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Research Article

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Chemical constituents of soil and vegetation of two locations in AL Baha area (Saudi Arabia)

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ABSTRACT

Soil chemical constituents and vegetation were studied in Saudi Arabia from two locations (Mandag and Baljorashi) in AL Baha area. The study revealed the presence of fifty seven plant species belonging to twenty nine families in the first location(Mandag), with the family Asteraceae showing the highest number of species(fifteen species),whereas in the second location(Baljorashi), twenty nine species belonging to thirteen families were identified and the family Lamiaceae represented by the highest number of species(five species).Soil organic matters are very high in the twolocations with location two having the highest levels of minerals contents.

Key words: AL Baha; Soil; Chemical Constituents; Vegetation; Saudi Arabia

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INTRODUCTION

The vegetation of Arabian Peninsula including Saudi Arabia has attracted the attention of scientists. Some studies of the vegetation and ecology of Saudi Arabia have been reported by many authors[1,2,3,4,5,6,7,8].Among the investigated parts in Saudi Arabia Al Baha region has received the least attention[9,8].

Baha Plateaus one of the richest and most variable floristic regions of Asir mountains, Southwest Saudi Arabia [10,9]. This Plateau is part of the Arabian Shield, essentially of Precambrian crystalline rocks [11].It extends for a distance of 70 km in the north-south direction with elevation above sea level ranging between 1700m eastwards, and 2400m west-wards. The soils in the area vary considerably, being shallow and coarse textured elevated and sloping sites.

In recent years there has been increased interest in the investigation of the relationships between nutrient status in the soil and tree species [12,13,14].

The species are characterized by the utilization of nutrient element from different soil horizon, but this is affected mainly by the soil types and edaphic factors.

The vegetation growth and distributions vary from place to place depending upon soil characteristics of site, climatic factors and farmer's management practices [15,16].

All over Saudi Arabia different tree species including fruit trees are successfully grown. The decrease in storage quality and presence of species were considered as results of nutrient elements disorder in the soil[12].

Therefore the present investigation is meant to be a documentary study for the vegetation and soil elements in two locations in Al BahaArea and it aims to present a correlation between the soil chemical constituents and vegetation type in the future.

EXPERIMENTAL SECTION

Study area

The study area includes two locations in AL Baha: (1) Mandag, (Al- Karrar, Hedwa)which is situated east north ,1763.1 ± 10m height above sea level, at Latitude 20.1267 N and Longitude 41.2646 E . (2)Baljorashy,(Ben Amer) which is situated southeast, 2061.2± 10m height above sea level, at Latitude 19.52 N and Longitude 41.34 E.

Field work and vegetation analysis:

Detailed field surveys were collected during summer and winter periods. Plant species were collected from the two studied locations. 130 stands were chosen. Plant specimens were identified according to the available literature[3,5,6,7]. Their names were updated using Plant African Database (2010). All the identified species were listed in a system according to their families in Alphabetical order [17].

Soil Analysis

Soil samples were taken at three random points from each location as a profile (composite). Chemical content was estimated as PPm by oxidation according to the modified Walkley and Black method [18], using AA atomic absorption Model 3100 by Berkin Elmer. Soil amount used for the analysis is 0.5gr according to the methodology mentioned above. All the analysis was carried out in Faculty of Earth Sciences, University of King Abdul Aziz, Saudi Arabia.

RESULTS

A. Vegetation Lists:

All the identified species were listed according to their families in Tables (1&2).

Location(1):Mandag: Al- Karrar (Hedwa):

Twenty nine families were identified including fifty seven species. Large number of species was represented by the family Asteraceae (fifteen species), followed by the Solanaceae which was represented by five species. The family Lamiaceae was represented by three species and all the other families were represented by either two or only one species.

Table(1): Vegetation List of Mandag Location

No.	Family	Scientific name
1	Amaranthaceae	*Aerva javanica* (Burm.f.) Schult.
2	Asclepiadaceae	*Calotropis procera*(Ait.) Ait. f.
		Gomphocarpus sinaicus Boiss.
3	Asteraceae	*Ambrosia artemisiifolia* L.
	,,	*Artemisia scoparia* Waldst. & Kit.
	,,	*Conyza dioscoridis* (Linn) Desf.
	,,	*Conyza pyrrhopappa* Sch.Bip.x A.Rich.
	,,	*Flaveria trinervia* (Spreng.) C. Mohr.
	,,	*Gnaphalium luteo-album* L.
	,,	*Helichrysum schimperi* (A. Rich.)
	,,	*Osteospermum vaillantii* (DECNE)
	,,	*Psiadia punctulata* (DC.)
	,,	*Phagnalon schweinfurthii* Sch. Bip.
	,,	*Pluchea dioscorides* (L.) DC.
	,,	*Pulicaria crispa*(Forssk.) Oliv.
	,,	*Senecio cineraria* L.
	,,	*Senecio flavus* Decne.
	,,	*Xanthium pungens* L.
4	Boraginaceae	*Heliotropium lasiocarpum* Fisch..
5	Brassicaceae	*Brassica tournefortii* L.
	,,	*Raphanus sativus* L.
6	Capparaceae	*Cleome ramosissima* L.

7	Chenopodiaceae	*Chenopodium ambrosioides* L.
8	Cupressaceae	*Juniperus excels*M. Bieb.
9	Ephedraceae	*Ephedra alata* Decne
10	Euphorbiaceae	*Ricinus communis* L.
11	Geraniaceae	*Geranium arabicum* Forssk.
12	Labiatae = Lamiaceae	*Lavandula pubescens* Decne.
	,,	*Mentha longifolia* L.
	,,	*Otostegia fruticosa* Schweinf.
13	Leguminosae= Fabaceae	*Acacia etbaica* Schwein.
	,,	*Acacia iraquensis* Rech.
14	Moraceae	*Ficus carica* L.
	,,	*Ficuspalmate* Forsk
15	Najadaceae	*Najas graminea* Delile
	,,	*Najas minor* C. Gmelin
16	Nyctaginaceae	*Commicarpus mistus* Thulin
17	Papaveraceae	*Argemone ochroleuca* Sweet
18	Plantaginaceae	*Plantago major* L.
19	Polygonaceae	*Polygonum amphibium* (L.)
20	Pteridaceae	*Anogramma leptophylla* (L.)
21	Potamogetonaceae	*Potamogeton schweinfurthii* A. Benn.
	,,	*Potamogeton crispus* L.
22	Resedaceae	*Ochradenus baccatus* Delile
23	Rhamnaceae	*Ziziphus nummularia*(Burm.f.)whigh
24	Sapindaceae	*Dodonaea angustifolia* Jacq.
	,,	*Dodonaea viscosa* (L.)
25	Scrophulariaceae	*Verbascum nigrum* L. (Dark Mullein)
26	Solanaceae	*Datura inoxia* P. Mill.
	,,	*Lycium shawii* Roem
	,,	*Nicotiana glauca* Graham
	,,	*Solanum incanum* L.
	,,	*Withania somnifera*(L.) Dunal
27	Tamaricaeae	*Tamarix aphylla*(L.) H.Karst.
28	Urticaceae	*Forskalea tenacissima* L.
	,,	*Forskalea viridis* Ehrenb. Arab.
29	Zygophyllaceae	*Fagonia paulayana* Wagner&Vierth.

Location(2): Baljorashi : Ben Amer:

The vegetation in this location was represented by thirteen families including twenty species. The family Lamiaceae was represented by five species, whish considered to be the richest family, followed by the Asteraceae which was represented by three species. The Leguminosae was represented by two species and all the other families were represented by only one species.

Table(2):Vegetation List of: Baljorashi Location:

No.	Family	Scientific name
1	Asteraceae	*Centaurea sinaica* DC.
	,,	*Psiadia punctulata*(DC.)
	,,	*Pulicaria crispa(* Forssk.) Oliv.
2	Boraginaceae	*Cordia africana* Lam.
3	Burseraceae	*Commiphora quadricincta* L.
4	Cupressaceae	*Juniperus excels* M.Bieb.
5	Ebenaceae	*Euclea schimperi* (A.DC.) Dandy
6	Ephedraceae	*Ephedra alata* Decne
7	Labiatae= Lamiaceae	*Lavandula pubescens* Decsne
	,,	*Nepeta deflersiana* Schweinf.
	,,	*Otostegia fruticosa* Schweinf.
	,,	*Salvia multicaulis* Vahl.
	,,	*Teucrium fruticans* L.
8	Leguminosae=Mimosaceae	*Acacia etbaica* Schwein
	,,	*Faidherbia albida* (Delile) A. Chev.
9	Liliaceae	*Asphodelus fistulosus* L.
10	Papaveraceae	*Argemone ochroleuca* Sweet.
11	Rhamnaceae	*Ziziphus spina-christi* (L.) Desf.
12	Salicaceae	*Populus euphratica* Oliv.
13	Solanaceae	*Solanum incanum* L.

B. Chemistry of soil :

Table (3): Chemical Constituents of Soils in the Two Studied Locations

Site (1) Al-Karrar Hedwa	Value (ppm)	Site (2) Ben Amer	Value (ppm)
N	51875	Na	50240
P	3700	P	2242
K	14083.3	K	12860
Mg	42633	Mg	32630
Ca	56291	Ca	53200
Al	189666.7	Al	178400
Fe	85783.3	Fe	72260
Mn	2283.3	Mn	1199
Organic matter %	6.5	Organic matter %	5

Critical limits of nutrients in mg/kg*							
Limits	**N**	**P**	**K**	**Fe**	**Mn**	**Zn**	**Cu**
Low	< 40.0	< 5.0	< 85.0	< 4.0	< 2.0	< 1.0	< 0.5
Medium	40.0-80.0	5.0- 10.0	85.0-170.0	4.0-6.0	2.0-5.0	1.0-2.0	0.5-1.0
High	> 80.0	> 10.0	> 170	> 6.0	> 5.0	> 2.0	> 1.0

**Critical levels of nutrients after[19,20].*

Concerning the studied soils chemical properties, data illustrated in Table (3) indicated that soil organic matter is very high in the tow locations.Location two has the highest levels of organic matters (6.5%).

DISCUSSION AND CONCLUSION

A total of eighty six plant species belonging to forty two families were collected and identified from the two locations in AL Baha.

Mandag location is represented by rich vegetation. Fifty seven species were identified and the family Asteraceae constitutes the large number of species(fifteen species) which is the largest family in this location, whereas in Baljorashy location the family Lamiaceae was the largest and constitutes five species. This could be attributed to the influence of altitude, humidity or the highest levels of soil nutrients [14].

Although there are significant differences in the richness of vegetation between the different locations, soil chemical analysis revealed that, the two locations characterized by having high amount of organic matter . This may be due to the mineral nature of soil deposits. Additionally, it is noteworthy that different studies recorded that available contents of N, P, K. Fe, Mn, in general, lie at a very high level (19&20).

Some species share the presence in the two locations: *Acaia etbaica,Argemone ochroleuca , Ephedra alata, Juniperus excels, Lavandula pubescens, Pulicaria crispa, Otostegia fruticosa* and *Solanum incanum*. This attributed to the presence of the same chemical constituents found in the two locations.

There is a clear correlation between organic matter and the distribution of different plant species. Deficiency of one or more element in the soil is one of the major reasons for poor cultivation of soils[21]. Attempting for reclamation of such type of nutrients deficient soils depends on addition of different elements by fertilization. However increased amount of Na+ ions in the soil antagonizes with the absorption of many ions especially K+ ions[22].

The floristic and chemical composition of soil data outlined above clearly indicate that AL Baha area is rich, with variable vegetation.

In conclusion, the results of the present work strongly suggested or enhanced more investigations on the ecology of this widely distributed species.

This work will be followed by a future study on mapping the plant communities along the same area to make a full description of their structure, distribution and location of each community in relation to the chemical constituents of the soil.

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