

Floristic Composition of the plants associated with the *Artemisia monosperma* communities within three regions of Riyadh Region, Saudi Arabia

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Abstract In three locations of the Riyadh Region, Saudi Arabia, the current study surveys the floristic features of the plant communities associated with the aromatic plant, *Artemisia monosperma* Delile. The floristic analysis revealed the presence of 39 flowering plant species, belonging to 37 genera and 22 families. Poaceae, Brassicaceae, Boraginaceae, and Asteraceae constituted 46.15% of the plant species, making them the most representative families. The Al-Thumama area was the highest of the three areas in terms of diversity, where 23 plant species (21 perennials and 2 annuals) were recorded. *Artemisia monosperma* was dominant and the most abundant, where its presence was 100% in the three regions, while *Bassia eriophora*, *Convolvulus auricomus*, *Heliotropium digynum* and *Rhanterium epapposum* were high in the three regions, accounting for 66.66%. The recorded species are classified under 5 types of life-form according to the Raunkiaer system, therophytes and chamaephytes are the dominant life form. Contrarily, the results of the chorological diversity showed that the Saharo-Arabian type was the most representative (46.15%), followed by the Sudanian desert (17.95%), the Euro-Siberian, the Mediterranean, and the Tropical, which was the least represented.

keywords: Saudi Arabia; Riyadh Region; floristic survey; flora; chorotype.

1. Introduction

Due to its arid climate, Saudi Arabia's flora has long been neglected. The first attempt to cover Saudi Arabia's flora was done in 1974 [1]. Many areas of the Arabian Peninsula, particularly Saudi Arabia, are home to medicinal plants that have long been used to treat a variety of human and animal maladies [2].

The main majority of the Arabian Peninsula is covered by Saudi Arabia (Lat. 32° 34' N – 16° 83' N, long 34° 36' E – 56° E), a dry desert with a size of around 2,250,000 square kilometers. In light of this, xerophytic vegetation constitutes the main characteristics of the plant life in the kingdom [3]. Numerous studies of the Saudi Arabia flora have been released, but Chaudhary and Al-Jowaid [4] and Chaudhary [5] flora is the most thorough. Other

works on Saudi Arabian flora include the illustrated flowers of Saudi Arabia by Collenette [6] and a number of studies on local or regional floras in specific areas of the country, such as those by Hosni and Hegazy [7] on the Asir region. Additionally, floristic studies are crucial for understanding the range of plants existing in a region as well as having socioeconomic importance. For the local human population as well as other species, they supply all they need, including housing, food, and medical care [8].

The central part of Saudi Arabia, has received attention regarding its floristic survey. Al-Turki [9] published a checklist on the Flora of Al-Qassim region, Al-Turki and Al-Olayan [10] published synoptic analysis of the Flora of Hail. Studies on the Al-Aushazia Sabkha

vegetation in Al-Qassim region was also described by Al-Huquial and Al-Turki [11]. Al-Farhan [12] also reported on Raudhat Khuraim's floral account from the central area. Al-Ghanim [13] carried out comparative ecological research on the regional vegetation around Riyadh. However, very few research have examined Saudi Arabia's species diversity and vegetation analyses. Therefore, our aim is to analyses the vegetation of three areas of the Riyadh region in terms of species floristic composition, life-form and chorotype.

2. Materials and Methods

2.1. Study area

Saudi Arabia is a country with vast area occupying about 80% of the area of Arabian Peninsula. The central region of Saudi Arabia is the middle region (the Riyadh region), which encompasses the eastern section of the Najd Plateau and has an area of around 404,240 km² (Figure 1). It is located between latitudes 19° 29' and 27° 28' N and longitudes 41° 48' and 48° 14' east (Figure 1). Geomorphological features of Riyadh region, the Tuwaiq Mountains, which have an elevation of 1062 m, and occasional areas of sand dunes between escarpments of the plateau, as well as in the region's northern and southern halves [14,15]. The central region of the Saudi Arabia, which includes the "study sites", is characterized by drought, rare and fluctuating rains, and it lacks water bodies, and this noticeably affects the temperatures, throughout the day as well as the annual orbit, and affects the humidity. Most of the year, it is described as having a dry climate with a high temperature variation. Also, the central region, which is located on the plateau of Najd, is surrounded by the western mountainous heights (the Sarawat Mountains), which are considered a barrier that prevents the climate of the Red Sea from it. We do not ignore the impact of the elevation of the Najd plateau above sea level on the climate of this region.

2.2. Plant species analysis

After we determined the study sites, we made periodic field trips to the three regions (Jaham, Ghat, and Thumamah), in Riyadh region to record plant species associated with *Artemisia monosperma*, and each visit was once per each season, where the start of the visit was

determined after confirming the entry of the season, whether it was: (winter, spring, summer, autumn) according to the globally applicable astronomical geographical division. The distribution of the stands chosen for floristic composition studies in the Riyadh region is shown in Table 1. The taxonomy of living forms used in this study was based on Raunkiaer's [16] system of classification. Migahid [17], Chaudhary [5,18,19], and Collenette [20] were consulted for classification, identification, nomenclature, and chorotype.



Fig 1: Map showing the study area, KSA.

Table 1. Number and coordinates of sites in the study area.

Province	Location	Lat./long.
Rumah	Jaham	25°51'55.4"N 47°32'40.2"E
Ghat	Al-Ghat City	26°04'11.9"N 44°42'49.3"E
Riyadh	Thumamah	25°15'04.0"N 46°37'45.0"E

3. Results and Discussion

3.1. Floristic analysis of the study area

A list of the plant species found at the various survey locations in three regions of

Riyadh is provided in Table 1, together with information on their life spans, plant families, Raunkiaer life forms, and regional distribution of plants. The research area has 39 different plant species.

After conducting field visits to the different study areas (Jaham, Thamama, and Ghat), all plant species associated with the *Artemisia monosperma* were counted. From the results, it became clear to us that there are fundamental differences in the floristic composition of the three studied areas, where the floristic analysis showed that there were 29 perennial plant species, which represented about 74.36%, and 10 species of annual plants representing about 25.64% in the study areas. The dominant plant among these plant species was *Artemisia monosperma* and its representation was about 100%, followed by *Heliotropium digynum*, *Bassia eriophora*, *Rhanterium epapposum* and *Convolvulus auricomus*, and the percentage of their representation was about 66%, while the rest of the other plant species were the least represented in the different study sites and seasons, where they constituted about 33% (Table 1).

Through Table 1, we found that the Al-Ghat area contained 16 plant species (8 perennials and 8 annuals), while the Al-Thumama area was the highest of the three areas in terms of diversity, where 23 plant species (21 perennials and 2 annuals) were found, in contrast to the Jaham Reserve, which was the least diverse, where 6 plant species (5 perennials and one annuals) were found (Figure 2). *Artemisia monosperma* was the dominant species in the three regions and the most abundant, where its presence was 100% in the three regions, while *Bassia eriophora*, *Convolvulus auricomus*, *Heliotropium digynum* and *Rhanterium epapposum* were high in the three regions, accounting for 66.66%, while the rest of the 34 plant species achieved a lower rate of 33.33%, as these plants were found in one of the three sites. It has been demonstrated in several studies that a wide range of environmental parameters, such as temperature, rainfall, topography, morphometric variables, soil composition, and others, may impact how plants are dispersed geographically and what circumstances are ideal for their growth. Temperature is one of the most important

elements influencing how plants are distributed on a ball's surface.

The most majority of perennial plant species are herbaceous, with either a woody base or subterranean sections called tubes, and very few are shrubs. Approximately 74% of the plant species in the Riyadh region are perennial, giving the region's vegetation a lasting quality. This could be explained by the comparatively low rainfall, which suppresses the growth of many annuals [21,22]. Additionally, the large number of annual species (>40%) may be a result of the study's timing as well as local climate factors. Numerous investigations conducted in various Saudi Arabian provinces, including those by Mossalam [21] in Taif, Alatar et al. [22] in AlJufair wadi, and Fadl et al. [23] in wadi Elkor, Sarawat Mountain, confirm with this. Annuals predominate over perennial species in coastal lowland vegetation in eastern Saudi Arabia and az Zakhnuniyah Island, respectively, according to Shaltout et al. [24] and Wafa'a [25].

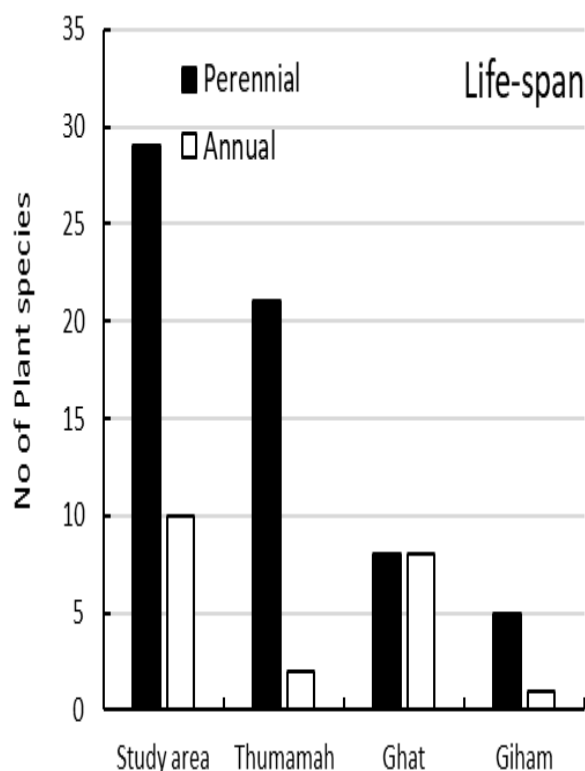


Fig 2: Plant life span in the study area and three locations.

3.2. Plant Life-Forms in the Study Area

According to the Raunkiaer approach, the study's documented species are divided into 5 categories of life-forms. Therophytes made up

around 20.51% of the plant species, followed by Chamaephytes, which made up 41.03% of the species that were reported. The remaining 2.56% of the examined plant species were comprised of hemicryptophytes, phanerophytes, and geophytes, which had the lowest representation (Figure 3b). The species' tolerance to grazing, salinity, sand building, drought, and other environmental conditions may account for the chamaephytes' extraordinarily high scores [26,27]. As a result of biotic influence, topographic variation, and regional climate (annual rainfall), therophytes seem to predominate other life forms [28]. Only during the rainy season and when salinity is not a limiting factor, are therophytes in great numbers. Their existence is a seasonal phenomenon, and they are equally unsuited to salinity and drought [29]. Therophytes predominate throughout the favourable season in the study area because of the area's predominately arid habitat, water availability, and sandy soil type. Similar findings were observed in other areas in Saudi Arabia, including Taif by Mossalam [21], AlJufair by Alatar et al. [22], and Sarawat Mountain by Fadl et al. [23].

3.4. The Floristic Analysis of the Study Area

Figure 3a indicates the plant families of the 39 species registered in the study area, which belong to 37 genera and 22 families. Whereas these plant species are divided into 22 families, Poaceae, Brassicaceae, Boraginaceae, and Asteraceae constituted 46.15% of the plant species, making them the most representative families.

Contrarily, the results of the chorological research showed that the Saharo-Arabian type was the most representative (46.15%), followed by the Sudanian desert (17.95%), the Euro-Siberian, the Mediterranean, and the Tropical, which was the least represented Figure (3c).

The bulk of plant species, according to Moawad [30], come from the Saharo-Arabian, Irano-Turanian, and Sudanian areas and are found in the Alaqan area in the Tabuk region in northwest Saudi Arabia. Alsherif et al. [31] found that Saharo-Arabian and Sudanian elements made up the majority of the region's overall flora in the Khulais area in west Saudi Arabia. Similar findings indicate that Saharo-

Arbian and Sudanese elements predominate in the Al Soada region of southwest Saudi Arabia [32].

4. Conclusion

The findings of this study highlight the necessity for more research on the varied and mutating flora of the Riyadh Region. The necessity for managerial strategies to preserve Saudi Arabia's plant variety is also highlighted in this essay. In the present result, the study area has 39 different plant species.

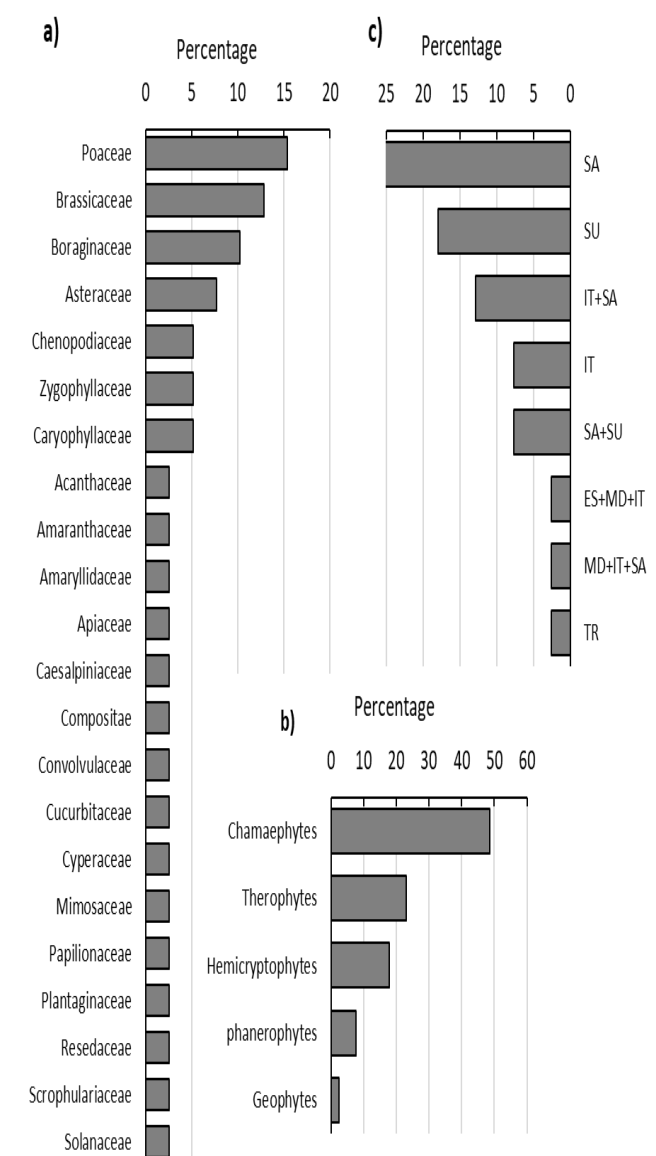


Fig 3. Floristic composition in the study area
a) Number of species in plant families b)
Percentage of various life-form, and c)
Percentage of various phytochorotype

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

No.	Botanical name	Family	Chorotype	Life form	Life span	Jaham	Thuma mah	Ghat	P%
1	<i>Acacia gerrardii</i> Benth.	Mimosaceae	SU	Ph	Perennial		√		33.33
2	<i>Aerva javanica</i> (Burm.f.) Juss. ex Schult.	Amaranthaceae	TR	Ch	Perennial		√		33.33
3	<i>Allium sindjarense</i> Boiss. & Hausskn ex Regel	Amaryllidaceae	IT+SA	G	Perennial	√			33.33
4	<i>Artemisia monosperma</i> Delile.	Asteraceae	SA	Ch	Perennial	√	√	√	100
5	<i>Bassia eriophora</i> (Schr.) Asch.	Chenopodiaceae	SA+SU	Th	Annual		√	√	66.66
6	<i>Blepharis attenuata</i> Napper	Acanthaceae	IT+SA	Ch	Perennial		√		33.33
7	<i>Cakile arabica</i> Velen.	Brassicaceae	SA	Th	Annual			√	33.33
8	<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	SA	He	Perennial		√		33.33
9	<i>Convolvulus auricomus</i> (A.Rich.) Bhandari	Convolvulaceae	SU	Ch	Perennial	√	√		66.66
10	<i>Cutandia memphitica</i> (Spreng.) Benth.	Poaceae	IT+SA	Th	Annual			√	33.33
11	<i>Cyperus macrorrhizus</i> Nees	Cyperaceae	SA	He	Perennial			√	33.33
12	<i>Deverra tortuosa</i> (Desf.) DC.	Apiaceae	SA	Ch	Perennial		√		33.33
13	<i>Echium plantagineum</i> L.	Boraginaceae	SA	Th	Perennial		√		33.33
14	<i>Echinops polyceras</i> Boiss.	Asteraceae	IT	He	Annual		√		33.33
15	<i>Eremobium aegyptiacum</i> (Spreng.) Asch. ex Boiss.	Brassicaceae	SA	Th	Annual			√	33.33
16	<i>Fagonia bruguieri</i> DC.	Zygophyllaceae	SA	Ch	Perennial		√		33.33
17	<i>Farsetia aegyptia</i> Turra	Brassicaceae	SU	Ch	Perennial		√		33.33
18	<i>Haloxylon salicornicum</i> (Moq.) Bunge ex Boiss.	Chenopodiaceae	SA	Ch	Perennial		√		33.33
19	<i>Heliotropium digynum</i> Asch. ex C.Ch.	Boraginaceae	SA	Ch	Perennial		√	√	66.66
20	<i>Heliotropium rotundifolium</i> Lehm.	Boraginaceae	IT	Ch	Annual			√	33.33
21	<i>Hyparrhenia hirta</i> (L.) Stapf	Poaceae	MD+IT+SA	Ch	Perennial		√		33.33
22	<i>Indigofera spiniflora</i> Boiss.	Papilionaceae	SU	Ch	Perennial		√		33.33
23	<i>Lasiurus scindicus</i> Henrard	Poaceae	SA	He	Perennial		√		33.33
24	<i>Launaea nudicaulis</i> (L.) Hook.f.	Asteraceae	SA	He	Perennial			√	33.33
25	<i>Lycium shawii</i> Roem. & Schult.	Solanaceae	SA+SU	Ph	Perennial		√		33.33
26	<i>Moltkiopsis ciliata</i> (Forssk.) I.M.Johnst.	Boraginaceae	SA	Ch	Perennial			√	33.33
27	<i>Neotorularia torulosa</i> (Desf.) Hedge & J.Léonard	Brassicaceae	IT	Th	Annual	√			33.33
28	<i>Ochradenus baccatus</i> Delile	Resedaceae	SU	Ph	Perennial		√		33.33
29	<i>Panicum turgidum</i> Forssk.	Poaceae	SA+SU	Ch	Perennial		√		33.33
30	<i>Plantago ovata</i> Phil.	Plantaginaceae	IT+SA	Th	Annual			√	33.33
31	<i>Polycarpaea repens</i> Asch. & Schweinf.	Caryophyllaceae	SU	He	Perennial			√	33.33
32	<i>Rhanterium epapposum</i> Oliv.	Compositae	SA	Ch	Perennial	√	√		66.66
33	<i>Scrophularia hypericifolia</i> Wydler	Scrophulariaceae	SA	Ch	Perennial			√	33.33
34	<i>Senna italica</i> Mill.	Caesalpiniaceae	SU	Ch	Perennial		√		33.33
35	<i>Silene arabica</i> Boiss.	Caryophyllaceae	SA	Th	Annual			√	33.33
36	<i>Stipagrostis drarii</i> (Täckh.) De Winter	Poaceae	SA	Ch	Perennial			√	33.33
37	<i>Stipagrostis plumosa</i> Munro ex T.Anderson	Poaceae	IT+SA	He	Perennial	√			33.33
38	<i>Tribulus terrestris</i> L.	Zygophyllaceae	ES+MD+IT	Th	Annual			√	33.33
39	<i>Zilla spinosa</i> (L.) Prantl	Brassicaceae	SA	Ch	Perennial		√		33.33

Abbreviations: Floristic characteristics of the recorded species associated with *Artemisia monosperma*. Chorotype: MD: Mediterranean, SA: Saharo-Arabian, SU: Sudanian, TR: Tropical, ES: Euro-Siberian, IT: Irano-Turanian, Life form: Ch: Chamaephytes, He: Hemicryptophytes, Hl: Helophytes, G: Geophytes, Ph: phanerophytes, Th: Therophytes

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