

ADDITIONS TO ASTRAGALUS SECT. HYMENOSTEGIS (FABACEAE) IN IRAN

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Four new species of the genus *Astragalus* L. sect. *Hymenostegis* Bunge are described from NW Iran, prov. Zanjan: *A. austromahnesanensis*, *A. qeydarnabiensis*, *A. subkohrudicus*, and *A. subrecognitus*. They are compared with their closest relatives. Furthermore, *A. sosnowskyi* Grossh. is recorded for the first time from Iran and *A. velenovskyi* Nábělek is excluded from the list of Iranian species of *Astragalus*. Based on these new findings, the number of species attributed to sect. *Hymenostegis* reaches to 57, with an endemism rate of about 75% in Iran. So, Iran, especially the NW of the country, is the main diversity center of this section.

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یافته‌های تکمیلی از جنس گون بخش *Hymenostegis* (باقلائیان) در ایران

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علی اصغر معصومی، استاد پژوهش مؤسسه تحقیقات جنگلها و مراتع کشور.

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چهار گونه جدید از بخش *Hymenostegis* از شمال غربی ایران، استان زنجان به نام های: *A. austromahnesanensis*, *A. qeydarnabiensis*, *A. subkohrudicus*, *A. subrecognitus* شرح داده و معرفی می‌شوند. این گونه‌های جدید با خویشاوندان خود مقایسه شده‌اند. گونه *Astragalus sosnowskyi* Grossh. برای اولین بار از ایران گزارش می‌گردد و وجود *A. velenovskii* Nábělek در ایران تایید نمی‌شود. بر پایه مطالعه حاضر ۷۵٪ گونه‌های این بخش به صورت انحصاری در ایران می‌رویند و بنابراین ایران مرکز اصلی تنوع گونه‌ای آن ایران، به ویژه شمال غربی کشور است.

INTRODUCTION

The genus *Astragalus* L. (Fabaceae) is the largest genus of flowering plants in the World and in Iran. Among the spiny species of the genus, members of sect. *Hymenostegis* Bunge are characterized by inflated calyx, basifixed hairs, as well as wide and conspicuous bracts. Based on the recent molecular phylogenetic studies, the section seems to be non-monophyletic and places within a clade including tragacanthic *Astragalus* along with other major groups of spiny *Astragalus* (Kazempour Osaloo et al., 2003, 2005; Kazemi et al., 2009). This placement is in accordance with informal classification presented by Fischer (1853) in some extent.

Taxonomy of sect. *Hymenostegis* was the subject of several controversial treatments. The section name was validly published by Bunge (1868, 1869) including originally 23 species and was typified with *A. hymenostegis* Fisch. by Podlech (Podlech, 1990). An inclusive taxonomic revision of the genus was published by Rechinger et al. (1959) with 40 species known at that time. The modern revisions of the genus increased the number of species assigned to this section to 41 (Ghahremaninejad, 1992a, 1992b; Maassoumi & Ghahremaninejad, 1999). In a local revision covering the Flora of Iran, 35 species were considered in the country (Maassoumi, 1995). Contrary to previous studies, a revision provided by Zarre and Podlech

(1996) applied a wide species concept in the section and reduced the number of species of this section to 23. However, this treatment was not followed in the most recent revision of sect. *Hymenostegis* (Maassoumi & Podlech, 2001). Afterwards and during the last years, several new species were added to the section increasing the number of this section to more than 50 species (Maassoumi, unpublished). The present paper performs the results of a M.Sc. thesis conducted in prov. Zanzan by the first author (Bagheri, 2009).

NEW SPECIES

1. *Astragalus austromahneshanensis* F. Ghahrem., Maassoumi & Bagheri, **sp. nov.**

Typus. Iran, prov. Zanzan: ca. 75 km from Zanzan to Mahneshan, mountainous slopes, 2160 m, 07.07.2009, Bagheri 8955 (holotypus TARI; Isotypus, FAR, MSB).

Astragalus basmaghensis Maassoumi & Podlech similis sed differt inflorescentiis dense globosis ad breviter cylindratis (nec longis, elongatis), calycibus pilis longis tantum dense obtectis (nec pilis longis et pilis brevissimis obtectis) et foliolis 4-7-jugis (nec 6-9-jugis).

Plant 20–25 cm tall. Stems branched at base. Stipules membranous, hyaline on upper part, yellow to yellowish-brown, 20–22 mm long, adnate to petiole for 10–12 mm, connate at opposite side for ca. 3 mm, free tips lanceolate-acuminate, glabrous. Leaves 7–13 cm long; petiole 3–5 cm long, like rachis densely covered with appressed and spreading hairs, spiny. Leaflets in 6–7 pairs, elliptic to oblong, 9–25 x 2.5–4.5 mm, acuminate, with a yellowish or very rarely purple mucro ca. 1.5 mm long, on both sides densely covered with appressed to subappressed hairs. Peduncles 16–19 cm long, overtopping the leaves, covered with scattered hairs. Racemes ovate to short cylindrical, 4.5–6 cm long and ca. 3 cm in diameter, densely many-flowered. Bracts mostly persistent, yellow, membranous, hyaline at margins, 8–13 mm long and 3–6 mm wide, ovate to lanceolate, acuminate, with a cusp ca. 4 mm long, glabrous. Calyx inflated, 15.5–16.5 mm long and ca. 4–6.5 mm wide, yellow, densely covered with ascending to spreading hairs up to 2 mm long, lacking short hairs; teeth subulate, 5.5–6 mm long, yellow, rarely pale purple. Petals yellow. Standard 12.5–15 mm long; limb 4–6 mm wide, oblong to oblong-elliptic, at the base sharply hastate-auriculate, rounded at the apex. Wings 15–18 mm long; limbs oblong to elliptic, acute at apex, 7–8×ca. 2 mm; auricles ca. 0.8 mm long; claw 8–9 mm long. Keel ca. 15 mm long; limbs obliquely obovate, ca. 6×2.5–3.3 mm; auricles acute; claw ca. 8.5–9.5 mm long. Ovary sessile, ca. 4 mm long, densely sub-

appressed hairy; style up to middle hairy. Legumes elliptic, ca. 6.5×3.5 mm, densely appressed hairy. Seed olive, smooth, ca. 3.2×2 mm.

Flowering and fruiting. June–July.

2. *Astragalus qeydarnabiensis* Bagheri, F. Ghahrem. & Maassoumi, **sp. nov.**

Typus. Iran, Prov. Zanzan: Gheidar, Gheidar Mt., 2330 m, 25.05.2009, Bagheri 8801 (Holotype, TARI; Isotypes, FAR, MSB).

Astragalus assadabadensis F. Ghahrem. & Podlech similis sed differt bracteis angustioribus, 14 x 4-6 mm (nec 14-18 x 7-10 mm), calyce 21-24 mm (nec 14-17 mm) longo et vexillo ca. 25 mm (nec ca. 18 mm) longo. Plant 15–17 cm tall. Caudex covered with yellow-brownish remnants of old petioles and stipules. Stipules hyaline-membranous, yellow, clearly with distinct reticulate venation at the base, 8–10 mm long, adnate to petiole for 10–12 mm, connate at opposite side for 5 mm, narrowly lanceolate, glabrous, non-ciliate at margins. Leaves 5–9 cm long; petiole 1.5–2 cm long, like rachis covered with appressed hairs ca. 0.3–0.4 mm long, spiny, pungent; leaflets in 6–8 pairs, narrowly elliptic, lanceolate to sublinear, 12–31×2–2.5 mm, acuminate at apex, with a yellowish mucro 1–2 mm long, on both sides sparsely covered with appressed hairs ca. 0.4–0.5 mm long. Peduncles 3–5 cm long, shorter than the leaves, densely covered with subappressed to spreading hairs ca. 1.5–2 mm long. Racemes cylindrical to subconical, 8–10 cm long and ca. 2.5–3 cm in diameter, many-flowered. Bracts yellow, membranous, 12–16 mm long and 5–7 mm wide, ovate, acuminate, glabrous. Calyx cylindrical, becoming inflated in fruit state, 18–20 mm long and ca. 4–6 mm wide, yellowish with purplish veins, densely covered with long spreading hairs 2.5–3 mm long; teeth subulate, 8–9 mm long. Petals yellow. Standard ca. 20 mm long, pandurate; limb 6 mm wide, oblong to oblong-elliptic, sharply constricted at the middle, acute-hastate or auriculate at base, acute at the apex. Wings 19 mm long; limbs oblong, elliptic to obovate, obtuse, 8×3 mm; auricle ca. 0.5 mm long, acute; claw 10 mm long. Keel 15 mm long; limbs obliquely obovate, ca. 6×3 mm; claw ca. 10 mm long. Ovary sessile, ca. 4 mm long, densely appressed hairy; style hairy at the lower part. Legume unknown.

Flowering and fruiting. May–June.

3. *Astragalus subkohrudicus* Maassoumi, F. Ghahrem. & Bagheri, **sp. nov.**

Typus. Iran, prov. Zanzan, Gheidar, Gheidar Mt., 2090 m, 05.06.2009, Bagheri 8812 (holotypus, TARI; Isotypes, FAR, MSB).

Astragalus assadabadensis F.Ghahrem. & Podlech similis sed differt bracteis angustioribus, 14x 4-6 mm (nec 14-18 x 7-10 mm), calyce 21-24 mm (nec 14-17 mm) longo et vexillo c. 25 mm (nec ca. 18 mm) longo.

Plant 12–17 cm tall. Stipules hyaline-membranous, 18–27.5 mm long, yellow, adnate to petiole for 7.5–14.5 mm, free tips lanceolate, glabrous. Leaves 7–10 cm long; petiole 2–4 cm long, like rachis densely covered with appressed hairs, spiny. Leaflets in 5–6 pairs, elliptic to elliptic-lanceolate, 15–30×2–3 mm, acuminate, with a yellowish mucro ca. 1.5–2 mm long, on both sides densely covered with appressed hairs. Peduncles 2–5 cm long, shorter than the leaves, densely covered with spreading hairs; hairs up to 2 mm long. Racemes, oblong, 4.5–5 cm long and ca. 2.5–3 cm in diameter, ±dense, 10–20-flowered. Bracts yellow, chartaceous-membranaceous, hyaline at margins, 14–15 mm long and ca. 5 mm wide, oblong to oblong-lanceolate, shortly acuminate, glabrous. Calyx tubular, inflated, 21–24 mm long and ca. 4–6 mm wide, yellow-purple, densely covered with spreading hairs up to 3 mm long; teeth subulate, purple, 8–11 mm long. Petals yellow. Standard ca. 25 mm long; limb ca. 7 mm wide, elliptic-ovate, pandurate, rounded at the apex. Wings 20–21 mm long; limbs oblong, elliptic to obovate, obtuse to acute, ca. 9 mm long, 2.5–3 mm wide; auricle ca. 0.6–0.7 mm long; claw 12–13 mm long. Keel 18–18.5 mm long; limbs obliquely obovate, ca. 6.5×3.5 mm; claw ca. 12.5 mm long. Ovary sessile. Legumes sessile, elliptic, ca. 10×3 mm, densely appressed-villous.

Flowering and fruiting. May-June.

4. *Astragalus subrecognitus* Bagheri, Maassoumi & F. Ghahrem., **sp. nov.**

Typus. Iran, prov. Zanjan, ca. 14 km on the road from Mahneshan to Parri, 2110 m, 07.07.2009, Bagheri 8960 (holotypus TARI; Isotypus FAR, MSB, TARI).

Astragalus zohrabii Bunge similis, sed differt, stipulis 18-21 mm (nec 6-16 mm) longis, calyce 18-20 mm longo, luteo, pilis 1-2.5 mm longis obtecto (nec 12-18 mm longo, omnino vel in medio superiore purpureo, pilis ad 4.5 mm longis obtecto) et leguminibus ca. 12 mm longis et 4.5 mm altis (nec 4-5 mm longis et 1.5-2.5 mm altis).

Plant 15–18 cm tall. Stems branched at base, in older parts covered with yellowish-brown remnants of old leaves. Stipules membranous, hyaline, yellow, 18–21 mm long, adnate to petiole for 10–12 mm, connate at opposite side for 5 mm, free portion hyaline, narrowly lanceolate, glabrous but ciliate on the margins. Leaves

5–9 (-10) cm long; petiole 1.5–2 cm long, like rachis densely covered with appressed to spreading hairs ca. 0.5–1 mm long, spiny, pungent. Leaflets in 5–6 pairs, narrowly elliptic, lanceolate to sublinear, 12–20×2–3 mm, acuminate, with a yellowish mucro ca. 1–2 mm long, on both sides densely covered with appressed to subappressed hairs. Peduncles 3–4 cm long, shorter than the leaves, densely covered with spreading hairs ca. 1–2.5 mm long. Racemes cylindrical, lax, with visible axis, 7.5–9.5 cm long and ca. 2.5–3 cm in diameter, many-flowered. Bracts yellow, membranous, soon deciduous, ca. 12–16 mm long and 5–7 mm wide, ovate to ovoid, acuminate, glabrous. Calyx cylindrical, becoming inflated in fruiting state, 18–20 mm long and ca. 4–8 mm wide, yellow, densely covered with spreading short and long hairs ca. 1–2.5 mm long; teeth subulate, 9–12 mm long, usually curved. Petals yellow. Standard 22–24 mm long; limb 7–8 mm wide, oblong to oblong-elliptic, minutely constricted at the middle, non-auriculate and non-hastate at the base, rounded at the apex. Wings 21 mm long; limbs oblong, elliptic to obovate, obtuse, ca. 10 mm; auricle ca. 0.5 mm long, acute; claw 12 mm long. Keel 15–17 mm long; limb obliquely obovate, ca. 6×2.5 mm; claw ca. 11 mm long. Ovary sessile, ca. 4 mm long, densely appressed hairy; style hairy at the lower part. Legume subsessile, elliptic, ca. 12×4.5×3.5, beak ca. 2 mm long, densely appressed hairs.

Flowering and fruiting. June-July.

NEW RECORD

Astragalus sosnowskyi Grossh.

Specimen seen. Iran, prov. Zanjan: 84 km from Zanjan to Bijar, 1550 m, 26.05 2009, Bagheri 6911 and 6915.

In Flora Iranica (Podlech & al. 2001) *A. sosnowskyi* was doubtfully recorded from Iraq. The new collection from Iran, prov. Zanjan extends the distribution area of this species to Iran. The species is now known from Iraq, Turkey, Iran and Transcaucasia.

SPECIES EXCLUDED FROM IRAN

A. velenovskyi Nábělek, Spisy. Priri. Fak. Masaryk. Univ. 35: 82 (1923).

The mentioned specimen in Flora Iranica is very close to *A. tabrizianus* Fisch. and probably represents the latter. *A. velenovskyi* was recorded in Flora Iranica (Maassoumi & Podlech, 2002) based on a single specimen collected in Azerbaijan, Sahand mountain (Grant 16283) where *A. tabrizianus* (Grant 16282) is common. So, the record of this species from this region is due to misidentification.

ASTRAGALUS SECT. HYMENOSTEGIS IN IRAN

Based on the present study, a list of accepted species of *Astragalus* sect. *Hymenostegis* in Iran with the country/countries of distribution is provided.

1. *A. anguranensis* Podlech & Maassoumi; Iran (endemic).
2. *A. altiusculus* Maassoumi & F. Ghahrem.; Iran (endemic).
3. *A. assadabadensis* F. Ghahrem. & Podlech; Iran (endemic).
4. *A. austrokhoranicus* Podlech; Iran (endemic).
5. *A. austromahnesanensis* F. Ghahrem., Maassoumi & Bagheri; Iran (endemic).
6. *A. bashmaghensis* Maassoumi & Podlech; Iran (endemic).
7. *A. bounophilus* Boiss. & Hohen.; Iran (endemic).
8. *A. bradosticus* Maassoumi & Podlech; Iran (endemic).
9. *A. brunsianus* Bornm.; Iran (endemic).
10. *A. capax* Maassoumi; Iran (endemic).
11. *A. chehreganii* Zarre & Podlech; Iran (endemic).
12. *A. chrysostachys* Boiss.; Iran, Turkey.
13. *A. demonstratus* Maassoumi; Iran (endemic).
14. *A. dianat-nejadii* F. Ghahrem.; Iran (endemic).
15. *A. doghrunensis* Maassoumi & Podlech; Iran (endemic).
16. *A. expetitus* Maassoumi; Iran (endemic).
17. *A. ferruminatus* Maassoumi; Iran (endemic).
18. *A. glumaceus* Boiss.; Iran (endemic).
19. *A. hirticalyx* Bunge; Iraq, Persia, Turkey.
20. *A. hymenostegis* Fisch. & C.A.Mey.; Iran (endemic).
21. *A. hymenosystis* Fisch. & C.A.Mey.; Iran, Turkey.
22. *A. jaldianensis* Ranjbar; Iran (endemic).
23. *A. kapherrianus* Fisch.; Iran, Azerbaijan, Transcaucasia.
24. *A. karl-heizianus* Maassoumi; Iran (endemic).
25. *A. kohrudicus* Bunge; Iran (endemic).
26. *A. lagopoides* Lam.; Iraq, Iran, Turkey, Armenia, Azerbaijan.
27. *A. laguriformis* Freyn; Iraq, Iran, Turkey.
28. *A. leptycticus* Maassoumi; Iran (endemic).
29. *A. marivanensis* Maassoumi & Podlech; Iraq, Iran.
30. *A. melanostitus* Freyn; Iran, Iraq.
31. *A. montis-nacarouzi* Maassoumi & Maroofi; Iran (endemic).
32. *A. naftabensis* Sirj. & Rech. f.; Iran (endemic).
33. *A. nervistipulus* Boiss.; Iran, Iraq.
34. *A. paralurges* Bunge; Iran (endemic).
35. *A. pauxillis* Maassoumi & F. Ghahrem.; Iran (endemic).
36. *A. pediculariformis* Maassoumi; Iran (endemic).
37. *A. pereshkhoranicus* Maassoumi & F. Ghahrem.; Iran, Turkey.
38. *A. persicus* (DC.) Fisch. & C. A. Mey.; Iran (endemic).
39. *A. pseudopersicus* Maassoumi & Podlech; Iran (endemic).
40. *A. qoturensis* Podlech; Iran (endemic).
41. *A. qeydarnabiyensis* Bagheri, F. Ghahrem. & Maassoumi; Iran (endemic).
42. *A. recognitus* Fisch.; Iran (endemic).
43. *A. rubriflorus* Bunge; Iran (endemic).
44. *A. rubrostriatus* Bunge; Iran (endemic).
45. *A. salavatabadensis* Podlech; Iran (endemic).
46. *A. sciureus* Boiss. & Hohen.; Iran (endemic).
47. *A. seidabadensis* Bunge; Iran (endemic).
48. *A. simakanensis* Maassoumi & Hatami; Iran (endemic).
49. *A. sosnowski* Grossh.; Iran, Iraq, Turkey, Transcaucasia.
50. *A. straussii* Bornm.; Iran (endemic).
51. *A. subkohrudicus* Maassoumi, F. Ghahrem. & Bagheri; Iran (endemic).
52. *A. subrecognitus* Bagheri, Maassoumi & F. Ghahrem.; Iran (endemic).
53. *A. tabrizianus* Fisch.; Iran (endemic).
54. *A. uraniolimneus* Boiss.; Iran, Armenia, Azerbaijan.
55. *A. vernaculus* Podlech; Iran, Turkey.
56. *A. zohrabi* Bunge; Iran, Turkey, Armenia.

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