

## REVIEW OF THE GENUS *SOLENA* (CUCURBITACEAE)

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### SUMMARY

The genus *Solena* Lour. is redefined, and its 3 species and 1 subspecies are keyed out and described: *S. amplexicaulis* occurs in S India, *S. heterophylla*, with 2 subspecies is widespread, but does not occur in S India, and *S. umbellata* (Klein ex Willd.) W.J. de Wilde & Duyfjes, *comb. nov.*, occurs in S India and Sri Lanka. The status of *S. heterophylla* subsp. *napaulensis* (Ser.) W.J. de Wilde & Duyfjes, *comb. & stat. nov.* needs further study as this subspecies is very similar to the more widespread subsp. *heterophylla*, but it is distinct by sigmoid thecae. *Solena amplexicaulis* is taxonomically more distinct from the other two species of *Solena*. In southern India *Kedrostis foetidissima* much resembles *Solena* in general habit, especially by the more or less amplexicaul leaves, and therefore it is discussed and keyed out against *Solena*.

**Key words:** Cucurbitaceae, *Solena*, SE Asia.

### INTRODUCTION

In the past the genus *Solena* Lour. was regarded to consist of only one widespread variable species, *S. amplexicaulis* (Lam.) Gandhi, ranging from NE Afghanistan through India and Sri Lanka, eastward to eastern and southern China, and into West Malesia (Jeffrey, 1980b). However, for China (Wu, 1984; Lu & Zhang, 1986; Chen, 1995) a second species, *S. delavayi* (Cogn.) C.Y. Wu, was accepted. Examining *Solena* over its whole area we found that 3 species can be recognised: 1) *S. amplexicaulis* in S India; 2) *S. umbellata* in S India and Sri Lanka; and 3) *S. heterophylla* with two subspecies: subsp. *heterophylla*, variable in general appearance and widely distributed from NE Afghanistan eastward, and subsp. *napaulensis* (synonym *S. delavayi*) in the area of N India, east to China. The latter occurs in mountainous areas; it is likewise variable in general habit and very similar to the type subspecies, but distinct by its obvious sigmoid thecae. According to the above cited Chinese authors, *S. delavayi* is further distinct by being monoecious and by having deeply 5-lobed (not 3-lobed or subentire) leaves, but we doubt whether these additional characters hold true unambiguously. The remaining three *Solena* taxa have straight or curved, never S-shaped, thecae. As the two character states for the thecae, straight or curved versus sigmoid, is a strong argument in the distinction of genera in Cucurbitaceae, it is surprising that, because of the absence of additional characters, one has to admit both character states within one single species *S. heterophylla*. For the sake of convenience we accept the plants with sigmoid thecae as a separate subspecies, subsp. *napaulensis*. This means that within the genus *Solena*, apparently as a unique exception, species occur with straight and

curved thecae, as well as with sigmoid thecae. A comparable exception of a strong genus character, variable within one genus, viz. stamens free versus stamens connate, is known in *Neoalsomitra* (De Wilde & Duyfjes, 2003).

Members of the genus *Solena* are easily recognised in the field by their comparatively short petioles, with the blade more or less embracing the stem. In southern India and Sri Lanka this character has led to incidental confusion of sterile *S. amplexicaulis* and *S. umbellata* with *Kedrostis foetidissima* (synonym *K. rostrata*); all three species superficially look very much alike, because of short-petioled leaves. Furthermore, *Kedrostis foetidissima* and *S. amplexicaulis* both have rather similar beaked fruits. Therefore, *K. foetidissima* is included in the key to the species. The genus *Kedrostis* contains several species in Madagascar and Africa and two species in Asia. The Asian species of *Kedrostis* are distinct from *Solena* e.g. in the male flowers by short filaments, inserted in the throat of the receptacle-tube, by the connective produced beyond the anther-thecae, and the apparent absence of a disc (as it is adnate to the receptacle-tube).

Asian *Kedrostis* can also be confounded with *Corallocarpus*, which differs in having anthers without produced connective, and with fruit opening in an operculate manner, with a ring-shaped seam at base. The fruits of most *Kedrostis* and of *Solena* are indehiscent. The petioles of *Corallocarpus* and *Kedrostis* (except *K. foetidissima*) are comparatively long.

*Solena* is characterised by basally inserted stamens, and a conspicuous glabrous or hairy disc, which is sometimes cup-shaped and deeply lobed, but mostly consists of thickish strap-shaped lobes, at the base of the receptacle-tube in both sexes. These lobes are not to be regarded as pistillode or staminodes, because in female flowers they are present around the base of the style, beside the slightly higher-up inserted small staminodes. In male flowers they are inserted between the stamens and there is no central remnant of a style.

## SOLENA

*Solena* Lour. (1790) 514; Keraudren (1975) 62. — *Melothria* sect. *Solena* (Lour.) Cogn. (1881) 604, p.p.; Pax (1889) 15, p.p.; Cogn. (1916) 104, p.p., for *M. heterophylla*, *M. delavayi* and *M. amplexicaulis* only. — Type: *Solena heterophylla* Lour.

*Karivia* Arn. (1840) 50; (1841) 275; Miq. (1855) 660. — Type: *Karivia amplexicaulis* (Lam.) Arn.

Herbaceous or at base subwoody climbers, 2–6 m tall, with perennial rootstock or tubers; monoecious or dioecious. *Leaves* simple, extremely variable in shape; petiole short, rendering the leaves frequently semi-plexicaul, and with the basal lobes often overlapping. *Tendrils* simple. *Probract* minute, linear, often caducous or absent. *Flowers* white or cream coloured. *Male flowers* in sessile or peduncled condensed racemes. *Pedicels* suberect, persistent, often with bracts at base or inserted about halfway. *Receptacle-tube* cup-shaped. *Sepals* 5, minute. *Petals* 5, free, valvate-induplicate, small, hairy. *Stamens* 3, two 2-thealous, one 1-thealous. *Filaments* free, long, inserted at base of the receptacle-tube. *Anthers* without or with swollen connective, not produced beyond the anther-thecae; thecae either erect and straight, or oblique and (slightly) curved, or sigmoid. *Disc* 3- (or 4-)lobed, conspicuous, carnose. *Female flowers* single, solitary or at base of male raceme; perianth resembling male. *Ovary* narrowly ellipsoid, glabrous or hairy; ovules few or rather many. *Staminodes* 3 (or 4), inserted on the receptacle. *Disc*

a deeply lobed cup or consisting of 3(–5) lobes, at base of style. *Fruit* fleshy, glabrous, hairy or scabrous. *Seeds* few or rather many, little compressed or nearly globose.

An Asian genus of 3 species and 1 subspecies of variable appearance, mainly due to variable leaf shape.

#### KEY TO SOLENA AND KEDROSTIS FOETIDISSIMA

- a. Plant hairy; monoecious. Male flowers without disc; filaments shorter than anthers, inserted in the throat of the receptacle-tube. [Thecae straight; connective produced beyond the anther-thecae.] Fruit beaked, with few pear-shaped seeds. — Africa, S India, Sri Lanka . . . . . ***Kedrostis foetidissima*** (Jacq.) Cogn.
- b. Plant hairy, (sub)glabrous, or scabrous; monoecious or dioecious. Male flowers with disc consisting of lobes; filaments longer than anthers, inserted at base of the receptacle-tube. Fruit beaked or unbeaked, with few or several globose or somewhat flattened seeds. — Asia . . . . . ***Solena***

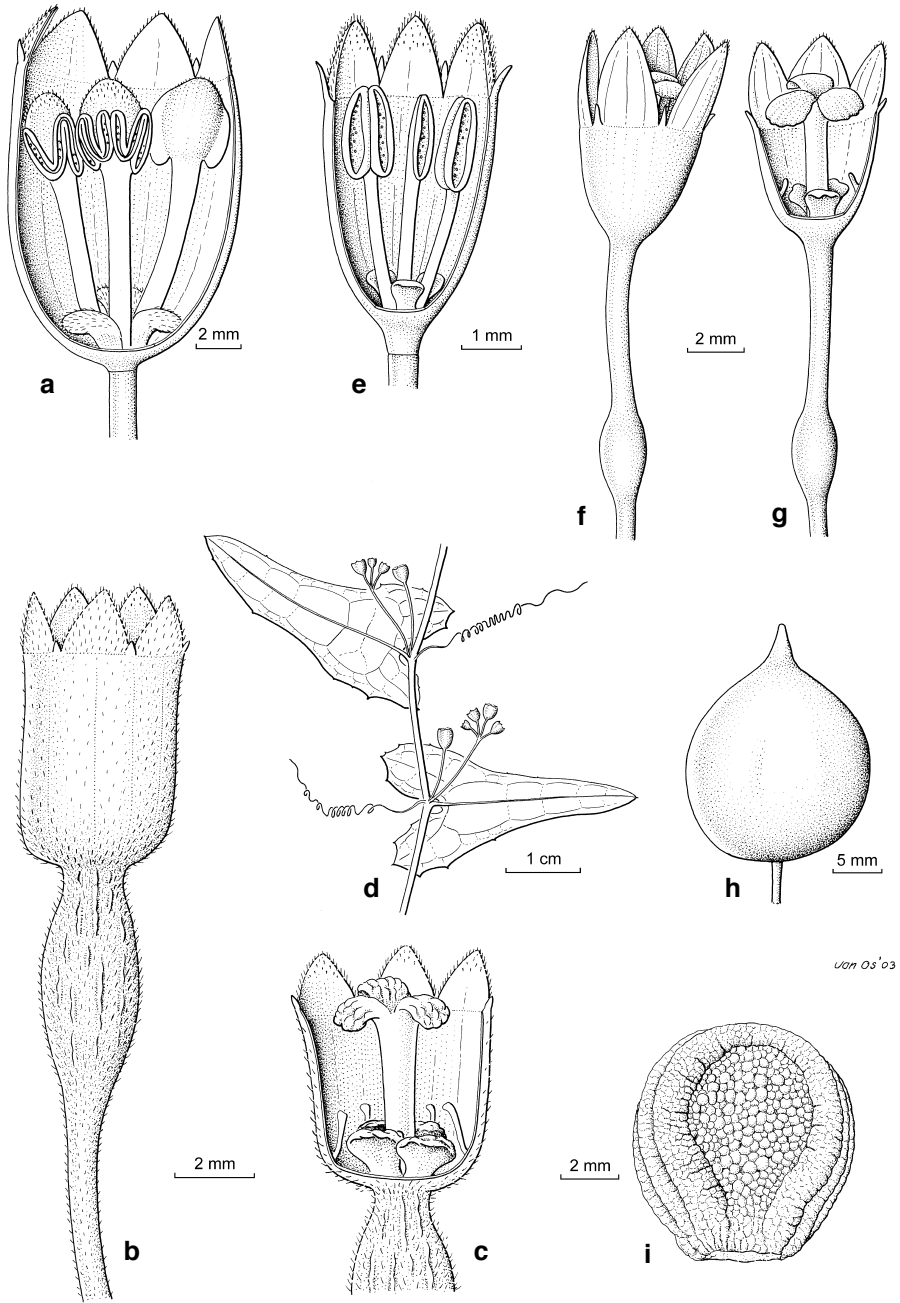
#### KEY TO THE SPECIES OF SOLENA

- 1a. Dioecious. Male bracts c. 1 mm long or less, or absent, at base of pedicel, persistent or caducous. Anther-thecae straight, vertical; connective narrow. Ovary apically narrowed into a long neck. Fruit at apex narrowed into a long beak; seeds 1–4 per fruit, c. 9 mm long, warty. — S India . . . . . **1. *S. amplexicaulis***
- b. Monoecious or dioecious. Male bracts 2–8 mm long, inserted about median on the pedicel, persistent or caducous. Anther-thecae curved or sigmoid, subvertical or transverse; connective swollen. Ovary apically not narrowed. Fruit at apex acute; seeds 5–40 per fruit, 6–7 mm long, smooth or finely warted. — S, N & NE India, Sri Lanka, east to S China, Indochina, Malesia (Peninsular Malaysia, Java) . . . 2
- 2a. Male bracts terete, carnose, 2–3 mm long, without glands. Petals with hairs and with gland hairs. Ovary glabrous. Fruit glabrous,  $\pm$  9-lined or angular. Seeds with broad, finely warty margin. — S India, Sri Lanka . . . . . **3. *S. umbellata***
- b. Male bracts flat or terete, membranous or slightly carnose, 3–8 mm long, without or with glands. Petals hairy, but without gland hairs. Ovary hairy. Fruit scabrous hairy, not lined nor angular. Seeds with faint smooth margin. — Widespread from NE Afghanistan, N India, to S China, southeast to Peninsular Malaysia, Java . . . . . **2. *S. heterophylla***

#### 1. *Solena amplexicaulis* (Lam.) Gandhi — Fig. 1d–i

*Solena amplexicaulis* (Lam.) Gandhi (1976) 179; C. Jeffrey (1980a) 801, p.p.; K.M. Matthew (1982) plate 303; (1983) 651, p.p. — *Bryonia amplexicaulis* Lam. (1785) 496; Ser. (1828) 306; Wight & Arn. (1834) 346; Wight (1841) t. 502. — *Karivia amplexicaulis* (Lam.) Arn. (1841) 275; M. Roem. (1846) 46. — *Melothria amplexicaulis* (Lam.) Cogn. (1881) 621; (1916) 125; Gamble (1919) 539; Chakrav. (1959) 146. — Type: *Sonnerat s.n.* (P), S India.

Extensive vine to 6 m, almost glabrous; dioecious. *Leaves* ovate or (narrowly) elliptic, 2.5–8 by 2–5 cm,  $\pm$  5-angular or deeply and narrowly hastately lobed, base deeply



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Fig. 1. a–c: *Solena heterophylla* Lour. subsp. *napaulensis* (Ser.) W.J. de Wilde & Duyfjes. a. Male flower; b, c. female flower. — d–i: *Solena amplexicaulis* (Lam.) Gandhi. d. Habit of male plant; e. male flower; f, g. female flower; h. fruit; i. seed (a: Ohasi et al. 773353; b, c: Thomson s.n., HLB 901.288.174; d: Matthew, Britto & Rani RHT 28388; e: Matthew & Arockissamy RHT 2562; f, g: Matthew RHT 72949; h, i: Matthew & Rajendran RHT 44545).

cordate (or hastate), apex rounded or acute, often c. 2 mm mucronate, margin remotely dentate, basal nerves (3–)5, reticulation coarse, not very distinct, glands abaxially few, scattered; petiole 0.2–0.4 cm long. *Probract* terete, linear or club-shaped, ± carnose, 2–3 mm long, apex subtruncate, shortly-roughly hairy. *Male inflorescences*: peduncle 10–20 mm long; raceme condensed, 5–10-flowered; pedicels 2–5(–7) mm long, without or with only an indication of a fugacious linear bract at base, c. 1 mm long, and in addition collateral with the peduncle a solitary c. 10 mm long pedicelled flower. *Male flowers*: glabrous except petals; pedicel articulate 1–2 mm below apex; bracts absent or linear, 1–2 mm long, fugacious; *receptacle-tube* 3–4 by 2.5–3 mm; *sepals* c. 0.5 mm long; *petals* long-triangular, 1.5–2 by 1–1.5 mm, hairy at both sides; *filaments* erect, 2–2.5 mm long, inserted at the base of the receptacle-tube; anthers mutually closely appressed (not connate), ellipsoid, shallowly notched at apex, 1.8–2 by c. 1 mm; thecae straight, vertical; connective not produced beyond the anther-thecae, narrow, glabrous; disc lobes 3, glabrous, c. 2 mm long. *Female flowers*: solitary, glabrous (except petals); pedicel 2–2.5 mm long; *ovary* consisting of an ovoid, c. 3 by 2 mm, fertile part, at apex narrowed into a 6–8 mm long, less than 1 mm thick ‘neck’; *receptacle-tube*, c. 4 by 4 mm; *sepals* as in male; *petals* larger than in male, ovate-elliptic, 3.5–4 by c. 2.5 mm, with rounded apex, 3(–5) parallel-veined, minutely pale hairy; style c. 4 mm long, glabrous; stigma consisting of 3 conspicuous frondose (deeply dissected) lobes, together c. 3.5 mm diam.; disc lobes (3–)5, glabrous, c. 1 mm long; staminodes narrowly elliptic, c. 0.5 mm long, inserted slightly above the base in the receptacle-tube. *Fruit* ovoid, 15–20 by 10–15 mm, base rounded, at apex tapering into a narrow beak 6–8 mm long, glabrous; red and pulpy when ripe; fruiting pedicel 2–4 mm long. *Seeds* 1–4, subcircular in outline, thick, 9–10 by 8–9 by 4(–5) mm, pale creamy brown, with conspicuously warty-cracked broad margin, faces tuberculate-warty.

Distribution — S India; possibly not in Sri Lanka.

Habitat & Ecology — In bushes and thickets, over shrubs; altitude 0–800 m. Flowering and fruiting: May to January.

Notes — 1. *Solena amplexicaulis* resembles vegetatively the other 2 species of *Solena* and *Kedrostis foetidissima*, and also *Adenia wightiana* (Passifloraceae). Sterile as well as flowering and fruiting specimens of *S. amplexicaulis* may be confused also with *Kedrostis foetidissima* (see introduction and key to the species).

2. *Solena amplexicaulis* is much more different from the other three taxa of *Solena* than those are from one another.

## 2. *Solena heterophylla* Lour.

*Solena heterophylla* Lour. (1790) 514. — For references and synonyms see under the subspecies.

Plant sparingly pubescent in younger parts, glabrescent, rarely densely hairy; dioecious or monoecious (subsp. *napaulensis*). *Leaves* ± ovate, 3–10(–22) cm long, to 15 cm wide, entire, or 3- or 5-angular, or 3- or 5- (long-)lobed to various depth, the lobes broad or (very) narrow, radiating or the lower ones frequently hastate, base deeply but rather narrowly cordate, apex acute(-acuminate), margin minutely or conspicuously sparsely 1–2 mm mucronate-dentate; nerves 3- or 5-palmate, reticulation distinct on both surfaces; glands several or many, small, scattered, most glands near the inser-

tion of the petiole; petiole 0.5–1(–1.5) cm. *Probract* 1–5 mm long, caducous. *Male inflorescences* with a solitary (abortive) flower at the node, co-axillary with 1 (or 2) persistent sub-umbellate or brush-like dense raceme(s), sessile or to 4 cm peduncled, flowers numerous, sparsely hairy, leaving persistent pedicels. *Male flowers*: pedicel 3–6(–10) mm long, articulate at apex; bract lanceolate or linear, 2–5 mm long, inserted on the pedicel (sometimes towards the apex), somewhat fleshy, with or without glands, persistent or caducous; *receptacle-tube* 3–4(–5) by 2–3 mm; *sepals* triangular, 0.2–0.5 mm long, wide apart; *petals* triangular, 1–2 mm long, finely papillose-hairy (without gland-hairs); *filaments* 2–3 mm long, glabrous, inserted at or slightly above the base of the receptacle-tube; anthers subglobose, 1–2 mm long, connective broad, convex above, papillose-hairy; thecae oblique or horizontal, curved, forming a nearly closed ring; disc lobes 3 (or 4), papillose-hairy, 1–2 mm long. *Female flowers* solitary (rarely a few in a short-shoot), or co-axillary at base of male inflorescence (subsp. *napaulensis*); pedicel (3–)5–10 mm long; *ovary* (narrowly-)ellipsoid, c. 10 mm long, short (densely) hairy, with or without scattered or irregular lines of dark-coloured dots; *perianth* resembling male but slightly larger, ± persistent in young fruit; style c. 2 mm long; stigma, consisting of 3 subglobose long-papillose lobes; staminodes 3 (or 4), elongate, 0.5–1 mm long, glabrous, inserted towards the base of receptacle-tube; *disc* deeply lobed or consisting of 3 (or 4) free lobes, 1–2 mm long, hairy. *Fruit* (narrowly-)ellipsoid, 2–5 by 1.5–2.5 cm, velutinous or scabrous, green, paler striped; when ripe yellow or red; pulp yellowish; fruiting pedicel 5–40 mm long. *Seeds* (5–)10–20, nearly globose or somewhat elongate, little compressed, (5–)6–7 mm long, c. 5 mm thick, smooth, with a very faint border, grey.

**Distribution** — Two subspecies. Widely distributed, from NE Afghanistan, the Himalayas, through Northern India to S & E China, and SE to Myanmar, Thailand, Indochina, Peninsular Malaysia and Java; not in Sumatra, Borneo.

**Habitat & Ecology** — Prefers a seasonal climate, often in open ± deciduous forest, pine savannah; on granitic as well as on calcareous soils; 0–3300 m altitude. Flowering: March to November; fruiting: April to November.

**Notes** — 1. The forms according to leaf shape, as proposed by Cogniaux (1916), and repeated by Keraudren (1975) have no taxonomic value, although Smitinand on a field label (Thailand) stated that deeply narrow-lobed leaf forms are found in the mountains.

2. In living specimens the leaves are conspicuously pale, glaucous beneath. Unripe fruits are green with irregular whitish stripes, ripe fruits red.

#### KEY TO THE SUBSPECIES

- 1a. Monoecious (always?). Anther-thecae vertical, sigmoid. Fruit (ovary) with dark dots; fruiting pedicel 20–40 mm long. — Mountainous areas; N India, Nepal, China, Myanmar . . . . . **b. subsp. *napaulensis***  
 b. Dioecious. Anther-thecae oblique, or (sub)horizontal, semi-circular curved. Fruit (ovary) with paler irregular stripes, rarely with few dots; fruiting pedicel 5–15 mm long. — Widespread, in lowland or montane areas. . . . . **a. subsp. *heterophylla***

**a. subsp. heterophylla** — Fig. 2h, i

*Solena heterophylla* Lour. (1790) 514; (1793) 629; Keraudren (1975) 63, pl. 10, f. 1–5. — *Melothria heterophylla* (Lour.) Cogn. (1881) 618; (1916) 121; Backer in Backer & Bakh. (1964) 297 — Type: *Lourero s.n.* (BM), Cochinchina and China.

*Bryonia rheedii* Blume (1826) 925; Ser. (1828) 306. — *Karivia rheedii* (Blume) M. Roem. (1846) 45; Miq. (1855) 661. — Type: *Blume s.n.*, barcode: L0127474 (L), Java.

*Bryonia sagittata* Blume (1826) 925; Ser. (1828) 305. — Type: *Blume s.n.*, barcode: L0127475 (L), Java.

*Zehneria connivens* Miq. (1855) 656. — Type: *Horsfield s.n.* (K), Java.

*Zehneria hastata* Miq. (1855) 656, nom. illegit. — Voucher specimens: *Zollinger 669* (L), *Horsfield s.n.* (K), both Java.

*Melothria delavayi* Cogn. (1916) 124. — *Solena delavayi* (Cogn.) C. Y. Wu (1984) 341, for the type only, see note 3 under subsp. *napaulensis*. — Type: *Delavay 2009* (lecto, here chosen, P, male and one detached fruit), Yunnan.

*Zehneria umbellata* auct. non (Willd.) Thwaites: C. B. Clarke (1879) 625, p.p.; Ridl. (1922) 851.

*Solena amplexicaulis* auct. non (Lam.) Gandhi: C. Jeffrey (1980b) 14; A. M. Lu & Zhi Y. Zhang (1986) 178, pl. 47, f. 1–9; Grierson (1991) 257, p.p.; S. K. Chen (1995) 322.

Dioecious (always?), with climbing or prostrate shoots. *Leaves* entire, ovate or hastate, or 3- or 5-angular, or shallowly or deeply 3- (rarely 5-)lobed. *Male flowers*: anthers with thecae in oblique or (sub)horizontal position, semi-circular, the two thecae forming a nearly closed ring below the broad hairy connective. *Female flowers*: pedicel 3–5 mm long; *ovary* hairy, without or with few irregular glabrous bands or blotches. *Fruit* 2–5 by 1.5–2.5 cm; fruiting pedicel 5–10(–15) mm long. *Seeds* as described under the species.

Distribution — Widespread, as the species.

Habitat & Ecology — As the species, but apparently not occurring above 2000 m altitude.

Note — A deviating male specimen, *Duthie 21434*, from Pilhibit District, W Himalaya, c. 2000 m altitude, differs from all other specimens by having 1 or 2 long-pediced male inflorescences from each node, with many-flowered racemes provided with persistent, relatively large glandular bracts. In general habit it resembles subsp. *napaulensis*, but the specimen is male (not monoecious) and the thecae (in bud) are curved, not sigmoid.

**b. subsp. napaulensis** (Ser.) W.J. de Wilde & Duyfjes, *comb. & stat. nov.* — Fig. 1a–c

*Bryonia napaulensis* Ser. (1828) 307. — *Zehneria umbellata* (Klein ex Willd.) Thwaites var. *napaulensis* (Ser.) C. B. Clarke (1879) 625 ('*nepalensis*'). — *Melothria heterophylla* (Lour.) Cogn. var. *nepalensis* (C. B. Clarke) Dhaliwal & M. Sharma (1999) 302. — Type: *Wallich s.n.* (G, photograph seen), Nepal.

?*Bryonia wallichiana* Ser. (1828) 309. — Type: *Wallich s.n.* (G, not seen), Nepal.

*Solena delavayi* auct. non (Cogn.) C. Y. Wu: C. Y. Wu (1984) 341, excl. the type; A. M. Lu & Zhi Y. Zhang (1986) 180, pl. 47, f. 10, 11; S. K. Chen (1995) 324 (see note 3).

Plant monoecious (or dioecious?), shoots often prostrate. *Leaves* subentire to deeply spreadingly 5-lobed, the middle lobe much longer. *Inflorescences* either male, with flowers fascicled in a sessile, or a short-peduncled raceme, usually with a co-axillary

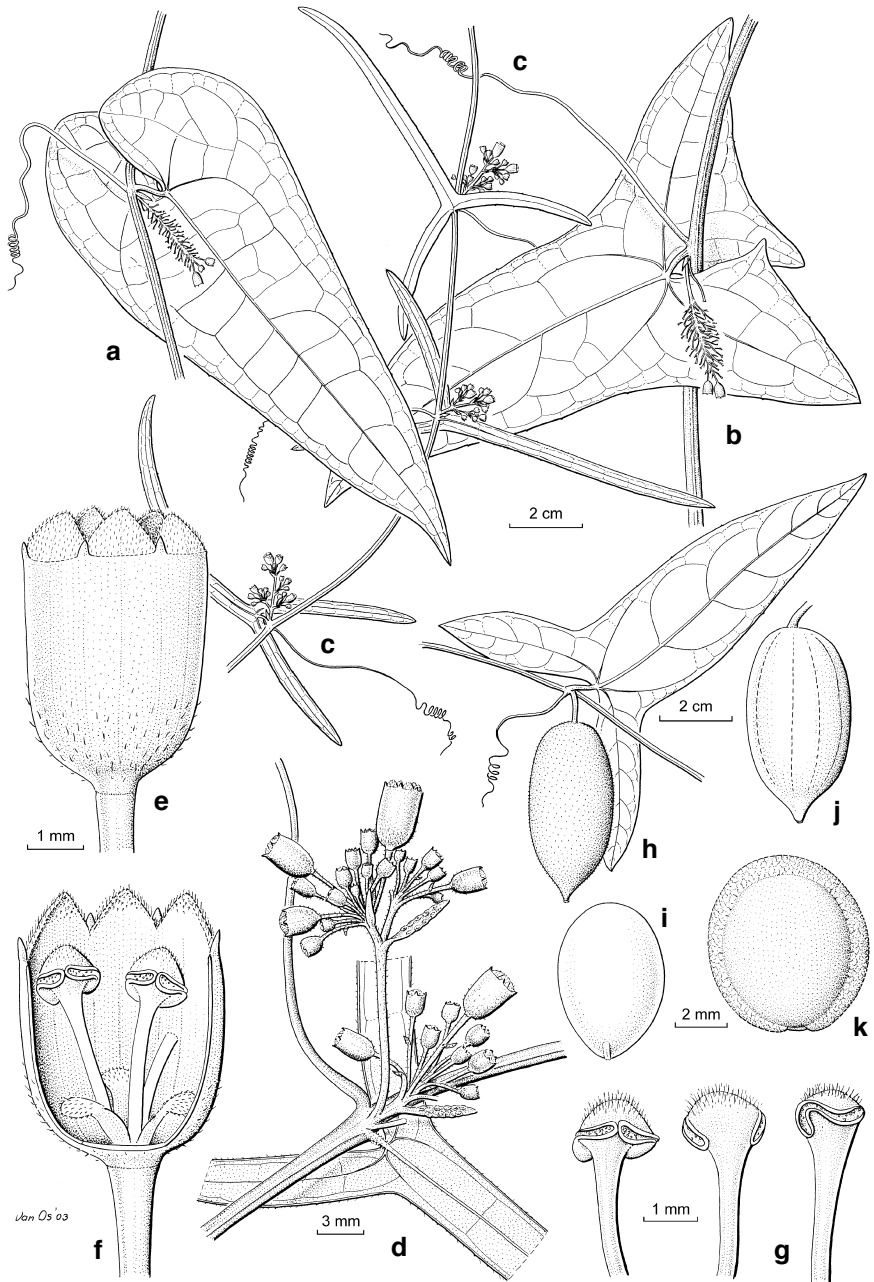


Fig. 2. a–i: *Solena heterophylla* Lour. subsp. *heterophylla*. a, b. Habit of male flowering specimens; c. ditto, a specimen with atypical more or less compound inflorescences resulting from axillary short-shoots; d. ditto, note gland-bearing bracts and bracteoles; e, f. male flower; g. stamens; h. fruit; i. seed. — j, k: *Solena umbellata* (Klein ex Willd.) W.J. de Wilde & Duyfjes. j. Fruit; k. seed (a: Koorders 41273; b: Zollinger 669; c–g: Garrett 1192; h, i: Whitmore FRI 20266; j: Matthew & Charles RHT 2287; k: Matthew & Charles RHT 51343).



single rather long-pedicelled female flower, or female flowers solitary at the nodes. *Male flowers*: as in subsp. *heterophylla*, but thecae vertical and sigmoid, not forming a nearly closed ring. *Female flowers*: pedicel 10–25 mm long; *ovary* hairy, mostly with few or many, glabrous glossy blackish spots. *Fruit* (broadly) ellipsoid, 3–3.5 by 2–2.5 cm, scabrous-hairy or subglabrous, base and apex  $\pm$  rounded; fruiting pedicel 20–40 mm long. *Seeds* c. 7 by 6–6.5 by 3–3.5 mm, grey-brown, smooth, not bordered.

Distribution — N India, Nepal, S China (Yunnan), Myanmar.

Habitat & Ecology — Mountainous areas at (1000?–)2000–3300 m altitude. Flowering and fruiting: April to August.

Notes — 1. The status of *S. heterophylla* subsp. *napaulensis* as a subspecies is unclear because in general habit, vegetatively as well as in most flower details, it is very similar to subsp. *heterophylla*. However, the strikingly S-shaped thecae and the fruit (according to Cogniaux (1916), for *Melothria delavayi* smaller, and glabrous) distinguish it clearly. More complete material should be studied to ascertain whether the sigmoid thecae is a valid character, or that this character-state may occur occasionally in specimens of local populations within the vast distributional area of *S. heterophylla*.

2. Specimens from high altitudes in the Himalayas, with 5-lobed leaves, monoecious flowers, the female flowers long-pedicelled, and ovary and fruit having dark dots, are quite distinct. However, several collections, partly from lower areas and often incomplete, look similar but may have characters tending to be intermediate between subsp. *napaulensis* and subsp. *heterophylla*; see also note 3. A specimen obviously belonging to subsp. *napaulensis* but with the thecae only weakly sigmoid is *Clarke 28348* (K), from Kashmir.

3. In Chinese literature (Wu, 1984; Lu & Zhang, 1986; Chen, 1995) the present taxon is named *Solena delavayi*, but we think that this name is synonymous with *S. heterophylla* subsp. *heterophylla*. In the original description of *Melothria delavayi* Cogn. the female flowers are erroneously described as situated solitary in the axil of the male raceme (“solitarii in eadem axilla cum masculis”). The anthers are described as oblong, c. 1 mm long, with ciliate loculi. The S-shape of the thecae is neither indicated in this description nor in the preceding key to the species (Cogniaux, 1916: 80). Moreover, on the lectotype-sheet in P (*Delavay 2009*, a male plant), Cogniaux made a pencil drawing of an opened male flower, depicting the thecae as only somewhat curved and erect, not S-shaped. In most specimens of subsp. *napaulensis* that we studied, the anthers with the vertical, sigmoid thecae are c. 2 mm long. Contrary to the statements by Cogniaux (1916: 124) and Jeffrey (1980b: 15), the type material *Delavay 2009* consists of different elements, viz. female and male flowering plants: in P male flowering with a loose fruit; in K female flowering and fruiting, and with some loose fruits in an envelope. The male material in P is chosen as lectotype.

**3. *Solena umbellata* (Klein ex Willd.) W.J. de Wilde & Duyfjes, *comb. nov.* — Fig. 2j, k**

*Bryonia umbellata* Klein ex Willd. (1805) 618; Ser. (1828) 305; Wight & Arn. (1834) 345; Dalzell & Gibbs (1861) 101. — *Momordica umbellata* (Klein ex Willd.) Roxb. (1832) 710. — *Karivia umbellata* (Klein ex Willd.) Arn. (1841) 275; Miq. (1855) 661. — *Zehneria umbellata* (Klein ex Willd.) Thwaites (1859) 125; C.B. Clarke (1879) 625, p.p. — Type: *Klein 765* (lecto B-W, here chosen, see notes), S India.

*Bryonia teedonda* Roxb. in Willd. (1805) 618, nom. nud., inval.

*Karivi-valli* Rheede (1688) 51, t. 26.

*Melothria angulata* Chakrav. (1952) 899; (1959) 165, pl. IIB, map 81, f. 74. — Type: *Malcolmpeth* 81 (CAL), S India.

*Solena amplexicaulis* auct. non (Lam.) Gandhi: Matthew (1983) 651, p.p.; (1999) 541; Philcox (1997) 40, p.p.

Creeper or climber, to 3 m, subglabrous; dioecious; roots tuberous. *Leaves* ovate or narrowly elliptic, 4–14(–20) by 2–10 cm, entire or deeply hastately 3-lobed, adaxially finely scabrous, abaxially with scattered minute gland-hairs, base cordate, apex acute or obtuse, margin remotely dentate; petiole 4–11 mm long. *Probract* absent. *Male inflorescences* subsessile or to 7 mm long peduncled, condensed, few- or many-flowered sub-umbellate racemes up to 1 cm long. *Male flowers*: pedicel 2–8 mm long, articulate at apex; bracts carnosae, ± terete, (narrowly-)ellipsoid, 1–2 mm long, apiculate, without glands, inserted on upper half of the pedicel, (sub)persistent; corolla and anthers very much the same as in *S. heterophylla*, except for glands on petals: *receptacle-tube* 3–5 by 2–4 mm; *sepals* triangular, 0.1–0.2 mm long, wide apart; *petals* triangular, 1–1.2 mm long, with simple papillose hairs and with numerous minute gland-hairs; *filaments* 2.5–4 mm long, glabrous, inserted at or slightly above the base of the receptacle-tube; anthers subglobose, c. 1.5 mm diam., connective broad, convex, with gland-hairs; thecae curved, forming an oblique or horizontal nearly closed ring; disc lobes 3, coarsely hairy and with scattered gland-hairs, c. 1 mm long. *Female flowers* similar to those of *S. heterophylla*: pedicel 5–10 mm long; ovary glabrous. *Fruit* solitary at the node, (narrowly-)ellipsoid, 3–7 by 1.5–3 cm, at both ends attenuate (acute, not narrowed into a beak), glabrous, smooth, slightly angled; when dry yellowish, with c. 9 faint ribs, when ripe red; fruiting pedicel 10–12(–15) mm long. *Seeds* 10–20, subcircular in outline, 6.5–7.5 by 5–6.5 by 3–5 mm, the faces light (grey-)brown, and with a broad paler, finely corky-warted and cracked marginal belt, rendering the seed base somewhat emarginate.

Distribution — S India, Sri Lanka.

Habitat & Ecology — Thickets, roadsides; altitude 0–1500 m. Flowering and fruiting all year round.

Notes — 1. Willdenow (1805) presents a number of references to previous authors, the first being “*Bryonia umbellata*. Klein in litt.”. Our present species is represented in B-W by two collections: one unnumbered collection by Roxburgh, and one collection by Klein, annotated: “765 *Bryonia* sp. nov. .... Nandaradah”. The latter sheet, with the smaller leaves, has been chosen as lectotype. In K there are two sheets of the Rottler herbarium (Herb. Rottlerianum), one sheet with 3, the other sheet with 8 separately labelled different collections, all representing the present *S. umbellata*. Among these collections obviously isotype material is present, but the precise assignment of which fragment is an isolectotype needs further consideration.

2. The seed figured by Chakravarty (1952, pl. 1, K) may represent seeds of *S. amplexicaulis*, because of the tuberculate faces.

## ACKNOWLEDGEMENTS

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## IDENTIFICATION LIST

- 1 = *Solena amplexicaulis* (Lam.) Gandhi  
 2a = *Solena heterophylla* Lour. subsp. *heterophylla*  
 2b = *Solena heterophylla* Lour. subsp. *napaulensis* (Ser.) W.J. de Wilde & Duyfjes  
 3 = *Solena umbellata* (Klein ex Willd.) W.J. de Wilde & Duyfjes

- Anderson 537: 2a — Anglade 1092: 3.
- Bakhuizen van den Brink 607: 2a — Barber 1662: 3 — Beddome 3295: 3 — Blume s.n., barcode: L0127474 (type): 2a; s.n., barcode L0127475 (type): 2a — Bourne July 1897: 3; 30 Oct. 1899: 3; 141: 3; 367: 3; 463: 3; 452: 3; 2628: 3 — Bowes Lyon 2304: 2a.
- Chantanamuck 134: 2a — Chatterjee 2638: 2a — Chen His Cheng 1016: 2a — Chung 1686: 2a; 1746: 2a; 2199: 2a; 2221: 2a — Clarke 28348: 2b — J. & M.S. Clemens 3670: 2a — Collett 363: 2b; 629: 2b; 770: 2b — Cramer 4791: 3.
- Dalhousie 01-07-1831: 2b — D'Alleizette May 1903: 2a; April 1908: 2a; June 1909: 2a — De Wilde & Duyfjes 22162: 2a; 22163: 2a — Delavay 2009 (fruit, lecto P; K): 2a — Diraviados RHT 27866: 1 — Du Pasquier in Pételot 1873: 2a — Dupont 81: 2a — Duthie 09-08-1899: 2a; 21434: 2a.
- Einarson, Skärby & Wetterhall 2589: 2b — Evrard 2145: 2a.
- Forrest 22085: 2a — Fosberg & Sachet 52990: 3 — Fraser 36: 3 — Fukuoka & Ito T34842: 2a.
- Gallatly 686: 2a — Gamble 4457A: 2b; 4822A: 2b; 9624: 2a; 9721: 2a; 14819: 3 — Gardner 313: 3; 314: 3; 542: 2b — Garrett 1192: 2a — Geesink, Phanichapol & Santisuk 6021: 2a — Grey-Wilson & Phillips 329: 2b — Griffith 752: 2a.
- Hepper 4517: 3 — Hohenacker 1506: 3 — How 70799: 2a — Huk s.n., 19-08-1890: 2a — Huq 10369: 2a.
- Ien 304: 2a — Iwatsuki & Fukuoka T1035: 2a.
- K'Tung-78 6050: 2a — Keng K2656: 2a — King 23-03-1876: 2a — Koorders 28241: 2a; 41024: 2a; 41273: 2a — Kostermans 510: 2a; 1289: 2a.
- Larsen 33888: 2a — Larsen, Santisuk & Warncke 3037: 2a — Larsen & Suppee Larsen 34173: 2a — Lawson 188A: 1 — Linsley Gressitt 787: 2a.
- Madras Herb. 10264: 3; 11579: 3 — Maire 6: 2a; 275: 2a; 3696: 2a — Malcolmpeth 81 (India, seen by Chakravarty, CAL): 3 — Malhotra 50980: 2a — Matthew RHT 23615: 1; RHT 72949: 1 — Matthew & Arockissamy RHT 2562: 1 — Matthew, Britto & Rani RHT 28388: 1; RHT 28777: 1 — Matthew & Charles RHT 2287: 3; RHT 41188: 3; RHT 51343: 3; RHT 51795: 3; RHT 73552: 3 — Matthew & Rajendran RHT 44545: 1; RHT 44789: 1 — Maxwell 71-702: 2a; 75-229: 2a; 75-577: 2a; 87-960: 2a; 88-537: 2a; 88-648: 2a; 91-324: 2a; 93-559: 2a; 93-1044:

- 2a; 95-922: 2a; 96-972: 2a — McCosh 209: 2b — Meebold 5870: 2a — Metcalf & Chang 581: 2a — Misra 38085: 2a.
- Ohashi, Kanai, Ohba & Tateishi 773353: 1; 775434: 2a — Ohba, Tikuchi, Wakabayashi et al. 8580071: 2b.
- Panigrahi 15142: 2a — Pételot 1085: 2a — Pierre 691: 2a; 4361: 2a — Poilane 17323: 2a; 19774: 2a; 21416: 2a — Polunin 101: 2b; 906: 2b; 987: 2b; 1383: 2b — Polunin, Sykes & Williams 155: 2b; 349: 2b; 889: 3; 2486: 2b; 4191: 2b; 4277: 2b; 4470: 2b; 5437: 2b.
- Ralavaram July 1845: 1 — Ramaswami 1398 (India, seen by Chakravarty, CAL): 3 — Rao 39147: 2a — Rich 221: 2b — Ritchie 308: 3.
- Saldanha 14755: 3 — Saulière 18: 3; 70 (India, seen by Chakravarty, CAL): 3; 71 (India, seen by Chakravarty, CAL): 3 — Shimizu, Huto & Chaiglom T9001: 2a — Smitinand & Sleumer 1099: 2a; 1340: 2a — Stainton 4934: 2b — Stainton, Sykes & Williams 381: 2b; 748: 2b; 646: 3; 2926: 3; 5333: 3; 8429: 2a.
- Tang 10608: 2a — Thompson CP 336: 3 — Thomson 06-06-1849: cf. 2a — Thorel 843: 2a — Thwaites CP 3506: 3 — Tsang Wai Tak 15693: 2a; 16799: 2a; 16803: 2a; 16844: 2a — Tsoung 202: 2a.
- Van Beusekom, Geesink, Phenklai & Wongwan 3586: 2a; 4508: 2a — Van Beusekom & Santisuk 2908: 2a.
- Wallich 6705: 2a — Whitmore KEP FRI 20266: 2a — Wight 1121: 1; 1122: 3; 1128 [in K 2 sheets: 1 & 3; in L: 1]; 1129 [in K 4 sheets: 3; in L: 2a]; 1130: 1.
- Zollinger 669: 2a.