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Floristic and Ecological Studies of the Western Mediterranean coastal land in Egypt, (Wadi Um Rakham)

Abstract

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The present study is an attempt to describe the floristic and ecological features in Wadi Um Rakham, which is seemed to be one of the richest wadies in the western Mediterranean coastal region of Egypt. Wadi Um Rakham area is characterized by prominent physiographic variations which lead to the distinction of different habitats. Mediterranean elements predominate the floristic structure of the study area; among these therophytes is the most frequent life form.

Introduction

The entire northern region of the Egyptian western desert, extending from the Libyan border to the Qattara Depression is covered by sedimentary formations, which range in age from lower Miocene to Holocene. The Holocene formations comprise lagoon and loamy deposits, sand dune accumulation. The entire northern region of the Egyptian western desert, extending from the Libyan border to the Qattara Depression is covered by sedimentary formations, which range in age from lower Miocene to Holocene. The Holocene formations comprise lagoon and loamy deposits, sand dune accumulations, wadi fillings and limestone crusts. Older formations (Pleistocene-Miocene) are of limestone or dolomite (Selim 1969).

Northern plateau attains an altitude of 215 m. a.s.l. at Sallum and slopes towards the Mediterranean coast to an escarpment dissected by an extensive system of ephemeral wadies (El Hadidi & Ayyad 1975).

The wadies of the western desert have been scarcely explored. The only known study to the authors is that carried out by El Hadidi and Ayyad (1975) in which they studied the floristic and ecological features of Wadi Habis.

The present account aims at studying the plant life and the floristic composition of Wadi Um Rakham that is seemed to be vegetationally and floristically one of the richest wadies in the Western Desert. The present study was undertaken during the period from March 2002 to April 2003. The characteristic features of the different habitats were described. Plant collections are kept in the herbarium of Menufiya University (MNF), Egypt. The identification and species arrangement is according to Täckholm (1974); Boulos (1995)

and El-Hadidi *et al.* (1994/1995). Life form used to construct a biological spectrum is due to Raunkiaer (1934).

Description of the study area

The study area is a part of the northwestern Mediterranean coast of Egypt. The western desert in its full extension is part of subtropical arid deserts (Walter & Breckle 1984). The climate of the Western Mediterranean coastal land belongs to the dry climatic zone of Köppen's classification system (see Trewartha 1954). Mild winters and very hot summers characterize the temperature regime of the area. The average January temperatures remain rather constant between 12 and 14°C, the July mean raises approximately 25°C at the Mediterranean coast, (Walter & Lieth 1967).

Wadi Um Rakhm (31° 24' N, 27° 02' W) is one of the wadies dissecting the limestone northern plateau (Fig. 1). It shows the most sign of Greco-Roman occupation. The lower reaches of the wadi are heavily disturbed by irrigation works and farming activities. Recent irrigation works, including cement-covered boulder dams are spread along considerable lengths of the wadi. The main channel of the wadi is about 4 km long and cuts through a limestone tableland, which is about 100 m above sea level. It runs in a SW-NE direction.

The wadi may be physiographically distinguished into: **A.** Desert plateau and upper terraces which are devoid of soil cover, its vegetation is a typical cliff vegetation restricted to notches and shallow drainage runnels, **B.** Middle terraces are covered by a shallow soil mixed with fragments of different sizes and dominated by shrubby chasmophytic species, **C.** Lower position of slopes with deep soil accumulation supporting a dense vegetation and **D.** The main channel of the wadi, which is divided into four plant communities associated with areas that differ with regard to edaphic factors. These are briefly described as follows:

1 — The mouth and lower reaches of the wadi, which extends for about 500 m and varies in broad from 80-120 m. is cultivated with old olive trees and characterized by deep accumulations of loamy sand. It is characterized by a dense cover of weeds

2 — Middle reaches of the wadi, which extends for about 900 m and ranges from 60 to 80 m in broad with sparse fig trees. The vegetation of this reaches is rather dense on hillocks formed from accumulation of soft soil material on both sides of cement-covered boulder dams.

3 — Upper reaches of the wadi can be distinguished into two distinct areas; (A) the first is fallow area which extends for about 700 m and varies in broad from 30-40 m. and (B) the wadi bed which is narrow, only about 7-10 m broad with shallow sand mixed and covered with boulders and conglomerates.

Results and Discussion

Special distribution of plant species and communities over a small geographic area in the desert ecosystem is related to heterogenous topography and landform pattern (Kassas 1953; Harness & West 1973). Several microhabitats were recognized viz. wadi bed, cliffs, slopes and terraces; each of these microhabitats has characteristic floristic composition and plant cover. The plant cover in desert is closely related to the physical prop

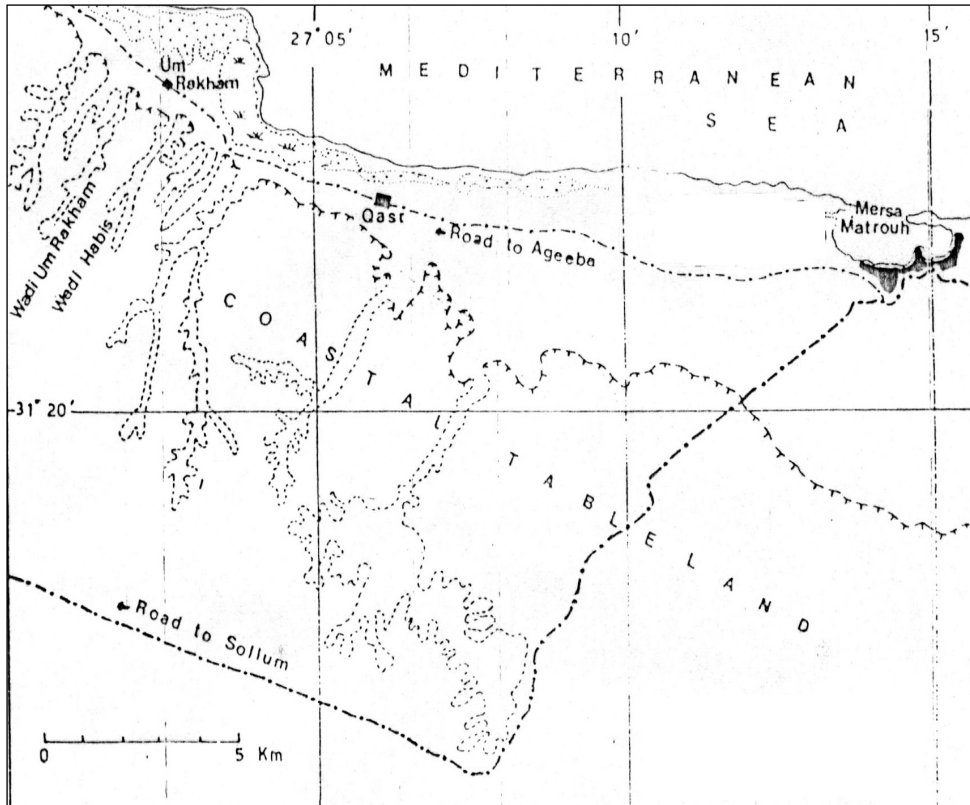


Fig. 1. A physiographic map of the Mediterranean coastal land of Egypt west of Mersa Matrouh indicating the location of wadi Um Rakham and wadi Habis.

erties of the soil as well as the water resources. Four communities can be distinguished in the study area as indicated in the following:

1. *Gymnocarpos decanderum* community

Vegetation type dominated by *Gymnocarpos decanderum* in the study area is confined to the plateau. This community comprises a number of the most common associates viz. *Salsola longifolia*, *Rumex vesicarius*, *Thymelea hirsuta*, *Coridothymus capitatus* and *Allium aschersonianum*.

2. *Devera tortuosa* community

This community grows on shallow soils in the slopes. *Devera tortuosa* is able to grow on very different soils (Batanouny 1969). This community includes the dominant plant together with *Phlomis floccosa*, *Gymnocarpos decandrum*, *Salsola longifolia*, *Haloxylon scoparium*, *Iphiona mucronata*, *Fagonia critica*, *Coridothymus capitatus*, *Asphodelus ramosus* and *Asparagus stipularis*.

3. *Atriplex halimus* community

This community is the most apparent community which occurs in edges and upstream

parts of the wadi. Among the frequent species of this community are *Dianthus cyri*, *Atriplex inflata*, *A. leucoclada*, *A. halimus*, *Suaeda pruinosa*, *Salsola longifolia*, *S. tetrandra*, *Haloxylon scoparium*, *Fagonia cretica*, *Devera tortuosa*, *Heliotropium digynum* and *Marrubium alysson*.

4. Main channel community

Three plant communities can be distinguished in the main channel of the wadi. These communities are represented in the following:

— A. Olive cultivation community

This community occupies the mouth of the wadi and characterized by a dense cover of weed which is co-dominated by *Trifolium tomentosum*, *Lotus creticus*, *Sisymbrium irio*, *Convolvulus althaeoides*, *Launaea nudicaulis*, *Bromus rubens* and *Cynodon dactylon*, which is characteristics of the cultivated land weeds. Associated species include the highest number of ephemerals.

— B. Fig cultivation community

This community occupies the middle reach of the wadi and characterized by rather dense vegetation which is co-dominated by *Launaea nudicaulis*, *Bromus rubens*, *Cynodon dactylon*, *Lolium rigidum*, *Mesembrianthemum forsskalii*, *Stellaria pallida*, *Spergula fallax*, *Chenopodium murale*, *Brassica tournfourthii*, *Erucaria pinnata* and *Trigonella maritima*.

Human activities contribute to the disruption of the natural equilibrium among the components of the ecosystem, thus causing its deterioration (Batanouny 1975, 1976). Cultivation processes carried out in the mouth, lower and middle reaches of the wadi, may lead to the disappearance of the natural vegetation of the wadi. The dominance of the species changes, and previously rather inconspicuous plant species were able to dominate plant communities. At the same time, the species of the desert flora start to disappear.

C. Upper reach community

This community occupies fallow area and wadi bed. The vegetation is sparse and dominated by shrubby species with chasmophytic nature, viz. *Gymnocarpus decandrum*, *Iphiaona mucronata*, *Capparis spinosa* *Coridothymus capitatus*, with other common associates viz. *Aizoon hispanicum* *Zygophyllum simplex*, *Devera tortuosa*, *Heliotropium digynum*, *Echium sericeum*, *Cynera cornigera*, *Cichorium endivia*, *Cynodon dactylon* and *Hordeum murinum* in addition to annuals growing on shallow soil accumulations between the boulders and rock fragments.

Taxa recorded from the different habitats of Wadi Um Rakham area are represented in table (1). The total number of recorded species from the different habitats was 165 species belonging to 38 families. It may be noticed that Mediterranean taxa (125 species, constituting about 76.8% of the recorded species.) are well represented, as mono-regional (29 species, 17.6%), bi-regional (65 species, 39.2%) or tri-regional (32 species, 19.4%). Bi-regional Mediterranean species are under the influence of Irano-Turanian elements (41 species, 24.9%) penetrating from the east, Saharo-Sindian or Sudano-Zambezi elements (23 species, 13.9% and one species, 0.4% respectively) penetrating from the south. Other more widespread Mediterranean taxa (tri-regional) showed the apparent influence of Irano-Turanian and Saharo-Sindian elements (12 species, 7.3%), tri-regional taxa under the influence of Irano-Turanian and Euro-Siberian elements are (13 species, 7.9%), tri-regional taxa under the influence of Sudano-Zambezi and Saharo-Sindian elements are apparently few (3 species, 1.8%).

Table 1. Floristic composition in the different habitats of Wadi Um Rakham: **Th**: Therophytes, **Cr**=Cryptophytes, **He**: Hemicryptophytes, **Ch**: Chamaephytes and **Ph**: Phanerophytes. **FC**: Floristic categories: **Cosm**=Cosmopolitan, **Pan**=Pantropical, **Pal**: Palaeotropical, **S-Z**=Sudano-Zambeian, **SA-SI**=Saharo-Sindian, **M**= Mediterranean, **IR-TR**=Irano-Turanian, **EU-SI**= Euro-Siberian. **Habit**: **Ann.**= annual, **Bi**= Biennial, **Frut.** = Woody perennials, **Per.**= herbaceous perennials. **Habitats**: **A**= Desert plateau and upper terraces, **B**= Middle terraces, **C**=lower position of slopes, **D**= Main channel.

Taxon	LF	Habitat				FC
		A	B	C	D	
<i>Ficus carica</i> L.	Ph				+	M
<i>Emex spinosa</i> (L.) Campd.	Th				+	PAN
<i>Polygonum equisetiforme</i> Sibth. & Sm.	Ch				+	M+IR-TR
<i>Rumex vesicarius</i> L.	Th	+			+	SA-SI+M+S-Z
<i>Mesembryanthemum nodiflorum</i> L.	Th				+	M+SA-SI+EU-SI
<i>Mesembryanthemum forskahlei</i> Hochst. ex Boiss.	Th				+	S-Z+SA-SI
<i>Aizoon hispanicum</i> L.	Cr			+		SA-SI
<i>Dianthus cyri</i> Fisch. & Mey.	Th				+	M+IR-TR
<i>Silene apetala</i> Willd.	He				+	M
<i>Minuartia mediterranea</i> Hayek	Th				+	M+SA-SI+S-Z
<i>Stellaria pallida</i> (Dumort.) Pire	Th				+	M+SA-SI+S-Z
<i>Spergularia fallax</i> Lowe	Th			+	+	M+IR-TR+EU-SI
<i>Herniaria cinerea</i> DC.	Th			+	+	M
<i>Paronychia argentea</i> Lam.	Ch	+	+			M+IR-TR
<i>Gymnocarpos decandrum</i> Forssk.	Th				+	PAL
<i>Beta vulgaris</i> L. subsp. <i>vulgaris</i>	Th				+	PAL
<i>Beta vulgaris</i> subsp. <i>maritima</i> (L.) Thell.	Th				+	COSM
<i>Chenopodium murale</i> L.	Th			+	+	COSM
<i>Chenopodium glaucum</i> L.	Ch			+		SA-SI+M
<i>Atriplex inflata</i> F. Muell.	Ch			+		SA-SI+M
<i>Atriplex halimus</i> L.	Ch			+		SA-SI+M
<i>Atriplex leucoclada</i> Boiss.	Ch			+		M+SA-SI
<i>Suaeda pruinosa</i> Lange	Th			+		SA-SI+IR-TR
<i>Salsola inermis</i> Forssk.	Ch			+		M+IR-TR
<i>Salsola tetrandra</i> Forssk.	Ch	+	+	+		SA-SI+M
<i>Salsola longifolia</i> Forssk.	Ch		+	+		SA-SI+IR-TR
<i>Haloxylon scoparium</i> Pomel	Ch		+	+		M+IR-TR
<i>Noaea mucronata</i> Aschers. & Schweinf.	Ch					SA-SI+IR-TR
<i>Anabasis articulata</i> Moq. in DC.	Th				+	PAL
<i>Amaranthus graecizans</i> L.	Th			+	+	PAL
<i>Amaranthus lividus</i> L.	Th				+	EU-SI+IR-TR+M
<i>Adonis dentata</i> Delile	Th				+	M+IR-TR+EU-SI
<i>Papaver hybridum</i> L.	Th				+	M+IR-TR
<i>Papaver rhoeas</i> L.	Th			+	+	M
<i>Corydalis bracteosa</i> Spreng.	Ch					SA-SI+IR-TR+M
<i>Capparis spinosa</i> L.	Th				+	M+IR-TR+EU-SI
<i>Sisymbrium irio</i> L.	Th				+	M+IR-TR
<i>Matthiola longipetala</i> (Vent.) DC.	Th				+	M+IR-TR
<i>Brassica tournefortii</i> Gouan	Th				+	M+AS-SI
<i>Erucaria pinnata</i> (Viv.) Tackholm & Boulos	Th				+	SA-SI
<i>Enarthrocarpus strangulatus</i> Boiss.	Th				+	SA-SI

Table 1. Continued.

Taxon	LF	Habitat				FC
		A	B	C	D	
<i>Biscutella depressa</i> Willd.	Th				+	M+IR-TR
<i>Biscutella didyma</i> L.	Th				+	M+IR-TR
<i>Reseda decursiva</i> Forssk.	Ch				+	SA-SI+M
<i>Reseda phyteuma</i> L.	Th				+	M
<i>Sanguisorba verrucosa</i> (G. Don) Ces.	He				+	M
<i>Trigonella maritima</i> Delile	Th				+	M
<i>Trigonella laciniata</i> L.	Th				+	M+IR-TR+SA-SI
<i>Medicago littoralis</i> Loisel	Th				+	M+SA-SI
<i>Medicago truncatula</i> Gaertn.	Th				+	M+IR-TR+EU-SI
<i>Medicago polymorpha</i> L.	Th				+	M+IR-TR+EU-SI
<i>Medicago laciniata</i> Mill.	Th				+	SA-SI
<i>Trifolium tomentosum</i> L.	Th				+	M+IR-TR+EU-SI
<i>Trifolium scabrum</i> L.	Th				+	M
<i>Lotus creticus</i> L.	He				+	M
<i>Scorpiurus muricata</i> L.	Th				+	M
<i>Hippocrepis areolata</i> Desv.	Th				+	S-Z+M
<i>Astragalus boeoticus</i> L.	Th				+	M+SA-SI
<i>Astragalus peregrinus</i> Vahl	Th				+	SA-SI+M
<i>Astragalus hamosus</i> L.	Th				+	M
<i>Astragalus tribuloides</i> Delile	Th				+	SA-SI+IR-TR
<i>Onobrychis crista-galli</i> Lam.	Th				+	IR-TR+SA-SI
<i>Vicia peregrina</i> L.	Th				+	M+IR-TR
<i>Vicia monantha</i> Retz.	Th				+	M+IR-TR
<i>Lathyrus pseudocicera</i> Pamp.	Th				+	M
<i>Senna alexandrina</i> Garsault	Ch				+	S-Z+SA-SI
<i>Erodium gruinum</i> Soland. in Aiton	Th				+	M+SA-SI
<i>Erodium malacoides</i> (L.) L'Hér.	Th		+	+	+	M+IR-TR+EU-SI
<i>Erodium laciniatum</i> Willd.	Th		+	+	+	M
<i>Peganum harmala</i> L.	He				+	SA-SI+IR-TR+M
<i>Fagonia cretica</i> L.	Ch		+	+		M
<i>Zygophyllum simplex</i> L.	Ch				+	M+SA-SI
<i>Haplophyllum tuberculatum</i> Juss.	Ch				+	SA-SI
<i>Malva aegyptia</i> L.	Th			+	+	SA-SI+M
<i>Malva parviflora</i> L.	Th				+	PAN
<i>Thymelaea hirsuta</i> Pers.	Ch	+			+	M+SA-SI
<i>Helianthemum ciliatum</i> Pers.	He				+	S-Z+SA-SI
<i>Reaumuria hirtella</i> Jaub. & Spach	Ch				+	SA-SI+IR-TR
<i>Coriandrum sativum</i> L.	Th			+	+	M+IR-TR
<i>Bupleurum lancifolium</i> Hornem	Th				+	M+IR-TR
<i>Devera tortuosa</i> DC.	Ch		+	+		SA-SI
<i>Anagallis arvensis</i> L.	Th		+	+		M+IR-TR+EU-SI
<i>Limonium lobatum</i> (L. f.) Kuntze	Th				+	M+SA-SI
<i>Limonium tubiflorum</i> Kuntze	Cr				+	M+SA-SI+IR-TR
<i>Olea europaea</i> L.	Ph				+	M
<i>Convolvulus althaeoides</i> L.	He			+	+	M+SA-SI+IR-TR
<i>Heliotropium digynum</i> C.Christensen	He			+	+	M+SA-SI
<i>Anchusa milleri</i> Lam. ex Spreng.	Th			+	+	SA-SI+IR-TR+M

Table 1. Continued

Taxon	LF	Habitat				FC
		A	B	C	D	
<i>Echium sericeum</i> Vahl	He			+	+	M+SA-SI
<i>Verbena officinalis</i> L.	Ch			+	+	M+IR-TR+SA-SI
<i>Coridothymus capitatus</i> Rchb. f.	Ch	+	+	+		M
<i>Satureja myrtifolia</i> (Boiss. & Hohen.) Greuter & Burdet	Ch			+		M+IR-TR
<i>Salvia lanigera</i> Poir.	Ch			+		M+SA-SI
<i>Salvia verbenaca</i> L.	Ch			+		M+IR-TR+EU-SI
<i>Marrubium alysson</i> L.	Th			+		SA-SI+M
<i>Phlomis floccosa</i> D. Don	Ch			+		IR-TR+M
<i>Lycium europaeum</i> L.	Ph			+	+	M+IR-TR
<i>Nicotiana glauca</i> Graham	Ph				+	fromAmerica
<i>Verbascum letouneuxii</i> Aschers.	Ch				+	M+IR-TR
<i>Linaria albifrons</i> Spreng.	Th				+	M+IR-TR
<i>Kickxia spartioides</i> (Brouss.ex Buch) Janchen	Ch				+	SA-SI
<i>Cistanche violacea</i> Hoffmanns. & Link	Cr				+	SA-SI+IR-TR
<i>Plantago crypsoides</i> Boiss.	He				+	M
<i>Plantago lagopus</i> L.	Th				+	M+IR-TR
<i>Plantago crassifolia</i> Forssk.	He				+	M
<i>Campanula sulphurea</i> Boiss.	Th				+	M+SA-SI
<i>Echinops spinosus</i> L.	Ch				+	IR-TR+SA-SI
<i>Carlina involucreta</i> Poir.	Ch				+	M
<i>Carduus getulus</i> Pomel	Ch				+	M+SA-SI
<i>Atractylis prolifera</i> Boiss.	Th				+	SA-SI
<i>Cynara cornigera</i> Lindley	Th				+	M
<i>Centaurea alexandrina</i> Delile	Cr				+	M+IR-TR
<i>Centaurea glomerata</i> Vahl	He				+	M+IR-TR
<i>Centaurea bimorpha</i> Viv.	He				+	M+IR-TR
<i>Volutarella lippii</i> Cass.	He			+	+	SA-SI+M+EU-SI
<i>Amberboa crupinoides</i> DC.	Th					SA-SI+S-Z
<i>Kentrophyllum alexandrinum</i> Boiss.	Th		+		+	M
<i>Iphiona mucronata</i> Aschers. & Schweinf.	Th				+	SA-SI
<i>Carduncellus eriocephalus</i> Boiss.	Ch			+	+	SA-SI
<i>Achillea santolina</i> L.	Cr				+	M+IR-TR
<i>Chrysanthemum coronarium</i> L.	He				+	M+SA-SI
<i>Artemisia inculta</i> Sieber ex DC.	Th				+	M
<i>Senecio glaucus</i> L.	Ch				+	SA-SI+IR-TR
<i>Calendula arvensis</i> L.	Th				+	M+IR-TR+SA-SI
<i>Cichorium endivia</i> L.	Th				+	M
<i>Urospermum picroides</i> (L.) F.W.Schmidt	Th	+			+	M+IR-TR
<i>Picris asplenioides</i> L.	Th					M+IR-TR
<i>Picris sulphurea</i> Delile	Th				+	M+IR-TR
<i>Launaea nudicaulis</i> Hook.f.	Th				+	M+IR-TR
<i>Scorzonera undulata</i> Vahl	Th			+	+	IR-TR+SA-SI
<i>Reichardia picroides</i> Roth	Cr				+	M+IR-TR+SA-SI
<i>Sonchus oleraceus</i> L.	Th				+	COSM
<i>Hedypnois rhagadioloides</i> (L.) F.W.Schmidt	Th		+	+	+	M+IR-TR
<i>Onopordum alexandrinum</i> Boiss.	Th		+	+		IR-TR+SA-SI

Table 1. Continued

Taxon	LF	Habitat				FC
		A	B	C	D	
<i>Pallenis spinosa</i> (L.) Cass.	Th				+	M+IR-TR
<i>Thrinicia tripolitana</i> Sch.Bip. ex Buser	Cr				+	M
<i>Asphodelus ramosus</i> L.	Cr		+	+		M
<i>Asparagus stipularis</i> Forssk.	Cr		+	+		M
<i>Allium barthianum</i> Aschers.& Schweinf.	Cr		+	+		M
<i>Allium blomfieldianum</i>	Cr			+		M
<i>Allium erdelii</i> Zucc.	Cr			+		M+IR-TR
<i>Allium roseum</i> L.	Cr			+		M+SA-SI
<i>Allium aschersonianum</i> Barbey	Cr	+	+	+		M
<i>Bromus rubens</i> L.	Th				+	M+IR-TR+SA-SI
<i>Bromus fasciculatus</i> C. Presl	Th				+	M+IR-TR+SA-SI
<i>Briza minor</i> L.	Th				+	M+IR-TR+EU-SI
<i>Brachypodium distachyon</i> (L.) P.Beauv.	Th				+	M+IR-TR
<i>Festuca dichotoma</i> Forssk.	Th			+	+	IR-TR+SA-SI
<i>Lamarckia aurea</i> (L.) Moench	Th				+	M+IR-TR+S-Z
<i>Phragmites australis</i> (Cav.) Steud.	Cr				+	PAN
<i>Aegilops bicornis</i> Jaub. & Spach	Th				+	M+IR-TR+SA-SI
<i>Aegilops kotschi</i> Boiss.	Th				+	IR-TR+SA-SI
<i>Hordeum leporinum</i> Link	Th				+	M+IR-TR
<i>Hordeum murinum</i> subsp. <i>glaucum</i> (Steud.) Tzvelev	Th				+	M+IR-TR
<i>Lolium temulentum</i> L.	Th				+	EU-SI+M+IR-TR
<i>Lolium rigidum</i> Gaud.	Th				+	M+IR-TR
<i>Avena sterilis</i> L.	Th				+	M+IR-TR
<i>Crypsis schoenoides</i> (L.) Lam.	Th				+	M+IR-TR+EU-SI
<i>Cynodon dactylon</i> Steud.	Cr				+	PAN
<i>Phalaris minor</i> Retz.	Th				+	M+IR-TR
<i>Phalaris paradoxa</i> L.	Th				+	M+IR-TR
<i>Panicum coloratum</i> L.	Cr			+	+	M+IR-TR
<i>Setaria pumila</i> Roem. & Schult.	Th				+	M+IR-TR+S-Z
<i>Pennisetum divisum</i> (F.Gmel.) Henrard	Cr				+	M+S-Z
<i>Phoenix dactylifera</i> L.	Ph				+	SA-SI+S-Z

The results indicate that Mediterranean elements predominate the study area, although being under influence of elements belonging to Palaeotropical and Boreal kingdoms and this agrees with Good (1947). Saharo-Sindian taxa (14 species, 9.2%) are represented as mono-regional (9 species, 5.5%) and bi-regional under the influence of Sudano-Zambezian elements (5 species, 3.0%). Irano-Turanian taxa under the influence of Saharo-Sindian elements are also represented (12 species, 7.3%). Taxa of wide geographical range, viz. Cosmopolitan, Palaeotropical and Pantropical have apparently lower presence value (Table 2).

Cosmopolitan taxa are represented by *Chenopodium murale*, *C. glaucum* and *Sonchus oleraceus* while Palaeotropical taxa are represented by *Beta vulgaris* (2 subsp. *vulgaris* and *maritima*), *Amaranthus graecizans* and *A. lividus* and Pantropical taxa are represented by

Emex spinosa, *Malva parviflora*, *Cynodon dactylon* and *Phragmites australis*.

The life form of desert plants is closely related with rainfall, topography and land form (Kassas & Girgis 1965; Zohary 1973; Orshan 1982). Therophytes with their life span as short as few weeks are characteristic of desert regions and cultivated soils where the interference of man protects them from their natural competitors.

Table 2. Chorology of the species recorded in Wadi Um Rakham

FC	Number of recorded species	Percentage
M+IR-TR	41	24.9
M	29	17.9
M+SA-SI	23	13.9
M+IR-TR+EU-SI	13	7.9
M+IR-TR+SA-SI	12	7.3
IR-TR+SA-SI	12	7.3
SA-SI	9	5.5
SA-SI+S-Z	5	3.0
PAN	4	2.4
PAL	4	2.4
M+SA-SI=S-Z	3	1.8
COSM	3	1.8
M+SA-SI+EU-SI	2	1.2
M+IR-TR+S-Z	2	1.2
SA-SI+S-Z=IR-TR	1	0.4
M+S-Z	1	0.4
Naturalized from America	1	0.4

Table 3. Number and percentage of different life forms recorded in Wadi Um Rakham

Category	Number of species	Percentage
Therophytes	95	57.6
Chaemophytes	32	19.4
Cryptophytes	19	11.5
Hemicryptophytes	14	8.5
Phanerophytes	5	3.0
Total	165	100

Table 3 indicates that the most frequent life form in the present study is Therophytes (95 species, 57.6%) followed by Chamaephytes (32 species, 19.4%) and this reflects the arid condition of the study area.

The permanent framework of the vegetation was formed of common woody perennials, which constitute about 10.3% of the total number of species, viz. *Gymnocarpos decanderum*, *Atriplex inflata*, *A. halimus*, *Suaeda pruinosa*, *Salsola tetrandra*, *Noaea mucronata*, *Anabasis articulata*, *Capparis spinosa*, *Fagonia cretica*, *Devera tortusa*, *Lycium*

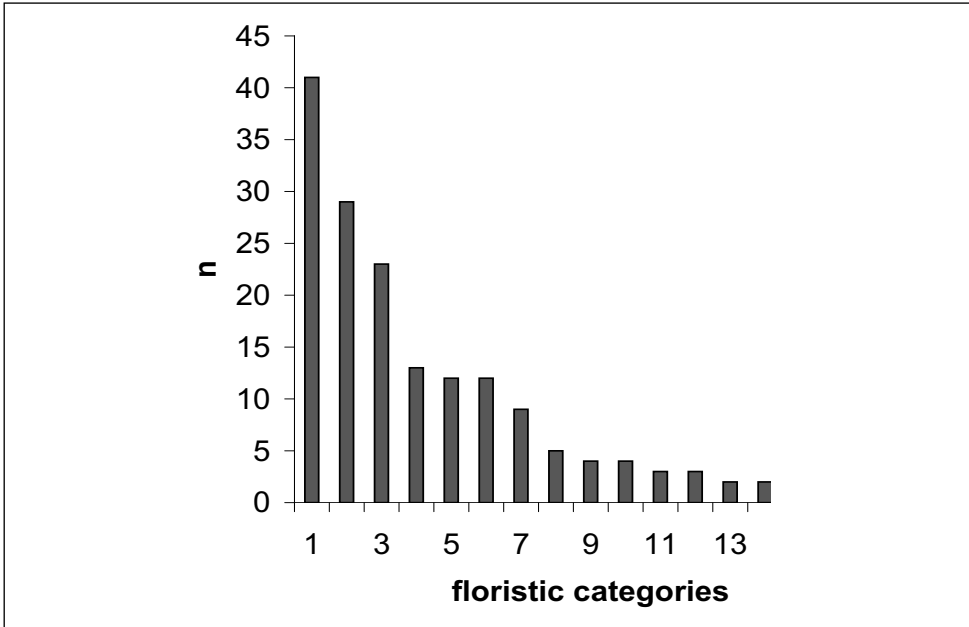


Fig. 2. Histogram of the number of species in each floristic category: 1) M+IR+TR; 2) M; 3) M+SA-SI; 4) M+IR-TR+EU-SI; 5)M+IR-TR+SA-SI; 6) IR-TR+SA-SI; 7) SA-SI; 8) SA-SI+S-Z; 9) PAN; 10) PAL; 11) M+SA-SI+S-Z; 12) COSM; 13) M+SA-SI+S-Z; 14) M+IR-TR+S-Z; 15) M+S-Z; 16) SA-SI+S-Z; 17) Naturalized from America.

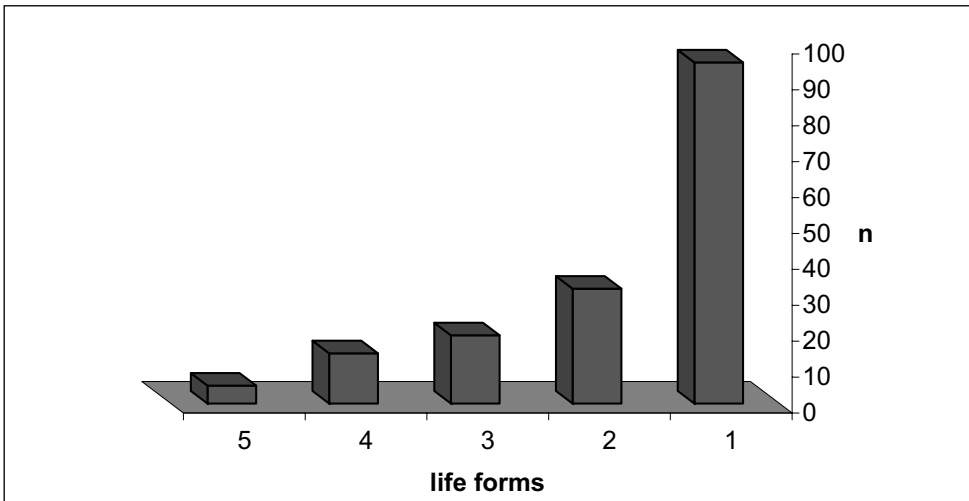


Fig. 3. Histogram of the number of species against different life form: 1) Therophytes; 2) Chamaephytes; 3) Cryptophytes; 4) Emicryptophytes; 5) Phanerophytes.

europaeum, in addition to many perennial herbs, viz. *Sanguisorba minor*, *Lotus creticus*, *Peganum harmala*, *Convolvulus althaeoides* and *Scorzonera undulata*.

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