

S. Brullo, G. Giusso del Galdo & C. M. Musarella

Taxonomic revision of *Astragalus angustifolius* group (*Fabaceae*)

Abstract

Brullo, S., Giusso del Galdo, G. & Musarella, C. M.: Taxonomic revision of *Astragalus angustifolius* group (*Fabaceae*). — *Boccone* 24: 19-52. 2012. — ISSN 1120-4060.

Taxonomical, nomenclatural and chorological aspects of *Astragalus angustifolius* Lam., a critical and still not deeply investigated species, are examined. It is a typical orophyte, with a thorny cushion-like habit, distributed in the eastern Mediterranean territories. Based on literature, *A. angustifolius* represents a species complex, including many taxa at specific, subspecific or variety level. From field, herbarium and literature investigations, it was possible to clarify the taxonomical position of the taxa hitherto referred to *A. angustifolius* s.l., as well as of those ones showing close relationships with this species. The identified taxa are the followings: *A. angustifolius* Lam. with the subsp. *angustifolius* (Anatolia), subsp. *echinoides* (L'Hér.) stat. nov. (Crete), subsp. *erinaceus* (C. Presl) stat. nov. (C & S Greece, Cephalonia), subsp. *balkanicus* subsp. nov. (N Greece, Bulgaria, Macedonia, Serbia, and Albania), subsp. *postianus* subsp. nov. (Lebanon and Syria), subsp. *aegeicus* subsp. nov. (Lesvos, Samos and Chios), and subsp. *odonianus* subsp. nov. (Thassos), *A. pungens* Willd. (Anatolia), *A. valdeviolaceus* sp. nov. (S Anatolia), *A. hubermorathii* sp. nov. (S Anatolia), *A. hermoneus* Boiss. (Lebanon and Syria), *A. sirinicus* Ten. (Italy), *A. tymphresteus* Boiss. & Spruner (N Greece, Macedonia, Albania and Serbia), *A. taygeteus* Perss. & Strid (S Peloponnese), *A. heideri* Wettst. (S Anatolia), *A. genargenteus* Moris (Sardinia), *A. gennarii* Bacch. & Brullo (Sardinia), *A. greuteri* Bacch. & Brullo (Corsica), *A. croaticus* Alegro & al. (Croatia). For each species the updated nomenclature, synonyms, type, iconography and distribution range are given. A phylogenetic tree based on morphological data is provided too.

Introduction

The *Astragalus* species, characterized by a thorny cushion-like habit and occurring in the Mediterranean area, represent an interesting and rather critical group, which certainly deserve in-depth taxonomical investigations. The first outcomes concerning some of these critical species brought to the description of new taxa belonging to *A. creticus* Lam. group, such as *A. dolinicolus* and *A. creticus* subsp. *minoicus* from Crete (Brullo & Giusso 2001, 2003), to *A. genargenteus* Moris group, as *A. gennarii* and *A. greuteri* from Sardinia and Corsica (Bacchetta & Brullo 2006), to *A. sirinicus* Ten. group, as *A. croaticus* from Croatia (Alegro & al. 2009) and to *A. tragacantha* L. group, such as *A. tegulensis* from Sardinia (Bacchetta & Brullo 2010).

Further on-going researches are focused on other thorny species belonging to different sections, such as *A. Sect. Racophorus* Bunge, *A. Sect. Pterophorus* Bunge, and *A. Sect.*

Adiaspastus Bunge. Several controversial taxa fall within these sections, such as *A. rumelicus* Bunge, *A. parnassi* Boiss., *A. thracicus* Griseb., *A. cylleneus* Fisch., *A. cephalonicus* C. Presl, *A. sempervirens* L., etc.

Another rather tricky species is *A. angustifolius* Lam. included by Chamberlain & Matthews (1970) into *A. Sect. Melanocercis* Bunge, while recently Podlech (2008) refers it to the Sect. *Tragacantha* DC. In particular, the latter section is characterized by leaves imparipinnate (terminal leaflet early deciduous) with spiny rachis, white and black bifurcate hairs, stipules joined below, raceme, bracteolate flowers and legume bi-locular exceeding the calyx.

According to literature, *A. angustifolius* represents within the genus *Astragalus* a critical and hitherto not deeply investigated species. This plant is a typical orophyte with a thorny cushion-like habit, growing at an altitude of 1000-2500 m a.s.l., and chiefly occurring in the eastern Mediterranean territories (Balkans, Aegean Islands, Anatolia, Armenia, Syria and Lebanon). On the basis of field and herbarium investigations, as well as on literature, *A. angustifolius* may be considered a species complex which includes many taxa, morphologically and chorologically more or less differentiated, usually considered sister species and treated as subspecies or varieties, as *A. retusus* Willd., *A. erinaceus* C. Presl., *A. pungens* Willd., *A. echinoides* L'Her., *A. olympicus* Pall., *A. heideri* Wettst., *A. angustifolius* subsp. *longidens* Hub.-Mor. & V.A. Matthews, *A. angustifolius* subsp. *pungens* (Willd.) Hayek, *A. angustifolius* var. *violaceus* Boiss., *A. angustifolius* var. *peduncularis* Boiss., *A. angustifolius* var. *glabrescens* Boiss., etc.

Aim of the present study is to clarify the taxonomy, nomenclature, typification and distribution of the taxa referred to *A. angustifolius*, taking advantage both from the observation of herbarium specimens and living material collected in the whole distribution range of this interesting group. Several allied species, showing close relationships with *A. angustifolius*, are also examined. They are *A. sirinicus* Ten., *A. tymphresteus* Boiss. & Spruner, *A. taygeteus* Perss. & Strid, *A. hermonicus* Boiss., *A. genargentus* Moris, *A. gennarii* Bacch. & Brullo, *A. greuteri* Bacch. & Brullo, and *A. croaticus* Alegro & al.

Results

Several authors have previously dealt with the *A. angustifolium* group, describing new taxa or proposing new combinations and synonyms. This brought to a great confusion in the taxonomic treatment of this group. In fact, the different arrangements proposed are in most cases very disagreeing, likely because they are not based on in-depth morphological analyses. The proposals of the main authors concerning the systematic of the group at issue are listed in the following scheme:

MONNET DE LA MARCK (1783) – *A. angustifolius* Lam. (Armenia).

L'HERITIER (1785) – *A. echinoides* L'Her. (Crete).

WILLDENOW (1799) – *A. creticus* Willd. non Lam. (Crete), =*A. echinoides* L'Her.; *A. retusus* Willd. (“in Oriente”); *A. angustifolius* Lam. (Armenia).

WILLDENOW (1802) – *A. angustifolius* Lam. (Armenia); *A. pungens* Willd. (Turkey); *A. echinoides* Willd. (Crete), =*A. echinoides* L'Her., *A. creticus* Willd. non Lam.; *A. retusus* Willd. (“in Oriente”).

- CANDOLLE (1825) – *A. bracteolatus* DC. (Turkey), =*A. pungens* Willd.; *A. angustifolius* Lam. (Armenia); *A. retusus* Willd. (“in Oriente”); *A. echinoides* L’Her. (Crete), =*A. echioides* Willd.; *A. creticus* Willd. (Crete); *A. olympicus* Pallas (Armenia), =*A. leucophyllus* Willd.
- PRESL (1845, 1846) – *A. erinaceus* C. Presl (Cephalonia).
- BUNGE (1868) – *A. angustifolius* Lam. (Crete, Greece, Cephalonia, Turkey, Syria, etc.), =*A. olympicus* Pall.; *A. retusus* Willd., *A. echinoides* L’Herit., *A. leucophyllus* Willd., *A. venosus* Ehrenb. n.n.; *A. pungens* Willd. (Turkey), =*A. bracteatus* DC.; *A. sirinicus* Ten. (Italy, Corsica, and Sardinia), =*A. genargenteus* Moris; *A. hermoneus* Boiss. (Lebanon); *A. tymphresteus* Boiss. & Sprun. (Greece).
- BOISSIER (1872) – *A. angustifolius* Lam. a) var. *genuinus* (Greece, Turkey, Syria, Lebanon, Armenia), =*A. olympicus* Pall., *A. retusus* Willd., *A. echinoides* L’Her., *A. leucophyllus* Willd., *A. erinaceus* Presl.; b) var. *violaceus* Boiss. (Greece, Turkey); c) var. *glabrescens* Boiss. (Turkey), =*A. olympicus* Pall., *A. retusus* Willd., *A. echinoides* L’Her., *A. leucophyllus* Willd., *A. erinaceus* Presl.; d) var. *peduncularis* Boiss. (Turkey), =*A. pungens* Willd., *A. bracteolatus* DC.; *A. tymphresteus* Boiss. & Sprun. (Greece); *A. hermoneus* Boiss. (Lebanon).
- WETTSTEIN (1889) – *A. sirinicus* Ten. (Corsica, Sardinia, Sicily, Italy, Dalmatia); *A. angustifolius* Lam. (Greece and Islands, Armenia); *A. pungens* Willd. (W Greece, Near East); *A. tymphresteus* Boiss. (Greece); *A. hermoneus* Boiss. (Near East); *A. gymnolobus* Fisch. (Near East); *A. heideri* Wettst. (Near East); *A. serbicus* Wettst. (Serbia, Bulgaria).
- HALÁCSY (1901) – *A. angustifolius* Lam., =*A. aristatus* Sieber?, *A. erinaceus* Presl non Fisch., *A. tragacantha* Hung.; *A. tymphresteus* Boiss. & Sprun.
- HAYEK (1926) – *A. angustifolius* Lam., a) subsp. *euangustifolius*, =*A. erinaceus* C. Presl non Fisch.; b) subsp. *tymphresteus* (Boiss. & Sprun.) Hayek, =*A. tymphresteus* Boiss. & Sprun., *A. serbicus* Wettst.; c) subsp. *pungens* (Willd.) Hayek, =*A. pungens* Willd., *A. bracteolatus* DC., *A. angustifolius* var. *b* Griseb., *A. angustifolius* var. *peduncularis* Boiss.
- RECHINGER (1943) – *A. angustifolius* Lam. a) subsp. *euangustifolius*; b) subsp. *tymphresteus* (Boiss. & Sprun.) Hayek, =*A. tymphresteus* Boiss. & Sprun.; c) subsp. *pungens* (Willd.) Hayek, =*A. pungens* Willd., *A. angustifolius* var. *bracteatus* Griseb.
- CHATER (1968) – *A. angustifolius* Lam. a) subsp. *angustifolius* (Albania, Bulgaria, Greece, Crete, Yugoslavia); b) subsp. *pungens* (Willd.) Hayek (N Greece).
- CHAMBERLAIN & MATTHEWS (1970) – *A. angustifolius* Lam., a) subsp. *angustifolius* var. *angustifolius*, =*A. echinoides* L’Her., *A. retusus* Willd., *A. erinaceus* C. Presl, *A. angustifolius* var. *genuinus* Boiss., *A. angustifolius* subsp. *euangustifolius* Hayek.; b) subsp. *angustifolius* var. *violaceus* Boiss., =*A. hermoneus* Boiss.; c) subsp. *longidens* Hub.-Mor. & Matthews; d) subsp. *pungens* (Willd.) Hayek, =*A. bracteolatus* DC., *A. pungens* Willd., *A. angustifolius* var. *peduncularis* Boiss., *A. heideri* Wettst.
- MOUTERDE (1986) – *A. angustifolius* Lam. (Greece, Crete, Turkey, Lebanon, Syria); *A. hermoneus* Boiss. (Lebanon, Syria).
- STRID (1986) – *A. angustifolius* Lam., =*A. olympicus* Pall., *A. pungens* Willd., *A. echioides* Willd., *A. leucophyllus* Willd., *A. bracteolatus* DC., *A. erinaceus* C. Presl non Fisch.; *A. taygeteus* Persson & Strid; *A. sirinicus* Ten., =*A. tymphresteus* Boiss. & Sprun.

GREUTER & al. (1989) – *A. angustifolius* Lam. a) subsp. *angustifolius* (Yugoslavia, Albania, Bulgaria, Greece, Crete, Aegean, Turkey, Lebanon, Syria), =*A. hermoneus* Boiss., *A. angustifolius* subsp. *violaceus* (Boiss.) Ponert; b) subsp. *longidens* Hub.-Mor. & Matthews (Turkey); c) subsp. *pungens* (Willd.) Hayek (Bulgaria, Greece, Turkey); *A. genargenteus* Moris (Sardinia, Corsica), =*A. sirinicus* subsp. *genargenteus* (Moris) Arcang., *A. sirinicus* auct.; *A. sirinicus* Ten. (Italy, Albania, Yugoslavia, Greece), =*A. tymphresteus* Boiss. & Sprun., *A. angustifolius* Lam. subsp. *tymphresteus* (Boiss. & Sprun.) Hayek; *A. taygeteus* Persson & Strid.

PODLECH (2008) – *A. angustifolius* Lam. subsp. *angustifolius* (Croatia, Bosnia, Serbia, Macedonia, Albania, Bulgaria, Crete, Greece, Turkey, Near East), =*A. taygeteus* Persson & Strid; *A. sirinicus* Ten. (Italy, Greece, Serbia, Macedonia), =*A. tymphresteus* Boiss. & Spruner; *A. genargenteus* Moris (Sardinia), =*A. sirinicus* subsp. *genargenteus* (Moris) Arcang.; *A. gennarii* Bacch. & Brullo (Sardinia); *A. greuteri* Bacch. & Brullo (Corsica).

As it is possible to infer, the opinions on the taxonomy of this group are rather conflicting! Therefore, an in-depth morphological analysis of each validly described taxon, based on herbarium specimens and living material chiefly coming from the type localities, was necessary. Such investigations, together with the typification of the taxa closely related to *A. angustifolius*, allowed to verify their proper systematic position.

The lectotypification of the old taxa is mainly based on the papers published by D. Podlech (1998, 2008).

Our morphological surveys allowed to recognize several diacritical features, which appear rather unchangeable in the investigated populations (Table 1). Thanks to these characters, it was possible to distinguish several taxa which are morphologically well differentiated.

Based on the morphological affinities observed, together with the available nomenclatural data, it is here proposed a new systematic arrangement of this group:

A. angustifolius Lam.

Syn.: *A. retusus* Willd.; *A. leucophyllus* Willd.

subsp. *angustifolius* (Anatolia)

subsp. *echinoides* (L'Hér.) stat. nov. (Crete)

Syn.: *A. echinoides* L'Hér.; *A. echioides* Willd.; *A. creticus* Willd. non Lam.

subsp. *erinaceus* (C. Presl) stat. nov. (C & S Greece, Cephalonia)

Syn.: *A. erinaceus* C. Presl; *A. tymphrestus* var. *peloponnesiacus* Bornm.

subsp. *balcanicus* subsp. nov. (N Greece, Bulgaria, Macedonia, Serbia, Albania)

Syn.: *A. olympicus* Pall.?, *A. serbicus* Wettst.?, nom. nud.

subsp. *postianus* subsp. nov. (Lebanon, Syria)

subsp. *aegeicus* subsp. nov. (Lesvos, Samos and Chios)

subsp. *odonianus* subsp. nov. (Thassos)

A. pungens Willd. (Anatolia)

Syn.: *A. angustifolius* subsp. *pungens* (Willd.) Hayek; *A. angustifolius* var. *peduncularis* Boiss.; *A. bracteolatus* DC.

A. valdeviolaceus sp. nov. (S Anatolia)

Syn.: *A. angustifolius* var. *violaceus* Boiss., non *A. violaceus* Basil.; *A. angustifolius* subsp. *violaceus* (Boiss.) Ponert; *A. angustifolius* var. *glabrescens* Boiss.

A. hubermorathii sp. nov. (S Anatolia)

Syn.: *A. angustifolius* subsp. *longidens* Hub.-Mor. & V.A. Matthews, non *A. longidens* Freyn

A. hermoneus Boiss. (Lebanon, Syria)

A. sirinicus Ten. (Italy)

A. tymphresteus Boiss. & Spruner (N Greece, Macedonia, Albania, Serbia)

Syn.: *A. angustifolius* subsp. *tymphresteus* (Boiss. & Spruner) Hayek

A. taygeteus Perss. & Strid (Peloponnese)

A. heideri Wettst. (S Anatolia)

A. genargenteus Moris (Sardinia)

Syn.: *A. sirinicus* subsp. *genargenteus* (Moris) Arch.

A. gennarii Bacch. & Brullo (Sardinia)

A. greuteri Bacch. & Brullo (Corsica)

A. croaticus Alegro & al. (Croatia)

Syn.: *Astragalus angustifolius* subsp. *biokovensis* Kušan, nom. inval.

Furthermore, in order to clarify the relationships among the taxa here recognized, a phylogenetic analysis was performed by using morphological characters (PAUP* ver. 4.0b.10). All characters used for the phylogenetic analysis were unordered and equally weighted. Some potential characters that deal with near-continuous variations were excluded.

The character states were determined by examination of living material, herbarium specimens, and literature data (see Electronic supplementary file ESF1). Character state based on literature data was verified by examination of living and herbarium material to the greatest possible extent. Organization, definition and scoring of character states within characters took advantage of natural breakpoints in character state distribution. The data matrix used for the analysis is shown in the Electronic supplementary file ESF2.

The results of the cladistic analysis partly support the outcomes of the morphological investigations. In fact, the heuristic search generated one most parsimonious cladogram (Fig. 1). A radial tree is also provided, in order to highlight the phylogenetic relationships among the surveyed taxa (Fig. 2).

As both these tree shows, there is a clear separation between the *A. angustifolius* group (clade A) and *A. sirinicus* group (clade B). Actually, within each clade different subgroups can be recognized. In particular, the first subclade of the clade A groups the taxa more closely allied to *A. angustifolius* s.str. (*A. aegeicus*, *A. echinoides*, *A. erinaceus* and *A. odonianus*). In fact, they show the same dense and compact pulvinate habit, inflorescence not or slightly exserted from the leaves, as well as an allopatric distribution. Therefore, we deem that these taxa can be treated at subspecific level. As concerns the other subclade, it includes *A. balcanicus*, *A. hubermorathii*, *A. pungens* and *A. postianus*. The taxa falling in this second subclade could be distinguished at specific level, since they appear morphologically much more differentiated from *A. angustifolius* s. str., compared to the taxa of the first subclade. Nevertheless, we prefer to consider *A. postianus* and *A. balcanicus* as subspecies of *A. angustifolius*, since they, besides sharing the same pulvinate-compact habit and some morphological features mainly regarding the inflorescence, they are geographically well isolated. It is important to note that both these taxa, together with the above mentioned subspecies, were previously referred to *A. angustifolius* s.str. On the other hand, the

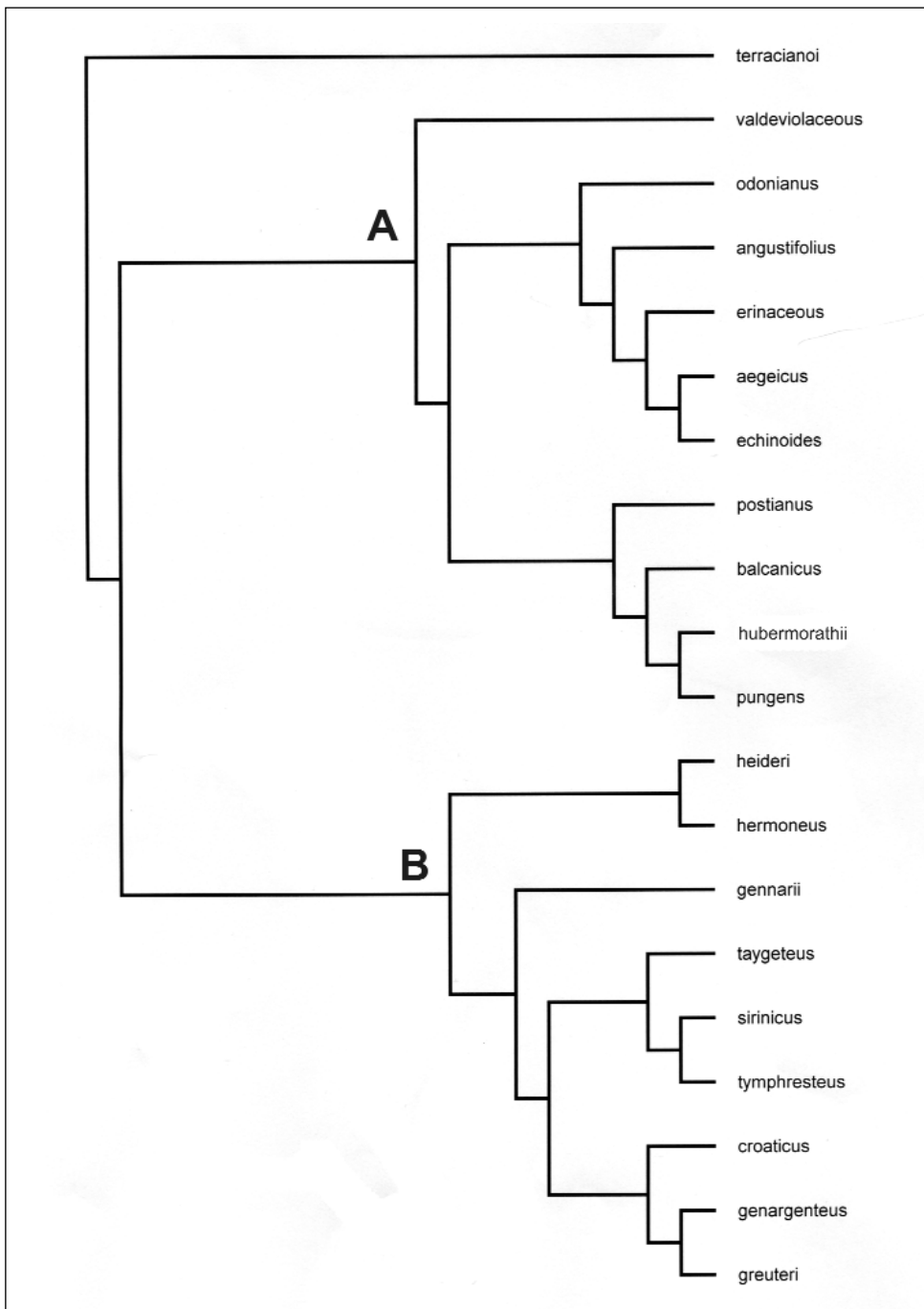


Fig. 1. Single most parsimonious cladogram resulting from the heuristic analysis of the taxa belonging to the *Astragalus angustifolius* group (*A. terracianoii* used as outgroup).

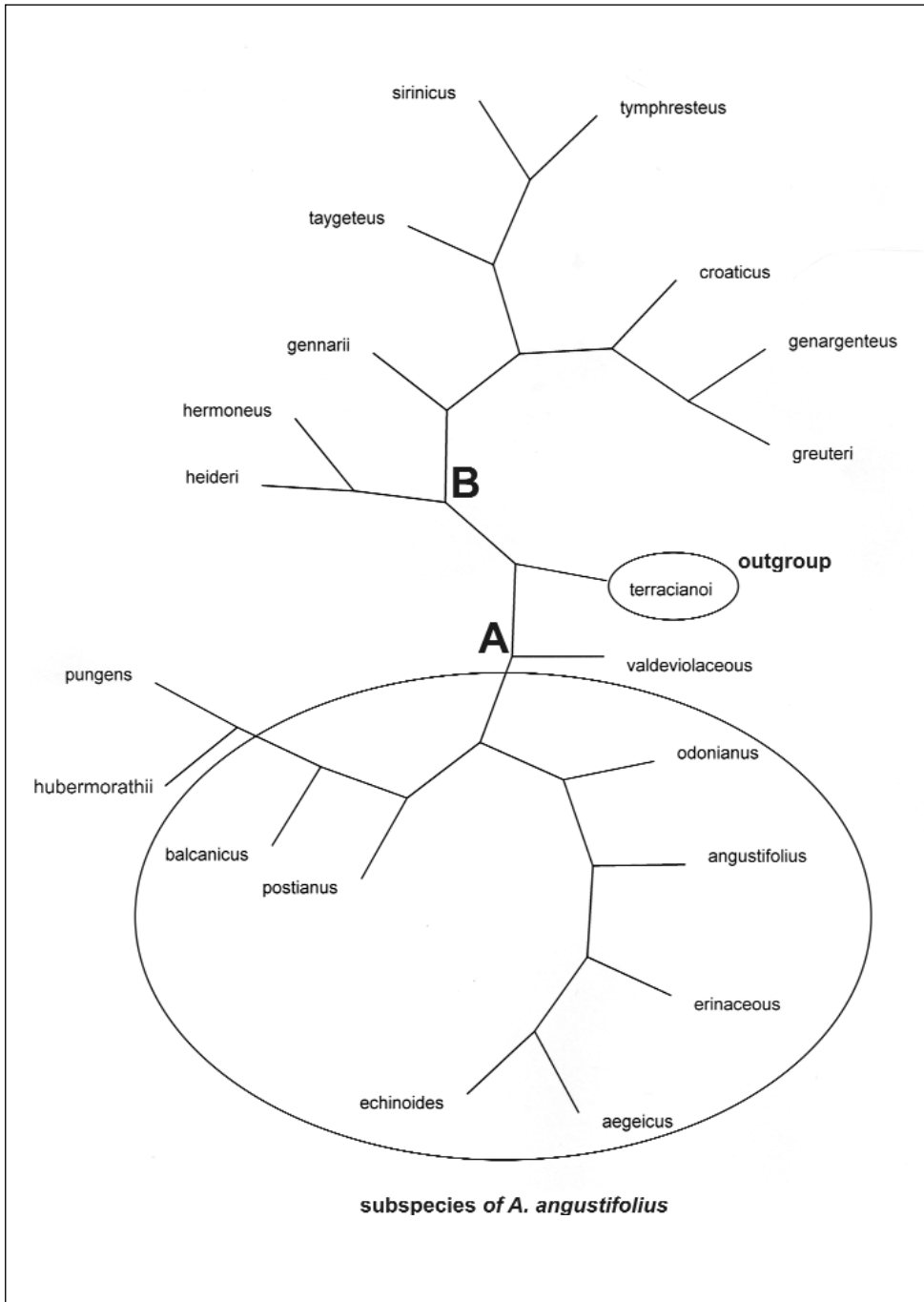


Fig. 2. Single most parsimonious radial tree resulting from the heuristic analysis of the taxa belonging to the *Astragalus angustifolius* group (*A. terracianoii* used as outgroup).

other two taxa, *A. hubermorathii* (= *A. angustifolius* subsp. *longidens*) and *A. pungens*, previously were treated by most authors as subspecies of *A. angustifolius*, even if they are characterized by a very different habit (forming quite loose pulvines) and a inflorescence longer than leaves, and a distribution sympatric with *A. angustifolius* subsp. *angustifolius*. Therefore they can be more correctly considered as distinct species. An isolated position within this clade is occupied by *A. valdeviolaceus* (= *A. angustifolius* var. *violaceus*) which, due to some morphological features (especially concerning the flower colour and its loose habit), seems to be more related to *A. sirinicus* group.

As concerns the clade B, it is possible to recognize two subclades: the first one includes *A. heideri* and *A. hermonensis*, both occurring in the Near East and morphologically more differentiated when compared with the other taxa of this group, while the second subclade groups *A. sirinicus* s.str., *A. tymphresteus*, *A. taygeteus*, *A. genargenteus*, *A. greuteri* and *A. croaticus*. An higher degree of isolation can be observed in *A. gennarii* which, indeed, shows some intermediate features between the *A. sirinicus* group and the *A. angustifolius* one. In particular, *A. gennarii*, due to its compact habit, is rather close with *A. angustifolius* s.str., while the legume indumentum (subglabrous) is more similar to that of *A. sirinicus* group.

Some of the more relevant morphological differences useful for distinguishing the taxa of this group are illustrated in Table 1a and 1b.

In order to easily identify the examined taxa, detailed information are provided for each of them. They regard the valid name, literature reference, type, synonyms (together with their own types), full description, iconography, chorology, distribution range, as well as a selection of examined specimens (B, BP, C, CAG, CAT, FI, G, ISTE, K, M, P, PAL, PR, PRC, TO, W, WU, ZA).

Taxonomic treatment

1 - *Astragalus angustifolius* Lam., *Encycl. Méth. Bot.* 1: 321, 1783

A) subsp. *angustifolius* (Figs. 3E, 4M, 5A, 6A, 7A)

Lectotype: “*Tragacantha orientalis humillima, foliis argentei angustissimis*”, Armenia, *J.P. de Tournefort* (P-LAM!; isotypes: M!, P-JUSS no. 15289!), designated by Podlech (1998). Synonyms: *Astragalus retusus* Willd., *Mém. Acad. Roy. Sci. Hist.* (Berlin) 1794-1795: 24, Tav.2 Fig.3, 1799; Lectotype: “*Tragacantha orientalis erectior, foliis viciae glabris et ramis tomentosis*”, in Oriente, cor.29, *J.P. de Tournefort* (B-W 14092!), designated by Podlech (2008). – *Astragalus leucophyllus* Willd., *Sp. Pl.*, ed.4, 3(2): 1331, 1802; Typonym: homotypic with *A. angustifolius* Lam.

Dwarf shrub forming a compact thorny cushion, 10-60 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2-4.5 cm long, with ivory rachis, 0.5-0.7 mm in diameter, when juvenile covered by scattered hairs and protracted into a straight spine, subequal or shorter than the terminal leaflets. Leaflets oblong, green, rounded, 6-8-paired, 2-6 × 1-2.1 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules ovate-

lanceolate, 4.5-6 × 1.8-2 mm, joined to the rachis about half-way, acuminate at apex, coriaceous, straw coloured, 1-nerved, totally hairy-ciliate. Raceme 3-6-flowered, with peduncle up to 2 cm long. Bract linear-lanceolate, hyaline, apiculate, 3.5-5 mm long, hairy. Bracteoles narrowly lanceolate, hairy, 2.5-3 mm long, inserted at the calyx base. Calyx cylindrical-campanulate, two-lipped, 9-10 mm long, 3-3.5 mm in diameter, densely covered by medifixed hyaline and black hairs; the hyaline ones 0.3-1 mm long, the black ones 0.2-0.8 mm long; lower teeth subulate, unequal (laterals 3-3.5 mm long, and central 3.2-4 mm long), the upper ones linear-triangular, 3-3.5 mm long. Corolla white, rarely tinged with pale-violet; standard oblanceolate-spathulate, retuse at apex, 16-18 × 7.5-8 mm; wings 16-17 mm long; keel 14-15 mm long. Stamen filaments 13-14 mm long; anther yellow, subcircular, 0.8-0.9 mm long. Pistil 10-11 mm long; ovary densely hairy, with subpatent hairs, 0.5-0.8 mm long; style glabrous; stigma hemispherical, papillose. Legume conic-ovoid, 9-10 × 3-3.2 mm, densely hairy, with white hairs 0.5-0.1 mm long, and black ones mainly above. 0.2-0.5 mm long, beak 0.5-0.7 mm long. Seeds kidney-shaped, dark brown, 2-2.2 × 1.2-1.5 mm, smooth, laterally compressed.

Chorology: Anatolia and Armenia (Fig. 8A).

B) subsp. *echinoides* (L'Hér.) Brullo, Giusso & Musarella stat. nov. (Figs. 3F, 4N, 5B, 6B, 7B)

Basionym: *Astragalus echinoides* L'Her., Stirp. Nov. 6: 170, 1785; Lectotype: "Tragacantha cretica, foliis minimis incanis, florum majore albo", Creta, J.P. de Tournefort (B-W 14091!; isotypes: P-JUSS 15286!), designated by Podlech (2008)

Synonyms: *Astragalus angustifolius* auct. fl. cret. non Lam., 1785 – *Astragalus echioides* Willd., Sp. Pl., ed.4, 3(2): 1326, 1802 (orthographic variant of "*echinoides*"); Typonym: homotypic with *A. echinoides* L'Hér. – *Astragalus creticus* Willd., Mém. Acad. Roy. Sci. Hist. (Berlin) 1794-1795: 23, Tav.2 Fig.2, 1799, non Lam., Encycl. Méth. Bot.1: 321, 1783; Typonym: homotypic with *A. echinoides* L'Hér.

Dwarf shrub forming a compact, thorny cushion, 10-50 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 1.5-3.2 cm long, with ivory rachis, protracted into a straight spine, subequal or shorter than the terminal leaflets. Leaflets oblanceolate, glaucous, acute, 7-8-paired, 1.8-6 × 1-1.5 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules ovate to ovate-lanceolate, 3-4(5) × 1.5-2 mm, joined to the rachis about 1/3 of its length, acuminate at apex, coriaceous, straw coloured, 1-nerved, ciliate at margin and hairy in the central part. Raceme 1-3-flowered, with peduncle 3-6 mm long. Bract narrowly lanceolate, hyaline, apiculate, 2.5-4.5 mm long, hairy. Bracteoles narrowly lanceolate, hairy, 1.5-2 mm long, inserted at the calyx base. Calyx cylindrical, two-lipped, 7.5-9 mm long, 3-3.5 mm in diameter, densely covered by medifixed hyaline and black hairs; the hyaline ones 0.2-0.5 mm long, the black ones 0.2-0.8 mm long; lower teeth subulate, subequal, 1.5-1.6 mm long, the upper ones triangular, 1.2-1.4 mm long. Corolla white, rarely tinged with pale-violet; standard obovate-spathulate, slightly retuse at apex, 15-17(18) × 6.5-9 mm; wings 10-15 mm long; keel 9-12 mm long. Stamen filaments 13-14 mm long; anther yellow, oblong, 1.2-1.3 mm long. Pistil 13-14 mm long; ovary densely hairy, with

hairs 0.1-0.4 mm long; style glabrous; stigma subglobose, verrucose. Legume ovoid, 10-12 × 3-3.5 mm, densely hairy, with white hairs 0.4-0.9 mm long, and black ones 0.1-0.4 mm long, beak 2.5-3 mm long. Seeds irregularly kidney-shaped, brown, 1.7-2.5 × 1.7-2 mm, with several black dots, smooth, laterally compressed.

Chorology: Crete (Fig. 8F).

C) subsp. *erinaceus* (C.Presl) Brullo, Giusso & Musarella stat. nov. (Figs. 3O, 4P, 5I, 6D, 7D)

Basionym: *Astragalus erinaceus* C. Presl., Abh. Königl. Böhm. Ges. Wiss., ser. 5, 3: 487, 1845; Bot. Bemerk.: 486, 1846 - Lectotype: “*Astragalus echinoides* L’Hér.” in monte Nero Cephaloniae, 4500’, 13.10.1834, *G.W. Schimper Wiest* (PR!; isotypes: HAL, HBG, HOH, M!, MSB!, P!, TUB, W!) designated by Podlech (2008).

Synonym: *Astragalus tymphrestus* Boiss. & Spruner, var. *peloponnesiacus* Bornm., Feddes Repert. 25: 36, 1928; Lectotype: Alpine region des Chelmos, *Bornmuller 532* (K!), designated by Podlech (2008).

Dwarf shrub forming a compact thorny cushion, 10-50 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2-3.5 cm long, with ivory rachis, 0.6-1 mm in diameter, when juvenile covered by scattered hairs and protracted into a straight spine, shorter than the terminal leaflets. Leaflets oblong, green, rounded, 6-9-paired, 2.5-7 × 1-1.8 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules ovate-lanceolate, 3-7 × 1.2-2.2 mm, joined to the rachis about 1/3-1/2 of its length, acuminate at apex, coriaceous, straw coloured, 1-nerved, ciliate at margin and hairy below. Raceme 2-6 flowered, with peduncle 0.5-2 cm long. Bract narrowly lanceolate, hyaline, apiculate, 3.5-5 mm long, hairy. Bracteoles subulate to linear-lanceolate, hairy, 2-3.5 mm long, inserted in the upper part of the peduncle. Calyx cylindrical-campanulate, two-lipped, 9-10.5 mm long, 3.5-4.5 mm in diameter, densely covered by medifixed hyaline and black hairs; the hyaline ones 0.3-0.8 mm long, the black ones 0.1-0.5 mm long; lower teeth subulate, subequal 2.4-3 mm long, the upper ones linear-triangular, 2.8-3.5 mm long. Corolla white, rarely tinged with pale-violet; standard oblanceolate-spathulate retuse at apex, 17-20 × 6.5-8.5 mm; wings 16-17 mm long; keel 14-15 mm long. Stamen filaments 12-14 mm long; anther yellow, oblong, 0.8-0.9 mm long. Pistil 12-14 mm long; ovary densely hairy, with hairs 0.5-1 mm long; style glabrous; stigma hemispherical, verrucose. Legume conic-ovoid, 9-10 × 2-3 mm, densely hairy, with white hairs 0.3-0.6 mm long, and black ones 0.1-0.3 mm long, beak 0.5-1.5 mm long. Seeds kidney-shaped, brown, 2.4-2.7 × 1.5-1.7 mm, smooth, laterally compressed.

Chorology: C & S Greece (Sterea Hellas, Peloponnisos) and Cephalonia (Fig. 8E).

D) subsp. *balkanicus* Brullo, Giusso & Musarella subsp. nov. (Figs. 3G, 4O, 5C, 6C, 7C)

Holotype: Makedonien, Voros Gebinge Kali Pediode, hochebene nordlich Aridea alpine matten an der Randern des Hochrmanes 1800 m., 11.VII.1984, *Erben* (M).

Synonym: *Astragalus olympicus* Pall.?, Sp. Astrag. :4, 1800; Lectotype: *Astragalus olympicus* tab.4, fig.3 (Pallas, 1800) - *Astragalus serbicus* Wettst. ?, Sitzungsber. Acad. Wien 98: 390. 1890, nom. nud., non Pančić ex Boiss., Fl. Orient. 2: 268, 1872.

A typo foliis rotundatis apice, 0.6-1.3 mm latis, stipulis lanceolatis vel lineari-lanceolatis, 5.5-10 × 1.2-1.7 mm, vexillo 5-5.5 mm lato, alis 13-14 mm longis, carina 12.5-13 mm longa, anthera oblonga, pistillo 11-12.5 mm longo, ovario pilis adpressis tecto, pilis 0.3-0.5 mm longis, stigmati plano, legumine ellipsoide, 10-13 mm longo, rostro 1-1.5 mm longo, differt.

Dwarf shrub forming a compact thorny cushion, 10-50 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2-5 cm long, with ivory rachis, when juvenile covered by scattered hairs and protracted into a straight spine, shorter than the terminal leaflets. Leaflets oblong to linear-oblong, green-glaucous, acute, 6-8-paired, 3.5-7.2 × 0.6-1.3 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules lanceolate to linear-lanceolate, 5.5-10 × 1.2-1.7 mm, joined to the rachis about 1/3 – 1/2 of its length, acuminate at apex, coriaceous, straw coloured, 1-nerved, hairy. Raceme 3-8-flowered, with peduncle 1-3 cm long. Bract narrowly lanceolate, hyaline, apiculate, 3-5 mm long, hairy. Bracteoles subulate-lanceolate, hairy, 1.8-3 mm long, inserted at the calyx base. Calyx cylindrical, two-lipped, 9-10 mm long, 3-3.5 mm in diameter, densely covered by medifixed hyaline and black hairs, 0.2-0.6 mm long; lower teeth subulate, subequal, 3.2-4 mm long, the upper ones triangular-subulate, 3-3.5 mm long. Corolla white, sometimes tinged with pale-violet; standard oblanceolate-spathulate, retuse at apex, 17-18 × 5-5.5 mm; wings 13-14 mm long; keel 12.5-13 mm long. Stamen filaments 13-13.5 mm long; anther yellow, oblong, 0.8-0.9 mm long. Pistil 11-12.5 mm long; ovary densely hairy, with appressed hairs, 0.3-0.5 mm long; style glabrous; stigma flattened, papillose. Legume ellipsoid, 10-13 × 2.5-3.8 mm, densely hairy, with white hairs 0.4-0.8 mm long, and black ones 0.1-0.4 mm long, beak 1-1.5 mm long. Seeds reniform, dark brown, 2-2.2 × 1.3-1.5 mm, smooth, laterally compressed.

Chorology: N Greece, Bulgaria, Macedonia, Serbia and Albania (Fig. 8B).

E) subsp. *postianus* Brullo, Giusso & Musarella subsp. nov. (Figs. 3P, 4R, 5F, 6E, 7E)

Holotype: Lebanon, Dabr el Qadib (sopra Bcharre), 2.VI.2010, *Brullo, Giusso del Galdo & N. Abdel Samad* (CAT; isotype:PAL!).

A typo rachide foliae 0.6-1 mm lata, foliolis glaucis, obtusis apice, 0.8-1.2 mm latis, stipulis 2-3 mm latis, pedunculo inflorescentiae 5-8 mm longo, bracteis 2.5-3.5 mm longis, dentibus superioribus calicis 2.5-3 mm longis, vexillo 5-5.5 mm lato, alis 15-16 mm longis, anthera oblonga, pistillo 11-12 mm longo, stigmati plano, legumine ellipsoide, 10-12 mm longo, rostro 1.5-2.5 mm longo, seminibus 2.2-2.7 × 2-2.4 mm, differt.

Dwarf shrub forming a compact thorny cushion, 10-30 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2-4.5 cm long, with ivory rachis, 0.6-1 mm in diameter at base, when juvenile covered by scattered hairs and protracted into a straight spine, shorter than the terminal leaflets. Leaflets oblong, glaucous, obtuse, 6-9-paired, 1.5-4 × 0.8-1.2 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules ovate-lanceolate, 3-5 × 2-3 mm, joined to the rachis about 1/3 – 1/2 of its length, acuminate at apex, coriaceous, straw coloured, 1-nerved, hairy. Raceme 3-6-flowered, with peduncle 5-8 mm long. Bract narrowly lanceolate, hyaline, apiculate, 2.5-3.5 mm long, hairy. Bracteoles subulate-lanceolate, hairy, 2-2.5 mm long, inserted at the calyx base. Calyx cylindrical, two-lipped, 8.5-10.5 mm long, 3-3.2 mm in diameter, densely covered by medifixed hyaline and black hairs, the hyaline ones 0.5-1.2 mm long and the black ones 0.1-0.7 mm long; lower teeth subulate, subequal, 2.5-3.5 mm long, the upper ones triangular-subulate, 2.5-3 mm long. Corolla white, sometimes tinged with pale-violet; standard oblanceolate-spathulate, retuse at apex, 17-19 × 5-5.5 mm; wings 15-16 mm long; keel 13-15 mm long. Stamen filaments 15 mm long; anther yellow, oblong, 0.7-0.8 mm long. Pistil 11-12 mm long; ovary densely hairy, with subpatent hairs, 0.3-0.6 mm long; style glabrous; stigma flattened, papillose. Legume ellipsoid, 10-12 × 3-3.5 mm, densely hairy with white hairs 0.2-0.5 mm long, and black ones 0.1-0.3 mm long, beak 1.5-2.5 mm long. Seeds reniform, brown, 2.2-2.7 × 2-2.4 mm, smooth, laterally compressed.

Chorology: Lebanon, Syria and Israel (Fig. 8G).

F) subsp. *aegeicus* Brullo, Giusso & Musarella subsp. nov. (Figs. 3L, 4S, 5G, 6F, 7F)

Holotype: Grecia, Isola di Lesbos, Mt. Olymbos, ca. 950m, 28.VI.2003, *Brullo & Giusso del Galdo* (CAT; isotype: PAL!).

A typo rachide foliae 1.3-1.5 mm lata, stipulis partim pilosis, bracteolis in pedunculo insertis, calice 7-9 mm longo, pilis 0.05-0.3 mm longis, dentibus inferioribus calicis 1.2-1.7 mm longis, superioribus 1.5-1.8 mm longis, vexillo 15-16.5 × 6-6.5 mm, alis 15-15.5 mm longis, carina 12-14 mm longa, anthera oblonga, pistillo 11-12.5 mm longo, stigmati plano, legumine ellipsoide, 10-12 mm longo, rostro 1.5-2.5 mm longo, seminibus 2.2-2.7 × 2-2.4 mm, differt.

Dwarf shrub forming a compact thorny cushion, 10-30 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2-3 cm long, with ivory rachis, 1.3-1.5 mm in diameter at base, when juvenile covered by scattered hairs and protracted into a straight spine, shorter than the terminal leaflets. Leaflets oblong, green-glaucous, rounded to subobtuse, 6-9-paired, 2.5-5 × 1.2-2.2 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.3-0.5 mm long. Stipules ovate-lanceolate, 4-6 × 1.5-2.5 mm, joined to the rachis about 1/3-1/2 of its length, acuminate at apex, coriaceous, straw coloured, 1-nerved, hairy in the central part and ciliate at margin. Raceme 3-6-flowered, with peduncle 5-15 mm long. Bract narrowly lanceolate, hyaline, apiculate, 2.5-4 mm long, hairy. Bracteoles subulate-lanceolate, hairy, 2-2.5 mm long, inserted in the upper part of the peduncle. Calyx cylindrical, two-lipped, 7-9 mm long, 3.2-3.5

mm in diameter, densely covered by medifixed hyaline and black hairs, 0.05–0.3 mm long; lower teeth subulate, unequal, 1.2–1.7 mm long, the upper ones triangular-subulate, 1.5–1.8 mm long. Corolla white, sometimes tinged with pale-violet; standard oblanceolate-spathulate, slightly retuse at apex, 15–16.5 × 6–6.5 mm; wings 15–15.5 mm long; keel 12–14 mm long. Stamen filaments 11–12.5 mm long; anther yellow, oblong, 0.8–0.9 mm long. Pistil 11–12.5 mm long; ovary densely hairy, with appressed hairs, 0.2–0.5 mm long; style glabrous; stigma hemispherical, verrucose. Legume ellipsoid, 9–10 × 2.5–3 mm, densely hairy, with white hairs 0.2–0.5 mm long, and black ones 0.1–0.3 mm long, beak 0.5–1 mm long. Seeds subreniform, brown, 2.5–3 × 1.7–1.8 mm, smooth, laterally compressed.

Chorology: Lesvos, Samos and Chios (Fig. 8D).

G) subsp. *odonianus* Brullo, Giusso & Musarella subsp. nov. (Figs. 3U, 4T, 5H, 6G, 7G)
 Holotype: Grecia, Thassos, affioramenti calcarei sotto Mt. Ipsaria, ca. 950m, 26.VI.2003, *Brullo & Giusso del Galdo* (CAT; isotype: PAL!).

A typo rachide foliae 1 mm lata, foliolis 8–9 paribus, stipulis partim pilosis, bracteolis 2.8–3.5 mm longis, dentibus inferioribus calicis 2.5–3 mm longis, vexillo 14–16 × 6.5–6.8 mm, alis 12–12.5 mm longis, carina 10–11 mm longa, filamentis staminorum 9.5–10 mm longis, anthera oblonga, pistillo 8.5–10 mm longo, ovario pilis adpressis tecto, 0.2–0.5 mm longis, stigmatate plano, legumine ellipsoide, rostro 1.2–1.5 mm longo, seminibus olivaceis, differt.

Dwarf shrub forming a compact thorny cushion, 10–30 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2–3 cm long, with ivory rachis, 1 mm in diameter at base, when juvenile covered by scattered hairs and protracted into a straight spine, subequalling the terminal leaflets. Leaflets oblong, green-glaucous, rounded, 8–9-paired, 2.5–7.5 × 1.2–2.3 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2–0.3 mm long. Stipules lanceolate to ovate-lanceolate, 4.5–5.5 × 1.8–2.2 mm, joined to the rachis about 1/4–1/3 of its length, acuminate at apex, coriaceous, straw coloured, 1-nerved, hairy in the central part and ciliate at margin. Raceme 3–6-flowered, with peduncle 0.5–1.5 cm long. Bract narrowly lanceolate, hyaline, apiculate, 4–6 mm long, hairy. Bracteoles subulate-lanceolate, hairy, 2.8–3.5 mm long, inserted at the calyx base. Calyx cylindrical, two-lipped, 8.5–10 mm long, 2.8–3 mm in diameter, densely covered by medifixed hyaline and black hairs, 0.4–1 mm long; lower teeth subulate, unequal, (lateral ones 2.8–3 mm long, and central one 2.5–2.8 mm long), the upper ones subulate, 3.2–3.5 mm long. Corolla white, sometimes tinged with pale-violet; standard oblanceolate-spathulate, retuse at apex, 14–16 × 6.5–6.8 mm; wings 12–12.5 mm long; keel 10–11 mm long. Stamen filaments 9.5–10 mm long; anther yellow, oblong, 0.8–0.9 mm long. Pistil 8.5–10 mm long; ovary densely hairy, with appressed hairs, 0.2–0.5 mm long; style glabrous; stigma flattened, papillose. Legume ellipsoid, 9–10 × 3–3.2 mm, densely hairy, with white hairs 0.5–1 mm long, and black ones 0.1–0.3 mm long, beak 1.2–1.5 mm long. Seeds reniform, olivaceous, 1.9–2.2 × 1.5–1.7 mm, smooth, laterally compressed.

Chorology: Thassos (Fig. 8C).

2 - *Astragalus hubermorathii* Brullo, Giusso & Musarella sp. nov. (Figs. 3A, 4Q, 5N, 6M, 7H)

Holotype: Turkey, C4 Icel, d. Gülnar, 900-970 m, 7.6.1950, *A. Huber-Morath 10436* (G!).
 Synonym: *Astragalus angustifolius* subsp. *longidens* Hub.-Mor. & V.A. Matthews in D.F. Chamb. & V.A. Matthews, Notes Roy. Bot. Gard. Edinburgh 29: 308, 1969, non *Astragalus longidens* Freyn, Bull. Herb. Boiss. 3: 131, 1895 - Holotype: Turkey, C4 Icel, d. Gülnar, 900-970 m, 7.6.1950, *A. Huber-Morath 10436* (G!).

Diagnosis: The reference is *Astragalus angustifolius* subsp. *longidens* Hub.-Mor. & V.A. Matthews in Chamb. & Matthews (1969).

Dwarf shrub forming a loose, thorny cushion, 20-60 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 1.5-5 cm long, with ivory rachis, 0.6-1 mm in diameter, when juvenile covered by scattered hairs and protracted into a straight spine, shorter than the terminal leaflets. Leaflets oblong, glaucous-sericeous, acute, 6-9-paired, 4-7 × 1.3-2 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.4 mm long. Stipules ovate-lanceolate, 3.5-6 × 1.2-2 mm, joined to the rachis about half-way, acuminate at apex, coriaceous, straw coloured, 1-nerved, hairy, with hairs 0.2-0.4 mm long. Raceme 3-6 flowered, longer than leaves, with peduncle 1.5-2.5 cm long. Bract narrowly lanceolate, hyaline, apiculate, 6-8 mm long, hairy-ciliate. Bracteoles subulate, hairy, 4-5.5 mm long, inserted at the calyx base. Calyx cylindrical-campanulate, two-lipped, 11.5-14 mm long, 3.3-3.5 mm in diameter, densely covered by medifixed hyaline and black hairs, the hyaline ones 0.8-1.6 mm long, the black ones 0.2-0.6 mm long; teeth subulate, subequal, 4.5-7 mm long. Corolla cream; standard oblanceolate-spathulate, retuse at apex, 15-19 × 5.5-7 mm; wings 12.5-14.5 mm long; keel 11.5-13.5 mm long. Stamen filaments 12.5-13 mm long; anther yellow, oblong, 0.7-0.8 mm long. Pistil 11-12 mm long; ovary densely hairy, with hairs 0.2-0.4 mm long; style glabrous; stigma subglobose, verrucose. Legume ovoid to ellipsoid, 10.5-13 × 2.8-3.5 mm, villous, with white hairs 0.5-1.2 mm long, and black ones 0.1-0.4 mm long, beak 1.5-2 mm long. Seeds reniform, brown-olivaceous, 2.8-3 × 1.8-2 mm, smooth, laterally compressed.

Chorology: S Anatolia (Fig. 9B).

Note: The epithet *longidens* is not available at specific level, since the binomial *Astragalus longidens* Freyn was used for describing a different species (see Podlech, 2008b).

3 - *Astragalus pungens* Willd., Sp. Pl., ed.4, 3(2): 1325, 1802. (Figs. 3Q, 4U, 5M, 6L, 7O)

Lectotype: “Tragacantha humillima se spargens floribus spicatis”, in Galatia, cor.29, *J.P. de Tournefort* (B-W 14089/1!; isotypes: B-W 14089/2!, P-JUSS 15288, P-VAILL), designated by Podlech (1998).

Synonyms: *Astragalus angustifolius* Lam. subsp. *pungens* (Willd.) Hayek, Feddes Repert. Beih. 30(1): 790, 1926 - *Astragalus angustifolius* var. *peduncularis* Boiss., Fl. Or. 2: 490, 1872; Typonym: homotypic with *A. pungens* Willd. - *Astragalus bracteolatus* DC, Astragalogia : 208, 1802; Typonym: homotypic with *A. pungens* Willd.

Dwarf shrub forming a loose, thorny cushion, 20-50 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2-7 cm long, with ivory rachis, 0.5-0.6 mm in diameter, when juvenile covered by scattered hairs and protracted into a straight spine, subequal or shorter than the terminal leaflets. Leaflets oblong, glaucous-sericeous, rounded to subobtusate, 6-8-paired, 3-5 × 0.9-1.5 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules ovate-lanceolate, 5-6 × 1.2-1.5 mm, joined to the rachis about 1/3 - 1/2 of its length, acuminate at apex, coriaceous, straw coloured, 1-nerved, hairy, with hairs 0.2-0.4 mm long. Raceme 6-15 flowered, longer than leaves, with peduncle 2.5-12 cm long. Bract narrowly lanceolate, hyaline, apiculate, 3-4.5 mm long, hairy. Bracteoles subulate, hairy, 2-2.6 mm long, inserted at the calyx base. Calyx cylindrical, two-lipped, 8-9.5 mm long, 3-3.7 mm in diameter, densely covered by medifixed hyaline and black hairs, 0.2-0.6 mm long; lower teeth subulate, subequal, 3-3.5 mm long, the upper ones linear-triangular, 2.5-3 mm long. Corolla cream; standard oblanceolate-spathulate, retuse at apex, 16-18 × 6-7 mm; wings 13-14 mm long; keel 12-13 mm long. Stamen filaments 12 mm long; anther yellow, oblong, 0.7-0.8 mm long. Pistil 11-12 mm long; ovary densely hairy, with hairs 0.4-0.6 mm long; style glabrous; stigma hemispherical, slightly flattened, papillose. Legume ovoid to ellipsoid, 9-13 × 2.8-3 mm, densely hairy, with white hairs 0.4-0.8 mm long, and black ones 0.1-0.3 mm long, beak 1.2-1.5 mm long. Seeds reniform, dark brown, 2-3 × 1.5-1.8 mm, smooth, laterally compressed.

Chorology: Anatolia (Fig. 9A).

4 - *Astragalus valdeviolaceus* Brullo, Giusso & Musarella sp. nov. (Figs. 3I, 4F, 5E, 6P, 7T)

Holotype: "*Astragalus angustifolius* var. *violaceus* Boiss.", supra Elmalu Lyciae, 9.6.1860, *E. Bourgeau* 69 (G-BOISS!).

Synonyms: *Astragalus angustifolius* var. *violaceus* Boiss., Fl. Or. 2: 490, 1872, non *A. violaceus* Basil., Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3: 115, 1922; Lectotype: supra Elmalu Lyciae, 9.6.1860, *E. Bourgeau* 69 (G-BOISS!; isotypes: G-BOISS!, W!), designated by Podlech (1998) - *Astragalus angustifolius* subsp. *violaceus* (Boiss.) Ponert, Feddes Repert. 83: 632, 1973 - *Astragalus angustifolius* var. *glabrescens* Boiss., Fl. Or. 2: 490, 1872; Lectotype: Lyciae in graminosis regionis alpinae, Montis Elmalu, 25.6.1860, *Bourgeau* 63 (G-BOISS!; isotypes: B!, W!), designated by Podlech (1998).

Diagnosis: The reference is *Astragalus angustifolius* var. *violaceus* Boiss. in Boissier (1872).

Dwarf shrub forming a loose spiny cushion, 10-40 cm tall. Stems woody, very branched, tough, with persistent stipules and rachis in the old part of the branches. Leaves imparipinnate, 2-4.5 cm long, with rachis ivory, 0.6-1 mm in diameter, juvenile covered by scattered hairs and protracted into a straight spine, subequal or longer than the upper leaflets. Leaflets oblong, glaucous, obtuse at apex, 7-10-paired, 2-5 × 0.8-1.3 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules linear-lanceolate, 4-5.5 × 1.4-1.6 mm, joined to the rachis about half-way, acuminate at apex,

coriaceous, straw coloured, uninerved, hairy-ciliate, with hairs 0.3-0.6 mm long. Raceme 3-10 flowered, with peduncle 1.2-2.5 cm long. Bract narrowly lanceolate, hyaline, acute, 3-5 mm long, hairy. Bracteoles lanceolate, hairy, 2.3-3 mm long, inserted at the calyx base. Calyx, cylindrical, two lipped, 8.5-10 mm long, 3.5-3.7 mm in diameter, densely covered by medifixed hyaline and black hairs, 0.4-1.6 mm long; teeth subequal, 2.5-3.2 mm long, the lower ones subulate, the upper ones subulate-triangular. Corolla pinkish-purple to pinkish-violet; standard obovate-spathulate, retuse at apex, 17-19 × 6-7 mm; wings 12-13 mm long; keel 11-12 mm long. Stamen filaments 13 mm long; anther yellow, oblong, 0.8 mm long. Pistil 12.5-13 mm long; ovary hairy, with hairs 0.5-1 mm long, style glabrous; stigma papillose, flattened. Legume ellipsoid to fusiform, 6.5-9.5 × 2-2.2 mm, sparsely hairy, with hairs black and white, 0.2-0.5 mm long, with a beak 1-1.5 mm long. Seeds reniform, 1.8-2 × 1-1.3 mm, dark brown, smooth, laterally compressed.

Chorology: CS Anatolia (Fig. 10L).

Note: The epithet *violaceus* is not available to be used at specific level, since the binomial *Astragalus violaceus* Basil. was used for describing a different species (see Podlech, 2008b).

5 - *Astragalus hermoneus* Boiss., Diagn. Pl. Orient., ser. 1, 9: 94, 1849. (Figs. 3B, 4A, 5P, 6N, 7I)

Lectotype: Gebel Scheick, Hermon Antilibani nec non in monte Gebel Baruck Libani inter Rascheya et Deir el Kammar, VII.1846, *E. Boissier* (G-BOISS!; isotypes: GOET, K, P). Syntype: Hermon cacumen, VII.1846, *Boissier* (G-BOISS!, CGE, K, LE, MSB!, P, W!, ZT), designated by Podlech (1998).

Dwarf shrub forming a loose spiny cushion, 5-15 cm tall. Stems woody, very branched, tough, with persistent stipules and rachis in the old part of the branches. Leaves imparipinnate, 2-4 cm long, with rachis ivory, 0.7-1 mm in diameter, juvenile covered by scattered hairs and protracted into a straight spine, shorter than the upper leaflets. Leaflets obovate to linear-obovate, glaucous, slightly pubescent, obtuse at apex, 7-8 paired, 2.5-5 × 1-1.5 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2 mm long. Stipules ovate-lanceolate, 3.5-5 × 1.8-2 mm, joined to the rachis about half-way acuminate at apex, coriaceous, straw coloured, uninerved, densely ciliate at margin with hairs 0.3-0.5 mm long and densely hairy in the central part. Raceme 3-4 flowered, with peduncle 1-2.5 cm long. Bract lanceolate, hyaline, acute, 2.5-3 mm long, densely hairy. Bracteoles subulate-lanceolate, densely hairy, 1.2-1.8 mm long, inserted at the calyx base. Calyx cylindrical, two lipped, 8-8.5 mm long, 2.5-3 mm in diameter, densely covered by medifixed hyaline and black hairs, the hyaline ones 0.4-0.8 mm long, the black ones 0.2-0.4 mm long; teeth subequal, 1.2-1.5 mm long, subulate-triangular. Corolla whitish-pink; standard oblanceolate-spathulate, retuse at apex, 15-18(20) × 4-5 mm; wings 13.5-14.5 mm long; keel 12.5-13.5 mm long. Stamen filaments 13-13.5 mm long; anther yellow, oblong, 0.8-0.9 mm long. Pistil 13-14 mm long; ovary subglabrous, style glabrous; stigma papillose, hemispheric. Legume 13-14 × 3-3.5 mm, glabrous, ellipsoid, with a beak 1.5-2 mm long. Seeds reniform, 2.3-3 × 1.8-2 mm, dark brown, smooth, laterally compressed.

Chorology: Lebanon, Syria and Israel (Fig. 10I).

6 - *Astragalus sirinicus* Ten., Prodr. Fl. Neap. App. 5:25 et Fl. Neap. 5:132, T.171, 1826.
(Figs. 3H, 4I, 5T, 6T, 7U)

Lectotype: “in montes Sirini, prope Lago negro” *M. Tenore* (K; isotypes: BR, REG), designated by Podlech (2008).

Dwarf shrub forming a loose spiny cushion, 10-30 cm tall. Stems woody, very branched, tough, with persistent stipules and rachis in the old part of the branches. Leaves imparipinnate, 3.5-6 cm long, with rachis ivory, 1-1.3 mm in diameter, juvenile covered by scattered hairs and protracted into a straight spine, subequal or shorter than the upper leaflets. Leaflets oblong-lanceolate, green-glaucous, acute at apex, 8-11 paired, 2.5-7 × 1.5-2.7 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.3-0.5 mm long. Stipules linear-lanceolate to linear-triangular, 7-9 × 1.8-2.2 mm, joined to the rachis about 1/4-1/3 of its length, acuminate at apex, coriaceous, straw coloured, uninerved, densely ciliate at margin with hairs 0.7-1.5 mm long and hairy in the central part. Raceme 8-15 flowered, with peduncle 1-3 cm long. Bract lanceolate, hyaline, acute, 4-6 mm long, densely hairy. Bracteoles lanceolate, densely hairy, 0.8-1.3 mm long, inserted at the base of calyx. Calyx cylindrical, two lipped, 7.5-8 mm long, 3.6-4 mm in diameter, densely covered by medifixed hyaline and black hairs; the hyaline ones 0.4-1 mm long, the black ones 0.3-0.9 mm long; teeth subequal, 2-2.5 mm long, linear-triangular, the lower ones linear-triangular, the upper ones triangular. Corolla white to yellowish-white, tinged with violet to white-violet in the keel; standard retuse at apex, 16-18 × 7-7.5 mm; wings 14-15 mm long; keel 12-14 mm long. Stamen filaments 12.5-13 mm long; anther yellow, oblong, 0.8 mm long. Pistil 12.5-13 mm long; ovary hairy, style glabrous; stigma papillose, hemispheric. Legume 13-15 × 4-5 mm, sparsely hairy, with hairs white, 1-2 mm long, ellipsoid to ovoid-ellipsoid with a beak 2.5-3 mm long. Seeds reniform, 3-3.2 × 1.9-2.2 mm, blackish-brown, smooth, laterally compressed.

Chorology: Italy (Fig. 10B).

7 - *Astragalus tymphresteus* Boiss. & Spruner in Boiss., Diagn. Pl. Orient, ser.1, 2: 63, 1843. (Figs. 3M, 4D, 5S, 6R, 7N)

Lectotype: In monte Velugo Aetolia, 1842, *Spruner* (G-BOISS!; isotypes: M!, P), designated by Podlech (2008).

Synonym: *A. angustifolius* Lam. subsp. *tymphresteus* (Boiss. & Spruner) Hayek, Feddes Rept. Beih. 30 (1):789, 1926.

Dwarf shrub forming a loose spiny cushion, 20-50 cm tall. Stems woody, very branched, tough, with persistent stipules and rachis in the old part of the branches. Leaves imparipinnate 1.8-3 cm long, with rachis ivory, 1-1.3 mm in diameter, juvenile covered by appressed long hairs and protracted into a straight spine, shorter than the upper leaflets. Leaflets oblong, green-glaucous, obtuse at apex, 6-10 paired, 2.8-5.5 × 1.3-2.5 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules linear-lanceolate, 4-8 × 1.8-2.2 mm, joined to the rachis about 1/5-1/4 of its length, acute at apex, coriaceous, straw coloured, uninerved, densely ciliate at margin with hairs 0.9-1.1 mm long and hairy at the base. Raceme 6-15 flowered, longer than leaves, with peduncle

1.5-3.5 cm long. Bract ovate-lanceolate to lanceolate, hyaline, acute (rar. rounded), 3-7 mm long, covered by subpatent hairs, 0.4-0.8 mm long. Bracteoles narrowly subulate, 1.2-1.6 mm long, covered by subpatent hairs, inserted at the base of calyx. Calyx cylindrical, two lipped, 7.5-9 mm long, 3.5-4.2 mm in diameter, densely covered by medifixed hyaline and black subpatent hair, 0.8-1.5 mm long; teeth subequal, 2.5-3 mm long, the lower ones subulate-triangular, the upper ones triangular. Corolla yellowish-white, tinged with violet especially in the keel; standard oblanceolate-spathulate, retuse at apex, 17-19 × 8-8.5 mm; wings 13.5-14 mm long; keel 11.5-12 mm long. Stamen filaments 11-12 mm long; anther yellow, subcircular, 0.8-0.9 mm long. Pistil 11-12 mm long; ovary hairy, with hairs 1-1.6 mm long, style glabrous; stigma verrucose, hemispherical. Legume 11-13 × 3.5-3.8 mm, densely lanuginose-hairy, with white hairs 0.8-1.5 mm long and black ones 0.1-0.4 mm long homogeneously distributed, ellipsoid to ovoid-ellipsoid with a beak 2.5-3.2 mm long. Seeds reniform, 2.3-3 × 1.6-2.1 mm, olivaceous, smooth, laterally compressed.

Chorology: N Greece, Macedonia, Albania and Serbia (Fig. 10A).

8 - *Astragalus taygeteus* Perss. & Strid, Willdenowia 12: 207, 1982. (Figs. 3C, 4B, 5R, 6O, 7L)

Holotype: Greece, Nom. Messinias, Ep. Kalamon, Mt. Taygetos, along ridge leading up to the main summit from the south, above places called Vrisi tou Dhespoti, just W of the crest, c. 2300 m, limestone, 1.7.1979, *Strid & Papanicolaou 15315* (C; isotypes: B!, G!).

Dwarf shrub forming a loose, thorny cushion, 10-30 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2-4.5 cm long, with ivory rachis, when juvenile covered by scattered hairs and protracted into a straight spine, longer than the terminal leaflets. Leaflets oblong-elliptical, silvery-sericeous, rounded or slightly apiculate, 4-7-paired, 3.5-8 × 1.2-2.2(3) mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.3-0.4 mm long. Stipules lanceolate, 5-5.5 × 1.5-2 mm, joined to the rachis about 1/4 of its length, acuminate at apex, coriaceous, straw coloured, 1-nerved, totally hairy-ciliate. Raceme 4-12-flowered, with peduncle 2-5 mm long. Bract lanceolate, hyaline, apiculate, 3-6 mm long, covered by appressed hairs, 0.2-0.4 mm long. Bracteoles subulate, hairy, 1.3-2 mm long, inserted at the calyx base. Calyx cylindrical, two-lipped, 7-9 mm long, 2.5-3.2 mm in diameter, densely covered by medifixed hyaline and black subappressed hairs, 0.2-0.8 mm long; lower teeth subulate-triangular, subequal, 2.5-3.4 mm long, the upper ones triangular, 1.8-2.7(3) mm long. Corolla cream, tinged with pinkish-purple; standard spathulate-obovate, retuse at apex, 14-18(19) × 5-7 mm; wings 13-14 mm long; keel 11-13 mm long. Stamen filaments 11.5-12 mm long; anther yellow, subcircular, 0.9-1 mm long. Pistil 10-10.5 mm long; ovary densely hairy, with hairs 0.6-1 mm long; style glabrous; stigma hemispherical, papillose. Legume ovoid-ellipsoid to ellipsoid, (9)10-13 × 3.2-4. mm, densely hairy, with white hairs 0.3-0.6 mm long and black ones 0.1-0.3 mm long homogeneously distributed, beak 2-3 mm long. Seeds reniform, brown-olivaceous, 2-2.5 × 1.6-17 mm, smooth, with dark brown dots, laterally compressed.

Chorology: S Greece at Mt. Taygetos (Fig. 10G).

9 - *Astragalus heideri* Wettst., Sitz.-Ber. Akad. Wiss. Wien, 98: 388, t.2 fig.1-7, 1890. (Figs. 3D, 4C, 5O, 6Q, 7M)

Lectotype: It.ner. Pamphyliam et Pisidiam, Auf Felsen bei Sagalassus, *A. Heider* (WU!), designated by Podlech (2008).

Synonym: *Astragalus heideri* Wettst., Oesterr. Bot. Zeit. 39: 157, 1889, nom. nud.

Dwarf shrub forming a compact, thorny cushion, 20-50 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 4-5 cm long, with ivory rachis, 0.5-0.6 mm in diameter, when juvenile covered by scattered hairs and protracted into a straight spine, shorter than the terminal leaflets. Leaflets elliptical to elliptical-oblong, glaucous-sericeous, rounded to subobtusate, 8-12-paired, 3.5-6 × 1.2-1.5(2) mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.1-0.2 mm long. Stipules ovate-lanceolate, 4.5-6 × 1.6-2 mm, joined to the rachis about half-way, acute at apex, coriaceous, straw coloured, 1-nerved, hairy, with hairs 0.4-0.6 mm long. Raceme 2-5-flowered, with peduncle 0.5-1 cm long. Bract narrowly lanceolate, hyaline, acute, 2.5-4 mm long, hairy-ciliate. Bracteoles subulate-lanceolate, hairy, 1.5-2 mm long, inserted at the calyx base. Calyx cylindrical, two-lipped, 8-8.5 mm long, 2.8-3 mm in diameter, densely covered by medifixed hyaline and black hairs, the hyaline ones 0.3-0.6 mm long, the black ones 0.1-0.3 mm long; lower teeth subulate, subequal, 2-2.3 mm long, the upper ones subulate-triangular, 1.6-1.8 mm long. Corolla cream; standard spatulate, slightly retuse at apex, 14.5-15.5 × 5.5-6 mm; wings 12-13 mm long; keel 11-12 mm long. Stamen filaments 10-11 mm long; anther yellow, oblong, 0.8-0.9 mm long. Pistil 8-9 mm long; ovary with subpatent hairs, with hairs 0.5-0.6 mm long; style glabrous; stigma subglobose, verrucose. Legume ellipsoid, 10-12 × 2.7-3 mm, villous, with white hairs 0.6-1 mm long, and black ones 0.1-0.3 mm long, distributed mainly above, beak 1.5-2 mm long. Seeds reniform, dark brown, 2.2-2.4 × 1.4-1.5 mm, smooth, laterally compressed.

Chorology: S Anatolia, near Isparta (Fig. 10H).

10 - *Astragalus gennarii* Bacch. & Brullo, Willdenowia 36:160, 2006. (Figs. 3R, 4L, 5D, 6U, 7Q)

Holotype: Sardinia, Monte Albo, Punta Turuddò-Lula, 26.5.2004, *Bacchetta* et al. (CAT!, isotypes: B!, CAG!, CAT!, FI!, PAL!).

Dwarf shrub forming a dense compact, spiny cushion, 20-50 cm tall. Stems woody, very branched, tough, with persistent stipules and rachis in the old part of the branches. Leaves imparipinnate 3-5 cm long, with rachis ivory, juvenile covered by scattered hairs and protracted into a straight spine, longer than the upper leaflets. Leaflets oblong, green, rounded to obtuse at apex, 6-11 paired, 2-6 × 1-2.2 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.4 mm long. Stipules triangular to obovate-lanceolate, 5-6 × 2-2.5 mm, joined to the rachis about half-way, acute at apex, coriaceous, straw coloured, uninerved, densely hairy in the outer faces and at margin with hairs 0.4-0.7 mm long. Raceme 2-4 flowered, with peduncle 0.2-1 cm long. Bract lanceolate, hyaline, long-apiculate, 1.5-3 mm long, densely hairy. Bracteoles lanceolate, densely hairy, 0.5-1.5 mm

long, inserted in the peduncle. Calyx cylindrical, two lipped, 6-7 mm long, 3-3.5 mm in diameter, densely covered by medifixed hyaline and black hairs; the hyaline ones 0.3-0.5 mm long, the black ones 0.1-0.5 mm long; teeth triangular, the lower ones 1-1.2 mm long, the upper ones 1.2-1.5 mm long. Corolla white tinged with pinkish-violet in the keel; standard, retuse at apex, 14-18 × 7-8 mm; wings 13-15 mm long; keel 12-15 mm long. Stamen filaments 12-13 mm long; anther yellow, oblong, 1 mm long. Pistil 11-12 mm long; ovary hairy, with appressed hairs, 0.2-0.5 mm long; style glabrous; stigma papillose, sub-hemispherical. Legume ellipsoid to fusiform, 11-13 × 3-3.2 mm, sparsely hairy, with hairs white 0.1-0.7 mm long, beak 1.5-1.8 mm long. Seeds reniform, 2.6-2.9 × 1.6-1.7 mm, brown-olivaceous, dotted, smooth, laterally compressed.

Chorology: Sardinia at Mt. Albo (Fig. 10E).

11 - *Astragalus greuteri* Bacch. & Brullo, Willdenowia 36: 162, 2006. (Figs. 3S, 4E, 5U, 6I, 7R)

Holotype: Corsica, Col di Bavella, Zonza, 27.5.2004, *Bacchetta, Brullo & Casti* (CAT!; isotypes: B!, CAG!, CAT!, FI!, PAL!).

Dwarf shrub forming a loose spiny cushion, 10-30 cm tall. Stems woody, very branched, tough, with persistent stipules and rachis in the old part of the branches. Leaves imparipinnate 3.5-6 cm long, with rachis ivory, juvenile covered by scattered hairs and protracted into a straight spine, longer than the upper leaflets. Leaflets oblong, green, rounded to obtuse at apex, 9-11 paired, 2-6 × 1.5-2.5 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.3 mm long. Stipules linear-lanceolate, 6.5-8.5 × 2-2.2 mm, joined to the rachis about half-way, acuminate at apex, coriaceous, straw coloured, uninnerved, densely hairy at margin with hairs 0.5-1 mm long. Raceme 3-5 flowered, with peduncle 1-3 cm long. Bract lanceolate, hyaline, long-apiculate, 5-6 mm long, densely hairy. Bracteoles linear-lanceolate, densely hairy, 2-3 mm long, inserted in the peduncle. Calyx cylindrical, two lipped, 9-10 mm long, 3.5-4 mm in diameter, densely covered by medifixed hyaline and black hairs; the hyaline ones 0.3-1 mm long, the black ones 0.3-1.2 mm long; teeth linear-triangular, the lower ones (2.5)3-4 mm long, the upper ones 2.5-3.5 mm long. Corolla white to white-violet; standard, retuse at apex, 20-23 × 8-9.5 mm; wings 15-16 mm long; keel 15-16 mm long. Stamen filaments 14-15 mm long; anther yellow, oblong, 1.1-1.2 mm long. Pistil 13-14.5 mm long; ovary hairy, style glabrous; stigma papillose, conic. Legume ellipsoid to fusiform, 11-12 × 3-4 mm, sparsely hairy, with hairs white 1-2 mm long, beak 1.5 mm long. Seeds reniform, 2.5-3 × 1.5-1.6 mm, brown-olivaceous, smooth, laterally compressed.

Chorology: Corsica (Fig. 10C).

12 - *Astragalus genargenteus* Moris, Stirp. Sard. Elench. 1:11, 1827. (Figs. 3N, 4H, 5Q, 6H, 7P)

Lectotype: *Astragalus gennargenteus*, *Moris* (TO!), designated by Corrias (1979).

Synonym: *A. sirinicus* subsp. *genargenteus* (*Moris*) *Arcang.*, *Comp. Fl. Ital.*: 187, 1882.

Dwarf shrub forming sub-loose piny cushion, 10-30 cm tall. Stems woody, very branched,

tough, with persistent stipules and rachis in the old part of the branches. Leaves imparipinnate 3-6 cm long, with rachis ivory, juvenile covered by scattered hairs and protracted into a straight spine, longer than the upper leaflets. Leaflets oblong, green, rounded to obtuse at apex, (5)9-11(12) paired, 2-6 × 1.5-3 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.4 mm long. Stipules linear-triangular, 6-7 × 2-2.5 mm, joined to the rachis about half-way, acute at apex, coriaceous, straw coloured, uninerved, sparsely hairy at margin with hairs 0.2-0.3 mm long. Raceme (2)3-5 flowered, with peduncle 1-2 cm long. Bract lanceolate, hyaline, long-apiculate, 2.5-3.5 mm long, densely hairy. Bracteoles lanceolate, densely hairy, 1.5-2 mm long, inserted in the peduncle. Calyx cylindrical, two lipped, 9-10 mm long, 4-4.5 mm in diameter, densely covered by medifixed hyaline and black hairs; the hyaline ones 0.5-1 mm long, the black ones 0.2-0.5 mm long; teeth linear-triangular, the lower ones 2.5-2.8 mm long, the upper ones 2-2.2 mm long. Corolla white tinged with pinkish-violet in the keel; standard oblanceolate-spathulate, 16-20 × 8-8.5 mm, retuse at apex; wings 15-18 mm long; keel 13-15 mm long. Stamen filaments 12-13 mm long; anther yellow, oblong, 1 mm long. Pistil 12.5-13 mm long; ovary hairy, with subappressed hairs, 0.4-1 mm long; style glabrous; stigma papillose, subglobose. Legume ellipsoid to fusiform, 12-15 × 3-4 mm, subglabrous to sparsely hairy, with hairs white 1-1.2 mm long, beak 2 mm long. Seeds reniform, 2.2-2.5 × 1.2-1.5 mm, brown-olivaceous, smooth, laterally compressed.

Chorology: Sardinia at Mt. Gennargentu (Fig. 10D).

13 - *Astragalus croaticus* Alegro, Bogdanović, Brullo & Giusso, Ann. Bot. Fenn. 46: 570, 2009. (Figs. 3T, 4G, 5L, 6S, 7S)

Holotype: Croatia, Dalmatia, Biokovo, Osičine, mountain rocky places within the clearings of *Pinus nigra* forests, 1320 m a.s.l., 07.VI.2007, *A. Alegro & S. Bogdanović s.n.* (CAT!; isotypes: CAT!, PAL!, ZA!).

Synonyms: *Astragalus angustifolius* Lam. subsp. *biokovensis* Kušan Acta Mus. Maced. Sci. Nat. 4: 64. 1956, nom. inval. - *Astragalus angustifolius* auct. fl. croat. non Lam., 1783 - *Astragalus sempervirens* auct. fl. croat. non Lam., 1783 - *Astragalus aristatus* auct. fl. croat. non L'Hér., 1791 - *Astragalus sirinicus* auct. fl. croat. non Ten., 1826.

Dwarf shrub forming a loose, spiny cushion, 10-30 cm tall. Stems woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. Leaves imparipinnate, 2-6 cm long, with ivory rachis, when juvenile covered by scattered hairs and protracted into a straight spine, longer than the terminal leaflets. Leaflets oblong, green-glaucous, obtuse at apex, 6-13 paired, 2-5 × 0.8-1.7 mm, covered by appressed medifixed hyaline hairs. Leaflet peduncle 0.2-0.6 mm long. Stipules lanceolate, 4-5.5 × 1.2-1.3 mm long, joined to the rachis about half-way, acuminate at apex, coriaceous, straw coloured, 1-nerved, hairy in the central part and ciliate at margin. Raceme 6-10-flowered, with peduncle up to 1.5 long. Bract lanceolate, hyaline below, greenish above, apiculate, 4-5 mm long, densely hairy. Bracteoles ovate-lanceolate, densely hairy, 1.4-2 mm long, inserted at the calyx base. Calyx cylindrical, tinged with pink, two-lipped, 8-9 mm long, 3-3.6 mm in diameter, densely covered by medifixed hyaline and black hairs; the hyaline ones 0.1-0.3 mm long, the black ones 0.1-0.2 mm long; teeth subulate, the lower ones unequal (the lat-

eral ones 2.8-3 mm long, and the central one 2.5-2.7 mm long), the upper ones 2.2-2.5 mm long. Corolla white tinged with pink; standard oblanceolate-spathulate, retuse at apex, 18-20 × 6.5-7 mm; wings 16-17 mm long; keel 13.5-14.5 mm long. Stamen filaments 12-14 mm long; anther yellow, subcircular, 0.8-0.9 mm long. Pistil 11-12 mm long; ovary sparsely hairy, hairs 0.2 mm long; style glabrous; stigma subglobose, verrucose. Legume ellipsoid, 11-12 × 2.5-3.5 mm, subglabrous, with white hairs, beak 1.8-2 mm long. Seeds reniform, 2-2.5 × 1.1-1.7 mm, olivaceous, smooth, laterally compressed.

Chorology: Croatia at Mt. Biokovo and Mt. Mosor (Fig. 10F).

Finally, by using morphologically more relevant characters, an analytical key was prepared for an easier identification of the investigated taxa.

Key to the species belonging to the *Astragalus angustifolius* group

- 1- Leaves with rachis apex longer than terminal leaflets2
- 1- Leaves with rachis apex subequal or shorter than terminal leaflets7
- 2- Corolla pinkish-purple to pinkish-violet; legumes densely hairy, with white and black hairs....3
- 2- Corolla white or tinged with pinkish-violet mainly in the keel; legumes subglabrous or sparsely hairy with white hairs only4
- 3- Rachis at the base 1.2-1.5 mm wide; leaflets 4-7 pairs; stipules joined to the rachis about 1/4 of its length; inflorescence peduncle 0.2-0.5 cm long; bracteole 1.3-2 mm long; seed dotted.....*A. taygeteus*
- 3- Rachis at the base 0.6-1 mm wide; leaflets 7-10 pairs; stipules joined to the rachis about halfway; inflorescence peduncle 1.2-2.5 cm long; bracteoles 2.3-3 mm long; seed not dotted*A. valdeviolaceus*
- 4- Pulvine hemispheric compact; inflorescence peduncle 0.2-1 cm long; bracteoles 0.5-1.5 mm long; calyx 6-7 mm long, with teeth 1-1.5 mm..... *A. gennarii*
- 4- Pulvine loose; inflorescence peduncle 1-3 cm long; bracteoles 1.5-3 mm long; calyx 8-10 mm long, with teeth 2.5-4 mm.....5
- 5- Leaf rachis at base 0.5-1 mm wide; stipules 4-5.5 mm long; raceme 6-10-flowered; bracteoles inserted in the calyx; ovary subglabrous.....*A. croaticus*
- 5- Leaf rachis at base 1-1.5 mm wide; stipules 6-8.5 mm long; raceme 3-5-flowered; bracteoles inserted in the peduncle; ovary hairy.....6
- 6- Stipules hairy; bracts 5-6 mm long; calyx teeth 2-2.8 mm long; standard 20-23 mm long; legume 11-12 mm long; seeds dotted.....*A. greuteri*
- 6- Stipules sparsely hairy below and ciliate at margin; bracts 2.5-3.5 mm long; calyx teeth (2.5)3-4 mm long; standard 16-20 mm long; legume 13-14 mm long; seeds not dotted..... *A. genargenteus*
- 7- Pulvine loose.....8
- 7- Pulvine hemispheric compact.....13
- 8- Rachis at base 1-1.3 mm wide; leaflets green-glaucous; stipules up to 9 mm long, joined to the rachis 1/5-1/3 of its length, legume beak 2.5-3.2 mm long.....9
- 8- Rachis at base 0.5-1 mm wide, leaflets glaucous to glaucous sericeous, stipules up

- to 6 mm long, joined to the rachis about halfway (rar. 1/3 of its length), legume beak 1-2 mm long.....**10**
- 9- Leaves 1.8-3 cm long, obtuse; inflorescence exceeding the leaves; calyx teeth 2.5-3 mm long; legume 11-13 mm long; seeds olivaceous*A. tymphreustus*
- 9- Leaves 3.5-6 cm long, acute; inflorescence not exceeding the leaves; calyx teeth 2-2.5 mm long; legume 13-15 mm long; seeds dark brown.....*A. sirinicus*
- 10- Inflorescence 6-15 flore with pedulcle 2.5-12 cm long.....*A. pungens*
- 10- Inflorescence 2-6 flore with pedulcle 0.5-2.5 cm long.....**11**
- 11- Leaf rachis at base 0.5-0.6 mm wide; inflorescence peduncle 0.5-1 cm long; leaves with 8-12 pairs of leaflets.....*A. heideri*
- 11- Leaf rachis at base 0.6-1 mm wide; inflorescence peduncle 1.2-2.5 cm long; leaves with 6-8(9) pairs of leaflets.....**12**
- 12- Stipules hairy in the central part and ciliate at margin; bracts 2.3-3 mm long; bracteoles 1.2-1.8 mm long; calyx 8-8.5 mm long with teeth 1.2-1.5 mm long; ovary and legume glabrous or subglabrous.....*A. hermoneus*
- 12- Stipules totally hairy; bracts 6-8 mm long; bracteoles 4.5-5 mm long; calyx 11.5-14 mm long with teeth 4.5-7 mm long; ovary and legume hairy.....*A. hubermorathii*
- 13- Leaf rachis at base 1-1.5 mm wide; calyx teeth 1.2-1.7 mm long.....**14**
- 13- Leaf rachis at base 0.5-1 mm wide; calyx teeth 2-4 mm long.....**15**
- 14- Leaflet rounded to subobtuse; stipules 4-6 mm long; raceme 3-6-flowered; bracteoles; bracteoles inserted in the peduncle; legume 9-10 mm long with beak 0.5-1 mm; seeds not dotted*A. angustifolius* subsp. *aegeicus*
- 14- Leaflet acute; stipules 3-4 mm long; raceme 1-3-flowered; bracteoles inserted in the calyx; legume 9-10 mm long with beak 2.5-3 mm; seeds dotted*A. angustifolius* subsp. *echinoides*
- 15- Leaflets acute; stipules lanceolate to linear-lanceolate, up to 10 mm long; raceme up to 8-flowered.....*A. angustifolius* subsp. *balcanicus*
- 15- Leaflets acute rounded to obtuse; stipules ovate-lanceolate, up to 7 mm long; raceme max 6-flowered.....**16**
- 16- Standard 14-16 mm long, wing 12-12.5 mm long, keel 10-11 mm long; seeds olivaceous*A. angustifolius* subsp. *odonianus*
- 16- Standard 16-20 mm long, wing 15-17 mm long, keel 13-15 mm long; seeds brown to dark brown.....**17**
- 17- Stipules hairy below and ciliate at margin; bracteoles inserted in the peduncle; calyx 3.5-4.5 in diameter; pistil 12.5-14 mm long*A. angustifolius* subsp. *erinaceous*
- 17- Stipules totally hairy, bracteoles inserted in the calyx, calyx 3-3.5 in diameter; pistil 10-12 mm long.....**18**
- 18- Stipules joined to the rachis about halfway; inflorescence peduncle up to 2 cm long; legume conic-ovoid, 9-10 mm long, with black hairs mainly above and beak 0.5-0.7 mm long; seeds dark brown, 2-2.2 mm long,.....*A. angustifolius* subsp. *angustifolius*
- 18- Stipules joined to the rachis 1/3-1/2 of its length; inflorescence peduncle up to 0.8 cm long; legume ellipsoid, 10-12 mm long, with black hairs homogeneously distributed and beak 1.5-2.5 mm long; seeds brown, 2.2-2.7 mm long*A. angustifolius* subsp. *postianus*

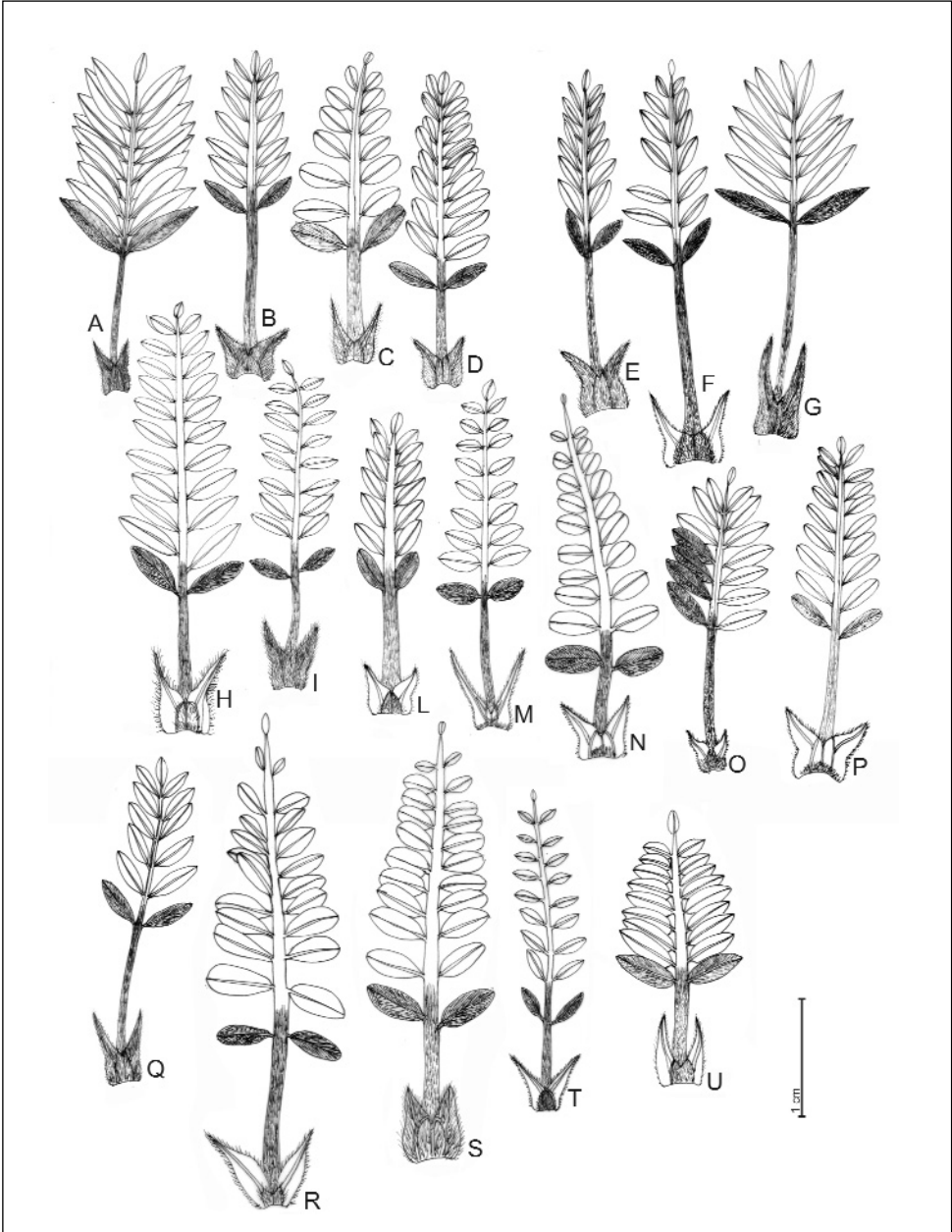


Fig. 3. Leaf of *Astragalus hubermorathii* (A), *A. hermoneus* (B), *A. taygeteus* (C), *A. heideri* (D), *A. angustifolius* subsp. *angustifolius* (E), *A. angustifolius* subsp. *echinoides* (F), *A. angustifolius* subsp. *balkanicus* (G), *A. sirinicus* (H), *A. valdeviolaceus* (I), *A. angustifolius* subsp. *aegeicus* (L), *A. tymphresteus* (M), *A. genargenteus* (N), *A. angustifolius* subsp. *erinaceus* (O), *A. angustifolius* subsp. *postianus* (P), *A. pungens* (Q), *A. gennarii* (R), *A. greuteri* (S), *A. croaticus* (T), *A. angustifolius* subsp. *odonianus* (U).

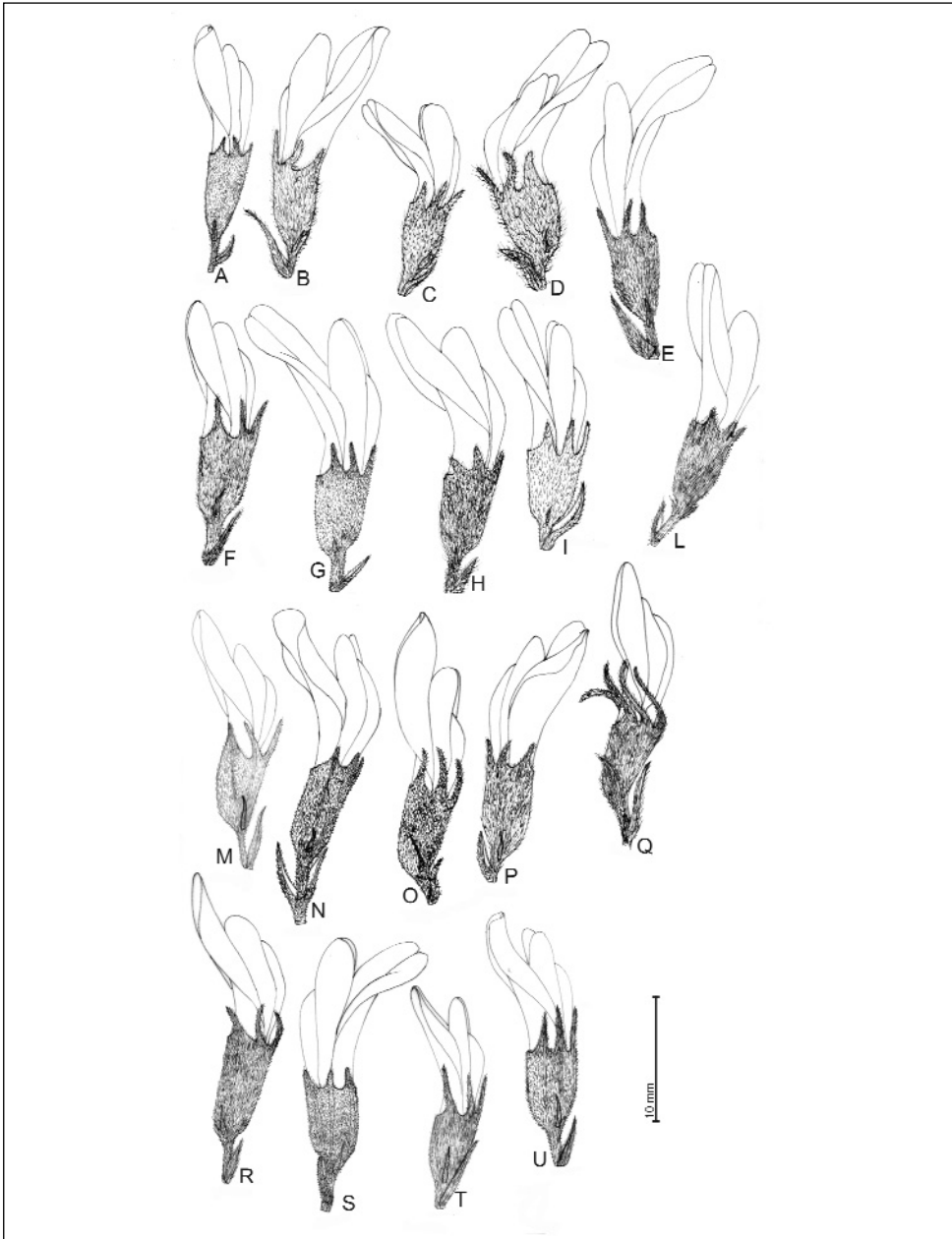


Fig. 4. Flower of *Astragalus hermoneus* (A), *A. taygeteus* (B), *A. heideri* (C), *A. tymphresteus* (D), *A. greuteri* (E), *A. valdeviolaceus* (F), *A. croaticus* (G), *A. genargenteus* (H), *A. sirinicus* (I), *A. gennarii* (L), *A. angustifolius* subsp. *angustifolius* (M), *A. angustifolius* subsp. *echinoides* (N), *A. angustifolius* subsp. *balcanicus* (O), *A. angustifolius* subsp. *erinaceus* (P), *A. hubermorathii* (Q), *A. angustifolius* subsp. *postianus* (R), *A. angustifolius* subsp. *aegeicus* (S), *A. angustifolius* subsp. *odonianus* (T), *A. pungens* (U).

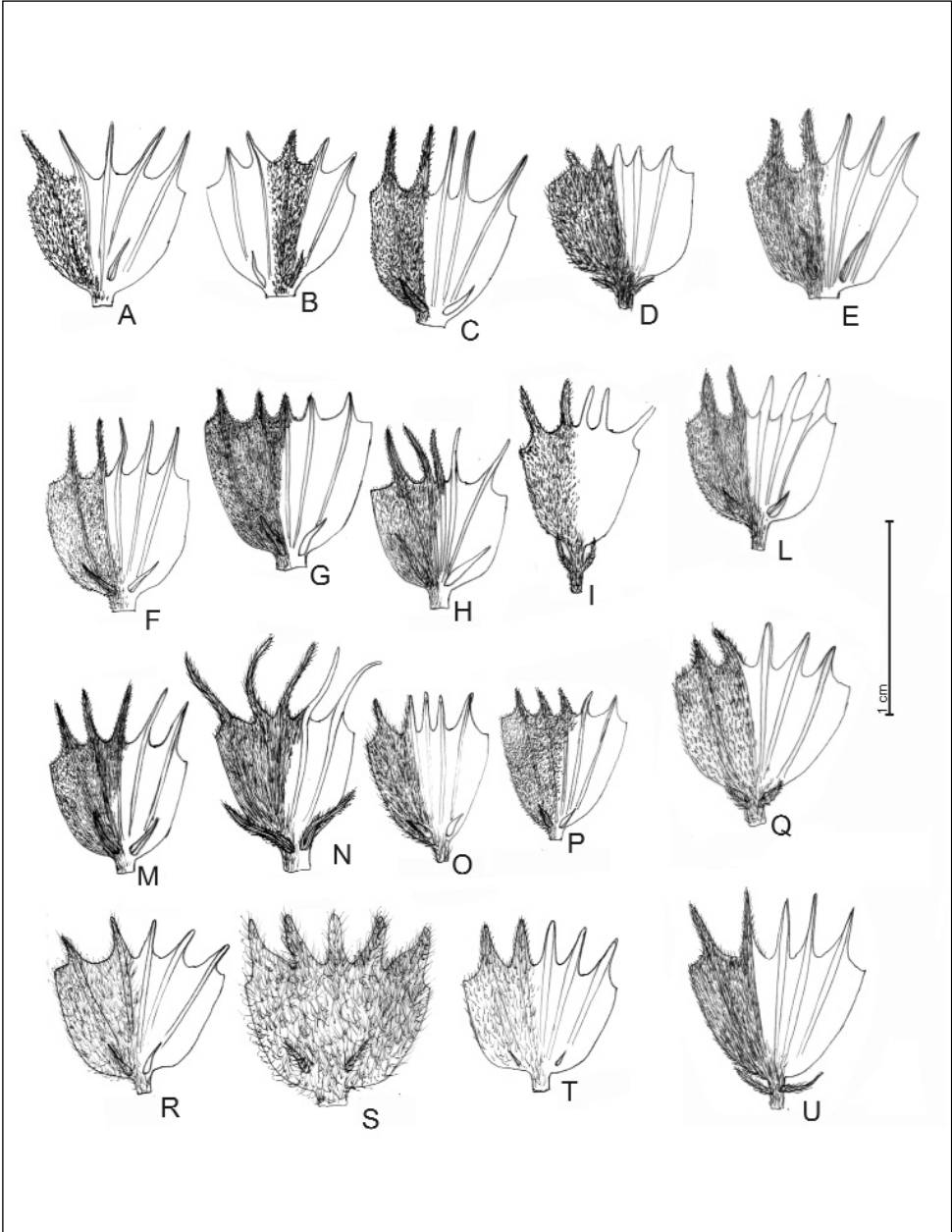


Fig. 5. Calyx of *Astragalus angustifolius* subsp. *angustifolius* (A), *A. angustifolius* subsp. *echinoides* (B), *A. angustifolius* subsp. *balcanicus* (C), *A. gennarii* (D), *A. valdeviolaceus* (E), *A. angustifolius* subsp. *postianus* (F), *A. angustifolius* subsp. *aegeicus* (G), *A. angustifolius* subsp. *odonianus* (H), *A. angustifolius* subsp. *erinaceus* (I), *A. croaticus* (L), *A. pungens* (M), *A. hubermorathii* (N), *A. heideri* (O), *A. hermonicus* (P), *A. genargentus* (Q), *A. taygeteus* (R), *A. tymphresteus* (S), *A. sirinicus* (T), *A. greuteri* (U).

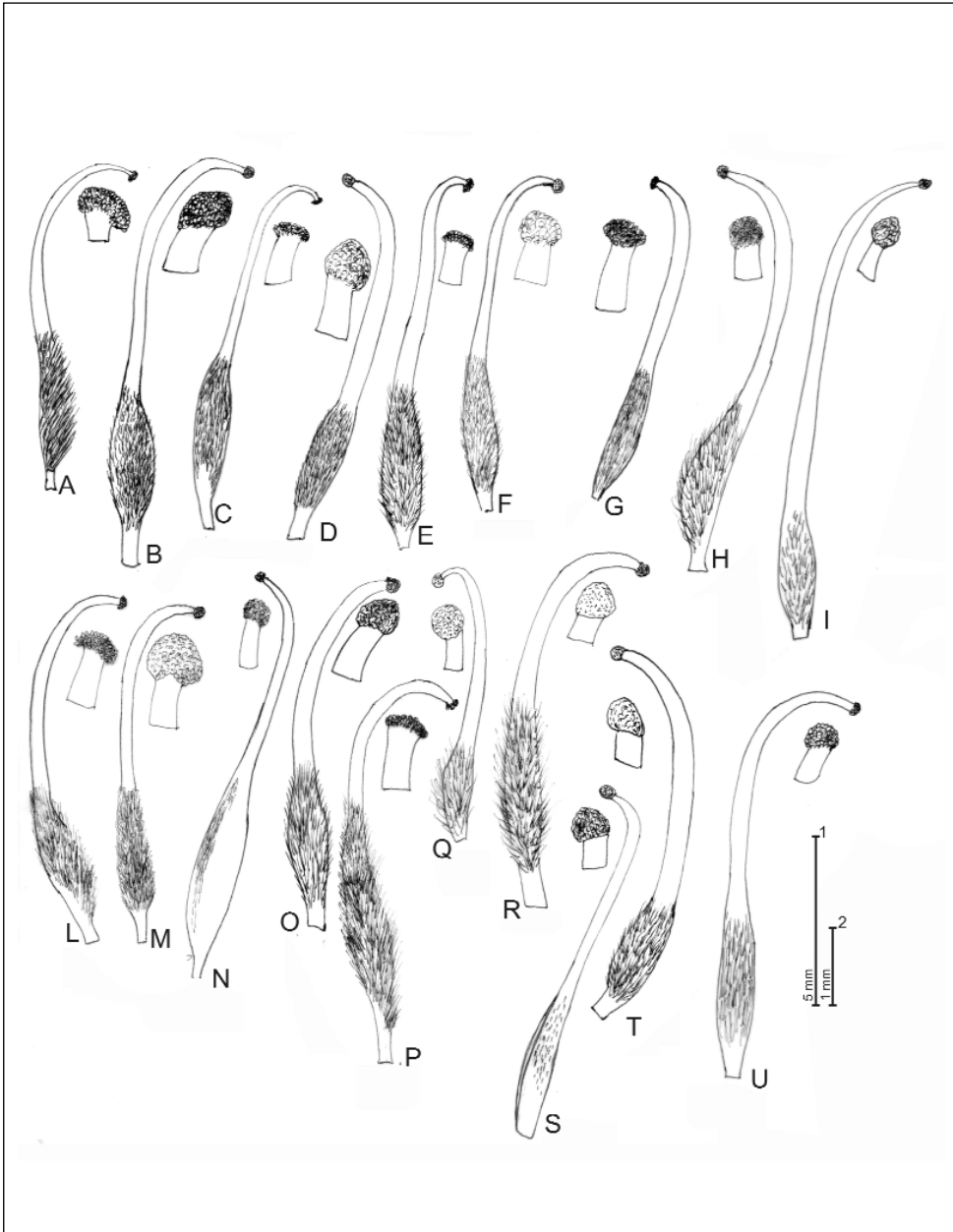


Fig. 6. Pistil of *Astragalus angustifolius* subsp. *angustifolius* (A), *A. angustifolius* subsp. *echinoides* (B), *A. angustifolius* subsp. *balcanicus* (C), *A. angustifolius* subsp. *erinaceus* (D), *A. angustifolius* subsp. *postianus* (E), *A. angustifolius* subsp. *aegeicus* (F), *A. angustifolius* subsp. *odonianus* (G), *A. genargenteus* (H), *A. greuteri* (I), *A. pungens* (L), *A. hubermorathii* (M), *A. hermoneus* (N), *A. taygeteus* (O), *A. valdeviolaceus* (P), *A. heideri* (Q), *A. tymphresteus* (R), *A. croaticus* (S), *A. sirinicus* (T), *A. gennarii* (U).

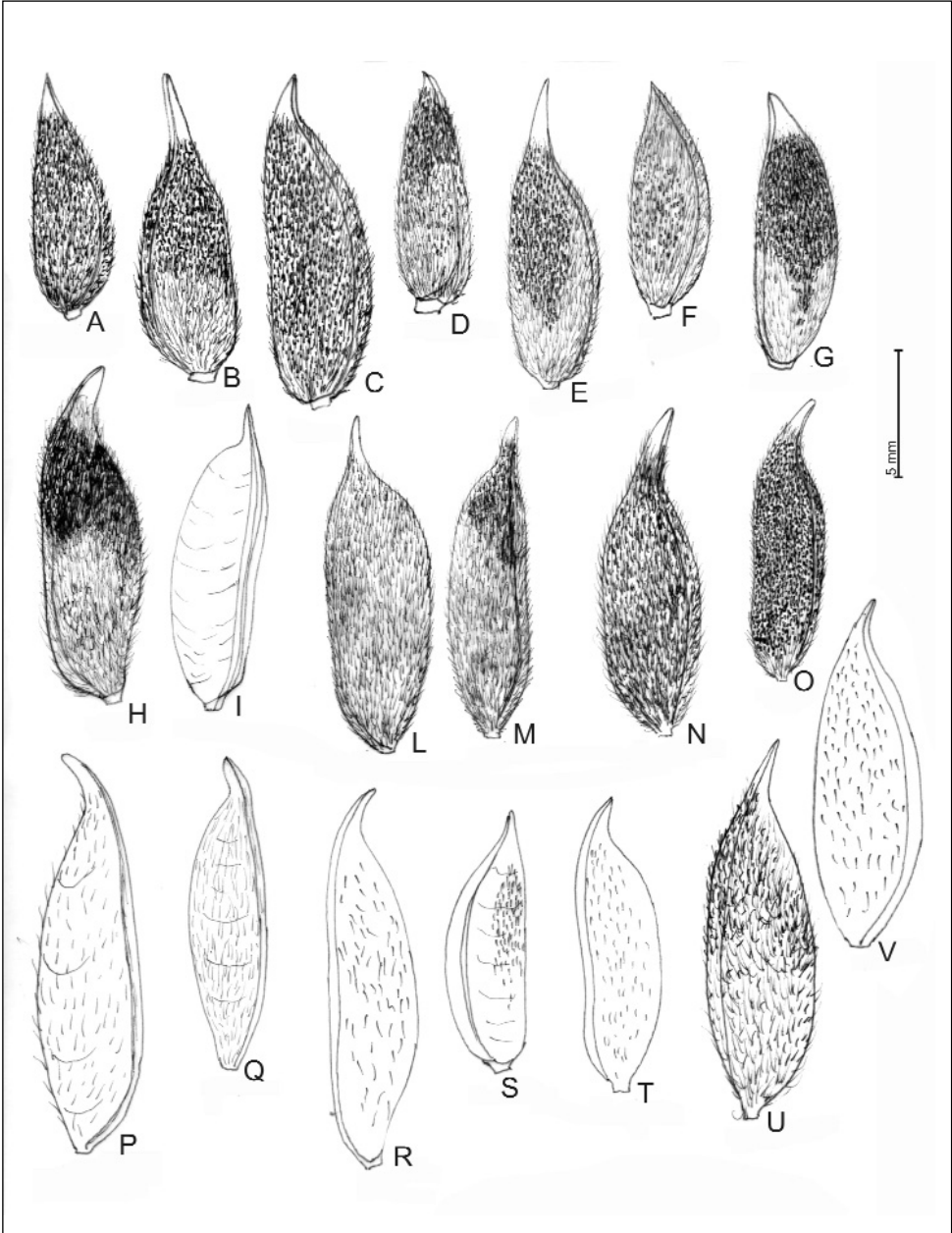


Fig. 7. Pod of *Astragalus angustifolius* subsp. *angustifolius* (A), *A. angustifolius* subsp. *echinoides* (B), *A. angustifolius* subsp. *balcanicus* (C), *A. angustifolius* subsp. *erinaceus* (D), *A. angustifolius* subsp. *postianus* (E), *A. angustifolius* subsp. *aegeicus* (F), *A. angustifolius* subsp. *odonianus* (G), *A. hubermorathii* (H), *A. hermoneus* (I), *A. taygeteus* (L), *A. heideri* (M), *A. tymphresteus* (N), *A. pungens* (O), *A. genargenteus* (P), *A. gennarii* (Q), *A. greuteri* (R, V), *A. croaticus* (S), *A. valdeviolaceus* (T), *A. sirinicus* (U).

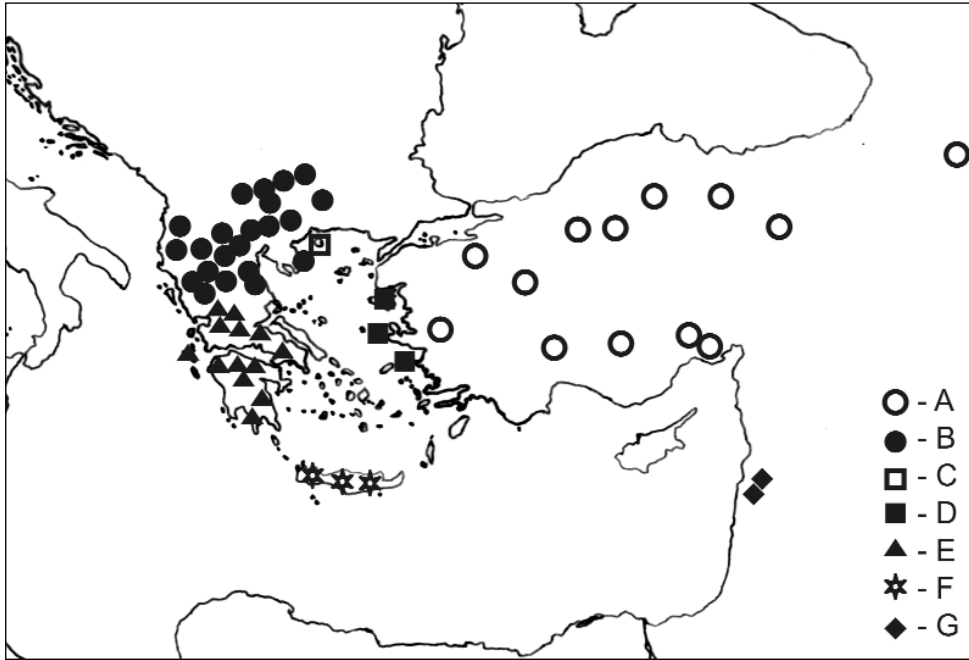


Fig. 8. Distribution map of *Astragalus angustifolius* subsp. *angustifolius* (A), subsp. *balcanicus* (B), subsp. *odonianus* (C), subsp. *aegeicus* (D), subsp. *erinaceus* (E), subsp. *echinoides* (F), subsp. *postianus* (G).

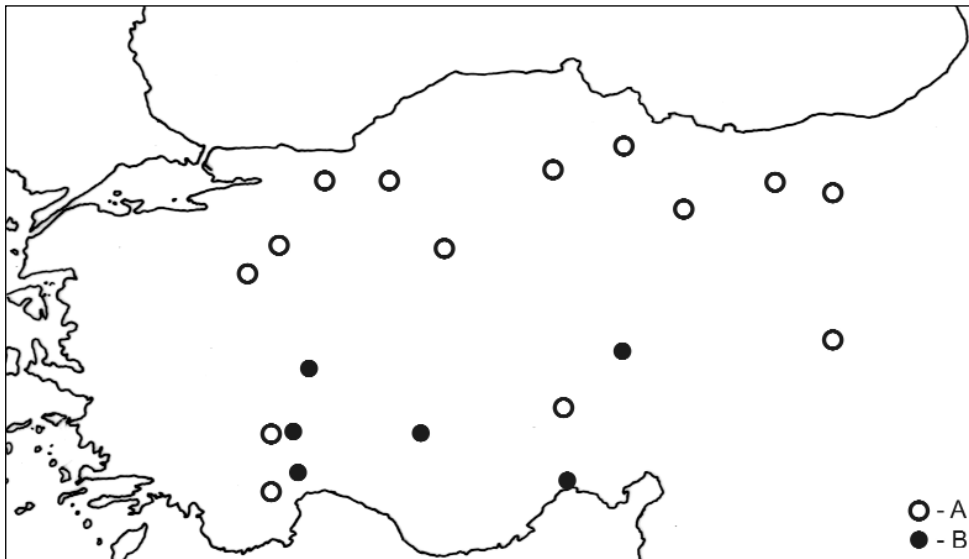


Fig. 9. Distribution map of *Astragalus pungens* (A), *A. hubermorathii* (B).

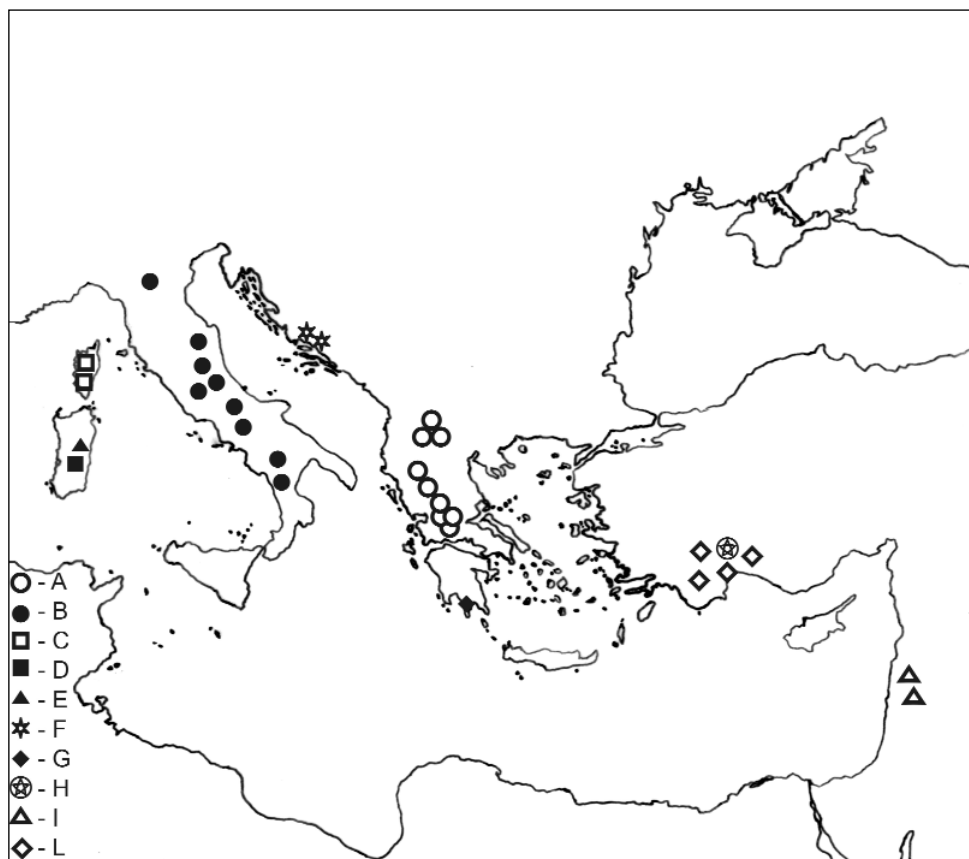


Fig. 10. Distribution map of *Astragalus tymphresteus* (A), *A. sirinicus* (B), *A. greuteri* (C), *A. genargenteus* (D), *A. gennarii* (E), *A. croaticus* (F), *A. taygeteus* (G), *A. heideri* (H), *A. hermoneus* (I), *A. valdeviolaceus* (L).

Acknowledgements

The authors thank the curators of the herbaria of B, BP, C, CAG, CAT, FI, G, K, ISTE, M, P, PR, PRC, TO, W, WU, ZA for loan or consultation of the exsiccata.

References

- Alegro, A., Bogdanović, S., Brullo, S. & Giusso del Galdo, G. 2009: *Astragalus croaticus* (*Fabaceae*), a new species from Croatia. – *Ann. Bot. Fennici* **46**: 569-573.
- Bacchetta, G. & Brullo, S. 2006: Taxonomic revision of the *Astragalus genargenteus* complex (*Fabaceae*). – *Willdenowia* **36**(1): 157-167.
- 2010: *Astragalus tegulensis* Bacch. & Brullo (*Fabaceae*), a new species from Sardinia. – *Candollea* **65**: 5-14.
- Boissier, P. E. 1843: *Diagnoses Plantarum orientaliun novarum*, ser.1, **1**(2). – Lipsiae & Parisiis.

- 1849: Diagnoses Plantarum orientalium novarum, ser.1, **2**(9). – Lipsiae & Parisiis.
- 1872: Flora orientalis, **2**. – Basileae, Genevae & Lugduni.
- Bormmüller, J. 192: Neue Arten und Formen aus Griechenland. – Feddes Repert. **25**: 33-37.
- Brullo, S. & Giusso del Galdo, G. 2001: *Astracantha dolinicola* (*Fabaceae*) a new species from Crete. – Nord. J. Bot. **21**: 475-480.
- 2003: Taxonomical considerations of *Astragalus creticus* Lam. group (*Fabaceae*) from Crete. – Israel J. Pl. Sci. **51**: 307-313.
- Bunge, A. 1869: Generis Astragali species gerontogaeae. Pars altera. Specierum enumeratio. – Mém. Acad. Imper. Sci. Saint. Pétersbourg **15**(1): 1- 254.
- Chamberlain, D. F. & Matthews, W. A. 1970: *Astragalus* L. – Pp. 49-253, in: Davis, P. H. (ed.) Fl. Turkey, **3**. – Edinburgh.
- Chamberlain, D. F. & Matthews, D. F. 1969; Materials for a flora of Turkey: XVIII. Leguminosae: *Astragalus*. – Notes Roy. Bot. Gard. Edinburgh **29**(3): 285- 310.
- Charter, A. O. 1968: *Astragalus* L. – Pp. 108-124, in Tutin, T.G. et al. (eds) Flora Europaea, **2**. – Cambridge.
- De Candolle, A. P. 1802: Astragalologia, nempe Astragali, Biserrulae et Oxytropidis, nec non Phacae, Cotulae et Lessertiae, Historia Iconibus illustrate. – Parisiis.
- 1825: Prodromus Systematis naturalis Regni vegetabilis, **2**. – Parisiis.
- Greuter, W., Burdet, H. M. & Long, G. 1989: Med-Checklist, **4**. – Genève.
- Halácsy, von E. 1901: Conspectus Florae graecae, **1**. – Lipsiae.
- Hayek, von A. 1926: Prodromus Florae Peninsulae balcanicae. – Feddes Repert. (Beih.) **30**(1): 673-960.
- Kušan, F. 1956: Uskolisni kozlinac (*Astragalus angustifolius* Lam.) u flori Hrvatske. – Acta Mus. Maced. Scie. Nat. **4**: 43-67.
- L' Héritier de Brutelle, C. L. 1785: Stirpes novae aut minus cognitae, **6**. – Parisiis.
- Monnet de la Marck, J. B. A. P. 1783: Encyclopédie méthodique. Botanique, **1**. – Paris.
- Moris, G. G. 1827: Stirpium sardoarum Elenchus, **1**. – Carali & Taurini.
- Mousterd, P. 1986: Nouvelle Flore du Liban et de la Syrie, **2**. – Beyrouth.
- Pallas, P. S. 1800: Species Astragalorum descriptae et iconibus coloratis illustratae. – Lipsiae.
- Persson, J. & Strid, A. 1982: A new species of *Astragalus* (*Fabaceae*) from Mt. Taygetos. – Willdenowia **12**: 207- 209.
- Podlech, D. 1998: Typification of *Astragalus* species II. Species mainly from the herbaria of Paris (P) an Geneva (G). – Sendtnera **5**: 247-263.
- 2008a: Thesaurus Astragalorum. - [www.sysbot.biologie.uni-muenchen.de/de/ personem/podlech/thesaurus_astragalorum.pdf](http://www.sysbot.biologie.uni-muenchen.de/de/personem/podlech/thesaurus_astragalorum.pdf). - München.
- 2008b: The genus *Astragalus* L. (*Fabaceae*) in Europe with exclusion of the former Soviet-Union. – Feddes Repert. **119**: 310-387.
- Ponert, J. 1973: Combinationes novae, stati novi et taxa nova non tantum specierum turcicarum. – Feddes Repert. **83**(9-10): 617- 644.
- Presl, C. B. 1845: Botanische Bemerkungen. – Abh. Königl. Böhm. Ges. Wiss., ser. 5, **3**: 431-584.
- 1846: Botanische Bemerkungen. – Prag.
- Rechinger, K. H. 1943: Flora aegaea. – Denkschr. Akad. Wiss. Math.-Nat. Kl. (Wien) **105**(1): 1-924.
- Strid, P. A. K. 1986: Mountain Flora of Greece, **1**. – Cambridge.
- Tenore, M. 1826: Ad Florae Neapolitanae Prodromum Appendix quinta. – Neapoli.
- Wettstein, von R. 1889 – Die *Astragalus* – Arten aus der Section Melanocercis. – Bot. Centr. **39**: 250.
- 1890: Beitrag zur Flora des Orientes. Bearbeitung der von Dr. A. Heider im Jahre 1885 in Pisidien und Pamphylien gesammelten Pflanzanzen. – Sitz.-Ber. Akad. Wiss. Wien **98**: 348-397.

Willdenow, C. L. 1799: Mémoire sur les diverses espèces de Tragacathe. – Mém. Acad. Roy. Sci. Hist. (Berlin) **1794-1795**: 16-31.

— 1802: Species Plantarum, 4 ed., **3(2)**. – Berolini.

For the *Specimina visa selecta* see Electronic supplementary file ESF3.

Address of the authors:

Salvatore Brullo, Gianpietro Giusso del Galdo & Carmelo Maria Musarella,
Dipartimento di Botanica, Università di Catania, Via A. Longo 19, I-95125 Catania,
Italy. E.mail: salvo.brullo@gmail.com