



<https://tbj.ui.ac.ir>

Taxonomy and Biosystematics

E-ISSN: 3115-9001

Document Type: Research Paper

Vol. 18, Issue 2, No.67, (2026), P:1-6

Received: 06/10/2025

Accepted: 15/11/2025

Research Paper

Extension of the known range of *Melampyrum chlorostachyum* (Hohen.) Beauverd (Orobanchaceae) into Iran

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Abstract

During seed collecting of alpine plants in Sabalan Mountain, Ardabil province (northwest Iran), specimens of *Melampyrum chlorostachyum* were collected, representing the first verified record of this species for the flora of Iran. Identification was established based on diagnostic morphological characters and confirmed through comparison with authenticated herbarium material and relevant taxonomic literature. The species was documented along the margins of *Quercus-Crataegus* woodlands in Meshkin-Shahr County at altitudes of 1800–2300 m. Distinctive features, including calyx and capsule indumentum as well as floral morphology, clearly separate it from the closely related *M. caucasicum*. Diagnostic descriptions, habitat characteristics, and comparative notes with allied taxa are provided. This discovery extends the known distribution range of *M. chlorostachyum* into Iran. We further emphasize that, in addition to conserving this species, urgent attention should be directed toward the protection of its ecologically valuable yet threatened habitat, particularly against overgrazing and land-use change.

Keywords: Ardabil, flora, new record, phytogeography, Scrophulariaceae

Introduction

The genus *Melampyrum* L. belongs to the family Orobanchaceae (formerly treated within Scrophulariaceae sensu lato, [Hong et al., 1998](#); [Jin et al., 2021](#); [Hyeon et al., 2023](#)) and comprises about 20 species of annual hemiparasitic herbs. This genus is distributed mainly in temperate regions of Eurasia and North America ([Kim & Yun, 2012](#)). Owing to their hemiparasitic lifestyle, species of the genus play ecologically significant roles in forest and meadow ecosystems ([Heer et al., 2021](#); [Westwood et al., 2010](#)). Within *Melampyrum*, *M. chlorostachyum* (Hohen.) Beauverd is regarded as a relatively rare taxon, with confirmed records restricted to the Caucasus region, including southwestern Russia, Armenia, Azerbaijan, and Georgia ([Beauverd, 1916](#); [Popova, 1980](#)). Despite its proximity to these areas, no verified occurrence of this species has previously been reported for the flora of Iran. ([Rechinger, 1981](#); [Saeidi Mehrvarz, 2011](#)). This finding contributes to understanding the phytogeographic connection between the Caucasus and Iranian floristic regions, suggesting that the Iranian population may represent a relic or recent range extension ([Bidarlord, 2024](#)). Documenting new records of narrowly distributed taxa is essential for updating the national flora. In this paper, we present the first documented occurrence of *M. chlorostachyum* in Iran, based on recently collected specimens. Diagnostic morphological features, habitat characteristics, and a comparison with related species are provided. A concise morphological comparison with *M. arvense* L., *M.*

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Bidar lord, M., Asri, Y. and Samadzadeh, A. (2026). Extension of the known range of *Melampyrum chlorostachyum* (Hohen.) Beauverd (Orobanchaceae) into Iran. *Taxonomy and Biosystematics*, 18(2), 1-6.



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<http://dx.doi.org/10.22108/tbj.2025.146909.1320>

caucasicum Bge., and *M. chlorostachyum* was added to strengthen identification.

Materials and Methods

During seed collecting of alpine plants in Sabalan Mountain, Ardabil province, an intriguing specimen of *Melampyrum* was collected. The specimen was identified using diagnostic keys from various floras, including Beauverd (1916), Gorshkova (1955), Kemularia Natadze (1967), Chater et al. (1972), Hedge (1978), Popova (1980), Tahtadzhlyana (1987), and Saeidi Mehrvarz (2011). Additionally, online resources such as the Global Biodiversity Information Facility (GBIF, 2025), and Plants of the World Online (POWO, 2025) were consulted for further taxonomic information and distribution data on the studied taxon. Morphological characteristics were meticulously observed in the field, and subsequently, the collected herbarium material was compared with specimens available in various herbaria: E, JACQ, K, MHA, and P, as referenced in Thiers (2025). The specimens have been deposited, and preserved in the GILAN and IRAN herbaria.

Result

Melampyrum chlorostachyum (Hohen.) Beauverd, Mem. Soc. Phys. Hist. Nat. Geneve, 38: 471 (1916), (Figs. 1, 2).

≡ *Melampyrum arvense* var. *chlorostachyum* Hohen. in Bull. Soc. Imp. Naturalistes Moscou 6: 81 (1838).

Type: Caucasus; Azerbaijan, Khanlar, Gandsha River watershed, June 1838, R. F Hohenacker 1544 (Holotype G, Isotype LE).

Description: Annual plant, stem 15–40 cm tall, velutinous-hispidulous, with erect, unicellular hairs, branched; branches erect or ascending, sparsely leafy. Leaves ovate-lanceolate or narrowly lanceolate, pubescent on both surfaces, rounded at base, sessile or with 1 mm long petioles; lower cauline leaves 2–3.5 cm long, 0.5–0.7 cm broad, soon deciduous; the upper cauline leaves 4–6 cm long, 1–1.5 cm broad, all entire, erect or obliquely spreading. Flowers in dense, cylindrical-spicate, 5–15 cm long, 2–3.5 cm broad inflorescence; elongated in fruiting. Bracts yellow-green at base; lower bracts ovate-lanceolate or elongated-ovate, 4 cm long, 1–2 cm broad, flat, broadly cuneate at base, with a few teeth along margin and elongated, linear-oblong tooth at tip; upper bracts 1.5 cm long, 1 cm broad, irregularly incised-dentate; teeth 5–7 mm. Calyx sessile, 1–1.4 cm long; tube subglabrous, 4 ribs, with 4–6 mm long, covered by short, white, unicellular hairs in upper parts; teeth straight or slightly arcuate, linear, long-acuminate, 7–8 mm long, scabrid along margin and ribs, posterior sinuses deeper than the anterior. Corolla white to light yellow, with 2 purple spots, 1.8–2 cm long, villous inside and outside; lower lip with convexities ornamented by cupuliform papillae. Stamens with 3 mm long; anthers with unequal appendages; lower 2 stamens longer than others. Ovary and style perfectly glabrous; ovary with a slightly recurved nectary; style 10 times as long as ovary. Capsule ovoid-elliptical, 7–8 mm long, glabrous, unilaterally dehiscent; valve margins thickened, dark cinnamon brown. Seeds oblong, up to 5 mm long, 2 mm broad, light brown.

Examined specimens: Iran. Ardabil Province, Meshkinshahr, Anzan protected Area, Anzan village, adjacent areas of the *Quercus-Crataegus* woodland, 38°17'44" N, 47°24'57" E, 1900 m, 02 Jun. 2025, M. Bidarlord 11895; Meshkinshahr, Anzan protected Area, Anzan village, 37°21'1.33" N, 48°37'4.17" E, 2200 m asl., 25 Jul. 2023, M. Bidarlord 11896 (Fig. 3).

Phenology: Flowering from June to July

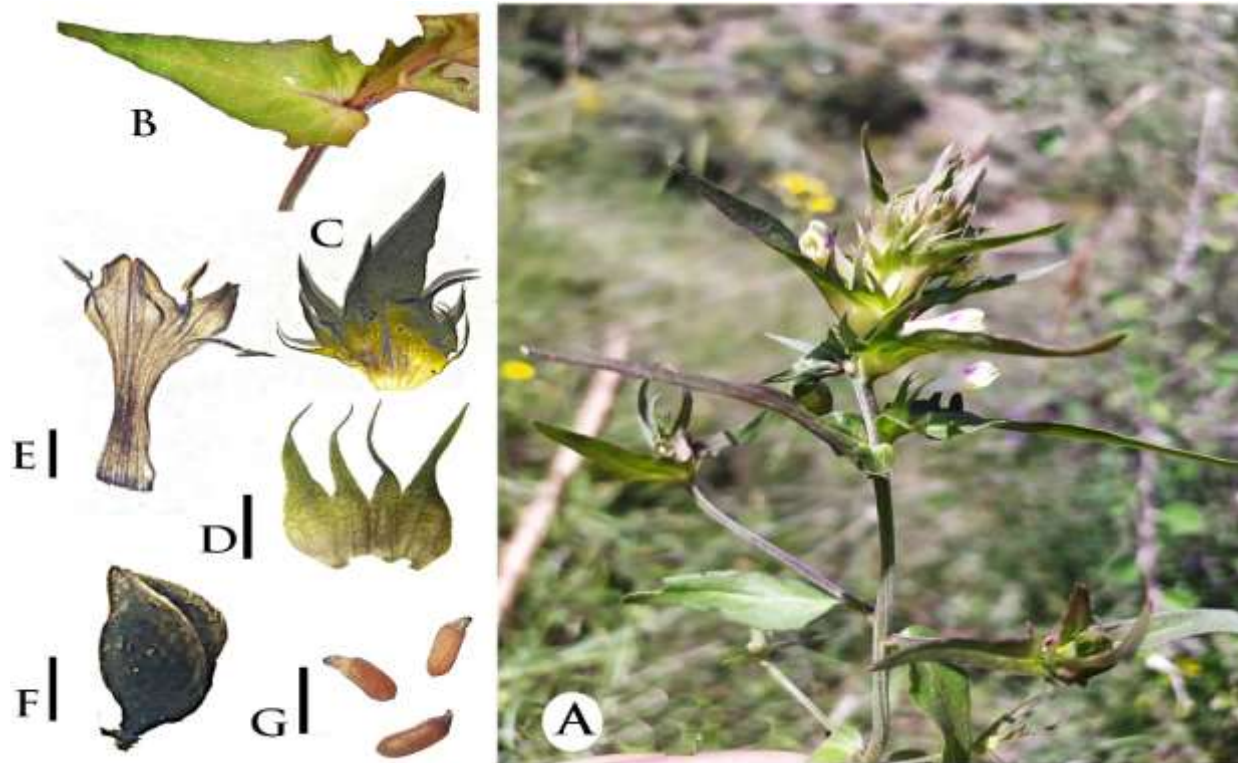


Fig. 1. Habit of *Melampyrum chlorostachyum* in flowering (A) and lower bract (B), upper bract (C), calyx (D), corolla (E), capsule (F), seeds (G);



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bars: 5 mm.

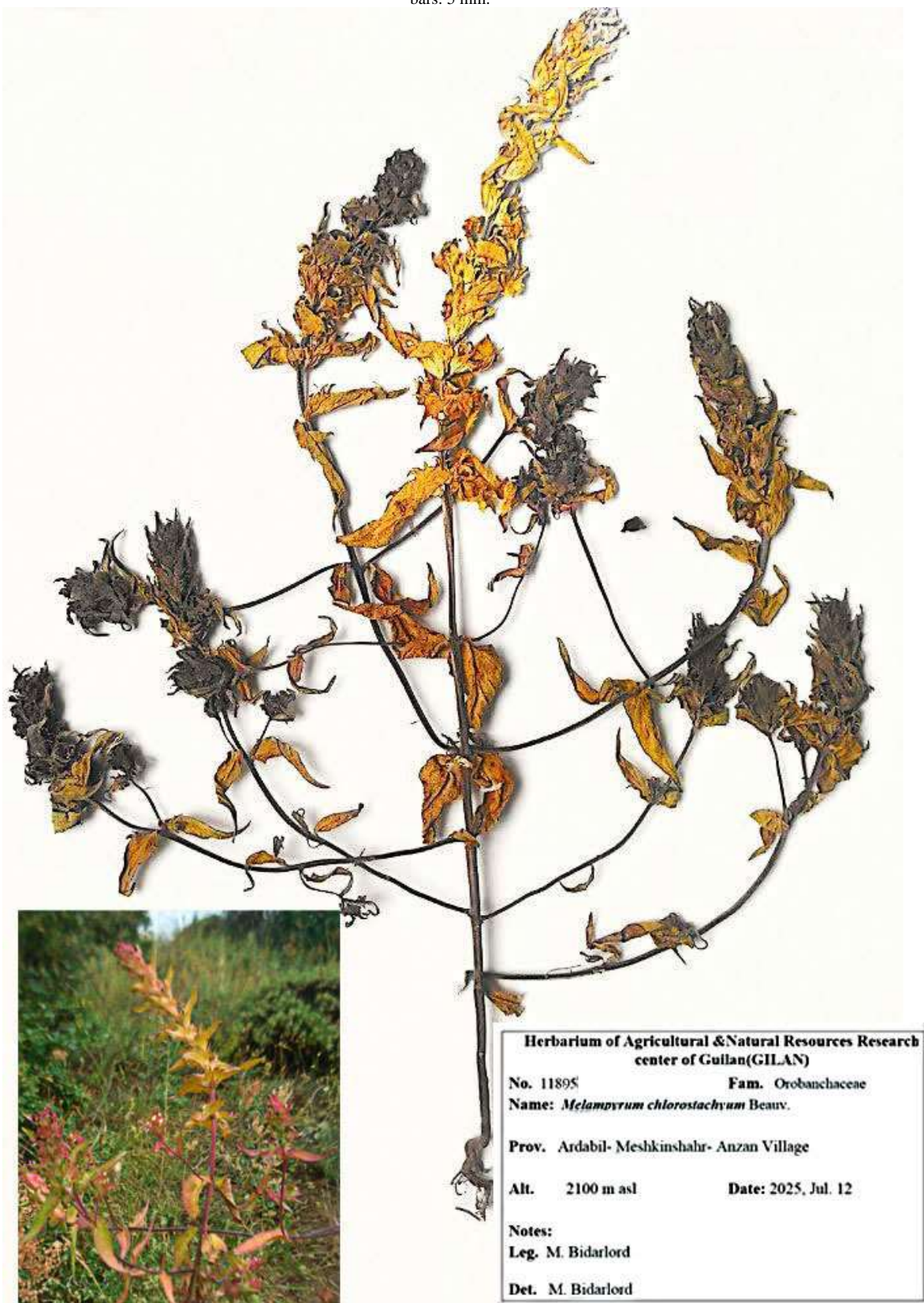


Fig 2. Herbarium specimen of *Melampyrum chlorostachyum* in fruiting (11895 GILAN)



<http://dx.doi.org/10.22108/tbj.2025.146909.1320>

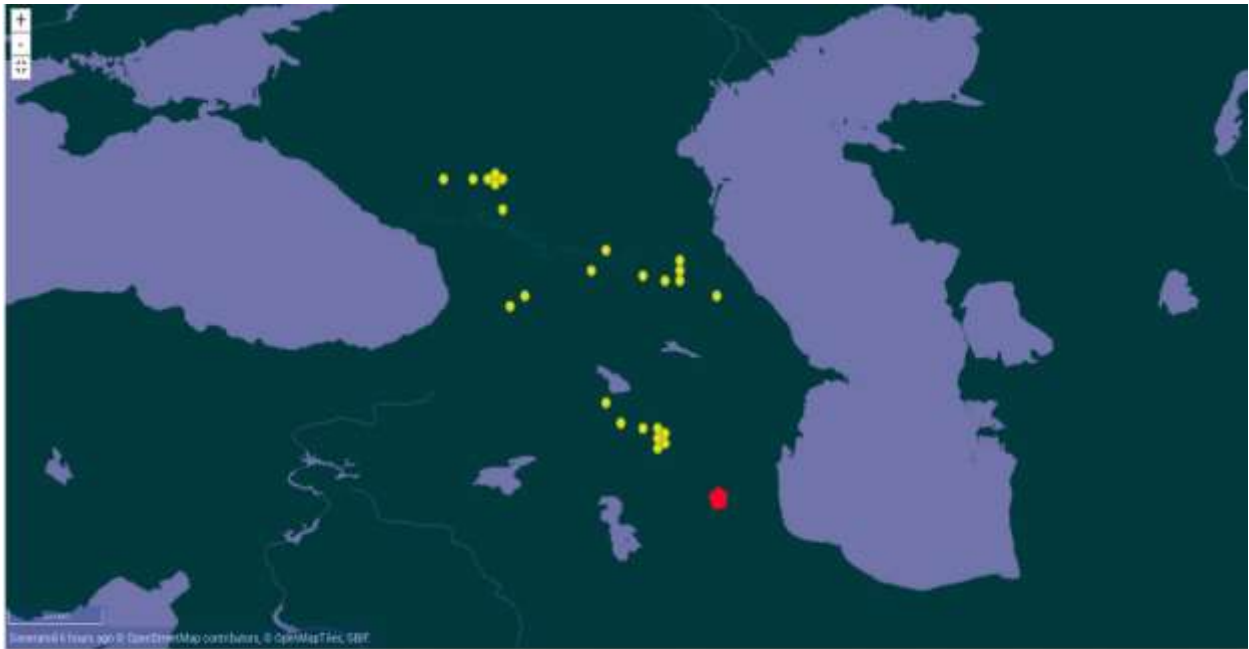


Fig. 3. Distribution map of *Melampyrum chlorostachyum* (after GBIF, 2025) and the distribution point in Iran (red pentagon).

Distribution and Habitat: *Melampyrum chlorostachyum* grows in the northwest of Iran, on adjacent areas of the *Quercus–Crataegus* woodlands, mountainous steppes, and dry grassy slopes, typically at altitudes ranging from 1800 to 2300 meters above sea level. It predominantly grows on the mountain sides, where it coexists with various plant species, including *Crataegus meyeri* Pojark., *Quercus macranthera* Fisch. & C.A.Mey. ex Hohen., *Cotoneaster* sp., *Bungea trifida* (Vahl) C.A.Mey., *Linaria pyramidata* Tourn. ex Spreng, *Dactylis glomerata* L., *Astragalus longirostratus* Pau, *Thymus kotschyanus* Boiss. & Hohen., *Alyssum minus* (L.) Rothm., *Bromus tomentellus* Boiss., and *Cruciata articulata* (L.) Ehrend. This rich biodiversity indicates that the area provides suitable conditions for growth, including adequate sunlight, moisture, and suitable soil composition.

Discussion

The specimen collected by F. R. Hohenacker in 1838 from the vicinity of Khanlar, Republic of Azerbaijan and originally identified by him as a variety of *M. arvense* L., was later designated as the type specimen for a species formally described in Beauverd's monograph on the genus *Melampyrum* (Beauverd, 1916) as *M. chlorostachyum*. This specimen has also been subject to differing interpretations in different taxonomic treatments: Bentham assigned Hohenacker's material to *M. barbatum*, Boissier to *M. caucasicum*, and Kozolovskiy to *M. argyrocotum* (Popova, 1980). *Melampyrum chlorostachyum* has been recorded from southwestern Russia, Ukraine, Armenia, Azerbaijan and Georgia (GBIF, 2025; Fig. 3), and has been reported in the literature from various regions, lower to upper mountain belts, on steppe, sometimes limestone slopes, screes, pebbles, meadows, less often in tall grass, on forest edges (Popova, 1980). Mozaffarian (1994) confirmed the presence of *M. caucasicum* in northwestern Iran, and this species has also been recorded in the Flora of Iran (Saeidi Mehrvarz, 2011). It can be distinguished from *M. chlorostachyum* by diagnostic morphological characters (Table 1). The diagnostic features of *M. chlorostachyum* are relatively stable. The most reliable characters are the capsule and calyx indumentum, and the size and shape of flower parts. Beauverd (1916) classified *Melampyrum* species into two groups based on capsule dehiscence: sect. *Completa*, capsule dehiscing in two directions; and sect. *Incompleta*, capsule dehiscing in one direction. Iranian *Melampyrum* species, *M. caucasicum* and *M. chlorostachyum*, respectively, are placed in these two separate groups. It should be noted that when dry and without ripe fruits, it can be difficult to distinguish *M. arvense*, *M. caucasicum*, *M. alboffianum* Beauv. and *M. chlorostachyum* from one another. These four species are more similar to each other than to any other species in Eurasia or elsewhere (Beauverd, 1916). Among the closely related species (Table 1), *M. chlorostachyum* is distinguished by having scabrid calyx and unilaterally dehiscent and glabrous capsule. In contrast, *M. arvense* and *M. caucasicum* possess bilaterally dehiscent capsules and a denser pubescence pattern on the calyx and bracts. These stable diagnostic traits, particularly capsule dehiscence and calyx indumentum, provide reliable characters for distinguishing species across populations.



Table 1. Comparison of diagnostic characters between *Melampyrum caucasicum*, *M. arvense*, and *M. chlorostachyum*

| | <i>M. caucasicum</i> | <i>M. chlorostachyum</i> | <i>M. arvense</i> |
|----------------|---|--|---|
| Bracts | green or light red | yellow-green | pinkish purple |
| Calyx | more than 1/2 corolla, densely pubescent above with long hairs | less than 1/2 corolla, scabrid by short hairs in upper parts | more than 1/2 corolla, densely pubescent |
| Corolla | yellow or light red, 2-3.2 cm long | white to yellow, 1.8-2.2 cm long | purple, 2-2.5 cm long |
| Style | villous above on one side | glabrous | glabrous or sometimes sparsely hairy |
| Capsule | elliptical-oblong, 8 mm long, densely pilose, bilaterally dehiscent | ovoid-elliptical 7-8 mm long, glabrous, unilaterally dehiscent | obovoid, 8-10 mm long, glabrous or rarely puberulent, bilaterally dehiscent |
| Seeds | 6 mm long 1.5 mm broad, dark cinnamon brown | up to 5 mm long, 2 mm broad, light brown | 3-4.5 mm long, 1.5-2.5 mm broad, dark cinnamon brown |

Acknowledgments

This study was supported by the Research Institute of Forests and Rangelands, Tehran, Iran (Project No.: 12-58-09-052-01007-010171, "Seed collecting of alpine plants in Sabalan Mountain, Ardabil province").

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<http://dx.doi.org/10.22108/tbj.2025.146909.1320>