

Floristic Features of the Plant Communities of Wadi Mukheil (Alkharj Province), KSA

Dakhil H. Al-Dosari¹, Saud L. Al-Rowaily¹, Ahmed M. Abd-ElGawad^{1,2,}*

¹Plant Production Department, College of Food & Agriculture Sciences, King Saud University, Saudi Arabia

²Department of Botany, Faculty of Science, Mansoura University, Mansoura 35516, Egypt

* **Correspondence to:** aibrahim2@ksu.edu.sa, dgawad84@mans.edu.eg; Tel.: +201003438980

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Abstract The current study investigates the floristic aspects of Wadi Mukheil (Alkharj Province), KSA, including a list of plant species, life-span, life-form spectra, and floristic analysis of the plant life. Floristically, the total number of the recorded flowering plant species in the present study is 39, belonging to 20 families. Chenopodiaceae, Asteraceae, Poaceae and Asclepiadaceae are the main families being represe

nted collectively by 15 species or about 38.46% of the total number of the recorded species. The recorded species are classified under 4 types of life-form according to the Raunkiær system Chamaephyte, Hemicryptophyte, Therophytes, Phanerophyte, make up the bulk of plants. The floristic analysis of the research region indicates that monoregional Saharo-Arabian and Sudan-Zambezians representing about 14 and 8 species, respectively. Some of the plants found in the study area belong to both regions (Saharo-Arabian + Sudano-Zambezian; Irano-Turanian + Saharo-Arabian), as well as, the group of plants belonging to the Euro-Siberian - Med - Irano-Turanian regions.

keywords: Wadi Mukheil, Floristic, Vegetation, Alkharj Province, KSA.

1. Introduction

Saudi Arabia covers a considerable portion of the Arabian Peninsula and is known for its diverse range of habitats and environments [1]. A dry and hot climate prevails most days of the year in Saudi Arabia, except for the southwestern region, where the distribution of vegetation cover is affected by the influence of the latter by soil, climate, surface features and rainfall. Soil moisture factor is the most influential factor in the distribution of vegetation cover in desert areas. Soil moisture and its quantity are related to the morphometric characteristics of drainage basins in dry areas [2]. When rain falls, it works to feed the valleys with water and water flow occurs in them. Surface runoff and the natural conditions that are affected by it, such as the discrepancy in the amounts of rain between abundance in the rainy season, complete interruption in the dry season, the morphometrics of the region, its geological structure and the materials that make up the surface of the soil, all are important natural data that affect the dominant natural vegetation in

the area and have their own effects among the landforms in the study area [3].

The vegetation cover spreads in desert areas relatively far apart in light of the scarcity of water resources and soil moisture, with some adaptations that help growth, such as the small size of the leaf and the transformation of leaves into thorns, covering the surface of the leaf with hairs in addition to changing the direction of the leaves to avoid direct sunlight. Furthermore, most of the perennial desert plants tend to grow in the bed of low wadis in which rain water collects, which helps them to store quantities of moisture for relatively long periods that the plant can benefit from in difficult days [4].

Despite the large number of floristic published studies [5-8] (Migahid 1996, Collenette 1999; Chaudhary 1999; Chaudhary 2001) and more recent studies such as Al-Turki [9], Al-Turki and Al-Olyan [10] and El-Ghanim et al. [11] and Al-Mutairi et al. [12], there is still scarcity in the information about the

diversity and distribution of plants in Saudi Arabia. This work mainly aims to study the floristic features and floristic categories of the Wadi Mukheil (Alkharj Province), KSA.

2. Materials and Methods

2.1. Study area

Wadi Mukheil (Alkharj Province), KSA is one of the tributaries of Wadi Al-Sahba, which flows from north to south in the east of the fertile Al-Kharj alluvial plain in the Riyadh region in the Kingdom of Saudi Arabia. The Wadi Mukheil situated from 24°12' - 24°25' N and 47°54' - 48°03' E (Figure 1). It is descending from north to south from heights ranging between 450 and 500m and flows into the Wadi al-Sahba stream, south of the northern al-Sahba stream, at an altitude of 366 m. The course of Wadi Makahil was determined using the descriptive analytical method, with the help of geographic information systems, and a set of thematic maps, such as topographic maps, valley maps, soil and geology, in addition to aerial photographs (Figure 1).

2.2. Study and analysis of vegetation cover

The vegetation cover was analyzed on each of the five ranks of the watercourses in Wadi Makahil, where five sites were chosen in each rank to be distributed to represent the rank along the valley. In each site, squares with an area of 100 m² were made. The sites were placed across the research region to cover a variety of habitats and to guarantee that a diverse range of vegetational variables was sampled. This study's taxonomy of living forms was based on Raunkiaer's [16] categorization scheme. For classification, identification, nomenclature, and floristic categories, Migahid [13], Chaudhary [14,15,7] and Collenette [6] were utilized

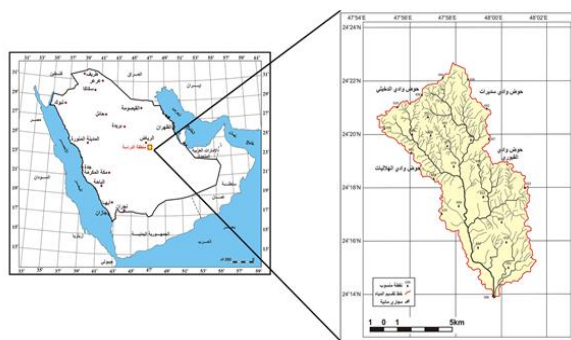


Fig 1: Map showing the study area (Wadi Mukheil, Alkharj Province, KSA).

3. Results and Discussion

3.1. Floristic analysis of the study area

Table 1 refers to the floristic analysis of the study area and includes a list of the recorded plants, their plant families, lifespan, life styles according to the Raunkiaer system, and the botanical geographical distribution. The records of plant species in the study area are 39.

Several studies have indicated that various environmental factors such as temperature, rainfall, topography, morphometric variables, soil composition, and others are among the factors affecting the determination of the geographical distribution of plants and the optimum environment for their growth, where temperature is one of the most important factors affecting the distribution of plants on the surface of the ball floor.

These species are classified as shown in Figure (2) into two major groups according to the plant longevity: 32 perennial species (82%) and 7 annual species (18%) of the total number of plant species present in the study area. The dominance of perennial species ($\geq 80\%$) provides the permanent character of the plant cover in the wadi. This may be credited to the rather short rainfall, which is not adequate for the appearance of many annuals

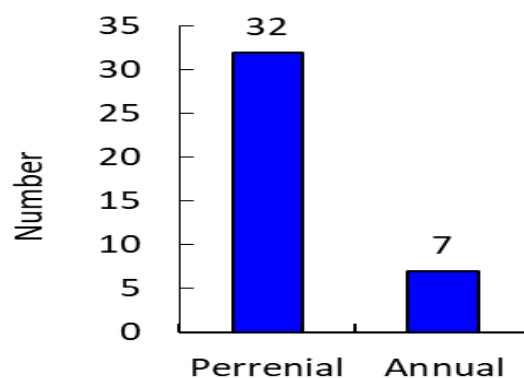


Fig 2: Plant life span in the study area

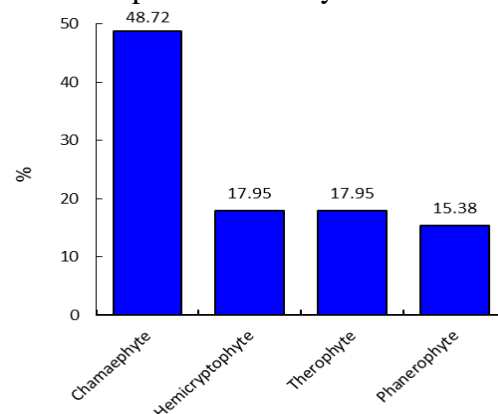


Fig 3. Plant life forms in the study area

Table 1. Plant species documented of the different environments in the study area.

No.	Species	Family	Life span	Life form	Chorotype
1	<i>Acacia ehrenbergiana</i> Hayne	Fabaceae	Perennial	Phanerophyte	Saharo-Arabian, Sudano-Zambezian
2	<i>Acacia seyal</i> Del.	Fabaceae	Perennial	Phanerophyte	Sudano-Zambezian
3	<i>Acacia tortilis</i> (Forssk.) Hayne	Mimosaceae	Perennial	Chamaephyte	Sudano-Zambezian
4	<i>Achillea fragrantissima</i> (Forssk.) Schi.-Bip.	Asteraceae	Perennial	Hemicryptophyte	Irano-Turanian - Saharo-Arabian
5	<i>Alhagi graecorum</i> Boiss.	Papilionaceae	Perennial	Hemicryptophyte	Med - Irano-Turanian
6	<i>Anthoxanthum odoratum</i> L.	Poaceae	Perennial	Hemicryptophyte	Euro-Siberian - Med - Irano-Turanian
7	<i>Anvillea garcini</i> (Burm.f.) DC.	Asteraceae	Perennial	Chamaephyte	Saharo-Arabian
8	<i>Artemisia sieberi</i> Besser	Asteraceae	Perennial	Chamaephyte	Saharo-Arabian
9	<i>Astragalus bombycinus</i> Boiss.	Papilionaceae	Annual	Hemicryptophyte	Irano-Turanian - Saharo-Arabian
10	<i>Atractylis carduus</i> (Forssk.) C. Christ.	Asteraceae	Perennial	Chamaephyte	Saharo-Arabian
11	<i>Barleria parviflora</i> R. Br. ex T.Anderson	Acanthaceae	Perennial	Chamaephyte	Saharo-Arabian
12	<i>Bassia eriophora</i> (Schrader) Asch.	Chenopodiaceae	Annual	Therophyte	Saharo-Arabian, Sudano-Zambezian
13	<i>Bassia muricata</i> (L.) Asch.	Chenopodiaceae	Annual	Therophyte	Irano-Turanian - Saharo-Arabian
14	<i>Blepharis ciliaris</i> (L.) B.L. Burtt.	Acanthaceae	Perennial	Chamaephyte	Irano-Turanian - Saharo-Arabian
15	<i>Calotropis procera</i> (Aiton) Aiton f.	Asclepiadaceae	Perennial	Phanerophyte	Sudano-Zambezian
16	<i>Chrozophora tinctoria</i> (L.) A. Juss.	Euphorbiaceae	Annual	Therophyte	Med - Irano-Turanian
17	<i>Convolvulus oxyphyllus</i> ssp. <i>sheilae</i> R. Mill.	Convolvulaceae	Perennial	Chamaephyte	Sudano-Zambezian
18	<i>Convolvulus oxyphyllus</i> ssp. <i>oxycladus</i> Rech. f.	Convolvulaceae	Perennial	Chamaephyte	Saharo-Arabian
19	<i>Cleome amblyocarpa</i> Barratte & Murb.	Capparaceae	Annual	Therophyte	Saharo-Arabian, Sudano-Zambezian
20	<i>Cleome ramosissima</i> Webb.	Capparaceae	Perennial	Therophyte	Saharo-Arabian, Sudano-Zambezian
21	<i>Citrullus colocynthis</i> (L.) Schrader	Cucurbitaceae	Perennial	Hemicryptophyte	Saharo-Arabian
22	<i>Cymbopogon schoenanthus</i> (L.) Sprengel	Poaceae	Perennial	Hemicryptophyte	Sudano-Zambezians
23	<i>Ephedra alata</i> Decne.	Ephedraceae	Perennial	Chamaephyte	Saharo-Arabian
24	<i>Fagonia arabica</i> L.	Zygophyllaceae	Perennial	Chamaephyte	Saharo-Arabian
25	<i>Glossonema varians</i> (Stocks) Benth.	Asclepiadaceae	Perennial	Phanerophyte	Med - Irano-Turanian
26	<i>Gymnocarpus decandrus</i> Forssk.	Caryophyllaceae	Perennial	Chamaephyte	Saharo-Arabian
27	<i>Gymnocarpus sclerocephalus</i> (Decne.) Dahlgren & Thulin	Caryophyllaceae	Perennial	Chamaephyte	Saharo-Arabian
28	<i>Haloxylon salicornicum</i> (Moq.) Bunge	Chenopodiaceae	Perennial	Chamaephyte	Sudano-Zambezian
29	<i>Heliotropium aegyptiacum</i> Lehm.	Boraginaceae	Annual	Chamaephyte	Med - Irano-Turanian
30	<i>Lycium shawii</i> Roem. & Schult.	Solanaceae	Perennial	Phanerophyte	Saharo-Arabian, Sudano-Zambezian
31	<i>Panicum turgidum</i> Forssk.	Poaceae	Perennial	Chamaephyte	Saharo-Arabian, Sudano-Zambezian
32	<i>Pergularia tomentosa</i> L.	Asclepiadaceae	Perennial	Chamaephyte	Sudano-Zambezian
33	<i>Polygala erioptera</i> DC.	Polygalaceae	Perennial	Therophyte	Saharo-Arabian
34	<i>Pulicaria undulata</i> (L.) C.A.Mey.	Asteraceae	Perennial	Chamaephyte	Saharo-Arabian, Sudano-Zambezian
35	<i>Rhanterium epapposum</i> Oliv.	Asteraceae	Perennial	Chamaephyte	Saharo-Arabian
36	<i>Stipagrostis ciliata</i> (Desf.) de Winter	Poaceae	Perennial	Hemicryptophyte	Saharo-Arabian
37	<i>Tribulus terrestris</i> var. <i>robustus</i>	Zygophyllaceae	Annual	Therophyte	Euro-Siberian - Med - Irano-Turanian
38	<i>Zilla spinosa</i> (L.) Prantl.	Brassicaceae	Perennial	Chamaephyte	Saharo-Arabian
39	<i>Ziziphus mucronata</i> Willd.	Rhamnaceae	Perennial	Phanerophyte	Sudano-Zambezian

Abbreviations: Med: Mediterranean.

3.3. Plant Life-Forms in the Study Area

The recorded species of the present study are classified under 4 types of life-form according to the Raunkiaer system (Raunkiaer 1934) as follows: chamaephytes (48.72%), hemicryptophytes (17.95%), therophytes (17.95%) and phanerophytes (15.38%) (Figure 3). Chamaephyte, which is the surface plants. These perennial plants have buds on fixed stems near the surface of the soil; They are woody plants with shoots close to the soil surface, and they grow to a maximum of 25 cm above the soil surface. Hemicryptophyte plants are semi-hidden plants with buds on or near the surface of the soil. Therophytes, which quickly complete their lives in favorable conditions and tolerate the unfavorable cold or dry season in the form of seeds. Many desert plants are necessarily plants of this type. The final life type is Phanerophyte, which are the visible plants. These plants, which are usually woody and perennial, grow in the air, with their buds rising to more than 50 cm above the soil surface.

3.4. The Floristic Analysis of the Study Area

Table (2) indicates the plant families of the species registered in the study area, which are (39) plant species belonging to 20 families. The Asteraceae family represents 6 plant species with a percentage of 15.38% of the total number of plant species, followed by the Poaceae family, to which three plant species are present in the study area, which amounted to 10.26% of the total number of plant species. The Asclepiadaceae and Chenopodiaceae families, each of which was represented by three plant species, amounting 7.69% of the total number of plant species in the study area. Then the Acanthaceae, Capparaceae, Caryophyllaceae, Convolvulaceae, Fabaceae, Papilionaceae and Zygophyllaceae families, each of which was represented by two plant species, amounting 5.13% of the total number of plant species in the study area. The remaining plant families, which numbered (9 families) (Boraginaceae, Brassicaceae, Cucurbitaceae, Ephedraceae, Euphorbiaceae, Mimosaceae, Polygalaceae, Rhamnaceae and Solanaceae), they were represented by only one species, each of which represented 2.56% of the total number of plant species found in the study

region.

Table 2. The plant families of the species recorded in the study area.

	Family	Number of species	%
1	Asteraceae	6	15.38
2	Poaceae	4	10.26
3	Asclepiadaceae	3	7.69
4	Chenopodiaceae	3	7.69
5	Acanthaceae	2	5.13
6	Capparaceae	2	5.13
7	Caryophyllaceae	2	5.13
8	Convolvulaceae	2	5.13
9	Fabaceae	2	5.13
10	Papilionaceae	2	5.13
11	Zygophyllaceae	2	5.13
12	Boraginaceae	1	2.56
13	Brassicaceae	1	2.56
14	Cucurbitaceae	1	2.56
15	Ephedraceae	1	2.56
16	Euphorbiaceae	1	2.56
17	Mimosaceae	1	2.56
18	Polygalaceae	1	2.56
19	Rhamnaceae	1	2.56
20	Solanaceae	1	2.56
	Total	39	100%

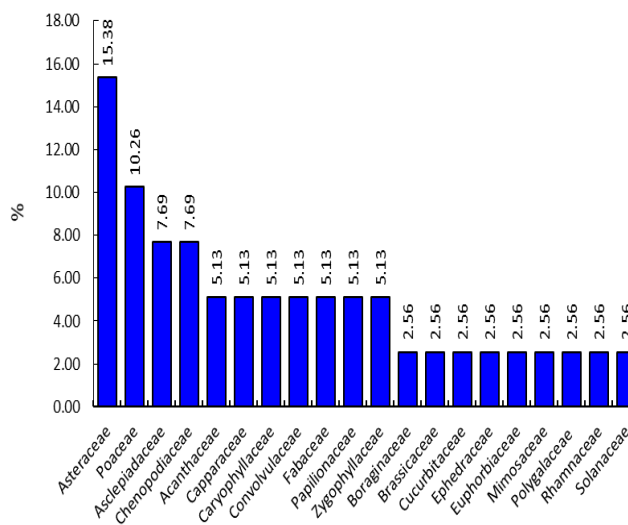


Fig 4: Percentages of plant families for the species registered in the study area.

Figure (3) reveals that the floristic categories of the plant species recorded in the study area, where it is clear that there are (14) plant species of the plants of the Saharo-Arabian, which is a vegetation area covered by hot and semi-desert deserts and savannah and represents about 35% of Total plant species identified in the study area (Figure 3). As for the Sudan-Zambezians, it is an African region with vast areas of forests, savannas and pasture plants, with flourishing forests and sometimes dry forests, and the

number in the study area is 8 plant species, representing about

20.51% of the total plant species that have been identified in the study area (Figure 3). Some of the plants found in the study area belong to both regions (Saharo-Arabian, Sudano-Zambezian), and their number in the study area is 7 plant species, representing about 17.95% of the total plant species that were identified in the study area.

There are a number of plants that were found in the study area belonging to the Irano-Turanian and Saharo-Arabian, and their number in the study area is 4 plant species, representing about 10.26% of the total plant species that were identified in study area. As for the number of plants that were found in the study area, they belong to the middle of the Iranian-Turanian region. Their number in the study area is 4 plant species, and they also represent about 10.26% of the total plant species that were identified in the study area. Finally, the group of plants belonging to the Euro-Siberian - Med - Irano-Turanian regions. Their number in the study area is 2) plant species and represents about 5.13% of the total plant species that were identified in the study area.

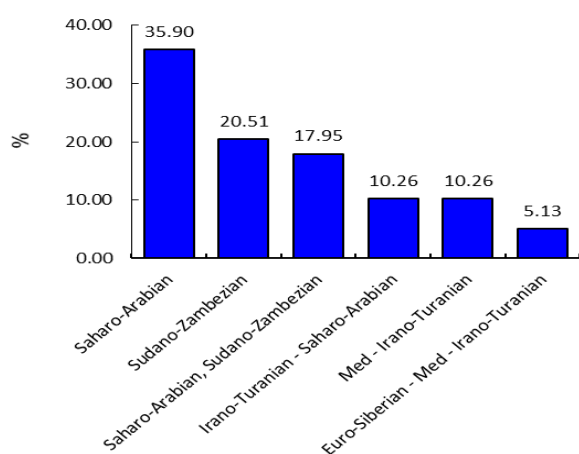


Fig 5. Percentage of various floristic category in the study area.

4. Conclusion

The present study provided an assessment of the vegetation and plant diversity in Wadi Mukheil (Alkharj Province), KSA to help in management and conservation of these natural resources. Different types of human impacts, including urbanization, agriculture, mining and quarrying, over collection and over cutting of woody species threaten biodiversity of Wadi

Therefore, the conservation of natural habitats of this desert is of vital importance. The recorded 39 plant species can play a vital role in the economic and medicinal purposes. Hence, for the Arabian Peninsula, especially the wadi vegetation, there is the need for judicious utilization and sustainable development

4. References

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