

Flora and Phytochorology of Lahij Governorate of Yemen: 1- Systematic Revision of Wild Legumes of the Family Fabaceae

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THE CURRENT study presents a revision of the family Fabaceae in the flora of Lahij Governorate, South Yemen. The recorded taxa were morphologically revised, life form, lifespan, and phytogeographical affinities were analyzed. Sixty-three taxa belonging to 20 genera of three subfamilies (Caesalpinioideae, Faboideae, and Mimosoideae) were recorded. For each species, accepted name, synonyms (if any), and local distribution are given. Keys to subfamilies, genera, species, and infra-specific taxa of species are provided. The recorded taxa consist of 76.19% perennials and 23.81% annuals. Phanerophytes, chamaephytes, and therophytes were the most frequent life forms. Phytogeographical analysis revealed that the Sudano-Zambezian elements are the most dominant, forming the major constituent (1/4 of the recorded plants) of the legume floristic structure. The most diverse genera were *Acacia* s.l. (13 taxa), *Indigofera* (12 taxa), *Tephrosia* (7 taxa), *Crotalaria*, and *Senna* (6 taxa each), accounting for about 69.84% of the total taxa recorded. Two species (*Acacia hunteri* Oliv. and *Zygocarpum yemenense* (J.B.Gillett) Thulin & Lavin) are endemic to Yemen. Besides, six species (*Acacia edgeworthii* T. Anders., *Acacia johnwoodii* Boulos, *Cadia purpurea* (Picc.) Ait., *Crotalaria saltiana* Andrews, *Indigastrum costatum* subsp. *goniodes* (Hochst. ex Baker) Schrire, and *Tephrosia heterophylla* Vatke) are considered near endemics.

Keywords: Chorotype, Endemic, Fabaceae, Lahij, Near endemic, Yemen.

Introduction



Fabaceae (Leguminosae nom. alter.) are one of the largest families of angiosperms, consisting of ca. 770 genera and 19,500 species of trees, shrubs, and herbs distributed throughout the world (Mabberley, 2008; Christenhusz & Byng, 2016; LPWG, 2017).

Members of the family exhibit high economic value since the family includes medicinal, aromatic plants, several fiber plants, and many members which are used around the world for

other economic aspects, such as food, timber, and horticulture. It is second to cereals in the human diet, and it is at the forefront of the plants utilized for grazing, oil production, gums, and dyes, with extraction from some species such as *Acacia* and *Indigofera*. Moreover, some types of nitrogen-fixing bacteria associated with their roots, contribute to enriching the soil nitrogen reserves and raising the productivity of other commercial plants (Pickersgill, 1996; Judd et al., 1999).

The flora of Yemen is characterized by high diversity and density, with ca. 2838 species, belongs to 1068 genera and 179 families of

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taxonomic importance as well as many endemic plants (461 endemic plants constituting 16% of the flora) making Yemen a fascinating botanical region (Al-Khulaidi, 2013). Species diversity is a result of considerable climatic changes in former periods, which enabled different species to survive in different ecological habitats (EPA, 2009). Moreover, the flora has affinities with the floras of the tropical African, Sudanese region, the Saharo-Arabian region, the Mediterranean countries, and the Irano-Turanian countries (Zohary, 1973; Gabali, 1995; Akhani, 2007).

To date, only a few studies have been concerned with the vascular plant flora of the southern Governorates of Yemen, especially at the levels of orders, families, and genera. The legume family is one of the most important and widespread families in Yemen, it ranked second after Poaceae in terms of the number of genera and species, comprising 81 genera and 277 species, of which 31 are endemic to Yemen (Al-Khulaidi, 2013). However, for some critical genera such as *Astragalus*, *Indigofera*, *Rhynchosia*, and *Tephrosia* the delimitation and identification are difficult for species (Lewis et al., 2005). This is a result of the scarcity of taxonomic surveys and studies in some geographical locations within Yemen due to its harsh topography and difficult access.

To the best of our knowledge, no previous study has examined the legume diversity in Lahij Governorate, which is an important hotspot of plant diversity in Yemen. The current study aims to identify the floristic diversity of the legume family in Lahij Governorate, perform a taxonomic re-evaluation of the genera and species of the family, and provide diagnostic morphological characteristics to distinguish between the genera and species of the family. It provides an updated identification key to all the legume species occurring in Lahij Governorate, Yemen.

Materials and Methods

Study area

This study was performed in Lahij Governorate, in the south-west of the Republic of Yemen. The study area is located between latitudes 12° 30' and 14° 00' N and longitudes 43° 30' and 45° 30' E. The center of Lahij Governorate (Al-Hawtah) is about 320 km from Sana'a (the capital of Yemen) (Fig. 1).

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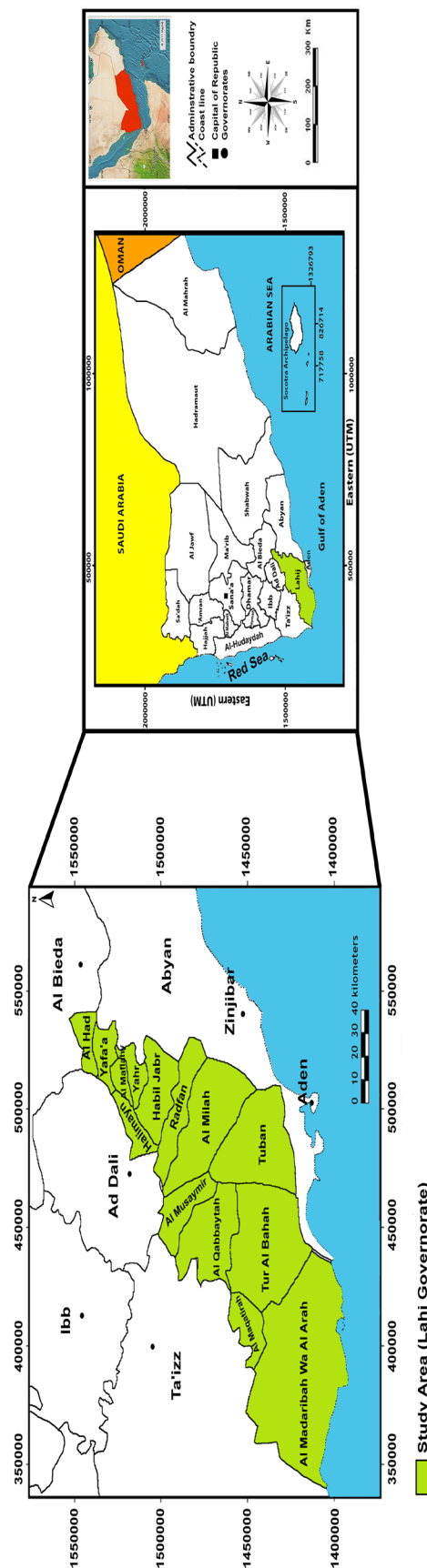


Fig. 1. Map of Yemen administrative divisions showing the study area of Lahij Governorate. Adapted from Kilian et al. (2002)

The study area lies within the subtropical dry zone which is characterized by hot summers and warm winters (Walter et al., 1975). Meteorological data obtained from WWO (2020) from (2018–2019) showed that the average annual temperature is 29°C; January is the coldest winter month, with the maximum average temperature (25.5°C), whereas, June is the hottest month with the maximum average temperature (32.5°C). The average annual rainfall during the field survey (January–December 2018/2019) was 6.5 mm/year, with a monthly mean that ranges between 0.54 mm in April and 14.6 mm in June (Fig. 2).

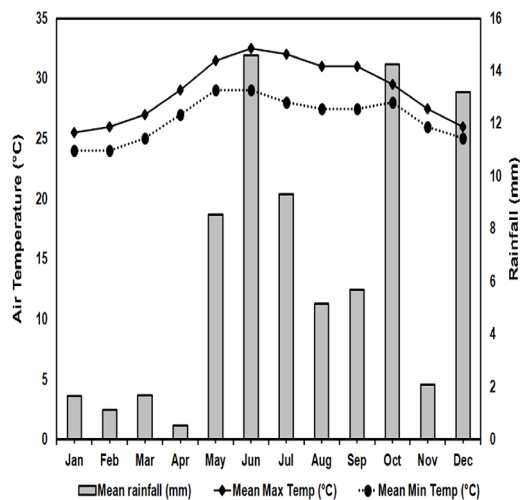


Fig. 2. Gaussen diagram showing average maximum and minimum monthly air temperature (°C) and monthly rainfall (mm) of Lahij Governorate, Yemen (2018–2019)

Species identification

Plant specimens were collected at different times from the field by the first author (O. S. S. Al-Hawshabi) during intensive floristic surveys (four trips per month, increased to eight during the rainy months and the flowering season) of the study area between January 2018–May 2019. The collected taxa were identified and named according to the available literature (Thulin, 1983, 1993; Wood, 1997; Chaudhary, 2001; Chaudhary, 1999; Collenette, 1999; Boulos, 1999, 2009), and were updated according to APG III (2009) and POWO (2020), except for the genus *Acacia* s.l., remains as it was traditionally recognized, where some species are endemic to Yemen and needs further investigations. Voucher specimens were kept in the Herbarium of Biology Department, Faculty of Education, Aden University, Yemen.

Results

Floristic composition

A total of 63 taxa (including infraspecific taxa), belonging to 20 genera of three subfamilies (Caesalpinioideae, Faboideae, and Mimosoideae) of the family Fabaceae were recorded in the study area (Lahij Governorate). Two species were considered endemic to the study area (*Zygocarpum yemenense* (J.B.Gillett) Thulin & Lavin, and *Acacia hunteri* Oliv). On the other hand, six species considered near endemics (*Acacia edgeworthii* T. Anders., *Acacia johnwoodii* Boulos, *Cadia purpurea* (Picc.) Ait., *Crotalaria saltiana* Andrews, *Indigastrum costatum* subsp. *goniodes* (Hochst. ex Baker) Schrire, and *Tephrosia heterophylla* Vatke) (Fig. 3, Table 1).

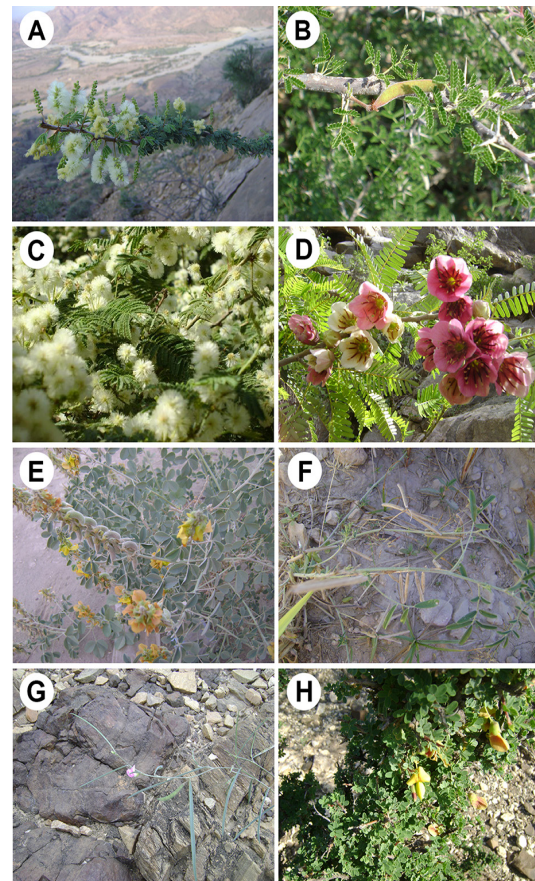


Fig. 3. Endemic and near endemic wild legums of Yemen: (A) *Acacia hunteri*, (B) *Acacia edgeworthii*, (C) *Acacia johnwoodii*, (D) *Cadia purpurea*, (E) *Crotalaria saltiana*, (F) *Indigastrum costatum* subsp. *goniodes*, (G) *Tephrosia heterophylla*, (H) *Zygocarpum yemenense*

TABLE 1. List of wild legumes recorded in Lahij Governorate, Yemen along with their sub-families, habit, life span, life form, and chorotypes (Zohary, 1966, 1972; Wickens, 1976).

No.	Studied taxa	Habit	Life span	Life-form	Chorotype
Sub-family: Caesalpinioideae (9)					
1	<i>Delonix elata</i> (L.) Gamble	Tree	Per	Ph	SA-AR + SU-ZA
2	<i>Parkinsonia aculeata</i> L.	Tree	Per	Ph	NEO
3	<i>Senna alexandrina</i> Mill.	Sub-shrub	Per	Ch	SA-SI + SU-ZA
4	<i>Senna holosericea</i> (Fresen.) Greuter	Herb	Per	Ch	SA-SI + SU-ZA
5	<i>Senna italica</i> Mill.	Herb	Per	Ch	IR-TR + ME + SA-SI + SU-ZA
6	<i>Senna obtusifolia</i> (L.) H.S.Irwin & Barneby	Herb	Per	Ch	NEO
7	<i>Senna occidentalis</i> (L.) Link	Herb	Per	Ch	NEO
8	<i>Senna sophera</i> (L.) Roxb.	Sub-shrub	Per	Ch	NEO
9	<i>Tamarindus indica</i> L.	Tree	Per	Ph	SU-ZA
Subfamily: Faboideae (39)					
10	<i>Astragalus vogelii</i> (Webb) Bornm subsp. <i>fatemensis</i> (Choiv.) Maire	Herb	Ann	Th	IR-TR + ME + SA-SI
11	[#] <i>Cadia purpurea</i> (Picc.) Ait.	Shrub	Per	Ph	SA-AR + SU-ZA
12	<i>Crotalaria incana</i> L.	Herb	Ann	Th	NEO
13	<i>Crotalaria microphylla</i> Vahl.	Herb	Ann	Th	SA-AR + SU-ZA
14	<i>Crotalaria pycnostachya</i> Benth.	Herb	Ann	Th	SU-ZA
15	[#] <i>Crotalaria saltiana</i> Andrews	Herb	Ann	Th	SU-ZA
16	<i>Crotalaria senegalensis</i> (Pers.) Bacle ex DC.	Herb	Ann	Th	SA-AR + SU-ZA
17	<i>Crotalaria spinosa</i> Hochst ex Benth.	Herb	Ann	Th	SU-ZA
18	<i>Galactia striata</i> var. <i>villosa</i> (Wight & Arn.) Verdc.	Herb	Per	He	PAN
19	[#] <i>Indigostrum costatum</i> subsp. <i>goniodes</i> (Hochst. ex Baker) Schrire	Herb	Ann	Th	SU-ZA
20	<i>Indigofera amorphoides</i> Jaub. & Spach.	Sub-shrub	Per	Ch	SU-ZA
21	<i>Indigofera arabica</i> Jaub. & Spach	Herb	Per	Ch	IR-TR + SA-AR + SU-ZA
22	<i>Indigofera argentea</i> Burm. f.	Herb	Ann	Th	IR-TR + ME + SA-SI + SU-ZA
23	<i>Indigofera articulata</i> Gouan	Sub-shrub	Per	Ch	IR-TR + SA-AR + SU-ZA
24	<i>Indigofera coerulea</i> var. <i>coerulea</i>	Sub-shrub	Per	Ch	IR-TR + SA-AR + SU-ZA
25	<i>Indigofera coerulea</i> var. <i>occidentalis</i> J.B.Gillett & Ali	Sub-shrub	Per	Ch	IR-TR + SA-AR + SU-ZA
26	<i>Indigofera colutea</i> var. <i>colutea</i>	Herb	Ann	Th	PAN
27	<i>Indigofera hochstetteri</i> Baker	Herb	Ann	Th	IR-TR + SA-AR + SU-ZA
28	<i>Indigofera oblongifolia</i> Forssk.	Sub-shrub	Per	Ch	IR-TR + SA-SI + SU-ZA
29	<i>Indigofera semitrijuga</i> Forssk.	Herb	Ann	Th	SA-AR + SU-ZA
30	<i>Indigofera spiniflora</i> Hochst. ex Boiss.	Sub-shrub	Per	Ch	SA-AR + SU-ZA
31	<i>Indigofera spinosa</i> Forssk.	Sub-shrub	Per	Ch	SA-AR + SU-ZA

TABLE 1. Cont.

No.	Studied taxa	Habit	Life span	Life-form	Chorotype
32	<i>Melilotus albus</i> Medik.	Herb	Ann	Th	COSM
33	<i>Microcharis tritoides</i> subsp. <i>tritoides</i>	Herb	Per	Ch	SA-AR + SU-ZA
34	<i>Rhynchosia elegans</i> A. Rich.	Herb	Per	He	SU-ZA
35	<i>Rhynchosia minima</i> var. <i>prostrata</i> (Harv.) Meikle	Herb	Per	He	SU-ZA
36	<i>Rhynchosia pulverulenta</i> Stocks	Herb	Per	He	IR-TR + SA-AR + SU-ZA
37	<i>Rhynchosia schimperi</i> Hochst. ex Boiss.	Sub-shrub	Per	He	IR-TR + SU-ZA
38	<i>Sesbania leptocarpa</i> DC.	Herb	Ann	Th	SU-ZA
39	<i>Sesbania pachycarpa</i> DC.	Shrub	Per	Ph	SU-ZA
40	# <i>Tephrosia heterophylla</i> Vatke	Herb	Per	Ch	SU-ZA
41	<i>Tephrosia nubica</i> (Boiss.) Baker	Herb	Per	Ch	SA-AR + SU-ZA
42	<i>Tephrosia pentaphylla</i> (Roxb.) G. Don	Herb	Per	Ch	SU-ZA
43	<i>Tephrosia pumila</i> (Lam.) Pers.	Herb	Per	Ch	PAN
44	<i>Tephrosia purpurea</i> (L.) Pers.	Herb	Per	Ch	PAN
45	<i>Tephrosia subtriflora</i> Hochst. ex Baker	Herb	Ann	Th	PAN
46	<i>Tephrosia uniflora</i> subsp. <i>uniflora</i>	Herb	Per	Ch	IR-TR + SA-AR + SU-ZA
47	* <i>Zygocarpum yemenense</i> (J.B. Gillett) Thulin & Lavin	Shrub	Per	Ph	SU-ZA
Subfamily: Mimosoideae (16)					
48	<i>Acacia asak</i> (Forssk.) Willd.	Tree	Per	Ph	SA-AR + SU-ZA
49	# <i>Acacia edgeworthii</i> T. Anders.	Shrub	Per	Ph	SA-AR + SU-ZA
50	<i>Acacia ehrenbergiana</i> Hayne	Tree	Per	Ph	SA-AR + SU-ZA
51	<i>Acacia etbaica</i> subsp. <i>uncinata</i> Brenan	Shrub	Per	Ph	SU-ZA
52	<i>Acacia hamulosa</i> Benth.	Shrub	Per	Ph	SU-ZA
53	* <i>Acacia hunteri</i> Oliv.	Tree	Per	Ph	IR-TR + SA-AR + SU-ZA
54	# <i>Acacia johnwoodii</i> Boulos	Tree	Per	Ph	SA-AR + SU-ZA
55	<i>Acacia laeta</i> R. Br. ex Benth.	Shrub	Per	Ph	IR-TR + ME + SA-SI + SU-ZA
56	<i>Acacia mellifera</i> (Vahl) Benth.	Tree	Per	Ph	SA-AR + SU-ZA
57	<i>Acacia nilotica</i> (L.) Willd. ex Del. subsp. <i>indica</i> (Benth.) Brenan	Tree	Per	Ph	PAL
58	<i>Acacia nilotica</i> (L.) Willd. ex Del. subsp. <i>kraussiana</i> (Benth.) Brenan	Tree	Per	Ph	SU-ZA
59	<i>Acacia oerfota</i> (Forssk.) Schweinf.	Shrub	Per	Ph	IR-TR + SA-AR + SU-ZA
60	<i>Acacia tortilis</i> (Forssk.) Hayne subsp. <i>tortilis</i>	Tree	Per	Ph	SA-SI + SU-ZA
61	<i>Leucaena leucocephala</i> (Lam.) De Wit	Shrub	Per	Ph	NEO
62	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Tree	Per	Ph	NEO
63	<i>Prosopis juliflora</i> (Sw.) DC.	Tree	Per	Ph	NEO

Legend. *: Endemic, #: Near Endemic. Life span: Ann.: Annual, Per.: Perennial. Life form: Ch.: Chamaephytes, He.: Hemicryptophytes, Ph.: Phanerophytes, Th.: Therophytes. Chorotypes abbreviations: COSM: Cosmopolitan, ME: Mediterranean, NEO: Neotropical, PAL: Palaeotropical, PAN: Pantropical, IR-TR: Irano-Turanian, SA-AR: Saharo-Arabian, SA-SI: Saharo-Sindian, SU-ZA: Sudano-Zambesian.

The most common genera with a larger number of species were *Acacia* Mill. with 13 species (20.63%), *Indigofera* L. with 12 species (19.05%), *Tephrosia* Pers. with seven species (11.11%), *Crotalaria* L., and *Senna* Mill. with six species each (9.52%), and *Rhynchosia* Lour. with four species (6.35 %) (Fig. 4, Table 1). Most of the species recorded during this survey were perennials with 48 species (76.19%) of the total recorded species, while the annuals were represented by 15 species (23.81%). Most of the plant species were herbs (49.21%), followed by trees (20.63%), sub-shrubs (15.87%), and shrubs (14.29%).

Life-form spectra

Wild legumes surveyed in the study area belongs to four life-forms. Phanerophytes [perennating buds well above the surface of the soil] and chamaephytes [perennating buds just above the surface of the soil] were the most frequent lifeforms (22 species and 21 species, respectively), followed by therophytes [annuals] (15 species), while hemicryptophytes [perennating buds at soil level] (Raunkiaer, 1934) were represented by five species (Fig. 5 A, Table 1).

Phytogeographical affinities

Chorological analysis of the 63 legume species recorded in this study classified them into three major phytogeographical groups:

Monoregional, biregional, and pluriregional (Fig. 5 B, Table. 1). The mono-regional chorotype was represented by 16 species (25.40%), of Sudano-Zambezian affinities. The bi-regional chorotype was represented by 18 species (28.57% of the total flora). The Saharo-Arabian/Sudano-Zambezian chorotype represented by 14 species (22.22%), while three species (4.76%) originally came from the Saharo-Sindian/Sudano-Zambezian chorotype, and only one species (1.59%) belonging to the Irano-Turanian/Sudano-Zambezian chorotype (*Acacia tortilis* (Forssk.) Hayne subsp. *tortilis*).

The pluri-regional elements are represented by a total of 14 species (22.22%) of different affinities. These pluriregional species fall under four main chorotypes: Irano-Turanian/Saharo-Arabian/Sudano-Zambezian (nine taxa representing 14.29% of recorded taxa), Irano-Turanian/Mediterranean/Saharo-Sindian/Sudano-Zambezian (three taxa representing 4.76% of recorded taxa), and both the Irano-Turanian/Mediterranean/Saharo-Sindian and Irano-Turanian/Saharo-Sindian/Sudano-Zambezian regions were represented by one species (1.59% of recorded taxa). The remaining 15 taxa were distributed among Neotropical (8 species= 12.70%), Pantropical (5 species= 7.94%), Cosmopolitan, and Palaeotropical (one species each= 1.59%) chorotypes.

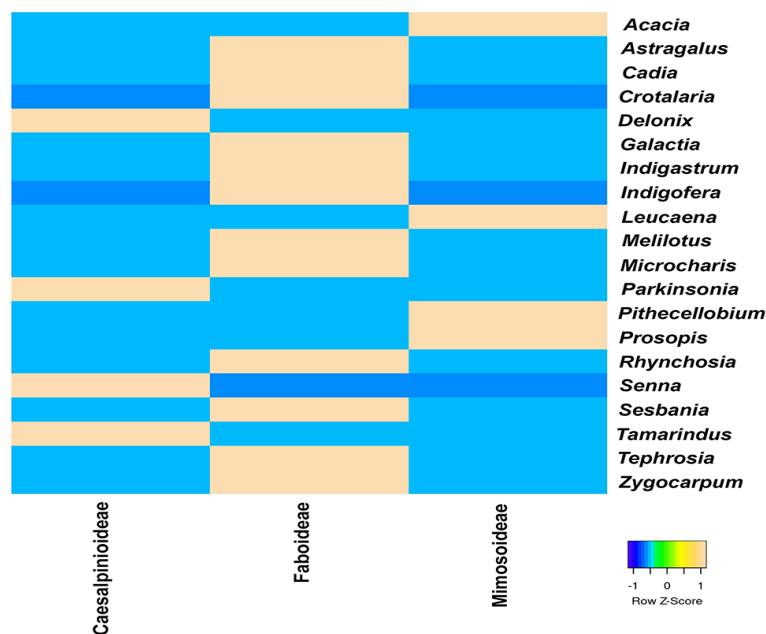


Fig. 4. Heatmap of species numbers within the genera of wild legumes relative to the three sub-families of Fabaceae in Lahij Governorate, Yemen

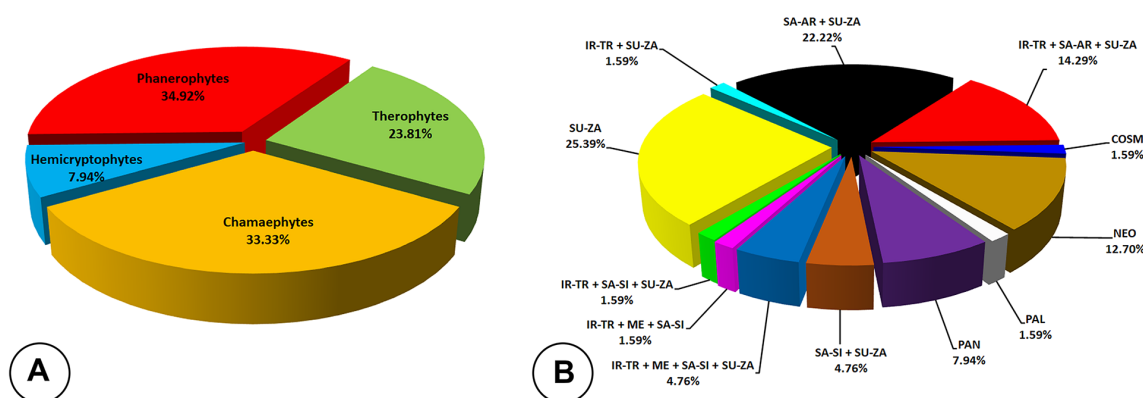


Fig. 5. A. Life form relative spectrum percentages, B. Chorological analysis of wild legumes in Lahij Governorate, Yemen [For abbreviations see Table 1]

Artificial key to the subfamilies of Fabaceae recorded in Lahij Governorate

1. Flowers actinomorphic; perianth aestivation valvate or rarely imbricate; stamens 10 or usually more **3. Mimosoideae**

1. Flowers zygomorphic; perianth aestivation usually imbricate or vexillary; stamens between 5-10..... **2**

2. Corolla aestivation ascending imbricate, posterior petal innermost; petals 5 and polypetalous; stamens polyandrous or monadelphous **1. Caesalpinioideae**

2. Corolla aestivation vexillary, posterior petal outermost. Petals 5 but anterior petals basally fused. Stamens monadelphous or diadelphous **2. Faboideae**

1. Subfamily: Caesalpinioideae

Four genera and nine species were recorded in the study area.

Artificial key to the genera of Caesalpinioideae recorded in Lahij Governorate

- 1a. Plant armed **2. Parkinsonia**
- 1b. Plant un-armed **2**
- 2a. Leaves unipinnate **3**
- 2b. Leaves bipinnate **1. Delonix**
- 3a. Trees **4. Tamarindus**
- 3b. Herbs or herbaceous shrubs **3. Senna**

1.1. Delonix Raf., Fl. Tellur. 2: 92 (1837).

1.1.1. Delonix elata (L.)Gamble, Fl. Madras 396 (1919).

= *Poinciana elata* L., Cent. Pl. II. 16 (1756).

See POWO (2020) for a list of further synonyms.

Native. Tree: usually grows on cliffs and steep rocky slopes above wadis (Kilian et al., 2004) .

1.2. Parkinsonia L., Sp. Pl. 1: 375 (1753).

1.2.1. Parkinsonia aculeata L., Sp. Pl. 1: 375 (1753).

= *Parkinsonia inermis* Spreng., Syst. Veg., ed. 16 [Sprengel] 2: 345 (1825).

= *Parkinsonia spinosa* Kunth, Nov. Gen. Sp. [H.B.K.] 6: 335 (1823)

= *Parkinsonia thornberi* M.E.Jones, Contr. W. Bot. 12: 12 (1908).

Introduced American species. Small spiny tree or shrub: naturalized, grows in clay and sandy soils in roadsides near villages in Lahij Governorate.

1.3. Senna Mill., Gard. Dict. Abr., ed. 4. [1280] (1754).

The genus is represented by six species widely distributed in the study area; the key below distinguishes between them:

- 1a. Leaves with three pairs of leaflets **4.S. obtusifolia**
- 1b. Leaves with more than three pairs of leaflets **2**
- 2a. Pods cylindrical to subcylindrical with convex valves **3**
- 2b. Pods compressed flat, oblong, or oblong-falcate with or without flab-like crests valves**4**

3a. Leaflets in 3-7 pairs; peduncles 0.3-0.5cm long; bracts acute..... **5. *S. occidentalis***

3b. Leaflets in 8-12 pairs; peduncles 0.8–2.5cm long; bracts ± obtuse**6. *S. sophera***

4a. Leaflets lanceolate to elliptic, acute at apex **1. *S. alexandrina***

4b. Leaflets obovate, rounded at apex**5**

5a. Pod glabrous, with a longitudinal crest in the middle **3. *S. italica***

5b. Pod pubescent, without a longitudinal crest in the middle **2. *S. holosericea***

1.3.1. *Senna alexandrina* Mill., Gard. Dict., ed. 8. n. 1 (1768).

= *Cassia acutifolia* Delile, Descr. Egypte, Hist. Nat. 219, t. 27 (1813).

= *Cassia alexandrina* (Mill.) Spreng., Bot. Gart. Halle 21 (1800).

Native. Sub-shrub grows along sandy and gravelly drainage lines including the larger wadis.

1.3.2. *Senna holosericea* (Fresen.) Greuter, Willdenowia 15(2): 429 (1986).

= *Cassia holosericea* Fresen., Flora 22(1): 54 (1839).

See POWO (2020) for a list of further synonyms.

Native. Prostrate to erect woody perennial herb: growing on sandy and stony plains, it favors depressions where water accumulates, and is frequently found near irrigation channels.

1.3.3. *Senna italica* Mill., Gard. Dict., ed. 8. n. 2 (1768).

= *Cassia italica* (Mill.) Spreng., Bot. Gart. Halle 21, adnot. 18 (1800).

See POWO (2020) for a list of further synonyms.

Native. Prostrate, woody, perennial herb growing in bushland, and semi-desert, usually found on open stony and sandy plains.

1.3.4. *Senna obtusifolia* (L.) H.S.Irwin & Barneby, Mem. New York Bot. Gard. 35: 252 (1982).

= *Cassia obtusifolia* L., Sp. Pl. 1: 377 (1753).

= *Cassia rogeonii* Ghesq., Rev. Bot. Appl. Agric. Trop., xiv. 238 (1934).

= *Cassia tora* var. *obtusifolia* (L.) Haines, Bot. Bihar & Orissa, 304 (1922).

= *Emelista obtusifolia* Raf., Sylva Tellur. 127 (1838).

= *Senna toroides* Roxb., Fl. Ind. ii. 341 (1832).

This introduced American species is an erect annual herb growing in waste ground, on roadsides, and field borders. It is abundant in high rainfall areas.

1.3.5. *Senna occidentalis* (L.) Link, Handbuch [Link] 2: 140 (1831).

= *Cassia occidentalis* L., Sp. Pl. 1: 377 (1753).

= *Ditremexa occidentalis* Britton & Rose, Sci. Surv. Porto Rico & Virgin Islands 5: 372 (1924).

See POWO (2020) for a list of further synonyms.

This introduced American species is an erect perennial herb growing in waste ground, field borders, in wadi beds, and along irrigation channels and alluvial plains.

1.3.6. *Senna sophera* (L.) Roxb., Fl. Ind. (Roxburgh) ii. 347 (1832).

= *Cassia aegyptiaca* Willd., Enum. Pl.: 442 (1809)

= *Cassia sophera* L., Sp. Pl. 1: 379 (1753).

= *Ditremexa sophera* Britton & Rose, Sci. Surv. Porto Rico & Virgin Islands 5: 372 (1924).

See POWO (2020) for a list of further synonyms.

This introduced American species is a subshrub, growing on roadsides and in waste ground and wadi beds.

1.4. *Tamarindus* Tourn. ex L., Sp. Pl. 1: 34 (1753).

1.4.1. *Tamarindus indica* L. (1753)

= *Cavaraea elegans* Speg., Anales Soc. Ci. Argent. 82: 223 (1916).

= *Tamarindus erythraeus* Mattei, Boll. Reale Orto Bot. Palermo 7: 95 (1908).

= *Tamarindus somalensis* Mattei, Boll. Reale Orto Bot. Palermo 7: 94 (1908).

= *Tamarindus officinalis* Hook., Bot. Mag. 77: t. 4563 (1851).

See POWO (2020) for a list of further synonyms.

Native. An evergreen tree is usually found near wadis, on open hillsides in high rainfall areas.

2. Subfamily: Faboideae

Shrubs and herbs (annual and perennial) recorded in the studied area included 39 taxa within 12 genera, among them 12 taxa belong to *Indigofera*.

Artificial key to the genera of Faboideae recorded

in Lahij Governorate

- 1a. Shrubs 2
 1b. Herbs or subshrubs 3
 2a. Petals papilionaceous; pod constricted between the seeds, jointed **2. Zygotheca**
 2b. Petals equal, not papilionaceous; pod straight, flat, not jointed **2. Cadia**
 3a. Plants usually climbing, trailing or spreading 4
 3b. Plants usually erect 6
 4a. Leaves with 3-leaflets 5
 4b. Leaves with 10–16 leaflets **1. Astragalus**
 5a. Pod oblong, c. 0.8–2.2cm long **9. Rhynchosia**
 5b. Pod linear-oblong, more than 3cm long ..
 **4. Galactia**
 6a. Leaves 1-3 leaflets 7
 6b. Leaves more than 3 leaflets **9**
 7a. Flowers yellow; pod inflated **3. Crotalaria**
 7b. Flowers white or red; pod not inflated **8**
 8a. Flowers white; pod small, ovoid **7. Melilotus**
 8b. Flowers pink or red; pod tetragonal, straight, erect **8. Microcharis**
 9a. Leaves imparipinnate, with 3–17 leaflets **10**
 9b. Leaves paripinnate with 16–88 leaflets **10. Sesbania**
 10a. Standard [of flower] glabrous outside **5. Indigostrum**
 10b. Standard of flower pubescent outside **11**
 11a. Flowers solitary in the leaf axils; pod elongate **11. Tephrosia**
 11b. Flowers in racemes; pod orbicular **6. Indigofera**

2.1. Astragalus L., Sp. Pl. 2: 755 (1753).

2.1.1. Astragalus vogelii subsp. *fatemensis* (Choiv.) Maire, Mém. Soc. Hist. Nat. Afrique Nord 3: 126. (1933).

= *Astragalus arabicus* Ehrenb. ex Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 7. 11(16): 9 (1868); 15(1): 6 (1869), non-*A. arabicus* Kotschy (1866).

= *Astragalus fatemensis* Choiv., Ann. Reale Ist. Bot. Roma 8: 95 (1903).

Native. Annual herb, spreading, found on open rocky hillsides.

This subspecies and its basionym are used by Al-Khulaidi (2000) and Boulos (2009), and it is the only taxon known from Yemen.

2.2. Cadia Forssk., Fl. Aegypt.-Arab. 90 (1775).

2.2.1. Cadia purpurea (G.Piccioli) Aiton, Hort. Kew. [W. Aiton] 3: 492 (1789).

= *Panciatia purpurea* G.Piccioli, Hort. panciat. 9 (1783).

Native. Shrub: growing in areas of good rainfall on slopes of the central escarpment, rain shadow mountains, abundant on heavily eroded slopes.

2.3. Crotalaria L., Sp. Pl. 2: 714 (1753).

Six species are recorded from the study area, all but one of them is native. The artificial key below distinguishes between them:

- 1a. Plant armed **6. C. spinosa**
 1b. Plant unarmed **2**
 2a. Flowers solitary or paired in the leaf axils **2. C. microphylla**
 2b. Flowers in racemes (rarely a few also in the leaf axils) **3**
 3a. Stipules absent **4. C. saltiana**
 3b. Stipules present **4**
 4a. Racemes short, about 5cm long **3.**
 **C. pycnostachya subsp. pycnostachya**
 4b. Racemes long, about 10–30 cm long **5**
 5a. Pod shortly stipitate, appressed pubescent outside, 6–16 seeded **5. C. senegalensis**
 5b. Pod sessile, spreading pilose outside, hairs not appressed, ± 40–50 seeded **1. C. incana**

2.3.1. Crotalaria incana L., Sp. Pl. 2: 716 (1753).

= *Crotalaria cubensis* DC., Prodr. [A. P. de Candolle] 2: 131 (1825).

= *Chrysocalyx schimperi* Hochst. ex A.Rich., Tent. Fl. Abyss. 1: 151 (1847).

= *Lupinus rotundifolius* Sessé & Moc., Fl. Mexic., ed. 2 165 (1894).

This introduced American species is an erect annual herb, growing on the escarpment, alluvial soils close to cultivation and areas of good rainfall.

2.3.2. Crotalaria microphylla Vahl, Symb. Bot. (Vahl) 1: 52 (1790).

Native. A prostrate annual herb is widely distributed in semi-desert grassland, usually on the sand.

2.3.3. Crotalaria pycnostachya Benth., London J. Bot. 2: 584 (1843).

= *Crotalaria melilotoides* Steud. ex A.Rich., Tent. Fl. Abyss. 1: 155 (1847).

Native. A procumbent or erect annual herb, common on stony hillsides, on cultivated or waste ground, and in open scrub along the escarpment.

2.3.4. *Crotalaria saltiana* Andrews, Bot. Repos. t. 648 (1811).

= *Crotalaria lupinoides* Hochst. ex Benth., London J. Bot. ii. 583 (1843).

= *Crotalaria argyraea* Franch., Sert. Somal. 27 (1882).

= *Crotalaria franchetii* Baker f., J. Linn. Soc., Bot. xlii. 309 (1914).

= *Crotalaria farcta* R.Br. & Baker f., J. Linn. Soc., Bot. xlii. 310 (1914).

Native. An erect annual herb, growing on semi-desert scrub, often along wadis and on gravelly soils.

2.3.5. *Crotalaria senegalensis* (Pers.) Bacle ex DC, Prodr. 2: 133 (1825).

= *Crotalaria carinata* Steud. ex A.Rich., Tent. Fl. Abyss. 1: 154 (1847).

= *Crotalaria maxillaris* Klotzsch, Naturw. Reise Mossambique [Peters] 6(Bot., 1): 58 (1861).

Native. Annual herb erect; growing on sandy plains.

2.3.6 *Crotalaria spinosa* Hochst. ex Benth. in Lond. Journ. Bot. 2: 576 (1843).

= *Crotalaria minima* Baker f., J. Bot. 34: 52 (1896).

Native. Bushy annual herb, growing on grassy earth banks around fields.

2.4. *Galactia* P.Browne, Civ. Nat. Hist. Jamaica 298 (1756).

2.4.1. *Galactia striata* var. *villosa* (Wight & Arn.) Verdc., Fl. Zambes. 3(5): 42 (2001).

= *Galactia villosa* Wight & Arn., Prodr. Fl. Ind. Orient. 1: 207 (1834).

= *Galactia tenuiflora* var. *villosa* (Wight & Arn.) Benth., Fl. Bras. (Martius) 15(1): 143 (1859).

Introduced. Perennial climbing herb; weed of cultivation.

2.5. *Indigastrum* Jaub. & Spach, Ill. Pl. Orient. 5(49): 101, t. 492 (1857).

2.5.1. *Indigastrum costatum* subsp. *goniodes* (Hochst. ex Baker) Schrire, Bothalia 22(2): 168 (1992).

= *Indigastrum macrostachyum* Jaub. & Spach, Ill. Pl. Orient. 5(49): 101, t. 492 (1856).

= *Indigofera goniodes* Hochst. ex Baker, Fl.

Trop. Afr. [Oliver & al.] 2: 85 (1871).

Native. Erect annual herb, growing in fields, slopes, clay soils mixed with gravel, roadsides, rocky grassland, and stony ground in areas of average to good rainfall.

2.6. *Indigofera* L., Sp. Pl. 2: 751 (1753).

Widely distributed in the study area, 12 species are recorded from the study area, all of them are considered native.

The artificial key below distinguishes between them.

- 1a. Plant armed **2**
- 1b. Plant unarmed **3**
- 2a. Inflorescence rachis orange, pod not torulose **11. *I. spinosa***
- 2b. Inflorescence rachis green; pod strongly torulose **10. *I. spinofflora***
- 3a. All plant parts with stalked glands **6. *I. colutea***
- 3b. All plant parts lacking stalked glands (trichomes typically medifixed (T-shaped)) **4**
- 4a. Leaf-rhachis up to 0.6–3.5cm long including petiole..... **5**
- 4b. Leaf-rhachis up to 4–11cm long including petiole..... **9**
- 5a. Stamens c. 3 mm long **6**
- 5b. Stamens 4–5 mm long **8**
- 6a. Procumbent herb..... **9. *I. semitrijuga***
- 6b. Shrubby herb or shrub **8**
- 7a. Stem with dark-stalked glands scattered among silvery appressed hairs **3. *I. argentea***
- 7b. Stem lack stalked glands **4. *I. articulata***
- 8a. Leaflets alternate, oblong.. **8. *I. oblongifolia***
- 8b. Leaflets opposite, obovate or oblanceolate **2. *I. arabica***
- 9a. Calyx 2–3 mm long; pod 5–9-seeded .. **7. *I. hochstetteri***
- 9b. Calyx 1.3–1.5mm long; pod 1–4-seeded **10**
- 10a. Pod up to 6 mm long, not torulose ... **1. *I. amorphoides***
- 10b. Pod up to 15 mm long, torulose ... **5. *I. coerulea***

2.6.1. *Indigofera amorphoides* Jaub. & Spach, Ill. Pl. Orient. 5(49): 93, t. 483 (1856).

= *Indigofera abyssinica* Hochst. ex Baker, Fl. Trop. Afr. [Oliver & al.] 2: 97 (1871).

Native. Shrubby herb up to 1 m tall, growing on roadsides, open disturbed stony slopes, and arable land.

2.6.2. *Indigofera arabica* Jaub. & Spach, Ill. Pl. Orient. 5(49): 89, t. 479 (1856).

Native. Perennial herb, procumbent, often growing on the escarpment, high plateau, rocky plain, exposed hillsides, and rock crevices.

2.6.3. *Indigofera argentea* Burm.f., Fl. Ind. (N. L. Burman) 171 (1768).

= *Indigofera argentea* L., Mant. Pl. Altera 273 (1771).

= *Indigofera brachycarpa* Graham, Numer. List [Wallich] n. 5470 (1831).

= *Indigofera burmanni* Boiss., Fl. Orient. [Boissier] 2: 187 (1872).

Native. Erect annual herb growing on dunes in great abundance after rain.

2.6.4. *Indigofera articulata* Gouan, Ill. Observ. Bot. 49 (1773).

= *Indigofera tinctoria* Forssk., Fl. Aegypt.-Arab. 138 (1775).

= *Indigofera glauca* Lam., Encycl. [J. Lamarck & al.] 3(1): 246 (1789).

Native. Erect shrubby perennial to about 75 cm tall, growing in grassland and bushland, roadsides, on stony [soils] with poor rainfall, in soils mixed with gravel and on arable land.

2.6.5. *Indigofera coerulea* Roxb., Fl. Ind. (Roxburgh) 3: 377, 864 (1832).

Native. Erect shrubby perennial herb to about 75 cm tall, growing in roadsides and field in the silt plain.

Two varieties occur in Lahij Governorate

1a. Leaflets glabrous adaxial var. *coerulea*

1b. Leaflets hairy on both sides.....var. *occidentalis*

2.6.5.1. *Indigofera coerulea* var. *coerulea* Roxb., Fl. Ind. (Roxburgh) 3: 377, 864 (1832).

2.6.5.2. *Indigofera coerulea* var. *occidentalis* J.B. Gillet & Ali, Kew Bull., Addit. Ser. 1: 102 (1958).

This variety is not mentioned in POWO (2020), but it occurs in Yemen (Al-Khulaidi, 2000).

2.6.6. *Indigofera colutea* (Burm.f.) Merr.,

Philipp. J. Sci. 19: 355 (1921). **var. *colutea***

= *Indigofera viscosa* Lam., Encycl. [J. Lamarck & al.] 3(1): 247 (1789).

See POWO (2020) for a list of further synonyms.

Native. Erect or spreading annual herb, becoming weedy on roadsides, fields, disturbed rocky ground, preferring areas of good rainfall.

2.6.7. *Indigofera hochstetteri* Baker, Fl. Trop. Afr. [Oliver & al.] 2: 101 (1871).

= *Indigofera anabaptista* Steud. ex Baker, Fl. Brit. India [J. D. Hooker] 2(4): 102 (1876).

See POWO (2020) for a list of further synonyms.

Native. Decumbent annual herb, found in grassland on the escarpment, sandy and stony ground, often in field borders.

2.6.8. *Indigofera oblongifolia* Forssk., Fl. Aegypt.-Arab. 137. (1775).

= *Indigofera lotoides* Lam., Encycl. [J. Lamarck & al.] 3(1): 247 (1789).

= *Indigofera paucifolia* Delile, Descr. Egypte, Hist. Nat. 251 (1813).

= *Indigofera argentea* Buch.-Ham. ex Roxb., Hort. Bengal. 57; Fl. Ind. iii. 374 (1832).

Native. Undershrub. A widespread plant on silt and stony plains.

2.6.9. *Indigofera semitrijuga* Forssk., Fl. Aegypt.-Arab. 137. (1775).

= *Indigofera saltiana* Steud., Nomencl. Bot. [Steudel], ed. 2. 1: 808 (1840).

= *Indigofera somalensis* Vatke, Oesterr. Bot. Z. 28: 201 (1878).

Native. Procumbent annual herb, a rare plant of dunes near the sea.

2.6.10. *Indigofera spiniflora* Hochst. ex Boiss., Fl. Orient. [Boissier] 2: 190, in obs. (1872).

= *Indigofera spinosa* var. *spiniflora* Schweinf., Bull. Herb. Boissier 2: 237 (1896)

Native. A spiny undershrub, growing in semi-desert grassland, on clay soils, also on slopes in clay soils mixed with gravel.

2.6.11. *Indigofera spinosa* Forssk., Fl. Aegypt.-Arab. 137. (1775).

Native. A spiny undershrub, growing in semi-desert grassland, on sand and stony hills.

2.7. *Melilotus* (L.) Mill., Gard. Dict. Abr., ed. 4. [876] (1754).

2.7.1. *Melilotus albus* Medik., Vorles. Churpfälz. Phys.-Öcon. Ges. 2: 382 (1787).

= *Melilotus vulgaris* Willd., Enum. Pl. [Willdenow] 2: 790 (1809).

= *Melilotus leucanthus* Koch ex DC., Fl. Franc. [de Candolle & Lamarck], ed. 3. 6: 564 (1815).

= *Melilotus melanospermus* Besser ex Ser., Prodr. [A. P. de Candolle] 2: 186 (1825).

= *Melilotus argutus* Rchb., Fl. Germ. Excurs. 499 (1832).

Native. Annual herb erect, often growing as a garden weed. Considered native – might it occur in gardens because of its medicinal properties – also for forage.

2.8. *Microcharis* Benth., Trans. Linn. Soc. London 25(2): 297, t. 33 (1865).

2.8.1. *Microcharis tritoides* (Baker) Schrire, Bothalia 22(2): 167 (1992). subsp. *tritoides*

= *Indigofera tritoides* Baker, Bull. Misc. Inform. Kew 1895(105): 214 (1895).

Native. Perennial woody herb, erect or decumbent. A rare plant of gravelly plain and semi-desert grassland.

2.9. *Rhynchosia* Lour., Fl. Cochinch. 2: 425 (460) (1790).

Four taxa are recorded from the study area, all of them native. The artificial key below distinguishes between them.

- 1a. Standard of corolla glabrous ... **1. *R. elegans***
 1b. Standard of corolla pubescent **2**
 2a. Plant densely tomentose, grey or grey-green **3**
 2b. Plant glabrous, always green **2. *R. minima*** var. *prostrata*
 3a. Flowers solitary or paired in the leaf axils ...
 **4. *R. schimperi***
 3b. Flowers racemes **3. *R. pulverulenta***

2.9.1. *Rhynchosia elegans* A.Rich., Tent. Fl. Abyss. 1: 228 (1847).

Native. Perennial climbing herb, growing on field borders climbing on *Euphorbia inarticulata*, also in sheltered rock crevices.

2.9.2. *Rhynchosia minima* var. *prostrata* (Harv.) Meikle, Kew Bull. 9(2): 275 (1954).

This variety is mentioned in the Flora of Yemen by Al-Khulaidi (2000).

Native. Perennial climbing or prostrate herb, in

grassland or bushland, often on alluvial soils and escarpments.

2.9.3. *Rhynchosia pulverulenta* Stocks, Hooker's J. Bot. Kew Gard. Misc. 4: 147 (1852).

= *Rhynchosia elachistantha* Chiov., Ann. Ist. Bot. Roma 8(1): 100–101 (1903).

= *Rhynchosia rhombifolia* Blatt. & Hallb., J. Bombay Nat. Hist. Soc. 26: 242 (1918).

Native. Erect or climbing woody herb, growing on scrub-covered roadside banks and in clay soils mixed with sand.

2.9.4. *Rhynchosia schimperi* Hochst. ex Boiss., Fl. Orient. [Boissier] 2: 626 (1872).

= *Rhynchosia arenaria* Blatt. & Hallb., J. Bombay Nat. Hist. Soc. 26: 243 (1918).

= *Rhynchosia cliffordii* Hutch. & E.A. Bruce, Bull. Misc. Inform. Kew 1941(2): 121 (1942).

Native. Prostrate or spreading shrub or subshrub, growing in stony or sandy ground.

2.10. *Sesbania* Scop., Intr. Hist. Nat. 308 (1777).

Two species occur in Lahij Governorate, both native.

1a. Style glabrous; seeds ellipsoid ... **1. *S. leptocarpa***

1b. Style pubescent; seeds cube-shaped ... **2. *S. pachycarpa***

2.10.1. *Sesbania leptocarpa* DC., Prodr. [A. P. de Candolle] 2: 265 (1825).

Native. Annual herb, woody, erect, up to 1-2 m high. It is common as a field weed in the alluvial plains and irrigated fields with some plants of Poaceae such as *Sorghum* etc.

2.10.2. *Sesbania pachycarpa* DC., Prodr. [A. P. de Candolle] 2: 265 (1825).

Native. An erect woody shrub, up to 4 m high, only known from a sorghum field in wadi beds.

2.11. *Tephrosia* Pers., Syn. Pl. [Persoon] 2: 328 (1807).

Widely distributed in the study area, seven taxa are recorded from the study area, all of them native. The artificial key below distinguishes between them.

1a. Leaves simple **1. *T. heterophylla***

1b. Leaves compound **2**

- 2a. Stem life form erect, smooth 3
 2b. Stem life form prostrate, rough 4. **T. pumila**
 3a. Leaflets pubescent or tomentose on both surfaces 4
 3b. Leaflets glabrous above, silvery beneath..6
 4a. Flowers 2-3 in the leaf axils 8. **T. uniflora** subsp. **uniflora**
 4b. Flowers >3 in racemes 5
 5a. Pod densely long white tomentose, ovoid **2. T. nubica**
 5b. Pod strigose or spreading pubescent, linear **5. T. purpurea**
 6a. Leaflets usually 5 **3. T. pentaphylla**
 6b. Leaflets usually 7 or more 7
 7a. Pod 2-3cm long, with 5-9 seeds **6. T. subtriflora**
 7b. Pod 4.5-5cm long, with 9-13 seeds **7. T. uniflora**

2.11.1. *Tephrosia heterophylla* Vatke, Oesterr. Bot. Z. 28: 214 (1878).

= *Tephrosia simplicifolia* Franch., Sert. Somal. 28 (1882).

= *Tephrosia schweinfurthii* Deflers, Bull. Soc. Bot. France 42: 302 (1895).

= *Tephrosia franchetii* Hutch. & E.A. Bruce, Bull. Misc. Inform. Kew 1941(2): 117 (1942).

Native. Perennial herb, prostrate or erect; widespread on open well-drained hillsides and rocky plains on the escarpment, or high plateau, in the central escarpment of *Euphorbia* scrub and on limestone hills.

2.11.2. *Tephrosia nubica* (Boiss.) Baker, Fl. Trop. Afr. [Oliver et al.] 2: 125 (1871).

= *Pogonostigma nubicum* Boiss., Diagn. Pl. Orient. ser. 1, 2: 40 (1843).

Native. Erect, bushy perennial growing on stony outcrops and gravel banks.

2.11.3. *Tephrosia pentaphylla* (Roxb.) G. Don, Hort. Brit. [Sweet], ed. 3. 170, no. 32 (1839).

= *Galega pentaphylla* Roxb., Fl. Ind. (Roxburgh) 3: 384 (1832).

= *Tephrosia decidua* Steud. ex A. Rich., Tent. Fl. Abyss. 1: 189 (1847).

= *Tephrosia similis* Chiov., Fl. Somalia 2: 161 (1932).

Native. Woody, ascending perennial herb, growing in irrigated fields, in canals, valley scrub, and on limestone dip slope.

2.11.4. *Tephrosia pumila* (Lam.) Pers., Syn. Pl. [Persoon] 2(2): 330 (1807).

= *Galega pumila* Lam., Encycl. [J. Lamarck & al.] 2(2): 599 (1788).

Native. Perennial herb procumbent grows on the escarpment, usually in partial shade on banks round fields or in scrub in areas of good rainfall.

2.11.5. *Tephrosia purpurea* (L.) Pers., Syn. Pl. [Persoon] 2(2): 329 (1807).

= *Cracca purpurea* L., Sp. Pl. 2: 753 (1753).

= *Galega purpurea* (L.) L., Syst. Nat., ed. 10. 2: 1172 (1759).

Native. Perennial herb, woody below, growing in grassland and cultivated areas, sandy places, sometimes frequent on dunes after rain.

2.11.6. *Tephrosia subtriflora* Hochst. ex Baker, Fl. Trop. Afr. [Oliver & al.] 2: 117 (1871).

= *Tephrosia encoptosperma* Schweinf., Bull. Herb. Boissier 4(App. 2): 246 (1896).

= *Tephrosia graminifolia* Chiov., Ann. Bot. (Rome) 13: 381 (1915).

= *Tephrosia sulphurea* Chiov. Fl. Somalia 1: 142 (1929)

Native. Prostrate or ascending annual herb, grows in stony plain and on rocky slopes.

2.11.7. *Tephrosia uniflora* Pers., Syn. Pl. [Persoon] 2(2): 329 (1807).

= *Galega uniflora* Steud., Nomencl. Bot. [Steudel] 350 (1821).

Native. Perennial herb, woody, spreading to erect, usually rare on the sand and stony steppe, more frequent on exposed rocky slopes in the foothills.

One subspecies occur in Lahij Governorate

2.11.7.1. *Tephrosia uniflora* subsp. *uniflora*
 = *Tephrosia vicioides* A. Rich., Tent. Fl. Abyss. 1: 188 (1847).

= *Tephrosia quartiniana* Cuf. ex Greuter & Burdet, Willdenowia 16(2): 446, nom. nov. (1987).

See POWO (2020) for a list of further synonyms.

Native. Procumbent perennial herb, known from dunes.

2.12. *Zygocarpum* Thulin & Lavin, Syst. Bot. 26(2): 308 (2001).

A single species, endemic to the area.

2.12.1. *Zygocarpum yemenense* (J.B. Gillett) Thulin & Lavin, Syst. Bot. 26(2): 313 (2001).

= *Ormocarpum yemenense* J.B.Gillett, Kew Bull. 20(2): 339 (1966).

Shrub up to 3 m high, widespread on the escarpment, in areas of good rainfall.

3. Subfamily: Mimosoideae

Shrubs and trees, sixteen species belonging to four genera are recorded in the studied area, among them, 13 species belong to the genus *Acacia* as traditionally recognized. The characters below distinguish between the four genera.

Artificial key to the genera of Mimosoideae recorded in Lahij Governorate

- 1a. Plant armed 2
- 1b. Plant unarmed **2. *Leucaena***
- 2a. Pinnae and leaflets in one pair **3. *Pithecellobium***
- 2b. Pinnae and/or leaflets in more than one pair **3**
- 3a. Stamens 10 only **4. *Prosopis***
- 3b. Stamens numerous **1. *Acacia***

3.1. *Acacia* Mill., Gard. Dict. Abr., ed. 4. 1: [25] (1754).

Shrubs or trees with 13 taxa represented in the study area, all of them native. Although the name *Acacia* has officially been changed to *Vachellia* or *Senegalia* for these species we prefer to retain the traditional *Acacia*, where some endemic species are not following the new taxonomy and needs further investigations. Thus, we cited the new names in the synonymy.

Artificial key to the Acacia species recorded in the study area

- 1a. Inflorescence a head 2
- 1b. Inflorescence a spike **8**
- 2a. Flowers yellow **3**
- 2b. Flowers white or cream **4**
- 3a. Pod glabrous, falcate, slightly constricted between the seeds at maturity ... **3. *A. ehrenbergiana***
- 3b. Pod ±tomentose, straight or slightly curved, regularly constricted between the seeds **10. *A. nilotica***
- 4a. Shrubs to 1.5-2m tall **5**
- 4b. Trees or rarely shrubs to 6-10m tall **6**
- 5a. Branchlets red or purple-brown, pubescent, becoming glabrous with age **2. *A. edgeworthii***

Egypt. J. Bot. **61**, No. 2 (2021)

5b. Branchlets white, pubescent **11. *A. oerfota***

6a. Pinnae usually more than 10 pairs, leaflets more than 30 pairs **7. *A. johnwoodii***

6b. Pinnae usually less than 10 pairs, leaflets 6-30 pairs **7**

7a. Pod glabrous, straight ... **4. *A. etbaica*** subsp. ***uncinata***

7b. Pod pubescent, spirally twisted **12. *A. tortilis*** subsp. ***tortilis***

8a. Leaves: petiole and rachis together less than 1 cm long **6. **A. hunteri***

8b. Leaves: petiole and rachis together more than 1 cm long **9**

9a. Pinna-pairs only two per leaf, leaflets only one, rarely two pair (s) per pinna **9. *A. mellifera***

9b. Pinna-pairs per leaf more than 2, leaflets per pinna >2 **10**

10a. Stem prickles in pairs or rarely in threes, hooked **8. *A. laeta***

10b. Stem prickles usually in threes **11**

11a. Lateral prickles curved upwards; pinnae abaxial surface with a recurved small prickle on the rachis at or just below the apex **5. *A. hamulosa***

11b. Lateral prickles horizontal or slightly curved upwards; pinnae abaxial surface not prickly **1. *A. asak***

3.1.1. *Acacia asak* Willd., Sp. Pl., ed. 4 [Willdenow] 4(2): 1077 (1806).

Accepted name: *Senegalia asak* (Forssk.) Kyal. & Boatwr., Bot. J. Linn. Soc. 172(4): 507 (2013).

= *Mimosa asak* Forssk., Fl. Aegypt.-Arab. 176 (1775).

= *Acacia glaucophylla* Steud. ex A.Rich., Tent. Fl. Abyss. 1: 243 (1847).

Native. Small tree, growing on mountain escarpments, steep rocky slopes, cliffs, rocky gullies, rocky hillsides, and sandy soils.

3.1.2. *Acacia edgeworthii* T. Anderson, J. Proc. Linn. Soc., Bot. 5(Suppl. 1): 18 (1860).

Accepted name: *Vachellia edgeworthii* (T.Anderson) Kyal. & Boatwr., Bot. J. Linn. Soc. 172(4): 512 (2013).

= *Acacia socotrana* Balf.f., Proc. Roy. Soc. Edinburgh xi. 511 (1882).

= *Acacia pseudosocotrana* Chiov., Fl. Somala 1: 161 (1929).

= *Acacia sultani* Chiov., Fl. Somala 1: 162 (1929).

= *Acacia erythraea* Chiov., Fl. Somala 1: 163 (1929).

= *Acacia humifusa* Chiov., Fl. Somala 1: 163 (1929).

Native. Spreading shrub, in bushland, semi-desert, scrub, dunes, on sandy soils mixed with gravel and stony steppe.

3.1.3. *Acacia ehrenbergiana* Hayne, Getreue Darstell. Gew. 10: t. 29 (1827)

Accepted name: *Vachellia flava* (Forssk.) Kyal. & Boatwr., Bot. J. Linn. Soc. 172(4): 513 (2013).

= *Mimosa flava* Forssk., Fl. Aegypt.-Arab. 176 (1775), nom. illeg.

= *Acacia flava* Schweinf., Bull. Herb. Boissier iv. App. II. 214 (1896).

Native. Large shrub stems many from the base; growing in foothills, wadis, sandy plains, and gravel plains.

3.1.4. *Acacia etbaica* subsp. *uncinata* Brenan, Kew Bull. 12(1): 91 (1957).

Accepted name: *Vachellia etbaica* subsp. *uncinata* (Brenan) Kyal. & Boatwr., Bot. J. Linn. Soc. 172(4): 512 (2013).

Native. Tree, growing on open slopes and drier areas of the mountain escarpment.

3.1.5. *Acacia hamulosa* Benth., London J. Bot. 1: 509 (1842).

Accepted name: *Senegalia hamulosa* (Benth.) Boatwr., Bot. J. Linn. Soc. 179(2): 293 (2015).

= *Acacia paradoxa* Chiov., Fl. Somala 1: 165 (1929).

Native. Shrub, growing on stony plains, stony steppe, and on escarpments.

3.1.6. *Acacia hunteri* Oliv., Hooker's Icon. Pl. 14: t. 1350 (1881).

Accepted name: *Vachellia hunteri* (Oliv.) Ragup., Seigler, Ebinger & Maslin, Phytotaxa 162(3): 176 (2014).

The accepted name by POWO (2020) for that species needs more investigations as the plant is endemic to Yemen, and no previous work dealt with it.

Native. Shrub, growing on stony plains, wadis, near arable land, and sandy soils mixed with gravel.

3.1.7. *Acacia johnwoodii* Boulos, Kew Bull. 50(2): 327 (1995).

Accepted name: *Vachellia johnwoodii* (Boulos) Ragup., Seigler, Ebinger & Maslin, Phytotaxa

162(3): 176 (2014).

Native. Tree up to 10 m, growing on rocky hillsides and plains, the edge of cultivation, wadi beds, and valley forests.

3.1.8. *Acacia laeta* R.Br. ex Benth., London J. Bot. 1: 508 (1842).

Accepted name: *Senegalia laeta* (R.Br. ex Benth.) Seigler & Ebinger, Phytologia 91(1): 27 (2009).

Native. Small tree growing on escarpment, hillsides, and in sandy plains mixed with gravel.

3.1.9. *Acacia mellifera* (Vahl) Benth., London J. Bot. 1: 507 (1842).

Accepted name: *Senegalia mellifera* (Vahl) Seigler & Ebinger, Phytologia 92(1): 94 (2010).

= *Mimosa mellifera* Vahl, Symb. Bot. (Vahl) 2: 103 (1791).

= *Inga mellifera* (Vahl) Willd., Sp. Pl., ed. 4 [Willdenow] 4(2): 1006 (1806).

Native. Small tree, growing on escarpment, hillsides, and in sandy plains mixed with gravel.

3.1.10. *Acacia nilotica* (L.) Willd. ex Del., Descr. Egypt, Hist. Nat. 2(1): 79 (1813).

Accepted name: *Vachellia nilotica* (L.) P.J.H.Hurter & Mabb., Mabblerley's Pl.-Book 1021 (2008).

= *Mimosa nilotica* L., Sp. Pl. 1: 521 (1753).

Two subspecies are found in the study area

1a. Pods strongly constricted in between the seeds, green at maturity, pubescent or glabrous
.....*A. nilotica* subsp. *indica*

1b. Pods shallow crenate to straight-sided (not strongly constricted between seeds), black at maturity, minutely pubescent *A. nilotica* subsp. *kraussiana*

1.1.1.1. *Acacia nilotica* subsp. *indica* (Benth.) Brenan, Kew Bulletin 12(1): 84 (1957).

Accepted name: *Vachellia nilotica* subsp. *indica* (Benth.) Kyal. & Boatwr., Bot. J. Linn. Soc. 172(4): 515 (2013).

= *Acacia arabica* var. *indica* Benth., London J. Bot. 1: 500 (1842).

Native in POWO (2020). Tree; naturalized.

1.1.1.2. *Acacia nilotica* subsp. *kraussiana* (Benth.) Brenan, Kew Bulletin 12(1): 84 (1957)

Accepted name: *Vachellia nilotica* subsp.

kraussiana (Benth.) Kyal. & Boatwr., Bot. J. Linn. Soc. 172(4): 515 (2013).

= *Acacia arabica* var. *kraussiana* Benth., London J. Bot. 1: 500 (1842).

Native. Small tree, growing around fields and on stony plains.

1.1.10. *Acacia oerfota* (Forssk.) Schweinf., Bull. Herb. Boissier 4 (appendix 2): 213 (1896).

Accepted name: *Vachellia oerfota* (Forssk.) Kyal. & Boatwr., Bot. J. Linn. Soc. 172(4): 515 (2013).

= *Mimosa oerfota* Forssk., Fl. Aegypt.-Arab. 177 (1775).

Native. Shrub, common on gravel, stony plain, dry hills, and rocky slopes.

1.1.11. *Acacia tortilis* (Forssk.) Hayne, Getreue Darstell. Gew. 10: t. 31 (1827)

Accepted name: *Vachellia tortilis* (Forssk.) Galasso & Banfi, Atti Soc. Ital. Sci. Nat. Mus. Civico Storia Nat. Milano 149(1): 150 (2008).

= *Mimosa tortilis* Forssk., Fl. Aegypt.-Arab. 176 (1775).

1.1.12. *Acacia tortilis* subsp. *tortilis*

Accepted name: *Vachellia tortilis* subsp. *tortilis*

Native. Tree growing in foothills of the escarpments, gravel plains, along wadis and sandy regions.

3.2. *Leucaena* Benth., J. Bot. (Hooker) 4: 416 (1842).

3.2.1. *Leucaena leucocephala* (Lam.) de Wit, Taxon 10: 54 (1961).

= *Mimosa leucocephala* Lam., Encycl. [J. Lamarck & al.] 1(1): 12 (1783).

= *Acacia leucocephala* (Lam.) Link, Enum. Hort. Berol. Alt. 2: 444 (1822).

Introduced American species. Shrub, naturalized, found in wadis near villages.

3.3. *Pithecellobium* Mart., Flora 20(2, Beibl.): 114 (1837), nom. et orth. cons. (1837).

3.3.1. *Pithecellobium dulce* (Roxb.) Benth., London J. Bot. 3: 199 (1844).

= *Mimosa dulcis* Roxb., Pl. Coromandel 1(4): 67, t. 99 (1798).

= *Inga dulcis* (Roxb.) Willd., Sp. Pl., ed. 4 [Willdenow] 4(2): 1005 (1806).

Introduced American species. Small tree,

naturalized, found in wadis and arable land.

3.4. *Prosopis* L., Mant. Pl. 10 (1767).

3.4.1. *Prosopis juliflora* (Sw.) DC., Prodr. [A. P. de Candolle] 2: 447 (1825).

= *Acacia juliflora* (Sw.) Willd., Sp. Pl., ed. 4 [Willdenow] 4(2): 1076 (1806).

= *Mimosa juliflora* Sw., Prodr. [O. P. Swartz] 85 (1788).

See POWO (2020) for a list of further synonyms.

Introduced American species. Small tree naturalized near waterholes, along wadis, and on roadsides.

Discussion

There is a dearth of studies on the Flora of the southern governorates of Yemen: Abyan, Aden, Al-Mahra, Hadramout, Lahij, and Shabwah (Kilian et al., 2002). Thus, the diversity and phytogeographical distribution of their vascular plants are barely known. In the current study, a floristic analysis of wild legume species from Lahij Governorate includes a total of 63 taxa (including infraspecific taxa), belonging to 20 genera of three subfamilies (Caesalpinioideae, Faboideae, and Mimosoideae) of the family Fabaceae (Table 1). Despite the large number of species recorded in the study area, the share of endemism is too little. Only two species (3.17%) are endemic to the study area. Moreover, six species are considered near endemics, present in ecogeographical boundaries of two or five countries regardless of their political boundaries (Shaltout et al., 2018) (Fig. 3). The flora of Yemen is like that of the neighboring regions such as Jabal Fayfa, south-west Saudi Arabia. The presence of endemic and near-endemic legume species in the flora of Lahij Governorate, South Yemen might be caused by the constant humidity-laden breezes from the Red Sea on the west-facing slopes, which contain many micro hotspots appropriate for the maintenance of these plants (Abbas et al., 2020).

In Yemen, members of the family Fabaceae are well represented. Al-Khulaidi (2013) recognized 81 genera encompassing 277 species belonging to the former three subfamilies. Thus, the recorded taxa from Lahij Governorate represent 22.74% of the total published species in the Flora of Yemen. This high number of wild/native legume taxa may

be due to the presence of a mosaic environment in the study area, forming a distinct number of habitats each with unique features regarding topographic differences, soil composition, water resources, in addition to human and animal interference (Alshammari & Sharawy, 2010; Osman et al., 2014). Moreover, Faboideae is the dominant subfamily, represented by 12 genera and 37 species (Table 2).

These results conform with those of Al-Hawshabi et al. (2017). Moreover, *Acacia* (13 taxa), *Indigofera* (12 taxa), *Tephrosia* (7 taxa), *Crotalaria*, and *Senna* (6 taxa each), are the most species-rich genera (Fig. 4). These results are consistent with the previous studies in the flora of Yemen (Gabali & Al-Gifri, 1990; Ibrahim, 2006; Al-Hawshabi, 2017; Al-Hawshabi et al., 2017). This can be attributed to their efficient seed dispersal capabilities and wide ecological range of tolerance.

Unlike the flora of other areas of Yemen, two-thirds (76.19%) of the wild/native legume flora of Lahij Governorate is represented by perennials while annuals were represented by 23.81% of the total taxa recorded. The dominance of perennial taxa may be attributed to the rather low rainfall, which is not enough to sustain many annuals. Instead, perennials are adapted to the extreme habitats of the area, which then offers a characteristic physiognomy to the plant cover (Shaltout et al., 2010; Abdel Khalik et al., 2013; El-Amier, 2016).

Wild legumes of Lahij Governorate exhibit a great diversity of life forms. The life-form spectrum is predominantly phanerophytes and chamaephytes (34.92% and 33.33%, respectively), followed by therophytes (23.81%) and hemicryptophytes (7.94%). The dominance of phanerophytes and

chamaephytes over other life forms may be in response to the high altitude, topography, landform, hot dry climate, and variation in rainfall in addition to urbanization activities (El-Ghani & Fawzy, 2006; Shaltout et al., 2010; Alshammari, 2013). Therophytes are short-lived plants characterized by their high growth rate which enables them to resist biotic influence, their ability to set numerous seeds, their genetic and morphological plasticity under a high level of disturbance, hot dry climate, lack of rainfall, and topographic variation (Barbero et al., 1990; Shaltout & Al-Sodany, 2008). This trend of lifeform spectra is similar to that of other regions of Yemen (Al-Hawshabi, 2017; Al-Hawshabi et al., 2017).

Phytogeographical analysis of the 63 legume taxa surveyed in the study area revealed that the monoregional elements of the Sudano-Zambeian chorotype (25.40%) are the most dominant, forming the major constituent (1/4 of the recorded plants) of the floristic structure in Lahij Governorate, followed by the biregional elements of the Saharo-Arabian/Sudano-Zambeian chorotypes (22.22%), and the Irano-Turanian/ Saharo-Arabian/Sudano-Zambeian chorotypes (14.29%) (Fig. 5 C). Similar results were obtained in different studies of the flora of Yemen (Al-Hawshabi, 2017). Moreover, Wickens (1976), recognized five subregions within the Sudano-Zambeian region; of these the South Arabian subregion is an extension of the Sudano-Zambeian including parts of southern Saudi Arabia and Yemen bordering the coasts of the Red Sea and the Gulf of Aden. This combination of different chorological elements with uneven numbers of plant taxa can be attributed to various factors such as diversity of habitats, topography, water availability, and the capability of certain legume taxa to penetrate the study area from different adjacent phytogeographical regions.

TABLE 2. Number of genera and species of the subfamilies of Fabaceae reported by different authors concerned with the flora of Yemen

Subfamily	Study	Study					Current study (2020)
		Boulos (1988)	Gabali & Al-Gifri (1990)	Al-Khulaidi (2013)	Al-Hawshabi (2017)	Al-Hawshabi et al. (2017)	
Caesalpinioideae	No. genera	2	5	11	1	4	4
	No. species	6	9	33	3	9	9
Faboideae	No. genera	9	14	60	4	12	12
	No. species	18	30	172	6	37	37
Mimosoideae	No. genera	2	2	7	1	4	4
	No. species	11	17	39	4	15	15

Conclusion

The study revised the family Fabaceae/Leguminosae in the flora of Lahij Governorate, South Yemen. A total of 63 taxa (including infraspecific taxa), belonging to 20 genera of three subfamilies (Caesalpinioideae, Faboideae, and Mimosoideae) were recorded. New keys were added for plant taxonomists to aid the accurate identification of wild legumes in the flora of Yemen. Plant names were updated except for the genus *Acacia* s.l., which remains as it was traditionally recognized as some species are endemic to Yemen and await future systematic and phylogenetic studies.

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References

- Abbas, A.M., Al-Kahtani, M.A., Alfaifi, M.Y., Elbehairi, S.E.I., Badry, M.O. (2020) Floristic diversity and phytogeography of JABAL Fayfa: A subtropical dry zone, South-West Saudi Arabia. *Diversity*, **12**, 345.
- Abdel Khalik, K., El-Sheikh, M., El-Aidarous, A. (2013) Floristic diversity and vegetation analysis of Wadi Al-Noman, Mecca, Saudi Arabia. *Turkish Journal of Botany*, **37**, 894–907.
- Egypt. J. Bot.* **61**, No. 2 (2021)
- Akhani, H. (2007) Diversity, biogeography, and photosynthetic pathways of *Argusia* and *Heliotropium* (Boraginaceae) in South-West Asia with an analysis of phytogeographical units. *Botanical Journal of the Linnean Society*, **155**, 401–425.
- Al-Hawshabi, O.S.S. (2017) Floristic composition, life-forms and chorotypes of Al-Asabah Region, Ash Shamayatayn District, Taiz Governorate, Yemen. *Feddes Repertorium*, **128**, 42–54.
- Al-Hawshabi, O.S.S., Al-Meisari, M.A., El-Naggari, S.M.I. (2017) Floristic composition, life-forms and biological spectrum of Toor Al-Baha District, Lahej Governorate, Yemen. *Current Life Sciences*, **3**, 72–91.
- Al-Khulaidi, A.A. (2000) "*Flora of Yemen (Checklist of flora)*". Sustainable Environmental Management Programme. YEM/97/100, Sub-Programme II., Sana'a, Yemen.
- Al-Khulaidi, A.A. (2013) *Flora of Yemen. Sustainable Natural Resource*", Management Project (SNRMP) II, Sana'a, Yemen.
- Alshammari, A.S. (2013) Soil classification, water quality and chemical pollution of some crops and soils at farms in Wadi Al-Aderaa-Hail. *Ph.D. Dissertation*, King Abdu Aziz University, Jeddah, Saudi Arabia.
- Alshammari, A.M., Sharawy, S.M. (2010) Wild plants diversity of the Hema Faid region (Ha'il province, Saudi Arabia). *Asian Journal of Plant Sciences*, **9**, 447–454.
- APG III (2009) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. *Botanical Journal of the Linnean Society*, **161**, 105–121.
- Barbero, M., Bonin, G., Loisel, R., Quézel, P. (1990) Changes and disturbances of forest ecosystems caused by human activities in the western part of the Mediterranean basin. *Vegetatio*, **87**, 151–173.
- Boulos, L. (1988) A contribution to the flora of South Yemen (PDRY). *Candollea*, **43**, 549–585.
- Boulos, L. (1999) "*Flora of Egypt*", Volume 1: Azollaceae - Oxalidaceae. Al Hadara Publishing, Cairo.

- Boulos, L. (2009) "*Flora of Egypt Checklist*" - Revised Annotated Edition. Al Hadara Publishing, Cairo.
- Chaudhary, S.A. (1999) "*Flora of the Kingdom of Saudi Arabia*", illustrated, Volume 1. Ministry of Agriculture and Water, National Herbarium : National Agriculture and Water Research Center, Riyadh.
- Chaudhary, S.A. (2001) "*Flora of the Kingdom of Saudi Arabia*", Volum II. Ministry of Agriculture and Water, National Herbarium: National Agriculture and Water Research Center, Riyadh.
- Christenhusz, M.J.M.M., Byng, J.W. (2016) The number of known plants species in the world and its annual increase. *Phytotaxa*, **261**, 201–217.
- Collenette, S. (1999) Wildflowers of Saudi Arabia. National Commission for Wildlife Conservation and Development (NCWCD), Riyadh, Saudi Arabia.
- El-Amier, Y.A. (2016) Vegetation structure and soil characteristics of five common geophytes in desert of Egypt. *Egyptian Journal of Basic and Applied Sciences*, **3**, 172–186.
- El-Ghani, M.M.A., Fawzy, A.M. (2006) Plant diversity around springs and wells in five oases of the western desert, Egypt. *International Journal of Agriculture and Biology*, **8**, 249–255.
- EPA (2009) Assessing Progress towards the 2010 Target – the 4th national CBD report. Environment Protection Authority, Ministry of Water and Environment, Republic of Yemen.
- Gabali, S.A. (1995) Plant Life in Yemen. A General Survey and Preliminary Checklist of the Flowering Plant Species. Aden University Press, Aden.
- Gabali, S.A., Al-Gifri, A. (1990) Flora of South Yemen—Angiospermae A provisional checklist. *Feddes Repertorium*, **101**, 373–383.
- Ibrahim, H.M. (2006) Studies on the flora of Al-Mahweet governorate, Republic of Yemen. *M. Sc. Dissertation*, Sana'a University, Sana'a, Yemen.
- Judd, W.S, Campbell, C.S., Kellogg, E.A., Stevens, P.E. (1999) "*Plant Systematics: A Phylogenetic Approach*". Sinauer Associates Inc. Publishers, Sunderland, Massachusetts U.S.A.
- Kilian, N., Hein, P., Hubaishan, M.A. (2002) New and noteworthy records for the flora of Yemen, chiefly of Hadhramout and Al-Mahra. *Willdenowia*, **32**, 239–269.
- Kilian, N., Hein, P., Hubaishan, M.A. (2004) Further notes on the flora of the southern coastal mountains of Yemen. *Willdenowia*, **34**, 159–182.
- Lewis, G.P., Schrire, B., Mackinder, B., Lock, M. (2005) Legumes of the World. Richmond, Royal Botanic Gardens, Kew, London.
- LPWG (2017) A new subfamily classification of the Leguminosae based on a taxonomically comprehensive phylogeny. *Taxon*, **66**, 44–77.
- Mabberley, D.J. (2008) "*Mabberley's Plant-Book: A Portable Dictionary of Plants, Their Classifications, and Uses*". Cambridge University Press, Cambridge, Uk.
- Osman, A.K., Al-Ghamdi, F., Bawadekji, A. (2014) Floristic diversity and vegetation analysis of Wadi Arar: A typical desert Wadi of the Northern Border region of Saudi Arabia. *Saudi Journal of Biological Sciences*, **21**, 554–565.
- Pickersgill, B. (1996) "*Advances in Legume Systematics Part 8: Legumes of Economic Importance*", Lock J. M. (Ed.). Royal Botanic Gardens, Kew.
- POWO (2020) Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew [online]. Website <http://powo.science.kew.org/> [accessed 18 August 2020].
- Raunkiaer, C. (1934) "*The Life Forms of Plants and Statistical Plant Geography*". Clarendon Press, Oxford.
- Shaltout, K.H., Al-Sodany, Y.M. (2008) Vegetation analysis of Burullus Wetland: A RAMSAR site in Egypt. *Wetlands Ecology and Management*, **16**, 421–439.
- Shaltout, K.H., Sheded, M.G., Salem, A. I. (2010) Vegetation spatial heterogeneity in a hyper arid Biosphere Reserve area in north Africa. *Acta Botanica Croatica*, **69**, 31–46.
- Shaltout, K., Ahmed, D., Diab, M., El-Khalafy, M. (2018) Re-assessment of the near-endemic taxa in the Egyptian Flora. *Taekholmia*, **38**, 61–83.

- Thulin, M. (1983) "*Leguminosae of Ethiopia*". Council for Nordic Publications in Botany.
- Thulin, M. (1993) "*Flora of Somalia, Volume 1-Pteridophyta; Gymnospermae; Angiospermae (Annonaceae-Fabaceae)*". Royal Botanical Gardens, Kew.
- Walter, H., Harnickell, E., Mueller-Dombois, D. (1975) "*Climate Diagram maps of the Individual Countries and the Ecological Climatic Regions of the Earth*". Springer-Verlag, Berlin.
- Wickens, G.E. (1976) The Flora of Jebel Marra (Sudan Republic) and Its Geographical Affinities: Kew Bulletin Additional Series V. HMSO, London.
- Wood, J.R.I. (1997) "*A Handbook of the Yemen Flora*". Royal Botanic Gardens, Kew, UK.
- WWO (2020) Lahj, Al Ghaydah, Yemen Historical Weather Almanac. [online]. Website <https://www.worldweatheronline.com/lahj-weather-history/al-ghaydah/ye.aspx> [accessed 8 August 2020].
- Zohary, M. (1966) "*Flora Palaestina: Equisetaceae to Moringaceae*". The Israel Academy of Science and Humanities, Jerusalem.
- Zohary, M. (1972) "*Flora Palaestina: Platanaceae to Umbelliferae*". The Israel Academy of Science and Humanities, Jerusalem.
- Zohary, M. (1973) Geobotanical Foundations of the Middle East. Vol. 1-2. Gustav Fischer Verlag Press, Stuttgart, Swets and Zeitlinger, Amsterdam.

لفلورة والتوزيع الجغرافي للنباتات في محافظة لحج اليمنية: 1- مراجعة تصنيفية للبقوليات البرية من الفصيلة البقولية

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تناولت الدراسة الحالية مراجعة تصنيفية للفصيلة البقولية في فلورة محافظة لحج ، جنوب اليمن. تمت مراجعة التصنيف للعينات المسجلة بشكل منهجي وتم تحليل أشكال الحياة والعمر والصلات الجغرافية النباتية. تم تسجيل 63 نوعاً تنتمي إلى 20 جنساً من ثلاث فصائل فرعية (القمية، الفراشية، والطحلية). لكل نوع مسجل، تم إعطاء الاسم المقبول والمرادفات (إن وجدت) والتوزيع المحلي. تم توفير مفاتيح تصنيفية للفصائل الفرعية، والأجناس، والأنواع، والأصناف متعددة الأشكال. تتكون الأصناف المسجلة من 76.19% نباتات معمرة و 23.81% نباتات حولية. كانت النباتات المعمرة ظاهرة البراعم، والنباتات المعمرة سطحية البراعم والنباتات الحولية أكثر أشكال الحياة شيوعاً. كشف التحليل الجغرافي للنباتات أن العناصر السودانية الزامبية هي الأكثر سيطرة، وتشكل المكون الرئيسي (¼ من النباتات المسجلة). كانت الأجناس الأكثر تنوعاً هي *Acacia* s.l (13 تصنيفاً)، *Indigofera* (12 تصنيفاً)، *Tephrosia* (7 أصناف)، *Senna*، *Crotalaria* (6 أصناف لكل منها)، تمثل حوالي 69.84% من إجمالي الأصناف المسجلة. نوعان (*Zygocarpum yemenense* (J.B.Gillett) Thulin و *Acacia hunteri* Oliv.) و *Acacia edgeworthii* T.) و *Lavin* (& مستوطنان في اليمن. إلى جانب ذلك، تعتبر ستة أنواع (*Acacia edgeworthii* T.) و *Anders* و *Crotalaria* و *Cadia purpurea* (Picc.) Ait و *Acacia johnwoodii* Boulos و *Saltiana* Andrews و *Indigastrum costatum* subsp. *goniodes* (Hochst. ex Baker) و *Tephrosia heterophylla* Vatke و Schrire تعتبر قريبة التوطن.