Taxonomic revision of *Astragalus* L. section *Onobrychoidei* DC. (Fabaceae) in Turkey

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Abstract: This study concerned the taxonomic revision of *Astragalus* L. section *Onobrychoidei* DC in Turkey. The morphological, cytological, and phenological characteristics of 29 species in this section are discussed. Moreover, 11 names at specific levels are reduced to synonymy: *Astragalus eskishehiricus*, *A. hololeucoides*, *A. sakaryaensis*, *A. phanothrix*, *A. canescens*, *A. robertianus*, *A. rausianus*, *A. tunceliensis*, *A. pseudovegetus*, *A. bingoeellensis*, and *A. bithynicus*. The conservation statuses based on the IUCN Red List categories are mentioned for endemic taxa.

Key words: Anatolia, Leguminosae, systematics synonym, conspectus

1. Introduction
The first classification of the genus *Astragalus* L. (Fabaceae) was presented by Tournefort and followed by de Candolle (1802) for considering several nonvalid series and some sections, including the sect. *Onobrychoidei* DC. The classification of the genus was divided into eight subgenera and several sections, but ignored the valid names introduced by de Candolle (1802). Therefore, the members of the sect. *Onobrychoidei* have been classified under the sect. *Onobrychium* Boiss. for a long time (Bunge, 1868, 1869).

*Astragalus* includes about 2438 species, which are classified into 10 subgenera and 130 sections according to Maassoumi (1998), and 2398 species and 136 sections according to Podlech and Zarre (2013) in the world. Turkey has 63 sections and 457 taxa and the endemism rate is about 51% (Aytaç et al., 2012; Taeb and Uzunhisarcıklı, 2012; Dinç et al., 2013; Karaman Erkul and Aytaç, 2013). According to Podlech and Zarre (2013), the genus has 58 sections and 425 species in Turkey. Therefore, Turkey is an important diversification center of the genus.

The present study examined the sect. *Onobrychoidei*. One of the most challenging problems during this study was the delimitation of the members of the sect. *Onobrychoidei* from those of the sect. *Hololeuce* Bunge. The only significant difference that is useful in separating these two sections is the presence of a well-developed stem in members of the sect. *Onobrychoidei*, which is absent in the sect. *Hololeuce*. However, there are many transitional forms between these two sections. Consequently, some researchers attributed the members of one section to another and vice versa. For example, *Astragalus psoraloides* Lam. and *Astragalus xerophilus* Ledeb. were assigned to the sect. *Hololeuce* in the *Flora of USSR* (Komarov, 1965), while they were treated as members of the sect. *Onobrychoidei* in the *Flora of Turkey* (Chamberlain and Matthews, 1969). Another example is *Astragalus karputanus* Boiss. et Noé, which was first reported in the sect. *Onobrychoidei*, but transferred to the sect. *Hololeuce* (Chamberlain and Matthews, 1969). However, we are treating only the sect. *Onobrychoidei* in the classical sense (as defined in Chamberlain and Matthews (1969)) here and consider it as separated from the sect. *Hololeuce* until a more detailed analysis can be provided.

The reasons for treatment of the sect. *Onobrychoidei* in Turkey are summarized below: 1– problems regarding the previous determination key of the section in the *Flora of Turkey* (Chamberlain and Matthews, 1969), 2– addition of 11 new taxa to this section in recent years, which have not been included in any diagnostic key until now, 3– paucity of collection for some taxa, so that for several species, such as *Astragalus cicerellus* Boiss. and Balansa, *A. phanothrix* Bornm., *A. adunciformis* Boiss., *A. psoraloides* Lam., *A. canescens* DC., and *A. eubrychioides* Boiss., no collection later than 1900 was available.
2. Materials and methods

Many specimens kept in different herbaria (GAZI, ANK, AEF, HUB, EGE, W, M, MSB, E, K) were examined during this study. Several field trips were made to different locations during the vegetation time of flowering and fruiting periods between 2001 and 2004. The chromosome numbers were counted according to the methods of Elçi (1982). Morphological examinations based on the length of internodes; stipule texture and length; length of leaf; leaflet numbers; shape of leaflets; size of leaflets and their hair structure; inflorescence shape, bract texture and indumentum; calyx size and length of its teeth as well as their indumenta; shape of standard, wing, and keel; and size and shape of fruit and its beak. The measurements were provided based on at least 20 specimens.

The conservation statuses of endemic taxa are based on the IUCN Red List Criteria (2012).

According to morphological, palynological (Pınar et al., 2009), and cytological studies on the collected samples and the results of type specimens analyzed, some species have been reduced to synonymy and these changes are given in the Results section.

3. Results

**Astragalus** L. section *Onobrychoidei* DC., Prodr. 2: 285. 1825.

**Lectotype:** *Astragalus onobrychis* L.

**Type:** *Astragalus onobrychis* L.


**Lectotype:** *Astragalus onobrychis* L.


Distinctly or rarely shortly caulescent perennial herbs, hairs mainly bifurcate to simple. Stipules small, membranous, not joined to petiole, rarely joined to petiole. Leaves imparipinnate. Peduncle straight, mainly equal to leaves. Bracts ovate to lanceolate. Bracteoles absent. Calyx resembling a tube or like a bell. Petals without hairs or hairs very few. Wing and keel is adnate only at base to stamen tube. Stamen tube mostly truncate at mouth. Legumes bilocular. Chromosome number: 2n = 16, 32, 64.

<table>
<thead>
<tr>
<th>A new key for the Turkish species of the section <em>Onobrychoidei</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Corolla hairy</td>
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<tr>
<td>2. Only standard sparsely to loosely hairy on dorsal surface</td>
</tr>
<tr>
<td>3. Calyx 2–5 mm; its teeth 0.5–1.5 mm</td>
</tr>
<tr>
<td>4. Leaves 4–10 cm; leaflet pairs 10–13, upper glabrous; legumes 5–6 mm</td>
</tr>
<tr>
<td>5. Leaflets more than 4 pairs, mainly 2–4</td>
</tr>
<tr>
<td>6. Leaflets elliptic to obovate, calyx 8–10 mm, its teeth 3–5 mm</td>
</tr>
<tr>
<td>7. Plants herbaceous; Peduncle 5–10 cm; Leaflets 12–27 × 1–2 mm, glabrous or sparsely hairy; standard elliptic, distinctly narrowing into a tongue-like appendix..18. <em>xylobasis</em></td>
</tr>
<tr>
<td>8. Bracts 7–11 mm; calyx 11–15 mm, its teeth 6–9 mm</td>
</tr>
<tr>
<td>9. Standard at least 30 mm</td>
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<td>10. Leaves 7–15 cm; legumes 10–12 mm</td>
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<tr>
<td>11. Legumes pendulous</td>
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<tr>
<td>12. Standard 14–15 mm; calyx 5–6(–7) mm</td>
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<tr>
<td>13. Leaves 4–12 cm; Peduncle 5–18 cm; fruit 12–20 mm...</td>
</tr>
<tr>
<td>14. Raceme cylindrical, 30–50-flowered; bracts 5–7 mm</td>
</tr>
<tr>
<td>15. Calyx appressed hairs</td>
</tr>
<tr>
<td>16. Leaflets at most 10 pairs; standard 12–20(–22) mm</td>
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</tbody>
</table>

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17. Calyx 8–11 mm, its teeth 2.5–4 mm; standard emarginate at apex
18. Plants 5–15 cm; leaves 2–7 cm; Leaflets 3–10 mm.......... 
10. cadmicus
18. Plants usually taller than 15 cm; leaves 12–14 cm;
Leaflets 15–25 mm.................................................7. eliasianus
17. Calyx 5–8 mm, its teeth 1.5–2.5 mm; standard obtuse, 
subacute to retuse at apex 
19. Leaflets (4–) 5–8 pairs; standard obtuse at apex..........
11. psoraloides
19. Leaflets 8–13 pairs; standard subacute or retuse at apex 
20. Stems 1–8 cm; Leaflets 3–7 mm..........…..13. heldreichii
20. Stems 15–30 cm; Leaflets 7–14 mm...........15. lyicus
15. Calyx at least partly with ascending to spreading hairy 
21. The above part of leaflets glabrous to sparsely hairy 
22. Stems 1–5 cm; calyx 8–10 mm........12. onobrychis 
22. Stems 8–25(–40) cm; calyx 5–8 mm..........20. onobrychis
21. Leaflets densely hairy on both surfaces 
23. Standard emarginate at apex 
24. Peduncle 7–14 cm; standard 20–25 mm; fruits 10–12 
mm.................................................................16. asciocalyx
24. Peduncle 3–7 cm (if 8 cm, fruits 6–7 mm at A. 
adunciformis); standard 13–19 mm; fruits 6–10 mm
25. Leaflets subappressed to spreading hairy on both 
surfaces; fruit and calyx 6–7 mm...............8. adunciformis
25. Leaflets appressed hairy on both surfaces; fruit and 
calyx 7–10 mm...................................................9. demirizii
23. Standard not emarginate at apex 
26. Peduncle smaller than leaves; calyx simple hairy ...
...........................6. cancellatus
26. Peduncle longer than leaves; calyx bifurcate hairy 
27. Leaves 6–8 cm; standard 20–23 mm; inflorescence not 
elongating in fruit.............................................23. trachytrichus
27. Leaves 1.5–6 cm; standard 10–20 mm; inflorescence 
elongating in fruit
28. Raceme 7–15–flowered; stipule 5–7 mm; calyx 8–10 
(–12) cm; standard 7–8 mm wide...............2. mesogitanus
28. Raceme 15–40-flowered; stipule 2–5 mm; calyx 6–8 mm; 
standard 3–5 mm wide
29. Stipule 2–3 mm; standard 10–15 × 5 mm; fruits 6–8 
mm..............................................................14. karamasicus
29. Stipule 4–5 mm; standard 16–18 × 3–3.5 mm; fruits 
8–10 mm ........................................................5. strigillosus

Species descriptions
1. Astragalus cicerellus Boiss. and Balansa, Diagn. Pl. 
Or., Nov. ser. 2, 6: 53. 1859. Figs. 1–2.
Type: ad occidentem urbis Caesareae [bord des marais 
situés au NO de Césarée (Cappadoce)], 7.7.1856, Balansa 
(bolo.: G–BOIS photo!; iso: PI MSB!).
= Astragalus eskishehiricus Podlech, Sendtnera 6: 164, 
1999a. syn. nova
Holotype: Turkey: Eskişehir: 1 km South of Hamidiye, 
930 m, 15 June 1993, Nydegger 47470 (MSB!).

Plants up to 30 cm, hairs appressed. Stems growing 
flat along the ground, directing upward from a curved 
base, 5–30 cm, slightly branched near base. Stipules 3–7 
mm, below membranous at base with greenish tips, upper 
one greenish, stipules are free, margin of stipule is ciliate. 
Leaves 4–10 cm, usually without petiolate. Leaflets pairs 
are 10–13, leaflets are elliptic, 5–14 × 1–4 mm, obtuse at 
apex, glabrous above, sparsely hairy below. Peduncle 5–12 
cm. Raceme globose to ovate, densely 5–15-flowered,
in fruiting times slightly becoming elongate. Bracts are similar to membranous, 0.5–1 mm, narrowly triangular. Flowers subsessile. Calyx 2–5 mm, calyx is bell-shaped, hairs are white appressed and some black mixed; teeth 0.5–1.5 mm, linear. Petals yellow or violet. Standard 8–15 × 5–6 mm, lanceolate to ovate, rounded at apex, narrowed at base. Wings 5–10 × 2 mm, closely oblong, the apex slightly emarginate. Keel 4–7 × 2 mm, acutish at apex. Ovary sessile, has white hairs, style glabrous. Legumes erect, closely ellipsoid, 5–6 × 1.5–2 mm, shortly mucronate at apex; sparsely to densely appressed simple white hairy. Seeds 4, reniform, dark brown.

2n = 16 (Ekici 2543).

Fl. and fr.: 6–8. Steppe, sandy places; 1000–1600 m.

Distribution: Endemic, Irano-Turanian element (Ir.-Tur. el.).

Conservation status: VU

Specimens examined:

B3 Eskişehir: Çifteler–Sivrihisar 4 km, Abbashalimpaşa köyü girişi, tarla kenarı, 900 m, 19.6.2002, 39°24′08″N, 31°05′22″E, M. Ekici 2991 et al. (GAZI); Çifteler–Eskişehir, Hamidiye köyüne 1 km kala, tarla kenarı, 900 m, 19.6.2002, 39°33′72″N, 30°55′00″E, Ekici 2992 et al. (GAZI).

B4 Konya: Konya–Ankara, 9 km south of Kulu, 3.6.1993, 1040 m, Nydegger 47377 (MSB). B5 Kayseri: ad occidentum urbis Caesareae (bord des marais situes au NO de Cesaree, Cappadoce) 7.7.1856 Balansa s.n. (MSB); Develi–Yahyali, 15. km, steppe, 1350 m, 2.6.2001, 38°17′35″N, 35°25′60″E, M. Ekici 2535 et al. (GAZI); Çifteler–Eskişehir, Hamidiye köyüne 1 km kala, tarla kenarı, 900 m, 19.6.2002, 39°33′72″N, 30°55′00″E, Ekici 2992 et al. (GAZI). B4 Konya: Konya–Ankara, 9 km south of Kulu, 3.6.1993, 1040 m, Nydegger 47377 (MSB). B5 Kayseri: ad occidentum urbis Caesareae (bord des marais situes au NO de Cesaree, Cappadoce) 7.7.1856 Balansa s.n. (MSB); Develi–Yahyali, 15. km, steppe, 1350 m, 2.6.2001, 38°17′35″N, 35°25′60″E, M. Ekici 2535 et al. (GAZI); Çifteler–Eskişehir, Hamidiye köyüne 1 km kala, tarla kenarı, 900 m, 19.6.2002, 39°33′72″N, 30°55′00″E, Ekici 2992 et al. (GAZI). B4 Konya: Konya–Ankara, 9 km south of Kulu, 3.6.1993, 1040 m, Nydegger 47377 (MSB).

Until 2000, A. cicerellus was known only from holotype gathering. It was considered CR according to Ekim et al. (2000). However, after this study, it was indicated that it has distribution around Ankara, Eskişehir, Kayseri, and Konya as well. Therefore, it should be VU (IUCN, 2012).


= Astragalus hololeucoides Podlech and Sytin, Sendtnera 8: 155. 2002. syn. nova

Lectotype (Podlech, 1998): Turkey. Burdur: Dirmil to Tefenni, 1260 m, 9 June 1938, Huber–Morath 5531 (G: sheet marked as lectotypus, photo in E! and MSB!; iso: G: photo in LE! and MSB!).

Plants 15–30 cm tall, mainly with bifurcate hairs, 0.2–2 mm. Caudex strongly and intricately branched. Stems 3–16 cm, branched near base. Stipules brownish, membranous, 5–7 mm, not joined to petiole, near base often glabrous, ciliate at margins. Leaves 1–6 cm; petiole 1–2 cm, rarely 0.5 cm, hairs are appressed to directing upward from a curved base. Leaflets in 4–11 pairs, 2–10 × 0.5–3.5 mm, closely elliptic, acute at apex, both surfaces mainly with bifurcate hairs, sometimes folded. Peduncle 2–10 (~18) cm, erect, often curved, angular, covered with white and black hairs, partly hairy. Raceme densely obovate to oblong, has about 7–15 flowers, during fruiting time becoming elongate. Bracts whitish, 2–5 mm, narrowly ovate, acute, has black and white hairs. Pedicels 0.8–1 mm, hairy. Calyx 8–10 (~12) mm, tubular, with flexuous, subbifurcate, appressed to subapressed black hairs and with bifurcate straight or directing upward from a curved base, white hairs, sometimes only with white hairs; teeth 2–4 (~5) mm, subulate. Petals violet or mauve. Standard 15–22 × 7–8 mm, rhombus-shaped to shape of an ellipse, at apex narrowly rounded, above side with white hairs, more rarely subglabrous. Wings 13 × 6–7 mm, narrowly oblong, rounded at apex. Keel 10–11 × 5 mm, oblong, rounded at apex. Ovary sessile, elliptic, hairy; style only hairy at base. Legumes dense, obliquely erect, sessile, 5–11 × 2–3 mm, narrowly ellipsoid to ovoid, appressed bifurcate and subbifurcate white hairy, carinate ventrally, rounded dorsally, constricted at apex into an acute; beak 2–5 mm, curved. Seeds 4, dark reddish-brown, shiny. 2n = 16 (M. Ekici 2545).


Specimens examined:

A3 Ankara: Beypazarı, Nallihan, meyve bağları, 18.5.1978, Y. Akman 8833 (ANK); Nallihan to Mudurnu, 850 m, dry banks, 9.7.1962, Davis 37075 and Coode (E).

A4 Ankara: Ankara–Ayaş, Akyatak mevkii, steppe, 1200 m, koruma bölgesi, 1000–1100 m, 13.6.1990, Z. Aytaç 3107 (GAZI); Ayaş–Beypazarı, Güdül yol ayrımı, 750 m, 19.5.1985, H. Sümül 3288 (ANK); Kırıkkale: Delice Büyükavşar köyü, Büyükhemit mev., 1150 m, 16.6.1990, meşelik, C. Birden 1130 (GAZI).

B1 İzmir: In alpina Tmolii (Boz Dağları) supra Philadelphiam, 6.1842, E. Boissier s.n. (K).

B2 Burdur: Tefenni–Çavdır arası, Karakuzu geçidi, yol kenarı yamaç, 1280 m, 25.5.1993, L. Bekat 3022 et E. Leblebici (EGE); Burdur–Antalya 6. km, Y akaköyü çevresi, 1200 m, 7.7.1993, L. Bekat 3113 et E. Leblebici (EGE); Tefenni–Çavdır 9–10. km, step, 1200 m, 29.5.2002, 37°13′97″N, 29°44′94″E, M. Ekici 2888 et al. (GAZI); Afyon: Denizli–Çardak, 10 km from Dinar, 1000–1200 m, Q. coccifera, 10.6.1962, Davis 35641 and Dudley (E); 11 km west of Dinar on the road from Denizli to Dinar, 15.6.1966, R. Alava 5176 and G. Bocquet (E); Uşak: Uşak, 940 m, 8.7.1857, Balansa 1225 (MSB); 11 km west of Dinar on the road from Denizli to Dinar, 15.6.1966, R. Alava 5176 and G. Bocquet (E); Uşak: Uşak, 1000–1200 m, Q. coccifera, 10.6.1962, Davis 35641 and Dudley (E); 11 km west of Dinar on the road from Denizli to Dinar, 15.6.1966, R. Alava 5176 and G. Bocquet (E); Uşak: Uşak, 940 m, 8.7.1857, Balansa 1225 (MSB); Yaporlar köyü girisi, 900 m, 22.6.1993, Ö. Seçmen 4234 (EGE); Uşak: Sivaslı, Karagöl deresi civari, 800 m, 22.6.1993, Ö. Seçmen 4246 (EGE); Kütahya: Dumulpınar, Çalköy, Zafertepe Şehit Şançanlar anıtı civari, 1150 m, 5.7.1996, Ö. Seçmen 4747 (EGE). B3 Afyon: Bayat’ın 2 km kuzeydoğusu, 1050 m, Ö. Seçmen 2249 et al. (EGE); Bayat, Köröglübeli, yol kenarı, 1350 m, 25.5.1975, M. Vural 117 (ANK); Bilecik: Karaköy bei Bilecik, 8.6.1873, Dingler 97 (M); Eskişehir: Sündiken Dağı, kaliker ve marnlı step, 1000–1300 m, 21.6.1973, T. Ekim 594 (ANK, E); 18 miles from Polatlı to Sivrhisar, 800 m, chalky fields, 12.4.1965, Coode et Jones 2287 (E);
Ekici et al. / Turk J Bot

Isparta: Senirkent, Garip köyü çıkışı, Kadıdağ serisi, Cedrus libani orman çıkışı, 1250 m, 9.6.1983, L. Bekt 1017 (EGE).
B4 Konya: 21 km N Hûyûk, zwischen Doganhisar und Beşsehir, 1400 m, 1.6.1992, Nydegger 46145 (MSB); Akschefer (Aksheker), 1100 m, 13.6.1899, Borrmüller 4389 (B); Sultandagh supra Engeli (Engilli), 1500 m, Borrmüller 4391 (MSB); Yavuşan Memlehası, nr. Tuz Gölü, 8.6.1952, Davis 18672 et Dod (E); 53 km N Konya, 1000 m, 29.5.1973, Sorger 73–3–30 (W); 16 km N Konya, 1200 m, 10.6.1966, Sorger 66–38–38 (W); in valle Baschara–Su ad Konya, 13.6.1911; Antrasovský 444 (B); Konuklar Nadas, step, 30.5.1956, H. Birand 139 (ANK); Kulu–Konya 9 km, step, 1050 m, 17.5.2001, 39°00′28″N, 33°01′62″E, M. Ekici 2197 (Gazi).

Ankara: NE Polatlı, 1020 m, summer 1965, Ankara: "E, "62 28 step, 1050 m, 17.5.2001, 39°00′13″ (ANK); Kulu–Konya 9 km, 19.6.1979, M. Vural 1484 (ANK); C5 Adana: W Bosanti–sou (Pozanti), sur la route de Tarsus à Césarée (Kayseri), 13.6.1856, Balansa 933 (MSB); Pozanti to Niğde, 8–10 km, 1300 m, fallow fields and roadside, 20.5.1965, Coode et Jones 1250 (E). Niğde, 1900 m, 7.6.1898, Siehe 64 (W); (Ulukışla) bei Bereketli Maaden, 1600 m, 6. 1906, Siehe 330 (W); Ulukışla–Darboğaz yol ayrımı, kalker kaya, 13.6.1991, Y. Gemici 6070 (EGE).

Astragalus mesogitanus has a wide distribution population in Turkey, especially in Central Anatolia. According to Chamberlain and Matthews (1969), it is different from A. lydius only in fruit characters, which should be 5–9 mm and ovate in A. mesogitanus, while 10–11 mm and oblong–lanceolate in A. lydius. As there are several samples with fruits of intermediate size and shape, we reduced A. lydius to synonymy here. The pollen structures are also the same among the specimens attributed to both species (Pınar et al., 2009).

The standard of A. mesogitanus is generally pubescent. However, during the fieldwork done in the vicinity of Burdur, the standard of some specimens was found to be totally hairless. These specimens were described as a new species (namely A. hololeucoides) by Podlech and Sytín (2002). As the density of hairs on the standard can be variable among different samples, this variation is not considered to be reliable and the taxonomic names reflecting this variation are reduced here to synonymy.

Some specimens, which have been determined as A. mesogitanus in the Flora of Turkey (Chamberlain and Matthews, 1969), belong in fact to A. lycaonicus Hub.–Mor. and Reese (Ekici et al., 2005).


Type: Turkey. Kleinasien, Lycaonien, Konya, 5.6.1937, H. Reese s.n.

Plants 10–15 cm, growing flat along the ground to directing upward from a curved base, strongly divided. Stipules 4–7 mm, ovate, free from petiole, loosely hairy, often glabrous at base, ciliate at margins. Leaves 2–5 cm; petiole 1–2 cm, adpressed and spreading white hairs are dense. Leaflets 4–8 pairs, 3–10 × 1–2 mm, linear–ellipsoid, elliptic, oblong or egg-shaped, two sides with adpressed hairs. Peduncle 2.5–8 cm, erect, sometimes curved, white
and black hairs are dense, partly glabrescent. Inflorescence a dense globose raceme, about 25-flowered, becoming elongate during fruiting time. Bracts white to yellowish, 2–6 mm, linear–lanceolate, acute, with white and black hairs. Pedicels 0.4–0.5 mm, hairy. Calyx 8–12 mm, tubular, with flexuous adpressed to subadpressed black hairs and adpressed to spreading straight or directing upward from curved base hairs, sometimes with only white hairs; teeth 2–5 mm, linear, often predominantly black hairy. Petals violet or mauve. Standard 15–20 × 4–5 mm, rhombic–ellipsoid, upper white hairy. Wings 12–14 mm, closely oblong, white hairy. Keel 9–11 mm, oblong, above white hairy. Ovary sessile, elliptic, hairy; style not hairy above. Legumes sessile, obliquely erect, 7–9 × 3–4 mm, ellipsoid, appressed and simple spreading white hairs are dense; beak 2–4 mm, curved. Seeds ovoid to globose, 2–3 mm, dark brown, smooth. 2n = 16 (M. Ekici 3850).

Fl. and fr.: 5–7. Steppe, open forests; 1000–1650 m.

Distribution: Endemic. East Mediterranean Element (E. Medit el.).

Conservation status: NT

Specimens examined:
C4 Konya: Ermenek, Yassikaya (Keben) üstü tepeler, 1100–1600 m, 15.6.1982, M. Koyuncu 5379 et al. (AEF, GAZI); Ermenek–Tekeçatı giriş, dağı stebi, 1650 m, 31.5.1979, M. Vural 1316 (GAZI); Ermenek–Mut, Narlısu’dan sonra, korunmuş makilikler, 1100 m, 2.5.1980, F. Ilisulu s.n. (AEF, GAZI); Konya: dry sand wind eroded plain, 1000 m, Topraksu Government Station near Karapınar, 100 km east of Konya, 16.7.1965, G.F. Ledingham 4366 and T. Ekim, R. Yurdakulol (E); Konya–Beyşehir, steppe, 8 km westlich, Konya, 1140 m, 5.6.1948, H. Morath s.n. (E). C5 Mersin: Gülnar–Silifke, P. brutia açıklık, A. Everest s.n. (GAZI).

During this study, several specimens were collected from the Konya, Ermenek, and Karaman regions containing densely hairy corolla. As mentioned above, in Astragalus mesogitanus, only the standard is hairy. This character makes A. lycaonicus unique in the section and brings it closer to the sect. Sisyrophorius Bunge. In addition, the fruits in A. lycaonicus are adpressed and simple hairy and not as in A. mesogitanus.


Type: Anatolia. Near Karahisar, Cappadocia, 20 June 1856, Balansa 152 (G–BOIS photo!; iso: P!).

Figure 4. Astragalus lycaonicus: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 3248).

Figure 5. Distribution map of Astragalus strigillosus (■), A. lycaonicus (▲), A. psoraloides (★), A. eliasianus (□), and A. setulosus (∆).
Table 1. Character comparison of *A. setulosus* and its synonyms (according to literature and specimens examined).

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>A. setulosus</em></th>
<th><em>A. konyaensis</em></th>
<th><em>A. sakaryaensis</em></th>
</tr>
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<tr>
<td>Stem</td>
<td>5–20 cm</td>
<td>up to 30 cm</td>
<td>c. 12 cm</td>
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<tr>
<td>Leaves</td>
<td>7–12 cm</td>
<td>10–15 cm</td>
<td>4–6 cm</td>
</tr>
<tr>
<td>Leaflets</td>
<td>4–12 mm</td>
<td>6–23 mm</td>
<td>4–10 mm</td>
</tr>
<tr>
<td>Peduncle</td>
<td>5–12 cm</td>
<td>9–19 cm</td>
<td>6–10 cm</td>
</tr>
<tr>
<td>Calyx</td>
<td>9–11 mm</td>
<td>11–15 mm</td>
<td>11–12 mm</td>
</tr>
<tr>
<td>Calyx teeth</td>
<td>(3–) 5–7 mm</td>
<td>6–9 mm</td>
<td>2.5–4 mm</td>
</tr>
</tbody>
</table>


Type: Konya: Ereğli–Karapınar 22. km, *Huber-Morath* 13324 (Gb: hh. H.uber-Morath)


*Astragalus sakaryaensis* Podlech and M. Ekici, Feddes Repert. 119: 30. 2008. syn. nova

Plants 6–35 cm tall. Root stock has small branches. Stems mostly a few, 5–30 cm, procumbent to erect, bifurcate and curved base hairs are dominant. Stipules greenish, 5–12 mm, closely triangle-shaped, not joined to petiole, bifurcate hairy. Leaves 7–15 cm, petiole 0.5–1.5 cm, with spreading long hairs. Leaflets in 6–11 pairs (in side branchlets often with 4–5 pairs of small leaflets), 4–23 × 2–7 mm, elliptic. Peduncle 5–20 cm, white hairs. Raceme short, globe-like to egg-shaped, densely 10–15–flowered. Bracts somewhat green; 6–11 mm, closely like a triangle to linear–acute, directing upward from curved base subbifurcate and simple white hairs are dense, at margins mostly sitting on small tubercles. Pedicels 0.8–1 mm, simple white hairy. Calyx 9–15 mm, tubular–campanulate, with bifurcate white hairs; teeth 4.5–7 mm, subulate, sparsely hairy on inner side. Petals violet, glabrous. Standard 16–20 × 6–10 mm, ovate, rounded and slightly emarginate at apex. Wings 11–14 × 6–9 mm, narrowly obovate, obliquely retuse at apex. Keel 9–12 × 4–6.5 mm, obliquely obovate, with widely rounded lower side and nearly straight upper side, minutely acuminate at apex. Ovary sessile, egg-shaped, hairy; style not hairy. Legumes 10–12 × 2.5–3 mm, oblong, erect simple setulose; beak 1.5–2.5 mm. Seeds 2–3.5 mm, brown, smooth. 2n = 32 (*M. Ekici* 2544).

Fl. and fr.: 5–7. Steppe, rocky and scree places, open forest; 700–1900 m.

Distribution: Endemic, Ir.-Tur. el.

Specimens examined:


The differences among *Astragalus setulosus*, *A. konyaensis*, and *A. sakaryaensis* are based on measurements rather than structures and there are many overlapping cases (Podlech, 1999a). Based on comparison of the material from the type locality and adjacent areas, the separation of these taxa is not supported. Podlech and Zarre (2013) reduced *A. konyaensis* to a synonym of *A. setulosus*. Moreover, *A. sakaryaensis* was reduced to a synonym of *A. setulosus*, because all the characters are overlapping with those of *A. setulosus*. In addition, it is growing in the same area. This new synonym is a kind of variation of *A. setulosus* (Table 1).

According to Maassoumi (1998), *Astragalus leonidae*, which is reported from Georgia, is a synonym of *A. setulosus*, but we did not examine the Georgia specimen. Therefore, *A. setulosus* should be kept in the list of Turkish endemic species.

Tragacantha strигillosа (Bunge) Kuntze, Revis. Gen. 2: 948. 1891.

Type: Turkey. Anatolicae prov. Tokati in monte Kisch–kisch–dagh, Wiedemann s.n (P: photo in MSB!; G–BOIS photo!).

Plants 10–25 cm, branched. Stems a few, procumbent to directing upward from a curved base, 6–18 cm, branched, with bifurcate white hairs, often flexuose–tangled. Stipules membranous to greenish, 4–5 mm, closely triangle-shaped, not joined to petiole, bifurcate white and black hairy, simple hairs at margins sometimes sitting on minute tubercles. Leaves 2.5–5 cm, petiolate; rachis bifurcate white hairs. Leaflets 8–12 pairs (rarely with 5–7 pairs of small leaflets), 4–10 × 1.5–3.5 mm, closely ellipse shape, subacute to acute at apex, directing upward from a curved base, bifurcate and rigid hairs are dense. Peduncle 3–11 cm, with black hairs. Raceme short, globose to ovoid, densely 20–40-flowered. Bracts membranous, 3–4 mm, closely triangle-shaped, has white hairs, at margins with simple hairs. Pedicels 0.5–1 mm, mostly with white hairs. Calyx 6–8 mm, tubiform–campanulate, with bifurcate black hairs; teeth 2–3 mm, subulate, inner side with white hairs. Petals glabrous, purplish–blue. Standard 16–18 × 3–3.5 mm, gradually tongue-like narrowed in upper half, rounded at apex. Wings 10–11 × 2 mm, closely in the form of a rectangle, tip not sharp. Keel 8–9 × 2 mm, in the form of a rectangle. Ovary sessile, egg-shaped, generally with white hairs; style not hairy. Legumes, sometimes erect, 8–10 × 2 mm, narrowly ellipsoid, hairy, slightly grooved dorsally; beak 3–4 mm, curved. Seeds 2–2.5 mm, pale brownish, shallowly pitted. 2n = 16 (M. Ekici 3188).

Fl. and fr.: 4, 7. Steppe, gypsum and scree places; 500–2400 m.

Distribution: Turkey, Russia. Ir.-Tur. el.

Specimens examined:

A4 Ankara: Çubuk yolu, 4.6.1943, H. Bağda s.n (ANK); Çankırı: ad oppodium Çankırı (Germanicopolis), 800 m, 10.6.1929, Bornmüller 14009 (B); ibid. gypsum hills, 5.6.1954, Davis 21516 (ANK, E). A5 Amasya: Amasia, 10.5.1889, Bornmüller 102 (B, W); Merzifoun, 5.5.1892, Manisadjan 1182b (B, M, W); Sana–dagh, 1000 m, 14.5.1890, Bornmüller 1841 (B); Suluova, 700 m, clay and rocks, 31.5.1969, Tobey 2648 (E); Çorum: Boğazkale, 1000 m, 16.6.1971, Sorger 71–7–98 (W); Kastamonu: Tossia, ad Kawak Tschechme, 7.6.1892, Sintenis 4105 (E, MSB); Tossia, 21.5.1892, Sintenis 3888 (M); 12 km S Taşköprü
an der Strasse nach Tosya, 550 m, 24.5.1988, Nydegger 43110 (MSB); Kastamonu, Manisadjan 1183 (W); Buzluk, Kastamonu, 8.6.1892, Manisadjan 1182 (B, M, W); Küre, 4000 ft, on semi-steppe hills, 8.6.1954, Davis 21698 (E); Dikmen–dagh, 900–1000 m, 2.6.1929, Bornmüller 14008 (B); Samsun: Ladik, at Buroboy–Taşova road, 700 m, 10.6.1964.

Tobey 730 (E). A6 Tokat: Tokat, 500–600 m, 11.5.1889, Bornmüller 102 (B); Anatolicae prov. Tokatensi in monte Kisch–dagh Wiedemann s.n. (MSB photo). B3 Afyon: 10 km SW Iscehisar an der Strasse nach Afyon, 1070 m, 27.5.1969, Buttler 13193 (M).

B4 Ankara: Koçhisar yolu, 137. km, 25.4.1953, H. Birand 1410 (ANK); Tuzgölü NW de yavşan birliği, H. Birand 228 (ANK).

B5 Kayseri: Erciyes Dagi, auf dem Pelikartyny oberhalb Goreme, 2400 m, 6.1902, Zederbauer 528 (W); Kayseri–Ürgüp 29. km, step, 1000 m, 1.6.2002, M. Ekici 2954 et al. (GAZI).

C4 Konya: Adana–Konya 242. km, Karapınar çevresi, 29.5.1956, H. Birand s.n. (ANK); Karapınar, 7.6.1974, H. Khom 1214 (ANK); Ereğli–Karapınar 20–25. km, step, 1000 m, 1.6.2002, M. Ekici 2954 et al. (GAZI).

Astragalus strigillosus has been found to have a distribution in Russia (Maassoumi, 1998). Also we examined the specimen from Russia and decided this species is not endemic for Turkey.


= Astragalus phanothrix Bornm., Magyar Bot. Lapok 14: 52. 1915. syn. nova


Type: Azerbaijan. Transcausica, prov. Nachitschevan, in montibus Darry–Dagh, 1000 m, 22.5.1923, A.A. Grossheim s.n. (holo.: ERE; iso: LE).


Lectotype: Azerbaijan. Transcausica australis, distr. Nachitschevan, prope oppidum
ovoid, with 10–25 flowers. Bracts greenish, 2–7 mm linear, acute, hairy. Flowers have short pedicel. Calyx 6–10 mm, campanulate, tube whitish, with white and black bifurcate hairs; teeth greenish, 3–5 mm, subulate, hairy like tube. Petals purple or violet. Standard 13–20 (23) × 5–7 mm, elliptic, at base cuneately narrowed. Wings 10–12 (15) × 2–3 mm, obliquely obovate, rounded or laterally slightly retuse at apex. Keel 8–10 (11) × 2–2.5 mm, obovate, obtuse to acute at apex. Ovary hairy; style glabrous. Legumes sessile, 5–12 × 2–3 mm, ellipse-shaped, bifurcate hairy white hairy; beak 3–5 mm, curved. Seeds 2–3 mm, dark greenish to brown, smooth. 2n = 32 (M. Ekici 75).

In the key, *A. cancellatus* is included in an informal group, characterized by a calyx that has simple villous hairs, and *A. perrarus* is included in another group with a short calyx that has spreading bifurcate hairs. However, after analyzing the material attributed to *A. perrarus*, it was found that its calyx has simple hairs. After the fieldwork and analysis of several herbarium specimens assigned to *A. perrarus*, we became certain that the calyx is always simple hairy in this species. The morphological characters that should be useful in distinguishing these two species based on the *Flora of Turkey* (Chamberlain and Matthews, 1969) are presented in Table 2.

A similar confusion has occurred for *Astragalus phanothrix* in the *Flora of Turkey* (Chamberlain and Matthews, 1969). It should be an endemic species in Turkey, resembling *A. setulosus*. In the key, *A. phanothrix* was given as calyx bifurcate hairy. However, in the original identification, the calyx of this species was described as simple hairy. As the other differences useful in distinguishing these two species were rather obscure, we consider *A. phanothrix* also to be a synonym of *A. cancellatus*.

### Table 2. Character comparison of *A. cancellatus* and its synonyms (according to literature and specimens examined).

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>A. cancellatus</em></th>
<th><em>A. perrarus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stipule</td>
<td>3–4 mm</td>
<td>2–3 mm (4–5 mm, <em>Flora of USSR</em>)</td>
</tr>
<tr>
<td>Inflorescence</td>
<td>c. 15-flowered 3–7 mm</td>
<td>18–25-flowered, much elongating in fruit</td>
</tr>
<tr>
<td>Bracts</td>
<td>8–10 mm</td>
<td>c. 2 mm (3–6 mm, <em>Flora of USSR</em>) 8–11 mm</td>
</tr>
<tr>
<td>Calyx</td>
<td>4–5 mm</td>
<td>3–4 mm</td>
</tr>
<tr>
<td>Corolla</td>
<td>13–18 mm</td>
<td>16–21 mm</td>
</tr>
<tr>
<td>Legume</td>
<td>6–8 mm</td>
<td>11–12 mm</td>
</tr>
</tbody>
</table>


**Type:** A9 Kars: 10 km South of Sarıkamış, open *Pinus sylvestris* forest, 2200 m, 23 July 1981, Sorger 81–48–1 (Hb. F. Sorger; iso. RSA).

Plants erect, to 50 cm, covered mostly with bifurcate white hairs. Stems 8–20 cm, sulcate, appressed hairy. Stipules 4–6 mm, almost not joined to petiole, covered with bifurcate pilose hairs. Leaves 12–14 cm, petiole 2–5 cm, dominant with appressed bifurcate hairs. Leaflets 6–9 paired 15–25 × 2–4 mm, narrowly elliptic, acutish to mucronulate at tip, appressed hairs are on both sides. Peduncle 20–28 cm, dominant with appressed hairs. Raceme has 15–20 flowers, it becomes elongate during fruiting, up to 4–5 cm. Pedicels 0.7–1 mm. Flowers erect. Bract membranous, 2–5 mm, lanceolate, hairs are sparse, margins with ciliate. Calyx 8–10 mm, tubular–campanulate, dominant with bifurcate black and white hairs; teeth 1.5–2.5 mm, triangular, inner side has been covered with asymmetrically bifurcate and simple hairs.
Petals glabrous, purple. Standard 20–22 × 4–6 mm obtusely rhombic, emarginate at tip as shallowly, mainly becomes narrow at bottom. Wings 17–18 × 3–4 mm, narrowly rectangular, obliquely emarginate at apex. Keel 13–16 × 2–3 mm, obliquely narrowly ovate, with nearly straight upper side, acutish at apex. Ovary sessile, densely long white–villous with few black bifurcate hairs at base of style. Legumes with stalk, about 1 mm, 15–20 × 5–6 mm, oblong–ovoid, tuberculate, spreading subbifurcate black and simple white hairy; beak 2–3 mm, slightly curved. Seeds 1–2 mm, brown, rugulose. 2n = 32 (Ekici 2611).

Fl. and fr.: 7–8. Open forest; 2200 m.

Distribution: Endemic. Ir.-Tur. el.

Conservation status: CR.

Specimens examined:

A9 Kars: 10 km from Sarıkamış to Erzurum, P. sylvestris openings, 2000 m, 21.7.2001, 40°15′46″N, 42°38′14″E, M. Ekici 2611 et al. (GAZI).

Kit Tan and Sorger identified Astragalus eliasianus as a new species in 1987. It has a natural distribution only in its type locality, among Scots pine (Pinus sylvestris L.) forest neighborhood in Sarıkamış, town of Kars, east Anatolia. The distribution of this species, which is very narrow between open forest and roadsides, is under significant danger due to pasturage and future road widening works. The future of the species is under threat if the necessary measures are not taken. Therefore, it should be CR (IUCN, 2012).

8. Astragalus adunciformis Boiss., Diagn. Pl. Or. Nov. ser. 1, 2: 42. 1843. Figs. 2, 10
≡ Tragacantha adunciformis (Boiss.) Kuntze, Revis. Gen. 2: 942. 1891.

Type: Turkey. Asia Minores, P.M.R. Aucher–Eloy 1352 (G–BOIS photo!; iso: BM, FI, FI–WEBB, K!, LE, MSB!, P: photo in MSB!).

Plants 15–25 cm. Stem erect or ascending at bottom, 4–20 cm, branched, dominant with bifurcate white hairs, sometimes with some black hairs. Stipules membranous with partly greenish tips, 2–5 mm, joined to petiole about 0.5–1 mm, free tips often greenish, narrowly triangular, margins with simple hairs. Leaves 4–7 cm; petiole 0.5–2 cm, loosely to densely hairy. Leaflets in 8–11 pairs, 3–5 × 0.5–1 mm, narrowly elliptic, obtuse at apex, two sides dominant with bifurcate, subappressed to spreading, white hairs. Peduncle 4–8 cm, angular–sulcate, in

Figure 9. Astragalus eliasianus: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2611).

Figure 10. Astragalus adunciformis: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamen, g. ovary (M. Ekici 2201).
upper part with increasing black hairs. Raceme densely 6–12-flowered. Bracts membranous, 2–4 mm, narrowly triangular, predominantly white and margins bifurcate hairy. Pedicels 0.4–0.6 mm, white hairy. Calyx 6–7 mm, tubular–campanulate, bifurcate white hairs at dorsal side are dominant and at teeth also with black hairs; teeth 1–2 mm, narrowly triangular, inner part is white hairy. Petals glabrous, purplish–violet. Standard 15–16 × 4 mm, narrowly oblong, widely emarginate at apex. Wings 10–11 × 1–2 mm, narrowly oblong, obtuse at apex. Keel 8–9 × 1–1.5 mm, oblique–obovate, upper edge straight, lower edge curved. Ovary sessile, white hairy; style not hairy. Legumes sessile, obliquely erect, 6–7 × 2 mm, narrowly ellipsoid, with spreading subbifurcate white hairs; beak 2–3 mm, curved to hooked. Seeds 2–3 mm, brown, smooth. 2n = 16 (M. Ekici 2546).

Fl. and fr.: 5, 7. Steppe; 1100–1200 m.

Distribution: Turkey, China, Iraq, Russia. Ir.-Tur. el.

Specimens examined:


Astragalus adunciformis was only known from its type material from the Kayseri region. However, it is realized that the species also has a large distribution area in Asia (Maassoumi, 1998).


Type: Ankara, Tuz Lake, 14 km South of Sereflikoçhisar, 900 m, 20.5.1986, Kramer 52 (BSB–VO: MSB photo!; iso: BSB–VO, MSB!).

Plants procumbent to ascending, 20–50 cm, mostly has ±bifurcate white hairs. Caudex about 10 mm diam. Stems 10–45 cm, appressed hairy. Stipules membranous, 2–4 mm, not joined to petiole, with two triangular tips, sparsely covered with bifurcate hairs, glabrescent, ciliated. Leaves 6–10 cm, rarely 2 cm; petiole about 0.2–0.5 cm, appressed bifurcate hairy. Leaflets 6–9–paired, closely ellipsoid to narrowly ovate, 5–12 × 2–5.5 mm obtuse or acute, both surfaces appressed hairy. Peduncle 3–7 cm, appressed hairy. Raceme with 20–50 flowers, becoming elongate during fruiting, about 7 cm. Pedicels 0.8–1 mm. Bract membranous, 1.5–2.5 mm, triangular–triangle-shaped, sparsely hairy, ciliate at margin. Calyx 8–10 mm, tube-like to slightly inflated, appressed bifurcate white hairy; teeth 1–2 mm, triangular, with bifurcate and simple hairs. Petals glabrous, pink, fading dark violet. Standard 13–19 × 6–9 mm, gradually narrowed at base. Wings 12–18 × 1.5–2.5 mm, narrowly oblong, widely emarginate at apex. Keel 10–14 × 2–2.5 mm, obliquely and narrowly egg-shaped, with nearly straight upper side, acute at apex. Ovary sessile, covered with somewhat flattened white hairs; style hairy at bottom. Legumes about 1 mm stalk, 7–10 × 2–3 mm, narrowly ellipsoid, with subbifurcate straight to flexuous hairs, carinate ventrally, rounded dorsally; beak 1–1.5 mm, strongly curved. Seeds 1–2 mm, brown, rugulose. 2n = 16 (M. Ekici 2977).

Fl. and fr.: 5, 7. Salty places; 900–1000 m.

Distribution: Endemic.

Conservation status: CR.

Specimens examined:

B4 Ankara: Sereflikoçhisar–Ankara 10 km, tuzcul alanlar, 950 m, 5.6.2002, 39°01′44″N, 33°26′92″E, M. Ekici 2982 et Z. Aytac (GAZI); Sereflikoçhisar–Ankara 18. km, Tuz gölü kenari, 39°04′47″N, 33°24′67″E, M. Ekici 2977 et Z. Aytac (GAZI).

Astragalus demirizii was known from type gathering. It is under danger due to the fact that its distribution area is between agricultural lands and a salt lake. The risk of utilization of this area as an agricultural land and pasture field is relatively high. The population of the species is rather poor. Therefore, it should be CR (IUCN, 2012).


≡ Tragacantha cadmica (Boiss.) Kuntze, Revis. Gen. 2: 943. 1891.
**Lectotype** (Podlech, 1998): in Cadmo (Babadag) supra Denisleh, 6.1842, Boissier s.n. (G–BOIS photo!; iso: C, LE, MSB!, P, W!).


Plants (4–) 10–15 cm, hairy. Rootstock has branches that are short to elongated, slender. Stems many, growing flat along the ground to directing upward from a curved base or erect, slender, 1–8 cm, branched near base, bifurcate white hairs are dominant, the nodes with black hairs. Stipules membranous, sometimes with greenish tips, 3–4 mm, closely triangle-shaped to triangular, not joined to petiole, white hairy or black hairy at base. Leaves 2–7 cm; petiole 0.8–1.5 cm, hairy. Leaflets (4–) 5–9-paired, 3–10 × 1–1.5 mm, closely ellipsoid to obovate, subacute to obtuse or retuse, bifurcate white hairs are dominant. Peduncle slender, 3–7 cm, dominant with white hairs or black hairy. Raceme capitate to egg-shaped, densely 4–10-flowered. Bracts whitish, 1–3 mm, triangle-shaped, has white and black hairs, simple hairs present at margins, and sessile glands near base. Pedicels 0.8–1 mm, has predominant black hairs. Calyx 8–11 mm, tube-like, dominant with bifurcate hairs; teeth subulate, 3–4 mm, inner part is white hairy. Petals violet. Standard 15–20 × 6 mm, elliptic, gradually and ±equally narrowed toward emarginate apex and toward base. Wings 14–15 × 2 mm, narrowly oblong, rounded. Keel 12–13 × 2–3 mm, subacute. Ovary hairy; style not hairy. Legumes sessile, obliquely erect, 9–10 × 2–3 mm, narrowly oblong, with bifurcate white hairs, glabrescent soon, narrowly grooved dorsally; beak 2–3 mm, curved. Seeds 2–3 mm, smooth. 2n = 32 (*Ekici* 2998).

Fl. and fr.: 5, 7. Steppe, scree and rocky places, open forest; 600–2300 m.

Distribution: Endemic.

Conservation status: LC.

Specimens examined:

A2 (A) Bilecik: 26 km N Bozüyük, 600 m, 22.5.1962, *Sorger* 62–18–4 (W).

B2 Kütahya: ad Tscheltikci (Çeltikçi) Pisidiae S Bouldour toward Adalia, 20.5.1845, *Heldreich* *Figure 12. *Astragalus cadmicus*: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (*M. Ekici* 2878).

![Figure 12](image12.png)

*Figure 13. Distribution map of *Astragalus asciocalyx* (■), *A. heldreichii* (▲), *A. cadmicus* (□), and *A. karamasicus* (∆).*

![Figure 13](image13.png)
The habitus of *Astragalus cadmicus* is similar to that of *A. heldreichii*, but it is distinguishable from the latter by having a longer calyx as well as long calyx teeth.


≡ *Astragalus canescens* DC., Astragalogia: 142, t. 16. 1802. syn. nova


≡ *Astragalus georgicus* Boiss., Diagn. Pl. Or. Nov. ser. 1, 2: 42. 1843.

**Table 3.** The morphological characteristics useful in distinguishing *Astragalus psoraloides*, *A. canescens*, and *A. robertianus* (Davis et al., 1988).

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>A. psoraloides</em></th>
<th><em>A. canescens</em></th>
<th><em>A. robertianus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>5–12 cm</td>
<td>4–6 cm</td>
<td>6–12 cm</td>
</tr>
<tr>
<td>Stipule</td>
<td>3–6 (–8) mm</td>
<td>c. 3 mm</td>
<td>6–8 mm</td>
</tr>
<tr>
<td>Peduncle</td>
<td>5–17 mm</td>
<td>c. 9 mm</td>
<td>12–17 cm</td>
</tr>
<tr>
<td>Raceme</td>
<td>5–20-flowered, elongating in fruit</td>
<td>c. 15-mm, elongating in fruit</td>
<td>c. 10-flowered, not elongating in fruit</td>
</tr>
</tbody>
</table>

Figure 14. *Astragalus psoraloides*: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (*M. Ekici* 2486).


Type: Turkey, B9 Ağrı: S.W. of Balık Gölü, grazed alpine meadow, open steppe, 2400 m, 4.8.1983, Sorger 83–36–18 (Hb. F. SORGER)

Plants 6–25 cm, densely bifurcate hairy. Rootstock has branches. Stems 1–5 cm, erect, terete white hairy. Stipules whitish to yellowish-membranous, 3–6 mm, rarely 8 mm, egg-shaped to narrowly ovate, not joined to petiole, connate stem at least for 1/2 of their length, triangular to subulate at apex, sparsely to densely appressed white hairy, mostly
glarescent to glabrous soon. Leaves 5–12 cm; petiole 1–4 cm, white hairy, glabrescent. Leaflets 6–12-paired, 4–13 (–19) × 1–2 mm, elliptic to oblong, mucronulate at tip, sparse hairs present, the upper of leaflet subglabrous, the lower part of leaflets have dense hairs. Peduncle 5–17 cm, covered with white and black hairs. Raceme ovoid to oblong, has 5–20 flowers, 1.5–3 × 1–2 cm, becomes elongate during fruiting. Bracts yellow-like–white, green-like at apex, yellowish-membranous when dried, 3–6 mm, narrowly triangular, white and black hairs are present, margin and apex are ciliate, often glabrescent. Pedicels up to 1 mm, thick, with hairs. Calyx greenish or white-like–yellow, 8–10 mm, tube-like–campanulate, white and black hairs are present; teeth green, 2–5 mm, linear–acute, black and white hairy, only white hairy inside. Petals violet or purplish. Standard 15–20 × 5–7 mm, oblong–ellipsoid. Wings 12–15 × 7–8 mm. Keel 10–15 × 3–6 mm. Ovary densely white hairy, very shortly stipitate; style has hairs at bottom. Legumes erect, 6–12 × 2–4 mm, ovoid to oblong, bifurcate black or white hairs arising from tubercles, compressed laterally; beak 2–4 mm, curved. Seeds two in each locule, 2–3 mm, smooth. 2n = 16 (M. Ekici 2582).

Fl. and fr.: 6, 7. Steppe, scree and limestone slopes, meadows; 1500–3000 m.

Distribution: Turkey, Armenia. Ir.-Tur. el.

Specimens examined:
A8 Erzurum: Erzurum–Tortum 35. km, kireçli topraklar, 2100 m, 12.6.2001, N 40°13′54″N, 41°28′90″E, M. Ekici 2451 et al. (GAZI); Bayburt: Bayburt giriş, step-taşlık yamaçlar, 1500–1600 m, 13.6.2001, 40°15′01″N, 40°14′11″E, M. Ekici 2486 et al. (GAZI). B9 Ağrı: Taşlıçay, Balık gölü güneybatı yamaçları, çayırlıklar, 2350–2400 m, 18.7.2001, 39°44′77″N, 43°31′22″E, M. Ekici 2582 et al. (GAZI).

**Astragalus psoraloides** and **A. canescens** are given as two different species (Chamberlain and Matthews, 1969). However, the types of these two names were reported by Podlech as the same (Podlech, 1998). They have already been considered conspecific.

Sorger collected a specimen from Balıkhlıgöl in 1983 and described it as a new species (**A. robertianus**). This taxon was considered to have a close relationship with **A. canescens** Kit Tan and Sorger (Davis 1988). Based on our field studies as well as measurement of several herbarium materials, the differences in leaf characters, stipules, peduncle length, and elongation of inflorescence in fruit are minor, as seen in Table 3. Therefore, **A. robertianus** is reduced to synonymy of **A. psoraloides** here.

**Astragalus psoraloides** has already been reported from Armenia (Maassoumi, 1998), Gruzia (Gruzia), Azerbaijan, and Armenia (Podlech and Zarre, 2013). Therefore, it should be removed from the list of Turkish endemic plant species.

The population density of **A. psoraloides**, especially in the Bayburt locality, is rather poor, and very close to the city center. The same is true for the population near Balıkhlıgöl, which is close to agricultural lands. Among the three localities known for this species, the one between Erzurum and Tortum may be under the lowest risk, but this population is also poor in individual numbers.


Type: Turkei. B9 Van. Prope pagus Uçum a Mukus 20 km austro-occidentum versus, Frödin 11303 (UPS; iso. W!).

Plants 7–25 cm tall, covered with ascending hairs. Stems few to several, growing flat along the ground or directing upward from a curved base to vertical, short, at the bottom has branches, 2–10 cm, mainly with bifurcate hairs. Stipules membranous, 4–7 mm, not joined to petiole, nearly triangle-shaped, with subapressed bifurcate hairs. Leaves 2–10 cm; petiole 1.5–4 cm, mainly hairy. Leaflets 5–10 pairs, 5–14 × 1–5 mm, closely ellipsoid to rectangular, with bifurcate hairs. Peduncle 7–14 cm, hairy but sometimes glabrescent. Raceme globular, has...
8–20 flowers. Bracts hyaline–membrane, 2–7 mm, closely triangular, hairy. Pedicels 0.3–0.5 mm, with dense hairs. Calyx 7–10 mm, at anthesis tube-like, soon becoming ovoid–inflated, bifurcate white hairy and among them with strongly appressed one with one arm very reduced and looking like simple hairs, also sometimes black hairy; teeth 1.5–4 mm, linear–acute, white and black hairs on inside. Petals purple to violet. Standard 20–25 × 5–8 mm, ovate, deeply and widely emarginate at the apex. Wings 14–17 × 3–4 mm, nearly obovate, rounded at the tip. Keel 11–15 × 2.5–3 mm, ellipsoid, minutely acuminate at the apex. Ovary white hairy; style not hairy. Legumes sessile, erect, 10–12 × 3 mm, narrowly ellipsoid, hairy with white and black hairs, narrowly grooved dorsally, beak 2–3 mm, recurved. Seeds 2–3 mm, smooth. 2n = 64 (Ekici 2557).

Fl. and fr.: 5, 8. Steppe, scree and rocky places; 1300–3100 m.

Distribution: Turkey, Iran. Ir.–Tur. el.

Specimens examined:

A2 (A) Bursa: Mt. Olympus (Ulu Da.), Anon. s.n. (W).
A8 Gümüşhane: Aghakoei, in montis arenosis, 20.6.1894, Sintenis 5959 (E, M, MSB); Stovri, 6800 ft, 30.7.1933, Balls 504 (E).
B5 Adana: Gürümze, 1400 m, 19.5.1859, Kotschy 162 (W).
B6 Sivas: 48 km E Kangal, S der Strasse, 1500–2000 m, 29.6.1970, Sorger 70–29–58 (E); Kangal–Divriği 40 km, Koluncak village, 1900–2000 m, 14 June 1998, Ekici 2074 (GAZI);
B7 Elazığ: Kharput, Buslutasch, 5.6.1889, Sintenis 337 (MSB); Keban, Çakmakbeli, 1650 m, 26.6.1993, Ş. Civelek 6387 (GAZI); Karakoçan–Gündoğdu village, 1000 m, 18.6.1981, Y. Altan 3536 (ANK); Harput, steppe, 1475 m, 3.6.2001, 38°42′98″N, 39°15′63″E, M. Ekici 2263 et al. (GAZI).
B8 Muş: Solhan–Muş 12 km, Buğlan pass, 1650 m, 13.7.2001, 38°57′33″N, 40°16′94″E, M. Ekici 2556 et al. (GAZI); Erzincan: Egin (Kemaliye), Ischek–Medan, 18.6.1890, Sintenis 2660 (W); Keşiş Dağ above Cimin, 2800–2900 m, rocky limestone slopes, 28.7.1957, Davis 31787 et Hedge (E); Malatyı: Pütürge–Alihan village, 1500 m, 20.6.1982, Y. Altan 2543 (ANK); Doğanşehir, Dedeyazı, 1400 m, 24.6.1967, H. Peşmen 2124 (EGE).
B9 Bitlis: W side of Pelli Dağ pass, 2200 m, schistose slopes, 7.7.1966, Davis 46029 (E); Bitlis/Van: mt. 10 km SE of Pelli, 9000 ft rocky slopes, 8.7.1954, Davis 22528 et O. Polunin (E); Nemrut mountain, 7600 ft, in crater, 3.7.1954, Davis 23528 et O. Polunin (E); Tatvan, Nemrut mountain, Şahmuran village, 2200 m, 4.6.2001, 38°33′58″N, 42°14′37″E, M. Ekici 2237 et al. (GAZI); Van: dist. Çatak, Kavuşşahap mountain, 3100 m, rocky ridge, 23.7.1954, Davis 23138 et O. Polunin (E); 20 km E Erçişi, 1900–2200 m, 6.7.1982, Sorger 82–43–112 (W); 15 km N Muradiye, 1900 m, 2.7.1981, Sorger 81–10–15 (W); Çiçekli–Bahcesaray 19–21 km, 2050 m, 7.6.2001, 38°13′13″N, 43°13′57″E, M. Ekici 2314 et al. (GAZI); Bahçesaray–Uçum (Mukus) 10 km, Akkönit dist. 2000 m, 7.6.2001, Ekici 2335 et al. (GAZI).

C10 Hakkari: Pass Bacırge–Yüksekova road, 2600 m, foothills, 29.6.1967, Watson 2951 et al. (E); Yüksekova–Esendere (Bacırge) 16 km, step, 2300 m, 6.6.2001, 37°41′98″N, 44°23′63″E, M. Ekici 2263 et al. (GAZI).

The differences according to Chamberlain and Matthews (1969) for separation of Astragalus mukusiensis from A. asciocalyx are in the type of indumentum on the calyx, which shows high variability among different populations of the species studied and is insufficient for separation of the species. Therefore, A. mukusiensis is reduced to synonymy of A. asciocalyx.


= Tragacantha heldreichii (Boiss.) Kuntze, Revis. Gen. 2: 945. 1891.

Figure 16. Astragalus heldreichii: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2930).
Lectotype (Podlech, 1998): Turkey. Davros Dağ, 1850 m, 29 May 1845, Heldreich s.n. (G–BOIS photo!; iso: BM!, E!, W!).

Plants 8–15 cm, densely hairy. Stems many, prostrate to ascending, 1–8 cm, branched near the base, bifurcate hairy, sometimes partly glabrescent. Stipules membranous, sometimes with greenish tips, 3–4 mm, not joined to petiole, white hairy and mostly also black hairy, margins with short glands. Leaves 1.5–5 cm, subsessile or with a short petiole; rachis slender, hairy. Leaflets in 8–13 pairs, 3–7 × 1–1.5 mm, narrowly elliptic, obtuse, bifurcate white hairy. Peduncle slender, 2–5.5 cm, hairy. Raceme globose to egg-shaped, has (2–) 5–15 flowers. Bracts white-membranous, 2–5 mm, ovate, hairy and at the bottom often with small glands. Pedicels 0.4–0.5 mm, predominantly with white hairs. Calyx 5–8 mm, tube-like, hairy; teeth 1–2 mm, narrowly triangular, inside hairy. Petals yellow, drying purplish. Standard 12–18 × 5 mm, nearly rectangular, obliquely retuse at the tip. Keel 8.5–9 × 2 mm, ellipsoid, obtuse at the apex. Ovary with hairs; style not hairy. Legumes sessile, 9–10 × 2–3 mm, narrowly oblong, bifurcate white hairy, soon glabrescent, narrowly grooved dorsally; beak 2–3 mm. Seeds 2–3 mm, smooth. 2n = 32 (M. Ekici 2996).

Fl. and fr.: 5, 7. Stony, meadow, scree areas; 1300–2700 m. Distribution: Endemic. E. Med. el.

Conservation status: EN

Specimens examined:
C3 Isparta: Davros Dağ, 1800 m, 29 May 1845, Heldreich s.n. (BM, E, MSB); Davras Dağna çıkis, 1700–1750 m, 5.6.1981, T. Ekim 5457 et B. Yıldız (ANK); ibid. 31.5.2002, 37°47′18″N, 30°45′13″E, M. Ekici 2930 et al. (GAZI); Isparta: Atabey–Gelincik, alpinik zon, 2200–2700 m, 22.7.1983, L. Bekat 1231 (EGE);
Antalya: Elmalı to Korkuteli 21 miles from E, 1300 m, steppe, 31.5.1962, Davis 35247 (E).

Astragalus heldreichii is a rare species. It is weak and crawling and has stems directing upward from a curved base. It is distributed in the west Anatolia and Mediterranean regions. It resembles A. cadmicus. It is an endemic species to Turkey and its distribution area is limited to southwest Anatolia.

≡ Tragacantha karamasica (Boiss. and Balansa) Kuntze, Revis. Gen. 2: 945. 1891.

Type: in monte Karamas Dagh Cappadociae, W Caesareae, 3.7.1856, Balansa 174 (G–BOIS photo!; iso E!).

Syntypes: 27 km South East of Sivas, 17 June 1939, Reese et Skrivanek s.n.; 47 km South East of Sivas, 17 June 1939, Reese et Skrivanek s.n. (G photo!).

Plant 10–25 cm, bifurcate hairy. Rootstock about 10 mm diam, short, intricate shortly branched. Stems mostly several, divided to branches, 2–20 cm, hairy, sometimes glabrescent soon. Stipules 2–3 mm, not joined to petiole, white and black hairy and subbifurcate to simple hairy. Leaves 1.5–4 cm; petiole 0.3–1 cm, slender, ±appressed hairy. Leaflets 7–10-paired, 2.5–8 × 1–2 mm, nearly elliptoid, closely rounded at the apex, on both sides with subappressed white hairs. Peduncle 3–11 cm, hairy, black hairy, partly glabrescent. Raceme globose, with 15–40 flowers, becoming elongate above 5 cm. Bracts whitish, closely triangle-shaped, 2–2.5 mm, ciliated. Pedicels 0.5–1
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Table 4. The morphological characteristics that should be useful in distinguishing Astragalus karamasicus, A. ulaschensis, and A. haelbekii (Chamberlain and Matthews, 1969; Podlech and Zarre, 2013).

<table>
<thead>
<tr>
<th>Characters</th>
<th>A. karamasicus</th>
<th>A. ulaschensis</th>
<th>A. haelbekii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>2–3 cm; 7–10 paired</td>
<td>3–5 cm; 6–8-paired</td>
<td>3–5 cm; 8–12-paired</td>
</tr>
<tr>
<td>Peduncle</td>
<td>3–11 cm</td>
<td>3–5 cm</td>
<td>3–4 cm</td>
</tr>
<tr>
<td>Inflorescence</td>
<td>10–15 flowered</td>
<td>20–35-flowered</td>
<td>Many flowered</td>
</tr>
<tr>
<td>Standard</td>
<td>12–14 mm</td>
<td>10–12 mm</td>
<td>c. 13 mm</td>
</tr>
</tbody>
</table>

mm, hairy. Calyx 6–8 mm, rarely 5 mm, tube-like, covered with short adpressed black and long spreading white hairs; teeth 2–4 mm, with hairs. Petals pink to purplish, not hairy. Standard 10–15 × 5–6 mm, ovate. Wings 10–11 × 2–3 mm. Keel 8–9 × 2 mm. Ovary stalk up to 1 mm, hairy; style slender, not hairy. Legume sessile, obliquely erect, 6–8 × 2–3 mm, narrowly elliptic, bifurcate white hairy, ventrally subcarinate by the thick nerve, dorsally widely grooved; beak 2–3 mm. Seeds rectangular, 2–2.5 mm, dark reddish-brown. 2n = 32 (M. Ekici 3011).

Fl. and fr.: 5, 7. Steppe, scree places; 450–2060 m.
Distribution: Endemic. Ir.-Tur. el.
Conservation status: LC.

Specimens examined:
B5 Kayseri: monte Jool Allah–dagh prope Baatsch, 4800′, Th. Kotschy 233 (E, G–BOIS photo, MSB);
Nevşehir: 1200 m, steppe, 21.6.1952, Davis 19097 et al. (E); Environments de Urgüp, 1200 m, 15.7.1973, M.D. Cartier s.n. (E).
C5 Niğde: Aladağ, between Çukurbağ crossroads and the beginning of Narpiz gorge, 1500–2060 m, stony meadows, 18.6.1963, E. Parry 25 (E).

It was stated by Podlech and Zarre (2013) that A. haelbekii is growing in Turkey (Konya: Küçükköy, 40 km SE Konya, 23.6.1962, H. Helbaek 2626). The plant with these characters is overlapping with A. karamasicus and we could not gather this species. Therefore, it is evaluated as a doubtful record for the Flora of Turkey.

Chamberlain and Matthews (1969) stated that A. ulaschensis is close to A. strigillosus and A. karamasicus. According to the identification key presented there, these two species are distinguished from each other through spreading hairy calyx in A. ulaschensis and adpressed hairy calyx in A. karamasicus. After fieldwork and studying the herbaria specimens, it was observed that the calyx in both species has long spreading hairs, besides the short appressed hairs. Thus, this character is not significant for separating these two taxa. Therefore, A. ulaschensis has been reduced to synonymy of Astragalus karamasicus. All diagnostic characters separating these species in the Flora of Turkey are given in Table 4.

Type: Turkey. In Lycia prope Elmalu, 1846, Pestalozza s.n. (G–BOIS photo; iso: P: fragm. minut.). Note: Chamberlain and Matthews (1969) stated that the

Figure 18. Astragalus lycius: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2937).
Holotype is erroneously designated to be in P, but there is only a minute fragment there.

= *Astragalus collinus* Boiss., Fl. Or. 2: 438. 1872, illeg. (non G. Don 1832).

Lectotype (Podlech, 1998): [Turkey] Kamechly–Tschai près de Bereketly Cappadoce, 1300 m, 17.6.1856, B. Balansa 170 (G–BOIS photo; iso: K!).


Type: Turkey, Prov. Ankara, south west Kalecik, 1250 m, in summer, 1995, Maxted 16/156 (MSB!).


Type: Turkey, A4 Çankırı, Devres–Tal östlich von Ilgaz, trockene, beweidete hange nördlich des Fuller, 1200 m, 5. 8. 1982, Raus 6910

Plants 15–40 cm tall, appressed hairy. Rootstock divided into branches. Stems ascending to straight, 15–30 cm, at the bottom is branched, bifurcate hairy. Stipules membranous, 2–3 mm, not joined to petiole, with loose hairs. Leaves 2–7 cm, sometimes with petiole about 0.8–1.5 cm; rachis slender, grooved on upper side. Leaflets 8–13-paired, 7–14 × 0.8–1.5 mm, narrowly ellipsoid, hairy on both surfaces. Peduncle 5–10 cm, sulcate, hairy. Raceme 5–20-flowered, globular to shortly oblong, becoming elongate during fruiting. Bracts membranous, 1.5–3 mm, ovate, predominantly with white hairs, sometimes with sessile minute glands at the margins. Pedicels 0.4–0.5 mm, white and black hairy. Calyx 5–7 mm, tube-like, hairy; teeth 1.5–2.5 mm, subulate to linear–acute, inner surface hairy. Petals purple, glabrous. Standard 11–17 (22) mm.

Table 5. The morphological characteristics that should be useful in distinguishing *Astragalus lycius* and *A. rausianus* according to the Flora of Turkey and Podlech and Zarre (2013).

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>A. lycius</em></th>
<th><em>A. rausianus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>2–7 cm; 8–13-paired</td>
<td>1.5–2 cm; mostly 3–7-paired</td>
</tr>
<tr>
<td>Stipule</td>
<td>2–3 mm</td>
<td>2–2.5 mm</td>
</tr>
<tr>
<td>Peduncle</td>
<td>5–10 cm</td>
<td>0.5 – 5 cm</td>
</tr>
<tr>
<td>Inflorescence</td>
<td>5–20-flowered</td>
<td>10–15-flowered</td>
</tr>
<tr>
<td>Standard</td>
<td>11–17 (22) mm</td>
<td>12–15 mm</td>
</tr>
</tbody>
</table>

Distribution: Endemic.
Conservation status: NT.
Specimens examined:

A3 Ankara: SE of Polatlı, 1040 m, 39°04’N, 32°14’E, summer 1995, Maxted 7/128 (MSB); Kalecik–Gölköy 3. km, step, 1150 m, 21.5.2003, 40°05’21”N, 33°24’41”E, M. Ekici 3218 et M.E. Uzunhisarcıklı (GAZI).

A5 Çorum:
Boğazkale, 1000 m, 16.6.1971, Sorger 71–7–60 (W). B3 Eskişehir: 6 km S Eskişehir an der Strasse nach Akpınar köyü knapp unterhalb N des Passes, 970 m, 10.6.1969, Buttlar 13402 (M). B4 Ankara: NE of Polath, 1010 m, summer 1995, Maxted 3/1 (MSB). B5 Kayseri: Develi–Bakırdağ 4. km, step, 1400 m, 2.6.2001, 38°23′36″N, 35°31′65″E, M. Ekici 2527 et al. (GAZI); Kayseri–Erciyes Dağı 9. km, taşlık alanlar, 1750 m, 2.6.2001, 38°23′57″N, 35°31′02″E, M. Ekici 2536 et al. (GAZI). B6 Kayseri: ad pagum Gala Koı prope Argaeum (Kayseri), 24.5.1859, Kotschy 177/227 (MSB); Bakır Da. above Kisge, 1400 m, 28.6.1952, Davis 19304 et al. (E, M); Pınarbaşı, 1300 m, 25.5.1960, Stainton 5148 et Henderson (E, M); Bünanya–Pınarbaşı 20. km, step, 1500 m, 2.6.2001, 38°45′37″N, 35°58′13″E, M. Ekici 2204 et al. (GAZI); Pazarakören–Tomarza 15. km, step, 1450 m, 2.6.2001, 38°33′99″N, 36°10′26″E, M. Ekici 2207 et al. (GAZI). Sivas: Sivas–Malatya 47. km, step, 1550 m, 15.6.2001, M. Ekici 2518 et al. (GAZI); Gürün–Gökpınar köyü 1–2. km, yol kenari, 1450 m, 11.7.2001, M. Ekici 2550 et al. (GAZI). C2 Antalya: Elmalı, 18.5.1860, Bourgeau 286 (M); Burdur: 1 km nach Dirmil gegen Tefenni, 1250 m, 9.6.1938, Hedge 2569 et al. (GAZI). C3 Isparta: Kamechly–Tschai 30415 et al. (GAZI); Develi–B5 Kayseri: 3/1 (MSB). C4 Konya: Zwischen Konya und Ereğli, 1000 m, 19.5.1960, Sorger s.n. C5 Niğde: Balansa 5530 (W). C6 Gaziantep: Balls 170 (K); Cilician Taurus, Büyük Gilbekut 6.6.1934, près de Bereketly [Çamardı], 1300 m, 17.6.1856, Balansa 1613 m, mixed pasture, 5.5.1971, D.M. Brown 413 (E); Doğubeyazıt, Gürbulak, Sarıçavuş köyü, step, 1550 m, 9.6.2001, 39°25′14″N, 44°22′54″E, M. Ekici 2324 et al. (GAZI). B10 Ağrı: 5 km N of Doğubeyazıt, 1613 m, mixed pasture, 5.5.1971, D.M. Brown 413 (E); Doğubeyazıt, Gürbulak, Sarıçavuş köyü, step, 1550 m, 9.6.2001, 39°25′14″N, 44°22′54″E, M. Ekici 2324 et al. (GAZI). C10 Hakkari: Yüksekova–Başkağlı 57. km, step, 2000 m, 6.6.2001, 37°54′38″N, 44°04′88″E, Ekici 2279 et al. (GAZI).

One of the collections of Astragalus specimens were mentioned under A. fumosus B9 Van: 24 km from Gürpınar to Hoşap, 2000 m, 9.6.1966, Davis 44697 (E]) in the Flora of Turkey was named A. shagalensis Grossh. After detailed examination, it was understood that this specimen belongs to A. fumosus. Therefore, the distribution of A. shagalensis is Iran and Armenia and it is not growing in Turkey.


A. fumosus onobrychis L. var. orientalis DC., Astragalologia 125, 1802.


Tragacantha aduncus (Willd.) Kuntze, Revis. Gen. 2: 942. 1891.

Type: Armenia. Tournefort (B–W 13978; iso: LE, M!, P–TRF 36371).


A. kotschyanus var. medicagineus (Boiss.) Boiss., Fl. Or. 2: 437. 1872.

Tragacantha medicagina (Boiss.) Kuntze, Revis. Gen. 2: 946. 1891.

Holotype: Turkey. Şanlıurfa, Siverek, Kotschy 53 (G–BOIS!; iso: BM, K, W!).


Holotype: [Lebanon] prope Rascalchya Antilibani, 6.1846, E. Boissier s.n. (G, GOET, K!, ZT).


Table 6. The morphological characteristics that should be useful in distinguishing Astragalus aduncus, A. tunceliensis, A. sufianicus, A. pseudovegetus, and A. bingoellensis according to the Flora of Turkey and Podlech and Zarre (2013).

<table>
<thead>
<tr>
<th>Characters</th>
<th>A. aduncus</th>
<th>A. tunceliensis</th>
<th>A. sufianicus</th>
<th>A. pseudovegetus</th>
<th>A. bingoellensis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>2–6 cm; 4–7-paired</td>
<td>1.5–3 cm; mostly 3-paired</td>
<td>2–4 cm; 5–10-paired</td>
<td>3–5 cm, 5–7-paired</td>
<td>9–13 cm; 5–10-paired</td>
</tr>
<tr>
<td>Stipule</td>
<td>c. 3 mm</td>
<td>2–4 mm</td>
<td>1.5–3 mm</td>
<td>2–4 mm</td>
<td>4–8 mm</td>
</tr>
<tr>
<td>Peduncle</td>
<td>4–6 cm</td>
<td>3–5 cm</td>
<td>2–6 cm</td>
<td>2.5–8 cm</td>
<td>13 cm</td>
</tr>
<tr>
<td>Inflorescence</td>
<td>6–30-flowered</td>
<td>8–15-flowered</td>
<td>6–10-flowered</td>
<td>8–12-flowered</td>
<td>many flowered</td>
</tr>
<tr>
<td>Standard</td>
<td>12–18 mm</td>
<td>c. 15 mm</td>
<td>13–15 (–17) mm</td>
<td>18–20 mm</td>
<td>15–17 mm</td>
</tr>
</tbody>
</table>
Lectotype (Podlech, 1999b): Turkey. Papilagonae ad Tossia, ad Kawak Tcheschme, 7.6.1892, P.E.E. Sintenis 4128 (BRNM; iso: B!, BM!, BP, BR, E!, G, GOET, JE, KI, LE, M!, MSB!, OXF, PR, PRC, W!, WU!).


1955.

Holotype: On the border of Southern Turkey and Northern Syria; env. of Killis, 1911, Haradjian s.n. (HUJ).


1955.

Syntypes: Iraq. N Beled Sindjar, 600 m, 27.4.1933, A. Eig et M. Zohary s.n. (HUJ: M. Zohary et s.n. (HUJ).


Plants 17–45 cm, appressed hairy. Rootstock strongly branched. Stems numerous, procumbent to directing upward from a curved base or erect, terete to angular–sulcate, 10–30 cm, with predominantly bifurcate and white and few black hairs (0.5–0.7 mm) near the nodes. Stipules membranous, 2.5–5 mm, narrowly triangular, hairy or only with simple cilia and margins with sessile glands, otherwise glabrous. Leaves (1.5–) 2–7 cm, sometimes a petiole about 0.5–2 cm; rachis grooved on upper side, hairy. Leaflets (4–) 5–8–paired, 4–15 (20) × 1.5–3 (4) mm, hairy. Peduncle 2–9 cm, suberect to often obliquely spreading, with appressed hairs. Raceme subcapitate, densely 10–25-flowered, becoming elongate during fruiting. Bracts whitish or brownish–membranous, 1.5–3 mm, ovate to closely triangle-shaped, obtuse, hairy and with minute glands. Pedicels 1–2 mm, white and black hairy. Calyx 5–8 mm, tubular–bell-shaped, hairy, generally towards and at the teeth; teeth 1.5–2.5 mm, subulate, white hairs at inner side. Petals bluish-purple to pink. Standard curved. Seeds 2–2.5 mm, brown. 2n = 16 (2226).

Distribution: Turkey, Iraq, Iran, Lebanon, Russia, and Syria. Ir.-Tur. el.

Specimens examined:

A5 Kastamonu: Papilagonae ad Tossia, ad Kawak Tcheschme, 7.6.1892, Sintenis 4128 (M, MSB); Yozgat: 12 km N Sorgun gegen Çekerek, 1080 m, 26.6.1987, Nydegger 42945 (MSB); Çekerek, Dondurmanlarına tepesi, P. sylvestris ormani, 1700–1900 m, 7.7.1979, T. Ekim 3862 et A. Düzenli (ANK); Çorum: 20 km SE Sungurlu zwischen Ankara und Sivas, Ruinengelände von Hattusas bei Bogazkale, 17.6.1987, Lange 3542 (MSB). A6 Sivas: Südseite Yıldız Dağ, zwischen Tokat und Sivas, 1500 m, 12.7.1982, Nydegger 17077 (MSB); Susehri, Kelkit vadisi, 700–800 m, 10.7.1986, B. Yıldız 8227 (EGE). A7 Gümüşhan: Stadopi, 6.1894, Sintenis 6033 (E, M, MSB). A8 Erzurum: Ispir'den Erzurum'a 15 km, Çoruh nehri kayısı, kuzey manacağ, 1370 m, 3.7.1975, R. Çetik 5540 (KNYA). A9 Kars: 15 km from Tuzluca to Kağızman (Aras valley), 950 m, 25.5.1966, Davis 43605 (M); Erzurum: Şemkya–Oltu 29. km, taşlı yamaçlar, 1300 m, 21.7.2001, M. Ekici 2614 et al. (GAZI).

B5 Nevşehir: N. Zelve, 1200 m, 29.6.1971, Sorger 71 59–18 (W); 3 km S Urgüp, 1150 m, 10.7.1977, Sorger 77 33–5 (W). B6 Kayseri: 14 km S Pazarören gegen Tomarza, 1430 m, 9.6.1987, Nydegger 42695 (MSB); Malatya: S der Strasse Malatya–Gürün, bei Kozluca an der Strasse nach Darica, 1580 m, 26.8.1975, Buttler 20312 (M); Malatya–Elazığ
Salachlü, 25.6.1890, Sintenis
Egin (Kemaliye), Kota, 1.7.1890, Erzincan: et al. (GAZI);
061475 m, 3.6.2001, 38°42′98″N, 39°15′10″E, M. Ekici 2227 et al. (GAZI).

**Astragalus aduncus** is one of the widespread species in Turkey and so it has many ecological variations. Consequently, it has many synonyms, such as *A. tunceliensis* and *A. pseudovegetus*, which were published as new species recently. The type specimen of *A. tunceliensis* was mentioned in the *Flora of Turkey*, vol. 3, page 209, which was collected by Davis and Hedge 31121. The characters of *A. aduncus* and *A. tunceliensis* match each other, and so after examining the photo of the type specimen (MSB) and investigating the literature of *A. tunceliensis*, it was reduced to a synonym of *A. aduncus*. Moreover, *A. pseudovegetus* is a synonym, because of the overlapping characters (Table 6).

The specimens were collected by Ekici et al. 2270, from Hakkari, identified as *A. sufianicus* by Podlech and Sytin; however, this specimen belongs to *A. aduncus*. In addition, the characters given by Podlech and Zarre (2013) match those of *A. aduncus*. *A. sufianicus* is widespread in Iran, Azerbaijan, and Armenia.

**Astragalus bingoei** Podlech, Type: Turkey, Prov. Muş. [B8] Buğulan Geçidi (pass) E. Solhan, between Bingöl and Muş 1640 m, 17.7.1983, Max Nydegger 18265, (MSB!) was published as a new species in the sect. Incani DC. (Podlech and Zarre, 2013), after examination of type specimen (MSB), it was realized that this new species is caulescent. The main character of the sect. *Incana* is acaulous. The results of our study show that it should be placed in the sect. *Onobrychoidei*. All characters of *A. bingoei** overlap with those of *A. aduncus*. Therefore, *A. bingoei* is reduced to a synonym of *A. aduncus*.


≡**Astragalus xylobasis** Freyn and Bornm. var. *xylobasis*

**Type:** Turkey. B7 Erzincan: distr. Egin (Kemaliye), prope Salachlû in collibus, 7.1890, Sintenis 2721 (W!).

≡**Astragalus xylobasis** var. *angustus* (Freyn and Sint.) Freyn. and Bornm.


Holotype: Bilecik, Karasu, 400 m, 20 May 1929, Bornmüller 14107 (B!, iso: BM!, W!).

27. km, step, 800 m, 3.7.2001, 38°23′16″N, 38°38′56″E, M. Ekici 2226 et al. (GAZI). Sivas: Between Gürün and Sivas, 1400 m, 20.6.1960, Stainton 5728 et Henderson (E, M); 42 km N Gürün, 1.7.1970, Sorger 70–33–55 (W); 10 km S of Gürün, Gö kpınar, 1800 m, 26.6.1971, Sorger 71–50–34 (W); Sivas, 1300 m, 6.6.1890, Bornmüller 1645 (W);

Yıldızeli, SW Kümbet köyü, 500 m, kalker kayalar ve az derin topraklı yamaçlar, 1500–1550 m, 19.7.1979, T. Ekim Yıldızeli, SW Kümbet köyü, 500 m, kalker kayalar ve az...
Plants 20–70 cm, appressed hairy. Rootstock with short branches. Stems several, erect, branched near the base, slightly angular, with appressed white hairs. Stipules 3–6 mm, subsessile glands at the margins. Leaves 2–6 cm; petiole 1–1.5 cm, slender, hairy. Leaflets 3–6-paired, in uppermost leaves sometimes only in 1–2 pairs, 10–27 × 1–4 mm, linear to elliptic, subobtuse, upper surface with bifurcate hairs, always folded. Peduncle 4.5–10 cm, with some black hairy mixed in upper part. Raceme short, has 10–15 flowers. Bracts membranous, 2–3 mm, nearly triangle-shaped, sparsely covered with white hairs, also with subbifurcate hairs at the margins. Pedicels 0.4–0.5 mm, white hairy. Calyx 5–8 mm, tubular to bell-shaped, white hairy, sometimes black hairy; teeth 1–2 mm, narrowly triangular, inner surface with white hairs. Petals violet. Standard 13–22 × 3–4 mm, elliptic. Wings 9–15 × 1–2 mm, nearly oblong, rounded. Keel 7–13 × 0.5–1 mm, obovate–triangle-shaped. Legumes 7–10 × 2–3 mm, oblong, appressed bifurcate hairy; beak 2–2.5 mm, curved. Seeds 3–4 mm, smooth. 2n = 16 (M. Ekici 3037).

Fl. and fr.: 5–8. Steppe, meadows, scree and rocky places; 300–2200 m.

Distribution: Turkey, Iran. Ir.-Tur. el.

Specimens examined:

Figure 22. Astragalus xylobasis: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2498).

Figure 23. Distribution map of Astragalus onobrychis (■), A. xylobasis (▲), A. kadschorensis (★), A. trachytrichus (□), and A. onobrychioides (Δ).

**Astragalus xylobasis** should be represented by two varieties in the *Flora of Turkey* (Chamberlain and Matthews, 1969), and the differences between these varieties were given as follows:

1. Leaflets closely ellipsoid, 4 mm at the midpoint. ........................................ var. *xylobasis*
2. Leaflets linear, 2 mm wide at the midpoint. ........................................... var. *angustus*

As there is high variation in leaf width even among different individuals of one population, we decided not to apply this variety concept.

Podlech and Sytin (2002) elevated the rank *Astragalus xylobasis* var. *angustissimus* to species level and suggested the name *A. bithynicus* for it. The new species should be different from *A. xylobasis* in having a shorter standard (13–14 mm vs. 16–22 mm). However, again there are several intermediates regarding this character, and therefore *A. bithynicus* has been reduced to synonymy here. According to Podlech and Zarre (2013), the specimens were collected around Ağrı Province by Davis (44064 and 43971) and were evaluated as *A. brevipes* Bunge. After examining the type photo of *A. brevipes* (MSB) and the related literature, we concluded that these specimens belonged to *A. xylobasis* and it is not growing in Turkey.


*Type:* Ankara, 18 km west of Polatlı, 850 m, 6 June 1990, Aytaç 3075 (GAZI!; iso: ANK!).

Plants (5–)10–20 cm, suffruticose. Rootstock almost 10 mm thick, branched, thick to slender, short underground ligneous branches. Stems several, (3–)5–15 cm, branched, bifurcate and subbifurcate hairy. Stipules 3–5 mm, membranous, often with greenish tip, joined to petiole, hairy, partly glabrescent soon. Leaves 1.5–4 cm; petiole 0.5–1.5 cm, hairy. Leaflets 2–5-paired, 5–15 × 1–3 mm, elliptic, obtuse or subacute at the tip, both surfaces hairy. Peduncle 1.5–5 cm, striate, hairy. Raceme ovate–globose, c. 2 cm diam., densely 10–20-flowered, becoming elongate during fruiting to 5 cm. Bracts membranous, 2–4 mm, closely ovate–acuminate, white hairy, rarely with sessile glands at margins. Peticels 0.3–0.5 mm, hairy. Calyx 5–7 mm, tube-like to campanulate, dominant with white and black hairs; teeth 2–3 mm, subulate. Petals purple. Standard 15–18 × 6–7 mm, ovate. Wings 12–14 mm. Keel 10–12 mm. Ovary with appressed white hairs, 5–6-ovulate; style glabrous. Legumes 6–10 mm, narrowly ovoid, beak 2–3 mm, valves white hairy. 2n = 16 (Z. Aytaç 8797).


**Specimens examined:**


This species was added to the Turkish flora recently (Ekim et al., 1991). It is mostly distributed on calcareous and gypsum mixed soils at 15 km on the Polatlı (Ankara)–Sivrihisar (Eskişehir) highway and thereafter. A part of these areas is a military zone and under conservation. The species is distributed also in similar habitats (calcareous and gypsum mixed soil) at 12 km on the Beypazarı–Nallihan highway and at 10 km on the Sivrihisar–Afyon highway.


≡ *Astragalus onobrychis* var. *alpinus* DC., Astragal.: 124. 1802, illeg. (Type variety)

*Type:* habitat in Austria, Linn 926/8 (LINN).

Figure 24. *Astragalus kochakii*: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2995).


Table 7. The morphological characteristics that should be useful in distinguishing Astragalus onobrychis, A. goktschaicus, A. atrocarpus, and A. kitianus according to Chamberlain and Matthews (1969).

<table>
<thead>
<tr>
<th>Characters</th>
<th>A. onobrychis</th>
<th>A. goktschaicus</th>
<th>A. atrocarpus</th>
<th>A. kitianus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>6–10 cm long</td>
<td>6–10 cm long</td>
<td>4.5–6 cm long</td>
<td>5–7 cm long</td>
</tr>
<tr>
<td>Leaflets</td>
<td>10–18 mm, narrowly elliptic, sparsely hairy; 8–13-paired</td>
<td>10–18 mm, linear elliptic, sparsely hairy; 8–13-paired</td>
<td>10–18 mm, narrowly elliptic, sparsely hairy; 8–13-paired</td>
<td>6–12 mm, narrowly elliptic, densely hairy; 7–12-paired</td>
</tr>
<tr>
<td>Legume</td>
<td>8–10 mm</td>
<td>5–7 mm</td>
<td>5–6 mm</td>
<td>8–10 mm</td>
</tr>
</tbody>
</table>

Figure 25. Astragalus onobrychis a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2471).

Holotype: prope Varna, viii.1885, Velenovsky s.n. (PRC).


Holotype: supra Dragalevce distr. Sof. 7.1888, Skorpiol s.n. (PRC).


(type: [Serbia] m. Treskavec pr. Prilepe in Mazedonia.


Type: Typus non designatus; several localities in Romania are indicated.


Syntypes: Jugoslawien. Treskavec pr. Prilepe in Mazedonia.

=A. chlorocarpus f. albiflorus Vandas, Reliqui.


Syntypes: Jugoslawien. Treskavec pr. Prilepe in Mazedonia.


Type: Deliblatt.


Type: Mihalaceni, distr. Hotin, 15.6.1928.


Holotype: Transcaucasia australi, prope lacum Gilli, 15.7.1923, A.A. Grossheim et O. Zedelmejer s.n. (BAK; iso: LE photo!).


Holotype: Ukraine, insula maetica Birjuczij, 12.6.1935, Cziczac s.n. (CWU).


Holotype: Turkey, A8 Erzerum, in jugo Kop Dagh inter Askale et Bayburt, 2300–2500 m, 18.8.1967, K.H. Rechinger 37681 (E!; iso: W!).


Holotype: Turkey, Van, 2 km S Caldıran, 2200 m, 10.7.1982, Sorger 82–60–23 et Buchner (W!).


Holotype: Turkey, Erzurum, 70 km NW of Erzurum, 2200 m, 12.8.1982, Sorger 82–122–54 et Buchner (W!; iso: RSA).


Holotype: Turkey, Prov. Sivas, Yazyurdü, 11 of July 1995, P. Rasmont 105 (MSB!).

Plants (6–) 12–40 cm, dominated with bifurcate hairs, even black hairs present on inflorescence. Stems (5–) 8–25 (–40) cm, have bifurcate hairs. Stipules (2–) 3–6 (–7) mm, joined to the petiole, not hairy or few hairs, margins have cilia. Leaves (2–) 6–10 cm; petiole (0.5–) 1–2 cm, with grooves, sparse hairs are present. Leaflets 8–15 pairs, 4–14 (–20) × 1.5–3 mm, closely ellipsoid to nearly obovate, both surfaces hairy. Peduncle 4–11 (–20) cm, sulcate, longer than the leaves, covered with bifurcate hairs. Raceme with 10–40 flowers, becoming elongate to 10 cm. Bracts membranous, 1.5–4 (–6) mm, closely triangular to closely ovate, margins are ciliated. Pedicels 0.5–1.5 mm, with erect flowers. Calyx tube-like, 5–8 mm, with black hairs; teeth 0.8–3.5 mm, subulate, inner side with white hairs. Petals not hairy, violet. Standard (13–) 17–25 × 1.5–2.5 mm. Ovary sessile, hairy; style glabrous or some part hairy at bottom. Legumes stalk at most to 1.5 mm, 5–10 (–12) × 2–3 mm, narrowly oblong, with appressed to
directing upward from a curved base white hairs, carinate ventrally, grooved dorsally; beak 1–2 mm, curved. Seeds 1.5–2 mm, compressed, pale brownish to reddish-brown, rugulose, shiny. 2n = 16, 32, 64 (M. Ekici 2626, M. Ekici 2630, M. Ekici 2634)

Distribution: Turkey, C and S Europe, Armenia, Iran, Georgia, Russia.

Specimens examined:
A8 Erzurum: in jugo Kop Dagh inter Aşkale et Bayburt, 2300–2500 m, 18.8.1967, K.H. Rechinger 37681 (E); Aşkale–Bayburt 13. km, steppe, 1800 m, 23.7.2001, M. Ekici 2634 et al. (GAZI); Erzurum–İspir 61. km, steppe, 2150 m, 22.7.2001, M. Ekici 2626 et al. (GAZI); Ilica–Aşkale 22. km, steppe, 1800 m, 23.7.2001, M. Ekici 2630 et al. (GAZI).
Bayburt: In collibus prope Baibourt, 24.6.1869, E. Bourgeau s.n. (E).
A9 Erzurum: Horasan, 1600 m, soft loamy hills, 13.6.1957, Davis 29370 et Hedge (E);
Kars: Sarıkamış–Selim, 1900 m, earthy igneous scree in ravine, 13.6.1957, Davis 29542 et Hedge (E); 15 km from Tuzluca to Kağızman (Aras valley), 950 m, 25.5.1966, Davis 43600 (E); Sarıkamış, Akçay–Cumaçay 24. km, steppe, 2400 m, 21.7.2001, 40°02′42″N, 43°19′04″E, M. Ekici 2651 et al. (GAZI);
Ardahan: Ardahan–Çıldır 15. km, P. sylvestris openings, 1800 m, 12.7.2002, 41°07′99″N, 42°52′97″E, M. Ekici 3098 et al. (GAZI).
B6 Kayseri: Pınarbaşı–Kayseri 68. km, taşlı yamaçlar, 1700 m, 2.6.2001, 38°46′44″N, 36°58′13″E, M. Ekici 2211 et F. Karaveliöğulları (GAZI); Sivas: Zwischen Kayseri und Sivas, 1 km S Gemerek, 12.6.1992, Nydegger 46238 (MSB).
B7 Sivas: Sivas–Erzincan, 1600 m, 10.7.2002, 39°52′27″N, 38°07′60″E, M. Ekici 3041 et al. (GAZI).
B9 Van: SE jugi inter Bashkale et Hoshap, 2200 m, 30.6.1975, Rechinger 53870 (M); Çaldıran–Muradiye 2. km, 2200 m, 8.6.2001, M. Ekici 2383 et al. (GAZI).
B10 Ağrı: Doğubeyazıt–Ağrı–Van, steppe, 1700 m, 9.6.2001, M. Ekici 2404 et al. (GAZI);
Doğubeyazıt–İğdır 9. km, halophytic area, 1550 m, 14.7.2002, M. Ekici 3169 et al. (GAZI).

It has a distribution in Middle and Eastern Turkey and it also has a very wide distribution area especially in European countries, Caucasia, and Iran. Its chromosome numbers vary from 2n = 16 to 32 and 64, resulting in high morphological plasticity in this species. Therefore, we do not suggest describing any new species in this complex until the influence of environmental factors on the morphological diversity of this species is known.

There is great similarity between Astragalus onobrychis and A. goktschaicus as shown in Table 7. The important difference between these two taxa is that the fruit should be 5–7 mm long in A. goktschaicus and 8–10 mm in A. onobrychis. In some specimens, such as J.G. Ross s.n. (E), Davis 29370 et Hedge (E), Nydegger 46238 (MSB), M. Ekici 3041 et al. (GAZI), the fruits show the intermediate size of 5–12 mm. Moreover, another character used for distinguishing A. goktschaicus from A. onobrychis was the width of the leaflets, which has been confirmed to be of low value, based on studying herbarium materials and field observations.

During this study, it was found that Astragalus onobrychis and A. atrocarpus have some similarities; they were reported as two distinct species in the Flora of Turkey (Chamberlain and Matthews, 1969). These two species should be distinguished from each other through leaf and legume size as shown in Table 7. However, at the end of fieldwork and analysis of many herbarium specimens, these differences have been arbitrarily fixed and, consequently, A. atrocarpus is a synonym of A. onobrychis.

The Astragalus kitianus type specimen was collected from Erzurum Province by Sorger and Buchner in 1982 and has been considered to have close relationships with A. atrocarpus. Due to more or less the same reasons why we preferred to consider the latter a synonym of A. onobrychis, it was found that this species is similar to A. onobrychis to a great extent.

Sorger and Buchner collected a specimen 2 km south of Çaldıran in 1982 and Kit Tan and Sorger published it in 1987 as a new species, namely Astragalus chaldiranicus. The researchers distinguished this species from A. xylobasis. However, following the analysis of type specimens and topotype samples of A. chaldiranicus, it was found that this species is similar to A. onobrychis to a great extent.

The characters that distinguish Astragalus xylobasis and A. onobrychis in the Flora of Turkey (Chamberlain and Matthews, 1969) are given below:

- The leaflets 4–6 (–7) paired; calyx adpressed hairy........................................ A. xylobasis
- The leaflets 6–) 7–18 paired; calyx adpressed or spreading hairy..................................... A. onobrychis

Leaflet paired numbers in Astragalus chaldiranicus are 10–12. Therefore, if the key was searched for leaflet paired numbers of 7–18, then it would be understood that A. chaldiranicus is closer to A. onobrychis. Astragalus chaldiranicus has been found to be similar to A. onobrychis rather than A. xylobasis and therefore it has been reduced to synonymy of A. onobrychis.

The specimens were collected from Ağrı Province (Rechinger 32770a and 32756) and were evaluated as A. aspindzicus Manden and Chinth. in Podlech and Zarre (2013). We examined a photo of these specimens and collected many specimens from the same location and it was decided that all of them belong to A. onobrychis. According to our findings, A. aspindzicus is not growing in Turkey.

The specimens were collected from Van (C9), 80–86 km S Gürpınar, 2800 m, 32. 08. 1984, Sorger 84–78–20
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(MSB!) and described as A. sevangensis Grossh. After examining the specimen and photo of this species and collecting many specimens from the same location, it was realized that all of them belong to A. onobrychis.


Lectotype (Podlech and Sytin, 1996): in montibus Schirvanicis, near Kurtbulak, 1796,
Bieberstein s.n. (LE photo!)

Lectotype (Podlech, 1988): Russia. Daghestan bor., in alpe Chalakoi–tau supre pagum
Danuch, 8800', 4.7.1861 (fl.), A.P. Owerin s.n. (P: photo in MSB!)
1868.

Lectotype: (Podlech and Sytin, 1996): Russia. Caucasus or Daghestania boreal., supra
Gimri, 11.6.1861, Ruprecht s.n. (P: photo in MSB!; iso: LE photo).

Plants 20–30 cm, has no stem or with short stem, mainly has bifurcate hairs. Rootstock has branches. Stems 3–10 cm, mainly vertical, furrowed, generally white hairy. Stipules with white membranes light brown at the bottom part, 5–10 mm, broad and rounded at the base and tapering toward the end, in a restricted way similar to egg shape, narrowing to a sharp point to awl-shaped at the peak, not joined to petiole, mainly no hairs or the edges are white hairy. Leaves 4–10 (~13) cm; petiole 2–4 (~7) cm, white hairy. Leaflets 5–15 pairs, plane, rounded like an egg, acute at the tip, 5–17 × 1.5–4 mm, hairs have two branches. Peduncle 10–22 cm, furrowed, the bottom part white hairy, the high part black hairy. Raceme ovoid to rectangular shape, with 10–20 flowers, 2.5–4 × 2–3 cm, in a small measure, becomes large during fruiting. Bracts 7–10 mm, hyaline white, ovoid, it is tapering to a point or awl-shaped, no hair or sparsely hairy. Pedicels 0.8–1 mm, have hairs. Calyx milky 8–12 mm, tube-like, mainly white and black hairs present; teeth narrow triangular to straight–acute shape, 4–6 mm, somewhat green, almost equal to each other, outer side black hairy, inner side white hairy. Petals violet, lilac or purple. Standard 27–30 × 5–7 mm, rectangular to narrow ellipsoid, claw not clear, at the bottom, it becomes narrow. Wings 20–23 × 3–6 mm, rectangular, rounded at the tip. Keel 18–21 × 2–4 mm, almost the shape of an ellipse, acute at the tip. Ovary ± stalk, almost the shape of an ellipse, white hairy; style hairy at the bottom. Legumes ovoid to oblong, 7–14 × 3–5 mm, mainly black and white hairs dominant; beak 2–3 mm, curve shaped. Seeds 3–4 mm, generally smooth and brown. 2n = 32 (Ekici 2602).

Fl. and fr.: 5–7. Stony places, grassland scree areas; 1500–2300 m.

Distribution: Turkey, Armenia, Georgia, Russia. Ir.-Tur. el.

Specimens examined:

Astragalus onobrychioides resembles A. hyalolepis Bunge morphologically, which belongs to the sect. Hololeuce. However, it has a more definite stem than A. hyalolepis and so it was considered in the sect. Onobrychoidei.

= Tragacantha kadschorensis (Bunge) Kuntze, Revis. Gen. 2: 945. 1891.

Plants 10–25 cm. Rootstock slender, divided. Stems mostly several, 3–13 cm, often slightly branched, white and black hairs dominant. Stipules triangular, 3–5 mm, bottom membranous, upper greenish, joined to the petiole, with sparse hairs. Leaves 3–7 cm; petiole 1–3.5 cm. Leaflets 7–16-paired, 8–15 × 1–3 mm, mainly obovate, subobtuse to slightly emarginate at the apex, mainly with bifurcate hairs. Peduncle 6–16 cm, sulcate, hairy. Raceme with 10–20 flowers. Bracts 3–4 mm, greenish, has narrow triangular shape, predominantly bifurcate white hairs and at the margins partly subbifurcate. Pedicels 0.4–0.5 mm, hairy. Calyx 9–10 mm, like a short tube, mainly bifurcate to subbifurcate white hairs; teeth 4–5 mm, subulate. Petals glabrous, pale purple to violet. Standard 20–23 × 6–7 mm, narrowly ovate. Wings 14–16 × 3 mm, closely ellipse shape to obovate. Keel 13–14 × 2–2.5 mm, almost elliptic. Ovary sessile narrow rectangular, hairy. Legumes erect, 7–8 mm, oblong, dominant with white and black hairs, grooved dorsally, beak 2–3 mm, curved. Seeds 2–3 mm, brown, smooth. 2n = 64 (Ekici 2570).

Fl. and fr.: 5–7. Steppe, scree places; 1300–2700 m. Distribution: Turkey, Iran, Georgia. Ir.-Tur. el.

Specimens examined:

B9 Van: Toprakkale, 1850 m, steppe, 8 of June 2001, Ekici 2352 (GAZI).

Figure 27. Astragalus kadschorensis: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2352).

A. kadschorensis that was reported doubtfully in the Flora of Turkey (Chamberlain and Matthews, 1969) was collected by Deyrolle from Toprakkale (Van). There is no other record from Turkey for this species. Since this species has been reported in the Flora of Turkey (Chamberlain and Matthews, 1969) without being seen by the authors, it was included in an indefinite group. A quite good population of this species was found, especially at a military area during the fieldwork in 2001. The species is conserved to some extent in this distribution area, and so the population density is quite high. The population is not dominant outside of the conservation area due to excessive pasturage. Currently, the distribution area of the species is under protection, and so at least there is limited threat to this species in the near future.


Lectotype (Podlech, 1998): Turkey. prope Ispir Armeniae, 7.7.1862, E. Bourgeau 216 (as A. onobrychis) (P: photo in MSB!; iso: G–BOIS photo!, K!).

Plants 16–35 cm, bifurcate white hairs dominant. Stems 9–22 cm, the bottom erect or directing upward from a curved base, bifurcate hairs dominant. Stipules 4–5 mm, membranous, not joined to petiole. Leaves 6–8 cm; petiole (0.5–) 1–2 cm, hairy. Leaflets 8–14-paired, 8–14 × 1.5–4

Figure 28. Astragalus trachytrichus: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2468).
mm, narrowly elliptic, obtuse to acute at the tip, both sides hairy. Peduncle 6–16 cm, angular–sulcate, dominant with subbifurcate, flexuose, tangled and mostly with bifurcate long white hairs. Raceme 3.5–4 × 2.5–3 cm, capitate to ovoid, with 15–25 flowers. Bracts membranous, 3–5 mm, closely triangle-shaped, with long white hairs and black hairs shorter. Pedicels 0.4–0.5 mm, white hairy. Calyx 7–8 mm, tube-shaped to campanulate, teeth 1.5–3 mm, subulate, inner side densely white hairy. Petals blue–violet, yellowish if dry, glabrous. Standard 18–22 × 6–7 mm, elliptic. Wings 12–14 × 2–3 mm, nearly oblong, rounded at the tip. Keel 10–11 × 2.2–3 mm, mostly elliptic. Ovary sessile, hairy; style is not hairy, or just hairy at bottom. Legumes sessile, erect, narrowly ovoid, 8–9 × 2.5–3 mm, bifurcate long white hairs dominant. Beak up to 4 mm, slightly curved. Seeds 2–2.5 mm, light brown, smooth. 2n = 16 (M. Ekici 2636).


Specimens examined:
A8 Erzurum: Erzurum gegen Ispir, vor Eğerti, 1850 m, 19.8.1987, Engel 146 (MSB); Aşkale –Bayburt 13. km, yol kenari, 1800 m, 13.6.2001, 39°58′73″N, 40°33′81″E, M. Ekici 2468 et al. (GAZI); ibid. 23.7.2001, M. Ekici 2636 et al. (GAZI). B6 Sivas: 11 km NE Gemerek, Kayseri–Sivas road, 1300 m, 12.6.1992, Nydegger 46241 (MSB). This location is where A. pseudovegetus was collected, which is given as a new species by Podlech and M. Ekici. B7 Erzincan: Karsoe, inter Szadagh et Kikischkoie, 25.7.1890, Sintenis 3027 (W).

This taxon is close to A. onobrychis, but it is distinguished from it through its densely hairy leaflets, peduncle, and calyx structure. Peduncle length, which was given as 12–16 cm in the Flora of Turkey (Chamberlain and Matthews, 1969) can be reduced to 6 cm. Its population is rather poor in growing localities. Although it is distributed in a very narrow area, its distribution area is on heights over 2000 m, and so pressures on the species are reduced. Therefore, its category should be EN (IUCN, 2012).


Type: Cappadocia orientalis, Auber-Eloy 1368 (G–BOIS photo!; BM!, K!).

Plants at least 30 cm tall. Stems 15–30 cm, white and black hairy, partly glabrescent soon. Stipules membranous, 5–9 mm, not joined to petiole, margins white hairy, otherwise sparsely hairy or glabrous. Leaves 4–8 cm, ±sessile; rachis white hairy. Leaflets 7–18-paired, 8–20 mm, narrowly elliptic to oblong, both surfaces hairy. Peduncle 4–10 cm, angular to sulcate, hairy. Raceme cylindrical, with 30–50 flowers. Bracts 5–7 mm, closely triangle-shaped, with white hairs. Calyx 5–9 mm, shortly tubular, hairy; teeth linear–acute, 2–3 mm. Petal purple–violet. Standard 15–20 × 5–6 mm, oblong to narrowly elliptic. Wings 13–18 × 3–4 mm, ±oblong. Keel 14–18 × 3 mm, ellipsoid. Legumes sessile, 8–10 × 2–3 mm, narrowly oblong, hairy, partly glabrescent soon; beak 1–2 mm, curved. Seeds 3–4 mm, smooth. 2n = 32 (M. Ekici 2635).


Specimens examined:
A8 Erzurum: Kop Dağı, Aşkale–Bayburt 13. km, 1800 m, step, 13.6.2001, 39°58′73″N, 40°33′81″E, M. Ekici 2467 et al. (GAZI); ibid. 23.7.2001, M. Ekici 2635 et al. (GAZI).

According to Ekim et al. (2000), it was in the DD category and its type was collected by Auber-Eloy 1368, from Cappadocia. The species was recollected from its type and the exact data for its locality are provided here. It was transferred here from the DD to CR category due to the poor population in individual numbers of this species (Aytaç et al., 2005).


Lectotype (Podlech, 1998): Turkey. In valle Arguri in monte Ararat, 2.6.1856, Seidlitz s.n. (P: photo in MSB!; iso: G–BOIS photo!, MSB!).


Holotype: Gruzia. Prov. Tiflis, distr. Akhalzikha, prope Ota Tamala, 29.6.1922, W. Kozlovsky s.n. (TBI; iso: B!, LE photo!).

Plants (10–) 15–40 cm, appressed to subappressed hairy. Stems numerous, directing upward from a curved base to erect, with mostly distant leaves, internodes sometimes about 10 cm, angular–sulcate, with appressed ±bifurcate white and black hairs. Stipules 3–8 mm, membranous at the base, not joined to petiole, linear to closely triangle-shaped, with black and white hairs, margins with sessile glands. Leaves 4–12 cm; petiole 2–4 cm, grooved on upper side, loosely white hairy. Leaflets 8–15-paired, 4–13 × 1.5–3 mm, narrowly oblong, obtuse to narrowly truncate at the tip, both sides hairy. Peduncle 5–18 cm, hairy. Raceme short, ovoid, densely 5–25-flowered, elongating in fruit. Bracts membranous, 2–4 mm, closely triangle-shaped, hairy. Pedicels 1–1.5 mm, predominantly black hairy. Calyx 6–10 mm, tubular to bell-shaped, hairy; teeth 1.5–2 mm, linear, white hairy on inner side. Petals lilac, purple to violet. Standard (18–) 20–25 × 4–8 mm, ovate. Wings 14–16 × 2–2.5 mm, narrowly oblong. Keel 12–13 × 2.2–3 mm. Ovary closely oblong, hairy; style not hairy. Legumes hanging downward, straight, 12–20 × 1.5–2 mm, narrowly oblong, hairy, narrowly grooved dorsally; beak up to 5 mm, recurved to hooked. Seeds 2–3 mm, brown, smooth.

2n = 32 (M. Ekici 3151).

Fl. and fr.: 5–7. Meadows, scree and rocky places; 1450–2600 m.

Distribution: Turkey, Azerbaijan, Armenia, Georgia, Iran. Ir.-Tur. el.

Specimens examined:


Figure 30. Astragalus arguricus: a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 2409).

Figure 31. Distribution map of Astragalus xerophilus (■), A. adzharicus (▲), A. trabzonicus (★), A. arguricus (□), and A. melitenensis (∆).

**Type:** A8 Trabzon: Bayburt to Araklı 41 km, steppe, 2280 m, 10.7.2002, Ekici et al. 3046 (GAZI!)

Plants 10–40 cm. Stems numerous, hairy. Stipules 2–4 mm, not joined to petiole, closely triangular, black and white hairs together. Leaves 3–5 cm; petiole 1–1.5 cm, loose, predominantly white hairy. Leaflets 5–13-paired, 3–8 × 0.5–1 mm, linear to linear elliptic, sparsely above and densely adpressed white hairy below. Peduncle 5–10 cm, sparsely white hairy. Raceme globose, with 10–20 flowers, becoming elongate during fruiting. Bracts 2–3 mm, linear or sometimes lanceolate, margins with simple hairs, or dominant with bifurcate black hairs. Pedicels 0.5–1 mm, generally black hairs dominant. Calyx 5–6 (–7) mm, tube-shaped, dominant with black and subbifurcate white hairs; teeth 2–3 mm, linear, outer surface similar to calyx tube, inner surface with white hairs. Petals violet. Standard 14–15 × 6–7 mm, becoming narrow claw at the bottom, retuse at the tip. Wings 11–12 × 2–2.5 mm, narrowly oblong, obtuse to slightly retuse at the apex. Keel 9–10 × 2–3 mm, oblong to oblique–ovate, obtuse to subacute at the tip. Ovary narrowly oblong, dominantly hairy; style glabrous. Legumes pendulous, stipitate, 10–12 × 1.5–2 mm, oblong, short bifurcate black and long white hairs dominant, grooved dorsally; beak 2–2.5 mm, slightly becoming recurved. 2n = 16 (Ekici 3046).

Fl. and fr.: 6–8. Steppe; 2300–2400 m.

Distribution: Endemic.

Conservation status: CR.

It is known only from the type collection.


**Type:** Gruzia. In Adzharia, ad fl. Adzhariszkali, prope Kedy, 21.5.1939, M. Popov s.n. (TBI: photo in K!).

Plants 7–20 cm, in dense tufts. Rootstock has some branches, sometimes above 30 cm. Stems growing flat along the ground to directing upward from a curved base, slender, c. 1 mm thick, flexuous, with short internodes, branched, with subappressed to spreading bifurcate white hairs. Stipules green-like, 2–3 mm, closely triangle-shaped to triangular–acuminate, not joined to petiole, covered with white or black hairs, sometimes margins with subbifurcate hairs. Leaves 1.5–5 cm; petiole 0.4–1 cm, above with grooves, hairs similar to stem. Leaflets 6–10 (–12)-paired, 2–8 × 1–2 mm, closely elliptic, obtuse to slightly retuse at the tip, above is covered with white hairs, inner surface with appressed bifurcate white hairs. Peduncle 1–4 cm, slender, with white bifurcate, generally with short hairs and sometimes with ±spreading long hairs. Raceme with 4–12 flowers, scarcely elongating in fruit. Bracts greenish, 1.5–2 mm, egg-shaped to triangular, margins ciliated. Pedicels 0.5–1 mm, hairy. Calyx 7–9 mm, tubular, generally with white, bifurcate and black hairs;
teeth 2–4 mm, closely triangular to subulate. Petals pale, blue, drying to whitish. Standard 17–20 × 6–7 mm, ovate. Wings 13–14 × 2–3 mm, narrowly obovate. Ovary sessile, appressed hairs; style not hairy. Legumes sessile, obliquely erect, 8–10 × 2–3 mm, narrowly ellipsoid, straight, generally with spreading bifurcate white hairs, beak 1–1.5 mm, slightly incurved beak. Seeds 2–3 mm, brown, smooth. 2n = 32 (Ekici 2842).

Fl. and fr.: 4–7. Dampish places, scree, forest; 450–1850 m.

Distribution: Turkey, Georgia, Russia. Ir.-Tur. el.

Specimens examined:
A8 Artvin: Stony bank, 500 m, 15.4.1960, Stainton 8188 (ANK, E); Borçka to Murgul, Kokolet district, openings of forest, 450 m, 18.4.1976, A. Düzenli s.n. (E); Melo–Sıtımzar road, P. sylvestris forest, 1890 m, 9.7.1978, A. Düzenli s.n. (ANK); near Artvin, 13 April 1996, Khokhrjakov et Sytin s.n. (MSB).

In the Flora of Turkey, the standard length was 15–20 mm (Chamberlain and Matthews, 1969). However, in the type specimen and in the field specimens, there were no specimens that had a 15 mm standard length. Therefore, the standard length was changed to 17–20 mm in the definition of the species.

It is one of the species in the section whose fruits are pendulous (besides Astragalus trabzonicus and A. arguricus). However, these three taxa differ from each other by length of leaves, standard shape and length, calyx length, peduncle length, and fruit characters.


Type: [Turkey] Mt. Ararat, Huhn s.n. (LE photo!).

Plants 5–15 cm, in dense tufts. The stem base about 10 mm thick. Stems 1–2 cm, numerous, growing flat along the ground to directing upward from a curved base, sometimes erect, angular–sulcate, subglabrous (in lower part) or with bifurcate white hairs at the nodes, also with some black hairs. Stipules hyaline–membranous or sometimes with green-like tips, 2–5 mm, not joined to petiole for 1–2 mm, white hairy, sometimes also with simple black hairs at the margins. Leaves (1.5–) 2–3 cm; petiole 0.5–1.5 cm, slender, upper side with grooves, densely hairy. Leaflets 7–11-paired, 2–5 × 0.8–2 mm, closely ellipsoid to nearly obovate, with bifurcate white hairs, sometimes folded. Peduncle 1–7 cm, slender, hairy. Raceme capitate, with 3–12 flowers, becoming elongate during fruiting. Bracts white-like, 2–2.5 mm, closely triangle-shaped–acute, with black hairs. Pedicels 0.9–1 mm, with black hairs. Calyx 4–5 mm, shortly tubular, hairy; teeth 0.3–1.5 mm, closely triangle-shaped, white hairy on inner side. Petals bright violet, to pale violet in drying specimens. Standard 11–16 × 5–6 mm. Wings 8–12 × 2–2.8 mm, closely oblong. Keel 7–10 × 2–2.5 mm. Ovary sessile to ovoid, with white hairs; style not hairy. Legumes oblong to ovoid, 7–8 × 2–2.5 mm, hairy; beak 0.8–1 mm. Seeds 2–3 mm long, brown, smooth. 2n = 16 (M. Ekici 2609).

Fl. and fr.: 6–9. Steppe, scree places; 1250–4100 m.

Distribution: Turkey, Iran. Ir.-Tur. el.

Specimens examined:
A9 Kars: Yalnızçam Geçidi between Ardahan and Ardanuç, 2400 m, 21.6.1961, Kerck 40/10 (W) Aralık, Büyük Ağrı Dağı above Serdar Bulak, 2900 m, 20.7.1966, Davis 46950 (E, M); Ardahan–Ardanuç, 2 km W Tepeler, 1980 m, Nydegger 44495 (MSB); Akçay–Cumayyar 24. km, 2400 m, step, 20.7.2001, 40°02′4″ N, 43°19′04″ E, Davis 24659 et al. (Gazi); ibid. 14.7.2002, M. Ekici 3156 et al. (Gazi). B9 Ağrı: 5 km N Doğubeyazıt on road to Kars, 1610 m, 5.6.1971, Brown 413 (E); Bitlis: Süphan Dağ, above Adilcevaz, 4120 m, 26.8.1954, Davis 24659 et al. Polunin (E, M). B10 Ağrı: Ararat, 3100 m, 31 July 1966, Steiner s.n. (W).

This species is thought to belong to the sect. Hypoglottidei DC. due to its stem structure. However, it should be transferred to the sect. Onobrychoidei due to the fact that its leaflets are bifurcate hairy.

≡ Tragacantha melitenensis (Boiss.) Kuntze, Revis. Gen. 2: 946. 1891.

Type: Turkey. B7 Malatya: near Euphratem, Eloy 1349 (G–BOIS photo!; iso: K!, MSB!).
Plants 5–20 cm, hairy. Rootstock slender, branched with short to long stolons. Stems 1.5–6 cm, with subpressed to partly directing upward from a curved base or even nearly spreading bifurcate white hairs, mixed with some black hairs. Stipules 3–6 mm, membranous, triangle-shaped, not joined to petiole; with white and black hairs. Leaves 2–7 cm; petiole 1–2 cm, hairy. Leaflets 2–4 (–6)-paired, 5–12 × 2.5–6 mm, ellipsoid–obovate, both sides bifurcate white hairs. Pedicels 0.4–0.5 mm, hairy. Calyx 8–10 mm, tube-like–bell-shaped, bifurcate white hairy, flexuous; teeth 3–5 mm, subulate, white hairy on inner surface. Petals glabrous, purple–violet. Standard 18–24 × 8–9 mm, ovate. Wings 14–15 × 3–4 mm, narrowly ellipsoid. Keel 11–12 × 2–2.5 mm. Ovary sessile, heart-shaped; style hairy at the base. Legumes sessile, almost erect, 10–12 × 3–3.5 mm, closely oblong, with white hairs; beak 2–3 mm, slightly recurved. Seeds 2–3 mm, smooth. 2n = 16 (M. Ekici 2551).

Fl. and fr.: 5–8. Steppe, scree places, open forest; 850–1700 m.

Distribution: Endemic. Ir.-Tur. el.

Conservation status: VU.

Figure 32. Astragalus trabzonicus. a. habit, b. calyx, c. standard, d. wings, e. keel, f. stamens, g. ovary (M. Ekici 3046).

Specimens examined:

B6 Sivas: Gürün–Darendê 19. km, taşlık alanlar, 1350 m, 11.7.2001, 38°39′10″N, 37°26′65″E, M. Ekici 2551 et al. (GAZI); Malatya: above Darendê, 5000 ft, 19.6.1954, Davis 23110 et O. Polumin (E); Akçadağ′ın 1.6 km güney batısı, step, 850 m, 3.6.2001, 38°21′45″N, 37°50′61″E, M. Ekici 2213 et al. (GAZI); Malatya–Elazığ 3. km, step, 950 m, 3.6.2001, 38°20′86″N, 38°24′48″E, M. Ekici 2215 et al. (GAZI); Maraş: 18 km E Elbistan to Malatya, 1380 m, 4.6.1981, Nydegger 42602 (MSB). B7 Malatya: prope Malatia (Melitenem) ad Euphratem, A. Eloy 1349 (G–BOISS photo, K); rocky hillside on the southeastern side of the city; south side of the road to Elazığ, 2.6.1968, R. Alava 6825 (E).

In the section, this species is the smallest one. It can be differentiated easily due to its large and elliptic–obovate leaflets. Despite the fact that its threatened category was determined to be LC, the distribution area of this taxon is limited to the Malatya, Kahramanmaras, and Sivas triangle (Ekim et al., 2000). Although its known population is in good condition, its distribution area is rather narrow. Therefore, its category has been suggested here as VU (IUCN, 2012).

4. Discussion

Conclusions and comments for each species were given under the descriptions of the species. This information is summarized here.

Eleven taxa were reduced here to synonymy that can be considered as syn. nova. In addition, it was found that A. pinetica and A. arakliensis, which were described as new species by Podlech in 1999 (Podlech and Zarre 2013), do not belong to Onobrychoidei. The investigation of the type and toptype specimens indicated that the leaflets of these two taxa are simple hairy. Therefore, they belong to the sect. Hypoglottidei DC. It was also decided that A. arakliensis is a synonym of A. viciaeolius DC.

Before the present study, the total number of taxa belonging to the sect. Onobrychoidei was 40 in Turkey. However, based on the present study, the total number of taxa attributed to this section has been reduced to 29.

Based on the data obtained here, the descriptions of the species have been emended and the deficiencies (Chamberlain and Matthews, 1969) have also been completed. These changes are mentioned in Table 8.

According to this list, the chromosome numbers in 15 species are 2n = 16 (A. adunciformis, A. aduncus, A. cicerellus, A. demirizii, A. kochaki, A. lycaonicus, A. lyculus, A. melitinensis, A. mesogitanus, A. psoraloides, A. strigillosus, A. trabzonicus, A. trachytrichus, A. xerophilus, A. xylobasis), in 11 species are 2n = 32 (A. adzharicus, A. arguricus, A. cadmicus, A. cancellatus, A. eliasianus, A. eubrychioides, A. fumosus, A. heldreichii, A. karamasicus,
Table 8. Comparison of the descriptions provided by Chamberlain and Matthews (1969) and in the present study for the species of *Astragalus* sect. *Onobrychoidei*.

<table>
<thead>
<tr>
<th>Species</th>
<th>Traits</th>
<th>Chamberlain and Matthews (1969)</th>
<th>Present study</th>
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<td></td>
<td>Plant height (cm)</td>
<td>10–20 6–11</td>
<td>10–30</td>
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<tr>
<td><em>A. cicerellus</em></td>
<td>Stem (cm)</td>
<td>–</td>
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<td></td>
<td>Leaflets (pairs)</td>
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<td>Peduncles (cm)</td>
<td>5–7</td>
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</tr>
<tr>
<td></td>
<td>Calyx (mm)</td>
<td>2–3, white appressed bifurcate–hairy; teeth c. 0.5</td>
<td>2–5, white appressed and some black bifurcate–hairy mixed, teeth 0.5–1.5</td>
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<td>Calyx (mm)</td>
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<td>Legume (mm)</td>
<td>c. 12 × 3</td>
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<td>Leaflets (mm)</td>
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<td>4–10, 5–14–paired</td>
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<td>Peduncles (cm)</td>
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<td>Raceme</td>
<td>15 flowers</td>
<td>10–25 flowers</td>
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<td>Standard (mm)</td>
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<td>Legume (mm)</td>
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<td>Bracts (mm)</td>
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<td>Leaves (cm)</td>
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<td>6–12</td>
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<tr>
<td></td>
<td>Leaflets (mm)</td>
<td>7–10 mm long, narrowly elliptic, 8–10–paired</td>
<td>4–13 (–19) mm long, elliptic–oblong, 6–12–paired</td>
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<td>Stipules (mm)</td>
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<td>Peduncles (cm)</td>
<td>8–10</td>
<td>5–17</td>
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<td></td>
<td>Bracts (mm)</td>
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<td>3–6 mm long</td>
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<td>c. 6 × 2.5 mm; beak c. 2 mm long</td>
<td>6–12 × 2–4 mm; beak 2–4 mm long</td>
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<td>Stem (cm)</td>
<td>Up to 15 cm long</td>
<td>7–25 cm long</td>
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<td>Leaves (cm)</td>
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<td>Leaflets (mm)</td>
<td>7–12 mm long, oblong</td>
<td>5–14 mm long, elliptic–oblong</td>
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<td>Bracts (mm)</td>
<td>2–5</td>
<td>2–7</td>
</tr>
<tr>
<td></td>
<td>Calyx</td>
<td>8–10 mm long, simple pilose; teeth 2–3 mm long</td>
<td>7–10 mm long, simple and bifurcate pilose; teeth 1.5–4 mm long</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>Traits</th>
<th>Chamberlain and Matthews (1969)</th>
<th>Present study</th>
</tr>
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<tbody>
<tr>
<td><em>A. karamasicus</em></td>
<td>Stem (cm)</td>
<td>2–10</td>
<td>2–20</td>
</tr>
<tr>
<td></td>
<td>Leaves (cm)</td>
<td>2–3</td>
<td>1.5–4</td>
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</tbody>
</table>

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<tbody>
<tr>
<td><em>A. lycius</em></td>
<td>Leaves (cm)</td>
<td>2.5–5</td>
<td>2–7</td>
</tr>
<tr>
<td></td>
<td>Bracts (mm)</td>
<td>c. 3</td>
<td>1.5–3</td>
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<tbody>
<tr>
<td><em>A. fumosus</em></td>
<td>Leaves (cm)</td>
<td>1–2.5</td>
<td>1.5–5</td>
</tr>
<tr>
<td></td>
<td>Calyx (mm)</td>
<td>5–6</td>
<td>5–7</td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td><em>A. aduncus</em></td>
<td>Plant height (cm)</td>
<td>20–40 cm long</td>
<td>17–45 cm long</td>
</tr>
<tr>
<td></td>
<td>Stem (cm)</td>
<td>15–25</td>
<td>10–30</td>
</tr>
<tr>
<td></td>
<td>Leaves (cm)</td>
<td>2–6</td>
<td>(1.5–) 2–7</td>
</tr>
<tr>
<td></td>
<td>Leaflets (mm)</td>
<td>4–14</td>
<td>4–15 (–20)</td>
</tr>
<tr>
<td></td>
<td>Stipules (mm)</td>
<td>c. 3</td>
<td>2.5–5</td>
</tr>
<tr>
<td></td>
<td>Peduncles (cm)</td>
<td>4–6</td>
<td>2–9</td>
</tr>
<tr>
<td></td>
<td>Raceme</td>
<td>10–15 flowers</td>
<td>10–25 flowers</td>
</tr>
<tr>
<td></td>
<td>Bracts (mm)</td>
<td>c. 2.5–6</td>
<td>1.5–3</td>
</tr>
<tr>
<td></td>
<td>Calyx (mm)</td>
<td>5–6</td>
<td>5–8</td>
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<tr>
<td></td>
<td>Standard (mm)</td>
<td>12–18</td>
<td>12–20</td>
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Astragalus pseudovegetus Podlech and M. Ekici has been given as a doubtful record from Turkey, because the specimen collected by Nydegger 46241 belongs to A. trachytrichus; otherwise the type specimen of A. pseudovegetus belongs to A. aduncus. The other specimen was collected by Rabaute [(Kayseri: 2 km W of Dörtyol at road to Ürgüp, 21.5.2005, Rabaute (MSB)] and has not been seen by us, but this specimen might belong to A. aduncus.

Acknowledgments

We thank the Scientific and Technological Research Council of Turkey (TÜBİTAK) (Project No: TBAG–1959), Dr D Yüzbaşoğlu and S Yılmaz for their comments on the chromosome numbers, artist Seçil Soydan for drawings of the specimens, and Dr P Podlech for participation with his experience. Special thanks to the herbaria curators of GAZI, ANK, AEF, HUB, EGE, W, M, MSB, E, and K for permission to examine the specimens.

References


