

The revision of the section *Alopecuroidei* of the genus *Astragalus* (Fabaceae) in Turkey

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Abstract: In this research, the morphological, anatomical, palynological, and cytological characteristics of the section *Alopecuroidei* DC. species belonging to genus *Astragalus* L. in Turkey were studied. As a result of this study, the members of the *Alopecuroidei* section represented by 22 taxa were evaluated under 24 taxa. While 3 taxa were reduced to synonyms, 4 new taxa have been added to the literature. Those are *Astragalus aytatchii* Akan & Civelek, *A. ovabaghensis* Akan & Aytaç, *A. bahcesarayensis* Akan, Fırat & Ekici, and *A. ekicii* H.Duman & Akan. In addition, it was determined that *A. edmondi* (Kuntze) Sheld. and *A. maximus* Willd. var. *dasysemius* Chamb. & Matthews were synonymies of *A. decurrens* Boiss. and *A. alopecurus* Pall., respectively. Although *A. macrocephalus* Willd. subsp. *macrocephalus*, *A. erythrotaenius* Boiss., and *A. bracteosus* Boiss. & Noé were previously stated to be endemic for Turkey, they are now found not to be endemic. Moreover, it was decided that *Astragalus trichocalyx* Trautv. is illegitimate and the name of *A. petropolitanus* Sheld. is valid. In this study, *Astragalus genuflexus* Freyn & Sint. was reevaluated as a distinct species.

Key words: *Alopecias*, *Alopecuroidei*, *Astragalus*, revision, Turkey

1. Introduction

In terms of the species number, *Astragalus* L. (Fabaceae), represented by about 10 subgenera, 130 sections, and nearly 2500 taxa (Maassoumi, 1998), is the richest genus of vascular plants on earth. The number of taxa of the genus in the former USSR is about 1000, and in Iran it is approximately 850. Represented by nearly 425 species in 62 sections (Chamberlain & Matthews, 1970; Davis et al., 1988; Podlech, 1999; Aytaç, 2000; Mehr et al., 2012), it is also the largest genus in Turkey and mainly distributed throughout the Irano-Turanian region. In Turkey, the endemism rate is about 48% for this genus. The closely related genus is *Oxytropis* DC. and it is separated easily from *Astragalus* by beaked keel (Erkul Karaman & Aytaç, 2013).

Investigators have revised some sections belonging to genus *Astragalus* since the publication of Volume 3 of *Flora of Turkey*. *Astragalus* (Agerer-Kirchhoff, 1976), *Alopecuroidei* DC. (Becht, 1978), *Dasyphyllium* Bunge (Aytaç, 1997), and *Hololeuce* Bunge (Ekici & Ekim, 2004) are some sections that have been revised recently.

The taxonomical problems of the section *Alopecuroidei* were mentioned by the authors (Chamberlain & Matthews, 1970; Davis & Hedge, 1975) of *Flora of Turkey and the East*

Aegean Islands and they suggested that the section should be revised to solve these taxonomical problems. This was for reasons such as the inadequacy of the identity key, lack of satisfactory information on morphological descriptions, uncertainty of distinguishing different species regarding key type, the conflict between the key and description, and the lack of some morphological characters. Chamberlain and Matthews (1970) stated that the section has taxonomic problems that require further studies.

Sect. *Alopecuroidei* was established by Bunge (1868, 1869). The entire section was revised by Becht (1978) and has been studied some areas, such as in the flora of Iran (Podlech, 1999; Maassoumi & Ranjbar, 1996; Ranjbar et al., 2002; Ranjbar & Karamian, 2003), the flora of Turkey (Chamberlain & Matthews, 1970; Akan & Civelek, 2001; Duman & Akan, 2003; Akan & Aytaç, 2004; Akan et al., 2008), the flora of the former USSR (Gontschharov & Borissova, 1946; Shishkin, 1965), and the flora of Iraq (Townsend & Guest, 1974).

The members of sect. *Alopecuroidei* section are distributed throughout the central, eastern, and south-eastern parts of Anatolia and partly in the Mediterranean, Marmara, and Black Sea regions (Chamberlain & Matthews, 1970). The section members have been preceded

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in Turkey with 24 taxa; Iran with 20; the former USSR with 13; Iraq with 6; Syria with 5; Afghanistan with 4; China with 3; Bulgaria, Spain, France, and West Pakistan with 2; and Lebanon, Israel, Italy, Algeria, and Morocco with 1. The members of the section in the world are about 50 taxa and these are distributed in 15 countries. The section members are not represented in the Americas, Australia, or Antarctica (Becht, 1978).

This study is primarily based on the revision of the section *Alopecuroidei* to solve its taxonomical problems as mentioned above. The palynological, cytologic, anatomic, and morphologic characteristics of the species belonging to the section were studied; the descriptions of species were rewritten; and taxonomic positions were determined. New treatment categories are given in this study.

2. Materials and methods

The specimens of section *Alopecuroidei* were collected from different parts of Turkey between April and August, both in flowering and fruiting periods, during 1996–2004. In addition to those specimens, the contents of the AEF, ANK, ATA, BULU, CUFH, DUF, EGE, ESSE, FUH, GAZI, HUB, INU, ISTE, ISTF, KNYA, OMUB, and VANF herbaria of Turkey were examined. Some types of specimens, which were deposited in the W herbarium, were also examined. Cibachromes and photographs of isotype and holotypes of some species were sent to us from the B, BM, BRA, E, G, K, MSB, OXF, UPS, and W herbaria.

The distribution and threat categories of the species were determined according to the IUCN (2006). These categories are stated with their abbreviations: CR: Critical Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened, LC: Least Concern.

Specimens collected during this study were kept at GAZI and in the herbarium of the Department of Biology, Harran University, Şanlıurfa, Turkey.

2.1. Morphological studies

The following characteristics were used as having taxonomical importance in the section: stipule texture and length, leaf measurement, leaflet shape, number of leaflets, length of peduncle, the inflorescence shape, bract, length of calyx, whether inflated or not, length of fruit and beak, and whether curved or erect. The measurements were provided based on at least 10 specimens.

2.2. Anatomical studies

Specimens that were collected from the field were preserved in 70% alcohol. The bottles were labelled. The cross-section was taken from the stem and leaflets, and permanent preparations were made by using glycerine-gelatine. Photographs were taken with an Axioplan Universal microscope (Zeiss, Germany).

2.3. Palynological studies

Pollen morphology of species were examined by scanning electron microscope, and pollen preparations were made by using the Woodhouse method and were stained with basic fuchsin (Akan et al., 2005).

2.4. Cytological studies

The analyses of chromosome numbers were carried out during the mitotic phase. The seeds were put into petri dishes and lined with filter paper. After germination the preparations were made by using the phase method. Suitable preparations were examined under microscope. The photographs of preparations were taken with an Olympus BH2 camera (10–100× magnifications; 24 × 36 mm, 250 µN).

3. Results

3.1. Taxonomic treatment of the section

Astragalus L. sect. *Alopecuroidei* DC., Prodr. 2: 294 (1825).

Type: *Astragalus alopecuroides* L.

= *Alopecias* Steven, Bull. Soc. Imp. Naturalistes Moscou iv. 266 (1832).

= *Astragalus* sect. *Alopecias* (Steven) Bunge, Mém. Acad. Imp. Sci. Saint-Pétersbourg 11(16): 58 (1868). Type: *Alopecias alopecias* (Pall.) Steven.

° *Astragalus alopecias* Pall., Sp. Astragal. 12, t. 9. (1800–1803).

Erect, caulescent, usually stout, perennial herbs. Stipules free from the petiole, rarely decurrent, linear, lanceolate, linear to lanceolate, triangular, triangular-lanceolate, ovate to acuminate, glabrous or pilose, ciliate. Leaves imparipinnate. Leaflets oblong, narrowly oblong, ovate, elliptic, narrowly elliptic, lanceolate, narrowly lanceolate, oblong to lanceolate, obtuse or acute; usually simple-hairy beneath, rarely glabrous on both surfaces. Inflorescence many-flowered, usually dense, sessile or pedunculate spike; usually globose, oblong, globose to ovoid, oblong to cylindrical. Bracts linear, lanceolate, linear-lanceolate; pilose, sparsely adpressed pilose or with a ciliate margin. Bracteoles present or absent; if it present, usually linear with ciliate margin. Calyx usually white, simple-hairy, rarely glabrous; tubular, campanulate or tubular-campanulate, somewhat inflated in fruit, not so in flower; teeth ±equal, linear, linear-subulate or triangular and with ciliate margin. Petals yellow to deep yellow, rarely greenish yellow, drying yellow, pale yellowish brown, purple and rarely cream. Standard stenonychioid, wings and obtuse keel usually shorter than standard. Stamens diadelphous, filaments usually glabrous, rarely with margin ciliate. Ovary white, simple-hairy; ovate, triangular or ovate-oblong. Legume oblong, ovate or obovate, hairy or glabrous, with beak 1–5 mm in length, erect or curved, included within the calyx, bilocular, 2-many seeded. Seeds

reniform, yellowish brown, yellow, dark brown, light brown or blackish, and smooth.

The section *Alopecuroidei* is close to section *Argeus* Boiss. and *Grammocalyx* Bunge. The members of sect. *Alopecuroidei* are caulescent, the stipules are free from one another and from the petioles, and the calyx is not inflated in flowers, whereas in sect. *Grammocalyx* the stipules are joined at the base and the calyx becomes inflated. In sect. *Argeus* the stipules are adnate to the petiole.

Cross-sections from the stem of section members show that the cuticle is on the outer layer. The epidermis is under the cuticle and multicellular. The epidermis is simple-hairy in some species. The supporting tissue, collenchyma, is under the epidermis. Parenchyma cells are oval or hexagonal in shape and are under the collenchyma. The interfascicular cambium gives rise to parenchymatic cells toward phloem. The secondary phloem consists of many sclerenchymatic cells of mass and thin-layered parenchymatic cells with narrow spacing. The cambium is made of up 2–4 layers. The secondary xylem consists of trachea, tracheids, sclerenchyma cells, and a few parenchyma cells. The trachea are large-sized, abundant, and grouped or individual. Tracheids, xylem sclerenchyma, and xylem parenchyma are rare. In the primary xylem, trachea is limited and narrowly sized. In the centre is pith, which consists of parenchymatic cells and starch grains.

In the cross-section of leaflets of section members, it was determined that the upper and lower epidermis layers are similar to each other, but sometimes the upper epidermis has a thicker layer. Epidermis cells are square and rectangular in shape and the side layer is slightly wavy. It was observed that the mesophyll layer consists of the same type of parenchymatic cells. Therefore, leaflets are isobilateral. The palisade parenchymatic cells are arranged in columns and made up of 4–5 layers, which consist of chloroplast in abundance. The main vessel is surrounded by 3–4 layers of collenchyma cells. There is a bundle sheath around vascular bundles with hexagonal shape and rows. There are xylem members around the upper epidermis, whereas phloem members are located around the lower epidermis. The amaryllis type of stomata is present on both surfaces of leaves.

The pollen of section members has an average polar-axis length of between 26.71 µm and 35.18 µm. The length of the equatorial axis is between 23.47 µm and 28.57 µm. The pollen shape is subprolate or prolate-spheroid. The exine structure is tectate with a thickness of 0.6–0.92 µm. The intine thickness is 0.5 µm. Pollen is tricolporate. Colpus is thin and long with clear margins. Ornamentation is reticulate. Amb shape is semiangular (Akan et al., 2005). Chromosome number: 2n = 16.

Key to the Turkish species of the section *Alopecuroidei*

1. Inflorescence cylindrical at flowering time, at least 2 times longer than width
 2. Leaflets glabrous on both surface
 3. Calyx and stipules glabrous **A. ovabaghensis**
 3. Calyx and stipules hairy **A. oocephalus**
 2. Leaflets hairy at least below, if glabrous, only midrib and margins ciliate, glabrous above
 4. Standard 14–23 mm; calyx rarely tinged with purple
 5. Calyx 10–14 mm, tinged with purple, teeth 1–5 mm **A. erythrotaenius**
 5. Calyx 13–19 mm, not tinged with purple, teeth 5–11 mm
 6. Peduncles absent or if present, not more than 2 mm; leaflets acute at the apex; calyx teeth 5–7 mm **A. crinitus**
 6. Peduncles 6–30 mm; leaflets obtuse at the apex; calyx teeth 6–11 mm
 7. Leaflets elliptic, hairy below; peduncle 6–12 mm **A. stojanii**
 7. Leaflets oblong, only margin ciliate; peduncle 12–30 mm **A. petropolitanus**
 4. Standard 23–35 mm; calyx not tinged with purple
 8. Petiole 20–30 mm; leaflets in 15–20 pairs, 7–11 mm; calyx teeth 5–7 mm **A. bracteosus**
 8. Petiole 30–35 mm; leaflets in 20–37 pairs, 8–26 mm; calyx teeth 11–19 mm **A. decurrens**
 1. Inflorescence globose to ovoid during the flowering or cylindrical during at fruiting time, not longer, 2 times width
 9. Inflorescence ovoid-cylindrical, especially at fruiting time
 10. Stipule decurrent; standard 23–35 mm **A. decurrens**
 10. Stipule nondecurrent; standard 15–25 mm
 11. Leaflets glabrous on both surface
 12. Calyx glabrous; its teeth 1–5 mm **A. ovabaghensis**
 12. Calyx hairy; its teeth 4–15 mm **A. oocephalus**
 11. Leaflets hairy below, glabrous above
 13. Calyx teeth 8–11 mm **A. stojanii**
 13. Calyx teeth shorter than 7 mm

14. Leaflets acute at the apex; peduncle not more than 2 mm *A. crinitus*
 14. Leaflets obtuse at the apex; peduncle 4–10 mm *A. erythrotaenius*
 9. Inflorescence globose, oblong, 1.5× longer than width
 15. Peduncles 2–11 cm
 16. Stipules 7–13 mm; bracteoles 7–12 mm *A. echinops*
 16. Stipules 15–70 mm; bracteoles absent *A. macrocephalus*
 15. Peduncles absent or if present not more than 3 cm
 17. Stipules glabrous; bracteoles 1–8 mm *A. gymnalopencias*
 17. Stipules ciliate or hairy; bracteoles absent
 18. Leaflets hairy on both surface
 19. Leaflets 9–14 pairs *A. bahcesarayensis*
 19. Leaflets 14–30 pairs
 20. Leaflets 14–24 paired; calyx 20–25 mm *A. ekicii*
 20. Leaflets 18–30 paired; calyx 11–14 mm *A. panduratus*
 18. Leaflets glabrous or hairy only below
 21. Bracts 2–7 mm; calyx teeth 1–3 mm; beak 4–5 mm *A. ponticus*
 21. Bracts 7–21 mm; calyx teeth 2–7 mm; beak 1–3 mm
 22. Peduncle absent or if present, not more than 5 mm
 23. Leaflets in 8–20 pairs
 24. Peduncles 1–5 mm; calyx 8–10 mm *A. aytatchii*
 24. Peduncles absent; calyx 12–18 mm *A. alopecurus*
 23. Leaflets in 21–26 pairs *A. dipsaceus*
 22. Peduncles 3–30 mm
 25. Stipules triangular; calyx tubular–campanulate
 26. Stipules 10–15 mm; leaflets 15–17 paired *A. uhlwormianus*
 26. Stipules 15–32 mm; leaflets 18–30 paired *A. genuflexus*
 25. Stipules lanceolate; calyx tubular *A. elatus*

3.2. *Astragalus erythrotaenius* Boiss., Diagn. Pl. Orient. ser. 1, 6: 39 (1845) (Figure 1)

= *Tragacantha erythrotaenia* Kuntze, Revis. Gen. Pl. 2: 944 (1891).

Type: Turkey, C8 Diyarbakır: prope Diyarbakır, 26.06.1841, *Kotschy* 265 (holo. G photo! iso. BM, K photo! P, W!).

Erect, caulescent, perennial, 20–70 cm. Stipules linear, 12–20 mm, membranaceous, light white, long-ciliate. Leaves 10–19 cm; petiole 1–2 cm. Leaflets in 13–24 pairs, elliptic-narrowly oblong, 7–17 × 1.5–5 mm, obtuse at the apex, glabrous above, simple-pilose below. Peduncles 4–10 mm. Racemes oblong to cylindrical, 4–6 cm long, flowers sessile or with pedicel at most 1 mm. Bracts linear, 8–12 mm, membranaceous, ciliate. Bracteole absent. Calyx 10–14 mm, tubular to campanulate, tube inflated in fruit, purple-striped, white hairy; teeth 1–5 mm, filiform to linear, ciliate. Petals yellow-drying purple. Standard 20–23 × 4–5 mm, blade elliptic, emarginated, subabruptly contracted into a slender claw, glabrous. Wings 20–21 × 1–1.5 mm, blades narrowly oblong, obtuse. Keel 20–21 × 1–2 mm, blades obliquely elliptic, with gibbously curved lower edge and nearly straight upper edge. Filaments 18–19 mm, glabrous, white to yellowish; anthers yellow,

dorsifixed. Ovary 4–6 mm, ovoid, densely white hairy; style 11–13 mm, hairy at the base, stigma capitate. Legumes 12 × 3–4 mm, oblong, included within the calyx, sparsely pilose, bilocular; beak curved, 2.5–2.8 mm. Seeds 3 × 1.5 mm, reniform, light brown and smooth. 2n = 16. Fl. 5–6.

Habitat: Stony places, fields, roadsides, meadows, etc.; 800–1000 m. *Distribution*: Turkey and Syria. Irano-Turanian element. *IUCN category*: CR.

Specimens seen: C7 Diyarbakır: From Ovabağ to Harami, 1000 m, stony places, 1984, *Kaynak* 662 (BULU); Şanlıurfa: Karacadağ, 1410 m, 7.vi.1983, roadside, *Kaynak* 759 (ANK); Diyarbakır: 3 km from Kalkan to Eğil, 28.4.1977, 830 m, fields, *Kaynak* 3659 (DUF); Diyarbakır: 6 km from Çınar to Aşağıkonak village, roadside, 28.4.1977, *Kaynak* 3659 (DUF).

In Turkey, it was only known from the type gathered throughout Diyarbakır Province. Many years later it was collected by *Kaynak* (specimen nos. 662 & 3659) from the same region. Chamberlain and Matthews (1970) previously stated that *A. erythrotaenius* is endemic for Turkey, but it was later realised that it is not endemic as it is distributed in Syria (Becht, 1978; Maassoumi, 1998; Agerer-Kirchhoff & Agerer, 1977). In addition, Chamberlain and Matthews (1970) included this species in sect. *Alopecuroidei*, but

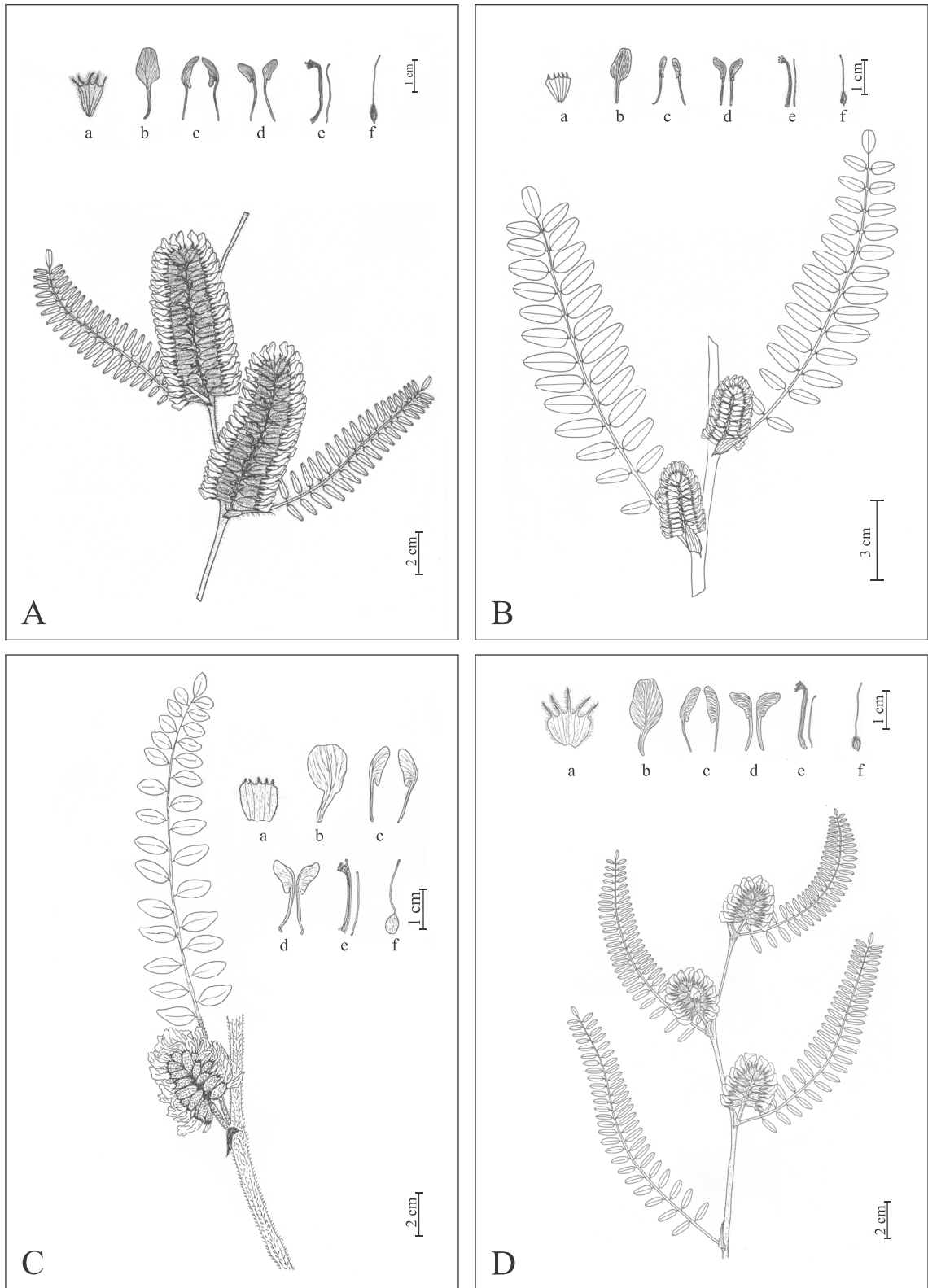


Figure 1. A- *Astragalus erythrotaeniensis* (Akan 3662): a- calyx, b- standard, c- wings, d- keel, e- stamens, f- ovary; B- *A. ovabaghensis* (Akan 1592): a- calyx, b- standard, c- wings, d- keel, e- stamens, f- ovary; C- *A. ponticus* (Akan 1008): a- calyx, b- standard, c- wings, d- keel, e- stamens, f- ovary; D- *A. genuflexus* (Akan 1425): a- calyx, b- standard, c- wings, d- keel, e- stamens, f- ovary.

recently it has been transferred to sect. *Laxiflori* (Becht, 1978; Agerer-Kirchhoff & Agerer, 1977). However, the type specimens of the species were examined during this revision and it was determined that they should be maintained within sect. *Alopecuroidei*.

By observations of the herbarium specimens and especially of the type specimens (G photo! W!), it was determined that the colour of the flowers is yellow to drying purple. During this revision, many excursions were carried out in Diyarbakır Province in order to find the species, but it could not be found due to its local distribution and excessive grazing in the region.

3.3. *Astragalus ovabaghensis* Akan & Aytaç, Ann. Bot. Fennici 41: 209–212 (2004) (Figure 1)

Type: Turkey, C8 Diyarbakır: Diyarbakır-Ovabağ, 13. km, 800–1000 m, 28.05.1999, fields, *Akan* 1592 (holo. GAZI! iso. ANK!).

Erect, caulescent, perennial, 50–90 cm. Stipules triangular-lanceolate, 18–30 mm, membranous, purple, glabrous. Leaves 25–30 cm; petiole 3–6.5 cm. Leaflets in 9–14 pairs, elliptic-narrowly oblong, obtuse or acute, 25–50 × 12–15 mm, glabrous on both surfaces. Peduncles absent. Racemes oblong to cylindrical, 3–5 × 1.5–2 cm, flowers sessile. Bracts linear, 7–16 mm, membranaceous, ciliate. Bracteole absent. Calyx 7–11 mm, tubular to campanulate, tube inflated in fruit, purple-striped, glabrous; teeth 1–5 mm, linear, glabrous. Petals yellow. Standard 18–20 × 3–4 mm, stenonychioid, glabrous. Wings 15–16 × 2–3 mm. Keel 16–17 × 2–3 mm. Filaments 14–16 mm long, glabrous, white to yellowish; anthers yellow, dorsifixed. Ovary 4–6 mm, ovoid, densely white hairy; style 10–11 mm, hairy at the base, stigma capitate. Legumes 10–12 × 3–4 mm, oblong, included within the calyx, sparsely pilose, bilocular; beak 2–3 mm long, curved. Seeds 3 × 1.5–2 mm, reniform, light brown and smooth. 2n = 16. Fl. 5–6.

Habitat: Fields, roadsides, meadows; 800–1000 m. *Distribution*: Endemic to Turkey. Irano-Turanian element. *IUCN category*: EN.

Specimens seen: C8 Diyarbakır: around airport, meadows, 29.05.1976, *Kaynak* 503 (DUF, ISTF, ESSE); Diyarbakır-Ovabağ, 11. km, W of Eşref Ağa village, 1000 m, 9.06.1998, *Akan* 1412 (GAZI).

Astragalus ovabaghensis resembles *A. erythrotaenioides*. However, *A. ovabaghensis* can be easily differentiated by its glabrous calyx, leaflets, and stem. There are also other differences between *A. erythrotaenioides* and *A. ovabaghensis* from the view point of pair of leaflets and length of leaves and peduncles.

3.4. *Astragalus ponticus* Pall., Sp. Astrag. 14, t. 11 (1800) (Figure 1)

≡ *Tragacantha pontica* Kuntze, Revis. Gen. 2: 947 (1891).
≡ *Alopecias ponticus* Steven, Bull. Soc. Imp. Naturalistes

Moscou iv.266 (1832). Type: in littorali montano Tauricae, praesertim in saxosa valle inter Sudac et Kutlak.

= *Astragalus chartaceus* Ledeb., Fl. Ross. 1(3): 634 (1843). ≡ *Tragacantha chartacea* Kuntze, Revis. Gen. 2: 943 (1891). Type: Iran ad torrentum Avrin distr. Khoi prov Adserbidshan Persiae Szovits 549 (holo. LE photo! iso. G-BOIS photo! MSB photo! fragm., P, ZT).

= *Astragalus chlorotaenioides* Freyn & Sint., Oesterr. Bot. Z. 42: 12 (1892). Lectotype (Podlech, 1999): Turkey, Pontus australis, Jatmisch, prope Tokat, 1400 m, 31.5.1890, *Bornmüller* 2117 (B sheet marked as lectotypus, iso. B! MSB! BRNM! K photo!).

= *Astragalus idae* Grossh., Dokl. Akad. Nauk Azerb. SSR 3: 544 (1947). illeg. [non Širj. 1939]. Type: Turkey: B8 Erzurum Palendöken Dag, *Von Radde* 77.

Erect, caulescent, perennial, 25–100 cm. Stipules linear-lanceolate, 12–30 mm, sparsely adpressed-pilose especially on margins. Leaves 7–35 cm, petiole 7–30 mm; leaflets in 9–23 pairs, oblong, narrowly ovate, obtuse, 7–40 × 3.5–12 mm, glabrous above, adpressed simple-pilose below. Peduncles 0.5–1 cm. Racemes globose or ovate, flowers sessile. Bracts lanceolate-ovate or linear, 2–7 mm, ciliate on margins. Bracteole absent. Calyx 12–15 mm, tubular, tube slightly inflated in fruit, villous; teeth 1–3 mm, linear, ciliate. Petals yellow. Standard 18–22 × 6 mm, stenonychioid, glabrous. Wings 18 × 3 mm. Keel 17–18 × 2–5 mm. Filaments 16–17 mm, glabrous, white to yellowish; anthers yellow, dorsifixed. Ovary 5 mm, ovoid, densely white hairy; style 15 mm, hairy at the base, stigma capitate. Legumes 10 × 4–4.5 mm, ovoid, compressed, included within the calyx, pilose, bilocular; beak curved, 4–5 mm. Seeds reniform, 4 × 2.5–3 mm, light brown and smooth. Fl. 5–8.

Habitat: Stony places, fields, roadsides, meadows, spaces of forests, riversides, dry banks, etc.; 500–2800 m. *Distribution*: Turkey, Crimea, Iran, Europe, S. Russia, Bulgaria. *IUCN category*: LC.

Specimens seen: A7 Bayburt: 39 km from Bayburt to Gümüşhane, 1600 m, 26.07.1999, stony places, *Akan* 1186 & *Ekici* (GAZI). A8 Erzurum: Erzurum-Tortum, 14. km, 1900 m, 24.07.1997, roadside, *Akan* 1182 & *Ekici* (GAZI). A9 Erzurum: Horasan-Sarıkamış, 25. km, 2000 m, 6.08.1997, fields, *Akan* 1365 & *Ekici* (GAZI). B2 Kütahya: Andız village, 900 m, 11.06.1999, roadside, *Akan* 1598 (GAZI). B3 Afyonkarahisar: Çay-Sultandağı, 15. km, 1050 m, 10.06.1997, roadside, *Akan* 1238 & *Ekici* (GAZI). B6 Sivas: İmranlı, 1650 m, 5.08.1997, roadside, *Akan* 1357 & *Ekici* (GAZI). B7 Erzincan: Refahiye to Sivas, 4. km, 1600 m, 5.08.1997, roadside, *Akan* 1358 & *Ekici* (GAZI). B8 Erzurum: Aşkale to Bayburt, 1. km, 1650 m, 29.06.1997, roadside, *Akan* 1307 & *Ekici* (GAZI). C4 Konya: Bozkır-Seydişehir, 1130 m, 3.06.1997, roadside, *Akan* 1041 & *Ekici* (GAZI).

A. ponticus can be confused with *A. panduratus*, which is endemic to Turkey, due to the similarity of bracts, but the leaflets of *A. panduratus* are hairy on both surfaces whereas in *A. ponticus* the leaflets are glabrous above.

3.5. *Astragalus genuflexus* Freyn & Sint., Oesterr. Bot. Z. 42: 12 (1892) (Figure 1)

Type: Armenia turcica, Karpuz, inter Hamedi et Karangerd, 21.5.1889, *Sintenis* 344 (WU photo! MSB! iso. B! BP! BR! BRNM! JE, K! LD photo! K! P, PR, W!).

Erect, caulescent, perennial, 30–70 cm. Stipules triangular, 15–32 mm, simple pilose, especially on margins. Leaves 7–25 cm; petiole 12–35 mm. Leaflets in 18–30-pairs, oblong, oblong-ovate, 7–23 × 3.5–12 mm, obtuse, glabrous above, adpressed simple-pilose below. Peduncles 0.9–2 cm. Racemes globose-ovoid, especially ovoid in fruiting. Bracts linear, 12–21 mm, ciliate on margins. Bracteole absent. Calyx 13–16 mm, tubular-campanulate, tube slightly inflated in fruit, villous; teeth 2–7 mm, linear-subulate, ciliate. Petals lemon yellow with green veins. Standard 19–24 × 8–13 mm, stenonychioid, glabrous. Wings 15–19 × 3–5 mm. Keel 18–22 × 4–5 mm. Filaments 15–18 mm, glabrous, white to yellowish; anthers yellow, dorsifixed. Ovary 5–6 mm, ovoid; style 15–19 mm, glabrous; stigma capitate. Legumes 6–10 × 5–6 mm, ovoid, included within the calyx, adpressed pilose, bilocular; beak curved, 1.5–2 mm. Seeds reniform, 3 × 2.5 mm, light brown and smooth. Fl. 5–6.

Habitat: Mountains, stony places, fields, roadsides, 400–1180 m. *Distribution*: Endemic to Turkey. Irano-Turanian element. *IUCN category*: EN.

Specimens seen: B7 Elazığ: Harput, İçme village, 1100 m, 4.06.1981, steppe, *Altan* 3352 (GAZI); Elazığ: Harput-Hamedi, 16. km, 1080 m, 13.6.1998, fields, *Akan* 1425 & *Ekici* (GAZI).

In *Flora of Turkey*, *Astragalus genuflexus* Freyn & Sint. was given as a synonym of *A. uhlwormianus* Freyn & Bornm. This means that the mistake to combine *A. uhlwormianus* Freyn & Bornm. with *A. genuflexus* Freyn & Sint. goes back to *Flora of Turkey* and to Becht (1978) in her revision. In fact, neither had seen any plants from *A. uhlwormianus*, but rather only those from *A. genuflexus*. Therefore, the descriptions from both are of *A. genuflexus*. We have studied the type of *A. uhlwormianus* and indeed these are 2 completely different plants in many characters.

3.6. *Astragalus uhlwormianus* Freyn & Bornm., Oesterr. Bot. Z. 40: 441 (1890)

Lectotype: (Podlech, 1999): [Turkey] Pontus australis, prope Khaousa, 400–500 m, 3.6.1889 [label: Amasia, in regione subalpina mts. Abadschidagh, 1300–1500 m], *Bornmüller* 98/c (B sheet marked as lectotypus, iso. B photo! MSB! BRNM! K photo! LE).

Erect, caulescent, perennial, at least 50 cm tall, nearly completely glabrous. Stipules very narrowly triangular,

very long acuminate, 10–15 mm, very shortly adnate to the petiole, very sparsely furnished with hairs. Leaves 10–20 cm; petiole 2–3 cm. Leaflets in 15–17 pairs, narrowly elliptic, 10–22 × 3–6 mm, obtuse, on upper side glabrous, on underside glabrous or very sparsely covered with appressed hairs. Racemes subsessile, globose, 3.5–4 cm in diameter, rather densely many-flowered. Bracts narrowly triangular, 2–5 mm, sparsely white hairy. Bracteoles absent. Calyx 9–10 mm, campanulate-tubular, rather densely covered with ascending to partly nearly spreading hairs; teeth 1–2.5 mm, subulate. Petals yellow. Standard 17–19 × 8 mm, blade obovate, slightly constricted below the middle, emarginate, obtuse-angularly passing into the rather short claw. Wings 15–19 × 3–5 mm; blades narrowly oblong, rounded. Keel 17–18 × 4–5 mm; blades slightly obliquely elliptic, obtuse. Stamen tube obliquely cut at the mouth. Ovary densely white hairy; style hairy in lower third. Legumes unknown. Fl. 5–6.

Habitat: Subalpine. *Distribution*: Endemic to Turkey. *IUCN category*: CR.

Specimens seen: Turkey. Amasya: in regione subalpina mts. Abadschidagh, 1300–1500 m, 3.6.1889, *Bornmüller* 98/c (B photo!).

3.7. *Astragalus alopecurus* Pall., Sp. Astragal. 11 (1800) (Figure 2)

= *Tragacantha alopecurus* Kuntze, Revis. Gen. 2: 942 (1891). = *Astragalus alopecuroides* L. var. *typicus* Pamp. f. *alopecurus* Pamp., Nuovo Giorn. Bot. Ital., N.S. 14: 335 (1907) quoad nomen. Typus: Kirgisio-Songaria: “Circa Sacmaram fluvium et australia uralensis jugi promentoria, unde per montes Asiae mediae extenditur usque ad Buchtorma, Tscharysch rt Obum fluvios” (BM).

= *Astragalus maximus* Willd., Sp. Pl. 3: 1258 (1802). = *Tragacantha maxima* Kuntze, Revis. Gen. 2: 946 (1891). Typus: in Armenia. *Astragalus orientalis maximus glaber alopecuroides flore luteo. Tournefort cor.* (B photo! P).

= *Astragalus alopecurus* Pall. var. *pallasiana* Trautv., Acta Hort. Petrop. 5: 424 (1877). = *Astragalus alopecuroides* L. var. *winterlii* Pamp. f. *pallasianus* (Trautv.) Pamp., Nuov. Giorn. Bot. Ital. N.S. 14: 358 (1907).

= *Astragalus alopecuroides* L. var. *typicus* Pamp., nom. Illeg., Nuov. Giorn. Bot. Ital. N.S. 14: 334 (1907).

= *Astragalus alopecuroides* L. var. *typicus* Pamp. f. *saussureanus* Pamp., Nuov. Giorn. Bot. Ital. N.S. 14: 346 (1907).

= *Astragalus alopecuroides* L. var. *typicus* Pamp. f. *robustus* Pamp., Nuov. Giorn. Bot. N.S. 14: 347 (1907).

= *Astragalus alopecuroides* L. var. *typicus* Pamp. f. *intermedius* Pamp., Nuov. Giorn. Bot. N.S. 14: 349 (1907).

= *Astragalus alopecuroides* L. var. *typicus* Pamp. f. *ledebourii* Pamp., Nuov. Giorn. Bot. N.S. 14: 350 (1907).

= *Astragalus alopecuroides* L. var. *typicus* Pamp. f. *ispirensis* Pamp., Nuov. Giorn. Bot. N.S. 14: 352 (1907).

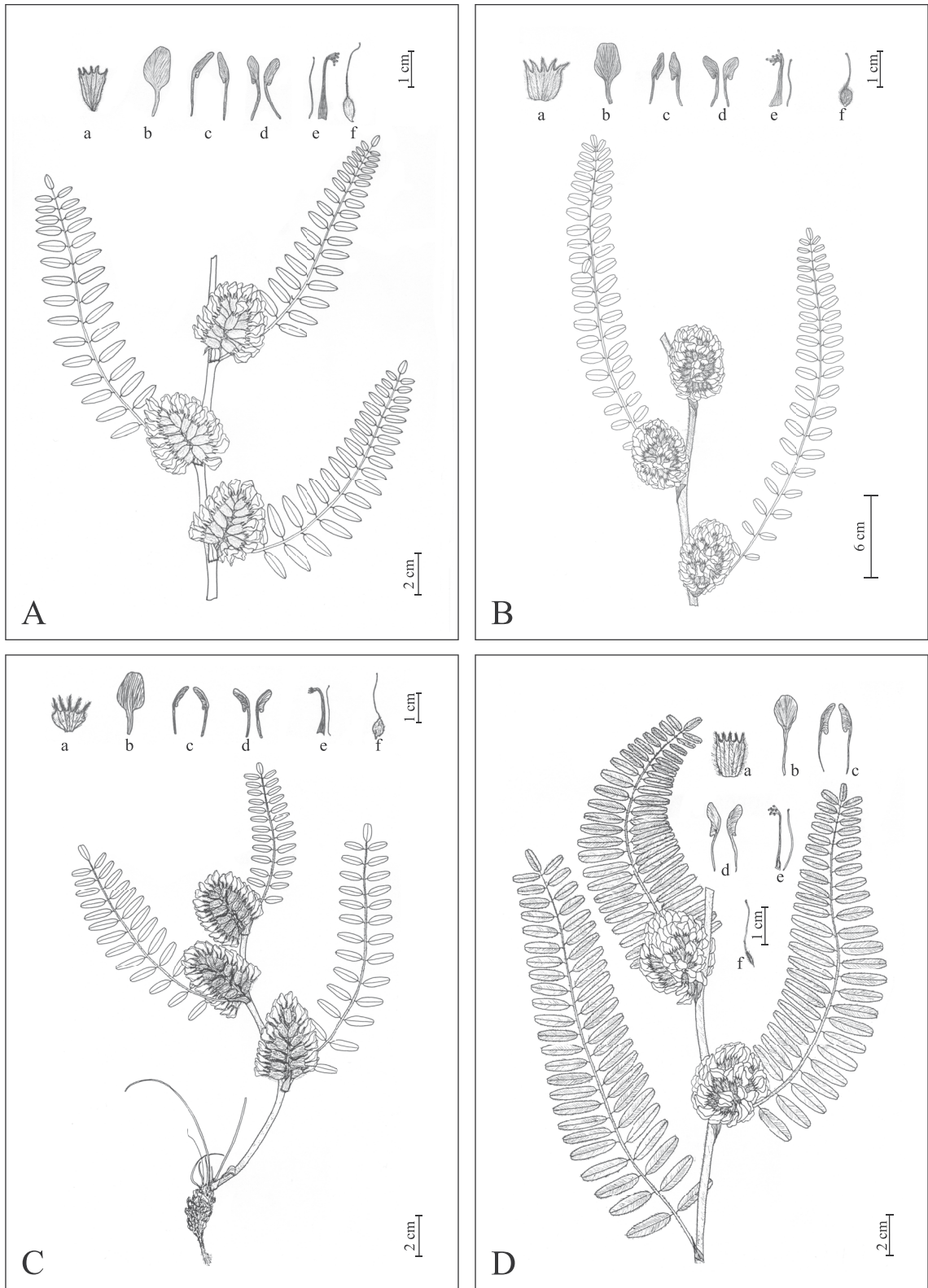


Figure 2. **A-** *Astragalus alopecurus* (Akan 1190): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; **B-** *A. elatus* (Akan 1341): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; **C-** *A. aytatchii* (Akan 1428): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; **D-** *A. panduratus* (Akan 1532): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary.

= *Astragalus alopecuroides* L. var. *winterlii* Pamp., nom. illeg. Nuovo Giorn. Bot. Ital., N.S. 14: 353 (1907).

= *Astragalus alopecuroides* L. var. *winterlii* Pamp. f. *wildenowii* Pamp., Nuovo Giorn. Bot. Ital., N.S. 14: 354 (1907).

= *Astragalus alopecuroides* L. var. *hookeri* Pamp., nom. illeg. Nuovo Giorn. Bot. Ital., N.S. 14: 360 (1907).

= *Astragalus alopecuroides* L. var. *hookeri* Pamp. f. *gallicus* Pamp., Nuovo Giorn. Bot. Ital., N.S. 14: 361 (1907).

= *Astragalus alopecuroides* L. var. *hookeri* Pamp. f. *caucasicus* Pamp., Nuovo Giorn. Bot. Ital., N.S. 14: 365 (1907).

= *Astragalus alopecuroides* L. var. *hookeri* Pamp. f. *elongatus* Pamp., Nuovo Giorn. Bot. Ital., N.S. 14: 367 (1907).

= *Astragalus dzhawakheticus* Bordz., Sympos. Mem. Fomin (Akad. Sci. Ukraine): 58 (1938). Holotype: in prov. Georgiae Dzhawakhetia, prope Akhalkalaki haud procul a castello Turcico, 7.7.1907, *Bordzilowski s.n.* (in herb. Bordzilowski).

= *Astragalus centralpinus* Braun-Blanq., Feddes Repert. 79: 49 (1968). Holotype: [Italy] in valle Augustana (Valle d'Aosta), vallis di Cogne, inter Epinel et Cretaz, 1480 m, 28.7.1904, *Ferro s.n.* (FI).

= *Astragalus maximus* Willd. var. *dasysemius* D.F.Chamb. & V.A.Matthews, Notes Roy. Bot. Gard. Edinburgh 29: 302 (1969). Holotype: Turkey, A8 Gümüşhane, between Aşkale and Bayburt, 2300 m, 15.7.1964, *Karamanoglu 1644* (ANK!) **syn. nov.**

Erect, caulescent, perennial, 40–90 cm. Stipules lanceolate, 8–25 mm, ciliate. Leaves 9–30 cm; petiole 15–30 mm. Leaflets in 8–20-pairs, narrowly elliptic, 6–35 × 7–13 mm, acute or sometimes obtuse, glabrous above, simple-pilose below. Peduncles absent. Racemes oblong ± cylindrical. Bracts linear-lanceolate, 7–17 mm, ciliate on margins. Bracteole absent. Calyx 12–18 mm, tubular, tube slightly inflated in fruit, pilose; teeth linear, 2–4 mm, white-hairy. Petals yellow. Standard 16–22 × 4–6 mm, stenonychioid, glabrous or very sparsely hairy. Wings 12–17 × 2–3 mm. Keel 14–17 × 2–3 mm. Filaments 12–16 mm, glabrous, whitish; anthers yellow, dorsifixed. Ovary 6–7 mm, ovoid, densely pubescent; style 9–13 mm, pubescent at the base, stigma capitate. Legumes 7–12 × 2–4 mm, ovate, included within the calyx, compressed pilose, bilocular; beak slightly curved, 1–3 mm. Seeds reniform, 3–4 × 1.5–3 mm, brown and smooth. 2n = 16. Fl. 6–9.

Habitat: Mountainous districts, stony slopes, roadsides, fields, meadows, spaces of forests, tombs, riversides; 1200–2350 m. *Distribution:* Turkey, S. Russia, Georgia, Soviet Armenia. Irano-Turanian element. *IUCN category:* LC

Specimens seen: A8 Erzurum: Erzurum-Tortum, 17. km, 1800 m, 28.6.1997, roadside, *Akan 1288/b* & *Ekici* (GAZI); Bayburt: Bayburt-Aşkale, 16. km, 1800 m,

29.6.1997, slopes, *Akan 1302* & *Ekici* (GAZI). A9 Erzurum: Horasan-Sarıkamış, Bademözü district, 1770 m, 6.8.1997, *Akan 1366* & *Ekici* (GAZI). B6 Sivas: İmranlı, 1550 m, 2.7.1997, *Akan 1336* & *Ekici* (GAZI). B9 Ağrı: Eleşkirt, Sarıcan village, 2000–2200 m, 5.8.1997, streamside, *Akan 1361* & *Ekici* (GAZI).

According to *Flora of Turkey*, *A. maximus* var. *dasysemius* is the only taxon whose standard is hairy, and the occurrence of hairiness on standards is an interesting characteristic in the sect. *Alopecuroidei*. However, during this study, it was observed that the occurrence of hairs is absent in all members of the section. One of the other characteristics that causes confusion among these taxa is the calyx teeth. The calyx teeth were measured in all type specimens and in all samples that were gathered during this study. It was observed that this characteristic is also overlapping. It is not an indicator characteristic for the separation of these taxa from each other. Therefore, some small differences could be regarded as variation within the species, and *Astragalus maximus* var. *dasysemius* and *A. dasysemius* should be synonyms of *A. alopecurus*.

3.8. *Astragalus elatus* Boiss. & Balansa, Diagn. Pl. Orient. ser. 2, 6: 57 (1859) (Figure 2)

= *Tragacantha alidaghensis* Kuntze, Revis. Gen. 2: 940 (1891). Type: Turkey, Alidagh Cappadociae ad orientem Caesareae, 1600 m, 27.7.1857, *Balansa s.n.* (G-BOIS! iso. BM, E, G, G-BOIS, GOET, JE, K, MPU, MSB, OXF, P, W photo! MSB photo!).

= *Astragalus karasarensis* Podlech, Sendtnera 6: 155 (1999). Type: B7 Prov. Sivas, 5 km E Karasar pass, zwischen Kangal und Divrighi, 1550 m, 15.6.1992, *Nydegger 46284* (holo. MSB, iso. BASBG).

Erect, caulescent, perennial, 50–90 cm. Stipules lanceolate, 10–20 mm, sparsely adpressed-pilose. Leaves 10–36 cm, petiole 10–20 mm. Leaflets in 20–25 pairs, narrowly elliptic, 9–40 × 3–8 mm, obtuse, glabrous above, simple-pilose below. Peduncles 5–27 mm. Racemes globose to ovate. Pedicel at most 1 mm. Bracts linear-narrowly lanceolate, 7–15 mm, long-ciliate on margins. Bracteole absent. Calyx 12–18 mm, tubular, tube slightly inflated in fruit, long-villous; teeth linear, 3–5 mm, ciliate. Petals yellow. Standard 15–22 × 4–7 mm, stenonychioid, glabrous. Wings 15–17 × 2–3 mm. Keel 15–17 × 2–3 mm. Filaments 12–15 mm, glabrous, whitish to yellowish; anthers yellow, dorsifixed. Ovary 6–7 mm, ovoid, densely pubescent; style 12–14 mm, pubescent at the base, stigma capitate. Legumes 7–8 × 3–4 mm, obovoid, included within the calyx, sparsely long-pilose, bilocular; beak slightly curved, 2–3 mm. Seeds reniform, 3 × 1–2 mm, brown and smooth. Fl. 6–9.

Habitat: *Pistacia* sp. shrubs, mountainous districts, stony slopes, roadsides, fields, meadows, riversides, 100–1600 m. *Distribution:* Endemic to Turkey; Irano-Turanian element. *IUCN category:* NT.

Specimens seen: B5 Kayseri: Talas, 1100 m, 25.08.1998, Akan 1534 & Ekici (GAZI); Nevşehir: Göreme, 10 km W of Ürgüp, 3.09.1956, Neill 395 (MSB photo! ISTE). C5 Niğde: Çamardı, Demirkazık village, 1420 m, 3.09.1995, roadside, Aytaç 7308 & Adıgüzel (GAZI).

The sample that was gathered by Aytaç (Leg 7308, GAZI!) from around Niğde has a variation with short leaflets (5–8 × 3–4 mm), but the general description of the sample belongs to *A. elatus*.

3.9. *Astragalus aytatchii* Akan & Civelek, Ann. Bot. Fennici 38: 167–170 (2001) (Figure 2)

Holotype: Turkey, B6 Sivas: Taşlıdere, Domuzluk district, Hocabey village, Al hill, gypsum fields and slopes, 1500–1600 m, 14.06.1998, Akan 1428 & Civelek (GAZI).

Erect, caulescent, perennial, 10–35 cm tall. Stipules linear to narrowly lanceolate acuminate at apex, 8–15 mm, ciliate. Leaves 6–18 cm, petiole 2–4 cm long. Leaflets in 9–14 pairs, oblong, obtuse to acute at apex, 10–18 × 3–7 mm, glabrous above, adpressed-simple-pilose below, especially under midrib. Peduncles 1–5 mm. Racemes globose to oblong, with sessile flowers. Bracts linear, 9–10 mm, ciliate. Bracteole absent. Calyx 8–10 mm, tubular to campanulate, densely long-villous, tube inflated in fruit, purple-striped; teeth 3–5 mm long, linear, with ciliate. Petals yellow. Standard 18–19 × 6–7 mm, stenonychioid, glabrous. Wing 18–19 × 2–3 mm. Keel 16–18 × 2–4 mm. Ovary 8–9 × 3–4 mm, ovoid, densely white-villous, style 14–15 mm, hairy at the base, stigma globose. Legumes included within the calyx, ovoid, compressed, 10–11 × 5–6 mm, white hairy, bilocular, with a slightly curved beak, 2–3 mm long. Seeds reniform, light brown and smooth. $2n = 16$. Fl. 6–7.

Habitat: Deep soil, gypsum fields, and slopes. *Distribution:* Endemic to Turkey. Irano-Turanian element. *IUCN category:* EN.

Specimens seen: Turkey: B6 Sivas, Taşlıdere, Domuzluk district, Hocabey village, Al hill, gypsum field and slopes, 1550–1600 m, 18.06.1985, Civelek 1753 (FUH).

Astragalus aytatchii is related to *A. elatus* but can be distinguished by shorter length of leaves, leaf shape, and glabrous stipule.

3.10. *Astragalus panduratus* Bunge, Mém. L'Acad. Impér. Sci. St. Pétersb. Ser. 7, 15, 1: 95 (1869) (Figure 2)

= *Tragacantha pandurata* Kuntze, Rev. Gen. 947 (1891). *Holotype:* Turkey, B4 Ankara, prope Angoram, 1834, Wiedemann s.n. (LE).

Erect, caulescent, perennial, 40–50 cm. Stipules narrowly triangular-lanceolate, 14–18 mm, densely pilose. Leaves 10–20 cm, petiole 18–30 mm. Leaflets in 18–30-pairs, narrowly elliptic, 16–30 × 2–6 mm, obtuse at apex, both surfaces adpressed-pilose but sparsely above.

Peduncles 0–2 cm. Racemes globose. Bracts linear, 6–8 mm, ciliate on margins. Bracteole absent. Calyx 11–14 mm, tubular-campanulate, tube slightly inflated in fruit, densely long-pilose; teeth 2–4 mm, narrowly triangular. Petals yellow. Standard 15–18 × 7–8 mm, stenonychioid, glabrous. Wings 14–15 × 2–3 mm. Keel 15–16 × 3–4 mm. Filaments 16–18 mm, glabrous, whitish to yellowish; anthers yellow, dorsifixed. Ovary 5–6 mm, ovoid, densely pilose, style 12–13 mm, pubescent at the base, stigma capitate. Legumes 8 × 4 mm, ovoid, included within the calyx, sparsely long-pilose, bilocular; beak slightly curved, 4 mm. Seeds reniform, 5–6 × 2–4 mm, brown and smooth. Fl. 6–8.

Habitat: Stony slopes, roadsides, fields, meadows, riversides, 900–1600 m. *Distribution:* Endemic to Turkey; Irano-Turanian element. *IUCN category:* EN.

Specimens seen: A5 Kastamonu: Tosya, Sint. 1892:4558; ibid. Wedsuluk dere, Ross s.n. (MSB photo). B4 Ankara: İdris Da., Bornm. 1891:3152; Aysanti pass, south slopes, 1250–1300 m, 1.08.1998, Akan 1532 & Adıgüzel; ibid., 27.06.1986, steppe, Vural 4155 (GAZI).

According to *Flora of Turkey*, the inflorescence was previously stated to be sessile for this species. With this study, it was observed that the peduncle length is 1–2 cm. The species is very local and has limited population. Field observations proved that it is in the endangered category. In the original short description of species, the legume was given as unknown, but during this revision, it was decided that the legume is ovoid, 8 × 4 mm, included within the calyx, sparsely long-pilose. *A. panduratus* is allied to *A. ponticus*, but is distinguished by leaf indumentum and length of peduncle.

3.11. *Astragalus oocephalus* Boiss., Diagn. Ser. 1 (2): 56 (1843) (Figure 3)

Erect, caulescent, perennial, 50–100 cm. Stipules narrowly lanceolate, 10–42 mm, glabrous but sparsely ciliate. Leaves 10–38 cm, petiole 12–80 mm. Leaflets in 12–20 pairs, narrowly elliptic, 10–50 × 4–9 mm, obtuse at the apex, rarely acute, both surfaces glabrous. Peduncles absent or to 10 mm. Racemes ovate-cylindrical. Bracts linear, 8–25 mm, ciliate on margins. Bracteole absent. Calyx (11–)12–24 mm, tubular-campanulate, tube slightly inflated in fruit, densely pilose; teeth 4–15 mm, linear. Petals yellow. Standard 15–25 × 5–10 mm, stenonychioid, glabrous. Wings 12–20 × 2–4 mm. Keel 15–22 × 2–5 mm. Filaments 10–19 mm, glabrous, whitish; anthers yellow, dorsifixed. Ovary 3–7 mm, ovoid, densely pilose, style 10–17 mm, pubescent at the base, stigma capitate. Legumes 6–14 × 3–4 mm, ovoid, compressed, included within the calyx, densely long-pilose, bilocular; beak curved, 4–3 mm. Seeds reniform, 3–4 × 1.5–2 mm, brown and smooth. Fl. 5–8.

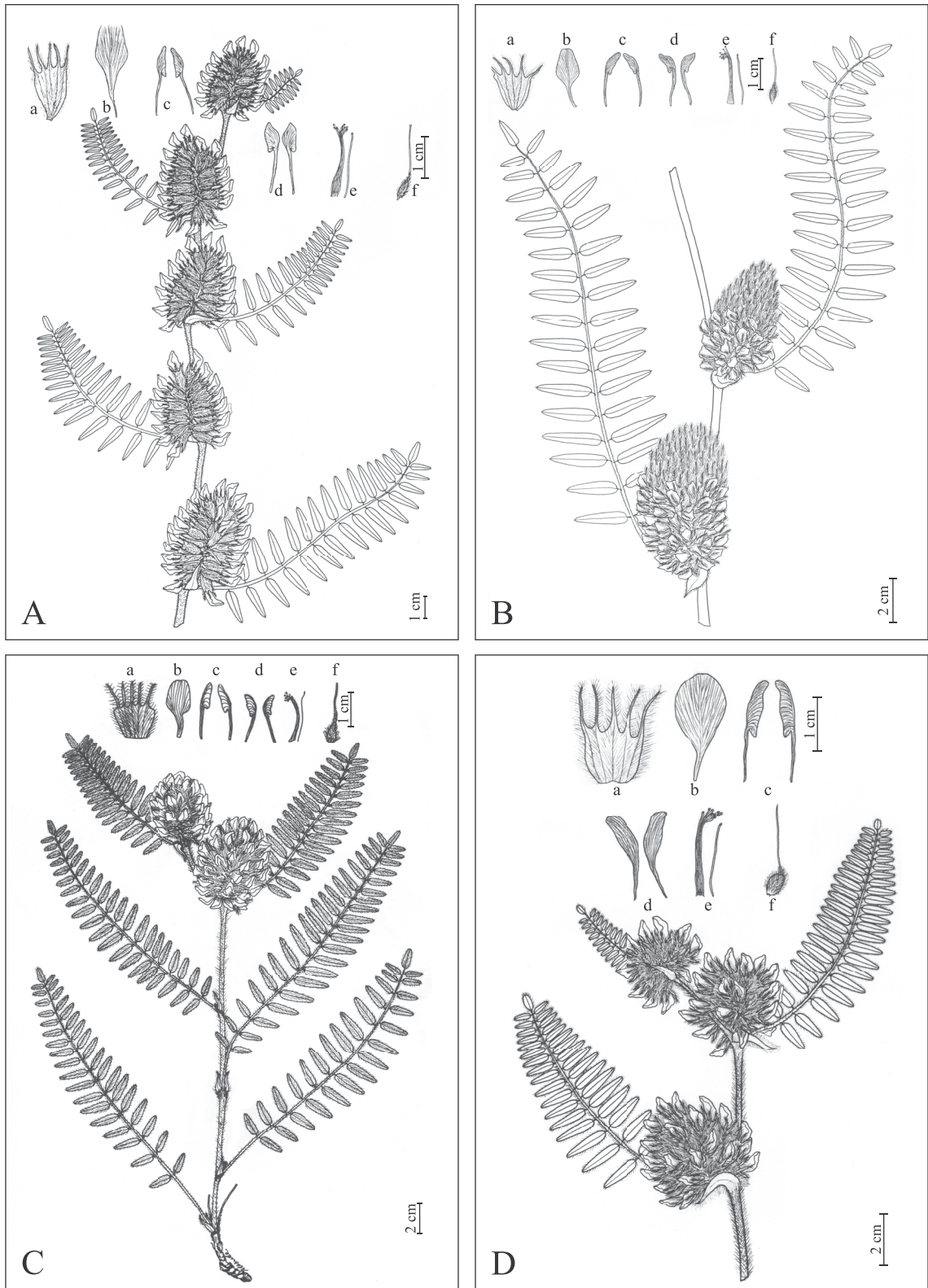


Figure 3. A- *Astragalus ocephalus* subsp. *ocephalus* (Akan 1486): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; B- *A. ocephalus* subsp. *stachyophorus* (Akan 1417): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; C- *A. ekicii* (Akan 3646): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; D- *A. dipsaceus* (Akan 1308): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary.

Key to distinguishing subspecies:

1. Young stems hairy; stipule 19–36 mm; calyx teeth 5–7 mm; inflorescence ovoid subsp. **oocephalus**
1. Young stems glabrous; stipule 13–14 mm; calyx teeth 8–15 mm; inflorescence cylindrical subsp. **stachyophorus**

Subsp. oocephalus

= *Tragacantha oocephala* Kuntze, Revis. Gen. 2: 947 (1891). Type: Syria prope Aleppum, *Aucher-Eloy* 1298 (holo.G-BOIS! iso. FI-W, G! K! P).

Habitat: Openings of forests, stony slopes, roadsides, fields, meadows, riversides, 400–2200 m. *Distribution:* Palestine, Syria, Iraq. Irano-Turanian element. *IUCN category:* LC.

Specimens seen: **B9** Erzurum: Erzurum-Horasan, 40. km, Sarıcan village, 2000–2100 m, 29.07.1998, stream side, *Akan* 1486 & *Ekici* (GAZI). **C7** Şanlıurfa: Şanlıurfa-Akçakale, 7. km, 400 m, 17.05.1957, fallow fields, *Davis & Hedge* 28117 (ANK); Şanlıurfa: Ceylanpınar, Gürgürbaba stream, stream length, 470 m, 10.06.1996, steppe, *Adigüzel* 2572 & *Aytaç* (GAZI). **C10** Hakkari: Bacırge-Yüksekova, 27. km, 2150 m, D. 45217.

Subsp. **stachyophorus** Hub.-Mor. & Chamb., Notes R.B.G. Edinb. 29: 302 (1969).

= *Astragalus oocephalus* Boiss. var. *stachyophorus* (Hub.-Mor. & D.F.Chamb.) Ponert, Feddes Repert. 83: 629 (1973). Holotype: Turkey, B7 Tunceli: Pertek-Tunceli, 28 km, N Pertek, 1250 m, 24.6.1951, *Huber-Morath* 11427 (G!).

Habitat: Serpentine, roadsides, fields, meadows, 500–1350 m. *Distribution:* Endemic to Turkey; Irano-Turanian element. *IUCN category:* VU.

Specimens seen: **B7** Tunceli: Pertek-Tunceli, 18. km, Cankurtaran district, 1350 m, 12.06.1998, meadows, *Akan* 1417 (GAZI); *ibid.*, 1350 m, 28.07.1998, *Akan* 1483 (GAZI). **C8** Şanlıurfa: Ceylanpınar, 540 m, *Karamanoğlu* 1292 (ANK); Hilvan, 650 m, 18.5.1957, *Davis-Hedge* 28273 (ANK).

Subsp. *stachyophorus* can be easily differentiated by its cylindrical inflorescence, glabrous stem, shorter stipule and calyx teeth. In *Flora of Turkey*, it was previously stated that the inflorescence is sessile, but during this revision, it was observed that subsp. *oocephalus* has a peduncle of about 1–5 mm in length and subsp. *stachyophorus* has a peduncle of about 5–10 mm in length.

3.12. Astragalus ekicii H.Duman & Akan, Bot. J. Linn. Soc. 143: 201–205 (2003) (Figure 3)

Holotype: Turkey: **B6** Malatya/C6 Adıyaman: Sürgü-Gölbaşı, 5. km, 1400–1450 m, rocky slopes, 29.6.2001, *Akan* 3646 (GAZI!).

Erect, caulescent, perennial, 20–35 cm. Stipules linear to narrowly lanceolate, leaf-like, acuminate at apex, 10–25

mm long, with spreading pilose. Leaves 10–21 cm long, petiole 1.5–4 cm long. Leaflets in 14–24 pairs, oblong-lanceolate, acute at apex, 12–30 × 4–8 mm, adpressed densely and simple-pilose below, sparsely adpressed and simple-pilose above. Peduncles 0–15 mm long. Racemes globose to oblong, 4–7 × 4–4.5 cm, with sessile flowers. Bracts linear, 9–20 mm long, spreading hairy. Bracteole absent. Calyx 20–25 mm long, tubular to campanulate, densely long-villous, tube inflated in fruit, teeth 9–12 mm long, linear to triangular, densely spreading pilose. Petals yellow. Standard 23–26 × 6–7 mm, stenonychioid, glabrous. Wing 22–24 × 3–4 mm. Keel 19–21 × 2–4 mm. Filaments 19–21 mm, glabrous, whitish, anthers yellow, dorsifixed. Ovary 6–9 × 3–5 mm, ovoid, densely white-villous, style 19–20 mm, hairy at base, stigma globose. Legumes 10–12 × 5–6 mm, included within the calyx, ovoid-oblong, densely spreading pilose. Seeds ±reniform, smooth, brownish-dotted, 3–4 × 2–3 mm. Fl. 6.

Habitat: Rocky slopes, steppe, clearing of *Juniperus* forest, 1400–1800 m. *Distribution:* Endemic to Turkey. Irano-Turanian element. *IUCN category:* CR.

Specimens seen: **B6/C6** Malatya/Adıyaman: Sürgü-Gölbaşı, 5. km, 1450 m, steppe of high mountains, 25.6.2001, *Duman* 8604 (GAZI). **B7** Malatya: Doğanşehir, Eskiköy, Çoban stream, *Juniperus excelsa* forest, 1800 m, 25.7.1971, *Peşmen* 2665 (HUB).

Astragalus ekicii is related to *A. oocephalus* and *A. panduratus*. However, *A. ekicii* is different from *A. oocephalus* with its adpressed-pilose leaflets on both surfaces, simple-pilose bracts, and spreading pilose stipules. In addition, it can be distinguished from *A. panduratus* by acute leaflets at apex, longer calyx (20–25 mm), longer calyx teeth (9–12 mm), and longer bracts (9–20 mm).

3.13. Astragalus dipsaceus Bunge, Mém. L' Acad. Impér. Sci. St. Pétersb., ser. 7, 15, 1: 97 (1869) (Figure 3)

= *Tragacantha dipsacea* Kuntze, Revis. Gen. 2: 944 (1891). Type: Alandagh prov. Tokat, prope Merzifoun, 1855, *Wiedemann* 393 (holo. P iso. G-BOIS! K! LE).

= *Astragalus bornmuelleri* ('bornmüller') Freyn, Oesterr. Bot. Z. 40: 403 (1890). Type: Turkey, Amasia: 400–500 m, 13.6.1889, *Bornmüller* 89 (BRNM! sheet marked as lectotypus, iso. B! MSB photo! BM! BR, BRNM, G! LE, PRC, W!).

= *Astragalus dipsaceus* Bunge var. *germanicopolitanus* Bornm., Repert. Spec. Nov. Regni Veg. Beih. 89: 179 (1940). Type: Türkei, Paphlagonia austr., ad oppidum Cankri (Germanicopolis), 800 m, 3.7.1929, *Bornmüller* 14098 (holo. B! iso: G! PRC, STU, W photo! MSB! WU! Z).

Erect, caulescent, perennial, 50–70 cm. Stipules lanceolate, 17–40 mm, long-pilose. Leaves 10–30 cm, petiole 20–30 mm. Leaflets in 21–26 pairs, narrowly oblong-lanceolate, 12–35 × 3–7 mm, acute at the apex,

glabrous above, long-simple-pilose below. Peduncle 0–5 mm. Racemes globose-oblong. Bracts linear, 10–18 mm, long-pilose. Bracteole absent. Calyx 13–18 mm, tubular-campanulate, tube slightly inflated in fruit, densely pilose; teeth 3–7 mm, linear. Petals yellow. Standard 17–22 × 7–9 mm, stenonychioid, glabrous. Wings 14–19 × 3–4 mm. Keel 15–19 × 3–4 mm. Filaments 10–17 mm, glabrous, whitish to yellowish; anthers yellow, dorsifixed. Ovary 4–5 mm, ovoid, densely pilose, style 12–16 mm, glabrous, stigma capitate. Legumes 9–10 × 4–5 mm, ovate, compressed, included within the calyx, densely long-pilose, bilocular; beak curved. Seeds 3–4 × 2–2.5 mm, reniform, smooth, and brown. Fl. 6–7.

Habitat: Foot of mountains, steppe, stony slopes, roadsides, fields, meadows, riversides, 400–1550 m. *Distribution:* Endemic to Turkey. Irano-Turanian element. *IUCN category:* LC.

Specimens seen: A4 Kırıkkale: Akpınar-Keskin, 10 km, 1000–1100 m, 4.8.1997, steppe, *Akan* 1353 & *Ekici* (GAZI). A6/B6 Sivas: Kızılıniş, 1200–1300 m, 14.6.1999, roadside, *Akan* 1610 (GAZI). A8 Bayburt: Bayburt-İspir, 60. km, 1320 m, 29.6.1997, roadside, *Akan* 1308 & *Ekici* (GAZI). B7 Erzincan: İliç, Yakuplu village, 1200 m, 27.6.1997, roadside, *Akan* 1277 & *Ekici* (GAZI).

The legume and corolla of *A. dipsaceus* were unknown in the original description. During this revision, it was observed that the corolla was yellow and the legume ovoid, 9–10 × 4–5 mm. The length of bract in this species causes some confusion because, in the original description, it was given as about 10–13 mm. However, the observations of the herbaria specimens and the field observations from the type locality around A6 Tokat (*Akan* 1599, 1608, 1609, 1610) show that the length of bract varies between 16 and 18 mm. *Astragalus bornmuelleri* and *A. germanicopolitanus* were given as synonyms of *A. dipsaceus* (Chamberlain & Matthews, 1970; Becht, 1978; Podlech, 1999). In this study, it was also decided that these 2 taxa should be treated as synonyms of *A. dipsaceus* because there is a variation within the population of the species and these 2 taxa are no more than a form of *A. dipsaceus* with longer bracts.

3.14. *Astragalus bahcesarayensis* Akan, Firat & Ekici, Bot. J. of Linn. Soc., 156: 439–444 (2008) (Figure 4)

Type: Turkey, B9 Van: Bahçesaray, Karabel (Kirapit) pass, 3200–3400 m, stony places, 05.08.2004, *M.Firat* 4221 (holo. GAZI! iso. VANF!).

Erect, caulescent, perennial, 22–55 cm. Stipules linear to narrowly lanceolate, leaf-like, 12–27 mm long, acuminate at apex, spreading pilose. Leaves 10–27 cm long, petiole 1.5–7 cm long. Leaflets in 9–14 pairs, oblong-lanceolate, 10–40 × 3–9 mm, acute at the apex, densely spreading pilose below, sparsely spreading pilose above. Peduncles 0–20 mm long. Racemes globose to oblong, 2.5–6 × 2–3.8 cm, with sessile flowers. Bracts linear, 7–14

mm long, densely spreading long hairs. Bracteoles absent. Calyx 15–20 mm long, tubular to campanulate, densely long villous, tube inflated in fruit; teeth 4–9 mm long, linear to triangular, densely pilose. Petals yellow. Standard 18–20 × 6–8 mm, glabrous. Wings 16–17 × 2–3 mm. Keel 16–18 × 2–4 mm. Filaments 15–17 mm, glabrous, anthers yellow, dorsifixed. Ovary 6–8 × 2–3 mm, ovoid, densely white-villous, style 12–13 mm long, hairy at the base, stigma globose. Legumes 8–10 × 5–6 mm, included within the calyx, ovoid-oblong, densely spreading pilose. Seeds 3–4 × 2–3 mm, ±reniform, smooth, brownish. Fl. 7–8.

Habitat: Stony and rocky places, steppe of high mountains, snowy scree, 2500–3400 m. *Distribution:* Endemic to Turkey. Irano-Turanian element. *IUCN category:* EN.

Specimens seen: Turkey. B9 Van: Bahçesaray, between Yukarı Narlıca and Karabel pass, 2500 m, stony slopes, 7.07. 2001, *Akan* 2256 & *Ekici* (GAZI & HRU).

Astragalus bahcesarayensis resembles *A. dipsaceus* Bunge and *A. panduratus* Bunge and is endemic to Turkey. *A. bahcesarayensis* differs from *A. dipsaceus* Bunge by spreading-pilose leaflets on both surfaces and by fewer pairs of leaflets (9–13) (not 21–26), and it differs from *A. panduratus* Bunge by longer bracts (7–14 mm long) (not 6–8 mm long) and fewer pairs of leaflets (9–13) (not 18–30).

3.15. *Astragalus crinitus* Boiss., Diagn. Pl. Orient. ser. 1, 2: 55 (1843) (Figure 4)

= *Tragacantha crinita* Kuntze, Revis. Gen. 2: 944 (1891). Type: in Armenia, *Aucher-Eloy* 1297 (G-BOIS! iso. FI-W, G! P! MSB photo!).

Erect, caulescent, perennial, 20–70 cm. Stipules linear, 17–27 mm, long-pilose. Leaves 7–23 cm, petiole 5–15 mm. Leaflets in 15–25 pairs, narrowly elliptic, 10–35 × 4–9 mm, acute at the apex, glabrous above, long-simple-pilose below. Peduncles 0–2 mm. Racemes oblong or cylindrical. Bracts linear, 6–18 mm, long-pilose. Bracteole absent. Calyx 13–18 mm, tubular, tube slightly inflated in fruit, densely pilose; teeth 5–7 mm, linear. Petals yellow. Standard 18–22 × 5–8 mm, stenonychioid, glabrous. Wings 14–16 × 2–4 mm. Keel 16–17 × 4–7 mm. Filaments 17 mm, glabrous, whitish; anthers yellow, dorsifixed. Ovary 2.5–3 mm, ovoid, densely pilose; style 12–13 mm, glabrous, stigma capitate. Legumes 6–13 × 4 mm, ovoid, compressed, included within the calyx, densely long-pilose, bilocular; beak curved, 2–4 mm. Seeds 3 × 2 mm, reniform, brown and smooth. Fl. 6–8.

Habitat: Foothills of mountains, roadsides, 1220–2150 m. *Distribution:* Endemic to Turkey. Irano-Turanian element. *IUCN category:* NT.

Specimens seen: A8 Erzurum: Oltu-Tortum, 30. km, Yayla village, 2100 m, 7.8.1997, roadside, *Akan* 1377 & *Ekici* (GAZI). B7 Erzincan: Erzincan-Erzurum, 21. km,

1250 m, 23.7.1997, roadside, *Akan* 1391 & *Ekici* (GAZI). B9 Ağrı: Horasan-Ağrı, 37. km, 2000 m, 30.6.1997, streamside, *Akan* 1316 & *Ekici* (GAZI).

In the original description, the length of stipule was unknown, and it was determined that it is linear with 17–27 mm in length. The length of legume was given at about 6 mm, but the measurements in all specimens show that it is about 13 mm. *A. crinitus* is allied to *A. dipsaceus* and *A. stojanii*, but it can be differentiated by oblong and cylindrical inflorescence from *A. dipsaceus*, which has globose inflorescence. It can also be easily differentiated by shorter calyx teeth (5–6 mm, not 9–11 mm).

3.16. *Astragalus stojanii* Nabélek, Spisy Přír. Fak. Masarykovy Univ. 35: 84 (1923) (Figure 4)

Holotype: Turkey, C8 Mardin: In Mesopotamiae superiors montibus Tur Abdin (Gebel et-tur), in agris incultis ad pagum Takjan inter Gezerit-ibn-Omar et Midyat, c. 900 m, 2.7.1910, Nabélek 3076 (SAV photo!).

Erect, caulescent, perennial, 40–50 cm. Stipules linear-lanceolate, 10–30 mm, red-striped, ciliate on margin. Leaves 8–40 cm, petiole 13–50 mm. Leaflets in 8–18 pairs, elliptic, 10–30 × 6–12 mm, obtuse at the apex, glabrous above, sparsely simple-long hairs below, especially on the margin and under the midrib. Peduncles 6–12 mm. Racemes oblong-cylindrical. Bracts linear, 10–21 mm, ciliate. Bracteole absent. Calyx 15–19 mm, campanulate, tube slightly inflated in fruit, densely long-pilose; teeth 8–11 mm, linear. Petals yellow. Standard 15–23 × 7–10 mm, stenonychioid, glabrous. Wings 16–18 × 2–4 mm. Keel 18–20 × 3–5 mm. Filaments 10–17 mm, glabrous, whitish; anthers yellow-orange, dorsifixed. Ovary 2–6 mm, ovoid, densely white-hairy, style 10–19 mm, glabrous, stigma capitate. Legumes 6–8 × 3–5 mm, ovoid, compressed, included within the calyx, densely long-pilose, bilocular; beak curved, 2–4 mm. Seeds 3–4 × 1–2 mm, reniform, brown and smooth. Fl. 6–7.

Habitat: Roadsides, fields, meadows, 900–1100 m. *Distribution*: Endemic to Turkey. Irano-Turanian element. *IUCN category*: CR.

Specimens seen: C8 Mardin: Midyat-Cizre, 1. km, 1100 m, 4.6.1998, fields, *Akan* 1402 (GAZI); *ibid.*, 15.7.1998, *Akan* 1460 (GAZI).

It has a very local population in Turkey. The original description of this species was very short and many morphological characters were missing. In *Flora of Turkey*, the stipule is given at about 10 mm, bract c. 12 mm, and calyx teeth c. 9 mm, whereas in this study it was determined that the stipule is 11–30 mm, bract 10–21 mm, and calyx teeth 8–11 mm. Therefore, *A. stojanii* has some taxonomical problems and its short original description causes confusion even for revisionists. In Becht's monograph (1978), this species was given as a synonym of *A. ocephalus*, but we determined that it should be regarded in the range of

a separate species because *A. ocephalus* has glabrous leaflets on both surfaces whereas the bottom surface of leaflets of *A. stojanii* have simple-long hairs. *A. stojanii* is also allied to *A. crinitus* but can be easily differentiated by longer peduncle (6–13 mm) and clay teeth (8–11 mm).

3.17. *Astragalus bracteosus* Boiss. & Noé, Diagn. Pl. Orient. ser. 2, 2: 31 (1856)

Type: Turkey, Tokat: prope Tokat Anatoliae, 6.1852, Noé 806 (holo. G-BOIS! iso. BM! G! H, K! P photo! MSB! W!).

= *Astragalus butleri* Dinsm., Publ. Amer. Univ. Beirut, Nat. Sc. ser., No. 2, Minor studies [Plantae Postianae et Dinsmoreanae fasc. 1]: 5. (1932).

Erect, caulescent, perennial, 20–30 cm. Stipules linear-lanceolate, 15–20 mm, ciliate on margin. Leaves 6–13 cm, petiole 20–30 mm. Leaflets in 15–20 pairs, narrowly elliptic-oblong, 7–11 mm, obtuse at the apex, glabrous above, densely long-pilose below. Racemes lax, 7–15 × 4–5 mm, cylindrical, flowers sessile or with 20–35 shortly pedicellate (c. 1 mm) flowers. Bracts linear, 15–20 mm, glabrous with a ciliate margin. Bracteole absent. Calyx 13–16 mm, tubular-campanulate; tube slightly inflated in fruit, densely long-pilose; teeth 5–7 mm, linear. Petals yellow-drying purple. Standard (23–)25–30 × 8 mm, stenonychioid, glabrous. Wings 23–24 × 2–3 mm. Keel 22–23 × 3–4 mm. Filaments 25 mm, glabrous, yellowish; anthers yellow-orange, dorsifixed. Ovary 5–6 × 1–2 mm, ovoid, densely white-hairy. Legumes 6–8 × 3–5 mm, ovoid-oblong, compressed, included within the calyx, sparsely pilose, bilocular; beak curved, 2–3 mm. Seeds 3–4 × 1–2 mm, reniform, brown and smooth. Fl. 6.

Habitat: Subalpine. *Distribution*: Turkey, Syria. Irano-Turanian element. *IUCN category*: CR.

Specimens seen: Syria: Plantes des Etats de Syrie, du Libon de Lattaquie et de Djebel-Druze, desert de Syrie, Jebel Jeyes, *Herbier Gombault s.n.* (MSB photo!).

Astragalus bracteosus was first collected in 1852 by Noé around Tokat, Turkey, and thus far there is no second record for the collection of this taxon. Moreover, during this study, many excursions were carried out around Tokat Province, especially in subalpine habitats, to find the species, but it could not be found. As is understood from Noé's gathering, the type locality is insufficient, and the altitude and flowering time are also not given exactly in the original publication. Thus, there was difficulty finding this species due to some missing important information related to the locality type. Moreover, no specimens were observed while visiting the herbaria in Turkey. Another taxonomical problem for this species is the confusion of the section that was mentioned by Gontscharov and Borrisova (1946). Both revisionists have stated that *A. bracteosus* should be in the sect. *Brachycarpus* Boriss. and that it is not endemic to Turkey, but is also distributed in Russia and Lebanon. It is surprising that sect. *Brachycarpus* includes 120 taxa worldwide and

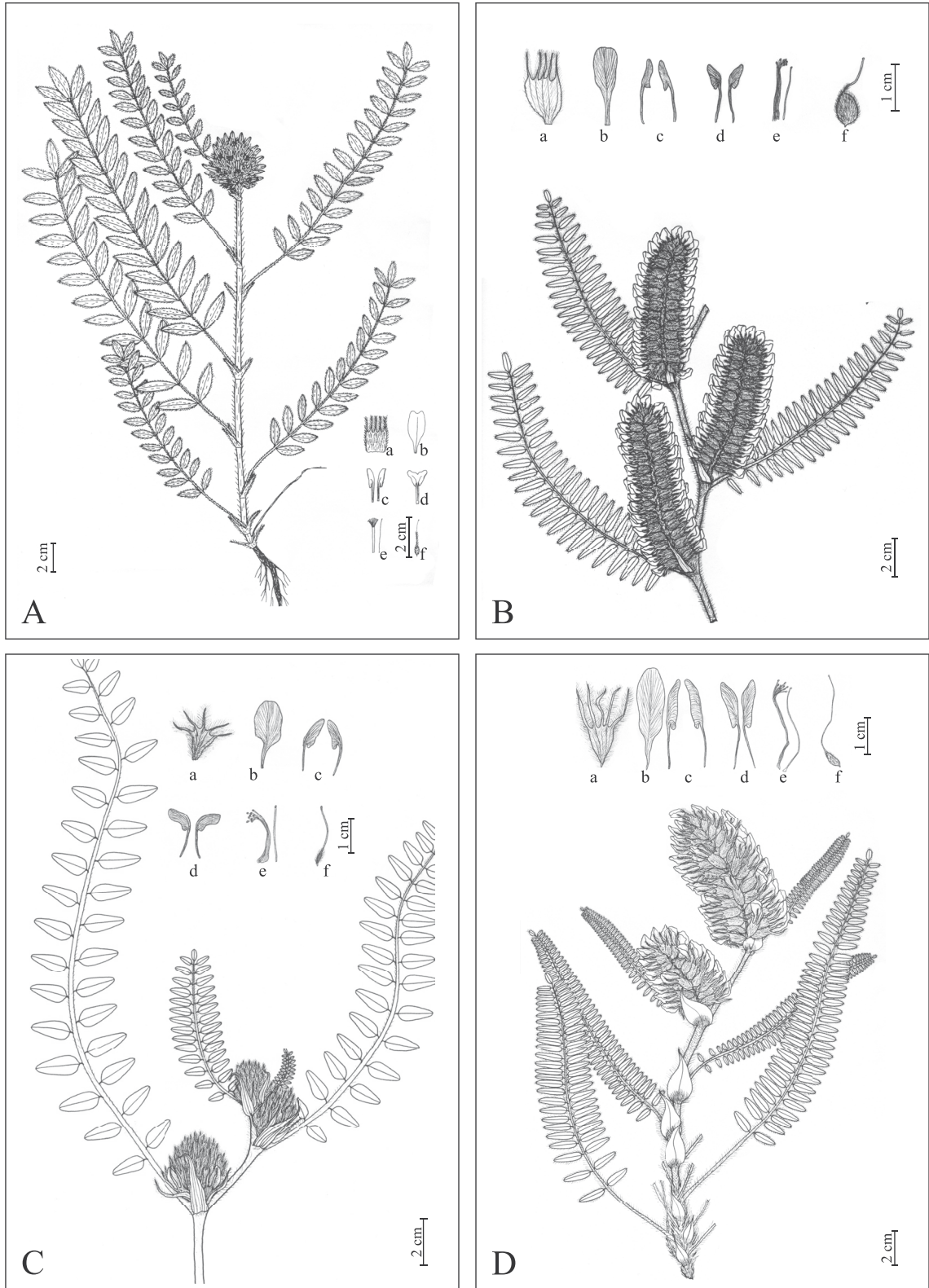


Figure 4. A- *Astragalus bahcesarayensis* (Firat 4221): a- calyx, b- standard, c- wing, d- keel, e- ovary, f- stamens; B- *A. crinitus* (Akan 1295): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; C- *A. stojanii* (Akan 1402): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; D- *A. decurrens* (Akan 1339): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary.

the majority of members have distribution throughout Russia, China, and Pakistan but no taxon of sect. *Brachycarpus* has distribution in Turkey except for *A. bracteosus*. In our opinion, it was doubtfully recorded because the distribution and the general characteristics of sect. *Brachycarpus* were not suitable for *A. bracteosus* since the important peculiarity of sect. *Brachycarpus* is the “clearly-inflated calyx” at flowering time, whereas the calyx of *A. bracteosus* is not inflated at flowering. In addition, the type specimen of the species was observed (W!) during this study and it was determined that the species should be maintained in sect. *Alopecuroidei*, which has members without inflated calyx at flowering. Other studies showed that *A. bracteosus* was transferred to sect. *Laxiflori* by Becht (1978) and Agerer and Kirchoff (1977). Sect. *Laxiflori* has some members that have lax inflorescence and mainly these taxa are separated from sect. *Alopecuroidei*. Thus, the taxonomical situation of this species at the section level has some problems. In order to decide whether *A. bracteosus* should be in sect. *Laxiflori* or sect. *Alopecuroidei*, all the other members of both sections should be observed at the same time; otherwise, it is impossible to resolve this situation. The situation of *Alopecuroidei* and *Laxiflori* is confusing and characters overlap for both sections.

The other interesting confusion is the identification of *Astragalus bracteosus*, which was doubtfully recorded as *Astragalus butleri* Post & Beauverd by Agerer-Kirchoff and Agerer and by Becht (Agerer-Kirchoff & Agerer, 1977; Becht, 1978). *A. butleri* was one of the endemic species to Lebanon, but later it was reduced to a synonym of *A. bracteosus* (Agerer-Kirchoff & Agerer, 1977; Becht, 1978). *A. bracteosus* is allied to *A. decurrens* but has shorter calyx teeth (6 mm) and fewer leaflets pairs (15–20 pairs) than *A. decurrens*.

3.18. *Astragalus decurrens* Boiss., Diagn. Pl. Orient. ser. 1, 6: 40 (1846) (Figure 4)

≡ *Tragacantha decurrens* Kuntze, Revis. Gen. 2: 944 (1891). Type: Turkey, Diyarbakır: prope Diyarbakır, *Kotschy* 207 (holo. W! iso. BM! BR, G-BOIS! K! W! MSB photo!).

= *Astragalus pectinatus* Boiss., Diagn. Pl. Orient. ser. 1, 2: 54 (1843). illeg. [non Douglas].

≡ *Astragalus edmondi* Sheld., Minnesota Bot. Stud. 1: 131 (1894) **syn. nov.**

≡ *Tragacantha edmondi* Kuntze, Revis. Gen. 2: 941 (1891). ≡ *Astragalus elegantulus* Greene, Erythea 1: 207 (1893). Type: Malatya: prope Malatia (Melitenem), *Aucher-Eloy* 1350 (G-BOIS! iso. FI, FI-W, BM! G! K! LE, OXF, P, MSB photo! W!).

= *Astragalus dichroanthus* Freyn & Sint., Oesterr. Bot. Z. 42: 13 (1892). ≡ *Astragalus decurrens* Boiss. subsp. *dichroanthus* (Freyn & Sint.) Ponert, Feddes Repert. 83: 629 (1973). Lectotype (Podlech, 1999): Armenia turcica, Keban-Maden in montosis ad Denislü, 21.6.1889, *Sinten* 819 (BRNM).

Erect, caulescent, perennial, 20–50 cm. Stipules broadly ovate-acuminate, decurrent, 15–47 mm, long-ciliate on margin. Leaves 5–26 cm, petiole 30–35 mm. Leaflets in 20–37 pairs, narrowly ovate or oblong-cylindrical, 8–26 × 2–10 mm, obtuse at the apex, glabrous above, densely long-pilose below. Peduncles 0–30 mm. Pedicel 1–2 mm. Racemes 6–18 × 4–5 mm, ovoid-cylindrical. Bracts linear, 4–22 mm, ciliate on margin. Bracteole absent. Calyx 17–25 mm, tubular-campanulate, tube slightly inflated in fruit, densely long-pilose; teeth 11–19 mm, linear. Petals yellow-drying purple. Standard 23–35 × 6–8 mm, stenonychioid, glabrous. Wings 18–27 × 2–4 mm. Keel 19–30 × 2–4 mm. Filaments 18–26 mm, glabrous, whitish; anthers yellow, dorsifixed. Ovary 4–10 mm, ovoid, densely white-hairy; style 15–22 mm, rarely hairy at the base; stigma capitate. Legumes 9–16 × 4–6 mm, ovoid, included within the calyx, glabrous with the sparsely hairy on ventral suture, bilocular; beak curved, 2–5 mm. Seeds 4–5 × 2–3 mm, reniform, brown and smooth. Fl.: 6–7.

Habitat: Screen of *Quercus* sp., steppe, foots of mountains, rocky places, calcareous, vineyards, fields, riversides, 680–2000 m. *Distribution*: Endemic to Turkey. Irano-Turanian element. *IUCN category*: NT.

Specimens seen: B7 Malatya: Balaban-Levent, 9. km, 1000–1100 m, 13.6.1998, stony slopes, *Akan* 1427 & *Ekici* (GAZI). B9 Van: Kevenli village, 2000 m, 21.6.1986, fields, Özçelik 686 (VAN). C6 Malatya: Kömürhan, 1200 m, 17.9.1981, *Altan* 1605 (FUH). C7 Adıyaman: Adıyaman-Samsat, 600 m, 19.6.1987, *Tanker* & *Koyuncu* 14406 (AEF).

In *Flora of Turkey*, *A. edmondi* and *A. decurrens* were given as different species. However, with this study, it was understood that the morphological characteristics of both species overlap each other. These 2 species are so closely related that they could not be separated accurately in the distinguishing key. Moreover, in the field study and in herbaria observations, there was difficulty in distinguishing these species from each other. In addition, *A. edmondi* was said to be a synonym of *A. decurrens* by Becht (1978). In this study, all the type specimens were compared with each other and the opinion of Becht is accepted to be suitable for the rearrangement of *A. edmondi* to be a synonym of *A. decurrens*. Furthermore, *A. pectinatus*, previously given as a synonym of *A. edmondi*, was transferred to be a synonym of *A. decurrens*.

3.19. *Astragalus petropolitanus* Sheld., Minnesota Bot. Stud. 1: 171 (1894) (Figure 5)

≡ *Astragalus trichocalyx* Trautv., Trudy Imp. S.-Petersburgsk. Bot. Sada 4: 362 (1876). Illeg. [non Torr. & Gray]. Hololectotype (Podlech & Sytin, 1996): [Gruzia] Achalzich, prope Abastuman, 1845, *G.R.F.J.von Radde s.n.* (LE photo!).

Erect, caulescent, perennial, 15–30 cm. Stipules linear-lanceolate, 15–30 mm, ciliate on margin. Leaves 5–26 cm,

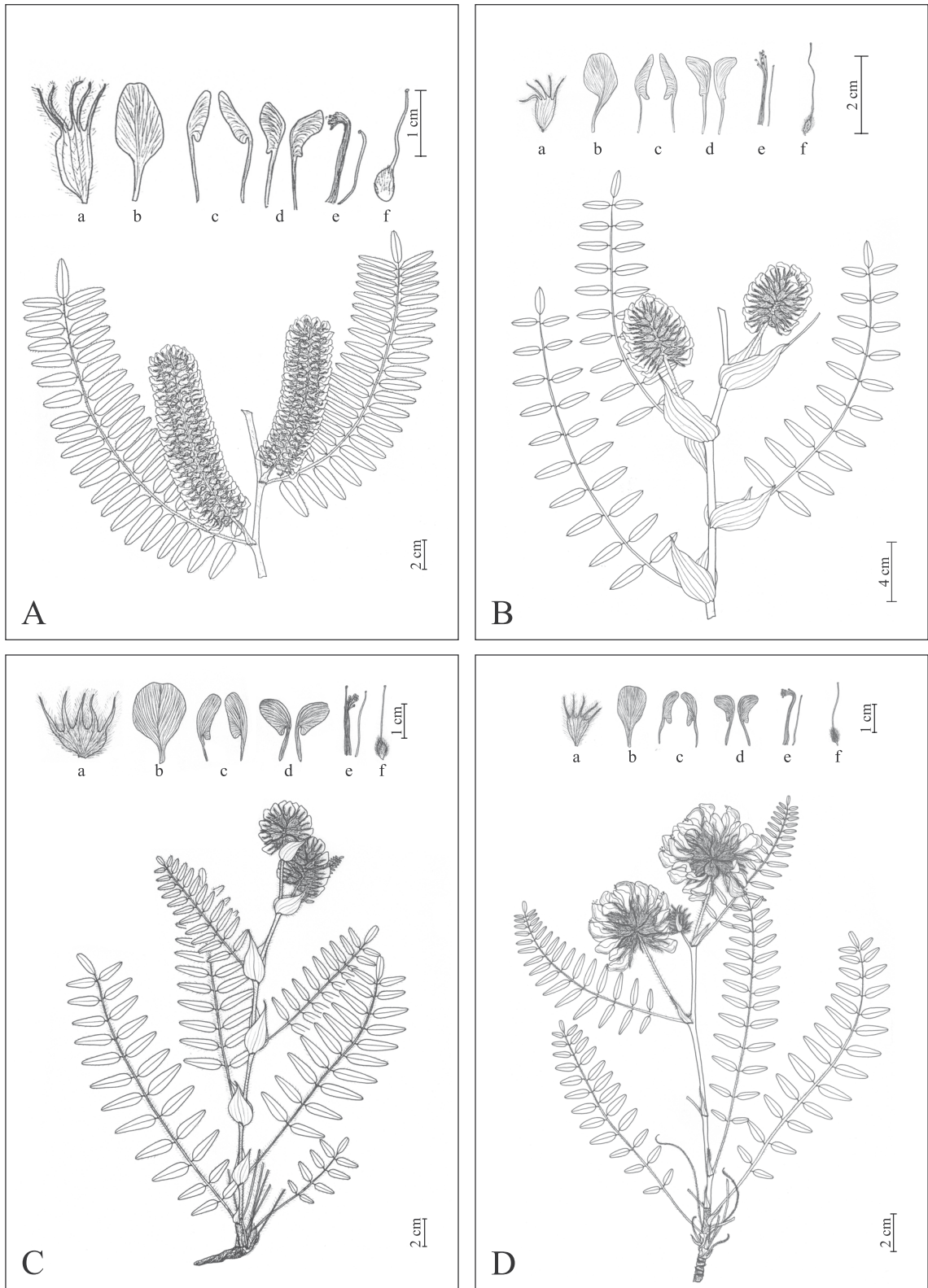


Figure 5. **A-** *Astragalus petropolitanus* (Akan 1294): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; **B-** *A. macrocephalus* subsp. *macrocephalus* (Akan 1342): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; **C-** *A. macrocephalus* subsp. *cucullaris* (Akan 1410): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; **D-** *A. macrocephalus* subsp. *finitimus* (Akan 1201): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary.

petiole 10–25 mm. Leaflets in 13–21 pairs, oblong, oblong-lanceolate, 15–41 × 6–10 mm, obtuse at the apex, glabrous above, with a few scattered simple hairs on the margin and below the midrib. Peduncles 12–30 mm. Pedicel 1 mm. Racemes 5–17 × 2–3.5 mm, cylindrical. Bracts linear, 15–24 mm, ciliate on margin. Bracteole absent. Calyx 14–18 mm, tubular-campanulate; tube slightly inflated in fruit, densely long-pilose; teeth 6–10 mm, linear. Petals yellow-drying purple. Standard 14–23 × 3–6 mm, stenonychioid, glabrous. Wings 17–18 × 2–3 mm. Keel 17–18 × 3–4 mm, Filaments 15–16 mm, glabrous, whitish; anthers yellow, dorsifixed. Ovary 4–5 mm, ovoid, densely white-hairy; style 14–17 mm, rarely hairy at the base; stigma capitate. Legumes 6–11 × 4–5 mm, ovoid, compressed, included within the calyx, glabrous with the sparsely hairy on ventral suture, bilocular; beak curved, 1–3 mm. Seeds 4–5 × 2–3 mm, reniform, brown and smooth. Fl. 6–7.

Habitat: Steppe, foots of mountainous, rocky places, 680–2000 m. *Distribution:* Georgia, Turkey. Irano-Turanian element. *IUCN category:* NT.

Specimens seen: A9 Erzurum: Horasan-Akşar, 10 km W of Gaziler, 1840 m, 6.7.1992, Nydegger 46620 (MSB photo!); Erzurum: Oltu-Şenkaya, 28. km, Gözalan village, 1750 m, 28.6.1997, stony places, Akan 1294 & Ekici (GAZI).

In *Flora of Turkey*, the corolla colour and stipule length were unknown. It was determined that corolla colour is yellow-drying purple and the stipule length is 15–30 mm. The flowering time was given as August but it was observed that it should be earlier, between June and July in Turkey. *A. petropolitanus* was not given in *Flora of Turkey* to be a synonym of *A. trichocalyx*, but in the monograph by Becht (1978), it was given as a synonym. *Astragalus trichocalyx* Trautv. is illegitimate because it is a later homonym of *A. trichocalyx* Torr. It is not possible that 2 different species can have the same name. Thus, the older name is valid and legitimate while the newer one is illegitimate. Sheldon named it first and therefore *A. petropolitanus* is the valid name.

3.20. *Astragalus macrocephalus* Willd., Sp. Pl. 3 (2): 1260 (1802) (Figure 5)

Erect, caulescent, perennial, 40–80 cm. Stipules narrowly triangular, narrowly lanceolate or broadly lanceolate, 15–70 mm, acute at the apex, glabrous or ciliate on margin. Leaves 10–40 cm, petiole 15–75 mm. Leaflets in 10–20 pairs, narrowly lanceolate-narrowly elliptic, 10–65 × 3–20 mm, obtuse or acute, both surfaces glabrous or rarely sparsely simple hairy below. Peduncles 20–110 mm. Pedicel 0–3 mm. Racemes globose or oblong. Bracts linear, 13–40 mm, ciliate on margin. Bracteole absent. Calyx tubular-campanulate, 15–27 mm; tube slightly inflated in fruit, densely long-pilose; teeth 6–17 mm, linear. Petals yellow or rarely drying-purple. Standard 18–35 × 6–15 mm, stenonychioid, glabrous. Wings 16–24 × 2–6 mm. Keel

18–21 × 5–8 mm. Filaments 17–23 mm, glabrous, whitish to yellowish; anthers yellow, dorsifixed. Ovary 3–8 × 3–4 mm, ovoid, densely white-hairy; style 18–22 mm, glabrous or rarely hairy at the base, stigma capitate. Legumes 8–12 × 4–7 mm, ovoid, included within the calyx, sparsely hairy, bilocular; beak curved, 2–5 mm. Seeds reniform, 4–6 × 2–4 mm, brown and smooth. Fl. 5–8.

Key for the subspecies:

1. Leaflets glabrous above, sparsely hairy below; stipule ciliate
 2. Stipule 15–20 mm; calyx teeth 6–10 mmsubsp. **finitimus**
 2. Stipule 25–55 mm; calyx teeth 14–17 mmsubsp. **cucullaris**
1. Leaflets and stipules glabrous.... subsp. **macrocephalus**

subsp. **macrocephalus**

= *Tragacantha macrocephala* Kuntze, Revis. Gen. 2: 946 (1891). Type: Turkey, in Galatia, *Tournefort s.n.* (holo. K! iso. HAL).

= *Astragalus megalacmus* Freyn & Sint., Oesterr. Bot. Z. 43: 419 (1893). Type: Turkey, Kastamonu: Paphlagoniae ad Tossia, ad Tschinonbaba, 5.7.1892, *Sintenis* 4578 (holo. W! iso. B! BM! BP, BR, BRNM! FI, G! GOET, JE, K! LD photo! K! LE, MSB! P, PR, PRC, WU! Z).

Habitat: Steppe, foots of mountainous, *Quercus* sp. spaces, calcareous, roadsides, 600–1250 m. *Distribution:* Turkey, Iran, Iraq, Syria and Russia. Irano-Turanian element. *IUCN category:* LC.

Specimens seen: A4 Çorum: Dodurga-İskilip, 720 m, 28.6.1989, *Quercus* sp. & *Carpinus* sp. mixed forest, Aytaç 2735 (GAZI). B4 Ankara: Eryaman-Eskişehir highway, 850 m, 5.07.1997, roadside, Akan 1342 & Adigüzel (GAZI).

Subsp. *macrocephalus* was previously stated to be endemic in Turkey; however, now it is shown to not be endemic in Turkey, as it is distributed in Iran, Iraq, Syria, and Russia (Becht, 1978). In the monograph by Becht (1978) and in *Flora Iranica* (Podlech, 1999), subsp. *cucullaris* and subsp. *macrocephalus* were combined, and subsp. *cucullaris* was given as a synonym of subsp. *macrocephalus* due to the priority principal. There is geographic isolation between subsp. *cucullaris*, localised in SE Anatolia, and subsp. *macrocephalus*, localised in inner Anatolia. Thus, with this study, against the views of Becht and *Flora of Iranica*, it is determined that subsp. *macrocephalus* and subsp. *cucullaris* should be regarded as different taxa.

subsp. **cucullaris** (Boiss.) D.F.Chamb., Fl. Turkey 3: 189 (1970).

Type: Turkey, Mardin: in Assyria prope Mardin et Assuaner, *Kotschy* 365 (holo. G-BOIS! iso. BM! K! W!).

= *Astragalus cucullaris* Boiss., Diagn. Pl. Orient., ser. 1, 6: 39 (1846).

= *Tragacantha cucullaris* Kuntze, Revis. Gen. 2: 944 (1891).

Habitat: Steppe, foots of mountains, *Quercus* sp. spaces, vineyards, 1000–1050 m. *Distribution*: Iraq and Turkey. Irano-Turanian element. *IUCN category*: EN.

Specimens seen: C8 Mardin: Zinnar district, *Akan* 1588 (GAZI); Mardin: Bakırkırı, 1000 m, 27.05.1999, *Quercus* forest, *Akan* 1589 & *A.Duran* (GAZI); Mardin: Derik-Mazıdağı, 1. km, 1000 m, 25.05.1999, steppe, *Akan* 1562 & *A.Duran* (GAZI).

It was determined that the stipules are broadly lanceolate and calyx teeth are 14–17 mm. Subsp. *cucullaris* can be easily differentiated from subsp. *finitimus*, which has narrowly lanceolate stipule and shorter calyx teeth (6–10 mm). In the field observations, it was observed that subsp. *cucullaris* is local and its population is weak and very limited.

subsp. *finitimus* (Bunge) Chamb., Flora of Turkey, 3: 190 (1970).

= *Astragalus finitimus* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11: 61 (1868).

= *Tragacantha finitima* Kuntze, Revis. Gen. 2: 944 (1891). Type: Azerbaijan in Somchetia ad pedem montium Schah-bulak, *A.J.Szovits* 175 (holo. G-BOIS! iso. K! LE! P photo! K! MSB! ZT).

= *Astragalus ajubensis* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11: 61 (1868).

= *Tragacantha ajubensis* Kuntze, Revis. Gen. 2: 942 (1891). Type: Iran, Persia australis, mt. Ajub prope Persepolis, 20.5.1842, *Kotschy* 405 (holo. P! iso. FI, FI-W, G! G-BOIS! GOET, K! LIV, MSB photo! W! ZT).

= *Astragalus grandiflorus* Freyn, Oesterr. Bot. Z. 42: 46 (1892) illeg. [non L. nec Bunge] ° *Astragalus schuschnasensis* Freyn & Bornm., Bull. Herb. Boiss. 6: 983 (1898). Type: Turkey, Elazığ: Armenia turcica, Kharput, ad Schuschnas, 8.6.1889, *Sintenis* 720 (holo. BRNM iso. B! K photo! MSB photo! BR, JE, LD, K photo! P).

= *Astragalus vaccarii* Pamp., Nuov. Giorn. Bot. Ital. 14:592 (1907). Holotype: Turkey, Anatolia, *Fischer s.n.* (LE).

= *Astragalus finitimus* (Bunge) Chamb. var. *crinitus* Bornm., Beih. Bot. Centralbl. 33(2): 286 (1915). Type: Iran Flufstal des Djade-rud, 29.5.1890, *Brunns* 531b (holo. B! photo! iso. B!: MSB photo!).

= *Astragalus durhamii* Turrill, Kew Bull. 1923: 294 (1923). Holotype: Turkey, Çanakkale: Gallipoli penins., Maidos, 18.5.1923, *Durham* 11 (K!).

= *Astragalus arbelicus* Bornm. Beih. Bot. Centralbl. 57 (2): 281 (1937). Syntypes: E Erbil am Kuh-i-Sefin beim Dorf Schaklawa, 1200 m, 21.5.1893, *Bornmüller* 1181; Umgebung von Riwandus, nahe der persischen Grenze auf dem Händarin, 1300 m, 21.6.1893, *Bornmüller* 1180 (B!). Lectotype (Podlech, 1999): Iraq, E Erbil am Kuh-i-Sefin

beim Dorf Schaklawa, 1200 m, 21.5.1893, *Bornmüller* 1181 (B!).

= *Astragalus oloricus* Manden., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 98 (1947). Syntypes: Prov. Erzurum, distr. Olty, inter pagos Tausker et Kjach, 16.7.1903, *E. Koenig*; prope Olor, 7.7.1911, *Sosnowsky s.n.*. Lectotype (Becht, 1978): Prov. Erzurum, distr. Olty, prope Olor (Olor), 7.7.1911, *Sosnowsky s.n.* (LE iso: E, TBI, K)

= *Astragalus sphaerocephalus* Manden., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 97 (1947).

= *Astragalus johannis* Rzazade, Dokl. Akad. Nauk Azerbajdzhansk. SSR 9 (12): 740 (1953), illeg. [non Boiss.]. Holotype: distr. Divitschi, 5–6 km ad orientem pag. Arab-dagnja (Chaltan-dagnja), 27.5.1937, *Karjagin s.n.* (BAK).

= *Astragalus ashuricus* Parsa, Fl. Iran 9: 110 (1966). Holotype: Iran, Mal-Ashour of Mahallat, 5.1951, *Parsa s.n.* (K!).

Habitat: Steppe, *Quercus* sp. spaces, fields, riversides, *Cedrus libani* openings, 460–2600 m. *Distribution*: Turkey, Iraq, Lebanon, Soviet Armenia, Azerbaijan. Iran. Irano-Turanian element. *IUCN category*: LC.

Specimens seen: A1 Çanakkale: Güzelyalı-Çanakkale, 12. km, 30–50 m, 6.8.1998, *Pinus* sp. forest, *Akan* 1533 (GAZI). A8 Bayburt: Aşkale-Bayburt, 56. km, 1600 m, 29.6.1997, roadside, *Akan* 1298 & *Ekici* (GAZI). B3 Eskişehir: Mihaliççık-Alpu, W of Kayı village, 1050–1100 m, 23.7.1993, *Quercus* sp. forest, *Aytaç* 6181 (GAZI). B4 Ankara-Şereflikoçhisar, 135 km, around Tuz Lake, 800 m, 24.5.1997, roadside, *Akan* 1197 (GAZI). B5 Kayseri: Ali mountain, 4.6.1997, *Akan* 1256 & *Ekici* (GAZI). B7 Elazığ: Harput-Eğin-İnceler crossroad, 1550 m, 20.7.199, *Akan* 1388 & *Aytaç* (GAZI). B9 Van: Çatak; Aşağı Narlıca vil-lage, 2080 m, 18.7.1997, steppe, slopes, *Akan* 1348 (GAZI). C4 Mersin: Mut, Kozlar plateau, 1450 m, 20.6.1989, *Aytaç* 2731 (GAZI). C9 Hakkari: Hakkari-Uludere, Süvari Halil pass, 2600 m, 26.7.1983, steppe, *Ekim* 8091 (ANK).

Subsp. *finitimus* is one of the most widespread subspecies of *A. macrocephalus*. According to Becht (1978) and Podlech (1999), *A. ajubensis* Bunge is endemic to Iran and has no distribution in Turkey. However, according to Ranjbar et al. (2002), *A. ajubensis* perfectly matches *A. macrocephalus* subsp. *finitimus*. Thus, the specimen of *A. ajubensis* that was doubtfully recorded from Çanakkale is transferred to *A. macrocephalus* subsp. *finitimus*.

3.21. *Astragalus echinops* Aucher ex Boiss., Diagn. Pl. Ser. 1:57 (1843) (Figure 6)

= *Tragacantha echinops* Kuntze, Revis. Gen. Pl. 2: 944 (1891). Type: Lebanon in Coelesyria prope Balbeck (1839), *Aucher-Eloy* 1300 (holo. G-BOIS! iso. FI-W, G! K! MSB! OXF! P, W!).

= *Astragalus superbus* Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 7., 11: 62 (1868). = *Tragacantha superba* Kuntze, Revis. Gen. Pl. 2: 948 (1891). Syntypes: Iran, Persia

borealis inter Turkmenschai et Tikmedesch, *Bunge & Bienert s.n.* (G-BOIS!), in Persia, *Belanger s.n.* (G).

= *Astragalus regelii* Trautv, Trudy Imp. S.-Petersburgsk. Bot. Sada 2: 472 (1873). Type: in Armenia, prope pagum Belaw, 17.6.1871, *von Radde s.n.* (LE sheet marked as lectotypus, iso. MSB photo!).

= *Astragalus superbus* Bunge var. *ovalifoliolatus* Širj. & Rech.f., Oesterr. Akad. Wiss., Math.-Naturwiss. Kl., Anz. 92: 111 (1955). = *Astragalus echinops* Aucher ex Boiss var. *ovalifoliolatus* (Širj. & Rech.f.) R.Becht. Phanerogam. Monogr. 10: 102 (1978). Holotype: Iran, Luristan, Bisheh, 15 km, E Khorammabad, 1200–1400 m, 14.–16.7.1948, *Rechinger 5764* (W!).

Erect, caulescent, perennial, 30–60 cm. Stipules linear-lanceolate, 7–13 mm, pilose. Leaves 15–30 cm, petiole 8–32 mm. Leaflets in 8–15 pairs, elliptic, 10–40 × 8–15 mm, obtuse or acute at the apex, simple-sericeous on both surfaces. Peduncles 30–110 mm. Racemes globose or rarely oblong. Bracts linear, flat or navicular, 7–13 mm, ciliate on margin. Bracteole 7–12 mm, linear, ciliate. Calyx 10–18 mm, campanulate; tube slightly inflated in fruit, densely long-villous; teeth 2–4 mm, linear. Petals cream. Standard 15–22 × 6–8 mm, stenonychioid, glabrous. Wings 11–15 × 2–3 mm. Keel 15–18 × 3–4 mm. Filaments 13–16 mm, glabrous, whitish; anthers yellow, dorsifixed. Ovary 5–7

mm, ovoid, densely white-hairy; style 12–13 mm, hairy at the base; stigma capitate. Legumes 9–13 × 4–5 mm, obovate, included within the calyx, laterally compressed, densely long-villous, and bilocular; beak curved, 2–4 mm. Seeds 5–6 × 3–5 mm, reniform, brown and smooth. Fl. 7–8.

Habitat: Steppe, *Quercus* sp. spaces, fields, roadsides, woods, 1000–1900 m. *Distribution*: Turkey, Lebanon, Syria, N. Iraq, Russia and N.W. Iran. Irano-Turanian element. *IUCN category*: LC.

Specimens seen: **B7** Elazığ: Elazığ-Tunceli, 60. km, 1020 m, 3.7.1997, roadside, *Akan 1338 & Ekici* (GAZI); Diyarbakır: Eğil-Diyarbakır, 3 km, 800–900 m, 7.6.1998, fields, *Akan 1411* (GAZI). **B8** Mardin: Senar, 32 km SW of Mardin, 6.6.1888 *Sint.* 1888:980 (MSB photo!). **C6** Gaziantep: Aintap (Gaziantep), 600 m, *Hauskn s.n.* (MSB photo); Gaziantep: Bahçe-Gaziantep, 68. km, 1.8.1998, 1000 m, roadside, *Akan 1536* (GAZI). **C10** Hakkari: Zap pass, 3.8.1954, *Davis-Palunin 23869* (ANK); Hakkari: Hakkari-Van, 9 km, 1200 m, 14.6.1966, *Davis 44936* (ISTE); Hakkari: Yüksekova-Şemdinli, Sapata pass, 1600 m, 24.7.1983, *Quercus* sp. forest, *Ekim 7948* (GAZI, ANK).

It is mainly distributed in E and SE Anatolia. The presence of bracteole and creamy corolla make it easier to differentiate it from other members of the section in Turkey.

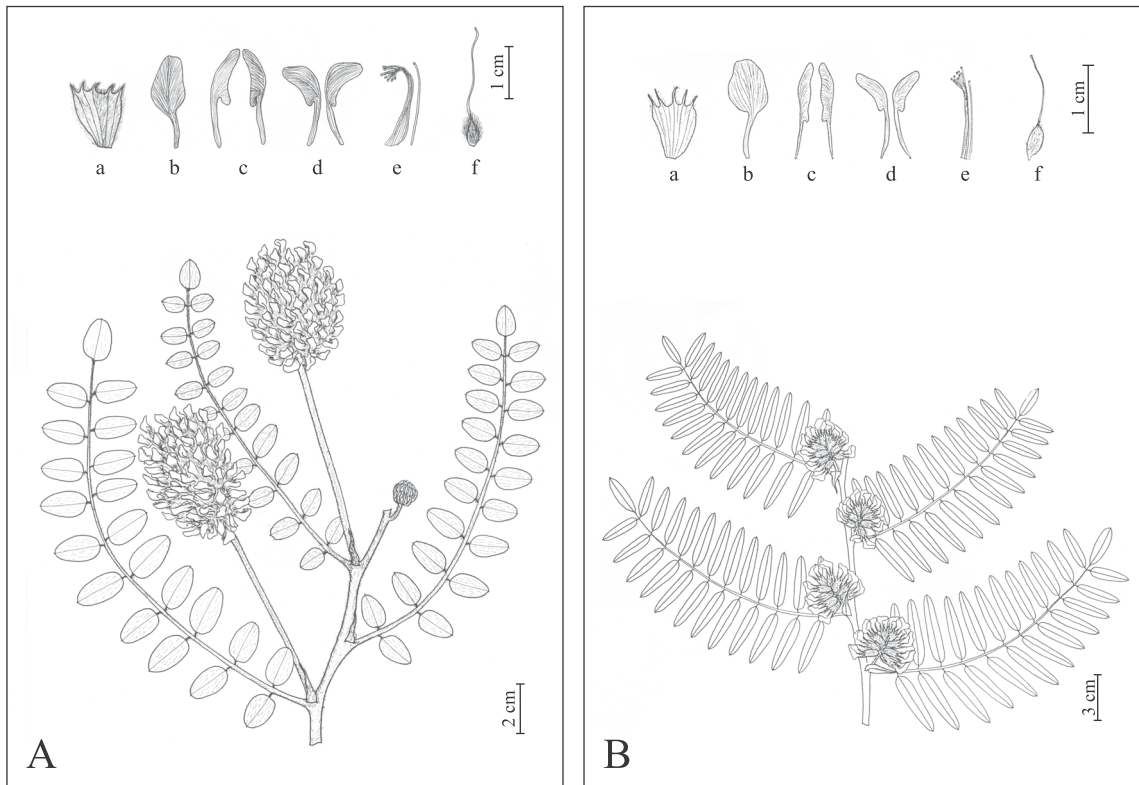


Figure 6. **A-** *Astragalus echinops* (Akan 1536): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary; **B-** *A. gymnalopecias* (Akan 1351): a- calyx, b- standard, c- wing, d- keel, e- stamens, f- ovary.

3.22. *Astragalus gymnales* Rech.f., Oesterr. Bot. Z. 95: 423 (1949) (Figure 6)

Holotype: Turkey, B9 Bitlis: Delan stream, 11 km von Mukus, 1900 m, 22.6.1939, Frödin 318 (UPS photo!).

Erect, caulescent, perennial, 40–80 cm. Stipules linear-lanceolate, 13–27 mm, glabrous. Leaves 9–55 cm; petiole 12–28 mm. Leaflets in 8–16 pairs, narrowly elliptic, 15–60 × 6–20 mm, acute at the apex, glabrous on both surfaces. Peduncles 0–12 mm. Pedicel 1–1.5 mm. Racemes globose. Bracts linear, 3–12 mm, ciliate on margin. Bracteole linear, 1–8 mm, ciliate. Calyx 9–14 mm, tubular; tube slightly inflated in fruit, densely long-pilose; teeth linear, 1.5–5 mm. Petals yellow. Standard 14–20 × 5–8 mm, stenonychioid, glabrous. Wings 15–17 × 2–3 mm. Keel 15–18 × 3 mm. Filaments 17 mm, glabrous, whitish; anthers yellow, dorsifixed. Ovary 6 mm, ovoid, densely white-hairy; style 12 mm, sparsely hairy at the base; stigma capitate. Legumes 15–16 × 4–5 mm, ovoid, included within the calyx, densely long-pilose, bilocular; beak curved, 3–3.5 mm. Seeds 3 × 2–3 mm, reniform, brown and smooth. Fl. 6–8.

Habitat: Steppe, alpine meadows, river sides, road sides, 1900–2400 m. *Distribution*: Endemic to Turkey. Irano-Turanian element. *IUCN category*: EN.

Specimens seen: B9 Van-Mukus (Bahcesaray) 74 km, Yukari Narlica village, 2300–2400 m, 18.07.1997, steppe, Akan 1351 (GAZI).

According to *Flora of Turkey*, it was a species of uncertain affinity. The type specimen is kept in the UPS (photo!) herbarium. After examining the image of the type specimen and collecting the topotype materials, it was determined that it is a certain species of section *Alopecuroidei* and its uncertain affinity is solved with this study. The specimens that were collected by L. Behcet & Y. Altan (VANF 2733!) have bracts with 8 mm length and leaflets with about 50–55 mm length. In addition, the specimens that were gathered by Güner (HUB, 7840!) have longer bracteoles (11 mm) and some of the morphological characters of the specimens are also not parallel to the description in *Flora of Turkey*. However, the field observations and the herbaria specimens show that there is variation within the population of species from the view point of bracts, bracteoles, and leaflets length.

A. gymnales is allied to *A. ponticus* but can be easily differentiated by having bracteoles and glabrous leaflets.

4. Discussion

In this study, by adding 4 new taxa, the number of taxa in the section is increased to 24. Thirteen taxa are endemic to Turkey and the other 11 nonendemics are spread in Iran, Russia, Iraq, Syria, Algeria, Morocco, Lebanon, Europe, and Palestine. In addition, it is determined that *Astragalus ajubensis* Bunge does not occur in Turkey. *Astragalus edmondi* (Kuntze) Sheld. and *A. maximus* Willd. var. *dasy-*

semius Chamb. & Matthews were found to be synonyms of *Astragalus decurrens* Boiss. and *Astragalus alopecurus* Pall., respectively.

In this study, it was determined that the calyx is somewhat inflated in fruit, but not in flower.

The members of sect. *Alopecuroidei* were thought to be in the group of sessile flowers, but some members of the section, such as *A. decurrens*, *A. bracteosus*, and *A. erythrotaeniis*, have a short pedicel of c. 1–3 mm.

The contradiction in *Flora of Turkey* between the distinguishing key and the description of taxa is corrected with this study and it is determined that the leaflets of some taxa, such as *A. gymnales*, *A. ocephalus*, *A. macrocephalus* subsp. *macrocephalus*, and *A. ovabaghensis*, are glabrous on both surfaces, while the leaflets of some species (*A. echinops* and *A. panduratus*) are pubescent on both surfaces and the leaflets of the other taxa are simple-hairy just below the surface.

In *Flora of Turkey*, it was mentioned that the standard of *A. maximus* var. *dasysemius* was hairy. The occurrence of hairs on the standard is a rare feature in sect. *Alopecuroidei*. Thus, during the revision of this section, it was observed that the occurrence of hair has not been recorded in all members of the section. Notably, the type specimen of *A. maximus* var. *dasysemius* was observed in detail (ANK!) and the occurrence of the hairs on the standard could not be seen.

Some species that were gathered about a century ago, such as *A. uhlwormianus*, *A. stojanii*, *A. macrocephalus* subsp. *cucullaris*, and *A. gymnales*, were rediscovered during this study and have been added to the herbaria.

It was observed that the pollen type in the members of this section is subprolate or prolate-spheroid. The pollen is tricolporate and the ornamentation is reticulate. The amb type is semiangular (Akan et al., 2005).

The anatomical structures of the stem and leaflets of members of the section have been studied for the first time in this study with the exception of *A. panduratus*, which was studied by Engin et al. (1994), and *A. decurrens*, studied by Çobanoğlu and Altan (1989).

By cytogenetic studies, it was determined that the number of chromosomes in the members of the section is $2n = 16$.

The distribution and threat categories (IUCN, 2006) of species were determined with new observations in the field. Among 13 endemic taxa, 5 of them are CR, 4 of them EN, 1 of them VU, 1 of them LC, and 2 of them NT.

In recent years, a new section, namely *Laxiflori*, was formed by Agerer-Kirchhoff and Agerer to include the transition species between sect. *Alopecuroidei* and sect. *Astragalus* (Agerer-Kirchhoff & Agerer, 1977). The questionable species (species dubia) allied to sect. *Alopecuroidei* that were recorded by Rechinger et al. (1959) were also included in sect. *Laxiflori*. However, the determination

of the section is open to discussion and difficult for some species very close to sections *Alopecuroidei*, *Astragalus*, or *Laxiflori*, like *A. hamadanus*, which is endemic to Iran. Sect. *Astragalus*, with inflorescence that is single-flowered or lax spiked (Kirchhoff, 1976), is allied and close to sect. *Alopecuroidei*. Sect. *Laxiflori*, with short and filiform peduncle bearing lax and many flowers (Agerer-Kirchhoff & Agerer, 1977), is close to both *Alopecuroidei* and *Astragalus* sections. In this situation, 2 species (*A. erythrotaenius* and *A. bracteosus*) of the section *Alopecuroidei* in Turkey, due to their lax inflorescence, were transferred to sect. *Laxiflori*. The type specimens (W) of both species, *A. erythro-*

taenius and *A. bracteosus*, were examined during this revision and it was determined that they should be maintained within sect. *Alopecuroidei*.

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