

Flora conspectus of Fabales order spread in the territory of the Azerbaijan Republic

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ABSTRACT

Flora conspectus of Fabales and “Ecological-geobotanical map of some phytocenoses formed by legumes in the natural vegetation of Azerbaijan” was prepared on the basis of the collected herbarium samples, literary sources, systematic, biomorphological, geographical, ecological and endemic analysis of the Fabales orders distributed in the flora of Azerbaijan during the researches carried out in 2007–2021. Order is represented by a Fabaceae family and 70 genus and 460 species was determined. According to this research, 7 genus (10 %) and 13 species (2.83 %) belong to the Caesalpinioideae subfamily, 1 genus (1.4 %) and 1 species (0.22 %) to Cercidoideae subfamily, 62 genus (88.6 %) and 446 species (96.95%) belong to the Faboideae subfamilies. It became clear during the research that species composition of the Fabales order in the flora of Azerbaijan consists mainly of plants belonging to the Fabaceae family. The compilation of the flora conspectus of the Fabales order has scientific and practical importance in terms of preserving and increasing the number of species belonging to the order in the flora of Azerbaijan, especially its endangered representatives.

KEY WORDS

Area; endemic; formation; relief; taxon.

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INTRODUCTION

The flora of Azerbaijan has a certain richness depending on soil and climatic conditions, relief, historical development, ecological, natural, and anthropogenic features, etc. Plants belonging to the Fabales order have a special place in this richness. Representatives of the order are distinguished by their important features in nature and human life and are widespread throughout the globe. However, in recent years, their occurrence has been relatively low due to environmental factors. Their preservation and increase in number, especially the protection of endangered species is an important issue.

Representatives of the Fabales order were also touched upon and provided with valuable information, but the representatives of the series were systematically studied by a number of scientists in the study of Azerbaijani flora (Abbasov, 2014; Ganbarov, 2016; Gurbanov, 2018; Nasibova, 2017) and especially by Hajiyev & Musayev (1996; 1997), and some families on floristics and regions were studied by other scholars in different directions (Askerov, 2014; 2016; Mammadova & Gurbanov, 2015; İbadullayeva & Huseynova, 2021). However, the systematic-taxonomic composition of the representatives of the Fabales order was not a separate object of study. Taking all this into account, the aim is to clarify the taxonomic compo-

sition of the representatives of the Fabales in the flora of Azerbaijan.

MATERIAL AND METHODS

Taxonomic composition of representatives of the Fabales order, distributed in the flora of Azerbaijan in 2007-2021 has been studied.

Herbariums collected during the research were determined by "Flora of Azerbaijan" (1950-1961), Cherepanova (1995), Asgarov (2016) and <http://www.theplantlist.org/>.

The Fabales order was analyzed by species according to the Plantlist, the life forms were analyzed according to the classifications given by Raunkier (1934) and Serebryakov (1964), and the geographical types and habitat classes were identified by Grossheim (1952), Portenier (2000) and Jalilian et al. (2014).

In the analysis of species belonging to the Fabales order distributed in the flora of Azerbaijan by ecological groups, taking into account ecological-geobotanical indicators, ecological conditions, relief, mechanical composition, salinization, etc. of the soil where each species is distributed was considered the main criterion (Shennikov, 1964). Species belonging to the Fabales category in terms of water demand of plants have been identified in 3 groups according to ecological groups.

RESULTS AND DISCUSSION

The most represented family of the Fabales order is Fabaceae (Fig. 1) as it became clear while analysing the families included in it.

7 genus (10%) and 13 species (2.83%) belong to the Caesalpinioideae subfamily, 1 genus (1.4%) and 1 species (0.22%) to Cercidoideae subfamily, 62 genus (88.6%) and 446 species (96.95%) belong to the Faboideae subfamilies as can be seen from Fig. 1.

The Fabales order was analyzed by genus according to modern databases during the study, and this is reflected in Table 1. A total of 460 species belonging to 43 genus (out of 70) of the Fabales order have been found in the flora of Azerbaijan. Of these 43 genus, most are represented by two or more species, while 27 genus by just one species. *Astragalus*

L., *Vicia* L., *Trifolium* L., *Onobrychis* Mill, *Medicago* L., *Lathyrus* L., *Trigonella* L. and *Amoria* C. Presl (= *Trifolium*) predominate among of the 43 genus including 307 species of regional legumes. They make up more than 66.8%.

The life forms of the species Fabales order found in the flora of our Republic are very diverse. Among the species included in the order, all known life forms are found except parasites and epiphytes.

Life forms of plant species belonging to the Fabales order have been analyzed according to classical classifications (Tables 2, 3).

As shown in Table 2, life forms of the Fabales order is widespread in grasses, with 382 species (83%), of which 238 species (51.7%) in perennial grasses, 127 species (27.6%) in annual grasses, 9 species (2%) in annual or biennial grasses, 6 species (1.3%) in biennial grasses, and 2 species (0.4%) in perennial grasses. The other life forms are represented in the following way: 43 species (9.4%) in bushes, 13 species (2.8%) in trees, 10 species (2.2%) in shrubs, 8 species (1.7%) in semi-bushes, and 4 species (0.9%) in trees or shrubs.

Division of plants into monoecious, biennial or perennial species is shown in many studies (Gurbanov & Mammadova, 2013). In this regard, the above-mentioned annual, biennial or perennial grasses may also change their status depending on the growing conditions.

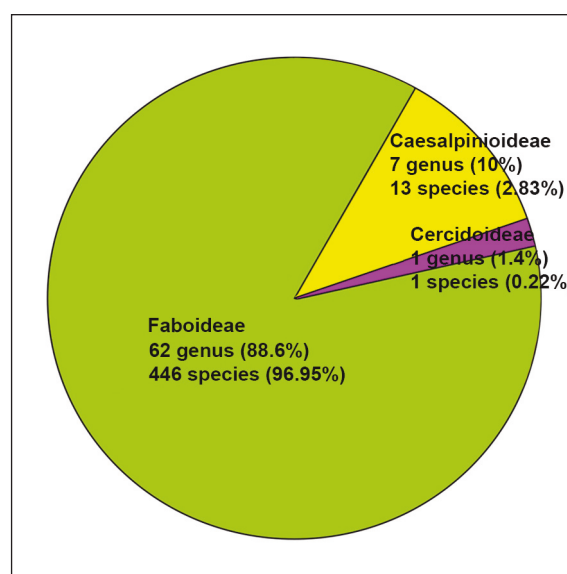


Figure 1. Distribution of species and subfamilies belonging to the Fabaceae family in the flora of Azerbaijan.

| № | Genus | N. of species | % |
|----|---|---------------|------|
| 1 | <i>Astragalus</i> L. | 140 | 30.4 |
| 2 | <i>Vicia</i> L. | 43 | 9.4 |
| 3 | <i>Trifolium</i> L. | 27 | 5.9 |
| 4 | <i>Onobrychis</i> Mill | 25 | 5.4 |
| 5 | <i>Lathyrus</i> L. (<i>Orobus</i> L.) | 24 | 5.2 |
| 6 | <i>Medicago</i> L. | 20 | 4.4 |
| 7 | <i>Trigonella</i> L. | 17 | 3.7 |
| 8 | <i>Amoria</i> C. Presl (= <i>Trifolium</i>) | 11 | 2.4 |
| 9 | <i>Oxytropis</i> DC. | 8 | 1.8 |
| 10 | <i>Hedysarum</i> L. | 8 | 1.8 |
| 11 | <i>Melilotus</i> Mill. | 7 | 1.5 |
| 12 | <i>Genista</i> L. | 6 | 1.3 |
| 13 | <i>Chrysaspis</i> Desv. (= <i>Trifolium</i>) | 6 | 1.3 |
| 14 | <i>Galearia</i> Presl (= <i>Trifolium</i>) | 6 | 1.3 |
| 15 | <i>Securigera</i> DC. | 6 | 1.3 |
| 16 | <i>Lotus</i> L. | 6 | 1.3 |
| 17 | <i>Ononis</i> L. | 5 | 1.1 |
| 18 | <i>Colutea</i> L. | 5 | 1.1 |
| 19 | <i>Glycyrrhiza</i> L. | 5 | 1.1 |
| 20 | <i>Lupinus</i> L. | 4 | 0.9 |
| 21 | <i>Robinia</i> L. | 4 | 0.9 |
| 22 | <i>Acacia</i> Mill | 3 | 0.7 |
| 23 | <i>Cercis</i> L. | 3 | 0.7 |
| 24 | <i>Cassia</i> L. | 3 | 0.7 |
| 25 | <i>Wisteria</i> Nutt. | 3 | 0.7 |
| 26 | <i>Cicer</i> L. | 3 | 0.7 |
| 27 | <i>Lens</i> Mill. (= <i>Vicia</i>) | 3 | 0.7 |
| 28 | <i>Prosopis</i> L. (= <i>Lagonychium</i>) | 2 | 0.4 |
| 29 | <i>Gleditsia</i> L. | 2 | 0.4 |
| 30 | <i>Caesalpinia</i> L. | 2 | 0.4 |
| 31 | <i>Styphnolobium</i> Schott | 2 | 0.4 |
| 32 | <i>Argyrolobium</i> Eckl. et Zeyh. | 2 | 0.4 |
| 33 | <i>Melilotoides</i> Heist. ex. Fabr. (= <i>Trigonella</i>) | 2 | 0.4 |
| 34 | <i>Anthyllis</i> L. | 2 | 0.4 |
| 35 | <i>Dorycnium</i> Mill. | 2 | 0.4 |
| 36 | <i>Amorpha</i> L. | 2 | 0.4 |
| 37 | <i>Galega</i> Tourn. ex L. | 2 | 0.4 |
| 38 | <i>Caragana</i> Fabr. | 2 | 0.4 |
| 39 | <i>Coronilla</i> L. | 2 | 0.4 |
| 40 | <i>Alhagi</i> Tourn. ex Gagnebin | 2 | 0.4 |
| 41 | <i>Pisum</i> L. | 2 | 0.4 |
| 42 | <i>Phaseolus</i> L. | 2 | 0.4 |
| 43 | <i>Vigna</i> Savi | 2 | 0.4 |
| | Genus consisting of 1 species | 27 | 5.9 |
| | Total = 70 | 460 | 100% |

Table 1. The *Fabales* common in the flora of Azerbaijan.

| № | Life forms | N. of species | % |
|---|------------------------|---------------|------|
| 1 | Tree | 13 | 2.8 |
| 2 | Tree and shrub | 4 | 0.9 |
| 3 | Bushes | 43 | 9.4 |
| 4 | Semi-bushes | 8 | 1.7 |
| 5 | Shrub | 10 | 2.2 |
| 6 | Grasses (including) | (382) | |
| | a) perennial | 238 | 51.7 |
| | b) biennial | 6 | 1.3 |
| | c) annual | 127 | 27.6 |
| | d) annual or biennial | 9 | 2 |
| | e) annual or perennial | 2 | 0.4 |
| | Total | 460 | 100 |

Table 2. Analysis of life forms of species belonging to the *Fabales* order widespread in the flora of Azerbaijan (Serebryakov, 1964).

| № | Biomorphological groups | N. of species | % |
|---|-------------------------|---------------|------|
| 1 | Phanerophytes | 60 | 13.1 |
| 2 | Chamephytes | 18 | 3.9 |
| 3 | Hemicryptophytes | 238 | 51.7 |
| 4 | Therophytes | 144 | 31.3 |
| | Total | 460 | 100 |

Table 3. Analysis of life forms of species belonging to the *Fabales* order widespread in the flora of Azerbaijan (Raunkier, 1934).

238 species (51.7%) are hemicryptophytes and 144 (31.4%) species are therophytes as can be seen in Table 3. The other places are occupied by 60 species (13.1%) of phanerophytes and 18 species (3.9%) of chamephytes.

The distribution of species belonging to the *Fabales* order is uneven in the botanical-geographical regions. Research has shown that many species have a wide range, some have a very small area, while others have a disjunctive range. The areological study of legumes is based on their modern distribution patterns.

Legumes are widespread, some of which play an important role in the formation of vegetation, as well as dominance and subdominant in some plant groups in the flora of Azerbaijan. *Vicia* L., *Medicago* L., *Trifolium* L., *Lathyrus* L. and others are widely distributed in the flora of Azerbaijan.

The geographical types, habitat classes and types of plants belonging to the Fabales order was determined according to classical and modern methods (Table 4) during the study.

Species are predominant in the formation of species belonging to the Fabales order, which are widespread in the flora of Azerbaijan, belong to the ancient Mediterranean (187 species, 40.7%), Caucasus (115 species, 25%) and boreal (67 species, 14.6%) habitat types as has shown in Table 4. Other habitat types are represented in a smaller quantity: 25 species (5.4%) in adventive habitat, 19 species (4.1%) in ancient (III period forest) habitat and 13 species (2.8%) in steppe habitat. The habitat type of 34 species has not been determined. This is 7.4% of the total species. Ancient Mediterranean habitats have a special role in the formation of species belonging to the Fabales order which is widespread in the flora of Azerbaijan.

The main criterion is ecological-geobotanical indicators, ecological conditions, relief, mechanical composition, salinization, etc. of the soil where each species belonging to the Fabales order distributed in the flora of Azerbaijan according to the analysis of species by ecological groups. Species belonging to the Fabales order have been identified in 3 groups according to ecological groups (Table 5).

Xerophytes dominate with 368 species (80%) and Mesophytes dominate with 63 species with 13.7% in terms of the number of species among Fabales order as can be seen in Table 5. These two groups make up 93.7% of the total flora of 431 species. Mesoxerophytes from other ecological groups are represented by 29 species and make up 6.3%. As a result of research, we can note that xerophytes of the Fabales order in the flora of Azerbaijan are widespread and form the main associations and formations in phytocenoses.

The study and analysis of the endemism of the Fabales order, which are widespread in the flora of Azerbaijan, is also of great importance for the protection of biodiversity. Usually, the index of flora depends on the degree of endemism. According to recent literature, 548 species of endemic (146) and

subendemic (402) species (including Caucasian and Azerbaijani endemics) are widespread in the flora of Azerbaijan, which is 17.7% of the flora (Askerov, 2014). As a result of our research on these endemics, only 81 species of Fabales or Leguminosales order are endemic in the flora of Azerbaijan, of which 24 species are endemic and 57 species are subendemic. These endemics are clarified by genus and reflected in Table 6.

The number of 81 endemic and subendemic species, belonging to 16 genus of the Fabales order in the flora of Azerbaijan, was determined. Of which, Caucasian endemic and subendemic taxa are 57 species and 9 genus (*Albizia* Durazz., *Astragalus* L., *Colutea* L., *Medicago* L., *Onobrychis* Mill, *Oxytropis* DC., *Trifolium* L., *Vicia* L., *Vavilovia* Fed.); Azerbaijan endemic and subendemic taxa are 24 species and 7 genus (*Trifolium* L., *Galearia* Presl. and *Amoria* C. Presl (= *Trifolium*), *Securigera* DC., *Astragalus* L., *Onobrychis* Mill, *Lathyrus* L.), as described in Table 6.

| № | Type of areals | N. of species | % |
|---|-----------------------------|---------------|------|
| 1 | Ancient (III period forest) | 19 | 4.1 |
| 2 | Boreal | 67 | 14.6 |
| 3 | The steppe | 13 | 2.8 |
| 4 | Ancient Mediterranean | 187 | 40.7 |
| 5 | Caucasus | 115 | 25 |
| 6 | Adventive | 25 | 5.4 |
| 7 | Undefined | 34 | 7.4 |
| | Total | 460 | 100 |

Table 4. Analysis of habitats of Fabales species in the flora of Azerbaijan.

| № | Ecological groups | N. of species | % |
|---|-------------------|---------------|------|
| 1 | Xerophytes | 368 | 80 |
| 2 | Mesoxerophytes | 29 | 6.3 |
| 3 | Mesophytes | 63 | 13.7 |
| | Total | 460 | 100 |

Table 5. Ecological groups of species belonging to the Fabales widespread in the flora of Azerbaijan.

| № | Genus | E | SE |
|----|--|----|----|
| 1 | <i>Astragalus</i> L. | 11 | 42 |
| 2 | <i>Trifolium</i> L. | 6 | 1 |
| 3 | <i>Oxytropis</i> DC. | 3 | 2 |
| 4 | <i>Onobrychis</i> Mill | - | 4 |
| 5 | <i>Vicia</i> L. | - | 3 |
| 6 | <i>Medicago</i> L. | - | 2 |
| 7 | <i>Amoria</i> C. Presl (= <i>Trifolium</i>) | 1 | - |
| 8 | <i>Galearia</i> Presl (= <i>Trifolium</i>) | 1 | - |
| 9 | <i>Lathyrus</i> L. | 1 | - |
| 10 | <i>Securigera</i> D.C. | 1 | - |
| 11 | <i>Albizia</i> Durazz. | - | 1 |
| 12 | <i>Colutea</i> L. | - | 1 |
| 13 | <i>Vavilovia</i> Fed. | - | 1 |
| | Total | 24 | 57 |

Table 6. Endemic (E) and subendemic (SE) genus of Fabales order in the flora of Azerbaijan.

Endemic species are more widespread in the Nakhchivan Autonomous Republic in the botanical and geographical regions of Azerbaijan, which is primarily evidence of the region's antiquity. Intensive introgressive hybridization has also become clear during this study. Due to a large number of endemic species, the *Astragalus* L. (53 species) genus is predominant. There are rare and endangered species among these endemic species, whose names are listed in the Red Book of Azerbaijan (2013), and it is expedient to establish sanctuaries for their protection and conservation.

The compilation of the flora abstract of Fabales order, which is found in the flora of Azerbaijan, is also one of the important issues in terms of preserving and increasing the number of species belonging to the family, especially its endangered representatives.

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