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The revision of the genus *Oxytropis* (Leguminosae) in Turkey

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Abstract: A taxonomic revision of the genus *Oxytropis* DC. (Leguminosae) in Turkey is presented. According to the recent literature, the genus had 13 taxa in Turkey; however, at the end of our studies the number was reduced to 11. It was determined that *Oxytropis engizekensis* Duman & Vural is a synonym of *O. persica* Boiss., and *O. fominii* Grossh. is a synonym of *O. argyroleuca* Bornm. Red List categories of the taxa were re-evaluated according to our results based on IUCN Red List categories. The Red List categories of *O. pallasii* Pers. and *O. pilosa* (L.) DC., which are ascribed as DD in the Red Data Book of Turkish Plants, were collected and defined in new threat categories after this study. In addition, phytogeographical areas for *O. pallasii*, *O. pilosa*, *O. albana* Steven, and *O. lazica* Boiss. are suggested here.

Key words: Turkey, revision, *Oxytropis*, Leguminosae

1. Introduction

Oxytropis DC. belongs to the subfamily Papilionoideae in the family Leguminosae (or Fabaceae) under the subtribe *Astragalinae* of the tribe *Galegeae* of a total number of approximately 300 species (Polhill, 1981; Lock & Schrire, 2005). Bunge (1874) classified 181 *Oxytropis* species into 4 subgenera and 19 sections. Two more subgenera and 9 new sections were added to the subgenera singled out by Bunge (Fedtschenko & Schischkin, 1948; Vasilchenko, 1966).

De Candolle (1802) recognised 2 genera by splitting Linnaean *Astragalus* L. into *Astragalus* and *Oxytropis* and labelled as *Astragalus* those with obtuse keel and bilocular pods due to the septum arising from the ventral suture. As *Oxytropis*, De Candolle classified those with mucronate keel at the apex and bilocular pods due to a septum arising from the dorsal suture. A short taxonomic history of the genus can be seen in Figure 1.

Oxytropis is considered one of the closest relatives of *Astragalus*; originally it was a part of *Astragalus* in the Linnaean circumscription of the genus. Although it differs from *Astragalus* only in the shape of the keel petal (pointed vs. obtuse) and the shape of the pod septum (arising from adaxial suture vs. abaxial), it has never been considered in *Astragalus*, since its separation was made by De Candolle (1802). Recent molecular studies based on nrDNA ITS and chloroplast *trn*L Intron data (Wojciechowski et al., 1999; Wojciechowski, 2005) clearly demonstrated that *Oxytropis* is monophyletic and not nested within *Astragalus*, but forms instead a separate clade within the larger Astragalean clade (Figure 1). It has also been established that *Oxytropis* is a sister group of *Astragalus*, which is of Eurasian origin (Ranjbar et al., 2010).

Oxytropis has been revised by numerous researchers, for instance, Peter-Stibal (1938), Fedtschenko et al. (1948), Gray (1864), Barneby (1952, 1964, 1989), Vasil'chenko (1984), Ranjbar (1999, 2000), Ranjbar and Bayat (2009), and Ali (1958).

The members of the genus are largely distributed across the Central and Eastern parts of Anatolia and Black Sea regions in Turkey, as well as in Russia, Africa, North America, Iran, Iraq, Afghanistan, China, Pakistan, Italy, France, Austria, Sweden, Yugoslavia, Spain, Romania, Albania, Czechoslovakia, Poland, Bulgaria, Norway, England, Germany, Greece, Hungary, and Finland (Barneby, 1964; Chater, 1968; Jurtzev, 1978; Vasilchenko, 1984; Podlech, 1999; Zhu, 2002). The world distribution for the genus is illustrated in Figure 2.

The *Flora of Turkey* recognises 13 species, of which 3 are endemic for Turkey (Chamberlain & Matthews, 1970; Özhatay et al., 2000).

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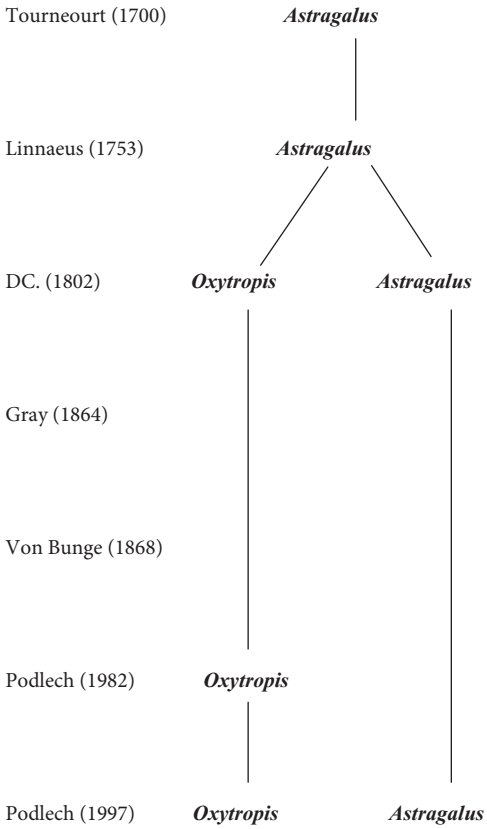


Figure 2. World distribution of the genus *Oxytropis*.

2. Materials and methods

Research material was collected from different parts of Turkey from May to September, during the flowering and fruiting periods between 2005 and 2008. In order to study the variation patterns, specimens were collected from as many different parts of the existing distribution area of the section as possible. In addition, the collections of AEF, ANK, EGE, GAZI, HUB, VANF, and LE and the photos of E, B, G, and GB herbaria were also examined.

Morphological studies with a range of characteristics that were considered to be of taxonomic significance were also investigated. In this study, the following taxonomic characteristics were used: stipule structure, stipule length, and indumentum; leaf length; leaflet shape, leaflet length, and indumentum; inflorescence shape, number of flowers; bract shape, bract length, and indumentum; calyx structure; corolla standard, wing, and keel, beak structure and size; fruit structure, with inflation or not; and seed structure. Measurements were obtained from at least 10 replicates from each of the 10 specimens and the average value of each character was evaluated as well. The maximum and minimum values of the measurements can be seen in the taxa's descriptions. The author names are taken from the *Authors of Plant Names* (Brummitt & Powell, 2001). Red List categories of some taxa were revised according to IUCN Red List categories (IUCN, 2001). The abbreviations used in text: CR: Critically endangered, VU: Vulnerable. Among the taxa that need protection although they are not endemic, and which are spread in constricted areas, IUCN categories for taxa that could be defined in the CR, EN, and VU categories are given. Danger categories are supplied with their descriptions. LC and other classification were deemed unnecessary. The sections of the species are arranged according to Malyshev (2008).

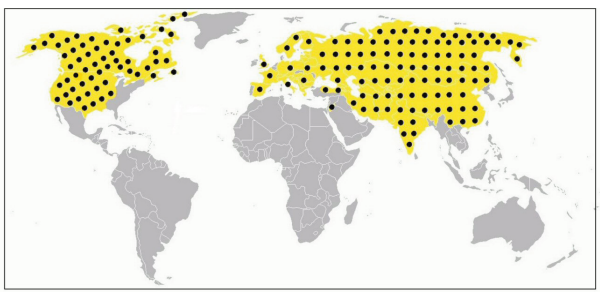


Figure 1. Short taxonomic history of the genus *Oxytropis*.

3. Results

Oxytropis DC., Astragalogia ed. fol. max. 53; ed. fol. min. 66. 15.11.1802 (*nom. cons.*).

= ***Spiesia*** Necker ex O.Kuntze, Revisio Generum Plantarum 1: 205 (1891). **Type**: *Oxytropis montana* (Linnaeus) A.P. de Candolle (*Astragalus montanus* Linnaeus) (*typ. cons.*) Phan.-Fabaceae, (55), 09.02.1996.

Perennial herbs or cushionlike shrublets, caulescent or acaulescent, with glandular trichomes, glands, or scalelike or slender basifixed trichomes. Stipules conspicuous, membranous, papery, leathery, scarious, herbaceous, or leaflike, usually persistent, free or adnate to petiole, distinct or connate. Leaves imparipinnate (in Turkey); leaflets alternate, opposite, subopposite, verticillate, or subverticillate; leaflet blades various in shape, base oblique. Inflorescences racemes, spicate or capitate, dense or lax, with 1- to many flowered. Bracts usually triangular or lanceolate–triangular. Bracteoles usually absent or sometimes present and narrowly triangular. Calyx campanulate, tubular–campanulate, or tubular, with 5 subequal lobes. Corolla various in colour, petals clawed; standard various in shape, apex rounded, emarginate, or 2-lobed; wings variously shaped, apex rounded or emarginate; keel variously shaped, apex beaked with vascular bundles reaching beak apex. Stamens diadelphous. Ovary sessile or stipitate, glabrous or pubescent. Legume sessile or stipitate, membranous or leathery, covered by calyx or exserted from calyx, usually 1-locular or 2-locular, septum absent, narrow or wide.

Key to the Turkish species of the genus *Oxytropis*:

1. Plant caulescent
   2. Corolla lavender–blue; fruit pendant.....1. **kotschyana**
   2. Corolla yellow; fruit erect
      3. Peduncles equal to or shorter than leaves; standard 16–18 mm; beak 2.5 mm; fruit longer than 20 mm..... .....2. **pallasii**
      3. Peduncles longer than leaves; standard 10–14 mm; beak 1.5 mm; fruit up to 20 mm.....3. **pilosa**
1. Plant acaulescent
      4. Stipules form a sheath around petiole.....4. **savellanica**
      4. Stipules do not form a sheath around petiole
         5. Peduncle prostrate
            6. Leaflets grey; fruit inflated, thin-walled, without septum.....5. **persica**
            6. Leaflets green; fruit not inflated, thick-walled, with septum .....*6.* **albana**
         5. Peduncle ascending or erect
            7. Fruit erect
               8. Inflorescence capitate; fruit inflated…….....7. **lazica**
               8. Inflorescence lax raceme; fruit not inflated….....11. **lupinoides**
            7. Fruit pendant
               9. Calyx teeth shorter than tube; beak 1–1.5 mm long; fruit length 3 times longer than width ....8. **argyroleuca**
               9. Calyx teeth equal or longer than tube; beak 2 mm long; fruit length 3 times shorter than width
                  10. Stipule 6–8 mm long; Inflorescence capitate; leaves 3–9 cm…….....9. **aucheri**
                  10. Stipule 15–20 mm long; Inflorescence lax raceme; leaves 6–18 cm long..... 10. **karjaginii**

1. *Oxytropis kotschyana* Boiss. & Hohen., Diagn. Pl. Orient. 1(9): 36 (1849).

(Subgen. *Phacoxytropis*, Sect. *Mesogaea* Bunge), Figure 3.

Type: (Iran, Elburz, Mts.) M. Demavend prope Lar., *Kotschy* 332 (holotype: G, photo! isotype: K)

=*Astragalus sorkhabadensis* Sirj. & Rech.f., Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl. xc. 118 (1953).

Type: In valle fluvii Talar, Sorkhabad Iran, 20.06.1948, *K.H. Rechinger* & *Frida* 5599 (E).

Herbs, 25–50 cm tall, caulescent, ascending, covered with greyish simple hairs. Stipules 20–25 mm long, membranous, triangular, connate at base, apex acute, covered with villous hairs. Leaves 7–15 cm long; petioles shorter than rachis, covered with white dense hairs below and black spreading hairs above. Leaflets 15–30 × 5–8 mm long, 12–16-paired, oblong–lanceolate, apex acute, covered with appressed spreading hairs. Raceme lax below, dense above, 12–20-flowered; peduncles 15–20 cm long, longer than leaves, erect, covered with white and black spreading hairs. Bracts linear, 5–6 mm long, apex acute, covered with spreading hairs. Calyx 14–15 mm long, tubular–campanulate, covered with densely black hairs and sparsely white spreading hairs; teeth 4–5 mm long, shorter than tubes, triangular–lanceolate. Corolla lavender–blue. Standard 20–24 × 3–14 mm long, ovate, apex emarginate, cuneate to base. Wings 17–18 mm long, limb narrowly oblong, clearly constricted above auricle, apex emarginate, auricle 2–2.5 mm long, claw 8–9 mm long. Keel 10–11 mm long, beak 2–2.5 mm long, straight. Stamens 10–11 mm long, filaments hairy. Ovary 9–10 mm long, densely white hairy, stipitate. Legume 35–40 mm long, oblong–linear, deflexed, septum developed, covered with spreading short white hairs; beak 2 mm long, straight. Seeds reniform, 1.7–2 × 1.5–2 mm long, dark brown, hilum terminal.

Flowering time and habitat: 5–6, steppe, screes and rocky slopes, 1750–1850 m.

Specimens examined: Turkey: **C9** Van: Çatak, Kıyıcak village, Kato mountain, Lisek hill, northern slopes, steppe, 2200 m, 07.06.2003, *B.Bani* 1778 (VANF); **C10** Hakkari 21 km from Bacirge to Yüksekova, 2230 m, 18.06.1966, *P.H.Davis* 45225 (E, photo); Hakkari: Nehil stream, 62 km from Hakkari to Yüksekova, steppe, 1750 m, *P.H.Davis* 44912 (G , photo); ibid., 27.05.2008, *S.Karaman* 2183, *Z.Aytaç* & *M.Armağan* (GAZI); ibid., 1850 m, 27.05.2008, *M.Armağan* 3115 (VANF).

Distribution and conservation status: Turkey and Iran. Irano-Turanian element. CR (A1aB1aC2a).

Oxytropis kotschyana is closely related to *O. pallasii* but differs by its lavender–blue corolla (not yellow) and pendant legume (not erect).

2. *Oxytropis pallasii* Pers., Synops. Pl. 2: 334 (1807).

(Subgen. *Oxytropis* DC., Sect. *Chyrsantha* Vass.), Figure 4.

Type: Hab. in Tauria (Crimea) (BM, photo!).

= *Oxytropis sintenisii* Freyn, Öst. Bot. Zeitschr. 44: 65 (1894).

Type: (Turkey), 10.06.1892–29.07.1892, *Sintenis* 4216 (BR).



Figure 3. *Oxytropis kotschyana*. a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2183, *Z.Aytaç* & *M.Armağan*).

Herbs, 15–30 cm tall, caulescent, prostrate or ascending, covered with spreading villous hairs. Stipules 8–10 mm long, herbaceous, lanceolate, free, apex acute, villous. Leaves 15–30 cm long; petioles shorter than rachis, covered with villous hairs. Leaflets 7–20 × 2–4 mm long, 7–14-paired, lanceolate-oblong, apex acute, covered with villous hairs. Raceme dense, globose or short ovate, 6–10-flowered; peduncles 10–30 cm long, equal to or shorter than leaves, ascending or prostrate, covered with white villous and sparsely black spreading hairs above. Bracts triangular, 8–10 × 1–2 mm long, apex acute, covered with white villous hairs. Calyx 10–12 mm long, tubular–campanulate, covered with long white and sparsely short black hairs; teeth 5–7 mm long, equal or longer than tubes, lanceolate. Corolla pale yellow. Standard 16–18 × 6–7 mm long, ovate, apex emarginate, cuneate to base. Wings 14–16 mm long, limb narrowly oblong, clearly constricted above auricle, apex obtuse, auricle 2–2.5 mm long, claw

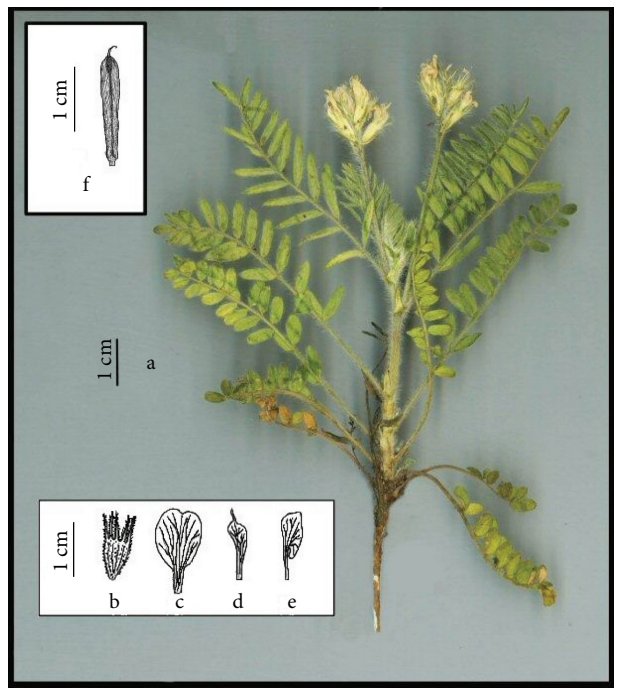


Figure 4. *Oxytropis pallasii.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2181).

5–6 mm long. Keel 11–12 mm long, beak 2.5 mm long, curved. Stamens 9–10 mm long, filaments hairy towards base. Ovary 9–10 mm long, densely white hairy, stipitate. Legume 20–25 × 4–5 mm long, oblong to cylindrical, erect, septum developed, covered with appressed white hairs, not stipitate; beak 1.5–2 mm long. Seeds reniform, 1.5–2 × 1.5–2 mm long, light or dark brown, hilum terminal.

Flowering time and habitat: 5–7, roadsides, slopes, steppe, 300–1750 m.

Specimens examined: Turkey: **A4** Karabük: Karatepe, Cumayanı, *Pinus brutia* forest, c. 300 m, 18.06.1984, *M.Demirörs* 2046 (ANK); ibid., steppe, 418 m, 01.05.2008, *S.Karaman* 2179 (GAZI); ibid., 15.07.2008, *S.Karaman* 2188 (GAZI); Kırıkkale: Delice, near Samsun road, 800 m, 29.04.1989, *A.Dönmez* 1824 (HUB); **A9** Erzurum: 21 km from Erzurum to Oltu, 1750 m, steppe, 02.06.2008, *S.Karaman* 2181 (GAZI).

Distribution and conservation status: Turkey, Russia, Caucasus. Euro-Siberian element. CR (A1aB1aC2a).

Oxytropis pallasii is related to *O. pilosa*, but it is argued that the characteristics presented in the *Flora of Turkey* are not sufficient to allow them to be viewed as separate species. Their differences are illustrated in the Table.

3. *Oxytropis pilosa* (L.) DC., Astragalogia 91 (1802).

(Subgen. *Oxytropis* DC., Sect. *Chyrsantha* Vass.), Figures 5–6.

Type: Described from Siberia, Thuringia (syn.: LINN. 926/3, photo)

Table. The diagnostic morphological characters of *Oxytropis pallasii* and *O. pilosa*.

Oxytropis pallasii	*Oxytropis pilosa*
Prostrate or ascending	Erect
Bract triangular	Bract lanceolate
Leaflet apex acute	Leaflet apex obtuse
Peduncle equal to or shorter than leaves	Peduncle longer than leaves
Raceme short–ovate or globose	Raceme elliptic
Corolla cream–yellow	Corolla light yellow or sulphur
Keel beak curved	Keel beak uncurved

≡ *Astragalus pilosus* L, Sp. Pl. 756 (1753).

Type: (LINN).

Herbs, 15–50 cm tall, caulescent, erect, covered with spreading dense long hairs. Stipules 10–15 mm long, herbaceous, oblong–ovate to lanceolate, adnate to base of petiole, apex acute, covered with pubescent hairs. Leaves 10–45 cm long; petioles equal or shorter than rachis, covered with long spreading hairs. Leaflets 12–32 × 2.5–4 mm long, 11–15-paired, oblong–linear or lanceolate, apex obtuse, covered with pubescent hairs. Raceme dense, ovate, 6–10-flowered; peduncles 15–50 cm long, longer than leaves, erect, covered with white villous and sparsely black spreading hairs. Bracts linear–lanceolate, herbaceous, 20–22 × 2–3 mm long, covered with white long villous hairs, apex acute. Calyx 12–13 mm long, tubular–campanulate, covered with long white hairs; teeth 5–7 mm long, longer than tubes, linear–subulate. Corolla pale yellow. Standard 10–14 × 4–5 mm long, ovate, apex emarginate, cuneate to base. Wings 9–13 mm long, limb narrowly oblong, clearly constricted above auricle, apex obtuse, auricle 1–2 mm long, claw 5–6 mm long. Keel 8–12 mm long, beak 1–1.5 mm long, straight. Stamens 7–10 mm long, filaments hairy towards base. Ovary 7–9 mm long, densely white hairy, stipitate. Legume 15–30 × 3–4 mm long, oblong to cylindrical, erect, septum developed, covered with appressed white hairs, stipitate, 0.5 mm long; beak 2 mm long. Seeds reniform, 2–2.5 × 1.5–2 mm long, light and dark brown, hilum terminal.

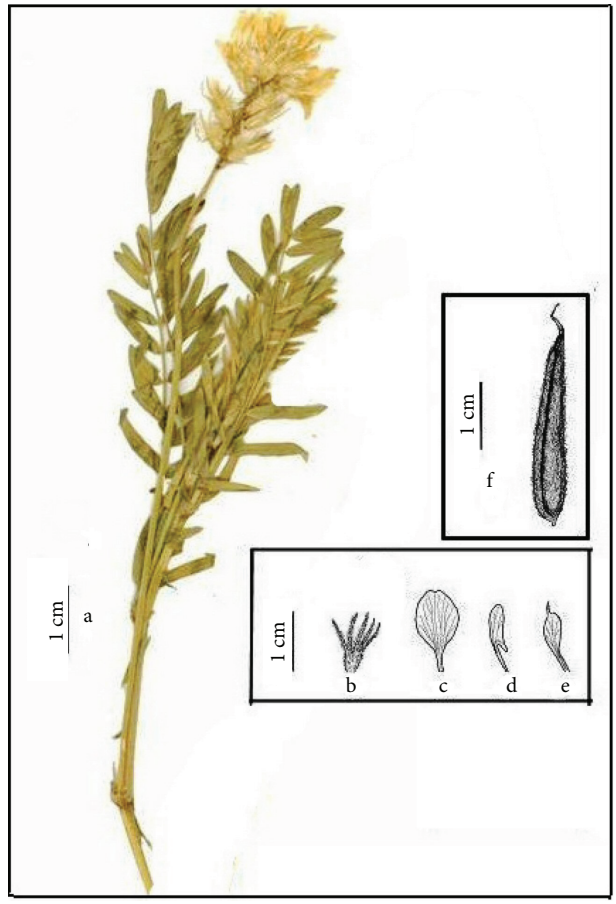


Figure 6. *Oxytropis pilosa.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*Nydegger* 43556).

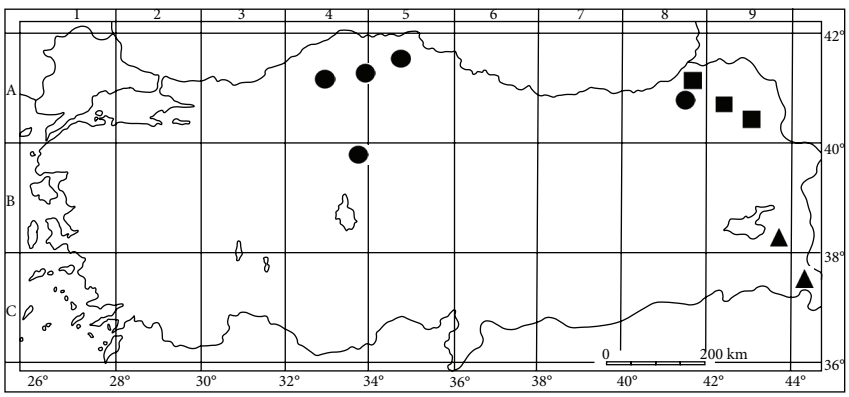


Figure 5. Distribution of (▲) *Oxytropis kotschyana*, (●) *O. pallasii*, and (■) *O. pilosa* in Turkey.

Flowering time and habitat: 5–6, valleys, meadows and shrublands, 300–1800 m.

Specimens examined: Turkey: **A8** Artvin: between Artvin and Şavşat 5 km, 400 m, 10.05.2008, *M.Ekici* 3795 (GAZI); ibid., *S.Karaman* 2185 & *Z.Aytaç* (GAZI); ibid., 29.06.2008, *S.Karaman* 2200 (GAZI); **A9** Kars: between Sarıkamış and Karakurt, 4 km near Karakurt, 02.07.1988, 1780 m, *Nydegger* 43556 (GAZI); Kars: Güvercin village, steppe, 1800 m, 26.08.1998, *Ocakverdi* 2818 (GAZI).

Distribution and conservation status: Turkey, Iran, Russia, Central and Eastern Europe, Northern Asia. Cosmopolitan. CR (A1aB1aC2a).

4. *Oxytropis savellanica* Boiss., Fl. Orient. 2: 503 (1872).

(Subgen. *Phacoxytropis* Bunge, Sect. *Protoxytropis* Bunge), Figure 7.

Type: (Iran, Azerbaijan) In sumo monte Savellan ad templum dirutum, 15-27.08.1856, *Seidlitz s.n.* (holo: G, photo!).

=*Oxytropis carduchorum* Hedge, Notes Roy. Bot. Gard. Edinburgh 22: 429 (1958).

Type: (Turkey C9 Hakkari): Kara mountain, 3504 m, *P.H.Davis* & *O.Polunin* 24420 (ANK! E, photo!).

Herbs, 3–5 cm tall, acaulescent, prostrate, covered with white appressed hairs. Stipules 3–4 mm long, herbaceous, triangular–ovate, connate at base, covered with sparse hairs glabrous above. Leaves 1–2.5 cm long; petioles shorter than rachis, covered with appressed white appressed hairs. Leaflets 6–8-paired, ovate–oblong, (1)1.5–4 × (0.5) 1–2 mm long, apex retuse to acute, covered with appressed white hairs. Raceme lax, capitate, (1 or) 2–8-flowered; peduncle 3–7 cm long, longer than leaves, decumbent, with appressed black and white hairs. Bracts linear to narrowly lanceolate, 1–2 mm long, apex acute, covered with sparse hairs. Calyx 5–7 mm long, tubular–campanulate, covered with appressed white and black hairs; teeth 0.8–1.8 mm long, longer than tubes, subulate. Corolla purple. Standard 9 –12 × 7–8 mm long, suborbicular, apex emarginate, cuneate to base. Wings 8–11 mm long, limb narrowly oblong, clearly constricted above auricle, apex obtuse, auricle 1.5–2 mm long, claw 5–6 mm long. Keel 7–9 mm long, beak 1–2 mm long, straight. Stamens 6–7 mm long, filaments hairy towards the base. Ovary 5.5–6 mm long, densely covered with white hairs, stipitate. Legume 10–12 × 4–4.5 mm long, oblong to cylindrical, septum developed, covered with short white and black pubescent hairs, shortly stipitate, 0.5 mm long; beak 1 mm long. Seeds reniform, 2.5–3 × 5–2 mm long, light brown and spotted, hilum sub-terminal.

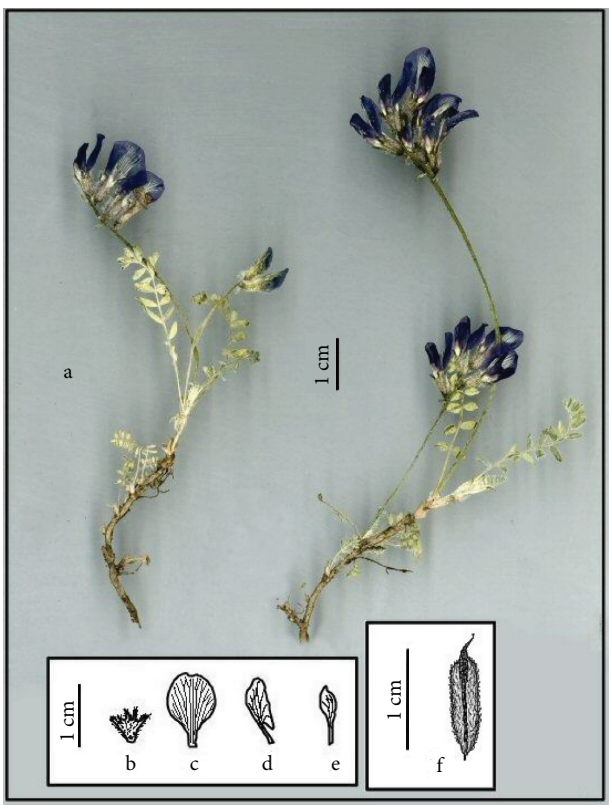


Figure 7. *Oxytropis savellanica.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2128 & *A.Savran*).

Flowering time and habitat: 7–8, alpine meadows, 2900–3900 m.

Specimens examined: Turkey: **B7** Tunceli: Munzur mountain, above Ovacık, 2800 m, 17.07.1957, *P.H.Davis* 31278 (ANK; E, photo); **B9** Bitlis: Süphan mountain, 3840 m, *P.H.Davis* 24669 (E, photo); **C5** Niğde: Aladağ, Meydan plateau, alpine meadows, 2900 m, 05.07.2007, *S.Karaman* 2129 & *A.Savran* (GAZI); ibid., Tekneli plateau, alpine meadows, 05.07.2007, *S.Karaman* 2128 & *A.Savran* (GAZI); ibid. 27.09.2007, *S.Karaman* 2164 (GAZI); ibid., 05.08.1962, *Urdl* (ANK); **C9** Hakkari: Kara mountain, 3504 m, *P.H.Davis* 24420 (ANK, E, photo); ibid., 16.08.1954, *P.H.Davis* 24496 (photo, E); **C10** Hakkari: Mor mountain, 3300 m, *Watson* et al. 3640, (ANK; E, photo).

Distribution and conservation status: Turkey, Iran, Iraq, Afghanistan, Pakistan, Pamir Altai, Himalayas. Irano-Turanian element. VU (A1acB2b,i,iii).

Oxytropis savellanica is similar to *O. persica* but differs from it by its stipules and legume. *O. savellanica* stipules form a sheath around the petiole, legume is not inflate, it is thick walled, with a septum and covered with short white and black pubescent hairs. *O. persica* has stipules that do not form a sheath around the petiole and the thin-walled inflated legume is inflated with a thin wall, without a septum and covered with short white pubescent hairs.

5. *Oxytropis persica* Boiss, Diagn. Pl. Orient. ser. 1, 2: 40 (1843).

(Subgen. *Phacoxytropis* Bunge, Sect. *Janthina* Bunge), Figures 8-9.

Type: (Iran) Elburz, in cacumine montis Elamout Persiae borealis, *Aucher* 4420 (holotype: G, photo!).

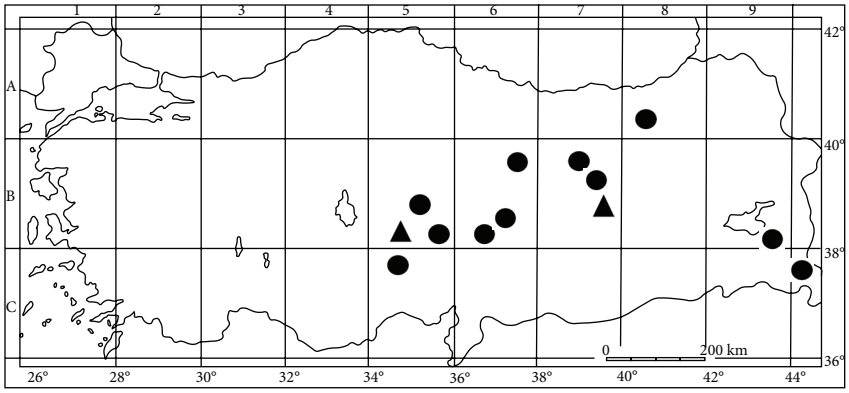


Figure 8. Distribution of *Oxytropis savellanica* (▲) and *O. persica* (●) in Turkey.

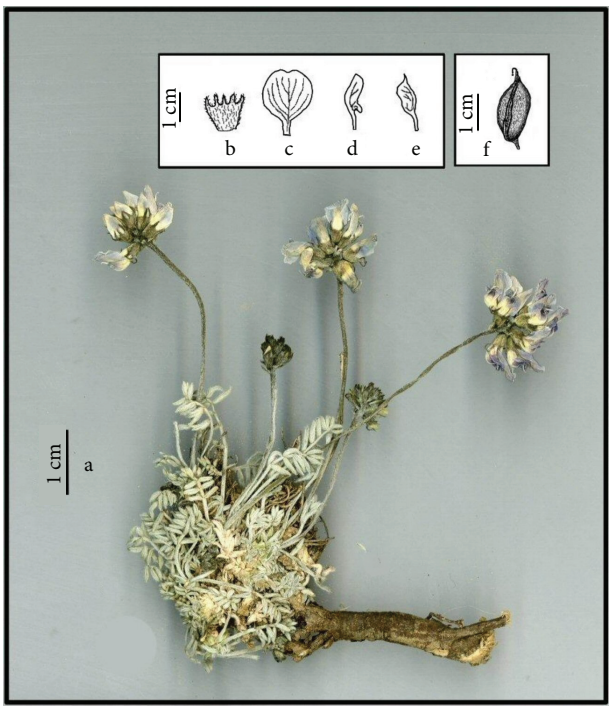


Figure 9. *Oxytropis persica.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2131 & *A.Savran*).

= *Oxytropis engizekensis* Duman & Vural, Turk J Bot 14: 43 (1990). **syn. nov.**

Type: (Turkey C6 Kahramanmaras) Engizek mountain, above Taşpınar, 2700–2800 m, 14.07.1988, *H.Duman* 4225 (holotype: ANK!; isotype: HUB!; GAZI!).

= *Oxytropis dioritica* Boiss, Diagn. Pl. Orient. ser. 2, 5: 84 (1856).

Type: (Turkey) In arenosis dioriticis montis Gisyl Deppe (Kızıltepe) ad argenti fodinas, 15.06.1853, *Kotschy* 129/253 (iso: B).

Herbs, 3–5 cm tall, acaulescent, prostrate, covered with simple white hairs. Stipules 3–5 mm long, herbaceous, triangular–lanceolate, connate at base, apex acute, sparsely simple hairs. Leaves 1–4 cm long; petioles shorter than rachis, covered sparsely simple –pilose hairs. Leaflets 5–8-paired, linear–lanceolate or linear–elliptic, 3–10 × 1–2.5 mm long, apex acute, covered with subbifurcate, sparsely simple hairs. Raceme lax, capitate, 4–10-flowered; peduncles 3.5–11 cm long, longer than leaves, prostrate or ascending, with appressed black and white hairs. Bracts linear to lanceolate, 1.5–2 × 1–1.5 mm long, apex acute, covered with white and black hairs. Calyx 3–6 mm long, tubular, covered with appressed white and spreading black hairs; teeth 1–1.5 mm long, shorter than tubes, triangular–lanceolate. Corolla purple, light pink–white. Standard 8–9 × 4–6 mm long, ovate–orbicular, apex emarginate, cuneate to the base. Wings 5–7 mm long, limb narrowly oblong, clearly constricted above auricle, apex obtuse, auricle 1 mm long, claw 1.5–2 mm long. Keel 5–7 mm long, beak 2 mm long, straight. Stamens 4–5 mm long, filaments hairy towards base. Ovary 4.5–5 mm long, densely covered with white hairs, stipitate. Legume 15–20 × 3–6 mm long, inflated, oblong–ovate, deflexed, septum developed, covered with white pubescent hairs, shortly stipitate, 1–1.5 mm long; beak 2 mm long. Seeds orbicular–reniform, 2–2.5 × 2–2.5 mm long, light or dark brown, hilum terminal.

Flowering time and habitat: 6–7, alpine meadows, 2500–3700 m.

Specimens examined: Turkey: **A8** Gümüşhane/ Erzurum: Kop mountain, 2400 m, *Balls* 1794 (ANK; E, photo); **B6** Sivas: Gürlevik mountain, 2400–2600 m, limestone slopes, 17.07.1984. *B.Yıldız* 4641& *N.Çelik* (HUB); Kayseri: Tomarza, Kesir village, Beydağı hill, rocky places, 2800 m, 24.08.2006, *B.Bani* 4732 (GAZI); **B7** Tunceli: Munzur mountain, above Ovacık, limestone slopes, 2800 m, 17.07.1957, *P.H.Davis* 31236 (ANK; photo E); Erzincan: Başvillage–Çayırlı, Spikor pass, limestone slopes, 29.09.2007, 2340 m, *Hamzaoğlu* 4912 & *Aksoy* (GAZI); ibid., *Hamzaoğlu* 4975 & *Aksoy*

(GAZI); **B9** Van: Başkale, İspiriz mountain, 3200 m, 31.07.1954, *P.H.Davis* 23764 (ANK); Van: Gevaş, Artos mountain, 3650 m, 15.07.1954, *P.H.Davis* 22846 (ANK); ibid., 3505 m, 15.07.1954, *P.H.Davis* 22889 (E, photo); Van: Karabel (Karpit) pass, 3000–3200 m, *N.Demirkuş* 6027 & *M.Koyuncu* (VANF); Van/Siirt: Kavuşşahap mountain, S of Pişvanik, above Arpit, 2950 m, *Watson* et al. 3581 (ANK); **C5** Niğde: Kızıltepe, 2760 m, 06.07.2007, *S.Karaman* 2131, *A.Savran* & *Başköse* (GAZI); ibid., 25.09.2007, *S.Karaman* 2165; Niğde: Çamardı, 2630 m., rocky slopes, 02.07.2007, *S.Karaman 2113*, *A.Savran & Başköse* (GAZI); **C6** Kahramanmaraş: Engizek mountain, Körsulak, rocky slopes, 2700 m, 17.07.1987, *H.Duman* 3562 (GAZI); ibid., 04.07.2007, *S.Karaman* 2118 & *Başköse* (GAZI); Kahramanmaraş: Kadıpınarı, rocky slopes, 2675 m, 04.07.2007, *S.Karaman* 2119 & *Başköse* (GAZI); Kahramanmaraş: Taşpınar, rocky slopes, 2700–2800 m, *H.Duman* 3791 (GAZI); ibid., 04.07.2007, *S.Karaman* 2119 & *Başköse* (GAZI).

Distribution and conservation status: Turkey, Iran, Iraq. Irano-Turanian element.

Oxytropis engizekensis was endemic to the Turkish flora and used to be known only from the local type found only at Engizek Mountain, Kahramanmaraş (location type). However, it was collected from Erzincan, Sivas, Kayseri, and Niğde for the purpose of these field studies. *O. engizekensis* is different from *O. persica* as it has only 4–6 pairs leaflet (instead of 6–8 pairs), shorter peduncle, and white corolla (not purple) according to the *Flora of Turkey* (Özhatay et al., 2000). During our field study and according to our observations, the corolla colour of *O. persica* ranged from purple to white. Moreover, the leaves and peduncle length of *O. persica* living in rocky habitats were short. However, the leaf and leaflet size, as well as the peduncle length of individuals living in the soil and *Onobrychis cornuta* communities were much longer. In addition, there were no differences found between the 2 species; thus it is concluded that *O. engizekensis* should be regarded as *O. persica*.

6. *Oxytropis albana* Steven, Nouv. Mem. Soc. Nat. Mosc. 4: 54 (1813).

(Subgen. *Phacoxytropis* Bunge, Sect. *Janthina* Bunge), Figure 10.

Type: (USSR Caucasicus) In Caucaso orientali supra Chinalug, *Steven s.n.* (holotype: H)

= *O. cyanea* M.Bieb., Fl. Taur.-Caucas. 3: 502 (1819).

= *O. samurensis* Bunge ex Boiss., 2: 504 (1872).

= *O. kasbecki* Boiss., Bunge ex Boiss., Fl. Orient. 2: 506 (1872).

= *O. caucasica* Regel, Index Seminum [St. Petersburg] ***40 (1865).***

Type: *Radde* 922 (E).

= *O. roseililacina* Vassilcz.

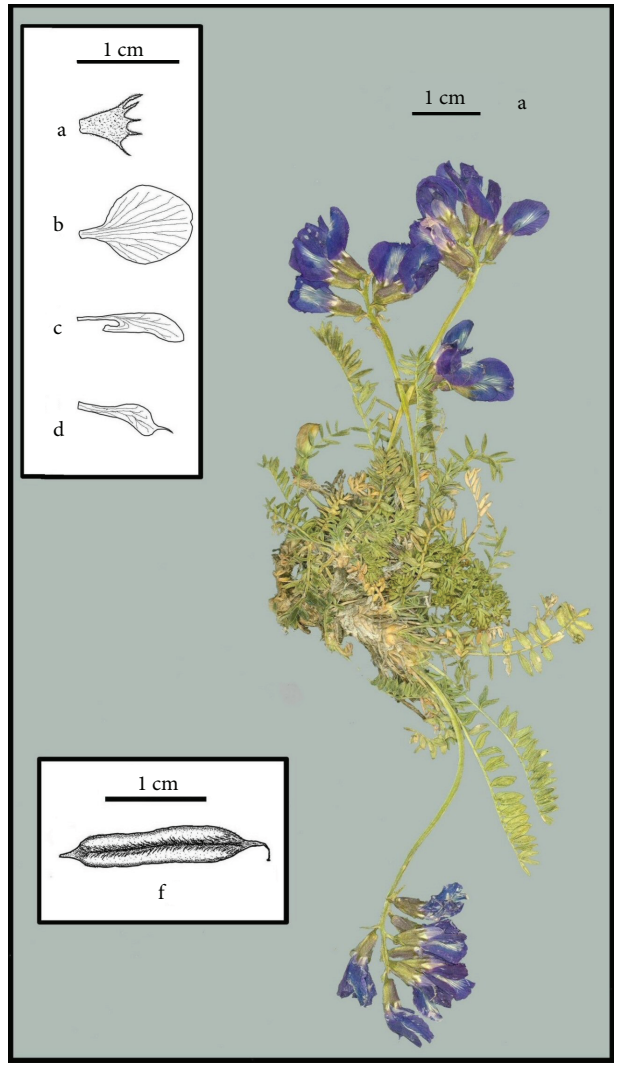


Figure 10. *Oxytropis albana.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2028 & *Z.Aytaç*).

Herbs, 5–7 cm tall, acaulescent, prostrate, covered with spreading hairs. Stipules ovate–lanceolate, adnate to petiole, membranous to leathery, sericeous with dense white and black hairs above, glabrous towards base. Leaves 2.5–5 cm long, 8–12-paired; petioles shorter than rachis, petiole and rachis with appressed hairs; leaflet blades ovate–lanceolate to lanceolate, 2–5 × 0.5–3 mm long, appressed sericeous with long hairs, apex acute. Racemes globose, 3–9-flowered; peduncle 2–6 cm long, erect to diffuse, with sparse white and white–black hairs above; bracts linear–subulate, 2–2.5 mm long, with white and black hairs. Calyx campanulate, 4.5–6 mm long, with dense black short and white long hairs; lobes shorter than tubes, linear–subulate, 1.5–2 mm long. Corolla purple; standard 10–13 × 7–8 mm long, lamina orbicular, apex emarginate. Wings 9–12 mm long, limb narrowly oblong, clearly constricted above

auricle, apex obtuse, auricle 1.5–2 mm long, claw 5–6 mm long. Keel 8–11 mm long, beak 2 mm long, straight. Stamens 7–8 mm long, filaments hairy towards. Ovary 7–8 mm long, densely covered with white hairs, stipitate. Legume 15–25 × 4–5 mm long, oblong, septum developed, covered with appressed hairs, shortly stipitate, 3–4 mm long; beak 2–2.5 mm long. Seeds reniform, 2–2.5 × 1–1.5 mm long, light brown and spotted, hilum sub-terminal.

Flowering time and habitat: 7–8, gravelly areas in valleys, alpine meadows, 2600–3650 m.

Specimens examined: Turkey: **A7/8** Trabzon: Mesourach mountain, 2500–3000 m, 02.07.1933, *Balls* 448 (ANK); **A8** Artvin: Göktaş–Tiryal (Alaca) mountain, Ziyaretdüzü, alpine meadows, ca. 2700 m, 22.07.1978, *A.Düzenli* 1179 (ANK); **A9** Kars: Susuz, Kiziroğlu village, Kısır mountain, alpine meadows, 2940–3165 m, 03.07.1957, *P.H.Davis* & *Hedge* 30539 (ANK); ibid., 27.07.2000, *M.Vural* 8444, *H.Ocakverdi* & *M.Pınar* (GAZI); ibid., 10.07.2007, *S.Karaman* 2151 (GAZI); **B5** Kayseri: Erciyes mountain, alpine meadows, 2846 m, 16.7.1973, *R.Çetik* 4089 E (ANK); ibid., 02.07.1988, *Z.Aytaç* 2407 (GAZI); ibid., 01.07.2007, *S.Karaman* 2028 & *Z.Aytaç* (GAZI); ibid., 28.09.2007, *S.Karaman* 2166 (GAZI); **B9** Bitlis: Süphan mountain, east of Kızılyurt village, rocky slopes, 2300–3650, 13.08.1997, *L.Behçet* 471 (VANF); Kars: Kısır mountain, Çıldır Lake, 3000 m, 03.07.1934, *P.H.Davis* 30539 (E, photo); Gümüşhane: Szandschak Gümüschkane Karaguelldagh, in alp Manator, 2430–2740 m, 03.08, no 7149 (LE); ibid., 9000 ft, 25.08, no 7150 (LE); Küp-göl, 08.08.1971, no 710 (LE).

Distribution and conservation status: Turkey, Caucasia, France. Euro-Siberian element.

In the *Flora of Turkey* (Chamberlain & Mathews, 1970) it is stated as a footnote that leaf and leaflet lengths of the Caucasian specimens are longer than those of the species living at the mountain Erciyes. This variation in leaf size of the specimens was corroborated by the present research.

Oxytropis albana is close to *O. lazica* but differs from it by having prostrate leaves (not erect), 10–13 mm corolla (not 19–20 mm), and not inflated legume.

7. *Oxytropis lazica* Boiss, Fl. Orient. 2: 499 (1872).

(Subgen. *Euoxytropis* (Boiss.) Bunge, Sect. *Orobia* Bunge), Figures 11 and 12.

Type: (Turkey A8 Rize) Supra Djimil et Khabakhar (İkizdere, Gölyayla), 2100–2400 m, 07.08.1866, *Balansa* 1399 (holotype: G, photo! isotype: K).

= *Oxytropis micans* Freyn & Sint, Bull. Herb. Boiss. 3: 87 (1895).

Type: (Turkey) Szandschak Gumuschkhane, Karavelldagh, in pascuis alp, Manator, 03.08.1894, *Sintensis* 7148 (E).

Herbs, 15–20 cm tall, acaulescent, ascending, covered with long appressed hairs. Stipules 10–12 mm long, membranous, whitish, triangular–lanceolate, connate at base, glabrous, white hairs on margins. Leaves 10–12 cm long; petioles shorter than rachis, covered with white dense hairs below and black spreading hairs above. Leaflets 6–12 (15)-paired, oblong–ovate, oblong–lanceolate or lanceolate, 4–12 × 1.5–3 mm long, covered with long appressed spreading hairs below and long appressed hairs above. Raceme dense short, globose, 5–10-flowered; 5–18 cm long, longer than leaves, erect, covered with white and black spreading hairs. Bracts oblong–lanceolate, 6–13 × 1.5–3.5 mm long, covered with white or black–white spreading hairs. Calyx 8–12 mm long, tubular–campanulate, covered with short black hairs and white spreading hairs; teeth 1–2 mm long, shorter than tubes, lanceolate. Corolla lilac–blue, yellow–blue–white, blue–white. Standard 19–20 × 7–8 mm long, oblong–ovate, emarginate at apex, cuneate to base. Wings 12–15 mm long, limb narrowly oblong or oblong, clearly constricted above the auricle, emarginate at apex, auricle 1.5– 2 mm long, claw 7–7.5 mm long. Keel 12–14 mm long, beak 0.5–1 mm long, straight. Stamens 11–12 mm long, filaments hairy. Ovary 10–11 mm long, densely covered with white hairs, stipitate. Legume 20–25 × 7–9 mm long, oblong–ovate, septum developed, inflated, covered with spreading appressed white and black hairs; stipe 0.5–1 mm long, beak 1.5–2 mm long, straight. Seed orbicular–reniform, 2.5–3 × 2–2.5 mm long, light and dark brown, spotted or not, hilum terminal.

Flowering time and habitat: 7–8, alpine meadows, 2100–2900 m.

Specimens examined: Turkey: **A7** Trabzon: Zigana pass, 2560–2700 m, alpine meadows, 12.07.2007, *S. Karaman* 2158 (GAZI); ibid., *Hub.-Mor.* 16423 (ANK); Gümüşhane: Karagöl mountain, Manadur, *Sintenis* 1894: 7148, (E, photo); **A8** Rize: İkizdere, Ballıvillage, Anzer, Küçük Alcahal, 2658–2750 m, alpine meadows, 20.07.1984, *A.Güner* 5922, *M.Vural* (GAZI); ibid., 11.07.2007, *S.Karaman* 2155 (GAZI); ibid., 03.09.2008, *S.Karaman* 2206 (GAZI); Rize: İkizdere, between Gölyayla and Cihantepe, 2780 m, alpine meadows, 25.07.1985, *A.Güner* 6611 & *M.Vural* (GAZI); ibid., 11.07.2007, *S.Karaman* 2156 (GAZI); ibid., Başvillage (Cimil), Kalçarak, 2300–2650 m, alpine meadows, 26.06.1986, *A.Güner* 7020 (GAZI); Gümüşhane: Haldizan, N of Baiburt, 2900 m, *Balls* 1680a. (E, photo); **B9** Ağrı: Ala mountain, massif, Hüdavendigar Tepe (from Diyadin) 2750 m, *Watson* et al. 3070 (E, photo).

Distribution and conservation status: Turkey, Georgia. Euro-Siberian element. VU (A1acB2b,i,iii).

8. *Oxytropis argyroleuca* Bornm., Feddes. Rep. 3: 131 (1906).

(Subgen. *Oxytropis* DC., Sect. *Dolichocarpon* Vass.), Figures 13–14.

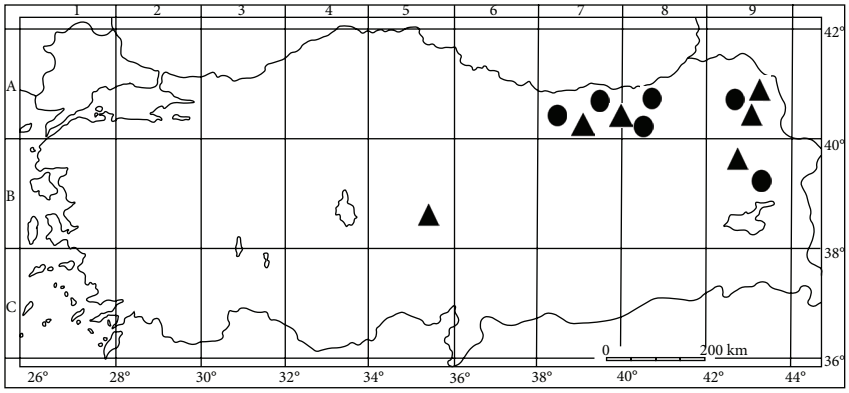


Figure 11. Distribution of (▲) *Oxytropis albana*,(●) *O. lazica* in Turkey.

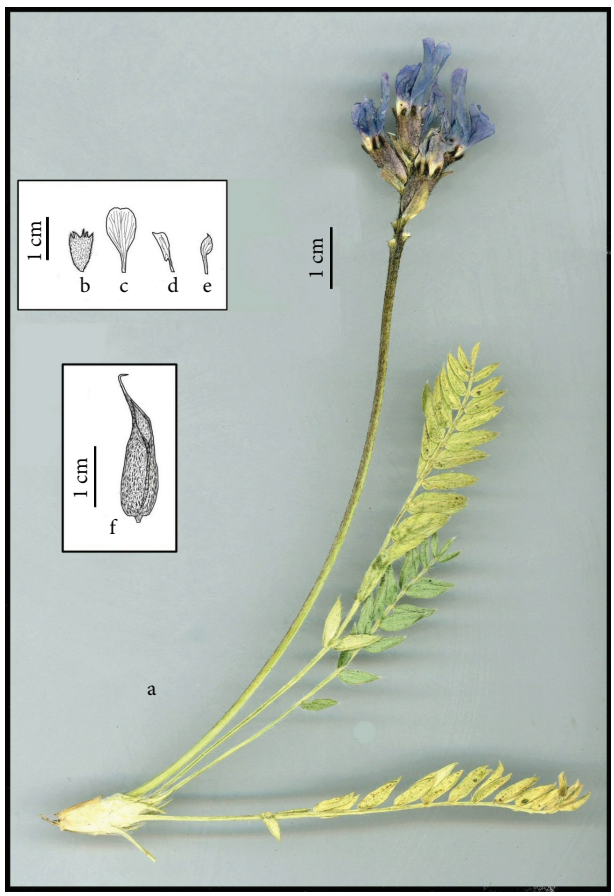


Figure 12. *Oxytropis lazica*. a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2155).

Type: (Turkey B3 Eskişehir) Sazilar, in collibus calcareis, 15.04.1901, *Warburg* & *Endlicher* 86 (B, photo!), Eskişehir: inter Kaheh et Caraja, 26.04.1901, *Warburg & Endlicher* 1143 (B, photo!).

= *Oxytropis fominii* Grossh., Fl. Kavk., ed. 1, 2:340 (1930); emend. et ampl. Woron. in Acta Inst. Bot. Akad. Sci. URSS ser 1(1): 216 (1933). **syn. nova.**

Type: (Turkey A9 Kars) Araxis in detriticis faucium Küldere, 19.06.1913, *Woronow* 472, (LE!)

= *Oxytropis alboviolacea* Hub.-Mor., Feddes Rep. 48: 285.1940.

Herbs, 9–20 cm tall, acaulescent, erect, covered with appressed sparse hairs. Stipules 15–20 mm long, membranous, whitish, triangular–lanceolate, adnate to petiole, simple sparse white hairs above and on margin. Leaves 9–14 cm long; petioles equal or longer than rachis, covered with sparsely appressed simple hairs. Leaflets 6–12-paired, elliptic–lanceolate, 7–20 × 2–5 mm long, covered appressed spreading hairs. Raceme lax, 7–30-flowered; peduncles 9–20 cm long, longer than leaves, erect, covered with simple spreading hairs. Bracts linear–subulate, 4–5 × 1–1.5 mm long, covered with sparsely spreading hairs. Calyx 7–8 mm long, tubular–campanulate, covered with densely sparsely white spreading hairs; teeth 4–5 mm long, shorter than tubes, linear–lanceolate. Corolla pink. Standard 15–16 × 8–9 mm long, ovate, apex emarginate, cuneate to base. Wings 14–15 mm long, limb oblong, clearly constricted above the auricle, emarginate at apex, auricle 1.5–2 mm long, claw 5–6 mm long. Keel 12–13 mm long, beak 1–1.5 mm long, straight or curved. Stamens 11–12 mm long, filaments hairy. Ovary 10–11 mm long, densely covered with white hairs, stipitate. Legume 20–25 × 4 mm long, oblong, septum developed, covered with appressed white hairs; stipe 5–6 mm long; beak 2–2.5 mm long, straight. Seeds reniform, 2.5–3.5 (4) × 2–2.5 mm long, light brown, hilum sub-terminal.

Flowering time and habitat: 5–6, limestone slopes, 1000 m.

Specimens examined: Turkey: **A3** Ankara: Nallıhan, Boraman village, *Pinus sylvestris* forest, 770–850 m, 27.07.1993, *Z.Aytaç* 6289, *M.Ekici* & *A.Dönmez* (GAZI); **A4** Çankırı: Çankırı, 800 m, *P.H.Davis* 21512 (E, photo); ibid., *Bornmüller* 14055 (E, photo); Kırıkkale: from Kırıkkale to Şarklı village, 6 km, rocky slopes, 800 m, 26.05.1990,

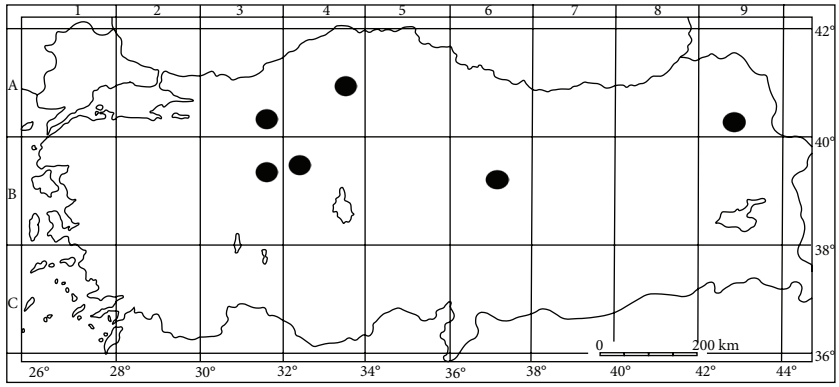


Figure 13. Distribution of (●) *Oxytropis argyroleuca* in Turkey.



Figure 14. *Oxytropis argyroleuca.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 1893 & *Z.Aytaç*).

A.Dönmez 2103 (HUB); **A8** Erzurum: İspir road, 61 km, steppe, 1950 m, 22.07.2001, *Z.Aytaç* 8308 (GAZI); Erzurum: between Oltu and Tortum 24 km, steppe, 1950 m, 22.07.2001, *Z.Aytaç* 8304 (GAZI); ibid., Oltu, *A.Duran* 4793 (GAZI); **A9** Kars: Araxis in detriticis faucium Küldere, 19.06.1913, *Woronow* 472 (LE); **B3** Eskişehir: between Mihaliççık and Alpu, Kayı village, *Quercus* forest, 1050–1100 m, 23.07.1993, *Z.Aytaç* 6289, *A.Dönmez* & *M.Ekici* (GAZI); ibid., Doğanoğlu village, marly slopes, 870 m, 01.07.1995, *M.Vural* 7388 & *N.Adıgüzel* (GAZI); ibid., 09.06.2005, *S.Karaman* 1836 & *M.Vural* (GAZI); **B4** Ankara: Polatlı–Sazılar, gypseous slopes, 748 m, 30.05.2007, *S.Karaman* 1893 & *Z.Aytaç* (GAZI); ibid., 21.07.2008, *S.Karaman* 2104; Polatlı–Sivrihisar 18 km, Acıkır, limestone slopes, 840–860 m, 04.06.1991, *Z.Aytaç* 3832 (GAZI); ibid., *S.Karaman* 1939 & *M.Vural* (GAZI); 06.06.1990, *Z.Aytaç* 3074 & *H.Duman* (GAZI); Ankara: between Nallıhan and Çulhalan village, 6 km, steppe, 930 m, 09.06.2005, *S.Karaman* 1838 & *Z.Aytaç* (GAZI); ibid., 30.06.2006, *S.Karaman* 2010 & *Z.Aytaç* (GAZI).

Distribution and conservation status: Endemic. Irano-Turanian element.

In the *Flora of Turkey*, *Oxytropis argyroleuca* is presented as different from *O. fominii* with 2.5–3 cm leaves (not 6–12), leaflets 5–6 × 3 mm (not 13–18 × 2–3 mm), and calyx 7 mm (not 11–12 mm). *O. argyroleuca* is illustrated as 2.5–3 cm long in the *Flora of Turkey* (Chamberlain & Matthews, 1970) since the specimen type is not an ideal specimen. Our field studies at the locality type (Ankara, Sazılar) of *O. argyroleuca*, especially with respect to leaf, leaflet, and peduncle size, enable an extensive description. This description entirely overlaps with that of *O. fominii*. The latter is therefore treated as a synonym of the former, in other words treated as the same species.

The specimen collected and numbered as *Bornmüller* 14055 by Bornmüller was defined as *O. fominii* by Hedge, who wrote about the genus *Oxytropis* in the *Flora of Turkey* (Chamberlain & Matthews, 1970). *O. fominii* is positioned in *Flora of U.S.S.R.*; however, this record belongs to Kars, Kağızman. Consequently, it could be argued that *O. argyroleuca* is endemic. *O. argyroleuca* spreads from western to eastern cities such as Ankara, Eskişehir, Çankırı, Sivas, Erzurum, Gümüşhane, and Kars.

9. *Oxytropis aucheri* Boiss., Diagn. Pl. Orient. ser. 1, 2: 41 (1843).

(Subgen. *Oxytropis* DC., Sect. *Eumorpha* Bunge), Figure 15.

Type: (Persia) Azerbaijan, Ardebil, *Aucher* 4424 (holotype: G photo! isotype: K)

Herbs, 3–10 cm tall, acaulescent, ascending, covered with simple pilose hairs. Stipules 6–8 mm long, membranous, triangular–lanceolate, adnate to petioles, sparsely white hairs above glabrous below hairs' base. Leaves 3–9 cm long; petioles shorter than rachis, covered with simple pilose hairs. Leaflets 5–11-paired, ovate–lanceolate or oblong–lanceolate, 7–10 × 2.5–3 mm long, covered with pilose hairs. Peduncles 3–7 cm long, longer than leaves, 6–8-flowered, ascending, with appressed black and white hairs. Inflorescence lax. Bracts linear, 3–5 × 1 mm long, covered with pilose hairs. Calyx 7–10 mm long, campanulate, covered with dense white and sparse black hairs; teeth 0.8–1.8 mm long, teeth equal to or shorter than tubes, lancetolate. Corolla purple. Standard 13–14 × 7–8 mm long, oblong–elliptic, apex emarginate, cuneate to base. Wings 12–13 mm long, limb oblong, clearly constricted above auricle, obtuse at apex, auricle 1–1.5 mm long, claw 4–5 mm long. Keel 11–12 mm long, beak 2 mm long, straight. Stamens 10–11 mm long, filaments hairy towards base. Ovary 10–11 mm long, densely covered with white pilose hairs, stipitate. Legume 20–30 × 4–6 mm long, oblong, septum developed, covered with appressed hairs, shortly stipitate, 0.5–1 mm long; beak 2–3 mm long. Seeds reniform, 2.5–3 × 2–2.5 mm long, light brown and spotted, hilum sub-terminal.

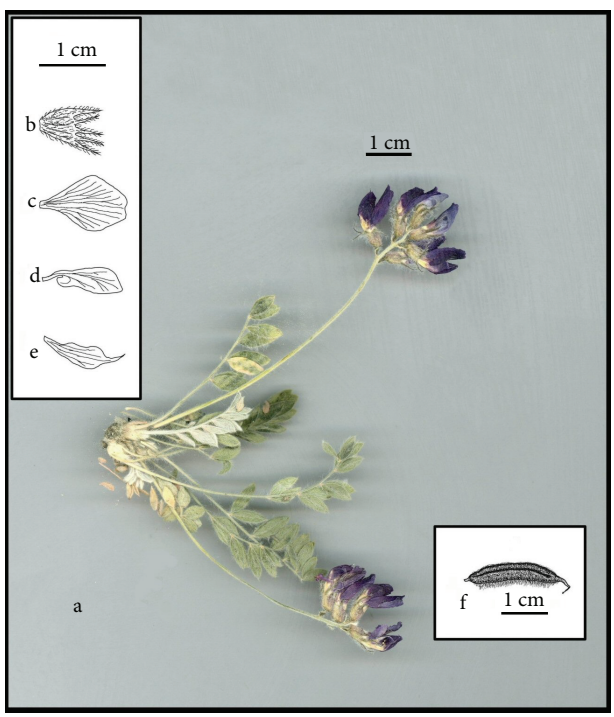


Figure 15. *Oxytropis aucheri.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2090 & *Z.Aytaç*).

Flowering time and habitat: 5–6, clayey slopes, 1800–1900 m.

Specimens examined: Turkey: **B9** Van: Özalp, steppe, 2800 m, 26.06.2006, *F.Özgökçe* 554 (VANF); ibid., North of Damlacık village, Ziyarettepe, steppe, 2300 m, 26.06.2006, *F.Özgökçe* 556 (VANF); **B10** Ağrı: Doğubeyazıt, gypseous slopes, 08.07.2007, *S.Karaman* 2140 (GAZI); Ağrı: Above Doğubeyazıt, İshak Pahsa palace, 1850 m, *P.H.Davis* 43897, (E, Photo); ibid., 1800–1900 m, 10.06.2007, *S.Karaman* 2090 & *Z.Aytaç* (GAZI).

Distribution and conservation status: Turkey, Afghanistan, Iran. Irano-Turanian element. VU (A1acB2b,i,iii).

While *Oxytropis lupinoides*, *O. karjagini*, and *O. aucheri* were treated as separate species in the *Flora of Turkey* (Chamberlain & Matthews, 1970), similarities between them could not be overlooked. In point of illustration, our examination of herbarium samples and material collected in the field has shown that *O. aucheri* is different from *O. lupinoides* with a pendant legume (not erect). It also bears a morphological similarity to *O. karjaginii*. *O. aucheri* differs from *O. karjaginii* with stipule 6–8 mm long (not 15–20 mm), capitate raceme (not lax) and leaves 3–9 cm long (not 6–18 mm).

10. *Oxytropis karjaginii* Grossh., Trudy Azerb. Otd. Zakavk. Fil. Akad. Nauk SSR, Bot. 1:54 (1933)

(Subgen. *Phacoxytropis* Bunge, Sect. *Janthina* Bunge), Figure 16.

Type: (Azerbaijan) Ordubad, 15.05.1933, *Grossheim* s.n. (LE!).

Herbs, 7–26 cm tall, acaulescent, ascending, covered with appressed white hairs. Stipules 10–12 mm long, membranous, triangular–lanceolate, adnate to petiole, connate at base, simple white hairs below and on margins. Leaves 6–18 cm long; petioles shorter than rachis, covered with sparsely simple hairs. Leaflets 5–10-paired, ovate–oblong or lanceolate, 7–20 × 3–5 mm long, covered with appressed white hairs. Raceme lax, 7–20-flowered; peduncles 7–26 cm long, longer than leaves, erect, with simple white hairs. Bracts linear–lanceolate, 9–11 × 1.5–2 mm long, covered with sparse hairs. Calyx 10–12 mm long, tubular–campanulate, covered with appressed dense white and sparse black hairs; teeth 5–7 mm long, longer than tubes, linear–lanceolate to subulate. Corolla purple. Standard 12–14 mm long, oblong–elliptic, apex emarginate, cuneate base. Wings 10–12 mm long, limb narrowly oblong, clearly constricted above auricle, obtuse at apex, auricle 1–1.5 mm long, claw 3–3.5 mm long. Keel 10–11 mm long, beak 2 mm long, straight. Stamens 11–12 mm long, filaments hairy towards. Ovary 10–11 mm long, densely covered with white hairs, stipitate. Fruits 20–30 × 5–6 mm long, oblong, septum developed, covered with pilose hairs, shortly stipitate, 0.5 mm long; beak 2

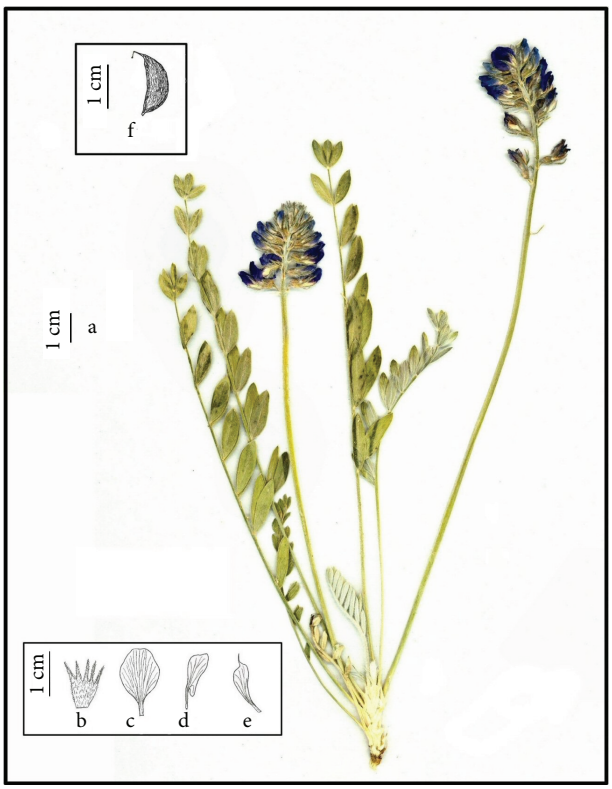


Figure 16. *Oxytropis karjaginii.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2066 & *Z.Aytaç*).

mm long. Seeds reniform, 2–3.5 × 1.5–2.5 mm long, light brown and spotted, hilum sub-terminal.

Flowering time and habitat: 6–7, moving slopes, 1600–1700 m.

Specimens examined: Turkey: **B8** Erzurum: Hınıs, near Aras river, calcareous slopes, 1677 m, 06.06.2007, *S.Karaman* 2066 & *Z.Aytaç* (GAZI); ibid., 08.07.2007, *S.Karaman* 2141 (GAZI); Erzurum: from Hinis to Erzurum 66 km, in Aras gorge, 1650 m, *P.H.Davis* 46438 (E, photo); Van: between Hoşap and Gürpınar, near Zernek dam, moving slopes, *S.Karaman* 2184, *Z.Aytaç* & *M.Armağan* (GAZI); **B10** Ağrı: Doğu Beyazıt, 1813–1905 m, gypseous slopes, 10.06.2007, *S.Karaman* 2090 & *Z.Aytaç* (GAZI).

Distribution and conservation status: Turkey, Caucasia, Azerbaijan. Irano-Turanian element. VU (A1acB2b,i,iii).

Oxytropis karjagini differs from *O. lupinoides*, as it has a pendant legume (not erect).

11. *Oxytropis lupinoides* Grossh, Fl. Kavk. 5: 44 (1955). (Subgen. *Phacoxytropis* Bunge, Sect. *Protoxytropis* Bunge), Figure 17 and 18.

Type: [Nachiczevan SSR] distr. Noraschen near Achura, 11.05.1947, *Grossheim* et al. s.n. (LE!)

Herbs, 10–40 cm tall, acaulescent, ascending, covered with sparse simple hairs. Stipules 10–15 mm long, herbaceous, lanceolate–ovate, connate to petiole at base, simple white hairs above, glabrous below. Leaves 6–20 cm long; petiole shorter than rachis, covered with simple hairs. Leaflets 9–13-paired, lanceolate, 9–19 × 3–5 mm long, covered with pilose hairs. Raceme lax, 7–20-flowered; peduncles 10–40 cm long, longer than leaves, erect, with appressed long white and black hairs. Bracts linear, 4–5 × 1 mm long, covered with appressed white and sparse black hairs. Calyx 10–13 mm long, tubular, covered with black and dense white hairs; teeth 6–7 mm long, longer than tubes, linear–lanceolate. Corolla purple–pink. Standard 13–14 × 6–9 mm long, ovate, emarginate at apex, cuneate to base. Wings 11–13 mm long, limb narrowly oblong, clearly constricted above auricle, obtuse at apex, auricle 1–2 mm long, claw 4–5 mm long. Keel 10–11 mm long, beak 1 mm long, straight. Stamens 9–10 mm long, the upper 1–1.5 mm free, filaments hairy to base. Ovary 9–10 mm long, densely covered with white hairs, stipitate. Legume 20–25 × 3–4 mm long, oblong, septum developed, covered with villous appressed hairs, shortly stipitate, 1–2 mm long; beak 2–2.5 mm long. Seeds reniform, 2.5–3.5 × 1.5–2 mm long, light brown and spotted, hilum sub-terminal.

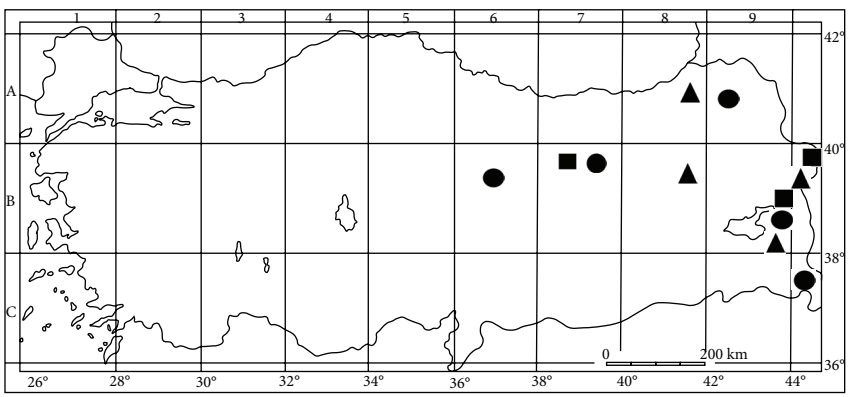


Figure 17. Distribution of (■) *Oxytropis aucheri*, (▲) *O. karjaginii*, and (●) O. *lupinoides* in Turkey.



Figure 18. *Oxytropis lupinoides.* a- habit, b- calyx, c- standard, d- wing, e- keel and beak, f- fruit (*S.Karaman* 2055 & *Z.Aytaç*).

Flowering time and habitat: 5–6, steppe, gypseous slopes, 1100–2250 m.

Specimens examined: Turkey: **B6** Sivas: 40 km from Kangal to Sincan, gypseous slopes, 1400 m, 19. 07.1996. *Z.Aytaç* 7464 et al. (GAZI); **B7** Erzincan: Ekşisu, gypseous slopes, 1115 m, 06.06. 2007, *S.Karaman* 2064, *Z.Aytaç* & *Kandemir*; ibid., 08.08.2007, *S.Karaman 2143*; Erzincan: Kemah–İliç, 2 km, gypseous slopes, 1115 m, 03.06.2005, *Kandemir* 6895 (GAZI); ibid., 06.06.2007, *S.Karaman* 2062 & *Z. Aytaç*; ibid., 03.07.2006, *S.Karaman* 1885 & *Kandemir* (GAZI); ibid., 06.06.2007, *S.Karaman* 2055 & *Z.Aytaç* (GAZI); Sivas: Kelkit 16 km, 1138 m, 03.07.2006, *S.Karaman* 1886 (GAZI); **B9** Van: between Gürpınar and Van, Kurubaş pass, 2000–2200 m, *M.Koyuncu* 1173 b, *N.Demirkuş* 5303 b (VANF); ibid., 1850 m, 12.06.1993, *Y.Altan* 4875 (VANF); **C10** Hakkari: Yüksekova Esendere, steppe, 1750–1850 m, 31.05.1978, *A.Güner* & *B.Yıldız* 1981 (GAZI); 10 km from Bacirge to Yüksekova, 1900 m, *P.H.Davis* 45189, (E, photo); ibid., 2550 m, 29.06.1967, *Watson* 2942 et al., (E, photo).

Distribution and conservation status: Turkey, Azerbaijan. Irano-Turanian element.

In the *Flora of Turkey* (Chamberlain & Matthews, 1970) in a footnote, it is observed that the Erzincan specimen differs from the rest; namely it has a shorter calyx and a smaller beak on the keel. During the field work in the same region and some other locations and after collecting adequate specimens, it was reasoned that these samples are similar in terms of calyx and beak size.

4. Discussion

We have come to the following conclusions from our morphological studies on a wide range of herbarium material from a number of herbaria and from material collected in the wild. The taxonomic results and conclusions about each species are given at the end of the taxa. The genus *Oxytropis* is represented by 13 species in the *Flora of Turkey* (Chamberlain & Matthews, 1970; Özhatay et al., 2000). In this study, the number of taxa was determined as 11 species, 1 taxon of which is endemic. *O. engizekensis* is reduced to a synonym of *O. persica* and *O. fominii* reduced to a synonym of *O. argyroleuca*. Some phytogeographical areas are suggested for *O. pallasii*, *O. pilosa*, *O. albana*, and *O. lazica*. *O. pilosa* are cosmopolitan and the rest of the species can be classified as limited to the Euro-Siberian region. The threat categories of *O. pallasii* and *O. pilosa* were changed from DD to CR. *O. savellanica* and *O. lazica* are determined as VU, while *O. persica*, *O. albana*, and *O. lupinoides* are LC. The keys for species identification have been modified to suit a large scale. This study has indicated that the legume features have a taxonomic significance for the genus *Oxytropis* and that the beak structure varies among the species studied.

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