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A New Species of *Corydalis* DC. (Fumariaceae) from Kashmir, North-west Himalaya, India

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ABSTRACT: While revising the genus *Corydalis* (Fumariaceae) occurring in the Kashmir Himalaya, *Corydalis amarnathiana* Dar, Semi & Naqshi is described and illustrated as a new species. This new species is allied to *C. thyrsiflora* Prain and *C. pakistanica* Jafri, but can be easily differentiated from them in having only one (shorter and less robust) stem; lower cauline leaves with petioles basally sheathing to half their length, upper cauline leaves forming a whorl; and racemes short and only 5-15(-18)-flowered. It also resembles *C. shakyae* Lidén in stem characters, but can be easily distinguished from it by the presence of 2-3-pinnatisect leaves, smaller and broader ultimate leaf-segments, and 12-14 mm long flowers.

KEY WORDS: *Corydalis*, *Corydalis amarnathiana*, Fumariaceae, India, Kashmir, North-west Himalaya.

INTRODUCTION

The genus *Corydalis* DC. is popularly placed in family Fumariaceae (Cronquist, 1981). Based on the evidence of morphology and nucleotide sequence data, many modern workers, however, consider Fumariaceae as one of the several subfamilies under the broadly-circumscribed, monophyletic poppy family (Papaveraceae *s. l.*) (for example, see Kadereit, 1993; Kadereit et al., 1994, 1995, 1997; Judd et al., 2002).

Corydalis is distributed mainly in temperate regions of the Northern Hemisphere, mostly Eurasia; with one species in the subarctic Russia and North America, one species in the mountains of eastern Africa, and 3 species in the subtropical Indo-China. A highly diverse genus, with ca. 400 species the world over (Mabberley, 1997), *Corydalis* is one of the larger genera in India, being represented in the country by 53 species (Ellis and Balakrishnan, 1993). Most of the *Corydalis* species in India occur in alpine and subalpine ranges of the Himalaya, constituting an important component of the Himalayan angiosperm flora.

Our recent studies on *Corydalis* in the Kashmir Himalaya revealed 31 species, including *C. amarnathiana*, described as new hereunder. This species is based on the study of specimens collected recently from Amarnath area in the Kashmir Valley. These specimens did not exactly resemble those of any of the known species of *Corydalis*, as ascertained by the study of all material of the genus present in the herbarium of Kashmir University (KASH), and by the scrutiny of relevant literature (Hooker and Thomson, 1855; Hooker, 1872; Blatter, 1927; Coventry, 1927; Mowat and Chater, 1964; Stewart, 1972; Jafri, 1974; Dhar and Kachroo, 1983; Polunin and Stainton, 1984; Ellis and Balakrishnan, 1993; Majumdar, 2002; Zhang et al., 2008).

TAXONOMIC TREATMENT

Corydalis amarnathiana Dar, Semi & Naqshi, *sp. nov*.
Figs. 1 & 2

Corydalis thyrsiflorae Prain *et Corydalis pakistanicae Jafri affinis, sed caulibus tantum unis (curtioribus et sine robustis); petiolis infra caulifoliorum ad basaliodimidia vaginatis; supra foliis caulinarum verticillatis; racemis curtis, 5-15(-18)-floriferis differt et Corydalis shakyae Liden affinis, sed foliis 2-3-pinnatisectis; ultimofoliosegmentis brevioribus & latioribus et floribus 12-14 mm longis differt.*

Type specimen: India: North-west Himalaya, Kashmir, Sind Valley, near Amarnath shrine, below glacier on the mountain slope, 3,500 m, 02 Aug. 2003, *Semi* 064 (holotype: KASH).

Perennial ascending herb, up to 35 cm high; stem one from the base, branching above; branches arising from the upper whorl of leaves on stem, pale – green. Radical leaves early withering. Lower cauline leaves alternate, up to 25 cm long, long-petioled; petioles up to 15 cm long, basally broadened and sheathing to about half their length; lamina 2-3-pinnatisect; primary pinnae 1-2 pairs

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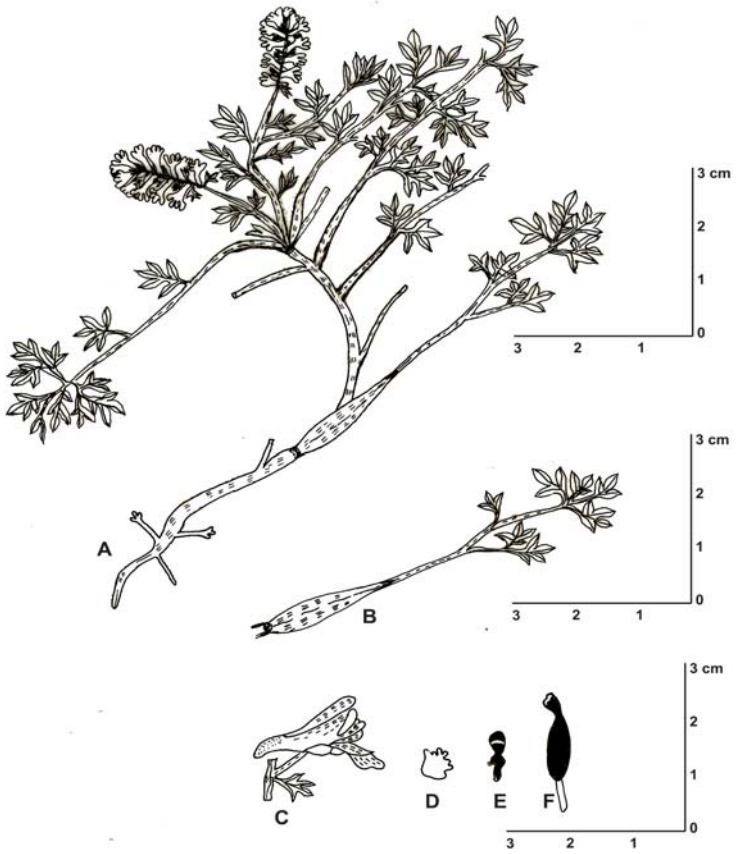


Fig. 1. *Corydalis amarnathiana sp. nov*. A: Habit. B: Lower cauline leaf. C: Flower. D: Sepal. E: Inner petal with winged margin. F: Capsule. (Drawn from the *holotype*).



Fig. 2. Photograph of *Corydalis amarnathiana sp. nov*.

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Table 1. Comparison of diagnostic characters of *Corydalis amarnathiana* and its closely allied species.

Characters	*C. thyrsiflora* Prain	*C. pakistanica* Jafri	*C. amarnathiana* *sp. nov.*
Habit	15- 60 cm high	20-50 cm high	Upto 35 cm high
Stems	Many from base	Many from base	One from base, branching above
Cauline leaves	Lower ones with petioles 12-14 cm long and slightly sheathing at base; lamina 2-3 pinnatisect, with 5-10 pairs of lateral pinnae; upper leaves alternate to sub-opposite	Lower ones with petioles 4-10 cm long and slightly sheathing at base; lamina 2-3 pinnatisect, with(3-)4-5 pairs of lateral pinnae; upper leaves usually alternate	Lower ones with petioles up to15 cm long and sheathing to half their length at base; lamina 2-3 pinnatisect, with 1-2 pairs of lateral pinnae; upper leaves whorled
Ultimate leaf-segments	(3-)5-10 × 1-3 mm	3-10(-15) × 2-4(-7) mm	3-10 × 1-5 mm
Racemes	Branched, (3-)5-12 cm long, 20-40 flowered	Branched, 3-6(-15) cm long, 15-20 flowered	Simple or branched, ca. 3 cm long, 5-15(-18) flowered
Flower-buds	Not exceeding bracts	Exceeding bracts	Not exceeding bracts
Flowers	11-15 mm long	15-20 mm long	12-14 mm long
Spur	Mostly straight, 5-7 mm long	Usually curved at tip, 7-10 mm long	Slightly curved, 6-8 mm long
Capsule	5-7 × 4 mm, 3-4 seeded	8-10 × 2.5-3 mm, 6-8 seeded	6-7 × 1.5-2 mm, 3-6 seeded
Seed-aril	0.9-1.3 × 0.8-1 mm, pale to brownish-white	0.5-1 × 0.3-0.8 mm, creamy-white	0.5-0.8 × 0.2-0.4 mm, brown

and a terminal one, 3-5-pinnuled, petioluled; ultimate segments linear, elliptic to oblanceolate, 3-10 × 1-5 mm, apex subulate, acute to minutely mucronate. Upper cauline leaves whorled, gradually reduced upwards, similar to lower leaves. Racemes simple or branched, short, ca. 3 cm long, 5-15(-18)-flowered; peduncle 0.5-3 cm long; bracts leafy, dissected, 4-8 mm long; pedicels 2-7 mm long; flower-buds not exceeding the bracts, 4-5 mm long. Flowers irregular, zygomorphic, 12-14 mm long. Sepals 2, in one whorl, polysepalous, opposite, sub-orbicular, apically dentate, small, ca. 1 × 0.9 mm, glabrous, caducous. Petals orange-yellow, 4, biseriate, 2 + 2, dimorphic; upper petal lamina 6-8 mm long, dorsally winged, tip brown-streaked, spurred; spur slender, slightly curved, 6-8 mm long; lower petal concave, sub-saccate at base; inner petals 2, smaller and narrower, oblong, apex rounded, margin winged. Stamens 6, diadelphous, in bundles of 3 each, 6-6.5 mm long; anthers oblong, dimorphic, yellow. Carpels 2, syncarpous; ovary superior, unilocular; style 1, filiform, with 2 united stigmas. Capsules oblong to ellipsoid, 6-7 × 1.5-2 mm, 3-6-seeded. Seeds sub-biseriate, sub-orbicular to rounded, 1-1.5 × 1.5-2 mm, smooth, shiny-black, base depressed, tip sub-rounded, arillate; aril oblong to bi-lobed, 0.5-0.8 × 0.2-0.4 mm, brown; raphae flat, 0.2-0.4 × 0.1-0.3 mm, dark-brown.

Flowering and Fruiting: July-September.

Ecology: Somewhat shady and moist situations along mountain slopes in the alpine zone. Frequency: Infrequent.

Distribution: Presently known only from Sangam to Amarnath area in the Sind Valley of Kashmir, North-west Himalaya, India. Altitude range: 3,300-3,500 m.

Additional specimen studied: KASHMIR: India, North-west Himalaya, Kashmir, Sind Valley, near the start of Sangam (enroute to Amarnath shrine), 3,300 m, 03 Aug. 2003, *Semi* 065 (paratype: KASH).

Etymology: The specific epithet is based on the place name ‘Amarnath’, the famous Hindu shrine in Kashmir, wherefrom the species was first collected.

Taxonomic notes: *Corydalis amarnathiana* is allied to *C. thyrsiflora* Prain and *C. pakistanica* Jafri, but can be differentiated from them usually in having only one (shorter and less robust) stem; lower cauline leaves with petioles basally sheathing to half their length, upper cauline leaves forming a whorl; and racemes short and only 5-15(-18)-flowered. It also resembles *C. shakyae* Liden in stem characteristics, but can easily be distinguished from it by the presence of 2-3-pinnatisect leaves, smaller and broader ultimate leaf-segments, and 12-14 mm long flowers. A comparison of the distinguishing characters *C. amarnathiana* and its closely allied species – *C. thyrsiflora* and *C. pakistanica* is given in Table 1.

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印度喀什米爾西北喜馬拉雅紫堇科紫堇屬植物（*Corydalis*, Fumariaceae）的一個新種

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摘要：本文更新印度喀什米爾喜馬拉雅的紫堇科紫堇屬植物，提出一個新種 *Corydalis amarnathiana* Dar, Semi & Naqshi；並對該種進行描述和繪圖說明。這一新種與 *C. thyrsiflora* Prain 和 *C. pakistanica* Jafri 有差異，其僅具有一個短而不堅硬的莖、下部莖生葉片的葉柄基部具有達半長的鞘、上部莖生葉片成輪生、以及總狀花序僅 5-15(-18)朵花。該種也與 *C. shakyae* Lidén 相似，但可以從該種的葉片僅具有 2-3 個小羽片、尾羽片小且寬，以及花朵長 12-14 mm 來做區別。

關鍵詞：紫堇屬、*Corydalis amarnathiana*、紫堇科、印度、喀什米爾、西北喜馬拉雅。

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