



Floristic composition and vegetation cover analysis of delta outlet of wadi kharaz, lahej, Yemen

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Abstract

This study is the first report conducted on Wadi Kharaz of Lahej area in Yemen. The present study aimed to determine floristic composition, the vegetation structure and species distribution at 15 sample plots on Delta outlet of Wadi Kharaz, southwestern Aden. The study revealed 40 plant species belonging to 32 genera and 19 families. Poaceae was the dominant families. Using DCT (Dominant Community Type) analysis, four major vegetation groups found, they are the followings: (I) *Cymbopogon schoenanthus*, (II) *Zygophyllum simplex*, (III) *Salvadora persica* and (V) *Acacia tortilis*. dominant community types. Chorological analysis exhibited the Somali- Masai, most dominant element represented by (22.5%) of the studied species. The Hemicryptophyte and Therophytes were the most dominant life form, constituted by 13 species representing (32.5%) each of the total recorded species followed by the chamaephytes represented by 10 species (25.%). On the other hand, three species of the Phanerophytes estimated 7.5% conducted of the total recorded taxa. Cryptophytes have the lowest contribution by one species of *Cyperus conglomeratus*, with a percentage of 2.5%.

Keywords: wadi kharaz, chorology, flora, life form, vegetation

Introduction

The (Wadi = dry river valleys) are unique intrazonal landscapes in arid and semi-arid regions of the world [13] in the dry lands, Wadi represent one of the most prominent desert landforms, which exhibit physiographic irregularities that lead to parallel variations in plant species distribution [18]. These Wadies are drainage systems for collecting water from extensive catchments areas such as hills, cliffs, slopes, etc. Accordingly, the water supply of a Wadi is many times the recorded rainfall with richer vegetation than other types of desert habitat. This advantage is however, counterbalanced by two destructive agents: torrents and grazing. The waterway of the torrents is usually devoid of plant cover, which is restricted to the Wadi sides. The influence of torrents on plants is partly mechanical, destroying and uprooting the plants, and partly erosion removing the soil [17]. In addition, certain species subjected to serious grazing by animals, while woody plants are liable for cutting as a source of fuel. The development of Wadi bed includes the gradual accumulation of transported material. The soil barren bed allows the growth of chaemophytes, while a shallow soil cover, moistened during the rainy season, allows the appearance of the ephemerals. When a deep soil is accumulated allowing the establishment of a wet-soil layer, perennials will find it favorable for their growth. At an advanced stage, deep alluvial deposits allow free water to be stored in the subsoil and a water table is established. At this stage shrubs and/or trees are characteristic of the habitat, these Wadi are home to pastoral communities utilizing the area as rangelands for camels, goats and sheep [19], good indicators of biodiversity support capacity, and are the prime focus for conservation managements in desert habitats [1, 3, 17].

Wadi vegetation of Yemen got little attention, so there are few studies such as Wadi Tuban [23], Wadi Rijaf [2], Wadi Bana [1], Wadi Marah [15] and Wadi Dahr [11, 12].

Aden and Coastal part of Yemen as whole is a part of the arid region and despite the fact that the natural plant cover of Yemeni deserts is quite low and scattered; the flora in the South West Coast is relatively rich and diverse. The natural range considered the basic source of animal feedstuff in the Southwestern Coast. Due to poor management and environmental impacts, the native vegetation deteriorated and seriously depleted. The region known as one of the range for the sheep, goats, camels and Bee for Bukurah and Subaihi shepherds. The Delta vegetation described as open shrub vegetation, characterized by sparse and slightly sparse stands of semi-shrubs with a cover of ephemerals of varying density that increase in depressions. The natural vegetation depends mainly on rainfall, which varies greatly both from year to year and in its duration. The various range types are closely associated with soil and climatic characteristics. The grazing ecosystem is complex with interacting biotic, edaphic, and climatic factors, confined with human intervention, which in turn reflects varied social and economic influences. Plant cover productivity depends on various factors as climate, soil, botanical composition, vegetation structure and type and intensity of management, e.g. grazing patterns, stocking rates and wild life. Climatic factors such as precipitation, light, temperature, relative humidity and edaphic factors such as soil topography, texture and fertility are the most important factors affecting natural plant distribution and the amount of moisture that the vegetation will receive. Many investigators studied the Wadies vegetation, as affected with locations and seasonal effects [3, 13, 17]. Up to now, the coastal part of Yemen poorly studied with respect to vegetation aspects still are a rarity for this large area. Most studies available are descriptive and consist of more or less summarizing articles. One could mention [4, 5, 6, 7, 14, 15, 20, 22, 23, 24, 25, 27].

The present study is a phytosociology of the natural vegetation in Delta of Wadi Kharaz in Southwestern coast of Aden (Map1).

The aim of this study was to survey and identify to natural vegetation in Delta of Wadi Kharaz in Southwestern coast of Aden.

Study Area

Topographic features - Kharaz and its surroundings belong to the Somalia-Masai floral region sense [28], characterized by an arid to hyper arid climate with an annual rainfall of less than 50 mm per year. Plant life in this phytochorion is normally sparse and mostly confined to depressions, Wadi, runnels and rocky pavements that receive water from large

catchment areas. In general, these areas are spiny sub trees and the plant communities are often composed of very few species [19].

It formed dry delta are with 13 x 9 Km, its soil at the first two third of the area are gravels cover soil, the last part up to the seacoast are sandy.

December and January are the coldest months (22°C) while the hottest month is, July (39°C). The maximum precipitation (20.0 mm) falls during June, while the minimum precipitation of about 6.0 mm falls during November.

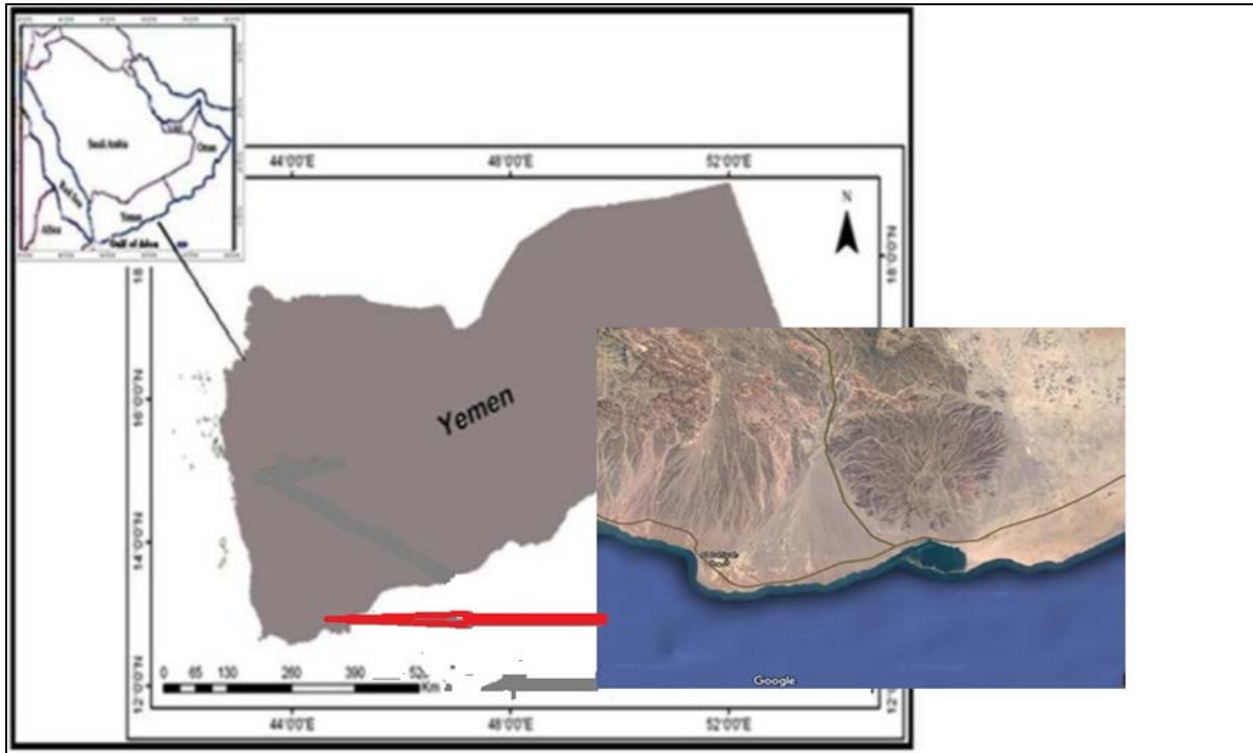


Fig 1: (Map 1): Location of the Study Area

Materials and methods

Fieldwork - The fieldwork conducted in February 2015. All sampling localities indicated in (Table.1).The vegetation sampled in 15 plots (10x10 m).

Vegetation data - The present study follows the traditional Braun-Blanquet approach [9], using the modified scale of [10] for the combined valuation of cover and abundance. Cover-abundance values stands analyzed. Frequency classes (1–5) given in the synoptic tables following [10].The vegetation sampled in 15 plots, the cover-abundance values of the phytosociological plots. Cover (dominance, co-dominance) is an important and decisive feature in the physiognomy of a community. The weighted spectra (mean cover-abundance values for each taxa, resulted in DCT Dominant Community type, following [29].

Life forms were determined according to [21].

A chorological analysis of the recoded species made to assign to world geographical groups, according to [28].

The collected specimens identified and deposited at Aden University Herbarium.

The geographical coordinates measured using GPS

(Geographical Position System) for each plot. (Table 1).

Table 1: GPS Coordinates and Soil type for Each Plot

Plot No.	N. longitude	E. latitude	Soil type
1.	12 37 229	044 11 945	Sandy gravel
2.	12 38 568	044 07 280	Sandy
3.	12 38 568	044 07 260	Sandy gravel
4.	12 39 215	044 10 243	Sandy gravel
5.	12 39 872	044 07 497	Sandy gravel
6.	12 40 058	044 07 373	Sandy loam
7.	12 40 393	044 07 541	West slope
8.	12 40 405	044 07 551	Rocky
9.	12 40 407	044 07 568	Rocky
10.	12 40 453	044 07 279	Sandy loam
11.	12 40 471	044 14 945	Sandy gravel
12.	12 41 540	044 17 121	Sandy gravel
13.	12 46 756	044 45 159	Sand dune
14.	12 47 501	044 46 175	Sandy gravel
15.	12 47 546	044 45 209	Sandy gravel

Results

Our finding summarized in (Tables 2, 3,4,5,6 and 7) as follows:

Table 2: The Vegetation Cover and Dominant Species P.S1 to P.S15 represents Plot Studied; 1, 2, 3, 4, + represents the cover abundance scale

No	Species Names	Plot Studied														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	<i>Acacia tortilis</i> subsp. <i>raddina</i>	1	-	-	-	-	-	-	-	-	3	2	2	1	2	1
2.	<i>Acacia tortilis</i> subsp. <i>tortilis</i>	-	-	-	-	-	-	-	-	-	4	3	3	4	2	3
3.	<i>Aerva lanata</i>	+	-	-	-	-	1	+	+	1	-	-	-	-	-	-
4.	<i>Anticharis glandulosa</i>	2	1	-	1	-	-	-	-	-	+	1	+	+	-	-
5.	<i>Aristida adscensionis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
6.	<i>Calotropis procera</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
7.	<i>Cenchrus ciliaris</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
8.	<i>Chloris barbata</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
9.	<i>Cleome brachycarpa</i>	+	1	1	+	+	3	4	3	4	-	-	-	-	-	-
10.	<i>Cleome paradoxa</i>	-	+	-	-	-	+	+	+	+	-	-	-	-	-	-
11.	<i>Cleome trinerva</i>	-	-	-	-	-	-	+	1	+	-	-	-	-	-	-
12.	<i>Cleome viscosa</i>	+	-	-	-	-	1	+	+	+	-	-	-	-	-	-
13.	<i>Cometes abyssinica</i>	+	-	-	-	-	+	+	+	+	-	-	-	-	-	-
14.	<i>Cymbopogon schoenanthus</i>	+	+	+	3	3	3	3	4	4	-	-	-	2	-	-
15.	<i>Cyperus conglomeratus</i>	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
16.	<i>Dipterium glaucum</i>	1	1	2	1	2	-	+	-	-	+	1	1	+	1	3
17.	<i>Eragrostis papposa</i>	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
18.	<i>Euphorbia granulata</i>	+	+	+	+	-	+	+	+	+	-	-	-	-	-	-
19.	<i>Fagonia indica</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
20.	<i>Fagonia paulayana</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
21.	<i>Forssskolea tenacissima</i>	-	-	-	-	-	2	1	1	+	-	-	-	-	-	-
22.	<i>Heliotropium bacciferum</i>	1	1	+	+	-	-	+	-	-	+	+	+	-	+	1
23.	<i>Indigofera arabica</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	+
24.	<i>Indigofera argentea</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
25.	<i>Leptadenia pyrotechnica</i>	+	+	+	+	-	-	-	-	-	-	+	-	-	-	-
26.	<i>Odontanthera radians</i>	+	+	+	+	-	-	-	-	-	+	+	+	-	-	-
27.	<i>Odyssea mucronata</i>	-	-	-	-	-	-	-	-	-	-	-	-	3	-	1
28.	<i>Panicum turgidum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	+
29.	<i>Pergularia tomentosa</i>	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-
30.	<i>Polycarpea repens</i>	+	+	+	+	-	-	-	-	-	-	+	+	-	-	-
31.	<i>Pulicaria glutinosa</i>	-	-	-	-	2	1	+	+	+	-	-	-	-	-	-
32.	<i>Reseda sphenocleoides</i>	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-
33.	<i>Salsola spinescens</i>	+	+	+	+	-	-	-	-	-	-	+	-	-	-	-
34.	<i>Salvadora persica</i>	-	-	-	3	3	1	1	1	1	3	4	-	-	-	-
35.	<i>Senna holosericea</i>	2	1	-	1	1	-	-	-	-	-	+	1	+	+	-
36.	<i>Senna hookerina</i>	+	-	-	-	-	+	+	+	+	-	-	-	-	-	-
37.	<i>Senna italica</i>	1	1	+	1	1	-	-	-	-	+	-	+	1	+	1
38.	<i>Tephrosia purpurea</i>	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-
39.	<i>Tribulus parvispinus</i>	+	-	-	-	-	+	+	+	+	-	-	-	-	-	-
40.	<i>Zygophyllum simplex</i>	2	2	3	1	2	2	3	2	1	-	-	+	4	3	+

P.S1 to P.S15 represents Plot Studied; 1, 2, 3, 4, + represents the cover abundance scale & - species not available at the Plot Studied.

Dominant Community Types (DCT)

The Distribution of the plant community types among their altitudinal ranges, location, the mean cover abundance values and the description of the four plant community types as follows:

I-Cymbopogon schoenanthus, this community type was widespread, along the study area, it found in four plots associated with *Cleome brachycarpa*, *Cleome paradoxa*, *Cleome trinerva*, *Cleome viscosa*, *Cometes abyssinica* and *Cyperus conglomeratus*; the abundance plant cover is about 40 %. (Table 3, plate 1).

Table 3: To Show *Cymbopogon schoenanthus* DCT with Its Associated Specie within the Studied Plots.

	Species Names	Studied Plots			
		5	6	7	8
1.	<i>Aerva lanata</i>	-	1	+	+
2.	<i>Aristida adscensionis</i>	+	-	-	-
3.	<i>Cenchrus ciliaris</i>	-	+	-	-
4.	<i>Chloris barbata</i>	-	-	-	+
5.	<i>Cleome brachycarpa</i>	+	3	3	3
6.	<i>Cleome paradoxa</i>	-	+	+	+
7.	<i>Cleome trinerva</i>	-	+	1	+
8.	<i>Cleome viscosa</i>	-	1	+	+
9.	<i>Cometes abyssinica</i>	-	+	+	+
10.	<i>Cymbopogon schoenanthus</i>	3	3	3	4
11.	<i>Dipterium glaucum</i>	2	-	+	-
12.	<i>Euphorbia granulata</i>	-	+	+	+

13.	<i>Forsskolea tenacissima</i>	-	2	1	1
14.	<i>Heliotropium bacciferum</i>	-	-	+	-
15.	<i>Pergularia tomentosa</i>	-	+	+	+
16.	<i>Pulicaria glutinosa</i>	2	1	+	+
17.	<i>Reseda sphenocleoides</i>	-	1	1	1
18.	<i>Salvadora persica</i>	3	1	1	1
19.	<i>Senna holosericea</i>	1	-	-	-
20.	<i>Senna hookerina</i>	-	+	+	+
21.	<i>Senna italic</i>	1	-	-	-
22.	<i>Tephrosia purpurea.</i>	-	+	+	+
23.	<i>Tribulus parvispinus</i>	-	+	+	+
24.	<i>Zygophyllum simplex</i>	2	2	3	2



Plate 1: The *Cymbopogon schoenanthus* Community Type

II-*Zygophyllum simplex*, this community type found in 4 sites and associated with *Acacia tortilis* subsp.*raddiana* and *tortilis*, *Diptergium glaucum*, *Heliotropium bacciferum*,

Senna holosericea, *Senna italica*, vegetation cover is about 45 % (Table 4, plate 2).

Table 4: To show *Zygophyllum simplex* Dominant Species and Its Associates with the Studied Plots.

	Species Names	Studied Plots			
		1	2	3	4
1.	<i>Acacia tortilis</i> subsp. <i>raddiana</i>	1	-	-	-
2.	<i>Aerva lanata</i>	+	-	-	-
3.	<i>Anticharis glandulosa</i>	2	1	-	1
4.	<i>Calotropis procera</i>	-	-	+	-
5.	<i>Cleome brachycarpea</i>	+	1	1	+
6.	<i>Cleome paradoxa</i>	-	+	-	-
7.	<i>Cleome viscosa</i>	+	-	-	-
8.	<i>Cometes abyssinica</i>	+	-	-	-
9.	<i>Cymbopogon schoenanthus</i>	+	+	+	3
10.	<i>Diptergium glaucum</i>	1	1	2	1
11.	<i>Euphorbia granulata</i>	+	+	+	+
12.	<i>Heliotropium bacciferum</i>	1	1	+	+
13.	<i>Leptadenia pyrotechnica</i>	+	-	-	-
14.	<i>Odontanthera radians</i>	+	+	+	+
15.	<i>Polycarpea repens</i>	+	+	+	+
16.	<i>Salsola spinescens</i>	+	+	+	+
17.	<i>Salvadora persica</i>	-	-	-	3
18.	<i>Senna holosericea</i>	2	1	-	1
19.	<i>Senna hookerina</i>	+	-	-	-
20.	<i>Senna italica</i>	1	1	+	1
21.	<i>Tribulus parvispinus</i>	+	-	-	-
22.	<i>Zygophyllum simplex</i>	2	2	3	1



Plate 2: Rocky Area with Vegetation Cover of *Zygophyllum simplex*

III-Salvadora persica community type, located at the end of the Wadi along the Wadi bed and sandy soils. It found along four sites and associated with *Pergularia tomentosa*,

Polycarpea repens, *Pulicaria glutinosa*, *Reseda sphenocleoides*, *Salsola spinescens* and *Senna hookeriana*; cover abundance about 50%. (Table5, plate 3).

Table 5: To Show the *Salvadora persica* DCT with Its Associated Species.

Species Names		Studied Plots			
		8	9	10	11
1.	<i>Acacia tortilis</i> subsp. <i>Raddina</i>	-	-	3	2
2.	<i>Acacia tortilis</i> subsp. <i>Tortilis</i>	-	-	3	3
3.	<i>Aerva lanata</i>	+	1	-	-
4.	<i>Anticharis glandulosa</i>	-	-	+	1
5.	<i>Calotropis procera</i>	+	-	-	-
6.	<i>Cenchrus ciliaris</i>	-	+	-	-
7.	<i>Chloris barbata</i>	-	-	-	+
8.	<i>Cleome brachycarpea</i>	3	4	-	-
9.	<i>Cleome paradoxa</i>	+	+	-	-
10.	<i>Cleome triverva</i>	+	1	-	-
11.	<i>Cleome viscosa</i>	+	+	-	-
12.	<i>Cometes abyssinica</i>	+	+	-	-
13.	<i>Cymbopogon schoenanthus</i>	2	3	-	-
14.	<i>Dipteridium glaucum</i>	-	-	+	1
15.	<i>Eragrostis papposa</i>	-	-	-	+
16.	<i>Euphorbia granulate</i>	+	+	-	-
17.	<i>Fagonia indica</i>	-	-	1	-
18.	<i>Fagonia paulayana</i>	-	-	-	+
19.	<i>Forsskolea tenacissima</i>	1	+	-	-
20.	<i>Heliotropium bacciferum</i>	-	-	+	+
21.	<i>Leptadenia pyrotechnica</i>	-	-	-	+
22.	<i>Odontanthera radians</i>	-	-	+	+
23.	<i>Pergularia tomentosa</i>	+	+	-	-
24.	<i>Polycarpea repens</i>	-	-	-	+
25.	<i>Pulicaria glutinosa</i>	+	+	-	-
26.	<i>Reseda sphenocleoides</i>	1	1	-	-
27.	<i>Salsola spinescens</i>	-	-	-	+
28.	<i>Salvadora persica</i>	1	3	3	4
29.	<i>Senna holosericea</i>	-	-	-	+
30.	<i>Senna hookeriana</i>	+	+	-	-
31.	<i>Senna italica</i>	-	-	+	-
32.	<i>Tephrosia purpurea.</i>	+	+	-	-
33.	<i>Tribulus parvispinus</i>	+	+	-	-
34.	<i>Zygophyllum simplex</i>	2	1	-	-



Plate 3: *Salvadora persica* Community Types with Association of *Acacia tortilis*

V-Acacia tortilis community type, widespread along the Wadi bed and the slopes too, it found in two subspecies types (*raddina* and *tortilis*). This community type distributed among six sites and

associated with *Anticharis glandulosa*, *Diptergium glaucum*, *Heliotropium bacciferum* *Senna holosericea* and *Senna italica*, their cover abundance about 40%. (Table 6, plate 4).

Table 6: To show the *Acacia tortilis* DCT with Its Associated Species

Species Names		Studied plots			
		12	13	14	15
1.	<i>Acacia tortilis</i> subsp. <i>raddina</i>	2	1	2	1
2.	<i>Acacia tortilis</i> subsp. <i>tortilis</i>	3	4	2	3
3.	<i>Aerva lanata</i>	-	-	+	-
4.	<i>Anticharis glandulosa</i>	+	+	-	-
5.	<i>Aristida adscensionis</i>	-	-	-	+
6.	<i>Cenchrus ciliaris</i>	-	-	+	+
7.	<i>Chloris barbata</i>	+	-	-	-
8.	<i>Cometes abyssinica</i>	-	-	+	-
9.	<i>Cymbopogon schoenanthus</i>	-	2	-	-
10.	<i>Cyperus conglomeratus</i>	-	1	-	1
11.	<i>Diptergium glaucum</i>	1	+	1	3
12.	<i>Eragrostis papposa</i>	+	-	-	-
13.	<i>Euphorbia granulata</i>	-	-	+	-
14.	<i>Fagonia indica</i>	-	+	-	-
15.	<i>Fagonia paulayana</i>	-	-	-	+
16.	<i>Forsskolea tenacissima</i>	-	+	-	-
17.	<i>Heliotropium bacciferum</i>	+	-	+	1
18.	<i>Indigofera arabica</i>	-	-	1	+
19.	<i>Indigofera argentea</i>	-	-	2	1
20.	<i>Leptadenia pyrotechnica</i>	+	-	-	-
21.	<i>Odontanthera radians</i>	+	-	-	-
22.	<i>Odysea mucronata</i>	-	3	-	1
23.	<i>Panicum turgidium</i>	-	-	1	+
24.	<i>Polycarpea repens</i>	+	-	-	-
25.	<i>Pulicaria glutinosa</i>	-	+	-	-
26.	<i>Reseda sphenocleoides</i>	-	-	+	-
27.	<i>Salsola spinescens</i>	+	-	-	-
28.	<i>Salvadora persica</i>	-	1	-	-
29.	<i>Senna holosericea</i>	1	+	+	-
30.	<i>Senna hookerina</i>	-	-	+	-
31.	<i>Senna italica</i>	+	1	+	1
32.	<i>Tribulus parvispinus</i>	-	+	-	-
33.	<i>Zygophyllum simplex</i>	+	4	3	+



Plate 4: *Acacia tortilis* Community Type

Life -form Spectrum

According to the life form classification of [21] and as shown in (Table 7& Fig 1) the Hemicryptophyte and Therophytes were the most dominant life form, constituted by 13 species representing (32.5%] each of the total recorded species followed by the chamaephytes occurred by 10 species (25%). On the other hand, three species of the Phanerophyte estimated 7.5 % conducted of the total recorded taxa. Cryptophytes have the lowest contribution by one species of *Cyperus conglomeratus*, with a percentage of 2.5%.

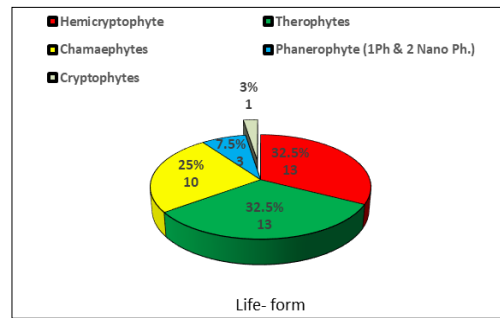


Fig 2: Life-form Spectrum of Flora of Delta outlet of Wadi Kharaz (numbers and percentage are inserted inside the circle)

Phytogeographical Data

Regarding the global floristic regions, monoregional and biregional constructed as phytochoria regions (Table7 & Fig 2) 23 species representing 57.5 % fell under monoregional region. In this area the highest number of 9 species was recorded in Somali-Masai(22.5 %), Sudano-Zambeziian was represented with 4 species (10%), Pantropical was represented with 3 species (7.5%), Arabian with 2 species (5%), whereas the lowest one which estimated by 5 species of each recoded in Afro-mountain, Nebo- sind, Tropical, Saharo-Arabian and Iran-Turan regions. Biregional area included the larger number of species (17 species with 42.5 %). Also in this region, 7 species (17.5%), shared by Saharo -Arabian and Sudano-Zambeziian, Saharo-Arabian and Iran-Turan represented with 4 species [10%), Saharo-Arabian and Somali-Masai, Saharo-Arabian and Sindian were represented with 2 species [5%) each, whereas the lowest are represented in Saharo-Arabian and Tropical as well as Mediterranean and Iran-Turan regions by only one species (2.5%) each.

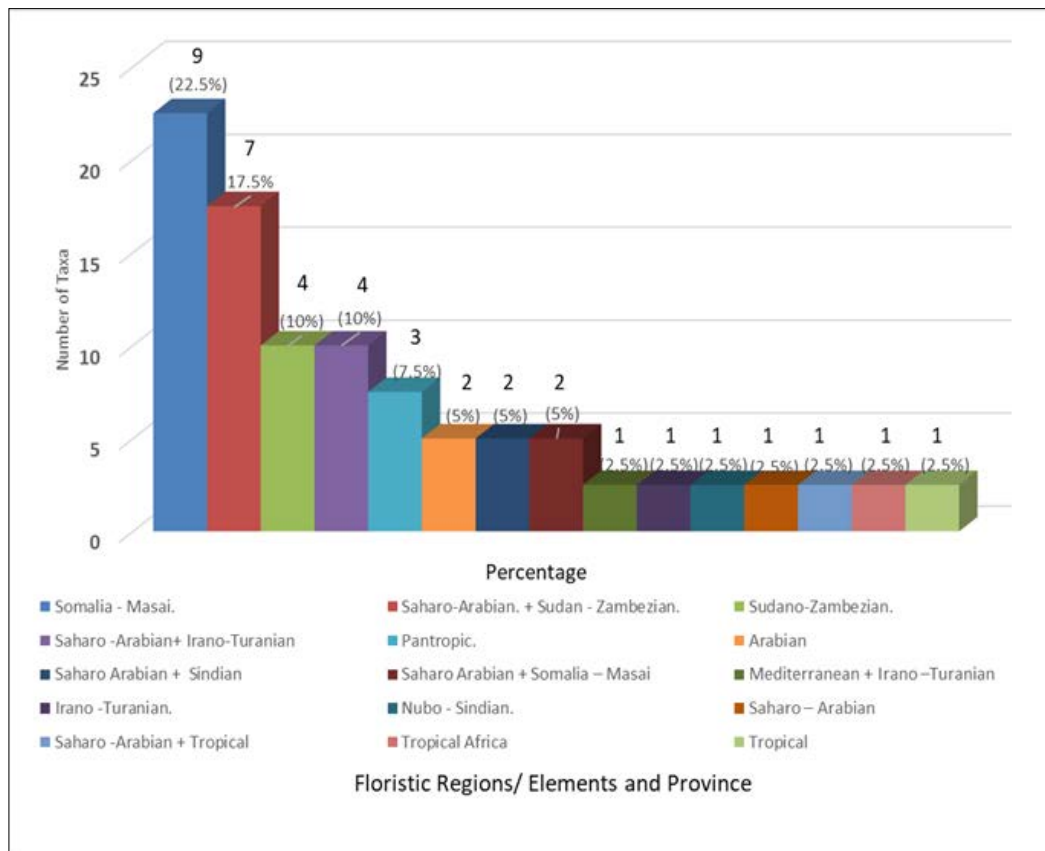


Fig 3: The Phytogeographical affinities on the Flora of Delta outlet of Wadi Kharaz and their Percentage.

Discussion

Fourty plant species belonging to 32 genera and 19 families recorded from study area. The floristic analysis revealed the most abundant plant_family_in the study area_are Poaceae. These findings were in accordance with those of [5, 6, 25]. The abundance

of the Annual might be due to water availability, including annual precipitation and soil properties [26]. Four plant dominant community types identified and described with varying degrees of species richness, evenness and diversity. The third and fourth plant communities (*Salvadora persica*)

exhibited the highest richness (34 species) and (*Acacia tortilis*) with 33 species. The increase in the number of samples increased the species encountered [5, 14]. This result could be attributed to variations in their environmental gradients that can limit the ecological distributions of plant species [6]. Moreover, the area covered by these plants was large in size and occupied vast area of the quadrates.

The community types *Cymbopogon schoenanthus* (I) and *Zygophyllum simplex* (II) appeared with the lowest species richness (22 and 24 species each).

On the other hand, *Senna italica*, *Odyssea mucronata*, *Heliotropium bacciferum*, *Cleome viscosa*, *Halopeplis perfoliata*, *Cyperus conglomeratus* and *Dipterium glaucum* recorded from the sample plots of the study area. This result matches that of [5, 6], as well as, the association of various species in plant communities (I) *Cymbopogon schoenanthus* and (II) *Zygophyllum simplex* is in agreement with [20]. Life forms were diverse and the vegetation is sparse; Therophytes and Hemicryptophyte were dominant,

referring to the ephemeral (or annual) vegetation that can be accompanied by permanent plant growth depending on the amount of precipitation in a given year as indicated with the finding of [4]. Moderate cover abundance in the study area may be due to the soil mobility, as indicated by [5&6]. The dominance of Therophytes and Hemicryptophyte over other life forms seen to be an outcome of hot dry climate, topographic variation, human and animal interference [4&23]. The high contributions of Therophytes lead to adjustment of the flora to water balance, so the phytoclimate of the study area classified as Thero-Hemicryptophytic type. Phytogeographical Data analysis indicated that Monoregional elements are more dominant than Biregional elements. The Somali- Masai represented with 9 species and 22.5%, while the highest in Biregional area, is Saharo-Arabian. + Sudan - Zambebian with 7 species and 17.5%. These results are in accordance with several reports proceeded in different regions of Yemen [6, 8, 14, 16].

Table 7: Collected Plant Species with Their Floweristic Composition, Life Forms and Chorotype

Family	Genera Numbers	Species Name	Life form	Chorotype
Amaranthaceae	<i>Aerva</i> (1 sp.)	<i>Aerva lanata</i>	Ch.	SA + Ir.-Tur
Asclepiaceae	<i>Calotropis</i> (1 sp.)	<i>Calotropis procera</i>	Nano Ph.	SA + Ir.-Tur.
	<i>Leptadenia</i> (1 sp.)	<i>Leptadenia pyrotechnica</i>	Ch.	SA.+ Ir.-Tur
	<i>Odontanthera</i> (1 sp.)	<i>Odontanthera radians</i>	Ch.	TR.
	<i>Pergularia</i> (1 sp.)	<i>Pergularia tomentosa</i>	Ch.	SA. + Sind.
Asteraceae	<i>Pulicaria</i> (1 sp.)	<i>Pulicaria glutinosa</i>	He.	SM.
Boraginaceae	<i>Heliotropium</i> (1 sp.)	<i>Heliotropium bacciferum</i>	He.	Ir.-Tur.
Caesalpinaceae	<i>Senna</i> (3 sp.)	<i>Senna hookerina</i>	Ch.	Arab. *
		<i>Senna italica</i>	Ch.	SA. + SZ.
		<i>Senna holosericea</i>	Ch.	SM.
Capparaceae	<i>Dipterium</i> (1 sp.)	<i>Dipterium glaucum</i>	Th.	SA. + SZ.
Chenopidiaceae	<i>Salsola</i> (1 sp.)	<i>Salsola spinescens</i>	Ch.	SM.
Cleomeaceae	<i>Cleome</i> (4 sp.)	<i>Cleome brachycarpa</i>	He	SA.+TR.
		<i>Cleome paradoxa</i>	He	SZ.
		<i>Cleome triverva</i>	Th	SZ.
		<i>Cleome viscosa</i>	He	SM.
Cyperaceae	<i>Cyperus</i> (1 sp.)	<i>Cyperus conglomeratus</i>	Cr	SA.
Euphorbiaceae	<i>Euphorbia</i> (1 sp.)	<i>Euphorbia granulate</i>	Th	SA. + Ir.-Tur.
Fabaceae	<i>Indigofera</i> (2 sp.)	<i>Indigofera arabica</i>	He	SM.
		<i>Indigofera argentea</i>	He	SA. + SZ.
	<i>Tephrosia</i> (1 sp.)	<i>Tephrosia purpurea</i> .	He	SZ.
Mimosaceae	<i>Acacia</i> (2 ssp.)	<i>Acacia tortilis</i> subsp. <i>Raddiana</i>	Nano Ph.	SA. + SZ.
		<i>Acacia tortilis</i> subsp. <i>Tortilis</i>	Ph.	SM.
Poaceae	<i>Aristida</i> (1 sp.)	<i>Aristida adscensionis</i>	Th	Pan.
	<i>Cenchrus</i> (1 sp.)	<i>Cenchrus ciliaris</i>	He	Pan.
	<i>Chloris</i> (1 sp.)	<i>Chloris barbata</i>	Th	SZ.
	<i>Cymbopogon</i> (1 sp.)	<i>Cymbopogon schoenanthus</i>	He	Nub. -Sind.
	<i>Eragrostis</i> (1 sp.)	<i>Eragrostis papposa</i>	Th	Pan.
	<i>Odyssea</i> (1 sp.)	<i>Odyssea mucronata</i>	Ch.	SA.-SM.
	<i>Panicum</i> (1 sp.)	<i>Panicum turgidium</i>	He	SA. + SZ.
Polycarpeaceae	<i>Cometes</i> (1 sp.)	<i>Cometes abyssinica</i>	Th	SM.
	<i>Polycarpea</i> (1 sp.)	<i>Polycarpea repens</i>	Th	SA.+SM.
Resedaceae	<i>Reseda</i> (1 sp.)	<i>Reseda sphenocleoides</i>	He	Arab.*
Salvadoraceae	<i>Salvadora</i> (1 sp.)	<i>Salvadora persica</i>	Ch.	SA.+SZ
Scrophyllaraceae	<i>Anticharis</i> (1 sp.)	<i>Anticharis glandulosa</i>	Th	T. Afr.
Urticaceae	<i>Forsskaolea</i> (1 sp.)	<i>Forsskaolea tenacissima</i>	He	SM
Zygophyllaceae	<i>Fagonia</i> (2 sp.)	<i>Fagonia indica</i>	Th	SA. + Sind.
		<i>Fagonia paulayana</i>	Th	SA. + SZ.
	<i>Tribulus</i> (1 sp.)	<i>Tribulus parvispinus</i>	Th	Medit. + Ir.-Tur.
	<i>Zygophyllum</i> (1 sp.)	<i>Zygophyllum simplex</i>	Th	SM.

Ch.: Chamaephytes; Cr: Cryptophytes; He: Hemicryptophytes; Ph.: Phanerophytes & Th: Therophytes. Ir.-Tur. =Irano.-Turanian., Medit.=Mediterranean, Pan. =Pantropical, SA. = Saharo.-Arabian, T. Afr. = Tropical Africa, SM= Somali- Masai, SZ= Sodano. - Zambebian, TR. =Tropical, Nub.-Sind = Nubo. - Sindian, Arab = Arabian * = Endemic.

Conclusions

The floristic composition and community structure along the study area mainly determined by climatic condition, but it

strongly influenced by the human and its animal's activities, which disturbed the equilibrium of the ecosystem and implicitly affected the entire vegetation types. The results

here obtained reflect the physiognomy, floristic composition, and ecology of this plant community in the area, show how poor and delicate the vegetation of the study area.

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