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Floristic Analysis of the Family Fabaceae in Msallata city- Libya

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التحليل الفلوري للفصيلة البقولية في مدينة مسلاته- ليبيا

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Abstract

A survey of the family Fabaceae in Msallata was taken for two consecutive seasons in the period between February 2024 to April 2025. A total number of 55 plant species belong to 23 genera have been collected and identified, the dominant genera were *Astragalus* and *Medicago* which represented by 6 species each, followed by the genera *Ononis* and *Vicia* which followed by 5 species each, and *Hippocrepis*, *Lotus*, *Trifolium* with 4 species each.

The study of the chorological spectrum revealed the dominance of the Mediterranean plants with 36 species and a percentage of 65.45%, followed by Mediterranean/Irano-Turanean plants with 8 species and a percentage of 14.54%. The results of the analysis of the life form spectrum of the species based on the Raunkiaer's method showed the absolute dominance of Therophytes with 44 species (80%), followed by Nanophanerophytes, Hemicryptophytes with 4 species each (7.27%) and Chamaephytes with 3 species (5.45%).

Keywords: Flora, Fabaceae family, Mesalata city, Life forms, Chorotype.

الملخص

تم إجراء مسح للعائلة البقولية في منطقة مسلاته خلال موسمين متتاليين، في الفترة الممتدة من فبراير 2024 إلى أبريل 2025م, وقد تم تجميع وتعريف 55 نوعًا نباتياً تنتمي إلى 23 جنساً، وكان الجنسان السائدان هما *Astragalus* و*Medicago*، حيث تم تمثيل كل منهما بعدد 6 أنواع، يليهما الجنسان *Ononis* و *Vicia* بعدد 5 أنواع لكل منهما، ثم *Hippocrepis* و *Lotus* و *Trifolium* بعدد 4 أنواع لكل منها.

أظهرت دراسة التوزيع الجغرافي للنباتات سيادة النباتات المتوسطية بعدد 36 نوعاً وبنسبة 65.45%، تليها النباتات المتوسطية - الإيرانية الطورانية بعدد 8 أنواع وبنسبة 14.54%, كما أظهرت نتائج تحليل أشكال الحياة للأنواع المدروسة وفقاً لطريقة راونكيير سيادة النباتات الحولية (Therophytes) بعدد 44 نوعًا (80%)، تليها النباتات تحت الشجيرية

(Nanophanerophytes) والنباتات الشبه أرضية (Hemicryptophytes) بـ 4 أنواع لكل منهما (7.27%)، ثم النباتات فوق سطحية (Chamaephytes) بـ 3 أنواع (5.45%).

الكلمات المفتاحية: فلورا، الفصيلة البقولية، مدينة مسلاته، أشكال الحياة، التوزيع الجغرافي.

Introduction

The family Fabaceae (legume) is the third biggest family of Angiospermae lies after Orchidaceae and Asteraceae in the world (Lewis et al, 2005). It is cosmopolitan family comprise of 730 genera and 19,400 species, in Flora of Libya the family is represented by 201 species and 42 genera with a few more cultivated species (Fawza, 1994; Jafri and El-Gadi, 1980). The largest genera in the Family Fabaceae in the flora of Libya are *Astragalus* which includes 26 species, followed by *Trifolium* with 21 species, *Medicago* (19 species), *Vicia* (15 species), *Lotus* (14 species), *Lathyrus* and *Ononis* (12 species each), *Hippocrepis* and *Trigonella* (8 species each), the rest genera less than 8 species for each genus (Al-Sghair and Mahklouf, 2020).

It is ranked second only after family Poaceae in terms of commercial and economic importance, as most of the members of this family are source of protein-rich seeds for the human diet, palatable nutritious fodder, timber, fuelwood, tannins, resins, pulp, toxins, dye, medicines and ornamental plants (Ahmad et al., 2016). Genus *Phaseolus*, *Glycine*, *Pisum*, *Cicer*, *Arachis*, *Medicago* and *Glycyrrhiza* mostly having herbaceous plants are widely cultivated throughout world for economic value to human beings (Verma and Jain, 2022). Worldwide more than 150 species of Fabaceae have been recorded for use of fodder and food (Olmedilla et al., 2010). Certain members of the family function as keystone species in various ecosystems while others act as bottom-up control species (Sanjappa, 2020). The efficiency of the Fabaceae species in using atmospheric nitrogen with soil rhizobia is probably the most well-known ecological trait of the Fabaceae (Werner et al., 2015).

This study aims to analyze the floral composition of the family Fabaceae in the Mesallata region by understanding their life forms and geographical distribution, due to their economic and medicinal importance, their use for livestock, and their significant role within the ecosystem, which is affected by negative impacts such as drought and various human activities, which in turn influence the sustainable development of the vegetation. .

Study area

The city of Msallata is located in northwestern Libya, at the end of the north-eastern edge of the Nafusa Heights, east of the city of Tripoli, about 120 km away, between longitudes 13°49′–14°14′ east and two latitudes 32°25′–32°36′ north, Its elevation ranges from approximately 200 to 350 meters above mean sea level, bordered north by Al-Khums area, south of Tarhuna area while extending westward to Qara Bolly area, The area is about 15 Km away from the Mediterranean coast, and occupies an area approximately 1050 km (Figure 1). the study area is located within the transition zone between the Mediterranean climate prevailing in the strip The coastal and northern highlands climate is generally mild in winter, hot and dry in summer, and winter rains. The average annual temperature is 20.3°C and rainfall, on average ranges 298mm annually (Al-Mahdi, 2005).

Due to the relatively close proximity of the city of Mesalata to the Mediterranean coast, this location has clearly influenced the characteristics of the natural vegetation cover in the region. The area is distinguished from many other uplands forming part of the Western Mountain by the presence of a denser and more diverse vegetation cover. This phenomenon is attributed primarily to maritime influence, particularly the relatively higher levels of atmospheric

humidity and the increased probability of precipitation, rather than being a direct result of topographic elevation. Geographical studies indicate that desert influence is more pronounced in the uplands of Tarhuna and Yafran, which are located relatively far from maritime climatic effects.

In contrast, maritime influence predominates in the plateaus and highlands of Mesallata, which are situated closer to the coast. This climatic setting facilitates the spread of Mediterranean shrublands and forests on the northern slopes of these highlands. This occurs despite their relatively lower elevation compared with some other highland areas; however, their geographical proximity to the Mediterranean Sea enhances the impact of the Mediterranean climate on their ecosystems and vegetation cover (Sharaf, 1962).

Figure 1: Showing location of the study area

Materials and Methods

This study was conducted in Msallata Area from February 2024 to April 2025 during active plant growth period, when most species were expected to be present. The wild vegetation's were sampled in eight localities; in each locality, the present species were recorded, and transferred after drying and numbering to the laboratory of the Department of Biology, University of Elmergib in order to define them according to the Libyan flora (Jafri and EL-Gadi, 1980) and Key to The Families of Flora of Libya (Erteb, 1994). for knowledge of the floristic composition of plant species.

The life forms of plants were determined by Raunkier method (Raunkier, 1934). Geographical distribution of species was determined based on vegetative areas classified by Zohary (Zohary, 1973).

Results and Discussion

In the present study a total of 55 species belonging to 23 genera of family Fabaceae were recorded in the study area. Among the recorded species 44 annuals and 11 perennials. The list species, life forms, live span and their chorotypes is presented in table 1.

Table 1. List of plant species recorded in the study area with their live span, life forms and chorotypes.

Scientific name	Live span	Life form	Chorotype
Anagyris foetida L.	Per	NP	Med./Ir-Tu.
Anthyllis tetraphylla L.	Ann	Th	Med.
Anthyllis vulneraria L.	Ann	Th	Med.
Argyrolobium uniflorum (Decne.) Jaub. & Spahc	Per	Ch	Sah-Ar
Astragalus asterias Stev. ex Ledeb.	Ann	Th	Med./Sah-Ar.
Astragalus caprinus L.	Per	He	Sah-Ar.
Astragalus hamosus L.	Ann	Th	Med.
Astragalus sinaicus Boiss.	Ann	Th	Med./Ir-Tu.
Astragalus stella Gouan	Ann	Th	Med.
Astragalus tribuloides Del.	Ann	Th	Med./Ir-Tu.
Calicotome villosa (Poir.) Link.	Per	NP	Med.
Coronilla repanda (Poir.) Guss.	Ann	Th	Med.
Coronilla scorpioides (L.) Koch.	Ann	Th	Med.
Ebenus pinnata Ait.	Per	He	Med.
Genista acanthoclada DC.	Per	Ch	Med.
Genista microcephala Coss. & Dur.	Per	NP	Med.
Hedysarum spinosissimum L.	Ann	Th	Med.
Hippocrepis bicontorta Lois.	Ann	Th	Sah-Ar.
Hippocrepis ciliata Willd.	Ann	Th	Med.
Hippocrepis multisiliquosa L.	Ann	Th	Med.
Hippocrepis scabra DC.	Per	He	Med.
Hymenocarpos circinatus (L.) Savi	Ann	Th	Med./Ir-Tu.
Lathyrus cicera L.	Ann	Th	Med./Ir-Tu.
Lotus cytisoides L.	Per	Ch	Med.
Lotus edulis L.	Ann	Th	Med.
Lotus halophilus Boiss. & Spruner.	Ann	Th	Med.
Lotus ornithopodioides L.	Ann	Th	Med.
Medicago coronate (L.) Bart.	Ann	Th	Med.
Medicago laciniata (L.)Mill.	Ann	Th	Med.
Medicago littoralis Rohde ex Lois.	Ann	Th	Med.
Medicago minima (L.) Bart.	Ann	Th	Med./Ir-Tu.
Medicago polymorpha L.	Ann	Th	Euro-Si./Med./Ir-Tu
Medicago tornata (L.) Mill.	Ann	Th	Med.
Melilotus indicus (L.) All.	Ann	Th	Med.
Melilotus sulcatus Desf.	Ann	Th	Med.
Ononis ornithopodioides L	Ann	Th	Med.
Ononis reclinata L.	Ann	Th	Med./Ir-Tu.
Ononis serrata Forsk.	Ann	Th	Med./Sah-Ar.
Ononis sicula Guss.	Ann	Th	Med.
Ononis viscose L.	Ann	Th	Med.

Psoralea bituminosa L.	Per	He	Med.
Retama raetam (Forsk.) Webb.	Per	NP	Sah-Ar.
Scorpiurus muricatus L.	Ann	Th	Med.
Scorpiurus subvillosus (L.) Lam.	Ann	Th	Med./Euro-Si.
Tetragonolobus purpureus Moench.	Ann	Th	Med./Euro-Si.
Trifolium campestre Schreb.	Ann	Th	Med.
Trifolium scabrum L.	Ann	Th	Med.
Trifolium stellatum L.	Ann	Th	Med.
Trifolium tomentosum L.	Ann	Th	Euro-Si./Med./Ir-Tu
Trigonella stellata Forsk.	Ann	Th	Sah-Ar.
Vicia laxiflora Brot.	Ann	Th	Med.
Vicia lutea L.	Ann	Th	Med.
Vicia monantha Retz.	Ann	Th	Med./Ir-Tu.
Vicia sativa L.	Ann	Th	Med.
Vicia Villosa Roth.	Ann	Th	Med.

The dominant genera recorded in this study were *Astragalus* and *Medicago* both represented by 6 species each, followed by *Ononis* and *Vicia* which represented by 5 species each, then *Hippocrepis*, *Lotus* and *Trifolium*, each represented by 4 species (Table 2) (Figure 2).

Table 2: Shows number of species depending on the genus in the family Fabaceae

Genus	No of species	Genus	No of species
Anagyris	1	Lotus	4
Anthyllis	2	Medicago	6
Argyrolobium	1	Melilotus	2
Astragalus .	6	Ononis	5
Calicotome	1	Psoralea	1
Coronilla	2	Retama	1
Ebenus	1	Scorpiurus	1
Genista	2	Tetragonolobus	1
Hedysarum	1	Trifolium	4
Hippocrepis	4	Trigonella	1
Hymenocarpos	1	Vicia	5
Lathyrus	1		

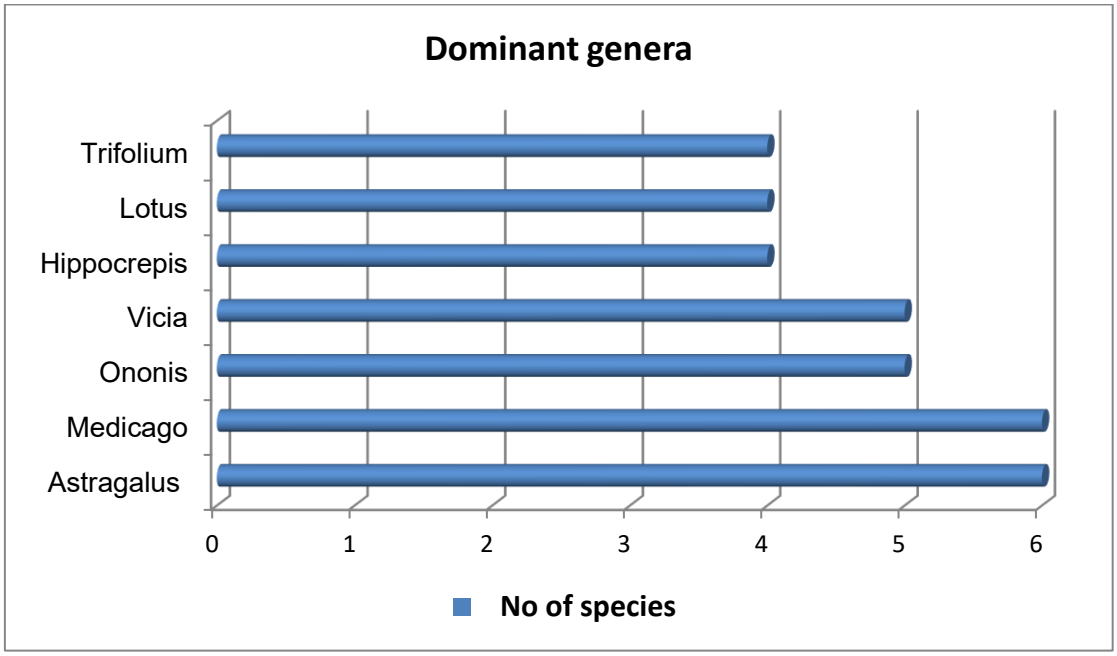

Figure 2**:** Dominant genera according to the number of species in the Study area

The life forms of the collected species were classified according to Raunkiaer's system (1934), as modified by Govaerts et al. (2000). This classification is based on the degree of protection provided to the bud and its position relative to the soil surface.

It is evident from Table (1,3) and Figure (3) that therophytes dominate the plant life forms in the study area, representing (80%) of the total species, followed by Nanophanerophytes, Hemicryptophytes (7.27%) each, and Chamaephytes (5.45%). As expected Therophytes have greater capacity for growth than other life forms, apparently because of their wider ecological amplitude, greater plasticity in size, and their small growth requirements. In addition, according to the result in (Fig 3), there is a clear positive correlation between Therophytes and Mediterranean chorotype, this explain why Therophytes dominating the study area which falls within the Mediterranean region. These results are consistent with the studies of (Al-Osta, 2018), (Al-Sghair and Mahklouf, 2020).

Table 3: Life forms of collected species

Life form	No of species	of total species%
Therophytes	44	80
Hemicryptophytes	4	7.27
Chamaephytes	3	5.45
Nanophanerophytes	4	7.27

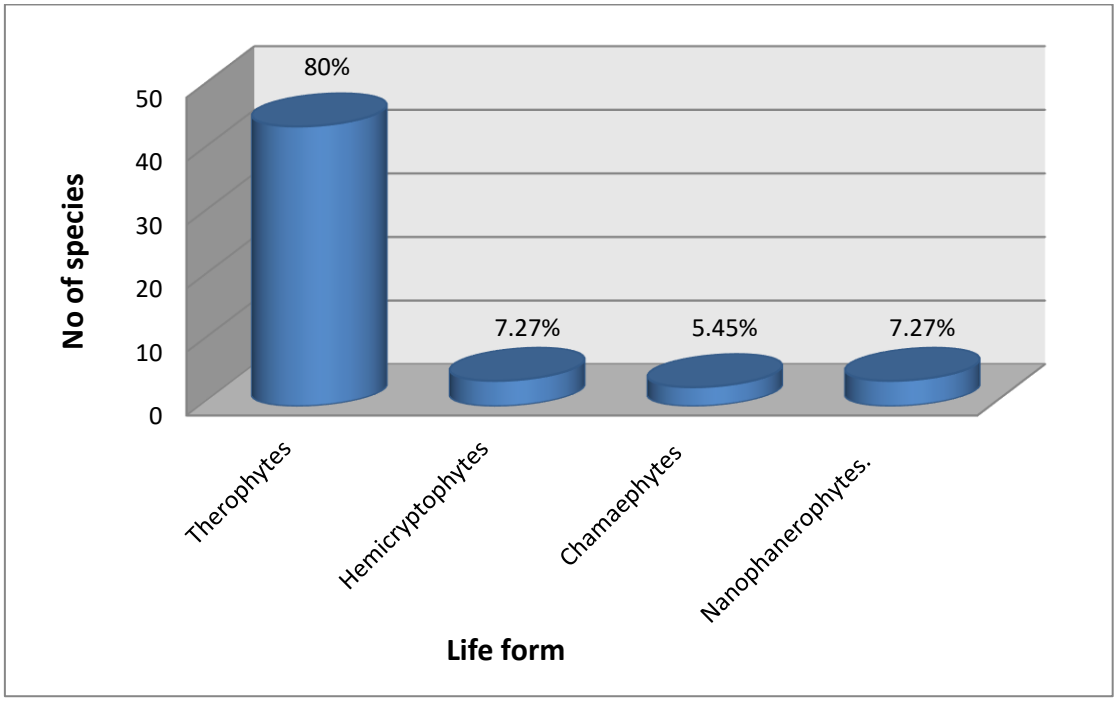

Figure 3: Life forms with their numbers and percentages

Chorological characteristic of the recorded species showed that 36 species (65.45%) are dominated in the Mediterranean region (Table 1,4) (Figure 4). A ratio of 14.54% (8 species out of the total) belongs to Mediterranean/ Irano-Turanian regions, 9.09% (5 species) belong to Saharo-Arabain region, 2 species with a ratio of 3.63% belong to Mediterranean/ Euro-Siberian, Mediterranean/ Saharo-Arabain and Euro-Siberian/ Mediterranean/ Irano-Turanian regions.

This result is expected and not surprising because the study area is located mainly in the Mediterranean region which characterized by sub humid bioclimate, where the temperature is not very high and the moisture remained longer. The presence of Mediterranean / Irano-Turanean chorotypes with respected ratio because the Iranu-turanean region is overlapped with the east Mediterranean and both with more or less similar climate conditions, instead other chorological types were poorly represented.

Table 4: Showing chorotypes of collected species

Chorotype	No of species	% of total species
Med.	36	65.45
Med./Ir-Tu.	8	14.54
Med./Euro-Si.	2	3.63
Med./Sah-Ar.	2	3.63
Sah-Ar.	5	9.09
Euro-Si./Med./Ir-Tu.	2	3.63

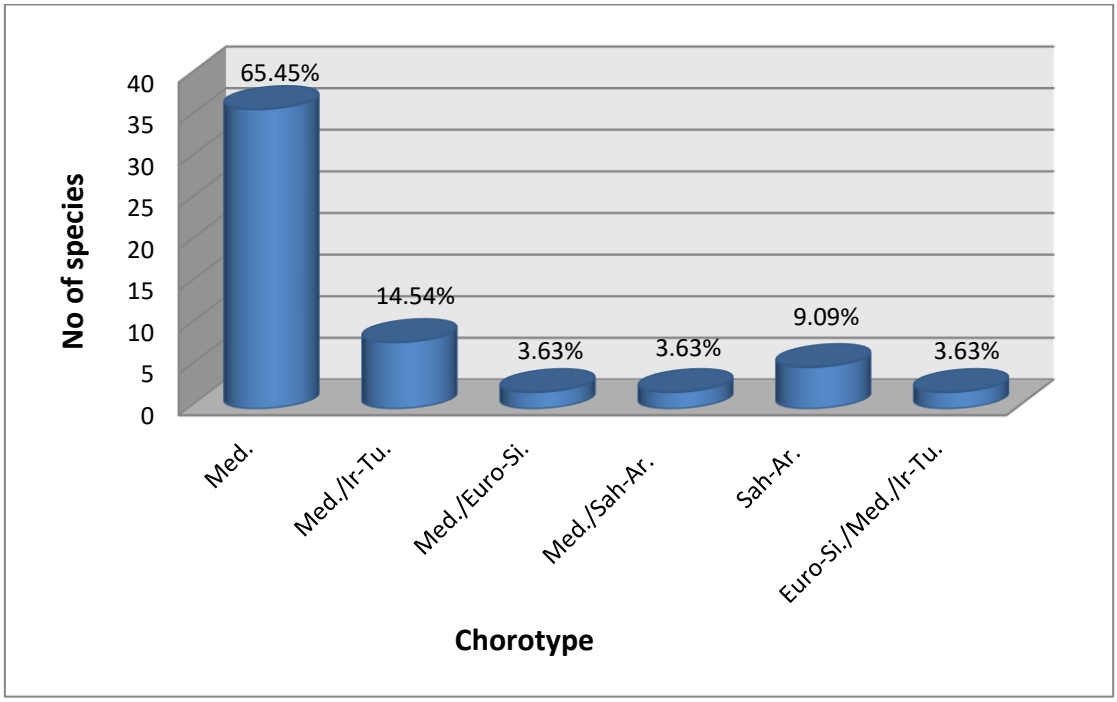

Figure 4: Chorotypes with their numbers and percentages

Table 5: Comparison between the current study and Al-Osta study (2018)

	Scientific name	Current study	Al-Osta study (2018)
1	*Anagyris foetida* L.	+	-
2	*Anthyllis tetraphylla* L.	+	+
3	*Anthyllis vulneraria* L.	+	+
4	*Argyrolobium uniflorum* (Decne.) Jaub. & Spahc	+	+
5	*Astragalus asterias* Stev. ex Ledeb.	+	+
6	*Astragalus caprinus* L.	+	-
7	*Astragalus hamosus* L.	+	+
8	*Astragalus sinaicus* Boiss.	+	-
9	*Astragalus stella* Gouan	+	-
10	*Astragalus tribuloides* Del.	+	+
11	*Calicotome villosa* (Poir.) Link.	+	+
12	*Coronilla repanda* (Poir.) Guss.	+	-
13	*Coronilla scorpioides* (L.) Koch.	+	+
14	*Ebenus pinnata* Ait.	+	+
15	*Genista acanthoclada* DC.	+	-
16	*Genista microcephala* Coss. & Dur.	+	+
17	*Hedysarum spinosissimum* L.	+	+
18	*Hippocrepis bicontorta* Lois.	+	+
19	*Hippocrepis ciliata* Willd.	+	+
20	*Hippocrepis multisiliquosa* L.	+	+
21	*Hippocrepis scabra* DC.	+	-

22	*Hymenocarpos circinatus (L.) Savi*	+	+
23	*Lathyrus cicera* L.	+	+
24	*Lotus cytisoides* L.	+	+
25	*Lotus edulis* L.	+	+
26	*Lotus halophilus* Boiss. & Spruner.	+	-
27	*Lotus ornithopodioides* L.	+	-
28	*Medicago coronate* (L.) Bart.	+	+
29	*Medicago laciniata* (L.)Mill.	+	-
30	*Medicago littoralis* Rohde ex Lois.	+	+
31	*Medicago minima* (L.) Bart.	+	+
32	*Medicago polymorpha* L.	+	+
33	*Medicago tornata* (L.) Mill.	+	-
34	*Melilotus indicus* (L.) All.	+	+
35	*Melilotus sulcatus* Desf.	+	-
36	*Ononis ornithopodioides L*	+	+
37	*Ononis reclinata* L.	+	+
38	*Ononis serrata* Forsk.	+	+
39	*Ononis sicula* Guss.	+	-
40	*Ononis viscose* L.	+	-
41	*Psoralea bituminosa* L.	+	+
42	*Retama raetam* (Forsk.) Webb.	+	+
43	*Scorpiurus muricatus* L.	+	+
44	*Scorpiurus subvillosus* (L.) Lam.	+	-
45	*Tetragonolobus purpureus* Moench.	+	-
46	*Trifolium campestre* Schreb.	+	+
47	*Trifolium scabrum* L.	+	+
48	*Trifolium stellatum* L.	+	+
49	*Trifolium tomentosum* L.	+	+
50	*Trigonella stellata* Forsk.	+	-
51	*Vicia laxiflora* Brot.	+	-
52	*Vicia lutea* L.	+	-
53	*Vicia monantha* Retz.	+	+
54	*Vicia sativa* L.	+	+
55	*Vicia Villosa* Roth.	+	-

Conclusion

The present study provides a floristic analysis of the family Fabaceae in Msallata city, Libya, during two consecutive growing seasons from February 2024 to April 2025. The results revealed that the study area supports a considerable diversity of Fabaceae, represented by 55 species belonging to 23 genera. The genera Astragalus and Medicago were the most dominant, followed by Ononis, Vicia, Hippocrepis, Lotus, and Trifolium. This indicates that the family Fabaceae forms an important component of the natural vegetation in the study area.

The analysis of life forms showed a clear dominance of therophytes, which represented 80% of the recorded species. This dominance reflects the ability of annual plants to adapt to Mediterranean environmental conditions, especially seasonal rainfall, summer drought, and variable soil moisture. The chorological analysis also showed that Mediterranean elements

were the most dominant, representing 65.45% of the total recorded species. This confirms the strong influence of the Mediterranean climate on the floristic composition of Msallata.
Overall, the findings indicate that the vegetation of the study area is mainly shaped by its geographical position, climatic conditions, and ecological characteristics. The high representation of Mediterranean species and annual life forms reflects the natural adaptation of Fabaceae species to the local environment. The study also highlights the ecological and economic importance of the family Fabaceae in Msallata, especially in relation to biodiversity, livestock grazing, soil fertility, and ecosystem stability.

Recommendations

Based on the findings of this study, the following recommendations are suggested:

1. Further floristic studies should be conducted in different seasons and in wider areas of Msallata to obtain a more comprehensive understanding of plant diversity in the region.
2. Conservation efforts should be encouraged to protect the natural habitats of Fabaceae species, especially in areas affected by urban expansion, overgrazing, agricultural activities, and drought.
3. Regular monitoring of the vegetation cover is recommended in order to detect changes in species composition and distribution over time.
4. More ecological studies should be carried out to investigate the relationship between Fabaceae species, soil properties, rainfall patterns, and human activities.
5. Economically and medicinally important species of the family Fabaceae should be studied in greater detail to evaluate their potential uses in agriculture, livestock feeding, traditional medicine, and environmental restoration.
6. Public awareness should be increased regarding the importance of native plant species and their role in maintaining biodiversity and ecological balance.
7. The establishment of a local herbarium or plant database for Msallata is recommended to document plant species and support future botanical research.

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APPENDIX: (Photos of some plant species collected from the study area)

Astragalus asterias **Stev. ex Ledeb.**

Anthyllis vulneraria **L.**

Anthyllis tetraphylla **L.**

Calicotome villosa **(Poir.) Link**

Astragalus tribuloides **Del**

Astragalus hamosus **L.**

Lotus cytisoides L.

Hippocrepis ciliata Willd.

Hedysarum spinosissimum L.

Retama raetam (Forsk.) Webb.

Psoralea bituminosa L.

Medicago minima (L.) Bart.

Trifolium stellatum L.

Trifolium scabrum L.

Scorpiurus muricatus L.

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Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.