

PLANT FLORA IN THE RANGELAND OF WESTERN SAUDI ARABIA

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Abstract

During this study plant diversity in the Western Saudi Arabia including rangeland of Bahra and Hada was examined in active plant growth period, from November 2010 to April 2011. Out of 58 plant species recorded in the rangeland, 37 were found to be frequent, 15 occasional, and 6 rare based on occurring frequency range of IUCN (International Union for Conservation of Nature) classification system. The area was found to be rich in plant species belonging to poaceae family compared to other families. Plant species, occurring with frequency range below 0.5% were categorised rare, including *Launaea mucronata*, *Cyperus conglomeratus* Rottb., *Trigonella stellata* Forssk., *Astragalus sieberi* DC., *Stipagrostis ciliata* (Desf.) De Winter, *Polygonum arenastrum* Boreau. These species growing in harsh climate can be considered tolerant to heat and drought stress. The rareness of plant species and vegetation cover in Saudi Arabia may be attributed to overgrazing and some anthropogenic activities such as urbanization and landfill. This situation may further deteriorate if appropriate rangeland management, scheduled grazing, and programs for increasing awareness among people are not initiated. On basis of our study, rare plant species may need to conserve in botanical garden in their own habitat to maintain the biodiversity.

Introduction

Throughout the world rangelands have been recognized as a major resource for animal-based industries. The area of natural rangeland in Saudi Arabia exceeds 175 million ha. The Bedouin 'nomadic' community has been grazing these native rangelands for thousands of years. Many of these traditional Bedouin tribes have settled now, but a large number of these people still continue to pursue a nomadic or semi-nomadic lifestyle. People belonging to the later category are the largest users of rangelands (Cole, 1981).

In the past, rangelands used to be sustainable, as preserved through environmental restriction, social constraints, and nomadic movements that restored the rangeland during different seasons. The changes in the socio-economic conditions and rapid economic growth in the region since late 1970s have increasingly degraded rangelands in Saudi Arabia. Tremendous increases in population, transport activities, and urban development have also substantially reduced plant biodiversity (Abo-Hassan, 1981; Al-Rowaily, 1999; Galaty, 1981) to new strains of diseases.

Many studies (Rahman *et al.*, (2004), Ziqiang *et al.*, (2007), Bowers & Boutin (2008), Aavik & Liira (2009), Roba & Oba (2009), and Giam *et al.*, (2010)) have shown the practical importance of conserving rangeland biodiversity; however, such study has not been performed in Western Saudi Arabia that has vast rangeland. Therefore, the objective of this study was to explore the plant biodiversity of rangeland in Western Saudi Arabia, for which we documented the frequency of occurrence of various plant species to draw attention to conservation of threatened species in a botanical garden. The data generated may prove useful for the international community to generate interest about conservation of such threatened ecosystems in their own countries or concerned areas.

Materials and Methods

Study area: The study pertains to a degraded rangeland in Western Saudi Arabia extending over 164,000 km² along the coast of Red Sea, including two major rangeland sites, Bahra & Hada areas in Makkah Province (Fig. 1). The region has a mixture of natural vegetation, rangeland, and localized farmlands. The sites have similar meteorological and ecological attributes, characterized by hot arid desert type climate, with scarce rainfalls and an average annual temperature of 27.7°C (Fig. 2). The relative humidity ranges between a maximum of 57% during August and April, and a minimum of 37% during May and June.

Study procedure: The study was performed from November 2010 to April 2011 during active plant growth period in the area, when most species were expected to be present. Data on distributions of plant species were collected according to Baskaran *et al.*, (2012), using the procedure of transect walks carried out monthly in the areas. Each time different transect (1–2 km long, 6 m wide) was followed to record and count occurrences of different plant species. The percentages for different species from all visits were calculated using the following formula in Microsoft Excel (Microsoft Corp., Redmond, WA, USA).

Classification of the species was done on the basis of their occurrences into, frequent (>1%), occasional (0.5% – 1%) and rare species (<0.5%) using method of IUCN (2001). For species identification and their local (Arabic) as well as technical names, we consulted plant taxonomists, indigenous people and the data published by Chaudhary (1989, 1999, 2000, and 2001), and the species were recorded after complete confirmation.

$$\text{Percent occurrence of a plant species} = \frac{\text{Sum for individual plant species}}{\text{Sum for over all plant species}} \times 100$$



Fig. 1. Location map, the areas around Hadda & Bahra is almost rangeland, Figure 1 (a).

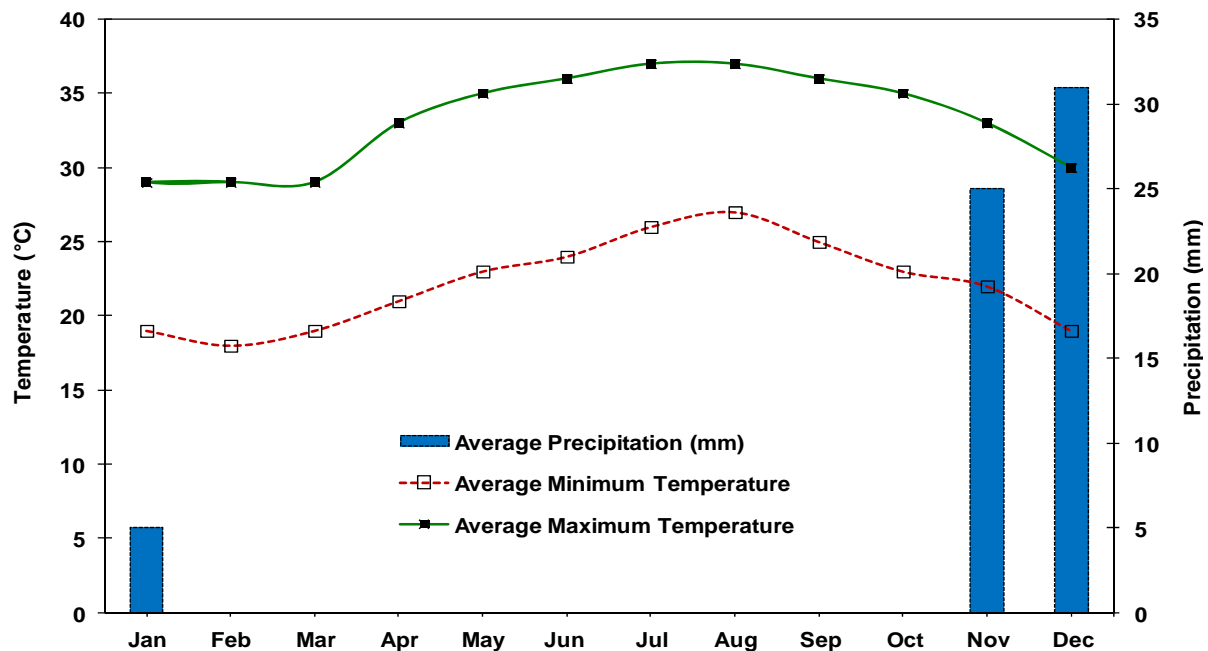


Fig. 2. Average daily maximum and minimum temp (°C), and rainfall in western Saudi Arabia

Results and Discussion

We examined (Tables 1, 2, and 3) 58 plant species belonging to 16 families in the study area that were much less than those reported by Rahman *et al.*, (2004) and Ziqiang *et al.*, (2007) because the area has comparatively high temperature and low rainfall. Our results are in line with those of Yang *et al.*, (2012), who reported that vegetation is correlated to the temperature and precipitation of the area. The species belonged to Aizoaceae, Amaranthaceae, Cyperaceae, Boraginaceae,

Brassicaceae, Chenopodiaceae, Cistaceae, Compositae, Convolvulaceae, Leguminosae, Malvaceae, Papaveraceae, Plantaginaceae, Poaceae, Polygonaceae, and Zygophyllaceae families. This rangeland is commonly grazed by sheep and camels. In addition, overgrazing and camping of people was observed in the area, and landfill in some areas created an unfavourable environment for plants; according to Giam *et al.*, (2010), unfavourable environment or habitat degradation for plant species caused loss of biodiversity.

Table 1. Plant species occurrences as frequent (>1%), occasional (0.5%–1%) and rare (<0.5%) in rangeland of western Saudi Arabia.

No.	Botanical name	(Local name)	Family
*frequent plant species (frequency of occurrences >1%)			
1.	<i>Aegilops kotschyi</i> Boiss.	(Abu Sharb)	Poaceae
2.	<i>Alhagi maurorum</i> Medik.	(Shubrum)	Leguminosae
3.	<i>Amaranthus viridis</i> L.	(Qutaifa Qutaifa)	Amaranthaceae
4.	<i>Anthemis deserti</i> Boiss.	(Nawar)	Compositae
5.	<i>Argemone</i> spp.	(Argemone or Shook)	Papaveraceae
6.	<i>Aristida adscensionis</i> L.	(Al-safsaf)	Poaceae
7.	<i>Aristida mutabilis</i> Trin.& Rupr.	(Al-drari)	Poaceae
8.	<i>Artemisia sieberi</i> Bess.	(Sheeh)	Compositae
9.	<i>Asteriscus graveolens</i> (Forssk.) Less.	(Haarar)	Compositae
10.	<i>Astragalus spinosus</i> Vahl.	(Katad)	Leguminosae
11.	<i>Bassia muricata</i> (L.) Murr.	(Quttain)	Chenopodiaceae
12.	<i>Cenchrus ciliaris</i> L.	(Al-khazr)	Poaceae
13.	<i>Chenopodium album</i> L.	(Zarbeeh)	Chenopodiaceae
14.	<i>Chenopodium murale</i> L.	(Zarbeeh/Jakheeraa)	Chenopodiaceae
15.	<i>Convolvulus trabutianus</i> Schweinf & Muschl	(Daybaa daadkh)	Convolvulaceae
16.	<i>Conyza bonariensis</i> (L.) Cronquist	(Nafle)	Compositae
17.	<i>Cressa cretica</i> L.	(Nadiwa)	Convolvulaceae
18.	<i>Cynodon dactylon</i> (L.) Pers.	(Nagil)	Poaceae
19.	<i>Dactyloctenium aegyptium</i> (L.) Willd.	(Bahma)	Poaceae
20.	<i>Dactyloctenium scindicum</i> Boiss.	(Marbika)	Poaceae
21.	<i>Desmostachya bipinnata</i> (L.) Stapf	(Halfa)	Poaceae
22.	<i>Dichanthium annulatum</i> (Forssk.) Stapf	(Zamzum)	Poaceae
23.	<i>Eleusine indica</i> (L.) Gaertn	(Hamra)	Poaceae
24.	<i>Halocnemum strobilaceum</i> (Pallas) Bieb.	(Slis)	Chenopodiaceae
25.	<i>Haloxylon salicornicum</i> (Moq.) Bunge	(Rimth)	Chenopodiaceae
26.	<i>Helianthemum lippii</i> (L.) Pers.	(Hashima)	Cistaceae
27.	<i>Heliotropium arbainense</i> Fresen.	(Ramraam)	Boraginaceae
28.	<i>Lactuca serriola</i> L.	(Libbayn)	Compositae
29.	<i>Launaea nudicaulis</i> (L.) Hook.	(Al-Hewa)	Compositae
30.	<i>Malva parviflora</i> L.	(Khubbayza)	Malvaceae
31.	<i>Medicago laciniata</i> (L.) Miller	(Mudaad)	Leguminosae
32.	<i>Panicum turgidum</i> Forssk.	(Sumam)	Poaceae
33.	<i>Plantago psammophila</i> Agnew & Chal.	(Rabla)	Plantaginaceae
34.	<i>Sorghum halepense</i> (L.) Pers.	(Haliaan)	Poaceae
35.	<i>Stipa capensis</i> Thunb.	(Samhaa)	Poaceae
36.	<i>Zilla spinosa</i> (L.) Prantl.	(Silla)	Brassicaceae
37.	<i>Zygophyllum simplex</i> L.	(Harm)	Zygophyllaceae
*occasional plant species (frequency of occurrences 0.5%–1%)			
1.	<i>Achillea fragrantissima</i> (Forssk) Sch	(Kesoom)	Compositae
2.	<i>Aeluropus lagopoides</i> L.	(Hukrus)	Poaceae
3.	<i>Aeluropus littoralis</i> (Gouan) Parl.	(Shreeb)	Poaceae
4.	<i>Aizoon canariense</i> L.	(Dahaah)	Aizoaceae
5.	<i>Aristida funiculata</i> Trin.& Rupr.	(Al-batra)	Poaceae
6.	<i>Brachypodium distachyon</i> L.	(Al-shahira)	Poaceae
7.	<i>Bromus fasciculatus</i> Presl	(Zil Abulkhsin)	Poaceae

Table 1. (Cont'd.).

No.	Botanical name	(Local name)	Family
8.	<i>Bromus hordeaceus</i> L.	(Zarih)	Poaceae
9.	<i>Dinebra retroflexa</i> (Vahl) Panzer	(Zinb)	Poaceae
10.	<i>Echinochloa colona</i> (L.) Link	(Abu rakba)	Poaceae
11.	<i>Fagonia bruguieri</i> DC.	(Janeeba)	Zygophyllaceae
12.	<i>Haplophyllum tuberculatum</i> (Forssk.) A. Juss.	(Fijel)	Rutaceae
13.	<i>Plantago afra</i> L.	(Rubla)	Plantaginaceae
14.	<i>Setaria viridis</i> (L.) P.Beauv.	(Shahir Alfar)	Poaceae
15.	<i>Stipagrostis plumosa</i> (L.) Munro	(Seeham)	Poaceae
*rare plant species (frequency of occurrences <0.5%)			
1.	<i>Astragalus sieberi</i> DC.	(Kataad/Meshto-zaib)	Leguminosae
2.	<i>Cyperus conglomeratus</i> Rottb.	(Al-sandaa)	Cyperaceae
3.	<i>Launaea mucronata</i>	(Yamroor)	Compositae
4.	<i>Polygonum arenastrum</i> Boreau	(assa-er-rai)	Polygonaceae
5.	<i>Stipagrostis ciliata</i> (Desf.) De Winter	(Sabota)	Poaceae
6.	<i>Trigonella stellata</i> Forssk.	(karkas)	Leguminosae

*The classification system as frequent, occasional and rare is according to of IUCN (2001)

Conclusions and Recommendations

Preservation of the plant species in in-situ conservation is important to maintain the biodiversity adapted area. In addition, the area has a small number of plant species, and thus, introduction of new exotic species that can adapt to the area should be performed. People should be educated about maintaining biodiversity as national wealth while camping in the areas and to avoid overgrazing, filling, dumping of wastes, and from urban development in the rangeland area.

Acknowledgement

This article was funded by the Deanship of Scientific Research (DSR), King Abdulaziz University, Jeddah. The author, therefore, acknowledge with thanks DSR technical and financial support.

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