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Floristic Composition of the Plant Communities Associated with *Limoniastrum monopetalum* L.

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Abstract : The study aimed to conduct a comprehensive survey of the vegetationassociated with *Limoniastrum monopetalum* in the Mediterranean coastal desert. The total number of documented plant species scanned in this work was 81 species belonging to 63 genera and 26 families. The Chenopoidaceae family comprised 14 species of the total recorded species, followed by Asteraceae with 12 species, Poaceae with 10 species, Fabaceae with 5 species, and Caryophyllaceae and Zygophyllaceae with four species each. The deltaic Mediterranean coastal desert environment was characterized by 49 species, but the western desert ecosystem had the highest species richness with 73 species. The therophytes accounted for the largest proportion of reported species, at 45.24%. They were followed by chamaephytes and hemicryptophytes, both at 16.67%. The floristic analysis reveals that 72 species, which account for about 66.87%of the total recorded species, belong to the Mediterranean taxa. The taxa may be categorized as either multiregional (17 species, or 20.99%), biregional (24 species, or 29.63%), or monoregional (13 species, or 16.05%). The floristic analysis of the study area showed that Mediterranean taxa make up the majority of plant species and are used for food, animal fodder, agro-industrial raw materials, and medicine. Coastal desert ecosystems must be conserved and used wisely for sustainable development.

keywords: Limoniastrum species; Mediterreanean coast, Desert; Chorotype, Vegetation.

Introduction

Plants have been used since ancient times as a source of nourishment and medicinal products. Plants include a diverse array of bioactive chemical components and have often been used in traditional remedies or as concentrated active ingredients. Utilizing indigenous flora, whether cultivated or wild, as alternatives to artificial preparations is a sensible approach. The efficacy of traditional herbal remedies has been verified by several researchers. The use of herbal medicines as a form of complementary and alternative medicine has seen a substantial increase over the last 20 to 25 years [1,2].

Egypt comprises six phytogeographical regions [3,4], namely: The geographical regions of Egypt include the Mediterranean Coastal Region, the Eastern Desert, the Western Desert, the Sinai Peninsula, the Red Sea Coastal Region, and the River Nile Region. The prevailing natural factors in each location, including climate, soil, geomorphology, and subsurface water, impose limitations on the number and size of its ecosystems. The salt-affected areas, also known as saline ecosystems, are found in almost all six phytogeographical zones of Egypt [4].

Several semi-arid regions around the globe possess soil and water resources with excessive salinity levels, rendering them unsuitable for cultivating the most commercially viable crops [5]. The use of halophytic plants on salty soils for the purpose of pasture and fodder production is now the sole economically viable approach [6,7]. Halophytes comprise around 1%-2% of the global plant species, including both monocots and dicots (Kumari et al., 2015). Halophytes have a wide range of growth responses to higher salt levels, which may vary from inhibition to significant stimulation.

Halophytes universally need the regulation of cellular concentrations of Na^+, Cl^-, and K^+ as they adapt to changes in external water potential [8-11].

Limoniastrum is a halophyte that employs the tactic of salt absorption and secretion via specialized structures called salt glands located on its leaves. *L. monopetalum* is a wild plant belonging to the family Plumbaginaceae, and it is an obligatory halophyte. The plant in Egypt faced endangerment because of poorly executed urbanization. Plants have evolved several adaptations to cope with dryness and high salt levels via three mechanisms: avoidance, evasion, and tolerance. The adaptive processes include a spectrum of responses, including physiological adaptations as well as structural and morphological changes [12].

Several studies have been published in Egypt dealing with the floristic and phytosociological studies on the natural flora of the Deltaic seashore of Egypt [13-18]. The main objective of this study is to examine the floristic features of the indigenous plants associated with *L. monopetalum*, including records of wild species, duration, life-form distribution, and phytochorotype.

2. Materials and Methods

2.1. Study area

The research is focused on an area situated in the northern section of the Nile Delta region in Egypt. This area encompasses the northern boundaries of four Governorates: El-Dakahlia, Kafr El-Sheikh, El-Behira and Alexandria (Figure 1). The central portion of Egypt's Mediterranean coastline area, known as the Deltaic coast, stretches from Abu Quir in the west (longitude 32°19' E) to Port Said in the east (longitude 31°19' E). It spans around 180 km in length and has a breadth ranging from 5 to 15 km in a north-south direction from the shore.

Based on the globe distribution map of arid areas [19], the climate of the Mediterranean coastal desert is typically less dry compared to the southern sections of Egypt. The climatic conditions consist of pleasant summers, with temperatures ranging from 20 to 31ºC, and moderate winters, with temperatures ranging from 10 to 20 ºC [20].

2.2. Estimation of plant species

The stands were strategically distributed across the study area to guarantee the collection of a diverse range of flora types and to include various ecosystems. The collected samples are stored at the herbarium located at the Faculty of Science, Mansoura University. The categorization approach used in this research for categorizing survey flora was based on Raunkiaer's taxonomy [21]. The works of Davis [22], Zohary [23], Täckholm [24], Feinbrun-Dothan [25], and Boulos [26] were used for the purposes of categorization, identification, naming, and the classification of plant species.

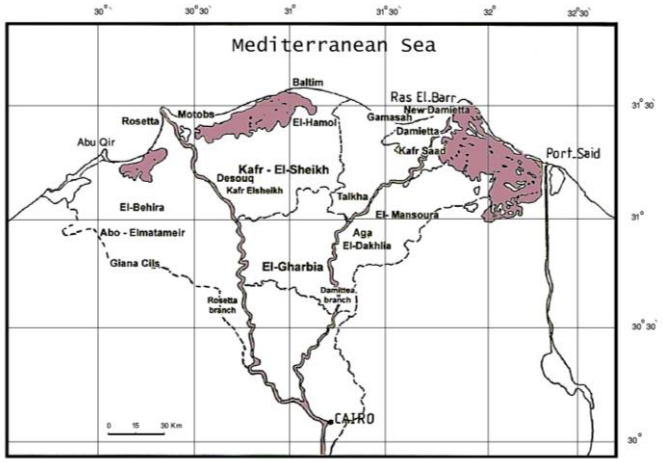


Figure 1: Map of Nile Delta (Egypt) showing the study area.

3. Results and Discussion

3.1. Floristic Composition and Distribution of Plant Species in the Study Area

The study's reported plant species are aggregated in terminology of their presence percentages (P%). Table (1) represents the floristic configuration of plant species in the Deltaic Mediterranean coastal desert.

Based on the tabulated data, the study area had a total of 81 distinct vascular plant species. The deltaic Mediterranean coastal desert environment was characterized by 49 species, but the western desert ecosystem had the highest species richness with 73 species, constituting around 90.13% of the total recorded species. The Western Mediterranean coastal belt is by far the richest part of Egypt in its floristic composition owing to its relatively high rainfall in the winter season [Zahran and Willis, 2009].

Table 1. Vegetation composition of the taxa of the different habitats in the study area.

No.	Species	Family	Life form	Floristic category	Habitat type		P%
					Deltaic coast	Western desert	
Perennials:							
1	*Aeluropus lagopoides* (L.) Trin. Ex Thwaites	Poaceae	H	SA-SI + IR-TR	+	+	6.38
2	*Alhagi graecorum* Boiss	Fabaceae	H	ME+IR-TR		+	12.77
3	*Arthrocnemum macrostachyum* (Moric.) K. Koch	Chenopodiaceae	Ch	ME+ SA-SI	+	+	31.91
4	*Atractylis carduus* (Forssk.) C.Chr.	Asteraceae	H	ME+SA-SI	+	+	17.02
5	Atriplex semibaccata. R.Br	Chenopodiaceae	H	AUST	+	+	10.64
6	Atriplex halimus L.	Chenopodiaceae	Nph	ME+SA-SI	+	+	14.89
7	Atriplex portulacoides L.	Chenopodiaceae	Ch.	ME+IR-TR+ER-SR		+	6.38
8	Calligonum polygonoides L. subsp. comosum (L' Her.) Soskov	Polygonaceae	Nph	SA-SI+ IR-TR	+	+	21.28
9	Cistanche phelypaea (L.) Cout.	Orobanchaceae	P, G	ME+SA-SI	+	+	8.51
10	Cressa cretica L	Convolvulaceae	H	ME+IR-TR	+	+	14.89
11	Cynanchum acutum L.	Asclepiadaceae	H	ME+IR-TR	+	+	8.51
12	Cyondon dactylon (L.) Pers.	Poaceae	G	PAN	+	+	17.02
13	Echinops spinosus L.	Asteraceae	H	ME+SA-SI	+	+	14.89
14	Fagonia arabica L.	Zygophyllaceae	Ch	SA-SI		+	6.38
15	Fagonia cretica L	Zygophyllaceae	Ch	Me		+	4.26
16	Frankenia hirsuta L	Frankeniaceae	H	ME+IR-TR+SA-SI	+		8.51
17	Halocnemum strobilaceum (Palla.) M. Bieb.	Chenopodiaceae	Ch	ME+IR-TR+SA-SI	+	+	59.57
18	Limbarda crithmoides (L.) Dumort.,FI.Belg.	Asteraceae	Ch	ME+ER-SR+SA-SI		+	10.64
19	Juncus acutus L.	Juncaceae	He	ME+IR-TR+ER-SR		+	6.38
20	Launaea mucronata (Forssk.) Muschl.	Asteraceae	H	ME+SA-SI	+	+	17.02
21	Launaea nudicaulis (L.) Hook.f.	Asteraceae	H	SA-SI		+	4.26
22	Limoniastrum monopetalum (L.) Boiss.	Plumbaginaceae	Ch	ME	+	+	100.00
23	Limonium delicatulum (Girard) Kuntze	Plumbaginaceae	G, He	SA-SI	+		2.13
24	Limonium pruinosum(L)Chaz	Plumbaginaceae	H	SA-SI	+	+	40.43
25	Lycium schweinfurthii subsp. aschersohnii	Solanaceae	Nph	ME		+	4.26
26	Lycium shawii Roem	Solanaceae	Nph	SA-SI+S-Z		+	12.77
27	Moltkiopsis ciliata (Forssk.) I. M. Johnst.	Boraginaceae	Ch	ME+SA-SI+S-Z	+		2.13
28	Pancratium maritimum L.	Amaryllidaceae	G	ME	+	+	14.89
29	Phragmites australis (Cav.) Trin. ex Steud.	Poaceae	G, He	COSM	+	+	42.55
30	Plantago crassifolia Forssk.	Plantaginaceae	H	ME		+	2.13
31	Pluchea dioscridis (L)DC	Asteraceae	Nph	SA-SI+S-Z		+	4.26
32	Retama raetam (Forssk.)Webb & Berthel.	Fabaceae	Nph	SA-SI		+	2.13
33	Salsola tetrandra Forssk.	Chenopodiaceae	Ch	SA-SI		+	8.51
34	Sarcocornia fruticosa (L.) A.J.Scott	Chenopodiaceae	Ch	ME+ SA-SI		+	8.51
35	Silene succulenta Forssk.	Caryophyllaceae	H	ME	+		12.77
36	Sporobolus pungens (Schreb.) Kunth.	Poaceae	G	PAN	+		2.13
37	Suaeda monoica Forssk.	Chenopodiaceae	Ch	ME+SA-SI		+	12.77
38	Suaeda pruinosa Lange	Chenopodiaceae	Ch	ME		+	23.40
39	Tamarix nilotica(Ehrenb)Bunge	Tamaricaceae	Nph	SA-SI+S-Z	+	+	25.53
40	Verbascum letourneuxii	Scrophulariaceae	Nph	ME+SA-SI		+	4.26
41	Zygophyllm aegyptium Hosny.	Zygophyllaceae	Ch	ME		+	6.38
42	Zygophyllum albam L.	Zygophyllaceae	Ch	ME+SA-SI	+	+	23.40
Biennials:							
43	Centaurea aegyptiaca L.	Asteraceae	Th	SA-SI		+	4.26
44	Spergularia marina (L.) Griseb.	Caryophyllaceae	Th	ME+IR-TR+ER-SR	+	+	10.64
Annuals:							
45	Aegilops bicornis (Forssk.) Jaub. & Spach	Poaceae	Th	ME+SA-SI	+	+	6.38
46	Anchusa humilis (Desf)L.M. Johnst	Boraginaceae	Th	ME+ SA-SI	+	+	10.64
47	Astragalus bombycinus Boiss.	Fabaceae	Th	SA-SI + IR-TR		+	6.38
48	Astragalus peregrinus Vahl	Fabaceae	Th	SA-SI		+	10.64
49	Atriplex lindleyi Moq.	Chenopodiaceae	Th	ME+IR-TR+ER-SR		+	8.51
50	Avena fatua L.	Poaceae	Th	PAL		+	6.38
51	Bassia indica (Wight)A. J. Scott.	Chenopodiaceae	Th	IR-TR+S-Z	+	+	17.02
52	Bromus diandrus Roth	Poaceae	Th	ME	+	+	6.38
53	Bupleurum nanum Poir.	Apiaceae	Th	ME+IR-TR+SA-SI		+	17.02
54	Cakile maritima Scop.	Brassicaceae	Th	ME+ER-SR	+	+	19.15
55	Centaurea glomerata Vahl	Asteraceae	Th	ME		+	10.64

56	Centaurium pulchellum(L)Fritsch	Gentianaceae	Th	ME+IR-TR+ER-SR	+	+	2.13
57	Chenopodium murale L.	Chenopodiaceae	Th	COSM	+	+	12.77
58	Cutandia memphitica (Spreng.) Benth.	Asteraceae	Th	ME+IR-TR+SA-SI	+	+	17.02
59	Daucus litoralis Sm.	Apiaceae	Th	ME	+	+	4.26
60	Emex spinosa (L.) Campd.	Polygonaceae	Th	ME+SA-SI		+	8.51
61	Enarthrocarpus lyrotus (Boiss)	Boraginaceae	Th	SA-SI		+	2.13
62	Erodium laciniatum (Cav.) Willd.	Geraniaceae	Th	ME	+	+	12.77
63	Hordeum murinum L.	Poaceae	Th	ME+IR-TR+ER-SR	+	+	14.89
64	Ifloga spicata (Forssk.) Sch. Bip.	Asteraceae	Th	SA-SI	+	+	27.66
65	Legousia speculum-veneris (L.) Chaix	Campanulaceae	Th	ME+ IR-TR		+	2.13
66	Lotus polyphyllos E. D. Clarke	Fabaceae	Th	ME	+	+	8.51
67	Malva parviflora L	Malvaceae	Th	ME+IR-TR		+	4.26
68	Mesembryanthemum crystallinum L.	Aizoaceae	Th	ME+ER-SR	+	+	17.02
69	Mesembryanthemum nodiflorum	Aizoaceae	Th	ME+ER-SR+SA-SI	+	+	25.53
70	Parapholis incurva (L.) C.E.Hubb	Poaceae	Th	ME+IR-TR+ER-SR	+		6.38
71	Paronychia arabica (L)DC	Caryophyllaceae	Th	ME+SA-SI+S-Z	+		10.64
72	Plantago albicans L.	Plantaginaceae	Th	ME+SA-SI		+	14.89
73	Plantago lagopus L.	Plantaginaceae	Th	ME+IR-TR		+	2.13
74	Reichardia tingitana (L.) Roth	Asteraceae	Th	ME+IR-TR	+	+	42.55
75	Rumex pictus Forssk.	Polygonaceae	Th	ME+SA-SI	+	+	36.17
76	Salsola kali L.	Chenopodiaceae	Th	COSM	+	+	8.51
77	Scorzonera undulata Vahl	Asteraceae	Th	IR-TR+SA-SI		+	10.64
78	Senecio glaucus L.	Brassicaceae	Th	ME+IR-TR+ER-SR	+	+	63.83
79	Silene vivianii Steud.	Caryophyllaceae	Th	SA-SI	+		8.51
80	Sphenopus divaricatus (Gouan) Rchb.	Poaceae	Th	ME+IR-TR+SA-SI	+	+	17.02
81	Suaeda maritima (L.) Dumort	Chenopodiaceae	Th	COSM	+	+	4.26

Table 2. The major floristic composition of the families in the study area.

Family	Genus	Species	COSM	PAL	PAN	Pluri regional	Bi regional	ME	SA-SI	AUST
Chenopoidiaceae	8	14	3			3	5	1	1	1
Asteriaceae	10	12				2	6	1	3	
Poiaceae	10	10	1	1	2	3	2	1		
Fabiaceae	4	5					2	1	2	
Caryophyllaceae	3	4				2		1	1	
Zygophyllaceae	2	4					1	2	1	
Boraginaceae	3	3				1	1		1	
Plantaginaceae	1	3					2	1		
Plumbaginaceae	2	3						1	2	
Polygoniaceae	3	3					3			
Aizoaceae	1	2				1	1			
Apiaceae	1	2				1		1		
Brassicaceae	2	2				1	1			
Solanaceae	1	2					1	1		
Amaryllidaceae	1	1						1		
Asclepiadaceae	1	1					1			
Campanulaceae	1	1					1			
Convolvulaceae	1	1					1			
Frankeniaceae	1	1				1				
Gentianaceae	1	1				1				
Geraniaceae	1	1						1		
Juncaceae	1	1				1				
Malvaceae	1	1					1			
Orobanchaceae	1	1					1			
Scrophulariaceae	1	1					1			
Tamaricaceae	1	1					1			
Total	**63**	**81**	**4**	**1**	**2**	**17**	**32**	**13**	**11**	**1**
Percentage			**4.94**	**1.23**	**2.47**	**20.99**	**39.51**	**16.05**	**13.58**	**1.23**

Table 3. Varieties of habitat in the research region, number of species present, and proportion of each floristic group.

Floristic category	Study area		Deltaic coast		Western coast		Geographical distribution
	No	%	No	%	No.	%	
COSM	4	4.94	4	8.16	4	5.48	Worldwide
PAL	1	1.23		0.00	1	1.37	
PAN	2	2.47	2	4.08	1	1.37	
ME+IR-TR+ER-SR	8	9.88	5	10.20	7	9.59	Pluriregional elements
ME+IR-TR+SA-SI	5	6.17	4	8.16	4	5.48	
ME+ER-SR+SA-SI	2	2.47	1	2.04	2	2.74	
ME+SA-SI+S-Z	2	2.47	2	4.08		0.00	
ME+ IR-TR	7	8.64	3	6.12	7	9.59	Biregional elements
ME+ SA-SI	15	18.52	10	20.41	15	20.55	
ME+ER-SR	2	2.47	2	4.08	2	2.74	
IR-TR+SA-SI	4	4.94	2	4.08	4	5.48	
IR-TR+S-Z	1	1.23	1	2.04	1	1.37	
SA-SI+S-Z	3	3.70	1	2.04	3	4.11	
ME	13	16.05	7	14.29	12	16.44	Monoregional elements
SA-SI	11	13.58	4	8.16	9	12.33	
AUST	1	1.23	1	2.04	1	1.37	
Total	81	100	49	100	73	100	

Based on their lifespan, the 81 species seen in the study area may be categorized into three primary categories as follows: The species documented in the research region (81) may be categorized into three primary categories based on their lifespan: 42 perennial species, 2 biannual species, and 37 annual species.

The perennial taxa were seen throughout every field visit. Among the perennial plants, there are 20 species that have a broad distribution, being found in two different environments. Some examples of these species are Aeluropus lagopoides, Alhagi graecorum, Arthrocnemum macrostachyum, Atractylis carduus, Atriplex semibaccata, Atriplex halimus, etc. A total of 21 perennial species were documented in a single habitat type, including Fagonia arabica, Fagonia cretica, Launaea nudicaulis, Legousia speculum-veneris, Lycium schweinfurthii subsp. aschersohnii, Lycium shawii, etc.

The floristic composition includes just two biennial species, namely *Centaurea aegyptiaca* and *Spergularia marina*, with corresponding percentages of 4.26% and 10.64%. Based on their biological distribution, the species that appear annually (37 in total) may be categorized according to their occurrence percentages:

a) There are 22 species that have a broad distribution range and are found in two different environments. Some examples of these species are Aegilops bicornis, Anchusa humilis, Centaurium pulchellum, Chenopodium murale, Cutandia memphitica, Daucus litoralis, etc.

b) Fifteen species were seen in a single habitat type, with a 50% occurrence rate. Some of these species are Astragalus bombycinus, Astragalus peregrinus, Atriplex lindleyi, Avena fatua, and others.

3.2. Plant duration in the Study region

The plant species present in the two habitats of the study area may be classified into three primary groups according to their duration of existence: annuals, biennials, and perennials. It was previously mentioned that a total of 81 plant species were found in the study area. Among these species, there were 37 annuals, accounting for 45.68% of the total, 2 biennials, making up 2.47%, and 42 perennials, representing 51.85%.

A total of 49 species were identified in the Deltaic Mediterranean coastal desert habitat. Among these, 24 species were annual, accounting for 48.98% of the total. One species was a biennial, making up 2.04% of the total. The other 24 species were perennials, representing 48.98% of the total. Conversely, the Western Mediterranean coastal desert environment had a total of 73 species,

consisting of 34 annuals (46.58%), 2 biennials (2.74%), and 37 perennials (50.69 percent). Remarkably, the plant lifespan in both habitats within the study zone was almost identical (Figure 2). Annual and perennial plant occurrence percentages were higher in the Western coast ecology compared to the coastal environment of the Deltaic Mediterranean. The Western coastal habitat has two biannual species and the Deltaic coast habitat of the Mediterranean had one biennial species (Table 1).

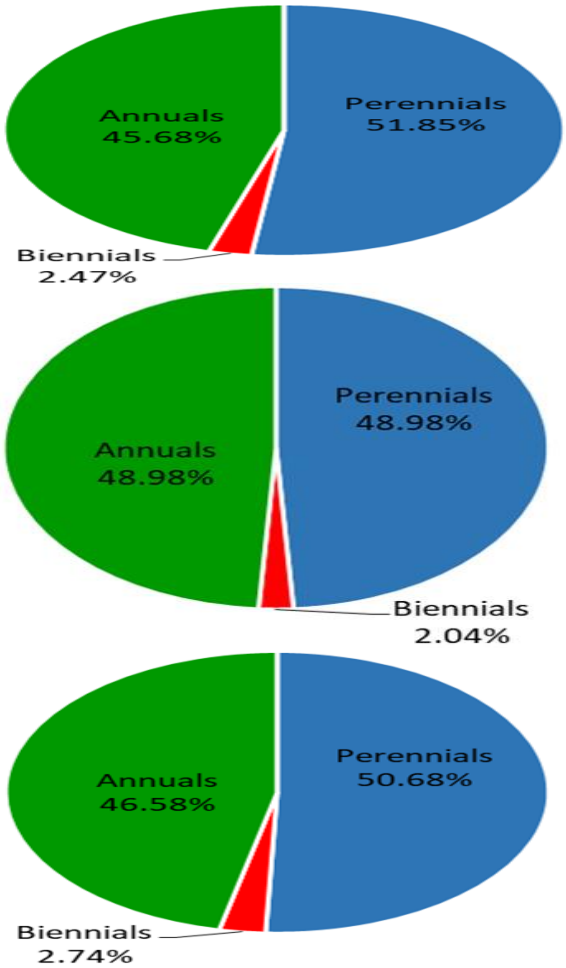


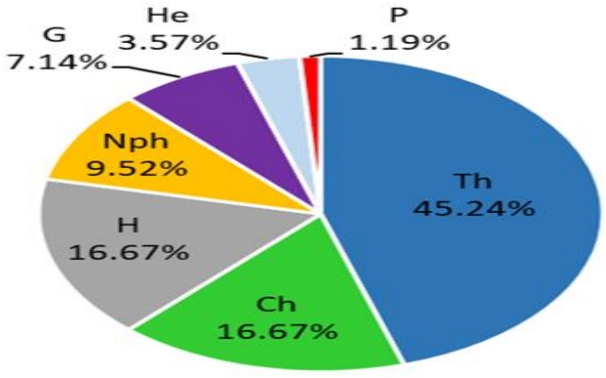
Figure 2. Plant lifespan in the study space (a), Deltaic desert (b) and Western desert (c).

3.3. Plant documented Life-Forms.

The study's flora was classified into seven distinct categories of life forms, as described and categorized by Raunkiaer (1934). The therophytes accounted for the largest proportion of reported species, at 45.24%. They were followed by chamaephytes and hemicryptophytes, both at 16.67%. Nanophanerophytes made up 9.52% of the species, while geophytes accounted for 7.14%. Helophytes had the smallest representation, at 3.75%. The parasite had the lowest percentage across all life-forms, measuring 1.19% as seen in Table 1 and Figure 3.

According to Kensa et al. (2014), therophytes dominance over other living forms appears to be a reaction to the hot, dry climate، changes in the morphology of the land, and disturbances from people and animals. They can handle the heat and lack of rain in the area because they spend most of their lives as seeds (Asri, 2003; El-Husseini et al., 2008). These results match what El-Amier and Abdul-Kader (2015) found about the range of plants in dry areas of the Middle East.

The distribution of life forms varied across different environments. The Western Mediterranean coastal environment is home to a total of 73 species, which can be classified into seven distinct categories based on their life forms. The most common category is therophytes, accounting for 46.67% of the species. Chamaephytes make up 17.33%, hemicryptophytes make up 16.00%, nanophanerophytes make up 10.67%, geophytes make up 5.33%, and helophytes make up 2.67%. Parasite achieved the lowest percentage among all life-forms (1.33%). The species seen in the Deltaic Mediterranean coastal environment (49 in total) may be categorized into the following life forms: therophytes (48.08%), chamaephytes (9.62%), hemicryptophytes (19.23%), nanophanerophytes (5.77%), geophytes (11.54%), helophytes (3.85%), and parasites (1.92%). It is noteworthy that the predominant life-form in all habitats in the research region was therophytes. Parasites and helophytes are characterized by relatively small numerical values (Figure 3).



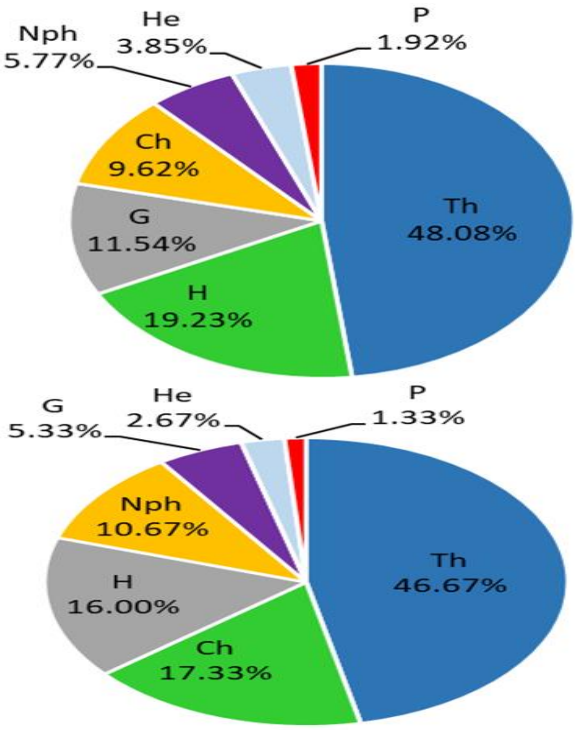


Figure 3. Plant life form spectra in the study area (a), Deltaic coast (b) and Western coast (c).

3.4. The Floristic Analysis of the Study Area

The study documented a total of 81 plant species, which were classified into 63 genera and 26 families. Table (2) indicates that Chenopodiaceae accounts for 14 species, which represents 17.28% of the total recorded species. Asteraceae follows with 12 species, equivalent to 14.81%, and Poaceae with 10 species, representing 12.35%. Fabiaceae consists of 5 species, amounting to 6.17%, while Crayophyllaceae and Zygophyllaceae each have 4 species, accounting for 4.94%. The remaining families were represented by three or fewer taxa.

Due to their ability to adapt to adverse circumstances and successfully disperse their diaspores by wind, the Asteraceae and Poaceae span a vast ecological range (Oudtshoorn and Rooyen, 1999). The Poaceae family has adapted to withstand heavy grazing and prolonged periods of drought. They were able to successfully scavenge moisture from the soil due to the extensive network of shallow, highly rami-fied roots (Stanley, 1999). There are several main plant families in Egypt's flora, not only the Asteraceae (Boulos, 2002; El-Amier and El Hayyany, 2020), which is the biggest and most extensively distributed family of flowering plants in the world.

Table 3 of the research region's floristic analysis reveals that 72 species, which account for about 66.67% of the total recorded species, belong to the Mediterranean taxa. The taxa may be categorized as either multiregional (17 species, or 20.99%), biregional (24 species, or 29.63%), or monoregional (13 species, or 16.05%). Additionally, it has been shown that the Saharo-Sindian element was significantly prevalent in 65 species (67.01%). This element may be further categorized as follows: 11 species (13.58%) as Monoregional, 22 species (27.16%) as Biregional, and 9 species (11.11%) as Pluriregional elements. However, 7 species, which account for about 7.22% of the total reported species, may be classified as either Cosmopolitan (4 species, equivalent to 4.94%), Palaeotropical (one species, equivalent to 1.23%), or Pantropical (2 species, equivalent to 2.47%). Another floristic group was underrepresented, since it consisted of just a small number of species.

Table (3) shows that the floristic groups differed across habitats. The Western Mediterranean coastal desert environment has the greatest number of Mediterranean components, with 49 species accounting for 67.12%. The components consist of 13 species (17.81%) classified as Pluriregional taxa, 24 species (32.88%) classified as Biregional taxa, and 12 species (16.44%) classified as monoregional taxa. Within the Deltaic Mediterranean coastal environment, there were a total of 34 species (69.39%) belonging to the Mediterranean taxonomy. These taxa were classified as either pluriregional (12 species = 24.49%), biregional (15 species = 30.61%), or Monoregional (7 species = 14.29%). Generally, the Palaeotorpical and Neotropical components were visibly equivalent in all environments within the research region. Other floristic groups were either sparsely represented or entirely absent in the various ecosystems.

The fact that Saharo-Sindian and Mediterranean elements were able to move into this area could explain why there are so many of them there, as well as the human effect. Plants from the Saharao-Arabian region are well suited to desert conditions, whereas Mediterranean species exhibit a more mesic environment, according to El-Demerdash et al. (1994); El-Amier and El Hayyany (2020).

4. Conclusion

In Egypt, there are current efforts to use renewable resources from both cultivated and uncultivated areas in order to enhance the production of food, forage, and medical products. The study documented a grand total of 97 plant species, which were spread out across 89 different genera and 27 distinct families. The documented species only included Mediterranean taxa. Moreover, it has been ascertained that the Saharo-Sindian component was notably prevalent in 65 species. Ensuring the long-term sustainability of key natural resources such as land, water, air, minerals, forests, fisheries, and wild flora and fauna is of utmost importance.

4. References

1. Gurib-Fakim, A., (2006). Medicinal plants: traditions of yesterday and drugs of tomorrow. Molecular aspects of Medicine, **27(1)**, pp.1-93.
2. Saboon, Chaudhari, S.K., Arshad, S., Amjad, M.S. and Akhtar, M.S., (2019). Natural compounds extracted from medicinal plants and their applications. Natural Bio-active Compounds: Volume 1: Production and Applications, pp.193-207.
3. Hassib, M. (1951). Distribution of plant communities in Egypt. Bull. Fac. Sci. Fouad I Univ. **29**: 59–261.
4. Zahran, M. A., & Willis, A. J. (2009). The Sinai Peninsula. In The Vegetation of Egypt (pp. 213-249). Springer, Dordrecht.
5. Nedjimi B (2009) Salt tolerance strategies of Lygeum spartum L.: a new fodder crop for Algerian saline steppes. Flora **204**:747–754.
6. Khan MA and Duke NC (2001). Halophytes -A resource for the future. Wetlands Ecology and Management, **9(6):** 455-456.
7. Nedjimi B (2011). Is salinity tolerance related to osmolytes accumulation in Lygeum spartum L. seedlings? *Journal of the Saudi Society of Agricultural Sciences*, **10(2):** 81-87.
8. Handa, S., Handa, A.K., Hasegawa, P.M. and Bressan, R.A., (1986). Proline accumulation and the adaptation of cultured plant cells to water stress. Plant physiology, **80(4),** pp.938-945.
9. Glenn, E.P., Brown, J.J. and Blumwald, E. (1999). Salt tolerance and crop potential of halophytes. Critical reviews in plant sciences, **18(2)**: 227-255.
10. Shabala, S. and Mackay, A. (2011). Ion transport in halophytes. Advances in botanical research, **57**:151-199.
11. Zhao, C.; Zhang, H.; Song, C.; Zhu, J.K. and Shabala, S. (2020). Mechanisms of plant responses and adaptation to soil salinity. The innovation, **1(1)**: p. 100017.
12. Batanouny, K.H., (1993). Adaptation of plants to saline conditions in arid regions. Towards the rational use of high salinity tolerant plants: Vol. **1** Deliberations about High Salinity Tolerant Plants and Ecosystems, pp.387-401.
13. El-Demerdash, M.A. (1984). Ecological studies on Juncus plants. Ph.D. Thesis, Mansoura university, Egypt.
14. Zahran, M. A.; El-Demerdash, M. A.; Abu-Ziada, M. and Serag, M. S. (1988). On the ecology of the deltaic Mediterranean coastal land, Egypt. II Sand formation of Damietta-Port Said coast. Bull. Faculty of Science - Mansoura University, Egypt, **15(2)**, 581-606.
15. El-Halawany, E.F. (2002). Characterization of the wetland's habitat alongside the fish farms in the North Nile Delta. Egypt. *Pakistan journal of biological sciences*, **5(5)**: 626-632.
16. El-Amier, Y.A., El-Halawany, E.F. and Abdullah, T.J., (2014). Composition and diversity of plant communities in sand formations along the northern coast of the Nile Delta in Egypt. Research *Journal of Pharmaceutical, Biological and Chemical Sciences*, **5(4)**: -847.
17. Yasser, A. and Shawky, R.A., (2017). Floristic Features and Vegetation Structure of Salt Affected Lands at the North Nile Delta, Egypt. *Journal of Environmental Sciences*, **46(1)**, pp.71-88.
18. El-Zeiny, A., Elagami, S.A., Nour-Eldin, H., El-Halawany, E.S.F., Bonanomi, G., Abd-ElGawad, A.M., Soufan, W. and El-Amier, Y.A., (2022). Wild plant habitat characterization in the last two decades in the Nile Delta coastal region of Egypt. Agriculture, **12(1)**, p.108.
19. UNESCO (1977). Map of the World

Distribution of Arid Regions. MAB Technical Notes, 7.
20. Anonymous (1975). Climatic Normals of Egypt. Ministry of Military Production, Meteorological Dept., Cairo, Egypt.
21. Raunkięr, C. (1934-1937) "Plant life forms". Clarendon Press..
22. Davis, P. H. (ed.) (1965, 1967, 1970,1972, 1975, 1978, 1982, 1984&1985). Flora of Turkey and the East Agean Islands. Vols. **1,2,3,4,5,6,7,8&9**. Edinburgh Univ. Press.
23. Zohary, M. Flora Palestine. (1996 and 1972) Vols. **1&2.** The Israel Academy of Science and Humanities, Jerusalem..
24. Meikle, R.D. (1977 & 1985). Flora of Cyprus. Vols. **1** and **2**. Bentham-Maxon Trust, Royal Botanic Gardens, Kew.
25. Feinbrun-Dothan, N. (1978&1986). Flora Palaestina. Parts 3&4. The Israel Academy of Sciences and Humanities, Jerusalem.
26. Boulos, L (1999-2005). "Flora of Egypt. (Vol. **1-4**). Al Hadara Publishing, Cairo,.
27. Kensa, M. and Pramila, S.R., (2014). Floristic, phenological and life form spectrum analysis in vilathivilai area, kanyakumari district, tamil nadu, s. India. Unique *J. Med. Dent. Sci*., **2(3):** 33-39.