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Floristic Composition of the Plant Communities Associated with *Ochradenus baccatus,* Eastern Desert, Egypt

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Abstract In the current study, floristic components of plant communities associated with *Ochradenus baccatus* are examined. This includes a recorded list of plant species, duration, life-form spectra, and phytochorotype of taxa in the wadis El-Rashrash in the Eastern Desert. Egypt. The total number of reported plant documented in this paper was 87, which were split into 70 genera and 27 families. Family Asteraceae covers 20 species (22.99%) of the total documented taxa, followed by family Fabaceae and Poaceae 7 species each (8.05%), Chenopodiaceae 6 species (6.90%), Brassicaceae and Zygophyllaceae comprise 5 species each (5.75%), Caryophyllaceae and Plantiginaceae 4 species each (4.60), Asclepiadaceae, Boraginaceae and Polygonaceae each 3 species (3.45%). The remaining (16) families were represented by two or one species. Therophytes account for the bulk of the documented species (37.93%), followed by chamaephytes (32.18%), and hemicryptophytes (13.79%). According to chorotype, the majority of the documented species were Mediterranean taxa, with a strong Saharo/Sindian component.

keywords: *Ochradenus* species; Desert; Floristic, Vegetation, Wadi El-Rashrash.

1.Introduction

In the dry and semi-arid regions, there is an abundance of wild plants and animals, and stunning scenery. Government administration cannot ignore this fascinating topic, even if it hasn't been given much thought to yet [1,2]. The world's semiarid and subhumid regions are frequently referred to as dryland farming areas. Agriculture in arid regions is mostly restricted to animal grazing, and even in semiarid areas, a major portion of the land is exclusively utilized for grazing. As a result, agricultural in dryland areas is far more extensive than dryland farming, especially in terms of area. Roughly 4% of the Earth's land area, or 4 billion hectares, is made up of the semiarid and subhumid zones, which make up about 27% of the Earth's land. However, only approximately 10% of this land is actually cultivated each year [3,4].

The Sahara Desert may be found to the east of the Nile. From the Nile Valley in the east to the Gulf of Suez and the Red Sea, it extends across a total area of 223,000 km^2, accounting for 21% of Egypt. The Eastern Desert is higher than the Western Desert because it is backed by a spine of precipitous, jagged mountains that run parallel to and are near to the sea. Frequently referred to as the Red Sea Hills [5,6]. Wadis that flow eastward into the Gulf of Suez include Wadi Hommath, Wadi Hagul, Wadi El-Bada, Wadi El-Ghweibba, Wadi Al-Atfihi, and Wadi Araba. There are also several wadis that flow into the Red Sea, including Wadi Bali, Wadi Ghadir, Wadi Gimal, and Wadi Aideib.

There are 107 recognized species of plants that belong to the Resedaceae family, which is a family of dicotyledonous plants that are predominantly herbaceous [8]. Annuals, biennials, and perennials are all members of this family, and they may be found growing in places that range from temperate to subtropical latitudes all over the world, including Europe, western Asia, the Middle East, East Asia, North America, Mesoamerica, the Caribbean, and South Africa. There is a wide variety of life

forms found in the Resedaceae family, including annuals and facultative perennials (*Reseda*, *Oligomeris*, and *Caylusea*), shrubs (*Ochradenus and Randonia*), and subshrubs (*Randonia*) (Sesamoides). *Ochradenus baccatus* (Resedaceae) is a yellow-green shrub that is indigenous to the deserts of the Middle East [9], and it may be found almost everywhere in Egypt's deserts [10]. Despite the fact that earlier research [11,9] concluded that the species in question is a semi-deciduous shrub. *O. baccatus* is a significant medicinal plant that has been found to have high levels of both antioxidants and anti-inflammatory compounds [12, 13, 14]. In the Arabian Peninsula, since it provides an essential source of sustenance for a number of desert-dwelling animal species [15].

The primary objective of this study is to explore the floristic characteristics of wild plants that are connected to *Ochradenus baccatus*. Some of these characteristics that will be investigated include the duration, life-form spectrum, registrations of wild taxa, and phytochorotype.

2.Materials and Methods

2.1. Study area

The study region can be found on the eastern side of the Nile Valley. It is bounded to the south by the El-krumat - El-Zafrana road, to the north by the Cairo-Suez Road, to the east by the Suez Gulf, and to the west by the Nile Valley. Wadi El-Rashrash are the wadi that make up the study regions in the northern sector of the Eastern Desert (Figure 1).

In Giza Governorate's northern Eastern Desert (Helwan Desert), Wadi El-Rashrash is a depression. It is 79 meters high; its coordinates are 29°27'51" N, 31°22'02" E (Figure 1). The meandering wadi basin is 67km long. Wadi Rishrash flows from 787 m-high Gebel El-Galala El-Baharia to 21 m-high Nile Valley. Midstream had 460 km^2 more catchment area than upstream (about 25 km^2). The midstream location had more water because the larger the catchment area, the more water enters a microhabitat [7]. Xerophytic vegetation dominates the Wadi basin's xeric habitat. The gravel desert defines this Wadi. It has local physiographic and physiognomic heterogeneity

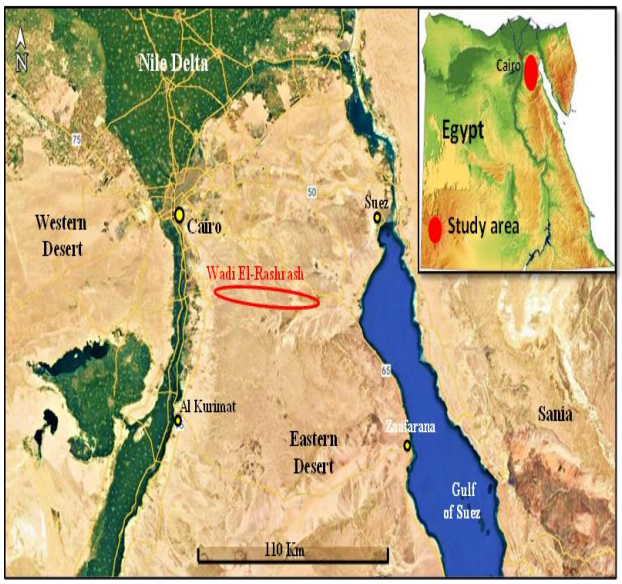

Figure 1: Map of Egypt showing the study area

2.2. Estimation of plant species

In the present study, 58 stands were selected in wadi Wadi El-Rashrash, eastern desert. The stands were spread out across the study region to ensure random sample of a wide variety of vegetational differences and to cover the different ecosystems. All of the samples that were gathered are kept in the herbarium at Mansoura University's Faculty of Science. The taxonomy of living forms used in this study was built on Raunkiaer's classification system. Davis [16], Zohary [11], Täckholm [10], Feinbrun-Dothan [17], and Boulos [18] were used for categorization, identification, nomenclature, and floristic categories.

3. Results and Discussion

3.1. Floristic Features

The floristic makeup of plant species that are related with *Ochradenus baccatus* is shown in Table (1). There are 58 stands that have been chosen for the purpose of sampling vegetation in Wadi El-Rashrash, which is located in the northern section of the Eastern desert.

3.2. Plant Life-Span in the Study Area

The records of wild plants that were found in the research area are shown in Table (1). This table revealed that there were 87 different kinds of plants found in the region that was being investigated. As can be seen in Figure (2), these species are divided into three primary categories: annual species make up 35.63 %of the total, biennial species make up 2.30%, and perennial species make up 62.07%.

3.3. Plant Life-Forms in the Study Area

According to the description and classification of life-forms (Raunchier, 1934), the life-forms of the wild plants that were recorded in the present study are grouped under eight different types as follows: therophytes, geophytes, nanophanerophytes, hemicryptophytes, chamaephytes, helophytes, parasite, and phanerophytes (Figure 3). Therophytes make up the largest proportion of the species that have been catalogued (37.93%), followed by chamaephytes (32.18%), hemicryptophytes (13.79%), nanophanerophytes (8.05%), geophytes (4.60%), and phanerophytes (3.45%). The value of helophytes and parasites, which together acquired a value of 1.15%, was noted as the lowest of all life forms.

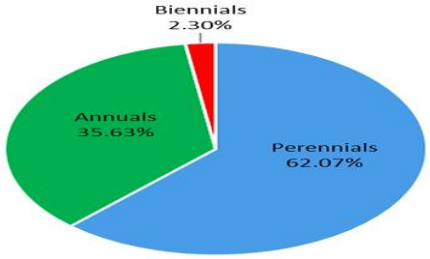

Figure 2. Plant life-span in the study area

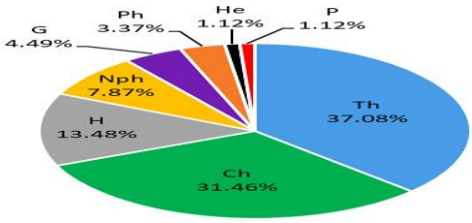

Figure 3. Plant life-forms in the study area

Table 1. Floristic composition of the plant life in the study area.

Plant Species	Family	Life form	Floristic analysis
Perennial			
Acacia tortilis (Forssk.) Hayne	Fabaceae	Ph	S-Z
Achillea fragrantissima (Forssk.)Sch.Bip.	Asteraceae	Ch	SA-SI+IR-TR
Aerva javanica (Burm.F.) Juss. ex Schult.	Amaranthaceae	Ch	SA-SI + S-Z
Alkanna lehmanii (Tin.) A.DC.	Boraginaceae	H	ME
Anabasis articulata (Forssk.) Moq.	Chenopodiaceae	Ch	SA-SI+IR-TR
Artemisia judiaca L.	Asteraceae	Ch	SA-SI
Artemisia monosperma Delile.	Asteraceae	Ch	SA-SI+ME
Astragalus bombycinus Boiss.	Fabaceae	H	SA-SI + IR-TR
Astragalus spinosus (Forssk.) Muschl.	Fabaceae	Ch	SA-SI + IR-TR
Atractylis carduus (Forssk.) C.Chr.	Asteraceae	H	ME+SA-SI
Calligonum polygonoides L. subsp. *comosum* (L′Hér.)Soskov	Polygonaceae	Nph	IR-TR+SA-SI
Calotropis procera (Willd.) R.Br.	Asclepiadaceae	Ph	SA-SI + S-Z
Cistanche phelypaea (L.) Cout.	Orobanchaceae	P, G	SA-SI+ME
Cleorne droserifolia (Forssk.) Delile	Cleomaceae	Ch	SA-SI + IR-TR
Crotalaria aegyptiaca Benth	Fabaceae	Ch	SA-SI
Cyondon dactylon (L.)Pers	Poaceae	G	COSM
Deverra tortuosa (Desf.)DC	Apiaceae	Ch	SA-SI
Diplotaxis harra (Forssk.) Boiss.	Brassicaceae	Ch	ME+ SA-SI
Echinops spinosus L.	Asteraceae	H	ME+SA-SI
Fagonia arabica L.	Zygophyllaceae	Ch	SA-SI
Fagonia mollis Delile.	Zygophyllaceae	Ch	SA-SI
Farsetia aegyptia Turra.	Brassicaceae	Ch	S-Z+SA-SI
Francoeuria crispa (Forssk.) Cass.	Asteraceae	Ch	SA-SI
Gypsopila capillaris (Forssk.) C.Chr.	Caryophyllaceae	H	IR-TR+SA-SI
Haloxylon salicornicum (Moq.) Bunge ex Boiss.	Chenopodiaceae	Ch	SA-SI
Haplophyllum tuberculatum (Forssk.) Juss	Rutaceae	H	SA-SI
Heliotropium arbainense Fresen.	Boraginaceae	Ch	SA-SI
Herniaria hemistemon J.Gay	Caryophyllaceae	H	SA-SI
Hyoscyamus muticus L.	Solanaceae	Ch	SA-SI
Iphiona mucronata (Forssk.) Asch. &Schweinf. Asteraceae		Ch	SA-SI
Kickxia aegyptiaca (L.) Nábelek	Scrophulariaceae	Ch	ME+SA-SI
Lasiurus scindicus Henrard.	Poaceae	G	SA-SI+S-Z
Launaea mucronata (Forssk.) Muschl.	Asteraceae	H	ME+SA-SI
Launaea nudicaulis (L.) Hook.f.	Asteraceae	H	SA-SI
Launaea spinosa (Forssk.) Sch.Bip. ex Kuntze.	Asteraceae	Ch	SA-SI
Lavandula coronopifolia Poir.	Lamiaceae	Ch	SA-SI
Leptadenia pyrotechnica (Forrsk.) Decne.	Asclepiadaceae	Nph	SA-SI
Lycium shawii Roem. & schult.	Solanaceae	Nph	SA-SI+S-Z

Nauplius graveolens (Forssk.) Wilklund	Asteraceae	Ch	SA-SI
Nitraria retusa (Forssk.) Asch.	Nitrariaceae	Ph	SA-SI
Ochradenus baccatus Delile.	Resedaceae	Nph	SA-SI
Panicum turgidum Forssk.	Poaceae	H	SA-SI
Pergularia tomentosa L.	Asclepiadaceae	Ch	SA-SI
Phragmites australis (Cav.) Trin.exSteud	Poaceae	G, He	COSM
Polycarpaea repens (Forssk.) Asch.	Caryophyllaceae	Ch	SA-SI
Pulicaria undulata (L.) C.A.Mey.	Asteraceae	Ch	SA-SI
Retama raetam (Forssk.)Webb&Berthel.	Fabaceae	Nph	SA-SI
Spergularia media (L.) C. Presl	Caryophyllaceae	H	ME+ IR-TR+ER-SR
Tamarix aphylla (L.) H. Karst.	Tamaricaceae	Nph	SA-SI+S-Z
Tamarix nilotica (Ehrenb.) Bunge.	Tamaricaceae	Nph	SA-SI
Trichodesma africanum (L.) R.Br.	Boraginaceae	H	S-Z+SA-SI
Zilla spinosa (L.) Prantl. .	Brassicaceae	Ch	SA-SI
Zygophyllum coccinum L.	Zygophyllaceae	Ch	SA-SI
Zygophyllum decumbens Delile.	Zygophyllaceae	Ch	SA-SI
Biennials			
Centaurea aegyptiaca L.	Asteraceae	Th	SA-SI
Launaea capitata (Spreng)Dandy	Asteraceae	Th	S-Z+SA-SI
Annuals			
Anthemis cotula L.	Asteraceae	Th	ME+IR-TR+ER-SR
Bassia indica (Wight) Scott.	Chenopodiaceae	Th	S-Z+IR-TR
Bassia muricata (L.)Asch.	Chenopodiaceae	Th	IR-TR+SA-SI
Atriplex lindleyi Moq. subsp. inflate (F.Muell.)Wilson.	Chenopodiaceae	Th	ME+IR-TR+ER-SR
Chenopodium murale L.	Chenopodiaceae	Th	COSM
Cleome amblyocarpa Barratte & Murb.	Cleomaceae	Th	SA-SI
Emex spinosa (L.) Campd.	Polygonaceae	Th	ME+SA-SI
Erodium laciniatum (Cav.) Wild.	Geraniaceae	Th	ME
Erysimum repandum L.	Brassicaceae	Th	ME+IR-TR+ER-SR
Euphorbia retusa Forssk.	Euphorbiaceae	Th	SA-SI
Hordeum spontaneum K. Koch	Poaceae	Th	ME+IR-TR
Ifloga spicata (Forssk.) Sch.Bip.	Asteraceae	Th	SA-SI
Lactuca serriola L.	Asteraceae	Th	ME+IR-TR+ER-SR
Lolium multiflorum Lam.	Poaceae	Th	ME+IR-TR+ER-SR
Lotus glinoides Delile	Fabaceae	Th	S-Z
Malva parvifolra L.	Malvaceae	Th	ME+IR-TR
Matthiola longipetala (Vent.) DC.	Brassicaceae	Th	ME+IR-TR
Mesembryanthemum forsskaolii Hochst.ex Boiss.	Aizoaceae	Th	SA-SI
Neurada procumbens L.	Neuradaceae	Th	SA-SI+S-Z
Plantago ciliata Desf.	Plantaginaceae	Th	SA-SI + IR-TR
Plantago lagopus L.	Plantaginaceae	Th	ME+IR-TR
Plantago notata Lag.	Plantaginaceae	Th	IR-TR+SA-SI
Plantago ovata Forssk.	Plantaginaceae	Th	IR-TR+SA-SI
Poa annua L.	Poaceae	Th	COSM
Reichardia tingitana (L.) Roth	Asteraceae	Th	ME+IR-TR
Reseda decursiva Forssk.	Resedaceae	Th	SA-SI
Rumex vesicarius L.	Polygonaceae	Th	SA-SI+ME+S-Z
Senecio glaucus L.	Asteraceae	Th	ME+IR-TR+SA-SI
Trigonella stellata Forssk.	Fabaceae	Th	SA-SI+IR-TR
Volutaria lippii (L.) Cass. ex Maire	Asteraceae	Th	SA-SI
Zygophyllum simplex L.	Zygophyllaceae	Th	SA-SI

Abbreviations: Life Form: H.= Hemicryptophytes Th. = Therophytes, Ph. = Phanerophytes, Ch. = Chamaephytes, Nph = Nanophanerophytes, G = Geophytes, He = Helophytes, P = Parasite; Floristic Category: COSM = Cosmopolitan, NEO = Neotropical, ME = Mediterranean, SA-SI = Saharo-Sindian, ER-SR = Euro-Siberian, IR-TR = Irano-Turanian, S-Z=Sudano-Zambezian

3.4. The Floristic Analysis of the Study Area

In the current study, 87 plant species from 70 distinct genera and 27 different families were found. These plant species were documented over the course of the investigation. According to Table 2, the family Asteraceae has 20 species, which accounts for 22.99% of the total number of plant species that have been documented. The families Fabaceae and Poaceae each include 7 species, which accounts for 8.05% of the total. Chenopodiaceae 6 species (6.90 %), Brassicaceae and Zygophyllaceae comprise 5 species each (5.75 %), Caryophyllaceae and Plantiginaceae 4 species each (4.60), Asclepiadaceae, Boraginaceae and Polygonaceae each 3 species (3.45%). The remaining families (16) were represented by either two or one species.

Table (2) displays, by floristic category, the many types of plant life found in the region under investigation. The Saharo-Sindian (10 species), the Biregional (7 species), and the Pluriregional (3 species) categories make up the majority of the family Asteraceae's floral diversity. The floristic elements in Fabaceae were Biregional (3 species), Saharo-Sindian and Sudano-Zamdzeian are represent by two species each. In Poaceae, the chorotypes were Pluriregional (4 species), Cosmopolitan (3 species), Biregional (2 species), Pluriregional and Saharo-Sindian (one species each). Chenopodiaceae was represented by 6 species distributed in four floristic elements: Cosmopolitan, Pluriregional and Saharo-Sindian are representing only one species each, and Biregional (3 species). The common floristic categories in Brassicaceae were Pluriregional and Saharo-Sindian is represent only one species and Biregional (3 species). In Zygophylaceae, the floristic categories are Saharo-Sindian (5 species). In Caryophyllaceae, the floristic categories were Saharo-Sindian (2 species), Pluriregional and Biregional (one species each). In Plantaginaceae, the floristic categories are Biregional (4 species). The most common floristic elements of the family Asclepiadaceae are Biregional is represent by only one species and Saharo-Sindian (2 species). In Boraginaceae the floristic categories were Biregional, Saharo-Sindian and Mediterranean (one species each). In Polygonaceae, the floristic categories were Pluriregional (one species) and Biregional (2 species). The remaining families (16), on the other hand, were represented by two or fewer species.

In addition, Table 3 demonstrates that the Mediterranean region is home to 23 species, which accounts for 26.44% of the total number of species that have been reported. These taxonomic groups are classified as either Pluriregional (8 species, which accounts for 9.20%), Biregional (13 species, which accounts for 14.94%), or Monoregional (2 species, which accounts for 2.30%). It has been found Saharo-Sindian 67 species represented by 77.02% these taxa are either Monoregional (36 species = 41.38%), Biregional (29 species = 33.33%) and Pluriregional (2 species = 2.30%). Additionally, 4 species or represented by 4.60% Cosmopolitan and two species or represented 2.30% of the total number of recorded species are Sudano-Zamdzeian

Table 2. The dominant chorotype among the research zone's families.

No.	Families	Genus	Species	COSM	Plurio-regional	Bi-regional	ME	SA-SI	S-Z
1	Asteraceae	16	20		3	7		10	
2	Fabaceae	6	7			3		2	2
3	Poaceae	7	7	3	1	2		1	
4	Chenopodiaceae	5	6	1	1	3		1	
5	Brassicaceae	4	5		1	3		1	
6	Zygophyllaceae	2	5					5	
7	Caryophyllaceae	4	4		1	1		2	
8	Plantaginaceae	1	4			4			
9	Asclepiadaceae	1	3			1		2	
10	Boraginaceae	3	3			1	1	1	
11	Polygonaceae	3	3		1	2			
12	Cleomaceae	1	2			1		1	
13	Resedaceae	2	2					2	
14	Solanaceae	2	2			1		1	
15	Tamaricaceae	1	2			1		1	
16	Aizoaceae	1	1					1	
17	Amaranthaceae	1	1			1			
18	Apiaceae	1	1					1	
19	Euphorbiaceae	1	1					1	
20	Geraniaceae	1	1				1		
21	Lamiaceae	1	1					1	
22	Malvaceae	1	1			1			
23	Neuradaceae	1	1			1			
24	Nitrariaceae	1	1					1	
25	Orobanchaceae	1	1			1			
26	Rutaceae	1	1					1	
27	Scrophulariaceae	1	1			1			
Total		**70**	**87**	**4**	**8**	**35**	**2**	**36**	**2**
Percentage				**4.60**	**9.20**	**40.23**	**2.30**	**41.38**	**2.30**

Table 3. Number of species and percentage of various floristic categories of the study area.

Floristic category	Study area		Geographical distribution
	No.	%	
COSM	4	4.60	Worldwide
ME+IR-TR+ER-SR	6	6.90	Pluriregional elements
ME+IR-TR+SA-SI	1	1.15	
ME+SA-SI+S-Z	1	1.15	
ME+IR-TR	5	5.75	Biregional elements
ME+SA-SI	8	9.20	
IR-TR+SA-SI	12	13.79	
IR-TR+S-Z	1	1.15	
SA-SI+S-Z	9	10.34	
ME	2	2.30	Mono-regional elements
SA-SI	36	41.38	
S-Z	2	2.30	
Total	87	100.00	

4. Conclusion

Egypt is attempting to enhance food, forage, and medical supply production by using renewable resources from both cultivated and uncultivated areas. The current study found 87 identified plant species dispersed over 70 genera and 27 families. The majority of the taxa reported were from the Mediterranean. Furthermore, 65 species were discovered to have a significant Saharo-Sindian component. It is critical to use essential natural resources carefully, including untamed wildlife, forests, fisheries, and the land, water, and air.

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