Taxonomic revision of the Astragalus genargenteus complex (Fabaceae)

Authors: Bacchetta, Gianluigi, and Brullo, Salvatore

Source: Willdenowia, 36(1) : 157-167

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.36.36113

GIANLUIGI BACCHETTA & SALVATORE BRULLO

Taxonomic revision of the *Astragalus genargenteus* complex *(Fabaceae)*

Abstract

Bacchetta, G. & Brullo, S.: Taxonomic revision of the *Astragalus genargenteus* complex *(Fabaceae)*. – Willdenowia 36 (Special Issue): 157-167. – ISSN 0511-9618; © 2006 BGBM Berlin-Dahlem.
doi:10.3372/wi.36.36113 (available via http://dx.doi.org/)

Within the *Astragalus genargenteus* complex three morphologically, ecologically and chorologically well differentiated taxa are distinguished: *A. genargenteus* from siliceous substrate in the Gennargentu massif (central Sardinia) and two species described as new to science, *A. gennarii* from limestone on Monte Albo (NE Sardinia) and *A. greuteri,* widespread on siliceous substrate in the Corsican mountains. The relationship of these species with the allied, spine cushion-like *A. sirinicus* and *A. angustifolius* is examined. A key to the species and illustrations are given.

Key words: *Leguminosae,* Sardinia, Corsica, taxonomy, endemism.

Introduction

The populations in Sardinia and Corsica hitherto referred to *Astragalus genargenteus* Moris, being orophilous, pulvinate shrubs with a tragacanthoid habit, are examined. In Corsica this species is widespread in mountains on Palaeozoic siliceous substrata. In Sardinia, instead, it is restricted to the tops of Mt Gennargentu and Mt Albo. In the first locality it occurs on Palaeozoic siliceous substrate, in the second on Mesozoic limestone.

Field investigations carried out on the various known sites of this species highlighted the presence of marked differences between the two Sardinian populations, as well as between these and the Corsican ones. Morphological features, ecology and chorology allow separation of three taxa, *Astragalus genargenteus* exclusive of the Gennargentu massif, *A. gennarii* restricted to Mt Albo and *A. greuteri* in Corsica, the latter two being species new to science.

Material and methods

The present study is based on specimens of the herbaria CAG, CAT, FI, M, TO (abbreviations according to Holmgren & Holmgren 1998-) and living material collected in various Sardinian, Corsican and peninsular Italian localities.

Fig. 1. *Astragalus genargenteus* – A: flowers; B: flower bud; C: opened calyces; D: calyx indumentum; E: petals; F: stamens; G: pistil; H: stigma; I: legumes; J: seeds; K: leaves. – Drawn after material from Bruncu Spina in Mt Gennargentu (locus classicus).

Results

Astragalus genargenteus Moris, Stirp. Sard. Elench. 1: 11. 1827.
Lectotype (designated by Corrias 1979): *Moris* (TO!); paratypes: Genargentu, in editis apricis aridis, junio julio, *Moris* (TO!); in apricis editis montibus Genargentu, junio, Moris (TO!) – Fig. 1.

Dwarf shrub forming a compact, 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, 3-6 cm long, with ivory rachis, when juvenile covered by scattered hairs and protracted into a straight spine, longer than the upper leaflets. *Leaflets* oblong, green, rounded to obtuse at the apex, (5-)9-11(-12) paired, 2-6 × 1.5-3 mm, covered by appressed, medifixed hyaline hairs; petiolules 0.2-0.4 mm long. *Stipules* linear-triangular, 6-7 mm long, joined to the rachis about half-way, acute at the apex, coriaceous, straw-coloured, uninerved, sparsely hairy at the 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 on the pedicel. *Calyx* cylindrical, bilabiate, 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 to yellowish, 16-20 mm long; *standard* platonychioid, undulate at the margin, retuse at the apex, 16-20 × 8-9 mm; *wings* 15-18 mm long; *keel* 13-15 mm long. *Stamina* with filaments 12-13 mm long; anthers yellow, oblong, 1 mm long. *Pistil* 12-13 mm long; ovary hairy; style glabrous; stigma papillose, subglobose. *Legume* 12-15 × 3-4 mm, subglabrous to sparsely hairy, with white, 1-1.2 mm long hairs, irregularly oblong with a short, 2 mm long beak. *Seeds* reniform, 2.2-2.5 × 1.2-1.5 mm, brown-olivaceous, smooth, laterally compressed. – Chromosome number: $2n = 16$ (Villa 1979).

Etymology. – The name refers to the Gennargentu massif, where the taxon occurs.

Phenology. – Flowering May to June, fruiting July to August.

Distribution and habitat. – *Astragalus genargenteus* is an orophyte occurring at an altitude of 1250-1750 m and is restricted to a few sites in the Gennargentu massif (central Sardinia). It grows on the more or less sloping side on Palaeozoic siliceous rocks, such as metamorphytes, metaquarzites and granodiorites. It is found in dwarf shrub communities belonging to the Carici-Genistetea lobelii Klein 1972, accompanied by many Sardinian or Cyrno-Sardinian endemics of mountain habitats, such as *Thymus catharinae* Camarda, *Helichrysum microphyllum* subsp. *tyrrhenicum* Bacch. & al., *Armeria sardoa* subsp. *genargentea* Arrigoni, *Festuca morisiana* Parl., *Viola corsica* subsp. *limbarae* Merxm. & W. Lippert, *Carlina macrocephala* Moris, *Galium corsicum* Spreng., *Genista corsica* (Loisel.) DC., *Hieracium soleirolianum* Arv.-Touv. & Briq., *Plantago subulata* subsp. *insularis* (Gren. & Godr.) Nyman. It grows in the temperate-sub-Mediterranean bioclimate between the lower supratemperate and the upper supratemperate belt, with an upper subhumid and lower humid ombrotype.

Additional specimens examined. – SARDINIA: Gennargentu, 7.1859, *Gennari* (FI); Monte Novo, ad radices montis Gennargentu, 29.4.1872, *Marcucci* (FI); Monte Gennargentu, 8.6.1883, *Sardagna* (FI); prope fodinam Corr'e Boi, Gennargentu, 1250 m, 31.5.1884, *Forsyth-Major* (FI); sopra la miniera di Corr'e Boi in Monte Gennargentu, 31.5.1884, *Forsyth-Major 32* (FI); Mte Gennargentu presso Desulo, 29.6.1898, *Martelli* (FI); Pressi di Desulo, *Bonomi* (CAG); Gennargentu au dessus du rifugio Broncu Spina, 1570-1700 m, 27.5.1983, *Charpin & al AC 17798* (FI); Gennargentu, 15.6.1993, *Fogu* (CAG); Correboi - Fonni (NU), 15.5.1989, *Mulas* (CAG); Genna Perdu Surdu - Bruncu Spina, Fonni, esp. ENE, 7.7.2000, *Bacchetta & al.* (CAG); Broncu Spina - Fonni (NU), metamorfiti, 1635 m, NNE 30°, 40°01.397'N, 9°17.861'E, supratemp. sup.-umido inf., 25.6.2003, *Bacchetta & al. 399/03* (CAG); Broncu Spina - Desulo (NU), metamorfiti paleozoiche, 1645 m, W 270°, 40°01.219'N, 9°18.035'E, 6.12.2003, *Bacchetta & al. 784/03* (CAG); Gennargentu, Broncu Spina - Fonni, 25.5.2004, *Bacchetta & Brullo* (CAT); Broncu Spina, Gennargentu – Fonni (NU),

versante NE, 18.7.2004, *Bacchetta & Brullo* (CAT); Broncu Spina - Fonni (NU), graniti, 1675 m, E 85°, 11.6.2005, *Bacchetta & al. 274/05* (CAG); Riu Aratu – Desulo (NU), metamorfiti, 1635 m, NW 310°, 11.6.2005, *Bacchetta & al. 282/05* (CAG).

Conservation status. – At present the populations, although well spread, are threatened by overgrazing, fire and skiing. It is suggested to classify *Astragalus genargenteus* as Endangered (EN), according to the IUCN criteria (IUCN 2001), B 1ab (ii, iii, v) + 2ab (ii, iii, v); C2a (i).

Astragalus gennarii Bacchetta & Brullo, **sp. nov.**
Holotype: Sardinia, Monte Albo, Punta Turuddò - Lula, 26.5.2004, *Bacchetta & al.* (CAT; isotypes: B, CAG, CAT, FI) – Fig. 2.

Astragalo genargenteo affinis sed habitu dense compacto, usque ad 80 cm alto, foliolis 1-2.2 mm latis, stipulis late triangularis, 5-6 mm longis, dense pilosis exteriori superficie, pilis 0.4-0.7 mm longis, pedunculo racemi 2-10 mm longo, bractea 1.5-2.5 mm longa, bracteolis 0.5-1.5 mm longis, calyce 0.6-0.7 mm longo, 3-3.5 mm diametro, pilis hyalinis 0.3-0.5 mm longis, calycis dentibus triangularibus, inferioribus 1-1.2 mm longis, superioribus 1.2-1.5 mm longis, vexillo 14-18 × 7-8 mm longo, alis 13-15 mm longis, pistillo 11-12 mm longo, stigmate subhemisphaerico, legumine densiore piloso, 11-13 × 3-3.2 mm, pilis 0.1-0.7 mm longis, rostro 1.5-1.8 mm longo, semine saepe maculato, 2.6-2.9 × 1.6-1.7 mm differt.

Dwarf shrub forming a dense, compact, spiny cushion, 20-80 cm tall. *Stems* woody, densely branched, tough, with persistent stipules and rachis in the old parts of the branches. *Leaves* imparipinnate, 3-5 cm long, with ivory rachis, when juvenile covered by scattered hairs and protracted into a straight spine, longer than the upper leaflets. *Leaflets* oblong, green, rounded to obtuse at the apex, 6-11-paired, 2-6 × 1-2.2 mm, covered by appressed, medifixed hyaline hairs; petiolules 0.2-0.4 mm long. *Stipules* widely triangular, 5-6 mm long, joined to the rachis about half-way, acute at the apex, coriaceous, straw-coloured, uninerved, densely hairy in the outer faces and at the margin with 0.4-0.7 mm long hairs. *Raceme* 2-4-flowered, with 0.2-1 cm long peduncle. *Bract* lanceolate, hyaline, long-apiculate, 1.5-3 mm long, densely hairy. *Bracteoles* lanceolate, densely hairy, 0.5-1.5 mm long, inserted on the pedicel. *Calyx* cylindrical, bilabiate, 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 to yellowish, tinged violet mainly on the keel, 15-18 mm long; *standard* platonychioid, undulate at the margin, retuse at the apex, 14-18 × 7-8 mm; *wings* 13-15 mm long; *keel* 12-15 mm long. *Stamina* with filament 12-13 mm long; anthers yellow, oblong, 1 mm long. *Pistil* 11-12 mm long; ovary hairy; style glabrous, stigma papillose, subglobose. *Legume* 11-13 × 3-3.2 mm, more densely hairy, with white, 0.1-0.7 mm long hairs, irregularly oblong with a short, 1.5-1.8 mm long beak. *Seeds* reniform, 2.6-2.9 × 1.6-1.7 mm, brown-olivaceous, often blotched, smooth, laterally compressed.

Eponymy. – Named in honour of the Sardinian botanist Patrizio Gennari (1820-97), founder of the Botanical Garden of Cagliari.

Phenology. – Flowering May to June, fruiting June to July.

Distribution and habitat. – *Astragalus gennarii* is an orophyte occurring at an altitude of 800-1055 m, in a very restricted area near the top of Punta Turuddò in the SW part of the Monte Albo massif (NE Sardinia), from where it was already reported by Corrias (1979) and Camarda (1984a-b). The species is represented by a small population localized on the W and NW slope of this mountain, on Mesozoic limestone. It prefers lithosoils or pedogenetically little developed soils. *A. gennarii* grows in the Mediterranean pluviseasonal oceanic bioclimate, in the upper meso-Mediterranean and the lower supra-Mediterranean belt and the upper subhumid ombrotype. It is found in dwarf shrub communities belonging to the Carici-Genistetea lobelii Klein 1972, ac-

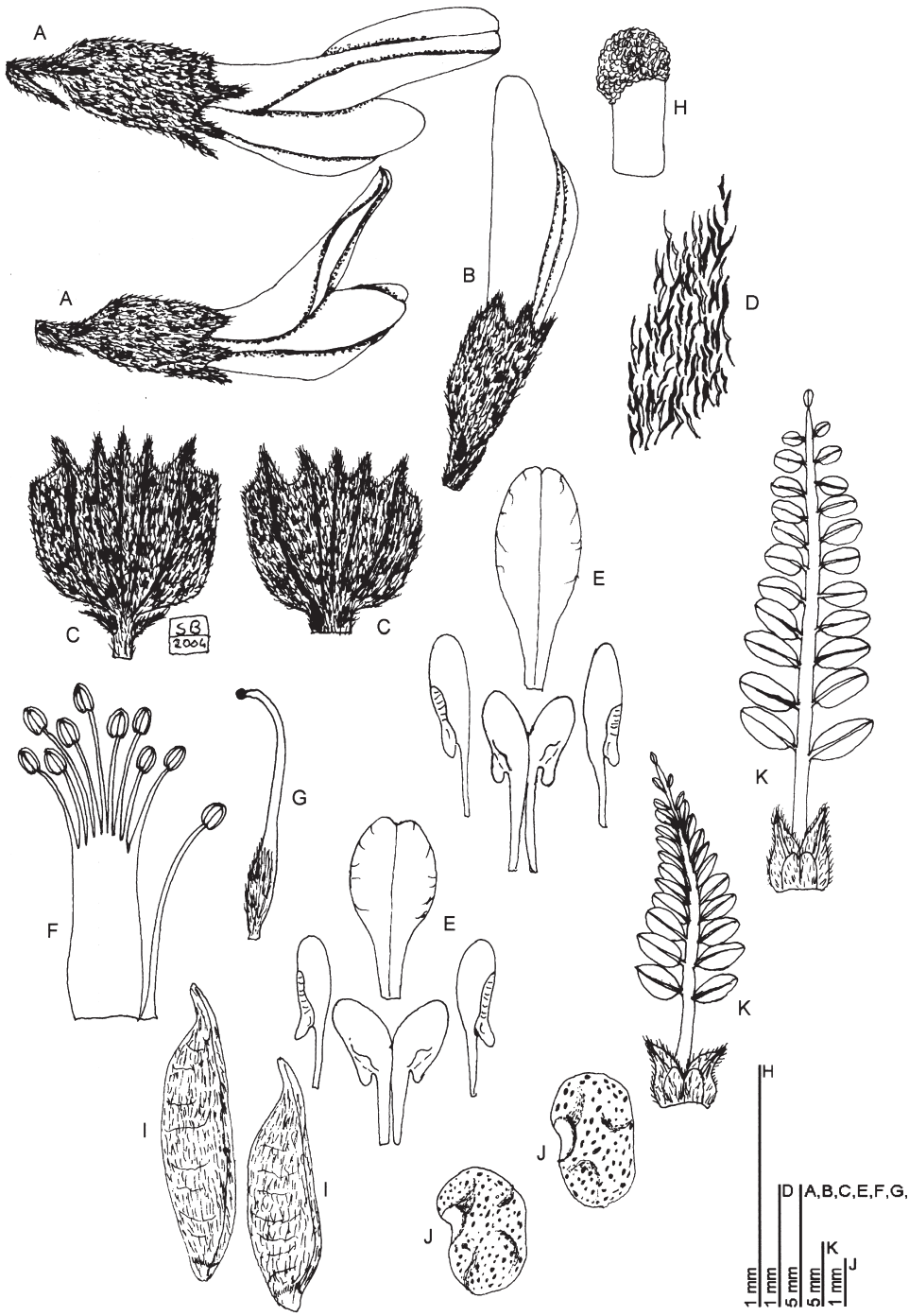

Fig. 2. *Astragalus gennarii* – A: flowers; B: flower bud; C: open calyces; D: calyx indumentum; E: petals; F: stamens; G: pistil; H: stigma; I: legumes; J: seeds; K: leaves. – Drawn after material from Punta Turuddò in Mt. Albo (locus classicus).

companied by endemic species such as *Cerastium supramontanum* Arrigoni, *Cephalaria mediterranea* (Viv.) Szabó, *Sesleria insularis* subsp. *barbaricina* Arrigoni, *Santolina corsica* Jord. & Fourr., *Brassica insularis* Moris, *Dianthus sardous* Bacch. & al., *Acinos sardous* (Asch. & Levier) Arrigoni, *Stachys corsica* Pers.

Additional specimens examined. – SARDINIA: Punta Turuddò - Lula (NU), calcari, 1025 m, SW 235°, 23.12.2002, *Bacchetta & al. 563/02* (CAG); ibid., calcari mesozoici, 1050 m, W 265°, 40°27.708'N, 9°31.192'E, 26.5.2004, *Bacchetta & al. 266/04* (CAG); Punta Turuddò - Lula (NU), calcari mesozoici, 1050 m, W 265°, 40°27.708'N, 9°31.192'E, 14.7.2005, *Bacchetta 340/05* (CAG).

Conservation status. – Because of its rarity, its scarce numerical presence and great fire hazard of the only known population, it is suggested to classify *Astragalus gennarii* as Critically Endangered (CR), according to the IUCN criteria (IUCN 2001) B1 ab (i, ii, iii, v) + 2ab (i, ii, iii, v), C2a (ii).

Astragalus greuteri Bacchetta & Brullo, **sp. nov.**
Holotype: Corsica, Col di Bavella, Zonza, 27.5.2004, *Bacchetta, Brullo & Casti* (CAT; isotypes: B, CAG, CAT, FI) – Fig. 3.

Astragalo genargenteo affinis sed habitu laxe ramoso, stipulis linearilanceolatis, 6.5-8.5 mm longis, dense pilosis margine, pilis 0.5-1 mm longis, pedunculo racemi usque ad 30 mm longo, bractea 5-6 mm longa, bracteolis lineari-lanceolatis, 2-3 mm longis, calyce 3.5-4 mm diametro, pilis nigris 0.3-1.2 mm longis, calycis dentibus inferioribus (2.5-)3-4 mm longis, superioribus 2.5-3.5 mm longis, corolla alba vel albo-violacea, 20-23 mm longa, vexillo 20-22 mm longo, carina 15-17 mm longa, filamentis staminalibus 14-15 mm longis, antheris 1.1-1.2 mm longis, pistillo 13-14.5 mm longo, stigmate conico, legumine 11-12 mm longo, pilis 1-2 mm longis, rostro 1.5 mm longo, semine pallide brunneo-olivaceo, 2.5-3 × 1.5-1.6 mm differt.

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, 3.5-6 cm long, with ivory rachis, when juvenile covered by scattered hairs and protracted into a straight spine, longer than the upper leaflets. *Leaflets* oblong, green, rounded to obtuse at the apex, 9-11-paired, 2-6 × 1.5-2.5 mm, covered by appressed, medifixed hyaline hairs; petiolules 0.2-0.3 mm long. *Stipules* linear-lanceolate, 6.5-8.5 mm long, joined to the rachis about half-way, acuminate at the apex, coriaceous, straw-coloured, uninerved, densely hairy at the margin with 0.5-1 mm long hairs. *Raceme* 3-5-flowered, with 1-3 cm long peduncle. *Bract* lanceolate, hyaline, long-apiculate, 5-6 mm long, densely hairy. *Bracteoles* linear-lanceolate, densely hairy, 2-3 mm long, inserted in the pedicel. *Calyx* cylindrical, bilabiate, 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, 20-23 mm long; *standard* platonychioid, undulate at the margin, retuse at the apex, 20-23 × 8-9.5 mm; *wings* 15-16 mm long; *keel* 15-16 mm long. *Stamina* with filaments 14-15 mm long; anthers yellow, oblong, 1.1-1.2 mm long. *Pistil* 13-14.5 mm long; ovary hairy; style glabrous; stigma papillose, conic. *Legume* 11-12 × 3-4 mm, sparsely hairy, with white, 1-2 mm long hairs, irregularly oblong with a short, 1.5 mm long beak. *Seeds* reniform, 2.5-3 × 1.5-1.6 mm, pale brown-olivaceous, smooth, laterally compressed. – Chromosome number: $2n = 16$ (Contandriopoulos 1962, sub *Astragalus genargenteus*).

Eponymy. – Named in honour of Werner Greuter, botanist in Berlin.

Flowering. – May to July, fruiting June to August.

Distribution and habitat. – *Astragalus greuteri* is an orophyte very widespread at (600-)800-2100(-2300) m in the mountains of S, central W and NW Corsica. It grows on siliceous substrate (metamorphites and granites) and subacid, little developed soils, in the temperate sub-Mediterra-

Fig. 3. *Astragalus greuteri* – A: flowers; B: flower bud; C: open calyces; D: calyx indumentum; E: petals; F: stamens; G: pistil; H: stigma; I: legumes; J: seeds; K: leaves. – Drawn after material from Col di Bavella (locus classicus).

nean bioclimate, ranging between the upper mesotemperate and the lower orotemperate belt, with an upper subhumid and lower humid ombrotype. It occurs in dwarf-shrub communities of the Carici-Genistetea lobelii Klein 1972, characterized by many Corsican and Sardo-Corsican endemics such as *Thymus herba-barona* Loisel., *Armeria multiceps* Wallr., *Genista salzmanni* var. *lobelioides* (Gamisans) Gamisans & Jeanm., *Hieracium soleirolianum* Arv.-Touv. & Briq., *Carlina macrocephala* Moris, *Poa balbisii* Parl., *Bunium corydalinum* DC., *Cerastium soleirolii* Duby, *Ligusticum corsicum* Gay and *Galium corsicum* Spreng.

Additional specimens examined. – Corsica: Serre di Scapamere, pres de Sartene (Corse), 9.6.1879, *Tillet* (FI); in dumosis apricis inter Silvana del Melo, in vallem Niolo, secus viam a Corte et Calacuccia, 13.7.1880, *Levier 18* (FI); Passo di Vizzavona, 10.6.1999, *Brullo & al.* (CAT); Col di Bavella - Zonza (Ajaccio), graniti, 1155 m, S 185°, 41°38.302'N, 9°14.173'E, 20.11.2003, *Bacchetta & al. 748/03* (CAG); Col di Vizzavona, 27.5.2004, *Bacchetta & al.* (CAT); Aullene, 27.5.2004, *Bacchetta & al.* (CAT); Col di Bavella - Zonza (Ajaccio), graniti, 1180 m, WNW 280°, 41°47.330'N, 9°13.198'E, 25.7.2004, *Adamo & al. 469/04* (CAG); Col di Bavella, Zonza, 25.7. 2004, *Bacchetta & al.* (CAT); Col di Bavella - Zonza (Ajaccio), graniti, 1130 m, WSW 240°, 41°47.537'N, 9°13.308'E, 18.7.2005, *Bacchetta & al. 346/05* (CAG).

Conservation status. – Since *Astragalus greuteri* is widespread in most of the Corsican mountains, protective steps do not seem necessary.

Taxonomic remarks

Astragalus genargenteus shows a close relationship with *A. sirinicus* Ten. (Fig. 4), which is widespread in the central and S Apennines and in the central and SW Balkan peninsula and diploid with $2n = 16$ like the *A. genargenteus* group (Pellegrini 1963). Whereas Chater (1968) and Pignatti (1982) considered *A. genargenteus* a subspecies of the latter species, many other authors (Corrias 1979, Camarda 1984a-b, Greuter & al. 1989, Gamisans & Jeanmonod 1993) treated them as distinct species, a view confirmed by our investigations. The differences between the three species of the *A. genargenteus* complex and *A. sirinicus* are summarised in Table 1. An identification key is given below.

The *Astragalus genargenteus* complex, distributed in the Cyrno-Sardinian biogeographical province, and *A. sirinicus* form a species group, which shows close phylogenetic relationship with *A. angustifolius* Lam. The latter represents another very complex group, which is distributed in the E Mediterranean and included by Chater (1968) in *A.* subg. *Cercidothrix* Bunge, whereas by Chamberlain & Matthews (1969) in *A.* sect. *Melanocercis* Bunge.

Key to the *Astragalus sirinicus* group

1. Plant 20-50(-70) cm tall; stipules widely triangular, 5-6 mm long; bract 1.5-2.5 mm long; calyx 6-7 mm long with 1-1.5 mm long teeth; seeds often blotched . . . . . *A. gennarii*
– Plant up to 30 cm tall; stipules linear-triangular to linear-lanceolate, 6-9 mm long; bract 2.5-6 mm long; calyx 7.5-10 mm long with 2-3.5 mm long teeth; seeds never blotched . . 2
2. Stipules 6-7 mm long, sparsely hairy at the margin, with 0.2-03 mm long hairs; bract 2.5-3.5 mm long; legume 12-15 mm long; seed 2.2-2.5 mm long . . . . *A. genargenteus*
– Stipules (6.5-)7-9 mm long, densely hairy at the margin, with 0.5-2 mm long hairs; bract 4-6 mm long; legume 10-12 mm long; seed 2.5-3.2 mm long 3
3. Leaflet tips rounded to obtuse; raceme 3-5-flowered; bracteoles 2-3 mm long, inserted in the pedicel; calyx 9-10 mm long with 2.5-3.5 mm long teeth; standard 20-23 × 8-9.5 mm; keel 15-16 mm long; anthers 1.1-1.2 mm long; pistil 13-14.5 mm long, with conic stigma; legume sparsely hairy, 3-4 mm wide, with only white hairs; seed pale brown-olivaceous, 2.5-3 × 1.5-1.6 mm . . . . . *A. greuteri*
– Leaflet tips acute; raceme 8-15-flowered; bracteoles 0.8-1.3 mm long, inserted at the base of the calyx; calyx 7.5-8 mm long, with 2-2.5 mm long teeth; standard 16-18 × 7-7.5 mm;

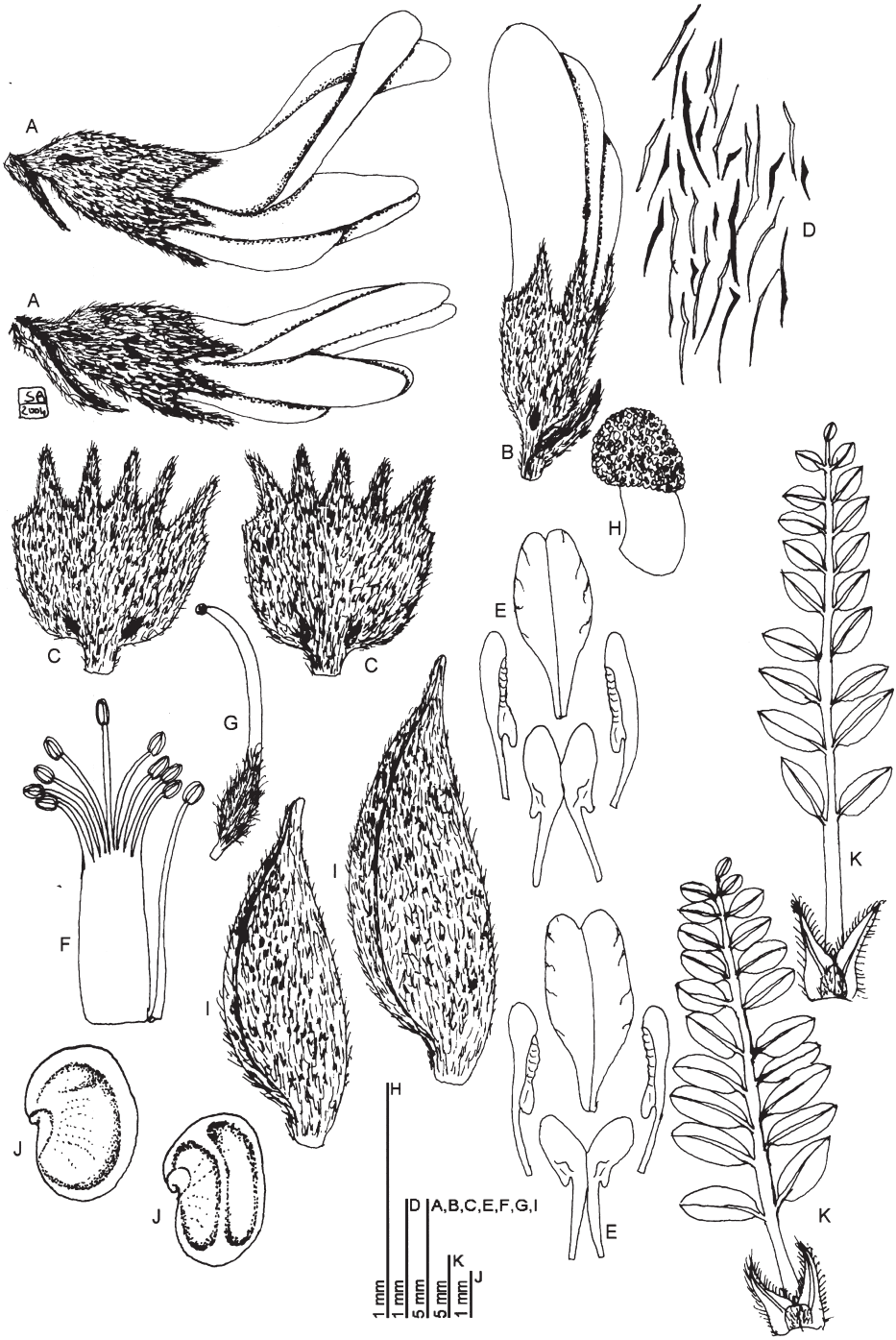

Fig. 4. *Astragalus sirinicus* – A: flowers; B: flower bud; C: open calyces; D: calyx indumentum; E: petals; F: stamens; G: pistil; H: stigma; I: legumes; J: seeds; K: leaves. – Drawn after material from Mt Sirino (locus classicus).

Table 1. Main differential characters of the species belonging to the *Astragalus genargenteus* group and *A. sirinicus* s.s.

Characters	*A. genargenteus*	*A. gennarii*	*A. greuteri*	*A. sirinicus*
Habit	compact 10-30 cm tall	compact 20-50(-70) cm tall	loose 10-30 cm tall	loose 10-30 cm tall
Leaflet shape size [mm] tip	oblong 2-6 ×1.5-3 rounded to obtuse	oblong 2-6 × 1-2.2 rounded to obtuse	oblong 2-6 × 1.5-2.5 rounded to obtuse	oblong-lanceolate 2.5-7 × 1.5-2.7 acute
Stipules	linear-triangular, 6-7 mm long, sparsely hairy at the margin; hairs 0.2-0.3 mm long	broad- triangular, 5-6 mm long, densely hairy on outer face and at the margin; hairs 0.4-0.7 mm long	linear-lanceolate, 6.5-8.5 mm long, densely hairy at the margin; hairs 0.5-1 mm long	linear-triangular, 7-9 mm long, densely hairy at the margin and on central outer face; hairs 0.7-2 mm long
Raceme	(2-)3-5-flowered	2-4-flowered	3-5-flowered	8-15-flowered
Bract length [mm]	2.5-3.5	1.5-2.5	5-6	4-6
Bracteoles length [mm]	on the pedicel 1.5-2	on the pedicel 0.5-1.5	on the pedicel 2-3	at the calyx base 0.8-1.3
Calyx size [mm]	9-10 × 4-4.5	6-7 × 3-3.5	9-10 × 3.5-4	7.5-8 × 3.6-4
Calyx teeth - lower length [mm] - upper length [mm]	linear-triangular 2.5-2.8 linear-triangular 2-2.2	triangular 1-1.2 triangular 1.2-1.5	linear-triangular (2.5-)3-4 linear-triangular 2.5-3.5	triangular 2-2.5 broad-triangular 2-2.5
Calyx indument white hairs black hairs	densely hairy 0.5-1 mm long 0.2-0.5 mm long	densely hairy 0.3-0.5 mm long 0.1-0.5 mm long	densely hairy 0.3-1 mm long 0.3-1.2 mm long	densely hairy 0.4-1 mm long 0.3-0.9 mm long
Corolla	white to yellowish, 16-20 mm long	white to yellowish tinged violet at the keel, 15-18 mm long	white to violet, 20-23 mm long	white to yellowish tinged violet at the keel, 17-18 mm long
Standard	16-20 × 8-9 mm, retuse at apex	14-18 × 7-8 mm, ± retuse at apex	20-23 × 8-9.5 mm, retuse at apex	16-18 × 7-7.5 mm, emarginate at apex
Keel length	13-15 mm	12-15 mm	15-16 mm	12-14 mm
Filament length	12-13 mm	12-13 mm	14-15 mm	12.5-13 mm
Anther length	1 mm	1 mm	1.1-1.2 mm	0.8 mm
Pistil length stigma	12-13 mm subglobose	11-12 mm sublglobose	13-14.5 mm conical	12.5-13 mm subovoid
Legume size [mm] beak [mm] hairs	± sparsely hairy 12-15 × 3-4 ± 2 white, 1-1.2 mm	± densely hairy 11-13 × 3-3.2 1.5-1.8 white, 0.1-0.7 mm	sparsely hairy 11-12 × 3-4 1.5 white, 1-2 mm	densely hairy 10-12 × 4-5 2.5-3 black and white, 0.3-1.5 mm
Seed colour	brown-olivaceous	brown-olivaceous, often blotched	pale brown-olivaceous	blackish brown
size [mm]	2.2-2.5 × 1.2-1.5	2.6-2.9 × 1.6-1.7	2.5-3 × 1.5-1.6	3-3.2 × 1.9-2.2

keel 12-14 mm long; anthers 0.8 mm long; pistil 12.5-13 mm long, with subovoid stigma; legume densely hairy, 4-5 mm wide, with black and white hairs; seed blackish brwon, 3-3.2 × 1.9-2.2 mm . . . . . *A. sirinicus*

References

Camarda, I. 1984a: Studi sulla flora e vegetazione di Monte Albo (Sardegna centro-orientale). I: La Flora. – Webbia **37:** 283-327.

— 1984b: Ambiente e flora del Monte Albo. Sardegna centro-orientale. – Villanova Monferrato.

Chamberlain, D. F. & Matthews, W. A. 1969: *Astragalus* L. – Pp. 49-253 in: Davis, P. H. (ed.), Flora of Turkey and the East Aegean Islands **3.** – Edinburgh.

Chater, A. O. 1968: *Astragalus* L. – Pp. 108-124 in: Tutin, T. G., Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H., Walters, S. M., Webb, D. A. (ed.), Flora europaea **2.** – Cambridge, etc.

Contandriopoulos, J. 1962: Recherches sur la flore endémique de la Corse et sur ses origines. – Ann. Fac. Sci. Marseille **32:** 1-354.

Corrias, B. ["1978"] 1979: Le piante endemiche della Sardegna: 54-55. – Boll. Soc. Sarda Sci. Nat. **18:** 297-309.

Gamisans, J. & Jeanmonod, D. 1993: Catalogue des plantes vasculaires de la Corse (seconde édition) 3. – In: Jeanmonod, D. & Burdet, H. M. (ed.), Complements au prodrome de la Flore Corse. – Genève.

Greuter, W., Burdet, H. M. & Long, G. 1989: Med-Checklist **4.** – Genève & Berlin.

Holmgren, P. K. & Holmgren, N. H. 1998- (continuously updated): Index herbariorum. – http://sciweb.nybg.org/science2/IndexHerbariorum.asp

IUCN 2001: IUCN Red List categories and criteria: version 3.1. – Gland & Cambridge.

Pellegrini, O. 1963: Dati citotassonomici su alcune specie italiane di *Astragalus* della sezione *Tragacantha*. – Delpinoa, ser. 2, **5:** 1-8.

Pignatti, S. 1982: Flora d'Italia, **1.** – Bologna.

Villa, R. 1979: Numeri cromosomici per la flora italiana: 457-463. – Inform. Bot. Ital. **10:** 241-248.

Addresses of the authors:

Gianluigi Bacchetta, Centro Conservazione Biodiversità (CCB), Dipartimento di Scienze Botaniche, Università degli Studi di Cagliari, v.le S. Ignazio da Laconi 13, I 09123 Cagliari, Italy; e-mail: bacchetta@unica.it

Salvatore Brullo, Dipartimento di Botanica, via A. Longo 19, I-95125 Catania, Italy; e-mail: brullo@dipbot.unict.it