 0.03, where P is the precipitation and ETP is the potential evapotranspiration according to Penman's formula. The mean relative humidity in the area is 66.5%. The rainfall was (100 mm/y) during winter season.

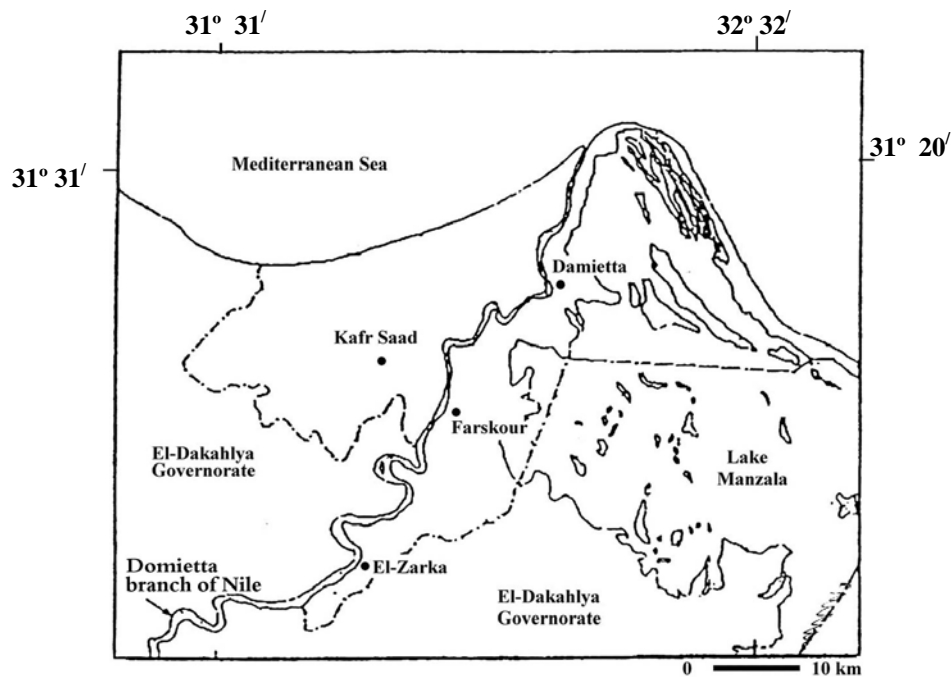


Fig.1. Map of Damietta Governorate showing different sites (•) of the study area.

Methods

Between 1999 – 2000, extensive field trips were carried out to the study area. Sampling sites were selected to cover the major agricultural sectors of Damietta district: Damietta, Kafr Saad, Faraskour and El-Zarka. (Fig. 1). The major field crops selected for this study were: wheat (*Triticum aestivum*), clover (*Trifolium alexandrinum*), broad bean (*Vicia faba*) as winter crops and maize (*Zea mays*), cotton (*Gossypium barbadense*) and rice (*Oryza sativa*) as summer crops. Fields of summer and winter vegetables were also surveyed. In orchards, were raised grape (*Vitis vinifera*) and gugava (*Psidium guajava*). Furthermore, canal bank plants have been recorded in each locality during the regular visits. Identification and nomenclature of plants followed Tackholm (1974) and Boulos (1995). The description and classification of life forms are due to Raunkiaer (1934). Analysis of phytogeographical ranges are carried out according to Tutin *et al.* (1964-1980), Zohary (1966 & 1972), Davis (1965-1985) and Meikle (1977 & 1985). Voucher specimens were deposited in the Herbarium of Botany Department, Faculty of Science, Mansoura University.

Results

1. Floristic records

The records of weed assemblages in the different habitats under investigation are summed in terms of presence estimates (P%). Table (1) present the floristic composition of three habitats namely: canal and canal banks, orchards and field crops in Damietta area. It shows that, the total number of weeds recorded in the study area is 171 species including 65 perennials, 8 biennials and 98 annuals. The perennials comprise 12 species recorded in all habitats (p= 100%), 14 species recorded in two habitats (P = 66.66%) and 39 species recorded in only one habitat (P = 33.33%). The biennials include one species (*Apium graveolens*) which is recorded in the three habitats (P = 100%), five species recorded in two habitats (P = 66.66%) namely: *Beta vulgaris*, *Chenopodium ambrosoides*, *Rorippa palustris*, *Sesbania sericea* and *Spergularia marina*; *Centaurea calcitrapa* and *Coronopus squamatus* are recorded in one habitat only (P = 33.33%).

On the other hand, the annuals (98 species) can be grouped under three categories (Table 1):

- a- All year annuals including 14 species recorded in the habitats (P = 100%).
- b- Winter-spring annuals comprising 64 species are distributed as follows: 19 species recorded in three habitats (P = 100%), 15 species in two habitats (P = 66.66%) and 30 species in only one habitat (P = 33.33%).
- c- Summer-autumn annuals comprise 20 species are, of which: 10 species were recorded two habitats (P = 66.66%) and another 10 species were recorded in one habitat (P = 33.33%).

Table (1). Floristic composition of the different habitat types of the study area.

No	Species	Life form	Chorophyte	Habitat type			Pres-ence	Presence Percent-age
				Canal bank	Field Crop	Orchard		
A. Perennials:-								
1	<i>Alternanthera sessilis</i> (L.) DC.	He	PAN	+	+	+	3	100.00
2	<i>Aster squamatus</i> (Spreng.) Hieron	CH	NEO	+	+	+	3	100.00
3	<i>Cynodon dactylon</i> (L.) Pers.	G	COSM	+	+	+	3	100.00
4	<i>Cyperus rotundus</i> L.	G	PAN	+	+	+	3	100.00
5	<i>Leptochloa fusca</i> (L.) Kunth	G, He	PAL	+	+	+	3	100.00
6	<i>Lotus glaber</i> Mill	H	ER-SR+M+IR-TR	+	+	+	3	100.00
7	<i>Paspalum distichum</i> L.	G	PAN	+	+	+	3	100.00
8	<i>Phragmites australis</i> (Cav)Trin. ex steud.	G, He	COSM	+	+	+	3	100.00
9	<i>Phyla nodiflora</i> (L.) Greene	Ch	PAN	+	+	+	3	100.00
10	<i>Plantago major</i> L.	H	COSM	+	+	+	3	100.00
11	<i>Pluchea dioscoridis</i> (L.) DC	NPh	S-Z + SA-SI	+	+	+	3	100.00
12	<i>Polypogon viridis</i> (Gouan) Breistr	H	ME+IR-TR+ER-SR	+	+	+	3	100.00
13	<i>Bromus catharticus</i> Vahl	G	ER-SR+ME+IR-TR	-	+	+	2	66.66
14	<i>Convolvulus arvensis</i> L.	H	COSM	+	+	-	2	66.66
15	<i>Cyperus alopecuroides</i> Rottb.	He	PAN	+	+	-	2	66.66
16	<i>Echinochloa stagnina</i> (Retz.) P. Beanv.	G, He	PAL	+	+	-	2	66.66
17	<i>Imperata cylindrica</i> (L.) Beauv.	H	PAL	+	-	+	2	66.66
18	<i>Leersia hexandra</i> Swartz	He	PAN	+	+	-	2	66.66
19	<i>Lemna gibba</i> L.	Hy	COSM	+	+	-	2	66.66
20	<i>Mentha longifolia</i> (L.) Huds.	He	PAL	+	+	-	2	66.66
21	<i>Oxalis corniculata</i> L.	H	COSM	+	+	-	2	66.66
22	<i>Panicum repens</i> L.	G	PAN	+	-	+	2	66.66
23	<i>Paspalidium geminatum</i> (Forssk..) Stapf.	He	PAL	+	-	+	2	66.66
24	<i>Persicaria salicifolia</i> Broussex Willd	G	PAL	+	-	+	2	66.66
25	<i>Polygonum equisetiforme</i> Sibth. & Sm.	G	ME + IR – TR	+	-	+	2	66.66
26	<i>Sonchus macrocarpus</i> Boulos et. C.Jeffrey	Ch	Egypt (endemic)	+	-	+	2	66.66
27	<i>Adiantum capillus-veneris</i> L.	He	ME+IR-TR-ER-SR	+	-	-	1	33.33
28	<i>Alhagi graecorum</i> Boiss.	H	PAL	+	-	-	1	33.33
29	<i>Arthrocnemum macrostachyum</i> (Moric.) Moris et Delponte	Ch	ME+SR-SI	+	-	-	1	33.33
30	<i>Arundo donax</i> L.	He, G	Cult. & Nat.	+	-	-	1	33.33
31	<i>Atriplex portulacoides</i> L.	Ch	ME+ER-SR+IR-TR	+	-	-	1	33.33
32	<i>Carex extensa</i> Good	G	ME+ER-SR	+	-	-	1	33.33
33	<i>Ceratophyllum demersum</i> L.	Hy	COSM	+	-	-	1	33.33
34	<i>Cressa cretica</i> L.	H	ME+PAL	+	-	-	1	33.33
35	<i>Cynanchum acutum</i> L.	H	ME+IR-TR	+	-	-	1	33.33
36	<i>Cyperus articulatus</i> L.	G, He	PAL	+	-	-	1	33.33
37	<i>Cyperus Laevigatus</i> L.	G, He	PAL	+	-	-	1	33.33
38	<i>Eichhornia crassipes</i> (Mart.) Solms-Laub.	Hy	NEO	+	-	-	1	33.33
39	<i>Elymus elongatus</i> (Host) Runemark	G	ME	+	-	-	1	33.33
40	<i>Halocnemum strobilaceum</i> (Pallas) M.Bieb.	Ch	ME+IR-TR+SA-SI	+	-	-	1	33.33
41	<i>Heliotropium curassavicum</i> L.	Ch	NEO	+	-	-	1	33.33
42	<i>Inula crithmoides</i> L.	Ch	ME+IR-TR-ER-SR	+	-	-	1	33.33
43	<i>Ipomoea carnea</i> Jacq.	Ch	Cult. & Nat.	+	-	-	1	33.33
44	<i>Juncus acutus</i> L.	He	ME+IR-TR+ER-SR	+	-	-	1	33.33
45	<i>Juncus rigidus</i> Desf.	G, He	ME+SA-SI+IR-TR	+	-	-	1	33.33
46	<i>Juncus subulatus</i> Forssk.	G, He	ME+IR-TR+SA-SI	+	-	-	1	33.33
47	<i>Limonium narbonneuse</i> Mill	H	ME	+	-	-	1	33.33
48	<i>Ludwigia stolonifera</i> (Guill et Perr.) Raven	He	S-Z	+	-	-	1	33.33
49	<i>Nymphaea lotus</i> L. var. <i>aegyptia</i> Tuzs.	Hy	PAL	+	-	-	1	33.33

Table (1). Cont.

No	Species	Life form	Chorophyte	Habitat type			Pres-ence	Presence Percent-age
				Canal bank	Field Crop	Orchard		
50	<i>Persicaria lapathifolia</i> Willd.	G	PAL	+	-	-	1	33.33
51	<i>Persicaria senegalensis</i> (Meisn) Sojak	G	PAL	+	-	-	1	33.33
52	<i>Pistia stratiotes</i> L.	Hy	PAN	+	-	-	1	33.33
53	<i>Saccharum spontaneum</i> L.	G.He	ME + PAL	+	-	-	1	33.33
54	<i>Scirpus litoralis</i> Schrad	G	ME + PAL	+	-	-	1	33.33
55	<i>Scripus maritimus</i> L.	G	COSM	+	-	-	1	33.33
56	<i>Silybum marianum</i> (L.) Gaertn	H	ME+IR-TR+ER-SR	+	-	-	1	33.33
57	<i>Sorghum virgatum</i> (Hack) stapf	G	SA-SI	+	-	-	1	33.33
58	<i>Suaeda pruinosa</i> lang.	Ch	ME	+	-	-	1	33.33
59	<i>Suaeda vera</i> Forssk. ex. J.F. Gmelin	Ch	ME+SA-SI+ER-SR	+	-	-	1	33.33
60	<i>Tamarix nilotica</i> (Ehrenb.) Bge.	NPh	SA-SI+S-Z	+	-	-	1	33.33
61	<i>Tamarix tetragyna</i> Ehrenb.	NPh	SA-SI+ME+IR-TR	+	-	-	1	33.33
62	<i>Typha domingensis</i> Pers.	He	PAN	+	-	-	1	33.33
63	<i>Veronica anagallis-aquatica</i> L.	He	COSM	+	-	-	1	33.33
64	<i>Vigna luteola</i> (Jacq.) Benth.	H	PAL	+	-	-	1	33.33
65	<i>Zygophyllum aegyptium</i> A. Hosny	Ch	ME	+	-	-	1	33.33
B. Biennials:								
1	<i>Apium graveolens</i> L.	Th	ME+ER-SR+IR-TR	+	+	+	3	100.00
2	<i>Beta vulgaris</i> L.	Th	ME+IR-TR+ER-SR	-	+	+	2	66.66
3	<i>Chenopodium ambrosioides</i> L.	Th	COSM	+	-	+	2	66.66
4	<i>Rorippa palustris</i> (L.) Besser	Th	ME+ER-SR+IR-TR	+	+	-	2	66.66
5	<i>Sesbania sericea</i> (Willd.) Link	Th	PAL	+	+	-	2	66.66
6	<i>Spergularia marina</i> L.	Th	ER-SR+ME+IR-TR	+	+	-	2	66.66
7	<i>Centaurea calcitrapa</i> L.	Ch	ME+ER-SR	+	-	-	1	33.33
8	<i>Coronopus squamatus</i> (Forssk.) Asch.	Th	ME+ER-SR+IR-TR	-	+	-	1	33.33
C. Annuals:								
a. All year annuals:								
1	<i>Amoranthus lividus</i> L.	Th	ME+IR-TR	+	+	+	3	100.00
2	<i>Chenopodium glaucum</i> L.	Th	ME+ER-SR	+	+	+	3	100.00
3	<i>Chenopodium murale</i> L.	Th	COSM	+	+	+	3	100.00
4	<i>Conyza bonariensis</i> (L.) Crong.	Th	NEO	+	+	+	3	100.00
5	<i>Echinochloa colona</i> (L.) Link	Th	PAN	+	+	+	3	100.00
6	<i>Echinochloa crus-galli</i> (L.) P. Beauv.	Th	PAN	+	+	+	3	100.00
7	<i>Gnaphalium luteo-album</i> L.	Th	COSM	+	+	+	3	100.00
8	<i>Hibiscus trionum</i> L.	Th	PAL	+	+	+	3	100.00
9	<i>Portulaca oleracea</i> L.	Th	COSM	+	+	+	3	100.00
10	<i>Rumex dentatus</i> L.	Th	ME+IR-TR+SA-SI	+	+	+	3	100.00
11	<i>Solanum nigrum</i> L.	Th	COSM	+	+	+	3	100.00
12	<i>Sonchus oleraceus</i> L.	Th	COSM	+	+	+	3	100.00
13	<i>Conyza aegyptiaca</i> (L.) Dryand.	Th	ME	-	+	+	2	66.66
14	<i>Ethulia conyzoides</i> L.	Th	PAL	+	+	-	2	66.66
b. Winter-spring annuals:								
1	<i>Anagallis arvensis</i> L. var. <i>arvensis</i>	Th	COSM	+	+	+	3	100.00
2	<i>Anagallis arvensis</i> L. var. <i>caerulea</i> (L.) Gouan	Th	COSM	+	+	+	3	100.00
3	<i>Centaureum pulchellum</i> (Swartz) Druce	Th	ME+IR-TR+ER-SR	+	+	+	3	100.00
4	<i>Chenopodium album</i> L.	Th	COSM	+	+	+	3	100.00
5	<i>Chenopodium ficifolium</i> Sm.	Th	ME-ER-SR	+	+	+	3	100.00
6	<i>Cichorium endivia</i> L.	Th	ME+IR-TR	+	+	+	3	100.00
7	<i>Coronopus didymus</i> (L.) Sm.	Th	COSM	+	+	+	3	100.00
8	<i>Lolium perenne</i> L.	Th	ME+ER-SR+IR-TR	+	+	+	3	100.00

Table (1). Cont.

No	Species	Life form	Chorophyte	Habitat type			Pres-ence	Presence Percent-age
				Canal bank	Field Crop	Orchard		
9	<i>Malva parviflora</i> L.	Th	ME+IR-TR	+	+	+	3	100.00
10	<i>Medicago intertexta</i> (L.) Mill.	Th	ME+ER-SR	+	+	+	3	100.00
11	<i>Medicago polymorpha</i> L.	Th	COSM	+	+	+	3	100.00
12	<i>Melilotus indicus</i> (L.) All.	Th	ME+IR-TR+SA-SI	+	+	+	3	100.00
13	<i>Phalaris minor</i> Retz.	Th	ME+IR-TR	+	+	+	3	100.00
14	<i>Polypogon monspeliensis</i> (L.) Desf.	Th	COSM	+	+	+	3	100.00
15	<i>Senecio glaucus</i> L.	Th	ME+SA-SI+IR-TR	+	+	+	3	100.00
16	<i>Setaria verticillata</i> (L.) P. Beauv.	Th	COSM	+	+	+	3	100.00
17	<i>Sisymbrium irio</i> L.	Th	ME+IR-TR+ER-SR	+	+	+	3	100.00
18	<i>Trifolium resupinatum</i> L.	Th	ME+IR-TR+ER-SR	+	+	+	3	100.00
19	<i>Vicia sativa</i> L.	Th	ME+IR-TR+ER-SR	+	+	+	2	100.00
20	<i>Ammi majus</i> L.	Th	ME+IR-TR+ER-SR	+	+	-	2	66.66
21	<i>Atriplex prostrata</i> DC.	Th	ME+ER-SR+IR-TR	+	+	-	2	66.66
22	<i>Avena fatua</i> L.	Th	PAL	+	+	-	2	66.66
23	<i>Bassia indica</i> (Wight) A.J. Scott.	Th	S-Z+IR-TR	+	+	-	2	66.66
24	<i>Bidens pilosa</i> L.	Th	PAN	+	-	+	2	66.66
25	<i>Capsella bursa-pastoris</i> L. Medik.	Th	COSM	-	+	+	2	66.66
26	<i>Euphorbia peplus</i> L.	Th	ER-SR+ME+IR-TR	-	+	+	2	66.66
27	<i>Hordeum marinum</i> Huds.	Th	ME+IR-TR+ER-SR	+	-	+	2	66.66
28	<i>Lathyrus hirsuta</i> L.	Th	ME+IR-TR+ER-SR	-	+	+	2	66.66
29	<i>Lepidium sativum</i> L.	Th	ME	+	-	+	2	66.66
30	<i>Poa annua</i> L.	Th	COSM	-	+	+	2	66.66
31	<i>Ranunculus sceleratus</i> L.	Th	ME+IR-TR+ER-SR	+	+	-	2	66.66
32	<i>Senecio vulgaris</i> L.	Th	ME+ER-SR+IR-TR	+	+	-	2	66.66
33	<i>Torilis arvensis</i> (Huds.) Link	Th	ME+IR-TR+ER-SR	+	-	+	2	66.66
34	<i>Urtica urens</i> L.	Th	ME+ER-SR+IR-TR	+	-	+	2	66.66
35	<i>Aegilops bicornis</i> (Forssk.) Jaub. & Spach	Th	ME+SA-SI	+	-	-	1	33.33
36	<i>Anthemis pseudocotula</i> Boiss.	Th	ME	+	-	-	1	33.33
37	<i>Brassica nigra</i> (L.) Koch	Th	COSM	-	+	-	1	33.33
38	<i>Brassica rapa</i> L.	Th	Cult.	-	+	-	1	33.33
39	<i>Brassica tournefortii</i> Gouan	Th	ME+IR-TR+SA-SI	-	+	-	1	33.33
40	<i>Bromus diandrus</i> Roth	Th	ME	+	-	-	1	33.33
41	<i>Cakile maritima</i> Scop.	Th	ME+ER-SR	+	-	-	1	33.33
42	<i>Cenchrus biflorus</i> Roxb.	Th	NEO	-	-	+	1	33.33
43	<i>Cuscuta pedicellata</i> Ledeb.	P	S-Z+SA-SI+IR-TR	-	+	-	1	33.33
44	<i>Emex spinosa</i> (L.) Campd.	Th	ME+SA-SI	-	-	+	1	33.33
45	<i>Euphorbia helioscopia</i> L.	Th	ME+IR-TR+SA-SI	-	-	+	1	33.33
46	<i>Lactuca serriola</i> L.	Th	ME+IR-TR+ER-SR	-	-	+	1	33.33
47	<i>Lamium amplexicaula</i> L.	Th	ME+IR-TR+ER-SR	-	-	+	1	33.33
48	<i>Lathyrus aphaca</i> L.	Th	ME+IR-TR+ER-SR	-	-	+	1	33.33
49	<i>Lathyrus pseudocicera</i> Pomp.	Th	ME	-	-	+	1	33.33
50	<i>Lolium multiflorum</i> Lam.	Th	ME+ER-SR+IR-TR	-	+	-	1	33.33
51	<i>Mesembryanthemum crystallinum</i> L.	Th	ME+ER-SR	+	-	-	1	33.33
52	<i>Mesembryanthemum nodiflorum</i> L.	Th	ME+SA-SI+ER-SR	+	-	-	1	33.33
53	<i>Orobancha crenata</i> Forssk.	P	ME+IR-TR	-	+	-	1	33.33
54	<i>Parapholis incurva</i> (L.) C.E. Hubb.	Th	ME+IR-TR+ER-SR	+	-	-	1	33.33
55	<i>Pennisetum glaucum</i> (L.) R. Br.	Th	PAL	-	-	+	1	33.33
56	<i>Reichardia tingitana</i> (L.) Roth	Th	ME+SA-SI+IR-TR	+	-	-	1	33.33
57	<i>Schismus barbatus</i> (L.) Thell.	Th	ME+IR-TR+SA-SI	-	+	-	1	33.33
58	<i>Setaria viridis</i> (L.) P. Beauv.	Th	PAL	+	-	-	1	33.33
59	<i>Silene rubella</i> L.	Th	PAL	-	-	+	1	33.33

Table (1). Continued.

No	Species	Life form	Chorophyte	Habitat type			Pres-ence	Presence Percent-age
				Canal bank	Field Crop	Orchard		
60	<i>Sinapis arvensis</i> L.	Th	COSM	-	+	-	1	33.33
61	<i>Stellaria pallida</i> (Dumort.) Pire	Th	ME+ER-SR	-	-	+	1	33.33
62	<i>Suaeda maritima</i> (L.) Dumort.	Th	ME+ER-SR+IR-TR	+	-	-	1	33.33
63	<i>Urospermum picrioides</i> (L.) F. W. Schmidt	Th	ME-IR-TR	+	-	-	1	33.33
64	<i>Vicia monantha</i> Retz.	Th	ME+ER-SR	-	-	+	1	33.33
C. Summer autumn annuals:								
1	<i>Amaranthus graecizans</i> L.	Th	ME+IR-TR	+	+	-	2	66.66
2	<i>Amaranthus hybridus</i> L.	Th	PAL	+	+	-	2	66.66
3	<i>Amaranthus tricolor</i> L.	Th	PAL	-	+	+	2	66.66
4	<i>Corchorus olitorius</i> L.	Th	PAL	-	+	+	2	66.66
5	<i>Dactyloctenium aegyptium</i> (L.) P. Beauv.	Th	PAL	-	+	+	2	66.66
6	<i>Dinebra retroflexa</i> (Vahl) Panz	Th	PAN	-	+	+	2	66.66
7	<i>Eclipta alba</i> (L.) Hassk.	Th	NEO	-	+	+	2	66.66
8	<i>Eleusine indica</i> (L.) Gaertn.	Th	PAL	-	+	+	2	66.66
9	<i>Sida alba</i> L.	Th	PAN	+	+	-	2	66.66
10	<i>Xanthium strumarium</i> L.	Th	COSM	+	-	+	2	66.66
11	<i>Abutilon theophrasti</i> Medik.	Th	ME+IR-TR+ER-SR	-	+	-	1	33.33
12	<i>Ammania baccifera</i> L.	Th	S-Z+IR-TR	-	+	-	1	33.33
13	<i>Ammania senegalensis</i> Lam.	Th	PAN	-	+	-	1	33.33
14	<i>Bergia capensis</i> L.	Th	PAL	-	+	-	1	33.33
15	<i>Cyperus difformis</i> L.	Th	PAL	-	+	-	1	33.33
16	<i>Digitaria sanguinalis</i> (L.) Scop.	Th	PAN	-	-	+	1	33.33
17	<i>Euphorbia heterophylla</i> L.	Th	PAN	-	-	+	1	33.33
18	<i>Euphorbia prostrata</i> Aiton	Th	PAN	-	+	-	1	33.33
19	<i>Salsola Kali</i> L.	Th	COSM	+	-	-	1	33.33
20	<i>Verbena supina</i> L.	Th	IR-TR+SA-SI	+	-	-	1	33.33

Nph : Nanophanerophytes

Ch : Chamaephytes

H : Hemicryptophytes

G : Geophytes

He : Helophytes

ER-SR : Euro-Siberian

Th : Therophytes

COSM : Cosmopolitan

PAN : Pantropical

PAL : Palaeotropical

NEO : Neotropical

ME : Mediterranean

P: Parasites

IR-TR: Irano-Turanian

S-Z: Sudano-Zambezian

Nat.: Naturalized

Cult.: Cultivated

Hy : Hydrophytes

SA-SI: Saharo-Sindian

2. Plant life-span

According to the duration or life-span, the weeds growing in the area of study can be distinguished into three major groups: annuals, biennials and perennials. As mentioned before, the total recorded species in the study area are 171 taxa classified into 98 annuals (57.31%), 8 biennials (4.68%) and 65 perennials (38.01%) (Fig. 2a).

In the canal and canal bank habitat, 130 species are recorded including: 64 perennials (49.23%), 6 biennials (4.61%) and 60 annuals (46.15%) (Fig. 2b). In the field crop-orchard habitat; 91 species were recorded which classified into: 20 perennials (21.98%), 6 biennials

(6.59%) and 65 annuals (71.43%) (Fig. 2c). In the orchard habitat, 83 species are recorded which categorised into: 19 perennials (22.89%), 3 biennials (3.61%) and 61 annuals (73.49%) (Fig. 2d).

It is interesting to denote that, the canal and canal bank is floristically the richest habitat in the study area followed by the field crop habitat type and then the orchard type. It is also obvious that, the annuals are the most frequent species in the different habitats followed by the perennial species and then the less frequent biennial species.

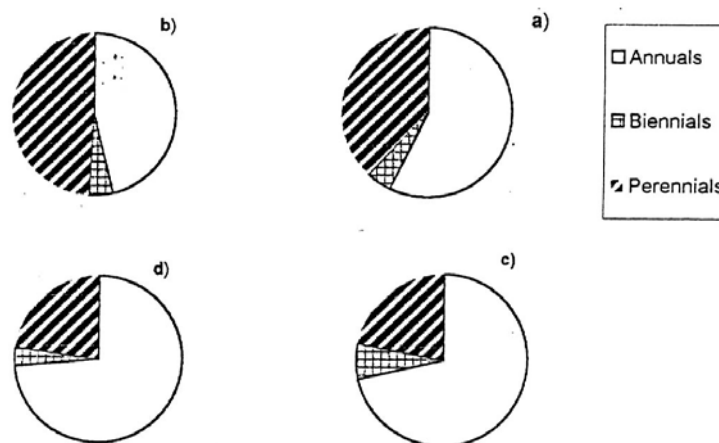


Fig. 2. Plant life span spectra: a. The total recorded species in the study area, b. Canal and canal bank habitat, c. Field crops habitat and d. Orchard habitat.

3. Plant life-forms

In the study area, the recorded species (171) are grouped under 6 types of life-forms according to Raunkiaer (1934) as follows: therophytes (103 species = 60.23%), cryptophytes (38 species = 22.22%), chamaephytes (13 species = 7.60%), hemicryptophytes (12 species = 7.02%), nanophanerophytes (3 species = 1.75%) and parasites (2 species = 1.17%) (Fig. 3a).

It is evident that, the relative percentages of the life-form spectra vary from one habitat type to the other (Fig. 3a,b,c and d). In the canal bank habitat, the recorded species (130) are classified into the following 5 types of life-forms: therophytes (51.54%), cryptophytes (28.46%), hemicryptophytes (7.69%), chamaephytes (10%) and nanophanerophytes (2.31%). In the habitat of field crop, the recorded species (91) are grouped into the following life-forms: therophytes (75.82%), cryptophytes (15.38%), hemicryptophytes (3.3%), chamaephytes (2.20%), nanophanerophytes (1.10%) and parasites (2.20%). In the orchard habitat, five types of life-forms are distinguished, these are: therophytes (78.31%),

cryptophytes (14.46%), hemicryptophytes (3.61%), chamaephytes (2.41%) and nanophanerophytes (1.20%).

It is worth to mention that, the life-form spectrum in all habitat types of the study area is mainly represented by therophytes and partly by cryptophytes, hemicryptophytes and chamaephytes with a negligible values for both of nanophanerophytes and parasites. The later life-form is completely missed in both of canal bank and orchard habitat types.

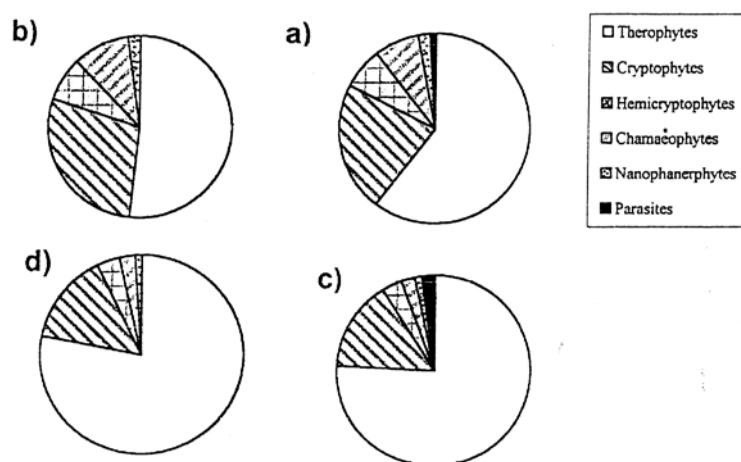


Fig. 3. Plant life forms spectra: a. The total recorded species in the study area, b. Canal and canal bank habitat, c. Field crops habitat and d. Orchard habitat.

4. Floristic analysis

The total number of flowering plant species surveyed in the present study is 171 belonging to 128 genera and related to 44 families (Table 2). Gramineae (36 species), Compositae (21), Chenopodiaceae (15), Leguminosae (13) and Cruciferae (11) are represented collectively by 96 species or about 56.14% of the total number of the recorded species. Cyperaceae (8 species), Polygonaceae (6 species), Amaranthaceae (5 species), Euphorbiaceae and Malvaceae (4 species each) comprise 15.79% of the total number of species. Caryophyllaceae, Convolvulaceae, Juncaceae and Umbelliferae are represented by 3 species each. The remaining families (30) are either represented by 2 or one species.

Floristically and as shown in Table (2), the most common chorotypes of the Gramineae are: Palaeotropical (8 species), Pantropical (7 species), pluriregional (6 species), biregional and Cosmopolitan (4 species each). In Compositae the most common floristic elements are: pluriregional (6 species), biregional (4 species), Cosmopolitan and Neotropical (3 species each). The most abundant floristic elements in Chenopodiaceae are: Cosmopolitan and pluriregional (5 species each) and biregional (4 species). In Leguminosae, the most common elements are: pluriregional (6 species) and Palaeotropical (3 species), while in Crucifere; Cosmopolitan and pluriregional are the most abundant floristic elements (4 species each). Other families (with less than 10 species each) comprise different types of floristic elements which are generally represented by a few number of species.

Table (2). The principal floristic categories of the families of the Damietta Province. Abbreviations (see table 1).

Family	Genera	Species	COSM	PAN	PAL	NEO	Pluri-regional	Biregional	ME→PAL	ME	SA-SI	Endemic	S-Z	Nat. & Cult.
Adiantaceae	1	1					1							
Aizoaceae	1	2					1	1						
Amaranthaceae	2	5		1	2			2						
Araceae	1	1		1										
Asclepiadaceae	1	1						1						
Boraginaceae	1	1				1								
Caryophyllaceae	3	3			1		1	1						
Ceratophyllaceae	1	1	1											
Chenopodiaceae	8	15	5				5	4		1				
Compositae	18	21	3	1	1	3	6	4	1	2		1		
Convolvulaceae	3	3	1											1
Cruciferae	8	11	4				4	1		1				1
Cuscutaceae	1	1					1							
Cyperaceae	3	8	1	4	1			1	1					
Elatinaceae	1	1			1									
Euphorbiaceae	1	4		2			2							
Gentianaceae	1	1					1							
Gramineae	30	36	4	7	8	1	6	4	2	2	1			1
Juncaceae	1	3					3							
Labiatae	2	2			1		1							
Leguminosae	8	13	1		3		6	2		1				
Lemnaceae	1	1	1											
Lythraceae	1	2		1				1						
Malvaceae	4	4		1	1		1	1						
Nymphaeaceae	1	1					1							

Table (2). Continued.

Family	Genera	Species	COSM	PAN	PAL	NEO	Pluri - regional	Biregional	ME→PAL	ME	SA-SI	Endemic	S-Z	Nat. & Cull.
Onagraceae	1	1											1	
Orobanchaceae	1	1						1						
Oxalidaceae	1	1	1											
Plantaginaceae	1	1	1											
Plumbaginaceae	1	1								1				
Polygonaceae	4	6			3		1	2						
Pontederiaceae	1	1				1								
Portulacaceae	1	1	1											
Primulaceae	1	2	2											
Ranunculaceae	1	1					1							
Scrophulariaceae	1	1	1											
Solanaceae	1	1	1											
Tamaricaceae	1	2					1	1						
Tiliaceae	1	1		1										
Typhaceae	1	1		1										
Umbelliferae	3	3					3							
Urticaceae	1	1					1							
Verbenaceae	2	2		1				1						
Zygophyllaceae	1	1								1				
Total	128	171	28	21	22	6	47	28	4	9	1	1	1	3
Percentage (%)			16.37	12.28	12.86	3.51	27.49	16.37	2.34	5.26	0.59	0.59	0.59	1.75

The floristic analysis of the study area as shown in Table 3 reveals that, 81 species or about 47.37% of the total recorded species are Mediterranean taxa. These taxa are either pluriregional (46 species = 26.90%), biregional (26 species = 15.20%) or monoregional (9 species = 5.26%). It has been also found that, 77 species or about 45.03% of the total number of recorded species are either Cosmopolitan (16.37%), Palaeotropical (12.86%), Pantropical (12.28%) or Neotropical (3.51%). The other floristic categories are poorly represented where each chorotype is represented by a few number of species. In general, the Cosmopolitan, Pantropical, Palaeotropical and Neotropical elements are obviously comparable in all habitats of the study area (Table 3). While, the Mediterranean element is highly represented in canal bank habitat (41 species), followed by the field crop habitat (36 species) and then the orchard habitat type (26 species). Some floristic categories are missed in different habitat types.

Table (3). Number of species and percentage of various floristic categories of the different habitats. Abbreviations (see table 1).

No.	Floristic category	Total area		Habitat type					
				Orchards		Field Crops		Canal and drain banks	
		No.	%	No.	%	No.	%	No.	%
1	COSM	28	16.37	19	22.89	22	24.17	24	18.46
2	PAN	21	12.28	12	14.46	12	13.19	13	10.00
3	PAL	22	12.86	10	12.05	13	14.29	19	14.62
4	NEO	6	3.51	4	4.82	3	3.30	4	3.08
5	ME + IR + TR + ER-SR	33	19.30	18	21.69	21	23.08	23	17.69
6	ME + IR-TR+SA-SI	10	5.85	3	3.62	5	5.49	8	6.15
7	ME + SA-SI + ER-SR	3	1.75	1	1.20	-	-	3	2.31
8	SA-SI + S-Z + IR – TR	1	0.59	-	-	1	1.10	-	-
9	ME + IR – TR	10	5.85	5	6.02	6	6.59	8	6.15
10	ME + ER – SR	9	5.26	5	6.02	3	3.30	7	5.38
11	ME + PAL	4	2.34	-	-	-	-	3	2.31
12	ME + SA – SI	3	1.75	1	1.20	-	-	2	1.54
13	SA – SI + S-Z	3	1.75	1	1.20	1	1.10	2	1.54
14	S – Z + IR – TR	2	1.17	-	-	2	2.20	1	0.77
15	SA – SI + IR – TR	1	0.59	-	-	-	-	1	0.77
16	ME	9	5.26	3	3.62	1	1.10	7	5.38
17	SA – SI	1	0.59	-	-	-	-	1	0.77
18	Endemic	1	0.59	1	1.20	-	-	1	0.77
19	S-Z	1	0.59	-	-	-	-	1	0.77
20	Cult. & Nat.	3	1.75	-	-	1	1.10	2	1.54
	Total	171	100	83	100	91	100	130	100

Discussion

The present study in Damietta area reveals that, the natural plant wealth of the area is composed of 171 species belonging to 128 genera grouped into 44 families. Gramineae (36 species), Compositae (21 species), Chenopodiaceae (15 species), Leguminosae (13 species) and Cruciferae (11 species) are the major families contributing collectively with about 56.14% of the total recorded species. This indicate that, these five families are leading taxa and

constitute the main bulk of the flora in the study area. This agrees more or less with findings of Quézel (1978) concerning the floristic structure of the Mediterranean Africa, Mashaly (1987) concerning the floristic studies of Dakahlia-Damietta region and Shalaby (1995) on plant life at Kafr El-Sheikh province.

The recorded species (171 species) are classified into 65 perennial species (38.01%), 8 biennial species (4.68%) and 98 annual species (57.31%). The dominance of annuals could be attributed to the fact that, annuals have higher reproductive capacity and ecological, morphological and genetic plasticity under high levels of disturbance (e.g., agricultural practices; Grime, 1979). Shaltout and El-Fahar (1991) stated that, in cultivated crops, the predominance of annuals (>70%) in the weed communities in the Nile Delta is mainly related to the niche coincidence of both weeds and host crops. Raunkiaer (1934) designated the Mediterranean climate type as a "therophyte climate" because of the high percentage (more than 50% of the total species) of this life form in several Mediterranean floras (Raven, 1971). Plant life forms result from evolved adaptation to environment and climate (Kershaw, 1973). In the present study, the life form spectra indicated that, the therophytes are the most frequent type followed by cryptophytes. This trend is similar to spectra reported for canal bank habitat in the middle Delta region (El-Sheikh, 1989) field crop habitat in Kafr El-Sheikh Province (Shalaby, 1995) and orchard habitat in the middle Delta (El-Kady *et al.*, 1999).

From the phytogeographical point of view, Egypt is the meeting point of 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). In the present study, the Mediterranean taxa in Damietta area are represented by a relatively higher percentage of plant species (47.37%). This was confirmed by El-Demerdash *et al.* (1990) and Shalaby (1995). The other floristic elements such as Cosmopolitan, Pantropical, Palaeotropical, Irano-Turanian, Saharo-Sindian, Euro-Siberian Neotropical and Sudano-Zambezian elements are represented by varying number of species, reflecting their different capability to penetrate the region. This can be attributed to the influence of man and the history of agriculture in the study area.

Sonchus macrocarpus is known to be endemic in the Nile Delta region. It was firstly collected from the cultivated lands of Mansoura-Damietta region (Boulos and Jeffrey 1969), and recently by Mashaly (1987) from the same area and by Shalaby (1995) in Kafr El-Sheikh Province.

The present study favours that, the flora of Damietta area is mainly belonging to the Mediterranean Territory. This opinion is based on the findings in different directions such as: ecoclimatic condition, life-span, life-form spectra and chorological categories.

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