

Five new species of *Astragalus* sect. *Malacothrix* (*Fabaceae*) from Iran

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Abstract

Five new *Astragalus* species from section *Malacothrix* Bunge, namely, *A. musaianus* Maassoumi & Joharchi sp. nov., *A. neo-iranshahrii* Maassoumi & Amini Rad sp. nov., *A. pseudocomosus* Maassoumi, F. Ghahrem. & Bagheri sp. nov., *A. subaspadanus* Maassoumi, F. Ghahrem. & Bagheri sp. nov. and *A. takabensis* Maassoumi & Maroofi are described and illustrated. These are endemic from different parts of Iran. New species are compared with their nearest relatives.

Introduction

Based on new collections and the materials in TARI herbarium, an updated revision of the section *Malacothrix* Bunge since the publication of Flora Iranica (Podlech *et al.* 2010, 2012) is under preparation by the corresponding author. In the course of this revision five new species from different parts of Iran, in particular high altitudes of Mahneshan Mt., Tekab area and Qeydar Mt. were identified. These species are described in this paper with indication of their close affinities. The type specimens are preserved in TARI and some local Iranian herbaria.

1. *Astragalus musaianus* Maassoumi & Joharchi, sp. nov. (Fig. 1)

- Diagnosis

Similar to *A. protractus* Boriss., but differs from it in having dense capitate inflorescence with many flowers (not elongated) and calyx with only white hairs (not white and black hairs).

Plants 10–12 cm tall, shortly caulescent, with thin, tousled hairs 0.2–0.5 mm long. Caudex branched, with short to elongated subterranean branches. Stems of the year 2–3 cm long, sulcate, densely covered with spreading tousled white hairs 0.2–0.5 mm long. Stipules whitish, 10 mm long, triangular, narrowly triangular acuminate, adnate to the petiole for 3 mm, shortly vaginate-connate behind the stem, rather densely subappressed hairy. Leaves 7–10 cm long; petiole 1.5–2 cm long, like the rhachis sulcate at upper side, densely furnished with ascending to nearly spreading

white hairs 0.2–0.8(–1) mm long and with fewer \pm spreading, partly with distinctly double indumentum. Leaflets in 10–17 pairs, elliptic, 5 \times 3 mm, shortly acuminate to subobtuse or rarely rounded to slightly retuse at the apex, covered on upper side loosely, on underside densely with subappressed hairs up to 0.7–1 mm long. Peduncle 5–6 cm long, angular-sulcate, hairy like the rhachis. Raceme capitate to subcapitate, rather densely many-flowered; axis mainly white hairy. Bracts linear-acute, 4–5 mm long, only spreadingly white hairy. Pedicels ca. 0.5 mm long hairy. Calyx 16–17 mm long, tubular, later on slightly inflated, densely covered with ascending to nearly only spreading white hairs 0.5–2 mm long; teeth from narrowly triangular base subulate-acuminate, 5 mm long, densely white hairy at the inner side. Petals yellow later becoming pale violet. Standard 20 mm long; blade 7 mm wide, elliptic to obtrullate, widest in the middle or in upper third, rounded at apex, triangularly narrowed in lower part, subabruptly attenuate into the claw. Wings 17 mm long; blades narrowly oblong, 8 \times 2.5 mm; auricle 1 mm long, claw 10 mm long. Keel 17 mm long; blades obliquely obovate to oblong-upcurved, with in upper part widely to rectangular-curved lower edge and distinctly concave upper edge, subacute at the apex, 8 \times 3 mm; auricle minute, claw 12 mm long. Staminal tube truncate at the mouth. Ovary sessile, ellipsoid, white hairy; style glabrous. Legumes with a curved stipe up to 1 mm long, ovoid, 8 mm long, 3 mm high and 4 mm wide, ventrally carinate, widely grooved dorsally, subabruptly narrowed into a 2–3 mm long and slightly recurved beak; densely covered with spreading white hairs up to 4 mm long and with very short spreading hairs. Fruit completely bilocular, with two seeds. Seeds rectangular, 2.5 \times 2 mm, light brown.

Type: N Khorassan prov., between Golestan National Park and Bojnurd, Ghorkhod Protected Area, Kuh-e Ghorkhod, above the village Pashkalateh, 1800–2500 m, *Assadi & Hamdi 85544* (Holotype: TARI).

- Other examined specimens: N Khorassan prov., Bojnurd to Jajarm, 15 km to Garmeh, 1342 m, *Paryab & Amirabadi 11425* (TARI).

- Etymology: This new species named in the honor of the Iranian botanist Dr. Musa Iranshahr for his half century scientific activities in plant taxonomy.

2. *Astragalus neo-iranshahrii* Maassoumi & Amini Rad, sp. nov. (Fig. 2)

- Diagnosis

Similar to *A. Aspadanus* Bunge but differs from it in having white and black hairs on the petioles and rachis (not only white hairs), rhomboid or trullate-ovate standard (not elliptic), stipules ca. 1 mm adnate to the petiole (not 2 mm), leaflets 18–20 pairs (not 8–12 pairs), upper side only sparsely hairy near the margin and lower sides covered with dense appressed hairs (not both sides hairy), wings 18–20 mm long (not 13–14 mm), keel 18 mm long (not 12–14 mm). The new species differs from *A. clivicola* Podlech & Maassoumi with 18–20 pairs leaflets (not 9–12 pairs), bracts ca. 6 mm long, covered with dense black and white patent hairs (not appressed).

Plants 10–20 cm tall, shortly caulescent. Caudex branched, mostly with short, rarely with somewhat elongated branches. Stem of the year up to 2–3 cm long, densely covered with appressed white hairs 0.2–1 mm long. Stipules whitish with greenish tip, triangular, 5 mm long, adnate to the petiole for 1 mm, connate behind the stem up to 0.5 mm high, sparsely to rather densely covered with appressed white and few black hairs. Leaves 13–15 cm long; petiole 2.5–4 cm long, like the rhachis rather densely covered with subappressed white and few black hairs 0.2–0.7 mm long. Leaflets in 18–20 pairs, narrowly elliptic to elliptic, 10 \times 3–4 mm, at the apex rounded, on upper side glabrous in the middle part, loosely spreading hairy toward margin, on underside more densely covered with subappressed to spreading, straight hairs 1 mm long, sometimes folded. Peduncle 10–18 cm long, angular-sulcate, loosely to rather densely covered with \pm appressed to spreading white and toward the raceme with increasing black hairs up to 0.8 mm long. Raceme rather densely 6–15-flowered. Bracts

greenish, 5–6 mm long, narrowly triangular, covered with short, predominantly black hairs. Pedicels very short. Calyx 11 mm long, tubular at the beginning of anthesis, oblique at the mouth, with indistinct purple nerves, loosely to rather densely covered with very spreading white hairs 1 mm long and especially at the dorsal side with distinctly shorter black hairs; teeth subulate, white and black hairy, unequal, 2–2.5 mm long, spreading white hairy on inner side. Petals pale violet. Standard 22 mm long; blade 8–9 mm wide, rhomboid or trullate-ovate, \pm gradually narrowed toward the obtuse or emarginate apex, at the base gradually to subabruptly narrowed into the claw. Wings 19 mm long; blades narrowly oblong, obtuse at the apex, 7 mm long, 2.5 mm wide; auricle ca. 1 mm long, claw 12 mm long. Keel 18–19 mm long; blades oblique-oblong, with in upper part widely, nearly rectangularly curved lower edge and slightly concave upper edge, obtuse to subacute at the apex, 7 mm long and 3 mm wide; auricle indistinct, acute, claw ca. 12–13 mm long. Staminal tube truncate at the mouth. Ovary with c. 1 mm stipe, elliptic, densely long white hairy; style glabrous.

Type: Zanzan prov., Qeydar to Abhar, 1980 m, 09.05.2009, *Bagheri 6463* (Holotype: TARI; Isotype: FHU).

- Etymology: The species epithet is dedicated to Dr. Musa Iranshahr, on occasion of his 90th birthday. *A. iranshahrii* Maassoumi & Podlech is another species belonging to sect. *Caprinii* (*Ramak Maassoumi & Podlech 1988*).

3. *Astragalus pseudocomosus* Maassoumi, F. Ghahrem. & Bagheri, sp. nov. (Fig. 3)

- Diagnosis

Similar to *A. comosus* Bunge but differs in having the greenish to yellow corolla (not violet), the long standard ca. 25 mm long (not 18–23 mm), standard limb rhomboid, emarginate at apex (not truncate), inflorescence with remote flowers (not densely capitate).

Plants 17 cm tall, acaulescent to shortly caulescent, with hairs 1–1.5 mm long. Caudex simple to repeatedly divided, with short subterranean branches.

Stems, 2 cm long, densely furnished with appressed white hairs 0.2–0.3 mm long. Stipules whitish to greenish, with a distinct, elevated main nerve, the lower ones 4–5 mm long, triangular, shortly adnate to the petiole, shortly vaginate-connate behind the stem, often reflexed, white hairy, sometimes ciliate with rigid, spreading hairs up to 0.2 mm long. Leaves 5–10 cm long; petiole 2–3 cm long, like the rachis sulcate at the upper side, loosely to rather densely covered with 0.2–0.5 mm long appressed hairs. Leaflets in 8–10 pairs, elliptic to narrowly ovate or narrowly elliptic, 5–7 \times 2–3.5 mm, subacute to obtuse at the apex, on upper side glabrous or only scarcely hairy towards the margin, on underside loosely to rather densely covered with appressed hairs up to 1 mm long. Peduncle 7 cm long, angular-sulcate, hairy like the rachis but with increasingly black hairs towards the raceme. Raceme oblong, remotely 10–18-flowered, later on elongating and in fruit up to ca. 8 cm long; axis with black hairs. Bracts greenish, linear-acute, 6–8 mm long, with white and black hairs. Pedicels 1 mm long, hairy. Calyx 14–15 mm long, tubular to slightly saccate at the base, oblique at the mouth, loosely to rather densely covered with spreading, white hairs up to 1.5 mm long and often at the abaxial side and towards the teeth with spreading black hairs; teeth subulate, 3–4 mm long, glabrous, but hairy at the inner side. Petals greenish-yellow to yellow. Standard 25 mm long; blade 10 mm wide, rhombic-elliptic, triangularly narrowed toward the emarginate apex, slightly constricted in the middle, gradually to subabruptly narrowed into the cuneate claw. Wings 20 mm long; blades narrowly oblong, rounded apex, 7 \times 3 mm; auricle 1–1.5 mm long, claw 11 mm long. Keel 17 mm long; blades obliquely oblong to somewhat upcurved, with in upper third widely to rectangularly curved lower edge and slightly to distinctly concave upper edge, subobtuse to subacute at the apex, 7 \times 2.5 mm; auricle short, claw 13 mm long. Staminal tube truncate at the mouth, Ovary sessile, ovoid, villous; style glabrous.

Type: Zanzan prov., 63 km from Zanzan to Mahneshan, 1705 m, 24.05.2009, *Bagheri 6793* (Holotype: TARI; Isotype: FAR).

- Flowering and fruiting time: May–June

- Etymology: The specific epithet “*pseudocomosus*” comes from the resemblance of the new species to *A. comosus* Bunge.

4. *Astragalus subspadanus* Maassoumi, F. Ghahrem. & Bagheri, sp. nov. (Fig. 4)

- Diagnosis

Similar to *A. chrysotrichus* Boiss. but differs in having the leaflets with upper side glabrous (not laxly or densely hairy), wings and keels 20–21 mm long (not 15–16 mm), pods covered with only white hairs (not long and short hairs); from *A. aspadanus* Bunge upper side of leaflets glabrous (not laxly or densely hairy), standard limb trullate-ovate or clearly rhomboid (not narrowly elliptic).

Plants 25 cm tall, subcaulescent to shortly caulescent. Caudex diffusely branched, mostly with short, rarely with somewhat elongated branches. Stem of the year up to 4 cm long, densely covered with appressed white hairs 0.2–0.5 mm long. Stipules greenish, narrowly triangular, 8 mm long, acuminate, adnate to the petiole for 2 mm, connate behind the stem up to 2 mm high, sparsely to rather densely covered with appressed white and more black hairs. Leaves 15–17 cm long; petiole 4–5 cm long, like the rhachis loosely to rather densely covered with subappressed and few ascending white and few scattered black hairs 0.2–0.6(–0.8) mm long. Leaflets in 14–15 pairs, narrowly elliptic to elliptic, 7–10 × 2–4 mm, at the apex rounded, on upper side glabrous or loosely, on underside more densely covered with subappressed to spreading, hairs 0.7–1 mm long. Peduncle 13–15 cm long, loosely to rather densely covered with ± appressed white and toward the raceme with black hairs up to 1.2 mm long. Raceme rather densely 4–10-flowered. Bracts whitish, 6–7 mm long, narrowly triangular, acuminate, covered with predominantly black hairs. Pedicels very short. Calyx 13 mm long, tubular at the beginning of anthesis, soon slightly inflated, constricted below the teeth, strongly oblique at the mouth, with indistinct purple nerves or suffused purple with age, loosely to rather densely

covered with spreading black and white hairs 1–1.8 mm long and especially at the dorsal side with distinctly shorter black hairs; teeth subulate, unequal, 3–4 mm long, white hairy on inner side. Petals yellow. Standard 20–22 mm long; blade 7–8 mm wide, trullate to narrowly elliptic, constricted at the middle, gradually narrowed toward the obtuse or emarginate apex, at the base gradually to subabruptly narrowed into the claw. Wings 21 mm long; blades narrowly oblong, obtuse at the apex, 7–9 mm long and 2–3 mm wide; auricle ca. 1 mm long, claw 13 mm long. Keel 20 mm long; blades oblique-oblong to oblique-obovate, with in upper part widely, nearly rectangularly curved lower edge and slightly concave upper edge, obtuse to subacute at the apex, 8 mm long and 2.5 mm wide; auricle short, subacute, claw ca. 12 mm long. Staminal tube truncate at the mouth. Ovary sessile, elliptic, densely long white hairy; style glabrous. Legumes sessile, narrowly elliptic, attenuate at both ends, 10–12 mm long, 3.5–4 mm high and 3 mm wide, carinate ventrally, narrowly grooved dorsally, acuminate at the apex into the slightly curved beak ca. 2 mm long, fully bilocular; valves thin, brownish, covered with obliquely ascending hairs up to 5 mm long, all sitting on little tubercles, without short hairs.

Type: Zanjan prov., Qeydar, Qeydar mountain, 05.06.2010, *Bagheri* 32 (Holotype: TARI; Isotype: FAR).

Flowering and fruiting time: May–June

- Etymology: The specific epithet “*subspadanus*” comes from the resemblance of the new species to *A. aspadanus* Bunge.

5. *Astragalus tekabensis* Maassoumi & Maroofi, sp. nov. (Fig. 5)

- Diagnosis

Related to *A. jacobsii* Podlech but differs in having the calyx 6–7 mm long (not 9–12 mm), standard, wings and keels shorter, pods stipitate, stipe ca. 5 mm (not 3 mm), beak ca. 8 mm long, erect (not 4 mm and curved), densely covered with long and short white hairy (not white and black hairy).

Plants 5–30 cm tall, caulescent, covered with appressed white hairs, in the inflorescences mixed with few scattered black hairs up to 0.2 mm long. Caudex repeatedly branched with slender, erect subterranean branches. Stems several, 5–20 cm long, evenly foliate, finely striate, loosely covered with appressed hairs 0.4–0.5 mm long. Stipules greenish, 3–4 mm long, narrowly triangular, adnate to the petiole for ca. 1 mm, indistinctly vaginate-connate behind the stem, all distinctly longitudinally nerved, sparsely to loosely hairy. Leaves 5–12 cm long; petiole 2.5–3 cm long, hairy like the stem. Leaflets in 4–5 pairs, obovate to elliptic, 10–15 × 4–5 mm, rounded at the apex, both sides densely covered with spreading to subappressed short hairs. Peduncles 3–4 in each stem, in the axils of the upper leaves 4–5 cm long, erect, angular-striate, hairy like the stem. Raceme remotely cylindrical, at anthesis rather densely many-flowered, soon elongating and up to 12 cm long; axis hairy like the peduncle but rarely with few very short, spreading black hairs. Bracts whitish-greenish, 1–2 mm long, narrowly triangular, with appressed black and white and often with very short black hairs. Pedicels 1–2 mm long, deflexed. Calyx greenish, 6–7 mm long, tubular, oblique at the mouth, loosely covered with spreading white hairs up to 1 mm long and with short black hairs, but falling soon; teeth narrowly triangular to subulate, 1–1.5 mm long, covered

black and white hairy, at inner side covered white hairy. Petals violet to purple. Standard 16 mm long; blade 6–7 mm wide, trullate-ovate to rhombic, widest near the middle, in upper part triangularly narrowed towards the slightly emarginate apex, at the base gradually narrowed. Wings 14 mm long; blades narrowly oblong, rounded at the apex, 6–8 × 2 mm; auricle ca. 1 mm long, claw 6 mm long. Keel 10 mm long; blades obliquely oblong, with lower edge in upper part broadly curved and straight upper edge, subacute at the apex, 4 × 2 mm; auricle ca. 0.5 mm long, claw 5–5.5 mm long. Staminal tube truncate at the mouth. Ovary with a stipe 1.5 mm long, narrowly elliptic, sparsely hairy; style glabrous. Pod on a stipe ca. 5 mm long, obliquely elliptic, attenuate at both ends, 10–12 mm long, ca. 5 mm high and 4 mm wide, carinate ventrally, narrowly grooved dorsally, at the apex with a straight beak ca. 9 mm long, nearly fully bilocular; valves thin, densely covered with flexuose-spreading white hairs up to 2 mm long and with very short, spreading white hairs. Seeds 2 in each locule.

Type: Kurdistan prov., 15 km from Bijar to Tekab, Salavat abad village, 1550 m, *Maroofi* 764 (Holotype: HKS; Isotype: TARI).

- Additional specimens collected from type location: Kurdistan prov., 25 km from Bijar to Zanjan, Salavat abad village, 1550 m, *Maroofi, Yousefi & Divani* 1786 (HKS).

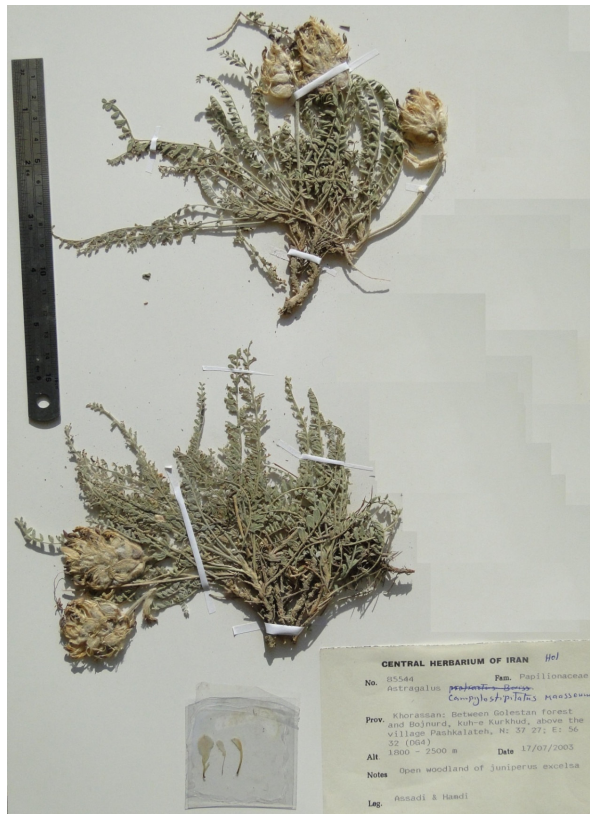


Fig. 1. *Astragalus musaianus*: Habit.



Fig. 2. *Astragalus neo-iranshahri*: Habit.



Fig. 3. Holotype of *Astragalus pseudocomosus* (after A. Bagheri 6793).



Fig. 4. Holotype of *Astragalus subaspadanus* (after A. Bagheri 32).

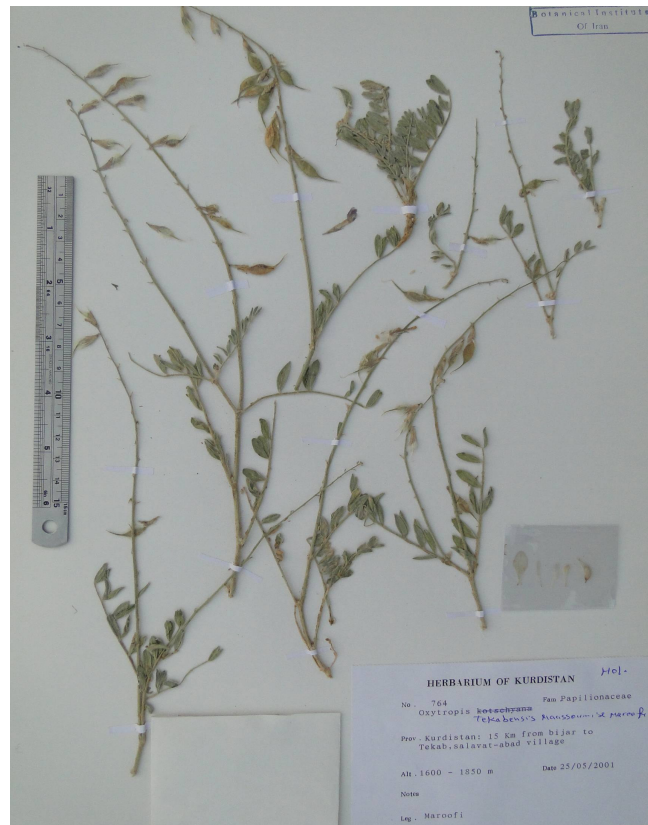


Fig. 5. *Astragalus tekabensis*: Habit.

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