

New taxa of tuberous *Corydalis* (Fumariaceae)

Author: Lidén, Magnus

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MAGNUS LIDÉN

New taxa of tuberous *Corydalis* (*Fumariaceae*)

Abstract

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Nine species, i.e. *C. fukuharae*, *C. geocarpa*, *C. gyrophylla*, *C. linjiangensis*, *C. lydica*, *C. ohii*, *C. ornata*, *C. podlechii*, *C. seisumsiana*, 13 subspecies and 10 subdivisions of the genus *Corydalis* are described as new to science; nine combinations are formed as names new to science. A synopsis of the classification of the tuberous species of *Corydalis* is given.

The genus *Corydalis* comprises close to 440 species distributed among 32 sections (Su & Lidén in prep.), and has its main distribution in China/Tibet where all sections occur. The tuberous groups, however, have a rather poor representation in the Sino-Himalayan area. They count altogether 95 species, and occur chiefly in SE Europe, the Middle East, Central Asia, NE China, Korea, Japan, and SE Siberia. All of them belong in the large subgenus *Corydalis* (Tab. 1), but do probably not form a monophyletic entity (Fukuhara & Lidén 1995, Lidén & al. 1995).

The tuberous species have attracted much attention, partly because of their distribution, and partly because of the horticultural merits of some species. Interestingly, several of the new tuberous taxa are known mainly or exclusively from cultivated wild material (Lidén 1989, 1991, and this paper). The wealth of newly described taxa, and a recent availability of a majority (69) of the tuberous species in cultivation have contributed to make *Corydalis* something of a new fashion among garden people. A monograph of these groups is thus a hot desideratum.

During monographic work of the tuberous species of *Corydalis* several new species and subspecies have come to light, some during herbarium studies, and some among recently received material in cultivation. New subsectional classifications have also been worked out. I consider it desirable to publish these new taxa in a taxonomic journal, but for illustrations and more complete distributional and ecological data, as well as for biological and horticultural observations, the reader is referred to the monograph (Lidén & Zetterlund 1997), which is scheduled to appear in March.

(1) *Corydalis* sect. *Corydalis*

Subsect. *Corydalis* ser. *Helicosyne* Lidén, ser. nova

Nectarium longe et anguste acuminatum. Caruncula spiralis. Capsula ambitu lineari usque lanceolata. Stigma papillis lateralibus saepe non vel indistincte geminatis. Bracteae integrae vel divisae.

Tab. 1. Synopsis of tuberous *Corydalis* (new names and combinations in bold face).*C. sect. Corydalis* (52 species):subsect. *Corydalis*:

ser. ***Helicosyne***: *C. integra* Barbey & Fors.-Major, *C. zetterlundii* Lidén; alexeenkoana group (*C. alexeenkoana* N. Busch, *C. kusnetzovii* A.P. Khokhr., *C. vittae* Kolak.); caucasica group (*C. caucasica* DC., *C. malkensis* Galushko); wendelboi group (*C. wendelboi* Lidén, *C. paschei* Lidén, *C. tauricola* (Cullen & P.H. Davis) Lidén, *C. haussknechtii* Lidén, *C. paczoskii* N. Busch, *C. angustifolia* (M. Bieb.) DC., *C. tarkiensis* Prokh.); *C. intermedia* (L.) Mérat, *C. gotlandica* Lidén

ser. *Corydalis*: solida group (*C. solida* (L.) Clairv., *C. densiflora* C. & J. Presl, *C. pumila* (Host) Reichenb.); bracteata group (*C. bracteata* (Willd.) Pers., *C. gracilis* Ledeb.)

ser. *Repentes*: ambigua group (*C. ambigua* Cham. & Schlechtend., *C. fumariifolia* Maxim.); *C. ussuriensis* Aparina, ***C. fukuharae*** Lidén, *C. repens* Mandl & Mühld.; lineariloba complex (*C. kiaotschouensis* Poelln., *C. humilis* B.U. Oh, *C. hallaisanensis* H. Lev., ***C. ohii*** Lidén, *C. lineariloba* Siebold & Zucc., *C. grandicalyx* B.U. Oh; *C. orthoceras* Siebold & Zucc., *C. papilligera* Ohwi, *C. maculata* B.U. Oh, ***C. linjiangensis*** Z.Y. Su

ser. ***Raphanituber***: *C. gorodkovii* Karav, *C. magadanica* A.P. Khokhr., *C. gorinensis* V.M. Van

ser. ***Adianta***: *C. triternata* Zucc., *C. henrikii* Lidén

subsect. ***Brevinctaria***: *C. nudicaulis* Regel, *C. ruksansii* Lidén, *C. schanginii* (Pall.) B. Fedtsch., *C. glaucescens* Regel

subsect. ***Numullaria***: *C. caudata* (Lam.) Pers., *C. humosa* Migo

subsect. ***Officinales***: *C. turtshaninovii* Besser, ***C. ornata*** Lidén & Zetterlund, *C. gamosepala* Maxim., *C. yanhusuo* (Y.H. Chou & C.C. Hsü) Wang ex Z.Y. Su & C.Y. Wu

subsect. ***Monstruosa***: *C. filistipes* Nakai

C. sect. Radix-cava (2 species):

C. cava (L.) Schweigg. & Körte, *C. blanda* Schott

C. sect. Leonticoides (21 species):

ser. ***Petiolaris***: *C. diphylla* Wall.

ser. ***Coronatae***: ledebouriana group (*C. cyrtocentra* Prain, *C. ledebouriana* Kar. & Kir., *C. maracandica* Michajlova); *C. popovii* Nevskii ex Popov, *C. sewerzovii* Regel, *C. darwasica* Regel ex Prain

ser. ***Elegantes***: *C. afghanica* Gilli, ***C. podlechii*** Lidén, *C. griffithii* Boiss.

ser. ***Macrocentrae***: *C. macrocentra* Regel

ser. *Leonticoides*: *C. aitchisonii* Popov, *C. chionophila* Czerniak; rutifolia group (*C. rutifolia* (Sm.) DC., *C. uniflora* (Siebold) Nyman, *C. oppositifolia* DC., ***C. lydica*** Lidén, *C. erdelii* Zucc., *C. nariniana* Fed., ***C. seisumsiana*** Lidén, *C. verticillaris* DC.)

C. sect. Dactylotuber (17 species):

subsect. *Dactylotuber*: *C. hepaticiloba* C. Y. Wu & Z. Y. Su, *C. hemidicentra* Hand.-Mazz., *C. ludlowii* Stearn; hsiaowutaishanensis group (*C. hsiaowutaishanensis* T. P. Wang, *C. pseudoalpestris* Popov, *C. tianzhuensis* M.S. Yan & C.J. Wang); ***C. gyrophylla*** Lidén; pauciflora group (*C. alashanica* (Maxim.) Peshkova, *C. pauciflora* (Willd.) Pers., *C. sajanensis* Peshkova, *C. arctica* Popov); Caucasus group (*C. emanuelii* C.A. Mey., *C. alpestris* C.A. Mey., *C. conorhiza* Ledeb.)

subsect. ***Benecinctae***: *C. benecincta* W.W. Sm., *C. dajingensis* C. Y. Wu & Z. Y. Su, ***C. geocarpa*** Harry Sm. ex Lidén

C. sect. Duplotuber (3 species):

C. decumbens (Thunb.) Pers., *C. ternata* (Nakai) Nakai, *C. buschii* Nakai

Typus: *C. caucasica* DC.

Nectary long-tapering, slender. Elaiosome spirally twisted. Fruit linear to lanceolate in outline.

16 species, Caucasus, Anatolia, SE Europe.

Subsect. *Corydalis* ser. ***Raphanituber*** (A.P. Khokhr.) Lidén, **comb. & stat. nov.**

≡ *C. sect. Raphanituber* A.P. Khokhr. in Novosti Sist. Vysš. Rast. 10: 154. 1973. – Typus: *C. magadanica* A.P. Khokhr.

Subsect. *Corydalis* ser. ***Adianta*** Lidén, **ser. nova**

Bractae divisae. Calcar longum gracile. Nectarium brevissimum acutum. Stigma rectangulare. Caruncula non spiralis.

Typus: *C. henrikii* Lidén

Nectary very short, acute. Spur long and slender. Stigma rectangular with four rather large apical papillae. Inner petals tipped with dark brownish purple.

Two species, S Central Turkey, Lebanon, Syria, Israel.

This very distinct series shows some similarities to subsection *Brevinectaria* (dark-tipped inner petals; very short nectary).

Subsect. ***Brevinectaria*** Lidén, **subsect. nova**

Tubera filialia basin vulgo cohaerentia. Nectarium brevissimum obtusum. Caruncula non spiralis basin brunneola.

Typus: *C. schanginii* (Pall.) B. Fedtsch.

Tuber dark, rounded to oblong; daughter-tubers usually coherent at base (*C. glaucescens* excepted). Nectary very short, obtuse at apex. Elaiosome with brownish uneven base.

Four species, Tadjikistan, Kirgiziya, Kazakhstan, Uzbekistan, W Xinjiang, W Mongolia, S Russia.

Subsect. ***Numullaria*** Lidén, **subsect. nova**

Caulis ramosis ramis debilis. Folia conspicue vaginata foliolis rotundatis longe petiolulatis. Pedicelli longi graciles. Corolla late alata petalis interioribus brevibus. Nectarium longum obtusum. Capsula ovoidea usque ellipsoidea. Caruncula non spiralis.

Typus: *C. caudata* Lam.

Much-branched plants with weak ascending stems; leaves vaginate at base, leaflets rounded, petioles and petiolules long. Pedicels long and slender. Flowers broadly winged with short inner petals. Nectary long, obtuse at apex.

Two species, E China.

Subsect. ***Officinales*** Lidén, **subsect. nova**

Folia glauca subtus minute papillosa. Folium inferius basin vaginatum interdum ramum axillarem sustinens. Petala exteriora apice denticulata emarginata mucronata. Nectarium obtusum. Capsula linearis. Semina parva. Caruncula non spiralis.

Typus: *C. turtshaninovii* Besser

Stems sometimes with an axillary tuber in the scale-leaf. Leaves more or less glaucous, somewhat fleshy, finely and densely papillose below. Lower leaf vaginate at base, sometimes with an axillary branch. Corolla blue to purple, rarely white; outer petals with emarginate, usually more or less dentate limbs, and usually with a conspicuous mucro in the notch. Nectary about half as long as spur, obtuse at apex (short and subacute in *C. ornata*); dorsal wings of inner petals angular, rather broad, sometimes prolonged slightly beyond the apex. Fruit linear, straight, smooth to subtorulose, 5–13-seeded, 16–26 × 2 mm with style (1.5–)2 mm, uniseriate with rather small seeds; seeds 1.4–1.7 × 1.1–1.5 mm, smooth, with long narrow elaiosome.

Four closely related species, E Russia, Korea, Central, E, and NE China (Japan?).

Subsect. ***Monstruosa*** Lidén, **subsect. nova**

Planta robusta caule simplici. Pedicelli fructiferi multo elongati. Flos parvus inconspicuus calcar brevi. Nectarium breve obtusum. Semina magna. Caruncula non spiralis.

Typus: *C. filistipes* Nakai.

Ullung-do east of Korea in the Japanese Sea. April-May.

A very peculiar monotypic subsection, not similar to anything else.

***Corydalis caucasica* subsp. *abantensis* Lidén, subsp. nova**

A subsp. *caucasica* differt racemo densiore multifloro non secundo petalis exterioris truncatis seminibus minoribus.

Holotypus: Anatolia, Bolu vilayet, Bolu – Gerede, 1050 m, beach scrub facing N, flowers pink, 31.3.1957, *Davis & Hedge* 26286 (K; isotypus: E).

This subspecies, which was recently introduced into cultivation from lake Abant just S of Bolu, has previously been confused with *C. integra*. It differs from *C. caucasica* subsp. *caucasica* in its denser, more floriferous, and not secund racemes, its narrower flowers with truncate outer petals, the less flattened fruits, and smaller seeds. It occurs in a small area close to Bolu in NW Anatolia, very far from the distribution area of subsp. *caucasica*, which barely penetrates into NE Anatolia. *Corydalis integra* from W Anatolia and the Aegaeen area is similar, but can be distinguished by the dark-tipped inner petals and capsules which are almost linear in outline.

***Corydalis wendelboi* subsp. *congesta* Lidén & Zetterlund, subsp. nova**

[= *Corydalis solida* var. *densiflora* sensu Rix & Phillips, The Bulb Book : 48. 1981].

Racemo densissimo floribus latoribus (petalo inferiore 4–6 mm lato) capsulis parvis a subsp. *wendelboi* statim dignoscenda.

Holotypus: Anatolia, Ulu Dag, *Brian Mathew s.n.*, cultivated in Göteborg Botanic Garden (GB).

Distinguished from subsp. *wendelboi* by the dense racemes, the much broader flowers with lower petal 4–6 mm broad, and the smaller capsules, 10–16 mm long. – $2n = 16$ (type). Self-incompatible.

NW Anatolia from Ulu Dag eastwards to 36° E.

A homogeneous taxon throughout most of the distribution area. In Ankara Vilayet very narrow-lobed forms are found.

***Corydalis solida* subsp. *subremota* Popov ex Lidén & Zetterlund, subsp. nova**

[= *C. halleri* var. *subremota* Popov in Fl. SSSR 7: 672. 1937, nom. nud.]

Caulis gracilis 15–25 cm longus. Folia bi- vel subtritermata lobis ultimis anguste obovatis usque sub-linearibus. Racemus latus 5–12-florus. Pedicelli 5–8 mm longi, bracteis anguste obtriangularibus digitato-incisus aequantes, fructiferi patentes vel paulo recurvati. Corolla parva, azurea vel lilacina; petalum inferius non saccatum 9–12 mm longum emarginatum mucronatum; calcar petali superioris angustum strictum 9–11 mm longum; petala interiora 9–10 mm longa.

Holotypus: Sibiria, Jenisei, Krasnojarsk, 56°N, 13.6.1876, *H. W. Arnell s.n.* (S).

Stem very slender, 10–25 cm long, with rather small, twice to three times ternate leaves; ultimate leaflobes narrowly obovate to oblanceolate or linear. Racemes 4–12-flowered, very dense at first, elongating in fruit. Pedicels short and slender, 5–8 mm, patent to slightly arcuate-recurved in fruit. Bracts equalling the pedicels, narrowly obtriangular, digitately divided into narrow, acute lobes. Flowers narrow and small, blue to purplish blue; upper petal with straight slender spur 7–10(–13) mm; inner petals 9–10 mm; claw of lower petal narrow and straight without any trace of gibbosity; limb broad and emarginate (or sometimes rather narrow and obtuse), often with a short mucro in the notch. Capsule 13–27 × 4–5 mm, 3–12 seeded, gradually narrowed into a short style. Seeds 1.5–2 mm long.

Middle and Upper Jenisej; Krasnojarski kray; Tuvinskaya ASSR. May to June.

Immediately distinguished from the other subspecies by the very slender habit and the narrow bluish flowers. The capsules vary considerably in length, but are always narrower, paler, and more delicate in texture than those of subsp. *solida*. Only after considerable hesitation did we decide to keep it in *C. solida*, and not to recognise it as a separate species.

Grows with *C. gracilis* in deciduous humid forests at low altitudes.

***Corydalis solida* subsp. *longicarpa* Lidén, subsp. nova**

Capsula longiore et angustiore a subspeciebus ceteris differt.

Holotypus: Greece, Andros, N slope of Mt Kouvara (Petalon Oros), 2 km SW Arnas, 500–600 m, 2.4.1971, *Snogerup & Gustafsson 41876* (LD).

Stem slender, 15–25 cm long. Leaves thin, biternate with discrete broadly obovate leaflets deeply divided into oblong to obovate obtuse lobes. Racemes 3–10-flowered, becoming very lax, and further elongating in fruit. Pedicels patent to recurved, 5–10 mm in flower, up to 15 mm in fruit. Bracts deeply divided with acute lobes, sometimes with the primary lobes dentate. Corolla pale purple, darker at apex; spur of upper petal 12–16 mm; lower petal 12–15 mm, straight, without any trace of gibbosity. Capsule 20–25 × 3 mm, including a straight beak 4–8 mm, 2–7-seeded. Mature seeds unknown.

Island of Andros, 500–900 m. March.

This, occupying the extreme Southeast of the distribution area of the species, is similar to subsp. *solida* in general habit, but is readily distinguished by the long pale flowers with straight lower petal, and the long narrow capsules.

***Corydalis fumariifolia* subsp. *azurea* Lidén & Zetterlund, subsp. nova**

=? *C. jezoensis* Miq. in Ann. Mus. Bot. Lugduno-Batavi 3: 205. 1867. – Type: Hokkaido (Jezo), *Siebold* (not seen)

[= *C. ambigua* auct. plur., non Cham. & Schlechtend.]

A subsp. *fumariifolia* foliolis floribusque latioribus calcari subtriangulare differt.

Holotypus: Hokkaido, Abashiri, *Rokujo s.n.*, cultivated in Göteborg Botanic Garden (GB)

Leaves once to twice ternate, usually with broadly ovate leaflets, although forms with linear or crenate-dentate leaflets also occur. Bracts ovate to narrowly ovate-lanceolate, usually entire. Spur of upper petal usually distinctly triangular and somewhat laterally compressed; inner petals 10–12(–13) mm long; limb of lower petal 7–11 mm broad. – $2n = 16$ (type). Self-incompatible.

Hokkaido and S Sakhalin. “Woods and meadows in lowlands to mountains”. April, May.

Distinguished from subsp. *fumariifolia* mainly by the usually broader leaflets, broader flowers, and a more triangular spur. Widespread in cultivation.

***Corydalis fukuharae* Lidén, sp. nova**

A *C. fumariifolia* differt calcari longiore oblongo nectario longiore graciliore, sepalis majoribus. Praeterea differt a *C. lineariloba* caulibus erectis bracteis oblongis capsula lineari.

Holotypus: Honshu, Tohoku distr., Akita pref., Yamauchi-mura, Kurosawa (39°16'N, 140°43'E), 4.5.1995, 250 m, *T. Fukuvara s.n.* (GB; isotypi: B, KYO)

Stems slender, 10–23 cm high, erect, branched from the scale-leaf and rarely from the lower cauline leaf. Leaves thin, green above, slightly glaucous beneath, twice to almost three times ternate with entire to dentate or deeply divided leaflets; ultimate lobes obovate, obtuse to acute. Racemes rather dense at first, soon elongating, 3–13-flowered. Bracts oblong, entire, or rarely the lowermost slightly divided, acute to obtuse. Pedicels slender, 5–12 (–18) mm, equalling the bracts, arcuate-recurved in fruit. Sepals (0.3–)1–1.5 mm long, ovate to linear, entire to coarsely dentate. Corolla blue to purplish blue; spur of upper petal oblong, straight, rather narrow at base, and not or only slightly tapering towards the obtuse apex, (9–)12–16 mm long, with a slender caudate nectary at least half as long; inner petals 10–12 mm long; lower petal with a long narrow claw, abruptly dilated into an emarginate limb with entire to usually somewhat

crenulate margins; at the base of the lower petal a small spur is usually found. Fruit linear, 20–25 × 2 mm, about 10-seeded.

Central and N Honshu southwards at least to distr. Nagano (Shinano), Niigata and Gumma prefectures, growing in forests up to about 1000 m (Tatsundo Fukuhara, pers. comm.).

A rather variable species, closely related to *C. fumariifolia*, but easily distinguished by the longer spur with narrower base, a distinct spur on the lower petal, and a long, slender nectary.

***Corydalis ohii* Lidén, sp. nova**

[= *C. lineariloba* sensu Oh (1988)].

[= *C. ambigua* sensu Oh (1988)].

A *C. lineariloba* differt foliolis et floribus majoribus capsula anguste oblonga.

Caulis gracilis geniculatus in axillis squamarum tubere parvo praeditus. Folia subbiterata foliolis late obovatis usque late lanceolatis. Racemi 2–6-flori, laxi. Bracteae pectinato-incisae pedicellis 10–17 mm longis fructiferis strictis multo breviores. Corolla late alata quam in *C. lineariloba* major; calcar petali superioris 11–13 mm longum; petala interiora 12–13 mm longa. Capsula oblonga.

Holotypus: Korea, Kangwon-do, Mt Odae, 10.4.1986, B. Y. Oh s.n. (GB; isotypus: KU)

Stems slender, geniculate, 10–20 cm high, usually with an accessory tuber in the scale-leaf. Leaves twice ternate or almost so, with broadly lanceolate to broadly obovate leaf-lobes. Petioles comparatively shorter than in *C. lineariloba*. Racemes 2–6-flowered, lax. Bracts pectinately to flabellately dentate, much shorter than the 10–17 mm long pedicels which remain straight in fruit. Flowers large; spur 11–13 mm; inner petals 12–13 mm with dorsal crests protruding beyond the apex. Fruit oblong, 17–22 mm, including a short beak, 3–7-seeded, uni-seriate. Seeds 2 mm.

N and W South Korea. Deciduous woods.

Close to *C. lineariloba*, but distinguished by larger leaflets, larger flowers, and the narrowly oblong fruit.

***Corydalis linjiangensis* Z.Y. Su, sp. nova**

Caulis erectis. Folia ternata usque biternata, foliolis integris vel saepe crenato-dentatis late obovatis usque linearis. Racemi 7–15-flori. Bracteae pectinato-dentatae pedicellos subaequantes. Petalum inferiorum longe unguiculatum lamina leviter emarginata. Calcar petali superioris 12–13 mm longum strictum. Petala interiora 13–14 mm longa. Capsula ambitu lineari.

Holotypus: China, Jilin, Linjiang, Manjiang, Nanshan, 990 m, 13.5.1959, *Biol. Res. Exp.* 18466 (NENU).

Stems suberect, 10 to 20 cm. Leaves ternate to biternate with broadly ovate crenate-dentate to pectinate-dentate leaflets, or with linear leaflets, hairy below in the veinurections. Racemes 7–15-flowered. Bracts usually ovate, pectinate-dentate, more or less equalling the 10–13 mm long pedicels. Corolla blue; upper petal with a straight cylindrical spur 12–13 mm long; lower petal with a long claw, usually more or less sacate, but sometimes straight, and with rather small sharply set off blade, slightly emarginate. Inner petals 13–14 mm long. Nectary at least half as long as the spur. Stigma broad with six apical papillae and pronounced geminate papillae. Fruit (immature) linear, up to 10-seeded.

Mountains of E Liaoning and S Jilin, 800–1200(?) m.

Somewhat resembling *C. humilis* B. U. Oh, but easily distinguished by the erect habit, the narrower and less sharply emarginate petal-limbs, and the linear fruit. It is also similar to *C. fumariifolia*, but has much longer flowers and nectaries.

***Corydalis turtschaninovii* subsp. *vernii* (Franch. & Sav.) Lidén, comb. & stat. nov.**

≡ *C. vernii* Franch. & Sav., Enum. Pl. Jap. 2: 273. 1876. – Holotypus: Honshu, near Yedo (Tokyo), *Savatier* (P).

***Corydalis ornata* Lidén & Zetterlund, sp. nova**

A *C. turtshaninonii* differt nectario multo brevior subacuto atque chromosomatum numero tetraploideo.

Holotypus: SE Russia, Primorskij Kray, C. Arsen'yev, *J. Ruksans s.n.*, cultivated in Göteborg Botanic Garden (GB; isotypus: B).

A very beautiful plant, similar to *C. turtshaninonii*, but leaves more divided with narrower lobes, racemes laxer, bracts smaller and more divided, capsules narrower, and seeds smaller. Corolla white, blue, or greyish purple with the mouth lined with a thin blue lipstick; outer petals with broad-dentate or entire limbs, emarginate at apex with a distinct mucro in the notch; spur rather triangular in shape, somewhat upwardly directed (usually oblong and horizontal in *C. turtshaninonii*), 9–11 mm long with a subacute nectary only 2 mm long; inner petals 11–12 mm long. – $2n = 32$ (type). Perhaps self-compatible to a certain degree.

SE Russia, so far only known from the original collection.

(2) *Corydalis* sect. *Radix-cava*

Corydalis sect. *Radix-cava* is here considered to comprise two species: the mesic forest herb *C. cava* sensu lato (including *C. marshalliana*) and the alpine *C. blanda*, distinguished by a different tuber, very glaucous and differently divided leaves, much stouter and lower growth, and few-seeded short and broad capsules with considerably larger seeds. *C. blanda* is divided into four subspecies. The morphologically most deviating of these is subsp. *oxelmannii*, whereas subsp. *blanda* stands out in the tetraploid chromosome number, although it morphologically comes close to subsp. *parnassica*.

***Corydalis blanda* subsp. *parnassica* (Orph. & Heldr.) Lidén, comb. & stat. nov.**

≡ *C. parnassica* Orph. & Heldr. in Boissier, Diagn. Pl. Orient. ser. 2, 6: 9. 1859. – Holotypus: Parnassos, *Orphanides* (G; isotypus: S)

***Corydalis blanda* subsp. *olympica* Lidén, subsp. nova**

A subsp. *blanda* et subsp. *parnassica* habitu magis compacto, foliolis brevioribus ovato-lanceolatis usque linearo-lanceolatis vel linearibus, racemo densiore, corolla brevior angustior notata.

Holotypus: Greece, Nomos Pierias, eparchia Pierias, Mt Olimbos, SE of the Kakavrakos peak, 2200 m, damp stony alpine pasture, S-facing slope, 4. 6. 1992, *N. Ek 19*, cultivated in Göteborg Botanic Garden (GB; isotypi: B, C, UPA).

Stem 4–10 cm high. Leaves rather fleshy, cut into several linear to lanceolate lobes, with about 45–60 ultimate lobes or teeth. Racemes very dense, 7–10-flowered. Spur of upper petal 7–10 mm long. – $2n = 16$ (holotype; *Strid s.n.*).

Greece: Olimbos. Alpine meadows and screes, 2000–2400 m.

A very glaucous and compact plant with dense racemes of short-spurred flowers. It keeps compact also under glass.

***Corydalis blanda* subsp. *oxelmannii* Lidén, subsp. nova**

A subspeciebus ceteris praecipue forma foliorum diversa necnon racemo laxiore corolla graciliore dignoscenda.

Holotypus: Greece, Nomos Achaïas, eparchia Kalavriton, Mt Chelmos, Vrisi, 1800–1950 m, stony alpine pasture, 17. 6. 1991, *B. Oxelmann 1928* (GB)

Stem 6–12 cm high with racemes much overtopping the leaves. Leaf-lamina at least as long as broad (in the other subspecies broader than long), cut into several small, usually obtuse and overlapping, segments. Number of ultimate lobes or teeth 60–100. Racemes 4–10-flowered, dense, but becoming rather lax in shady situations. Flowers comparatively more slender with spur of upper petal 10–12 mm. Seeds slightly smaller than in the other subspecies, about 3 mm. – $2n = 16$ (type; *Ek 1*).

Greece: Peloponnisos, Chelmos. Alpine meadows and screes, 1800–2000 m.

In cultivation this subspecies is strikingly different, with long lax racemes and quite different leaves.

(3) *Corydalis* sect. *Leonticoides*

Ser. *Petiolatae* Lidén, **ser. nova**

Foliis conspicue petiolatis caule saepe ramoso a seriebus ceteris differt.

Typus: *C. diphylla* Wall.

The type and only species differs from the other species of *C.* sect. *Leonticoides* by the stalked leaves.

W Himalaya.

Ser. *Coronatae* Lidén, **ser. nova**

Pedicelli brevi. Caruncula crassa pileata.

Typus: *C. ledebouriana* Kar. & Kir.

Pedicels short, 2–15 mm. Elaiosome thick, rounded, closely capping the funicular region like a minute fur cap.

Five species, Central Asia.

Ser. *Elegantes* Lidén, **ser. nova**

Folia foliolis manifeste inaequalibus. Limbi petalorum exteriorum late alati obtusi.

Typus: *C. afghanica* Gilli

An exclusive group of three Afghan species with very elegant white broad-lipped flowers in lax racemes. Foliage rather much divided, usually with the median ultimate leaf-lobes much larger than the lateral.

Three species, Afghanistan.

Ser. *Macrocentrae* Popov ex Lidén, **ser. nova**

Caule valde ramoso bracteis divisis a consectionibus facile differt.

Typus: *C. macrocentra* Regel

A monotypic section, recognized by the divided bracts and three-leaved, branched stems.

Corydalis diphylla subsp. *occidentalis* Lidén, **subsp. nova**

A subsp. *diphylla* differt caulibus non ramosis pedicellis longioribus petalis majoribus latioribus.

Holotypus: Pakistan, Swat, E Kalam, 3000 m, 6.6.1965, *Lamond in Rechinger 30851* (S; isotypus: C, GZU. – Wendelbo 1974: t. 5(2)).

Stems not branched. Leaves often subopposite. Pedicels longer (up to 50 mm in fruit), Racemes usually more floriferous, and corolla very broad, white or rarely pale pink with contrasting purple front. Sepals up to 1 mm. Lower petal 9–13 mm long and up to 12 mm broad; spur 8–13 mm; inner petal 10–11 mm long. Fruit 12–15 mm long. $-2n = 16$ (*Kohli s.n.*). Self-incompatible.

Kashmir, locally common, preferring rich soil on shady banks, shrubberies and forests.

Corydalis diphylla subsp. *murreana* (Jafri) Lidén, **comb. & stat. nov.**

≡ *C. murreana* Jafri, Fl. Pakistan (*Fumariaceae*): 7. 1980. – Holotype: Pakistan, Murree hills, 2000 m, 20.4.1917, *R. R. Stewart & I. D. Stewart 1647* (RAW; isotypus: S).

Corydalis podlechii Lidén, **sp. nova**

A *C. afghanica* differt calcari sursum valde curvato, capsula anguste oblonda.

Folia triternata foliolis longe petiolulatis integris vel profunde ternatisectis segmentis late obovatis obtusis terminalibus quam lateralibus multo majoribus. Racemi laxi, 7–9-flori. Pedicelli floriferi 5–10 mm, fructiferi reflexi 10–25(–40) mm longi. Corolla verosimiliter alba; petala

exteriora late alata, emarginata; calcar petali superioris sursum valde curvatum c. 25 mm longum; petala interiora 12–13 mm longa, angusta. Capsula anguste oblonga, 6–11-sperma. Semina inconspicue reticulata.

Holotypus: Afghanistan, Laghman, Alishang Tal, Manangor im Darreh-i-Manangor W Dawlats-hah, 2060 m, 25. 3. 1971, *Podlech 17630* (herb. Podlech).

Leaves sessile, very rarely with a petiole up to 25 mm, triternate with long petiolules; leaflets entire to deeply ternatisect; the median divisions always much larger than the lateral ones; lobes rounded-obtuse, obovate. Racemes 7–9-flowered, lax. Bracts rhombic to ovate, entire to slightly crenulate, rarely 3-cleft, 7–10 mm, enlarging to 13–17 mm in fruit. Pedicels 5–10 mm in flower, elongating to 10–25(–40) mm and reflexed in fruit. Corolla like that of *C. afghanica*, but spur strongly curved upwards, about 25 mm, and inner petals 12–13 mm, very narrow with comparatively longer claw. Fruit narrowly oblong, 18–26 mm long (including a narrow seedless portion 3–5 mm), with a 4–5 mm long style, 6–11-seeded. Seeds faintly reticulate, 3.5 mm.

E Afghanistan, prov. Laghman and Panjshir. 1400–1900 m.

Similar to *C. afghanica* and *C. griffithii*, but fruit very different, and corolla strongly curved.

***Corydalis afghanica* subsp. *tenuis* Lidén, subsp. nova**

A subsp. *afghanica* atque subsp. *elegante* foliolis parvis lanceolatis non manifeste inaequalis et praeterea a priore calcari longiore, a posteriore racemis paucifloris foliis triangularibus bene notata.

Holotypus: Afghanistan, Zabul, Qalaat-i-Ghilzai, Westhänge des Passes an der Straße nach Shenkay, 2000–2200 m, 10. 4. 1970, *Podlech 20088* (herb. Podlech)

Tubers small in specimens seen; leaflets pinnatisect into several small narrowly lanceolate lobules, very glaucous. Racemes 2–6-flowered. Spur of upper petal 22–30 mm.

Known from two localities in the Zabul province S of Kabul. 2000–2200 m.

***Corydalis afghanica* subsp. *elegans* Lidén, subsp. nova**

A subsp. *afghanica* atque subsp. *tenui* foliolo primario centrali ovato-oblongo, racemo multifloro et praeterea a priore calcari longiore, a posteriore foliolis rotundatis imbricatis manifeste inaequalis bene notata.

Holotypus: Afghanistan, Parwan, Tob Darreh, 3 km SW Charikar, 24. 8. 1969, *Wendelbo 7369*, cultivated in Göteborg Botanic Garden (GB).

Median primary leaflet ovate-oblong, pinnate, with ternatisect secondary leaflets which are cut into several overlapping lobules, very unequal in size. Racemes 6–10(–14)-flowered. Corolla pure white; spur of upper petal 23–26 mm. – $2n = 32$ (type). Self-incompatible.

Salang pass area (N of Kabul).

***Corydalis aitchisonii* subsp. *kamelinii* (Kurbanov) Lidén, comb. & stat. nov.**

≡ *C. kamelinii* Kurbanov in Bot. Žurn. (Moscow & Leningrad) 70: 837. 1985. – Holotypus: Turkmenistan, Kjurendag, Kizilrvat, 28.3.1984, *Kamelin & Kurbanov* (LE).

***Corydalis chionophila* subsp. *firouzii* (Wendelbo) Lidén, comb. & stat. nov.**

≡ *C. firouzii* Wendelbo in Iranian J. Bot. 1: 61. 1976. – Holotype: Iran, Semnan, Kuh-e Ghatri, south side, 2200 m, on broad ledges of limestone rock near melting snow, 3.5.1974, *Wendelbo, Foroughi, Sanii & Shirdelpur 11162* (TARI; isotypi: E, GB, W).

***Corydalis chionophila* subsp. *parviflora* Lidén, subsp. nova**

[= *C. ledebouriana* sensu Wendelbo in Fl. Iran. 110: 61. 1976 p.p., incl. col. pl.].

Planta humilis, valde glauca. Folia duo, parva, vulgo subopposita; folium inferius integrum vel ternatisectum; folium superius ternatum, foliolis ovatis usque obovatis obtusis. Racemus laxus,

5–13-florus. Bracteae pedicellos aequantes. Corolla parva (18 mm longa), rosea (?), subacuta, anguste alata.

Holotypus: Afghanistan, Baghlan, N side of Salang pass, stony S-exposed slopes, *Hedge & Wendelbo 7548* (GB; isotypus: E).

Small, 2–10 cm, glaucous and fleshy. Leaves small, often subopposite; the lower one entire or ternate with fleshy ovate to obovate segments; the upper ternate with usually entire segments. Racemes 5–13-flowered. Bracts elliptic, equalling the pedicels, which are 10–20 mm long. Petals white to pale pink with reddish-purple keels, subacute to subobtusate at apex, rather narrowly winged; spur of upper petal 10 mm; inner petals 8 mm long. Fruit smaller and with fewer seeds than in subsp. *chionophila*.

NE Afghanistan, known from four collections only.

***Corydalis lydica* Lidén, sp. nova**

A *C. erdelii* petalis exterioribus alatis, a *C. oppositifolia* et *C. nariniana* stigmatibus diverso distinguitur. Planta valde glauca caule erecto 5–10 cm longo. Folia ternata foliolis primariis centralibus ternatis, lateralibus integris, segmentis late ellipticis. Racemus 8–10-florus densiusculus. Pedicelli 10–35 mm longi, bracteas aequantes vel superantes. Petala exteriora eburnea late alata obtusa; petalum superius calcari obtuso plus minusve stricto 13–15 mm longo; petala interiora 10 mm longa. Stigma latum quadratum pari singulari papillarum geminatarum lateralium.

Holotypus: Anatolia, Boz Dag, 1700–1800 m, 24.4.1991, J. & K. Persson 91–66, cultivated in Göteborg Botanic Garden (GB; isotypus: B).

Glaucous with stiff erect stems 5–10 cm high. Leaves ternate with the central leaflet again ternate, lateral leaflets entire or more or less deeply cleft into 2–3 lobes, petiolules short; leaf-lobes broadly elliptic. Racemes 8–11-flowered, dense (rather lax in cultivation). Pedicels 10–35 mm, equalling or longer than bracts. Flowers creamy white, turning pinkish with age, rather broadly winged, obtuse; spur 11–13 mm; inner petals 10 mm. Stigma broad, squarish, with a single pair of distinct geminate papillae. Capsules ovoid, 15–20 × 5–7 mm, 6–10-seeded, born on long recurved pedicels. Seeds smooth, 2.5 mm, with large elaiosomes. – 2n = 16 (type). Self-incompatible.

Mountains of W Anatolia (Kütahya, Izmir), known from three localities only.

Like *C. nariniana* and *C. erdelii* in the stigma, and *C. oppositifolia* and *C. nariniana* in the distinct margin of the outer petals. The compact growth, the long stiff pedicels and the usually creamy white corolla render it a distinct habit.

***Corydalis verticillaris* subsp. *parviflora* Lidén, subsp. nova**

A subsp. *verticillari* et subsp. *boissieri* floribus multo minoribus statim dignoscenda.

Holotypus: Iran, Kermanshah, Kerend, 16. 4. 1951, *Sharif 6554-E* (GB).

Like subsp. *verticillaris* but racemes 7–11-flowered; pedicels 10–15 mm (to 35 mm in fruit), flowers very small, spur 8–9 mm, inner petals 7–8 mm. Immature capsules with 1–2 seeds.

Iran: S Zagros mountains.

An imperfectly known taxon, only collected twice.

***Corydalis seisumsiana* Lidén, sp. nova**

[= *C. persica* auct. ross., non Cham. & Schlechtend.]

Caulis suberectus 5–10(–15) cm longus. Folia glauca bi-(tri-)ternata raro bipinnatisecta foliolis late ovatis incisibilibus lobis imbricatis late obovatis obtusis. Racemus erectus 5–10-florus laxiusculus. Bracteae parvae pedicellis 5–10(–20) mm longis breviores. Flos albus usque purpureus petalo inferiore apice atropurpureo; calcar petali superioris 13–19 mm longum attenuatum; petala interiora 9–10 mm longa. Capsula ovoidea ad ellipsoidea, 3–8-sperma. Semina parva.

Holotypus: Nakhichevan, Zangezur range, A. *Seisums s.n.*, cultivated in Göteborg Botanic Garden (GB; isotypus: B).

Stem 5–10(–15) cm long, suberect. Leaves glaucous, bi-(tri-)ternate or sometimes bipinnatisect (i.e. with small lateral primary leaflets). Leaflets broadly ovate, incised into broadly obovate partly overlapping lobules that are rounded or mucronate at apex. Raceme erect, 5–10-flowered. Bracts rather small, rhombic-ovate, entire or rarely slightly divided. Pedicels 5–10(–20) mm. Flowers purple to creamy white with darker markings towards the apex, resembling those of *C. darwasica*, due to the blackish purple colouring of the apical part of the lower petal, and the narrow dorsal crests of the outer petals; spur slender, tapering, 13–19 mm; inner petals 9–10 mm. Fruit ovoid to ellipsoid, 15–19 mm long, including a very short beak and a 1 mm long style, 3–8-seeded. Seeds rather small, c. 2 mm, with a large flat, obovate elaiosome. – $2n = 16$ (type). Self-incompatible.

Nakhichevan. S-facing rocky slopes, 1500–2200 m.

Closely related to *C. verticillaris* but readily distinguished by the shorter spur, the more unequally cut leaves, and the prominent purple blotch on the lower petal. It has the crests of the outer petals in common with *C. nariniana*, but is easily told from that species by the more divided leaves, the thin spur and the coloration of the lower petal.

(4) *Corydalis* sect. *Dactylotuber*

Species with fleshy geotropic pedicels are treated as subsection *Benecinctae*, whereas the subsection *Dactylotuber* comprises those with erect pedicels and explosively dehiscent capsules, including about half of the species previously placed in subsection *Benecinctae* by Fedde.

Sect. *Dactylotuber* subsect. *Benecinctae* (Fedde) Lidén, **comb. nova**

≡ *C.* [unranked] *Benecinctae* Fedde in Repert. Spec. Nov. Regni Veg. 25: 221. 1928 ≡ *C.* sect. *Eucorydalis* subsect. *Benecinctae* (Fedde) Fedde in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 17b: 134. 1936 ≡ *C.* sect. *Benecinctae* (Fedde) C.Y. Wu & Z.Y. Su in Acta Bot. Yunann. 4: 1. 1982. – Typus: *C. benecincta* W. W. Smith

Corydalis tianzhuensis subsp. *bullata* Lidén, **subsp. nova**

A subsp. *tianzhuensi* petalo inferiore plus minusve gibboso stigmatibus sine papillis lateralibus differt.

Holotypus: SE Tibet, Kam, Yang-tse basin, banks of small river Go-rin-chou, 14 000 feet, 17.5. 1901, *Ladigin* 50 (LE).

Differs from subsp. *tianzhuensis* by the slightly longer style, stigma without lateral papillae, a usually strongly gibbous lower petal, and often a more slender and sigmoidally curved spur. – $2n = 16$ (*KGB* 331). Self-compatible.

SE Tibet to Bhutan and NW Yunnan, Kashmir. 4000–5800 m. Snowledges.

Corydalis gyrophylla Lidén, **sp. nova**

A consectionibus foliis biternatis petalis exterioris late alatis longe distat.

Caulis ramosus. Folia petiolata laminis triangularibus biternatis foliolis sessilibus rotundatis carnis integris vel parce bipartitis subtus valde glaucis. Racemus corymbosus, 2–3-florus. Pedicelli floriferi 10 mm longi. Corolla verosimiliter purpurea non vel parce cristata; petala exteriora late alata, emarginata; calcar petali superioris strictum 10 mm longum; petala interiora 6–7 mm longa.

Holotypus: NW Sichuan, Dege, 4500 m, 18.6.1991, *Yang Jin-Zen* 91–362 (KUN).

Tuber rounded with a crown of scales on top. Stem about 10 cm long, without or perhaps with ephemeral scaleleaves, with three leaves (on the main stem), all with axillary branches. Leaves fleshy and glaucous, especially below, long-stalked with small ovate lamina twice cut into threes. Leaflets crowded, subsessile, almost orbicular, entire or slightly lobed. Peduncle 3 cm. Raceme corymbose, 2–3-flowered. Bracts ovate, 3–4 mm long. Pedicels thin, 10 mm long,

probably straight in fruit. Sepals 1 mm, shallowly dentate. Corolla apparently purple; outer petals without or with very narrow crest, rather broadly winged apically; spur of upper petal straight or slightly curved downwards, gradually attenuate towards the tip; lower petal with a cornute basal appendage and broad shallow pouch, distally widened into a shallowly emarginate limb 7–8 mm broad; inner petals 6–7 mm, with short claw. Nectary a little more than half as long as the spur. Stigma obtriangular like in *C. tianzhuensis*, but with both pairs of geminate papillae present. Fruit unknown.

Only known from the type collection.

A rather isolated species, easily recognized by the leaves and the comparatively broad outer petals.

Corydalis benecincta* subsp. *trilobipetala* (Hand.-Mazz.) Lidén, **comb. & stat. nov.*

≡ *C. trilobipetala* Hand.-Mazz. in Anz. Akad. Wiss. Wien, Math. Naturwiss. Kl. 60: 114. 1923. – Holotypus: Sichuan, Sagani über Muli, 4525 m, 30.7.1915, humöse Stellen auf Kalk, *Handel-Mazzetti 7339* (W, n.v.).

Corydalis geocarpa* H. Smith ex Lidén, **sp. nova*

Caulis ramosus foliatus foliis vaginatis pinnatisectis laminis ovato-oblongis. Foliola profunde divisa lobis rotundatis. Racemi terminales et axillares, laxi, 2–9-flori. Bractae petiolatae plus minusve profunde incisae segmentis obovatis vel lanceolatis acutis. Pedicelli 10–35 mm longi, fructiferi reflexi geotropi. Corolla ecristata calcari brevi conico obtuso; petala exteriora trilobata. Capsulae breves late ellipsoideae non explodentes.

Holotypus: Sichuan, Tatsienlu, Ta-pao shan, 4500 m, 20.8.1934, in fissuris terrosis rupium, *H. Smith 11282* (UPS; isotypus: S).

Tuber unknown. Related to *C. benecincta*, but with a very different appearance. Stems 7–11 cm long, much-branched, with several pinnately divided leaves. Lamina ovate-oblong in outline with 2 pairs of pinnae; pedicels broadly sheathing at base. Leaflets deeply cut into rounded obtuse segments. Racemes terminal and often axillary from the uppermost leaf(ves), lax, 2–9-flowered. Bracts stalked, deeply divided into obovate to oblanceolate acute lobes, or the upper entire. Pedicels as in *C. benecincta*, 10–35 mm. Sepals 2 mm, dentate. Corolla ecristate with a short (6 mm) broad-based tapering spur; outer petals distinctly 3-lobed. Fruit as in *C. benecincta*, 4–8-seeded.

Only known from the type collection.

Non-tuberous taxa:

Corydalis caseana* subsp. *aquae-gelidae* (M. Peck & W.C. Wilson) Zetterlund & Lidén, **comb. & stat. nov.*

≡ *C. aquae-gelidae* M. Peck & W.C. Wilson in Leafl. W. Bot. 8: 39. 1956. – Holotypus: USA, Oregon, Clackamas Co., junction of Clackamas river with Colliwash river, 30. 7. 1955, *W. C. Wilson* (WILLU 28829).

C. caseana is not a tuberous species, but belongs in *C. sect. Archaeacpnos* Popov, which comprises a few E Asian and NW American species. They are included in our forthcoming monograph (Lidén & Zetterlund 1997) because of their ornamental values.

References

- Fukuhara, T. & Lidén, M. 1995: Seed-coat anatomy in *Fumariaceae-Fumarioideae*. – Bot. J. Linn. Soc. **119**: 323–365.
 Lidén, M. 1989: Tuberous *Corydalis* in the Med-Checklist area. – Notes Roy. Bot. Gard. Edinburgh

- 45:** 349–363.
- 1991: New tuberous species of *Corydalis* (*Papaveraceae*). – Willdenowia **21**: 175–179.
 - & Zetterlund, H. 1997: *Corydalis*, a gardeners guide and a monograph of the tuberous species. – Alpine garden society, Woking (in press).
 - Fukuhara, T., & Axberg, T. 1995: Phylogeny of *Corydalis*, ITS and morphology. – Pl. Syst. Evol. Suppl. **9**: 183–188.
 - Oh, B. U. 1988: The taxonomic characters of Korean *Corydalis* (*Fumariaceae*) and their significance in phylogenetic consideration. – Korean J. Pl. Taxon. **18**: 33–51.
 - Su Z.-Y. & Lidén, M. 1996: *Corydalis* in China I: Some new species. – Edinburgh J. Bot. (in press).
 - Wendelbo, P. 1974: *Fumariaceae*. – In: Rechinger, K. H. (ed.), Flora iranica **110**. – Graz.

Address of the author:

Magnus Lidén, Department of Systematic Botany, University of Göteborg, Carl Skottsbergs Gata 22b, S-41319 Göteborg, Sweden.