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Vegetation Study within El-Riyadh City

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ABSTRACT. This study deals with the analysis of the vegetation of five locations within El-Riyadh city in central Saudi Arabia. The work aims to recognize and define the different vegetation types and plant communities as well as to estimate the change in the vegetation over time using concepts of climate, for biological conservation and management purposes. To attain these aims we have carefully chosen five locations in El-Riyadh region to cover different habitat types namely: 1-The beginning of El-Riyadh- El-Kharg road south east El-Riyadh city in which the vegetation is affected by the pollutants which emerge from the nearby factories. 2-El-Nargis district, in front of El-Emam Mohamed bin Saud Islamic University, north El-Riyadh in which the vegetation is exposed to the edaphic factors. 3-Wadi Hanifa, south El-Riyadh in which the vegetation is exposed to more water resources from neighbouring high grounds. 4 & 5-King khalid research center for wild life in El-Thomamah at the slope of Touwaik mountain, north El-Riyadh. 4-Exposed vegetation i.e. partial protected vegetation. 5-Protected vegetation. The results obtained proved that the vegetation in El-Riyadh region is scanty, diffuse, open and is largely influenced by human impacts and over grazing. It is dominated by perennial xerophytic shrubs which normally inhabit the disturbed habitats, and it is affected by drought stress throughout the last ten years. The diversity indices are very low which pointed to the severe effect of human impact, over grazing and both edaphic and climatic factors. Finally, flash-light has been switched on to illustrate the direction of the vegetation dynamics, as previously dominated species become associates to new species that start to dominate.

Introduction

Saudi Arabia is one of the large countries in the world. It posesses about 4/5 the area of the Arabian peninsula. This country has its characteristic plant forms, that encouraged the ecologists to study its vegetation. Since long time ago. Zohary (1957) is one of the pioneers who studied the flora of Saudi Arabia. Afterwards, DeMarco and Dinelli (1974) gave a satisfactory description of the flora of the country. Migahid and El-Sheikh (1977) described the major habitats and the plant populations in both central and eastern parts of Saudi Arabia. Since that time, lot of descriptive works have been done in order to cover the variations in both the habitats and plant populations{Migahid (1978, 1988, 1989 & 1990); Batanouny & Baeshin (1982); Chaudhary (1983, 1989 & 1999); Heemstra *et al.*(1990); Al-Welaie *et al.* (1993); Shaltout & Mady (1993 & 1996); Chandhary & Al-Jowaid (1999);

Hassan & Al-Hemaid (1997); Taia & El-Ghanem (2001) and Taia & El-Olayan (2003)}. These works and many others have added a lot in understanding the type of vegetation and the environmental conditions affected it. In the same time, they become documents to know how much the change in the environmental factors affected the dominant species covering this area. As well as, these previous works can help those who work in plant conservation and management to protect the species under stress.

The present study is carried out to identify the dominant and associate species grown in five locations within El-Riyadh city, central Saudi Arabia. Compare the recent species lists with the previous floristic works to illustrate the vegetation dynamic, and to know the effect of plant protection in both species diversity and richness.

The Study Area

Riyadh city is located at Najd plateau, which is an elevated ground belongs to the Afro-Arabian shield, in the center of Saudi Arabia. It is surrounded by large mountains and wide areas of sandy deserts; El-Dahnaa, El-Nofud & El-Robee al khaly. It has a characteristic climate which can be described by being over dry and hot with very low water soil contents (table 1). The five studied locations are as follows (Fig. 1): **1-** The beginning of El-Riyadh-El-Kharg road, south-east El-Riyadh city, where the vegetation is affected by the nearby factories pollutants. **2-** El-Nargis district, in front of El-Emam Mohamed bin Saud Islamic University, north El-Riyadh where the vegetation is typically exposed to the natural edaphic factors of the city. **3-** Wadi Hanifa, south El-Riyadh where the vegetation is more lucky in water coming from neighbouring high grounds , the vegetation has been studied in order to cover the beginning, the slope and the bed of the wadi. **4 & 5**- King Khalid research center for wild life in El-Thomamah district at the slope of Touwaik mountain, north El-Riyadh. **4**- Exposed vegetation i.e. partially protected & **5**- Completely protected vegetation.

Methods

A total of fourty one sampling quadrats (10 X 10 m2) were selected in order to cover most of vegetation variations in the five sites as follows: eight quadrats in the first and the second locations, fifteen quadrats in the third location (five in the beginning, five in the slope and five in the bed) and another ten in the fourth and fifth locations (five in each). A monthly visit was done from October 1999 till June 2001. Floristic lists, counts of the individual species was done to calculate the importance value of the recorded species (Ludwig and Reynolds, 1988). Classification of the stands were carried out by multivariate analysis (El-Demerdash *et al.*,1995) and by using a TWINSPAN computer programme (Hill,1979), clustering tree were obtained to show the relations between the quadrats (Fig. 2). Diversity indices; Shannon, species richness and evenness; have been calculated (Pielou, 1975 and Magurran, 1988). One way ANOVA test was carried out to evaluate the effect of complete plant protection on species richness and evenness.

Tahle (1). Variations in the climate during the period 1992-2002.

Climate Months	Temp. C (year)		Rainfal mm.		Humidity %		Evaporation mbar		Wind vel.&Dir.node	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
January	6.1(92) 10.5(94)	16.2(92) 23.5(94)	Trace (94,95)	54.6 (93)	38 (95,97)	69 (96)	5.7 (92)	10.8 (96)	4N (95)	6SSE (94,98)
February	9.0(92) 13.5(99)	20.4(92) 25.8(99)	0.0 (94,97)	15.6 (93)	23 (97)	48 (93)	3.9 (97)	10.3 (99)	6SE (92)	8SSE (93)
March	12.3(92) 15.4(96)	23.4(92) 28.1(99)	1.7 (92)	108.9 (95)	23 (92)	44 (95)	5.8 (92)	10.7 (97)	6SSE (92)	8SSE (95)
April	18.5(97) 20.9(94)	31.3(95) 35.8(99)	01.1 (92)	65.6 (93)	18 (99)	36 (95,96)	6.7 (99)	11.9 (93)	5WSW (93)	8N (92)
May	24.3(92) 26.2(99)	37.2(93) 40.8(99)	0.0 (92)	39.5 (93)	12 (99)	26 (93)	5.9 (99)	10.4 (93)	5N (96)	8N (94)
June	25.6(92) 29.1(98)	41.6(93) 44.4(99)	0.0	Trace (97,98)	8 (94)	12 (96)	4.3 (99)	7.1 (95)	5N (92)	9NNW (94)
July	27.0(92) 30.6(96)	41.7(94) 44.4(96)	0.0	Trace (95,98)	8 (94)	12 (98)	4.8 (99)	7.4 (98)	5NW (92)	9NNW (94)
August	26.4(93) 30.1(92)	42.0(92) 44.9(98)	0.0	Trace (93)	10 (94,95)	15 (98)	5.7 (94)	9.7 (98)	5N (92)	7N (97,99)
September	22.8(97) 28.0(98)	39.1(92) 42.6(97)	0.0	Trace (98)	12 (93,99)	16 (94)	5.9 (95)	8.0 (94,98)	4N (97)	7NNW (92)
October	18.8(92) 22.6(94)	24.7(96) 36.2(99)	0.0	11.4 (97)	13 (92)	35 (97)	5.0 (92)	11.5 (97)	3SSE (99)	5NE (93)
November	12.7(95) 17.1(94)	23.6(97) 30.2(98)	0.0(92, 93,94)	30.0 (97)	23 (98)	75 (97)	5.3 (95)	16.2 (97)	2SSE (93)	8SE (94)
December	9.4(94) 12.1(92)	17.8(95) 27.0(98)	0.0 (96)	63.9 (95)	29 (98)	76 (95)	6.2 (98)	11.5 (95)	3SSE (98)	7SE (94)

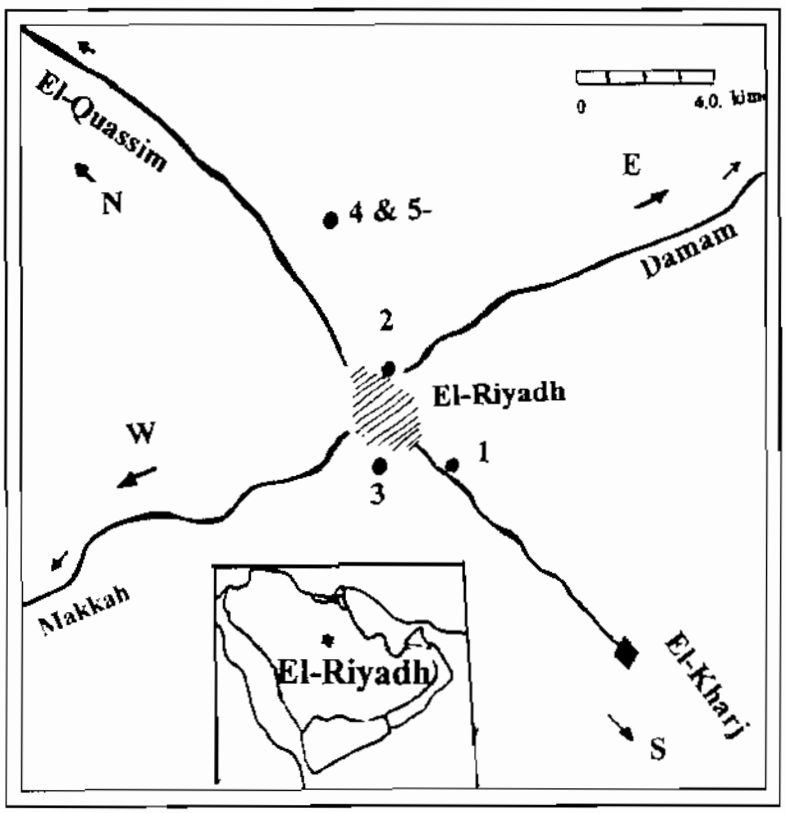

Fig. (1). Map showing the different locations studied.

Results

The results are summerised in tables 1, 2, 3 & 4. From table 1, we can notice that during the summer, the temperature has its maximum degree, the weather is dry and considerably windy. This weather affects the vegetation in that period in all the studied areas, which is mostly absent. During the rest of the year the vegetation is considerably poor in autumn and start to grow in winter and spring. The number of the annual species are considerably high in wadi Hanifa and in king Khalid research center (Locs. 3, 4 & 5). Table (2) summarises the species recorded, which are sixty six (twenty four annuals and the rest are perennials; seven species only belong to the monocot. and fifty nine to the dicots.), their presence in the five locations and their relative importance value as means throughout the period of study. From table 2, we can observe that the most important species in the studied locations are: *Salsola baryosma, Phragmites australis & Zygophyllum migahidii*, their RIV are 51.08, 33.14 & 25.13 respectively. From the species recorded, seven community types have been recognized as follows:

1- *Zygophyllum migahidii*

This type is dominant in the first location and can be found in the second location as well. This plant community is dominated by *Zygophyllum migahidii* and accompanied by, *Anabasis setifera, Ochradenus baccatus, Salsola baryosma Tamarix aphylla & Zilla spinosa.*

2-*Salsola barosma*

This plant community is dominated by *Salsola baryosma* with, *Basia eriophora, Francoeuria crispa, Tamarix aphylla & Zygophyllum migahidii* as associates. This type can be observed in the second location i.e. it is typically xerophytic type.

3- *Zilla spinosa*

In which *Zilla spinosa* dominate and accompanied by *Astragalus spinosus, Cenchrus cilliaris, Cynodon dactylon, Francoeuria crispa & Prosopis spicigera* . This community is present in the beginning of wadi Hanifa.

4- *Francoeuria crispa*

This community type is dominated by *Francoeuria crispa* with the association of, *Fagonia bruguieri, Frankenia pulverulenta, Salsola baryosma , Zilla spinosa & Zygophyllum migahidii.* This community type is present in the slope of wadi Hanifa.

5- *Phragmites australis*

This type is characterized by the abundance of *Phragmites australis* with the association of, *Atractylis carduus, Fagonia bruguieri, Polypogon monospliensis & Tamarix aphylla.* This community is distributed in the bed of wadi Hanifa.

6-*Hammada elegans*

This community is dominated by *Hammada elegans* and is associated by *Basia eriophora & Pituranthus triradiatus.* This community is found in king Khalid research center locations (4 &5).

7- *Rhanterium epaposum*

This plant community is present in location four and characterized by the abundance of *Rhaterium epaposum* with the association of *Echinops spinosissimus, Launea cassiniana & pituranthus triradiatus.*

Table (2). Recorded species, their life forms, sites of their presency, mean of their importance values (IV).
3a = Beginning of the wadi, 3b = Slope, 3c = bed, Per.= Pereunial, Ann.= Annoal

No.	Species	Life form	1	2	3a	3b	3c	4	5	IV
1	*Anabasis setifera* Moq.	Per. Dicot.	+	-	-	+	+	-	-	10.13
2	*Astragalus spinosus* (Forssk.) Musch.	Per. Dicot.	-	+	+	+	-	-	-	4.22
3	*Atractylis carduus* (Forssk.) Christens	Per. Dicot.	-	-	+	+	+	-	-	4.83
4	*Atriplex leucoclada* Boiss	Per. Dicot.	-	-	-	-	+	-	-	3.21
5	*Arnebia hispidisima* (L.) DC	Ann. Dicot.	-	-	-	-	-	+	-	2.05
6	*Basia eriophora* (Schrad) Asch.	Ann. Dicot.	+	+	+	-	+	+	+	5.12
7	*Calotropis procera* (Ait) A.T.F.	Per. Dicot.	+	-	+	-	-	-	-	2.04
8	*Capparis cartilaginea* Decne	Per. Dicot.	+	+	+	-	-	-	-	1.24
9	*Cenchrus ciliaris* L.	Per. Monocot.	+	-	+	-	-	-	-	0.64
10	*Chenopodium album* L.	Ann. Dicot.	+	-	-	-	+	-	-	0.67
11	*Chenopodium murale* L.	Ann. Dicot.	-	-	-	-	+	-	-	0.53
12	*Chrozophora oblique* (Vahl) A. Juss.	Per. Dicot.	-	-	+	-	+	-	-	2.31
13	*Citrullus colocynthis* (L.) Schrad.	Per. Dicot.	+	-	+	-	-	-	-	1.13
14	*Cleome arabica* L.	Per. Dicot.	+	-	-	-	+	-	-	1.04
15	*Conyza linifolia* (Willd.)Tackh.	Ann. Dicot.	-	-	+	-	-	-	-	0.64
16	*Cynodon dactylon* L.	Per. Monocot.	-	-	+	-	-	-	-	1.27
17	*Dichanthum annulatum* (Forssk.) Staff	Per. Monocot.	-	-	-	+	-	-	-	0.64
18	*Diplotaxis harra* Forssk	Per. Dicot.	-	-	-	-	+	-	-	0.53
19	*Ducrosia ismaelis* Asch.	Per. Dicot	+	-	+	+	-	-	-	2.65
20	*Echinops spinosissimus* Turra	Per. Dicot.	-	-	-	-	-	+	+	3.21
21	*Eragrostis barrelieri* Dav.	Ann. Monocot.	-	-	-	+	-	-	-	1.18
22	*Euphorbia granulata* Forssk	Ann. Dicot.	-	-	-	+	-	-	-	0.62
23	*Euphorbia retuse* Forssk	Per. Dicot.	-	-	-	-	+	-	-	0.53
24	*Fagonia bruguieri* DC	Per. Dicot.	+	+	-	-	+	-	-	10.15
25	*Farsetia aegyptiaca* Turr.	Ann. Dicot.	-	-	-	-	-	+	+	1.17
26	*Forskalea tenassicima* L.	Ann. Dicot.	-	-	-	-	+	-	-	1.04
27	*Francoeuria crispa* (Forssk) Cass.	Per. Dicot.	+	-	-	-	+	-	-	10.18
28	*Frankenia pulverulenta* L.	Ann. Dicot.	+	-	-	-	-	-	-	1.65
29	*Haloxylon ammodendron* Bunge	Per. Dicot.	+	-	-	-	-	-	-	2.69
30	*Hammada elegans* (Bunge) Botsch.	Ann. Dicot.	-	-	-	-	-	+	+	8.52
31	*Heliotropium bacciferum* Forssk	Per. Dicot.	-	-	-	-	-	+	-	0.95
32	*Heliotropium digynum* Forssk	Per. Dicot.	-	-	+	-	-	-	-	1.25
33	*Heliotropium longiflorum* A. DC	Per. Dicot.	-	-	-	-	-	+	-	1.05
34	*Horwoodia diksoniae* Turr.	Ann. Dicot.	-	-	-	-	-	+	-	1.62
35	*Lauenea cassiniana* Kuntze	Ann. Dicot.	-	-	-	-	-	+	-	1.21
36	*Lotus halophilus* Boiss et Sprun.	Ann. Dicot.	-	-	-	-	-	+	-	0.63
37	*Malva parviflora* L.	Ann. Dicot.	+	-	-	-	+	-	-	2.06
38	*Ochradenus baccatus* Del.	Per. Dicot.	+	-	-	+	+	-	+	6.43
39	*Oxalis corniculata* L.	Per. Dicot.	-	-	-	-	+	-	-	0.60
40	*Paronychia desertorum* Fres.	Per. Dicot.	-	-	-	-	-	-	+	0.24
41	*Pennisetum divisum* (Forssk) Henrard	Per. Monocot.	-	-	-	-	-	-	-	2.12
42	*Phragmites australis* (Cav.) Trim.ex Steud.	Per. Monocot.	+	-	-	+	+	-	-	33.14
43	*Polypogon bellardii* All.	Ann. Monocot.	+	-	-	-	-	-	-	3.86
44	*Polypogon monospliensis* (L.) Desf.	Ann. Monocot.	+	-	-	-	+	-	-	3.13
45	*Pituranthus triradiatus* Hochst.	Ann. Dicot.	-	-	-	-	-	+	+	25.18
46	*Plantago cylindrical* Forssk	Per. Dicot.	-	-	-	-	-	+	+	9.04
47	*Prosopis spicigera* L.	Per. Dicot.	-	-	+	-	-	-	-	8.12
48	*Reseda muricata* Prest.	Per. Dicot.	+	-	-	-	+	-	-	5.02
49	*Rhanterium epaposum* Oliv.	Per. Dicot.	-	-	-	-	-	+	-	13.12
50	*Rhazya stricta* Decne	Per. Dicot.	+	-	-	-	-	-	-	3.26
51	*Ridolfia segetum* (L.) Moris	Ann. Dicot.	-	-	+	+	-	-	-	3.42
52	*Rumex nervosus* Vahl.	Ann. Dicot.	+	-	-	-	+	-	-	3.02
53	*Rumex vesicarius* L.	Ann. Dicot.	-	-	+	+	+	-	-	5.75

54	*Salsola baryosma* (schul.) Dandy	Per. Dicot.	+	+	+	+	+	-	-	51.08
55	*Savignya parviflora* (Del.) Webb.	Ann. Dicot.	-	-	-	-	-	+	-	1.12
56	*Scorzonera intricate* Boiss	Ann. Dicot.	+	-	-	+	-	-	-	3.12
57	*Scorphularia desertii* Del.	Per. Dicot.	-	-	+	+	-	-	-	1.27
58	*Seetzinia lanata* (Willd.) Bullock	Per. Dicot.	-	+	-	-	-	-	-	1.22
59	*Sonchus oleraceus* L.	Ann. Dicot.	+	-	-	-	-	-	-	3.14
60	*Sisymbrium irio* L.	Ann. Dicot.	-	-	-	-	+	-	-	1.13
61	*Spergula fallax* (Lowe) Krause	Ann. Dicot.	-	-	-	-	-	+	-	0.65
62	*Tamarix aphylla* (L.) Karst.	Per. Dicot.	+	+	+	+	+	-	-	11.15
63	*Trichodesma africanum* (L.) R.Br.	Per. Dicot.	+	-	-	+	-	-	-	3.52
64	*Xanthium brassilicum* Velloza	Ann. Dicot.	-	-	-	-	+	-	-	0.86
65	*Zilla spinosa* (Turr.) Prantl.	Per. Dicot.	+	+	+	+	+	+	-	11.31
66	*Zygophyllum migahidii* Hadidi	Per. Dicot.	+	+	+	+	+	-	-	25.13

The species recorded are subjected to vegetation analysis to calculate some diversity indices such as species richness Shannon index and evenness (table 3). In general table 3 shows that the values of the diversity indices are very low. The lowest values in species richness and Shannon indices are in the second location (El-Nargis). These are due to the lowest number of species in that location. The first location (the beginning of El-Riyadh-El-Kharj road) has considerably high value in species richness but the other values is still low. Wadi Hanifa has gradual values which start from the beginning of the wadi and decrease gradually in the slope then the bed. In contrast to species dominance which is higher in the bed of the wadi and considerably high in the first location (El-Riyadh-El-Kharj road). In king Khalid research center, location four (partially protected area) has higher values in both species evenness and richness, in contrast to species dominance which is higher in the fifth location (completely protected area).

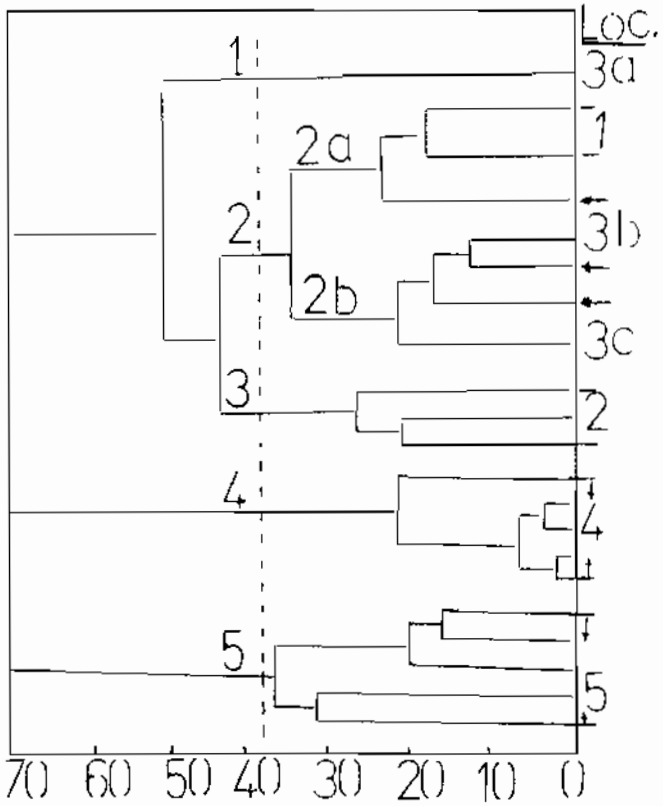

Fig. (2). Clustering analysis after the application of TWINSPAN.

Table (3). Variations in some diversity indices in the studied quadrats.

Loc.	N.Q.	T.species	T.individual	Richness	Shannon	Evenness
1	1	18	443	2.79	2.5	0.864
	2	17	399	2.67	2.48	0.876
	3	15	455	2.29	2.36	0.873
	4	21	533	3.17	2.74	0.901
	5	19	533	2.87	2.55	0.866
	6	15	453	2.29	2.4	0.887
	7	16	455	2.45	2.43	0.878
	8	18	542	2.7	2.62	0.905
2	9	8	354	1.19	1.83	0.881
	10	8	355	1.19	1.82	0.873
	11	9	254	1.44	1.8	0.817
	12	9	410	1.33	1.93	0.881
	13	9	376	1.35	1.92	0.874
	14	5	277	0.711	1.37	0.852
	15	6	299	0.877	1.52	0.848
	16	7	333	1.03	1.66	0.851
3a	17	18	457	2.78	2.71	0.939
	18	16	453	2.45	2.61	0.942
	19	16	551	2.38	2.62	0.945
	20	18	434	2.8	2.67	0.925
	21	17	558	2.53	2.72	0.959
3b	22	12	309	1.92	2.16	0.869
	23	12	365	1.86	2.28	0.917
	24	12	433	1.81	2.29	0.921
	25	14	499	2.09	2.39	0.905
	26	11	377	1.69	2.11	0.881
3c	27	17	420	2.65	2.61	0.922
	28	12	209	2.06	2.29	0.921
	29	13	287	2.12	2.34	0.912
	30	14	331	2.24	2.5	0.945
	31	11	287	1.77	2.16	0.902
4	32	7	190	1.14	1.70	0.876
	33	6	144	1.01	1.53	0.856
	34	8	194	1.33	1.83	0.878
	35	11	302	1.750	2.00	0.834
	36	10	248	1.630	1.91	0.831
5	37	4	185	0.575	0.945	0.681
	38	5	191	0.762	0.995	0.618
	39	5	142	0.807	1.190	0.739
	40	3	173	0.388	0.746	0.679
	41	2	224	0.185	0.688	0.993

The dendodrogram obtained from the application of TWINSPAN, by calculating single linkage Euclidean distances between the quadrats, shows five elustering groups. Quadrats of the beginning of wadi Hanifa have been grouped in the first group. The second group is subdivided into two subgroups, subgroup 2a gathered the quadrats of the first location while subgroup 2b have quadrats of both the slope and the bed of wadi Hanifa. Two quadrats of the slope (3b) are present with subgroup 2a (1st arrow) and one quadrat from the bed approach from that of the slope (2nd arrow). The third arrow indicates one quadrat from the 2nd location. All the partially protected sites are gathered in the fourth group as well as those representing the completely protected one which gathered in the fifth group.

ANOVA test has been applied in the sites of king Khalid research center to evaluate the effect of complete plant protection on the vegetation. From table (4) we can observe that the vegetation in the partially protected sites is more richer than in the eompletely protectcd especially during the autumn and winter whereas the variation becomes insignificant during the spring.

Table (4). The results of the application of ANOVA test for the eighteen recorded species present in locations 4 & 5

Autumn		Winter		Spring	
Part.prot.	**Comp.prot.**	**Part.prot.**	**Comp.prot.**	**Part.prot.**	**Comp.prot.**
0	54.09392	0	27.82732	0	40.772417
2.123602	2.002423	1.4535	8.913859	9.0899	20.915809
71.91313	0.756596	73.30585	3.17238	87.35842	7.4445739
0	0	0	0.014286	0	1.2083424
0	0	0	1.665822	0	0
3.29252	7.30169	3.636	22.42142	4.551676	32.690988
0	0	1.090763	10.77983	0	0
12.42596	30.6886	20.74544	13.50259	0	0
0	0	0.202	0.001299	0	0
0	3.980666	0	1.768705	0	1.08548
0	0	0	7.420238	0	0.368572
0	0	0	1.626337	0	0
2.102755	0.022128	0.565604	0.91849	0	0
0	1.020545	0	0.345622	0	0
0	0	0	1.117993	0	0
0	3.163851	0	0.609881	0	0
0.202033	0.002128	0	0	0	0
0	0	0	0.284577	0	0

Variables	**Autumn**	**Winter**	**Spring**
Species no.	17	17	17
Frequency	0.365541	0.218669	0.689858
Probability	0.022524	0.001547	0.225993
Qualification	**Significant**	**Significant**	**Insignificant**

Discussion

The vegctation of Saudi Arabia had been deseribed since Vesey-Fitzgerald (1957), who summerised some of the broader vegctation groups. Sinee that time little information have beeп added to our knowledge eoncerning the broad spectrum of the vegetation of the area until Shaltout & Mady (1993), Shaltout *et al.*(1997), Al-Hoinaid (1998) and Taia & El-Ghanem (2001). However, thc floristic studies have received more attention (e.g. Mandavillc, 1990; Migahid, 1990; Chaudhary, 1999; Chaudhary & Al-Jowaid, 1999; Hassan & Al-Hemaid, 1997). In this work, sixty six species have been recorded in the studied locations throughout the whole year. Four of these species arc restricted to the 1st location (*Haloxylon ammodendron, Polypogon bellardii, Rhazya stricta & Sonchus oleraceus*). One species is found in the 2nd loction only (*Seetzinia lanata)*, whereas twenty species are recognized in wadi Hanifa only. King Khalid research center has species which are mostly different from the other locations (Table 1). Twenty seven species are recorded iu more than one location. This result can indicate thc probable variation in the soil characteristics which in turn affect the type of the species and their richness. Rice (1981) mentioned that the sandy soil is more rich in speciation than the gravelly ones. This can be

one of the reasons that wadi Hanifa is more rich in species evenness than the other locations. The gradual decrease in the diversity indices from the beginning to the slope and then to the bed, can be due to the increase in the soil salinity, which increases gradually as we go down the wadi as a result of continuing washing of the soil by rain as mentioned by Shaltout *et al.* (1996). This is obvious from the type of the species dominated at each location. *Zygophyllum migahidii* and *Salsola baryosna* which are dominating the 1st and 2nd locations are salt tolerant species and usually inhabit the disturbed habitats (Al-Homaid *et al.*, 1990). *Zilla spinosa* which dominate the beginig of wadi Hanifa is a completely xerophytic species which ean be found in all the drought soils, but this species decrease with the increase of sodium chloride concentration (Shaltout *et al.*,1996). Same authors indicate the decrease of *Francoueria crispa* in the habitats with high concentrations of potassium ions and this can be the reason of its dominancy in the slope of the wadi. *Phragmites australis* is well known that inhabits the watery habitat, and for that it is dominating the plant community of the bed of wadi Hanifa. King Khalid research center has completely different species which may he due to the partial protection of the vegetation or to soil characteristics. Comparing between locations 4 & 5, we can find that the partially protected regions are more richer in species diversity but the completely protected areas have low speciation with high numbers of individuals. This may be due to the controlled grazing which stimulate the growing buds. The same conclusion has been obtained by Al-Moushileh and Kawas (2001).

When comparing the species recorded with those obtained from more than thirty years (El-Wailley, 1972) we can find that in the past the dominating species were *Astragalus spinosa, Rhazya stricta, Heliotropium sp., Francoeuria crispa, Fagonia sp.* and *Reseda muricata.* These species are still present but their density started to decrease and another species started to dominate as *Zygophyllum migahidii, Salsola baryosma, Francoeuria crispa, Zilla spinosa , Phragmites australis, Hammada elegans, Rhanterium epaposum* and *Tamarix aphylla.* These species are known to overcome the stress and usually inhabit the disturbed habitats. Finally, we have to switch the light on how much our vegetation face high stress from the climate, soil salinity, drought , overgrazing and severe human impacts which threaten our ecosystem in general, and to push those who are interested in plant life conservation to save our species.

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دراسة الكساء الخضرى فى مدينة الرياض بالمملكة العربية السعودية

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المستخلص. يتضمن هذا البحث دراسة الكساء الخضرى الطبيعى لخمس بيئات مختلفة فى مدينة الرياض بالمملكة العربية السعودية ومعرفة الأنواع السائدة والمرافقة لكل منهم. كما يهدف إلى التنبؤ بالتغيرات الحادثة فى الكساء الخضرى على مرور السنين وذلك لأغراض الحماية الفطرية ، مستندين إلى التغيرات الحادثة بالمناخ فى مدينة الدراسة. للوصول إلى هذة الأهداف فقد تم اختيار خمس مناطق تمثل خمس بيئات مختلفة فى منطقة الرياض. المنطقة الأولى تقع فى طريق الرياض– الخرج بجانب مصانع الأسمدة، جنوب شرق الرياض، حيث الضغوط الواقعة على الكساء الخضرى من الملوثات المنبثقة من المصانع. المنطقة الثانية هي منطقة النرجس، شمال الرياض، أمام جامعة الإمام محمد بن سعود حيث البيئة الصخرية المكشوفة والمعرضة للعوامل البيئية الطبيعية للمنطقة. المنطقة الثالثة هى وادى حنيفة ،جنوب الرياض، والممثلة للبيئة الخصبة المتوفر بها الماء. المنطقتين الرابعة والخامسة فى مركز أبحاث الملك خالد للحياة الفطرية بالثمامة عند منحدر جبل طويق ، شمال الرياض، موقع خارج أسوار المنطقة المحمية والموقع الآخر داخل المنطقة المحمية.

النتائج المتوصل اليها أشارت الى أن الكساء الخضرى فى مدينة الرياض يتسم بالشحة والتباعد ومتأثر الى حد كبير بالضغوط الواقعة عليه من النشاط السكانى والرعى الجائر والعوامل المناخية. كما اتسم الكساء الخضرى بسيادة الأنواع النباتية دائمة الخضرة والتي تسكن البيئات المضطربة والمتحملة للجفاف والملوحة . ومؤشرات التنوع فى مناطق الدراسة كانت ضئيلة أما مؤشر الغزارة سجلت أعلى قيمة لها فى المنطقة المحمية فى مركز الملك خالد للحياة الفطرية. ومن هذة الدراسة قد تم تسليط الضوء على اتجاه ديناميكية الكساء الخضرى حيث وجدت أنواع كانت سائدة فيما مضى أصبحت مرافقة لأنواع فى طريقها للسيادة.