

Systematic analysis and taxonomy of the genus *Glycyrrhiza* L. (Licorice) in the Flora of Azerbaijan (Legumes Fabaceae)

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ABSTRACT

In this paper, modern taxonomic status and systematic structural features of the genus *Glycyrrhiza* L. (Licorice) in the flora of Azerbaijan is provided. There are different opinions about the distribution of this genus in the flora of Azerbaijan. According to the work on the flora of Azerbaijan, 5 species (*G. glabra*, *G. asperula*, *G. echinata*, *G. glandulifera*, *G. foetidissima*) are recorded in this region but, in the flora synopsis of the Caucasus, the following 5 species are listed: *G. glabra*, *G. asperula*, *G. echinata*, *G. macedonica*, and *G. foetidissima*; finally, according to World flora online, the genus *Glycyrrhiza* is represented in Azerbaijan by 3 species with many variations and synonyms: *G. glabra* (sweet licorice), *G. asperula* (wrinkled licorice) and *G. echinata* (pumpkin licorice). Furthermore, we found the following variations of *G. glabra* in the flora of Azerbaijan: *G. glabra* var. *caduca* X.Y. Li., *G. glabra* var. *glabra*, and *G. glandulifera* Waldst. et Kit. One additional species cultivated in Azerbaijan, *G. uralensis* Fisch ex DC. (Ural licorice), has already spread in nature. Identification on key information about the wild species are detailed in the paper.

KEY WORDS

Licorice; *Glycyrrhiza*; taxonomic status; systematic structure; species.

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INTRODUCTION

In the flora of Azerbaijan, 460 species belonging to 70 genus of the family Fabaceae has been recorded (trees, shrubs and herbaceous species), of which 13 species belong to the subfamily Caesalpinioideae, 7 to the subfamily Mimosoideae subfamily, and 440 species to the subfamily Faboideae (Flora Azerbaijan, 1954).

Among these, the genus *Glycyrrhiza* L. (Licorice), one of the most popular of the family, included more than 20 species distributed in Eurasia, North and South America. *Glycyrrhiza* species are considered important resources, especially, due to their medicinal value (Ibadullayeva et al., 2017; 2018) but also in agriculture, folk, various fields of industry, soil

enrichment, greening of gardens, etc.

The most common species, *G. glabra* L., Hairless licorice, is widespread in Eurasia, Central and Southwest Asia, and the Mediterranean region (Flora Azerbaijan, 1954). *Glycyrrhiza glabra* is divided into two different populations: *G. glabra* var. *typica* L. (Spanish licorice) and *G. glabra* var. *glandulifera* (Waldst. & Kit.) Boiss. *Glycyrrhiza glabra* var. *violacea* (Boiss.) Boiss. from Iran and Türkiye also belongs to other regions (Zoe et al., 2013).

In Azerbaijan, this species is found mainly on the banks of rivers, shallow ravines, and cultivated fields with the following variations: *G. glabra* var. *caduca* X.Y. Li. and *G. glabra* var. *glabra*. Apart from these, *G. glandulifera* Waldst. et Kit., in recent nomenclature, is accepted as *G. glabra* subsp.

glandulifera (Waldst. & Kit.) Ponert or has been synonymized with *G. glabra* L.

MATERIAL AND METHODS

The research work was carried out in 2021–2023 with the collection of materials and observations in nature. In order to search for licorice species in Azerbaijan, the routes to all regions have been carried out regularly in different years and in different directions (from a.s.l. to 1500–1600 m altitude).

The materials found during this study are stored in the archive of the Institute of Botany of Ministry of Science and Education of Azerbaijan Republic and Azerbaijan State Agrarian University.

During these years of research, species belonging to the *Glycyrrhiza* genus were collected in Azerbaijan, photos were taken and an album was compiled. Classical and modern botanical-floristic methods were used in processing and determining the collected materials (Rabotnov, 1950; Barghi, 1990), reference literature - “*Flora of the USSR*” (1948), “*Flora of the Caucasus*” (Grossheim, 1952), “*Flora of Azerbaijan*” (1954) - and internet sites. The taxa were checked in “*Conspectus of the flora of Asian Russia*” (2012) and the nomenclature of each one with International databases (World Flora Online - Plants List, 2024).

RESULTS AND DISCUSSION

Systematics

ANGIOSPERMS

Ordo LEGUMES Bromhead

Family FABACEAE Lindl.

Genus *Glycyrrhiza* Tourn. ex L.

The morphological characteristics of the genus *Glycyrrhiza* are: a perennial herb, the stem is 50–150 cm high, the base is woody, densely scaly, glandular, white hairy; leaves 5–14 cm, stipule linear, 1–2 mm; petiole densely yellow-brown glandular, hairy; leaves ovate-oblong, oblong-lanceolate or elliptic, 1.7–4×0.8–2 cm, apex rounded or recurved; many and densely flowered; dense brown scaly glands, white in color; petals 2

mm, membranous; the ovary is glabrous; pod oblong, flat, 17–35 × 4.5–7 mm, rarely compressed between seeds, glabrous or sparsely pubescent, rarely glandular pubescent; seeds 2–8, about dark green, 2 mm in diameter, and smooth. Flowering occurs in May–June, fruiting in July–September. Chromosome number 2n = 16.

According to the work on the flora of Azerbaijan, 5 species (*G. glabra*, *G. asperula*, *G. echinata*, *G. glandulifera*, *G. foetidissima*) are recorded in this region but, in the flora synopsis of the Caucasus, the follows 5 species are listed: *G. glabra*, *G. asperula*, *G. echinata*, *G. macedonica*, and *G. foetidissima*; finally, according to World flora online, the genus *Glycyrrhiza* is represented in Azerbaijan by 3 species with many variations and synonyms: *G. glabra* (sweet licorice), *G. asperula* (wrinkled licorice) and *G. echinata* (pumpkin licorice).

The Plant List nomenclature (2024) includes 79 taxa belonging to the genus *Glycyrrhiza*: 21 of these are accepted species names and 13 are infraspecific species names. These names to the infraspecific level are primarily synonyms of accepted species. 3 species belong to Azerbaijani licorice (table 1). According to our observations, this genus is represented by 3 species and 1 additional non-naturalized species in the flora of Azerbaijan: *G. uralensis* Fisch ex D.C., Ural licorice.

Based on this, the identification key of the species of the *Glycyrrhiza* genus of Azerbaijan was compiled according to the new nomenclature:

1. The flower group is dense, almost spherical. The flowers are purple. The pod is thornless in the lower part and densely prickly in the upper part.....*G. echinata* L.
- . The flower group is dense, with a large head, globose or oval, much smaller than the leaves.....2
2. Flower group oval or oblong-oval, relatively few. The flower is deep purple. The entire surface of the bean is covered with thorns. The stem, leaf stalks and flower axis, sometimes the leaves have dense, thin spines on the underside. The leaves are oppositely ovate or elliptic-linear. Beans are cylindrical, smooth, stretched.....*G. glabra* L.
3. The plant is thornless.....*G. aspera* Pall.

***Glycyrrhiza glabra* L.**

This species is a perennial herb, 50–200 cm tall. The stem is bare, multiple, flat, simple and branched. The leaves are unpaired compound pea-like, 5–20 cm tall. The leaves are glossy, firm, oblong-ovate or lanceolate, and sticky. The length of the flowers is 12 mm, the flower crown is whitish-pink, the calyx is spiky. The fruit is oblong, flat or slightly curved. The underground system consists of a multi-layered system consisting of a main root, horizontal and vertical rhizomes (stolons), and is anchored to the soil by its roots and can reach a depth of 8 m. The aerial stem develops from the main root. Flowering occurs in May-June, and fruits ripen in September.

The Linnaean specific epithet “*glabra*” means hairless, referring to the absence of hairiness in the plant.

***Glycyrrhiza echinata* L.**

It is a herbaceous perennial plant growing from rhizomatous roots and rhizomes. It produces a cluster of stems that are simple or branched at the bottom, usually 50–100 cm tall and tend to rise. The

plant is collected from the wild for local use as food.

Glycyrrhiza echinata is native to Southeast Europe, Western Asia, and adjacent areas of Eastern Asia. It is one of the species described by Carl Linnaeus in 1753, and the specific Latin epithet *echinata* means “*hedgehog*”, *echinus* means “*thorny*”; the Azerbaijani toponym is named as “*turtle*”.

The following synonyms of the *Glycyrrhiza echinata* species are available in the botanical bibliography: *G. dioschoridis* Medik. Ýn Vorles., *G. duvia* Bernh. ex Steud, *G. echinata* f. *cylindrica* Boza in Razp., *G. echinata* var. *frearitis* Boiss., *G. echinata* var. *pedunculata* Grossh., *G. echinata* var. *subinermis* R. Uecchtr. & Sint, *G. echinata* f. *subsedens* Boza, *G. foetida* J. Jacq, *G. foetidissima* Tausch, *G. frearitis* (Boiss.) Orph. ex Beck, *G. inermis* Boros, *G. macedonica* Boiss. & Orph., *G. muricata* Georgi in Beschr., *G. subechinata* Boza in Razpr, *G. subinermis* Boros.

***Glycyrrhiza aspera* Pall.**

This Licorice is a perennial herb; the roots and rhizomes are thin; the stem is erect or bending, 10-



Figure 1. *Glycyrrhiza glabra* from Azerbaijan.



Figure 2. *Glycyrrhiza echinata* from Azerbaijan.

30 cm high, sparsely hairy and glandular hairy; leaves 2.5–10 cm, (5 or)7– or 9 paired; leaf base oval-triangular, 4–6×2–4 mm; petiole sparsely pubescent and glandular pubescent; leaves gray-green, ovate, broadly ovate, ovate or elliptic, 10–30×3–18 mm, sparsely hairy and glandular hairy on the lower side, glabrous on the upper side, hairy on the base, hairy with small spines on the margin. Cluster flower-shaped, many-flowered; flower axis longer than leaves, glands pubescent; the main vein of the leaf is linear-lanceolate, 3–6 mm, covered; sepal (calyx) cylindrical, 7–12 mm, sparsely hairy, 5-toothed; the upper 2 teeth are slightly confluent. The corolla is light purple or violet; oblong, 13–15×5–6.5 mm, base tapering to a claw, apex rounded; wings 1.2–1.4 cm; 1–1.1 cm; the ovary is shiny; pods usually become a curved ring, brown, 1.5–2.5 cm, glabrous; the seeds are 2–10, black-brown, round. Flowering occurs in May–June, and fruit-seeds occur in July–August.

The following synonyms of the *G. aspera* are cited in the botanical bibliography: *G. laxiflora* X.Y. Li & D.C. Feng, *G. laxissima* Vassilez., *G. macrophylla* X.Y. Li, *G. nutantiflora* X.Y. Li, *G. prostrata* X.Y. Li, *G. purpureiflora* X.Y. Li, *G. zaissanica* Serg.

However, there is no information about the existence of these synonyms in the flora of Azerbaijan (see also World Flora Online - Plants List, 2024).

CONCLUSIONS

Three species belonging to the genus *Glycyrrhiza* are part of the flora of Azerbaijan (*G. glabra*, *G. aspera*, and *G. echinata*) as also demonstrated by the result of our study. Another species cultivated in Azerbaijan, *G. uralensis* Fisch ex D.C. (Ural licorice), has already spread in nature. The species of this genus have great social importance because they are widely used by humans in multiple activities (i.e., pharmacological and food). With their presence, they contribute to

increasing the rich biodiversity of the flora of Azerbaijan and are worthy of protection and safeguard.

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