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A new species of *Astragalus* sect. *Anthylloidei* (Fabaceae) from Iran

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Summary. Following examination of specimens of *Astragalus* sect. *Anthylloidei* collected in Alborz Province, Iran, a new species, *Astragalus shahriarii*, is described. This species is similar to and closely related to *A. submitis* but differs in having a shorter calyx, as well as shorter standard, wings, keel, and pods. A detailed description, distribution map, and comparative table of morphological characteristics are provided for this new taxon.

Новый вид *Astragalus* секции *Anthylloidei* (Fabaceae) из Ирана

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Ключевые слова: очаг биоразнообразия, таксономия, эндемизм, *Anthylloidei*, *Astragalus*.

Аннотация. В ходе изучения образцов *Astragalus* секции *Anthylloidei*, собранных в провинции Альборз (Иран), описан новый вид *Astragalus shahriarii*. Новый вид морфологически сходен с *A. submitis* и близок к нему, однако отличается более короткой чашечкой, а также более короткими парусом, крыльями, лодочкой и бобами. Для нового таксона приведены подробное описание, карта распространения и сравнительная таблица морфологических признаков.

Introduction

The genus *Astragalus* L. is one of the largest genera of flowering plants in the Old World in terms of species richness (Ghahremaninejad et al.,

2022). It comprises approximately 850 accepted species in Iran and about 3000 species worldwide (Maassoumi, 2016, 2020, 2020–2021; Nasseh et al., 2020; Ghahremaninejad et al., 2022). With roughly 592 endemic species, *Astragalus* displays

the greatest species diversity within the Iranian flora (Ghahremaninejad et al., 2025a).

The broad geographic extent and climatic diversity of Iran suggest that many species in this genus remain undiscovered, as new taxa are described almost every year (e. g., Ghahremaninejad et al., 2025b; Karbalaee et al., 2025; Naderi et al., 2025). Due to their highly restricted distributions, several of these rare species are under significant threat of extinction (IUCN, 2022).

Although centers of endemism occur worldwide, Iran is recognized as an important biodiversity hotspot, harboring a rich array of both ancient (paleoendemic) and recent (neoendemic) taxa. Patterns of endemism and biogeographic regionalization identify Western Asia, particularly Iran, as a critical biogeographical bridge between Europe and Asia (Folk et al., 2024).

In Iran, *Astragalus* is represented by about 73 sections, nearly 50 of which are confined exclusively to the country. The section *Anthylloidei* DC. (De Candolle, 1825), with 21 endemic species, ranks as the seventh largest section in terms of endemism (Ghahremaninejad et al., 2025a). The use of sections as taxonomic ranks facilitates species identification and helps organize large genera such as *Astragalus*, although molecular phylogenetic studies have shown that several sections within *Astragalus* are artificial or non-monophyletic (Azani et al., 2017, 2019).

Section *Anthylloidei*, composed of perennial species characterized by simple, basifixed hairs, is distributed across a wide region including Afghanistan, Armenia, Azerbaijan, Iran, Iraq, Lebanon, Pakistan, Russia (Caucasus), Syria, Tajikistan, Transcaucasia, Turkey, Turkmenistan, and Uzbekistan. It comprises 38 species worldwide, 27 of which are found in Iran, Turkey, the South Caucasus, Turkmenistan, Iraq, and Afghanistan (Podlech, Zarre, 2013; IPNI, 2025; POWO, 2025). It is worth noting that trichome characteristics represent one of the most important diagnostic features in this genus (Zarre, 2003; Ghahremaninejad, 2004).

Numerous taxonomic studies have been conducted on this section in Iran, and several new species have recently been described from the country (e. g., Ghahremaninejad, 2005; Sabaii et al., 2007; Zeraatkar et al., 2024).

Material and methods

The specimens of the new species were collected from a mountainous area in Alborz Province, along Chalus Road, before the Kandovan Tunnel

(Alborz Mountain Range), Iran. The specimens are deposited in the Tehran Herbarium (T), Kharazmi University, Tehran. We reviewed and consulted the descriptions and identification keys in the relevant literature (Podlech et al., 2001; Podlech, Zarre, 2013; Maassoumi, 2016). The gross morphological features of the specimens were examined under a binocular stereomicroscope and compared with those of similar closely related species at FUMH, T, P, W and virtual herbaria of K and MW. The conservation status of the species was assessed according to the IUCN Red List categories and criteria (IUCN, 2022).

For SEM observations, pollen grains were prepared and analyzed using scanning electron microscopy. Initially, flowers were separated using forceps and placed on a slide. The anthers were then carefully removed under a stereomicroscope with a fine needle. To prepare the sample for SEM observation, pollen grains were carefully mounted onto aluminum stubs using double-sided adhesive tape. The samples were then gold-coated by sputter coating and examined at various magnifications with a ZEISS (Germany) scanning electron microscope.

Results

Astragalus sect. *Anthylloidei* DC., 1825, Prodr. 2: 300.

Type: *A. anthylloides* Lam.

= *A. sect. Halicacabus* Bunge, 1868, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 74.

= *A. sect. Megalocystis* Bunge, 1868, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 72.

Astragalus shahriarii Alirezaei, F. Ghahrem. et Maassoumi, **sp. nov.** (Fig. 1).

Holotype: “Iran. Alborz Province: Chalus Road, before Kandovan tunnel [Mountainous area], ca. 2100 m. VI 2003. F. Ghahremaninejad 1609” (T; iso – T).

Paratype: “Iran. Alborz Province: Chalus Road, before Kandovan tunnel [Mountainous area], ca. 2090 m. VI 2003. F. Ghahremaninejad 1608” (T!).

Diagnosis. This species is similar to *A. submitis* Boiss. et Hohen. but differs in having a shorter calyx, as well as shorter standard, wings, keel, and fruit.

Description. Perennial, acaulescent, ca. 30 cm tall, sparsely to densely covered with ascending hairs, on the vegetative parts only with white hairs, on the inflorescence and calyx mixed with short black hairs. Stipules hyaline, glabrous, ciliate along the margins, ca. 9 mm long, at the base ca. 3 mm adnate to the petiole, free from each other on the



Fig. 1. *Astragalus shahriarii*; F. Ghahremaninejad 1609, Tehran Herbarium (T), Kharazmi University, Holotypus.

opposite side. Leaves paripinnate, ca. 10–23 cm long; petioles ca. 5–8 cm, both petiole and rachis sparsely covered with long white ascending hairs. Leaflets ca. 34 pairs, minute, obovate, covered with patent hairs, 4×2 mm, petiolules ca. 0.5 mm long, hairy like the rachis. Racemes lax, spike-like, ca. 9.5 cm long, 18–23-flowered, axis covered with black

and white hairs. Peduncles ca. 18–20 cm long, hairy. Bracts ovate, covered with black hairs, ca. 4 mm long. Pedicels ca. 1.5 mm long, also covered with black hairs. Calyx in young (flowering) stage ca. 8–9 mm long, tubular, covered with black and white hairs, teeth ca. 1 mm long, triangular, inflated in fruit, with shallowly reticulate venation, ca. 9–10 mm long and

9 mm wide, densely covered with white hairs mixed with few short black hairs, on the teeth more dense black hairs. Bracteoles 2, situated at the base of the calyx, ca. 2 mm long. Corolla pale yellow to brown. Standard ca. 18 mm long, limb orbicular to shortly obovate, ca. 10 mm long and 8.5 mm wide, claw 8 mm long. Wings 17.5–18 mm, limb 8 mm long and 2 mm wide, claw ca. 10 mm, auricle very short 0.8–1 mm. Keel 16 mm long, limb triangular, pale purplish on the upper part, limb 6.2 mm long, claw ca. 10 mm long, auricle 0.5 mm long. Ovary pilose, ca. 4 mm long, shortly stipitate. Pods elliptic, ca. 5 mm long, white hairy, stipe ca. 1 mm long.

Etymology. This species is named in honor of Ostad Shahriar (1907–1988), a prominent figure in modern Persian literature. His full name is Seyyed Mohammad Hossein Behjat Tabrizi, though he is widely known by his pen name *Shahriar*. He composed poetry in both Persian and Azerbaijani, and his work is marked by deep emotion and a profoundly human perspective. To our knowledge, this is the first plant species named in his honor.

Distribution. This species occurs in mountainous areas with stony or rocky terrain along the Chalus Road, in the Central Alborz Mountain Range. This

road, which connects the cities of Karaj and Chalus, is a well-known montane route in northern Iran. The collection site lies within Alborz Province, near the border with Mazandaran Province. Chalus Road is one of the most famous, important, and scenic mountain roads in Iran, leading northward to the Hyrcanian forests and the Caspian Sea (Fig. 2).

Conservation. The extent of occurrence (EOO) for *Astragalus shahriarii* cannot be reliably estimated as the species is known from only a single locality. Applying the standard 2×2 km grid recommended by the International Union for the Conservation of Nature (IUCN, 2022), the area of occupancy (AOO) is estimated at a single grid cell, approximately 4 km². However, this value is based solely on the type collection, as no recent field explorations have been undertaken. Consequently, information regarding the species' population size, demographic trends, and geographic distribution remains unavailable. In the absence of such data, a rigorous conservation evaluation under the IUCN criteria is not feasible at present. Accordingly, *Astragalus shahriarii* should be classified as Data Deficient (DD) according to the IUCN Red List Categories and Criteria (IUCN, 2022). Continued field research is essential to



Fig. 2. Distribution map of *Astragalus shahriarii*.

elucidate its current range, population parameters, and conservation status.

Taxonomic notes. The new species closely resembles *A. submitis* Boiss. et Hohen. but differs in key morphological traits, including a shorter calyx, standard, wings, keel, and fruit. For the comparative analysis (Table 1), morphological data were obtained from Podlech and Zarre (2013) and from 16 herbarium specimens of *A. submitis* housed in the Tehran Herbarium (T), Kharazmi University.

Specimens examined of *A. submitis*: Iran. Alborz Province: “Karaj, Taleghan, 2300 m. 10 VI 1997. F. Ghahremaninejad, A. A. Maassoumi” (T 10805); “Karaj, Chalus Road around the Yakh Morad Cave, 2640 m. 10 VI 1988. M. Sabet Ghadam” (T 10899); “Yakh Morad Cave, 2640 m. 03 VI 1988. A. Panjehyani” (T 17099); “Kandovan Road, 2900 m. 21 V 1994. A. Tavakkoli” (T 19695); “Arangeh, Chalus Road, 1841 m. 02 V 2011. P. Fani” (T 21997); “Sirud village, 2091 m. 09 V 2023. M. Hashamparvar” (T 22349). Markazi Province: “Saveh, the Kharaqan Mountains, 1100 m. 04 V 1991. M. Mirtaheeri” (T 17500). Tehran Province: “Darbandsar, 2600 m. 10 VI 1988. B. Maleki” (T 17100); “Ahar village [near Fasham], 2091 m. 28 V 1999. P. Khosravani” (T 21000); “Tehran, 1214 m. 03 V 2001. Derakhshan” (T 21060); “Varish village, 2250 m. 30 V 2006. S. Manafzadeh, M. Edalatian, M. Khajehpiri” (T 21198); “A part of southern slopes of central Alborz around

of Vardij and Varish villages, 2072 m. 05 VI 2009. L. Gilani” (T 21199); “Sangan waterfall, 2025 m. 25 V 2019. V. Faghani” (T 21998). Zanjan Province: “Abhar, Rad village, 1542 m. 20 V 1998. A. Hoseini” (T 20999); “Qeydar, Qeydar Mountains, 2440 m. 29 V 2009. A. Bagheri” (T 6966); “15 km from Abhar to Qeydar, 1795 m. 19 V 2009. A. Bagheri” (T 6611).

Pollen Morphology. In many angiosperm families, pollen traits often provide helpful taxonomic information and can sometimes offer insights into evolutionary relationships as well (Noroozi et al., 2022). Pollen characteristics of the new species are illustrated in Fig. 3 using scanning electron microscopy (SEM). Given the apparent rarity of the species, documenting its pollen features was considered valuable. A recent study on some *Astragalus* species in Turkey, however, did not find pollen features particularly diagnostic, although some variation was observed among them (Pinar et al., 2009).

The pollen grains are small, monads, prolate to prolate-spheroidal, radially symmetrical, and isopolar. The apertures are trizonocolporate (three colpi with pores). The surface ornamentation is microreticulate (net-like). Pollen dimensions are as follows: polar axis, 25.41 μm ; equatorial axis, 20.02 μm (Fig. 3).

Table 1. Comparison of morphological characters between *Astragalus shahriarii* and *A. submitis*

Characters (mm) \ Species	<i>Astragalus submitis</i>	<i>Astragalus shahriarii</i>
Calyx length (young stage)	10–14	ca. 8–9
Calyx length (mature stage)	12–21	ca. 9–10
Calyx teeth length	1–2	ca. 1
Standard length	17–30(–33)	ca. 18
Standard blade length	9–16 $\times$ 7–11	ca. 10 $\times$ 8.5
Standard claw length	8–14	8
Wings length	16–26(–29)	17.5–18
Wings blade length	7–10 $\times$ 3–4	8 $\times$ 2
Wings auricle length	0.3–1.0	0.8–1.0
Wings claw length	11–15	ca. 10
Keel length	14–26	16
Keel blade length	4.5–7.0 $\times$ 2.5–3.5	6.2
Keel auricle length	0.5	0.5
Keel claw length	9	ca. 10
Ovary length	5	ca. 4
Legume length	6–7	ca. 5

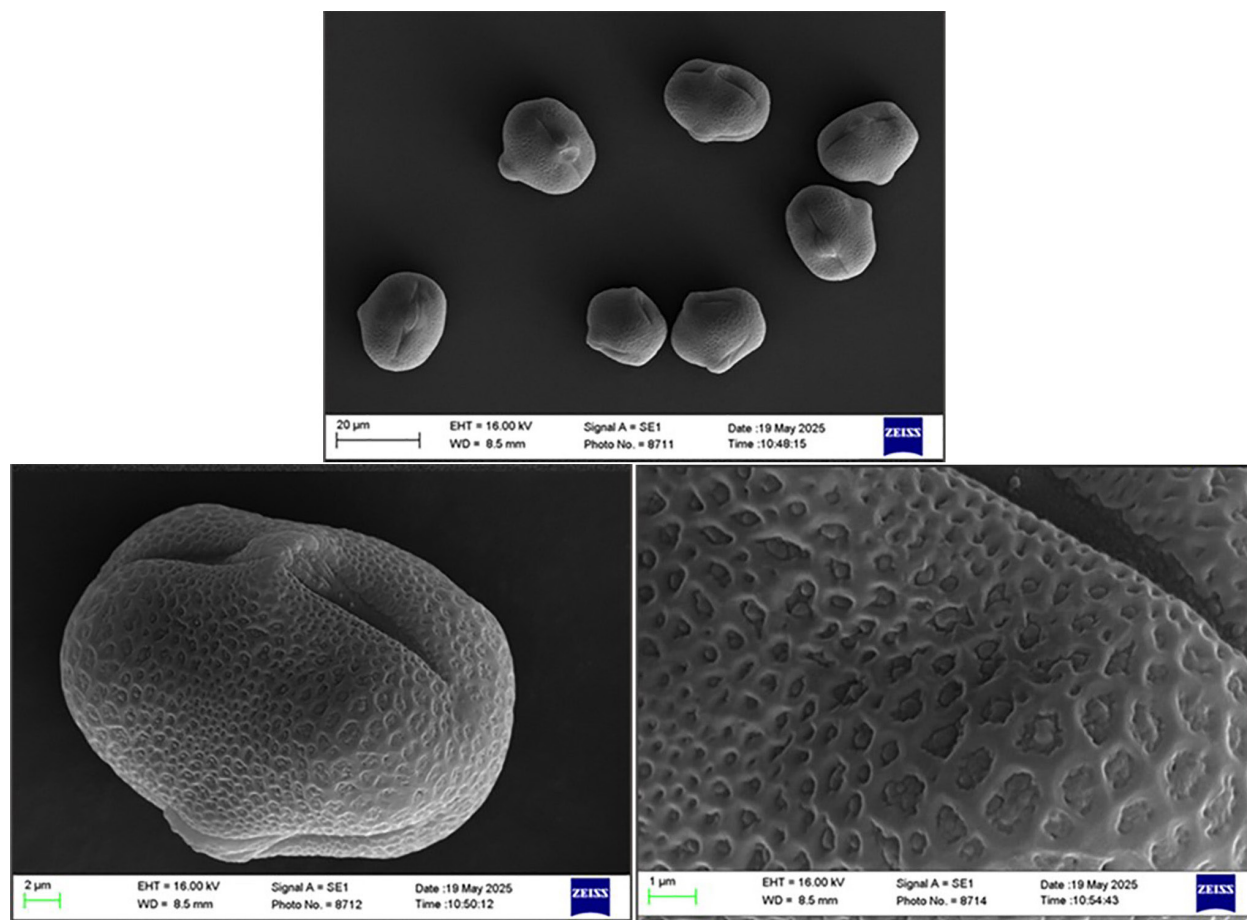


Fig. 3. Scanning electron micrographs of pollen of *Astragalus shahriarii*.

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