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A contribution to *Astragalus* sect. *Incani* (*Fabaceae*) in Iran

Abstract

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Astragalus masulehensis, a species of the *A. refractus* group from the province of Gilan, and *A. shahbishehensis*, a species of the *A. askius* group from the province of Mazandaran, are described as new to science and illustrated. Keys and tables of diagnostic features are provided. New records of *A. refractus* and *A. rostratus* are given from NW Iran, for the latter being an extension of its known range into Iran.

Introduction

Astragalus with nearly 3000 species is probably the largest genus of flowering plants (Lock & Simpson 1991, Mabberley 1997, Maassoumi 1998, Ranjbar & Karamian 2002). Iran alone shelters more than 850 species, being one of the main centres of diversity of the genus.

In the present contribution we add two new species of *Astragalus* sect. *Incani* from the NW Iranian provinces of Gilan and Mazandaran. This section of *A.* subg. *Cercidothrix* Bunge, which is characterized by perennial growth and the presence of bifurcate trichomes (Bunge 1868-69), comprises nearly 120 species (Rechinger & al. 1969, Yakovlev & al. 1996, Maassoumi 1998) and has its centre of diversity in the Irano-Turanian region (Podlech & Maassoumi 2003, Ranjbar & Karamian 2003). It seems that the section belongs to a monophyletic group of bifurcately hairy *Astragali* including *A.* sect. *Laguropsis* and *A.* sect. *Dissitiflori*, a view that recently received some support from molecular analyses (Kazempour Osaloo & al. 2003). *A.* sect. *Laguropsis* is not sharply separated from *A.* sect. *Incani*. The former differs from the latter mainly by characters such as an inflated calyx, corolla colour, the large number of leaflets and absence of bracteoles.

During several excursions in Iran the species were studied in the field by the first author. Herbarium material was examined from the following herbaria: Wien (W, WU), Herbarium of Bu-Ali Sina University, Herbarium of Ferdousi University of Mashhad, Herbarium of Isfahan University, Herbarium of the Research Center of Natural Resources and Animal Affairs of Mashhad, Isfahan and Kerman.

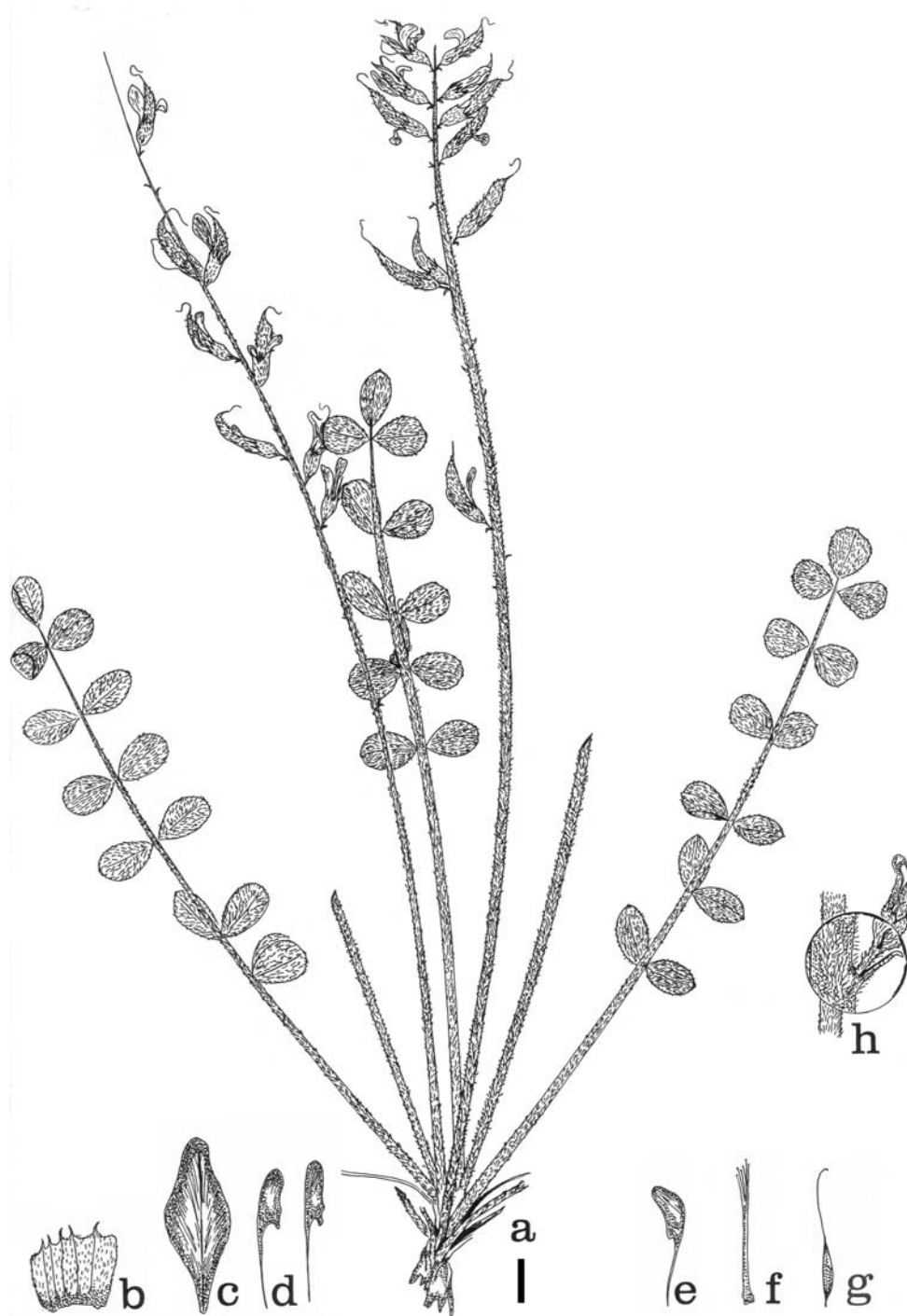


Fig. 1. *Astragalus masulehensis* – a: habit; b: calyx; c: standard; d: wings; e: keel; f: androecium; g: pistil; h: bract and bracteole. – Scale bar: a = 1 cm, b-h = 0.5 cm; drawn after the type collection.

Astragalus masulehensis Ranjbar & Assadi, **sp. nov.**

Holotype: Iran, Province of Gilan, 52 km from Masuleh to Khalkhal, Shal village, 1200 m, 1.6.2004, *Assadi & Ranjbar* 5975 (Bu-Ali Sina University Herbarium; isotypes: TARI, herb. Ranjbar) – Fig. 1.

Differt ab *Astragalo abharensis* Maassoumi & Podlech leguminibus erecto-subpatentibus (nec pendulis), pilis albis nigrisque (nec albis) appressis obtectis, foliolis 6-7- (nec 1-3- raro 5-) jugis, pedunculis 3-6 cm (nec 17-23 cm) longis.

Plants acaulescent, 45 cm tall, densely furnished with appressed, medifixed hairs 0.3-0.8 mm long. *Caudex* up to 10 mm in diameter, mostly with a pluricipital root crown, branches short, thick, covered with blackish remnants of old stipules and petioles. *Stipules* 5 × 3 mm, triangular-acuminate, adnate to the petiole for 2-3 mm. *Leaves* with lamina 19-21 cm long, densely hairy; petiole 9-13 cm long, like the rachis rather striate, 1-2 mm thick, densely white-hairy; leaflets in 6-7 pairs, obovate to elliptic or orbicular, 10-15 × 5-10 mm, obtuse to rounded at the tip, somewhat minutely mucronulate, on both sides densely hairy, often spotted with minute dark reddish dots. *Peduncles* 17-23 cm long, up to 3 mm thick, terete to angular-sulcate, densely hairy. *Racemes* densely many-flowered, in fruit mostly strongly elongated, up to 20 cm long. *Bracts* narrowly triangular, 2-4 × 1 mm, with white hairs, sometimes with a few black hairs intermixed. *Pedicels* 1.5-3 mm long, flowers erect to spreading. *Bracteoles* 0.5-0.7 mm long, at the base of calyx. *Calyx* 9-10 mm long, tubular, slightly gibbous at the base, obliquely cut at the mouth, loosely to rather densely covered with medifixed, appressed, black (0.2-0.4 mm) and white (0.5-0.8 mm long) hairs, teeth subulate, 2-3 mm long. *Petals* greenish cream; *standard* 22-23 mm long, limb c. 10 mm wide, elliptic, narrowed into a long tongue-like appendix, rounded at the tip, gradually narrowed into a short claw; *wings* 16-18 mm long, limbs oblong, 8-10 × 3 mm, auricle very short, claw 0.7-0.8 mm long. *Ovary* with a stipe c. 1 mm long, linear, appressed-hairy, style glabrous. *Legumes* sessile, erect to spreading, linear, upcurved, 20-25 × 2.5-3 mm, with a straight beak up to 4 mm long, bilocular; valves pale greenish brown, rather densely covered with medifixed, appressed, white (0.5-0.6 mm) and black (0.3-0.4 mm long) hairs.

Astragalus masulehensis is known from a single population in the Gilan province (Fig. 3), growing in the dry steppe on clay in the subalpine zone near the town Masuleh. It is associated with some species of *Astragalus* such as *A.* (sect. *Dissitiflora*) *viridis* Bunge, *A.* (sect. *Erioceras*) *triqueter* Bornm. & Gauba and *A.* (sect. *Caprini*) *fabaceus* M. Bieb.

Table 1. Diagnostic features of *Astragalus masulehensis*, *A. abharensis* and *A. refractus*.

	<i>A. abharensis</i>	<i>A. masulehensis</i>	<i>A. refractus</i>
Pod	pendulous	erect to nearly spreading	pendulous
Indumentum of pod	loose to rather dense, of appressed white hairs	rather dense, of appressed white and black hairs	loose, of appressed white and black hairs
Bracteole length [mm]	0.4-0.8	0.5-0.7	–
Stipule length [mm]	5-8	c. 5	6-12
Leaflets [pairs]	1-3(-5)	6-7	9-14
Indumentum of leaflets	densely hairy on both surfaces	densely hairy on both surfaces	sparsely to loosely hairy on upper surface only
Peduncle length and diam. [mm]	30-60 × 1.5	170-230 × 3	90-250 × 4
Lamina and petiole length [mm]	60-80 and 40-50	190-210 and 90-130	100-300 and 40-160
Wing and keel length [mm]	c. 21 and c. 17.5	16-18 and c. 13	c. 17 and c. 15

The new species belongs to the *Astragalus refractus* group and is closely related to *A. abharensis* and *A. refractus* with which it shares a similar shape and size of pods and yellowish to greenish cream flowers. The differences are given in Table 1 and in a key to the species of the *A. refractus* group.

Key to the species of the *Astragalus refractus* group

1. Bracteoles missing; pod longer than 25 mm; leaflets in 9-14 pairs, upper surface sparsely to loosely white-hairy *A. refractus*
- Bracteoles present; pod shorter than 25 mm; leaflets in 1-7 pairs, densely hairy on both surfaces 2
2. Leaflets in 1-3(-5) pairs; peduncles 3-6 cm long and up to 1.5 mm thick; leaves and petioles 6-8 and 4-5 cm long, respectively; pods pendulous, loosely to rather densely covered with merely white, appressed hairs *A. abharensis*
- Leaflets in 6-7 pairs; peduncles 17-23 cm long and up to 3 mm thick; leaves and petioles 19-21 and 9-13 cm long, respectively; pods erect to nearly spreading, rather densely covered with white and black, appressed hairs *A. masulehensis*

Astragalus siahbishehensis Rahiminejad & Ranjbar, **sp. nov.**

Holotype: N Iran, Province of Mazandaran, Siahbisheh to Chalus, 2200 m, 23.5.1978, *Rahiminejad 4523* (Isfahan University Herbarium) – Fig. 2.

Differt ab *Astragalo askio* Bunge foliis 3-8- (nec 9-14-) jugis, leguminibus erectis vel oblique patentibus (nec pendulis) 30-35 × 4-5 mm (nec 12-25 × 3-3.5 mm), vexilo 25-27 mm (nec 19-22 mm) longo.

Plant acaulescent, 30-35 cm tall, with symmetrically medifixed appressed hairs 0.5-0.9 mm long. *Caudex* 10-20 mm in diameter, with few short branches, covered with remnants of old leaves. *Stipules* triangular to narrowly triangular-acuminate, 6-9 × 2.5-5 mm, adnate to the petiole for 2-5 mm, pilose. *Leaves* 10-25 cm long; petiole 6-10 cm long, like the rachis striate, loosely to rather densely hairy; leaflets in 3-8 pairs, obovate to suborbicular, rounded to rarely obtuse at the tip, mostly minutely mucronulate, sparsely white-hairy on upper surface, loosely hairy on lower surface, both sides loosely spotted with minute purplish dots. *Peduncle* 15-16 cm long, 2-2.5 mm thick, finely striate, sparsely covered with a few white and, in the upper part, with black hairs. Raceme loosely many-flowered, 10-20 cm long, often longer in fruit. *Bracts* brownish, linear-acute, 3-4 mm long, sparsely ciliate. *Pedicels* 1-2 mm long, flowers erect to spreading. *Bracteoles* whitish, linear, c. 1 mm long, at the base of the calyx. *Calyx* 9-10 mm long, tubular, obliquely cut at the orifice, loosely and mostly black-hairy, teeth narrowly triangular, acute to acuminate, 1-2 mm long. *Corolla* yellowish green; *standard* 25-27 mm long, blade slightly to distinctly upcurved in upper part, 9-10 mm wide, obovate, minutely emarginate and attenuate at the tip, basally gradually narrowed into a short cuneate claw; *wings* 22-23 mm long, limbs obovate-spathulate, round-tipped, 1 × 4 mm, auricle narrow, c. 1.5 mm long, claw 12-13 mm long; *keel* 19-20 mm long, limbs obliquely obovate, with widely curved lower edge and slightly concave upper edge, acute-tipped, 9 × 4 mm, auricle indistinct, claw 10-11 mm long. *Stamen tube* truncate at the mouth. *Ovary* with a stipe 4-5 mm long, glabrous. *Legumes* spreading-erect, with a linear, 4-5 mm long stipe, straight or slightly curved, 30-37 × 4-5 mm, ventrally carinate, widely and deeply grooved dorsally with a straight beak 3-3.5 mm long, fully bilocular; valves thin, glabrous.

Key to the species of the *Astragalus askius* group

1. Pod erect to ascending or spreading 2
- Pod pendulous 3
2. Leaflets obovate to suborbicular; standard and pod ≥ 25 and ≥ 30 mm respectively *A. siahbishehensis*

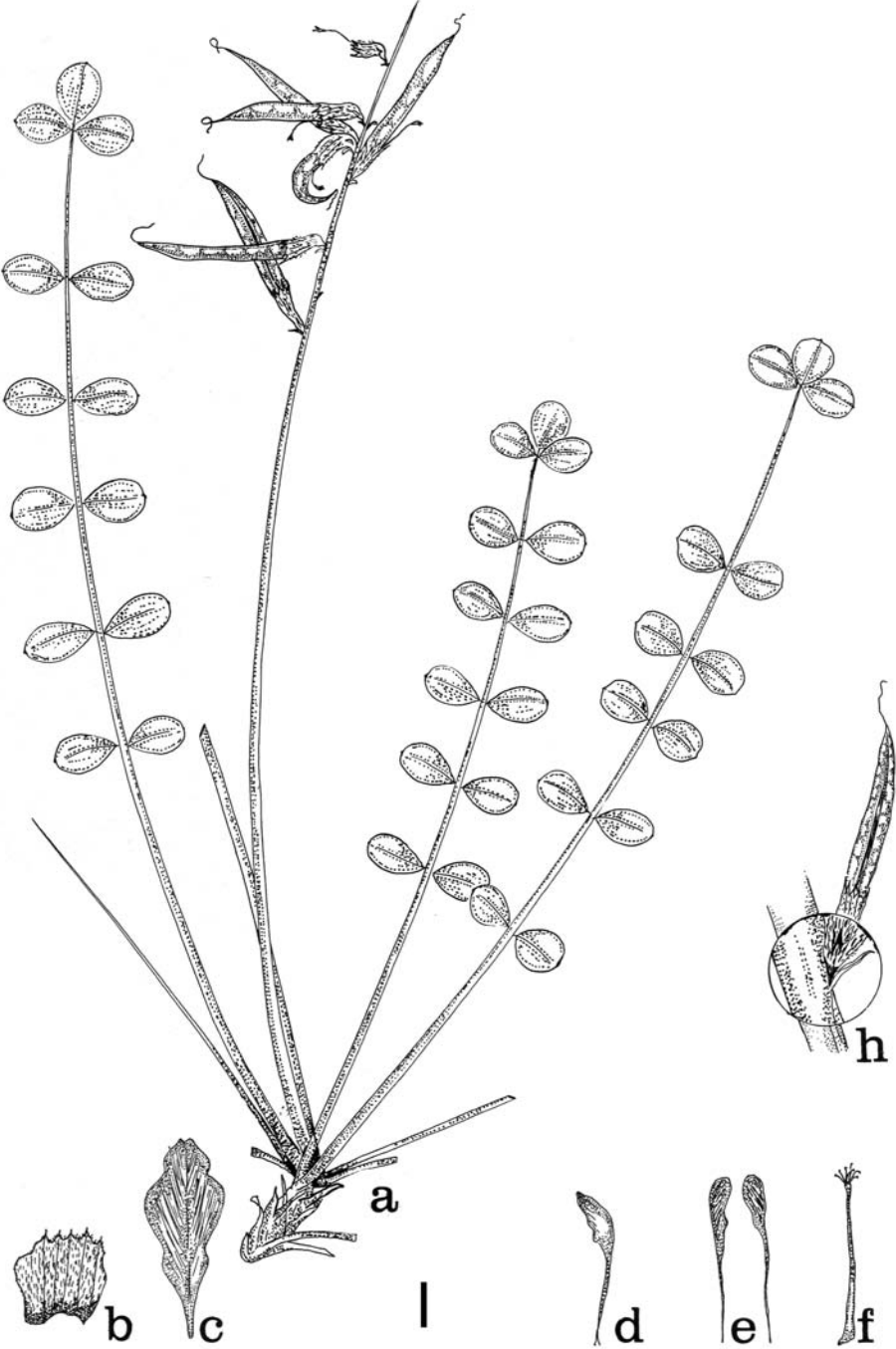


Fig. 2. *Astragalus siahbishehensis* – a: habit; b: calyx; c: standard; d: keel; e: wings; f: androecium; g: pistil; h: bract and bracteole. – Scale bar: a = 1 cm, b-h = 0.5 cm; after the type collection.

Table 2. Diagnostic features of *Astragalus siahbishehensis* and related species.

	<i>A. siahbishehensis</i>	<i>A. askius</i>	<i>A. subglaberrimus</i>	<i>A. thionanthus</i>	<i>A. lacus-valashti</i>
Shape of leaflets	obovate to sub-orbicular	narrowly to ovately elliptic	narrowly elliptic to obovate	linear-elliptic	elliptic to obovate
Pod	erect to spreading	pendulous	pendulous	pendulous	erect to ascending
Stipe of pod [length mm]	4-5	3.7	4-9	10-13	sessile
Pod [length mm]	30-35	12-25	15-20	20-30	12-20
Pod [width mm]	4-5	3-3.5	2-2.5	2.5-3	5-8
Number of leaflets	3-8 pairs	9-14 pairs	6-9 pairs	8-10 pairs	7-9 pairs
Keel [length mm]	19-20	15-16	c. 14	c. 15	c. 17
Wings [length mm]	22-23	17-19	c. 15	c. 17	18-19
Standard [length mm]	25-27	19-22	c. 18	c. 18	22-23

- Leaflets elliptic to obovate; standard and pod ≤ 23 and ≤ 20 mm respectively *A. lacus-valashti*
- 3. Leaflets linear-elliptic; stipe of pod ≥ 10 mm long *A. thionanthus*
- Leaflets narrowly elliptic to ovate-elliptic or obovate; stipe of pod ≤ 9 mm long 4
- 4 Leaflets in 6-9 pairs, glabrous or sparsely appressed-hairy on the midvein on the lower surface *A. subglaberrimus*
- Leaflets in 9-14 pairs, sparsely to loosely appressed-hairy and both surfaces . . . *A. askius*

Distribution. – The new species occurs in the province of Mazandaran (Fig. 3) and is known only from a single locality, where it grows in grass-covered forest openings in Siahbisheh Mt.

Further specimens seen. – Iran: Province of Mazandaran: Chalus valley, below Siahbisheh, 2000 m, 24.5.1974, *Wendelbo & Shirdelpur 11697* (TARI, W); Chalus road, near Siahbisheh, 2000 m, 27.6.2005, *Ranjbar 7001* (BASUH).

Relationships. – It belongs to the species group with a greenish cream corolla, stipitate pods, glabrous habit and many leaflets. It is compared with some species from this group, which include *A. askius* Bunge, *A. subglaberrimus* Podlech & Maassoumi and *A. thionanthus* Bornm. in Table 2 and in the identification key.

New records

Astragalus refractus C. A. Mey., Verz. Pfl. Cauc.: 144. 1831. – Lectotype (Podlech & Sytin 1996): [Azerbaijan], Talisch pr. Suwant, *C. A. Meyer* (LE).

The species belongs to the group with a greenish cream corolla, hairy habit and many leaflets. One of the conspicuous features of *A. refractus* is its pendulous pod and ebracteolate pedicel. It is one of the most widespread species of *A. sect. Incani* and was first reported for Iran by Mas-soumi (1998).

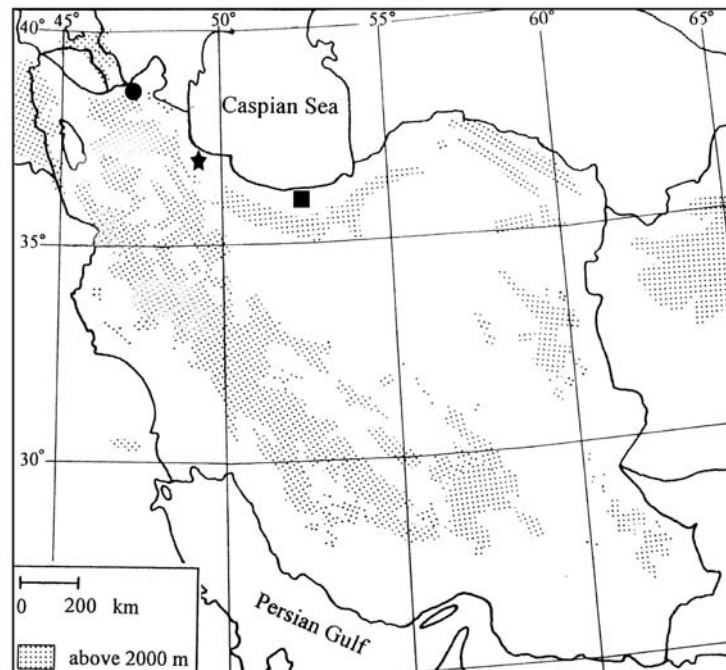


Fig. 3. Distribution of *Astragalus masulehensis* (★), *A. siahbishehensis* (■) and *A. rostratus* (●) in Iran.

The following records (specimens in the Herbarium of the Bu-Ali Sina University) supplement its known distribution in Iran.

ARDABIL: Khalkhal to Asalam, 1700 m, 10.6.2003, *Ranjbar & al.* 5105; 27 km after Masuleh, 1900 m, 1.6.2004, *Assadi & Ranjbar* 5963; 36 km after Masuleh to Khalkhal, 1950 m, 1.6.2004, *Assadi & Ranjbar* 5965; Khalkhal to Ardabil, 14 km after Heir village 2200 m, 2.6.2004, *Assadi & Ranjbar* 6004.

Astragalus rostratus C. A. Mey., *Verz. Pfl. Cauc.*: 144. 1831. – Lectotype (Podlech & Sytin 1996): [Azerbaijan], Talisch, prope Suwant, 20.6.1830, *C. A. Meyer* (LE: photo W; iso: G-BOIS: photo MSB, LE)

The species has not been reported hitherto for Iran. Its occurrence (Fig. 3) is substantiated by the following specimens in the Bu-Ali Sina University Herbarium.

IRAN: AZARBAIJAN: Ahar toward Kalibar, 35 km before Kalibar, 1700 m, 14.7.2003, *Rahiminejad & Ranjbar* 5522; 38 km to Kharvanaq, 1500 m, 4.6.2004, 1500 m, *Assadi & Ranjbar* 6043; 80 km from Ahar to Kharvanaq, toward Siyah-rud, 1550 m, 4.6.2004, *Assadi & Ranjbar* 6038; after Salavatabad toward Hurand, Dash-bolagh, village, 1450 m, 3.6.2004, 1450 m, *Assadi & Ranjbar* 6019.

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