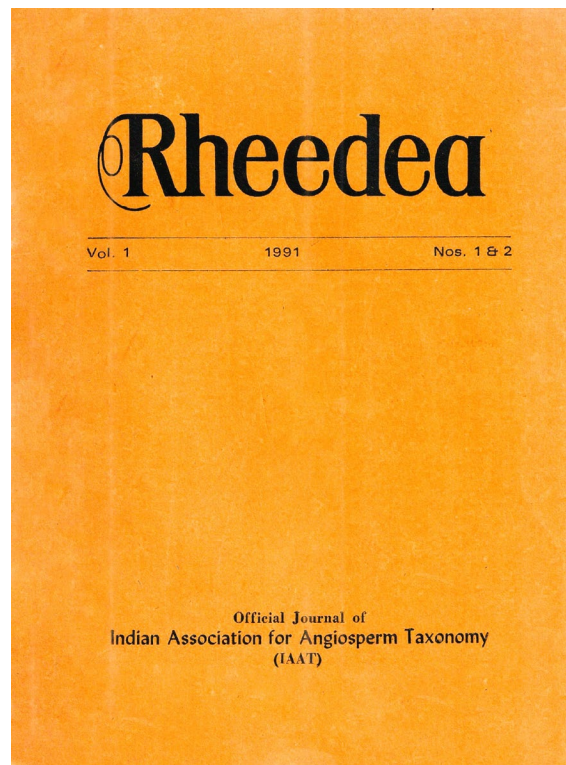




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**A Revision of *Corydalis* sect. *Fumarioides*
sect. nov., part I**

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Abstract

Corydalis sect. *Fumarioides* is described and a brief synopsis of the section is provided. It comprises about 20 species belonging to two subsections. They are distributed mainly in the Sino-Himalayan area. Six new species are described, viz. *C. yui*, *C. gouldii*, *C. rubrisepala*, *C. khasiana*, *C. aconitiflora*, and *C. pseudodrakeana*.

INTRODUCTION

Corydalis sect. *Fumarioides* is a very distinct and easily recognized section which has previously been included in *Ramoso-Sibiricae*. In the absence of any clear evidence for a relation between the *C. sibirica* group (here: sect. *Fumarioides*) and the *C. vaginans* ("ramosa") group (sect. *Ramoso-sibiricae*), the former is here described as a new section. In a recent study, the Nepalese taxa, previously lumped together in *C. longipes*, turned out to be four vicariant species (Liden 1989). Additional new species have also been discovered further east in Tibet, China, Burma, Bhutan, and India.

The first part of this revision presents a systematic synopsis of the section, a key to the species, and formal descriptions of the new taxa. Complete description, illustrations, specimen lists, and distribution maps will be given in the second part.

Systematic synopsis

Annual to perennial, usually glabrous herbs, remescent of the broad-leaved *Fumaria* in habit. Leaves alternate, usually ternately divided, lower ones long-stalked, upper ones smaller, less divided, and with shorter stalks. Racemes usually lax, many-flowered with usually divided bracts. Flowers small to medium-sized, yellow, rarely white, usually crested. Capsule linear, oblong or obovoid with a sharply set off style, explosively dehiscent. Stigma lacking basal papillae. Apical stigmatic papillae usually more or less stipitate or at least constricted at base. Seeds black, usually smooth (tuberculate in the series *Tuberculatae*). Elaiosomes short and broad (except in *C. lathyroides*) with short aril at base. 21–23 species.

The section falls naturally into two well-defined subsections. The subsection *Radiciosa* is a small group of perennial species confined to East Himalaya and

SE Tibet. It can be recognized by the thick perennial rootstock. The basal part of the stem seems to be partly subterranean or somewhat stolon-like in function and carries only scales or small petiole-remnants. Leaves, stems and capsules are usually papillose on the veins. The stigma lacks the geminate papillae that are present in the subsection *Fumarioides*, but has simple marginal papillae present also on the lateral sides (in subsect. *Fumarioides*, these are all apical).

The subsection *Fumarioides* comprises 18 species, distributed from Kashmir through the Himalayas, West China and East Tibet to Siberia. Two isolated endemic outliers are found in the Khasia hills in East India and on Mount Victoria in Central Burma. The subsection is easily distinguished by the small flowers and the peculiar stigma which is devoid of basal lobes and lateral simple papillae, but has four (rarely six) stipitate apical papillae. Many species seem to be annual, but some are probably perennial. In foliage and habit they are rather like the broad-leaved fumitories from the Mediterranean area. Most of the species are strictly vicariant, but *C. casimiriana* and *gracillima* are more wide spread. They have vicariant distributions but are partly sympatric with several of the other species. *C. changuensis* might be of hybrid origin from a cross between *C. pseudolongipes* and *gracillima*, both of which occur at the type locality.

List of taxa: New taxa in italics.

Corydalis sect. *Fumarioides* Liden

subsect. *Radiciosa* Liden

C. crispa Prain (syn: *C. stracheyoides* Fedde; *C. bowes-lyonii* D. G. Long; *C. papillipes* C. Y. Wu)

C. drepanantha D. G. Long

C. cavi D. G. Long

(*C. pseudothyrsiflora* C. Y. Wu & T. Y. Shu, not studied)

(*C. pubescens* C. Y. Wu & H. Chugn, not studied)

subsect. *Fumarioides*

series *Fumarioides*

C. sibirica (L. f.) Pers.

C. impatiens DC.

C. pseudoimpatiens Fedde

series *Tuberculatae* Liden

C. tongolensis Prain

C. yui Liden

series *Himalayanae* Liden

C. filiformis Royle (*C. longipes* sensu Jafri 1974)

C. calycina Liden

C. longipes DC.

C. pseudolongipes Liden (*C. longipes* sensu Long 1984)

C. gouldii Liden

C. changuensis D. G. Long

C. casimiriana Duthie ex Prain (syn:

C. stewartii Fedde, non *C. stewartii* sensu Jafri 1974)

C. gracillima C. Y. Wu (*C. gracilis* Franchet, non Ledebour; *C. casimiriana* "eastern type" in Liden 1989)

C. rubrisepala Liden

C. khasiana Liden

C. aconitiflora Liden

series *Pinnata* Liden

C. lathyroides Prain (syn: *C. brevicarata* Lublow)

series *Angustiflorae* Liden

C. pseudodrakeana Liden

Key to the species:

1. Perennials with stout rootstock, usually papillose on veins; stigma lacking submarginal geminate papillae, but with simple lateral marginal papillae present (subsect. *Radiciosa*) 2

1. Annuals or perennials with slender taproots; stigma with a pair of geminate papillae present, marginal papillae all apical (subsect. *Fumarioides*).....4
2. Ultimate leaf lobes lanceolate-acute; bracts much divided; fruits obovoid; stigma with 4 papillae.....**drepanantha**
2. Ultimate leaflobes obovate-obtuse; upper bracts entire; fruit oblong or linear, stigma with 6 papillae.....3
3. Crest of upper petal broad, entire, truncate at apex; spur shorter than limb.....**cavei**
3. Crest of upper petal often irregularly sinuose; spur equalling or usually longer than limb.....**crispa**
4. Leaves oblong, simply pinnate; seeds very small with prominent elaiosomes.....**lathyroides**
4. Leaves triangular to triangular-ovate, much divided; seeds with short inconspicuous elaiosomes.....5
5. Seeds tuberculate (series *tuberculatae*).....6
5. Seeds smooth.....7
6. Crest of outer petals entire; sepals less than 1 mm, deeply divided in 2-5 lobes.....**tongolensis**
6. Crest of upper petal irregularly sinuate - dentate; sepals 1.5-2 mm, fimbriate.....**yui**
7. Flowers very small with spur shorter than limb; crest of lower petal short and broad, often overtopping the apex (series *Fumarioides*, China and Siberia).....8
7. Flowers about 10 mm with spur equalling or longer than claw; crest of lower petal narrow or absent (Himalaya and SW China).....10
8. Lower petal without a pouch; fruit oblong.....6
8. Lower petal with a distinct pouch; fruit obovoid.....**sibirica**
9. Bracts small, but much divided; lofty plants with stems 30-80 cm, branched above; capsule (excluding style) c. 8 × 1 mm (W China).....**pseudoimpatiens**
9. Middle and upper bracts entire; diffuse much-branched plants 10-40 cm; capsule 10-12 × 1.5(-2) mm (Siberia).....**impatiens**
10. Pedicels 5-20 mm long; upper petal with a distinct crest (series *Himalayanae*).....11
10. Pedicels 3-4 mm long; outer petals almost ecristate; spur very narrow.....**pseudodrakeana**
11. Nectarium almost half as long as spur, and partly fused to it.....12
11. Nectarium less than one fourth as long as spur, not or very shortly fused to it.....19
12. Lower petal with a distinct gibbosity or a short spur at base.....13
12. Lower petal straight, not gibbous at base.....16
13. Sepals orbicular, 2-3 mm, deeply dentate.....14
13. Sepals 0.5-1.5 mm long or less.....15
14. Outer petals with a minute black dot at the very apex; stigma with four apical papillae.....**rubrisepala**
14. Outer petals not black-tipped; stigma with six apical papillae, the outer ones very short.....**filiformis**
15. Lower petal with a small but prominent spur at base; sepals minute (Sikkim).....**changuensis**
15. Lower petal saccate at base, but not in a spur-like fashion; sepals 1-1.5 mm (Khasia hills).....**khasiana**
16. Sepals 2-3 mm, deeply dentate to fimbriate.....17

16. Sepals minute.....18
17. Sepals ovate, fimbriate - dentate; lower petal narrowly crested; inner petals tipped black-purple (Bhutan)**gouldii**
17. Sepals orbicular, deeply and regularly dentate; lower petal devoid of crest; inner petals pale at tip (W Nepal)**calycina**
18. Fruit linear, uniseriate, 12-15 mm long (W Himalaya)**casimiriana**
18. Fruit narrowly obovoid, uni-to biseriate, 6-10 mm long (E Himalaya, China).....**gracillima**
19. Outer petals acute; inner petals tipped with blackish purple; stigma with 4 apical papillae.....20
19. Outer petals acuminate; inner petals pale at tip; stigma with six prominent apical papillae.....**longipes**
20. Most or all bracts divided; lower petal 5-6 mm; seeds 1.2 mm in diameter**pseudolongipes**
20. Bracts entire; lower petal 8 mm long; seeds 1.8 mm in diameter... ..**aconitiflora**

Corydalis sect. **Fumarioides** Liden sect. nov.

Herbae annuae vel perennes. Caules plures foliati ± ramosi debiles. Folia alterna, saepe bi vel tri-ternata, interdum subbipinnata vel (in *C. lathyroides*) pinnata. Flores parvi vel mediocres, lutei, raro albi. Nectarium breve obtusum. Stigma sine papillis basalibus, papillis apicalibus stipitatis.

Typus: *C. sibirica* (L.) DC.

subsection **Radicosa** Liden subsect. nov.

Radix perennis crassa. Caules, folia et capsulae saepe papilloso. Flores mediocres. Stigma sine papillis geminatis, sed cum papillis simplicibus lateribus. Typus: *C. crispa* Prain.

series **Angustiflorae** Liden ser. nov.

Floribus angustis pedicellis brevibus recurvatis capsulis linearibus distinguenda. Typus: *C. pseudodrakeana* Liden.

series **Himalayanae** Liden ser. nov.

A serie *Fumarioides* differt floribus majoribus cristis petalorum angustioribus non dentatis et non petalis superantibus. Typus: *C. longipes* DC.

series **Pinnata** Liden ser. nov.

Foliis regulariter pinnatis foliolis brevibus integris vel leviter divisis seminibus minimis carunculis conspicuis a sectionibus diversa. Typus: *C. lathyroides* Prain.

series **Tuberculata** Liden ser. nov.

Seminibus tuberculatis a serie *Fumarioides* distinguitur. Type: *C. tongolensis* Franchet.

Corydalis pseudodrakeana Liden sp. nov.

Radix ignota. Folia longe petiolata, ambitu triangularia, triternatisecta. Racemi laxi, 10-flori. Bractee parvae, integrae vel basin racemi parce divisae. Pedicelli brevi, plus minusve recurvati. Sepala minuta. Corolla flava, anguste cristata, calcari angusto. Capsula linearis, plurisperma.

Typus: SE Tibet, Kongbo province, valley above Tripe, 29° 37'N, 94° 56'E, 10000 feet, 20/7 1938, in deep shade of "Q. ilex" forest, perianth segments yellow with median green area and green at apex. *Ludlow, Sherriff & Taylor* 5401, (BM).

Basal parts unknown. Stems slender but rather straight. Leaves long-stalked, sheathing at base. Lamina triangular, three to four times ternatisect (or sub bipinnate

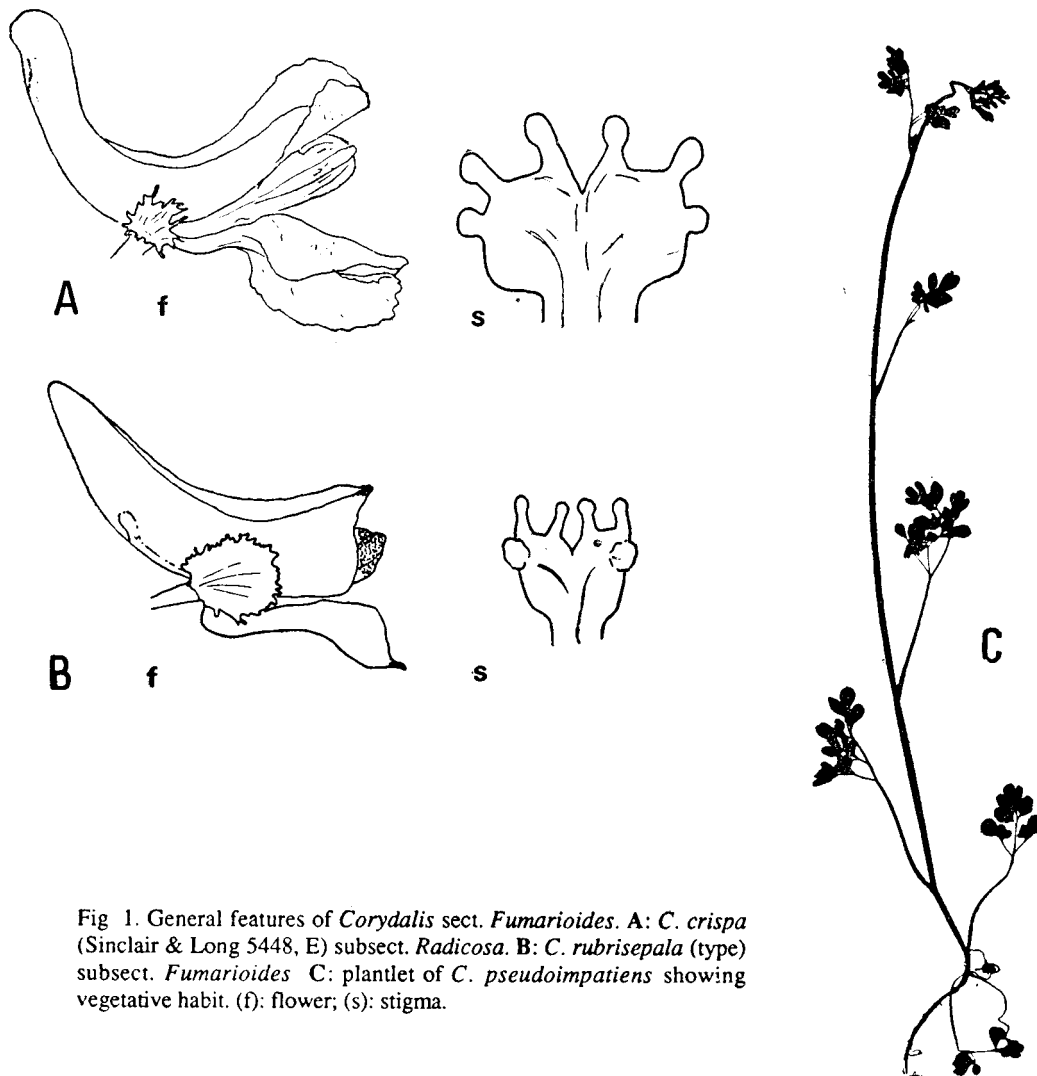


Fig 1. General features of *Corydalis* sect. *Fumarioides*. A: *C. crispera* (Sinclair & Long 5448, E) subsect. *Radicosa*. B: *C. rubrisepala* (type) subsect. *Fumarioides*. C: plantlet of *C. pseudoimpatiens* showing vegetative habit. (f): flower; (s): stigma.

with 3 pinnae, 1-3 pinnulae and ternatisect leaflets); ultimate leaflets entire to deeply divided into 2-4 obovate lobes. Racemes long and lax, \pm secund, ca 10-flowered. Bracts entire, small, or the lowermost dentate or divided, \pm papillose on the veins beneath. Pedicels recurved in fruit, very short, 3-4 mm. Sepals minute. Corolla almost ecristate, yellow with greenish markings, 12-13 mm long including a narrow spur 7-8 mm long.

Fruits linear, 11-13-seeded, $14-16 \times 15$ mm long. Mature seeds unknown.

Only known from the type specimen. The region by the great bend of the Tsangpo river is extremely rich in restricted endemics, including several species of *Corydalis*.

This species bears a superficial resemblance to *C. drakeana* Prain (syn: *C. eccer-*

mocarpa W. W. Smith) in the narrow and lax inflorescence, small entire bracts, and short recurved pedicels.

***Corydalis gouldii* Liden sp. nov.**

Corydalis casimiriana similis, sed bracteis profunde divisis pedicellis longioribus sepalis multo majoribus fimbriatis facile distinguitur. Caules ramosi, debiles. Racemi 5-10-flori. Sepala $2.5 \times 1.5-2$ mm, profunde fimbriato-dentata. Petalum superius 11-12 mm calcar 6 mm longa. Nectarium calcar connatum, c. 3 mm longum. Petalum inferius anguste cristatum. Petala interiora apicem versus nigro-purpurea. Stigma cum quattuor papillis stipitatis. Capsula verosimiliter obovoidea. Semina ignota.

Typus: Bhutan, Timphu district(?), Tsaliinake to Pumdla, 7700-12000 feet, 8/7 1938, *Gould* 922 (K holo).

Only known from the type specimen.

***Corydalis rubrisepala* Liden sp. nov.**

Corydalis calycina similis sed sepalis rubris petalo inferiore gibboso et petalis interioribus apicem nigropurpureis bene differt.

Caules debiles, ramosi. Racemi 3-8-flori. Bracteae parvae, divisae vel raro integrae. Pedicelli fructiferi 5-15 mm longi. Sepala rubra, magna, 2.5×2 mm, circumcirca dentata. Petalum superius 11 mm longum, anguste alatum, breviter nigro-apiculatum. Nectarium c. 3 mm longum, calcar connatum. Petala interiora 6 mm longa, apicem versus nigropurpurea. Petalum inferius gibbosum, 7 mm longum. Nectarium 3 mm longum, calcar connatum. Stigma cum quattuor papillis stipitatis. Capsula obovoidea, ca 15 - sperma, $7-8 \times 2$ mm. Semina nitida, 1.1 mm longa.

Typus: East Himalaya, Assam, Ze La, 14000 feet, 22/8 1922, "slopes among

dwarf Rhododendrons, bright yellow, calyx red", *Kingdon-Ward* 14138 (BM-holo).

Similar to the Nepalese endemic *C. calycina*, but easily distinguished by the red sepals, the gibbous lower petal, the black-purple apices to the inner petals, and the black tips on the outer petals.

***Corydalis khasiana* Liden sp. nov.**

Corydalis filiformis similis. Caules debiles. amosi. Folia triternatisecta, subtus, glauca, lobis ultimis obovato-acutis. Bracteae profunde divisae. Racemi 5-10-flori. Pedicelli fructiferi 7-14 mm longi. Sepala 1.5-2 mm, dentata. Petalum superius 11-13 mm calcar 7 mm. Petala interiora 7 mm longa, apicem versus nigro-purpurea. Petalum inferius basin versus gibbosum, 7-8 mm longum. Nectarium 3 mm longum, calcar connatum. Stigma cum quattuor papillis stipitatis. Capsula obovoidea, plurisperma. Semina nitida, 1.3 mm longa.

Typus: India, Khasia hills, Shilong, *Hooker f. & Thomson* s. n. (K holo; E, S, UPS). Rather similar to *C. filiformis* but a slightly more robust plant, lower leaves more divided and more glaucous beneath, bracts more divided, racemes 5-10-flowered, sepals smaller, seeds larger, and stigma with only four papillae.

India, Khasia hills.

***Corydalis aconitiflora* Liden sp. nov.**

Caules ramosi effusi, longissimi. Racemi laxi, 7-10-flori. Bracteae parvae, 4 mm longae, clavatae, integrae vel raro apicem versus parce dentate. Pedicelli 10-20 mm longi. Corolla aurantiaca, calcar apicem versus pallide purpureo-lilacina, petalorum interiorum apicem versus nigropurpureis. Petalum superius latum, cristatum, calcar brevi obtusi 5-6 mm longi.

Petalum inferius basin versus gibbosum, 9 mm longum. Nectarium breve, calcar, non connatum. Capsula obovoidea, 7.5-9 × 3-3.5 mm 7 - 9-sperma. Semina 1.8 mm, nitida.

Typus: Burma, Mt Victoria, turf slopes 8500 - 9500 feet, "a weak straggling plant, often more or less prostrate, flowers orange" *Kingdon-Ward* 22798 (GB holo; BM iso).

Corydalis yui Liden sp. nov.

Arcte affinis *C. tongolensis* sed sepalis majoribus profunde inciso-fimbriatis cri-

stis et alis petalorum exterioribus angustioribus repando-dentatis differt.

Type: Sichuan, Muli, Kulu, margin of thickets, 3200 m., flowers yellow, 18 Sept. 1937, *T. T. Yu* 14304 (E holo).

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