



REGULAR ARTICLE

STUDIES ON PLANT COVER OF WADI UMM EL-RAKHAM IN THE NORTHWESTERN COAST OF EGYPT

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SUMMARY

The present investigation was carried out to study the phytosociological characteristics of the range land in Wadi Umm El-Rakham, in Northwestern coast of Egypt during spring 2004 - fall 2005. Thirty eight plant species belong to 17 families were found in Wadi Umm El-Rakham. Eighteen species were annuals and 20 species were perennials. A total of 18 species were palatable, the rest were not. Among annulus, 11 species were palatable, whereas among perennials seven species only were palatable. Fresh and dry foliage yield, species density, frequency, herbage cover and the importance value as well as their relative values were determined in the different locations in the wadi (i.e. top, ridge and wadi bed). All these traits recorded their highest value in the wadi bed location during spring season of both years 2004 and 2005. Meanwhile, the lowest values of all these traits were recorded in the wadi top location. Significant interaction was noticed among the studied factors i.e. year, location and season) in wadi bed location during spring season of both years.

Keywords: Range plants, Frequency, Density, Cover, Fresh and Dry Forage Yields

M.H.M. El-Morsy and S. TH. Ahmed. Studies on Plant Cover of Wadi Umm El-Rakham in The Northwestern Coast of Egypt. J Phytol 2/3 (2010) 73-86.

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1. Introduction

Egypt is a part of the arid region and despite the fact that the natural plant cover of Egyptian deserts is quite low and scattered; the flora in the North West Coast is relatively rich and diverse. The natural range is considered the basic source of animal feedstuff in the Northwestern Coast. Due to poor management and environmental impacts, the native ranges are deteriorated and seriously depleted. The region is known as one of the highest number of sheep and goats in Egypt. The range vegetation can be described as open shrub vegetation, characterized by sparse and slightly sparse stands of semi-shrubs with a cover of ephemerals of varying density which increase in depressions (wadis = dry river valleys). The natural range vegetation depends mainly on rainfall, which varies greatly both from year to year and in its duration. The various range types are closely associated with soil and climatic characteristics. The grazing ecosystem is

complex with interacting biotic, edaphic, and climatic factors, confined with human intervention, which in turn reflects varied social and economic influences. Range productivity depends on various factors as climate, soil, botanical composition, vegetation structure and type and intensity of management, e.g. grazing patterns, stocking rates and wild life. Climatic factors such as precipitation, light, temperature, relative humidity and edaphic factors such as soil topography, texture and fertility are the most important factors affecting natural plant distribution and the amount of moisture which the vegetation will receive. Many investigators studied the wadis vegetation, as affected with locations and seasonal effects (Girgis, 1971; Girgis and Desouky, 1977; Girgis and Ahmad (1985); El-Kady and Sadek (1992). Also, yield measurements and plant identification were recorded under different range Locations;

Shahba (1994); Fossati et. al. (1999); El-Toukhy et. al., (2002) and El-Morsy (2002).

The present study is a phytosociology of the natural vegetation in Wadi Umm El-Rakham in Northwestern coast of Egypt. The aim of this study was to survey, identify and to assess range managements and productivity of natural vegetation in Wadi Umm El-Rakham in Northwestern coast of Egypt.

2. Material and Methods

This study was conducted at the North West Coast (NWC) of Egypt in Wadi Umm El-Rakham (about 40 km west Marsa Matruh) during the period from spring 2004 to fall 2005 seasons under rain fed conditions to study the productivity of native plants under

the effect of locations, growth seasons and years. The studied area lies between latitudes 31° 21' 952 " to 31° 22' 13" N, longitudes 27° 00' 490" to 27 ° 00' 68" E.

Climate of the studied area is warm coastal desert belongs to the Mediterranean coastal region of Egypt. Generally, the rain occurs during winter (from September and April) and is characterized by great fluctuation in distribution, intensity and annually. The rains fall and most of the days are sunny. The relative humidity in the coastal belt is generally high especially during summer. The monthly variation of some climatic factors for Marsa Matrouh station is shown in Table 1.

Table 1. The meteorological data of wadi Umm El-Rakham 2004 and 2005.

Year	2004					2005				
	Average Temperature (°C)			Rel. h. %	Rain fed mm.	Average Temperature (°C)			Rel. h. %	Rain fed mm.
	Max.	Min.	Mean			Max.	Min.	Mean		
January	17.50	9.10	13.30	62	39.60	18.27	10.27	14.27	62	44.00
February	19.00	10.00	14.50	62	19.00	17.80	9.53	13.67	59	12.00
March	20.43	12.20	16.32	62	2.00	20.77	11.57	16.17	56	6.00
April	22.83	12.63	17.73	62	0.40	21.97	13.80	17.89	59	1.00
May	25.39	15.50	20.43	63	0.00	25.17	16.13	20.65	57	0.00
June	28.07	18.43	23.25	67	0.00	27.07	19.03	23.05	66	0.00
July	30.80	22.20	26.50	67	0.00	29.05	21.20	25.13	71	0.00
August	29.77	22.53	26.15	67	0.00	30.37	22.87	26.62	69	0.00
September	29.27	20.07	24.67	64	0.00	29.87	21.90	25.89	65	0.00
October	27.43	18.53	22.98	59	0.00	25.70	18.67	22.18	61	5.00
November	23.97	16.13	20.05	61	14.40	23.47	15.47	19.47	61	16.00
December	19.33	11.23	15.28	63	22.10	19.57	11.37	15.47	67	21.00
Annual	24.48	15.71	20.10	63.3	97.50	24.09	15.98	20.04	63	105

Rel. h. % = Relative humidity (%) - *Source: Meteorological Authority, Cairo

Soil samples were collected from the different locations of Wadi Umm El-Rakham (top, ridge and bed) and mechanical analyses (Table 2) were conducted using the international pipette method as described by

Soil Conservation Service (1984). Chemical determinations of the soil saturated extract (Table3) were carried out according to Jackson (1956).

Table 2. Soil physical analysis of experimental location in Wadi Umm El-Rakham.

Location	Depth (cm)	Particle size distribution (mm) %				Class texture
		Coarse Sand (1 - 0.5)	Fine Sand (0.25-0.1)	Silt (0.05-0.002)	Clay < 0.002	
Wadi top	0-30	26.23	39.85	25.31	8.61	Sandy loam
Wadi ridge	0-30	25.72	44.12	20.60	9.56	
Wadi bed	0-30	18.32	43.51	22.18	15.99	
	30-60	12.65	47.40	23.33	16.62	

Table 3. Soil chemical analysis of experimental location in Wadi Umm El-Rakham.

Location	Depth (cm)	pH	CaCO ₃	Anions Mg/l		Cations Mg/l			
				So -	Cl -	Ca ++	Mg ++	Na +	K +
Wadi top	0 - 30	7.94	33.65	0.325	9.21	2.75	15.25	5.12	0.89
Wadi ridge	0 - 30	7.75	32.14	0.260	4.54	3.85	30.65	2.59	0.92
Wadi bed	0 - 30	7.88	30.26	0.417	5.5	2.31	18.65	3.48	0.64
	30 -60	7.93	29.84	0.397	5.1	2.43	17.86	3.22	0.60

Randomize complete blocks design was used. The collected data were statistically analyzed using the appropriate analysis of variance as described by Gomez and Gomez (1984). Means of treatments were compared by using least significant difference (LSD) at 5% probability.

Ten list and clip quadrates (5X5 each) were randomly distributed within each of the three locations (top, ridge and bed of the wadi) and were used for the phytosociological analysis as well as far pasture measurements.

1. Fresh foliage (forage) yield
 2. Dry foliage (forage) yield (Fresh and dry foliage in g/m² were estimated).
- Pasture measurements were done according to Mueller-Dombois & Ellenberg, 1974, as follows:
3. Density = (number of individual species) / (area sampled)
 4. Relative density = (density for a species) / (total density for all species) x 100
 5. Frequency = (number of sampled quadrates in which species occurs) / total number of quadrates sampled)
 6. Relative frequency = (frequency value for a species) / (total quadrature area) x 100
 7. Cover = (the area occupied by the species) / (the whole investigated area)
 8. Relative cover = (total of quadrature area for a species) / (total of quadrature area for all species) x 100
 9. Importance value = Relative density + Relative frequency + Relative cover

The importance value (IV) was determined according to Ludwig & Reynolds (1988) by calculating sum of relative density, relative frequency and relative cover for different species.

Palatability: A plant is palatable when grazed on by all grazing animals (goats, sheep and camels). In this study the classification of palatability includes two categories: 1. palatable species included (low, moderate and high palatable species). 2. Unpalatable species involved (un-palatable and toxic species).

Plant species and families were fully identified to the family level, and named according to Täckholm (1974) updated by Boulos, 1995.

3. Results and discussion

3.1. Floristic composition

As shown in Table 4, 17 families of 38 plant species were recorded in a grazing area of Wadi Umm El-Rakham during the period from spring 2004 to fall 2005 seasons.

There were eight species belonging to *Asteraceae*, five species belonging to *Chenopodiaceae*, four species for each of *Brassicaceae*, *Fabaceae* and *Poaceae* and two for each of *Boraginaceae* and *Caryophyllaceae*. The rest families have one species for each. It was noticed that 18 species were annuals and 20 species were perennials. There were 18 palatable species and the rest species were unpalatable. Among annuals, 11 species were palatable and seven were unpalatable. While, among perennials, seven species were palatable and 13 were unpalatable.

Table 4. Florestic composition of Wadi Umm El-Rakham vegetation during the period of spring 2004 to fall 2005.

NO.	FAMILY NAME	Scientific name	VERNACULAR NAME	Palatability	Life duration
1	<i>Apiaceae</i>	<i>Deoerra tortuosa</i>	Qozzaah	Up	Pr
2	<i>Araceae</i>	<i>Arisarum vulgare</i>	Reinish	P	Pr
3		<i>Achilla santolina</i>	Beeithraan	Up	Ann
4		<i>Anacyclus alexandrinus</i>	Sorret El-Kabsh	P	Ann
5		<i>Carduncellus eriocephalus</i>	Kharshoof	up	pr
6	<i>Asteraceae</i>	<i>Centaurea alexandrina</i>	Moraar	up	pr
7		<i>Chrysanthemum coronarium</i>	Oqhowaan	Up	Ann
8		<i>Echiuops spinosissus</i>	Qadaad	Up	Ann
9		<i>Scorzonera alexandrina</i>	Dabbaah	Up	Pr
10		<i>Silybum marianum</i>	Shoak El-Gamal	Up	Pr
11	<i>Boraginaceae</i>	<i>Echium sericeum</i>	Saaq El-Hamam	P	Pr
12		<i>Heliotropium bacciferum</i>	Libbeid	Up	Pr
13		<i>Brassica tiurnefortii</i>	Shilltaam	P	Ann
14	<i>Brassicaceae</i>	<i>Cardaria draba</i>	Lisli	P	Pr
15		<i>Erucaria pinnata</i>	Seleikh	P	Ann
16		<i>Moricandia nitens</i>	Rakham	P	Ann
17	<i>Caryophyllaceae</i>	<i>Gymnocarpos decandrum</i>	Garad	P	Pr
18		<i>Herniaria hirsuta</i>	Omm lebbeid	Up	Ann
19		<i>Anabsis articulata</i>	Agram	Up	Pr
20		<i>Atriplex halimus</i>	Qataaf	P	Pr
21	<i>Chenopodiaceae</i>	<i>Halocxylon salicornicum</i>	Rimth	Up	Pr
22		<i>Noaea mucronate</i>	ShoakEl-Hanash	Up	Pr
23		<i>Salsola vermiculata</i>	Khreiza	Up	Pr
24		<i>Lotus arabicus</i>	Gatb	Up	Ann
25	<i>Fabaceae</i>	<i>Trifolium tomentosum</i>	Qart	p	Ann
26		<i>Trigonella stellata</i>	Helba	p	Ann
27		<i>Vicia monantha</i>	Gharanboush	P	Ann
28	<i>Lamiaceae</i>	<i>Marrubium alysson</i>	Robeia	Up	Ann
29	<i>Liliaceae</i>	<i>Asphodelus microcarpus</i>	Basal El-Onsal	Up	Pr
30		<i>Aegilops kotschy</i>	Shaeer El-Faar	P	Ann
31	<i>Poaceae</i>	<i>Avena sativa</i>	Zommer	P	Ann
32		<i>Cynodon dactylon</i>	Nigeel	P	Pr
33		<i>Hordeum maritimum</i>	Shaeer barri	P	Ann
34	<i>Ranunculaceae</i>	<i>Adonis dentata</i>	Na'ab al gamal	Up	Ann
35	<i>Resedaceae</i>	<i>Reseda decursiva</i>	Rigl El-Ghraab	P	Ann
36	<i>Solanaceae</i>	<i>Lycium shawii</i>	Awsage	P	Pr
37	<i>Thymelaceae</i>	<i>Thymelaea hirsuta</i>	Methanan	Up	Pr
38	<i>Zygophyllaceae</i>	<i>Pegoanum harmala</i>	Harmal	Up	Pr

P= Palatable, Up = Unpalatable, Ann = Annual, Pr = Perennial

High numbers of unpalatable and spiny plant species indicate the grazing pressure to which Wadi Umm El-Rakham is exposed. Finally, the dominance of *Asteraceae* indicates the range deterioration and dominance of unpalatable species.

3.2. Fresh foliage (herbage) yield:

Tables 5a, 5b and 11 show the values of foliage yield (g m⁻²) of native plants in Wadi Umm El- Rakham from spring 2004 to fall 2005 seasons. Fresh foliage yield increased significantly in plants grown in spring seasons and decrease in fall of both years. Such decrease may be due to the lack of precipitation and absence of winter annuals. On the other hand, significant differences were

detected among the three locations of the wadi (top, ridge and bed) in spring. Wadi bed was the highest production (Table 5b), while in fall no significant differences were found among the different locations.

No significant differences in fresh yield were observed between both years (Table 5a). Slight decrease in fresh forage yield was shown in the first year compared with the second one. Significant interaction was found among locations and seasons, years and seasons, years and locations, and years, locations and locations during the studied years. Species in the top Location in fall 2004 had the lowest fresh yield.

Table 5a. Fresh forage yield (g m⁻²) as affected by year, interaction among year and season, year and location and year, season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Year	Season	Location			Season mean	Year mean
		Top	Ridge	Bed		
2004	Spring	67.17	89.78	127.71	94.89	50.36
	Fall	4.42	6.46	6.62	5.83	
Location x Season Mean		35.80	48.12	67.17	50.36	
2005	Spring	77.38	99.65	135.26	104.10	55.26
	Fall	3.63	6.15	9.50	6.43	
Location x Season Mean		40.51	52.90	72.38	55.26	
LSD. 0.05 Years = 8.16			LSD. 0.05 Years X seasons = 11.53			
LSD. 0.05 Years x location = 14.12			LSD. 0.05 Years X seasons x location = 19.97			

Table 5b. Fresh forage yield (g m⁻²) as affected by season, location and interaction between season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Season	Location			Mean
	Top	Ridge	Bed	
Spring mean	72.28	94.72	131.49	99.49
Fall mean	4.03	6.31	8.06	6.13
Total mean	38.15	50.51	69.77	52.81
LSD. 0.05 season = 8.16		LSD. 0.05 location = 9.19		LSD. 0.05 season X location = 19.97

Thymelaea hirsuta, *Atriplex halimus*, *Silybum marianum*, *Pegoanum harmala* and *Halocxylon salicornicum* plants showed highest fresh foliage yield (table 11). Most of these plants were unpalatable.

3.3. Dry foliage (herbage) yield

Data of the dry foliage (herbage) yield as affected by the studied factors and their interactions are shown in Table 6a, b, and 12; more or less similar to what was presented and discussed previously in fresh foliage yield with slight variations. No significant differences in dry yield were observed between both years (Table 6a). The greatest dry yield was obtained at the wadi bed followed by wadi ridge, than wadi top (Table

6b). This may be due to mild wind speed and more humidity in wadi bed compared with other studied locations as well as more favorable edaphic conditions. The higher yield in wadi bed may be due to more water content, as this area is considered as a rain-fed harvest. While the wadi ridge and wadi top faced soil surface erosion due to precipitation and wind velocity that formed the surface layer of seed bed resulted in. Significant difference in dry foliage yield was noticed between wet (spring) and dry seasons (fall) in both years. Significant interaction was found between locations and seasons during the studied years.

Table 6a. Dry forage yield (g m⁻²) as affected by year, interaction between year and season, year and location and year, season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Year	Season	Location			Season mean	Year mean
		Top	Ridge	Bed		
2004	Spring	18.98	27.08	35.45	27.17	14.92
	Fall	2.06	2.94	3.00	2.67	
Locations x Season Mean		10.52	15.01	19.23	14.92	
2005	Spring	22.53	30.58	36.30	29.80	16.23
	Fall	1.70	2.75	3.51	2.65	
Locations x Season Mean		12.12	16.67	19.91	16.23	
LSD. 0.05 Years = 2.20			LSD. 0.05 Years X seasons = 3.12			
LSD. 0.05 Years x location = 3.82			LSD. 0.05 Years X seasons x location = 5.40			

Table 6b. Dry forage yield (g m⁻²) as affected by season, location and interaction between season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Season	Location			Mean
	Top	Ridge	Bed	
Spring mean	20.76	28.83	35.88	28.49
Fall mean	1.88	2.85	3.26	2.66
Total mean	11.32	15.84	19.57	15.58
LSD. 0.05 seasons = 2.20		LSD. 0.05 location = 2.70		LSD. 0.05 seasons X location = 3.82

3.4. Plant density

Plant density is an efficient expression for evaluating the numerical strength of species. Data in Tables 7a, b, and 13a&b indicate that native plants show significant differences in plant density (m⁻²) during spring season (12.45 plant m⁻²), while, wadi bed (10.81 plant m⁻²), and no significant differences were found between both years. Plant density had minimum value in dry

season (fall) whereas interactions between studied factors were significant (Tables 7a and b). Plant density of species in the second year was greater than the first one. This may be due to the presence of adequate atmospheric circumstances for growing winter annuals and absence of summer annual plants.

Table 7a. Plant density (plant m⁻²) affected by year, interaction among year and season, year and location and years, season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Year	Season	Location			Season mean	Year mean
		Top	Ridge	Bed		
2004	Spring	11.23	5.16	18.64	11.68	6.58
	Fall	1.06	1.13	2.23		
Locations x Season Mean		6.15	3.15	10.44	6.58	
2005	Spring	13.03	6.08	20.55	13.22	7.34
	Fall	1.28	1.33	1.78		
Locations x Season Mean		7.16	3.71	11.17	7.34	
LSD. 0.05 Years = 1.7			LSD. 0.05 Years X seasons = 2.40			
LSD. 0.05 Years x location = 2.94			LSD. 0.05 Years X seasons x location = 4.16			

Table 7b. Plant density percentage (plant m⁻²) as affected by season, location and interaction between season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Season	Location			Mean
	Top	Ridge	Bed	
Spring mean	12.13	5.62	19.60	12.45
Fall mean	1.17	1.23	2.01	1.47 ^B
Total mean	6.65	3.43	10.81	6.96
LSD. 0.05 seasons = 1.7		LSD. 0.05 location = 2.08		LSD. 0.05 seasons X location = 2.94

Asphodelus microcarpus, *Scorzonera alexandrina*, *Anacyclus alexandrinus*, *Cardaria draba* and *Lotus arabicus*; most plants species mentioned before showed the highest density in both years were unpalatable, that affected the both grazing pressure and deterioration. Relative density for native plants in Wadi Umm El-Rakham had the same direction of density (Table 13b).

Species with high density may be considered to be dominant (Maroof, 1978, Abou-Deya 1984, and El-Morsy 2002).

3.4. Plant cover

Tables 8a, b& and 14a & b showed plant coverage percentage in grazing area of Wadi Umm El-Rakham; there were no-significant differences between both years (Table 8a). The plants *Lycium shawii*, *Thymelaea hirsute*, *Silybum marianum* and *Atriplex halimus* had the highest average value of plant cover and

relative cover in both years followed by forbs then grasses (Table 14a & b). Relative cover showed the same trends (Table 14b)

Plant coverage in wadi bed location was higher than other locations. This may be attributed to the favorable environmental conditions in the wadi bed location. Plant species showed the highest cover during spring season, followed by sharp drop during the fall season.

Interaction between location, season and year for coverage percentage was significant. Plant cover percentage in wadi bed locations in spring of 2005 was the highest, whereas in

wadi top of fall 2004 if was the lowest (Tables 8a and b). These results are matched with those of El-Morsy (2002).

The differences in vegetation cover between locations may be due to the variation between the canopy growth of individual species and different plant densities. These results are in accordance with those obtained by Rogers and King (1972) who mentioned that individual plant canopy and unequal intervals between adjacent plants may be the reason for differences in plant cover between locations.

Table 8a. Plant cover percentage (plant m⁻²) as affected by year, interaction among year and season, year and location and year, season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Year	Season	Location			Season mean	Year mean
		Top	Ridge	Bed		
2004	Spring	18.05	29.25	36.83	28.04	19.85
	Fall	8.99	12.71	13.26	11.65	
Location x Season Mean		13.52	20.98	25.05	19.85	
2005	Spring	19.50	31.91	39.63	30.35	21.45
	Fall	9.36	13.50	14.77	12.54	
Location x Season Mean		14.43	22.71	27.20	21.45	
LSD. 0.05 Year = 3.54				LSD. 0.05 Year X season = 5.00		
LSD. 0.05 Year x Location = 6.13				LSD.0.05 Year X season x Location = 8.66		

Table 8b. Plant cover percentage (plant m⁻²) as affected by season, location and interaction between season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Season	Location			Mean
	Top	Ridge	Bed	
Spring mean	18.78	30.58	38.23	29.19
Fall mean	9.18	13.11	14.02	12.10
Total mean	13.97	21.84	26.12	20.65
LSD. 0.05 season =3.54		LSD. 0.05 Location = 4.33		LSD. 0.05 season X Location = 6.13

3.5. Plant frequency

The frequency percentage in grazing area of Wadi Umm El-Rakham was higher in the spring than fall in both years. Species in spring 2005 had highest frequency percentage (Tables 9a & b), this may be attributed to the environmental conditions prevailing on this area which had increase precipitation average from 97.5mm 105 mm in 2004 and 2005, respectively (Table 1).

Plant species of *Anacyclus alexandrinus* , *Hordeum maritimum* , *Brassica tiurnefortii* and *Halocxylon salicornicum* has the highest percentage and most of these plants are annuals (Table 4 & 15a) . On the other hand,

the lowest frequency was record in *Herniaria hirsute* and *Anabsis articulate*. Relative frequency had the same trend (Table 15b).

Generally, it could be concluded that plant species characterized by high frequency in wadi bed than the ridge and the top ones, during the different seasons. This may be mainly due to great differences among locations in soil edaphic factor and physical properties (Tables 2&3). It means that soil of wadi bed was capable to maintain least exposure to precipitation due to its highest depth than other locations and wind effect. Therefore plant seeds pushed into wadi bed area to grow in and the abundance

of suitable humidity had a chance for seed flourishing.

Tag EL-Din et. al. (1994) pointed to the influence of soil properties on the distribution of different plant communities.

While, Sanford, et. al. (1990) concluded that the distribution of plants is largely determined by moisture availability and the activities of pastoralists and their herds rather than by soil or land form.

Table 9a. Plant Frequency percentage (plant m⁻²) affected by year, interaction among year and season, year and location and year, season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Year	Season	Location			Season mean	Year mean
		Top	Ridge	Bed		
2004	Spring	34.40	23.91	43.78	34.03	33.02
	Fall	31.43	31.25	33.33	32.00	
Location x Season Mean		32.92	27.58	38.56	33.02	
2005	Spring	37.60	25.56	48.16	37.60	34.31
	Fall	31.43	31.11	32.00	31.43	
Location x Season Mean		34.52	28.34	40.08	34.31	

Table 9b. Plant density percentage (plant m⁻²) as affected by season, location and interaction between season and location in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Season	Location			Mean
	Top	Ridge	Bed	
Spring mean	36.00	24.74	45.97	35.57
Fall mean	31.43	31.18	32.67	31.76
Total mean	33.72	27.96	39.32	33.67

3.5. Importance value:

Importance value (IV) is the efficiency method to compare among species by studying the relative density, relative coverage and relative frequency for each species. Importance value provides information that could help in determining which species from which habitat type is the most adapted and tolerant to environment stresses.

Results in Table 10 show the importance value of plant species in Wadi Umm El-Rakham. The highest IV was contributed by *Haloxylon salicornicum*, *Lycium shawii*, and *Thymelaea hirsute*, all these species are perennials, While, the lowest IV was

perennial spp. *Trigonella stellata*, *Trifolium tomentosum* (annual plants) and *Arisarum vulgare* (perennial plant with out shoot system in summer and fall seasons) Table 10.

These perennials showed high adaptation under Wadi Umm El-Rakham habitat conditions (varied topography, low content of soil CaCO₃ and salinity, and the soil pH ranged from neutral to low alkalinity). This result was true in all seasons with various magnitudes. Mashaly (2002) defined four edaphic factors that affect the characteristics species, i.e.: soil texture, moisture availability, and CaCO₃ and soil fertility.

Table 10. The Importance value of plant species as affected by year, location and season in Wadi Umm El-Rakham during the period from spring 2004 to fall 2005season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed
<i>Deverra tortuosa</i>	14.14	24.84	11.41	51.17	57.74	42.32	16.01	20.99	11.42	59.02	53.05	49.54
<i>Arisarum vulgare</i>	0.00	0.00	3.65	0.00	0.00	0.00	0.00	0.00	3.59	0.00	0.00	0.00
<i>Achilla santolina</i>	9.79	0.00	6.39	0.00	0.00	0.00	8.09	2.03	6.85	0.00	0.00	0.00
<i>Anacyclus alexandrinus</i>	20.38	0.00	12.30	0.00	0.00	0.00	16.87	4.07	11.24	0.00	0.00	0.00
<i>Carduncellus eriocephalus</i>	0.00	17.63	12.88	0.00	0.00	0.00	0.00	16.66	12.24	0.00	0.00	0.00
<i>Centaurea alexandrina</i>	8.38	10.34	6.50	0.00	0.00	0.00	6.65	6.83	7.28	0.00	0.00	0.00
<i>Chrysanthemum coronarium</i>	10.67	0.00	9.18	0.00	0.00	0.00	9.62	3.35	9.66	0.00	0.00	0.00
<i>Scorzonera alexandrina</i>	25.05	0.00	14.23	0.00	0.00	0.00	27.56	0.00	12.15	0.00	0.00	0.00
<i>Silybum marianum</i>	0.00	15.88	17.20	0.00	0.00	0.00	0.00	17.85	16.26	0.00	0.00	0.00
<i>Echium spinosissus</i>	5.69	0.00	4.27	0.00	0.00	0.00	5.63	0.00	4.05	0.00	0.00	0.00
<i>Heliotropium bacciferum</i>	0.00	7.37	5.44	0.00	0.00	0.00	0.00	7.06	6.06	0.00	0.00	0.00
<i>Echium sericeum</i>	0.00	8.60	0.00	0.00	0.00	0.00	0.00	7.11	2.20	0.00	0.00	0.00
<i>Brassica tiarnerfortii</i>	14.96	0.00	11.14	0.00	0.00	0.00	12.90	0.00	10.35	0.00	0.00	0.00
<i>Cardaria draba</i>	9.48	0.00	11.39	0.00	0.00	0.00	9.64	0.00	10.82	0.00	0.00	0.00
<i>Erucaria pinnata</i>	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	3.06	0.00	0.00	0.00
<i>Moricandia nitens</i>	3.77	0.00	3.80	0.00	0.00	0.00	5.71	0.00	3.55	0.00	0.00	0.00
<i>Gymnocarpos decandrum</i>	9.76	12.16	6.22	13.71	13.52	7.98	10.86	12.87	7.36	13.97	17.78	7.78
<i>Herniaria hirsuta</i>	0.00	7.03	4.30	0.00	0.00	0.00	0.00	7.08	5.16	0.00	0.00	0.00
<i>Anabasis articulata</i>	4.16	7.46	5.14	0.00	0.00	0.00	4.21	7.69	5.30	0.00	0.00	6.44
<i>Atriplex halimus</i>	0.00	17.46	10.81	0.00	34.17	26.69	0.00	16.66	11.20	0.00	31.83	23.86
<i>Halocoxylon salicornicum</i>	25.56	22.11	15.95	63.78	44.69	53.31	24.18	24.96	13.83	56.09	48.81	45.14
<i>Noaea mucronate</i>	10.76	13.71	9.84	31.31	31.37	48.13	11.08	16.20	10.58	35.26	26.69	44.74
<i>Salsola vermiculata</i>	0.00	5.64	3.38	0.00	5.44	4.61	0.00	6.74	2.39	0.00	5.06	9.78
<i>Lotus arabicus</i>	15.15	0.00	10.20	0.00	0.00	0.00	15.76	0.00	11.19	0.00	0.00	0.00
<i>Trifolium tomentosum</i>	0.00	0.00	3.30	0.00	0.00	0.00	0.00	0.00	4.06	0.00	0.00	0.00
<i>Trigonella stellata</i>	2.26	0.00	3.14	0.00	0.00	0.00	4.16	0.00	4.54	0.00	0.00	0.00
<i>Vicia monantha</i>	0.00	0.00	5.16	0.00	0.00	0.00	0.00	0.00	6.02	0.00	0.00	0.00
<i>Marrubium alysson</i>	0.00	21.13	9.30	0.00	0.00	0.00	0.00	20.30	9.55	0.00	0.00	0.00
<i>Asphodelus microcarpus</i>	23.44	19.11	15.38	0.00	0.00	0.00	21.58	18.92	14.12	0.00	0.00	0.00
<i>Aegilops kotschy</i>	8.29	6.18	8.38	0.00	0.00	0.00	7.96	4.44	8.07	0.00	0.00	0.00
<i>Avena sativa</i>	4.65	3.89	9.43	0.00	0.00	0.00	4.28	4.93	9.01	0.00	0.00	0.00
<i>Cynodon dactylon</i>	4.66	0.00	5.11	14.03	0.00	39.00	5.52	1.93	4.01	14.74	4.47	15.78
<i>Hordeum maritimum</i>	5.52	6.51	7.20	0.00	0.00	0.00	7.57	5.08	6.47	0.00	0.00	0.00
<i>Adonis dentata</i>	4.15	4.61	3.60	0.00	0.00	0.00	3.69	2.77	3.89	0.00	0.00	0.00
<i>Reseda decursiva</i>	0.00	6.12	3.54	0.00	0.00	0.00	0.00	5.15	2.78	0.00	0.00	0.00
<i>Lycium shawii</i>	27.08	27.41	7.20	50.21	60.19	24.26	26.92	24.92	9.25	50.75	50.72	34.93
<i>Thymelaea hirsuta</i>	27.52	28.44	17.02	75.79	52.88	53.69	27.14	28.40	16.67	70.18	61.58	62.02
<i>Pegoanum harmala</i>	4.72	6.38	3.97	0.00	0.00	0.00	6.41	5.01	3.75	0.00	0.00	0.00
Total	300	300	300	300	300	300	300	300	300	300	300	300

References

- Abou Deya, I. B. 1984. Studies on distribution and adaptation of range plants in Sinai. Ph. D. Thesis. Faculty of Agriculture. Cairo Univ.
- Boulos, L. 1995. Check list Flora of Egypt. Vol. one. Al-Hadara Publishing, Cairo, Egypt.
- El-Kady, H. F. and Sadek, L. A. 1992. On the phytosociology of Wadi Um-Ashtan in

- the Western Desert of Egypt. *Feddes repertorium* (Berlin) 103, 3-4: 269-277.
- El-Morsy, M. H. 2002. Studies on range plants in Wadi Magid and Wadi Mahgen in the North West coast of Egypt. Ph.D. Thesis, Faculty of Agric., Cairo Univ.
- El-Toukhy, S. A., Ahmed, K. M. and Hendawy, S. H. 2002. Productivity and nutritive value of some associations at Wadi El Natron- El Almeen Road in North Western coast. *J. Agric. Sci. Mansoura Univ.* 27, 1: 233-244.
- Fossati, J., Pautou, G., and Peltier, J. P. 1999. Water as resource and disturbance for wadi vegetation in a hyperarid area (Wadi Sannur, Eastern Desert, Egypt). *Journal of Arid Environments* 43: 63-77.
- Girgis, W. A. and Ahmad, A. M. 1985. An ecological study of wadis of south west Sinai, Egypt. *Desert Inst. Bull. A. R.E.* 36, 1: 265-308.
- Girgis, W. A. and Desouky, A. A. 1977. Anecological study of the Wadis Marsa Matruh area. *Desert Inst. Bull.* 27, 2: 231-242.
- Jakson, M. L. 1956. Soil chemical analysis advanced course. Published by the author, Dept. soils, Wisconsin Univ. Madison, USA.
- Maroof, S. S. 1978. Some studies on distribution and adaptation of grasses in northern Iraq. M. Sc. Thesis. Collage. Agric. And Forestry. Mosul Univ. (cf. M. K., Al-Syoof, 1988, M. Sc. Fac. Agric. Univ. Jordan)
- Mashaly, I. A. 2001. Contribution to the Ecology of the Deltaic Mediterranean Coast, Egypt. *Journal of Biological Sciences* 1, 7: 628-635.
- Mashaly, I. A. 2002. Ecological studies on *Zygophyllum aegyptium* in the Deltaic Mediterranean coast of Egypt. *Pakistan Journal of Biological Sciences* 5, 2: 152-160.
- Mueller-Dombois, D. and H. Ellenberg .1974. Aims and methods of vegetation ecology. Pub. John Wiley & Sons, Inc. New York. U.S.A.
- Rogers, J. A. and King, J. 1972. The distribution and abundance of grass land species in hill pasture in relation to soil aeration and base status. *J. Ecol.* 60, 1: 18-20.
- Sanford, W., Abdel-Samad, F. A., Ismail, T. 1990. A contribution to the study of the vegetation of North-Central Saudi Arabia. Proc. 4th Conf. Agron. Cairo. Vol II: 643-654.
- Shahba, M. A. 1994. Studies on range ecosystem of the Libyan desert. M.Sc. Thesis, Institute of African Research and Studies, Cairo Univ.
- Soil Conservation Service. 1984. Soil survey laboratory methods and procedure for collecting soil samples. Soil Survey Investigations, Report No. 1(Revised 1984), U.S. Dept. Agric., Washington, D. C., USA.
- Tackhölml, V. 1974. Student's flora of Egypt. Cairo University Pub.
- Tag El-Din, S. S., Assaeed, A. M. and Al-Seick, A. 1994. Distribution of range plant communities as influenced by edaphic factors in Raudhat Khuraim. *Egypt J. Appl. Sci.* 9, 10: 69-82.

APPENDIX

Table 11. Fresh forage yield (g plant⁻²) of plant species as affected by year, Location and season in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed
<i>Deverra tortuosa</i>	4.82	5.19	7.61	0.86	1.00	1.89	5.22	6.19	6.00	0.71	0.78	1.35
<i>Arisarum vulgare</i>	---	---	3.51	---	---	---	---	---	3.25	---	---	---
<i>Achilla santolina</i>	1.80	---	2.00	---	---	---	1.48	0.99	2.84	---	---	---
<i>Anacyclus alexandrinus</i>	3.61	---	4.18	---	---	---	3.94	0.87	5.18	---	---	---
<i>Carduncellus eriocephalus</i>	---	1.09	2.42	---	---	---	---	0.95	2.14	---	---	---
<i>Centaurea alexandrina</i>	4.49	3.59	4.35	---	---	---	4.62	3.21	3.00	---	---	---
<i>Chrysanthemum coronarium</i>	1.26	---	1.65	---	---	---	1.18	0.62	1.32	---	---	---
<i>Scorzonera alexandrina</i>	1.25	---	1.42	---	---	---	1.79	---	1.65	---	---	---
<i>Silybum marianum</i>	---	5.87	9.24	---	---	---	---	7.26	9.54	---	---	---
<i>Echiops spinosissus</i>	4.68	---	5.02	---	---	---	4.43	---	5.64	---	---	---
<i>Heliotropium bacciferum</i>	---	3.29	3.80	---	---	---	---	4.09	3.19	---	---	---
<i>Echium sericeum</i>	---	2.78	---	---	---	---	---	2.18	1.46	---	---	---
<i>Brassica tiarnefortii</i>	0.96	---	1.38	---	---	---	1.46	---	2.29	---	---	---
<i>Cardaria draba</i>	2.45	---	2.00	---	---	---	1.69	---	1.78	---	---	---
<i>Erucaria pinnata</i>	---	---	1.57	---	---	---	---	---	2.22	---	---	---
<i>Moricandia nitens</i>	2.17	---	4.18	---	---	---	3.30	---	3.87	---	---	---
<i>Gymnocarpus decandrum</i>	3.06	4.81	4.36	0.10	0.28	0.16	4.46	4.90	3.69	0.09	0.25	0.15
<i>Herniaria hirsuta</i>	---	0.84	1.28	---	---	---	---	0.90	1.75	---	---	---
<i>Anabasis articulata</i>	6.11	3.90	6.63	---	---	---	5.00	4.19	6.93	---	---	3.10
<i>Atriplex halimus</i>	---	9.58	7.01	---	1.72	1.45	---	11.90	10.47	---	1.86	1.81
<i>Haloxylon salicornicum</i>	3.89	8.92	5.19	1.52	1.58	1.11	5.59	7.06	4.49	1.10	1.39	1.23
<i>Noaea mucronate</i>	4.49	5.18	4.15	0.57	0.44	0.41	4.91	6.30	4.22	0.62	0.47	0.46
<i>Salsola vermiculata</i>	---	3.39	3.07	---	0.07	0.04	---	2.48	2.52	---	0.05	0.04
<i>Lotus arabicus</i>	0.33	---	0.59	---	---	---	0.21	---	0.35	---	---	---
<i>Trifolium tomentosum</i>	---	---	0.37	---	---	---	---	---	0.58	---	---	---
<i>Trigonella stellata</i>	0.49	---	0.24	---	---	---	0.61	---	0.43	---	---	---
<i>Vicia monantha</i>	---	---	1.16	---	---	---	---	---	0.85	---	---	---
<i>Marrubium alysson</i>	---	5.60	4.22	---	---	---	---	6.02	4.88	---	---	---
<i>Asphodelus microcarpus</i>	5.18	4.41	4.73	---	---	---	7.06	3.83	6.22	---	---	---
<i>Aegilops kotschy</i>	0.42	0.27	0.30	---	---	---	0.22	0.38	0.35	---	---	---
<i>Avena sativa</i>	0.53	0.88	1.46	---	---	---	0.72	0.82	1.62	---	---	---
<i>Cynodon dactylon</i>	1.43	---	1.96	0.04	---	0.03	1.11	0.19	1.74	0.02	0.05	0.12
<i>Hordeum maritimum</i>	1.16	0.22	0.47	---	---	---	1.33	0.41	0.63	---	---	---
<i>Adonis dentata</i>	0.43	0.12	0.45	---	---	---	1.00	0.46	0.32	---	---	---
<i>Reseda decursiva</i>	---	1.60	2.77	---	---	---	---	2.20	4.02	---	---	---
<i>Lycium shawii</i>	3.24	10.75	4.05	0.24	0.28	0.34	4.19	12.31	5.18	0.27	0.39	0.36
<i>Thymelaea hirsuta</i>	4.24	3.82	9.24	1.09	1.09	1.13	5.20	4.72	8.44	0.83	0.91	0.97
<i>Pegoanum harmala</i>	4.68	3.68	9.68	---	---	---	6.36	4.22	10.21	---	---	---
Total	67.17	89.78	127.71	4.42	6.46	6.56	77.38	99.65	135.26	3.63	6.15	9.50

Rid = ridge in this table and the following

Table 12. Dry foliage yield of plant species (g m⁻²) as affected by year, Location, and season in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed
<i>Deverra tortuosa</i>	2.09	2.20	3.28	0.51	0.62	1.22	2.41	2.97	2.94	0.42	0.45	0.70
<i>Arisarum vulgare</i>	---	---	0.63	---	---	---	---	---	0.59	---	---	---
<i>Achilla santolina</i>	0.28	---	0.30	---	---	---	0.22	0.15	0.40	---	---	---
<i>Anacyclus alexandrinus</i>	0.90	---	0.01	---	---	---	0.91	0.19	1.00	---	---	---
<i>Carduncellus eriocephalus</i>	---	0.21	0.47	---	---	---	---	0.17	0.42	---	---	---
<i>Centaurea alexandrina</i>	1.54	1.14	1.50	---	---	---	1.46	0.98	0.91	---	---	---
<i>Chrysanthemum coronarium</i>	0.22	---	0.28	---	---	---	0.21	0.11	0.22	---	---	---
<i>Scorzonera alexandrina</i>	0.18	---	0.18	---	---	---	0.22	---	0.19	---	---	---
<i>Silybum marianum</i>	---	2.05	3.10	---	---	---	---	2.54	3.15	---	---	---
<i>Echiops spinosissus</i>	1.67	---	1.73	---	---	---	1.57	---	1.94	---	---	---
<i>Heliotropium bacciferum</i>	---	0.92	1.02	---	---	---	---	1.04	0.80	---	---	---
<i>Echium sericeum</i>	---	1.14	---	---	---	---	---	0.85	0.59	---	---	---
<i>Brassica tiarnefortii</i>	0.17	---	0.23	---	---	---	0.25	---	0.37	---	---	---
<i>Cardaria draba</i>	0.39	---	0.35	---	---	---	0.30	---	0.29	---	---	---
<i>Erucaria pinnata</i>	---	---	0.61	---	---	---	---	---	0.85	---	---	---
<i>Moricandia nitens</i>	0.50	---	0.98	---	---	---	0.82	---	0.92	---	---	---
<i>Gymnocarpus decandrum</i>	1.25	1.94	1.70	0.06	0.18	0.07	2.01	2.16	1.54	0.05	0.15	0.09
<i>Herniaria hirsuta</i>	---	0.15	0.23	---	---	---	---	0.18	0.32	---	---	---
<i>Anabasis articulata</i>	1.28	0.86	1.30	---	---	---	1.02	0.82	1.25	---	---	0.68
<i>Atriplex halimus</i>	---	2.86	2.10	---	0.71	0.56	---	3.64	3.04	---	0.78	0.71
<i>Haloxylon salicornicum</i>	1.09	2.56	1.43	0.59	0.60	0.31	1.68	2.12	1.34	0.42	0.55	0.49
<i>Noaea mucronate</i>	1.80	2.00	1.61	0.29	0.23	0.21	1.93	2.51	1.66	0.32	0.24	0.23
<i>Salsola vermiculata</i>	---	0.71	0.61	---	0.02	0.04	---	0.53	0.58	---	0.01	0.01
<i>Lotus arabicus</i>	0.05	---	0.05	---	---	---	0.03	---	0.06	---	---	---
<i>Trifolium tomentosum</i>	---	---	0.05	---	---	---	---	---	0.07	---	---	---
<i>Trigonella stellata</i>	0.07	---	0.03	---	---	---	0.09	---	0.05	---	---	---
<i>Vicia monantha</i>	---	---	0.19	---	---	---	---	---	0.14	---	---	---
<i>Marrubium alysson</i>	---	1.57	1.16	---	---	---	---	1.72	1.37	---	---	---
<i>Asphodelus microcarpus</i>	1.22	1.03	1.06	---	---	---	1.55	0.86	1.35	---	---	---
<i>Aegilops kotschy</i>	0.14	0.10	0.09	---	---	---	0.07	0.13	0.11	---	---	---
<i>Avena sativa</i>	0.15	0.26	0.39	---	---	---	0.20	0.23	0.40	---	---	---
<i>Cynodon dactylon</i>	0.30	---	0.45	0.02	---	0.02	0.28	0.06	0.38	0.01	0.02	0.05
<i>Hordeum maritimum</i>	0.29	0.05	0.10	---	---	---	0.33	0.09	0.16	---	---	---
<i>Adonis dentata</i>	0.07	0.01	0.07	---	---	---	0.18	0.07	0.05	---	---	---
<i>Reseda decursiva</i>	---	0.43	0.76	---	---	---	---	0.59	1.06	---	---	---
<i>Lycium shawii</i>	0.89	2.96	1.03	0.10	0.11	0.09	1.21	3.42	1.50	0.11	0.15	0.14
<i>Thymelaea hirsuta</i>	1.46	1.18	2.58	0.49	0.47	0.50	1.77	1.61	2.26	0.37	0.40	0.41
<i>Pegoanum harmala</i>	0.98	0.75	2.77	---	---	---	1.81	0.84	2.03	---	---	---
Total	18.98	27.08	34.45	2.06	2.94	3.00	22.53	30.58	36.30	1.70	2.75	3.51

Table 13a. Plant density (plant m⁻²) as affected by Location, season and year in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed
<i>Deverra tortuosa</i>	0.40	0.46	0.42	0.22	0.31	0.33	0.69	0.43	0.44	0.36	0.34	0.40
<i>Arisarum vulgare</i>	---	---	0.32	---	---	---	---	---	0.38	---	---	---
<i>Achilla santolina</i>	0.49	---	0.52	---	---	---	0.42	0.02	0.60	---	---	---
<i>Anacyclus alexandrinus</i>	1.02	---	1.03	---	---	---	1.01	0.06	1.19	---	---	---
<i>Carduncellus eriocephalus</i>	---	0.42	0.60	---	---	---	---	0.52	0.73	---	---	---
<i>Centaurea alexandrina</i>	0.35	0.21	0.52	---	---	---	0.21	0.09	0.58	---	---	---
<i>Chrysanthemum coronarium</i>	0.62	---	0.84	---	---	---	0.64	0.02	1.01	---	---	---
<i>Scorzonera alexandrina</i>	2.39	---	2.25	---	---	---	3.25	---	2.23	---	---	---
<i>Silybum marianum</i>	---	0.17	0.27	---	---	---	---	0.21	0.30	---	---	---
<i>Echium spinosissus</i>	0.26	---	0.32	---	---	---	0.31	---	0.34	---	---	---
<i>Heliotropium bacciferum</i>	---	0.20	0.46	---	---	---	---	0.24	0.51	---	---	---
<i>Echium sericeum</i>	---	0.32	---	---	---	---	---	0.22	0.16	---	---	---
<i>Brassica tiurnefortii</i>	0.48	---	0.53	---	---	---	0.52	---	0.66	---	---	---
<i>Cardaria draba</i>	0.43	---	1.03	---	---	---	0.50	---	1.11	---	---	---
<i>Erucaria pinnata</i>	---	---	0.18	---	---	---	---	---	0.22	---	---	---
<i>Moricandia nitens</i>	0.10	---	0.21	---	---	---	0.16	---	0.20	---	---	---
<i>Gymnocarpus decandrum</i>	0.12	0.15	0.23	0.05	0.08	0.06	0.11	0.19	0.25	0.07	0.11	0.06
<i>Herniaria hirsuta</i>	---	0.08	0.10	---	---	---	---	0.11	0.13	---	---	---
<i>Anabsis articulata</i>	0.20	0.24	0.29	---	---	---	0.21	0.24	0.30	---	---	0.03
<i>Atriplex halimus</i>	---	0.09	0.21	---	0.07	0.09	---	0.12	0.23	---	0.07	0.07
<i>Haloxylon salicornicum</i>	0.42	0.31	0.50	0.23	0.19	0.29	0.47	0.51	0.56	0.15	0.26	0.16
<i>Noaea mucronate</i>	0.30	0.23	0.37	0.12	0.13	0.51	0.36	0.49	0.41	0.14	0.11	0.37
<i>Salsola vermiculata</i>	---	0.19	0.23	---	0.01	0.02	---	0.22	0.21	---	0.01	0.11
<i>Lotus arabicus</i>	0.88	---	1.03	---	---	---	1.03	---	1.17	---	---	---
<i>Trifolium tomentosum</i>	---	---	0.33	---	---	---	---	---	0.37	---	---	---
<i>Trigonella stellata</i>	0.08	---	0.28	---	---	---	0.06	---	0.31	---	---	---
<i>Vicia monantha</i>	---	---	0.51	---	---	---	---	---	0.54	---	---	---
<i>Marrubium alysson</i>	---	0.82	0.85	---	---	---	---	0.91	0.90	---	---	---
<i>Asphodelus microcarpus</i>	0.86	0.35	1.05	---	---	---	1.00	0.39	1.05	---	---	---
<i>Aegilops kotschy</i>	0.62	0.22	1.02	---	---	---	0.68	0.09	1.04	---	---	---
<i>Avena sativa</i>	0.18	0.07	1.01	---	---	---	0.22	0.11	1.08	---	---	---
<i>Cynodon dactylon</i>	0.15	---	0.21	0.05	---	0.64	0.17	0.01	0.22	0.06	0.01	0.05
<i>Hordeum maritimum</i>	0.11	0.03	0.18	---	---	---	0.12	0.10	0.21	---	---	---
<i>Adonis dentata</i>	0.13	0.02	0.11	---	---	---	0.11	0.04	0.14	---	---	---
<i>Reseda decursiva</i>	---	0.02	0.05	---	---	---	---	0.03	0.07	---	---	---
<i>Lycium shawii</i>	0.21	0.21	0.09	0.20	0.19	0.10	0.28	0.21	0.08	0.19	0.19	0.22
<i>Thymelaea hirsuta</i>	0.36	0.30	0.4	0.19	0.15	0.19	0.44	0.40	0.51	0.31	0.23	0.31
<i>Pegonium harmala</i>	0.07	0.05	0.09	---	---	---	0.07	0.10	0.11	---	---	---
Total	11.23	5.16	18.64	1.06	1.13	2.23	13.04	6.08	20.55	1.28	1.33	1.78

Table 13b. Relative density as affected by Location, season and year in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed
<i>Deverra tortuosa</i>	3.56	8.91	2.25	20.75	27.43	14.80	5.29	7.07	2.14	28.13	25.56	22.47
<i>Arisarum vulgare</i>	0.00	0.00	1.72	0.00	0.00	0.00	0.00	0.00	1.85	0.00	0.00	0.00
<i>Achilla santolina</i>	4.36	0.00	2.79	0.00	0.00	0.00	3.22	0.33	2.92	0.00	0.00	0.00
<i>Anacyclus alexandrinus</i>	9.08	0.00	5.53	0.00	0.00	0.00	7.75	0.99	5.79	0.00	0.00	0.00
<i>Carduncellus eriocephalus</i>	0.00	8.14	3.22	0.00	0.00	0.00	0.00	8.55	3.55	0.00	0.00	0.00
<i>Centaurea alexandrina</i>	3.12	4.07	2.79	0.00	0.00	0.00	1.61	1.48	2.82	0.00	0.00	0.00
<i>Chrysanthemum coronarium</i>	5.52	0.00	4.51	0.00	0.00	0.00	4.91	0.33	4.91	0.00	0.00	0.00
<i>Scorzonera alexandrina</i>	21.28	0.00	12.07	0.00	0.00	0.00	24.92	0.00	10.85	0.00	0.00	0.00
<i>Silybum marianum</i>	0.00	3.29	1.45	0.00	0.00	0.00	0.00	3.45	1.46	0.00	0.00	0.00
<i>Echium spinosissus</i>	2.32	0.00	1.72	0.00	0.00	0.00	2.38	0.00	1.65	0.00	0.00	0.00
<i>Heliotropium bacciferum</i>	0.00	3.88	2.47	0.00	0.00	0.00	0.00	3.95	2.48	0.00	0.00	0.00
<i>Echium sericeum</i>	0.00	6.20	0.00	0.00	0.00	0.00	0.00	3.62	0.78	0.00	0.00	0.00
<i>Brassica tiurnefortii</i>	4.27	0.00	2.84	0.00	0.00	0.00	3.99	0.00	3.21	0.00	0.00	0.00
<i>Cardaria draba</i>	3.83	0.00	5.53	0.00	0.00	0.00	3.83	0.00	5.40	0.00	0.00	0.00
<i>Erucaria pinnata</i>	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00	1.07	0.00	0.00	0.00
<i>Moricandia nitens</i>	0.89	0.00	1.13	0.00	0.00	0.00	1.23	0.00	0.97	0.00	0.00	0.00
<i>Gymnocarpus decandrum</i>	1.07	2.91	1.23	4.72	7.08	2.69	0.84	3.13	1.22	5.47	8.27	3.37
<i>Herniaria hirsuta</i>	0.00	1.55	0.54	0.00	0.00	0.00	0.00	1.81	0.63	0.00	0.00	0.00
<i>Anabsis articulata</i>	1.78	4.65	1.56	0.00	0.00	0.00	1.61	3.95	1.46	0.00	0.00	1.69
<i>Atriplex halimus</i>	0.00	1.74	1.13	0.00	6.19	4.04	0.00	1.97	1.12	0.00	5.26	3.93
<i>Haloxylon salicornicum</i>	3.74	6.01	2.68	21.70	16.81	13.00	3.60	8.39	2.73	11.72	19.55	8.99
<i>Noaea mucronate</i>	2.67	4.46	1.98	11.32	11.50	22.87	2.76	8.06	2.00	10.94	8.27	20.79
<i>Salsola vermiculata</i>	0.00	3.68	1.23	0.00	0.88	0.90	0.00	3.62	1.02	0.00	0.75	6.18
<i>Lotus arabicus</i>	7.84	0.00	5.53	0.00	0.00	0.00	7.90	0.00	5.69	0.00	0.00	0.00
<i>Trifolium tomentosum</i>	0.00	0.00	1.77	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00
<i>Trigonella stellata</i>	0.71	0.00	1.50	0.00	0.00	0.00	0.46	0.00	1.51	0.00	0.00	0.00
<i>Vicia monantha</i>	0.00	0.00	2.74	0.00	0.00	0.00	0.00	0.00	2.63	0.00	0.00	0.00
<i>Marrubium alysson</i>	0.00	15.89	4.56	0.00	0.00	0.00	0.00	14.97	4.38	0.00	0.00	0.00
<i>Asphodelus microcarpus</i>	7.66	6.78	5.63	0.00	0.00	0.00	7.67	6.41	5.11	0.00	0.00	0.00
<i>Aegilops kotschy</i>	5.52	4.26	5.47	0.00	0.00	0.00	5.21	1.48	5.06	0.00	0.00	0.00
<i>Avena sativa</i>	1.60	1.36	5.42	0.00	0.00	0.00	1.69	1.81	5.26	0.00	0.00	0.00
<i>Cynodon dactylon</i>	1.34	0.00	1.13	4.72	0.00	28.70	1.30	0.16	1.07	4.69	0.75	2.81
<i>Hordeum maritimum</i>	0.98	0.58	0.97	0.00	0.00	0.00	0.92	1.64	1.02	0.00	0.00	0.00
<i>Adonis dentata</i>	1.16	0.39	0.59	0.00	0.00	0.00	0.84	0.66	0.68	0.00	0.00	0.00
<i>Reseda decursiva</i>	0.00	0.39	0.27	0.00	0.00	0.00	0.00	0.49	0.34	0.00	0.00	0.00
<i>Lycium shawii</i>	1.87	4.07	0.48	18.87	16.81	4.48	2.15	3.45	0.39	14.84	14.29	12.36
<i>Thymelaea hirsuta</i>	3.21	5.81	2.15	17.92	13.27	8.52	3.37	6.58	2.48	24.22	17.29	17.42
<i>Pegonium harmala</i>	0.62	0.97	0.48	0.00	0.00	0.00	0.54	1.64	0.54	0.00	0.00	0.00
Total	100	100	100	100	100	100	100	100	100	100	100	100

Table 14a. Cover percentage of plant species (plant m⁻²) as affected by Location and season in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid.	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid.	Bed
<i>Deverra tortuosa</i>	1.07	2.00	2.01	1.10	1.31	1.44	1.26	2.13	2.16	1.19	1.30	1.69
<i>Arisarum vulgare</i>	---	---	0.03	---	---	---	---	---	0.04	---	---	---
<i>Achilla santolina</i>	0.14	---	0.19	---	---	---	0.12	0.08	0.26	---	---	---
<i>Anacyclus alexandrinus</i>	0.15	---	0.22	---	---	---	0.12	0.06	0.21	---	---	---
<i>Carduncellus eriocephalus</i>	---	1.18	2.42	---	---	---	---	1.20	2.36	---	---	---
<i>Centaurea alexandrina</i>	0.32	0.24	0.23	---	---	---	0.36	0.32	0.25	---	---	---
<i>Chrysanthemum coronarium</i>	0.09	---	0.13	---	---	---	0.09	0.04	0.15	---	---	---
<i>Scorzonera alexandrina</i>	0.26	---	0.34	---	---	---	0.10	---	0.08	---	---	---
<i>Silybum marianum</i>	---	3.15	5.12	---	---	---	---	3.67	5.00	---	---	---
<i>Echium spinosissus</i>	0.19	---	0.26	---	---	---	0.22	---	0.30	---	---	---
<i>Heliotropium bacciferum</i>	---	0.49	0.64	---	---	---	---	0.53	0.77	---	---	---
<i>Echium sericeum</i>	---	0.17	---	---	---	---	---	0.19	0.13	---	---	---
<i>Brassica tiurnefortii</i>	0.67	---	1.01	---	---	---	0.70	---	0.88	---	---	---
<i>Cardaria draba</i>	0.39	---	0.57	---	---	---	0.51	---	0.63	---	---	---
<i>Erucaria pinnata</i>	---	---	0.16	---	---	---	---	---	0.14	---	---	---
<i>Moricandia nitens</i>	0.31	---	0.53	---	---	---	0.46	---	0.59	---	---	---
<i>Gymnocarpus decandrum</i>	0.94	1.11	1.38	0.40	0.31	0.26	1.33	1.26	2.00	0.37	0.32	0.19
<i>Herniaria hirsuta</i>	---	1.07	1.16	---	---	---	---	1.22	1.36	---	---	---
<i>Anabsis articulata</i>	0.22	0.29	0.41	---	---	---	0.30	0.27	0.44	---	---	0.24
<i>Atriplex halimus</i>	---	3.00	3.34	---	2.03	2.12	---	3.30	3.56	---	2.14	2.02
<i>Haloxylon salicornicum</i>	2.47	2.05	2.84	1.74	1.51	2.25	2.56	2.05	3.10	1.60	1.54	2.57
<i>Noaea mucronata</i>	1.04	1.11	1.30	0.98	1.00	1.14	1.00	1.21	1.67	1.00	1.04	1.23
<i>Salsola vermiculata</i>	---	0.04	0.11	---	0.07	0.05	---	0.07	0.11	---	0.10	0.07
<i>Lotus arabicus</i>	0.06	---	0.13	---	---	---	0.08	---	0.23	---	---	---
<i>Trifolium tomentosum</i>	---	---	0.11	---	---	---	---	---	0.03	---	---	---
<i>Trigonella stellata</i>	0.07	---	0.15	---	---	---	0.10	---	0.12	---	---	---
<i>Vicia monantha</i>	---	---	0.21	---	---	---	---	---	0.26	---	---	---
<i>Marrubium alysson</i>	---	1.00	1.29	---	---	---	---	1.24	1.40	---	---	---
<i>Asphodelus microcarpus</i>	1.38	2.01	2.00	---	---	---	1.26	2.14	1.84	---	---	---
<i>Aegilops kotschy</i>	0.08	0.03	0.16	---	---	---	0.12	0.02	0.11	---	---	---
<i>Avena sativa</i>	0.13	0.21	0.34	---	---	---	0.09	0.07	0.19	---	---	---
<i>Cynodon dactylon</i>	0.18	---	0.33	0.02	---	0.04	0.20	0.10	0.30	0.09	0.02	0.07
<i>Hordeum maritimum</i>	0.19	0.14	0.25	---	---	---	0.26	0.17	0.21	---	---	---
<i>Adonis dentata</i>	0.12	0.17	0.20	---	---	---	0.14	0.21	0.19	---	---	---
<i>Reseda decursiva</i>	---	0.08	0.07	---	---	---	---	0.10	0.10	---	---	---
<i>Lycium shawii</i>	3.92	4.70	2.02	2.00	3.48	2.18	4.00	5.00	3.08	2.51	2.99	2.41
<i>Thymelaea hirsuta</i>	3.13	4.49	4.34	2.75	3.00	3.78	3.39	4.65	4.54	2.60	4.05	4.28
<i>Pegoanum harmala</i>	0.53	0.52	0.83	---	---	---	0.73	0.61	0.84	---	---	---
Total	18.05	29.25	36.83	8.99	12.71	13.26	19.50	31.91	39.63	9.36	13.5	17.77

Table 14b. Relative Herbage cover of plant species as affected by Location and season in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed
<i>Deverra tortuosa</i>	5.93	6.84	5.46	12.24	10.31	10.86	6.46	6.68	5.45	12.71	9.63	11.44
<i>Arisarum vulgare</i>	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00
<i>Achilla santolina</i>	0.78	0.00	0.52	0.00	0.00	0.00	0.62	0.25	0.66	0.00	0.00	0.00
<i>Anacyclus alexandrinus</i>	0.83	0.00	0.60	0.00	0.00	0.00	0.62	0.19	0.53	0.00	0.00	0.00
<i>Carduncellus eriocephalus</i>	0.00	4.03	6.57	0.00	0.00	0.00	0.00	3.76	5.96	0.00	0.00	0.00
<i>Centaurea alexandrina</i>	1.77	0.82	0.62	0.00	0.00	0.00	1.85	1.00	0.63	0.00	0.00	0.00
<i>Chrysanthemum coronarium</i>	0.50	0.00	0.35	0.00	0.00	0.00	0.46	0.13	0.38	0.00	0.00	0.00
<i>Scorzonera alexandrina</i>	1.44	0.00	0.92	0.00	0.00	0.00	0.51	0.00	0.20	0.00	0.00	0.00
<i>Silybum marianum</i>	0.00	10.77	13.90	0.00	0.00	0.00	0.00	11.50	12.62	0.00	0.00	0.00
<i>Echium spinosissus</i>	1.05	0.00	0.71	0.00	0.00	0.00	1.13	0.00	0.76	0.00	0.00	0.00
<i>Heliotropium bacciferum</i>	0.00	1.68	1.74	0.00	0.00	0.00	0.00	1.66	1.94	0.00	0.00	0.00
<i>Echium sericeum</i>	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.60	0.33	0.00	0.00	0.00
<i>Brassica tiurnefortii</i>	3.71	0.00	2.74	0.00	0.00	0.00	3.59	0.00	2.22	0.00	0.00	0.00
<i>Cardaria draba</i>	2.16	0.00	1.55	0.00	0.00	0.00	2.62	0.00	1.59	0.00	0.00	0.00
<i>Erucaria pinnata</i>	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00
<i>Moricandia nitens</i>	1.72	0.00	1.44	0.00	0.00	0.00	2.36	0.00	1.49	0.00	0.00	0.00
<i>Gymnocarpus decandrum</i>	5.21	3.79	3.75	4.45	2.44	1.96	6.82	3.95	5.05	3.95	2.37	1.29
<i>Herniaria hirsuta</i>	0.00	3.66	3.15	0.00	0.00	0.00	0.00	3.82	3.43	0.00	0.00	0.00
<i>Anabsis articulata</i>	1.22	0.99	1.11	0.00	0.00	0.00	1.54	0.85	1.11	0.00	0.00	1.62
<i>Atriplex halimus</i>	0.00	10.26	9.07	0.00	15.97	15.99	0.00	10.34	8.98	0.00	15.85	13.68
<i>Haloxylon salicornicum</i>	13.68	7.01	7.71	19.35	11.88	16.97	13.13	6.42	7.82	17.09	11.41	17.40
<i>Noaea mucronata</i>	5.76	3.79	3.53	10.90	7.87	8.60	5.13	3.79	4.21	10.68	7.70	8.33
<i>Salsola vermiculata</i>	0.00	0.14	0.30	0.00	0.55	0.38	0.00	0.22	0.28	0.00	0.74	0.47
<i>Lotus arabicus</i>	0.33	0.00	0.35	0.00	0.00	0.00	0.41	0.00	0.58	0.00	0.00	0.00
<i>Trifolium tomentosum</i>	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00
<i>Trigonella stellata</i>	0.39	0.00	0.41	0.00	0.00	0.00	0.51	0.00	0.30	0.00	0.00	0.00
<i>Vicia monantha</i>	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.00
<i>Marrubium alysson</i>	0.00	3.42	3.50	0.00	0.00	0.00	0.00	3.89	3.53	0.00	0.00	0.00
<i>Asphodelus microcarpus</i>	7.65	6.87	5.43	0.00	0.00	0.00	6.46	6.71	4.64	0.00	0.00	0.00
<i>Aegilops kotschy</i>	0.44	0.10	0.43	0.00	0.00	0.00	0.62	0.06	0.28	0.00	0.00	0.00
<i>Avena sativa</i>	0.72	0.72	0.92	0.00	0.00	0.00	0.46	0.22	0.48	0.00	0.00	0.00
<i>Cynodon dactylon</i>	1.00	0.00	0.90	0.22	0.00	0.30	1.03	0.31	0.76	0.96	0.15	0.47
<i>Hordeum maritimum</i>	1.05	0.48	0.68	0.00	0.00	0.00	1.33	0.53	0.53	0.00	0.00	0.00
<i>Adonis dentata</i>	0.66	0.58	0.54	0.00	0.00	0.00	0.72	0.66	0.48	0.00	0.00	0.00
<i>Reseda decursiva</i>	0.00	0.27	0.19	0.00	0.00	0.00	0.00	0.31	0.25	0.00	0.00	0.00
<i>Lycium shawii</i>	21.72	16.07	5.48	22.25	27.38	16.44	20.51	15.67	7.77	26.82	22.15	16.32
<i>Thymelaea hirsuta</i>	17.34	15.35	11.78	30.59	23.60	28.51	17.38	14.57	11.46	27.78	30.00	28.98
<i>Pegoanum harmala</i>	2.94	1.78	2.25	0.00	0.00	0.00	3.74	1.91	2.12	0.00	0.00	0.00
Total	100	100	100	100	100	100	100	100	100	100	100	100

Table 15a. Frequency percentage of plant species as affected by Location and season in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed
<i>Deverra tortuosa</i>	40	50	60	40	50	50	40	50	70	40	50	50
<i>Arisarum vulgare</i>	---	---	30	---	---	---	---	---	30	---	---	---
<i>Achilla santolina</i>	40	---	50	---	---	---	40	10	60	---	---	---
<i>Anacyclus alexandrinus</i>	90	---	100	---	---	---	80	20	90	---	---	---
<i>Carduncellus eriocephalus</i>	---	30	50	---	---	---	---	30	50	---	---	---
<i>Centaurea alexandrina</i>	30	30	50	---	---	---	30	30	70	---	---	---
<i>Chrysanthemum coronarium</i>	40	---	70	---	---	---	40	20	80	---	---	---
<i>Scorzonera alexandrina</i>	20	---	20	---	---	---	20	---	20	---	---	---
<i>Silybum marianum</i>	---	10	30	---	---	---	---	20	40	---	---	---
<i>Echium spinosissus</i>	20	---	30	---	---	---	20	---	30	---	---	---
<i>Heliotropium bacciferum</i>	---	10	20	---	---	---	---	10	30	---	---	---
<i>Echium sericeum</i>	---	10	---	---	---	---	---	20	20	---	---	---
<i>Brassica tiurnefortii</i>	60	---	90	---	---	---	50	---	90	---	---	---
<i>Cardaria draba</i>	30	---	70	---	---	---	30	---	70	---	---	---
<i>Erucaria pinnata</i>	---	---	20	---	---	---	---	---	30	---	---	---
<i>Moricandia nitens</i>	10	---	20	---	---	---	20	---	20	---	---	---
<i>Gymnocarpus decandrum</i>	30	30	20	10	10	10	30	40	20	10	20	10
<i>Herniaria hirsuta</i>	---	10	10	---	---	---	---	10	20	---	---	---
<i>Anabsis articulata</i>	10	10	40	---	---	---	10	20	50	---	---	10
<i>Atriplex halimus</i>	---	30	10	---	30	20	---	30	20	---	30	20
<i>Halocxydon salicornicum</i>	70	50	90	50	40	70	70	70	60	60	50	60
<i>Noaea mucronata</i>	20	30	70	20	30	50	30	30	80	30	30	50
<i>Salsola vermiculata</i>	---	10	30	---	10	10	---	20	20	---	10	10
<i>Lotus arabicus</i>	60	---	70	---	---	---	70	---	90	---	---	---
<i>Trifolium tomentosum</i>	---	---	20	---	---	---	---	---	40	---	---	---
<i>Trigonella stellata</i>	10	---	20	---	---	---	30	---	50	---	---	---
<i>Vicia monantha</i>	---	---	30	---	---	---	---	---	50	---	---	---
<i>Marrubium alysson</i>	---	10	20	---	---	---	---	10	30	---	---	---
<i>Asphodelus microcarpus</i>	70	30	70	---	---	---	70	40	80	---	---	---
<i>Aegilops kotschy</i>	20	10	40	---	---	---	20	20	50	---	---	---
<i>Avena sativa</i>	20	10	50	---	---	---	20	20	60	---	---	---
<i>Cynodon dactylon</i>	20	---	50	20	---	30	30	10	40	20	10	40
<i>Hordeum maritimum</i>	30	30	90	---	---	---	50	20	90	---	---	---
<i>Adonis dentata</i>	20	20	40	---	---	---	20	10	50	---	---	---
<i>Reseda decursiva</i>	---	30	50	---	---	---	---	30	40	---	---	---
<i>Lycium shawii</i>	30	40	20	20	40	10	40	40	20	20	40	20
<i>Thymelaea hirsuta</i>	60	40	50	60	40	50	60	50	50	40	40	50
<i>Pegoanum harmala</i>	10	20	20	---	---	---	20	10	20	---	---	---
Total	860	550	1620	220	250	300	940	690	1830	220	280	320

Table 15b. Relative frequency percentage of plant species as affected by Location and season in Wadi Umm El-Rakham from spring 2004 to fall 2005 season.

Scientific name	Spring 2004			Fall 2004			Spring 2005			Fall 2005		
	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed	Top	Rid	Bed
<i>Deverra tortuosa</i>	4.65	9.09	3.70	18.18	20.00	16.67	4.26	7.25	3.83	18.18	17.86	15.63
<i>Arisarum vulgare</i>	0.00	0.00	1.85	0.00	0.00	0.00	0.00	0.00	1.64	0.00	0.00	0.00
<i>Achilla santolina</i>	4.65	0.00	3.09	0.00	0.00	0.00	4.26	1.45	3.28	0.00	0.00	0.00
<i>Anacyclus alexandrinus</i>	10.47	0.00	6.17	0.00	0.00	0.00	8.51	2.90	4.92	0.00	0.00	0.00
<i>Carduncellus eriocephalus</i>	0.00	5.45	3.09	0.00	0.00	0.00	0.00	4.35	2.73	0.00	0.00	0.00
<i>Centaurea alexandrina</i>	3.49	5.45	3.09	0.00	0.00	0.00	3.19	4.35	3.83	0.00	0.00	0.00
<i>Chrysanthemum coronarium</i>	4.65	0.00	4.32	0.00	0.00	0.00	4.26	2.90	4.37	0.00	0.00	0.00
<i>Scorzonera alexandrina</i>	2.33	0.00	1.23	0.00	0.00	0.00	2.13	0.00	1.09	0.00	0.00	0.00
<i>Silybum marianum</i>	0.00	1.82	1.85	0.00	0.00	0.00	0.00	2.90	2.19	0.00	0.00	0.00
<i>Echium spinosissus</i>	2.33	0.00	1.85	0.00	0.00	0.00	2.13	0.00	1.64	0.00	0.00	0.00
<i>Heliotropium bacciferum</i>	0.00	1.82	1.23	0.00	0.00	0.00	0.00	1.45	1.64	0.00	0.00	0.00
<i>Echium sericeum</i>	0.00	1.82	0.00	0.00	0.00	0.00	0.00	2.90	1.09	0.00	0.00	0.00
<i>Brassica tiurnefortii</i>	6.98	0.00	5.56	0.00	0.00	0.00	5.32	0.00	4.92	0.00	0.00	0.00
<i>Cardaria draba</i>	3.49	0.00	4.32	0.00	0.00	0.00	3.19	0.00	3.83	0.00	0.00	0.00
<i>Erucaria pinnata</i>	0.00	0.00	1.23	0.00	0.00	0.00	0.00	0.00	1.64	0.00	0.00	0.00
<i>Moricandia nitens</i>	1.16	0.00	1.23	0.00	0.00	0.00	2.13	0.00	1.09	0.00	0.00	0.00
<i>Gymnocarpus decandrum</i>	3.49	5.45	1.23	4.55	4.00	3.33	3.19	5.80	1.09	4.55	7.14	3.13
<i>Herniaria hirsuta</i>	0.00	1.82	0.62	0.00	0.00	0.00	0.00	1.45	1.09	0.00	0.00	0.00
<i>Anabsis articulata</i>	1.16	1.82	2.47	0.00	0.00	0.00	1.06	2.90	2.73	0.00	0.00	3.13
<i>Atriplex halimus</i>	0.00	5.45	0.62	0.00	12.00	6.67	0.00	4.35	1.09	0.00	10.71	6.25
<i>Halocxydon salicornicum</i>	8.14	9.09	5.56	22.73	16.00	23.33	7.45	10.14	3.28	27.27	17.86	18.75
<i>Noaea mucronata</i>	2.33	5.45	4.32	9.09	12.00	16.67	3.19	4.35	4.37	13.64	10.71	15.63
<i>Salsola vermiculata</i>	0.00	1.82	1.85	0.00	4.00	3.33	0.00	2.90	1.09	0.00	3.57	3.13
<i>Lotus arabicus</i>	6.98	0.00	4.32	0.00	0.00	0.00	7.45	0.00	4.92	0.00	0.00	0.00
<i>Trifolium tomentosum</i>	0.00	0.00	1.23	0.00	0.00	0.00	0.00	0.00	2.19	0.00	0.00	0.00
<i>Trigonella stellata</i>	1.16	0.00	1.23	0.00	0.00	0.00	3.19	0.00	2.73	0.00	0.00	0.00
<i>Vicia monantha</i>	0.00	0.00	1.85	0.00	0.00	0.00	0.00	0.00	2.73	0.00	0.00	0.00
<i>Marrubium alysson</i>	0.00	1.82	1.23	0.00	0.00	0.00	0.00	1.45	1.64	0.00	0.00	0.00
<i>Asphodelus microcarpus</i>	8.14	5.45	4.32	0.00	0.00	0.00	7.45	5.80	4.37	0.00	0.00	0.00
<i>Aegilops kotschy</i>	2.33	1.82	2.47	0.00	0.00	0.00	2.13	2.90	2.73	0.00	0.00	0.00
<i>Avena sativa</i>	2.33	1.82	3.09	0.00	0.00	0.00	2.13	2.90	3.28	0.00	0.00	0.00
<i>Cynodon dactylon</i>	2.33	0.00	3.09	9.09	0.00	10.00	3.19	1.45	2.19	9.09	3.57	12.50
<i>Hordeum maritimum</i>	3.49	5.45	5.56	0.00	0.00	0.00	5.32	2.90	4.92	0.00	0.00	0.00
<i>Adonis dentata</i>	2.33	3.64	2.47	0.00	0.00	0.00	2.13	1.45	2.73	0.00	0.00	0.00
<i>Reseda decursiva</i>	0.00	5.45	3.09	0.00	0.00	0.00	0.00	4.35	2.19	0.00	0.00	0.00
<i>Lycium shawii</i>	3.49	7.27	1.23	9.09	16.00	3.33	4.26	5.80	1.09	9.09	14.29	6.25
<i>Thymelaea hirsuta</i>	6.98	7.27	3.09	27.27	16.00	16.67	6.38	7.25	2.73	18.18	14.29	15.63
<i>Pegoanum harmala</i>	1.16	3.64	1.23	0.00	0.00	0.00	2.13	1.45	1.09	0.00	0.00	0.00
Total	100	100	100	100	100	100	100	100	100	100	100	100