

Floristic Composition of Wadi Araba, North- Eastern Desert, Egypt

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Abstract The current study analyzed the floristic aspects of Wadi Araba, including the present taxa, duration, life-form spectra, and phytochorotype of the plant life in the north –eastern sector of Eastern desert. Floristically, the full wide variety of the recorded flowering plant species inside the gift study is 99, fitting to 82 genera and linked to 29 families. Asteraceae comprises 21 species (21.21%) of the total documented taxa, followed by family Poaceae 10 species (10.10%), Brassicaceae 8 species (8.08%), Chenopodiaceae and Fabaceae 7 species each (7.07%). The common of the reported taxa are therophytes (38%) followed by chamaephytes (32%) then hemicryptophytes (14%) nanophanerophytes (7%) geophytes (4%) and phanerophytes (3%). The least valuable of life forms were documented as helophytes (1%) and parasites (1%). The phytochorotype of the study zone exposed the 40 species (40.40%) of the fully noted taxa was belonging to monoregional Saharo-Sindian element.

keywords: Wadi Araba; arid land; Floristic, wild plants, Vegetation.

1. Introduction

Approximately 26-35% of the earth's land floor is arid location and about four% of this arid region are categorized as hyper-arid (FAO, 1989). The land of Egypt inhabits the northeastern portion of the African region. It is kind of quadrangular, extending around 1073 km from north to south and approximately 1229 km from east to west. Consequently, the whole location of Egypt is a little more than 1,000,000 square kilometers (1019 600 km²) inhabiting nearly 3% of the whole vicinity of Africa [1,2,3]. Egypt is considered by a warm and almost rainless weather. The entire country forms share of the great arid land zone that stretches from the Atlantic across the North Africa through Arabia [4].

The Egyptian desert occupy about 95% of the total area in Egypt and it is among the hyper-arid parts of the world, where rainfall is limited, variable, and irregular [5] three deserts form about 95% of Egypt's land (Eastern, Western and Sinai Peninsula), the desert vegetation is the most important type of natural plant life [4,5]. Bolous [6] reported that, the vegetation structure in the Eastern-Desert is

much richer than that of the Western-Desert. Also he stated that, the flora of the northern wadis and mountains of the Eastern-Desert west of the Suez-Gulf has strong relations with that of the Sinai Peninsula. The Red Sea coastal region and the internal desert are the two main phytogeographical zones which usually documented within the Eastern-Desert.

The Eastern Desert is the portion of the Sahara Desert that is situated east of the Nile River. It is inhabiting the area spreading from the Nile Valley eastward to the Suez Gulf and the Red Sea which is about 223,000 km², i.e. 21% of the fully zone of Egypt. The Eastern Desert is larger than the Western Desert because it is mostly made up of tall, steep mountains that are parallel to and very close to the coast. It is also recognized as the Red Sea Hills.

The climate in the Desert is semi-arid, arid, and hyper-arid. The area often has irregular rainfall patterns that rarely exceed 25 millimetres (0.98 in) per year on average. Around the mountains, the rainiest times of year are in the winter. The mountains' presence

may cause the remainder of the Desert to be under a rain shadow, which dries up the climate [7]. The inland part of the Eastern desert from north to south can be divided into four ecological regions, Cairo-Suez desert, limestone desert, sandstone desert, and Nubian desert [4].

The Eastern-Desert encompasses a semi-arid/arid/hyper-arid climate. On average, the region typically receives not up to twenty-five millimeters (0.98 in) of downfall annually in sporadic patterns. Most of the rainfall happens throughout the winter months round the mountains. The presence of the mountains will produce a rain shadow, for the remainder of the Desert, conducive to the arid surroundings [7]. The landlocked a part of the eastern-desert from north to south is divided into four ecological regions, Cairo-Suez desert, limestone-desert, sandstone-desert, and Nubian-desert [4].

This work mainly aims to study the vegetation composition counting: documented of the plant taxa, duration, life-form and phytochorotype of the wild plants in the arid land (Wadi Araba), Egypt.

2. Materials and Methods

2.1. Study area

The arid wadi (Wadi Araba) is extensive depression which spreads inland from the Gulf of Suez between the Northern El-Galala El-Baharia and the Southern El-Galala El-Kebliya ranges. Wadi Araba is an arid valley that running from Za'farana on the Red Sea shoreline to the Nile valley north of Beni Souef. Wadi Araba is approximately 30 km wide and covers westward to the central Eocene limestone plateau of the Eastern-Desert [3,8].

2.2. Estimation of plant species

The current study is represented via 92 stands (place = 20 x 20 m). The stands were located throughout the research region to cover a variety of habitats and to assure that a various variety of vegetational variables was sampled. The Botany Department's Herbarium at Mansoura University's Faculty of Science obtained all of the samples. This study's taxonomy of living forms was based on Raunkiaer's [9] categorization scheme. For classification, identification, nomenclature, and floristic categories, Davis [10], Zohary [11],

Täckholm [12], Meickle [13], Feinbrun-Dothan [14], and Boulos [15] have been applied.



Figure 1: Map display the study area.

3. Results and Discussion

3.1. Floristic Composition and Distribution of Plant Species

Table (1) documented the floristic configuration of taxa species in Wadi Araba (Northern sector of Eastern desert), 92 stands have been selected for sampling plant community.

The indexed of wild plants inside the study region are offered in Table (1), which confirmed that the whole number of plant taxa in the present have a look at is ninety-nine. these species are categorized as shown in table (1) into three important groups 38 annual species (38.38 %) two biennial species (2.02 %) and fifty-nine perennial species (59.60 %).

The life-pattern of the wild vegetation seen inside the research region is categorised and outlined by Raunchier (1934) into the following eight types: helophytes, therophytes, hemicryptophytes, geophytes, nanophanerophytes, chamaephytes, phanerophytes, and parasites (Figure 2), The common of the reported species are therophytes (38%) followed by chamaephytes (32%) then hemicryptophytes (14%) nanophanerophytes (7%) geophytes (4%) and phanerophytes (3%). The final value of life pattern is documented as helophytes (1%) and parasites (%1).

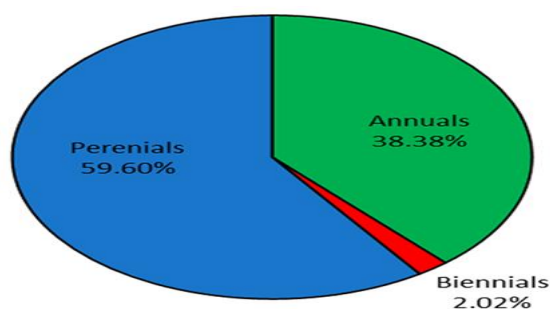
Table 1. Plant species documented in the study region.

No.	Species	Family	Life form	Floristic category
Perennials				
1	<i>Acacia raddiana</i>	Fabaceae	Ph	SZ
2	<i>Achillea fragrantissima</i> (Forsk.)Sich.Bip.	Asteraceae	Ch	SA/SI+IR/TR
3	<i>Aerva javanica</i> (Buerm.F.) i. ex Schult.	Amaranthaceae	Ch	SA/SI + SZ
4	<i>Alkanna lehmanii</i> (Tien.) A.DC.	Boraginaceae	H	ME
5	<i>Anabasis articulata</i> (Forssk.) Moq.	Chenopodaceae	Ch	SA/SI+IR/TR
6	<i>Artemisia judieaca</i> L.	Astereaceae	Ch	SA/SI
7	<i>A. monosperma</i> Delilie.	Asteraceae	Ch	SA/SI+ME
8	<i>Astragalus spinosus</i> (Forssk.) Mueschl.	Fabaceae	Ch	SA/SI + IR/TR
9	<i>Atractylis cardeuus</i> (Forssk.) C.Chir.	Asteraceae	H	ME+SA/SI
10	<i>Calligonum polygonoeides</i> L. subsp. <i>Comosum</i>	Polygonaceae	Nph	SA/SI + IR/TR
11	<i>Calotropis procera</i> (Willd.) R.Bir.	Asclepiadaceae	Ph	SA/SI + SZ
12	<i>Cistanche phielypaea</i> (L.) Cout.	Orobanchaceae	P, G	SA/SI+ME
13	<i>Cleome droserifolia</i> (Forssk.) Delile	Cleomaceae	Ch	SA/SI + IR/TR
14	<i>Crotalaria aegyptiaca</i> Bienth	Fabaceae	Ch	SA/SI
15	<i>Cynanchum acuetum</i> L.	Asclepiadaceae	H	ME+IR-TR
16	<i>Cyondon dactylon</i> (L.)Peers	Poaceae	G	COSM
17	<i>Desmostachya bipinneata</i> (L.) Steapf	Poaceae	Ch	S-Z+SA-SI+ME+IR-TR
18	<i>Deverrea tortuosa</i> (Deesf.)DC	Umbelliferae	Ch	SA/SI
19	<i>Diplotaxis harrea</i> (Forssk.) Boeiss.	Brassicaceae	Ch	ME+ SA-SI
20	<i>Fagonia arabeica</i> L.	Zygophyllaceae	Ch	SA/SI
21	<i>F. mollis</i> Deelile.	Zygophyllaceae	Ch	SA/SI
22	<i>Farsetia aegyptiea</i> Turra.	Brassicaceae	Ch	S-Z+SA-SI
23	<i>Forsskaolea tenacissima</i> L.	Urticaceae	H	SA-SI + S-Z
24	<i>Francoeuria crispa</i> (Forssk.) Caess.	Asteraceae	Ch	SA/SI
25	<i>Gypsophila capillaris</i> (Forssek.) C.Chr.	Caryophyllaceae	H	SA/SI + IR/TR
26	<i>Haloxylon salicornicum</i> (Moq.) Bungee ex Boiss.	Chenopodiaceae	Ch	SA/SI
27	<i>Haplophyllum tuberculatum</i> (Forssk.) Juss	Rutaceae	H	SA/SI
28	<i>Heliotropium arbainense</i> Freesen.	Boraginaceae	Ch	SA/SI
29	<i>H. digynum</i> (Forssek.) Asch. ex C.Chr.	Boraginaceae	Ch	SA/SI
30	<i>Herniaria hemiastemon</i> J.Geay	Caryophyllaceae	H	SA/SI
31	<i>Hyoscyamus muticus</i> L.	Solanaceae	Ch	SA/SI
32	<i>Iphia mucronata</i> (Forssek.) Asch. &Schweeinf.	Asteraceae	Ch	SA/SI
33	<i>Kickxia aegyptiea</i> (L.)Nábelek	Scrophulariaceae	Ch	ME+SA-SI
34	<i>Lasiurus scindicus</i> Henreard.	Poaceae	G	SA-SI+S-Z
35	<i>Launaea mucroneata</i> (Forssek.)Muschl.	Asteraceae	H	ME+SA-SI
36	<i>L. nudicaulis</i> (L.)Hook.f.	Asteraceae	H	SA/SI
37	<i>L. spinosa</i> (Forssek.) Sch.Bip. ex Kunetze.	Asteraceae	Ch	SA/SI
38	<i>Lavandula coronopifolia</i> Poer.	Labiatae	Ch	SA/SI
39	<i>Leptadenia pyrotechnica</i> (Forssek.)Decne.	Asclepiadaceae	Nph	SA/SI
40	<i>Lycium shawii</i> Roem. &sechult.	Solanaceae	Nph	SA-SI+S-Z
41	<i>Nauplius graveolens</i> (Forssek.)Wickleund	Asteraceae	Ch	SA/SI
42	<i>Nitraria reetusa</i> (Forssek.) Asch.	Nitrariaceae	Ph	SA/SI
43	<i>Ochradenus baccaetus</i> Deleile.	Resedaceae	Nph	SA/SI
44	<i>Panicum turgiedum</i> Forssek.	Poaceae	H	SA/SI
45	<i>Pergularia tomentosa</i> L.	Asclepiadaceae	Ch	SA/SI
46	<i>Phragmites australis</i> (Cav.) Trin.exSteeud	Poaceae	G, He	COSM
47	<i>Polycarpha repeens</i> (Forssek.) Asch.	Caryophyllaceae	Ch	SA/SI
48	<i>Pulicaria incisa</i> (Lam.) DC., Preodr.	Asteraceae	Ch	SA/SI
49	<i>Pulicaria undulata</i> (L.) C.A.Meey.	Asteraceae	Ch	SA/SI
50	<i>Retama raetam</i> (Forssek.)Webb&Beerthel.	Fabaceae	Nph	SA/SI
51	<i>Scrophularia deserti</i> Deliele	Scrophulariaceae	Ch	SA/SI
52	<i>Spergularia media</i> (L.) C. Preesl	Caryophyllaceae	H	ME+ IR-TR+ER-SR
53	<i>Tamarix aphylla</i> (L.) H. Kearst.	Tamaricaceae	Nph	SA-SI+S-Z
54	<i>Tamarix nilotica</i> (Ehrenb.)Bungee.	Tamaricaceae	Nph	SA/SI
55	<i>Trichodesma africanum</i> (L.)R.Br.	Boraginaceae	H	S-Z+SA-SI
56	<i>Zilla spinosa</i> (L.)Preantl.	Brassicaceae	Ch	SA/SI
57	<i>Zygophyllum coccineum</i> L.	Zygophyllaceae	Ch	SA/SI

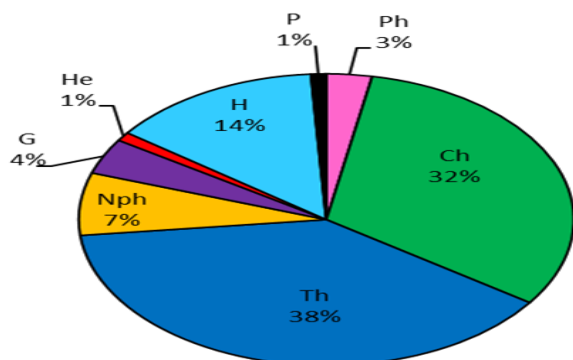
58	Zygophyllum decumbens Deleile.	Zygophyllaceae	Ch	SA/SI
59	Echinops spinosus L.	Asteraceae	H	ME+SA-SI
Biennials				
60	Launaea capitata (Spreng.)Dandy	Asteraceae	Th	S-Z+SA-SI
61	Centaurea aegyptiaca L.	Asteraceae	Th	SA/SI
Annuals				
62	Lactuca serriola L.	Asteraceae	Th	ME+IR/TR+ER-SR
63	Bassia indica (Wight) Scott.	Chenopodiaceae	Th	S-Z+IR/TR
64	Anthemis coteula L	Asteraceae	Th	ME+IR/TR+ER-SR
65	Zygophyllum simplex L.	Zygophyllaceae	Th	SA/SI
66	Chenopodium murale L.	Chenopodiaceae	Th	COSM
67	Cleome amblyocarpa Barrelet & Murb.	Capparaceae	Th	SA/SI
68	Erysimum repandum L.	Brassicaceae	Th	ME+IR/TR+ER/SR
69	Euphorbia retusa Forssek.	Euphorbiaceae	Th	SA/SI
70	Lolium multiflorum Lam.	Poaceae	Th	ME+IR/TR+ER/SR
71	Lotus glinoides Deleile	Fabaceae	Th	SZ
72	Bassia muricata (L.)Asch.	Chenopodiaceae	Th	IR-TR+SA/SI
73	Malva parvifolia L	Malvaceae	Th	ME+IR/TR
74	Matthiola longipetala (Vent.)DC.	Brassicaceae	Th	ME+IR/TR
75	Mesembryanthemum forsskaoleii Hochst.ex Boiss.	Aizoaceae	Th	SA/SI
76	Atriplex lindleyi Moq.	Chenopodiaceae	Th	ME+IR/TR+ER/SR
77	Neuradea procumbens L.	Neuradaceae	Th	SA-SI+SZ
78	Brassica tournefortii Gouan.	Brassicaceae	Th	ME+IR/TR+SA/SI
79	Diploxys acris (Forssek.)Boiss.	Brassicaceae	Th	SA/SI
80	Cardaria draba (L.) Desv	Brassicaceae	Th	SA/SI+IR-TR
81	Parapholis incurva (L.)C.E.Hubb.	Poaceae	Th	ME+IR/TR+ER/SR
82	Emex spinosa (L.)Campd.	Polygonaceae	Th	ME+SA/SI
83	Hordeum marinum Huds.	Poaceae	Th	ME+IR/TR
84	Plantago ciliata Desf.	Plantaginaceae	Th	SA/SI + IR/TR
85	P. lagopus L	Plantaginaceae	Th	ME+IR-TR
86	P. notata Lag.	Plantaginaceae	Th	IR-TR+SA/SI
87	Poa annua L.	Poaceae	Th	COSM
88	Hordeum spontaneum K. Koch	Poaceae	Th	ME+IR/TR
89	Erodium laciniatum (Cav.) Wild.	Geraniaceae	Th	ME
90	Ifloga spicata (Forssek.) Sch.Bip.	Asteraceae	Th	SA-SI
91	Reichardia tingitana (L.) Roth	Asteraceae	Th	ME+IR/TR
92	Reseda decurva Forssek.	Resedaceae	Th	SA/SI
93	Volutaria lippeii (L.) Cass. ex Maire	Asteraceae	Th	SA/SI
94	Rumex vesicarius L.	Polygonaceae	Th	SA-SI+ME+SZ
95	Salsola kalie L.	Chenopodiaceae	Th	COSM
96	Spergularia rubra (L.)J. & C.Preisl.	Caryophyllaceae	Th	ME+ER/SR
97	Senecio glaucus L.	Asteraceae	Th	ME+IR-TR+SA/SI
98	Trigonella stellata Forssk.	Fabaceae	Th	SA/SI + IR/TR
99	Astragalus bombycinus Boiss.	Fabaceae	H	SA/SI + IR/TR

Abbreviations: P: Presence

Life-form; Nph.: Nano-phanerophytes, **Ch.:** Chamaephytes, **H.:** Hemi-cryptophytes, **G.:** Geophytes, **He.:** Helophytes, **Hy:** Hydrophytes, **Th:** Therophytes; **Chorotype;** COSM: Cosmopolitan, PAN: Pantropical, NEO: Neotropical, PAL: Palaeotropical, IR/TR: Irano-Turanian, S/Z: Sudano-Zambezian, Cult. & Nat.: Cultivated and Naturalized, ME: Mediterranean, ER/SR: Euro-Siberian, SA/SI: Saharo-Sindian.



plant life span and three habitats



study region's plant life form and three habitats

3.2. The Chorotype of the Study Area

The fully number of the documented plant taxa measured in the present work is 99 taxa going to 82 genera and linked to 29 families Table (2) displayed that, the family Asteraceae includes 21 kinds (21.21%) of the full documented plant taxa, followed by family Poaceae 10 species (10.10%), Brassicaceae 8 species (8.08%), Chenopodiaceae/Fabaceae 7 kinds each (7.07%), Caryophyllaceae and Zygophyllaceae 5 species each (5.05%), Asclepiadaceae and Boraginaceae 4 species each (4.04%), Plantaginaceae and Polygonaceae 3 species each (3.03%), Resedaceae, Scrophulariaceae, Solanaceae and Tamaricaceae are 2 species each (2.02%), while The remaining families which include Aizoaceae, Amaranthaceae, Capparaceae, Cleomaceae, Euphorbiaceae, Geraniaceae, Labiatae, Malvaceae, Neuradaceae, Nitrariaceae, Orobanchaceae, Rotaceae, Umbelliferae and Urticaceae include single one kind each (1.01 %)

Table (3) presents the floristic classifications of the vegetation survey in the study zone. The most public floristic components of the family Asteraceae are Saharo/Sindian (11 kind), Biregional (7 kind) and Pluriregional (3 kind). In Poaceae represented by Biregional and pluriregional (each 3 species), Cosmopolitan (3 species) and Saharo/Sindian is characterized by

one kind. The most abundant floristic element in Brassicaceae is represented by Bi-regional (4 species), Pluriregional (2 species) and Saharo/Sindian (2 species). The most abundant floristic component in Chenopodiaceae is represented by Biregional (3 kind), Cosmopolitan (2 kind), Pluriregional and Saharo-Sindian each (One species). The most abundant floristic component in Fabaceae represented by Biregional (3 species) Saharo/Sindian (2 species) and Sudano/zambezian (2 species). The most abundant floristic components of the family Caryophyllaceae represented by Biregional and Saharo-sindian each (2 species) and pluriregional (one species). All the floristic elements of family Zygophyllaceae is Saharo/Sindian (5 species). Family Asclepiadiaceae represented by Biregional and Saharo-sindian each (2 species). The floristic elements of Boraginaceae represented by Saharo-Sindian (2 species), Biregional and mediterranean each (one species). In family Plantaginaceae all floristic elements represented by Biregional (3 species), while family Polygonaceae represented by Biregional (2 species) and Pluriregional only one species. The other families (with less than 3 species) include diverse types of floristic components which are normally characterized by a few numbers of kinds.

The research area's floristic analysis found that 40 of the total number of species reported belonged to a single monoregional Saharo/Sindian element.

Table 3 exposes also that, 29 species or signified 29.29% of the full number of documented species are Mediterranean taxa. This vegetation is either Pluriregional (11 kinds = 37.93%), Biregional (16 kinds = 55.17 %) or Monoregional (2 kinds = 6.89 %). It has been also reported that, 5 kinds or about 5.05 % of the full number of the documented species are worldwide (Cosmopolitan).

4. Conclusion

The documented flora in the research zone are remarkable because they suggestion a assorted range of products and services to the local community (*Tamarix nilotica*, *Haloxylon salicornicum*, *Alhagi graecorum*, *Deverra tortuosa*, *Panicum turgidum*, *Zilla spinosea*, etc.). Thus, to mitigate severe human impacts,

such as continued land reclamation, which has a negative impact on natural environments, particularly arid lands and sand formations (such as sand sheets, hillocks, and dunes) found on sand bars and some islets, population

diversity in this district needs long-term management (e.g., Wadi Araba, El-Reshrash, Hagoul). In these settings, several limited kinds of plants that do not occur elsewhere in the region can be establish.

Table 2. The main phytochorotype of the families in the study zone.

Families	Genus	Species	COSM	Plurio-regional	Bi-regional	ME	SA/SI	SZ
Asteraceae	16	21		3	7		11	
Poaceae	9	10	3	3	3		1	
Brassicaceae	7	8		2	4		2	
Chenopodiaceae	6	7	2	1	3		1	
Fabaceae	6	7			3		2	2
Caryophyllaceae	4	5		1	2		2	
Zygophyllaceae	2	5					5	
Asciepiadaceae	4	4			2		2	
Boraginaceae	3	4			1	1	2	
Plantaginaceae	1	3			3			
Polygonaceae	3	3		1	2			
Resedaceae	2	2					2	
Scrophulariaceae	2	2			1		1	
Solanaceae	2	2			1		1	
Tamaricaceae	1	2			1		1	
Aizoaceae	1	1					1	
Amaranthaceae	1	1			1			
Capparaceae	1	1					1	
Cleomaceae	1	1			1			
Euphorbiaeacea	1	1					1	
Geraniaceae	1	1				1		
Labiatae	1	1					1	
Malvaceae	1	1			1			
Neuradaceae	1	1			1			
Nitrariaceae	1	1					1	
Orobanchaceae	1	1			1			
Rutaceae	1	1					1	
Umbelliferae	1	1					1	
Urticaceae	1	1			1			
Total	82	99	5	11	39	2	40	2
Percentage			5.05	11.11	39.39	2.02	40.40	2.02

Table 3. Species number and % of various floristic groups in the research area's distinct habitat types.

No.	Floristic category	Study area		Phyto-geographical region
		No	%	
1	COSM	5	5.05	Worldwide
2	IR-TR+SZ+SA/SI+ME	1	1.01	Plurioregional element
3	IR/TR+ER/SR +ME	7	7.07	
4	IR/TR+SA/SI+ME	2	2.02	
5	ME+SA/SI+SZ	1	1.01	
6	ME+IR-TR	7	7.07	
7	ME+SA-SI	8	8.08	Biregional element
8	ME+ER-SR	1	1.01	
9	IR-TR+SA-SI	12	12.12	
10	IR-TR+SZ	1	1.01	
11	SA-SI+SZ	10	10.10	
12	ME	2	2.02	Monoregional element
13	SA-SI	40	40.40	
14	S-Z	2	2.02	
Total		99	100.00	

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