

# Plant Diversity in Some Habitats in Saudi Arabia with Its Economic Uses

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**Abstract:** In this study 236 species representing 10 families, were collected from different habitats in the Kingdom of Saudi Arabia. The family Asteraceae is represented by the highest number of species (55 species), followed by the Fabaceae (40 species), the Chenopodiaceae and Poaceae (each of them 22 species), the Lamiaceae and Zygophyllaceae (each of them 18 species), the Brassicaceae (17 species), the Asclepiadaceae and Solanaceae (each of them 15 species), and the Euphorbiaceae (represented by 14 species). Identification was carried out, and the updated scientific names and vernacular names with their families are cited. The economic uses (medicinal and industrial) of such species were presented in a cumulative table. This work clarifies the very common, common, rare, and very rare plants inside the ten families and also clarifies the plant diversity of the medicinal plants in the Kingdom Saudi Arabia. So, I recommended the conservation of such valuable plants for sustainable development.

**Keywords:** Plant diversity, Medicinal plants, Economic plants, Habitats, Saudi Arabia.

## 1. Introduction

One crucial element of our terrestrial ecosystems that plays a crucial part in preserving a region's environmental stability is the diversity of its native flora [1]. The floral diversity helps to maintain soil improvement, slopes, and adverse weather conditions, as well as providing habitat for wildlife [2]. Saudi Arabia contains a sizable expanse of desert lands (about more than 2.25 million km<sup>2</sup>), which encompass a significant portion of the Arabian Peninsula and are distinguished by a variety of ecosystems that differ in their plant diversity [3, 4]. According to the climatic and geographic variations, there are nine phytogeographical regions viz. sand sheets, dunes, deserts (sandy and gravelly), coastal plains, mountains, wades, volcanic zones, and hills [5, 6]. The plant diversity clearly appears in Saudi Arabia [3]. There are roughly 200 regional endemics, 2290 species, and 855 genera (including pteridophytes and gymnosperms) within its 131 families [7, 8]. The Kingdom's flora contains significant genetic resources for crops, xerophytic vegetation, and medicinal plants, making it one of the Arabian Peninsula's biodiversity hot spots [9].

The major publications dealing with the entire or partly flora of Saudi Arabia is those of [10, 11, 12]. These studies include valuable but insufficient information about the flora of Saudi Arabia in their habitats. Also, few publications dealt with the industrial and the medicinal uses of the flora in Saudi Arabia as [13]. The report by [14].

States that Saudi Arabia's northwest and southwest are the most densely vegetated and have the greatest variety of species, with almost 70% of the nation's plant species being reported from these regions. [12] Stated that survey of annual plants, that denote 60-70% of the total vegetation cover often causes in an incomplete list of species because of the variant in

the dormancy period of the seeds or the fluctuating climatic circumstances. To support ecosystems and preserve ecological balance and stability, not only in the Kingdom of Saudi Arabia but also around the world, plant diversity is essential. Since ancient times, various plant species have been employed in ethnomedicine [15, 16]. Due to the deficient data on the medicinal plants in Saudi Arabia, the current study aimed to providing an update list of the medicinal plants in their natural habitats in Saudi Arabia including identification, nomenclature (Scientific and vernacular names) with author citation, growth type, abundance. Also, it is thrown light about their uses especially the medicinal and industrial.

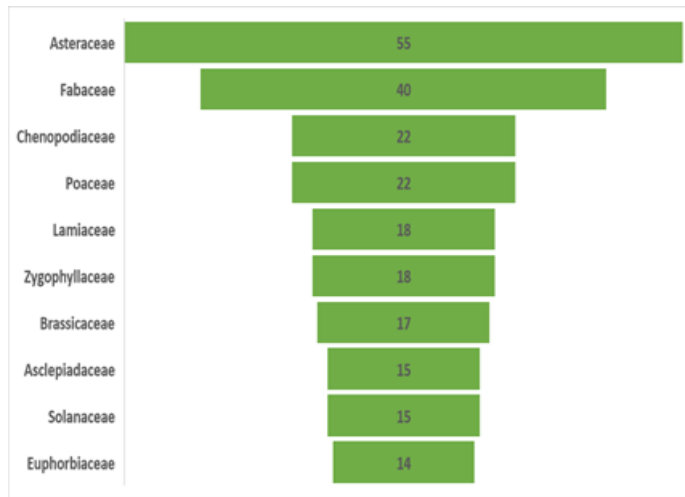
## 2. Materials and methods

In this study, 236 species of 10 families and 129 genera were collected from different habitats in Saudi Arabia during the period from 2021 - 2023. These species were identified according to [10, 11, 17, 18]. Also, the updated names are cited according to [19]. Plant species abundance was measured using visual cover estimates and presence/absence measurements [20]. Economic uses were clarified according to the information collected from the native inhabitants and literature review [21, 22, 23, 24].

## 3. Results:

### 3.1. Taxonomic diversity

Table A1 showed that the total number of the recorded species is 236 species related to 10 families were identified. The archichlamydic families are four (Fabaceae, Chenopodiaceae, Zygophyllaceae and Brassicaceae). While the sympetalic families are five, Asteraceae, Lamiaceae, Asclepiadaceae, Solanaceae and Euphorbiaceae. The monocotyledonous family is Poaceae.



**Figure 1:** Descending arrangement of the recorded species.

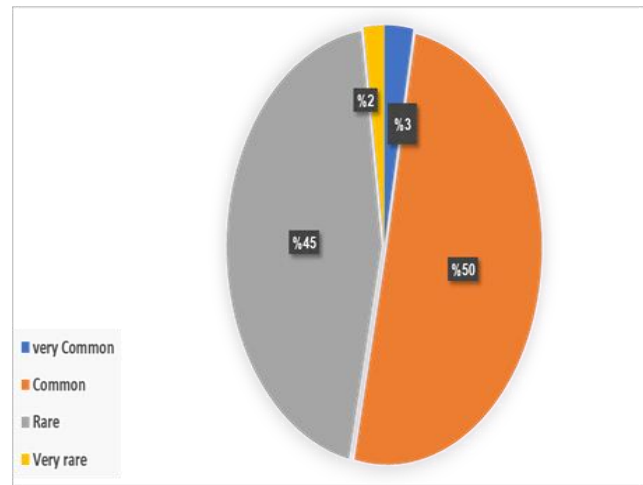
In Figure 1, the recorded species was arranged descendingly as follows: Asteraceae (55 species) → Fabaceae (40 species) → Chenopodiaceae (22 species) → Poaceae (22 species) → Lamiaceae (18 species) → Zygophyllaceae (18 species) → Brassicaceae (17 species) → Asclepiadaceae (15 species) → Solanaceae (15 species) → Euphorbiaceae (14 species).

### 3.2 Growth type

The growth type of the collected 236 species in this study was varied between perennials, annuals, short-lived perennial, biennial, subshrub, shrub, small tree, and trees. Most growth type of the recorded species was perennials, followed by the annuals. *Calotropus procera* (Aiton) W. T. Aiton, *Haloxylon persicum* Bunge ex Boiss., *Suaeda monoica* Forssk and *Nicotiana glauca* R. C. Graham were Shrub or small tree. While *Ambrosia maritima* L., *Farsetia stylosa* R.Br. in Denham and Clapp., *Suaeda aegyptiaca* (Hasselq.) Zohary, *Argyrolobium arabicum* (Decne.) Jaub. and Spach, *Lotononis platycarpa* (Viv.) Pic. Serm., *F. paulayana* Wagner and Vierh., *Fagonia schweinfurthii* (Hadidi) Hadidi, *Tribulus pentandrus* Forssk. and *Zygophyllum simplex* L. were annual or short-lived perennial. Moreover, *Anthemis yemenensis* Podlech., *Farsetia ramosissima* Hochst. ex Fourn., *Euphorbia granulate* Forssk, *Ricinus communis* L., *Crotalaria leptocarpa* Balf. f., *Fagonia ovalifolia* Hadidi and *Fagonia schweinfurthii* (Hadidi) Hadidi were annual or perennial. *Lactuca serriola* L. and *Launaea sonchoides* (Jaub. and Spach.) Kuntze were Annual or biennial. One species (*Hyoscyamus muticus* L.) was Perennial or shrub. and *Leptadenia pyrotechnica* (Forssk.) Decne was Perennial and succulent. Also, *Withania somnifera* (L.) Dunal in DC., *Fagonia bruguieri* DC. and *Fagonia indica* Burm. F. were Subshrub or perennial (Table A1).

### 3.3 Abundance

Among the recorded species, the results clarified the presence of three endemic species, five endangered and 108 rare to very rare species while the rest of the studied species (120 species) are common to very common (Table A1). Figure 2 demonstrated the percent of common species was 51% of recorded species while the percent of rare species was 45%. Moreover, the lowest percent was 3% and 2% of very common and very rare respectively.



**Figure 2:** the Abundance of recorded species as percent of total species.

### 3.4 Habitats

The taxonomic diversity of the 24 habitats indicated that hard rocks / volcanic gravel, cool rainy places, stream margins, ponds and coral reefs had one species. On the other hand, compact sandy plains had the maximum number (60) of species. The other habitats had the number of species between 25 to 2. Sandy wades, Coastal sandy areas / Saline habitat and Cultivated lands had the same number of species (18 species). (Table A1 and Figure 3).

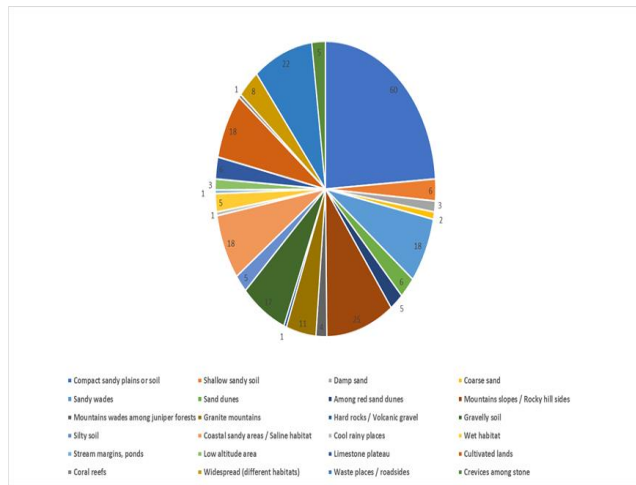
### 3.5 Economic / medicinal uses

The main economic uses of the recorded taxa can be classified into nine groups; fodder, edible (human food), Medicinal, fuel, ornamental, sand accumulator, enriches soil fertility, other uses viz. dye, oil soup, honey and fiber production, carpentry. Some of the recorded taxa could be considered as of multipurpose species (have many uses) (Table A1 and Figure 4). The economic uses fodder and of multipurpose had the maximum number of species (164 and 153 species respectively). But Ornamental, enriches soil fertility and other uses had the minimum species (16, 13 and 10 species respectively).

## 4. Discussion

In this work, 236 species related to 10 families were identified. These families are constituting the main structure of KSA flora. This result agrees with that of [17]. The results in this study demonstrated that the family Asteraceae (55 species) and Fabaceae (40 species) is represented by the highest number of species followed by Chenopodiaceae and Poaceae (each of them 22 species). These results were according to [25, 26] who stated that Asteraceae, Poaceae and Fabaceae were the most common plant families in the Flora of Saudi Arabia. It is well-known that many of the plants that belong to these plant families are distinctive feature of desert regions [27].

Additionally, Asclepiadaceae and Solanaceae in this work recorded each of them 15 species while the Euphorbiaceae represented by 14 species. This may be due to that these species of plants can manage and adapt with the difficult circumstances in these regions [28, 29].



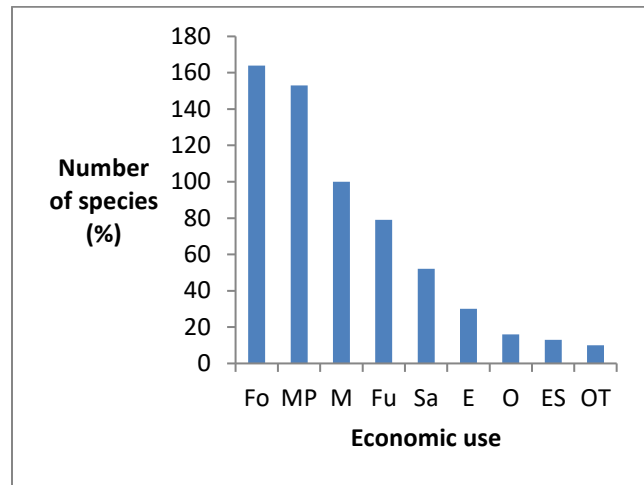
**Figure 3:** The different habitats of recorded species.

Many previous studies have been shown on many places inside KSA stated that Asteraceae, Poaceae, Fabaceae and Brassicaceae the most common plant families [30, 31]. On the other hand, other studies demonstrate that Asteraceae and Poaceae the most common plant families in another region [14, 32]. While a study in Floristic diversity and vegetation analysis of Wadi Al-Noman, Holy Mecca, Saudi Arabia showed that the Fabaceae, Poaceae, and Boraginaceae are the largest families widespread [3], and this work in agreement with observation.

The majority growth type of the recorded species was perennials, followed by the annuals. The life span of annuals can be attributed to their short life cycle that enables them to resist the instability of the environmental factors [33].

On the other hand, the high number of the perennial's affairs to their accommodation with the arid conditions. There are nearly 2250 wild plant species range between trees, shrubs, herbs, ferns, halophytes, parasites, and others [17]. They found that annual / short perennial was two species (*Alternanthera sessilis* and *Poa annua*) and annual / biennial was one species (*Lactuca serriola*) [4].

Besides the importance of wild plants as an element of ecosystems, many recorded plants in this work have a lot of economic and medicinal importance. The 164 species of the total recorded species (236) are fodders, 153 species are of multipurpose, 100 species are medicinal, 79 species are Fuel, 52 species are sand accumulator, 30 species used as edible, 16 species are ornamental, 13 species are soil fertility, and 10 species used as other economic uses. So, the economic uses of the recorded species could be organized descendingly as follows: fodder→ of multipurpose → medicinal → Fuel→ sand accumulator → edible → ornamental → enriches soil fertility→ other uses. Documented the species of plants are 75% as medicinal, 83% as grazing, 17% as edible, 40% as fuel wood, and 72% of them as other uses. Equally [23], recognized 149 plant species as medicinal plants in KSA [34]. Nevertheless, there is a lack of information about the multipurpose uses of natural plants. Many materials that we use in our daily lives are products of plants, while there are a lot of uses of plant species still indefinite.



**Figure 4:** The economic uses of the recorded species. E: edible, ES: enrich soil fertility, Fo: fodder, Fu: fuel, M: medicinal, MP: multipurpose, O: ornamental, OT: other uses, Sa: sand accumulator.

Various medicines, numerous industrial products are derived of plant. Most of all are eatable plant products that from the food source of human culture [23]. So, I recommended the conservation of such valuable plants for sustainable development.

### 5. Conclusion

This study presented that 236 species related ten families were identified. These families constitute the main structure of KSA flora. And the common growth type of the recorded species was perennials, followed by the annuals. The taxonomic diversity was in 24 habitats, hard rocks / volcanic gravel, cool rainy places, stream margins, ponds and coral reefs had one species. In contrast, compact sandy plains had the maximum number (60) of species. The economic uses of the recorded species in this work were elucidated and could be arranged descendingly as follows: fodder→ of multipurpose → medicinal → Fuel→ sand accumulator → edible → ornamental → enriches soil fertility→ other uses.

### Data availability statement

The data used to support the findings of this study are available from the corresponding author upon request.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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