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Authors: Ranjbar, Massoud, Rahiminejad, Mohammad-Reza, and Maassoumi, Ali-Asghar

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MASSOUD RANJBAR, MOHAMMAD-REZA RAHIMINEJAD & ALI-ASGHAR MAASSOUMI

Notes on the short-stemmed species of *Astragalus* sect. *Onobrychoidei (Fabaceae)* in Iran

Abstract

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Astragalus kiviensis and *A. kadschoroides* are described as species new to science and illustrated, raising the number of short-stemmed species of *A.* sect. *Onobrychoidei* in Iran to five. The other three are *A. asciocalyx, A. lilacinus* and *A. scapiger.* A key is provided to the species of this morphological group in Iran, characterized by short stems very densely covered with grey, appressed hairs and becoming woody at the base.

Key words: *Leguminosae,* taxonomy, *Astragalus kiviensis, Astragalus kadschoroides.*

Introduction

Astragalus L. is the most diverse genus in SW Asia, comprising about 1000 species, of which more than 840 occur in Iran, making it the largest genus in the flora of the country. *Astragalus* is also the most problematic genus in the legume systematics (Lock & Simpson 1991, Yakovlev & al. 1996, Ranjbar & Karamian 2002, 2003). In addition to its economic importance, its great diversity has attracted much interest in ecological as well as systematic studies. *A.* sect. *Onobrychoidei* DC. (= *A.* sect. *Onobrychium* Bunge) is a rather large section with more than 80 species. The first species was described as *A. onobrychis* by Linnaeus (1753). The section was revised for the flora of the former Soviet Union (Gontscharov & al. 1946), for the flora of Iran (Rechinger & al. 1958), the flora of Turkey (Chamberlain & Matthews 1970) and the flora of Iraq (Townsend 1974).

However, reliable identification of the species of *Astragalus* sect. *Onobrychoidei* with any available key still provides serious difficulties due to a number of taxonomic problems. Some par-

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Fig. 1. *Astragalus kiviensis* – A: habit (with fruits); B: indumentum of calyx; C: stipules; D: calyx; E: wings; F: keel; G: androecium; H: gynoecium; I: pod; J: standard; K: flower; L: leaflet pair. – Scale bar: A = 1 cm, C, L = 2.5 mm, D-K = 1.25 mm; drawn after the type collection.

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tial problems have been solved by previous studies (Ranjbar & Maassoumi 1998, Podlech & Sytin 2002), others still exist. The present study is another contribution towards a clarification of the taxonomy of this section. It deals with the morphological group of the short-stemmed species in Iran. This grade is characterized by short stems, which are very densely covered with grey, appressed hairs and become woody at the base. It shows morphological similarities to *A.* sect. *Hololence,* which may indicate a closer relationship as is supported also by molecular analyses (Kazempour Osaloo & al. 2003). Two new species are described and a key to all five species of this group in Iran is provided.

New species

Astragalus kiviensis Ranjbar & Rahiminejad, **sp. nov.**
Holotype: Iran, Province of Ardebil, 10 km after Kivi toward Khalkhal, 10 km before Khalkhal 1600-1800 m, 15.7.2003, *Rahiminejad & Ranjbar 5536* (Bu-Ali Sina University Herbarium; isotype: TARI) – Fig. 1.

Differt ab *Astragalo lilacino* Boiss. foliolis 5-6 jugis (nec 8-12 jugis), calyce 4-5 mm (nec 8-10 mm) longo, vexillo c. 12 mm (nec 17-19 mm) longo, alis 7-8 mm (nec 11-12 mm) longis, carina 7 mm (nec 9-10 mm) longa.

Plant up to 50 cm tall. *Caudex* with pluricipital root-crown, subterranean branches short to elongate. *Stems* up to 11 cm long, growing 2-3.5 cm per year, erect to ascending, angular-sulcate, densely covered with medifixed, appressed, silvery, 0.8-1.5 mm long hairs. *Stipules* hyaline-membranous, 2-3 mm long, adnate to the petiole for c. 1 mm, vaginate-connate high up, sometimes nearly to the top, free tips very shortly triangular, with loosely appressed, white and black, 0.8-1.5 mm long hairs. *Leaves* 6-9 cm long; petiole 3-5 cm long, hairy like the rachis; leaflets in 5-6 pairs, oblong to narrowly elliptic, 12-15 × 1-2 mm, obtuse to rounded, on upper side loosely to subdensely, on lower side subdensely covered with medifixed, appressed, white, 0.8-1.5 mm long hairs. *Peduncle* 25-35 cm long, slightly angular-sulcate, in basal part loosely to densely, in upper part sparsely hairy, toward the raceme mostly also with black hairs. *Raceme* many-flowered, elongating in fruit and up to 10 cm long. *Bract* white-membranous, narrowly triangular, 2-3 mm long, sparsely covered with white and black, 0.3-0.8 mm long hairs, at the margins with basifixed hairs. *Pedicels* 1-1.5 mm long, hairy. *Calyx* tubular, 4-5 mm long, loosely to subdensely covered with appressed, medifixed, white (0.7-1 mm long) and black (0.5-0.9 mm long) hairs; teeth narrowly triangular to linear, 2-3 mm long. *Petals* violet when dry; *standard* c. 12 mm long, blade 4-5 mm wide, rhombic-elliptic, in upper third subabruptly ligulately narrowed and 2-3 mm wide, apex truncate, at the base gradually cuneately narrowed; *wings* 7-8 mm long, blades narrowly oblong to narrowly obovate, rounded to slightly retuse at the apex, 4-4.5 × 2 mm, auricle c. 1 mm, claw 3-3.5 mm long; *keel* c. 7 mm long, blades obliquely obovate, with a lower edge widely curved in the upper third and a nearly straight upper edge, obtuse to subacute at the apex, 2-3 × 1-1.5 mm, auricle short, claw 2-3 mm long. *Stamen tube* truncate at the mouth. *Ovary* sessile, linear. Pods sessile, oblong, erect to rarely spreading, 5-7 mm long and 2-3 mm wide, subdensely covered with appressed, ± medifixed, white, 0.8-1 mm long hairs, beak 2-3 mm long. *Seed* usually 1-2, 2.8-3.2 × 1-1.5 mm long, elliptical, dull brownish.

Etymology. – The specific epithet refers to the type locality Kivi in Ardebil province, Iran.

Further specimens seen. – IRAN, GILAN: Masuleh to Khalkhal, Shal village, 1200 m, 1.6.2004, *Assadi & Ranjbar 5985* (BASUH); 48 km Masuleh to Khalkhal, 1200 m, 1.6.2004, *Assadi & Ranjbar 5973* (BASUH).

Distribution. – *Astragalus kiviensis* is known only from a localized area in the mountain range at the border of the provinces of Gilan and Ardebil in NW Iran (Fig. 3). It was collected from clay and stony ground at roadsides.

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Table 1. Differential features of *Astragalus kiviensis* and related species.

	A. kiviensis	*A. lilacinus*	*A. kadschoroides*	*A. scapiger*
Internode length [mm]	5-10	10-60	5-15	10-25
Leaflet pairs per leaf	5-6	8-12	4-6	4-7
Petiole length [mm]	5-15	40-70	15-40	15-35
Corolla [length, mm]				
standard	c. 12	c. 16	15-17	18-19
wing	7-8	11-12	10-12	12-13
keel	c. 7	9-10	7-8	9-10
Calyx length [mm]	4-5	7-10	7-8	8-9
Pod				
length [mm]	5-7	10-12	6-7	6-10
colour of hairs	white	white	white and few black	white
number of seeds	1-2	6-7	3-5	1-2

Affinities. – The similar shapes of pods, flowers and leaflets confirm a close relationship between *Astragalus kiviensis* and both *A. kadschoroides* and *A. lilacinus*. The new species differs from the former by a pod indumentum of merely white hairs, taller peduncles (25-35 cm instead of 7-13 cm) and inflorescences strongly elongating at fruiting time. From the latter species it differs in having fewer pairs of leaflets (5-6 instead of 8-12) and a shorter standard (c. 12 mm instead of 16 mm) and calyx (4-5 mm instead of 7-10 mm) (Table 1).

The new species shows the same habit as *Astragalus eremospartoides* Regel, a species of *A.* sect. *Corethrum*. Both species are short-stemmed with silvery indumentum and many-flowered racemes, which are usually strongly elongated in fruit. They differs, however, in the size of the calyx teeth and the shape of the leaves.

Astragalus kadschoroides Ranjbar, **sp. nov.**
Holotype: Iran, Province of Ardebil, 45 km from Namin to Germi, 2000-2200 m, 15.6.2002, *Ranjbar 6112* (Bu-Ali Sina University Herbarium; isotype TARI) – Fig. 2.

Differt ab *Astragalo onobrychis* M. Bieb. foliolis 4-6 jugis (nec 9-12 jugis), calyce 6-8 mm (nec c. 12 mm) longo, vexillo 15-17 mm (nec 20-25 mm) longo, alis 9-10 mm (nec c. 15 mm) longis, carina 7-8 mm (nec c. 13 mm) longa, ab *A. kadschorensi* Bunge foliolis 4-6 jugis (nec 7-16 jugis).

Plants up to 25 cm tall. *Caudex* with short to elongate subterranean branches. *Stems* many, 3-6 cm long, erect to ascending, slightly angular-sulcate, densely covered with medifixed, appressed, silvery, 0.5-0.7 mm long hairs, below the nodes also with black, 0.2-0.8 mm long hairs. *Stipules* 3-5 × 3 mm long, the lower ones hyaline-membranous, brownish to cream, sometimes with greenish tips, free from the petiole, behind the stem distinctly vaginate-connate, with loosely appressed white and black hairs. *Leaves* 4-7 cm long; petiole 2-3 cm long, hairy like the rachis; *leaflets* in 4-6 pairs, oblong to narrowly elliptic, 8-11 × 1.5-2 mm, obtuse to rounded, on upper side loosely to subdensely, on lower side densely covered with medifixed, appressed, white, 0.7-1.2 mm long hairs. *Peduncle* 7-13 cm long, angular-sulcate, loosely to densely covered with black hairs. *Racemes* oblong, 2-2.5 cm long, densely many-flowered, mostly rather dense in fruit and up to 3 cm long. *Bract* white-membranous, narrowly triangular, 2-4 mm long, sparsely covered with white and black hairs, at the margins and base with basifixed hairs. *Pedicels* 1.2-1.5 mm long, with white and black hairs. *Calyx* tubular, 7-8 mm long, densely covered with appressed, medifixed, predominantly black, 0.3-0.7 mm long and with few white, 0.6-0.8 mm long hairs; teeth narrowly linear to subulate, 4-5 mm long. *Petals* violet or brownish when dry; *standard* 15-17 mm long, blade 5-6 mm wide, rhombic-elliptic, in upper third subabruptly ligulately narrowed and 3-4 mm wide, apex obtuse, at the base gradually cuneately narrowed; *wings* 9-10 mm long, blades narrowly oblong, rounded at the apex, c. 5 × 1-1.5 mm,

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Fig. 2. *Astragalus kadschoroides* – A: habit (with fruits); B: calyx; C: standard; D: wings; E: keel; F: androecium; G: gynoecium; H: indumentum of leaflet; I: indumentum of rachis and peduncle; J: pod. – Scale bar A = 3 cm, B-G, J = 1.5 cm; drawn after the type collection.

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Table 2. Differential features of *Astragalus kadschoroides* and related species.

	A. kadschorensis	*A. onobrychioides*	*A. kadschoroides*
Stem length [cm]	3-13	3-8	3-6
Leaflet pairs per leaf	9-12	9-12	4-6
Peduncle length [cm]	7-13	10-20	7-13
Stipule length [mm]	minute	5-8	3-5
Calyx			
length [mm]	9-10	c.12	7-8
hairs	strongly asymmetrically bifurcate	medifixed	medifixed
Standard length [mm]	20-23	20-25	15-17
Pod			
length [mm]	8	c. 10	6-7
colour of hairs	white and black	brownish	white and few black
beak length [mm]	2-3	c. 6	1-2

auricle c. 1 mm, claw 4-5 mm long; *keel* 7-8 mm long, blades obliquely obovate, with a lower edge curved in upper third and nearly straight upper edge, obtuse to subacute at the apex, 2.5-3 × 1-1.5 mm, auricle short, claw 4-5 mm long. *Stamen tube* truncate at the mouth. *Ovary* sessile, linear. *Pods* sessile, oblong, erect to spreading, 6-7 mm long and 2-2.5 mm wide, densely covered with appressed, ± medifixed, 0.8-1 mm long white and with few, 0.2-0.5 mm long black hairs, beak 1-2 mm long. *Seed* usually 3-5, 1.5-2 × 0.8-3 mm long, cubic, pale brownish.

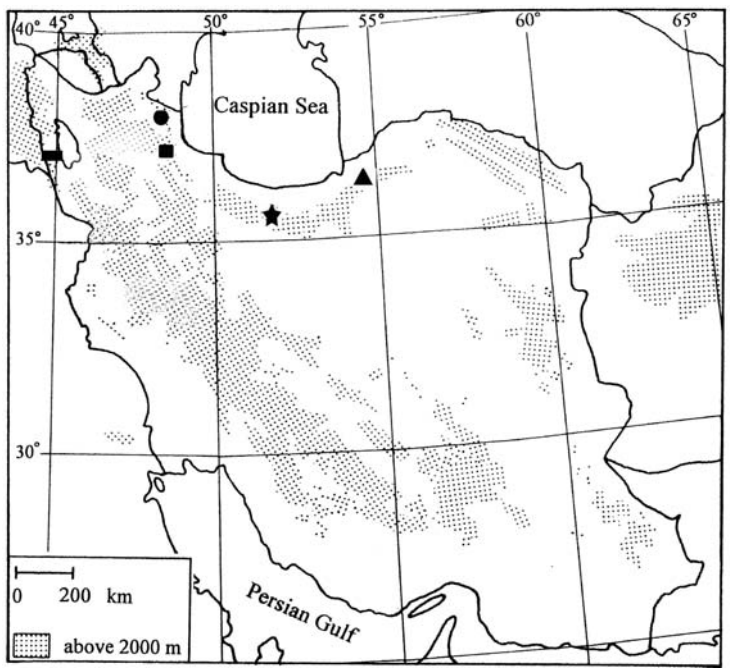


Fig. 3. Distribution of the short-stemmed species of *Astragalus* sect. *Onobrychiodei* in Iran – *A. kadschoroides* (●), *A. kiviensis* (■), *A. lilacinus* (★), *A. scapiger* (▲) and *A asciocalyx* (▬).

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Etymology. – The epithet *"kadschoroides"* expresses the similarity of the species to *Astragalus kadschorensis.*

Distribution. – *Astragalus kadschoroides* occurs in the province of Ardebil, NW Iran, and is known only from a single gathering. It was collected NW of Ardebil in a dry steppe on stony clay (Fig. 3).

Affinities. – The new species seems closely related to *Astragalus kadschorensis,* especially because of the similar type of stem indumentum and the shape and size of the pods. The new species differs by the lower number of leaflet pairs, the shorter standard and calyx (Table 2).

Key to the short-stemmed species of *Astragalus* sect. *Onobrychoidei* in Iran

1. Calyx strongly inflated in fruit . . . . . *A. asciocalyx*
– Calyx not or only slightly inflated in fruit 2
2. Pods longer than calyx, 9-12 mm long 3
– Pods shorter or slightly longer than calyx, 5-7 mm long 4
3. Leaflets 8-12 pairs; petiole 4-7 cm long; standard c. 16 mm long . . . . . *A. lilacinus*
– Leaflets 4-7 pairs, petiole 1.5-3.5 cm long; standard 18-19 mm long . . . . . *A. scapiger*
4. Inflorescence strongly elongated fruiting, peduncle 25-35 cm long. . . . . *A. kiviensis*
– Inflorescence dense at flowering and fruiting, peduncle 7-13 cm long . . *A. kadschoroides*

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Addresses of the authors:
Massoud Ranjbar, Department of Biology, Herbarium division, University of Bu-Ali Sina and University of Esfahan, P.O. Box 65175/4111, Hamadan, Iran; e-mail: ranjbar@basu.ac.ir

Mohammad-Reza Rahiminejad Department of Biology, University of Esfahan, Iran.

Ali-Asghar Maassoumi, Department of Botany, Research Institute of Forests & Rangelands, P.O. Box 13185-116, Tehran. Iran.

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