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Studies on the shallow wadies of the Mareotis sector of the Mediterranean coastal land of Egypt: Floristic features of Wadi Hashem

Abstract

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A total of 195 species were recorded in the different sectors of Wadi Hashem cut-in the limestone plateau west of Mersa Matruh (Egypt). The distribution of these species in the different sectors of the Wadi as well as the phytochoria for the recorded species is provided. The highest number of species (157) was recorded in the stream part of the Wadi bed while the lowest number (34) was recorded in the three cliffs of the Wadi. Sixty seven species forming 34.36% of the total are typical Mediterranean (monoregional) taxa. About 93 species (47.69%) are bi- or pluriregional taxa with apparent Mediterranean affinities.

Key words: flora, phytochoria, Wadi Hashem, Mareotis sector.

Introduction

The Mediterranean coastal land of Egypt remains floristically one of less known territories of this country. It is regarded by El-Hadidi (1980) as one phytogeographical (ecological) territory extending for about 970 km from Sallum on the Egyptian-Libyan border eastwards to Rafah on the Egyptian-Palestinian border, with an average width of 15-20 km in a north-south direction. Zahran & al. (1985, 1990) distinguished between three sectors of the Mediterranean coastal land: western (the Mareotis, extending for 550 km between Sallum and Alexandria), middle (Deltaic, extending for 180 km between Alexandria and Port Said) and eastern (Sinaitic, extending for 220 km between Port Said and Rafah). El-Hadidi (2000) divided the Mediterranean coastal land of Egypt into: Mareotis sector where Cyrenaican elements are prominent and Sinaitic sector where East Mediterranean taxa prevail. He regarded the Deltaic sector sensu Zahran & al. (1985, 1990) as transitional zone between both sectors. According to Zahran & Willis (1992), the western Mediterranean coastal belt is by far the richest part of Egypt in its floristic composition owing to its relatively high rainfall. Boulos (1975) cited 1095 taxa recorded along Mediterranean coastal land of Egypt and El-Hadidi (2000) gave an estimate of 1060 taxa which are recorded in the Mediterranean

coastal land, among which 321 are typical Mediterranean taxa which are not known elsewhere in Egypt. Mashaly (1987) recorded 225 species from Deltaic sector of the Mediterranean coastal land of Egypt; of which about 45% are Mediterranean taxa and Khedr (1999) recorded 135 species in the Mediterranean Deltaic Burullus Lake with more than half of the species (54.1%) have Mediterranean distribution. Gibali (1988) recorded 382 taxa from the Sinaitic sector, of which 50% are Mediterranean. At present no exact estimation can be given for the number of species of Mareotis sector extending for 550 km between Sallum and Alexandria, which can raise up to 600 taxa (El-Hadidi 1993). Among the earlier works that are known to the authors dealing with the floristic features and vegetation of some Wadies dissecting the limestone plateau running parallel to the west Mediterranean coast of Egypt are that of El-Hadidi & al. (1986), El-Kady & Sadek (1992), Kamal & El-Kady (1993), El-Garf (2003), Salama & al. (2003 & 2005), Osman & al. (2009) and Youssef & al. (2014).

The Study Area

Wadi Hashem (31° 21' 775" N, 27° 00' 476" E) is one of the main shallow gullies draining the southern limestone plateau, which lies parallel to the west Mediterranean coast (Fig. 1). These gullies (Wadies) are different from the true drainage systems (Wadies) of the Eastern Desert (El Hadidi 2000a, 2000b). The Wadi consists of several shallow effluents which cut through the limestone plateau. These effluents unite into a deep gorge-like channel about 5km long which varies in width between 10-100 meters. The Wadi may be photographically distinguished into the following sectors:

- a. Upper reach part:** (31° 21' 775" N, 27° 00' 476" E): comprises the first high area that provides a highly specialized habitat for a number of chasmophytic species. The Upper reach part lies at 88 m a.s.l.
- b1. Upstream part:** The upper level of the Wadi bed is next to upper reach (31° 21' 850" N, 27° 00' 504" E) (b1), about 81 m a.s.l. and 12 m wide.
- b2,b3: Middle and Downstream parts:** The middle and lower levels of the Wadi bed comprise the mouth of the Wadi (31° 22' 862" N, 27° 01' 355" E), which are delimited by salt marshes towards the sea coast. Large amounts of runoff water and alluvial soil, collect forming a plain where figs, olives and barley are cultivated; they are laid at 23-67 m a.s.l. and 20-100 m wide.
- C. Cliffs:** consists of three cliffs which provide a highly specialized habitat for a number of chasmophytic species. The first upper cliff next to upper reach (31° 21' 07"N+, 27° 00' 477" E, 85m a.s.l.) is 3-5 m. High; the second and the third ones at the middle stream part (31° 22' 612" N, 27° 01' 240" E, 50m a.s.l.) is 30-40 m high.
- S. Slopes:** comprises bordering slopes for the Wadi bed. The upper positions on the slopes are steep and accumulate few amounts of soil which supports chasmophytic vegetation. The middle and the down positions of slopes are less steep and accumulate shallow soil mixed with rock fragments of different sizes. They support shrubby vegetation which is more prominent in the lower positions of slopes.

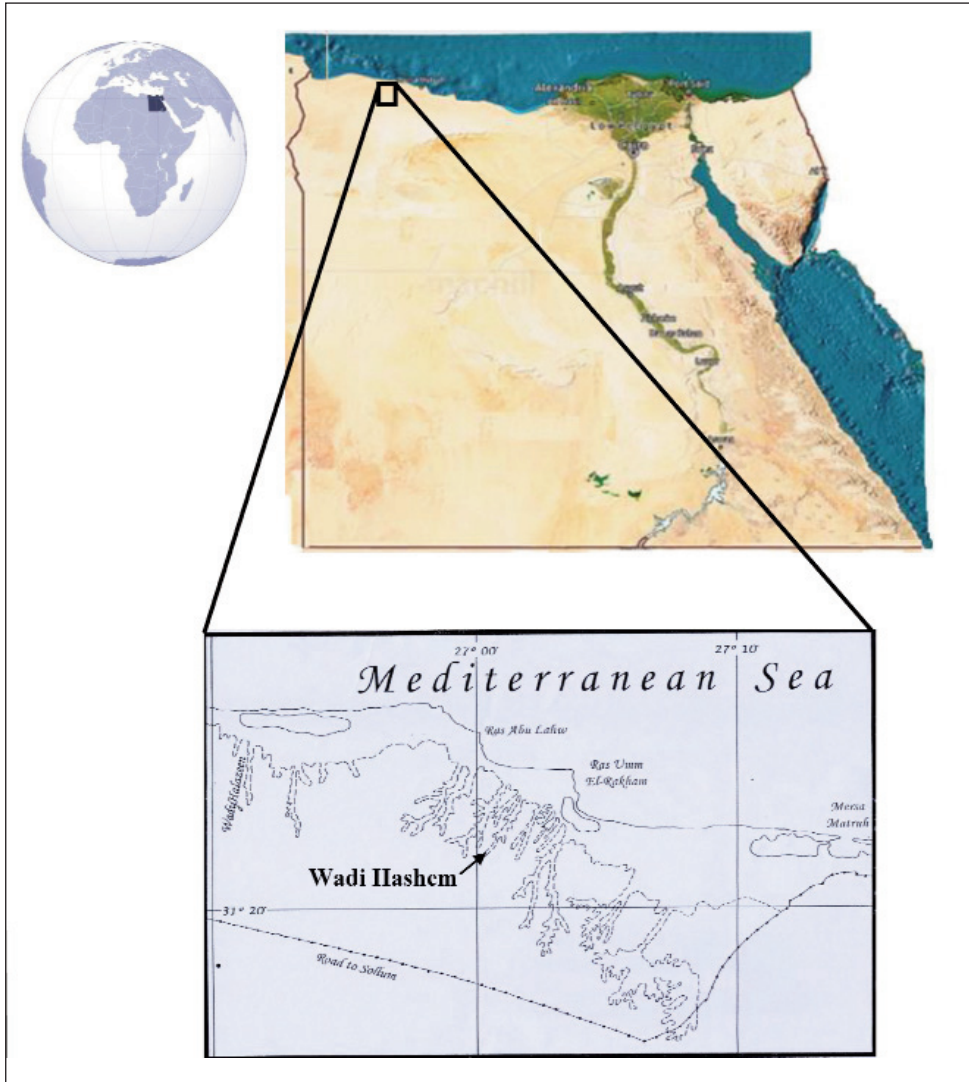


Fig. 1. Location map of Wadi Hashem west of Mersa Matruh town.

Materials and methods

Mediterranean regions are characterized by their long growing seasons of moderate to warm temperatures and little rainfall (with most precipitation occurring in the winter months (Fig. 2). The study area was visited periodically in the period from 2005 to 2006, twice yearly. The recorded species were arranged in alphabetic order. Floristic categories are those of White (1965), Wickens (1978) and Zohary (1973). Plant collections were iden-

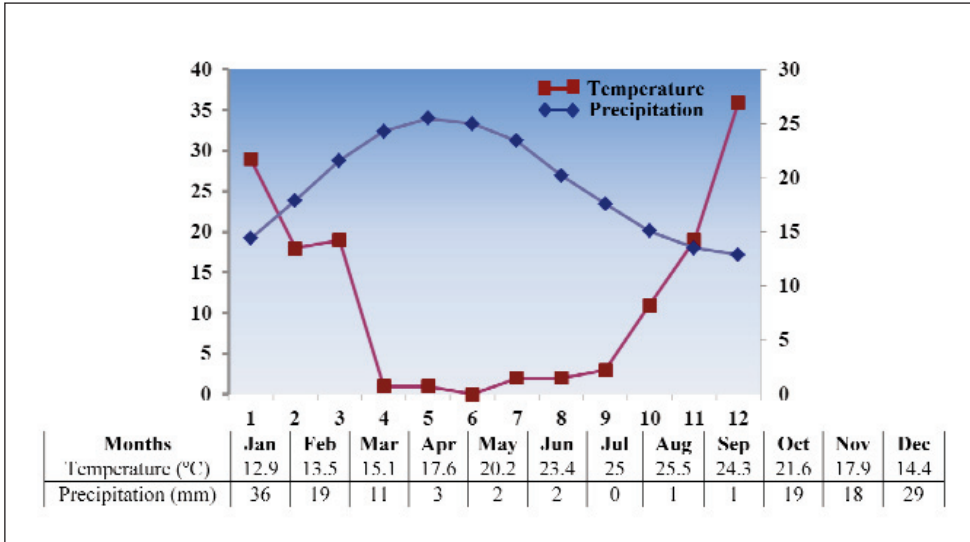


Fig. 2. Climate diagram of Matruh (N 31°19' – E 27 ° 13'), North East of Egypt.

tified according to Täckholm (1974), Boulos (1999, 2000, 2002, 2005 and 2009) and El-Hadidi (2000 a,b). Nomenclature is according to Boulos (1999, 2000, 2002, 2005 and 2009). Reference collections are kept in the Cairo University Herbarium (CAI) and Qena Faculty of Science, Botany Department Herbarium.

Results

Plant species recorded in different sectors of Wadi Hashem are listed in Table 1. The list includes 196 species belong to 41 families of phanerogams and one family (*Ephedraceae*) of vascular cryptogams. Their generic representation is quite variable, and only one family has more than thirty genera (*Asteraceae* 31), one family possesses 20 genera (*Poaceae*) and one family holds more than 10 genera (*Fabaceae* 14). Six families include from 4 to 9 genera (*Caryophyllaceae* 9, *Chenopodiaceae* 7, *Lamiaceae* 7, *Apiaceae* 6, *Brassicaceae* 6 and *Polygonaceae* 4), 10 families own two genera and 23 families comprise only one genus. Only one family exceeds 30 taxa (*Asteraceae* 38), two families includes from 20 to 27 taxa (*Poaceae* 27, *Fabaceae* 22) and one has more than 10 taxa (*Caryophyllaceae* 11), The lowest number of taxa (34 species) was recorded from the cliffs. Five taxa are confined to this sector viz. *Periploca angustifolia*, *Umbilicus horizontalis*, *Ephedra aphylla*, *Hyparrhenia hirta* and *Rostraria cristata*. Forty seven taxa were recorded in the upper reach sector, of which *Minuartia geniculata*, *Polycarpea repens*, *Aegilops bicornis* and *Vulpia fasciculata* are restricted to this habitat. Ninety-two taxa were recorded on the slopes of the wadi 19 taxa of which are restricted to this habitat viz. *Allium neapolitanum*, *A. roseum*, *Bupleurum nanum*, *B. semicompositum*, *Asphodelus aestivus*, *A. tenuifolius*,

Table 1. Distribution of species recorded in different sectors of Wadi Hashem and its floristic categories.

- **Sectors:-**
 a = Upper reach part, b1 = the first Wadi bed part next to upstream, b2 = the middle stream part of Wadi bed, b3 = the downstream part of Wadi bed (mouth), c1 = the first cliff next to upstream, c2 = the second cliff at the middle stream part, c3 = the third cliff down the second cliff directly, s1 = slopes at the upper part of the Wadi, s2 = slopes at the middle part of the Wadi, s3 = slopes at the down part of the Wadi.
- **Occurrence:-**
 — = absent, + = present.
- **Floristic categories:-**
 COSM. = Cosmopolitan, ER-SR. = Euro-Siberian, GC. = Guineo-Congolian region, IR-TR. = Irano-Turanian, MED. = Mediterranean, PAL. = Palearctic, PAN. = Pan-tropical, SA. = Saharo-Arabian, SA-SI. = Saharo-Sindian, S. = Somalian, S-Z. = Sudano-Zambesian.

Families No. of genera	Species	Sectors											Floristic categories		
		a	b1	b2	b3	c1	c2	c3	s1	s2	s3				
Aizoaceae 1	<i>Mesembryanthemum crystallinum</i> L.	-	-	-	+	-	-	-	-	-	-	-	-	-	MED+ER-SR MED+SA-SI+IR-TR
	<i>Mesembryanthemum nodiflorum</i> L.	-	-	-	+	-	-	-	-	-	-	-	-	-	MED
Alliaceae 1	<i>Allium barthianum</i> Asch. & Schweinf.	-	-	-	-	-	-	-	-	-	-	-	+	+	MED + IR-TR MED
	<i>Allium erdelii</i> Zucc.	-	-	-	-	-	+	-	-	-	-	-	-	+	MED
	<i>Allium neapolitanum</i> Cyr.	-	-	-	-	-	-	-	-	-	-	-	-	+	MED+SA-SI
Amaranthaceae 1	<i>Allium roseum</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	+	MED+IR-TR COSM.
	<i>Amaranthus graecicus</i> L. <i>Amaranthus viridis</i> L.	-	-	+	+	-	-	-	-	-	-	-	-	-	MED+IR-TR MED+SA-SI+IR-TR
Apiaceae 6	<i>Bupleurum nanum</i> Poir.	-	-	-	-	-	-	-	-	-	-	-	-	+	MED
	<i>Bupleurum semicompositum</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	MED
	<i>Coriandrum sativum</i> L.	-	-	+	+	-	-	-	-	-	-	-	-	-	MED
	<i>Daucus syriacus</i> Murb.	-	-	-	-	-	-	-	-	-	-	-	-	-	SA-SI
	<i>Deverra tortuosa</i> (Dest.) DC.	+	+	+	-	-	+	-	-	-	-	-	-	-	MED
	<i>Eryngium campestre</i> L.	-	-	+	-	-	-	-	-	-	-	-	-	-	MED+IR-TR
Araceae 1	<i>Foeniculum vulgare</i> subsp. <i>piperitum</i> (Uerua.) Cout.	-	-	-	+	-	-	-	-	-	-	-	-	-	MED
	<i>Arisarum vulgare</i> Targ. Tozz.	-	+	-	-	-	-	-	-	-	-	-	+	-	MED
Asclepiadaceae 1	<i>Periploca angustifolia</i> Labill.	-	-	-	-	-	-	-	-	-	+	-	-	-	MED
Asparagaceae 1	<i>Asparagus stipularis</i> Forssk.	-	+	-	-	-	-	-	-	-	-	-	+	-	MED
	<i>Asphodelus aestivus</i> Brot.	-	-	-	-	-	-	-	-	-	-	-	+	+	MED
Asphodelaceae	<i>Asphodelus fistulosus</i> L.	+	+	-	-	-	-	-	-	-	-	+	+	+	MED

Table 1. continued.

Convobulaceae 2	<i>Convobulus arvensis</i> L. <i>Convobulus oleifolius</i> Desr. <i>Cressa cretica</i> L.	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	PAL MED MED+IR-TR	
Crassulaceae 1	<i>Umbilicus horizontalis</i> (Guss.) DC.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MED	
Cyperaceae 2	<i>Carex divisa</i> Huuds. <i>Cyperus rotundus</i> L.	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MED+IR-TR+ER-SR PAN	
Dipsacaceae 1	<i>Pterocaulis plumosus</i> (L.) Coult.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MED+IR-TR	
Ephedraceae 1	<i>Ephedra aphylla</i> Forssk.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MED	
Euphorbiaceae 1	<i>Euphorbia forsskaolii</i> J. Gay. <i>Euphorbia hierosolymitana</i> Boiss. <i>Euphorbia pepalis</i> L. <i>Ahagi graecorum</i> Boiss. <i>Astragalus asterias</i> Steven <i>Astragalus hamosus</i> L. <i>Hypocrepis cyclocarpa</i> Muurb. <i>Hymenocarpus circinnatus</i> (L.) Savi <i>Lathyrus marmoratus</i> Boiss & Blanche <i>Lathyrus sativus</i> L. <i>Lotus creticus</i> L. <i>Lotus halophilus</i> Boiss. & Spruner. <i>Medicago polymorpha</i> L. <i>Medicago sativa</i> L. <i>Medicago truncatula</i> Gaertn. <i>Medicago indicus</i> (L.) Al. <i>Onobrychis crista-galli</i> (L.) Lam. <i>Ononis serrata</i> Forssk. <i>Scorpiurus muricatus</i> L. <i>Trifolium tomentosum</i> L. <i>Trigonella hamosa</i> L. <i>Trigonella maritima</i> Poir. <i>Trigonella stellata</i> Forssk. <i>Vicia montanana</i> Retz <i>Vicia sativa</i> L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	PAL MED+IR-TR COSM. MED+IR-TR MED+SA-SI MED+IR-TR MED MED MED MED MED+SA-SI MED MED COSM. SA-SI+IR-TR MED PAL MED MED+SA-SI MED MED+IR-TR+ER-SR MED+ SA-SI MED SA-SI+IR-TR MED+IR-TR MED+IR-TR+ER-SR
Fabaceae 14	<i>Erodium cressifolium</i> L' Hér. <i>Marrubium alysson</i> L. <i>Micromeria nervosa</i> (Desf.) Benth.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SA-SI MED+SA-SI MED	

Table 1. continued.

Lamiaceae 7	<i>Phlomis floccosa</i> D. Don	-	+	+	-	+	+	+	+	+	MED+SA-SI MED SA-SI+S-Z MED+ SA-SI MED+IR-TR+ER-SR MED+IR-TR
	<i>Prasium majus</i> L.	-	+	-	-	-	-	-	-	-	MED+ SA-SI MED
	<i>Sabia aegyptiaca</i> L.	-	+	-	-	-	-	-	-	-	MED+IR-TR
	<i>Salvia lantigera</i> Poir.	-	+	-	-	-	-	-	-	-	GC+S+SA+ SA-SI
	<i>Salvia lantigera</i> Poir.	-	+	-	-	-	-	-	-	-	MED+SA-SI
	<i>Salvia verbenaca</i> L.	+	+	-	-	-	-	-	-	-	MED
	<i>Teucrium polium</i> L.	-	+	+	-	-	-	-	-	-	MED+ SA-SI MED
Malvaceae 1	<i>Malva aegyptia</i> L.	-	-	+	+	-	-	-	-	-	MED+IR-TR
	<i>Malva parviflora</i> L.	-	+	+	+	-	-	-	-	-	MED
	<i>Malva sylvestris</i> L.	-	-	+	+	-	-	-	-	-	MED+IR-TR
Oleaceae 1	<i>Olea europaea</i> L.	-	-	+	+	-	-	-	-	-	GC+S+SA+ SA-SI
Orobanchaceae 2	<i>Cistanche tubulosa</i> (Schenk) Hook. f.	-	-	+	+	-	-	-	-	-	MED+SA-SI MED
	<i>Orobancha schultzei</i> Mutel.	-	-	-	-	-	-	-	-	-	MED+IR-TR+ER-SR MED
Papaveraceae 2	<i>Papaver hybridum</i> L.	+	+	-	-	-	-	-	-	-	MED
	<i>Papaver rhoeas</i> L.	-	-	+	+	-	-	-	-	-	MED
	<i>Roemeria hybrida</i> (L.) DC.	-	-	+	+	-	-	-	-	+	MED+IR-TR+ER-SR
Plantaginaceae 1	<i>Plantago albicans</i> L.	-	-	+	+	-	-	-	-	-	MED
	<i>Plantago crypsoides</i> Boiss.	-	-	+	+	-	-	-	-	-	MED
	<i>Plantago ovata</i> Forssk.	+	-	-	-	-	-	-	-	+	SA-SI+IR-TR
Plumbaginaceae 1	<i>Limonium lobatum</i> (L.f.) Chaz.	+	+	+	-	-	-	-	-	-	MED+SA-SI
	<i>Limonium pruinatum</i> (L.) Chaz.	-	-	+	+	-	-	-	-	-	SA-SI
	<i>Limonium tubiflorum</i> (Delle) Kuntze	-	-	-	-	-	-	-	-	+	MED
Poaceae 2 20	<i>Aegilops bicornis</i> (Forssk.) Jaub. & Spach	+	-	-	+	-	-	-	-	-	MED+ SA-SI SA-SI+ IR-TR
	<i>Aegilops kotschyi</i> Boiss.	-	+	+	+	-	-	-	-	-	MED+SA-SI+IR-TR
	<i>Avena fatua</i> L.	-	-	+	+	-	-	-	-	-	MED+IR-TR
	<i>Avena sterilis</i> L.	-	-	+	+	-	-	-	-	-	MED+IR-TR+ER-SR
	<i>Brachypodium distachyum</i> (L.) P. Beauv.	+	-	-	+	-	-	-	-	-	MED+SA-SI+IR-TR
	<i>Bromus catharticus</i> Vahl.	-	-	+	+	-	-	-	-	-	MED+SA-SI+IR-TR
	<i>Bromus rubens</i> L.	-	+	+	+	-	-	-	-	-	MED+SA-SI+IR-TR
	<i>Cutandia dichotoma</i> (Forssk.) Batt. & Trab.	-	-	+	+	-	-	-	-	-	MED+IR-TR
	<i>Cutandia memphitica</i> (Spreng.) Benth.	-	+	+	+	-	-	-	-	-	PAN MED
	<i>Cynodon dactylon</i> (L.) Pers.	-	+	+	+	-	-	-	-	-	COSM.
Poaceae	<i>Dactylis glomerata</i> L.	-	+	+	+	-	-	-	-	-	MED+IR-TR
	<i>Dichanthium annulatum</i> (Forssk.) Stapf	-	+	+	+	-	-	-	-	-	MED+IR-TR
	<i>Hordeum marinum</i> subsp. <i>leporinum</i> (Link.) Arcang.	-	+	+	+	-	-	-	-	-	MED+SA-SI+IR-TR
	<i>Hyparrhenia hirta</i> (L.) Stapf	-	-	-	-	-	-	-	-	-	MED+SA-SI+IR-TR

Scrozonera undulata, *Biscutella didyma*, *Herniaria hirsuta*, *Euphorbia forsskaolii*, *E. hierosolymitana*, *E. peplis*, *Lotus halophilus*, *Ononis serrate*, *Teucrium polium*, *Limonium tubiflorum*, *Lygeum spartum*, *Stipa lagascae* and *S. parviflora*.

The Wadi bed of the upper stream part (b1) had 64 taxa. Nine taxa were confined to this sector viz. *Daucus syrticus*, *Eryngium campestre*, *Spergularia marina*, *Marrubium alysson*, *Salvia aegyptiaca*, *Dichanthium annulatum*, *Sanguisorba minor* subsp. *verrucosa*, *Kickxia aegyptiaca* and *Verbascum letourneuxii*. The Wadi bed of the middle and the lower stream part (b2, b3) including the mouth had the highest number of the recorded species which were 131 (about 66.8 %) species. Forty seven species were only recorded from this sector, most of which are weeds of cultivation. Among those to mention, *Amaranthus graecizans*, *Sonchus oleraceus*, *Sisymbrium irio*, *Cyperus rotundus*, *Cressa cretica*, *Melilotus indicus*, *Vicia sativa* and *Polypogon monspiliensis*.

From a phytogeographical point of view, the recorded species in the different sectors of Wadi Hashem fall under three main phytochoria: Mediterranean taxa, Saharo-Sindian taxa and widely spread taxa. One species only (*Olea europaea*) is belonged to Guineo-Congolian region combined with other phytochoria (Table 2). A total of 161 species representing 82.1% of the total number of recorded species is Mediterranean taxa of different affinities. Among these, 68 species forming 34.7% of the total number of recorded species are typical

Table 2. The number of recorded species belonging to the main floristic categories and their relevant percent (%) (abbreviations according to tab. 1).

Phytochoria	Number of species	Percentage (%)
Monoregional		
ME	67	34.36
SA-SI	7	3.59
Total	74	37.95
Biregionals		
ME + SA-SI	25	12.82
ME + IR-TR	41	21.02
ME + ER-SR	1	0.51
SA-SI + IR-TR	11	5.64
SA-SI + S-Z	2	1.02
Total	80	41.02
Pleuriregionals		
ME + SA-SI + IR-TR	14	7.18
ME + IR-TR + ER-SR	11	5.64
ME + SA-SI + IR-TR + ER-SR	1	0.51
SA-SI + IR-TR + S-Z	1	0.51
GC+S+SA+SA-SI	1	0.51
Total	28	14.36
Cosm	8	4.10
Pal	3	1.54
Pan	2	1.02
Total	13	6.67

Mediterranean species (monoregional) which are well represented in the different sectors of the Wadi. The other 93 species (or 47.4 %) are bi- or pluriregional taxa, which are combined with other phytochoria. Saharo-Sindian taxa are represented by less number of species (21 species or 10.7%) including seven monoregional species and fourteen are bi- or pluriregional taxa. The widely spread taxa comprise 13 species, contributing to 6.6 % of the total number of recorded species (Figs. 3, 4). Most of these species are weeds of cultivation.

Discussion and conclusions

The present results indicate that in the Wadi Hashem area, 8 families only (*Asteraceae*, *Poaceae*, *Fabaceae*, *Caryophyllaceae*, *Lamiaceae*, *Chenopodiaceae*, *Brassicaceae* and *Apiaceae*) contribute nearly two thirds of the total flora. These families represent most of the floristic structure in the Mediterranean north African Flora (Quézel 1978). According to El-Hadidi (1993), about 600 taxa are represented in the Mareotis sector of the Mediterranean coastal land of Egypt. In Wadi Hashem area, the present survey records 195 species (about one third of the 600 taxa). The number of genera is 146, indicating a high generic index of 1.3 (196/146). This in accordance with Zohary's (1973) observation "that a striking feature in Egypt's flora is the large number of genera in proportion to that of species.

The distribution of the species in different sectors of the Wadi is shown in Table 1. Clearly the downstream part had the highest number of species (157) representing about 80% of the total. This can be related to the availability of adequate run-off water and accumulation of fine soil material of considerable depths. *Foeniculum vulgare* subsp. *piperitum* (Ucria) Cout.

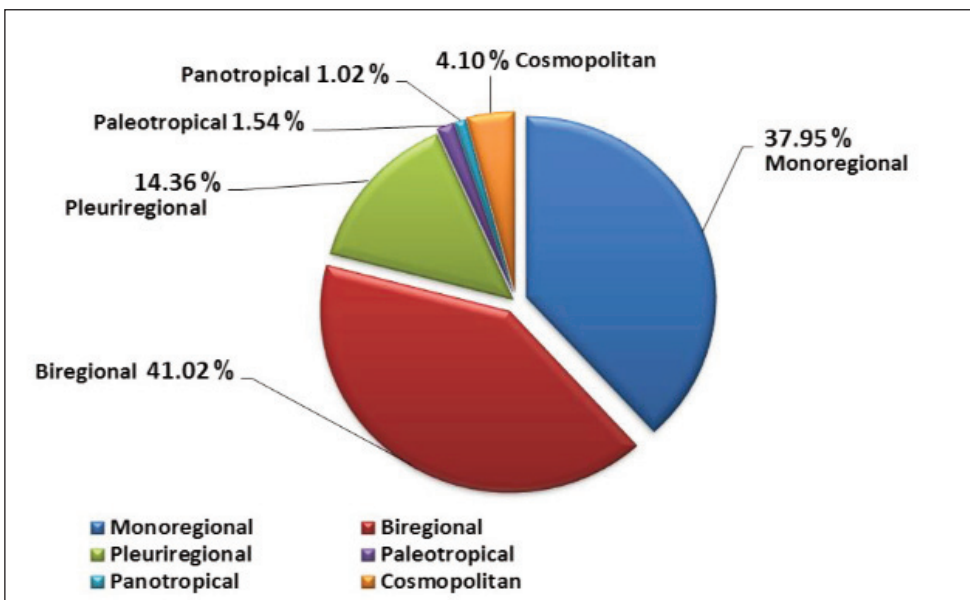


Fig. 3. Floristic category spectrum of Wady Hashem according to number of vegetarian regions.

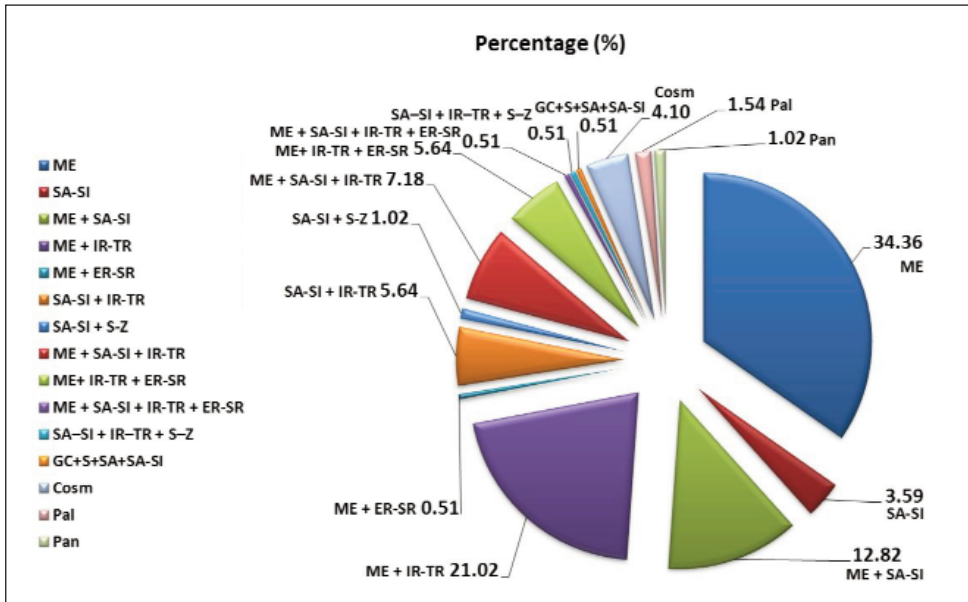


Fig. 4. Floristic category of Wadi Hashem: COSM. = Cosmopolitan, ER-SR. = Euro-Siberian, GC. = Guineo-Congolian region, IR-TR. = Irano-Turanian, MED. = Mediterranean, PAL. = Palaeotropical, PAN. = Pan-tropical, SA. = SaharoArabian, SA-SI. = Saharo-Sindian, S. = Somalian, S-Z. = Sudano-Zambesian.

Was recorded by Täckholm (1974) as very rare taxon from Nile delta and south Sinai. The occurrence of this taxon in western Mediterranean coastal land was recorded by Hosni (1984) based on a single collection from Wadi Habis, Wadi Um El Rukham and Osman & al. (2009) from Wadi Abu Lamguor. Wadi Hashem is a less known natural habitat where dense growth of *Foeniculum vulgare* ssp *piperitum* was encountered. The big size of the Wadi and the thickness of the soil in the downstream part provides favorable conditions for the growth of this rare taxon. Today the area is being subjected to rapid development due to increase in population pressure. Several dams have already been constructed by the native people across lower stream part of the Wadi. The natural vegetation is being plowed under for the cultivation of Fig and Orchards. One can expect the destruction of the remaining natural protective measures are taken. Mediterranean taxa (mono-, bi- and pluriregional) among Wadi Hashem flora are represented by a relatively higher percentage (82.04%) of plant species as compared with other floristic elements (Table 2). This attributed to the fact that the Mediterranean species stand for more music environmental conditions (Salama & al. 2003). This was also confirmed by El-Demerdash & al. (1990) for the eastern Mediterranean deltaic region, Khedr (1999) for a Mediterranean deltaic lake and El Garf (2003) for Wadi Halazeen. The other floristic elements such as cosmopolitan, pantropical, palaeotropical, Saharo-Sindian, Irano-Turanian and Guineo-Congolian elements are represented by a variable number of species reflecting their differential capability to penetrate the region.

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