

## Three new species in *Astragalus* sect. *Astragalus* (Fabaceae) from Iran

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Three new species, *Astragalus torbathaydariyehensis* Ranjbar & Zarin, *A. salehabadensis* Ranjbar & Zarin and *A. ilachchiensis* Ranjbar & Ghahremani (Fabaceae) are described from Iran and illustrated. They belong to *A.* sect. *Astragalus*, which contains species with basifixed white and black hairs and yellow flowers.

*Astragalus* (Fabaceae) is generally considered to be the largest genus of vascular plants with an estimated 2500–3000 species (Podlech 1986, Lock & Simpson 1991, Yakovlev *et al.* 1996, Maassoumi 1998). *Astragalus* sect. *Astragalus* was taxonomically revised by Agerer-Kirchhoff (1976) and treated for the ‘*Flora Iranica*’ by Podlech (1999). Studies focusing on *A.* sect. *Astragalus* in Iran have been carried out by the first author since 1991, and some new species have been described in the section from Iran (Maassoumi & Ranjbar 1994, Ranjbar & Karamian 2002, Karamian & Ranjbar 2005). This section, comprising yellow-flowered *Astragali*, is the second largest within *A.* subgen. *Astragalus*. The term “yellow-flowered *Astragali*” means species with simple, basifixed hairs, which were treated by Bunge (1868–1869) as subgenera *Phaca* and *Calycophysa*. This group consists of *Astragalus* sect. *Astragalus*, *A.* sect. *Chronopus*, *A.* sect. *Alopecuroidei*, *A.* sect. *Laxiflori*, *A.* sect. *Caprini* and *A.* sect. *Eremophysa* (Ranjbar & Karamian 2002, Karamian & Ranjbar 2005).

This study is mainly based on herbarium material and field observations during several excursions in Iran. The original materials of collections were in vegetative or fruiting phase and were deposited in the Herbarium of Bu-Ali-Sina University (BASU). Also several sheets have been examined for each species from the following herbaria: W, WU, TARI, FUMH, BASU, Herbarium of Esfahan University, Herbarium of Research Centers of Natural Resources and Animal Affairs of Mashhad, Esfahan, Shiraz, Kerman and Zahedan.

***Astragalus torbathaydariyehensis* Ranjbar & Zarin, *sp. nova* (Fig. 1)**

*Affinis* *A. basineri* sed *foliolis apice truncato-emarginatis (nec obtusis), floribus subsessilibus (nec pedicello 1.5–2 mm longo), calyce 20–23 mm (nec 11–15 mm longo), vexillo 23–25 × 11–12 mm (nec 16–22 × 6–9 mm), alis 21–23 × 4–5 mm (nec alis 15–19 × 2–3 mm), carina 19–20 mm (nec carina 14–17 mm longis).*



**Fig. 1.** *Astragalus torbathaydariyensis*. — **A:** Habit. — **B:** Calyx. — **C:** Standard. — **D:** Keel. — **E:** Wings. — **F:** Androecium. — **G:** Gynoecium. Scale bar = 2 cm.

**TYPE:** Iran. Khorasan: Torbathaydariyeh, Rabatsang, Ghanchi mountains, 1700–1900 m, 23.IV.1994 *Mosavi & Parya 3254* (holotype Herbarium of Research Institute of Forests and Rangelands of Khorasan; isotype BASU).

**ETYMOLOGY:** The specific epithet is derived from the type-locality, Torbathaydariyeh, in Khorasan Province, Iran.

Plants more than 30 cm tall. Stem erect, ± sulcate, densely or rarely loosely branched at base with dense white hairs in vegetative parts, 0.4–1.2 mm long, and also with black hairs on upper parts, 0.2–1 mm long. Stipules ± linear, at apex acuminate, leafy, yellowish-green, 7–8 mm long, adnate to petiole for ca. 1/3 of their length, sparsely hairy at external surface. Leaves 12–17 cm long; rachides ± thick to thin, slightly rigid, erect to suberect, covered with appressed, often white (rarely mixed with black) hairs; petiole 1/6–1/5 as long as rachis.

Leaflets in 14–18 pairs, complicate to flattened, green, 7–15 × 3–6 mm, elliptic to orbicular, at apex truncate to emarginate, upper side ± with dense hairs only in margins, underside densely hairy, hairs appressed to ascending. Peduncles 1.5–2 mm long, densely covered with appressed to ascending white and black hairs. Pedicels 0.5–1 mm long, loosely covered with black and white ascending hairs. Bracts 3–4 × 0.5–1 mm, linear, black and white ciliate at margins and tip, chartaceous to leafy. Bracteoles absent. Calyx brownish cream, tubular, 20–23 × 4–5 mm, with predominantly white hairs (mixed with black ones); teeth 8–10 mm long, linear. Petals yellow. Standard 23–25 × 11–12 mm, with distinctly differentiated claw; lamina ± orbicular, not constricted at middle, slightly emarginated at apex. Wings slightly shorter than standard; blade

oblong, round at apex, 21–23 × 4–5 mm; auricle 3–3.2 mm long. Keel 19–20 mm long; blades 8–9 × 4–5 mm. Ovary shortly stipitate, densely hairy; style glabrous. Legumes sessile, oblong to elliptic, shallowly grooved dorsally, acuminate at apex, 15–17 × 4–5 mm, loosely hairy, bilocular. Seeds unknown.

*Astragalus torbathaydariyehensis* is known only from the dry-steppe zone of the mountainous regions around Torbathaydariyeh in Khorasan Province (Fig. 2) in NE Iran. The similar shape of pods and leaflets suggest a close relationship with *A. basineri* (see Table 1 for the morphological distinctions).

***Astragalus salehabadensis*** Ranjbar & Zarin, *sp. nova* (Fig. 3)

*Affinis A. basineri sed plantae ad 30 cm (nec ad 60 cm) tantum altae, dentibus calycis ca. 3 mm (nec 5–9 mm longis), alis 14–15 mm (nec alis 15–19 mm longis), unguis alarum 6–7 mm (nec 8–10 mm longis), carina ca. 12 mm (nec carina 14–17 mm longis), unguis carina 5–6 mm (nec 8–9 mm longis), tubus dentes longior (nec tubus dentes brevior).*

TYPE: Iran. Khorasan: Torbatjam, Salehabad, beginning road of Mosaabad, 23.V.1984 *Ayatollahi & Mahvan 11189* (holotype FUMH).

ETYMOLOGY: The specific epithet is derived from the type-locality, Salehabad, in Khorasan Province, Iran.

Plants up to 30 cm tall. Stem erect to slightly zigzag, sulcate, densely or loosely branched, with spreading, mixed white and black hairs in

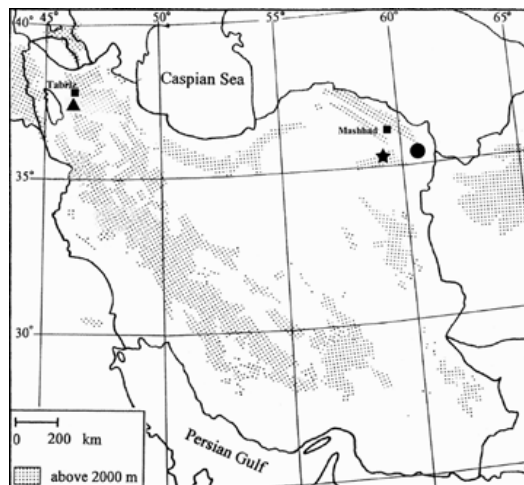


Fig. 2. Distribution of *A. salehabadensis* (★), *A. torbathaydariyehensis* (●) and *A. ilachchiensis* (▲) in Iran.

vegetative parts, 0.3–2 mm long. Stipules narrowly triangular, membranous to slightly chartaceous, brownish-cream, 5–7 mm long, adnate to petiole for ca. 1/3 of their length, with loosely spreading black and white hairs. Leaves 11–15 cm long; rachides ± thick to thin, erect to ascending, covered with spreading white hair; petiole 1/10–1/8 as long as rachis. Leaflets 18–21 pairs, 3–8 × 1.5–3.5 mm, oblong to elliptic, at apex round or rarely emarginate to truncate, upper side glabrous, underside densely ascending hairy. Peduncles 2–3 mm long, loosely to occasionally densely covered with spreading black and grayish-black hairs. Pedicels ca. 1 mm long, densely hairy ± with spreading black hairs. Bracteoles absent. Calyx brown, tubular,

Table 1. Morphological comparison of *Astragalus torbathaydariyehensis* and *A. basineri*.

	<i>A. basineri</i>	<i>A. torbathaydariyehensis</i>
Leaflet apex	obtuse	truncate to emarginate
Pedicel length (mm)	0.5–1	1.5–2
Calyx length (mm)	11–15	20–23
Calyx tube length (mm)	(5) 6–7	12–13
Shape of standard	± elliptic	± orbicular
Standard length (mm)	16–22	23–25
Standard width (mm)	6–9	11–12
Wing length (mm)	15–19	21–23
Wing width (mm)	2–3	4–5
Keel length (mm)	14–17	19–20



**Fig. 3.** *Astragalus salehabadensis*. — **A:** Habit. — **B:** Calyx. — **C:** Standard. — **D:** Keel. — **E:** Wings. — **F:** Androecium. — **G:** Gynoecium. Scale bar = 2 cm.

9–10 mm and 2.5–3 mm wide, loosely covered with appressed to  $\pm$  spreading black and white hairs; teeth 2–3 mm long, linear-subulate. Petals yellow. Standard 15–17  $\times$  7–8 mm, with undifferentiated claw,  $\pm$  obovate, round at apex. Wings slightly shorter than standard; blade oblong, obtuse at apex, 14–15  $\times$  3.5–4 mm; claw 6–7 mm long; auricle ca. 2 mm long. Keel ca. 12 mm long; blades 6–7  $\times$  ca. 4 mm. Ovary sessile,

densely hairy; style sparsely hairy in lower third. Legumes unknown.

*Astragalus salehabadensis* is known only from the type locality in the southwest Mashhad in Khorasan Province in Iran (Fig. 2). The small population grows in the dry-steppe and stony clay zone around the village Salehabad. It is closely related to *A. basineri*, especially in the similar habit, number of leaflets, shape and size of pods. Some of the differences between the two species are listed in Table 2.

***Astragalus ilachchiensis* Ranjbar & Ghahremani, sp. nova** (Fig. 4)

*Affinis A. caragane sed plantis ca. 6 cm (nec ad 40 cm) altis, foliolis 5–11 (nec 20–24) jugis, 10–12-floris (nec 4–7-floris), calyce 13–15 mm (nec 7–11 mm longo), pilis albis (nec albis nigri-sque) patulis obtectis.*

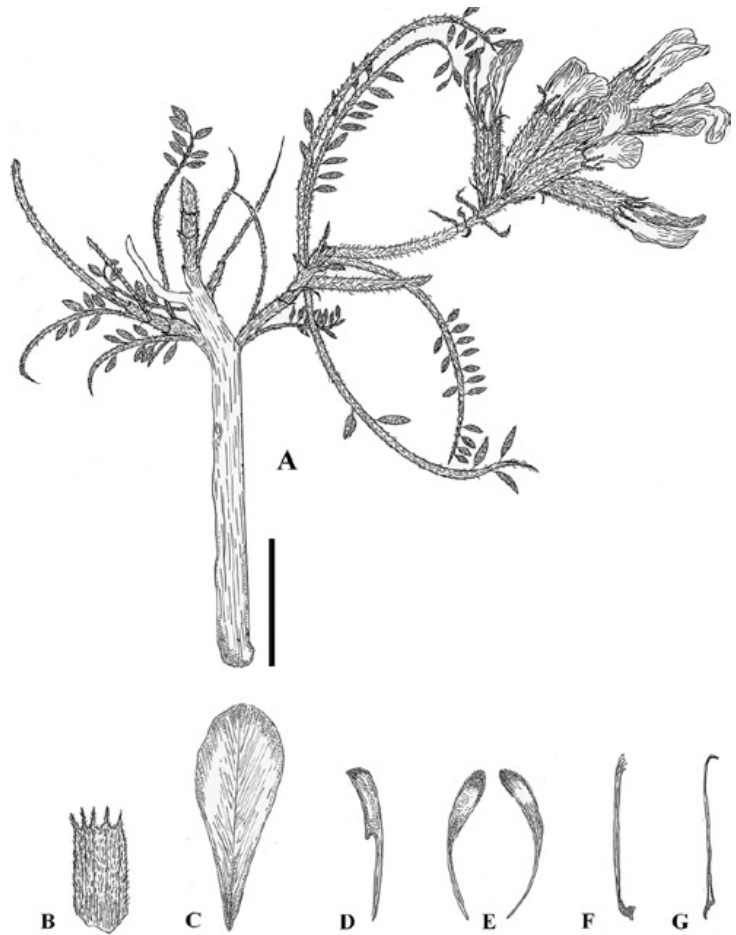
TYPE: Iran. East Azarbayjan: Tabriz to Azarshar, Ilachchi, 1800–2200 m, 23.IV.2000 *Ghahremani 7906* (holotype BASU).

ETYMOLOGY: The specific epithet is derived from the type-locality, Ilachchi, in Azarbayjan Province, Iran.

Plants ca. 6 cm tall, in vegetative parts densely covered with appressed to subappressed white hairs 0.3–1 mm long, sometimes mixed with black hairs in nodes. Internodes 2–3 mm long. Stems erect to ascending, at base 2–4 mm in diameter. Stipules green, 3–4  $\times$  1–1.5 mm long, narrowly triangular to linear, ciliate at margins with appressed hairs 0.5–0.8 mm long. Leaves 2–3 cm long; petiole 5–10 mm long, rachis densely covered with appressed to subappressed hairs up to 1 mm long. Leaflets in 5–11

**Table 2.** Morphological comparison of *Astragalus salehabadensis* and *A. basineri*.

	<i>A. basineri</i>	<i>A. salehabadensis</i>
Height (cm)	up to 60	up to 30
Color of pedicel hairs	white and brown	black
Calyx teeth length (mm)	5–9	ca. 3
Wing length (mm)	15–19	14–15
Wing claw length (mm)	8–10	6–7
Keel length (mm)	14–17	ca. 12
Keel claw length (mm)	8–9	5–6
Calyx teeth/calyc tube ratio	calyx teeth longer than calyc tube	calyc tube longer than calyx teeth



**Fig. 4.** *Astragalus ilachchiensis*. — **A:** Habit. — **B:** Calyx. — **C:** Standard. — **D:** Keel. — **E:** Wings. — **F:** Androecium. — **G:** Gynoecium. Scale bar = 2 cm.

pairs, complicate, greyish green,  $2\text{--}5 \times 1.5\text{--}2$  mm, both surfaces loosely to sparsely tomentose. Peduncles mostly 1–2 cm long, very densely covered with appressed to subappressed hairs up to 1 mm long. Racemes subglobose, 3.5–4 cm in diameter, sublaxely 10-flowered; axis rather densely long-hairy. Bracts greenish-herbaceous,  $5\text{--}6 \times 1\text{--}1.5$  mm, at margins with spreading hairs 1–1.5 mm long. Flowers subsessile. Bracteoles absent. Calyx 13–15 mm long, yellowish white, green at teeth, densely covered with ascending hairs 1.8–2.5 mm long; teeth subulate, unequal, 3–5 mm long. Petals yellow, glabrous. Standard 18–22 mm long; limb 8–10 mm wide, obovate to suborbicular, rounded at tip, subabruptly contracted into a claw 9–11 mm long. Wings 21–22 mm long; limbs narrowly oblong, rounded,  $8\text{--}10 \times 2\text{--}3$  mm; auricle rounded, 1–1.5 mm long, claw 6–8 mm long. Keel 14–16 mm long; limbs

obliquely obovate, with in upper part widely curved lower edge and  $\pm$  straight upper edge, subacute,  $5\text{--}6 \times \text{ca. } 3$  mm; auricle subacute, ca. 0.5 mm long, claw 8–10 mm long. Stamen-tube truncate at mouth. Ovary sessile, ellipsoid, densely white hairy; style hairy at base. Legumes unknown. Flowering and fruiting in May to June and April to May, respectively.

*Astragalus ilachchiensis* is known only from the type locality in the northwestern Sahand mountain in southwest Tabriz of East Azarbaijan Province in Iran (Fig. 2). The single known plant grows in the dry-steppe and stony clay zone around the village of Ilachchi. It is closely related to *A. caraganae*, especially in the similar the shape and size of its bracts, standard, wing and keel and the presence of black hairs. Differences between these two species are listed in Table 3.

**Table 3.** Morphological comparison of *Astragalus ilachchiensis* and *A. caraganae*.

	<i>A. caraganae</i>	<i>A. ilachchiensis</i>
Height (cm)	up to 40	up to 6
Number of leaflet pairs	20–24	5–11
Number of flowers	4–7	10–12
Calyx length (mm)	7–11	13–15
Color of calyx hairs	white and black	white

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