

ASTRAGALUS BOLDAJIENSIS AND ASTRAGALUS CENTRO-ZAGROSICUS (FABACEAE), TWO NEW SPECIES FROM WEST OF IRAN

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In recent studies on *Astragalus* specimens at the herbarium of Chaharmahal and Bakhtiari Agricultural and Natural Resources Research and Education Center (D), two new species have been identified: *A. boldajiensis* (sect. *Microphysa*) and *A. centro-zagrosicus* (sect. *Anthylloidei*). These species are only found in the Chaharmahal and Bakhtiari province and are considered local endemics. *A. boldajiensis* is closely related to *A. cephalanthus*, but can be distinguished by its remotely flowered cylindric raceme, 12 mm long standard, 4 long and 2 mm wide calyx, and obtuse leaflets. On the other hand, *A. centro-zagrosicus* is similar to *A. melanogramma*, but can be differentiated by its yellowish flowers and distinct enervate calyx. Illustrations of the new species, diagnostic characters, and distribution map are provided. Also, the conservation status of these species has been assessed.

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Astragalus boldajiensis و **A. centro-zagrosicus** (تیره Fabaceae)، دو گونه جدید از غرب ایران

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در مطالعات اخیر بر روی نمونه‌های جنس گون در هرباریوم مرکز تحقیقات و آموزش کشاورزی و منابع طبیعی چهارمحال و بختیاری (D)، دو گونه جدید *A. boldajiensis* (بخش *Microphysa*) و *A. centro-zagrosicus* (بخش *Anthylloidei*) شناسایی شده است. این گونه‌ها انحصاری استان چهارمحال و بختیاری هستند و بومزاد محلی محسوب می‌شوند. *A. boldajiensis* نزدیک به *A. cephalanthus* است، اما می‌توان آن را با گل آذین خوشه‌ای - استوانه‌ای با گل‌های پراکنده، درفش به طول ۱۲ میلی‌متر، کاسه به طول ۴ و عرض ۲ میلی‌متر و برگچه‌های نوک‌کند از آن گونه متمایز کرد. از سوی دیگر، *A. centro-zagrosicus* شبیه *A. melanogramma* است، اما می‌تواند با گل‌های مایل به زرد و کاسه بدون رگبندی

مشخص از آن گونه تفکیک می شود. نقاشی گونه‌های جدید، صفات تشخیصی و نقشه پراکنش ارائه شده است. همچنین جایگاه حفاظتی این گونه‌ها مورد ارزیابی قرار گرفته است.

INTRODUCTION

Astragalus L. is the largest genus of flowering plants, consisting of approximately 3156 species divided into 255 sections (Maassoumi 2020). This mega genus belongs to the Astragalean clade in the tribe Galegeae s.l. and includes a variety of plants such as annual and perennial rhizomatous or hemicryptophyte herbs as well as cushion-forming spiny shrubs found in arid and semi-arid regions (Lock & Schrire 2005; Podlech and Zarre 2013; Maassoumi 2020).

Astragalus has the highest species diversity in Southwest Asia, Central Asia, Western North America, and the Andes of South America (Barneby 1964; Maassoumi 2020). Iran is one of the main biodiversity centers of *Astragalus* in the Old World, harboring c. 900 species of which 600 are endemics (Maassoumi 2020; Maassoumi & Ashouri 2022). Based on a recent biogeographical study carried out by Maassoumi & Khajoei Nasab (2023), it was found that there are seven areas of endemism (AoEs) for this genus in Iran. One of the significant areas of endemism for this genus is the Bakhtiari mountains in western Iran.

The province of Chaharmahal and Bakhtiari in Iran is a hub for biodiversity research, where many new species have been discovered in recent years (Mozaffarian 2017). Recently, our field surveys and the revision of *Astragalus* collections in the treatment of Fabaceae for the 'Flora of Chaharmahal and Bakhtiari province', conducted by A.A. Maassoumi in 2024, have provided unequivocal evidence for the description of two new species of *Astragalus* in this region.

This paper describes two *Astragalus* species previously unknown to science and their morphological affinities with the closely related species in *Astragalus*. It provides detailed descriptions, photographs, a distribution map, and illustrations of these new species.

MATERIALS AND METHODS

Specimens of the new species were collected during the growing seasons of 2002 and 2023 in the Chaharmahal and Bakhtiari province during fieldwork. After examining the specimens, we compared them with other *Astragalus* species using diagnostic keys from relevant taxonomic literature and floras, such as Podlech & al. (2010, 2012), Podlech & Zarre (2013), and Maassoumi (2018). We determined the conservation status of the species using IUCN Red List categories and criteria (IUCN 2022). The type

specimens are preserved in D and TARI herbaria, as per the acronyms according to Thiers (2023).

RESULTS AND DISCUSSION

Astragalus boldajiensis Maassoumi, Zeraatkar & Khajoei Nasab, **sp. nov.** e Sect. *Microphysa* Bunge, Fig. 1.

Diagnosis: similar to *A. cephalanthus* DC. but differ from it in having calyx 4 mm long and 2mm wide (vs. 4-8 mm long and 2,5-8 mm wide), remotely flowered cylindrical raceme (vs. dense spherical raceme), standard 12 mm long (vs. 5.5-10.5 mm), leaflets obtuse (vs. acute to mucronulate).

Plant c. 30 cm tall, spiny densely covered with short appressed white hairs. Stem short, c. 3 cm long, densely hairy, internodes short. Leaves paripinnate, terminal spine equaling leaflets. Stipules 3-4 mm long, hyaline, glabrous, ciliate at the margin, at the base shortly adnate to the petioles, and the other side highly jointed. Leaves paripinnate, 2-4 cm long, indurate, terminating to a distinct spine, spine c. 5 mm long petioles 1-2 cm long, like rachis densely covered with short appressed hairs, 0.2-0.3 mm long; leaflets 6-7 pairs, narrowly elliptic, 6-8 mm long and 2-3 mm wide, both sides covered with appressed hairs. Peduncle 18-20 cm long, thin, sparsely to densely hairy. Raceme cylindric, many-flowered; flowers 18-20, nearly remote to each other, not compact. Bracts ovate, 1.5-1.7 mm long, with red midvein, covered with short appressed hairs, falling the lower once. Calyx campanulate to shortly tubular, densely covered with short appressed white hairs, c. 4 mm long, with very short teeth, c. 1.5 mm long, gradually inflating, in fruiting time c. 4 mm long and 2 mm wide. Flowers pale violet; standard c. 12 mm long, emarginate at apex, limb ovate c. 5 mm wide; wing 10-11 mm long, limb c. 6 mm long and 2.5 mm wide, at the base with short auricle; claw c. 5 mm long; keel c. 10 mm long, limb ovate, c. 3 mm long and 2.5 mm wide. Ovary pilose. Pods covered with appressed hairs, c. 2.5 mm long and 1.5 mm wide, unilocular, one-seeded.

Type: Chaharmahal and Bakhtiari province: Boldaji, south foothill, 31,55,10.76 N; 51,6,5. 4 E, 2260 m a.s.l., 26 May 2002, *Ayatollah Gholamian 4081* (Holotype: D!).

The specific epithet comes from the name of the locality where the specimen was collected (Boldaji area).

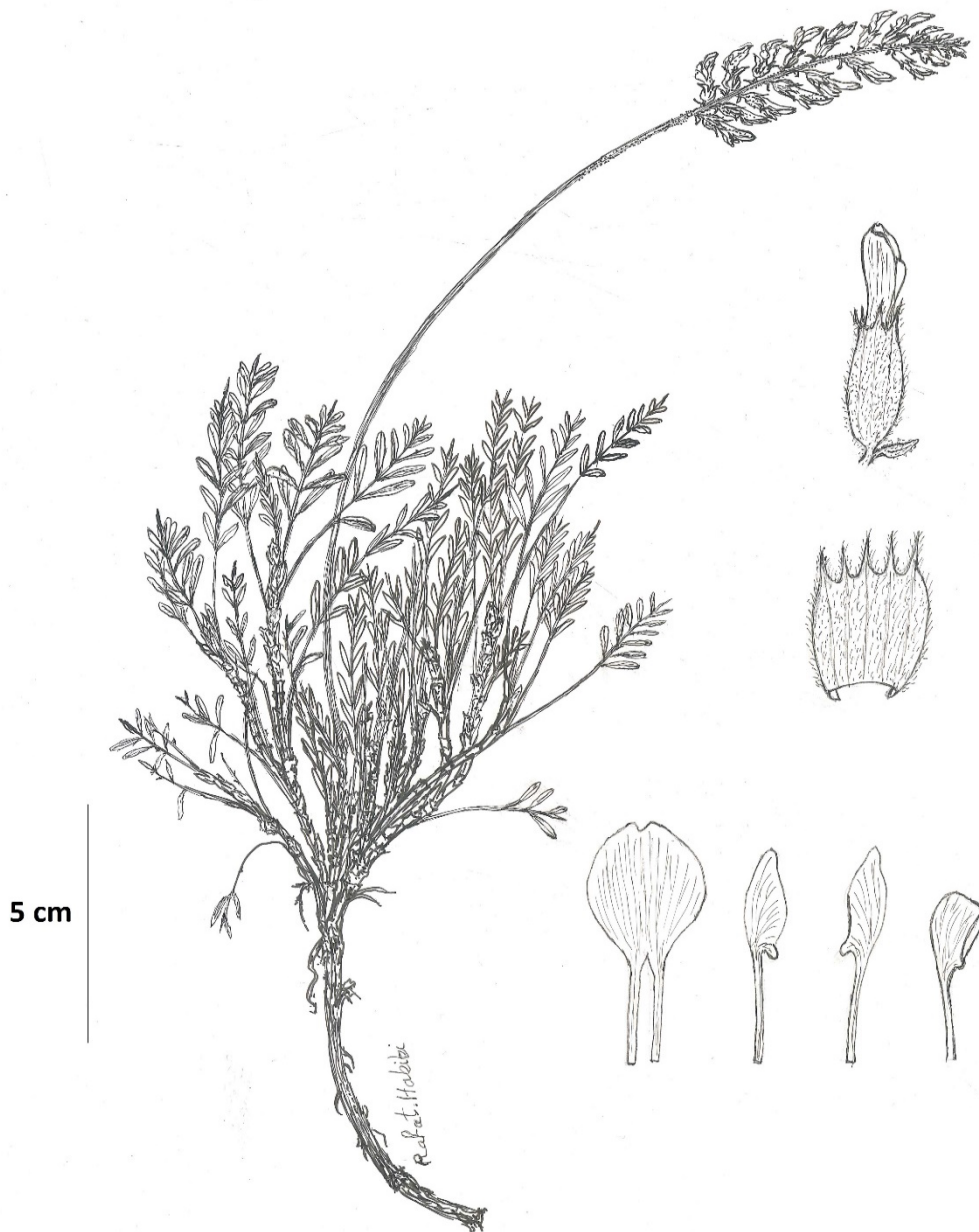


Fig 1. Holotype of *Astragalus boldajiensis* Maassoumi, Zeraatkar & Khajoei Nasab (Gholamian 4081).

Conservation status: Based on our understanding of the region, it appears that this species may be restricted to Borujen County (Fig. 4). However, due to insufficient data, accurately assessing its population size and geographical distribution is impossible, and needs further future studies.

Astragalus centro-zagrosicus Maassoumi, Zeraatkar

& Khajoei Nasab, **sp. nov.** e Sect. *Anthylloidei* DC. Figs. 2 & 3.

Diagnosis: similar to *A. melanogramma* Boiss. but differs from it in having yellowish flowers and calyx enervate, c. 15 mm long (vs. 10-12 mm), standard obovate to elliptic (vs. panduriform and angulate to hastate at the base).

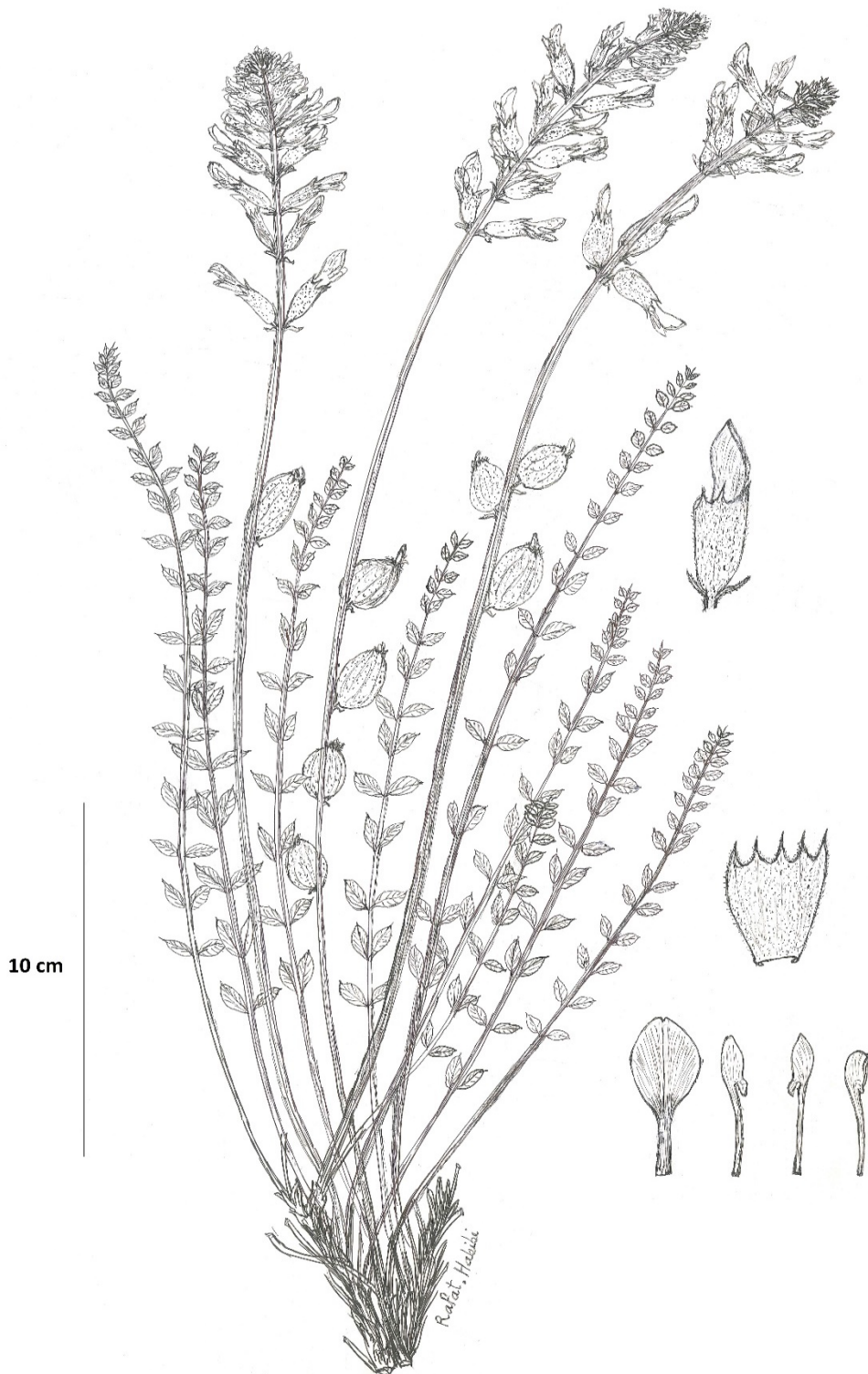


Fig 2. Holotype of *Astragalus centro-zagrosicus* Maassoumi, Zeraatkar & Khajoei Nasab, (Zeraatkar 7380).



Fig 3. *Astragalus centro-zagrosicus* in the wild in Chaharmahal and Bakhtiari, Karsang village, Ben (Photos by A. Zeraatkar).

Plant perennial, acaulescent, c. 50 cm tall, densely covered with short spreading to ascending white hairs up to 0.25 mm long, at the base much divided, with remnant of old petioles. Stipules membranous, hairy, at the base minutely adnate to the petiole, other side free from each other, c. 5 mm long. Leaves paripinnate, 20-30 cm long; petiole 5-7 cm long, terminating to a short spine, both petiole and rachis densely covered with short ascending white hairs; leaflets 15-17 pairs, oblong-elliptic, 10-15 mm long and 3-6 mm wide, pungent, densely covered with spreading to ascending short hairs, upper side with distinct nervation. Peduncle 27-30 cm long, flexible, like rachis densely covered with short spreading hairs. Raceme long spike-like, remotely 20-25 flowered. Bracts 7 mm long, narrowly ovate, densely hairy. Pedicel very short. Calyx in young stage 15 mm long and 5 mm wide, in fruiting time strongly inflated, elliptic to spherical, c. 25 mm long and 15 mm wide, densely covered with short spreading white hairs, pale yellow, toward the base gradually reddish, enervate; teeth subulate, triangular, c. 3 mm

long. Corolla yellow to whitish. Standard c. 23 mm long, limb ovate to elliptic, 10 mm long, gradually passing to a distinct claw; wing c. 20 mm long, limb elliptic, c. 8 mm long and 4 mm wide, at the base auriculate, auricle c. 1.5 mm long, claw c. 12 mm long. Keel c. 20 mm long, equaling the wing, limb elliptic, c. 6 mm long and 4 mm wide, claw 14 mm long. Ovary pilose, with stipe c. 3 mm long, unilocular, 1-2 seeded. **Type:** Chaharmahal and Bakhtiari province: Ben, Karsang village, 32.5285 N, 50.4662 E, 30 April 2022, 2525 m a.s.l, *Amin Zeraatkar 7380* (Holotype: D! Isotypes: TARI!, D!).

Species conservation assessment: The area of occupancy (AOO) for *Astragalus centro-zagrosicus* was calculated as 0.011 km², in which about 300 individuals were estimated to occur. Overgrazing by sheep and goat herds was observed. There was also an anthropogenic effect on the *A. centro-zagrosicus* population due to agricultural expansion. According to the criteria of the IUCN (2022), *A. centro-zagrosicus* is evaluated as “Critically Endangered” (CR) B2ab (ii, iii, v).

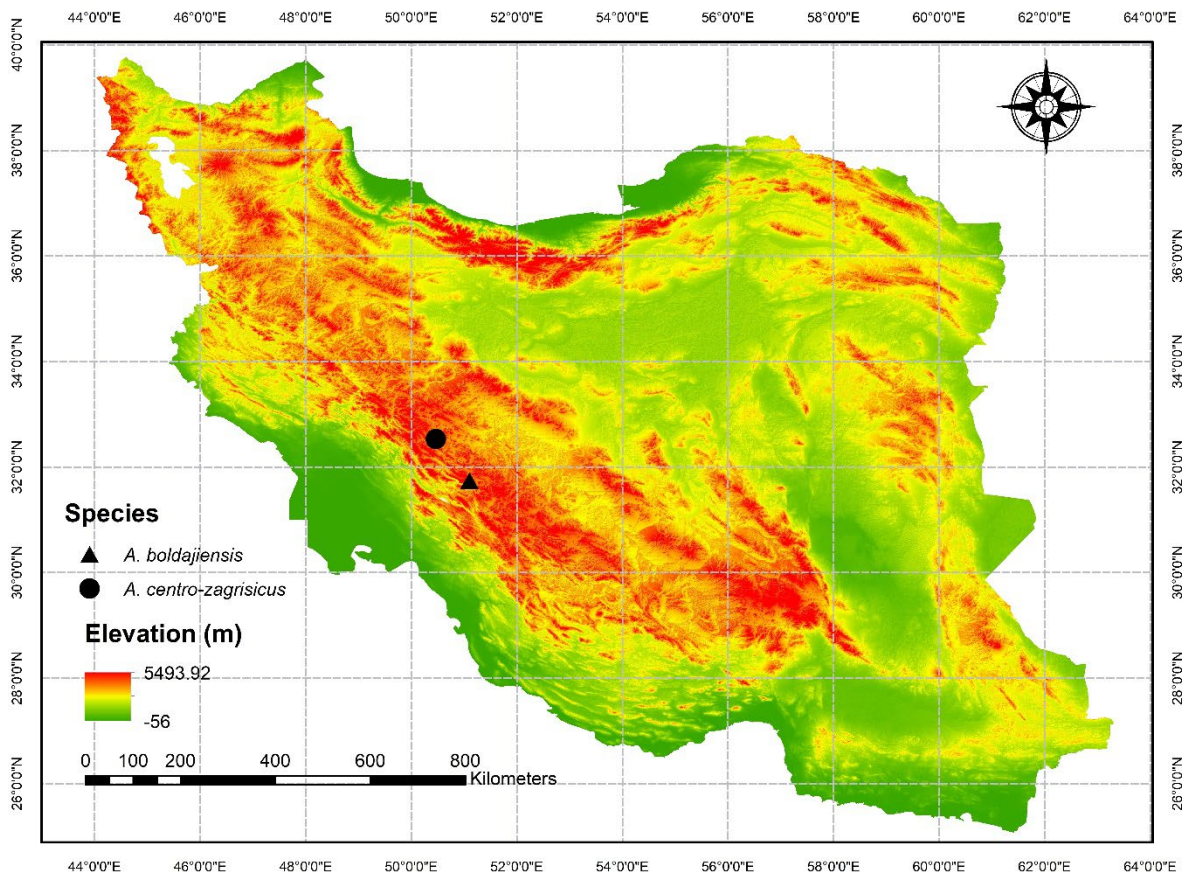


Fig 4. Distribution of *Astragalus boldajiensis* and *A. centro-zagrosicus*

Distribution, habitat, and ecology: The species only known from the type locality. *Astragalus centro-zagrosicus* is a local endemic restricted to the districts of Ben, Chaharmahal and Bakhtiari, western Iran (Fig. 4). It is an element belonging to the Irano-Turanian floristic region, colonizing in hilly environments where the climate is cold and semi-humid (Zeraatkar & al. 2024). It is typically found at 2500-2600 meters above sea level.

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