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DIVERSITY OF PERENNIAL PLANTS AT IBEX RESERVE IN SAUDI ARABIA

H. H. Al-Khamis, F. M. Al-Hemaid and A. S. S. Ibrahim

Department of Botany and Microbiology, College of Science, King Saud University, P.O 2455 Riyadh 11351, Kingdom of Saudi Arabia
Corresponding author e-mail: ashebl@ksu.edu.sa

ABSTRACT

This study has been conducted to survey the perennial plants diversity in the Ibex reserve, located at the middle of Saudi Arabia, about 180 Km south from the Riyadh city. Analysis of the perennial plants of the Ibex protectorate resulted in identification of six major plant communities. *Haloxylon salicornicum* community was the major plant community in Ibex protectorate, showing a relative importance of 140.4%, followed by *Rhazya stricta* (115.6%), *Ziziphus nummularia* (115%), *Acacia tortilis* (113.7%), *Rhanterium epapposum* (109.7%), and *Calotropis prosera* community (102.8%), respectively. In addition, 62 perennial species, representing 34 families, were recorded in Ibex reserve. The largest family was Poaceae, represented by six species, followed by Mimosaceae (five species), Capparaceae (four species), Asteraceae (three species), Lamiaceae (three species), Rhamnaceae (three species), Zygophyllaceae (three species), Boraginaceae (two species), Brassicaceae (two species), Cucurbitaceae (two species), Scrophulariaceae (two species), and Urticaceae (two species). Seven families were represented by only one species; examples include Acantheaceae, Amaranthaceae, Apocynaceae, Cistaceae, and Convolvulaceae. The study demonstrated high perennial plant diversity of Ibex reserve and abundance of many plant species that were deteriorated in other places of the country due overgrazing and social behavior in Saudi Arabia.

Keyword: Plant diversity; Plant community; Perennial plants Ibex Reserve; Saudi Arabia.

INTRODUCTION

Saudi Arabia (Lat. 32' 34ºN–16' 83ºN, Long. 34' 36ºE–56'E) is a vast arid desert with total area of about 2.25 million km^2 covering the major part of the Arabian Peninsula. Subsequently, xerophytic vegetation makes up the prominent features of the plant life in the Kingdom (Zahran, 1982). Although the Kingdom of Saudi Arabia lies within a typical arid to semi-arid region, it is characterized by its unique biological diversity and species that could acclimatize to live under adverse ecological circumstances including weather and dry conditions. There are several reports about the flora of Saudi Arabia have been previously published, the most comprehensive are by Mighaid and M. Hammuda in 1974, which were further published four times (Mighaid, 1996; Chaudhary 1999; 2000; 2001). In addition, a number of ecological studies has been published on the vegetation of several regions of Saudi Arabia. Al-Turki and Al-Olayan (2003) published synoptic analysis of the flora of Hail region and recorded 338 wild plants representing 221 genera spread over 61 families. Also recent vegetation analysis of this area was reported by El-Ghanim et al (2010), who recorded 124 species representing 34 families in this region. Vegtation analysis of Al-Aushazia Sabkha area in Al-Qassim region was also described by Al-Huquial and Al-Turki (2006). Floristic composition and vegetation analysis of other area in Saudi Arabia were also reported e.g Makkah city (EL-Deed, 2005) and Wadi El-Ghayl in Aseer mountains (Fahmy and Hassan, 2005).

The Saudi Arabia economic capriole has resulted in changed life styles in agricultural, industrial and urbanization practices; and the increased resource demand due to increased human population as well as pollution and other constrains negatively affected resources to an alarming extent (Mosallam, 2007; El-Bana, 2009). Pasture production depends on various factors such as climate, nature of soil, botanical composition, vegetation structure, type, and intensity of management. However, overgrazing, over cultivation and woodcutting are among the man-made factors, which lead to the deterioration of pasture production (Le Houerou and Hoste, 1977; Abdel-Fattah, 2005). In addition to the anthropogenic influences, other factor e.g., heavy grazing, wood fuel cutting and termites play additional impacts on the vegetation distribution in Saudi Arabia (Fahmy and Hassan, 2005; Al-Huquial and Al-Turki, 2006).

Therefore, Saudi Arabia government has established the Saudi Wildlife Commission (SWC) in 1985, with a mandate to prepare and implement plans to sustain terrestrial and marine wildlife and rehabilitate rare and threatened species and their habitats with the ultimate goal of SWC of getting back the natural environmental balance. At present, the Commission manages 15 protected areas, which have been ratified by its Board of Directors. One of these protected areas is Ibex Reserve, which is the area of study. Apparently, there are few

publications are available on the floral diversity of Ibex Protectorate, so this paper aims to generate a baseline data and complete the old studies on this Protectorate.

MATERIALS AND METHODS

The Study area: Ibex (In Arabic, Al-Waoul) protectorate is located at the middle of Saudi Arabia, about 180 Km south from the Riyadh city. It extends between latitudes 23' 12º and 23' 35º N, and between longitudes 46' 15º and 46' 50º E. It is bounded by Haoutat Bani Tamim on the east, Wadi Dasman on the west, and from the north and south by fire and Parak valley, respectively (**Figure 1**). Ibex protectorate is a semi-regular in shape, in a large plateau separated by valleys and coral. It extends from west to east by 62 km, and 42 km from north to the south, with a total diameter and area of about 212 Km and 2369 Km^2, respectively. The climate of Ibex protectorate is, generally, tropical, warm and dry in summer, cold in winter. There are no rains in summer, but in winter, it reaches 15.1-28.5 mm. Table 1 indicates the average temperature, rains, and humidity of Ibex reserve.

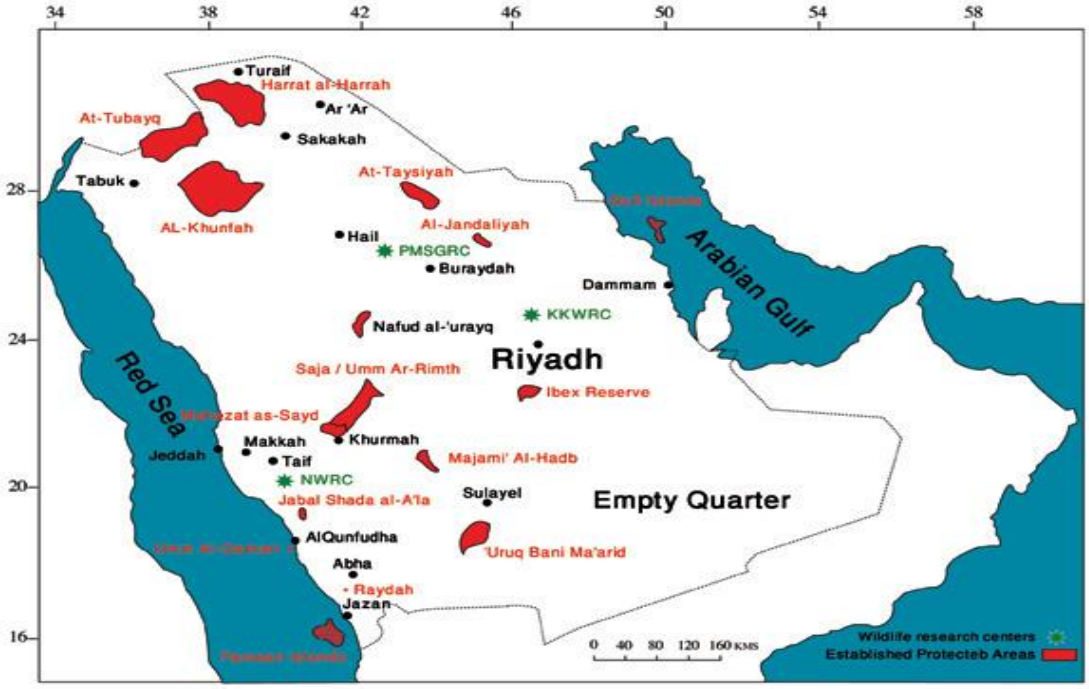

Figure 1: Location of Ibex reserve. The red colored area are the protected reserve managed by Saudi Wildlife Commission (SWC)

Table 1: Climatic records during 2005 and 2006 for Ibex reserve (Data collected from Meteorological Station of National Wildlife Research Center)

Month	Temperature (C)			Relative Humidity (%)	Rain (mm)	Wind (km/h)
	Maximum	Minimum	Average			
January	20.204	8.054	13.970	48.056	19.2	5.574
February	23.131	10.165	16.587	38.407	17.1	6.463
March	27.417	14.172	20.787	34.278	28.5	6.944
April	33.263	19.343	26.417	29.204	28.1	6.704
May	39.241	24.574	32.311	17.741	4.8	6.278
June	42.426	26.457	35.037	11.074	0	6.852
July	43.480	27.761	36.163	10.648	0	6.889
August	43.363	27.556	35.985	12.352	0	5.870
September	40.343	24.270	32.778	14.074	0	4.833
October	35.194	19.631	27.659	]20.963	2.8	4.037
November	27.917	14.472	21.126	36.204	18.8	5.000
December	22.128	9.776	15.785	47.889	15.1	5.296
Average	33.175	18.853	26.217	26.741	11.2	5.895

Data collection: A quantitative survey of the perennial vegetation was carried out during 2007 to 2008. For complete identification and characterization of the perennial plants communities in the Ibex reserve, stratified random sampling method was employed using List Quadrat method (Kent and Coker, 1992; Magurran, 2003): The area was divided into to seven sectors and each was divided into three squares with dimensions of 10 m x 10 m for each square. The study included recording of all perennial plants species in each square and the number of species of each type of coverage. Vegetation parameters were measured including: species density, species frequency, species distribution, species coverage, species abundance. The sum of the relative values gave the importance value for the different plant species. Voucher specimens were deposited in the herbarium of Department of Botany and Microbiology, college of Science, King Saud University (Riyadh, Saudi Arabia). The collected plant specimens were identified and named according to Collenette (1999), Mighaid (1996) and Chaudhary (1999, 2000, 2001). Calculations of various vegetative parameters were according to the following equations (Magurran, 2003):

1. Species Density in a sector (plant/square) = Number of plants in three squares/3
2. Species Density in a sector (plant/m^2) = Plant density (Plant/square)/Square area
3. Relative species density in a sector (%) = [Density (Plant/square)/Sum of plant densities of all species] × 100
4. Species Frequency (%) = [(Number of square in which a plant species in a sector appeared/the total number of squares in the sector] × 100
5. Relative Frequency of species in a sector (%) = [Species frequency/ sum of frequencies of all species in the sector] × 100
6. Species Abundance (Plant/square) = Total number of a plant species in all squares in a sector/number of squares contained the plant species
7. Species Coverage (%) = Sum of coverage in all square in a sectors/number of square
8. Relative Coverage in a sector (%) = [(Species coverage/ Sum of coverage of all species)] ×100
9. Relative Importance of a species in a sector (%) =Relative density + Relative frequency+ Relative coverage

RESULTS AND DISCUSSION

Analysis of the perennial vegetation of the Ibex protectorate resulted in identification of six major plant communities. *Haloxylon salicornicum* community was the major plant community in Ibex protectorate, showing a relative importance of 140.4%, followed by *Rhazya stricta* (115.6%), *Ziziphus nummularia* (115%), *Acacia tortilis* (113.7%), *Rhanterium epapposum* (109.7%), and *Calotropis prosera* community (102.8%), respectively including **(**Figure 2). The major plant communities in Ibex reserve were different from that reported for another protected area, Sudera, Taif, Saudi Arabia, where three main communities dominated by *Arnebia hispidissima*, *Aizoon canariense* and *Argemone mexicana* communities were recorded in that reserve (Mosallam, 2007).

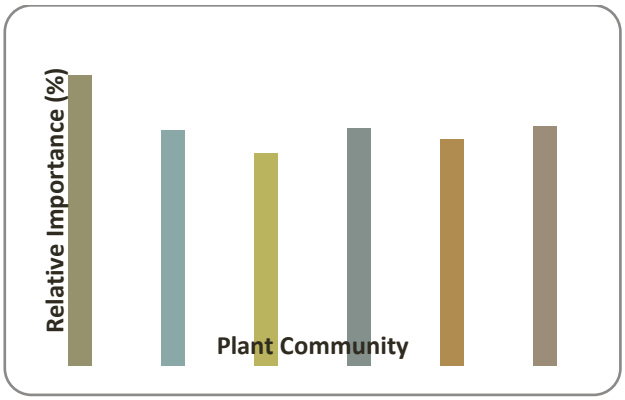

Figure 2: The major perennial plant communities recorded in the Ibex protectorate

In *H. salicornicum* community, *H. salicornicum* (Figure 3) was the major plant species; however, it was associated with other species including *Acacia tortilis*, *Fagonia cretica*, *Anvillea garcinii*, *Calotropis procera*, *Panicum turgidum*, and *otropium ramosisimum. H. salicornicum*, locally known as Rimth, belongs to the family Chenopodiacea. Its life form is perennial shrub, and major habitat is shallow to deep sands or silt soil, also, it is found in gravel plains. *H. salicornicum* is rounded multi-branched shrub, 50-100 cm high, often forming hammocks. The stems are cylindrical and appear naked and leaves are reduced to small scales. Flowers of *H. salicornicum* are in dense lateral and terminal spikes on the upper branches. Fruiting is perianth is with 5 membranous yellow to pink wings, nearly 5 mm in diameter. Generally, *H. salicornicum* is important for grazing by camels (Chaudhary 1999; 2000; 2001). In this community, *H. salicornicum* showed a relative importance value of 140.4% with a density of 0.296 plant/m^2, frequency of 100 % and covering percentage of about 41.6 % of the study area (**Table 2**). *H. salicornicum* is present in almost all of phytogeographical regions of Saudi Arabia, but with varied distribution rate (Mosallam, 2007). It is one of the most common plant species in sandy habitats. It is an effective sand binder, palatable plant and has the ability to resist overgrazing ((Migahid, 1978; Mosallam and Hassan, 2001). In addition, this species has been considered as one of the most promising species for reseeding deteriorating desert range vegetation and for sand dune fixation (Al-Qurain, 2007).

Figure 3: *Haloxylon salicornicum* in Ibex reserve.

A. tortilis (Figure 4) was the major species in *A. tortilis* community, in addition to other species including *Haloxylon salicornicum*, *Rhanterium epapposum*, *Fagonia cretica*, *Anvillea garcinii* and *Panicum turgidum*. *A. tortilis*, local name is Samur, belongs to the family Fabaceae. Its life form is large shrub or small tree, up to 3 m high, usually flat-topped with several main branches ascending from the base. The spines are often in alternating pairs of long (1-3 cm), straight and short curved ones. Leaves are pinnae mostly in 4-6 pairs, leaflets in 6-10 pairs, with pale yellow heads flowers. Pods more or less spirally coiled, nearly 5-10 cm long. The major habitat of *A. tortilis* is elevated well-drained

Table 2: Characterization of *Haloxylon salicornicum* community in Ibex reserve

Plant Species	Density (plant/m^2)	Relative Density (%)	Frequency (%)	Relative Frequency (%)	Abundance (%)	Coverage (%)	Relative Coverage (%)	Relative Importance (%)
Haloxylon salicornicum	0.296	60	100	25	29.6	41.6	55.4	140.4
Acacia tortilis	0.046	9.4	100	25	4.6	21.6	28.8	63.2
Fagonia cretica	0.073	15	33	8.3	22	3.3	4.4	27.7
Anvillea garcinii	0.04	8.2	66	16.5	6	1.6	2.1	26.8
Calotropis procera	0.003	0.6	33	8.3	1	5	6.6	15.5
Panicum turgidum	0.013	2.7	33	8.3	4	1.3	1.7	12.7
Heliotropium ramosisimum	0.016	3.3	33	8.3	5	0.6	0.8	12.4

plant for grazing to camels (Chaudhary 1999; 2000; 2001). The genus Acacia comprises over thousand species spread allover the world. Most of them grow in the arid and semi-arid regions, with an average temperature of 40-45 °C in summer and less than 5°C in winter. Acacias equipped with most of the features required to withstand severe climatic conditions, therefore they considered as the most successful "survivors" in the arid regions (Ibrahim and Aref, 2000; Aref, 2000& 2003). *A. tortilis* inside the protected fenced area showed a relative important value of 13.7 % with plant density of 0.1 plant/m^2, frequency of 100 % and plant coverage of about 1.6 % (Table 3). Acacias are among the widely spread species in Saudi, and more than twenty species are growing in the country, most of these are indigenous and some are exotic, but well adapted to the environment (Aref, 2000& 2003). Batanouny (1979) recorded *Acacia tortilis* along Jeddah-Mecca road in Saudi Arabia and recently recorded in Hail region north of central Saudi Arabia (El-Ghanim *et al*., 2010). Despite several other *Acacia* sp were recorded recently in Wadi Al-Jufair, a hyper-arid region in Najd, Saudi Arabia, *A. tortilis* were absent in that area (Alatar *et al*., 20102). It has been reported that *A. tortilis* abundance in the country has declined due to overgrazing (Aref, 2000; 2003).

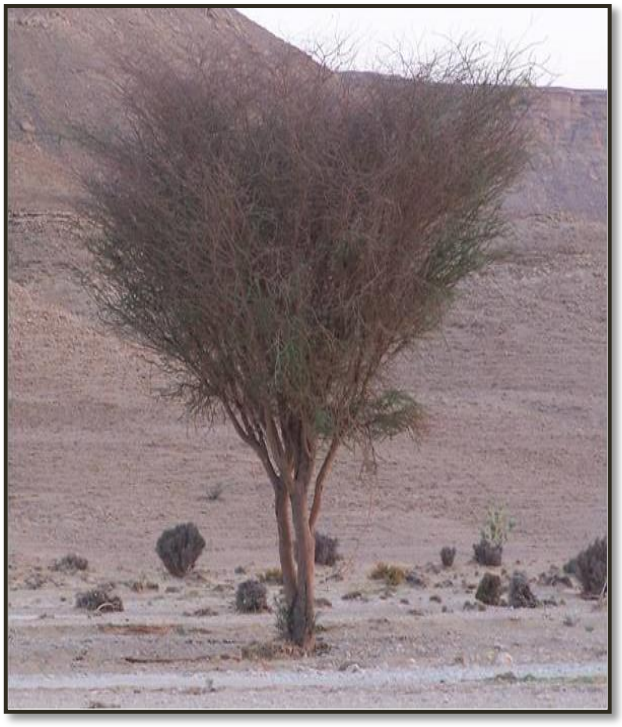

Figure 4*: Acacia tortilis* in Ibex reserve

Table 3: Characterization of *Acacia tortilis* community in Ibex reserve

Plant Species	Density (plant/m^2)	Relative Density (%)	Frequency (%)	Relative Frequency (%)	Abund-ance (%)	Coverage (%)	Relative Coverage (%)	Relative Importance (%)
Acacia tortilis	0.1	34	100	25	10	51.6	54.7	113.7
Fagonia cretica	0.036	57.7	100	30.1	3.66	1.16	5	92.8
Anvillea garcinii	0.02	32.1	66	19.8	3	0.66	2.9	54.8
Panicum turgidum	0.0003	0.48	100	30.1	26	5	12.6	52.1
Haloxylon salicornicum	0.003	1.02	66	16.6	44.7	25.6	27.1	44.7
Rhanterium epapposum	0.056	19	33	8.3	39.6	11.6	12.3	39.6

In *Calotropis prosera* plant community in Ibex reserve, *C. prosera* (Figure 5) was associated with several other species including *Blepharis ciliaris*, *Heliotropium ramosissimum*, *Haloxylon salicornicum* and *Zilla spinosa*. *C. prosera* life form is ascending to erect perennial glaucous shrub with white latex, woody below with corky bark, and about 1.5-4 m high. Leaves are opposite, oblong to obovate, 10-25 cm long, and 8-15 cm broad. Inflorescence is an umbel-like cyme on primary peduncles, about 5 cm long from the upper axils. Flowers of *C. prosera* are showy, purple colored, 1-2 cm across and fruits are smooth or somewhat wrinkled, inflated, ovoid follicle, and 8-15 cm long. Its major habitat is in disturbed waste ground on silt soils and alongside dry shallow runnels. *C. prosera* is a poisonous plant, so is not used in grazing (Chaudhary 1999; 2000; 2001). The relative importance value of *C. procera* inside the Ibex protectorate was 102.8 %, with density of 0.003 plant/ m^2, frequency of 33 % and coverage of about 6.6 % (Table 4). *C. prosera* was recorded in other region of the country but in with minor distribution (Alyemeni and Zayed, 1999; Alatar *et al*., 2012), indicating the significance of conservation strategy of protectorate area e.g. Ibex reserve in sustaining the terrestrial wildlife and keeping rare, threatened species, and their habitats (Mosallam, 2007).

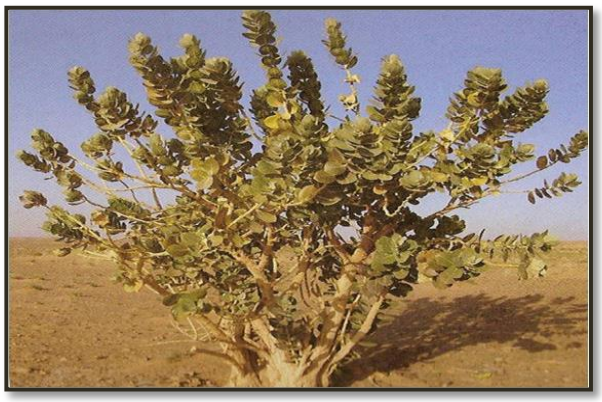

Figure 5*: Calotropis procera* in Ibex reserve

Table 4: Characterization of *Calotropis procera* community in Ibex reserve

Plant Species	Density (plant/m^2)	Relative Density (%)	Frequency (%)	Relative Frequency (%)	Abundance (%)	Coverage (%)	Relative Coverage (%)	Relative Importance (%)
Calotropis procera	0.003	10.7	33	14.3	1	6.6	77.8	102.8
Heliotropium ramosissimum	0.01	35.7	66	28.5	1,5	0.3	3.5	67.7
Senna senna	0.006	21.4	33	14.3	2	0.16	1.9	37.6
Haloxylon salicornicum	0.003	10.7	33	14.3	1	0.66	7.8	32.8
Zilla spinosa	0.003	10.7	33	14.3	1	0.6	7.1	32.1
Blepharis ciliaris	0.003	10.7	33	14.3	1	0.16	1.9	26.9

In *Ziziphus nummularia* community, *Z. nummularia* (Figure 6) was associated with *Fagonia cretica*, *Lycium showii*, *Pulicaria undulate* and *Abutilon fruticosum*. *Z. nummularia* showed a relative importance value of 115% with density of 0.07 plant/m^2, frequency of 66% and coverage of 33.3% (Table 5). *Z. nummularia*, local name is 'Sidr', belongs to the family Rhamnaceae. The life form of *Z. nummularia* is ascending multi-

branched spiny shrub perennial, 1-3 m high with Zigzagged branchlets. Spines are dimorphic, with one straight about 1 cm long and the other is small and hooked one. The leaves are mostly ovate with three main nerves from the base and the flowers are small (4 mm in diameter), axillary, and greenish yellow in color. The plant drupes are globose, reddish when ripe, and about 8 mm in diameter. The major habitat of Z. *nummularia* is silt basins and it is an important plant for grazing by camels (Chaudhary 1999; 2000; 2001). *Z. nummularia* grows wild throughout the country, but in higher density in the Southern and southwestern regions of Saudi Arabia (Said, 1986, Mussalam, 2007, El-Ghanim *et al*., 2010).

Rhanterium epapposum community contained other species, in addition to *R. epapposum* (Figure 7), including *Fagonia cretica, Anvillea garcinii* and *Panicum turgidum*. *R. epapposum*, local name is Arfaj, belongs to the family Asteraceae. *R. epapposum* is rounded, often hemispherical, intricately branched perennial shrublet up to 70 cm high, slightly aromatic, with white young stems. The leaves are sessile and linear up to 4 cm long, entire and remotely dentate heads numerous, solitary, and terminal up to 1.5 cm broad. The major habitat of *R. epapposum* is shallow and loamy soil, and it is very important plant for grazing especially for camels (Chaudhary 1999; 2000; 2001). Inside the protectorate, *R. epapposum* showed a relative importance value of 109.7%, with species density of 0.05 plant/m^2, frequency of 33% and species coverage of 11.6 % (Table 6). *R. epapposum* was recorded as one of the major plant communities in Al-Thumamah road in the central region of Saudi Arabia (Alyemeni and Zayed, 1999), and most recently with less distribution in Najd region, Saudi Arabia (Alatar *et al*., 2012).

Figure 6*: Ziziphus nummularia* in Ibex reserve

Table 5: Characterization of *Ziziphus mummularia* community in the Ibex reserve

Plant Species	Density (plant/m^2)	Relative Density (%)	Frequency (%)	Relative Frequency (%)	Availability (%)	Coverage (%)	Relative Coverage (%)	Relative Importance (%)
Ziziphus mummularia	0.07	21	66	25	10.5	33.3	69	115
Fagonia cretica	0.11	33	33	12.5	35	5	10.4	56
Lycium shawii	0.05	15	66	25	8	7,3	15.1	55
Abutilon fruticosum	0.07	21	33	12.5	2	0.3	0.6	34.1
Blepharis ciliaris	0.03	9	33	12.5	9	1.3	2.7	24.2
Pulicaria undulata	0.006	1,8	33	12.5	6	1	2	16.3

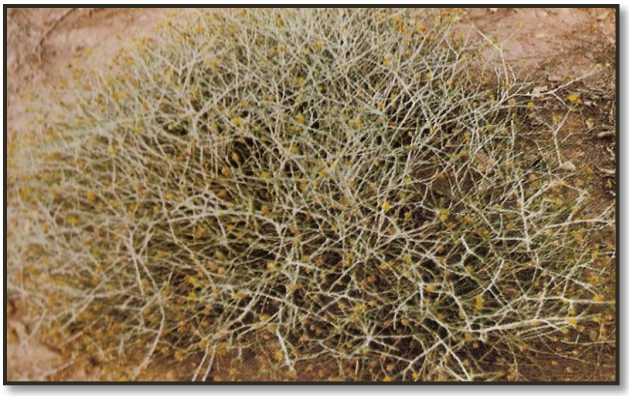

Figure 7: *Rhanterium epapposum* in Ibex reserve

Table 6: Characterization of *Ziziphus mummularia* community in Ibex reserve

Plant Species	Density (plant/m^2)	Relative Density (%)	Frequency (%)	Relative Frequency (%)	Availability (%)	Coverage (%)	Relative Coverage (%)	Relative Importance (%)
Rhanterium epapposum	0.05	27.7	33	14.2	17	11.6	67.8	109.7
Fagonia cretica	0.06	33.3	100	43.1	6	2.6	15.2	91,6.
Anvillea garcini	0.03	16.6	66	28.4	10	1.6	9.3	54.3
Panicum turgidum	0.04	22.2	33	14.2	12	1.3	7.6	44

The last dominant plant community in Ibex reserve was *Rhazya stricta*. *R. stricta* (Figure 8) was the major species in addition to others including *Panicum turgidum* and *Heliotropium ramosissimum. R. stricta* showed a relative importance value of 115.6 %, density of 0.011 plant/ m^2, frequency of 33 % and coverage of about 2.3 % (Table 7). *R. stricta*, local name is Harmal, belongs to the family Apocynaceae. It is known worldwide as a medicinal plant with economic potentialities (Magurran, 2003). It is glabrous perennial shrub with many branches ascending from the base up to 100 cm high, and often broader than taller. The leaves are linear oblong or elliptical, entire, acute, tapering at base to a short petiole up to 10 cm long. The flowers of *R. stricta* are in dense terminal cymes. Follicles are linear, terete, tapered toward apex, often densely grouped, 5-10 cm long, and containing several small seeds, and seeds shatter disperse in early summer. The major habitat of *R. stricta* is silt soil or shallow sand over silt. This plant is distributed in many parts of Saudi Arabia except the high mountains (Chaudhary 1999; 2000; 2001). *R. stricta* was one of the major plant communities recorded along Riyadh AI-Thumamah Road, Saudi Arabia (Alyemeni and Zayed, 1999). In addition, El-Deen (2005) reported extensive spread of *R. stricta* in middle parts of the western coastal plain around Makkah city. Furthermore, most recently, *R. stricta* was recorded as one of the major plant communities in Wadi Al-Jufair, a hyper-arid region in Najd, Saudi Arabia (Alatar *et al*., 2012).

Figure 8: *Rhazya stricta* in Ibex reserve

Table 7: Characterization of *Ziziphus mummularia* community in Ibex reserve

Plant Species	Density (plant/m^2)	Relative Density (%)	Frequency (%)	Relative Frequency (%)	Abundance (%)	Coverage (%)	Relative Coverage (%)	Relative Importance (%)
Rhazya stricta	0.011	27.5	33	33.3	3	2.3	54.8	115.6
Panicum turgidum	0.013	32.5	33	33.3	4	1.3	31	96.8
Heliotropium ramosissimum	0.016	40	33	33.3	5	0.6	14.3	87.6

In addition to the major plant communities recorded in Ibex reserve, many other perennial species, with less abundance, were also recorded. Table 8 demonstrates a list of all perennial species recorded in

Ibex reserve during this study. Sixty-two perennial species were recorded, representing 34 families. The largest family was Poaceae, that was represented by six species, followed by Mimosaceae (five species), Capparaceae (four species), Asteraceae (three species), Lamiaceae (three species), Rhamnaceae (three species), Zygophyllaceae (three species), Boraginaceae (two species), Brassicaceae (two species), Cucurbitaceae (two species), Scrophulariaceae (two species), and Urticaceae (two species). Seventeen plant families were represented by only one species; examples include Acantheaceae, Amaranthaceae, Apocynaceae, Cistaceae, and Convolvulaceae. Most recent analysis of vegetation analysis of Wadi Al-Jufair, (Najd, Saudi Arabia) reported by Alatar et al (2012) identified Poaceae and Asteraceae also as the major plant families in that area. However, the floristic composition of Ibex reserve is different from that reported recently for Hail region north of central Saudi Arabia,where Asteraceae was the largest family followed by Poaceae, and Brassicaceaem (El-Ghanim *et al*., 2010)

Table 8: List of *perennial* plants recorded in Ibex reserve

Plant species	Plant Family	Plant species	Plant Family
Blepharis ciliaris	Acantheaceae	*Acacia origena*	Mimosaceae
Aerva javanica	Amaranthaceae	*Acacia tortilis*	
Rhazya stricta	Apocynaceae	*Acacia raddiana*	
Calotropis prosera	Asclepiadaceae	*Senna senna*	
Glassonema varians		*Abutilon fruticosum*	Malvaceae
Periploca aphylla	Boraginaceae	*Ficus palmata*	Moraceae
Heliotropium crispum		*Ficus cordata*	
Trichodesma ehrenbergii		*Boerhavia elegans*	Nyctaginaceae
Capparis cartilaginea	Capparaceae	*Cistanche pholypaea*	Orobanchaceae
Capparis spinosa		*Phoenix dactylifera*	Arecaceae
Dipterygium glaucum		*Polygala Schwartziana*	Polygalaceae
Maerua crassifolia		*Ochradenus baccatus*	Resedaceae
Haloxylon persicum	Chenopodiaceae	*Reseda muricata*	Rhamnaceae
Haloxylon salicornicum		*Ziziphus nummularia*	
Helianthemum kahiricum	Cistaceae	*Ziziphus spin –Christi*	
Anvillea garcinii	Asteraceae	*Aptosimum pamilum*	Scrophulariaceae
Pulicaria undulata		*Scrophularia deserti*	
Rhanterium epapposum		*Lycium shawii*	Solanaceae
Scorzonera tortuosissima		*Tamarix nilotic*	Tamariceae
Convolvulus oxyphyllus	Convolvulaceae	*Corchorus depressus*	Tiliaceae
Anastatica hierochumtica	Brassicaceae	*Forsskaolea tenacissima*	Urticaceae
Farseta aegyptia		*Parietaria alsinifolia*	
Zilla spinosa		*Fagonia burguieri*	Zygophyllaceae
Citrullus colocynthis	Cucurbitaceae	*Fagonia glutinosa*	
Cucumis prophetarum		*Seetzenia lanata*	
Monsonia nivea	Geraniaceae		
Cenchrus ciliaris	Poaceae		
Cynodon dactylon			
Lasiurus scindicus			
Panicum turgidum			
Pennisetum setaceum			
Stipagrostis plumosa			
Juncus rigidus	Juncaceae		
Lavandula coronopifolia	Lamiaceae		
Salvia aegyptiaca			
Teucrium polium			
Acacia ehrenbergiana	Mimosaceae		

Conclusion: This study has been conducted to survey the perennial plants diversity in the Ibex reserve, 180 Km south of Riyadh city (Saudi Arabia), and is managed by Saudi Wildlife Commission (SWC). Analysis of the perennial plant of the Ibex protectorate resulted in identification of six major perennial plant communities. *Haloxylon salicornicum* community was the major community, showing a relative importance of 140.4%, followed by *Rhazya stricta* (115.6%), *Ziziphus nummularia* (115%), *Acacia tortilis* (113.7%), *Rhanterium epapposum* (109.7%), and *Calotropis prosera* community (102.8%), respectively. In addition to the major plant community, 62 perennial species, representing 34 families, were also recorded in Ibex reserve. The largest family was Poaceae, that was represented by six species, followed by Mimosaceae (five species), Capparaceae (four species), Asteraceae (three species), Lamiaceae (three species), Rhamnaceae (three species), Zygophyllaceae (three species), Boraginaceae (two species), Brassicaceae (two species), Cucurbitaceae (two species), Scrophulariaceae (two species), and Urticaceae (two species). In addition, seven families were represented by only one species; examples include Acantheaceae, Amaranthaceae, Apocynaceae, Cistaceae, and Convolvulaceae. The study demonstrated the high plant diversity of Ibex reserve and distribution of many plant species that were deteriorated in the country due overgrazing and social behavior and the significance of conservation strategy of protectorate area e.g. Ibex

reserve in sustaining the terrestrial wildlife and keeping rare and threatened species and their habitats

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