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Floristic Diversity and Environmental Relations in Two Valleys, South West Saudi Arabia

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Abstract: ***The study was conducted on two main sites (Ben Amer and Baida), Albaha region, South West Saudi Arabia. Floristic diversity and soil chemical analysis were studied. The study revealed the presence of seventy six species within sixty two genera of vascular plants belonging to thirty four families. Site 2 (Baida) with its two stands was found to be the most diverse in vegetation. The family Asteraceae was the richest (13 species) followed by Solanaceae (6 species), while, twenty families were represented by only one species each. Psiadia punctulata, Pulicaria crispa (Asteraceae), Lavandula pubescens, Otostegia fruticosa (Lamiaceae), Argemone ochroleuca (Papaveraceae) and Solanum incanum (Solanaceae) were the most common species in both sites. In the floristic spectrum, therophytes and phanerophytes were the most dominant life-forms (33%), while, cryptophytes and hydrophytes were the rarest life-forms (2%). The study area was characterized by plants with different life forms such as trees, shrubs and herbs. Site 1 (Ben Amer) was dominated by tress while site 2 (Baida) was dominated by shrubs and herbs. Genus Acacia was considered as the most speciose (4 species) pursued with genus Amaranthus and genus Boerhavia, which were represented by 3 species each. The soil samples from site 2 (Baida) was very rich in organic matter content as compared with that of site 1 (Ben Amer). Both sites contained considerable amount of elements and showed high level of aluminum and low level of manganese contents.***

Keywords: Floristic composition, vegetation, soil elements, organic matter

1. Introduction

The Kingdom of Saudi Arabia is a large arid land with an area of about 2,250,000 km^2 covering the major part of the Arabian Peninsula. It is approximately located between latitude 15˚45'N and 34˚35'N and between longitudes 34˚40'E and 55˚45'E. [1,2]. It consists of four topographic areas: The Coastal Plains, The South and West Escarpments, The Plateaus and The Deserts. The South and West Escarpments consist of two main mountains chains, the Hejaz Mountain Chain in the north and the Asir Mountain chain in the south. While the highest point in the north is about 2000 m, in the south the Sooda Mountain is the highest in Saudi Arabia, at about 3200 m. The southwest escarpment are composed mainly of Precambarian crystalline rocks which are overlain, particularly in the south, by large areas of limestone and sandstone of Jurassic age and extensive areas of volcanic rocks of Tertiary age [2]. This plateau is also part of the Arabian Shield, essentially of Precambrian crystalline rocks [3]. It extends for distance of 70 km in the north-south direction.

Floristic analyses are very useful for identifying locative patterns in plant diversity and composition, and when combined with environmental, geological and historical variables, can provide valuable information on the processes that maintain the species diversity within the ecosystem. Accordingly, floristic analyses have recently received considerable attention[4].

Several reports have been published on the Flora of the country; (Migahid ,1978 , and 1988-1990) [5,6]; (Chaudhary 1999, 2000, 2001a & 2001b) [7,8,9,10]; and the illustrated flowers of Saudi Arabia by Collenette (1999) [11]. Some reports of certain districts throughout the kingdom were also published [12,13].Various ecological studies have been published on the vegetation of Saudi Arabia [14], while, the vegetation of certain areas were also reported [15,16]. Whereas, vegetation-soil relationships in variable ecosystems were also documented [17,18].

Saudi Arabia is characterized by different ecosystems and diversity of plant species, therefore, it is considered as one of the richest biodiversities in the Arabian Peninsula. Components of the flora are a mixture of Asia, Africa and Mediterranean regions' plants. A total of 2284 species including naturalized and alien plants have been reported from different habitats of Saudi Arabia alone [19].

Saudi Arabia has no permanent rivers or lakes; however "Wadis or valleys" are frequent along the country and demonstrate physiographic irregularities that lead to parallel variations in plant species distribution[20].Vegetation of Wadis in general is not constant, it varies from year to year, depending upon many factors such moisture level, geographical position, physiographic features and human impacts[16,21,22,23].

Baha plateau embraces one of the richest and most variable floristic regions of Asir Mountains, Southwest Saudi Arabia [24].

The floristic diversity as well as the soil elemental compositions of two sites at Albaha province, Saudia Arabia were studied.

2. Material and Methods

Study Area

The study was carried out in Al Baha region between December 2012 to March 2013.Two main sites with three stands have been studied, Ben Amer and Baida (Figure1).

1. Ben Amer: is situated between 19° 51′ 34″ ° N latitude and 41° 33′ 26″ °E longitude, and altitude of 2000 m above sea level (m. a. s. l) (stand 1).
2. Baida: is situated between 20°19’ 62” °N latitude and 41°40’ 19” °E longitude, and altitude of 2000 m above sea level (m. a. s. l)of 1832.0 ± 10m above sea level the site was divided into two stands. Stand 2 at upstream and stand 3 at downstream of the dam.

Climate

Climatic conditions records were obtained from national meteorology and environment centre of Al Baha, Ministry of Defense and Aviation Presidency of Meteorology and Environment Protection. Minimum temperature records as low as 4°C in stand1, whereas, stands 2 , 3 minimum temperatures ranging from 2 to -4°C). The mean monthly temperature varies from 12°C in December and January to 25°C in August in Ben Amer ,and from 20°C in January to 33°C in August in Baida. The relative humidity in both areas is high in the winter (100%), while, in the summer it records around 75%. Therefore, both areas are considered with high humidity. The rainfall is irregular and variable with heavy sporadic rains of frequent occurrence.

Floristic data collection and identification:

Vegetation analysis of the study area was studied according to Braun-(Blanquet, 1956) [25].Determining of the life form was done according to Raunckier (1934) [26]. Plant specimens were taxonomically identified and authenticated according to the published flora of Migahid (1978;1988-1990;1996) [5,6,27], Miller &Cope (1996)[2], Chaudhary (1999; 2000; 2001a & 2001b) [7,8,9,10]and Collenette (1999)[11]. Plant specimens were deposited in the Herbarium of Al Baha University for further future references. The identified species along with their vernacular names were listed in Table 2.

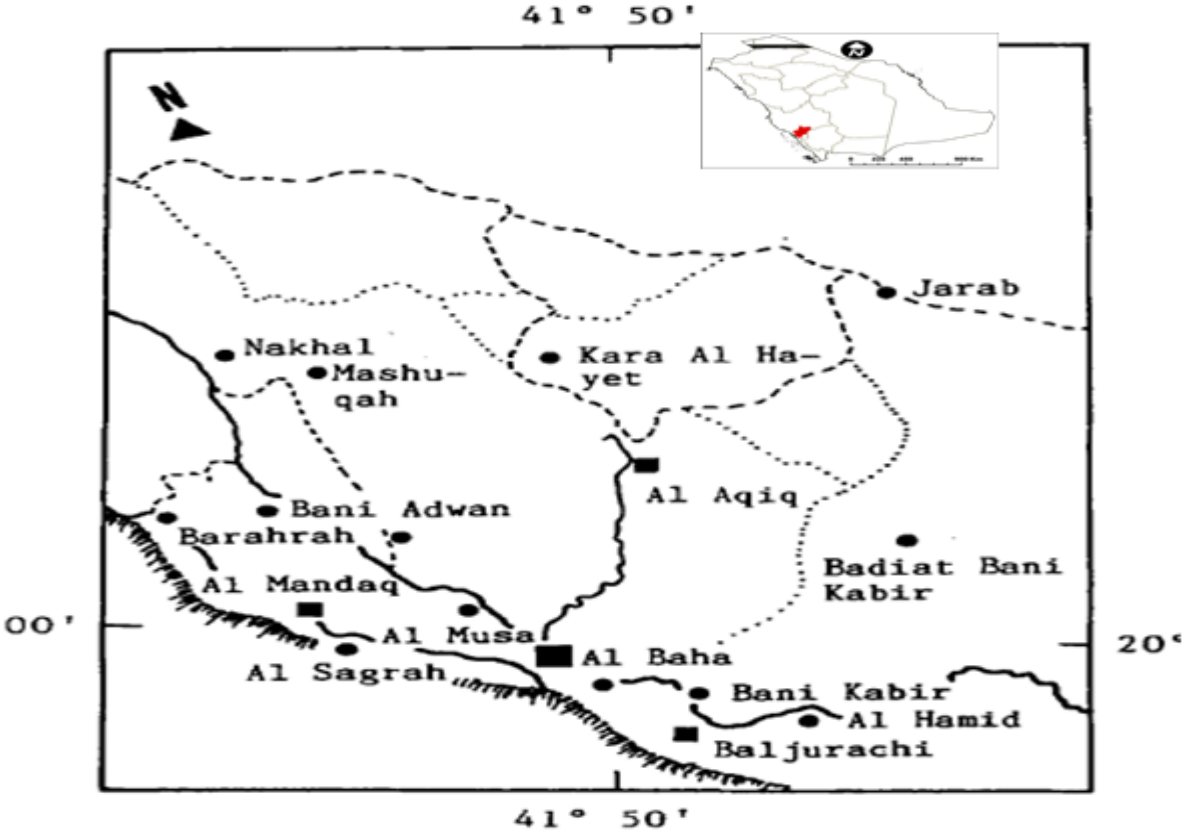

Figure 1: Stand map of the study area in Albaha district.

Soil sampling and analysis

Soil samples from three stands were collected from random points and mixed, homogenized and air-dried at room temperature (20°±2°C), then sieved through 2mm screen analyzed for some physical and chemical properties, according to Piper (1950)[28]. The determination of Ca, Mg, K and Na was carried out by using a flame photometer and an atomic absorption flame photometer (Berkin Elmer AA Atomic absorption Model: 3100) as described by Allen, et al. (1974)[29]. This was done in the laboratories of Faculty of Earth Sciences, King Abdulaziz University, Jeddah. For the determination of Cl, the method of Jackson and Thomas (1960)[30] was used. In the meantime, soil organic matter contents was estimated by oxidation according to the modified method of Walkley and Black as described by Jackson and Thomas (1960)[30].This part was conducted in the laboratories of the Fayoum University, Egypt. Values were measured in part per million (ppm) for elements and in percentage % for the organic matters.

3. Discussion

Soil Chemistry

Chemical constituents of the soil in the three stands are shown in Table1. The highest organic matter content was detected in stand 3 (At Baida). Aluminum was found to be the highest element in the three stands,while, Manganese was the lowest. Trace elements were not detected in stand1 (Ben Amer).

Even though there was no significant difference between elements content in the three stands in a single factor ANOVA (P-value> 0.05), there was a variation in the total nutrient contents in the studied soil sites. The highest element in all the three stands was Aluminum (Al) while the lowest was Manganese (Mn) (Table1). Sodium (Na), Potassium (K) and Phosphorus (P) were detected in similar quantities. The organic matter content was the highest in stand 3 "the dam terrain area" (6.2025%). This might be due to the continuous deposition of organic matter on the flat nature of the area followed by stand 2 at upstream (Baida), and the lowest was stand 1 "Ben Amer".

Trace elements were detected in both stands at Baida with a few variations between the two stands. Barium (Ba) was detected in high amount in both stands, whereas, Lead (Pb) detected in low amount. Whilst, trace elements were not detected in stand1 (Ben Amer).

Floristic analysis and plant diversity of the study area:
Vegetation in the three stands was represented by 76 species and 62 genera belonging to 34 families. Dicot plants (31 families, 62 genera &73 species) were found to be dominant than Monocot plants which were represented by (3 families, 3genera and 3 species) as shown in Figure 2. The family Asteraceae was the richest (13 species) followed by Solanaceae & Amaranthaceae (6 species each), Lamiaceae & Fabaceae (5 species each), Nyctaginacae (3species), Brassicaceae (3 species), Apocynaceae (3 species),and Six families were represented by two species. While, tewnety plant families were contributed to the vegetation by only one species as shown in Figure 3 and Table 2 .

Stands 2&3 (Baida) were the most diverse with about 43 and 36 different species, respectively., whereas, stand1 (Ben Amer) was less diverse with 21 species.

Genus Acacia was found to be the most speciose (4 species) pursued with Genus Amaranthus and Boerhavia which were represented by 3 species each.

Asteraceae and Solanaceae were highly contributed to the vegetation of stand 2 & 3 (Baida) comparing to stand1 (Ben Amir). Whereas, family Lamiaceae was obviously represented in stand1 (Ben Amir). Fabaceae was almost equally distributed among the study sites. Some families were not represented in certain study stands as shown in figure 4.

Psiadia punctulata, Pulicaria crispa (Asteraceae), *Lavandula pubescens,Otostegia fruticosa* (Lamiaceae), *Argemone ochroleuca (*Papaveraceae*) and Solanum incanum* (Solanaceae) were commonly observed in all of the studied stands. Trees were the most common growth type in stand1 (Ben Amer),such as *Barbeya oleoides, Cordia africana, Commiphora quadricincta , Juniperus excelsa , Euclea schimperi , Ephedra alata , Faidherbia albida, Ziziphus spina-christi* and *Populus euphratica.* Stand 2 (stand 2) has the following tree species: *Acacia etabica, Acacia negrii, Ochradenus baccauts, Dodonaea angustifolia,Terminalia brownii* and *Tamarix aphylla*. Finally stand 2 (stand2) has the least tree with only *Acacia abyssinica , Acacia etabica* and *Ficus plamata.* Herbs and shrubs were observed to be the most common growth type (forms) in stand 1&2 (Baida) as in Table 2.

The plant life form of the study area:

The life form spectrum of the study area exhibited predominant of therophytes and phanerophytes which were constituted 33% and 31% of the total flora ,respectively, followed by chamaephytes 28%,while, hemi-cryptophytes geophytes were 6%. On the other hand, cryptophytes and hydrophytes represented 2% of the total flora as shown in Figure 5.

The plant growth form of the study area:
It was observed that herbs was dominated the vegetation of the study area (51%) followed with shrubs (20%),trees (18%) and other individuals ranged shrubs to trees (8%) and herbs to shrubs (2%) as shown in Figure 6.

Soil analysis:
Total nutrient contents in soil of the studied stands:

Many investigators concluded that a soil system is a function of soil potentiality for the essential plant nutrients, which was usually related to the nature soil parent material. This may result from a combination of compositional differences between the physical and chemical in soils [31,32].

a. Nitrogen:
The obtained results illustrated in Table (1) reveal that there was a wide variation in total nitrogen, where its values most probably depend on soil organic component, total N values ranged between 33825 (downstream) and 50050 (upstream) mg kg^{-1} soil.The highest value was associated with the finest soil texture of soil profile as well as it contains a relatively higher organic matter content (6.2%). On the other hand the lowest value was found in a soil characterized by a very low content of organic matter (4.97 %) imbedded in a surface soil texture of very gravelly sand under a hyperthermic condition, which leads to rapid decomposition. Similar relationships have been reported for managed grassland soil[33].

b. Phosphorus:
The total phosphorus expressed as mg kg^{-1} in the different studied sites. The highest amount of total P (3272mg kg^{-1}) was recorded in downstream site with relative higher content of organic matter (6.2 %). Whereas, the lowest P value (2242mg kg^{-1}) was recorded in the stand 1(Ben Amer) exhibited organic matter (4.97 %).That means values of total P widely varied between the studied soils depending on the

type of deposits and their constituents. The environmental chemistry and plant availability of applied soil P are more related to its chemical forms in the solid phase [33]. The availability of soil P to plants depends on the replenishment of labile P from other P fractions [34].

c. Potassium

Concerning the data of total K in the different studied sites, Table (1) ranged from 10475-13625mg kg^{-1}. In general, the highest values of total K were obtained from the upstream site while the lowest ones were recorded for the downstream site. That is mainly due to the occurrence of a relatively high content of the K-bearing minerals in soil mechanical fractions such as feldspars and hydrous mica or illite as a clay mineral. This holds true, since the distribution pattern of the total content of K throughout the soil profile had no obvious trend, where it shows an increase with increasing clay contents, however, an opposite trend is noticed with the dominance of coarse fractions. It is also found in the secondary minerals, such as clays (illite and vermiculite). So, the inorganic potassium is about 99 % of the total potassium in soil, and about 95 % of K is within the crystal lattices of the silicate minerals [35].

d. Calcium

The obtained results illustrated in Table (1) reveal that there was a wide variation in calcium content, where its values most probably depend on soil organic matter and calcium carbonate, calcium values ranged between 42550 (stand 2 , Baida) and 53200 satnd 1 (Ben Amer) mg kg^{-1} soil .

e. Magnesium

The obtained results illustrated in Table (1) reveal that there was a wide variation in magnesium content, values ranged between 32630 (sand 1, Ben Amer) and 38200 (stand 2, Baida) mg kg^{-1} soil.

Total micronutrient contents

Mineral and organic constituents of soil besides a suitable air-moisture regime are of the most important factors affecting it's potentially for micronutrient supply. Data obtained for total contents of studied micronutrient given in Table (1).

a. Iron:

Data in Table (1) represent the total amounts of Fe in the different studied soil sediments. It is clear that total amounts of Fe in the studied soils ranged between 72260 and 91400 mg kg^{-1}. The highest value was recorded in the stand 2 (Baida), while the lowest was recorded in the satnd 1 (Ben Amer), respectively.

b. Manganese:

Total manganese contents in the different studied soil sediments matched similar trend to that of the total Fe values. Total amounts of Mn ranged between 1199 and 1900 mg kg^{-1} in stand 1 (Ben Amir) and stand 3 (Baida) respectively. In general, the highest values of total Mn in the soil profile layers were obtained from the fluvio-lacustrine sediments, while, the lowest ones were recorded for the desertic formation, respectively. The cation Mn^{+2} is known to replace some divalent cations (Fe^{+2} and Mg^{+2}) in silicates and oxides. The common forms of Mn oxides are birnessite, lithiophorite, and hollandite. Moreover, Mn^{+2}occurs as fixed cation in the structures of silicates and oxides or as a trace element in the lithosphere rocks [36][37][38] .

Organic matter content:

Positive correlation between available NPK and soil organic matter content were studied by many investigators, Deenik and Yost (2006)[39]clarified that organic matter is the main source and sink of nutrients; therefore, it should theoretically show a strong relationship with the nutrient status of the soil. Table (1) shows the total soil organic matter content and it is ranged between 6.2and 5.19 % in stand 2&3 (Baida), respectively.

Floristic Diversity:

The floristic composition of two valleys in South West of Saudi Arabia was studied. The valleys represented by two main sites: Ben Amer and Baida. In terms of floristic and vegetation composition in the studied areas some plant families such as Asteraceae is represented by the highest number of species (13 species), Amaranthaceae, Solanceae and Fabcaeae were coincided with the findings of (Farraj, 2012)[17] who studied the vegetation of Wadi Al-Arji of Taif region. This result is also similar to the whole flora of Saudi Arabia where the highest families in the whole flora are Poaceae (262 species), Asteraceae (233 species) and Fabaceae (210 species)[40].

The life-form distribution of plants growing in arid regions is closely related to its topography and landform [20,5,41,42,43,44,45,16]. The life form spectrum of the study area therophytes and phanerophytes constituted 33% and 31% ,chamaephytes 28%, hemi-cryptophytes & geophytes were 6%, cryptophytes and & hydrophytes 2% these results were coincided with the findings of Al-Turki and Al-Olayan,2003)[46]; Orshan, (1986)[42] and Shaltout *et al.*, (2010)[21]. The domination of phanerophytes, therophytes and chamaephytes in the study area also agrees with the spectra of vegetation in deserts and semi-desert habitats in other parts of Saudi Arabia as described by other authors such as El-Demerdash *et al.*, (1995)[47]; Fahmy and Hassan, (2005)[48]; El-Ghanem *et al.*, (2010)[15] and Alatar *et al.*, (2012)[16]. In addition, it is in congruent with the vegetation spectra of some parts of the Middle East[49,50].

Because Baida area is surrounding and near the water dam, most of the plants habitat of stand 2 & 3 are shrubs and herbs (Table 2). Therefore, these two stands are the richest in vegetation.

Vegetation-Soil relationship

Organic carbon and Electric conductivity are important ecological gradients affecting vegetation distribution [51, 52]. Stand 2 & 3 (Baida area) are the most diverse with about 43 and 36 different species, respectively. Whereas. stand 1 (Ben Amer) is the least diverse with 21 species only. This agreed with the fact that Baida area (upstream and downstream) of the dam has the higher content of the organic carbon. Therefore, there is a positive correlation between organic carbon content and species richness. This positive correlation is in accordance with many studies such as [53, 54].

4. Conclusion

The floristic composition of the two main study sites comprises diverse ecosystems and exhibited very interesting aspects for vegetation studies. Vegetation of the present study revealed the dominance of members of the family Asteraceae, Fabeaceae and Solanaceae in the different habitat. The life-form spectrum of the study areas exhibited predominant of phanerophytes and therophytes. Species diversity and dominance is related to soil physical characteristics and variation of habitat types. Vegetational groups in Baida habitats are more divers than those in Ben Amir. Vegetation of any area is decided by the complex of environmental factors such as soil, geology, and the vegetation of adjoining regions also affects it.

5. Results

Table 1: shows the chemical constituents of the soil of the three stands

Sites	Al_2O_3	CaO	Fe_2O_3	K_2O	MgO	MnO	N_2O	OM.%	P_2O_5
Stand 1 (Ben Amer)	171000 ± 4020^{A}	51250 ± 898^{A}	74575 ± 634^{B}	12700 ± 297^{A}	32525 ± 593^{A}	1225 ± 25^{B}	46700 ± 2471^{A}	6.0 ± 1.1^{A}	2625 ± 319^{A}
Stand 2 (Baida) Upstream	168500 ± 39809^{A}	48125 ± 3452^{A}	90300 ± 1864^{A}	13625 ± 2490^{A}	35450 ± 1988^{A}	1900 ± 68^{A}	50050 ± 10350^{A}	7.7 ± 3.1^{A}	2800 ± 410^{A}
Stand 3 (Baida) Downstream	134550 ± 3427^{A}	42550 ± 1149^{B}	91400 ± 1594^{A}	10475 ± 359^{A}	38200 ± 1665^{A}	1618 ± 173^{A}	33825 ± 2780^{A}	5.2 ± 0.6^{A}	3272 ± 168^{A}

Table 2: Plant diversity of the studied sites, stand 1: (Ben Amer) ,stand 2: (Baida, upstream and stand 3: Baida downstream). Life forms are: Ph. Phanerophytes; Ch. Chaemophytes; G. Geophytes; Hc. Hemi-cryptophytes Cr. Cryptophytes; Th. Therophytes and H. Hydrophytes.

Family	Botanical Name	Growth form	Life form	Stand 1	Stand 2	Stand 3	Vernacular name
Amaranthaceae	*Aerva javanica* (Burm. f.) Juss. ex Schult.	Herb	Ch		+	+	Altarfa, Arwa,Ra
	Amaranthus graecizans L.	Herb	Th			+	Althafla
	Amaranthus hybridus L.	Herb	Th		+		
	Amaranthus spp.	Herb	Th			+	
	Chenopodium album L.	Herb	Th		+		Zirbeih
	Chenopodium schraderianum Schult	Herb	Th		+		Aifjan
Apocynaceae	*Calotropis procera* (Aiton) W.T. Aiton	Shrub	Ph			+	Ushaar
	Caralluma acutangula (Decne.) N.E. Br.	Herb	Th		+		
	Gomphocarpus sinaicus Boiss.	Shrub	Th			+	Houb
Asteraceae	*Ambrosia maritima* L.	Herb	Th		+	+	
	Artemisia scoparia Waldst. & Kitam.	Herb	Ch			+	Selaika Awizran
	Centaurea sinaica DC.	Herb	Th	+			Murar,Burko'aan
	Pluchea dioscoridis (L.) DC.	Herb	Th			+	Wozab

	*Echinops spinosissimus*Turra	Herb	HC		+		Shadag
							al Gamal , Lusaig
	Gnaphalium luteoalbum L.	Herb	Ch		+		
	Helichrysum schimperi (Sch.Bip. ex A.Rich.) Moeser	Herb	G			+	
	Psiadia punctulata (DC.) Vatke	Herb	Ch	+	+	+	Tubag
	Pulicaria crispa Sch. Bip.	Herb	Ch	+	+	+	Arjag
							Gathgath
	Reichardia tingitana (L.) Roth	Herb	Cr		+		Khuzam
							Nakd
	Sonchus tenerrimus L.	Herb	Th		+		Hawa
	Xanthium pungens Wallr.	Herb	Th		+	+	
	Xanthium spinosum L.	Herb	Th			+	Shubait

Barbeyaceae	*Barbeya oleoides* Schweinf.	Tree	Ch	+				Kutha
Boraginaceae	*Cordia africana* Lam.	Tree	Ph	+				
	Heliotropiuml asiocarpum Fisch.&C.A.Mey.	Herb	Ch		+			Ragrag Ramram
Brassicaceae	*Brassica tournefortii* Guan	Herb	Th		+			
	Farsetia longisiliqua Decne.	Shrub	Ch		+			
	Morettia parviflora Boiss.	Herb	Ch		+			
Burseraceae	*Commiphora quadricincta* Schweinf.	Tree	Th	+				
Caryophyllaceae	*Cometes abyssinica* R.Br.	Shrub	Th		+			
Capparaceae	*Cleome ramosissima* Parl. ex Webb	Herb	Th				+	Al Ofeina
Combretaceae	*Terminalia brownii* Fresen.	Tree	Ph				+	Subagh
Cupressaceae	*Juniperus excelsa* M.Bieb	Tree	Ph	+				
Ebenaceae	*Euclea schimperi* (A.DC.) Dandy	Tree	Ph	+				Beiza
Ephedraceae	*Ephedra alata* Decne.	Tree	Ph	+				Alanda
Euphorbiaceae	*Euphorbia sp.*	Shrub	Th		+			
	Ricinus communis L.	Shrub	Ph		+		+	Khirwee
Fabaceae	*Acacia byssinica* Hochst ex. Benth.	Tree	Ph		+			
	Acacia etbaica schweinf.	Shrub to Tree	Ph		+		+	Seyal,Garaza
	Acacia gerrardii Benth.	Shrub to Tree	Ph	+				Taleh
	Acacia negrii Pic. Serm.	Shrub to Tree	Ph				+	
	Faidherbia albida (Delile) A.Chev.	Tree	Ph	+				
Geraniaceae	*Erodium sp.*	Herb	Th				+	
Lamiaceae	*Lavandula pubescens* Decne	Herb	Ch	+	+		+	Zuffera Ataan
	Nepeta deflersiana Schweinf. ex Hedge	Herb	Th	+				Shiaa
	Otostegia fruticosa Briq.	herb	Ch	+	+		+	Sharam
	Salvia multicaulis Vahl.	Shrub	Ch	+				
	Teucrium polium L.	Herb to sub shrub	HC	+				Ga'ada
Xanthorrhoeaceae	*Asphodelus fistulosus* L.	Herb	G	+				Broug,
Malvaceae	*Malva parviflora* L.	Herb	Ch				+	Khubeez
Moraceae	*Ficus carica* L.	Shrub to tree	Ph		+		+	Tein
	Ficus palmata Forssk.	Tree	Ph		+			Humadh
Hydrocharitaceae	*Najas graminea* Delile.	Aquatic Herb	H		+			
Nyctaginaceae	*Boerhavia coccinea* Mill.	Herb	Ch		+			
	Boerhavia mista (Thulin) Govaerts	Shrub	Ch		+		+	
	Boerhavia plumbaginea Cav.	Herb	Ph		+			Roqma
Papaveraceae	*Argemone ochroleuca* Sweet.	Herb	Ch	+	+		+	Argeomonia
Poaceae	*Saccharum spontaneum* L.ssp. *Spontaneum*	Grass	Ch		+			Helf
Polygonaceae	*Rumex nervosus* Vahl.	Herb	Th		+			Humadh
	Rumex vesicarius L.	Herb	Th		+			Humadh
Resedaceae	*Ochradenus baccatus* Delile.	Tree	Ph				+	Garadh Alandra
Rhamnaceae	*Ziziphus nummularia* (Burm.f.) Wight & Arn.	Shrub	Ph				+	El Siddr
	Ziziphus spina-christi var. *spina-Christi* (L.) Willd	Tree	Ph	+				El Siddr
Salicaceac	*Populus euphratica* Olivier	Tree	Ph	+				
Sapindaceae	*Dodonaea viscosa* subsp. *angustifolia* (L.f.) J.G.West	Shrub	Ph				+	Shith
	Dodonaea viscosa Jacq.	Shrub	Ph		+			
Scrophularaceae	*Buddleja polystachya* Fresen.	Shrub to Tree	Ph		+			
Solanaceae	*Datura innoxia* Mill.	Shrub	Th		+		+	El Banj
	Datura stramonium L.	Herb	Ch		+		+	El Banj
	Lycium shawii Roem. & Schult.	Shrub	Ph		+		+	El Osaj
	Solanum incanum L.	Shrub	Th	+	+		+	Nagam
	Solanum sp.		Th		+			
	Withania somnifera (L.) Dunal	Shrub	Ch		+		+	Ababa
Tamaricaceae	*Tamarix aphylla* (L.) Karst.	Tree	Ph				+	Al athil
Urticaceae	*Forsskaolea viridis* Ehrenb. ex Desf	Herb	Ch		+		+	Lussag
Zygophyllaceae		Shrub	Ch		+		+	Draima

Table 3: Tubular summary showing the total number of families, genera and species, growth forms and life forms of represented plant species.

Families	*Genera*	*species*	*Growth form*	*Number of species*	*Percentage %*	*Life form*	*Number of species*	*Percentage %*
34	62	76	Herb	39	51	Th	25	32.89
			Shrub	15	20	Ch	21	27.63
			Tree	14	18	Ph	24	31.58
			Herb to shrub	6	8	Cr	1	1.34
			Shrub to tree	2	3	H	1	1.34
						HC	2	2.63
						G	2	2.63

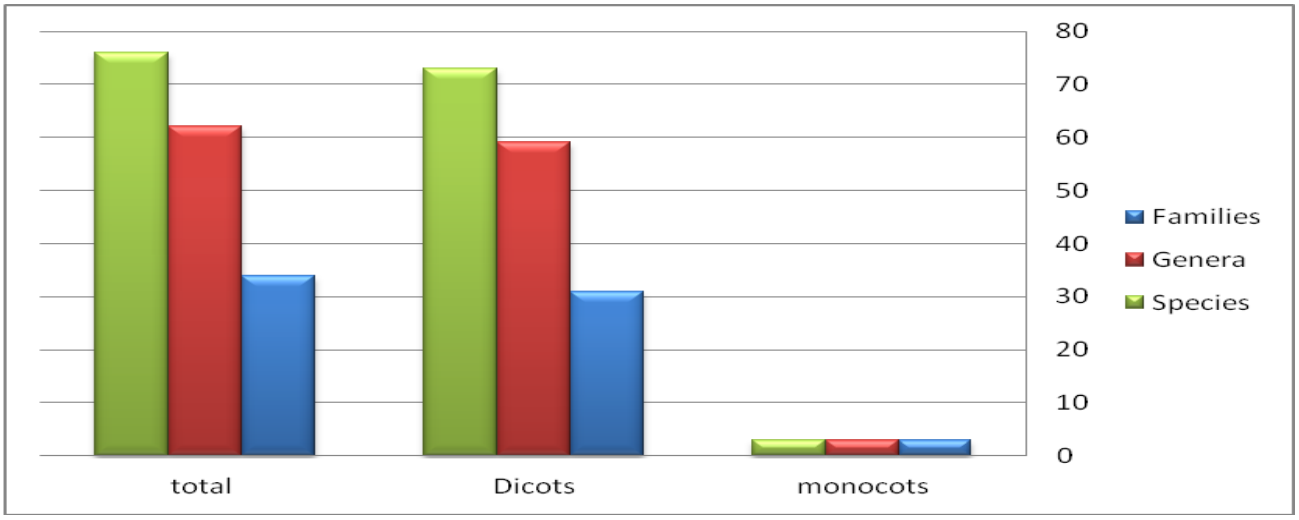

Figure 2: Floristic analysis of plants of the study area

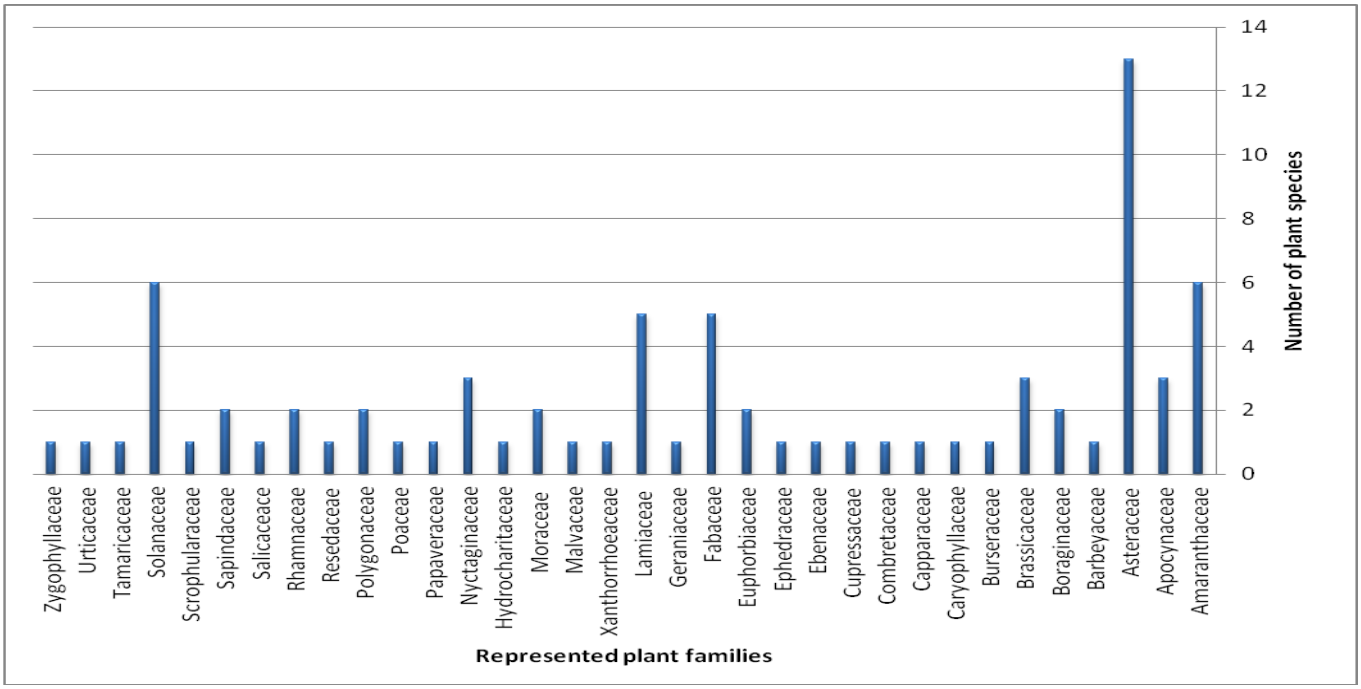

Figure 3: Floristic richness-Diversity- of the study area

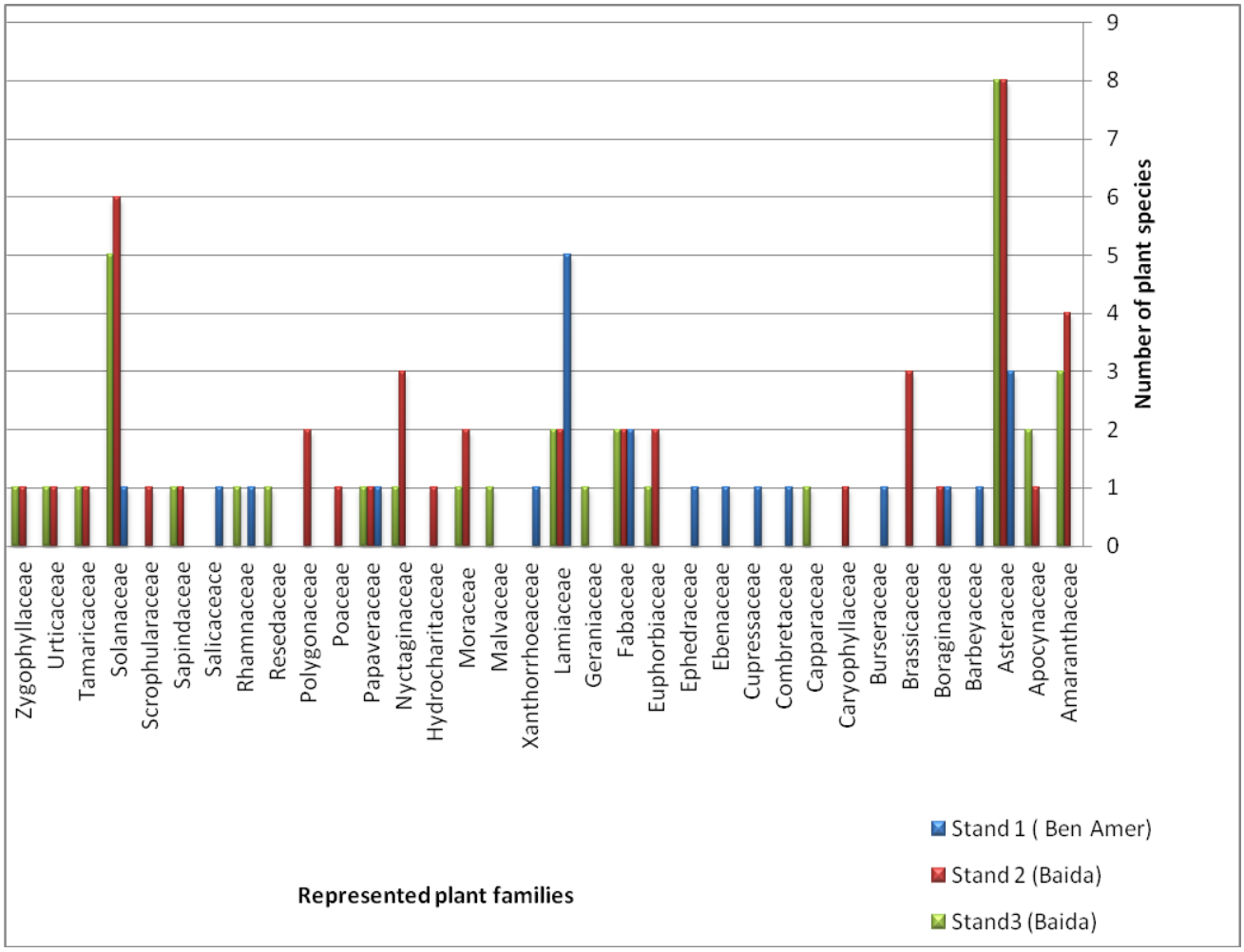

Figure 4: Floristic diversity at the two studied sites.

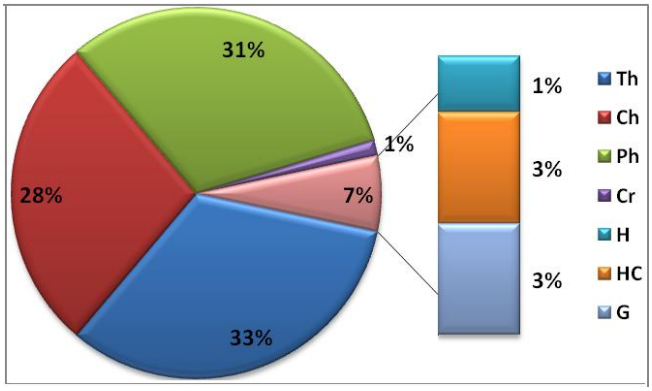

Figure 5: Life form relative spectrum of the study area

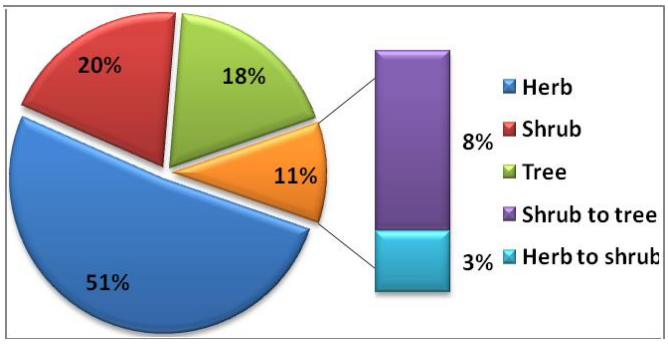

Figure 6: Growth form relative spectrum of the study area.

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