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Research Paper

***Oxytropis birjandica* (Fabaceae: Papilionoideae, Galegeae), a new species from Iran, South Khorassan Province**

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Abstract

A new species of *Oxytropis* (Fabaceae), distinguished by its white petals, is described and illustrated here as *Oxytropis birjandica* sp. nov., an endemic to South Khorassan Province in eastern Iran. Morphological evidence suggests a close affinity with *O. sutakensis* Maassoumi and *O. compacta* Maassoumi & Joharchi. The species was discovered at a single locality, and no additional records have been reported since the original collection in 1996. Given its apparent rarity and highly restricted distribution, its conservation status is provisionally assessed as Critically Endangered (CR) following the IUCN Red List criteria. A detailed morphological description, diagnostic comparisons, photographs, habitat information, distribution map, and conservation assessments are provided.

Keywords: Astragalean clade, arid habitats, Fabales, Iran, Fabaceae, Papilionoideae

Introduction

The polymorphic genus *Oxytropis* DC. is one of the most taxonomically complex groups within the Fabaceae family (Kholina et al., 2016), comprising approximately 300–350 species (Erkul & Aytac, 2013; Zhu et al., 2010; Malyshev, 2008). It was first described by de Candolle in 1802. Species of *Oxytropis* are herbaceous or cushion-like subshrubs that predominantly grow in cold and continental temperate grasslands; many of them thrive in montane or altimontane regions. The native range of this genus is the subarctic and temperate regions of the Northern Hemisphere (Lewis et al., 2005; POWO, 2025), and no species are found in Africa, South America, or Australia. Species of this genus typically occupy a variety of ecotones, including alpine scree slopes, wet meadows, arid sand dunes, and riparian corridors (Yurtsev, 1999). Species delimitation and sectional classification within *Oxytropis* remain challenging due to subtle and often cryptic morphological characters. Members of the genus are primarily distinguished by their beaked keel petals—a feature absent in *Astragalus* L.—which allows for reliable differentiation in the field, despite their superficial similarity. Molecular evidence confirms that *Oxytropis* forms a monophyletic clade and is not even the sister group of *Astragalus*, although both belong to the Astragalean clade (Wojciechowski et al., 2000; Shahi Shavvon et al., 2017). In Iran, *Oxytropis* is represented by 41 recorded species, with a wide distribution across the eastern and central Alborz Mountains extending into eastern Iran, and with few species found in the central regions of the country. The first comprehensive taxonomic treatment of *Oxytropis* in Iran was published in Flora Iranica by Vassilczenko (Vassilczenko, 1984). This was later revised by Maassoumi (2013), who excluded certain taxa and reduced others to synonymy. The highest species diversity is observed in the eastern provinces, particularly Khorassan, followed by Semnan

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and Golestan provinces. A few species also occur in the Zagros Mountains in western Iran. Most *Oxytropis* species bear shiny red-purple corollas, that often transition to violet. However, a few species, such as *O. pilosa* (L.) DC. and *O. guilanica* Maassoumi & Moradi, have yellow petals. The new species described in this study, *Oxytropis birjandica*, is notable for its white flowers, a characteristic that clearly distinguishes it from all previously known species. Since the Flora Iranica treatment by Vassilczenko (1984), several new species have been described from various regions of Iran (Vassilczenko, 1988; Ranjbar, 1999; Maassoumi, 2013, 2018, 2023; Moradi et al., 2015). The most recent and comprehensive revision was published by Maassoumi in 2023, in volume 177 of the Flora of Iran series. In that work, 41 *Oxytropis* species were recorded in Iran, approximately 30 of which are endemic to the country. More than half of the Iranian species exhibit narrow distributions and inhabit small, localized areas, placing many of them at potential risk of extinction. In comparison, neighboring countries host following number of species: Afghanistan (67), Pakistan (25), Turkey (13), and Turkmenistan (4) (Vassilczenko, 1984; Erkul & Aytac, 2013). The aim of this study is to describe and illustrate a new species of *Oxytropis* discovered in South Khorassan Province, eastern Iran, and to discuss its diagnostic morphological features, taxonomic placement, geographic distribution, and conservation status.

Materials and Methods

The new species was discovered during a revision of *Oxytropis* specimens housed at the herbarium of Ferdowsi University of Mashhad (FUMH). Morphological characters were examined using a stereomicroscope, and measurements were taken from dried herbarium material. Diagnostic traits were compared with descriptions available in relevant taxonomic literature (e.g., Vassilczenko, 1984; Maassoumi, 2013, 2023). The identification and novelty of the species were confirmed based on distinct morphological features not matching any known taxon. Distribution maps and conservation assessments were prepared using GeoCAT (Bachman et al., 2011), and the conservation status was assigned following the criteria of the IUCN Red List Categories and Criteria (IUCN, 2012).

Results and Discussion

Taxonomy

Oxytropis birjandica F.Ghahrem., Maassoumi & Joharchi **sp. nov.** (Fig. 1).

Diagnosis: Differs from *O. sutakensis* Maassoumi in having white petals (vs. purple to violet), shorter stipules (5.5 mm vs. 8 mm), shorter peduncle (4–4.5 cm vs. 5–7 cm), shorter bracts (1–1.5 mm vs. 3 mm), and shorter standard (11 mm vs. 14 mm). It differs from *O. compacta* Maassoumi & Joharchi in having white petals (vs. dark violet), longer stipules (5.5 mm vs. 4 mm), and larger leaflets (5 × 2–2.5 mm vs. 4 × 1.5 mm).

Description: Perennial, stemless, densely caespitose, and prostrate, approximately 8 cm tall, with numerous basal branches, densely covered with short, appressed hairs. Vegetative parts are covered with white hairs, while the bracts and raceme axis bear a mixture of white and a few black hairs. Stipules hairy, about 5.5 mm long, adnate to the petiole for approximately 3 mm; the free portion is lanceolate to linear, with both black and white hairs, around 3 mm long. Leaves 1.5–3 cm long, densely covered with short, appressed hairs; petiole about 1–1.5 mm long, with white appressed hairs on both the petiole and rachis. Leaflets in 6–7 pairs, narrowly oblong-elliptic to lanceolate, approximately 5 mm long and 2–2.5 mm wide, usually applanate, and hairy on both surfaces. Raceme 2–2.5 cm long, bearing 8 flowers, with an axis covered with white hairs only. Peduncle about 4–4.5 cm long, sparsely covered with white hairs, with a few scattered black hairs near the inflorescence. Corolla white. Calyx campanulate, 5.5–6.5 mm long; the tube bears a few sparse black hairs at the base. Calyx teeth about 3 mm long, covered with white hairs. Pedicel about 1 mm long. Bracts lanceolate, 1–1.5 mm long, covered with long black hairs (approx. 1 mm). Standard oblong-elliptic, about 11 mm long and 4.5 mm wide, rounded at the apex, gradually attenuated at the base, blade 9 mm long, with an indistinct claw. Wings about 9 mm long and 2.5–3 mm wide, blade 7 mm long, 3 mm wide, auricle 0.9 mm long, claw 2 mm long, obovate, obtuse at the apex. Keels about 10 mm long, slightly longer than the wings; limb oblique-elliptic, approx. 7 mm long and 3 mm wide, with a 1.5 mm mucrone, erect; claw 3 mm long. Ovary linear, semi-glabrous. Pods (immature) stipitate at the base, stipe about 1 mm long, sparsely hairy.

Typus: Iran, South Khorassan Province, 64 km from Ghaen to Birjand, 1750 m, 28.04.1996, Rafiee & Zangoie 26403 (holotype: FUMH!; isotype [in part, T!]). (Fig. 2)

Etymology: The species epithet *birjandica* refers to the city of Birjand in South Khorassan Province, eastern Iran, where the type specimen was collected. Birjand is the capital city of the province and one of the oldest and most historically significant regions in Iranian territory. Three other species have also been named after this city, which are: *Lactuca birjandica* Mozaff. (Mozaffarian, 2015), *Verbascum birjandense* Sotoodeh (Sotoodeh et al., 2022), and *Linaria birjandensis* Hamdi (Hamdi & Joharchi, 2023).

Ecological, Conservation, and Taxonomic Remarks

This desert-adapted, endemic species grows in arid to semi-arid mountainous regions of eastern Iran, on alkaline soils, and under relatively harsh environmental conditions, with an average annual precipitation of less than 200 mm. Based on morphological similarities, the new species appears to be closely related to *O. sutakensis* Maassoumi and *O. compacta* Maassoumi & Joharchi. Table 1 summarizes the key diagnostic traits that distinguish these three species and supports their taxonomic comparison. No additional specimens of this rare and localized species have been collected since the type collection in 1996, and its conservation status is provisionally assessed as Critically Endangered (CR) following the IUCN Red List Categories and Criteria (IUCN, 2012). We did not find any specimens of this new species in other herbaria. The authors did not return to the type locality to collect this species again. However, the exact habitat of the species was photographed recently (May 2025) (Fig. 4). Although the assessment is based on a single known locality, the apparent rarity and lack of subsequent records suggest a highly restricted distribution. A distribution map was generated using GeoCAT (Bachman et al., 2011) to visualize the species' known occurrence (Fig. 3), though formal EOO and AOO calculations were not applicable due to the limited data. Several plants associated with the new species include *Acroptylon repens* (L.) DC., *Rheum ribes* L., *Astragalus pellitus* Bunge, *Astragalus durandianus* Aitch. & Baker, *A. macrobotrys* Bunge, *A. argyroides* Beck, *Stipa* sp., *Achillea* sp., *Asperula* sp., *Cousinia* spp., *Iris* sp., *Acanthophyllum* sp., and *Rosa persica* J.F.Gmel.



Table 1. Comparative morphological characters of *Oxytropis birjandica* with *O. sutakensis* Maassoumi and *O. compacta* Maassoumi & Joharchi

Species characters	<i>Oxytropis sutakensis</i>	<i>Oxytropis compacta</i>	<i>Oxytropis birjandica</i>
Height	2–7 cm	7 cm	8 cm
Stipule length	8 mm	4 mm	5.5 mm
Adnate to the petiole	5 mm	3 mm	3 mm
Leaf length	2–4 cm	2–2.5 cm	1.5–3 cm
Petiole length	1–2 cm	1–1.5 mm	1–1.5 mm
Number of leaflet	6–8 pairs	7–9 pairs	6–7 pairs
Leaflet size	7 × 3 mm	4 × 1.5 mm	5 × 2–2.5 mm
Peduncle length	5–7 cm	3–4 cm	4–4.5 cm
Bract length	3 mm	2 mm	1–1.5 mm
Pedicel length	1 mm	1.5 mm	ca. 1 mm
Calyx length	6 mm	6–7 mm	5.5–6.5 mm
Calyx teeth length	3 mm	3–4 mm	3 mm
Petal color	purple to violet	dark violet	white
Standard length	14 mm	10 mm	11 mm
Standard blade length	6 mm	5 mm	9 mm
Wing length	13 mm	10 mm	9 mm
Wing blade length	10 × 5 mm	7 × 2.5 mm	7 × 3 mm
Wing auricle length	1.2 mm	1.5 mm	0.9 mm
Wing claw length	3.5 mm	3.5 mm	2 mm
Keel length	11 mm	9.5 mm	10 mm
Keel blade length	6 × 3 mm	7 × 3 mm	7 × 3 mm
Keel claw length	3.2 mm	3.5 mm	3 mm



Figure 1. *Oxytropis birjandica* F.Ghahrem., Maassoumi & Joharchi. Holotype: Rafiee & Zangoie 26403 (FUMH).



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Figure 2. Known distribution map of *Oxytropis birjandica* in eastern Iran.



Figure 3. Distribution and provisional conservation status map of *Oxytropis birjandica*



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Figure 4. Photographs showing the exact habitat of the new species, taken by Dr. M. Aliabadi in May 2025.

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