

## CUCURBITACEAE

(W.J.J.O. de Wilde & Brigitta E.E. Duyfjes, Leiden)<sup>1</sup>

*Cucurbitaceae* Juss., Gen. Pl. 393 (1789), nom. cons.; Miq., Fl. Ned. Ind. 1, 1 (1856) 652; C.B. Clarke in Hook. f., Fl. Brit. Ind. 2 (1879) 604; Cogn. in A. DC. & C. DC., Monogr. Phan. 3 (1881) 340; Pax in Engl. & Prantl, Nat. Pflanzenfam. 4 (5) (1889) 9; Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 3; Cogn. & Harms in Engl., Pflanzenr. 88, 4.275.2 (1924) 2; Backer in Backer & Bakh. f., Fl. Java 1 (1964) 292; Keraudren in Aubrév. & J.-F. Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 3; I. Telford, Fl. Australia 8 (1982) 158; W.J. de Wilde & Duyfjes, Fl. Thailand 9, 4 (2008) 411; A.M. Lu, Lu Q. Huang, S.K. Chen & C. Jeffrey, Fl. China, draft (2009); H. Schaefer & S.S. Renner, Fam. Gen. Vasc. Pl. [Kubitzki], in press.

Type genus: *Cucurbita* L.

Small or large climbers; herbaceous or woody; annual or perennial; leafy stems often grooved or angular; roots fibrous or tuberous; monoecious or dioecious. *Probract* present or absent (see below). *Tendrils* simple or branched, extra-axillary, present on each node. *Leaves* dispersed, simple or foliolate; leaf base usually cordate, apex acute (–acuminate); stipules absent. *Inflorescences*: flowers either solitary, or fascicled, or in racemes or in panicles; bracts minute to large, or absent; perianth usually 5-merous, small to large, composed of mostly free sepals and free or partly fused petals, rarely  $\pm$  zygomorphic; disc usually present. *Male flowers* with shallow or tubular receptacle; stamens 3 (anthers all three 2-theous or two 2-theous and one 1-theous) or stamens 5 (anthers 1-theous), filaments free or (partly) united, anthers free, coherent or connate, thecae straight, curved, plicate or contorted, connective narrow or broad, without or with apical appendage. *Female flowers*: perianth similar to male flowers; ovary largely or completely inferior, usually 3-locular, ovules few or numerous, (secondarily) parietal or apical, horizontal or hanging; staminodes present or absent; style either 1 and stigmas 3 (lobed or not) in subfam. *Cucurbitoideae*, or styles 3(–5) and stigmas 2-lobed in subfam. *Fevilleoideae*. *Fruit* small to large, either berry-like and pulpy and usually not opening (subfam. *Cucurbitoideae*), or capsular with 3 apical valves (subfam. *Fevilleoideae*). *Seeds* variable in size and shape, often compressed, unwinged or winged; embryo large, straight; endosperm absent.

There are 2 subfamilies, see Taxonomy.

### DISTRIBUTION

A family of about 120 genera and 900 species, distributed all over the world, the majority in the tropics with most genera in America, a few in temperate climatic zones, but not occurring in cold areas. Most genera have only few species. The larger genera in America are e.g., *Cayaponia*, *Gurania*, *Cyclanthera*, *Melothria*, and *Sicyos* (American

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1) With contributions by P. Baas (wood anatomy) and C.B. Mennes & R.W.J.M. van der Ham (pollen morphology). — Drawings by J.H. van Os except Fig. 52.

and Pacific); in Africa e.g., *Momordica*, *Cucumis*, *Pilogyne*, and *Neoachmandra*; in south-eastern Asia e.g., *Trichosanthes* (c. 100 species), *Hemsleya* (China, c. 20 species), *Pilogyne*, *Neoachmandra*, and *Thladiantha* (mainly China, 20 species, of which 1 or 2 in Malesia).

Most genera are confined to a single continental area, only a few are found in two continents, e.g. *Pilogyne* and *Neoachmandra*, both occurring in Asia and Africa.

Species distributional areas vary from those with bi-continental distributions, such as *Mukia maderaspatana*, to those with intermediate ranges, like *Trichosanthes globosa*, down to restricted local-endemics like *Borneosicyos*, or else they are known from only one or a few collections, or from a single locality like *Pilogyne trichocarpa* or *Anangia macrosepala*. The genus *Muellerargia* contains 1 species in eastern Malesia and northern Australia and 1 species in Madagascar.

In Malesia there are 29 native and 10 cultivated genera, the cultivated ones frequently with running wild species, notably in *Benincasa*, *Citrullus*, *Cucumis*, *Cucurbita*, *Cyclanthera*, *Lagenaria*, *Luffa*, and *Sechium*. *Benincasa* and *Luffa* contain wild as well as cultivated taxa. Introduced wild-running species are found in the genera *Cayaponia* and *Melothria*. The largest genera in Malesia are: *Trichosanthes* (43 species), *Pilogyne* (14 species), and *Neoachmandra* (12 species). Endemism is high in Borneo and New Guinea (particularly in *Trichosanthes*). In total 132 species of the Cucurbitaceae are treated in the present flora.

#### HABITAT & ECOLOGY

Tendrils climbing Cucurbitaceae occur worldwide in virtually all sorts of habitats, provided the climate is not too cold in winter. *Bryonia* species in Europe hibernate by their deep tubers which sprout in spring. Tuberos species are also common in the seasonal tropics. The tree-shaped, non-climbing, pachycaul endemic *Dendrosicyos* of dry Socotra Island, is unusual, although in eastern Malesia some species of *Neosalsmitra* have a pachycaul stem-base.

Malesian cucurbits are all climbers, most of them of small to medium length, but some reaching the tall forest canopy, notably *Alsomitra macrocarpa*, a liana with a stem up to 15 cm diameter. In general they seem to prefer more or less disturbed (primary) forest or scrub in the vicinity of (running) water. Limestone species sprawl on the rocks but usually root in the deeper soil below. Species with the highest elevation in Malesia are found in Java (*Pilogyne repanda*, to 2700 m), and in Papua New Guinea (*Gynostemma papuana*, to 3500 m). The incompletely known *Anangia macrosepala*, endemic to Kabaena Is, northern Moluccas, apparently grows each season from a subterranean tuber in yearly burnt vegetation.

Most species of Malesian Cucurbitaceae are perennial, without or with a woody rootstock, or with one or several tubers. Others are annual with mostly berry-like fruits that are dispersed by birds. Both annual and perennial species of subfamily *Fevilleoideae* mostly have capsular fruits which shed winged seeds. *Mukia maderaspatana* is usually

subannual, but plants with old, woody rootstocks are known from Java. Some species of *Trichosanthes* and possibly also *Bayabusua clarkei* are monocarpous, dying-off after prolific fruit production.

#### TAXONOMY

Jeffrey (1962, 1990) made efforts to improve the classification of Cucurbitaceae, the latest version (Jeffrey 2005) was modified on the basis of seed coat anatomy (Singh & Dathan 1998). Jeffrey divided the family into two subfamilies: *Nhandioboideae* and *Cucurbitoideae*. Subfam. *Nhandioboideae* (= *Fevilleoideae*, syn. *Zanonioideae*) contained one tribe with 5 subtribes, two of which included Malesian genera. The subfam. *Cucurbitoideae* consisted of 10 tribes, some with 2 subtribes, most of them containing Malesian genera.

In the most recent treatment of the whole of Cucurbitaceae which is based on molecular data as well as on morphological cladistics (Schaefer, Heibl & Renner 2009, Schaefer & Renner (in press (for Kubitzki))), subfamilies are not recognized, instead 104 genera are placed within 15 tribes, 9 of which occur in Malesia. These are:

Tribe 1 — *Gomphogyneae* (*Alsomitra*, *Bayabusua*, *Gomphogyne*, *Gynostemma*, and *Neoalsomitra*).

Tribe 3 — *Zanonieae* (*Zanonia*).

Tribe 6 — *Thladiantheae* (*Baijiana*, *Thladiantha*).

Tribe 7 — *Siraitieae* (*Siraitia*).

Tribe 8 — *Momordiceae* (*Momordica*).

Tribe 12 — *Sicyeae* (*Cyclanthera*, *Hodgsonia*, *Luffa*, *Sechium*, and *Trichosanthes* (including *Gymnopetalum*)).

Tribe 13 — *Coniandreae* (*Kedrostis*).

Tribe 14 — *Benincaseae* (*Benincasa*, *Borneosicyos*, *Citrullus*, *Coccinia*, *Cucumis* (including *Mukia*), *Diplocyclos*, *Indomelothria*, *Lagenaria*, *Melothria*, *Muellerargia*, *Papuasicyos* (including *Urceodiscus*), *Scopellaria*, *Solena*, and *Zehneria* (including *Anangia*, *Neoachmandra*, *Pilogyne*)).

Tribe 15 — *Cucurbiteae* (*Cayaponia*, *Cucurbita*).

In the present Flora Malesiana treatment two subfamilies as circumscribed by Jeffrey (2005) are followed but under the names *Fevilleoideae* and *Cucurbitoideae*. Various genera to be sunk by Schaefer, Heibl & Renner (2009) and Schaefer & Renner (in press (for Kubitzki)) are maintained on the basis of flower- and fruit-morphology. The subfamily *Fevilleoideae* generally are considered as more primitive (basal) than the *Cucurbitoideae*. According to Mennes & Van der Ham (see under Pollen Morphology) the two subfamilies differ significantly in pollen characters.

#### FEVILLEOIDEAE

*Fevilleoideae* Burnett, Outl. Bot. (1835) 756, 1092, 1129.

*Nhandioboideae* Kostel., Allg. Med.-Pharm. Fl. 2 (1833) 722, nom. illeg.

*Zanonioideae* Luerss., Handb. Syst. Bot. 2 (1882) 1080; C. Jeffrey, Kew Bull. 15 (1962) 345.

Dioecious. Tendrils distally 2-branched, spiralling below point of branching. Male flowers in panicles or racemes. Stamens 5, inserted on narrow, flat receptacle, free or united, disc not obvious, anthers small, 1-thecous (except *Alsomitra* and *Bayabusua*: stamens 3). Pollen small, usually striate, prolate. Styles (2 or) 3 (or 5), free. Ovary truncate at apex, not narrowed; ovules pendent. Fruits dehiscent, capsular, apically opening with 3 incurving valves releasing (mostly) winged seeds (except *Gynostemma*, p.p. indehiscent).

Six genera in Malesia — *Alsomitra*, *Bayabusua*, *Gomphogyne*, *Gynostemma*, *Neolalsomitra*, and *Zanonia*.

Note — The genus name *Nhandiroba* Kostel. is invalid because it is homotypical with *Fevillea*, the older name, and *Fevillea* L. was mentioned as a synonym. Therefore the subfamily name *Nhandiroboideae* Kostel. (1833) cannot be used.

### CUCURBITOIDEAE

Monoecious or dioecious. Tendrils simple, or branched mostly at or below the middle (in *Siraitia* and *Sinobaijania* distally 2-branched) and then either only the branches spiralling, or the part below the point of branching also spiralling (*Sinobaijania*, not in Malesia). Male flowers solitary, fasciculate, in racemes or in panicles. Stamens 3 (or 5), inserted in the receptacle-tube, mostly free; anthers small or large, 1- or 2-thecous, disc present, but may not be obvious. Pollen various, larger than in subfam. *Fevilleoideae*, isodiametric, reticulate. Style 1. Ovary constricted at apex; ovules mostly horizontal. Fruit a juicy or dry berry (pepo-fruit), mostly indehiscent (in *Luffa* with an operculum).

Thirty-one genera in Malesia — *Anangia*, *Baijania*, *Benincasa*, *Borneosicyos*, *Cayaponia*, *Citrullus*, *Coccinia*, *Cucumis*, *Cucurbita*, *Cyclanthera*, *Diplocyclos*, *Gymnopetalum*, *Hodgsonia*, *Indomelothria*, *Kedrostis*, *Lagenaria*, *Luffa*, *Melothria*, *Momordica*, *Mukia*, *Muellerargia*, *Neoachmandra*, *Papuasicyos*, *Pilogyne*, *Scopellaria*, *Sechium*, *Siraitia*, *Solena*, *Thladiantha*, *Trichosanthes*, and *Urceodiscus*.

### POLLINATION AND DISPERSAL

Flowers in Cucurbitaceae are unisexual, the plants either monoecious or dioecious. Hermaphroditic flowers are rare, occurring mostly in cultivated species and are typical in *Neoachmandra hermaphrodita* (endemic to Thailand). Sometimes they are parthenocarpic (e.g. cultivated *Cucumis*).

Cross-pollination by insects seems most likely throughout the family, but little is known for certain for most species. A variety of insects, including hoverflies (Syrphidae) have been seen visiting the flowers. Pollination by oil-collecting oil bees (genus *Ctenoplectra*) in the tribe *Thladiantheae* is remarkable (Vogel 1990; Schaefer & Renner 2008a; Renner & Schaefer 2010). *Trichosanthes* (most species) and some related genera (*Gymnopetalum*, *Hodgsonia*) flower at night. Their tubular, sweetly scented, flowers are possibly pollinated by sphingidae, or other nocturnal moths. We ourselves observed at night the very swift visits by hawk-moths to flowers in a large sprawling stand of *Gymnopetalum scabrum*.

The local endemic *Borneosicyos* has pollen in tetrads, presumably hinting at pollinator type.

In some groups, e.g., *Trichosanthes* and *Pilogyne*, the connective of the anthers is conspicuously set with comparatively stout, short hairs, which is also possibly related to pollination mechanics.

#### SEED DISPERSAL

The conspicuously coloured, berry-like, pulpy fruits of most Cucurbitaceae suggest that seed dispersal is by animals eating the fruit. The pendulous fruit of *Momordica*, (notably *M. charantia*), splits open at the apex, revealing the seeds enveloped in bright red pulpy arils.

*Gynostemma pentaphylla* fruit is small, berry-like, green-yellow or purple, containing 1 or 2 seeds only. The single globose seeds of *Neochamandra sphaerosperma* (Thailand), have been seen carried away by ants.

In South Africa the fruit of *Cucumis humifructus* is geocarpous and aardvarks play a role in fruit and seed dispersal.

In many *Trichosanthes* species the fruit pulp is green-black and bitter, in others it is yellowish, orange or whitish and not bitter; in *T. villosa* it is sweet. The fruit of *Siraitia grosvenorii* (cultivated) is known for its strong sweetness (Jeffrey 1979).

As noted above, species with capsular fruit, (mainly the subfamily *Fevilleoideae*, but also the fruits of *Luffa aegyptiaca* (synonym *L. cylindrica*)) open by valves or by an operculum at the apex, through which they shed their usually winged seed, although sometimes the wing can be narrow or absent.

Cultivated species or feral forms of these are generally dispersed by man. Their seeds often germinate from waste fruits, the plants either temporarily establishing or persisting for a longer time by roadsides, in waste places, abandoned fields, secondary scrub, or on or near rubbish dumps.

#### GERMINATION AND SEEDLING

Germination can be hypogeal or (mostly) epigeal, even in one genus, e.g., in *Momordica cochinchinensis* it is epigeal, but in the closely related *M. denticulata* it is hypogeal. The first true leaves develop generally after the leaf-like cotyledons enlarge and are shed, and soon they produce a lateral tendril. However, in *Bayabusua clarkei* the first four leaves are in one whorl.

#### SEXUAL CONDITION

Flowers are unisexual (with few exceptions). Whether a species is monoecious or dioecious can be determined by the presence of male flowers as well as female flowers or fruits on the same herbarium specimen, or preferably by observing living plants. Sexual condition is relatively constant within a genus, e.g. *Cucumis* is monoecious, *Trichosanthes* dioecious (*T. cucumerina* excepted), *Momordica* species can be either dioecious or monoecious, the economically important *M. charantia* is monoecious.

## INDUMENTUM, COLOUR OF PLANT ON DRYING

*Trichosanthes* species are variously hairy: some are conspicuously villose or strigose, but most are subglabrous, or glabrescent when the hairs disappear with age. The hairs may be grey or brown. Most species have a whitish (or black or brown), chalky punctation (cystoliths; cf. Zimmermann 1922) originating from the hair scars or hair bases, especially on the upper leaf-surface, rendering the leaves scabrid. In several species white cystoliths can be found on the stem, petiole and nerves of the lower leaf-surface. The presence of hairs within flowers can be diagnostic (Zimmermann 1922). *Siraitia* is covered with blackish gland-hairs.

With experience, the drying colour of herbarium specimens is useful for identification: species of *Neoachmandra* generally dry greenish, those of *Pilogyne* brown or blackish. Erkens et al. (2008) made an assessment of age and greenness of herbarium specimens as predictors for successful extraction and amplification of DNA, including some Cucurbitaceae.

## TENDRILS

Cucurbitaceae differ from other scandent-climbing plant families by the presence of a tendril on each node, which is never truly axillary (conspicuously so in subfamily Cucurbitoidae), nor opposite the leaf, but always at some angle with the leaf-petiole. The node, bearing a leaf, a lateral tendril and often a lateral vegetative shoot, when fertile together with a flower or an inflorescence, is very characteristic for Cucurbitaceae, an assemblage which is known as the nodal syndrome (Rugayah & De Wilde 1997). The morphological origin of the tendril is unknown, but most likely it is of cauline nature (Zimmermann 1922), and a process of concaulescence towards a higher node during its phylogeny may explain its lateral position. Whether the tendril is simple or branched, and whether it coils exclusively above the point of branching, or below as well, is taxonomically important. The latter condition is found in the Asian genera of the subfamily Fevilleoideae and in Sinobaijiana (Cucurbitoidae, China).

## LEAVES AND LEAF GLANDS

Leaves provide many useful taxonomic characters. They may be palmately or pedately compound (with petiolulate leaflets) or simple, with the blade either entire or variously (deeply) lobed. Lobing may be very variable within a species. The presence of small glands on the probracts and sepals can be characteristic, and these are frequently visited by small black ants. Glands on the lower surface of the leaf blade are common and their size, number and position provide good distinguishing characters for species of *Trichosanthes*. Leaves of juvenile plants may be greatly different from those of adult plants. The leaves of juvenile specimens of *T. tricuspidata* and related species are much dissected and they may look very much the same mutually.

## PROBRACKTS

Characters of the probract have been neglected by most previous authors. Probracts occur singly at each node and their presence and shape is usually typical for a genus. The shape, consistency and the presence of glands are useful characters, for distinguishing species of *Trichosanthes*. The probract can best be seen on young shoots. They can be conspicuous, linear-lanceolate, ovate, concave or flat, or they can be small and caducous; they are absent in some genera or species. The morphological origin of the probract is unknown, but possibly they are derived from the bract of a solitary or lowermost flower in an inflorescence (Zimmermann 1922).

## INFLORESCENCES AND FLOWERS

Flowers are solitary or (few-)fascicled in the leaf axils, or arranged in an axillary raceme (indeterminate). By contraction and reduction of foliage leaves to bracts the inflorescences may become (large) panicles. In dioecious species, male flowers are either solitary, or more usually arranged in a pedunculate, bracteate raceme, often with a single co-axillary male flower. Solitary female flowers develop at the nodes, or form (peduncled) clusters, e.g. in *Pilogyne*. In monoecious plants, solitary female flowers can be found at the nodes or (developing previously) beside the male raceme; which develops later (usually, female flowers develop after the male flowers). In some species of *Trichosanthes* the persistent pedicels of senescent or undeveloped solitary flowers appear as an elongated or 'straw-like appendage' beside the male raceme.

*Bracts* — The bracteate racemes of male flowers bear persistent or caducous bracts, either on the rachis, or in some species, higher-up on the pedicels. They differ in size, shape, and consistency, varying from linear to obovate or rhomboid, with entire, dentate or lacinate margins, are glabrous or sparsely to densely hairy, and may bear glands.

*Flowers* — The flowers are mostly unisexual, either white or yellow, and the perianths of male and female flowers are generally similar. In nocturnal species of *Hodgsonia*, *Gymnopetalum*, and *Trichosanthes*, the flowers are white, opening in the late afternoon or at night and close before sunrise, when the fallen corollas can be found on the ground. Other species e.g. *T. cucumerina* are largely diurnal.

*Pedicel* — The pedicel is mostly persistent and is articulated at or near its apex below the flower. The pedicels of solitary male or female flowers are much longer than those of the flowers in a raceme.

*Receptacle-tube* — The receptacle-tube is present in subfamily Cucurbitoideae. It is shallow, saucer- or cup-shaped, or tubular and carries the free sepals and free or partly connate petals on its rim, and the stamens inside.

*Sepals* — There are always 5 sepals, inserted on the margin of the receptacle (subfam. Fevilleoideae) or on the rim of the receptacle-tube (subfam. Cucurbitoideae).

Sepals are typically much smaller than the petals; (narrowly) triangular or linear, but are frequently enlarged, in *Cucurbita moschata*, or are larger than the petals in *Anangia*.

Their shape in male flowers, whether entire or lobed, is taxonomically important in *Trichosanthes*.

*Corolla* — The colour of the flowers, (i.e. of the petals), is usually either white or yellow. Some genera have a more indistinct flower colour: creamy, greenish creamy, or whitish with green veins. In *Trichosanthes* the usually white petals are in some species reddish veined, or either reddish or yellow-fringed. The petals of *Bayabusua* are by exception purple red.

The petals are (almost) free, or in some genera united at base, e.g. in *Cucumis*, *Mukia*, very distinctly so in *Coccinia*, *Cucurbita*.

*Male flowers* — The number of stamens is 3 or 5. In subfamily Fevilleoideae there are five stamens of one theca, the filaments free, or partially or wholly connate in a column. In subfamily Cucurbitoideae five (free) stamens only occur in the tribe Thladianthineae, where 4 stamens are arranged in two pairs, and 1 solitary. In the other tribes there are three stamens, of which either a pair of two-thecous anthers and the other one-thecous (e.g., *Cucumis*, *Mukia*, *Melothria*, *Indomelothria*), or else all three stamens have a two-thecous anther (e.g., *Pilogyne*, *Neoachmandra*). In many genera the thecae are connivent into a globose whole, or connate into a short column (e.g., *Trichosanthes* (mostly), *Hodgsonia*, *Cucurbita*). The thecae can be straight, curved, hooked, plicate or 3-plicate (S-shaped). The connective is often markedly dilated, with the thecae along a wavy margin, and when connivent, resulting in a globose synandrium with the thecae irregularly arranged into a tangle or ball.

The place of insertion of the stamens in the receptacle-tube is taxonomically important, e.g., at the base in *Pilogyne*, at or near the throat in *Neoachmandra*. In the centre of male flowers a conspicuous (nectary?) gland is often present, (which is mostly not a pistillode, because its homologue is usually present in female flowers as a broad collar around the base of the style).

*Female flowers* — The perianth is similar to the male flowers, but may differ slightly in size and shape, e.g., the sepals in *Trichosanthes quinquangulata*: entire in the female, are usually with few sidelobes in the male.

The ovary is inferior and 3-carpellate. It is very variable in detail in subfam. Cucurbitoideae, but it is always demarcated by a more or less pronounced constriction. In subfam. Fevilleoideae the ovary is broadly attached to the receptacle, bearing 3 separate styles, each usually furcate into a 2-lobed stigma. In subfam. Cucurbitoideae there is a single style, and the stigma essentially 3-parted but quite variable, from subentire (e.g. *Benincasa*, *Cucurbita*) to markedly divided (e.g. *Anangia*), with papillose or feather-like stigmatic surface.

The basic construction of the ovary is described by Eichler (1875). Ovules are mostly numerous, placed horizontally, attached to secondary-parietal placentas. The aberrant ovary of *Hodgsonia* is derived from the basic type by assuming a reduction of the ovules (De Wilde & Duyfjes 2001). In Fevilleoideae the three carpels often do not fuse completely, leaving the ovary  $\pm$  unilocular and the ovules are pendent (later on erect in the pendulous fruit).



*Nectary & staminodes* — A ring-shaped nectary, as well as staminodes are often present.

*Fruit* — In subfam. Cucurbitoideae it usually is a rather dry or juicy, indehiscent berry; the pericarp can be woody, or firm and thick, to filmy. The ripe fruit exocarp can be green, yellow, orange or red, or often paler (white) and flecked, striped, flamed or banded. Seeds are few or many, attached to 3 parietal or  $\pm$  septal placentas, each thought to be formed from two carpel edges from adjoining carpels, best to be seen in the developing ovaries, because in the ripe fruit the content is juicy and pulpy. The seeds are embedded in green-black, red or white pulp. The fruit in subfam. Fevilleoideae is a woody capsule, opening with three incurving valves and shedding winged seeds.

*Seeds* — These are very variable and distinctive for genera or species. Seeds of the capsular-fruited Fevilleoideae are usually winged (*Gynostemma* excepted). Seeds can be compressed, sculptured, and often possess a ‘margin’, all useful characters. Seeds of e.g. *Diplocyclos* and some *Trichosanthes* species seem 3-loculed with the embryo in the middle compartment. The two wart-like outer compartments can be hollow, or filled with large erect cells developed from the seed coat, either from the margin or the face. Seed coat anatomy is highly characteristic and has been used in taxonomy, notably for subdivision of the family into tribes (Sing & Dathan 1998; Jeffrey 2005). See also Corner (1976) who provided detailed notes on the seeds of several genera of Cucurbitaceae. Rugayah & De Wilde (1999: fig. 1), depict a choice of *Trichosanthes* seeds according to the sections.

*The use of the words margin and edge in the descriptions* — For leaves, bracts and sepals the word *margin* is used, which may be e.g. entire or dentate, etc. For seeds it is different: seeds are usually more or less, or strongly compressed (subglobose to almost flat), and seen at the faces there can be a distinct (or faint) narrow or broad bordering zone, called the *margin*, around the seed, differing from the rest of the seed-face in thickness, colour or surface (the seed-face can be smooth or sculptured). The very outer side of the seed showing the outline or profile is called the *edge*, described as e.g. straight (smooth), undulate, crenulate.

#### CHROMOSOMES

There is a large diversity in chromosome number within Cucurbitaceae. Schaefer & Renner (for Kubitzki, in press) report numbers for all genera, where known. It is noteworthy that the cucumber (*Cucumis sativus*) and the much resembling melon (*Cucumis melo*), are in different subgenera, and the chromosome numbers are:  $x = 7$  ( $2n = 14$ ) and  $x = 12$  ( $2n = 24$ ) respectively (Kirkbride, 1993). Within the genus *Cucumis* the number varies,  $2n = 14$ , or 24, or sometimes 20, 22, 48 or 72.

#### USES

Jeffrey (2001) gives a detailed worldwide account of cultivated Cucurbitaceae, while in PROSEA 8 (1993) all useful Cucurbitaceae occurring in Malesia are treated in detail

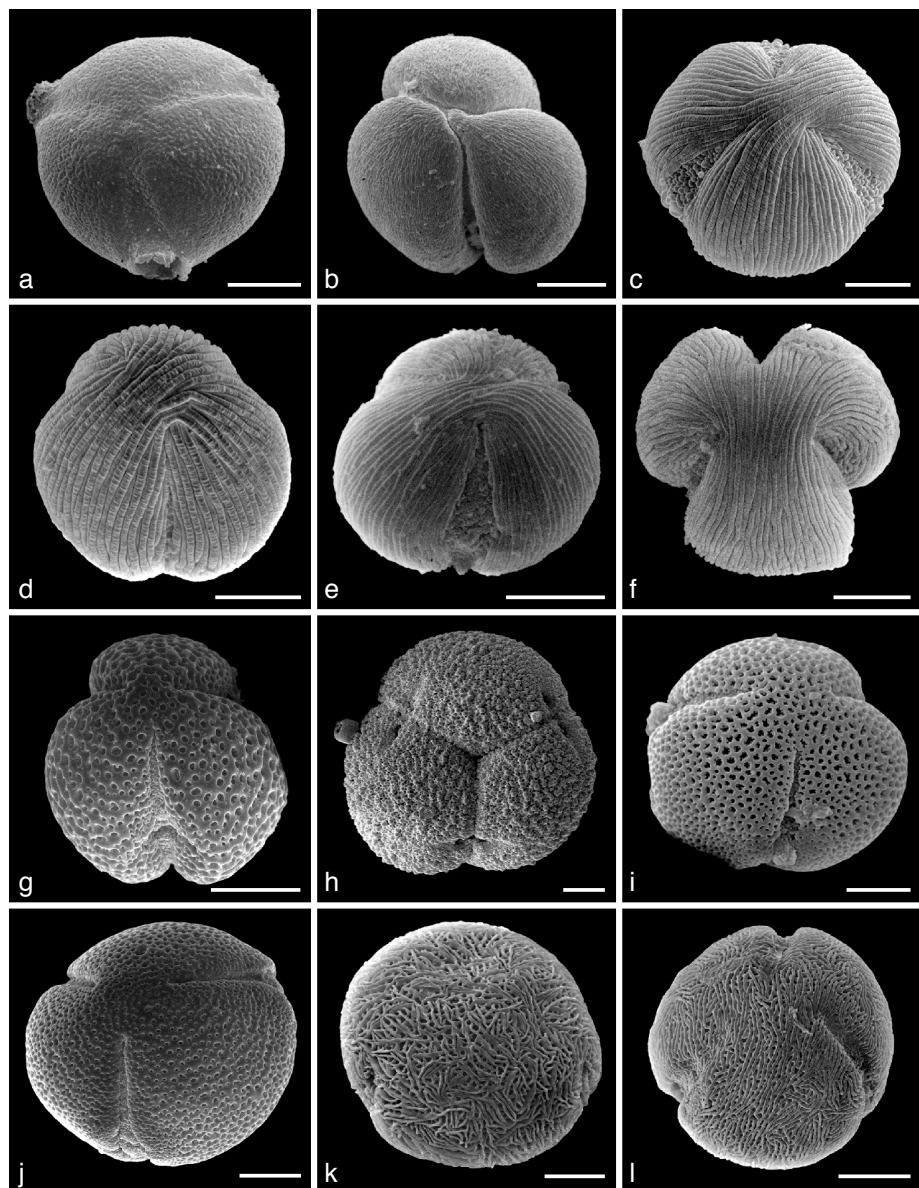


Plate 1. Pollen of mainly Malesian Cucurbitaceae; scanning electron micrographs of more or less polar views of 3-colporate monads, unless stated otherwise. Scale bar = 5  $\mu$ m (a–f), 10  $\mu$ m (g–l).

**a–f:** subfamily Fevilleoideae; **g–l:** subfamily Cucurbitoideae. **a.** *Alsomitra macrocarpa* (Blume) M.Roem., perforate to indistinctly rugulate pollen grain (Java, De Wilde & Duyfjes 21886); **b.** *Baya-busua clarkei* (King) W.J.de Wilde, partly syncolporate striate pollen grain (Peninsular Malaysia, De Wilde & Duyfjes 21886); **c.** *Gomphogyne cirromitrata* f. *minor* W.J.de Wilde & Duyfjes, striate pollen grain (Thailand, Phonsena et al. 4013); **d.** *Gynostemma pentaphyllum* (Thunb.) Makino f. *pentaphyllum*, striate pollen grain (Java, De Wilde & Duyfjes 21890); **e.** *Neoalsomitra schefferiana* (Cogn.) Hutch. subsp. *schefferiana*, striate pollen grain (Moluccas, Kornassi 1433); **f.** *Zanonía indica* L. subsp. *orien-*

by several authors. Young sprouts and flowers of all cultivated Cucurbitaceae are edible. In addition to Gildemacher, Jansen & Chayamarit (1993) can be mentioned that of New Guinean *Trichosanthes* species with red fruit pulp the fruits and seeds are edible, especially when cooked in a young state. Edible Cucurbits of SE Asia have been enumerated by De Wilde & Duyfjes (2008 ('2007')).

#### WOOD ANATOMY

(Pieter Baas)

Most Cucurbitaceae are herbaceous, and the secondary xylem of woody vines and shrubs in the family is very poorly documented or even completely unknown when considering species from the *Flora Malesiana* region. We owe a classical study of the internal phloem of the bicollateral primary vascular bundles to Worsdell (1915). Zimmermann (1922) described the intricate stem vasculature of many taxa, including species of *Coccinia*, *Lagenaria*, *Momordica* and *Sechium*. Carlquist's detailed wood anatomical account (1992) of 4 species included *Coccinia grandis* and *Zanonia indica*. Metcalfe & Chalk (1950) and Schaefer & Renner (in press (for Kubitzki)) summarized the general stem anatomy of both herbaceous and woody Cucurbitaceae. When woody, the secondary xylem of Cucurbitaceae is typically characterized by wide, simply perforated vessels, sheathed by paratracheal parenchyma (that may be lignified or not) and/or vasicentric tracheids, varying amounts of libriform fibres and unlignified apotracheal parenchyma, and broad, unlignified rays (uniseriate rays are absent). Many of these features are typical of the liana habit (Bamber & Ter Welle 1994; Carlquist 1992). The fibres of *Trichosanthes* are nucleated (Rajput & Rao 1999). Successive cambia occur in *Luffa* and *Melothria* (Carlquist 2001). The swollen stem bases of *Neoalsomitra podagrifolia* are largely parenchymatous with little secondary growth in the outer ring of collateral vascular bundles (pers. obs.).

#### POLLEN MORPHOLOGY

(C.B. Mennes & R.W.J.M. van der Ham)

The pollen of the Cucurbitaceae is nearly always shed as monads. Tetrads occur in a few genera in subfamily Cucurbitoideae (tribes Benincaseae, Coniandreae, Thladiantheae). Pollen grain size is small to very large (17–208 µm) and pollen grain shape mostly subspheroidal. The aperture system is mostly 3-zonocolporate, but 4–16-aperturate,

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*talis* W.J.de Wilde & Duyfjes var. *pubescens* Cogn., striate pollen grain (New Guinea, Hartley 10037); **g.** *Baijiania borneensis* (Merr.) A.M.Lu & J.Q.Li var. *borneensis*, reticulate pollen grain (Borneo, SAN 141929); **h.** *Borneosicyos simplex* W.J.de Wilde, brevicolporate gemmate tetrad (Borneo, SAN 144251); **i.** *Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes subsp. *chlorocarpa*, reticulate pollen grain (Borneo, SAN 144096); **j.** *Muellerargia timorensis* Cogn., reticulate pollen grain (Sumba, Iboet 185); **k.** *Scopellaria marginata* (Blume) W.J.de Wilde & Duyfjes subsp. *marginata* var. *penangense* (C.B.Clarke) W.J.de Wilde & Duyfjes, brevicolporate reticulate-striate pollen grain (Sumatra, De Wilde & Duyfjes 18234); **l.** *Urceodiscus belensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes subsp. *belensis*, reticulate-striate pollen grain (New Guinea, LAE 63476).

pantoaperturate, colpate and (operculate) porate systems also occur. The exine is usually tectate; in the tribes Benincaseae, Cucurbitaeae and Schizopeponeae intectate exines are found. Pollen grains of Fevilleoideae (Plate 1a–f) are usually striate, while perforate and reticulate are the most common ornamentation types in the Cucurbitoideae (Plate 1g–l). The Cucurbitaeae, Schizopeponeae and Sicyeae show some clearly deviating pollen types. Below, Cucurbitaceae pollen is described per subfamily and/or tribe, based on the literature provided by the ‘Bibliographic index to the pollen morphology of Angiosperms’ (Thanikaimoni & Van der Ham 1999), a few more recent studies and own observations. The taxonomy follows Schaefer et al. (2009), who recognised 15 tribes with 128 genera, 37 of which occur in Malesia. The pollen of three genera is unknown (see below). Pollen studies treating substantial numbers of genera include those by Erdtman (1952), Marticorena (1963), Alyoshina (1971), Keraudren-Aymonin & Straka (1984), Ayala-Nieto et al. (1988), Sharma (1991), Khunwasi (1998), Perveen & Qaiser (2008) and Yang et al. (2008). Less inclusive studies are mentioned below.

### Fevilleoideae

Tribes Actinostemmatae, Fevilleeae, Gomphogyneae, Zanonieae (19 genera; Malesia: *Alsomitra*, *Bayabusua*, *Gomphogyne*, *Gynostemma*, *Neoalsomitra*, *Zanonia*).

Pollen grains monads, mostly small to medium-sized (17–52 µm) and subprolate, sometimes subspheroidal or prolate. Aperture system 3-colporate. Ornamentation mostly striate with long subparallel muri, sometimes perforate to indistinctly rugulate (*Alsomitra*, Gomphogyneae; Plate 1a), irregularly striate (*Bolbostemma* p.p., Actinostemmatae) or reticulate (*Gerrardanthus*, Zanonieae). Literature: De Wilde et al. (2007a), Lira et al. (1998), Van der Ham (1999).

### Cucurbitoideae

Tribe Benincaseae (32 genera; Malesia: *Anangia*, *Benincasa*, *Borneosicyos*, *Citrullus*, *Coccinia*, *Cucumis* [incl. *Mukia* in Schaefer et al. 2009], *Diplocyclos*, *Indomelothria*, *Lagenaria*, *Melothria*, *Muellerargia*, *Neoachmandra*, *Papuasicyos*, *Pilogyne*, *Scopellaria*, *Solena*, *Urceodiscus*).

Pollen grains mostly monads, small to large (29–107 µm), subspheroidal, sometimes oblate or prolate; pollen of *Borneosicyos* occurs in tetrads of c. 85 µm diam. (Plate 1h). Aperture system 3-, rarely 4- or 6-colporate, sometimes 3-brevicolporate to -porate (*Borneosicyos*, *Cucumis*, *Diplocyclos*, *Scopellaria*, *Urceodiscus*; Plate 1h, k, l). Ornamentation mostly perforate to reticulate, sometimes reticulate-striate with short sinuous muri (*Dactyliandra*, *Papuasicyos*, *Peponium*, *Scopellaria*, *Urceodiscus*; Plate 1k, l), reticulate-echinate (*Diplocyclos*), intectate echinate (*Praecitrullus*), gemmate (*Borneosicyos*; Plate 1h) or verrucate (*Solena* p.p.). The pollen of the African-Madagascan *Zehneria*(?) *peneyana* deviates by being 6-porate (6-brevicolporate?), and that of *Cephalopentandra* by its operculate porate apertures and intectate gemmate exine. Literature: De Wilde et al. (2004, 2006, 2007b), Duyfjes et al. (2003), Van der Ham & Pruesapan (2006), Van der Ham & Van Heuven (2003).

Tribe Bryonieae (*Austrobryonia*, *Bryonia*, *Ecballium*; Malesia: absent).

Pollen grains monads, medium-sized to large (42–67  $\mu\text{m}$ ) and oblate spheroidal to prolate. Aperture system 3-colporate. Ornamentation reticulate in *Bryonia* and *Ecballium*, unknown in *Austrobryonia*.

Tribe Coniandreae (21 genera; Malesia: *Kedrostis*).

Pollen grains mostly monads, medium-sized to large (34–104  $\mu\text{m}$ ), subspheroidal, sometimes oblate or prolate; pollen of *Gurania* and *Psiguria* occurs in tetrads of 149–185  $\mu\text{m}$  diameter. Aperture system mostly 3-colporate, sometimes 3–4(5)-colporate (*Ceratosanthes*), 4-colporate (*Dieterlea*) or 3–6-porate (*Gurania*, *Psiguria*). Ornamentation mostly perforate to reticulate, sometimes reticulate-striate with short sinuous muri (*Kedrostis* p.p.) or locally intectate echinate (*Gurania*). Pollen unknown: *Tumamoca*.

Tribe Cucurbitae (13 genera; Malesia: *Cayaponia*, *Cucurbita*).

Pollen grains monads, large to very large (61–208  $\mu\text{m}$ ), spheroidal. Aperture system 3–10-zono- or pantoporate; pores operculate. Ornamentation intectate echinate. Pollen unknown: *Penelopeia*. Literature: Barth et al. (2005), Teppner (2004).

Tribe Indofevilleae (*Indofevillea*; Malesia: absent).

Pollen grains monads, mostly medium-sized (53  $\mu\text{m}$ ), oblate to subprolate. Aperture system 3-colp(or)ate. Ornamentation coarsely reticulate.

Tribe Momordiceae (*Momordica*; Malesia: 5 species).

Pollen grains monads, medium-sized to large (65–79  $\mu\text{m}$ ), oblate to prolate. Aperture system 3-colporate. Ornamentation reticulate.

Tribe Schizopeponeae (*Biswarea*, *Edgaria*, *Herpetospermum*, *Schizopepon*; Malesia: absent).

Pollen grains monads, medium-sized (23–49  $\mu\text{m}$ ; *Schizopepon*) or large to very large (111–134  $\mu\text{m}$ ), subspheroidal. Aperture system 3-colporate (*Schizopepon*) or 3-porate with operculate pores. Ornamentation reticulate (*Schizopepon*) or baculate/gemmate.

Tribe Sicyeae (24 genera; Malesia: *Cyclanthera*, *Gymnopetalum*, *Hodgsonia*, *Luffa*, *Sechium*, *Trichosanthes*).

Pollen grains monads, medium-sized to very large (30–168  $\mu\text{m}$ ), oblate to prolate, but usually subspheroidal. Aperture system 3(4)-(brevi)colporate to 3-porate (e.g. *Gymnopetalum*, *Hodgsonia*, *Luffa*, *Trichosanthes*) or 4–16-colp(or)ate (e.g. *Cyclanthera*, *Sechium*). Irregular aperture systems occur in several genera (e.g. *Echinocystis*, *Pseudocyclanthera*, *Rytidostylis*). Ornamentation mostly perforate-rugulate to reticulate, sometimes tectate echinate (e.g. *Sechium*), rarely verrucate (*Trichosanthes cucumerina*). The pollen of *Linnaeosicyos* deviates within the Cucurbitaceae by the presence of margos along the colpi and ridges connecting their apices. Literature: Alvarado et al. (1992), Monro & Stafford (1998), Pruesapan & Van der Ham (2005), Schaefer et al. (2008), Stafford & Sutton (1994).

Tribe Siraitieae (*Microlagenaria*, *Siraitia*; Malesia: *Siraitia*).

Pollen grains monads, mostly medium-sized (35–51  $\mu\text{m}$ ), subspheroidal, sometimes suboblate or prolate. Aperture system 3-colporate. Ornamentation reticulate.

Tribe Telfairieae (*Ampelosicyos*, *Cogniauxia*, *Odosicyos*, *Telfaria*, *Tricyclandra*; Malesia: absent)

Pollen grains monads, medium-sized to large (46–82  $\mu\text{m}$ ), spheroidal to subprolate. Aperture system mostly 3(4)-colporate, sometimes brevicolporate (*Tricyclandra*). Ornamentation mostly (coarsely) reticulate, sometimes reticulate-striate with short sinuous muri (*Ampelosicyos*) or verrucate (*Tricyclandra*). Pollen unknown: *Odosicyos*.

Tribe Thladiantheae (*Baijiana*, *Sinobaijiana*, *Thladiantha*; Malesia: *Baijiana*, *Thladiantha*)

Pollen grains mostly monads, medium-sized to large (26–79  $\mu\text{m}$ ), oblate to prolate; the pollen of one *Thladiantha* species occurs in tetrads. Aperture system 3(4)-colp(or)ate. Ornamentation (coarsely) reticulate. Literature: Zhang & Lu (1989).

Earlier accounts on the taxonomic and evolutionary significance of pollen characters in Cucurbitaceae were given by Marticorena (1963), Jeffrey (1964) and Khunwasi (1998), who agreed that the subdivision into two subfamilies, Fevilleoideae and Cucurbitoideae, is well supported by pollen morphology. Kocyan et al. (2007) compared the pollen diversity (unpublished data) in the family with a molecular phylogeny. He supported the perception that the pollen characters were relatively conserved and he confirmed the differences between the Fevilleoideae and Cucurbitoideae. Further, the special pollen types of the Cucurbitaceae and Sicyeae (s.s.) and the parallel evolution of echinate ornamentation in *Diplocyclos*, *Praecitrullus* (both Benincaseae) and the Cucurbitaceae and of tetrads in *Gurania/Psiguria* and *Borneosicyos* were noticed.

In the present study, pollen data of 123 out of the 128 genera in the family were evaluated by plotting them on the molecular phylogeny including 127 genera (*Khmeriosicyos* missing) by Schaefer et al. (2009). In this phylogeny, the genera traditionally comprising subfamily Fevilleoideae (syn. Nhandiroboideae, Zanonioideae) occur in four clades (tribes Actinostemmatae, Fevilleae, Gomphogyneae, Zanonieae), which together with subfamily Cucurbitoideae form a basal pentatomy (see also Schaefer & Renner 2008b). The pollen characters considered are: 1) dispersal unit (monad, tetrad); 2) pollen grain size (17–208  $\mu\text{m}$ ); 3) aperture number (2–16); 4) aperture distribution (zono-, pantoaperturate); 5) ectoaperture type (colpate, porate, operculate); 6) exine (tectate, intectate); and 7) exine ornamentation (rugulate, perforate, reticulate, striate, reticulate-striate, verrucate, echinate, gemmate).

Most common in Cucurbitaceae are medium-sized to large, 3-zonocolporate monads, which occur in all 15 tribes recognised by Schaefer et al. (2009). All genera in the four basal tribes (Fevilleoideae), except *Alsomitra* (Plate 1a) and *Gerrardanthus*, have striate pollen with long subparallel muri (Plate 1b–f), which clearly differs from the reticulate-striate pollen with short sinuous muri (Plate 1k, l) found in eight genera in three Cucurbitoideae tribes (Benincaseae: *Dactyliandra*, *Papuasicyos*, *Peponium*, *Scopellaria*, *Urceodiscus*; Coniandreae: *Kedrostis africana*; Telfairieae: *Ampelosicyos*).

*Papuasicyos*, *Scopellaria* and *Urceodiscus* make up a clade within the tribe Benincaseae. Striate pollen with long subparallel muri is found in a few outgroup members of the family (e.g. *Anisophyllea*, *Begonia*), but still it may represent a derived character supporting the monophyly of the four Fevilleoideae tribes (Van der Ham et al. in press). Most common in subfamily Cucurbitoideae is some form of perforate to reticulate ornamentation, which is present in 10 of the 11 tribes. The 3-zonocolporate reticulate pollen of *Khmeriosicyos*, which genus is missing in the analysis by Schaefer et al. (2009), clearly belongs to one of these 10 tribes, and would fit well in the tribe Benincaseae (see De Wilde et al. 2004).

Derived pollen types occur especially in the more derived tribes of subfamily Cucurbitoideae: Benincaseae, Coniandreae, Cucurbitae, Schizopeponeae and Sicyeae. These types have combinations of the following characters: tetrads, more than three apertures, pantoaperturate, brevicolpate or (operculate) porate ectoapertures, intectate exine and reticulate-striate, verrucate, echinate or gemmate ornamentation. All these characters, except maybe for pantoaperturate arrangement, evolved more than once in the derived Cucurbitoideae. Some groups show special combinations, e.g., operculate pores + intectate exine + echinate ornamentation (Cucurbitae) and 6–12 colpate ectoapertures + echinate ornamentation (Sicyeae: subtribe Sicyinae and *Frantzia* p.p.). Within the Sicyeae a trend in aperture number is present. The more derived, the larger the number of apertures: 3(4) (*Nothoalsomitra*, *Luffa*, *Trichosanthes*, *Hodgsonia*, *Gymnopetalum*), 4 (*Linnaeosicyos*), 4–6 (*Marah*, *Echinocystis*), 4–16 (rest of tribe). Fossil *Hexacolpites echinatus* pollen (6-colpate, echinate) from the Oligocene (34–23 mya) of Africa may be identified as Sicyeae pollen (Muller 1981); it dates the split between the clade *Marah-Echinocystis* and its sister clade at minimally 23 million years ago. *Cephalopentandra* (Benincaseae) and the clade *Biswarea-Edgaria-Herpetospermum* (Schizopeponeae) have large to very large, intectate, gemmate pollen with three operculate porate apertures, which would represent a remarkable case of parallel evolution. Tetrads always have short colpi or pori (without operculum). They are a synapomorphy of *Gurania* and *Psiguria* (Coniandreae), but originated independently in *Borneosicyos* (Benincaseae).

#### CHEMOTAXONOMY

Detailed notes on the chemistry and chemotaxonomy of the Cucurbitaceae have been provided by Hegnauer (1989) and Schaefer & Renner (in press (for Kubitzki)).

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#### KEYS TO THE GENERA

Note on the distinction of the subfamilies. — According to molecular phylogeny the here recognized two subfamilies in Cucurbitaceae, *Fevilleoideae* and *Cucurbitoideae* cannot be maintained because *Fevilleoideae* is paraphyletic (Schaefer & Renner 2008). However, morphologically the distinction is quite clear, although a single quick and user-friendly easily observable character in a collection is not always present. In practice one should check the presented characters in leads of both keys successively, which readily will exclude the subfamilies from each other.

#### 1 – GENERAL KEY FOR MALE FLOWERING MATERIAL

- 1a. Tendrils distally 2-branched. Inflorescences paniculate; bracts usually minute, 1–2 mm long. Flowers small, petals less than 5 mm long (6–8 mm long in *Alsomitra*) whitish or pale off-yellow, or purple-red in *Bayabusua*, never yellow. Stamens 3 (*Alsomitra*, *Bayabusua*), or 5 evenly spaced; filaments inserted on or near the disc (if present). Pollen small, striate. (Styles 3. Fruit a capsule (except *Gynostemma*)). — Subfam. *Fevilleoideae* . . . . . 2
- b. Tendrils simple or branched at or below the middle (except *Baijania* and *Siraitia* with tendrils distally 2-branched). Flowers solitary, or fascicled, or in racemes, or in panicles but then petals usually larger; bracts small or large. Flowers small or large, petals white, off-yellow or bright yellow. Stamens 3, or 5 but then 4 in two pairs and 1 solitary; filaments inserted on the receptacle-tube. Pollen generally larger, generally not striate. (Style 1. Fruit usually a berry). — Subfam. *Cucurbitoideae* . 7
- 2a. Large climber 15–30 m long. Stamens 3, anthers 3 or 5 . . . . . 3
- b. Small or large climber 1–15 m long. Stamens 5, anthers 1 mm long or less, all one-thecous . . . . . 4

- 3a. Petals valvate. Anthers 3–4 mm long, 2 two-thealous, 1 one-thealous. Perianth creamy . . . . . **1. Alsomitra**
- b. Petals imbricate. Anthers c. 2 mm long, white, two filaments with two anthers, one filament with one anther, all anthers one-thealous. Perianth red. . . **4. Bayabusua**
- 4a. Leaf blade simple, margin entire; petiole scar raised when dry. Inflorescences on the older wood. Perianth fleshy, c. 6 mm diameter . . . . . **37. Zanonia**
- b. Leaf blade often foliolate, margin entire or serrate; petiole scar not raised when dry. Inflorescences terminal or among the leaves. Perianth membranous, small but various of size . . . . . 5
- 5a. Filaments united into a solid column . . . . . **16. Gynostemma**
- b. Filaments free (or united into a hollow column in *Neoalsomitra hederifolia*) . . 6
- 6a. Blade margin entire . . . . . **27. Neoalsomitra**
- b. Blade margin serrate-dentate . . . . . **14. Gomphogyne**
- 7a. Petals or corolla (petals free or partly united) 8 mm long or more (open corolla more than 15 mm diam.) . . . . . 8
- b. Petals or corolla less than 8(–10) mm long . . . . . 23
- 8a. Petals yellow or greenish, or in *Momordica*, partly, near-white with dark blotch at base . . . . . 9
- b. Petals white, sometimes green veined, or pink, rarely with some yellow . . . . 19
- 9a. Flowers solitary, with conspicuous bract on flower stalk. . . . . **23. Momordica**
- b. Flowers either solitary, or in clusters, racemes, or panicles, without conspicuous bract on flower stalk (probract may be present or absent) . . . . . 10
- 10a. Corolla pale greenish yellow. Filaments united. — [Flowers in short-stalked clusters arranged in pseudo-racemes. Vigorous climber. Usually cultivated]. . . . . **31. Sechium**
- b. Corolla light or dark yellow. Filaments free (but anthers may be connate). — [Habit of plant and disposition of flowers various]. . . . . 11
- 11a. Flower solitary or in (sub)sessile clusters . . . . . 12
- b. Flowers in racemes or panicles . . . . . 15
- 12a. Probract conspicuous. Petals free . . . . . 13
- b. probract absent. . . . . 14
- 13a. Sepals larger, ± recurved. Leaf blade palmately veined or lobed . . **5. Benincasa**
- b. Sepals minute, patent or recurved. Leaf blade ± pinnately lobed . . **8. Citrullus**
- 14a. Tendrils unbranched. Flowers in sessile clusters; corolla c. 2 cm long or less, petals connate for lower 1/3 or less . . . . . **10. Cucumis**
- b. Tendrils branched. Flowers solitary, corolla larger, petals connate into a tube for c. halfway . . . . . **11. Cucurbita**
- 15a. Tendrils (2-)3-more-branched at or below the middle. Probract present . . . . . **21. Luffa**
- b. Tendrils unbranched or apically 2-branched. Probract absent or present. . . . . 16
- 16a. Receptacle and vegetative parts (especially leaves below) densely set with appressed blackish glandular hairs. Thecae conduplicate (hooked). . . **32. Siraitia**
- b. Blackish glandular hairs absent. Thecae straight, curved, or convolute, (not hooked) . . . . . 17

- 17a. Stamens 3, or 5, when 5 then four in two pairs, one single. Petals with basal scale . . . . . **34. Thladiantha** (& **23. Momordica**, p.p., namely . . . . *M. clarkeana*, a species sometimes with a panicle-like male inflorescence)
- b. Stamens 3. Petals without basal scale . . . . . 18
- 18a. Flowers in a panicle. — Borneo . . . . . **6. Borneosicyos**
- b. Flowers in a pedunculate raceme. — New Guinea . . . . . **36. Urceodiscus** p.p. . . . . (large-flowered species)
- 19a. Receptacle-tube short, cup-shaped. Petals largely fused. Filaments fused or tightly coherent . . . . . **9. Coccinia**
- b. Receptacle-tube elongate. Petals free. Filaments free (anthers coherent) . . . . 20
- 20a. Apex of petiole with two glands at the transition to the blade . . . **20. Lagenaria**
- b. Apex of petiole without glands . . . . . 21
- 21a. Stout climber. Probract thorn-like, triangular, coriaceous, with sharp apex. Petals long fimbriate . . . . . **17. Hodgsonia**
- b. Plant of medium or small stature. Probract not thorn-like or absent . . . . . 22
- 22a. Petals not fimbriate . . . . . **15. Gymnopetalum**
- b. Petals long-fimbriate . . . . . **35. Trichosanthes**
- 23a. Anthers forming a closed continuous ring. — Introduced . . . . . **12. Cyclanthera** (*C. brachystachya*)
- b. Anthers not forming a closed ring . . . . . 24
- 24a. Sepals twice as long as petals . . . . . **2. Anangia**
- b. Sepals (as long as or) shorter than petals . . . . . 25
- 25a. Flowers axillary to large bracts . . . . . **3. Baijiania**
- b. Bracts (minute or) absent . . . . . 26
- 26a. Flowers with short pedicels arranged in an elongate spike-like raceme. Petals yellow. Filaments nodding at apex . . . . . **19. Kedrostis**
- b. Pedicels long or short; flowers in fascicles, or (sub)paniculate, or in pedunculate short racemes. Petals white or yellow. Filaments straight . . . . . 27
- 27a. Anthers (thecae) plicate, contorted, or strongly hooked. . . . . 28
- b. Anthers (thecae) straight or  $\pm$  curved, not plicate . . . . . 32
- 28a. Plant glabrous or scabrous. Filaments distinct; connective not produced . . . . 29
- b. Plant hairy. Leaf blade unlobed or lobed. Filaments short; connective produced . . . . . 31
- 29a. Leaf blade unlobed. Flowers in peduncled raceme. — New Guinea . . . . . **28. Papuasicyos**
- b. Leaf blade mostly deeply palmately lobed. . . . . 30
- 30a. Flowers fasciculate in leaf axils. . . . . **13. Diplocyclos**
- b. Flowers arranged in loose panicles. — East Java, naturalized . . . . . **7. Cayaponia** (*C. martiana*)
- 31a. Thecae 2-plicate. Petals (corolla) yellow. . . . . **10. Cucumis**
- b. Thecae hooked. Petals white . . . . . **24. Muellerargia**
- 32a. Plant usually glabrous. Leaf blade subcoriaceous, with short petiole **33. Solena**
- b. Plant glabrous or hairy. Leaf blade membranous; petiole long (occasionally short in *Scopellaria*) . . . . . 33

- 33a. Plant coarsely rough-hairy. Flowers subsessile or short-pedicelled (pedicel 2–10 mm long), fascicled at the nodes . . . . . **25. Mukia**  
 b. Plant glabrous or finely rough or soft-hairy. Flowers either long-pedicelled (pedicel more than 10 mm long) or in a pedunculate raceme . . . . . 34
- 34a. Flowers in a pedunculate raceme. Stamens 3, inserted in or near the throat of the receptacle-tube; anthers two 2-theous, one 1-theous . . . . . 35  
 b. Flowers solitary or (few-)fascicled, directly inserted at the node, usually co-axillary with a female flower, or in a (short) pedunculate raceme or fascicle. Stamens 3; all anthers 2-theous . . . . . 36
- 35a. Petals (creamy-)white, apex obtuse . . . . . **18. Indomelothria**  
 b. Petals yellow, apex notched . . . . . **22. Melothria**
- 36a. Flowers 1 or few, each directly inserted on the node. Stamens inserted near the throat of the receptacle-tube; filaments short, as long as or shorter than the anther, thecae straight. Probract absent . . . . . **26. Neochandra**  
 b. Flowers in a pedunculate raceme or fascicle. Filaments (usually) longer than anthers, thecae straight or curved . . . . . 37
- 37a. Petals white, imbricate or valvate. Stamens inserted halfway or in the lower half in the receptacle-tube, (largely) included. Probract (small, linear) present . . . 38  
 b. Petals yellow, imbricate. Stamens inserted in the throat of receptacle-tube, (largely) exerted. Probract absent . . . . . 39
- 38a. Flowers mostly in a pedunculate raceme. Stamens mostly inserted at (or towards) base of hypanthium-tube; filament longer than anther (shorter in *Pilogyne viridifolia*) . . . . . **29. Pilogyne**  
 b. Flowers in a (sub)sessile fascicle. Stamens inserted about halfway the tube; filament about as long as anther. — Norfolk Is., not in Malesia . . . . . **Zehneria**
- 39a. Pedicels crowded. Disc free. — SE Asia & West Malesia . . . . . **30. Scopellaria**  
 b. Pedicels spaced. Disc urceolate, adnate to base of receptacle-tube. — New Guinea . . . . . **36. Urceodiscus** p.p. (small-flowered species)

## 2 – GENERAL KEY FOR FRUITING AND FEMALE FLOWERING MATERIAL

- 1a. Flowers or fruit in panicles or racemes, however sometimes much reduced. Ovary somewhat superior, at apex flat, broad, not constricted. Styles 3. Fruit becoming dry, dehiscent with valves in truncate apex (indehiscent in *Gynostemma*, p.p.). Tendrils 2-branched at apex. — Subfam. Fevilleoideae . . . . . 2  
 b. Flowers or fruit solitary or fascicled, or in racemes, or panicles. Ovary inferior, at apex narrow, constricted. Style 1. Fruits usually berry-like (pepo-fruit), usually indehiscent. Tendrils unbranched or branched at or below the middle (distally 2-branched in *Siraitia* and *Baijania*). — Subfam. Cucurbitoideae . . . . . 7
- 2a. Climber to 30 m long. (Ovary half-globose, 5–10 mm diam. in *Alsomitra*). Fruit 20–30 cm long. Seeds c. 2 cm diam., winged . . . . . 3  
 b. Small or medium climber to 15 m long. Fruit much smaller. Seeds large (*Zanonia*) or smaller. . . . . 4
- 3a. Fruit half-globose mitriform, 20–30 cm diam. Seed entire, broadly butterfly-like winged, c. 10 cm wide. Flowers creamy . . . . . **1. Alsomitra**

- b. Fruit claviform-cylindric, bluntly triangular, 8–10 cm wide. Seed toothed, with circular wing c. 5 cm wide. Flowers red (female flowers not known) . . . . . **4. Bayabusua**
- 4a. Ovary and fruit subglobose. Fruit 8 mm diam. or less, dehiscent or indehiscent. Seeds few, not winged . . . . . **16. Gynostemma**
- b. Ovary and fruit elongated. Fruit 1.5 cm long or longer, dehiscent. Seeds mostly winged . . . . . 5
- 5a. Sepals 3, petals 5. Fruit c. 8 cm long. Seeds large, 1.5–2 cm long, winged at both ends, including the wings 4–8 cm long . . . . . **37. Zanonnia**
- b. Sepals and petals 5. Fruit c. 8 cm long or shorter. Seeds shorter . . . . . 6
- 6a. Blade margin serrate. Fruit with 3 horn-like processes at apex. Seeds not winged or winged all around (broadest at the ends). Pedicel often with 1 or 2 small tendril(s). — East Malesia . . . . . **14. Gomphogyne**
- b. Blade margin entire. Fruit without horn-like processes at apex. Seeds winged at one side. Pedicel without tendril(s). — West & East Malesia . **27. Neoalsomitra**
- 7a. Sepals much longer than petals. — Moluccas: Morotai Is. . . . . **2. Anangia** (fruit not known)
- b. Sepals shorter than petals. . . . . 8
- 8a. Fruit (or ovary) ornamented with ridges, warts, or (few) (soft) spines, (irregular) grooves, or fruit fenestrate (fruit of *Momordica clarkeana* and *M. denticulata* almost smooth) . . . . . 9
- b. Fruit not ornamented (colour or fine texture excepted), surface glabrous or hairy . . . . . 18
- 9a. Fruit ± curved. — Introduced from America, cultivated or locally naturalized . . . . . **12. Cyclanthera**
- b. Fruit not curved . . . . . 10
- 10a. Tendrils 3- or more-branched. . . . . 11
- b. Tendrils unbranched or 2-branched . . . . . 13
- 11a. Fruit longitudinally ridged . . . . . **21. Luffa** (*L. acutangula*)
- b. Fruit smooth, or ± bullate, or grooved . . . . . 12
- 12a. Fruit pear-shaped, 10–15 cm long. Seed one . . . . . **31. Sechium**
- b. Fruit globose, ellipsoid or pyriform, small or large. Seeds numerous . . . . . **11. Cucurbita**
- 13a. Fruit (globose or) broadly ellipsoid, c. 10 cm diam. or more, warted (tuberclcd) or spiny all over. Seeds c. 15 mm long or more, flat, margin cogwheel-like undulate . . . . . **23. Momordica**
- b. Fruit (narrowly) ellipsoid or oblong, usually < 10 cm diam. Seeds generally smaller . . . . . 14
- 14a. Tendrils unbranched. Fruit echinate or aculeate-tuberclcd, or smooth, green or yellow. Seeds oblong, not ornamented, edge smooth . . . . . 15
- b. Tendrils unbranched or 2-branched. Fruit tuberclcd, ribbed or fenestrate, ± beaked. Seeds ornamented or with grooved margin . . . . . 16
- 15a. Fruit not squirting. Flowers yellow . . . . . **10 Cucumis**
- b. Fruit squirting. Flowers white. [Fruit occasionally smooth, not ornamented.] . . . . . **24. Muellerargia**

- 16a. Fruit green or yellow, fenestrate, hardly beaked . . . . . **34. Thladiantha**  
 b. Fruit orange or red, beaked . . . . . 17
- 17a. Tendrils (unbranched or) 2-branched. Fruit low-ribbed. Seeds  $\pm$  oblong, margin entire . . . . . **15. Gymnopetalum**  
 b. Tendrils unbranched. Fruit ribbed or (few-)tubercled. Seeds ellipsoid-globose, edge undulate . . . . . **23. Momordica**
- 18a. Plant cultivated (but frequently also found running wild) . . . . . 19  
 b. Plant wild (some wild species occasionally cultivated; *Cayaponia* naturalized in Java; *Melothria* widely naturalized) . . . . . 26
- 19a. Ripe dry fruit opening with apical operculum . . . . . **21. Luffa**  
 b. Fruit without apical operculum . . . . . 20
- 20a. Fruit frequently  $\pm$  flask-shaped constricted. Petiole with 2 glands at apex . . . . . **20. Lagenaria**  
 b. Fruit (depressed) globose, ellipsoid, or oblong. Petiole without glands at apex 21
- 21a. Leaf blade more or less pinnately (veined and) lobed. Seeds brown or black . . . . . **8. Citrullus**  
 b. Leaf blade palmately (pedately) veined, unlobed or lobed. Seeds pale brown or whitish . . . . . 22
- 22a. Tendrils unbranched. . . . . **10. Cucumis**  
 b. Tendrils 2–5-branched. . . . . 23
- 23a. Probract distinct, hooded. Seeds c. 10 mm long, almost unmarginated **5. Benincasa**  
 b. Probract absent or not obvious. Seeds usually > 10 mm long, margined . . . . . 24
- 24a. Fruit globose, c. 6 cm diam. Seeds subcircular, margin with double wing. — *Siraitia grosvenorii* (Swingle) A.M.Lu & Zhi Y.Zhang, cultivated in China, and sold in Malesia for its sweet, medicinal fruit . . . . . **32. Siraitia**  
 b. Fruit larger, globose, ellipsoid or cylindrical. Seeds elliptic in outline, not winged . . . . . 25
- 25a. Fruit globose, short-ellipsoid or pyriform. Seed edge not undulate . . . . . **11. Cucurbita**  
 b. Fruit long-cylindrical. Seed edge coarsely undulate . . . . . **35. Trichosanthes** (*T. cucumerina* var. *anguina*)
- 26a. Fruit large, globose, with 6 large seeds 5–8(–10) cm long. Probract sharp, thorn-like . . . . . **17. Hodgsonia**  
 b. Fruit various, smaller, less than 10 cm long, seeds more than 6 (1 or 2 in *Kedrostis*). Probract not sharp at apex, or absent . . . . . 27
- 27a. Seeds tumid (barrel-shaped or (sub)fusiform), or pyriform (see Fig. 19b, 91b) 28  
 b. Seeds either subglobose, or elongate, little or much compressed (ornamented or not) . . . . . 29
- 28a. Fruit c. 2 cm diam., green, later red and white-blotched or -striped, (sub)sessile . . . . . **13. Diplocyclos**  
 b. Fruit > 2 cm diam., pedicelled . . . . . **35. Trichosanthes**
- 29a. Fruit 5 cm long or more, seeds 1 cm long or more. Flowers large, petals white, long-fimbriate . . . . . **35. Trichosanthes**  
 b. Fruit shorter or longer than 5 cm, seeds various. Flowers small or large; petals yellow or white, not long-fimbriate . . . . . 30

- 30a. Tendrils several-branched (2- or more-branched). Probract conspicuous. Petals large, longer than 2 cm, yellow . . . . . 31
- b. Tendrils unbranched or 2-branched. Probract small or absent. Petals yellow or greenish, smaller, less than 1.5 cm long, or petals white . . . . . 32
- 31a. Fruit brown, operculate . . . . . **21. Luffa**
- b. Fruit green or usually with whitish bloom; not operculate . . . . . **5. Benincasa**
- 32a. Flowers large, white; petals free, c. 20 mm long. Tendrils unbranched or unequally 2-branched near the base . . . . . **15. Gymnopetalum**
- b. Flowers medium or small, white (whitish) or yellow; petals either (almost) free, 15 mm long or less, or petals largely fused and flowers large. Tendrils unbranched or 2-branched towards the apex . . . . . 33
- 33a. Flowers large, white, corolla c. 25 mm long, petals fused for c. 2/3. Fruit glabrous, pulp or juice red . . . . . **9. Coccinia**
- b. Flowers smaller, white or yellow, corolla c. 20 mm long or less, petals free or short-connate at base only. Fruit glabrous or hairy, pulp or juice white or yellow . . . . . 34
- 34a. Fruit globose, c. 5 cm diam. Seeds with 2- or 3-winged margin. Leaf blade with minute blackish appressed glandular hairs . . . . . **32. Siraítia**
- b. Fruit globose, or ellipsoid or fusiform, small or large. Seeds not winged. Blackish glandular hairs absent . . . . . 35
- 35a. Flowers medium, petals c. 10 mm long, yellow . . . . . 36
- b. Flowers small, petals c. 5 mm long or less, white, greenish or yellow . . . . . 39
- 36a. Female flowers or fruit solitary, in non-pedunculate raceme at the end of shoots, or flowers 4–7 in a short raceme. Fruit c. 5 cm long, smooth; seeds few or several, large, c. 9 mm long, subglobose, smooth. — Borneo . . . . . **6. Borneosicyos**
- b. Female flowers or fruit on the leaf-bearing node. Fruits various; seeds numerous, smaller, ornamented . . . . . 37
- 37a. Fruit hairy, glabrescent (see Fl. China). — Philippines . . . . . **34. Thladiantha (T. nudiflora)**
- b. Fruit glabrous. — New Guinea . . . . . 38
- 38a. Stigma 3 times parted, finely feather-like. Disc not obvious (absent) . . . . . **28. Papuasicyos**
- b. Stigma 3-lobed (papillose). Disc urceolate, largely adnate to the base of the receptacle-tube . . . . . **36. Urceodiscus** p.p. (larger-flowered species)
- 39a. Fruit globose, 3–4.5 cm across, hairy. — Borneo . . . . . **3. Baijiania**
- b. Fruit globose but much smaller, c. 1 cm diam., or fruit ellipsoid or ovoid . . . 40
- 40a. Seeds nearly globose, smooth . . . . . 41
- b. Seeds elongate, somewhat or much compressed. Petiole mostly long . . . . . 42
- 41a. Petiole short. Flowers creamy-white. Fruits 2–5 cm long. Seeds 5–20 **33. Solena**
- b. Petiole long, usually at least as long as half the length of the blade. Flowers yellow. Fruit 1–1.5 cm long. Seeds 1 or 2 . . . . . **19. Kedrostis**
- 42a. Fruit broad-ellipsoid, 2–5 cm long. Seeds smooth [Thecae plicate]. . . . . **10. Cucumis [feral forms]**
- b. Fruit various, when more than 5 cm long then elongate-fusiform. Seeds smooth or scrobiculate (pitted or warted). [Thecae plicate or not plicate]. . . . . 43



- 43a. Tendrils 2-branched. [Thecae plicate.] — East Java, naturalized . . . . .  
 . . . . . **7. Cayaponia** (*C. martiana*)
- b. Tendrils unbranched [Thecae not plicate.] . . . . . 44
- 44a. Fruit (sub)sessile, (few-)fascicled; fruiting pedicel to 10 mm long. Corolla yellow.  
 (Male) flowers short pedicelled in (sub)sessile fascicles or clusters . **25. Mukia**
- b. Fruit with short or longer pedicel. Corolla white or yellow. (Male) flowers long-  
 pedicelled or when shorter pedicelled then arranged in (small) pedunculate ra-  
 cemes or fascicles . . . . . 45
- 45a. Seeds thickish, margined, faces pitted or warted. Corolla yellow . . . . . 46
- b. Seeds compressed (or globose), faces smooth, glabrous or hairy . . . . . 47
- 46a. Fruit c. 1 cm diam. — West Malesia . . . . . **30. Scopellaria**
- b. Fruit c. 2 cm diam. — New Guinea . . . . .  
 . . . . . **36. Urceodiscus**, p.p. (smaller-flowered species)
- 47a. Corolla yellow, petals  $\pm$  notched at apex. Fruits purple-black; seeds hairy . . . . .  
 . . . . . **22. Melothria pendula** (naturalized)
- b. Corolla white, petals not notched. Fruit green, red or purple; seeds smooth or  
 hairy . . . . . 48
- 48a. Seeds narrowly margined. Probract (small, linear) present. Fruiting pedicel short,  
 usually shorter than the fruit . . . . . 49
- b. Seeds unmargined. Probract absent. Fruiting pedicel short or long . . . . . 50
- 49a. Stigma 3-parted, parts sessile or short-armed. Disc ring-shaped. Fruits solitary or  
 (few-)fascicled, small, to 1.5 cm long . . . . . **29. Pilogyne**
- b. Stigma parts long-armed, each 2-lobed. Disc 3-parted. Fruit 1.2–2 cm long. —  
 Norfolk Is. (not in Malesia) . . . . . **Zehneria**
- 50a. Seeds glabrous, sometimes short-winged at one side. Female flowers or male  
 flowers one or few, long-pedicelled, inserted at the node. Fruit globose, or el-  
 lipsoïd, or fusiform, green or red . . . . . **26. Neoachmandra**
- b. Seeds hairy, not winged. Female flowers with long pedicel solitary on the node,  
 co-axillary with male inflorescence. Male flowers in a pedunculate raceme. Fruit  
 (long) fusiform, green . . . . . **18. Indomelothria**

## 1. ALSOMITRA

*Alsomitra* (Blume) Spach, Hist. Nat. Vég. 6 (1838) 187; M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 117; Hutch., Ann. Bot. (Oxford) 6 (1942) 96, p.p. excl. *A. clarkei*; de Wit, Bull. Jard. Bot. Buitenzorg III, 18 (1949) 193. — *Zanonia* L. sect. *Alsomitra* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 937. — *Zanonia* L., p.p. (incl. *Zanoniae* sect. *Alsomitra* Blume; excl. *Alsomitra* auct. non (Blume) Spach: Benth. & Hook.f., Gen. Pl. 1 (1867) 840 = *Neoalsomitra* Hutch.) Benth. & Hook.f., Gen. Pl. 1 (1867) 839. — *Zanonia* L. sect. *Macrozanonia* Cogn. in A.D.C. & C.D.C., Monogr. Phan. 3 (1881) 927; Pax in Engler & Prantl, Nat. Pflanzenfam. 4 (5) (1889) 12. — *Macrozanonia* (Cogn.) Cogn., Bull. Herb. Boiss. 1 (1893) 612; Pax in Engl. & Prantl, Nat. Pflanzenfam. 4 (5) (1897) 392; Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 262. — Type species: *Alsomitra macrocarpa* (Blume) M.Roem. (*Zanonia macrocarpa* Blume).

Tall climber, perennial; dioecious; young plant with slender stem creeping up, with distichous leaves appressed to the substrate. *Probract* absent. *Tendrils* somewhat off-axillary, 2-branched at apex; peltate adhesive discs present in juvenile plants, with or

without elongated pads in adult plants. *Leaves*: blade simple, unlobed, glands absent, margin entire. *Male inflorescences* ± pendent, paniculate, in female inflorescences reduced, raceme-like; bracts minute, caducous. *Male flowers*: bud ovoid, acute; flower ± campanulate, fleshy; receptacle-tube cup-shaped; calyx at first fused, apically with narrow, minutely imbricately 5-lobed orifice, at anthesis tearing into 3 parts to about half-way; petals almost free, ± patent, narrow, acute, valvate, cream-coloured; stamens 3, inserted towards the rim of the receptacle-tube, filaments short, free, anthers basidorsifixed, either all 2-thecous or two 2-thecous and one 1-thecous, thecae oblong, opening lengthwise lateral-introrse, connective broad; disc obscure. *Female flowers* larger than male flowers; ovary not completely inferior, at apex ± convex, pseudo 3-locular; ovules numerous, pendent, inserted towards the apex on broad, fleshy placentas; styles 3, not close together, stigmas fleshy; calyx and corolla together caducous, the scar leaving a line on the ovary and fruit. *Fruit* solitary, pendent, capsular, unilocular, half-globose, 20–30 cm diam., with flattened 3-valved apex. *Seeds* numerous, compressed, smooth, ovate-elliptic, edge entire, with a butterfly-like wing extending laterally to both sides 10–12 cm wide.

Distribution — A genus with 1 species in southern Peninsula Thailand; in *Malesia*: Peninsular Malaysia east to New Guinea.

### 1. *Alsomitra macrocarpa* (Blume) M.Roem.

*Alsomitra macrocarpa* (Blume) M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 117; Hutch., Ann. Bot. (Oxford) 6 (1942) 96; de Wit, Bull. Jard. Bot. Buitenzorg. III, 18 (1949) 193; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 299; W.J.de Wilde & Duyfjes, Proc. Fourth Int. Fl. Males. Symp. 1998 (2001) 103; Fl. Thailand 9, 4 (2008) 416. — *Zanonia macrocarpa* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 937; Ser. in DC., Prodr. 3 (1828) 299; Miq., Fl. Ned. Ind. 1, 1 (1856) 683; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 927; Warb., Bot. Jahrb. Syst. 13 (1891) 444; Gibbs, Dutch NW New Guinea (1917) 17, 51, 222. — *Macrozania macrocarpa* (Blume) Cogn., Bull. Herb. Boiss. 1 (1893) 612; K.Schum. & Lauterb., Fl. Schutzgeb. Südsee (1901) 589; Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 262, f. 63, 64; Rolfe, Kew Bull. (1920) 197. — Type: *Blume* '1353' (holo L, barcode L0001604; iso L, barcodes L0001603 & L0001605), Java.

*Momordica coriacea* Cogn. in K.Schum. & Hollrung, Fl. Kais. Wilh. Land (1892) 82; Bot. Jahrb. Syst. 58 (1923) 240; in Engl., Pflanzenr. 66, 4.275.I (1916) 264. — Type: *Hollrung* 775 (iso K), Papua New Guinea, Kaiser Wilhelmsland.

*Zanonia philippinensis* Merr., Philipp. J. Sci. 1, suppl. 1 (1906) 241. — *Macrozania philippinensis* (Merr.) Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 264. — Type: *Clemens* 324 (holo PNH, not seen), Philippines.

*Erythralum triandrum* Merr. & Quisumb., Philipp. J. Sci. 37 (1928) 143. — Type: *Ramos & Edaña* BS 49096 (holo PNH, not seen; iso K), Philippines, Mindanao, Mati.

Climber, 30–50 m long, stem at base 15 cm thick. Shoots grooved, 3–4 mm diam., early glabrescent, at first with minute grey scurf; older twigs with raised leaf-scars. *Tendrils* 6–10 cm long, branches c. 2 cm long, adhesive pads 5–10 mm long. *Leaves*: petiole 2–4 cm by c. 2 mm; blade ovate(-elliptic), 8–16 by 3–13 cm, thinly coriaceous, glabrous, base rounded or shallowly broadly cordate or sometimes narrowed and ± obtuse, apex (obtuse or) acute-acuminate; 3(–5) palmately veined, venation ± fine, prominent on both surfaces. Lateral shoots and inflorescences, arising from a densely pale brown pubescent area. *Male inflorescences* in short leafy lateral shoots, many-flowered,

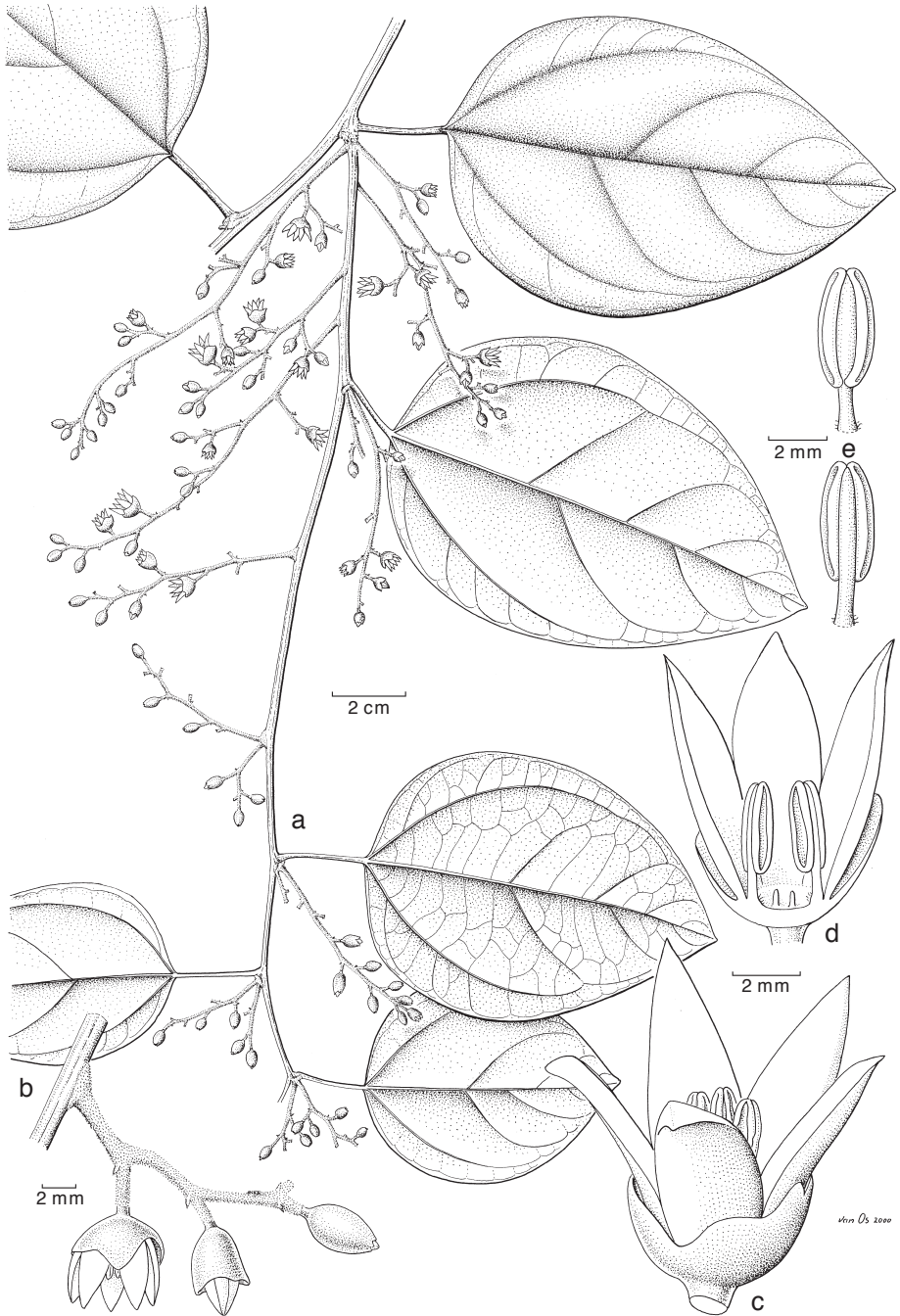


Fig. 1. *Alsomitra macrocarpa* (Blume) M.Roem. a. Twig with male inflorescences; b. detail of male inflorescence, note finely hairy branches; c. male flower; d. ditto, opened, note disc-appendages at base; e. stamens (a, b: *Hoogland 4918* (Papua New Guinea); c–e: *De Wilde & Duyfjes 21945* (West Java)).

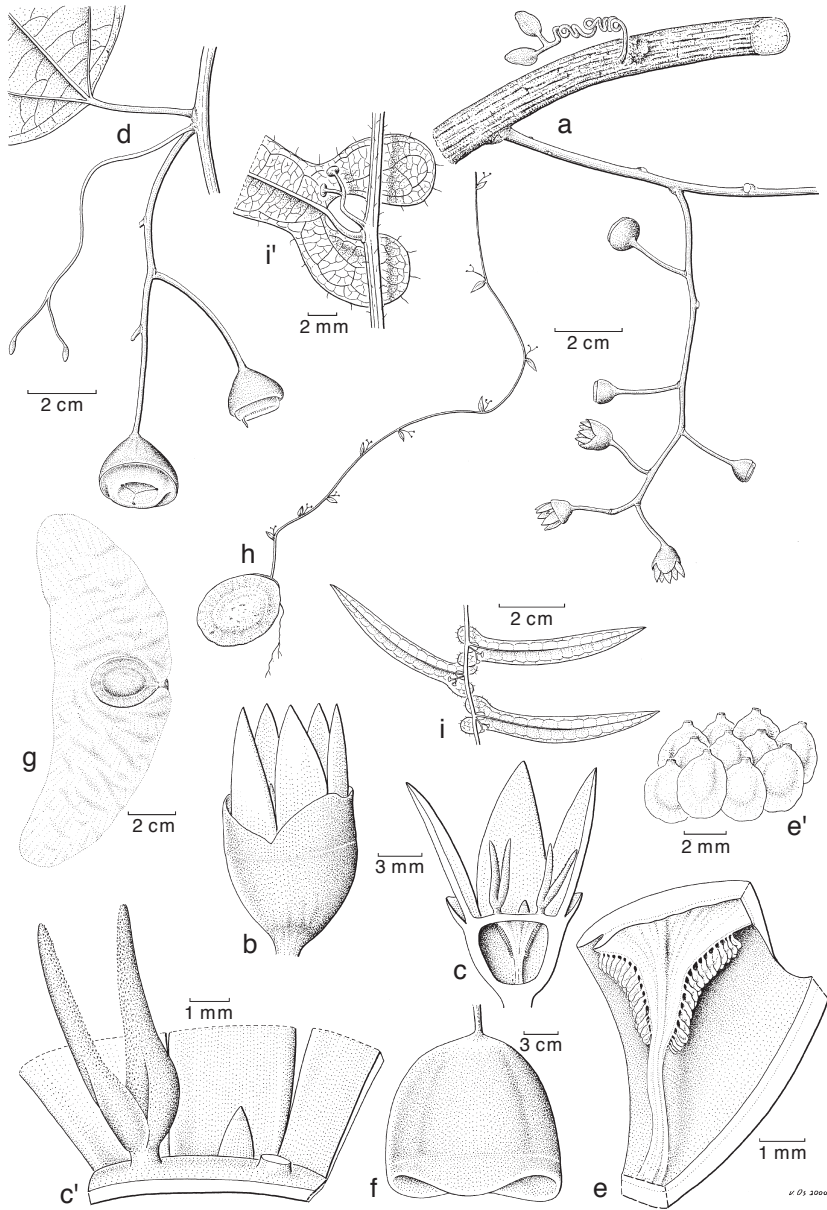


Fig. 2. *Alsomitra macrocarpa* (Blume) M. Roem. a. Branch with side branch with female inflorescence; b. female flower just before anthesis; c. ditto opened; c'. detail, note one style with 2-lobed stigma and one of the three minute staminodes; d. portion of twig with just developing fruit, note the typical design of apex, showing the three valve seams and the 2-branched tendril; e. placenta with young seeds; e'. detail; f. fruit, schematic; g. seed with butterfly-like wing; h. seedling; i. juvenile leaves; i'. detail (a: De Wilde & Duyfjes 21864; b–c': Annon., cult. Hort Bot. Bog. sub. XII-A-IX 12; d–e': Kostermans 21278; f: De Wilde & Duyfjes 21814; g: De Wilde & Duyfjes 21792; h: De Wilde & Duyfjes 21798; i, i': Korthals 2).

1 or 2 times branched, 5–15 cm long, peduncle (1–)2 cm long, sometimes with 1 or 2 additional smaller inflorescences from the same leaf axil; bracts c. 0.5 mm long; *female inflorescences* not or hardly branched, raceme-like, 5(–10)-flowered, 5–10 cm long. *Male flowers*: pedicel c. 2 mm long; perianth greenish creamy, 7–10 mm long; receptacle-tube c. 2 by c. 3 mm; calyx membranous, in bud ovoid-conical, c. 5 mm long; petals narrowly elliptic, 6–8 mm long, acute, papillose at apex; filaments 2–2.5 mm long, anthers ellipsoid-oblong, 3–4 mm long, thecae papillose hairy; 3 minute subulate appendages c. 1 mm long in the centre of the flower sometimes present. *Female flowers*: pedicel c. 20 cm long; perianth including ovary 15–20 mm long; ovary c. 3/4 inferior, half-globose-ellipsoid or ± conical, 5–10 mm wide; calyx c. 5 mm long; petals c. 9 mm long; styles not close together, short, stigmas elongated, 3–4 mm long, at apex deeply 2-lobed. *Fruit* green, ripening brown, opening with 3 incurving valves, 20–30 cm diam., with woody exocarp, c. 2 mm thick, smooth, glabrous, inside with a soft spongy layer, densely packed with winged seeds, line of perianth-scar 2–6 cm from the orifice; fruiting pedicel 2–4 cm long. *Seeds* pale brown, 25–30 by 20–23 mm, faces smooth, margin distinct, edge entire, wing butterfly-like, silvery-white, membranous, 10–12 cm wide. — **Fig. 1, 2, 8e, h–j, 97g; Plate 2c.**

*Distribution* — Southern Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, West Java, Philippines, Sulawesi, Moluccas (Aru Islands), New Guinea (West Papua, Papua New Guinea including Bismarck Archipelago).

*Habitat & Ecology* — Tall forest liana preferring rich soils, locally not rare on clayey soils along rivers; 0–800 m; flowering in West Java in the rainy season (December–January); fruiting, presumably set during the foregoing season, at the end of the rains or later, March–April(–June).

*Note* — The juvenile plant is extraordinary. After germination the primary shoot develops as a thread-thin stem with rather spaced small oblong leaves, c. 1 cm long, creeping over the forest soil, and when a suitable tree trunk is reached it climbs up vertically by means of small, peltate adhesive discs at the end of the small bifid tendrils. By then the plant clings close to the substrate, with the leaves distichous, appressed, and closely set. While climbing, the leaves which are hastate and in an early phase also auriculate, gradually grow larger (and the stem only moderately thicker), until at a height of about 5 m the leaves are c. 5 cm long and start approaching the adult shape.

## 2. ANANGIA

*Anangia* W.J.de Wilde & Duyfjes, Reinwardtia 12 (2006) 219. — Type species: *Anangia macrosepala* W.J.de Wilde & Duyfjes.

Low suberect herb, tuberous(?); monoecious. *Probract* present in association with flowers. *Tendrils* 2-branched from about the middle. *Leaves*: blade simple, not or shallowly lobed. *Flowers* solitary (or 2), erect, long-pedicelled; perianth large, sepals much longer than petals; petals free; disc absent; receptacle-tube small, shallow. *Male flowers*: stamens 5, free, inserted at base of receptacle, erect, four in two pairs and one solitary, anthers all 1-thecous, thecae sinuate. *Female flowers*: ovary elongate, ovules numerous, horizontal, style 1, columnar, 3-armed, each with bifurcate stigma.

*Distribution* — 1 species in the Moluccas.

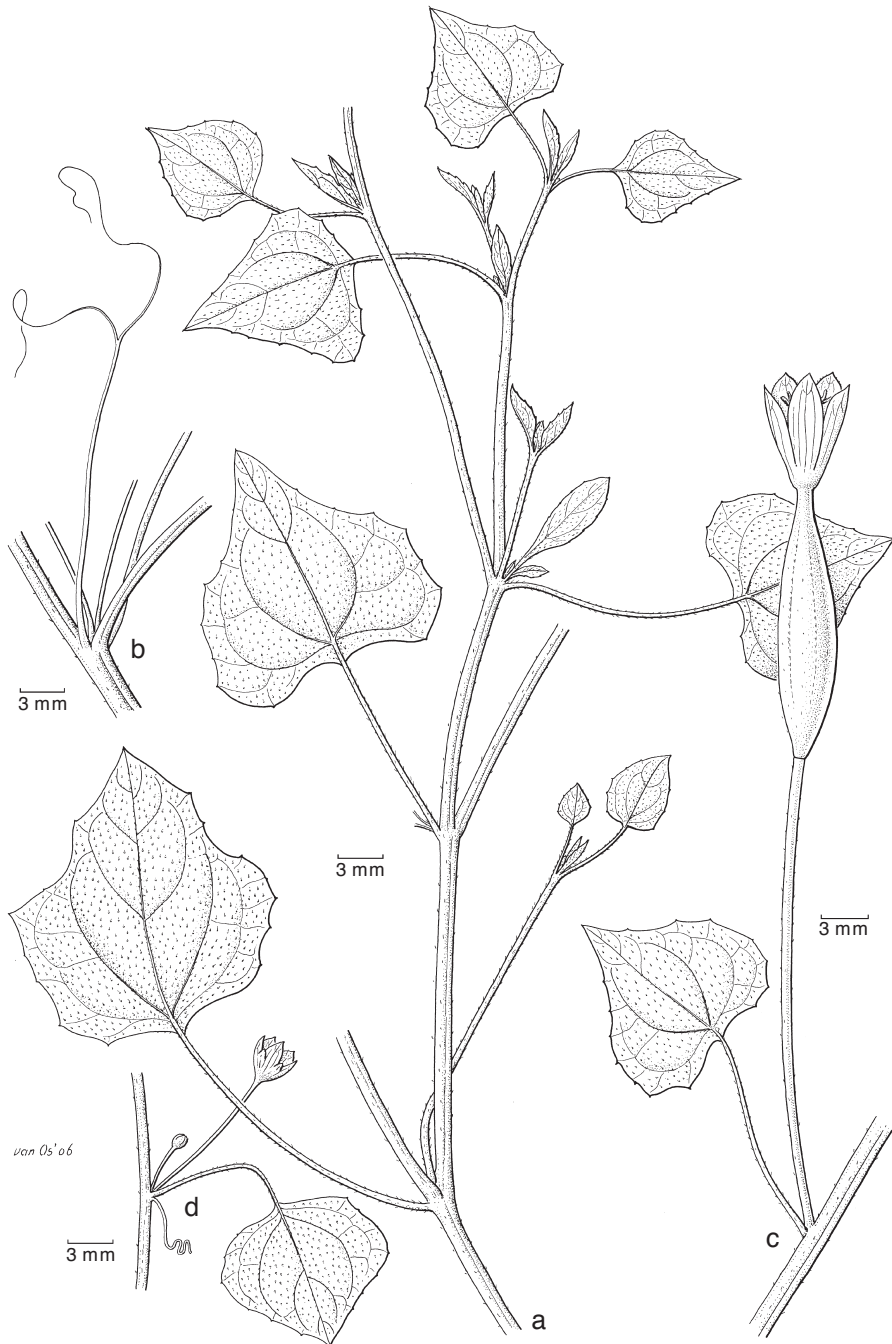


Fig. 3. a–c. *Anangia macrosepala* W.J.de Wilde & Duyfjes. a. Portion of sterile branch; b. lower node showing 2-branched tendril; c. node with female flower. — d. *Neoachmandra backeri* W.J.de Wilde & Duyfjes subsp. *backeri*. Node with male flower (a, b: *Anang* 325, type; c, d: *Buwalda* 4057).

### 1. *Anangia macrosepala* W.J.de Wilde & Duyfjes

*Anangia macrosepala* W.J.de Wilde & Duyfjes, *Reinwardtia* 12 (2006) 220, f. 1, 2. — Type: *Anang* 325 (holo BO; iso L), Moratai.

Herb, several-stemmed, c. 30 cm high, subglabrous; stems suberect, much branched, sparsely minutely hairy, (1–)2 mm diameter. *Probract* at base of pedicels, oblong-spathulate, 1(–1.5) cm long. *Tendrils* only seen on lower nodes. *Leaves*: petiole 1–3 cm long; blade membranous, elliptic-rhomboid or subtriangular, 1.5–2 by 1.5–2.5 cm, both surfaces minutely harshly hairy, cystoliths minute, inconspicuous; base truncate or ± cuneate, narrowly decurrent on the petiole (and hence the basal veins branching off from above the base of the blade), margin sparsely minutely dentate, apex acute. *Flowers* subglabrous; mature buds not known, colour not known. *Male flowers*: pedicel 35–40 mm long, at apex not articulate; receptacle-tube c. 1.5 by 3 mm, papillose inside; sepals (narrowly) elliptic, 10–12 by 5–6 mm, base ± narrowed and ± clawed, apex acute, glabrous but margin finely hairy (hairs c. 0.1 mm long), inner surface sparsely papillose;

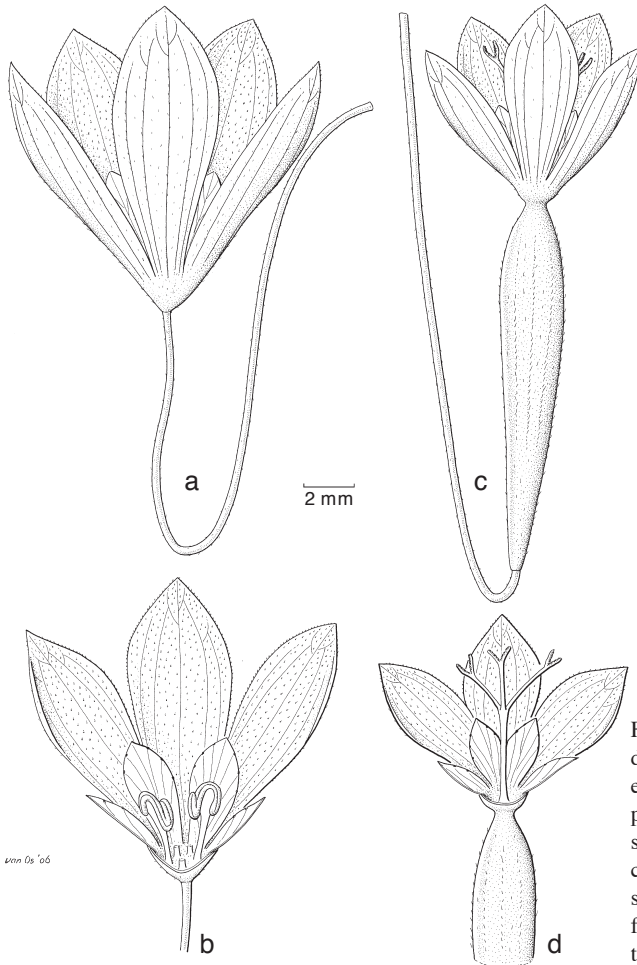


Fig. 4. *Anangia macrosepala* W.J. de Wilde & Duyfjes. a. Male flower, showing large sepals and small petals; b. male flower opened, showing irregularly sinuate thecae; c. female flower, showing large sepals and small petals; d. female flower opened (all: *Anang* 325, type).

petals free, shape similar to sepals, 5–6 by 2.5–3 mm, glabrous, the main veins ending in the margin with a minute dot; filaments c. 1.5 mm long, glabrous, anthers irregularly long-ellipsoid, 1.5–2 mm long, thecae irregularly sinuate, at one side along the margin of a broad and thin glabrous ‘connective’ (see Fig. 4b). *Female flowers*: pedicel 25–30 mm long, indistinctly articulate at apex; ovary oblong-linear, subfusiform, broadest above the middle, 15–17 by 2.5–3 mm, with 0.2 mm long hairs; perianth as in male flowers but smaller; receptacle-tube c. 1 by 3 mm; sepals c. 8 by 4 mm; petals (estimated because of incomplete material) c. 2.5 by 1.5 mm; style slender, c. 4 mm long, glabrous, at apex 3-armed, each arm 2–2.5 mm long ending in a deeply forked stigma c. 1 mm long, finely papillose. *Fruits and seeds* not known. — **Fig. 3a–c, 4.**

*Distribution* — Moluccas (Morotai, possibly also Yamdena), known only from the type.

*Habitat & Ecology* — Only the collecting date of the flowering plant is known: March 1938. Possibly it grows in grassy savanna, yearly burnt.

### 3. BAIJIANIA

*Baijiania* A.M.Lu & J.Q.Li in J.Q.Li, Acta Phytotax. Sin. 31 (1993) 50, p.p. for the type only, excluding material from China; W.J.de Wilde & Duyfjes, Blumea 48 (2003) 279. — Type species: *Baijiania borneensis* (Merr.) A.M.Lu & J.Q.Li (*Thladiantha borneensis* Merr.).

*Thladiantha* Bunge subg. *Microlagenaria* C.Jeffrey, Kew Bull. 15 (1962) 363, p.p.

*Siraitia* Merr. subg. *Microlagenaria* (C.Jeffrey) A.M.Lu & Zhi Y.Zhang, Guihaia 4 (1984) 30, p.p., for the specimens from Borneo only.

Plants with tuberous rhizome(?); dioecious; hairs not glandular. *Probract* absent. *Tendrils* coiling both below and above point of branching. *Leaves*: blade simple, unlobed. *Male inflorescences* racemose (sometimes ± branched), bracteate. *Male flowers*: receptacle-tube cup-shaped, about as long as wide or longer than wide; petals free, longer than sepals, creamy or greenish white; stamens 5 (3), inserted below the throat of the receptacle, two pairs with filaments connate at base, one stamen solitary, thecae somewhat curved, glabrous, filaments short; basal adaxial scales absent; disc at base of receptacle conspicuous, 3-parted. *Female flowers* in a few-flowered raceme; staminodes present. *Fruit* globose, c. 4 cm diam., pulp not sweet tasting. *Seeds* of medium size, ± compressed, smooth, margin faint.

*Distribution* — 1 species in Borneo with two varieties.

#### 1. *Baijiania borneensis* (Merr.) A.M.Lu & J.Q.Li

*Baijiania borneensis* (Merr.) A.M.Lu & J.Q.Li in J.Q.Li, Acta Phytotax. Sin. 31 (1993) 50, for the type only; Beaman et al., Pl. Mt. Kinabalu 4 (2001) 206, pl. 15 b, c; W.J.de Wilde & Duyfjes, Blumea 48 (2003) 280. — *Thladiantha borneensis* Merr., Univ. Calif. Publ. Bot. 15 (1929) 298. — *Siraitia borneensis* (Merr.) A.M.Lu & Zhi Y.Zhang, Guihaia 4 (1984) 31, p.p., specimens from Borneo only; Zhi Y.Zhang & A.M.Lu, Cathaya 1 (1989) 26, f. 26, 27. — Type: *Villamil 308* (holo UC, not seen; iso BO, K, PNH lost?), Sabah.

Climber, 3–6 m, sparsely grey soft hairy and minutely papillose on young parts, hairs c. 1 mm long; leafy stem 2.5–4 mm diameter. *Tendrils* 10–25 cm long. *Leaves*:



petiole 3–5 cm long; blade (narrowly) ovate, 10–20(–30) by 5–14(–17) cm, greenish on drying, above with cystoliths, margin entire or faintly lobulate-dentate near the base; (3–)5-palmiveined and 2 or 3 pairs of veins from the midvein. *Male inflorescences* 8–15 cm long, peduncle 4–8 cm long, flower-bearing part 4–10 cm long, bracts persistent, (narrowly) elliptic or spatulate, 3–10(–15) mm long, rounded, entire, conspicuously veined. *Male flowers*: pedicel 5–15(–30) mm long, faintly articulate 3–10 mm below perianth, the portion below articulation persistent; open flower 5–8 mm diam.; receptacle-tube cup-shaped, 2.5–4.5 by 2–4 mm; sepals narrowly triangular-linear, 1.5–3 mm long, patent or recurved; petals imbricate, elliptic, rounded, 2–5 mm long, 3(–5)-veined, papillose; stamens inserted 0.5(–1) mm below the rim of the receptacle, filaments 0.5–1 mm long, anthers (thecae) 2–3 mm long, half included or exserted; disc central, consisting of 3 contiguous subconical parts, 1–1.5 mm high. *Female inflorescences* (1–3)-flowered, peduncle 2–8 cm long; bracts as in male flowers, persistent. *Female flowers* as male flowers; pedicel 5–15(–30) mm long; ovary ellipsoid, c. 5 mm long, passing with short neck (c. 1 mm long) into shallow receptacle-tube c. 1 mm long; style conspicuous, c. 2 mm long, stigma with 3 thick notched lobes; staminodes small, 0.5–1 mm long, in 2 pairs and one solitary. *Fruits* solitary or 2 or 3 together (peduncle 2.5–10 cm long), ripening orange, globose, 3–4.5 cm diam., grey-white soft hairy, hairs 1–2 mm long; pericarp thin, pergamentaceous; endocarp pulpy-juicy; fruiting pedicel 0.5–1.5 cm long, soft hairy. *Seeds* numerous, pale, (broadly) ovate, c. 5 mm across, base truncate, apex rounded, edge entire.

#### KEY TO THE VARIETIES

- 1a. Male inflorescences simple, racemose or ± branched, flowers lax; pedicels (7–)20(–30) mm long. Male perianth 8–10 mm diam.; receptacle-tube about as long as wide, c. 4 mm long; anthers (thecae) c. 3 mm long. — Dry land forest . . . . . **a. var. borneensis**
- b. Male inflorescences a narrow raceme, densely set with flowers; pedicels 3–8 mm long. Male perianth 5–6 mm diam.; receptacle-tube longer than wide, c. 3 mm long; anthers (thecae) 1.5–2 mm long. — Peat swamp forest . . . . . **b. var. paludicola**

#### **a. var. borneensis**

Male inflorescences grey, yellow or pale brown soft hairy, simple or ± (1- or) 2-branched, each branch 10–20-flowered; bracts lanceolate or obovate-spathulate, 7–15 mm long; pedicels (7–)20(–30) mm long, longer than bracts. Male perianth 8–10 mm diam., receptacle c. 4 by 4 mm, sepals 2.5–3 mm long, petals 5–6 by 3.5 mm; filaments c. 1.5 mm long, anthers (thecae) c. 3 mm long. — **Fig. 5a, b, 6a–h; Plate 2a, b.**

Distribution — Borneo (Sabah and SE Kalimantan).

Habitat & Ecology — Forest edges, scrub in forest gaps, in (open or) shaded places; 90–1000 m altitude; flowering and fruiting throughout the year.

Note — Female flowers and fruit are only known from specimens which belong to var. *borneensis*.

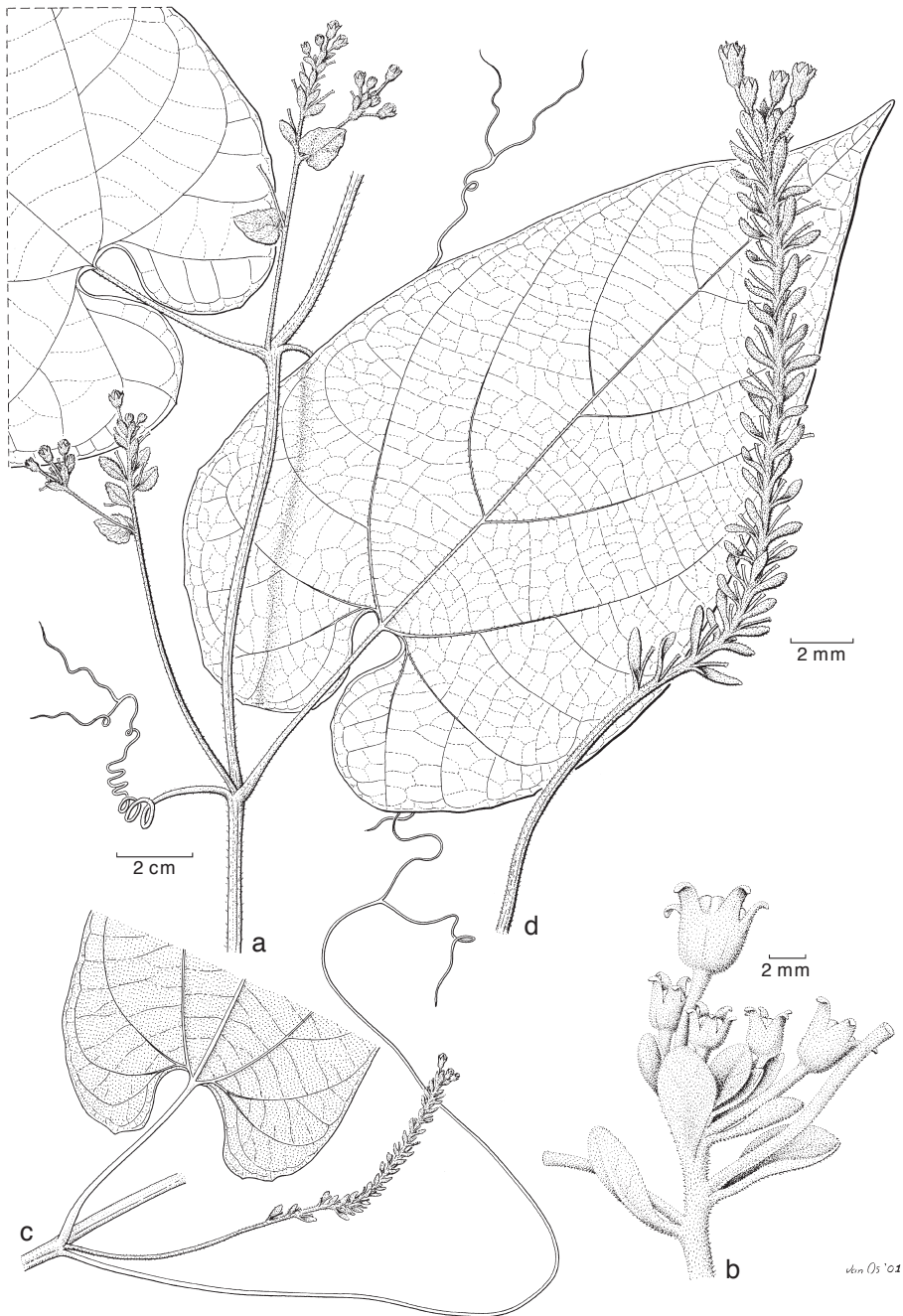


Fig. 5. a, b. *Baijania borneensis* (Merr.) A.M.Lu & J.Q.Li var. *borneensis*. a. Twig with male inflorescences; b. detail of male inflorescence. — c, d. *Baijania borneensis* (Merr.) A.M.Lu & J.Q.Li var. *paludicola* Duyfjes. c. Twig with male inflorescence; d. male inflorescence (a, b: De Wilde & Duyfjes SAN 139471; c, d: Kadir A2520).

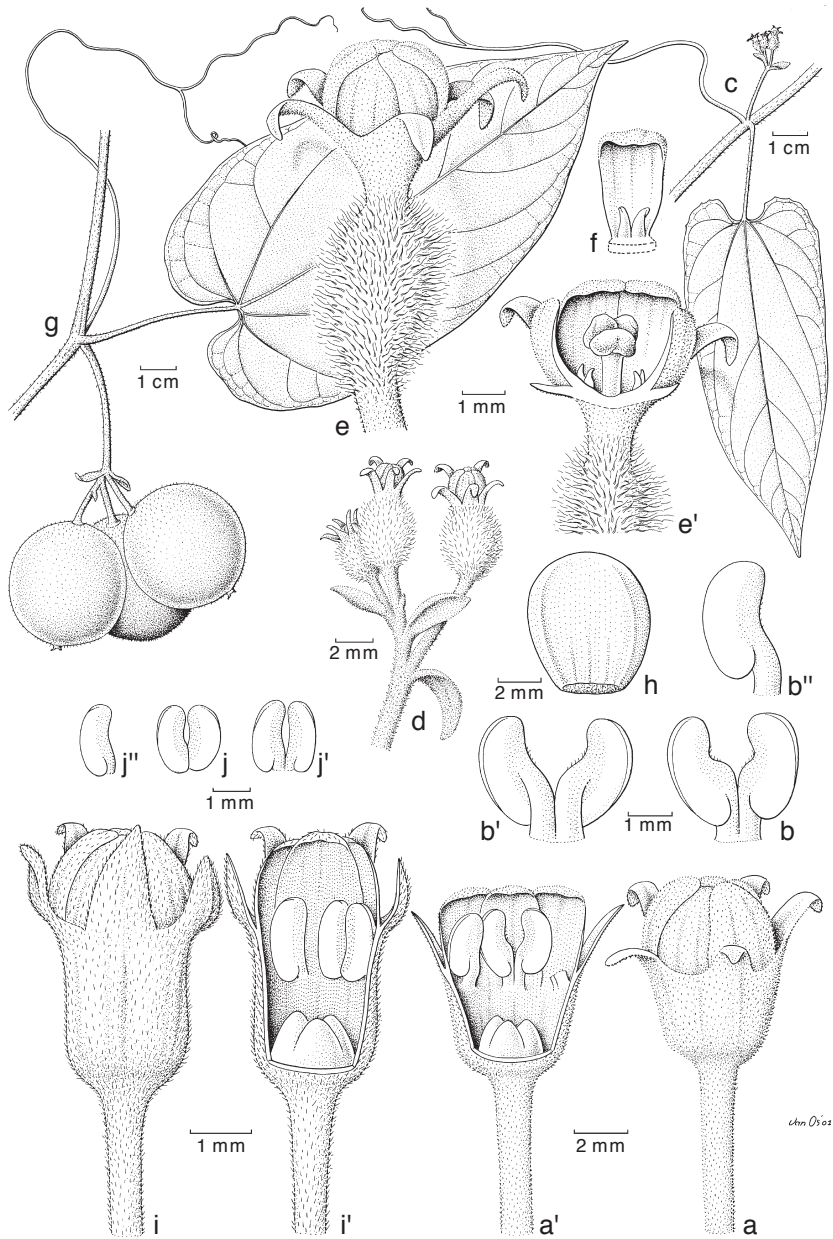


Fig. 6. a–h. *Baijiania borneensis* (Merr.) A.M.Lu & J.Q.Li var. *borneensis*. a. male flower; a'. ditto, opened, showing stamens; b, b', b''. stamens: adaxial, abaxial and lateral view respectively; c. twig with female inflorescence; d. detail of female inflorescence; e. female flower; e'. ditto, opened, showing style with 3-lobed stigma and staminodes; f. petal with basal staminodes; g. twig with infructescence; h. seed. — i–j''. *Baijiania borneensis* (Merr.) A.M.Lu & J.Q.Li var. *paludicola* Duyfjes. i. Male flower; i'. ditto, opened, showing stamens; j, j', j''. stamens: adaxial, abaxial and lateral view respectively (a–b'': De Wilde & Duyfjes SAN 141929; c–h: De Wilde & Duyfjes SAN 141932; i–j'': Kadir A2520).

**b. var. paludicola** Duyfjes

*Baijania borneensis* (Merr.) A.M.Lu & J.Q.Li var. *paludicola* W.J.de Wilde & Duyfjes, *Blumea* 48 (2003) 283. — Type: *Kadir BNB A2520* (holo K; iso BO, KEP), Sabah, Sandakan.

Male inflorescences light brown pubescent; raceme slender, unbranched, many (10–40)-flowered; bracts lanceolate, 3–6 mm long; pedicels 3–8 mm long, hardly longer than bracts. Male perianth 5–6 mm diam.; receptacle-tube c. 3 by 2 mm, sepals c. 2 mm long, petals 3–4 by c. 3 mm; filaments (0.5–)1 mm long, anthers (thecae) 1.5–2 mm long. — **Fig. 5c, d, 6i–j'**.

Distribution — Sabah, known from 2 collections (Sandakan and Tawau).

Habitat & Ecology — Climber in peat swamp forest; lowlands.

Note — The inflorescences of *Elmer 20472* is more lax than in the type, slightly approaching those of var. *borneensis*, but its flowers are similar to those in the type, *Kadir BNB A2520*.

**4. BAYABUSUA**

*Bayabusua* W.J.de Wilde, *Sandakania* 13 (1999) 1. — Type species: *Bayabusua clarkei* (King) W.J.de Wilde (*Zanonia clarkei* King).

Tall liana, perennial; dioecious; young plant sprawling, with at base first foliage leaves in one tier of 3 or 4. *Probract* not obvious. *Tendrils* slightly supra-axillary, not distinctly off-axillary, 2-branched above the middle, spiralling below the point of branching, with adhesive pads. *Leaves*: petiole scar raised; blade simple, margin entire. *Flowers*: purple-red. petals nearly free. *Male inflorescences* erect, raceme-like panicles, bracteate, with axillary clusters of few flowers. *Male flowers* rotate, receptacle shallow, sepals quincuncial, corolla lobes nearly free, contorted, revert at apex; stamens 3, inserted near the centre, anthers 5, 1-thecous, basifixed, two filaments with 2 anthers and one with 1 anther; thecae narrowly ellipsoid, opening lengthwise, with swollen creamy-white connective with a brown wart near the apex; disc not obvious. *Female inflorescences* small, 1- (or few)-flowered; *female flowers* not known. *Fruit* solitary, cylindrical-clavate, capsular, c. 23 by 10 cm, apex flattened, opening with 3 valves curving towards the inside. *Seeds* numerous, compressed, with 8 or 9 coarse marginal spines, and a membranous circular wing, c. 5 cm diameter.

Distribution — 1 species in Peninsular Malaysia.

**1. Bayabusua clarkei** (King) W.J.de Wilde

*Bayabusua clarkei* (King) W.J.de Wilde, *Sandakania* 13 (1999) 2, f. 1, 2a–d. — *Zanonia clarkei* King, *J. Asiat. Soc. Bengal*, Pt. 2, Nat. Hist. 67 (1898) 41; Ridl., *Fl. Malay Penin.* 1 (1922) 852. — *Macrozanonia clarkei* (King) Cogn. in Engl., *Pflanzenr.* 66, 4.275.I (1916) 264. — *Alsomitra clarkei* (King) Hutch., *Ann. Bot. (Oxford)* 6 (1942) 96. — Type: *King's Collector 7230* (holo CAL, not seen; iso K), Peninsular Malaysia, Perak.

Tall climber, hanging from lofty trees, 20–30 m long; shoots slender, 1.5–4 mm diam., early glabrescent, at first with minute red brown powdery hairs less than 0.1 mm long; older twigs with raised leaf-scars. *Tendrils* 10–15 cm long, adhesive pads

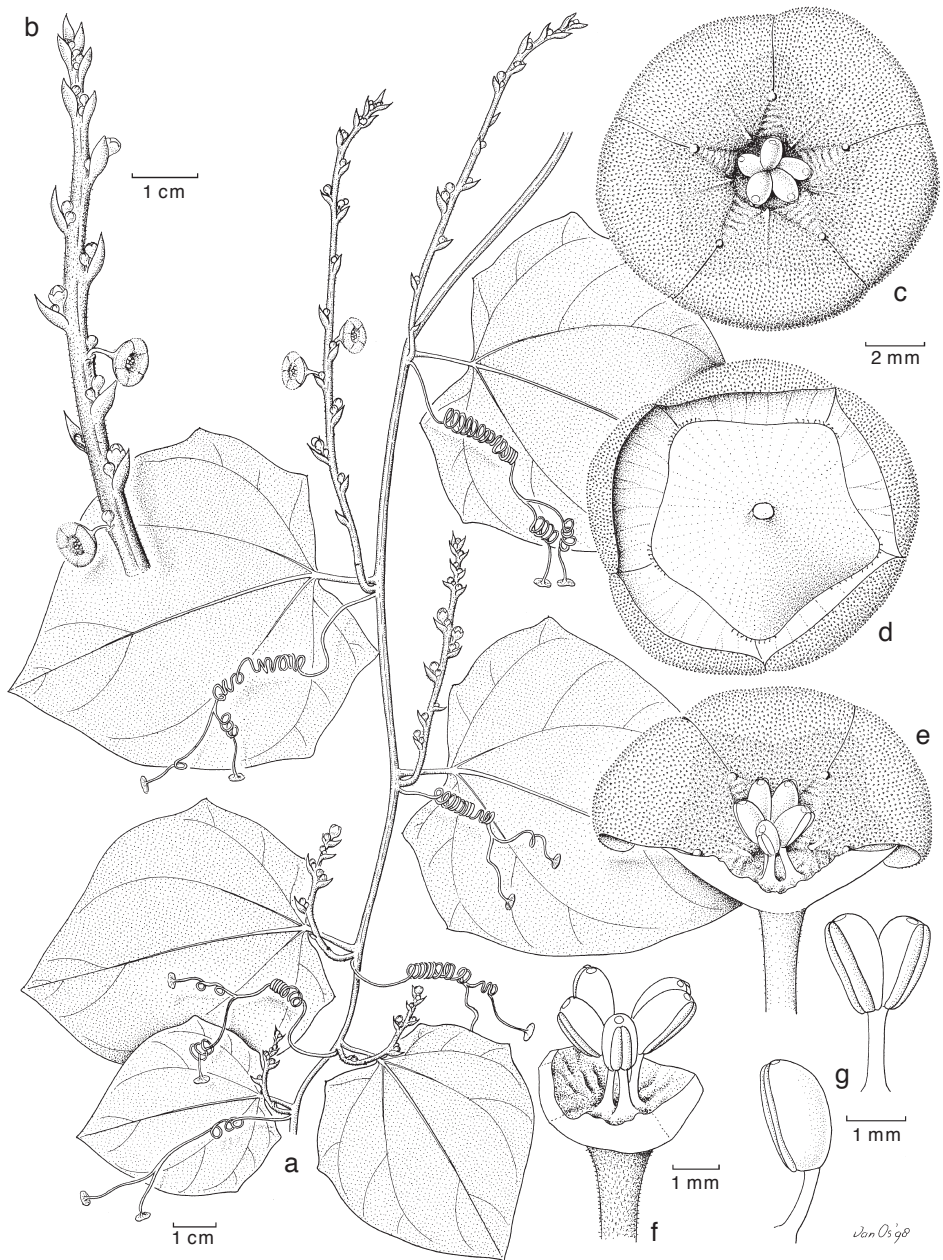


Fig. 7. *Bayabusua clarkei* (King) W.J.de Wilde. a. Male flowering twig; b. upper portion of inflorescence; c, d. male flowers seen from above and below; e. male flower, longitudinally dissected; f. androecium showing two 2-thecous stamens and one 1-thecous stamens; g. detail of stamens (all: *De Wilde & Duyfjes FRI 41901*).

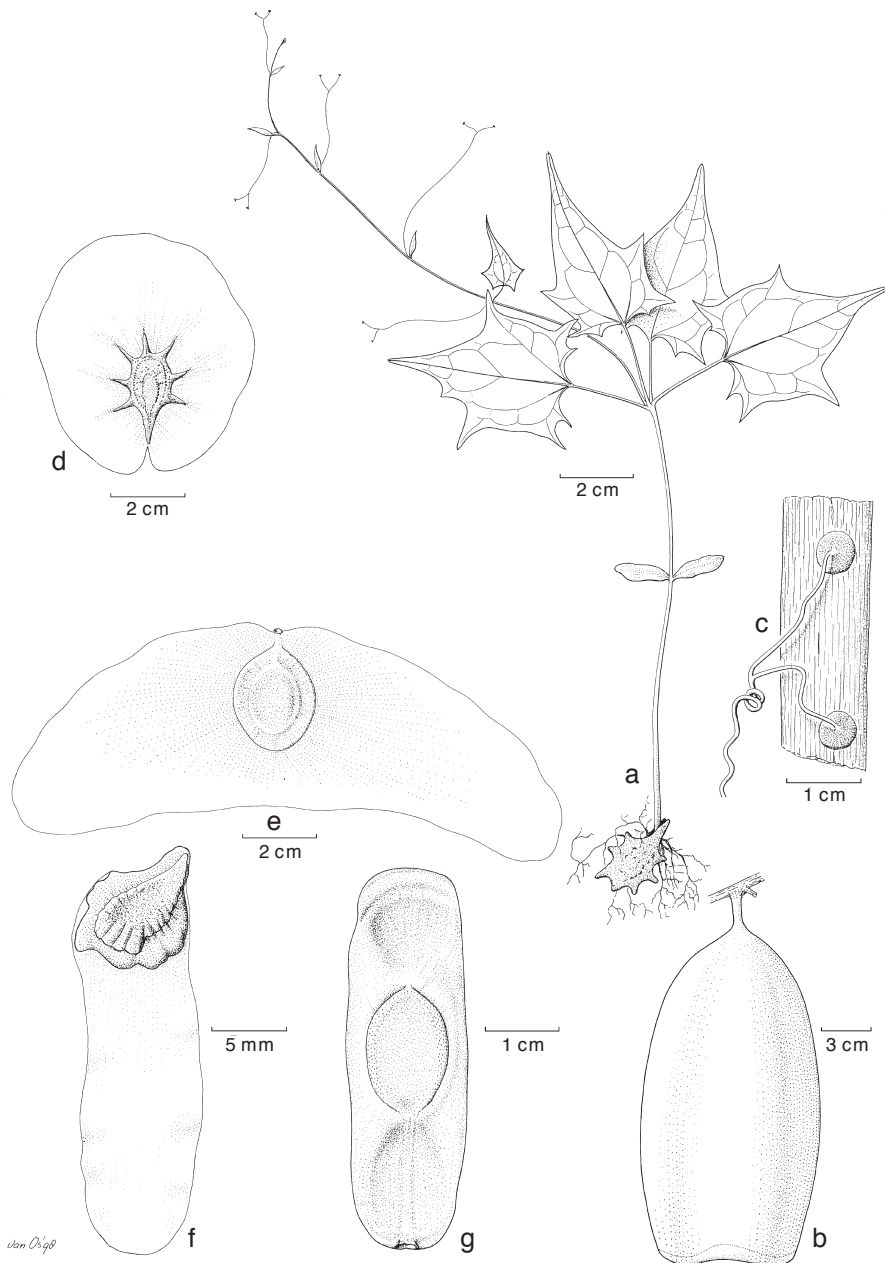


Fig. 8. Seeds, seedlings and fruits. — a–d. *Bayabusua clarkei* (King) W.J.de Wilde. a. Seedling, note cotyledons; b. fruit; c. portion of tendril of older plant with adhesive pads; d. seed with circular wing. — e. *Alsomitra macrocarpa* (Blume) M.Roem. Seed with butterfly-shaped wing. — f. *Nealsomitra clavigera* (Wall.) Hutch. Seed with wing. — g. *Zanonía indica* L. subsp. *orientalis* W.J.de Wilde & Duyfjes var. *pubescens* Cogn. Seed with 2-sided wing (a, c: De Wilde & Duyfjes 21961; b, d: De Wilde & Duyfjes 21781; e: De Wilde & Duyfjes 21792; f: Kerenga et al. LAE 73815; g: De Wilde & Duyfjes 21855).

2–6 mm diameter. *Leaves*: petiole 0.5–3 cm long, 1–2 mm wide; blade faintly laterally lobed towards the base, membranous or slightly succulent, broadly ovate, 3–15 by 2–12 cm, membranous and brittle on drying, glabrous, base (broadly) rounded or shallowly cordate with broad sinus, margin (sub)entire; 5(–7) palmately veined, venation lax. *Male inflorescences* spike-like, indeterminate panicles, bracteate; peduncle 0.5–1 cm long, up-curved, rachis 5–20 cm long, c. 2 mm thick, purple-red; bracts, subcaducous, 5–15 mm long, each with axillary a cluster of 2–5 flowers. *Female inflorescences* (according to infructescences) small, less than 5 mm long, 1 (or few)-flowered. *Male flowers* somewhat fleshy, pedicel c. 4 mm long; receptacle-tube shallowly cup-shaped, c. 5 mm diam., c. 0.5 mm thick, firm-fleshy (disc); sepals broadly obtuse-triangular, c. 2 mm long, together with the receptacle-tube showing up from beneath as a pale green pentagon c. 9 mm diam.; perianth circular in outline, c. 12 mm diam.; petals broadly obovate, 3.5–4.5 by 4–5 mm, inside papillose; filaments somewhat tapering, 1.2–1.5 mm long, whitish, anthers c. 2 mm long. *Female flowers* not known. *Fruit* pendent, green, ripening brown, smooth, glabrous, opening at the flat apex by 3 bluntly triangular inward curving valves, 20–25 by 8–10 cm, base  $\pm$  narrowed, subacute, apex flattened, pericarp woody, c. 0.5 mm thick, inside with a spongy-fibrous layer c. 10 mm thick, line of perianth-scar 0.5–1(–1.5) cm below the orifice; fruiting pedicel 1–1.2 cm long, 2–3 mm thick. *Seeds* densely packed in 3 rows throughout the fruit, dull brown, elliptic, 15–20 by 10 mm, faces finely warty, the edge with 8 (or 9) coarse, blunt spines 3–9 mm long, with a conspicuous membranous whitish subcircular wing around the seed, c. 5 cm diameter. — **Fig. 7, 8a–d; Plate 3, 4a, b.**

*Distribution* — Peninsular Malaysia (Kedah, Perak, and Selangor).

*Habitat & Ecology* — Foothill and lower montane forest, on good soil; 100–800 m altitude. Flowering recorded in February, June, August, and November; fruiting in December to February, rarely in August.

*Notes* — 1. Young plants have 4 verticillate, petioled pseudocotyledon-like first leaves, then sprawling, with leaves alternate, with long internodes; the margin of juvenile leaves is coarsely sinuate, the apex apiculate. Fresh leaves are somewhat fleshy, and glossy.

2. In male flowers, below each sinus between the corolla lobes, on the inner side of the receptacle-tube, are hard-fleshy, palish, glossy, verrucose, long-triangular markings, with at the apex, in each sinus, a minute globose creamy-white appendage, contrasting with the purple-red corolla. The meaning and morphological explanation of these structures is unknown.

3. Female plants are possibly monocarpous.

## 5. BENINCASA

*Benincasa* Savi, Mem. sopra una pianta Cucurbitaceae (1818) 158; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 301; C. Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1530; W.J. de Wilde & Duyfjes, Reinwardtia 12 (2007) 267; Sandakania 17 (2008 '2007') 45; Fl. Thailand 9, 4 (2008) 419. — Type species: *Benincasa cerifera* Savi.

Stout herbaceous annual climber; plant hairy; monoecious (sometimes flowers hermaphroditic). *Probract* hooded or concave. *Tendrils* branched, halfway or below.

*Leaves*: blade simple. *Flowers* solitary, long-pedicelled, large; sepals recurved; petals free, yellow. *Male flowers*: receptacle-tube shallow; sepals entire or serrate; petals large, obovate, margin entire; stamens 3, inserted towards the base of the receptacle-tube; filaments free, short, anthers all 2-thecous, exserted, thecae flexuous, connective broad, thin, 3-lobed; disc absent or low. *Female flowers*: perianth as in male flowers; ovary ovoid or narrowly ellipsoid, densely hairy, style short, thick, inserted on the disc, stigma robust; ovules numerous, horizontal; staminodes present, sometimes with reduced anthers. *Fruit* a pepo, mostly waxy-whitish, smallish or large, indehiscent. *Seeds* numerous, pale, compressed, margin only slightly thickened.

Distribution — One species with two forms, the cultivated form with several cultivars. The precise area of the wild form is not known, but it is speculated to include East Malesia and the Pacific. The species is mainly known by the widely cultivated form with edible fruits.

Note — Young developing leaves have small glands on the blade, and their lobes develop precociously and are conspicuously darker on drying. This phenomenon is also obvious in not closely related *Mukia*, *Cucumis sativus*, and some other genera.

### 1. *Benincasa pruriens* (Parkinson) W.J.de Wilde & Duyfjes

*Benincasa pruriens* (Parkinson) W.J.de Wilde & Duyfjes, Reinwardtia 12 (2008) 268; Sandakania 17 (2008 '2007') 45, Fl. Thailand 9, 4 (2008) 421. — *Cucurbita pruriens* Parkinson, J. Voy. South Seas (1773) 44.

Annual herb, shoots 2–7 m long, stem 3–5 mm diam., sparsely or densely grey or rusty hairy, hairs 2–5 mm long. *Probract* narrow- or broad-elliptic, (5–)10–20 mm long, acute or blunt. *Tendrils* 2- or 3-branched. *Leaves*: petiole 4–12(–20) cm long; blade 5–7-angular or shallowly (sometimes deeply) lobed, 7–20 cm diam., cystoliths not apparent, margin coarsely dentate, apex of lobes acute-acuminate. *Male flowers*: pedicel 40–150 mm long, hairy; receptacle-tube broadly cup-shaped, 4–6 by 10–15 mm; sepals narrowly elliptic or linear, 10–20 mm long, acute, entire or (deeply) 2- or 3-lobed or serrate; petals obovate to narrowly elliptic, 25–40(–70) mm long, subacute or obtuse, with minute mucro, hairy on veins outside; stamens inserted at c. 1/3 from the base in the receptacle-tube, very densely pilose-hairy where the stamens are inserted, the hairs screening off a small basal glabrous chamber (i.e. the basal portion of the receptacle-tube) without or with an inconspicuous disc at base, filaments glabrous, erect, broad, 2–3 mm long, anthers somewhat connivent, 4–5 by 5–7(–10) mm, somewhat exserted, thecae plicate along a broad, flat 3-lobed connective. *Female flowers*: perianth as in male flowers but somewhat smaller; pedicel 20–40 mm long; ovary densely hairy, (narrowly) ovoid or (narrowly) ellipsoid (cylindrical), 15–20(–40) by 5–10(–15) mm, style stout, 2–3 mm long, stigma stout, 5–10 mm diam., undulating by 3 horse-shoe-shaped lobes; disc a low ± undulating ring; staminodes inserted close to the disc, mostly inconspicuous, 1–2 mm long, flat. *Fruit* solitary, globose, ellipsoid or narrowly ellipsoid, 4–120 cm long, glabrescent; exocarp thin, leathery, when old woody, 1–1.5 mm thick; mesocarp ± absent or thick and fleshy; fruiting pedicel 3–5 cm long, usually curved, leaving a concave scar after breaking off. *Seeds* ovate-elliptic, 7–10 by 4–7 mm, faces not ornamented, margin narrow, finely 2-grooved, edge entire.



Distribution — The cultivated form widespread in SE Asia and elsewhere.

Uses — The young and ripe fruits and the young shoots are used as a vegetable.

#### KEY TO THE FORMS

- 1a. Fruit subglobose to narrowly ellipsoid (10–)20–60(–120) by 10–25 cm. Seeds 8–10 mm long. — Cultivated . . . . . **b. forma hispida**  
 b. Fruit globose or ellipsoid, 4–8 cm long. Seeds 7–8 mm long. — Growing wild . . . . . **a. forma pruriens**

#### a. forma pruriens

*Cucurbita vacua* F.Muell., Fragm. 6 (1868) 186. — *Benincasa vacua* (F.Muell.) F.Muell., Syst. Census Austral. Pl. 1 (1882) 76. — Type (syntypes, Telford 1982): *Dallachy s.n.* 28 Sept. 1867 & 20 Nov. 1867 (MEL, not seen), Queensland, Rockingham Bay.

*Benincasa hispida* (Thunb.) Cogn., for the wild form: I.Telford, Fl. Austr. 8 (1982) 170; Peekel, Fl. Bismarck Archip., translated by E.E.Henty (1984) 547, f. 874.

Plants generally of a more delicate stature compared to cultivated form *hispida*; hairs grey(-brown) coloured. Flowers smaller, in male 50–70 mm diameter. *Fruit* globose or ellipsoid (subacute at both ends), 4–8 cm long; exocarp woody, 1–1.5 mm thick; mesocarp ± absent. *Seeds* 7–8 mm long, embedded in rather juicy whitish pulp. —

**Fig. 9; Plate 31c.**

Distribution — Indochina, south-east through Malesia to Australia (Queensland), Solomon Islands, and islands in the Pacific; in *Malesia*: Borneo, East Java, Lesser Sunda Islands, Sulawesi, New Guinea (Papua New Guinea (New Ireland, fruit ellipsoid)).

Habitat & Ecology — Disturbed areas in lowland rainforest, forest edges, open forest, river banks, scrub-land and beach-vegetation; up to 700 m altitude.

Note — Forms similar to the truly wild form of *Benincasa pruriens* possibly are feral forms, developed from escaped populations of the cultivated form *hispida* in natural places. As the oldest collections of the wild form, with very small fruits, come from East Malesia, Queensland, and The Pacific, this area is the most plausible original place of occurrence of *Benincasa*.

#### b. forma hispida (Thunb.) W.J.de Wilde & Duyfjes

*Benincasa pruriens* (Parkinson) W.J.de Wilde & Duyfjes forma *hispida* (Thunb.) W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 47. — *Cucurbita hispida* Thunb., Nov. Acta Regiae Soc. Sci. Upsal. 4 (1783) 38; *Benincasa hispida* (Thunb.) Cogn. in A.DC. & C.DC, Monogr. Phan. 3 (1881) 513; Craib, Fl. Siam. 1 (1931) 757; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 302; Rifai & M.E.C.Reyes, PROSEA 8 (1993) 95. — Type: *Thunberg* 22775 (holo UPS, IDC microfiche), Japan.

*Benincasa cerifera* Savi, Mem. sopra una pianta Cucurbitaceae (1818) 58; Ridl., Fl. Malay Penin. 1 (1922) 852. — Type: not known, described from a cultivated plant, possibly originating from eastern Asia.

*Cucurbita villosa* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 931. — Type: *Blume* 1079 (holo L), Indonesia, Java.

*Cucurbita farinosa* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 931. — Type: not found, Indonesia, Java.

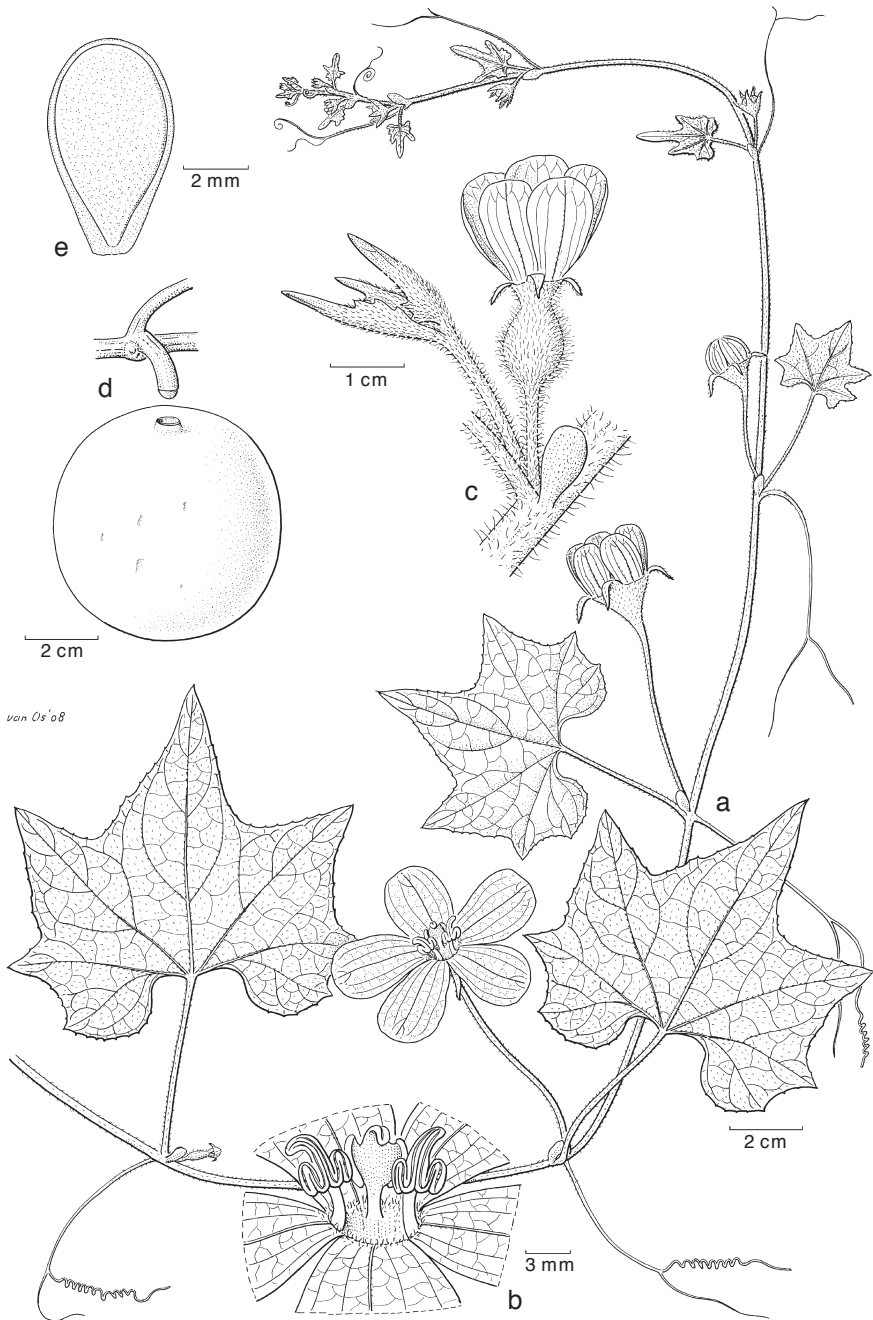


Fig. 9. *Benincasa pruriens* (Parkinson) W.J.de Wilde & Duyfjes forma *pruriens*. a. Habit; b. detail of male flower showing stamens; c. node with female flower; d. fruit and node with fruiting pedicel; e. seed (a, b: Brass 24290, a short-haired plant; c: Postar *et al.* SAN 144094, a long-haired plant; d, e: Postar *et al.* SAN 144142).

*Cucurbita littoralis* Hassk., Cat. Hort. Bot. Alt. (1844) 190. — Type: not found, Indonesia, Java.  
*Gymnopetalum septemlobum* Miq., Fl. Ned. Ind. 1, 1 (1856) 679. — Type: *Junghuhn s.n.* (holo L, barcode L0587810), Indonesia, Weltevreden.

Stout plant with grey or rusty coloured hairs. Flowers large, in *male* 6–10 cm diameter. *Fruit* subglobose or (long-)ellipsoid, (10–)20–60(–120) cm long; exocarp hard-leathery, c. 0.5 mm thick; mesocarp fleshy, 20–100 mm thick. *Seeds* 8–10 mm long, embedded in rather firm pulp. — **Plate 4c, d, 32a, c.**

Distribution — *Malesia*: Widely cultivated.

Uses — The young and ripe fruits and young shoots are used as a vegetable.

Notes — 1. The form *hispida*, or Wax Gourd, comprises all cultivated or escaped varieties or cultivars.

2. A more conspicuous disc in the (male) flower can be found in cultivated varieties, especially those with hermaphroditic flowers.

## 6. BORNEOSICYOS

*Borneosicyos* W.J.de Wilde, Reinwardtia 11 (1998) 224; W.J.de Wilde & Duyfjes, Fl. Males. Bull. 14 (2007) 35. — Type species: *Borneosicyos simplex* W.J.de Wilde.

Slender liana, perennial; dioecious. *Probract* present. *Tendrils* unbranched. *Leaves*: blade simple, unlobed. *Flowers* (pale) yellow. *Male inflorescences* racemose-paniculate, flowers short-pedicellate. *Male flowers*: receptacle-tube short cup-shaped, lobes minute; petals 5, entire, free, quincuncial; stamens 3, free, inserted towards base of tube, anthers free but connivent into a depressed globose head, two 2-theous, one 1- or 1.5-theous, thecae sigmoid, connectives broad, glabrous; disc absent or not obvious. *Female flowers* solitary or in a short raceme co-axillary with single female flower; ovary narrowly ellipsoid, ovules rather few, horizontal; receptacle-tube and perianth as in the male flowers; style conspicuous, stigma 3-parted; staminodes 4 or 5, subulate, inserted near the throat of the tube; disc present (obscure in the male ones). *Fruit* solitary (always?), somewhat baccate. *Seeds* rather large, near-globose, faintly margined; testa not ornamented.

Distribution — 1 (or 2?) species in Sarawak and Sabah.

### 1. *Borneosicyos simplex* W.J.de Wilde

*Borneosicyos simplex* W.J.de Wilde, Reinwardtia 11 (1998) 224; W.J.de Wilde & Duyfjes, Fl. Males. Bull. 14 (2007) 35. — Type: *Chow & Aban SAN 65050* (holo KEP; iso K, SAN), Sabah, Crocker Range.

Liana 6–12 m high, main stem to 10 mm diam., leafy stem terete, c. 2 mm diam., green, glabrous except for minute hairs on young parts. *Probract* narrowly elliptic, c. 3 mm long, acute, subtire, with minute scattered glands. *Tendrils* 6–16 cm long. *Leaves*: petiole 10–15 mm long, 1.5–2 mm thick; blade membranous or slightly succulent, ovate-oblong, 8–13 by 3–6 cm, glabrous, glands on lower surface numerous, scattered, less than 0.5 mm diam., cystoliths absent, base rounded or shallowly cordate, margin entire or more usually with some minute sparse teeth up to 1 mm long, sometimes distinctly dentate in sterile shoots, apex acute-acuminate; basal veins 3(–5)-palmate, arch-

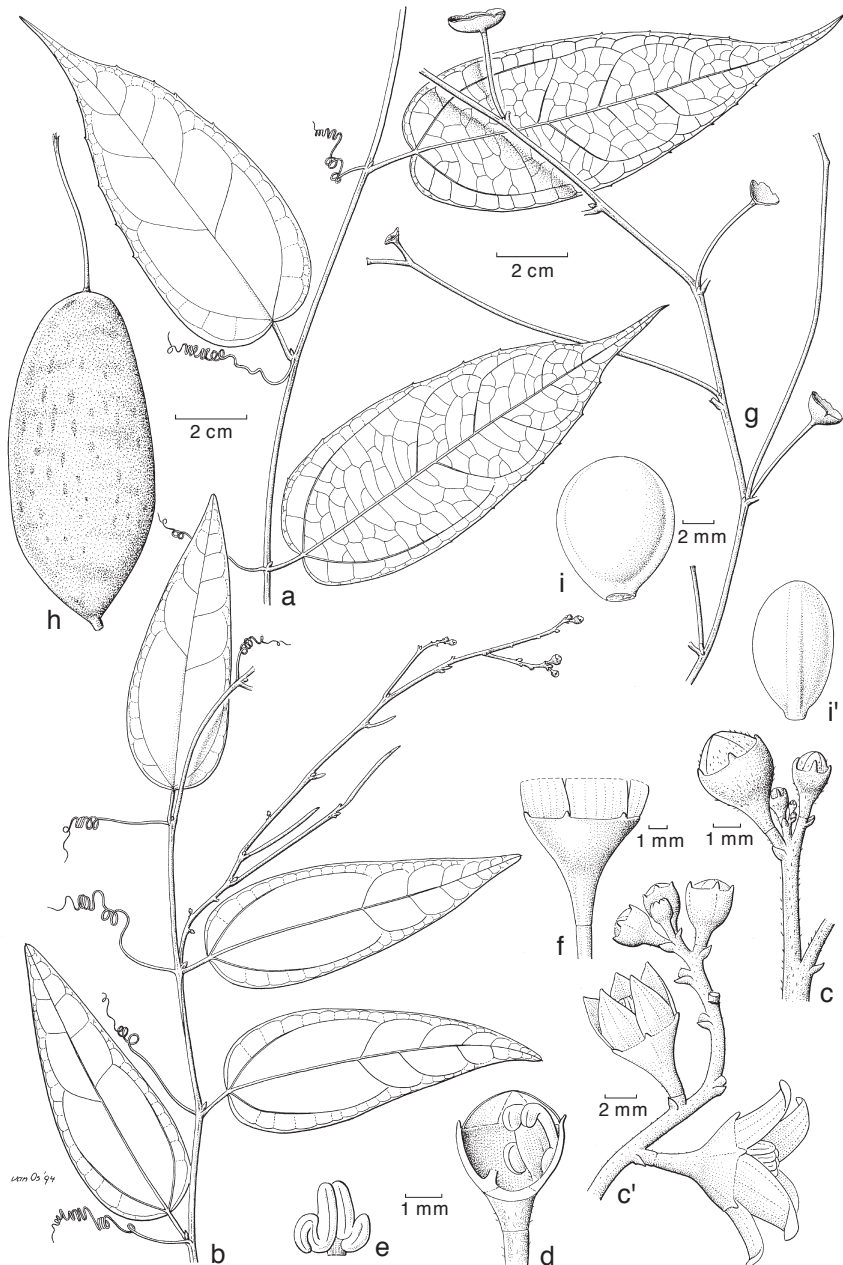


Fig. 10. *Borneosicyos simplex* W.J.de Wilde. a. Sterile leafy twig; b. portion of twig with male inflorescence; c, c'. apex of partial male raceme with buds; d. male bud opened, showing one immature stamen  $\pm$  adaxially; e. immature stamen, abaxially; f. male flower, lower portion, with receptacle-tube and sepals; g. twig with fruiting pedicels and basal portions of fruits; h. fruit; i, i' seed (a: *De Wilde & Duyfjes* 21959; b–f: *De Wilde & Duyfjes* SAN 139474; c': *Postar et al.* SAN 14425; g, i, i': *J. & M.S. Clemens* 26751; h: *Chow & Aban* SAN 65050).

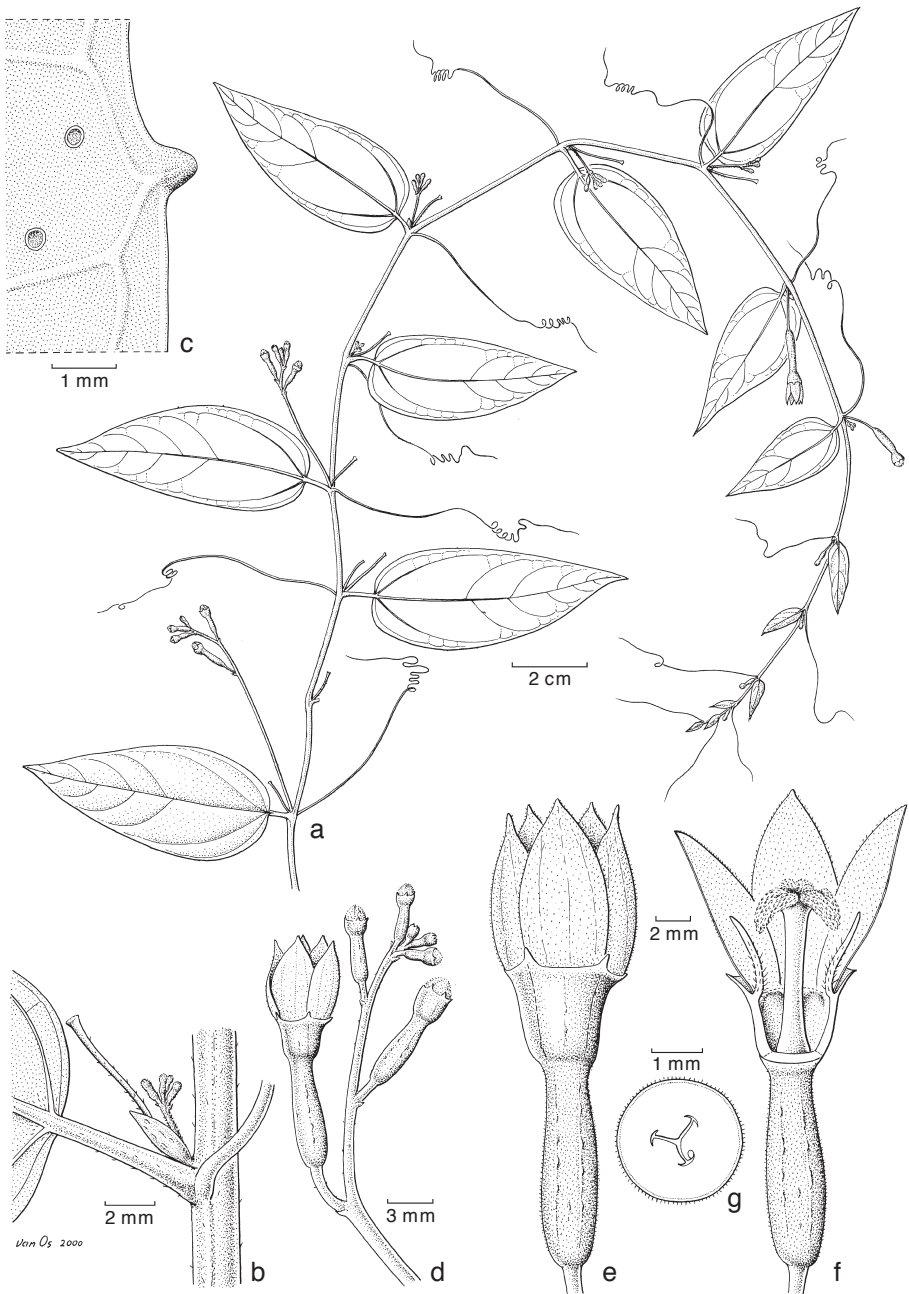


Fig. 11. *Borneosicyos simplex* W.J.de Wilde. a. Female flowering twig; b. node with developing female inflorescence, co-axillary with pedicel of fallen female flower, also showing probract; c. detail of leaf margin, abaxial side, showing small marginal tooth and two leaf glands; d. racemose female inflorescence; e, f. female flowers; g. ovary in cross section (a, b, d–g: *De Wilde, Postar & Ubaldus SAN 144018*; c: *De Wilde & Duyfjes 21959*).

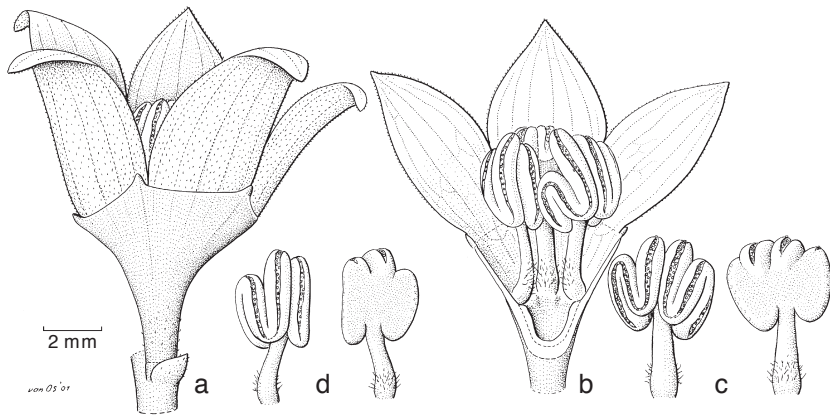


Fig. 12. *Borneosicyos simplex* W.J.de Wilde. a. Male flower; b. ditto, opened, showing anther head; c. separate stamen with anther 2-theous; d. stamen with anther 1.5-theous (all: *Postar, De Wilde & Ameng SAN 144251*).

ing-up to half the blade, lateral veins 2–4 per side. *Male inflorescences*  $\pm$  peduncled lateral panicles 10–15 cm long, loose, composed of few few-flowered short racemes 2–4 cm long; bracts small, 1 mm or less, tardily caducous. *Male flowers*: pedicel c. 4 mm long, articulate c.  $\pm$  halfway; expanded perianth 10(–15) mm wide; receptacle-tube c. 4 by 5 mm; sepals green, later brown, triangular, c. 0.5 mm long; petals (narrowly) elliptic, c. 8 by 4 mm, obtuse, 5–8-veined, inside and outside minutely sparsely grey-brown pubescent (hairs c. 0.2 mm long), margin finely fimbriate; filaments subulate, c. 3 mm long, with few hairs in the lower portion; anther head c. 4 mm wide, anthers c. 3 mm diam., connective broad, glabrous. *Female flowers* solitary or 4–7 in a short raceme (peduncle 3–4 cm long); bracts minute; pedicel in solitary flower 10–15 mm long, in raceme c. 5 mm long; ovary cylindrical-oblong, 9–10 by c. 3 mm, at apex somewhat narrowed into a c. 2 mm long neck, minutely brownish pubescent, green with paler irregular lengthwise flecks and faintly warty bands; receptacle-tube cup-shaped, c. 3.5 by 4 mm, inside thickened and with 5 faint disc pads; sepals shortly connate forming at anthesis a tube 1(–2) mm long with the lobes somewhat reflexed, acute, 1–1.5 by c. 0.5 mm; petals subacute, c. 10 by 4–5 mm, connate for up to 0.5 mm only, 3(–5)-veined, minutely papillose-hairy, short-woolly at base, apices in bud slightly contorted; style cylindrical, at base somewhat broadened, 9–10 by 1(–1.5) mm, stigma of 3 sessile  $\pm$  recurved parts, each elongated heart-shaped, 3.5–4 by c. 2 mm, papillose; staminodes subulate, c. 6 mm long, soft-haired. *Fruit* at first green, darker flecked, ripening red, smooth, glabrous, narrowly ellipsoid, (4–)8–10 by (2–)4–4.5 cm, base rounded, apex acute, 2–3 mm beaked; exocarp thin on drying; endocarp juicy, on drying leaving thin membranes around the seeds; fruiting pedicel slender, 0.5–1 cm long (in raceme) or 3.5–5 cm long (when fruit solitary), c. 5 mm thick. *Seeds* 20–30, somewhat compressed globose, 9–10 by 8–9 by c. 4 mm, with a faint margin, smooth, edge entire. — **Fig. 10–12; Plate 5.**

*Distribution* — Sabah: Crocker Range, Kinabalu Park (Tenompok area and Langanan Waterfall), but see note 2.

Habitat & Ecology — Primary montane *Lithocarpus* evergreen forest, (1000–)1500–1800 m altitude; flowering in July and December; fruiting in July and October. Full-grown *Borneosicyos* is a slender but tall liana, flowering in the tree crowns 5–10 m high. The immature sterile plants thrive in the moist atmosphere of the underscrub in the montane forest, preferably not far from streams.

Note — The collection, *Yii S 51389* with one open male flower only, from West Sarawak, Gn Merubong, possibly represents an undescribed species of *Borneosicyos*. It is distinct by a slightly stouter habit, and leaves with a rather deeply cordate base; its pollen is in tetrads as in *B. simplex*.

## 7. CAYAPONIA

*Cayaponia* Silva Manso, Enum. Subst. Braz. 31 (1836) 31, nom. cons.; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 738; Pax in Engl. & Prantl, Nat. Pflanzenfam. 4 (5) (1889) 34; C.Jeffrey, Kew Bull. 25 (1971) 201. — Type species: *Cayaponia diffusa* Silva Manso, typ. cons.

Climbers, perennial; monoecious (or dioecious, not in Malesia). *Probract* absent. *Tendrils* 2- or 3-branched or unbranched. *Leaves*: blade simple, unlobed or lobed, or 3–8-foliolate, usually with scattered glands near the insertion to the petiole. *Flowers* whitish or yellowish green, solitary or fascicled, arranged in racemes, or subpaniculate; petals free or short-connate. *Male flowers*: receptacle-tube campanulate or subcylindrical; petal lobes (ovate-)elliptic or oblong, valvate or (sub)imbricate; stamens 3, free, inserted near the throat of the receptacle-tube (or lower down, not in Malesia), anthers basifixed, often connivent, two 2-theous, one 1-theous, thecae plicate, connective not produced; disc (pistillode) absent or small. *Female flowers* solitary or few-fascicled, arranged in panicles; perianth as in male flowers; ovary ovoid, ovules 1–many per locule, erect, style long, with nectary-like annular disc at base, stigmas 3, unlobed, recurved; staminodes small. *Fruit* ovoid or subglobose, berry-like, with 3–12 seeds. *Seeds* little compressed, mostly smooth, margin absent, edge entire.

Distribution — About 50 species in the Neotropics, few species in Africa, including Madagascar; in *Malesia*: 1 introduced and naturalized species.

### 1. *Cayaponia martiana* (Cogn.) Cogn.

*Cayaponia martiana* (Cogn.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 777, including var. *acutiloba* & var. *tomentosa*; Backer in Backer & Bakh.f., Fl. Java 3 (1968) 645; C.Jeffrey, Kew Bull. 25 (1971) 233. — *Trianosperma martiana* Cogn. in Mart., Fl. Bras. 6, 4 (1878) 87, t. 25. — For typification see Cogn. (1878).

Climber or creeper to 5 m long; stem subglabrous. *Leaves*: petiole 4–8 cm long; blade (deeply) 3–7-lobate (upper leaves smaller, unlobed), 8–15 by 10–20 cm, scabrous-hairy, base narrowed into the petiole, margin crenate-dentate. *Inflorescences* elongate, variable, grouped into large leafy panicles, bracts minute. *Male flowers* fasciculate; pedicel 2–5 mm long, hairy, mostly with a bracteole; receptacle-tube narrowly campanulate, 3–4 by c. 1.5 mm; sepals c. 1 mm long; petals whitish, 5–6 by 2 mm, papillose-villose; filaments c. 2.5 mm long, anthers ± coherent into a head, c. 1.5 by 1 mm; disc elongate. *Female flowers* as in male flowers; ovary narrowly ellipsoid, constricted

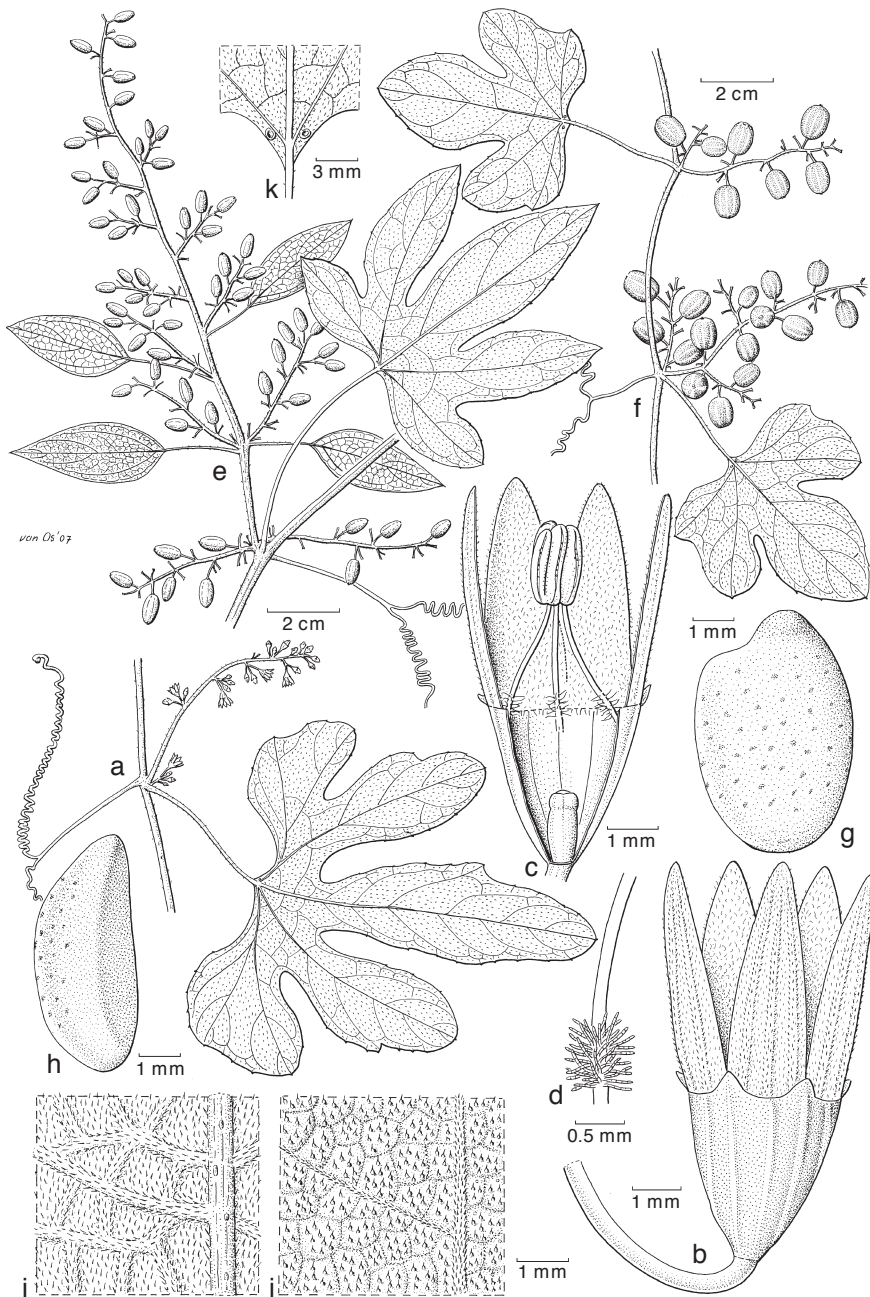


Fig. 13. *Cayaponia martiana* (Cogn.) Cogn. a. Habit of node with male inflorescence; b, c. male flower, from outside and opened respectively (thecae plicate); d. detail of portion of filament; e. infructescence with immature fruits; f. ditto, with mature fruits; g, h. seeds; i, j. detail of lower and upper leaf blade respectively; k. base of leaf blade with glands on lower surface (a–d, i–k: *Neubauer 594*; e: *Kostermans s.n.*, November 1938; f–h, k: herb. *Martius s.n.*, barcode L 0587282, Brasil).



at apex, receptacle-tube villose-papillose at the throat; staminodes inconspicuous. *Fruit* ripening green or yellow, yellowish striped, subglobose, c. 1 cm long; fruiting pedicel c. 0.5 cm long. *Seeds* few, grey, ovoid, 5–6 by 3.5–4 by 2–2.5 mm. — **Fig. 13.**

Distribution — South America (Brazil, Paraguay); in *Malaysia*: East Java, Ijen Plateau, where introduced and running wild; 800–1000 m altitude; flowering and fruiting probably throughout the year.

## 8. CITRULLUS

*Citrullus* Schrad. Enum. Pl. Afric. Austral. 2 (1836) 279, nom. cons.; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 507; I.Telford, Fl. Australia 8 (1982) 173; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1533. — Type species: *Citrullus vulgaris* Schrad., typ. cons.

Herbs, annual (or perennial with root-stock), trailing or climbing, plant scabrous or soft-hairy; monoecious. *Probract* present. *Tendrils* branched (unbranched or spinescent, not in Malesia). *Leaves*: blade simple, ± pinnately lobed. *Flowers* solitary, pedicelled, medium-sized, petals (nearly) free, yellow. *Male flowers*: receptacle-tube short, broadly campanulate; sepals narrow; petals ovate-oblong, obtuse, margin entire; stamens 3, inserted near the base of the receptacle-tube, filaments free, short, anthers coherent, two 2-thecous, one 1-thecous, thecae plicate, connective broad, flat; disc inconspicuous. *Female flowers*: perianth as in male flowers; ovary ovoid or subglobose, hairy, style short, stigma deeply 3-lobed, ovules numerous, horizontal; disc not apparent; staminodes small. *Fruit* a pepo, solitary, (small or) large, firm-walled, indehiscent. *Seeds* numerous, compressed, (narrowly) ovate in outline, (nearly) smooth, margined or not, edge entire.

Distribution — A genus of 4 species in Africa, east to Pakistan; in *Malesia*: 1 species, *C. lanatus*, widely cultivated.

### 1. *Citrullus lanatus* (Thunb.) Matsum. & Nakai

*Citrullus lanatus* (Thunb.) Matsum. & Nakai, Cat. Sem. & Spor. Hort. Bot. Univ. Imp. Tokyo (1916) 30; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 300; H.Hara, Taxon 18 (1969) 346, f. 5; I.Telford, Fl. Australia 8 (1982) 173; Paje & Van der Vossen, PROSEA 8 (1994) 144; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 49; Fl. Thailand 9, 4 (2008) 422. — *Momordica lanata* Thunb., Prodr. Pl. Cap. (1794) 13. — Type: *Thunberg s.n.* (UPS, photo seen), Cape Province, Republic of South Africa.

*Citrullus vulgaris* Schrad., Enum. Pl. Afric. Austral. 2 (1836) 279; Craib, Fl. Siam. (1931) 760. — Type: not known.

*Citrullus edulis* Spach, Hist. Nat. Vég. 6 (1838) 214; Miq., Fl. Ned. Ind. 1, 1 (1856) 662. — Type: not known.

Annual herb, shoots to 3 m long, stem 2–4 mm diam., soft grey-hairy, hairs 2–3(–5) mm long. *Probract* narrowly elliptic, (sub)obtuse, narrowed at base, 5–15(–20) mm long, glands not obvious. *Tendrils* 2- or 3-branched. *Leaves*: petiole 3–12 cm long, soft hairy; blade pinnately (deeply) 3–5-lobed, ovate to narrowly elliptic in outline, 5–20 by 3–15 cm, glabrescent above, scabrid beneath, cystoliths and glands not obvious, base shallowly cordate, margin irregularly dentate, apex and apices of lobes rounded, obtuse or acute. *Male flowers*: pedicel 10–80 mm long, hairy; receptacle-tube 3–4 mm long,

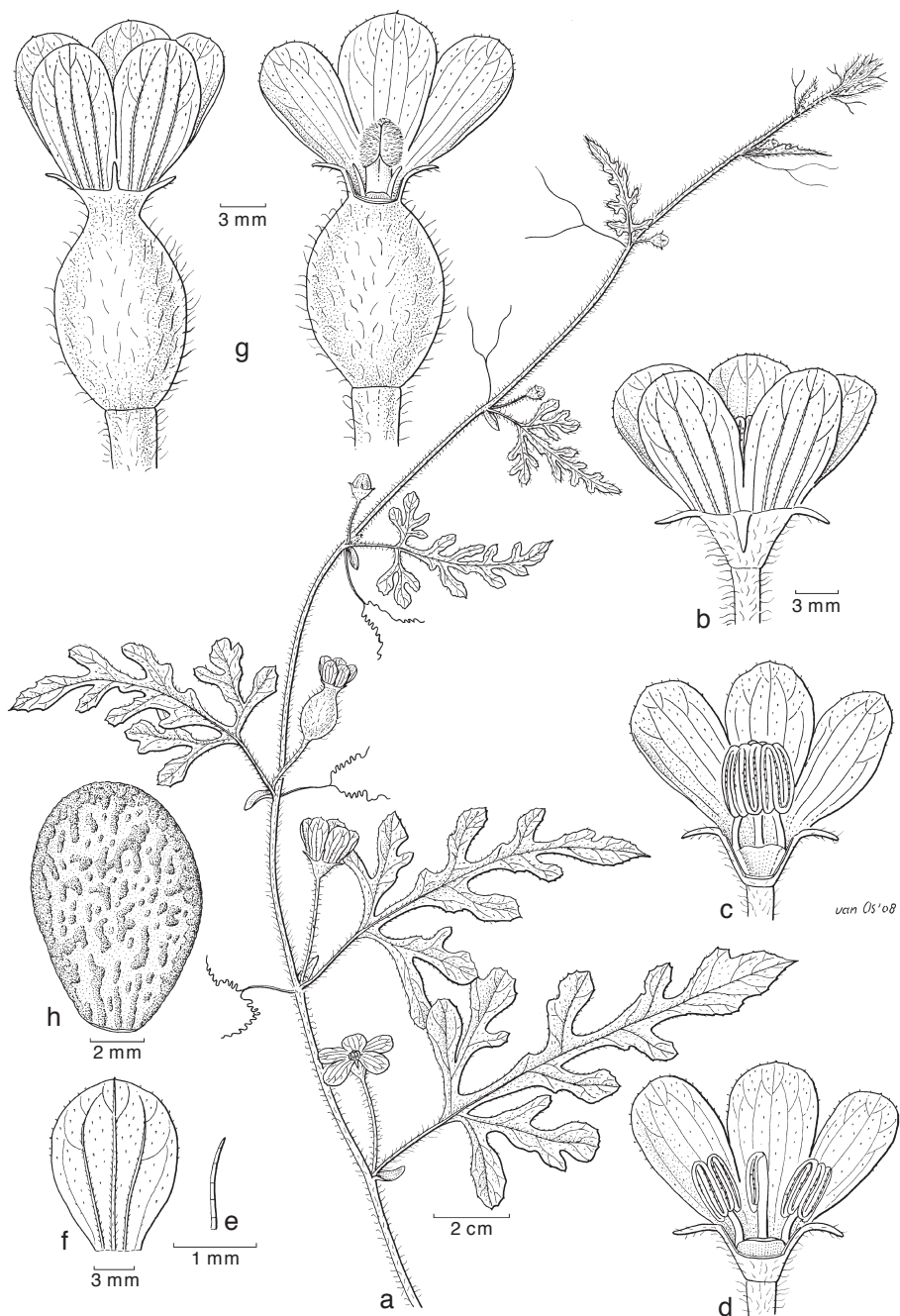


Fig. 14. *Citrullus lanatus* (Thunb.) Matsum. & Nakai. a. Growing branch with male and female flowers; b, c, d. male flowers, from outside and opened, in d stamens segregated by hand; e. hair of stem; f. petal; g female flower, from outside and opened; h. seed (a–g: *De Wilde & Duyfjes* 21803; h: *De Wilde & Duyfjes* 22328).

villous-hairy; sepals linear, 3–5 mm long; petals 8–15 mm long; filaments c. 2 mm long, glabrous, anthers connivent into a globose mass c. 3 mm diameter. *Female flowers*: pedicel 5–40 mm long; ovary 6–12 mm long, style 4–5 mm long. *Fruit* solitary, ripening (pale) green or greyish green without or with stripes or blotches, or yellow, (sub)globose or ellipsoid, 20–30(–60) cm long, glabrescent, smooth; exocarp hard but not woody; pulp (including mesocarp) white, yellow or pink(-red); fruiting pedicel 2–7 cm long. *Seeds* white, brown or nearly black, 6–12 mm long, smooth or ± rough, margin absent or present. — **Fig. 14; Plate 6c.**

Distribution — *Malesia*: widely cultivated.

Vernacular names — Semangka (Indonesia).

Note — *Citrullus lanatus*, the *watermelon*, is popular and cultivated everywhere in various cultivars for its fruits. Discarded seeds easily give rise to temporary spontaneous occurrence.

## 9. COCCINIA

*Coccinia* Wight & Arn., Prodr. Fl. Ind. Orient. 1 (1834) 347; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 528; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1529; W.J.de Wilde & Duyfjes, Fl. Thailand 9, 4 (2008) 423. — Type species: *Coccinia indica* Wight & Arn., nom. illeg. (*Bryonia grandis* L. = *Coccinia grandis* (L.) Voigt).

Herbaceous or (sub)woody perennial climbers, early glabrescent; dioecious. *Probract* small, caducous. *Tendrils* unbranched (or elsewhere 2-branched). *Leaves*: blade simple, variable of shape. *Flowers* white (or creamy or orange, not in *Malesia*), petals fused into corolla-tube. *Male flowers* solitary (or 2 or 3), white (elsewhere yellowish); receptacle-tube cup-shaped; sepals 5, small; corolla campanulate, 5-lobed, lobes fused for c. 2/3, margin entire; stamens 3; filaments fused or free but tightly appressed forming a column, inserted at or near the base of the receptacle-tube; anthers two 2-thecous and one 1-thecous (elsewhere all 2-thecous), free but mostly coherent into a globular synandrium; thecae plicate; connectives broad; base of receptacle with a nectariferous disc (all species?). *Female flowers* mostly solitary; ovary ovoid or oblong, smooth or faintly ribbed, glabrous; ovules many, horizontal; stigmas 3, each 2-lobed. *Fruit* ripening red, berry-like, ellipsoid (elsewhere globose), moderate of size, pericarp thin. *Seeds* numerous, (ovate-)elliptic, compressed, margin distinct, edge entire.

Distribution — A genus of c. 30 species mainly in Africa; in *Malesia* 1 species.

### 1. *Coccinia grandis* (L.) Voigt

*Coccinia grandis* (L.) Voigt, Hort. Suburb. Calcutt. (1845) 59; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 305; I.Telford, Fl. Australia 8 (1982) 176; Boonkerd, Na Songkhla & Thephuttee, PROSEA 8 (1993) 150; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 50; Fl. Thailand 9, 4 (2008) 423. — *Bryonia grandis* L., Mant. Pl. (1767) 126. — *Coccinia indica* Wight & Arn., Prodr. Fl. Ind. Orient. 1 (1834) 347, nom. illeg.; Craib, Fl. Siam. 1 (1931) 761. — *Cephalandra indica* (Wight & Arn.) Naudin, Ann. Sci. Nat. Bot., Sér. 5 (1866) 16, nom. illeg.; Ridl., Fl. Malay Penin. 1 (1922) 849. — Type: *Herb. Linn. No. 1153/2* (lecto LINN, designated by Jeffrey, Fl. Trop. E Africa (1967) 68 (see C.E.Jarvis, Order out of chaos (2007) 363)), India.

*Momordica bicolor* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 928, including vars. *a* and *b*. — Type: *Blume 1012* (holo L), Java.

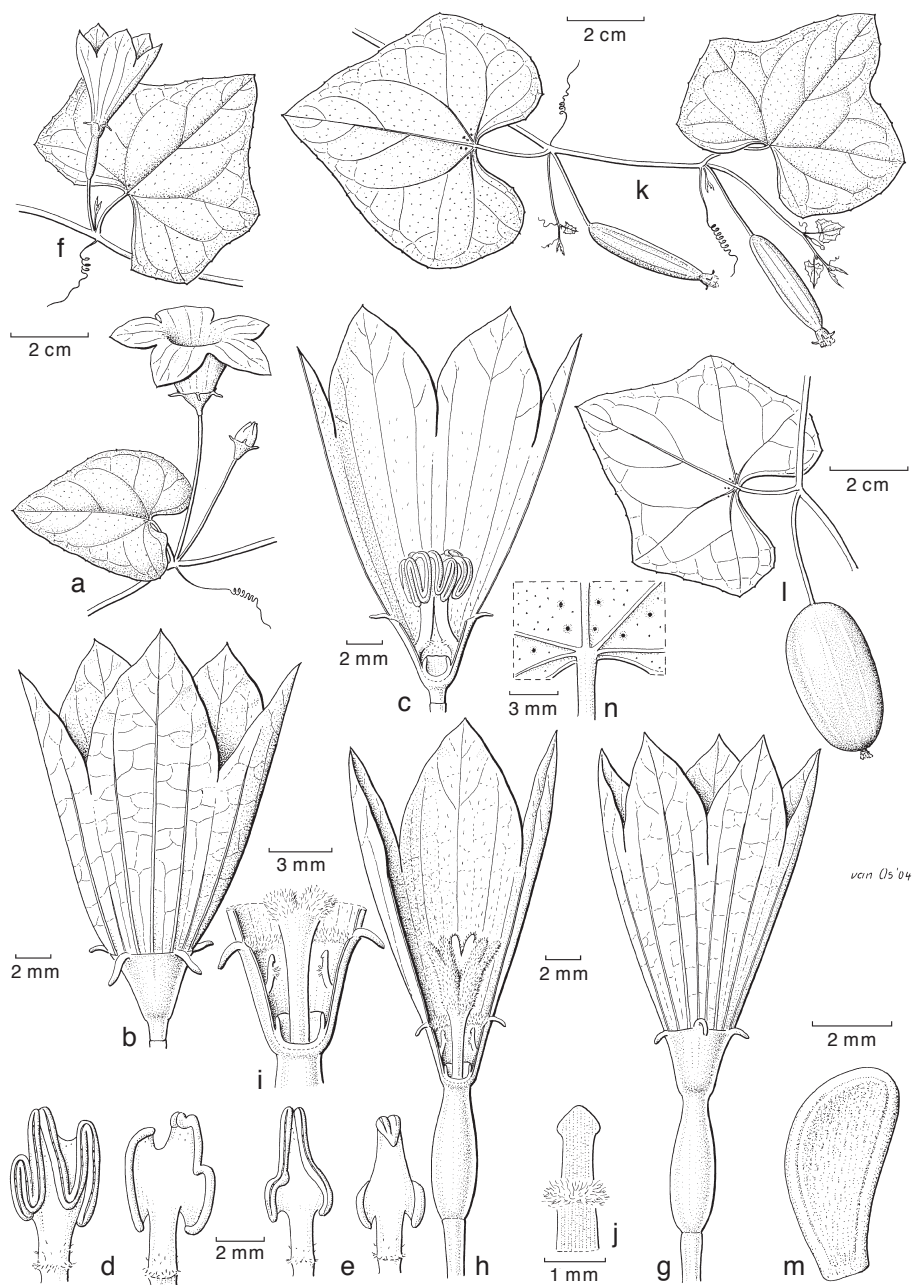


Fig. 15. *Coccinia grandis* (L.) Voigt. a. Node with male flowers; b, c. male flowers; d, e. stamens; f. node with female flower; g, h. female flowers; i. ditto, basal portion opened; j. staminode; k. portion of twig with immature fruits; l. node with fruit; m. seed; n. blade base, lower surface, showing glands; note: corollas lobed to about halfway deep (a: *De Wilde & Duyfjes* 21734; b–e: *De Wilde & Duyfjes* 22270; f, k: *De Wilde & Duyfjes* 21717; g–j: *De Wilde & Duyfjes* 22271A; l–n: *De Wilde & Duyfjes* 21739).

*Coccinia wightiana* M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 93. — Type: *Wight 1123* (not seen), but *Bryonia grandis* L. cited by Wight & Arnott (1834, l.c.) in the synonymy.

Herbaceous or soft-woody climbers to 8 m long, sparsely puberulous, early glabrescent; older stem to 20 mm across, with grey bark. *Probract* fleshy, elliptic to oblong, 2–3 mm long, caducous. *Tendrils* unbranched. *Leaves*: petiole 1–2.5 cm long; blade slightly succulent, unlobed, (3- or) 5-angular or (deeply) 3–5(–7)-lobed, or dissected to 4/5 deep, 3–10 cm across, glands small, several, near the insertion of the petiole and along lateral veins, cystoliths in older leaves present, margin minutely (blackish) dentate-sinuate, apex acute or rounded. *Male flowers* solitary (or 2 or 3); pedicel 20–50 mm long; receptacle-tube greenish white, cup-shaped, narrowed to the base, 6–8 by c. 6 mm at throat; sepals oblong-subulate, c. 3 mm long, ± up-curved; corolla white, pale green veined, broad campanulate, (15–)25–30 mm long, inside (sparsely) pubescent, lobes ovate-oblong, acute(-acuminate); stamens inserted c. 5 mm below the throat of the receptacle-tube, filaments either connate or free but coherent, forming a hollow column (4–)5–6 mm long (sometimes leaving 3 openings at base), synandrium c. 5 mm diam.; the receptacle-tube below the insertion of the stamens densely white-hairy, hiding a basal cavity, c. 3 mm deep, comprising a conspicuous green-yellow cup-shaped disc adnate to the base of the tube. *Female flowers*: pedicel 1–3 cm long; ovary oblong, 10(–13) by 2(–3) mm, narrowed at both ends, style 3–5 mm long, at base surrounded by a cup-shaped disc, stigmas 3, usually 2-lobed, 5–7 mm long, papillose; staminodes 3, minute. *Fruit* green-white blotched, ripening red (starting at the apex), (narrowly) ellipsoid, 2.5–6 by 1.5–3 cm, apex subacute, pulp red, juicy; fruiting pedicel 1–4 cm long. *Seeds* 6–7 by 2.5–3 by c. 1.5 mm, ± smooth, margin narrow. — **Fig. 15; Plate 7.**

**Distribution** — Widely distributed in the Old World, northern tropical Africa, east to Arabia through India to tropical North Australia; in *Malesia*: Peninsular Malaysia, Singapore, Borneo (Sabah, cultivated), eastern Java, Philippines (Cebu), Lesser Sunda Islands (Bali, Lombok, Flores Timor), Moluccas (Weri). Currently pantropical.

**Ecology** — In open forest, scrub, along waste land, roadsides, and near the coast; from sea level to 400 m altitude; flowering and fruiting throughout the year.

**Uses** — Young shoots are eaten as a vegetable.

**Note** — *Coccinia grandis* prefers a (strong to) light monsoon climate. Its fruits are (glaucous) green with contrasting white blotches in rows and turn into bright red when ripe, except for the very base. The pulp is frequently eaten by animals, mainly by birds.

## 10. CUCUMIS

*Cucumis* L., Sp. Pl. ed. 1 (1753) 1011; Gen. Pl. 5 (1754) 442; Miq., Fl. Ned. Ind. 1, 1 (1856) 670; C.B. Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 619; Cogn. in A.D.C. & C.D.C., Monogr. Phan. 3 (1881) 479; J.H. Kirkbr., Biosyst. Monogr. Gen. Cucumis (1993) 19; H. Schaeff., Blumea 52 (2007) 166; Ghebret. et al., Novon 17 (2007) 176; W.J. de Wilde & Duyfjes, Adansonia, sér 3, 29 (2) (2007) 240. — Lectotype (Britton & Wilson, Scientific Survey of Porto Rico and the Virgin Islands 6, 2 (1925) 264); *Cucumis sativus* L.

*Melo* Mill., Gard. Dict. Abr. ed. 4 (1754) without pagination. — Lectotype (Swart, Index Nom. Gen. (Pl.) Card (1960)): *Cucumis melo* L.

Small or medium-sized annual or subperennial climbers (rarely suberect), leafy stem 1–4 mm diam., plant scabrous or setose; monoecious (rarely dioecious); usually cultivated. *Probract* absent. *Tendrils* unbranched. *Leaves* simple. *Flowers* yellow, solitary or few-fascicled; pedicels short; corolla composed of partly fused petals, small- or medium-sized. *Male flowers*: receptacle-tube campanulate or turbinate, small; sepals mostly linear; petals (corolla) with margin entire; stamens 3, free, inserted about half-way the receptacle-tube, filaments short, anthers two 2-theous, one 1-theous, thecae sinuate, 3-plicate or S-shaped, connective considerably produced; disc large, gland-like, free from the tube. *Female flowers* usually solitary; ovary hairy, hairs sometimes apical on small protuberances, ovules numerous, horizontal; perianth as in male flowers but somewhat larger, stigma 3-lobed, lobes lobulate; staminodes often present, small; disc surrounding base of style, free from the tube. *Fruit* a (large) pepo (fleshy berry), indehiscent, pubescent or glabrous, or with fleshy spines or tubercles, green, yellow or orange (rarely maturing underground in *C. humifructus*, southern Africa). *Seeds* numerous, pale, compressed, (narrowly) elliptic, not sculptured, unmarginated with entire, acute edge, not winged (or rarely winged).

Distribution — About 30 species in the Old World, mostly Africa; in *Malesia* 2 species, widely cultivated.

Taxonomy — According to molecular research (Ghebret. et al., Novon 17 (2007) 176; H.Schaef., *Blumea* 52 (2007) 165) the genus *Cucumis* should include a number of smaller genera, including *Mukia*, but for the present purpose we treat *Cucumis* in the original sense.

#### KEY TO THE SPECIES

- 1a. Leaf lobes mostly rounded . . . . . **1. *C. melo*** (2 forms)  
 b. Leaf lobes acute-acuminate . . . . . **2. *C. sativus***

#### 1. *Cucumis melo* L.

*Cucumis melo* L., Sp. Pl. ed. 1 (1753) 1011; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 482; Craib, Fl. Siam. (1931) 760; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 301; I.Telford, Fl. Australia 8 (1982) 189; J.H.Kirkbr., Biosyst. Monogr. Gen. Cucumis (1993) 79; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1512; Paje & Van der Vossen, PROSEA 8 (1994) 153; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 54; Fl. Thailand 9, 4 (2008) 428. — Type: *Herb. LINN NO. 1152/8* (lecto LINN, designated by Meeuse, Bothalia 8 (1962) 61 (see C.E.Jarvis, Order out of chaos (2007) 465)), a plant cultivated at Uppsala.

Annual or subperennial (climber or) trailer to 6 m long, plant (woolly) hairy, hirsute or hispid. *Leaves*: petiole 3–10 cm long; blade ovate or subcircular in outline, 3–15 cm diam., (deeply) lobed or unlobed, mostly hispid, lobes mostly rounded, margin shallowly sinuate-toothed. *Male flowers* few-fascicled; pedicel 3–25 mm long, hairy; receptacle-tube 4–6 mm long; sepals 1–6 mm long; corolla united in lower third, lobes (narrowly) elliptic, 5–20 by 2.5–15 mm, apex obtuse or occasionally subacute, mostly finely hairy; filaments c. 0.5 mm long, anthers ± included, 1–2(–2.5) mm long, connective with (entire or) 2-lobed apical extension. *Female flowers* solitary; pedicel 5–30(–50) mm long; ovary ellipsoid, 4–10(–14) mm long, densely fine-hairy, hairs

spreading or appressed; sepals 1.5–3(–7) mm long; corolla 8–15(–25) mm long; style 1–2 mm long, stigma 1.5–2.5 mm diameter. *Fruit* ripening green, yellow, white or brown, plain-coloured, or striped or mottled, globose, (narrowly) ellipsoid or (ob)ovoid, 2–20(–100) by 2–5(–20) cm, smooth; exocarp leathery; mesocarp juicy or carnos; fruiting pedicel 2–4 cm long. *Seeds* 4–15 by 1–2 mm, usually not winged.

Distribution — Widely cultivated (and with feral forms) all over the world, including *Malesia*.

Note — *Cucumis melo*, the honey melon, known all over the world in numerous cultivars as a vegetable or table fruit, can be found seemingly wild when germinated from seeds from the waste and then sometimes producing forms approaching the truly wild forma *agrestis* (Naudin) W.J.de Wilde & Duyfjes.

#### KEY TO THE FORMS

- 1a. Plant generally more robust, leaf blade 4–15 cm diameter. Ovary usually with ± spreading hairs; corolla 8–20 mm long. Fruits (5–)10–20(–100) cm long. Seeds 8–15 mm long . . . . . **a. forma melo**
- b. Plant more slender, leaf blade 2–5 cm diameter. Ovary with appressed hairs; corolla 5–8 mm long. Fruits 2–5 cm long. Seeds 4–8 mm long . . . . . **b. forma agrestis**

#### **a. forma melo**

Plant rather robust. *Leaf blade* 4–15 cm diameter. *Ovary* usually with ± spreading hairs; corolla 8–20 mm long. *Fruit* (5–)10–20(–100) cm long. *Seeds* 8–15 mm long.

Distribution — As the species.

#### **b. forma agrestis** (Naudin) W.J.de Wilde & Duyfjes

*Cucumis melo* L. forma *agrestis* (Naudin) W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 55. — *Cucumis melo* L. var. *agrestis* Naudin, Ann. Sci. Nat., Bot., Sér. 4, 6 (1859) 73. — *C. melo* L. subsp. *agrestis* (Naudin) Pangalo in Zhuk., La Turquie Agricole (1933) 534; I.Telford, Fl. Australia 8 (1982) 189; J.H.Kirkbr., Biosyst. Monogr. Gen. Cucumis (1993) 81. — Type: *Naudin s.n.* (lecto P, designated by Kirkbride (1993) 105), cultivated from seeds from India.

Plant slender. *Leaf blade* 2–5 cm diameter. *Ovary* with appressed hairs; corolla 5–8 mm long. *Fruit* 2–5 cm long. *Seeds* 4–8 mm long. — **Fig. 16; Plate 6b.**

Distribution — Africa, Asia, Australia and the Pacific; in *Malesia*: Borneo (Kalimantan), Java, Philippines, Lesser Sunda Islands (Lombok, Sumba, Flores), New Guinea (West Papua, Papua New Guinea); often on barren fields and waste places, at low altitudes.

## **2. Cucumis sativus** L.

*Cucumis sativus* L., Sp. Pl. ed. 1 (1753) 1012; C.B.Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 620; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 498; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 301; I.Telford, Fl. Australia 8 (1982) 189; Gildemacher & G.J.Jansen, PROSEA 8 (1993) 157; J.H.Kirkbr., Biosyst. Monogr. Gen. Cucumis (1993) 84; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1520; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 56; Fl.

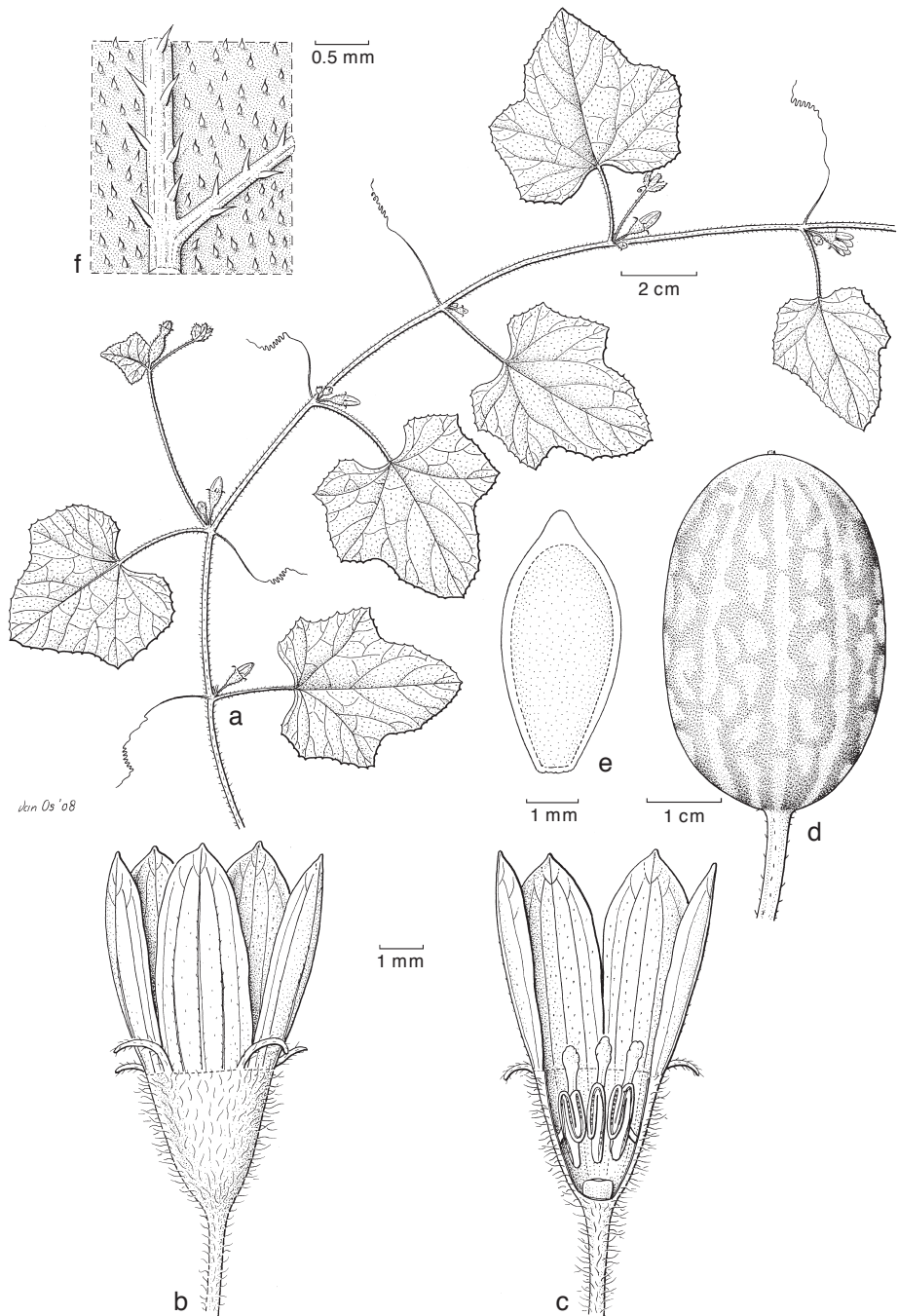


Fig. 16. *Cucumis melo* L. forma *agrestis* (Naudin) W.J.de Wilde & Duyfjes. a. Habit; b, c. male flower, from outside and opened respectively; d. fruit; e. seed; f. detail of lower surface of leaf blade (a: *Brass* 24287; b–f: *De Wilde & Duyfjes* 21859).



Thailand 9, 4 (2008) 428. — Type: *Burser* vol. 17, no. 97 (lecto UPS, designated by Ten Pas et al., Taxon 34 (1985) 291), from cultivation.

*Cucurbita vittata* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 932. — Type: not indicated.

*Cucumis? rumphii* Hassk., Abh. Naturf. Ges. Halle 9 (1866) 280; Merr., Interpr. Rumph. Herb. Amboin. (1917) 47, 492. — Type: Rumphius, Herb. Amboin. 5 (1747) 404, t. 146, f. 2. Possibly a feral form.

Annual climber or trailer, with fibrous roots, shoots to 5 m long, plant scabrid by bristly hairs. *Leaves*: petiole 5–10 cm long; blade broadly ovate in outline, 10–15(–20) cm diam., (shallowly or) deeply 5-lobed, the middle lobe largest, both surfaces sparsely hairy, margin finely dentate, lobes at apex acute-acuminate. *Male flowers* solitary or few-fascicled; pedicel 5–20 mm long, hairy; receptacle-tube 4–5(–10) mm long, hairy; sepals 4–5(–7) mm long; petals (corolla) (10–)20(–25) mm long, at base fused for 1/3; filaments short, anthers 2.5–3 mm long, included or hardly protruding, connective extension slender, entire or 2-lobed; disc 1–2 mm diameter. *Female flowers* solitary (or few-fascicled); pedicel 2–20 mm long; ovary 10(–20 in certain cultivars) mm long, glabrous or densely hairy; perianth as in male flowers; style short, stigma 2–3 mm diameter. *Fruit* ripening whitish or green, or variously two-coloured (striped), white, green or yellow(-brown), ellipsoid to cylindrical, 5–20(–50) cm long, blunt at apex, smooth or with low prickles; exocarp thin; mesocarp fleshy or pulpy, whitish or yellowish; fruiting pedicel 1.5–4 cm long. *Seeds* elliptic, 7–12 mm long, not winged.

Distribution — Originally occurring in SE Asia (the wild form, forma *hardwickii* (Royle) W.J.de Wilde & Duyfjes in northern India, Myanmar and Thailand), at present cultivated worldwide for its fruits.

Uses — *Cucumis sativus*, the cucumber, is probably the most commonly used source of raw or cooked vegetable.

## 11. CUCURBITA

*Cucurbita* L., Sp. Pl. ed. 1 (1753) 1010; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 542; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 305; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 102; Widjaja & Sukprakarn, PROSEA 8 (1993) 160; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1541; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 58; Fl. Thailand 9, 4 (2008) 430. — *Pepo* Mill., Gard. Dict. Abr., ed. 4 (1754) without pagination. — Type species: *Cucurbita pepo* L.

Medium-sized stout annual (or perennial not in our area) trailing or climbing herbs, leafy stem 3–5(–10) mm diam., plant hairy or scabrous; monoecious; usually cultivated. *Probract* absent. *Tendrils* (2–)3–6-branched. *Leaves*: petiole long; blade simple, large, ± unlobed or lobed, sometimes with whitish blotches, margin finely or coarsely dentate, apex of lobes rounded or acute. *Flowers* orange(-yellow), solitary (in male sometimes 2); receptacle-tube (shallowly) campanulate; sepals 5; corolla large, 6–10 cm long in cultivated species, petals fused for the lower half, lobes acute, patent or ± out-curved at apex. *Male flowers*: pedicel long; sepals oblong or linear, or obovate and long-clawed; corolla-lobes ovate(-oblong), (sub)entire; stamens 3, filaments free, swollen at base (in cultivated Asian species), inserted towards the bottom of the receptacle-tube, anthers two 2-thecous, one 1-thecous, united (fused) into an elongated whole, thecae plicate-

sinuate, connective narrow, not produced, connate, hidden by the thecae; disc (pistilode) absent. *Female flowers*: pedicel shorter than in male flowers; ovary globose or ellipsoid, 1(–2) cm diam., placentas 3(–5), ovules numerous, horizontal; perianth as in male flowers; style short, stout, stigma-lobes 3(–5), thickly fleshy, each lobe shallowly lobed; disc absent or inconspicuous; staminodes short, at base of receptacle-tube. *Fruit* a pepo, often with hard rind, small or (very) large, variable in shape and colour; mesocarp firm or pulpy. *Seeds* numerous, compressed, medium or large, (narrowly) elliptic in outline, little or not ornamented, margin narrow (rarely broad), edge entire.

Distribution — About 25 species. All *Cucurbita* species are originally indigenous in the New World; four species are cultivated all over the world, three extensively so in tropical as well as (in summer) in subtropical or extra-tropical regions; in *Malesia*: 3 species commonly cultivated, but *Cucurbita ficifolia* Bouché occasionally cultivated in the highlands of the Philippines.

Uses — Flowers, cooked or fried, are eaten. Fruits and (oily) seeds are widely used as food. Shoots are used as a vegetable. Also medicinal.

Note — Marked wild or feral forms do not occur in our area, and these have not been further accounted for. The three (five) cultivated species are each very variable and look-alike and can often only be recognized when completely known (habit, flowers and fruits); especially, well-developed fruit can be characteristic. Hybridization between the species seems difficult or absent. A brief description of each current species should suffice for distinction and naming a plant found in our area. The species of Malesia are annual.

#### KEY TO THE SPECIES

- 1a. Sepals mostly leaf-like broadened at apex (long-clawed) or  $\pm$  linear. Fruiting pedicel much broadened at the transition to the fruit . . . . . **2. C. moschata**
- b. Sepals linear. Fruiting pedicel not or hardly broadened at the transition to the fruit . . . . . 2
- 2a. Fruiting pedicel stout, terete, spongy . . . . . **1. C. maxima**
- b. Fruiting pedicel slender, angular, not spongy . . . . . **3. C. pepo**

#### 1. *Cucurbita maxima* Duchesne

*Cucurbita maxima* Duchesne, Essai Hist. Nat. Courges (1786) 7; Lam., encycl. (1786) 151; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 544; C.B.Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 622; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 103; Paris, Taxon 49 (2000) 316; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1545; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 60. — Type: *Lamarck s.n.* (holo P).

Plant, especially the leaves, rigid. *Leaf blades* lobed or not,  $\pm$  reniform in outline. *Flowers*: pedicel terete; receptacle-tube campanulate; sepals linear in male and female flowers. *Fruit* ripening (blue-)green or orange, smooth or warty; fruiting pedicel stout, short,  $\pm$  terete, spongy, often with a  $\pm$  fissured surface, not widened at the transition to the fruit. *Seeds* c. 20 mm long.

Distribution — Cultivated.

## 2. *Cucurbita moschata* Duchesne

*Cucurbita moschata* Duchesne, Essai Hist. Nat. Courges (1786) 7; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 305; Paris, Taxon 49 (2000) 316; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 61. — *Cucurbita pepo* L. var. *moschata* (Duchesne) Lam., encycl. (1786) 152; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 104; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1545. — Type (Keraudren, 1975): original material not known. *Gymnopetalum calyculatum* Miq., Fl. Ned. Ind., Eerste Bijv. 2 (1861) 332. — Type: *Amann* ('*Amand*') (= *Kurz*) s.n. (holo U, barcode U0001457), Bangka.

Plants including leaves pubescent, not scabrous. *Leaf blades* lobed, lobes acute or obtuse. *Male flowers*: pedicel subterete; receptacle-tube short-campanulate; sepals mostly linear. *Female flowers* pedicel  $\pm$  angular; receptacle-tube as in male flowers; sepals  $\pm$  linear or mostly leaf-like broadened at apex (long clawed). *Fruit* (depressed) globose, elongated or flask-shaped, often shallowly furrowed (sulcate) from apex to base of fruiting pedicel; fruiting pedicel angled, distinctly broadened at the transition to the fruit. *Seeds* variable in size, 10–15(–20) mm long. — **Plate 32c.**

Distribution — Widely cultivated.

Note — *Cucurbita moschata* is the most heat-tolerating species and found most frequently in the lowlands.

## 3. *Cucurbita pepo* L.

*Cucurbita pepo* L., Sp. Pl. ed. 1 (1753) 1010; C.B.Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 622; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 545; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 105; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1547; A.Goldman, Complete Squash (2004) 103; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 61. — Type: *Herb. LINN NO. 1151.4* (lecto LINN, designated by Keraudren (1975) (see C.E.Jarvis, Order out of chaos (2007) 465)).

Plant, including leaves, rigid or scabrous, in certain cultivated varieties bushy and not trailing. *Leaf blades* often deeply acutely lobed, lobes often lobulate. *Flowers*: pedicel subangular; receptacle-tube campanulate; sepals linear in male and female flowers; corolla lobes slightly out-curved. *Fruit* small, medium or very large, smooth, sometimes costate or verrucate; fruit pulp sometimes fibrous; fruiting pedicel rather slender, woody, angular (sulcate), not or only little thickened at the transition to the fruit. *Seeds* variable in size, 7–25 mm long.

Distribution — Cultivated.

Note — Here belong the non-trailing suberect 'bushy' growing (Italian) 'courgette' or 'zucchini', nowadays a popular vegetable in Europe, and also the flat 'scallop' or 'patison'. See further Jeffrey (2001), and Goldman (2004).

## 12. CYCLANTHERA

*Cyclanthera* Schrad., Index Sem. (Gottingen) (1831) 2; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 822; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 306; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1967) 19. — Type species: *Cyclanthera pedata* Schrad.

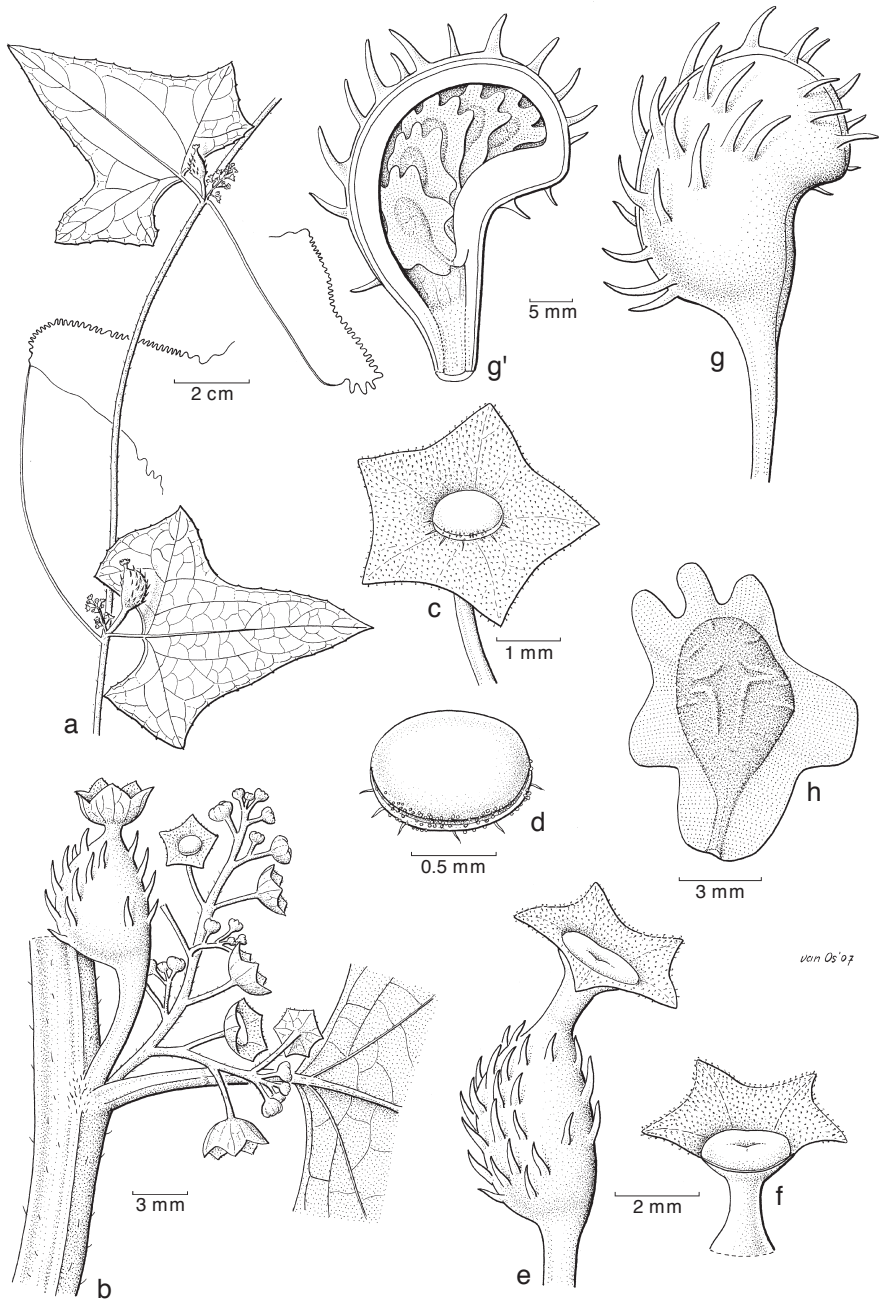


Fig. 17. *Cyclanthera brachystachya* (Ser.) Cogn. a. Portion of flowering shoot; b. node with female flower with co-axillary a male inflorescence; c. male flower, the perianth consisting of the broad hypanthium and broadly triangular petals, sepals absent; d. circular synandrium, opening by circumferential slit; e. female flower; f. female perianth, showing cushion-shaped sessile stigma; g, g'. fruit from outside and opened respectively; h. seed (all: *De Wilde & Duyfjes 21654*).

Annual or perennial herbaceous climbers, glabrescent; monoecious; cultivated or running wild. *Probract* absent. *Tendrils* unbranched or 2- or more-branched. *Leaves* simple, unlobed or deeply lobed to almost foliolate. *Flowers* small, pale greenish yellow, petals free or hardly connate at base. *Male inflorescences* racemose or paniculate. *Male flowers*: receptacle-tube small, shallow; sepals small, subulate or linear; stamens united a short central column, anthers connate into a head or into a horizontal (peltate) ring, opening with a horizontal slit; disc (pistillode) absent. *Female flowers* solitary or one co-axillary with male inflorescence; perianth as in male flowers; ovary narrowly ovoid or ellipsoid, somewhat oblique, rostrate, style short, stigma hemi-spherical, ovules 1 to many per locule; staminodes absent. *Fruit* oblique, ovoid(-oblong), various of shape, not juicy, glabrous or mostly with soft spines, 1- or more-locular, 5- to many-seeded, when ripe elastically opening and jetting the seeds away, leaving central column and placenta. *Seeds* few or several, compressed, angular, often toothed at the end(s), faces smooth or rough, margin distinct (wing-like), edge irregularly coarsely toothed.

Distribution — An American genus with some 40 species; in Asia 2 species introduced as vegetable; in *Malesia* 1 species.

### 1. *Cyclanthera brachystachya* (Ser.) Cogn.

*Cyclanthera brachystachya* (Ser.) Cogn., *Diag. Cucurb. Nouv.* 2 (1877) 64; in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 842; C. Jeffrey in Hanelt, *Mansfeld's encycl. agric. hort. crops* 3 (2001) 1555; W.J. de Wilde & Duyfjes, *Sandakanian* 17 (2008 '2007') 62. — *Elaterium brachystachium* Ser. in DC, *Prodr.* 3 (1828) 310; Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 842. — Type: based on a figure in Moçino & Sessé, *Fl. Mex. Icon. t.* 38, f. F, Mexico (unpubl.).

*Cyclanthera explodens* Naudin, *Ann. Sci. Nat., Bot., Sér.* 4 (1859) 160; Backer in Backer & Bakh.f., *Fl. Java* 1 (1964) 306. — Type: plant cultivated at P, originating from New Grenade, Mexico.

Vigorous but slender climber to 5 m long, lanate or (finely) hairy on the nodes, later scabrous or glabrescent. *Tendrils* (1- or) 2-branched. *Leaves*: petiole 1–5 cm long; blade triangular or ovate in outline, 6–9 cm long, 3- or 5-lobed up to halfway deep, lobes triangular, acute, margin finely dentate. *Male inflorescences* condensed 10–20-flowered racemes or few-branched panicles, 1–2.5 cm long, shorter than the leaves. *Male flowers*: pedicel 1–3 mm long; receptacle-tube c. 1.5 mm diam.; sepals less than 1 mm long, or  $\pm$  absent; petals green-yellow, triangular, c. 1 by 1 mm, finely papillate; anther circular, horizontal, c. 0.5 mm diam., opening with a circular slit. *Female flowers*: pedicel 3–7 mm long; ovary obliquely ovoid, style short, stigma broadly rounded. *Fruit* ripening green, 2–3 cm long, ovoid-reniform, with soft spines; fruiting pedicel 1–3 cm long. *Seeds* c. 8 per fruit, blackish brown, 9–14 by 6–8 mm,  $\pm$  5-angled, 3- (or 5-)toothed at base, 3-toothed at apex. — **Fig. 17; Plate 6a.**

Distribution — Tropical America; in *Malesia*: Java, locally cultivated for the young shoots used as a vegetable; in Cibodas Botanical Garden running wild.

Note — A second species, *C. pedata* Schrad., with deeply pedately lobed leaves, usually appearing as pedately 5–7-foliolate, is widely distributed in Central and South America, and is introduced and locally commonly cultivated as a vegetable in mountainous areas in the southern Himalayas of India and in China. The species can be expected in the future in the Malesian area. It is mentioned (PROSEA 8 (1994) 288) as occasionally cultivated in the Old World tropics, including Malaysia.

### 13. DIPLOCYCLOS

*Diplocyclos* (Endl.) T.Post & Kuntze, Lex. Gen. Phan. (1903) 178; corr. C.Jeffrey, Kew Bull. 15 (1962) 354. — *Bryonia* L. sect. *Diplocyclos* Endl., Prodr. Fl. Norfolk. (1833) 68. — Type species: *Bryonia affinis* Endl.

*Bryonia* L. sect. *Bryonopsis* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 922, p.p. — *Bryonopsis* (Blume) Hassk., Cat. Hort. Bogor. (1844) 188, p.p.; Naudin, Ann. Sci. Nat., Bot., Sér. 4, 18 (1862) 193, nom. inval., (not *Bryonopsis* Arn. (1841) = *Kedrostis*).

*Ilocania* Merr., Philipp. J. Sci., C 13 (1918) 65. — Type species: *Ilocania pedata* Merr. (= *Diplocyclos palmatus* (L.) C.Jeffrey).

Subannual or perennial climbers; monoecious. *Probract* present. *Tendrils* 2-branched. *Leaves*: blade simple, (deeply) palmately lobed. *Inflorescences* (from *D. palmatus*): male flowers few to many in fascicle-like short racemes, female flowers 1–5 co-axillary with male flowers, or in fascicle-like short racemes, or solitary; flowers pale greenish (creamy-)yellow. *Male flowers*: receptacle-tube cup-shaped, narrowed to the base; sepals small, linear; corolla of partly fused petals, lobes entire; stamens 3, inserted in upper part of the receptacle-tube, anthers two 2-theous, one 1-theous, anthers free but coherent, thecae plicate, connective broad; disc low, annular or indistinct. *Female flowers*: perianth as male flowers; ovary (broadly) ovoid or subglobose, ovules few, horizontal, style 3-armed, stigmas ± 2-lobed, papillose; staminodes 3, elongate; disc inconspicuous. *Fruit* berry-like, solitary or few-fascicled, broadly ovoid or ellipsoid or subglobose, shortly rostrate or not, exocarp thin. *Seeds* tumid, pyriform with strongly convex faces, margin thick, edge grooved.

Distribution — A genus of c. 5 species in the Old World, all in Africa, of which 1 species also widely distributed in Austral-Asia.

#### 1. *Diplocyclos palmatus* (L.) C.Jeffrey

*Diplocyclos palmatus* (L.) C.Jeffrey, Kew Bull. 15 (1962) 352; Keraudren in Aubrév. & J.-F.Leroy, Fl. Camb., Laos, Viêt-Nam 15 (1975) 109, pl. 11: 4–7; I.Telford, Fl. Australia 8 (1982) 178; W.J.de Wilde & Duyfjes, Fl. Thailand 9, 4 (2008) 432. — *Bryonia palmata* L., Sp. Pl. ed. 1 (1753) 1012. — Type: *Herb. Hermann* 2: 58, No. 353 (lecto BM, barcode BM000621700, designated by Jeffrey (1962)), Sri Lanka.

*Bryonia affinis* Endl., Prodr. Fl. Norfolk. (1833) 68 (no. 125). — *Bryonopsis affinis* (Endl.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 479. — Type: *Bauer s.n.* (holo W), Norfolk Is.

*Bryonia pedata* Hassk., Flora, Beibl. (1842) 32. — *Bryonopsis pedata* (Hassk.) Hassk., Cat. Hort. Bot. Bogor. (1844) 189. — Type: Java, not further indicated.

*Zehneria erythrocarpa* F.Muell., Hooker's J. Bot. Kew Gard. Misc. 8 (1856) 51. — *Bryonopsis laciniosa* (L.) Naudin forma *erythrocarpa* (F.Muell.) M.Mizush., J. Jap. Bot. 41, 9 (1966) 259. — Type: *Mueller s.n.* (K), Australia.

*Bryonopsis erythrocarpa* Naudin, Ann. Sci. Nat., Bot., Sér. 4, 18 (1862) 194. — *Bryonopsis laciniosa* (L.) Naudin var. *erythrocarpa* (Naudin) Naudin, Ill. Hort. 12 (1865) pl. 431; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 478. — Type: a plant cultivated at P from seeds imported from India.

*Bryonia laciniosa* auct. non L.: Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 927; Naudin, Ann. Sci. Nat., Bot., Sér. 4, 12 (1859) 139. — *Bryonopsis laciniosa* auct. non (L.) Naudin: Naudin, Ann. Sci. Nat., Bot., Sér. 4, 18 (1862) 195, p.p., excl. type; Ann. Sci. Nat., Bot., Sér. 5, 6 (1866) 30; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 477; Cogn. & Harms in Engl., Pflanzenr. 88, 4.275.2 (1924) 160;

Craib, Fl. Siam. (1931) 762; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 301. (*Bryonia laciniosa* L. = *Cayaponia laciniosa* (L.) C. Jeffrey.)

*Bryonia quinquefolia* Noronha, Verh. Batav. Genootsch. Kunsten 5 (1790) 48, nom. nud.

Climber 2–7 m tall, perennial, old plants with tuberous rootstock, leafy stem 1.5–3 (–4) mm diam., glabrous except few hairs in young parts. *Probract* membranous or fleshy, obovate, 2–5 mm long, ± concave, wrinkled when dry. *Tendrils* 10(–20) cm long, branched at or below the middle. *Leaves*: petiole 2–7 cm long, sometimes towards apex with course stiff upward directed hairs; blade membranous, circular in outline, deeply (3–)5(–7) palmately lobed nearly to the base, 4–16 cm diam., glabrous, except for few hairs on veins on lower surface, glands small, usually a few close to the insertion of the petiole, cystoliths generally not apparent, lobes (narrowly) elliptic, to 11 cm long, margin ± dentate-undulate or entire, minutely dentate-mucronate. *Inflorescences* up to 10 male flowers of various stage of development, mostly accompanied by up to 5 female flowers, or a few female flowers without male flowers. *Male flowers*: pedicel 2–20 mm long; receptacle-tube 2–4 mm long and wide, glabrous; sepals linear, 0.5–1(–2) mm long; corolla 5–7(–9) mm long, tube c. 2 mm long, lobes ± ovate, 3–5 mm long, obtuse, apex ± mucronate; filaments inserted towards the throat of the receptacle-tube, (0.5–)1–1.5 mm long, glabrous or slightly hairy at base, anthers 2–3 mm diameter. *Female flowers*: pedicel 1–5 mm long; ovary ovoid, 4–5 by 2.5–3.5 mm, often whitish striped; corolla lobes c. 5 mm long; style 1.5(–2) mm long, style arms 1–2(–3) mm long, stigmas stout; staminodes 1(–3) mm long. *Fruit* 1–5 in a cluster at the nodes, ripening bright red with (usually) pure white bands or rows of white blotches, 1.5–2(–2.5) cm diam.; fruiting pedicel 0.1–0.5 cm long. *Seeds* c. 12 or less, grey or pale brown, obovoid, 5(–8) by 2.5–3 by c. 4 mm, narrowed to the base, faces much protruding, smooth, margin broad.

Distribution — Widely distributed in Africa and SE Asia, from India and South China (not recorded for Yunnan), Japan (Ryukyu Is.) through Indochina south-east to North and NE Australia and western Pacific, incl. Norfolk Is.; in *Malesia*: Sumatra, Java, Philippines, Sulawesi, Lesser Sunda Islands, Moluccas (Buru), and New Guinea (Papua New Guinea); not yet recorded from West Papua.

Habitat & Ecology — Open places and fringes of primary and secondary forests, along stream banks, in old gardens, thickets, and grassland; on limestone as well as on granite bedrock; from sea level to 1800 m altitude.

Notes — 1. Telford (1982) remarks that plants from eastern Malesia, the Pacific and Australia, with larger ellipsoid fruits (*Bryonia affinis*) may be subspecifically distinct.

2. Cooked shoots are eaten in Papua New Guinea and cooked young fruits in Sulawesi (PROSEA 8 (1994) 290).

#### KEY TO THE VARIETIES

- 1a. Leaf blade deeply lobed, ± to 1/5 deep; middle leaf lobe 20 mm wide or more. . . . . **a. var. palmatus**  
 b. Leaf blade deeply lobed, nearly to the base; middle leaf lobe 2–7 mm wide. . . . . **b. var. pedata**

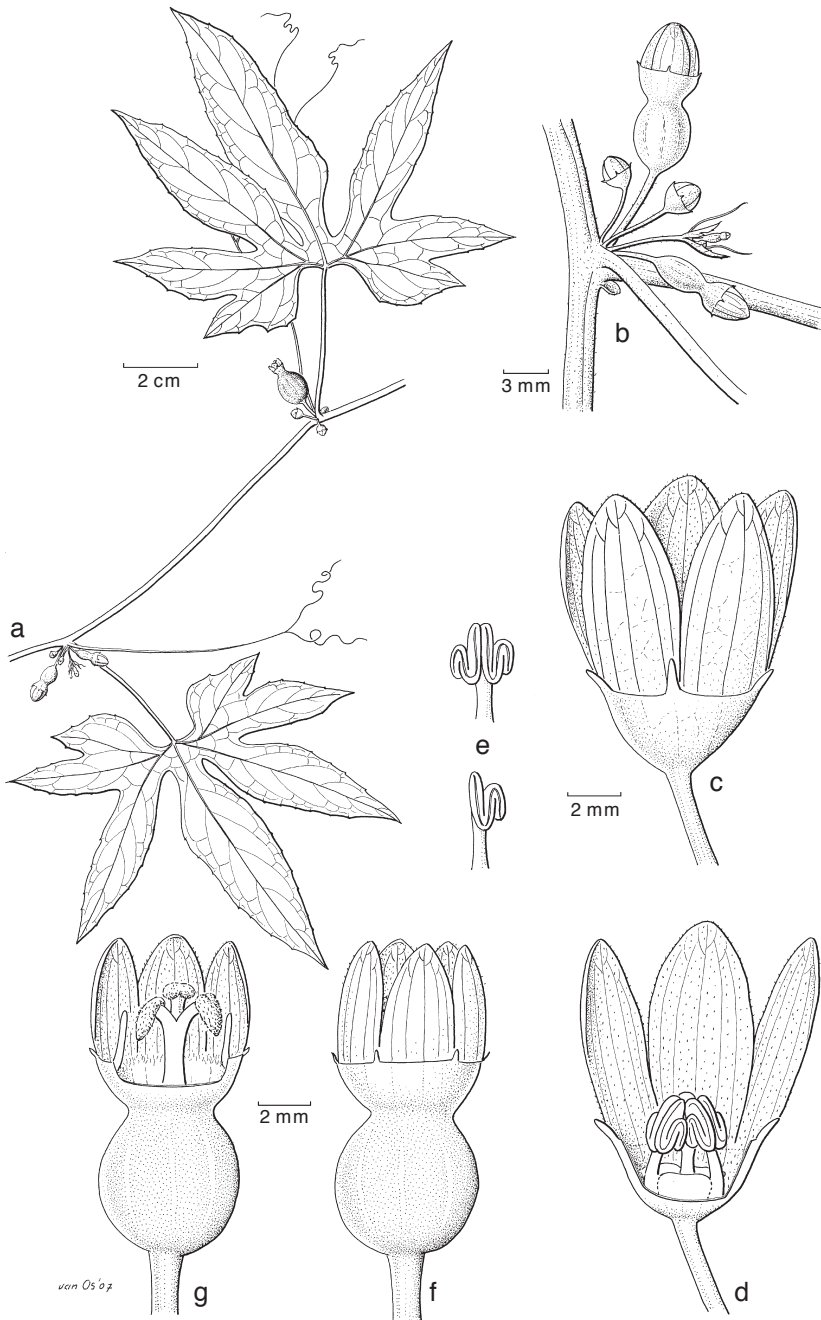


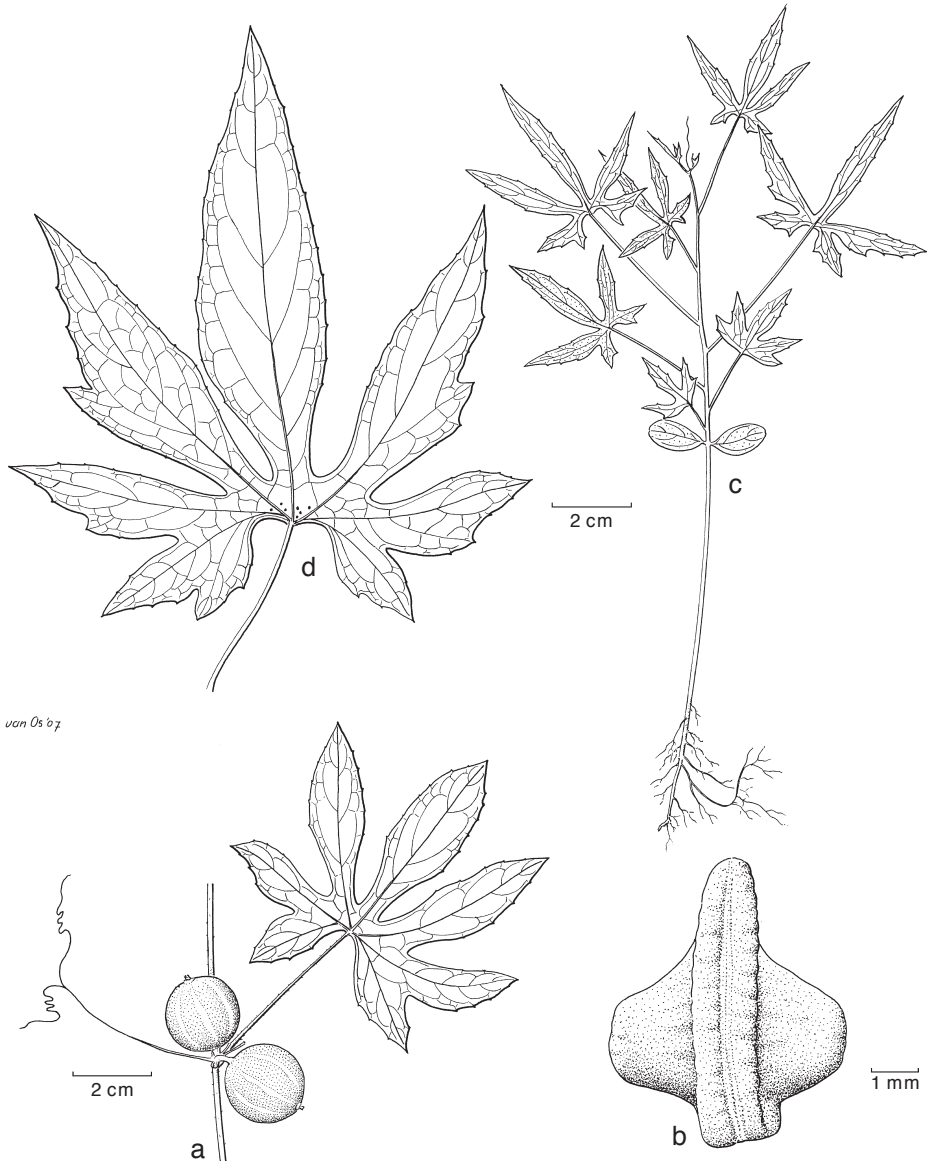
Fig. 18. *Diplocyclos palmatus* (L.) C. Jeffrey var. *palmatus*. a. Portion of twig with male and female flower buds on the nodes; b. node with male and female flower buds; c. male flower; d. ditto, opened; e. stamens; f. (immature) female flower; g. ditto, opened (a, b, f, g: *De Wilde & Duyfjes* 21653; c–e: *De Wilde & Duyfjes* 21707).



**a. var. *palmatus***

Leaf blade deeply lobed,  $\pm$  to 1/5 deep; middle leaf lobe 20 mm wide or more. —  
**Fig. 18, 19; Plate 8.**

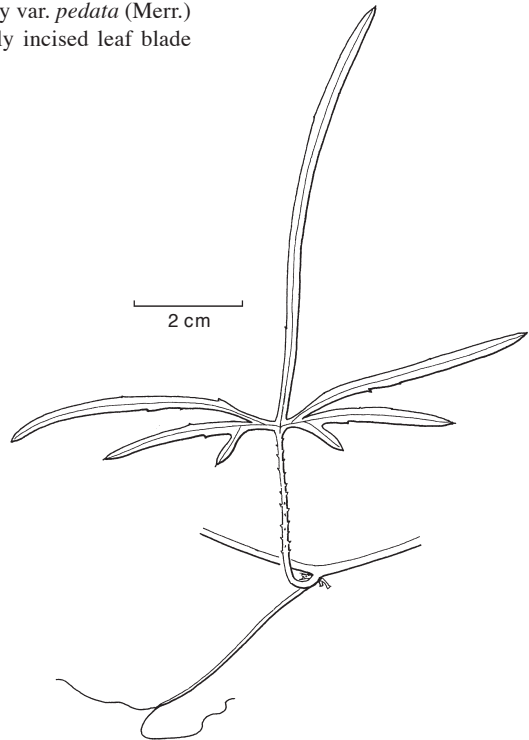
Distribution — As the species



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Fig. 19. *Diplocyclos palmatus* (L.) C. Jeffrey var. *palmatus*. a. Node with infructescence; b. seed; c. seedling; d. leaf, showing small glands near the blade base (a, b: De Wilde & Duyfjes 21653; c, d: De Wilde & Duyfjes 21707).

Fig. 20. *Diplocyclos palmatus* (L.) C. Jeffrey var. *pedata* (Merr.)  
W.J.de Wilde & Duyfjes. Node with deeply incised leaf blade  
(*Ramos BS 27490*).



**b. var. *pedata*** (Merr.) W.J.de Wilde & Duyfjes

*Diplocyclos palmatus* (L.) C. Jeffrey var. *pedata* (Merr.) W.J.de Wilde & Duyfjes, *Reinwardtia* 12 (2009) 405, f. 1. — *Ilocania pedata* Merr., *Philipp. J. Sci.*, C 13 (1918) 65. — Type: *Ramos BS 27552* (lecto US, designated by De Wilde & Duyfjes, *Reinwardtia* 12 (2008) 268), Ilocos Norte, Bangui.

Leaf blade deeply lobed, nearly to the base; middle leaf lobe 2–7 mm wide. —

**Fig. 20.**

Distribution — Philippines (Ilocos Norte).

## 14. GOMPHOGYNE

*Gomphogyne* Griff., *Account Bot. Coll. Cantor* (1845) 26; Hook.f. in Benth. & Hook.f., *Gen. Pl.* 1 (1867) 838; C.B. Clarke in Hook.f., *Fl. Brit. Ind.* 2 (1879) 632; Cogn. in A. DC. & C. DC., *Monogr. Phan.* 3 (1881) 923; Keraudren in Aubrév. & J.-F. Leroy, *Fl. Cambodge, Laos & Vietnam* 15 (1975) 22; W.J.de Wilde & Duyfjes, *Thai Forest Bull.*, Bot. 35 (2007) 50; *Fl. Thailand* 9, 4 (2008) 435. — Type species: *Gomphogyne cissiformis* Griff.

Delicate or slender herbaceous climbers, 0.5–5 m long, annual or biennial, dioecious; roots fibrous, without tuberous rootstock. *Probract* absent. *Tendrils* 2-branched at apex. *Leaves*: blade pedately foliolate (or simple, not in Malesia), ovate or subcircular in outline, membranous, leaflets up to 9, petiolulate, lateral ones usually smaller, elliptic or narrowly elliptic, base acute, margin finely or coarsely serrate-dentate, teeth mucronu-

late, apex acute or acute-acuminate; cystoliths absent or inconspicuous. *Flowers* white, small; sepals and petals free. *Male inflorescences* usually lateral, few- or many-flowered, paniculate with ultimate branches fine, raceme-like; minute linear bracts and lower portion of pedicels persistent. *Female inflorescences* few-branched or unbranched, with 1–3 flowers on a slender peduncle; pedicel slender, usually with 1 or 2 small, simple and subopposite tendrils close to the flower. *Male flowers*: pedicel articulate at or below halfway; buds with subacute apex; corolla rotate; receptacle narrow, flat or shallow; petals imbricate in bud; stamens 5, inserted in or near the centre of the receptacle, subpatent, anthers small, 1-theous, opening extrorse; disc inconspicuous or absent. *Female flowers*: ovary cylindrical-clavate, 1- or 3-locular, ovules 1 to several per placenta, pendulous, styles 3, free, stigma 2-lobed; staminodes absent. *Fruit* few or solitary, ripening green, small or medium-sized, capsular, cylindrical-clavate, longitudinally striate or ribbed, or irregular-veined, apex truncate, 3-valvate, with three horn-like processes partly formed by the styles at the angles. *Seeds* up to 12, imbricately arranged in 3 rows, (narrowly) elliptic in outline, compressed, tubercled or scrobiculate, not winged or the margin with a membranous or corky wing either only at the end(s) or all around.

Distribution — A genus of six species in SE Asia; in *Malesia* 1 species.

### 1. *Gomphogyne peekelii* W.J.de Wilde & Duyfjes

*Gomphogyne peekelii* W.J.de Wilde & Duyfjes, Thai Forest Bull., Bot. 35 (2007) 62, f. 6, map 1. —

Type: *Peekel 118* (holo BO), Papua New Guinea, New Ireland, Neu-Mecklenburg, Uguna Distr.

*Gynostemma pedatum* auct. non Blume: Peekel, Fl. Bismarck Archip., translated by E.E.Henty (1984) 551, f. 878.

Climber 1–4 m long; leafy stem 1–2 mm diam., subglabrous. *Leaves*: petiole 2.5–7 cm long; petiolules (0.2–)0.3–0.6 cm long; blade 3–5-foliolate, i.e. the lateral leaflets of 3-foliolate blade either deeply lobed or 2-foliolate, 5–14 cm diam.; leaflets narrowly or broadly elliptic, 3–9 cm long, pinnately veined, glabrous (hairy veins in Bismarck Archipelago). *Male inflorescences* 3–9 cm long, loose, once or twice branched with 2–5 lateral branches from the rachis, glabrous or finely hairy, few-flowered; peduncle 1.5–3 cm long; rachis straight or somewhat zigzag, 3–5 cm long, lateral branches 1(–2) cm long, ultimate spike-like racemes 3–5 mm long, set with bracts and c. 0.5 mm long basal portions of pedicels; bracts 0.5–3 mm long. *Male flowers*: pedicel 2.5–3.5 mm long, sparsely minutely hairy; perianth 3–4 mm diam.; receptacle shallow, 0.1–0.2 by 0.5–1 mm, sparsely hairy outside; sepals 1–1.5 mm long; petals ovate, elliptic or oblong, 1.5–2 mm long, subacute; filaments 0.5–0.6 mm long, glabrous; anthers ovoid or ellipsoid, c. 0.3 mm diameter. *Female inflorescences*: few-flowered; peduncle c. 3 cm long. *Female flowers* not seen. *Fruit* 1 or 2, ripening green, 5–5.5 cm long, with (6–)9 rib-like veins, sharply raised, in-between with coarse reticulate venation, base tapered, at apex c. 1.5 cm wide, apical horns 2–3 mm long, somewhat out-curved; fruiting pedicel c. 1 cm long, with 1 or 2 tendrils c. 2 cm long. *Seeds* c. 12(?), pale, compressed, elliptic, c. 6–7 by 3.5 mm, very finely tubercled, margin absent, edge entire, with a corky wing all around the seed, 2–4 mm broad. — **Fig. 21.**

Distribution — Moluccas (Seram), New Guinea (West Papua (Vogelkop), Papua New Guinea (East New Britain (Gazelle Peninsula), New Ireland)).

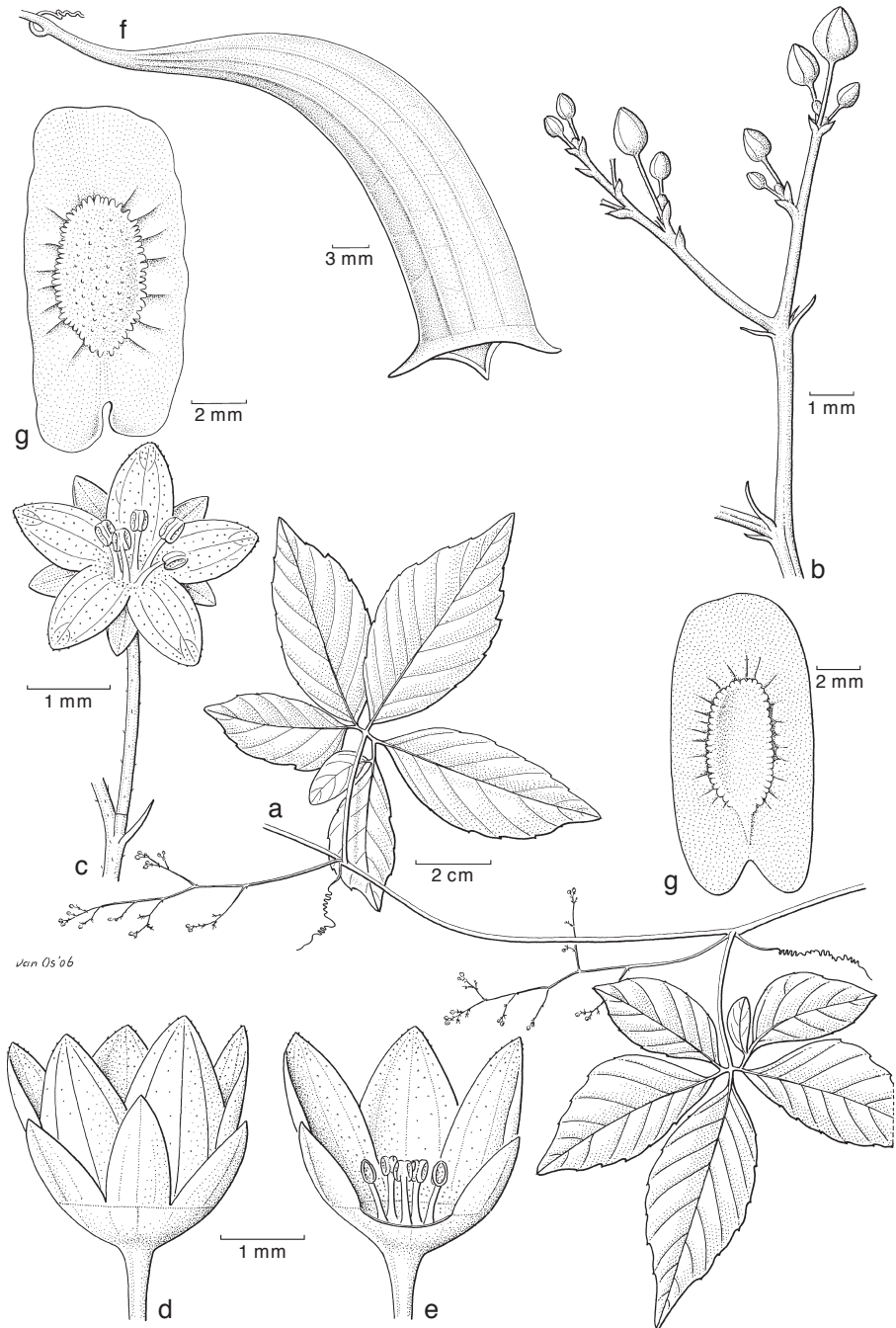


Fig. 21. *Gomphogyne peekelii* W.J.de Wilde & Duyfjes. a. Portion of branch with male inflorescences; b. detail of male inflorescence; c–e. male flowers; f. fruit; g. seeds (a, b: Vink BW 11487; c: F. & M. Panoff 361; d, e: Van Royen & Sleumer 6818; f, g: Peekel 118, type).

Ecology — Primary and secondary forests, along streams, in disturbed places and abandoned gardens; sandy and damp loamy soil; from sea level to c. 700 m altitude; fruiting in May.

## 15. GYMNOPETALUM

*Gymnometalum* Arn., Madras J. Lit. Sci. 12 (1840) 52; C.B. Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 611; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 387; Ridl., Fl. Malay Penin. 1 (1922) 846; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 302; W.J. de Wilde & Duyfjes, Blumea 51 (2006) 282, Fl. Thailand 9, 4 (2008) 442; Kocyan et al., Mol. Phyl. Evol. 44 (2007) 553. — Lectotype (Pfeiffer, Nom. 1 (1873) 1526): *Gymnometalum tubiflorum* (Wight & Arn.) Cogn. (*Bryonia tubiflorum* Wight & Arn.).

Annual or perennial, climbing or widely-creeping herbs, frequently rooting at the nodes, subglabrous or (densely) hairy, leafy stem (1–)2 mm diam.; monoecious. *Probract* present or absent. *Tendrils* unbranched or 2-branched. *Leaves*: blade simple, unlobed or lobed, margin sparsely finely dentate; glands not obvious. *Flowers*: petals white, free, margin entire or short-fimbriate. *Inflorescences* in male: flowers either solitary (or 2) on the nodes, long-pedicelled, or (co-axillary) in an erect several-flowered bracteate raceme, with flowers sessile or short-pedicelled; in female: flowers solitary. *Male flowers*: in bud folded into an elongate body, receptacle elongate, broadened in upper half and slightly constricted at the throat; stamens 3, filaments inserted about halfway the receptacle tube, free, short; anthers two 2-theous, one 1-theous, thecae plicate, united into an elongate synandrium, included; disc consisting of linear ribs adnate to the base of the tube, or of 3 lobes. *Female flowers*: ovary with many horizontal ovules; perianth as in male; style long, stigmas 3 (or single, deeply 3-lobed), included; disc not obvious; staminodes minute or absent. *Fruit* ripening orange or red, globose or ovoid-oblong, (2–)3–6 cm long, smooth or (low) ribbed, mesocarp yellow, soft-canose, pulp greenish black. *Seeds* numerous, ± compressed, not or little ornamented, margin present or absent, edge entire.

Distribution — A genus of 4 species in South India, Sri Lanka, North India, South China, east to East Malesia; in *Malesia* 3 species.

Note — The type species of *Gymnometalum* is *G. tubiflorum* from Sri Lanka. Cogniaux, 1881, divided the genus into two sections: sect. *Tripodanthera* (Roem.) Cogn. to which the three Malesian species belong and sect. *Gymnometalum*. Based on molecular data *Gymnometalum* is nested within *Trichosanthes* (Kocyan et al, 2007) with the Malesian species wide apart from the single species *G. tubiflorum*.

### KEY TO THE SPECIES

- 1a. Leaves finely bullate, densely hairy beneath, at least on the veins. Fruit ellipsoid or globose, rounded at apex, not ribbed. — Widespread . . . . . **3. *G. scabrum***
- b. Leaves not bullate, thinly hairy or subglabrous beneath. Fruit ellipsoid-fusiform, narrowed at apex, distinctly or faintly ribbed, or not ribbed . . . . . 2
- 2a. Male bracts cuneate or rounded at base, sessile, without glands. Sepals entire or rarely ± lobed. Male flowers in raceme pedicellate, pedicels persistent. Fruit ribbed. — Widespread . . . . . **1. *G. chinense***

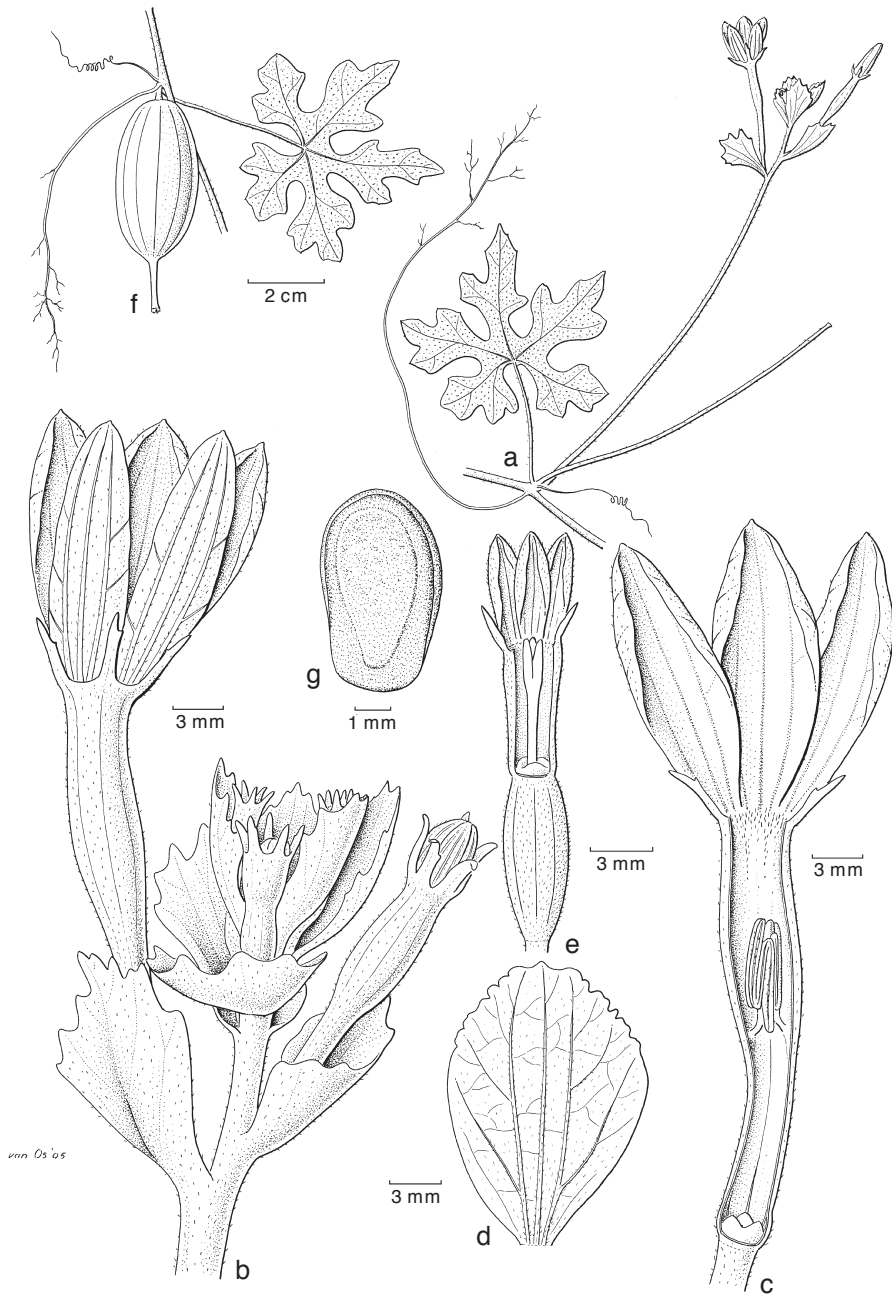


Fig. 22. *Gymnopetalum chinense* (Lour.) Merr. a. Node with male inflorescence, note persistent pedicel of fallen co-axillary male flower; b. apex of male raceme; c. male flower, opened, showing 3-lobed disc at the base of the receptacle-tube; d. unfolded petal; e. female flower bud, opened, showing disc at the base of the receptacle-tube; f. node with mature fruit; g. seed (a, f, g: *De Wilde & Duyfjes* 21719; b–e: *De Wilde & Duyfjes* 21722).

- b. Male bracts narrowly cuneate at base, sub sessile or short-stipitate, with scattered glands below. Sepals deeply lobed. Male flowers in raceme sessile. Fruit not ribbed. — East Malesia . . . . . **2. G. orientale**

### 1. *Gymnopetalum chinense* (Lour.) Merr.

*Gymnopetalum chinense* (Lour.) Merr., Philipp. J. Sci. (1919) 256; W.J.de Wilde & Duyfjes, Blumea 51 (2006) 283; Reinwardtia 12 (2008) 268, Fl. Thailand 9, 4 (2008) 443. — *Evonymus chinensis* Lour., Fl. Cochinch. (1790) 156. — Type: Untraced. Neotype: *Levine 1705* (holo A, designated by De Wilde & Duyfjes, Reinwardtia (2008)), South China.

*Bryonia cochinchinensis* Lour., Fl. Cochinch. (1790) 595. — *Gymnopetalum cochinchinense* (Lour.) Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 40 (1871) 57; C.B. Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 611; Cogn. in A.D.C. & C.D.C., Monogr. Phan. 3 (1881) 391; Ridl., Fl. Malay Penin. 1 (1922) 846; Craib, Fl. Siam. 1 (1931) 755; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 302. — Type: *Loureiro s.n.* (BM), Vietnam.

*Momordica surculata* Noronha, Verh. Batav. Genootsch. Kunsten 4 (1790) 21, nom. inval.

*Gymnopetalum quinquelobum* Miq., Fl. Ned. Ind. 1, 1 (1856) 681. — Type: *Horsfield s.n.* (holo U, barcode U0001464), Java, Soerakarta.

*Trichosanthes laciniata* Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 107. — Type: *Curtis in Ridley 8350* (holo K, not seen), Peninsular Malaysia, Langkawi.

Climbing or creeping herbs to 6 m long, finely scabrous and sparsely hairy or subglabrous. *Probract* (minute, caducous or) absent. *Tendrils* unbranched. *Leaves*: petiole 2–5 cm long; blade membranous, ovate or triangular in outline, or  $\pm$  3- or 5-angled or (deeply) lobed, 4–12 cm diam.,  $\pm$  sparsely scabrous-pubescent on both surfaces, upper surface not bullate, cystoliths usually faint. *Male inflorescences*: flowers solitary or in erect racemes 10–25 cm long; peduncle 4–12 cm long; bracts sessile, oblong, 15–20 mm long, (deeply) 2–5-lobed, without glands, base cuneate or rounded. *Male flowers*: pedicel persistent, 30–70 mm long in solitary flowers, 5–15 mm long for flowers in the raceme; receptacle tube narrow, widened in upper 1/3 where containing the synandrium, 25–35 by 3–4(–5) mm at throat, outside and inside  $\pm$  grey pubescent, throat yellow inside; sepals linear, rarely  $\pm$  lobed, 6–9 mm long, spreading to recurved; petals obovate, short-clawed, 20–30 by 12–15 mm, indistinctly veined, somewhat hairy, yellow at very base; stamens inserted 12–15 mm below receptacle throat, filaments short, synandrium 9–10 by c. 3.5 mm; disc short, 3-lobed. *Female flowers*: pedicel 5–20(–40) mm long; ovary narrowly ellipsoid, 10–12 by 2.5–4 mm, pubescent, (faintly) 10-ribbed; style 18–20 mm long, stigmas 4–6 mm long, included; staminodes minute. *Fruit* broadly fusiform, 2.5–5 by 1.5–3 cm, beaked mainly by receptacle remnant, glabrescent, sharply 10-ribbed; fruiting pedicel 1–4 cm long. *Seeds* narrowly elliptic, 7–8 by 2–3 by 1.5 mm, faces not ornamented, with marginal groove. — **Fig. 22, 26a, a'; Plate 9.**

Distribution — Widespread; north-eastern part of India, China, through Indochina; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines, Sulawesi, Lesser Sunda Islands east to Flores.

Ecology — Forest edges, clearings, scrub, in hedges and in open fields, on sandy soil, to 500 m altitude; flowering and fruiting throughout the year.

Note — The flowers of *G. chinense* open at night and are wilting the following morning.

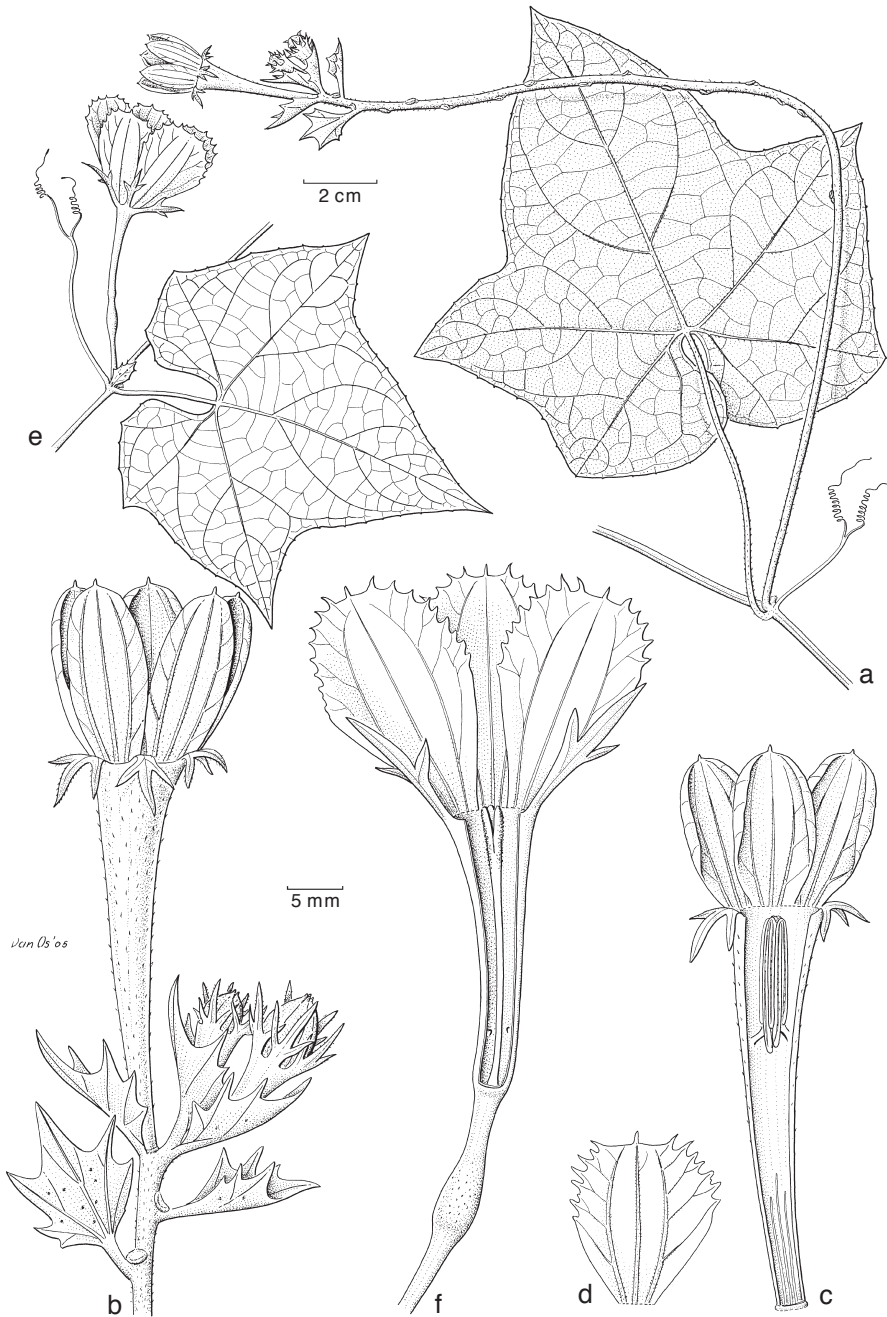


Fig. 23. *Gymnopetalum orientale* W.J.de Wilde & Duyfjes. a. Node with male inflorescence; b. apex of male inflorescence; c. male flower, opened, note disc composed of line-shaped thickenings adnate to the receptacle-tube; d. unfolded petal; e. node with female flower, and probract; f. female flower, opened (a–d: *Wieringa 1811*; e, f: *Schmutz 4301*).



## 2. *Gymnopetalum orientale* W.J.de Wilde & Duyfjes

*Gymnopetalum orientale* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 290, f. 5. — Type: *De Wilde & Duyfjes 21937* (holo L), Lombok.

Climber to 5 m long, minutely grey or brown hairy, subglabrescent; leafy stem c. 2 mm diameter. *Probract* absent or various in size, (ob)ovate, up to 1 cm long, irregularly sharp-dentate, glandular. *Tendrils* (simple or) unequally 2-branched in lower half. *Leaves*: petiole 2.5–7(–9) cm long; blade membranous, ovate or subcircular in outline, 6–14 cm diam., usually (3–)5 sharp-angular or (deeply) lobed, petiole and veins minutely scabrid-hairy on both surfaces, blade scabrous by cystoliths above. *Inflorescences*: male flowers either solitary with pedicel 20–60 mm long, or usually a solitary flower co-axillary with a later developing long-peduncled few- to 20-flowered raceme, 10–30 cm long, flowers (sub)sessile; bracts subpersistent or (late) caducous, rhomboid or ovate in outline, 10–15 by c. 10 mm, sharply 5(–7)-angular or -lobed, up to half its length, glandular beneath, subsessile or to 5 mm stipitate; rachis 5–20 cm long, peduncle 5–13 cm long, c. 2 mm diam.; female flowers solitary. *Male flowers* (sub)glabrous but petals minutely hairy especially on the veins; receptacle-tube 35–70 mm long, tapering, at throat 5–8 mm wide; sepals ± recurved, lanceolate or long-triangular, 5–15 mm long, with few narrow lobes to 9 mm long; petals (narrowly) obovate, 20–30 mm long, at base with some fringes to 5 mm long, margin crenulate-lobate, apex 1–2 mm mucronate; stamens inserted c. 15 mm below the throat in the receptacle-tube, filaments 2–3 mm long, synandrium 10–12 by 2–4 mm; disc consisting of 3 elongate, acute, carnosely bodies 3–15(–20) mm long, adnate to the basal portion of the receptacle-tube; pistillode absent. *Female flowers*: pedicel 10–20 mm long; ovary narrowly ellipsoid, 7–16 by 2–3 mm, harshly minutely hairy (hairs c. 0.1 mm long), faintly 6–8-ribbed; receptacle-tube c. 30 mm long; sepals (5–)10 mm long, with a few sidelobes; petals c. 20 mm long; style 15–20 mm long, stigma deeply 3-lobed, c. 10 mm long; disc absent; staminodes minute, inserted c. 5 mm above base of the tube. *Fruit* ellipsoid-fusiform, 5–6 by 3–4 cm, shortly beaked, harshly fine-hairy, glabrescent, sometimes with scattered wartlets; fruiting pedicel 2–7 cm long. *Seeds* numerous, long pear-shaped, rather acute at one end, 7–8 by 3.5 by 2.5–3 mm, faces shallowly verrucose-rugose, not margined. — **Fig. 23, 26d, d'**.

Field-notes — Flowers opening between 23.30 h and 24.00 h, still expanded at 12.00 h, with a spicy odour, visited by midges. Fruits eaten by crows.

Distribution — Sulawesi, Lesser Sunda Islands (Bali, Lombok, Flores), Moluccas (Seram, Babar Is.).

Habitat & Ecology — Climber in scrub and forest edges; damp sites; 25–1500 m altitude; flowering mainly June to January; fruiting in February.

Note — *Gymnopetalum orientale* resembles *G. chinense*, but the latter is less robust in all parts. The disc in the male flowers, consisting of carnosely elongate bodies adnate to the receptacle-tube is similar to those in most of *Trichosanthes*. *Gymnopetalum orientale* is reminiscent of *Trichosanthes quinquangulata* because of its leaf size and shape, its lobed sepals and sometimes ± fringed petals.

### 3. *Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes

*Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes, Reinwardtia 12 (2008) 268; Fl. Thailand 9, 4 (2008) 445. — *Trichosanthes scabra* Lour., Fl. Cochinch. (1790) 589. — Type: Untraced. Neotype: *Poilane 11322* (holo P, designated by De Wilde & Duyfjes, Reinwardtia (2008); iso L), Vietnam, Annam.

*Trichosanthes lucioniana* Náves ex F.Villar, Fl. Filip., ed. 3 [F.M. Blanco] (1880) Nov. App.: 95, pl. 460 (see note); Merr., Sp. Blancoan. (1918) 13.

*Gymnopetalum integrifolium* (Roxb.) Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 40 (1871) 58; C.B. Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 612; King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 67 (1898) 31; Ridl., Fl. Malay Penin. 1 (1922) 846; Cogn. & Harms in Engl., Pflanzenz. 88, 4.275.2 (1924) 179; W.J.de Wilde & Duyfjes, Blumea 51 (2006) 286. — *Cucumis integrifolius* ('*integrifolia*') Roxb., Fl. Ind. (1832) 724. — Type: *Wallich Cat. 6730* (KW, IDC microfiche), Myanmar, Ponlong.

*Gymnopetalum leucostictum* Miq., Fl. Ned. Ind. 1, 1 (1856) 680; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 302. — Type: *Junghuhn s.n.* (lecto L, barcode L0589693, designated by De Wilde & Duyfjes (2006); iso U, barcode U0001465), Java, Weltevreden.

Climbing or creeping herbs to 5 m long, stem (densely) long grey or brownish hairy. *Probract* green-yellow, lanceolate, unlobed or (deeply) 2- or 3-lobed, (1–)1.5–2.5 cm long, acute, sometimes caducous. *Tendrils* unbranched or unequally 2-branched near the base. *Leaves*: petiole 1–5 cm long; blade subcoriaceous, circular, or reniform, or broadly ovate in outline, or 5-angular, 2–11 cm diam., subglabrous above, densely coarse-hairy beneath, at least on the veins, when fresh bullate above, cystoliths in older leaves present, margin entire or finely dentate-mucronate or ± coarsely lobulate or wavy-dentate, apex rounded or subacute, reticulation of smaller veins distinct beneath. *Male inflorescences*: flowers solitary or in bracteate racemes; bracts sessile, 10–20 mm long, with upper margin regularly, finely, densely lacinate or few-lobed, base cuneate. *Male flowers*: pedicel persistent, 20–120 mm long in solitary flowers, 10(–20) mm long for flowers in the raceme; receptacle tube (strongly) narrowed below insertion of stamens, 15–20(–30) by 6–7 mm at the throat, outside and inside grey pubescent, throat inside yellow; sepals narrowly triangular, lanceolate, entire or ± lobed, recurved, (4–)5–8 mm long; petals obovate, ± clawed, c. 20 by 15 mm, distinctly veined; stamens inserted c. 10 mm below throat of the hypanthium-tube; filaments 2–2.5 mm long, ± glabrous, synandrium 8–12 mm long, 2–2.5 mm wide, apex of synandrium narrow, flat, hairy, bright yellow when fresh; disc consisting of 3 short linear bodies. *Female flowers* solitary; pedicel 10–30 mm long; ovary ellipsoid, 8–10 by 6–7 mm, long-pubescent; receptacle tube cylindrical, c. 10 by 5 mm; style 7–10 mm long, stigma lobes erect, c. 2 mm long; disc at base of the tube, minute or absent. *Fruit* short ellipsoid or globose, (2–)3–4 cm long, finely (sparsely) hairy, glabrescent, not ribbed; fruiting pedicel 1–3(–5) cm long. *Seeds* narrowly elliptic, 6–9 by 2.5–3 by 1.5–2 mm, faces small, almost smooth, demarcated by groove from broad, rounded margin.

Distribution — India, Sri Lanka, Myanmar, Thailand, South China, Laos, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia (Penang, Perak, Selangor), Singapore, Java, Philippines (Cebu), Sulawesi, and Lesser Sunda Islands (Bali)-; not known from Sumatra and Borneo.

Ecology — Roadsides and disturbed places, to 500 m; flowering and fruiting throughout the year.

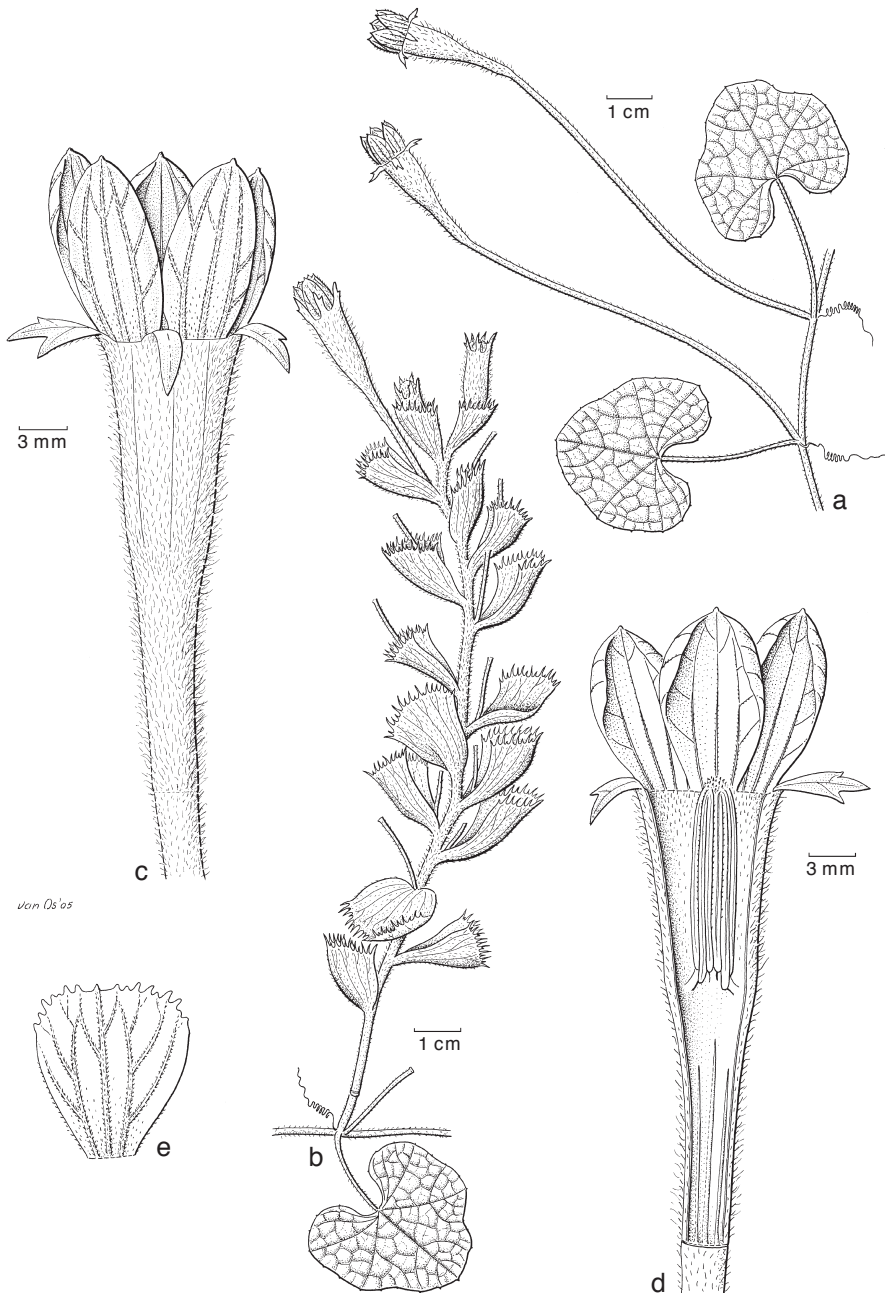


Fig. 24. a, b. *Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes var. *pectinatum* W.J.de Wilde & Duyfjes. a. Portion of twig with solitary male flowers; b. node with male raceme. — c–e. *Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes var. *scabrum*. c, d. Male flower from outside and opened respectively, note the disc composed of 3 line-shaped bodies; e. unfolded petal (a, b: De Wilde & Duyfjes 21692, type; c–e: Murata, Fukuoka & Sukasdi J1421).

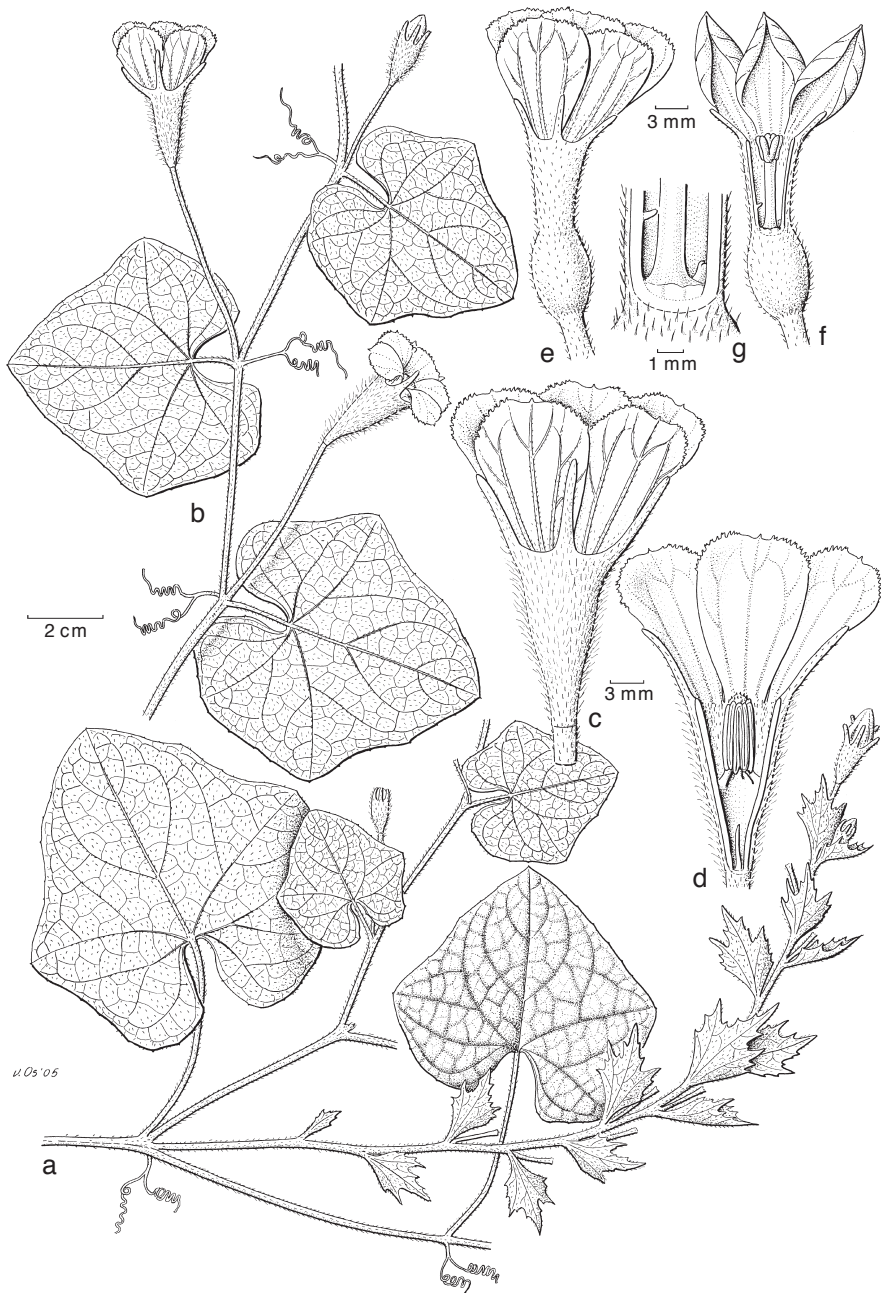


Fig. 25. *Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes var. *scabrum*. a. Twig with one male raceme, and one solitary male flower in bud; b. twig with solitary male flowers; c. male flower; d. male flower opened; e. female flower; f. female flower opened; g. detail of female flower showing base of style with traces of staminodes and disc (a: Phonsena, De Wilde & Duyfjes 3515; b: d'Alleizette s.n., barcode L0589688; c–g: De Wilde & Duyfjes 22269).

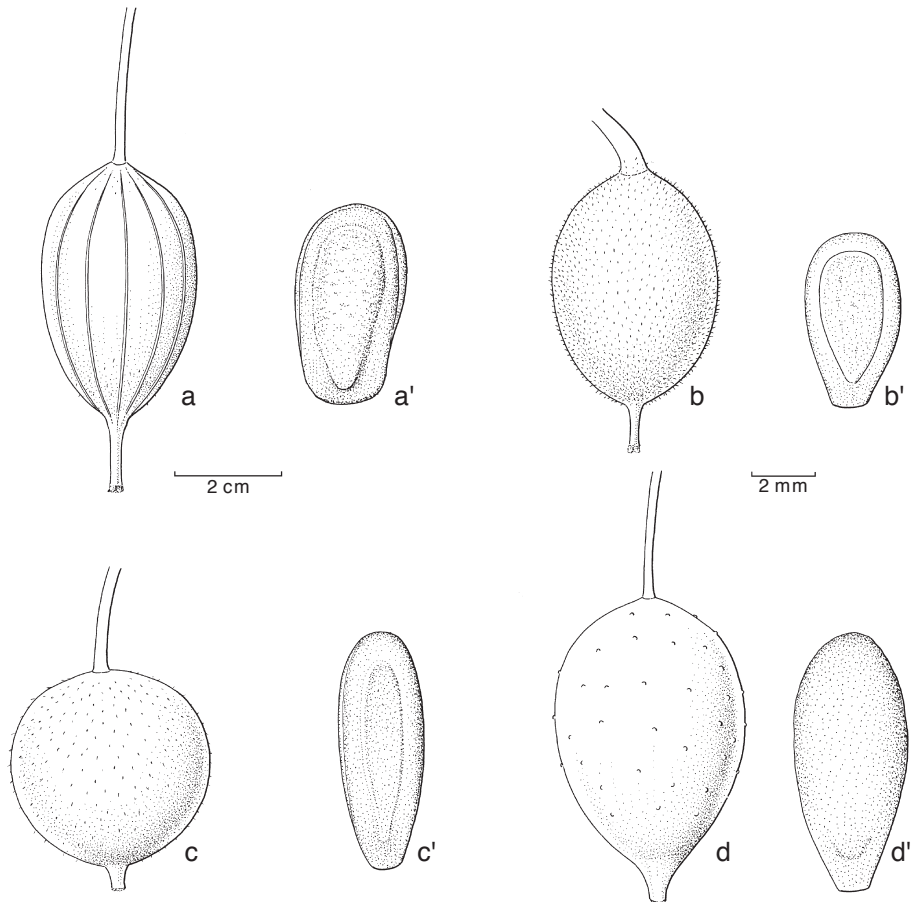


Fig. 26. Fruits and seeds of *Gymnopetalum* species. — a, a'. *Gymnopetalum chinense* (Lour.) Merr. — b, b'. *Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes var. *pectinatum* W.J.de Wilde & Duyfjes. — c, c'. *Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes var. *scabrum*. — d, d'. *Gymnopetalum orientale* W.J.de Wilde & Duyfjes (a, a': *De Wilde & Duyfjes* 21719; b, b': *De Wilde & Duyfjes* 21693; c, c': *Pruesapan et al.* KP-74; d, d': *Verheijen* 3819).

Note — The plate belonging with the name *Trichosanthes lucioniana* depicts *Gymnopetalum scabrum*, although the deeply lobed leaves and elongate fruit are suggestive of *G. chinense*. It clearly is not *Trichosanthes cucumerina* L. as stated by Merrill (l.c.).

#### KEY TO THE VARIETIES

- 1a. Bracts of male raceme (irregularly) shallowly or deeply few- or many-lobed or ± irregularly narrowly laciniate. Fruit globose . . . . . **a. var. scabrum**
- 1b. Bracts of male raceme regularly ± fine-laciniate in upper half. Fruit ellipsoid. — East Java . . . . . **b. var. pectinatum**

**a. var. *scabrum***

*Leaf blade* subcircular in outline or 3–5-angular, margin entire or shallowly dentate. *Bracts of male raceme* variously rather few-lobed. *Sepals* narrow-triangular, lanceolate, entire or shallowly few-lobed. *Fruit* (sub)globose, 2–3(–4) cm diam., glabrescent. — **Fig. 24c–e, 25, 26c, c'; Plate 10a–c.**

Distribution — As the species.

**b. var. *pectinatum* W.J.de Wilde & Duyfjes**

*Gynopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes var. *pectinatum* W.J.de Wilde & Duyfjes, *Blumea* 51, 2 (2006) 287, f. 1c, 4a, b. — Type: *De Wilde & Duyfjes 21692* (holo L), East Java, west of Pasuruan.

*Leaf blade* subcircular or angular in outline, margin (sub)entire. *Bracts of male raceme* with upper margin regularly, finely, densely laciniate. *Sepals* subentire or shallowly few-lobed. *Fruit* ellipsoid with obtuse apex, c. 4 cm long, finely hairy, not ridged. — **Fig. 24a, b, 26b, b'; Plate 10d.**

Distribution — East Java; known only from the type.

Habitat & Ecology — Among grasses on sawah-dike on clay soil; at sea level.

Note — The status of var. *pectinatum* is unclear. The finely incised male bracts give the plant a very distinct aspect. The ellipsoid fruit is unique and suggests a relationship with *G. chinense*; the fruit in the latter species is ridged, with a tapered apex. Possibly var. *pectinatum* is of hybrid origin.

**16. GYNOSTEMMA**

*Gynostemma* Blume, *Bijdr. Fl. Ned. Ind.* 15 (1825) 23; Hook.f. in Benth. & Hook.f., *Gen. Pl.* 1 (1867) 839; C.B. Clarke in Hook.f., *Fl. Brit. Ind.* 2 (1879) 633; Cogn. in A.D.C. & C.D.C., *Monogr. Phan.* 3 (1881) 912; Backer in Backer & Bakh.f., *Fl. Java* 1 (1964) 305; W.J.de Wilde & Duyfjes, *Blumea* 52 (2007) 264; *Fl. Thailand* 9, 4 (2008) 447. — *Pestalozzia* Zoll. & Moritz, *Syst. Verz. Zoll.* (1846) 31, nom. superfl. — Type species: *Gynostemma pedatum* Blume.

Small or medium climbers to 2 m long, main branches subherbaceous or soft woody, leafy stem 1–2 mm diam., glabrous or finely hairy, roots tuberous or not; dioecious or monoecious. *Probract* absent. *Tendrils* 2-branched at apex. *Leaves*: petiole long; leaflets petioluled; blade simple, not lobed or subpedately 3- or 5- (or 7-) foliolate, green on drying, margin dentate, cystoliths not obvious. *Flowers* (greenish) white, small, rotate; buds globose; sepals 5, free; petals 5, free, imbricate in bud, long-triangular, sometimes ± erose towards apex; disc inconspicuous. *Male inflorescences* paniculate, 2–4-times branched, few- or many-flowered, the ultimate branches slender with few or several flowers ± clustered in minute short racemes; bracts small, linear, glabrous or finely hairy. *Male flowers*: pedicel short, articulate, basal part persistent; receptacle narrow, flat or saucer-shaped; petals (long-)triangular or narrowly elliptic, apex acute or (long-)acuminate; filaments united into a staminal column, at apex with 5 (sub) sessile or short-stipitate anthers in a ring, anthers small, 1-thecous, short-ellipsoid, opening with a vertical slit, extrorse. *Female inflorescences* as in male inflorescences but less ramified and smaller. *Female flowers* as male flowers but somewhat larger; pedicel short

(or long); ovary subglobose, largely inferior, the inferior part not narrowed below the perianth, (2- or) 3- or 5-locular, each locule with 2 hanging ovules; sepals and petals inserted along broad, slightly convex apex of ovary; styles (2 or) 3 or 5, erect, free or  $\pm$  contiguous, glabrous, each at apex with a 2-branched stigma; staminodes sometimes present. *Fruit* ripening green, brown or purple, (sub)globose, less than 10 mm diam., with subpersistent perianth and styles (the latter becoming spaced and the perianth-scars leaving a thin line around the fruit), either a dry berry, not dehiscent or  $\pm$  capsular, opening with 3 valves (not in Malesia). *Seeds* 1–5, not much compressed, ovoid or subtriangular in outline, faces verrucose or wrinkled, margin narrow or broad, with  $\pm$  square, grooved edge.

Distribution — A genus of about 10 species, occurring in Sri Lanka and in South and NE India, ranging through China east to Japan and to New Guinea; in *Malesia*: 3 species.

Note — Although the androecium is characteristic for the genus *Gynostemma*, two species of the genus *Neoalsomitra*, namely *N. angustipetala* (Craib) Hutch. (from Thailand) and *N. hederifolia* (Moluccas), have a more or less similar androecium.

#### KEY TO THE SPECIES

- 1a. Monoecious. Inflorescences few-flowered. Plant delicate. — Papua New Guinea; subalpine; 2500–3200 m altitude . . . . . **2. *G. papuanum***  
 b. Dioecious. Inflorescences many-flowered. Plant stouter . . . . . 2  
 2a. Styles 5. — Eastern Papua New Guinea; montane; 1000–2500 m altitude . . . . .  
 . . . . . **1. *G. intermedium***  
 b. Styles (2 or) 3. — Widespread, lowland and montane areas; in New Guinea 200–1000(–1800) m altitude . . . . . **3. *G. pentaphyllum***

#### 1. *Gynostemma intermedium* W.J.de Wilde & Duyfjes

*Gynostemma intermedium* W.J.de Wilde & Duyfjes, *Blumea* 52 (2007) 265, f. 1a, b. — Type: *Pullen* 422, female flowers (holo L; iso CANB), Papua New Guinea, Eastern Highlands Province.

*Gynostemma pentaphyllum* auct. non (Thunb.) Makino: P.Royen, *Alpine Fl. New Guinea* (1982) 2008, p.p., f. 613a.

Small climber or creeper, root not known, 1–2 m long; leafy stem 1–1.5 mm diam., sparsely hairy, glabrescent; dioecious. *Leaves*: petiole 2–3.5 cm long; petiolules 0.5–1.5 cm long; blade membranous, (3–)5–7-foliolate, ovate or circular in outline, 3–6 cm diam., leaflets up to 5 by 2(–2.5) cm, middle leaflet largest, with 5–7 pairs of rather faint lateral veins, upper surface sparsely hairy mainly on veins, lower surface subglabrous, margin (shallowly) coarsely serrate. *Male inflorescences* many-flowered, paniculate, (2 or) 3 times branched, 10–15 by 5–10 cm, ultimately with up to 5 flowers in fascicles or short racemes up to 15 mm long; peduncle c. 3 cm long, finely pubescent; bracts minute, less than 1 mm long. *Male flowers*: pedicel 2–3 mm long, (sub)glabrous, articulation indistinct, at c. 1/3 from the apex; perianth glabrous, 4.5(–5) mm diam.; receptacle shallow, 0.6–0.9 mm wide; sepals ovate-narrowly elliptic, c. 1 by 0.5 mm; petals triangular-ovate, c. 2 by 1(–1.5) mm, entire, with narrowed apiculate

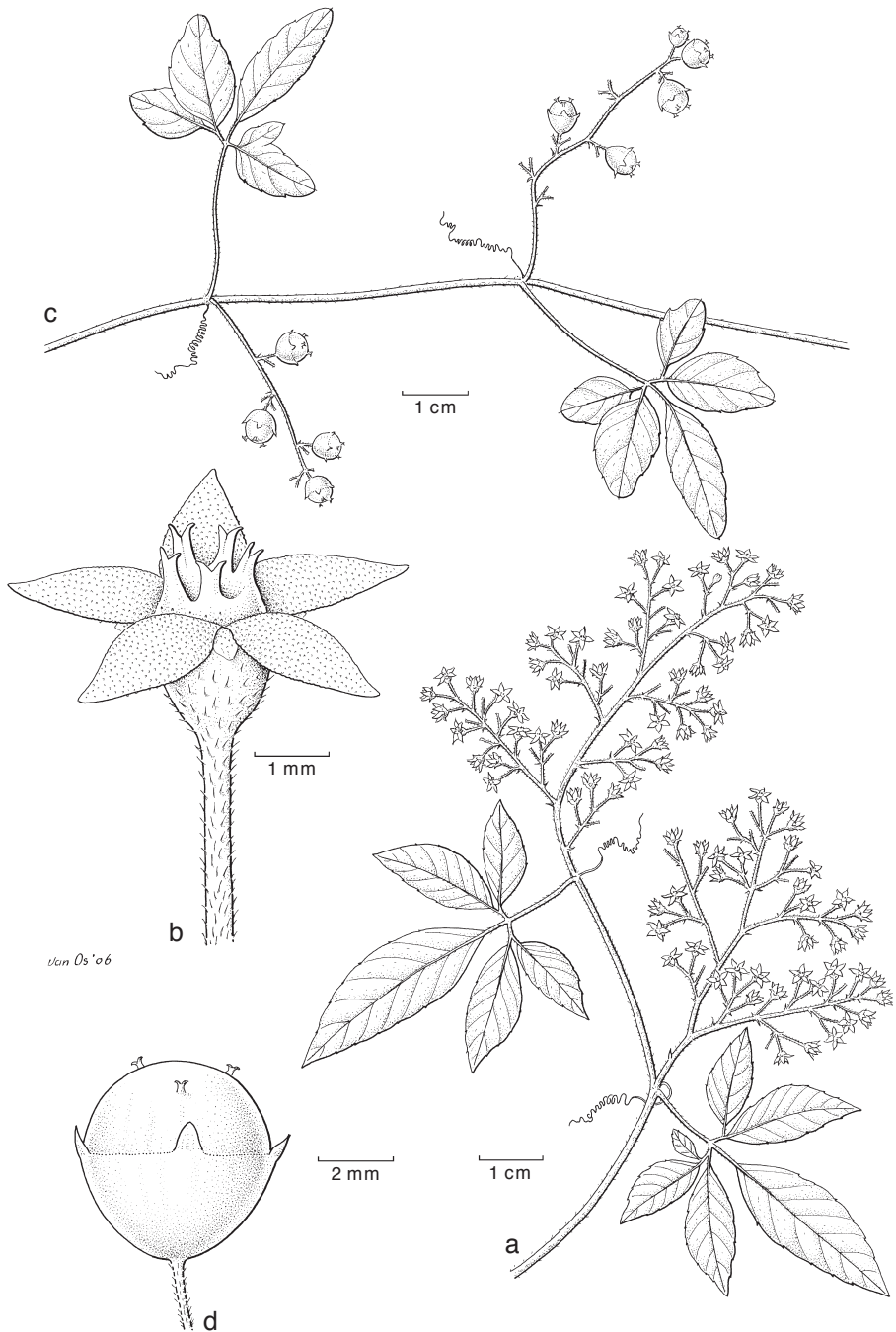


Fig. 27. a, b. *Gynostemma intermedium* W.J.de Wilde & Duyfjes. a. Habit of shoot with female inflorescences; b. female flower. — c, d. *Gynostemma papuanum* W.J.de Wilde & Duyfjes. c. Habit of fruiting shoot; d. fruit (a, b: Pullen 422, type); c, d: Stevens LAE 55693).



apex; staminal column (0.3–)0.5 mm long, synandrium c. 0.5 mm diam., anthers subsessile, subglobose, c. 0.2 mm diameter. *Female inflorescences* as in male, paniculate, rather many-flowered, 1(–3) times branched, 5–10 cm long; peduncle 1.5–3 cm long, (sparsely) hairy. *Female flowers*: pedicel 3–4 mm long, articulation not seen; ovary (hemi-)globose, c. 1.5 mm diam., (sparsely) hairy or glabrous; perianth c. 4 mm diam.; styles 5, each c. 1 mm long. *Fruit* few or up to 20 per infructescence, shiny, ripening green or dark purple, globose, 0.6–1(–1.2) cm diam., with 5 style-remnants and 5 (not opening) valve-sutures, glabrous; fruiting pedicel c. 0.5 cm long. *Seeds* 3 or 4 per berry, pale brown, rounded-triangular, c. 4 by 3.5 by 2 mm, with  $\pm$  flattish apex, coarsely sparsely warted or irregularly ridged, margin narrow. — **Fig. 27a, b.**

*Distribution* — New Guinea (Papua New Guinea (Madang, Eastern Highlands, and Morobe Provinces)).

*Habitat & Ecology* — Climber on tree ferns; along stream sides and gullies in mountain forest; 1500–2500 m altitude; flowering and fruiting throughout the year.

*Note* — *Gynostemma intermedium* occupies the altitudinal montane zone between *G. pentaphyllum* of the lowlands and *G. papuanum* of the subalpine zone.

## 2. *Gynostemma papuanum* W.J.de Wilde & Duyfjes

*Gynostemma papuanum* W.J.de Wilde & Duyfjes, *Blumea* 52 (2007) 267, f. 1c, d. — Type: *Vink 17364* (holo L), Papua New Guinea, Southern Highlands Province.

*Gynostemma pentaphyllum* auct. non (Thunb.) Makino: P.Royen, *Alpine Fl. New Guinea* (1982) 2008, p.p., f. 613b–d.

Small climber, 0.5–1 m long, root not known; leafy stem less than 1 mm diam., subglabrous or sparsely hairy; monoecious. *Leaves*: petiole 1.5–2.5 cm long; petiolules 0.2–0.4 cm long; blade filmy or membranous, (3- or) 5-foliolate, ovate in outline, 3–6 by 2.5–4.5 cm; the middle leaflet much longer than the lateral ones, with c. 5 pairs of faint lateral veins, both surfaces subglabrous or sparsely hairy, margin shallowly crenate-dentate. *Inflorescences* few-flowered, 1–2(–3) cm long, consisting of 1 (or 2) female flowers and later developing 1–3(–5) male flowers, inflorescence solitary or  $\pm$  fascicled, sometimes only female or only male flowers present in one inflorescence, sometimes short peduncled inflorescences aggregated in raceme-like short shoots; branches and pedicels hairy; peduncle 0.5–2 cm long; bracts narrow, acute, 1 mm long or less. *Male flowers*: pedicel 2–5 mm long, glabrous or hairy, articulate at c. 1/3 from the apex; perianth glabrous, c. 3 mm diam.; receptacle shallow, less than 0.5 mm wide; sepals ovate-narrowly elliptic, 0.7(–1) mm long; petals ovate-narrowly elliptic, c. 1.5 mm long, entire or somewhat incised, long-acuminate in upper 1/3; staminal column c. 0.3 mm long, synandrium 0.3(–0.4) mm diam., anthers sessile, subglobose, c. 0.2 mm diameter. *Female flowers*: pedicel 2–5 mm long, articulate at apex; ovary (sub)hemi-globose, c. 0.6 mm diam., glabrous; perianth 2.5–3 mm diam.; sepals c. 0.5 mm long; petals ovate-narrowly elliptic, 1(–1.5) mm long, acuminate; styles 3 (rarely 4), with stigma each c. 1 mm long. *Fruit* solitary, ripening light green, globose, 0.5–0.7 cm diam., with persistent sepals and styles and with 3 (not opening) valve-sutures; fruiting pedicel 0.4–0.6 cm long. *Seeds* 2 or 3 per berry, (pale) brown,  $\pm$  triangular-ovate, 2.5–3 by 2–2.5 by 1 mm, faces irregularly low-warty, margin narrow. — **Fig. 27c, d.**

Distribution — New Guinea (Papua New Guinea (West Sepik, East Sepik, Western Highlands (Kubor Range), Southern Highlands (Mt Giluwe), Eastern Highlands (Chimbu), and Milne Bay (Mt Suckling) Provinces)).

Habitat & Ecology — Open places in low forest, mossy forest, gullies, low scrub, grasslands, alpine shrubbery and in *Nothofagus* forest; also on limestone; (1600–)2100–3500 m altitude; flowering and fruiting all year round.

### 3. *Gynostemma pentaphyllum* (Thunb.) Makino

*Gynostemma pentaphyllum* (Thunb.) Makino, Bot. Mag. (Tokyo) 16 (1902) 179.

For literature and synonyms see under the forms.

Herbaceous or subwoody climber, 2–8 m tall, root perennial but not(?) tuberous, main stem to 1 cm thick, bark fissured, grey; leafy stem slender, 1(–2) mm diam., glabrous or hairy, hairs grey or rarely brown; dioecious. *Leaves*: petiole 3–6 cm long; petiolules 0.2–0.7 cm long; blade simple or foliolate, subcircular (or ovate) in outline, 4–10(–17) cm diam.; leaflets 3–5(–7), ovate to narrowly elliptic, 3–10 by 1–5 cm, outer leaflets smallest, 3–6(–7)-pinniveined, veins faint or distinct, margin (remotely) finely (or coarsely) dentate, upper surface variously (appressed) hairy or subglabrous (except veins), lower surface (sub)glabrous. *Male inflorescences* many-flowered, small or large, raceme-like or 2–4-branched, broadly paniculate, 5–15(–30) cm long, lateral branches to 10 cm long, hairy or subglabrous, ultimately with (1 or) 2–5 flowers in fascicles (or in condensed racemes), finely hairy or subglabrous; peduncle 1–7 cm long; bracts 1–2(–5) mm long. *Male flowers*: pedicel 1–3(–7) mm long, articulate in the middle, the basal part persistent after flowering; perianth (2.5–)3–5(–8) mm diam.; receptacle shallowly hollowed, c. 0.5 mm wide; sepals narrowly elliptic-linear, (0.5–)1 mm long; petals triangular, (narrowly) elliptic, 1–2(–3.5) by 0.5(–1) mm, apex acuminate or long-acuminate, adaxially usually ± hairy or papillose; staminal column 0.5(–1) mm long, syndrium 0.5(–1) mm diam., anthers subglobose, sessile or short-stalked, c. 0.2 mm diameter. *Female inflorescences* as male inflorescences, but smaller. *Female flowers*: pedicel 2–4 mm long, subapically articulate; perianth 2–4 mm diam.; ovary subglobose, c. 1 mm diam., glabrous or sparsely hairy; styles (2 or) 3, with stigma each 0.5–1 mm long. *Fruit* green, ripening pale yellow or blackish, globose, 0.5–0.8 cm diam., glabrous or (sparsely) hairy; fruiting pedicel 0.2–0.5 cm long. *Seeds* usually 2, subcircular, triangular or cordate in outline, 3–4 mm diam., little or moderately compressed, faces irregularly verrucose or wrinkled, margin broad or narrow.

Distribution — Widespread, as for the genus; India, Sri Lanka, east through China, to Japan and Korea, south-east through Indochina and Thailand; common throughout *Malesia*.

Habitat & Ecology — In a variety of habitats: damp or not too dry places in scrub and forest, often near water courses, also on limestone; at 200–2400 m altitude; possible also at sea level in the lowlands. Flowering and fruiting all through the year, but less frequent in April and May.

Notes — 1. Densely hairy plants with 3-foliate leaves from Myanmar, China, and Thailand, known as *G. burmanica* Chakrav. were placed in the synonymy of *G. pentaphyllum* by De Wilde & Duyfjes (2007, 2008), but the former species can probably better be regarded as a species of its own.

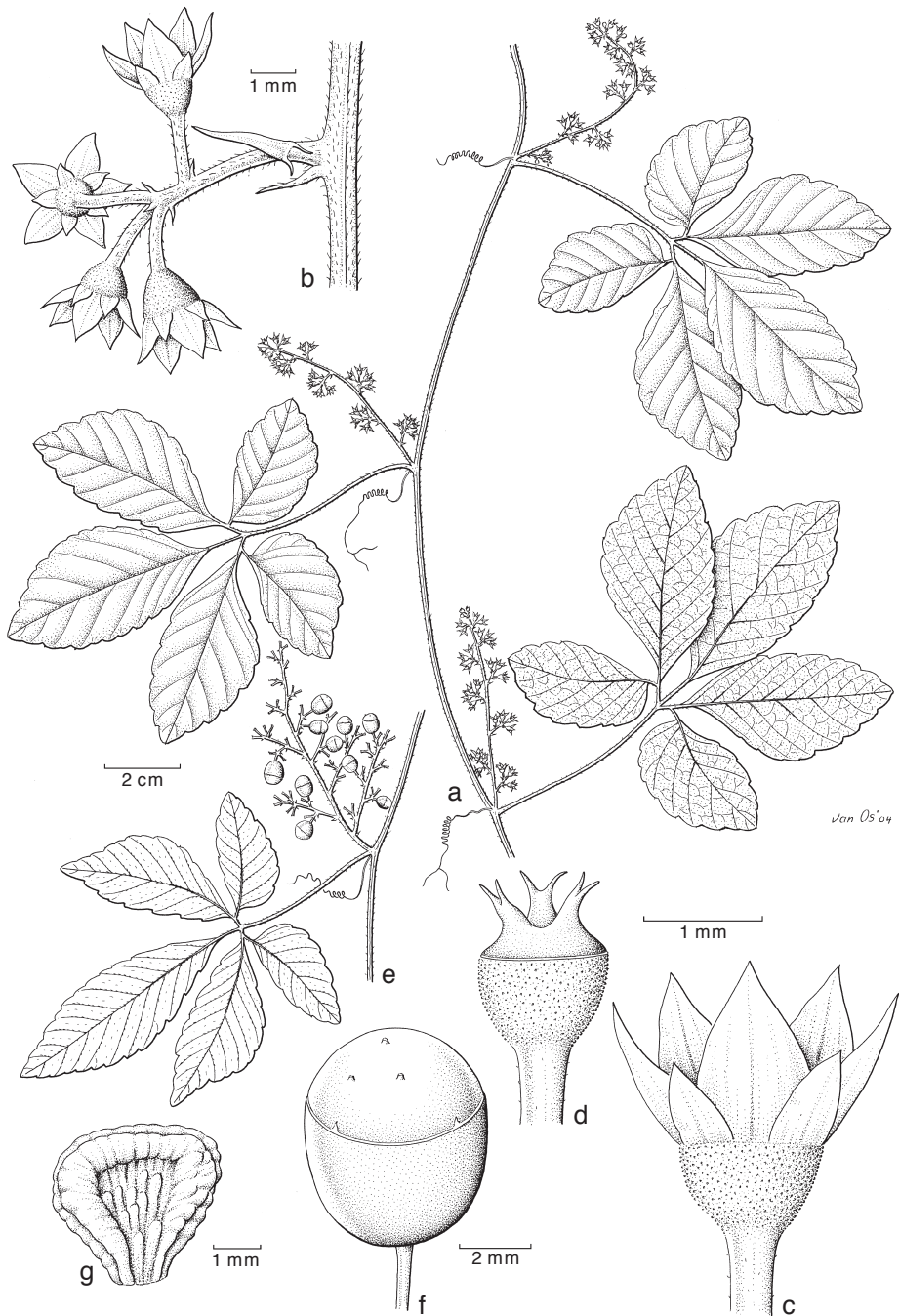


Fig. 28. *Gynostemma pentaphyllum* (Thunb.) Makino forma *pentaphyllum*. a. Habit of branch with female inflorescences; b. detail of female inflorescence; c. female flower; d. gynoecium; e. node with infructescence; f. fruit; g. seed (a–d: Kock 8; e–g: Soegandiredja 281).

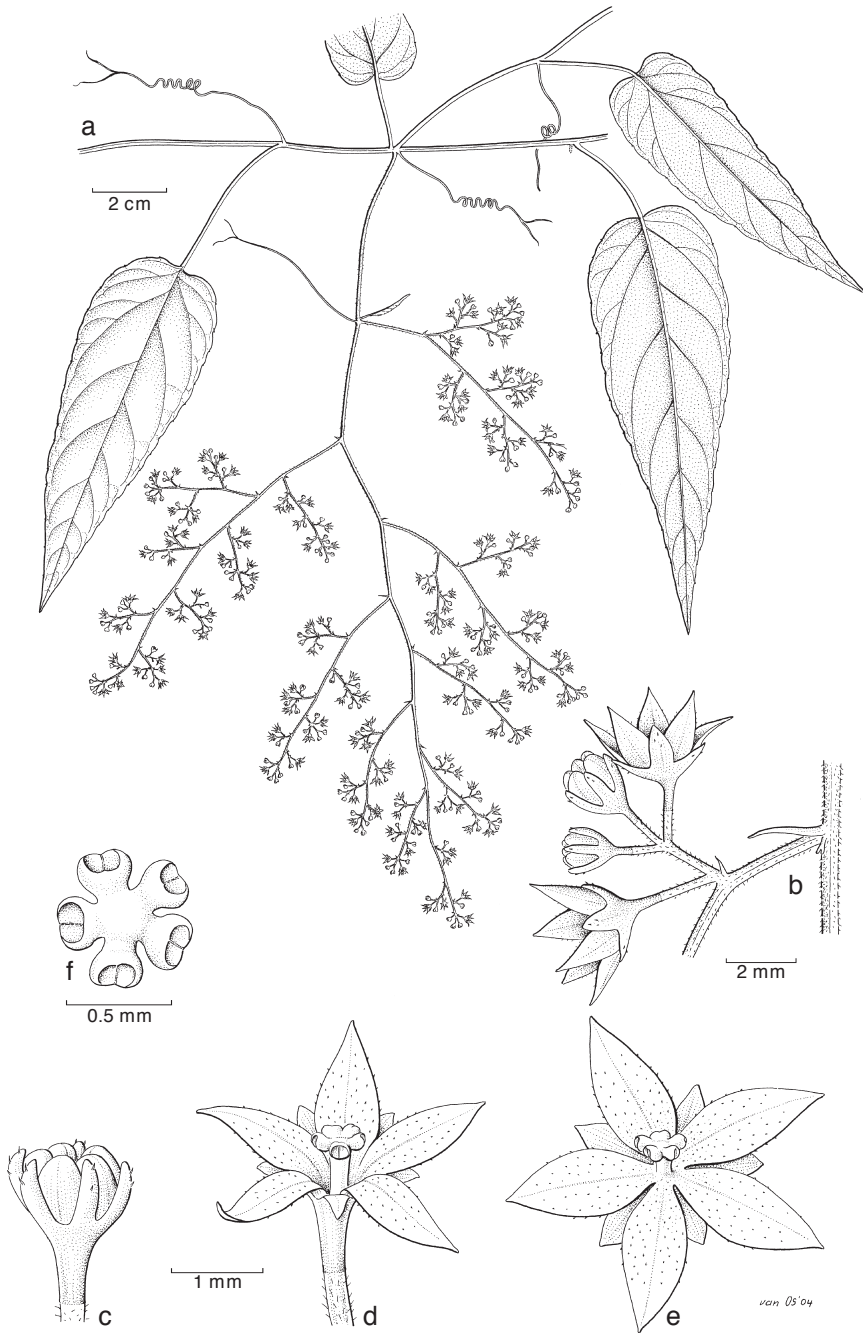


Fig. 29. a. *Gynostemma pentaphyllum* (Thunb.) Makino forma *simplicifolium* (Blume) W.J.de Wilde & Duyfjes. Habit of male inflorescence. — b–f. *Gynostemma pentaphyllum* (Thunb.) Makino forma *pentaphyllum*. b. Detail of male inflorescence; c. male bud; d, e. male flowers; f. androecium seen from above (a: Van Oostroom 14084; b–f: De Wilde & Duyfjes 21779).

2. *Gynostemma pentaphyllum* is very variable, comprising various not sharply demarcated local forms, or ecotypes. To acknowledge some of the variation, the following forms are recognized:

**a. forma pentaphyllum**

*Gynostemma pentaphyllum* (Thunb.) Makino, Bot. Mag. (Tokyo) 16 (1902) 179; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 306; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 25, pl. 5: 1–7; W.J.de Wilde & Duyfjes, Blumea (2007) 268, f. 2b–f, 3; Fl. Thailand 9, 4 (2008) 450. — *Vitis pentaphylla* Thunb., Fl. Jap. (1784) 105. — Type: *Thunberg 5858* (UPS, not seen), Japan.

*Gynostemma pedatum* Blume, Bijdr. Fl. Ned. Ind. 15 (1825) 23; C.B.Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 633 ('*pedata*'); Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 913; Craib, Fl. Siam. (1931) 766. — *Petalozzia pedata* Zoll. & Moritzi, Syst. Verz. Zoll. (1846) 31. — *Zanonia pedata* (Blume) Miq., Fl. Ned. Ind. 1, 1 (1856) 683. — Type: *Blume 1429* (lecto L, barcode L0588327, designated by De Wilde & Duyfjes (2007); iso L (6 sheets)), Java, Tjanjor & Krawang.

*Zanonia laxa* Wall., Pl. Asiat. Rar. 2 (1831) 29. — *Alsomitra laxa* (Wall.) M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 118. — *Petalozzia laxa* (Wall.) Thwaites, Enum. Pl. Zeyl. 2 (1859) 124. — *Gynostemma laxum* (Wall.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 914; Craib, Fl. Siam. (1931) 766; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 26. — Type: *Wallich 3727* (K; K-W), India, Silhet.

Plant as the species, not including the forms *dasycarpum*, *fasciculare*, and *simplicifolium*. The leaves of the typical form are 3- or 5- (or 7-)foliolate. — **Fig. 28, 29b–f; Plate 11a–c.**

Distribution — Widespread; in *Malesia*: Sumatra, Peninsular Malaysia, rare in Borneo, where it is replaced by forma *dasycarpum*, all over Java, Philippines, Lesser Sunda Islands, Moluccas, and New Guinea; not known from Sulawesi; from sea level to 1500(–2000) m altitude.

Uses — The form is cultivated for its medicinal properties. Tea prepared from the leaves, for instance, is used for reduction of blood pressure.

**b. forma dasycarpum** (C.Y.Wu) W.J.de Wilde & Duyfjes

*Gynostemma pentaphyllum* (Thunb.) Makino forma *dasycarpum* (C.Y.Wu) W.J.de Wilde & Duyfjes, Blumea (2007) 269, pl. 1c. — *Gynostemma pentaphyllum* (Thunb.) Makino var. *dasycarpum* C.Y.Wu, Acta Phytotax. Sin. 21 (1983) 362. — Type: *Li 534* (holo KUN, not seen), China, Yunnan.

*Gynostemma winkleri* Cogn. in H.Winkl., Bot. Jahrb. Syst. 48 (1912) 118. — Type: *Winkler 2757* (holo B†; iso K, L), South Kalimantan, Batu Babi.

Plant as forma *pentaphyllum*, but fruit hairy.

Distribution — Myanmar, southern China, Thailand; in *Malesia*: all over Borneo.

Habitat & Ecology — Primary forest, shaded and open places, damp places, riverbanks, and hillsides; often on limestone, also on basalt bedrock; mostly in the lowlands to 1650 m.

**c. forma fasciculare** W.J.de Wilde & Duyfjes

*Gynostemma pentaphyllum* (Thunb.) Makino forma *fasciculare* W.J.de Wilde & Duyfjes, *Blumea* 52 (2007) 270. — Type: *Johansson, Nybom & Riebe 384* (holo BO; iso L, S), Central Sulawesi.

Plant as forma *pentaphyllum*, but male flowers long-pedicelled, pedicels 4(–7) mm long, fascicled.

Distribution — Endemic to Central Sulawesi.

Habitat & Ecology — Primary and disturbed primary forest on alluvial soil; from sea level to 2200 m.

Note — In Sulawesi the typical form *pentaphyllum* seems absent.

**d. forma simplicifolium** (Blume) W.J.de Wilde & Duyfjes

*Gynostemma pentaphyllum* (Thunb.) Makino forma *simplicifolium* (Blume) W.J.de Wilde & Duyfjes, *Blumea* 52 (2007) 271, f. 2a. — *Gynostemma simplicifolium* Blume, *Bijdr. Fl. Ned. Ind.* 15 (1825) 24 ('*simplicifolia*'); Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 915; Backer in Backer & Bakh.f., *Fl. Java* 1 (1964) 306. — Type: *Blume 1493* (lecto L, barcode L0588361, designated by De Wilde & Duyfjes (2007); iso L), Java, Mt Krawang.

Plant as forma *pentaphyllum*, but leaves simple, occasionally with a few 2 (or 3) foliolate leaves among the simple leaves. — **Fig. 29a.**

Distribution — India, Myanmar, China; in *Malesia*: Peninsular Malaysia (Pahang), Borneo (Sarawak, Sabah), West Java, Philippines (Basilan).

Habitat & Ecology — Damp and shaded places in primary and old secondary forest, along roadsides in logged forest and river beds; yellow sandy and reddish clay-lateritic soils, also on limestone; 100–1600 m altitude.

Note — Simple-leaved (not foliolate) forms have been found almost all over the area of the species. Plants from the type locality in West Java have a relatively long petiole, almost as long as the rather narrow leaf blade. In simple-leaved forms from other localities the petiole is generally shorter.

**17. HODGSONIA**

*Hodgsonia* Hook.f. & Thomson, *Proc. Linn. Soc. London* 2 ('1853', 1854) 257; Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 348; Hutch., *Fam. Fl. Pl., Dicot. ed.* 3 (1973) 300, f. 109; Ridl., *Fl. Malay Penin.* 1 (1922) 843; Backer in Backer & Bakh.f., *Fl. Java* 1 (1964) 304; W.J.de Wilde & Duyfjes, *Blumea* 46 (2001) 169; *Fl. Thailand* 9, 4 (2008) 454. — Type species: *Hodgsonia heteroclita* (Roxb.) Hook.f. & Thomson (*Trichosanthes heteroclita* Roxb.).

Liana, to 30 m long, leafy shoots 4–7 mm diam., almost glabrous; dioecious. *Probract* c. 5 mm long, thorn-like, with glands on lower surface. *Tendrils* 2- or 3-branched. *Leaves*: blade coriaceous, subcircular in outline, 15–25 cm diam., palmately (deeply) 3–5-lobed, scattered minute glands often present, margin entire, tertiary veining on lower surface prominent. Flowers large, puberulous; corolla rotate; petals free, white, long-fringed, the in bud exposed portion conspicuously veined. *Male inflorescences* stout bracteate racemes, hairy; bracts elliptic or oblong, entire, 5–10 mm long, glandular on lower surface, often inserted on the pedicel, subdeciduous. *Male flowers*: receptacle-tube elongate, widened towards or near the apex; calyx lobes minute, with few glands

on lower surface sometimes also on the tube; petals cuneate; stamens 3, filaments short, free, inserted towards the apex of the receptacle-tube, anthers one 1-thecous, two 2-thecous, united into a head, largely included, thecae linear, plicate, connective narrow, not produced; disc consisting of 3 elongate parts, either free or largely adnate with basal portion of the tube. *Female flowers* solitary, resembling male flowers; ovary subglobose, 6-locular, ovules 6 or about 12, in each locule 1 or 2 (or 3) collaterally attached at the bottom (rarely the apex) of the locules; style filiform, stigma large, obconical, 3-lobed, partly exserted; staminodes and disc absent. *Fruit* a large drupe, hard-skinned, depressed globose, 12–25 cm diam., filled with firm pulp and 6 large, subovoid, deeply veined pyrenes, each containing 1 or 2 (or 3) seeds. *Seeds* large.

Distribution — An Asian genus of 2 species ranging from East India and South China through Indochina to Borneo and West Java; in *Malesia* 1 species.

Note — *Hodgsonia* is related to *Trichosanthes* L., which has similar flowers, but differs in fruits containing many smaller horizontal seeds. The pollen of *Hodgsonia* is different from *Trichosanthes*.

### 1. *Hodgsonia macrocarpa* (Blume) Cogn.

*Hodgsonia macrocarpa* (Blume) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 349; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 305; W.J.de Wilde & Duyfjes, Blumea 46 (2001) 174, f. 2a: 3–4. — *Trichosanthes macrocarpa* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 935. — Type: *Blume s.n.*, (holo P), Java, Gunung Salak.

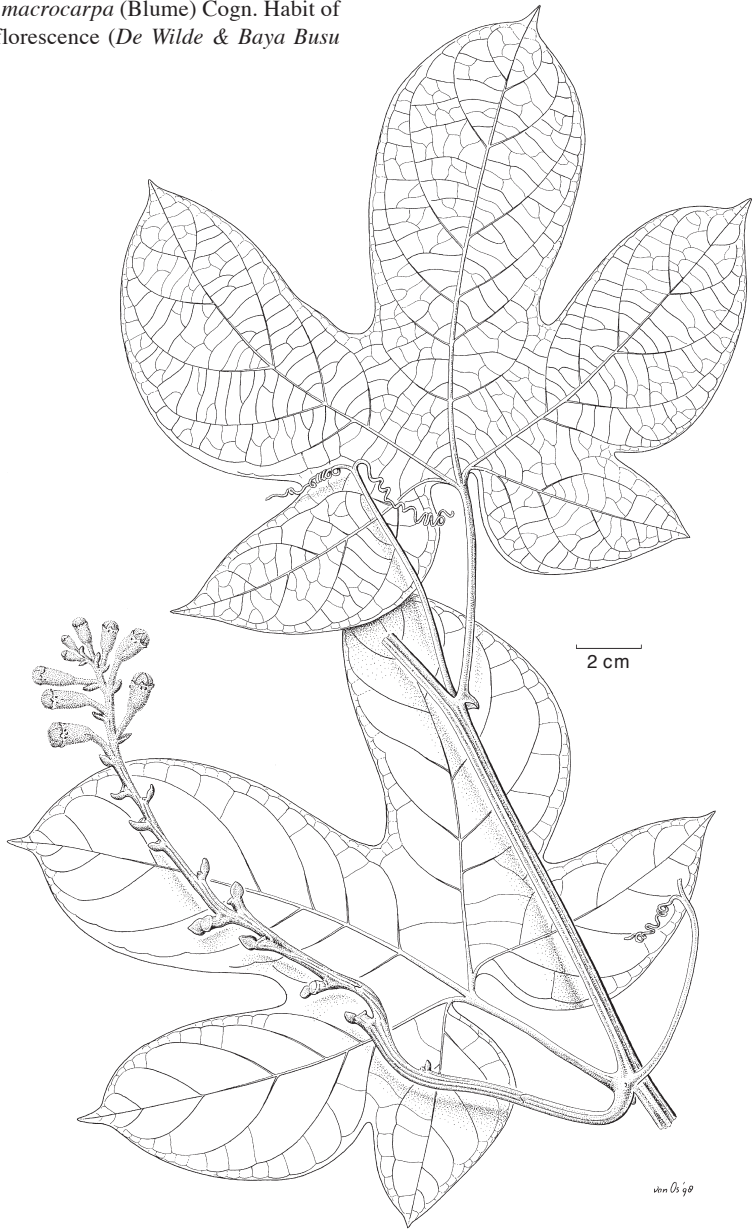
*Trichosanthes hexasperma* Blume, Bijdr. 15 (1826) 935; Ser. in DC., Prod. 3 (1828) 315; M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 95; Hassk., Pl. Jav. Rar. (1848) 192; Miq., Fl. Ned. Ind. 1, 1 (1856) 678. — Type: *Blume s.n.*(holo L, barcode L0589332; iso L, barcodes L0589331, L0589330), Java, Gunung Salak.

*Trichosanthes kadam* Miq., Fl. Ned. Ind., Eerste Bijv. (1861) 331. — *Hodgsonia kadam* (Miq.) Greshoff, Bull. Kol. Mus. 30 (1904) 163, with figure; Lewkowitsch, Chem. Techn. Anal. Oils 2 (1914) 515 (with references to literature on medicinal and chemical properties, mainly of the oily seed). — Type: *Diepenhorst in Teysmann s.n.* (2097 HB), (holo U, barcode U0001466; iso BO), Sumatra (Priaman).

*Hodgsonia capniocarpa* Ridl.; Fl. Malay Penin. 1 (1922) 843. — Type: *Ridley s.n.* (lecto K, designated by De Wilde & Duyfjes (2001)), Peninsular Malaysia, Pahang.

*Habit* as for the genus. *Leaves*: petiole 3–7 cm long; blade usually 3-lobed, lower surface puberulous or glabrescent, small glands several, especially towards the base, margin entire. *Male inflorescences* 12–20(–30) cm long, peduncle (2–)10–20 cm long, 3–5 mm thick; flowers (5–)10–20. *Male flowers*: pedicel 2–10 mm long, bract ovate, c. 5 mm long, inserted up to 10 mm from the base; receptacle-tube 50–70 mm long, basal part 30–45 mm by 3–4 mm, the tube above the middle widening into a dilated section 20–25 mm long, 10(–15) mm wide at the throat; sepals 1(–2) mm long; petals 20–30 mm long, white, outside at base rusty puberulous, threads c. 50 mm long, white, pendent(?), spiralling(?). Stamens inserted at about the middle of the receptacle-tube, i.e. where widening, filaments (5–)7 mm long; synandrium elongate, apex truncate, 10–12 by 3.5–4 mm, included; disc parts narrowly elliptic, 4–6 mm long, free. *Female flowers*: pedicel 3–4 cm long; receptacle-tube c.3 cm long (including c. 6 mm long solid basal part which remains on top of the ovary after anthesis), gradually widening to c. 7(–10) mm wide throat; style 15–20 mm long, stigma 13–14 by 6–8 mm, lobes

Fig. 30. *Hodgsonia macrocarpa* (Blume) Cogn. Habit of twig, with male inflorescence (*De Wilde & Baya Busu FRI 41401*).



truncate; ovary 10–12 mm diam., with soft brown hairs c.1 mm long, pustules absent (always?), ovules 6, one in each locule. *Fruit* ripening greyish green, 12–18 cm diam., densely grey or brown hairy, glabrescent, sometimes with large, scattered, dark-coloured wart-like lenticels, not grooved; fruiting pedicel 4–8 cm long, 10–15 mm wide. *Pyrenes* subovoid, hardly compressed, 6–9 cm long, containing 1 seed, faces of pyrenes smooth, margin absent, edge entire. — **Fig. 30, 31; Plate 11d.**



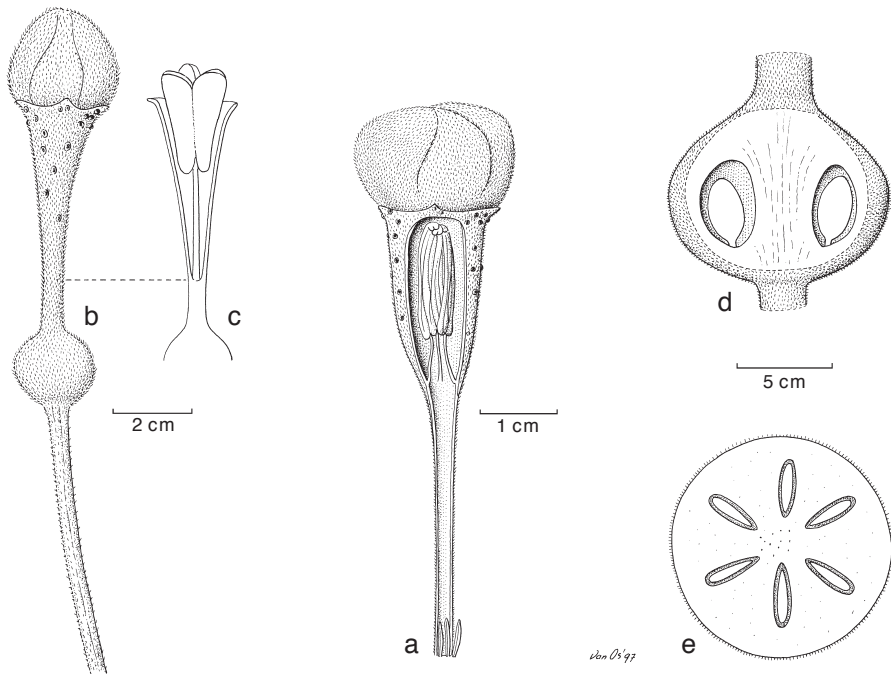


Fig. 31. *Hodgsonia macrocarpa* (Blume) Cogn. a. Opened submature male flower bud, showing androecium and disc-lobes at base of hypanthium tube; b. submature female bud; c. ditto, longitudinal section, showing style and stigma; d, e. ovary, longitudinal and cross section, showing position of the ovules. (a: De Wilde & Baya Busu FRI 41401; b–e: King's Collector 4021).

Distribution — Peninsular Thailand and South Myanmar; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, and West Java.

Habitat & Ecology — Moist places in primary and disturbed forests, forest fringes, and roadsides, mostly near riversides; 100–250 m altitude; flowering at night, flowers fragrant; flowering February and April, fruiting December and April.

Uses — The roasted fatty seeds are edible; *Whitmore KEP FRI 576* reported: “cotyledons edible after seed roasted and bitter skin removed”. The empty stone-seeds (pyrenes) can be found on the forest floor, gnawed open by rodents. The ashes of burnt leaves are used in healing wounds.

Note — The species is easily recognisable by its characteristic thorn-like probracts, present also in sterile shoots on each node.

## 18. INDOMELOTHRIA

*Indomelothria* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 5, f. 1b, 2a; t. 1; *Fl. Thailand* 9, 4 (2008) 458. — Type species: *Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes

Climbers 1–5 m long, (sub)perennial, leafy stem 1–2 mm diam., green on drying; monoecious. *Probract* absent. *Tendrils* unbranched. *Leaves*: blade simple, entire or

shortly hastately lobed, subpinniveined to palmiveined. *Flowers* 5(–10) mm diam., sepals minute, linear or subulate,  $\pm$  patent; petals white (but see note on *I. blumei*), free, obovate-elliptic, valvate in bud; receptacle-tube campanulate or urceolate. *Male inflorescence* a slender peduncled lax raceme, sometimes co-axillary with 1 female flower, pedicels persistent; bracts absent. *Male flowers*: sepals with or without adaxially a short spur; stamens 3, inserted close to the throat of the receptacle-tube, filaments short, thick, anthers two 2-theous, one 1-theous, only included at base, thecae  $\pm$  lateral, straight or slightly curved, connective broad, not produced; disc free, at apex  $\pm$  3-parted. *Female flowers* solitary or co-axillary with male raceme; ovary narrowly ellipsoid,  $\pm$  with slender neck, glabrous; stigma consisting of 3 short arms, each arm with numerous, thread-like appendages; staminodes absent; disc a faintly 3-lobed annulus, largely free from the receptacle-tube. *Fruit* solitary or co-axillary with male raceme, ripening green, narrowly ellipsoid, fusiform, 5–7 cm long, glabrous, pulpy; dry exocarp membranous-cartilaginous, smooth. *Seeds* numerous, compressed, ovate-elliptic, faces little convex, not sculptured, but with dense appressed hairs, margin absent, edge entire, not winged.

Distribution — A genus of 2 species extending from South Myanmar and South Thailand to West Malesia; in *Malesia* 2 species.

#### KEY TO THE SPECIES

- 1a. Leaf blade elliptic, usually two times longer than wide or longer. Male perianth c. 4 mm diam., sepals without(?) an appendage. Fruit 4(–5) cm long; seeds 2.5–4 mm long. — Widespread; lowlands . . . . . **1. *I. blumei***
- b. Leaf blade  $\pm$  ovate. Male perianth c. 6 mm diam., sepals with an adaxial appendage. Fruit 4–8 cm long; seeds c. 8 mm long. — Lowlands or mountains; two subspecies, each with a restricted area . . . . . **2. *I. chlorocarpa***

#### **1. *Indomelothria blumei* (Ser.) W.J.de Wilde & Duyfjes**

*Indomelothria blumei* (Ser.) W.J.de Wilde & Duyfjes, *Blumea* (2006) 6; *Fl. Thailand* 9, 4 (2008) 459. — *Bryonia blumei* Ser. in DC., *Prodr.* 3 (1828) 305. — *Bryonia heterophylla* auct. non (Lour.) Raeusch.: *Blume, Bijdr. Fl. Ned. Ind.* 15 (1826) 925 (see under *Solena heterophylla* Lour.). — *Melothria marginata* (Blume) Cogn. var. ? var. *heterophylla* (Blume) Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 594, p.p.; in Engl., *Pflanzenr.* 66, 4.275.I (1916) 93, p.p. — Type: *Blume s.n.* (holo L, barcode L0129721), Java, Batavia “inter frutices juxta Bataviam”.

Subperennial(?) climber, 1–3 m long; stem glabrescent. *Tendrils* glabrous. *Leaves*: petiole 1–2 cm long, rough-hairy; blade (ovate-)elliptic to narrowly elliptic or long-triangular, 4–8 by 1–4 cm, both surfaces scabrous, but veins shortly rough-hairy, cystoliths often inconspicuous, base subtruncate or cordate, occasionally short-hastate, margin entire or shallowly sparsely dentate, teeth to 4 mm long. *Male inflorescences*: finely scabrous or subglabrous; peduncle slender, 1–2 cm long, raceme 0.1–0.5(–1.5) cm long, with up to 10 flowers. *Male flowers* (incompletely known, mainly from 1 open flower in *Kerr 3735*, Thailand): pedicel (0.5–)1–2 mm long; corolla 4–5 mm diam.; receptacle-tube campanulate, 1.5–2 mm long and wide, inside curly hairy in

upper half, hairs 0.5 mm long or less; sepals 1 mm long, with sparse minute hairs or glabrous, adaxial appendage not apparent; petals ovate, 2 by 1.5 mm, (sub)obtusate, on both sides (papillose) hairy; filaments 0.5 mm long, anthers subcircular in outline, 1 mm diam., thecae curved, connective with few minute hairs; disc subglobose, 1 mm diam., irregularly lobed. *Female flowers* not seen. *Fruit* ripening colour not known, 4(–5) by 1–1.5 cm; fruiting pedicel 0.3–1 cm long. *Seeds* greyish brown, 2.5–4 by 2–2.5 by c. 1 mm.

Distribution — Widespread but rarely collected: Myanmar, Thailand; in *Malesia*: Sumatra, East Kalimantan, and West Java.

Habitat & Ecology — Forest edges, scrub, open marshy forest, marshland; sea level to 300 m; flowering and fruiting May to July and November.

Notes — 1. *Lörzing 3385* (Sumatra) recorded the flowers as yellow. More material and fieldstudy is needed. The observation of the flower colour, regarded as an important genus character, needs special attention. The petals in *I. chlorocarpa* are white.

2. This widespread species is apparently easily overlooked as no recent collections are known; the latest are of 1925 (*Posthumis 1046*, Sumatra; *Endert 2080*, East Kalimantan). Possibly a rare species.

## 2. *Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes

*Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes, *Blumea* (2006) 7, f. 3. — Type: *De Wilde, Postar, Tajuddin & Good SAN 143915* (holo L; iso SAN), Sabah, Imbak River area.

Subperennial climber, 2–5 m long, glabrescent (hairs c. 0.1 mm long); main stem c. 5 mm thick. *Tendrils* glabrous or harshly hairy. *Leaves*: petiole 1.5–4 cm long, (scabrous-)hairy, hairs to 1 mm long; blade unlobed or occasionally hastately lobed, subcircular, ovate(-elliptic) or elongate-triangular in outline, 5–12 by 4–8 cm, both surfaces glabrous but scabrous, except for sparse-hairy veins, cystoliths sometimes apparent, base broadly rounded or shallowly truncate-cordate, margin entire or sparsely shallowly dentate. *Male inflorescences* glabrescent; peduncle slender, 1–2 cm long, 0.2 mm thick; raceme (0.2–)0.5–3 cm long, 3–25-flowered. *Male flowers*: pedicel 2–10 mm long; perianth 5–8 mm diam.; receptacle-tube urceolate, 3.5–4.5 by 2.5–3.5 mm, outside glabrous, inside with a broad band of dense, c. 1 mm long hairs, 1.5–2 mm below the throat; sepals (0.5–)1 mm long, glabrous, adaxially with a short spur (Fig. 32a, f); petals (ob)ovate-elliptic, 3–4 by (2–)2.5–3 mm, blunt or rounded, papillose (gland-)hairy, (creamy-)white, ± recurved at anthesis and exposing anthers; filaments c. 0.5 mm long, rather thick, anthers broad-ellipsoid or subcircular, 1.2–1.5 mm diam., orange, contrasting with the white corolla, thecae short-ellipsoid, ± curved, sublateral with broad connective (Fig. 32); disc subglobose, c. 1.5 mm diam., 3-parted in the upper third. *Female flowers*: pedicel 2–10 mm long; ovary long-fusiform, glabrous, 10(–15) by 2.5 mm, at apex ± narrowed into a neck 2–3 mm long; perianth as in male flowers but larger, 10–12 mm diam., inside faintly hairy; style c. 4 mm long, glabrous, stigma c. 3 mm diam., consisting of 3 thick lobes densely set with slack (pendent) hairs 1–1.5 mm long; staminodes absent; disc a depressed ring-shaped cushion, c. 1 by 2.5 mm. *Fruit* ripening dark green, paler striped, (4–)5–8 by 1–1.5 cm; pulp greenish white; fruiting pedicel 0.4–1.5 cm long. *Seeds* 7–8 by c. 4 by c. 1.5 mm.

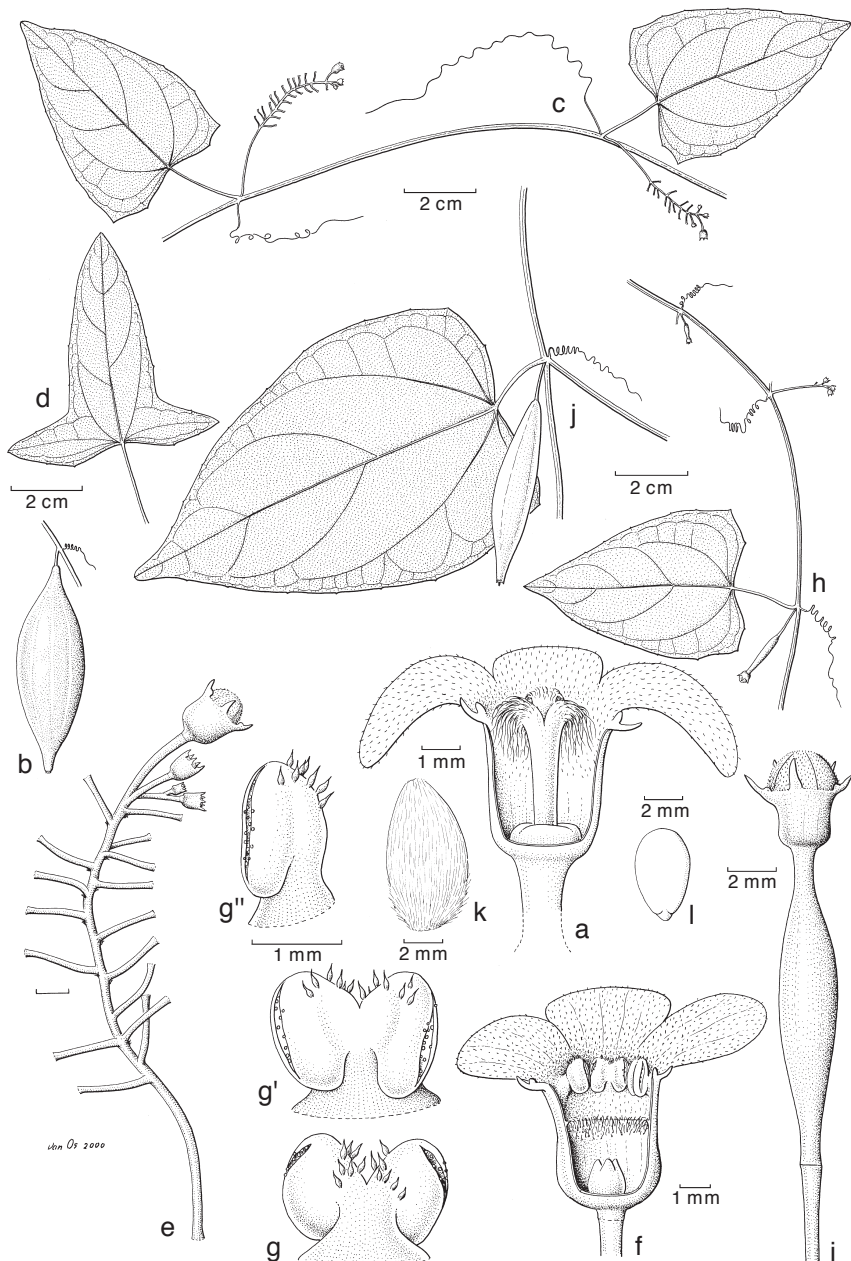


Fig. 32. a, b. *Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes subsp. *chlorocarpa*. a. Female flower, opened; b. fruit. — c–l. *Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes subsp. *halimunensis* W.J.de Wilde & Duyfjes. c. Portion of male branch; d. leaf; e. male inflorescence; f. male flower, opened; g, g', g'' stamens; h. portion of female branch; i. female flower bud; j. node with fruit; k. seed; l. embryo (a: De Wilde SAN 141909; b: Postar et al. SAN 143729; c, e–g: De Wilde 21876; d: De Wilde 21877; h–j: De Wilde & Duyfjes 21927, type; k, l: De Wilde 21875).

Distribution — Borneo (Sabah, NE Kalimantan), Java (Gn Halimun).

Field-notes — Flowers creamy-white, anthers orange. Fruits dark green, paler striped, smelling of cucumber. The flowers sometimes develop from short shoots on the older wood, in shady environment, close to the ground.

#### KEY TO THE SUBSPECIES

- 1a. Male pedicels 2–4 mm long. Male disc with rounded lobes. — NE Borneo . . . . .  
 . . . . . **a. subsp. chlorocarpa**  
 b. Male pedicels 5–10 mm long. Male disc with subacute lobes. — West Java (Gn Halimun) . . . . . **b. subsp. halimunensis**

#### **a. subsp. chlorocarpa**

Male pedicels 2–4 mm long; male disc with broadly rounded lobes. Fruiting pedicel 0.5(–1) cm long. — **Fig. 32a, b; Plate 17a, b.**

Distribution — Borneo (Sabah, NE Kalimantan).

Habitat & Ecology — Shaded in (disturbed) primary forest and forest edges; recorded from limestone and brown loamy soil; at altitudes from sea level to 1000 m; flowering and fruiting mainly from July to January.

#### **b. subsp. halimunensis** W.J.de Wilde & Duyfjes

*Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes subsp. *halimunensis* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 9, f. 3: c–l. pl. 2. — Type: *De Wilde & Duyfjes 21927* (holo L; iso BO), Java, Gn Halimun.

Male pedicels 5–10 mm long; male disc with subacute lobes. Fruiting pedicel c. 1 cm long. — **Fig. 32c–l; Plate 17c, d.**

Distribution — West Java: Gn Halimun.

Habitat & Ecology — Shaded in montane forest, along rivulets and on slopes; 800–1500 m; flowering and fruiting throughout the year.

### 19. KEDROSTIS

*Kedrostis* Medik., Philos. Bot. 2 (1791) 69; W.J.de Wilde & Duyfjes, Reinwardtia 12 (2004) 129.

— Type species: *Kedrostis africana* (L.) Cogn. (*Bryonia africana* L.).

*Cerasiocarpum* Hook.f. in Benth. & Hook.f., Gen. Pl. 1 (1867) 832; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 728; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 298. — Type species: *Cerasiocarpum zeylanicum* (Thwaites) C.B.Clarke (*Aechmandra zeylanica* Thwaites).

Herbaceous or woody climbers, (sub)perennial, leafy stem 1–2 mm diam., glabrous or hairy, with or without rootstock or tubers; monoecious or dioecious (not in Asia?). *Probract* absent. *Tendrils* unbranched (elsewhere 2-branched). *Leaves*: petiole long; blade simple, subentire or (deeply) lobed. *Flowers* small; petals yellow (elsewhere whitish). *Male inflorescences* in short or long pedunculate racemes; pedicels short, persistent; bracts mostly absent. *Male flowers*: receptacle-tube cup-shaped; sepals small;

petals free (elsewhere shortly united), imbricate, rounded at apex, glabrescent or short (glandular) hairy; stamens 3 (elsewhere 5 and all anthers 1-thealous), inserted in or close to the mouth of the receptacle-tube; filaments short, anthers two 2-thealous, one 1-thealous, with or without apically produced connective; thecae straight or little (much) curved, disc basal, minute, unlobed or not apparent and fused with the base of the receptacle-tube. *Female flowers* single or in a short, few-flowered raceme, sometimes co-axillary with male raceme; ovary ovoid, glabrous or hairy, 2- or 3- (or 4)-locular; ovules few; style distinct; stigmas 2 (or 3), each irregularly lobed; staminodes absent or usually 3 (or 5), inserted in the mouth of the tube; disc absent or not apparent. *Fruit* solitary or few-fascicled, ripening red, fleshy, glabrous or hairy, subglobose or ovoid, indehiscent (elsewhere fusiform, rarely dehiscent). *Seeds* 1 or 2 (elsewhere few), subglobose, usually smooth, not ornamented (elsewhere ornamented), without margin, edge entire.

Distribution — An Old World genus of c. 25 species, of which 4 (5) species in Asia; not in Australia; in *Malesia* 3 species.

#### KEY TO THE SPECIES

- 1a. Leaves with sparse appressed coarse hairs ..... **2. *K. hirta***  
 b. Leaves glabrous ..... 2  
 2a. Male raceme to 15 cm long. Fruiting pedicel 0.5–1 cm long. Fruit globose or ± transversely ellipsoid, 1–1.2 by 1–1.7 cm ..... **1. *K. bennettii***  
 b. Male raceme 1(–1.5) cm long. Fruiting pedicel c. 0.2 cm long. Fruit (narrowly) ovoid, c. 1.5 by 1–1.2 cm ..... **3. *K. monosperma***

#### 1. *Kedrostis bennettii* (Miq.) W.J.de Wilde & Duyfjes

*Kedrostis bennettii* (Miq.) W.J.de Wilde & Duyfjes, Reinwardtia 12, 2 (2004) 130, f. 1. — *Bryonopsis bennettii* Miq., Fl. Ned. Ind. 1, 1 (1856) 657. — *Cerasiocarpum bennettii* (Miq.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 729; in Engl., Pflanzenr. 66, 4.275.1 (1916) 239, p.p., excl. f. 55 and material from India and Sri Lanka; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 298. — Type: *Horsfield s.n.* (holo U, barcode U0001454; iso K, U, barcode U0001455), Java.

Climber 2–5 m long, glabrous (in young parts with minute greyish hairs and brown gland-hairs), cystoliths usually obvious; monoecious or seemingly dioecious. *Leaves*: petiole 3–6 cm long; blade unlobed, or ± 5-angular or shallowly (deeply) 3(–5)-lobed, subcircular or (narrowly) ovate in outline, 5–17 by 8–15 cm, glabrous, margin minutely remotely dentate. *Male raceme*: peduncle 3–7 cm long, solitary or co-axillary with female flower(s); raceme spike-like, up to 15 cm long, (10–)20–40-flowered, flowers rather spaced. *Male flowers*: pedicel persistent, 1–2(–5) mm long, faintly articulate 0.5–1 mm below receptacle-tube; receptacle-tube (2–)2.5–3 by (2–)3–5 mm, throat densely hairy, hairs white, 0.5–1 mm long; sepals triangular, (0.5–)1 by 0.7–1 mm, glabrous (except few minute brown gland-hairs); petals ± recurved, (ob)ovate, 2.5–3 by 2–2.5 mm, apex obtuse or rounded, in apical part densely fine hairy outside, densely gland-hairy inside; filaments 1(–1.5) mm long, with minute (gland) hairs, anthers connivent, dorsifixed above halfway, giving the anthers a ‘nodding’ aspect, (1–)1.5 mm

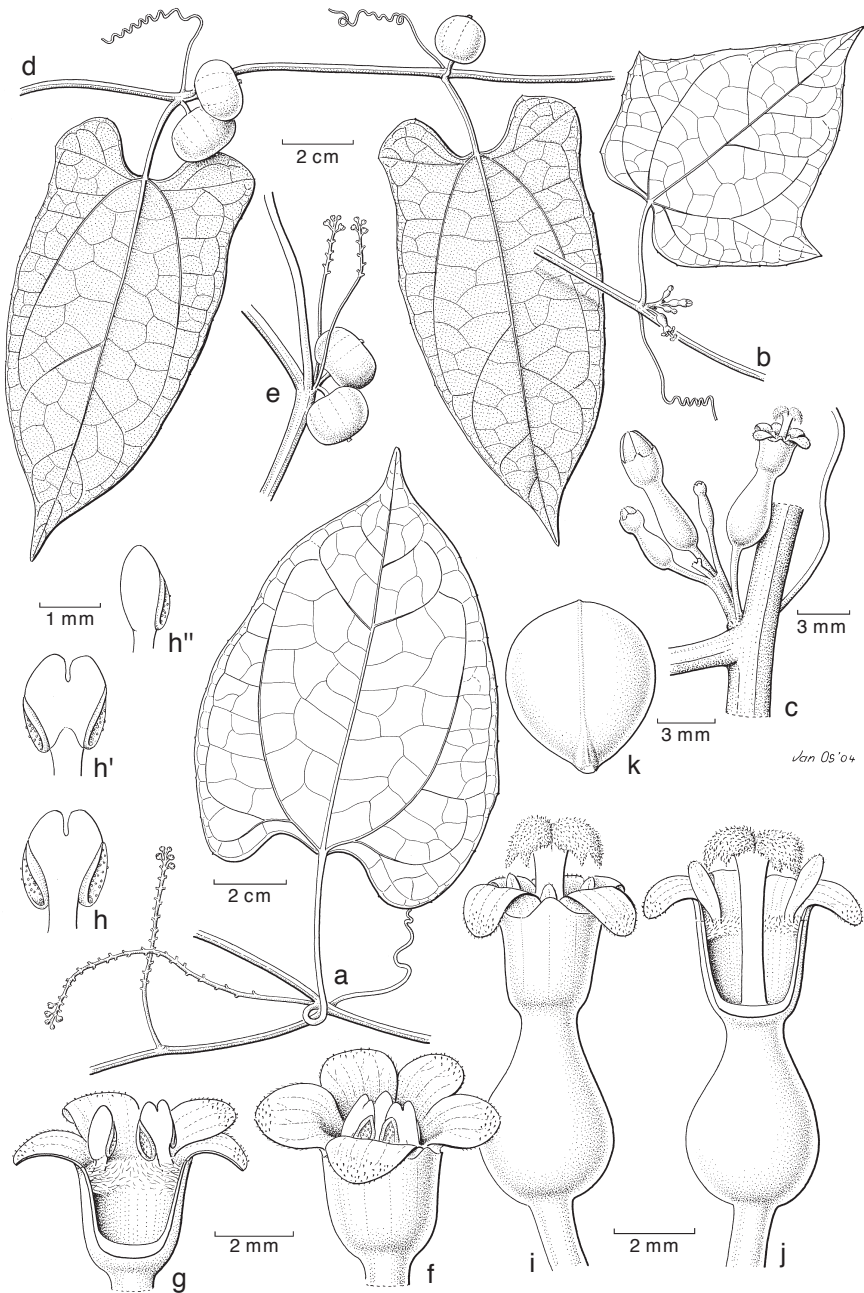


Fig. 33. *Kedrostis bennettii* (Miq.) W.J. de Wilde & Duyfjes. a. twig with male inflorescences; b. twig with female inflorescence; c. ditto, in detail; d. twig with fruits; e. twig with two male inflorescences and two fruits at the node; f. male flower; g. male flower, opened; h, h', h''. anther, seen abaxially, adaxially, and laterally respectively; i. female flower; j. female flower, opened; k. seed (a: Koorders & Koorders-Schumacher 44080; b, c, e–k: De Wilde et al. SAN 144527; d: Amdjah 218).

long, c. 1(–1.5) mm diam., connective broad and swollen, split at base and apex to c. 1/4 deep, apical lobes broadly rounded, thecae narrow, c. 1 mm long, straight,  $\pm$  introrsely opening; disc (or pistillode) absent. *Female flowers* 1–4 (sub)fascicled at the node; pedicel 2–5 mm long; ovary ovoid(-oblong), 3–4 mm long, 2–3 mm wide, glabrous; perianth as in male flowers; staminodes 5, minute, either c. 0.5 mm long or larger and broader, petal-like, 1(–1.5) mm long; style 2.5–3 mm long; stigma c. 2.5 mm diam., 2-lobed, lobes sessile, ( $\pm$  woolly) hairy, each shallowly 2- (or 3)-lobed; ovary 2- (or 4?-)locular, each locule in basal part with 1 ovule. *Fruit* ripening shiny yellow or red, smooth, on drying pale brown, finely wrinkled and dull, globose or  $\pm$  transversely ellipsoid, 1–1.2 by 1–1.7 cm; fruiting pedicel 0.5–1 cm long. *Seeds* 1 or 2, greyish or brownish, subglobose, 7–8 mm diam., faintly low-margined, smooth. — **Fig. 33; Plate 12c, d, 13a.**

Distribution — Sumatra, Borneo (Sabah, East Kalimantan), West & Central Java, Sulawesi, Lesser Sunda Islands (Bali).

Habitat & Ecology — A rare species of scattered distribution on damp, rich soil, also known from limestone; to 1400 m.

Note — The collection *van Balgooy 7551* from Bali, has in the male raceme caducous bracts, 1–3 mm long.

## 2. *Kedrostis hirta* W.J.de Wilde & Duyfjes

*Kedrostis hirta* W.J.de Wilde & Duyfjes, Reinwardtia 12, 2 (2004) 132. — Type: *De Wilde & Duyfjes 19257* (holo L), Sumatra, Aceh (Gn Leuser National Park, Ketambe).

Climber, 2–5 m; sparsely (brown-)grey hairy, leafy stem 1.5–5 mm diam., with curved hairs 0.1(–0.2) mm long, cystoliths not obvious; monoecious. *Leaves*: petiole 3–4 cm long, with curved hairs c. 0.5 mm long, the lower portion  $\pm$  twisted on drying; blade 3- or 5-lobed to 1/3–3/4, subcircular in outline, 9–13 cm diam., lobes narrowly triangular or narrowly elliptic, 3–9 cm long, both surfaces sparsely appressed hairy, hairs c. 1 mm long, margin with sparse brown-black soft teeth to 1 mm long. *Male raceme* 5–10-flowered in a condensed spike 0.5–1 cm long; peduncle c. 1.5 cm long, co-axillary with female flowers. *Male flowers*: pedicel c. 1 mm long; flowers not known. *Female flowers* solitary or 2–5 fascicled at the node or with (presumably) male flowers arranged in 0.5–3 cm long lateral short-shoots. *Fruit* subglobose-ellipsoid, 1–1.3 cm long, dull brown, coarsely wrinkled on drying; fruiting pedicel c. 0.3 cm long. *Seed* 1, globose, c. 7 mm diam., dark brown with a faint paler margin, smooth.

Distribution — Sumatra, only known from the type.

Habitat & Ecology — Forest edges or open places in forest, to 400 m; fruiting in July.

Note — *Kedrostis hirta* is similar to *K. bennettii*, the latter is glabrous and has a long many-flowered male inflorescence, to 15 cm long.

## 3. *Kedrostis monosperma* W.J.de Wilde & Duyfjes,

*Kedrostis monosperma* W.J.de Wilde & Duyfjes, Gard. Bull. Singapore 61, 1 (2009) 205, f. 1, 2. — Type: *Rahim Ismail KEP 100114* (holo KEP; iso K, L, SING), Peninsular Malaysia, Pahang, Gn Benom Game Reserve.



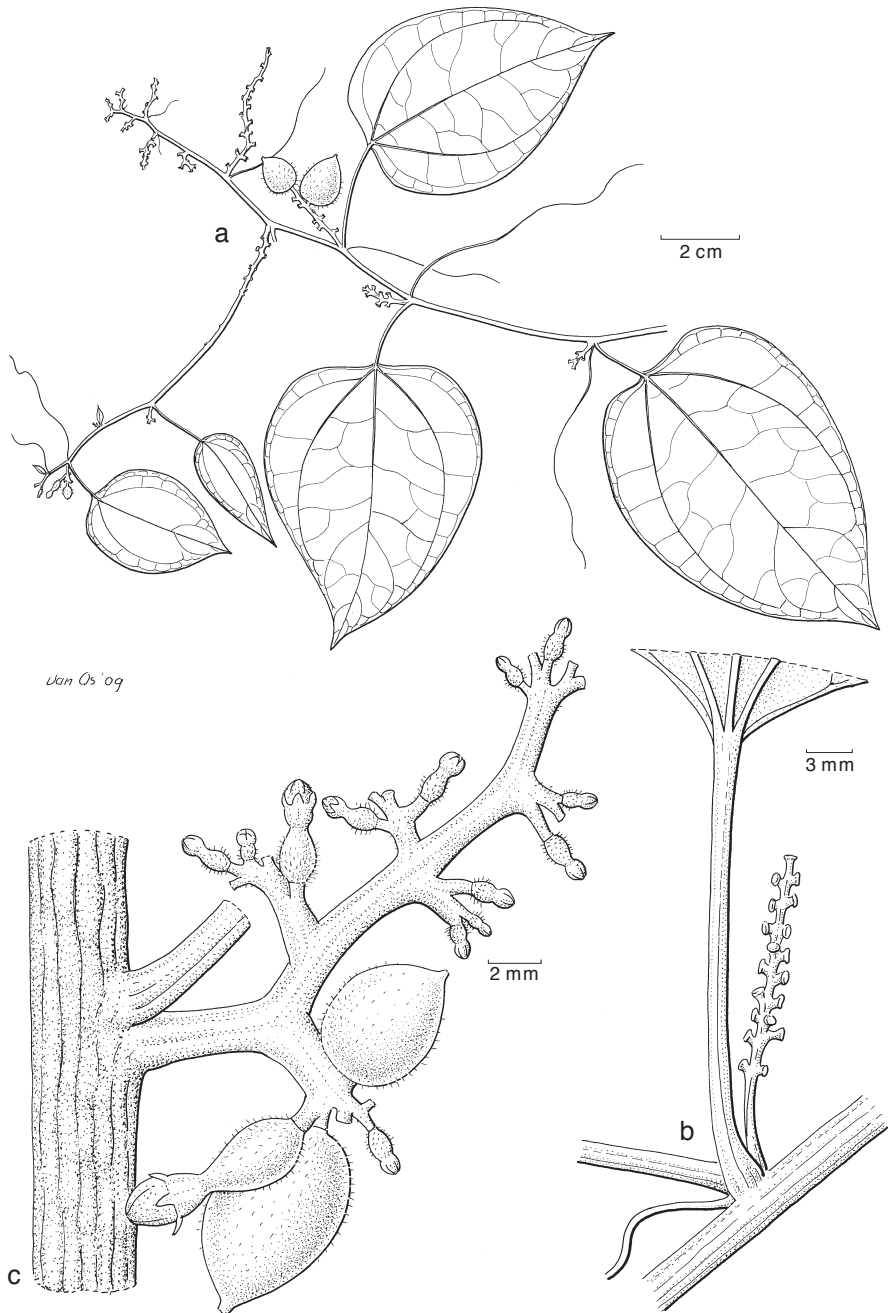


Fig. 34. *Kedrostis monosperma* W.J.de Wilde & Duyfjes. a. Apex of branch with female inflorescences with immature and mature fruit; b. node with male inflorescence (all flowers fallen off); c. node with compound female inflorescence with female flower buds and immature fruits (a, c: Siti Munirah *et al.* FRI 65736; b: Rahim Ismail KEP 100114, type).

Climber 5–7 m long, glabrous (except ovary), cystoliths not obvious; monoecious. *Leaves*: petiole 1.5–3 cm long; blade unlobed, (broadly) ovate, 9–13 by 4–7.5 cm, glabrous, base  $\pm$  rounded or truncate or faintly hastate, margin (sub)entire, apex 1–1.5 cm acuminate. *Male raceme*: peduncle 0.2–0.5 cm long, co-axillary with female inflorescence; raceme spike-like, 1(–1.5) cm long, 10–20-flowered, flowers  $\pm$  densely set. *Male flowers*: pedicel 1–1.5 mm long, persistent; mature flowers not known. *Female inflorescence* an axillary (lateral) or terminal few-branched short-shoot 10–30 mm long, the branches 5–10 mm long, each with 5(–10) flowers of different stages of development in loose clusters; bracts subulate, c. 0.5 mm long, caducous. *Female flowers*: pedicel 1–2 mm long; ovary ovoid, c. 5.5 mm by 3 mm, base rounded, gradually narrowed to the apex in upper half, (sparsely) fine-hairy, hairs 0.2 mm long of many serial cells, 2-loculed, each locule with 1 ovule; receptacle-tube 2(–2.5) mm across, inside glabrous; sepals (long) triangular, 0.5–1 mm long; petals (ob)ovate, c. 3 by (1.5–)2 mm, apex broadly rounded, both surfaces papillose hairy, hairs 0.1 mm long, style c. 3 mm long, stigma 2-lobed, 2–2.5 mm wide, lobes  $\pm$  lacerate, papillose; staminodes minute, fleshy, 0.2–0.3 mm long, two paired and one solitary. *Fruit* ripening glossy orange-red, drying glossy, (narrowly) ovoid, c. 1.5 by 1–1.2 cm, glabrescent; fruiting pedicel c. 0.2 cm long. *Seeds* 1 per fruit, (pale) brown, globose, c. 7 mm across, faintly low-margined, smooth. — **Fig. 34; Plate 12a, b.**

Distribution — Peninsular Malaysia, Pahang, Ulu Krau, known from 2 collections.

Habitat & Ecology — Dense primary lowland forest on hillsides with rich soil; flowering and fruiting in April and November.

Notes — 1. *Kedrostis monosperma* is similar to *K. bennettii*, the latter with a wider distribution in western Malesia, but not known from peninsular Malaysia. In *K. bennettii* the disposition of the fruit is different, single or few subaxillary to leaves, the fruits are dull on drying, globose or transversely ellipsoid, 1- or 2-seeded, with a longer fruiting pedicel, 5–10 mm long; the male racemes are much longer, to 15 cm long with longer peduncle, 3–7 cm long; the petioles are generally longer, 2–6 cm long. As far as can be judged from the few female flowering collections of *K. monosperma*, the ovary is hairy, the perianth glabrous inside, in *K. bennettii* the ovary is (sub)glabrous and the perianth hairy in the throat.

2. The older stem of the liana is c. 5 mm thick, and the bark has whitish corky patches.

## 20. LAGENARIA

*Lagenaria* Ser., Mém. Soc. Phys. Genève 3, 1 (1825) t. 2 [Mém. Fam. Cucurbitacées (1825), t. 2]; C. Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1531. — Type species: *Lagenaria vulgaris* Ser.

Robust annual (or perennial) climbing herbs, leafy stem 2–5 mm diam., plant finely hairy; monoecious (or dioecious). *Probract* absent (or present, not in Asia). *Tendrils* (unbranched or) 2-branched. *Leaves*: petiole long, usually with a pair of glands at apex; blade simple, unlobed or lobed. *Flowers* solitary, large; petals white, free. *Male flowers*: pedicel long; receptacle-tube campanulate or elongate; sepals narrow; petals obovate,

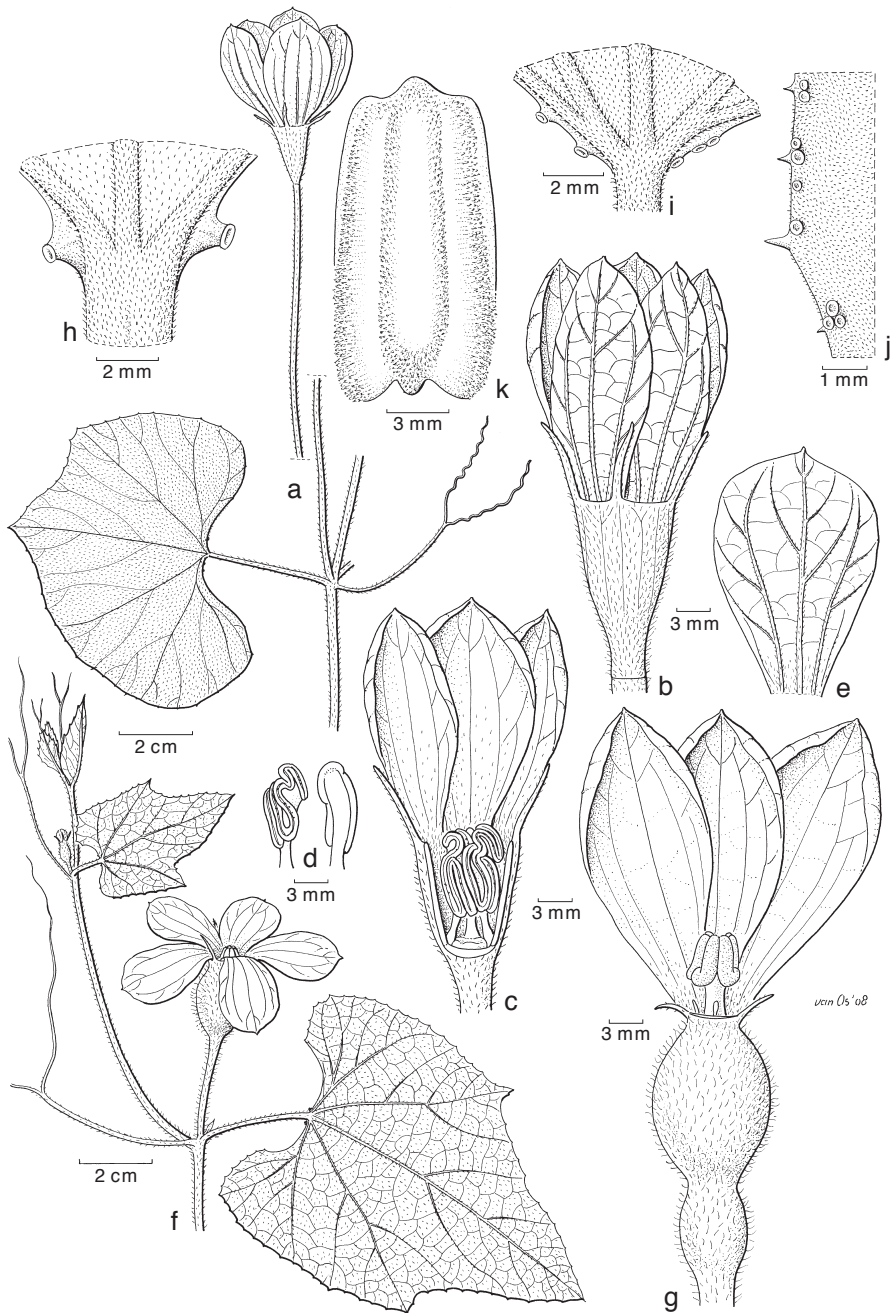


Fig. 35. *Lagenaria siceraria* (Molina) Standl. a. Habit of node with male flower; b, c. male flowers; d. stamens; e. petal; f. habit of node with female flower; g. female flower; h, i. blade bases with glands at transition to petiole; j. leaf margin showing glands, abaxial view; k. seed (a–e, g: De Wilde & Duyfjes 21873C, culta, Netherlands; f, i: Phonsena et al. 5683, Thailand; h, j, k: Wiradinata 472, culta, Sumba).

margin entire or  $\pm$  crisped; stamens 3, filaments free, inserted on the tube towards the base, anthers coherent but free, two 2-thecous, one 1-thecous, thecae plicate and often also much contorted, connective broad; disc present. *Female flowers*: pedicel shorter than in male flowers; ovary hairy, ovules numerous, horizontal; perianth as in male flowers, but receptacle-tube short; style short, stigma deeply 3-lobed or consisting of 3 subsessile parts, each  $\pm$  entire or 2-lobed; disc absent; staminodes small. *Fruit* ripening green or yellowish, large, hard-shelled, inside fleshy, indehiscent. *Seeds* numerous, compressed, margin  $\pm$  distinct, edge entire.

Distribution — About 6 species in Africa, one also in South America; in *Malesia*: 1 species, *Lagenaria siceraria*, widely cultivated.

### 1. *Lagenaria siceraria* (Molina) Standl.

*Lagenaria siceraria* (Molina) Standl., Field Mus. Nat. Hist., Bot. Ser. 3 (1930) 435; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 302; Widjaja & M.E.C.Reyes, PROSEA 8 (1993) 190; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 64; Fl. Thailand 9, 4 (2008) 460. — *Cucurbita siceraria* Molina, Sag. Stor. Nat. Chili (1782) 133. — Type: *Molina* (not seen), South America, Chile.

*Cucurbita lagenaria* L., Sp. Pl. ed. 1 (1753) 1010. — Type: *Herb. LINN No. 1151/1* (lecto, LINN, designated by Jeffrey in Milne-Redhead & Polhill (ed.), *Fl. Trop. E. Africa, Cucurbitaceae* 17 (1967) 51 (see C.E.Jarvis, Order out of chaos (2007) 465)), a cultivated plant at Uppsala.

*Lagenaria vulgaris* Ser., Mém. Soc. Phys. Genève 3, 1 (1825) t. 2; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 417; Craib, Fl. Siam. 1 (1931) 756. — Type: not indicated.

Robust climber or trailer to 5 m long, glabrescent; usually cultivated. *Probract* absent. *Tendrils* 2-branched. *Leaves*: petiole 4–20 cm long, laterally at apex with 2 small (raised) glands; blade unlobed or obscurely 3–9-lobed, reniform, suborbicular or ovate in outline, 5–30 cm diam., cystoliths not obvious, margin (sparsely) finely dentate, soft hairy, apex obtuse or acute. *Male flowers*: pedicel 40–300 mm long; perianth 40–60(–120) mm diam.; receptacle-tube (long-)campanulate, slightly bulbous at base, 10–15 mm long, soft hairy; sepals spaced, narrowly triangular or linear, c. 5 mm long; petals broadly obovate, 20–40(–50) by (10–)15–35 mm, soft hairy, margin (sub)entire; stamens inserted below halfway in the receptacle-tube, anthers forming a  $\pm$  elongate whole, filaments free, 2–3 mm long, glabrous; disc gland-like, at base of tube. *Female flowers*: pedicel 5–7 mm long; ovary cylindrical, reversed flask-shaped or obovoid, 10–20 mm long, villose; receptacle-tube 2–3 mm long; sepals and petals as in male flowers but somewhat smaller. *Fruit* solitary, ellipsoid or variously flask-shaped, often with a long 'neck', (6–)10–80 cm long, up to 20 cm wide, glabrescent; fruiting pedicel 5–10 cm long. *Seeds* pale brown, subtruncate at both ends, (7–)10–20(–25) mm long,  $\pm$  2-horned on the broader end, faces shallowly ornamented and with two submarginal ridges. — **Fig. 35; Plate 13b, 32b.**

Distribution — Worldwide cultivated.

Notes — 1. The flowers are open during the night.

2. *Lagenaria siceraria*, very variable in fruit- and seed-size and shape, was already known in pre-Columbian times in South America, but it possibly originates from Africa. Small-fruited forms, not necessarily wild forms, are known from e.g. the Moluccas or from Africa. Small immature fruits are offered as a vegetable on markets.

## 21. LUFFA

*Luffa* Mill., Gard. Dict. Abr., ed. 1–4 (1754) without pagination; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 455; G.J.Jansen, Gildemacher & Phuphathanaphong, PROSEA 8 (1993) 194; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1539. — Type species: *Luffa aegyptiaca* Mill.

Annual or subperennial, climbing herbs to 10 m long, leafy stem 2–5 mm diam., puberulous, late glabrescent, scabrid; monoecious (one species dioecious, not in our area); wild, cultivated or running wild. *Probract* fleshy, less than 5 mm long, with glands. *Tendrils* branched. *Leaves*: blade simple, mostly lobed. *Flowers* medium or large; petals folded in bud, yellow, free, margin entire. *Inflorescences*: male flowers in peduncled bracteate racemes; bracts narrowly ovate, to c. 5 mm long; female flowers solitary, often co-axillary with male inflorescence. *Male flowers* pedicelled; receptacle-tube small, shallow; sepals enclosing petals in bud; stamens 3 or 5: two in pairs and one single, the paired ones free or the filaments variously fused, then appearing as 3 stamens of which two 2-theous, one 1-theous, filaments free, inserted at base of the receptacle-tube, anthers free, but usually connivent into a subglobose synandrium, connective mostly broad, thecae marginal, convoluted-plicate; disc not apparent. *Female flowers*: receptacle-tube and perianth as in male flowers; ovary elongated or ovoid, smooth (or spiny not in Malesia), ovules numerous, horizontal; style short, stigma 3-parted, each part 2-lobed; staminodes small; disc absent. *Fruit* subglobose to (long-)cylindrical, smooth or ribbed (or with short spines), when ripe dry and fibrous within, dehiscing by an apical operculum. *Seeds* numerous, medium-sized, compressed, (narrowly) elliptic in outline, faces smooth or rugate, margin mostly distinct, edge entire.

Distribution — About 7 species, of which 4 in the Old World (mainly Africa) and 3 in America; in *Malesia*: 2 species, both widely cultivated in all tropical regions.

### KEY TO THE SPECIES

- 1a. Plant flowering during the night, flowers pale yellow. Fruit 10-ribbed. Leaves rather pale green, angular or lobed up to 1/3 deep . . . . . **1. *L. acutangula***
- b. Plant flowering during daytime, flowers bright yellow. Fruit not ribbed. Leaves dark green, variable of shape, lobed up to 4/5 deep . . . . .  
 . . . . . **2. *L. aegyptiaca*** (with two forms)

#### 1. *Luffa acutangula* (L.) Roxb.

*Luffa acutangula* (L.) Roxb., Hort. Bengal. (1814) 70; Fl. Ind. 713. 1832; Craib, Fl. Siam. 1: 756. 1931; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 300; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 67; Fl. Thailand 9, 4 (2008) 461. — *Cucumis acutangulus* L. (1753) 1011. — *Cucurbita acutangula* (L.) Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 932. — Type: not designated (see note in C.E.Jarvis, Order out of chaos (2007) 464).

Medium-sized climber to 5 m long, stem 2–4 mm diam., glabrous or subscabrous. *Probract* with 2–5 glands. *Tendrils* 3–5-branched. *Leaves*: pale green; petiole 5–12 cm long; blade unlobed or shallowly 5–7-lobed, subcircular in outline, 5–20 cm diameter.

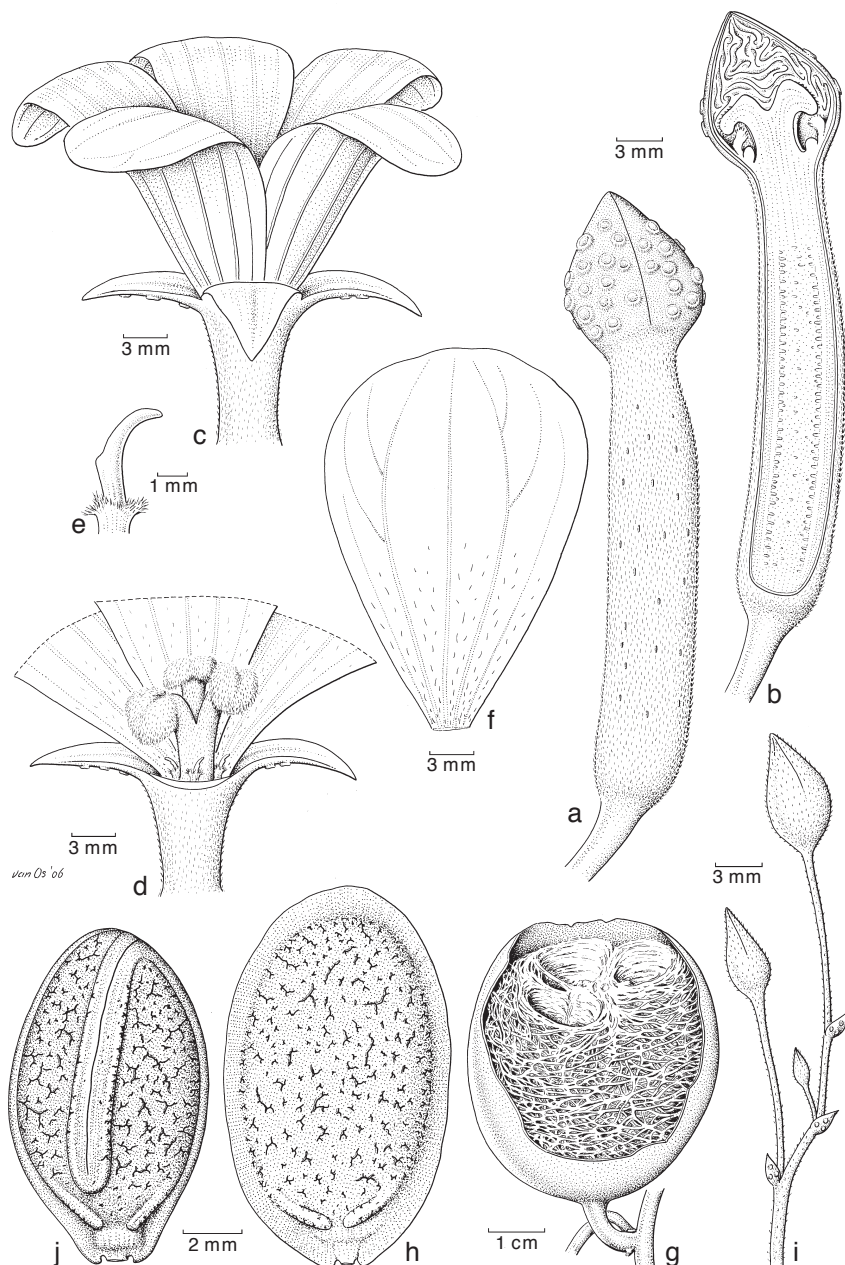


Fig. 36. a–f. *Luffa aegyptiaca* Mill. forma *aegyptiaca* (cultivated form). a, b. Female buds, from outside and opened respectively; c, d. female flower, from outside and opened respectively; e. staminode; f. petal. — g, h. *Luffa aegyptiaca* Mill. forma *sylvestris* (Miq.) W.J.de Wilde & Duyfjes (wild form). g. Fruit, opened, operculum removed; h. seed. — i, j. *Luffa acutangula* (L.) Roxb. (cultivated form). i. Apex of male inflorescence with buds; j. seed (anomalous) (a–f: De Wilde & Duyfjes 22305; g, h. De Wilde & Duyfjes 21861; i. De Wilde & Duyfjes 21679; j. De Wilde & Duyfjes 21743).

*Flowers* opening at night; pale yellow; male and female perianth similar; male flowers in a peduncled raceme; female solitary or usually co-axillary with male raceme. *Male flowers*: pedicel 10–40 mm long; receptacle-tube shallowly campanulate; sepals narrowly elliptic; petals obovate, c. 20 mm long, apex rounded or emarginate; stamens 3, filaments 3–4 mm long. *Female flowers*: pedicel 50–100 mm long; ovary obovate-ellipsoid, 10-ridged. *Fruit* long-ellipsoid, 10-ridged, 10–30 by 4–10 cm, apex obtuse or acute, green, glabrous; pulp fibrous, operculum small. *Seeds* numerous, grey-black, ovate-elliptic in outline, 10–12 by 6–8 mm, smooth or rugose, not winged, margin narrow,  $\pm$  square. — **Fig. 36i, j; Plate 33b.**

Distribution — Originally in South Asia (India); in *Malesia*: widely cultivated.

## 2. *Luffa aegyptiaca* Mill.

*Luffa aegyptiaca* Mill., Gard. Dict., ed. 8 (1768) without pagination, based on *Momordica luffa* L., Sp. Pl. ed. 1 (1753) 1009; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 300; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 ‘2007’) 68; Fl. Thailand 9, 4 (2008) 462. — Type: a cultivated plant, no specimen located.

*Momordica cylindrica* L., Sp. Pl. ed. 1 (1753) 1009. — *Luffa cylindrica* (L.) M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 63.; Craib, Fl. Siam. 1 (1931) 756; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 47; I.Telford, Fl. Australia 8 (1982) 179. — Type: *Herb. LINN No. 1150.9* (lecto, designated by Wunderlin, Ann. Missouri Bot. Gard. 65 (1978) 329 (see C.E.Jarvis, Order out of chaos (2007) 680; however, there is still no clarity about the type).

*Luffa petola* Ser. in DC., Prodr. 3 (1828) 303; Miq., Fl. Ned. Ind. 1, 1 (1856) 667. — Type: “*Petola*” in Rumphius, Herb. Amboin. 5 (1747) 405, t. 147.

*Luffa subangulata* Miq., Fl. Ned. Ind. 1, 1 (1856) 667. — *Luffa acutangula* (L.) Roxb. var. *subangulata* (Miq.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 461. — Type: *Horsfield s.n.* (holo U (barcode U0001467); iso BM).

Climbers 5–15 m long, stem 2–5 mm diam., glabrescent, scabrous. *Probract* 3–5 mm long, acute, with (1–)4–8 glands. *Tendrils* 2–6-branched. *Leaves*: petiole 2–15 cm long; blade dark green, palmately 3–5(–7)-lobed, c. 1/4 deep or much deeper, lobes various, suborbicular in outline, 5–15 cm diam., glands small. *Flowers* opening at daytime; bright yellow. *Male flowers* in peduncled raceme, 5–35 cm long, peduncle 5–12 cm long; bracts (narrowly) ovate, c. 5 mm long, glandular; pedicel 2–10 mm long; receptacle-tube c. 5 mm wide, mostly hairy inside; sepals triangular, acute(-acuminate), 5–10 mm long, with few glands; petals broadly rounded, 20–45 by 15–30 mm; stamens 3 or 5, exerting from receptacle-tube, anthers 3–5 mm diameter. *Female flowers*: pedicel 10–30 mm long, ovary ellipsoid or cylindrical, 15–30 mm long, finely hairy, smooth or obscurely ribbed. *Fruit* ripening (light and dark) yellow green, globose, short- to long-ellipsoid or cylindrical, 3–20(–50) cm long, not ribbed, glabrous; pulp fibrous, operculum small, beaked; fruiting pedicel 1–6 cm long. *Seeds* numerous, dull blackish, elliptic in outline, 7–12 by 4–8 mm, with narrow membranous wing-like border.

Distribution — Old World, Australia, naturalized in tropical America; in *Malesia*: widely cultivated and locally with feral or truly wild forms.

Vernacular names — Vegetable Sponge, Loofah.

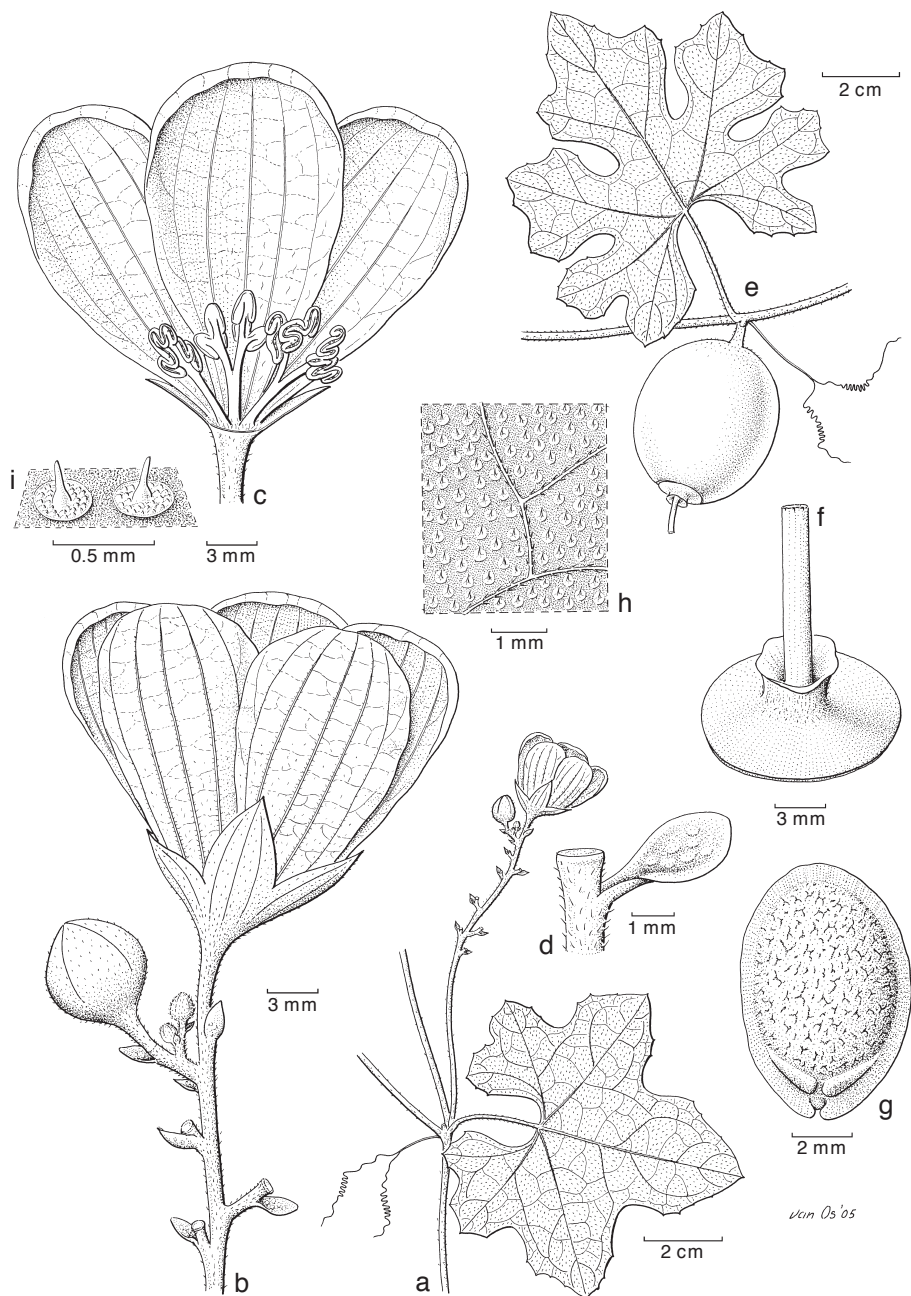


Fig. 37. *Luffa aegyptiaca* Mill. forma *sylvestris* (Miq.) W.J.de Wilde & Duyfjes (wild form). a. Node with male inflorescence; b. apex of male inflorescence; c. male flower, opened; d. detail of male pedicel with bract, shifted up along pedicel; e. node with fruit; f. operculum of fruit; g. seed, same shape as in cultivated form, but smaller; h, i. detail of upper leaf blade surface with coarse hairs inserted on cistolyths (all: De Wilde & Duyfjes 21861).



## KEY TO THE FORMS

- 1a. Plant robust. Fruit ellipsoid to cylindrical, 10–20(–60) cm long . . . . . **a. forma aegyptiaca**  
 b. Plant less robust in all parts. Fruit globose, 3–5 cm diam. or (broadly) ellipsoid, 3–8(–10) cm long . . . . . **b. forma sylvestris**

**a. forma aegyptiaca**

This is the cultivated form, very variable in fruit-size; often escaped into wild (secondary) vegetations, and at present occurring in all tropical areas. — Fig. **36a–f**; **Plate 13c, d, 33a**.

**b. forma sylvestris** (Miq.) W.J.de Wilde & Duyfjes

*Luffa aegyptiaca* Mill. forma *sylvestris* (Miq.) W.J.de Wilde & Duyfjes, Sandakania 17 (2008 ‘2007’) 70. — *Luffa sylvestris* Miq., Fl. Ned. Ind. 1, 1 (1856) 666. — Type: “*Petola silvestris*” in Rumph., Herb. Amboin. 5, p. 409, t. 150, Ambon.

*Luffa aegyptiaca* Mill. var. *leiocarpa* (Naudin) Heiser & E.E.Schill., Biotropica 20 (1988) 186; G.J. Jansen, Gildemacher & Phuphathanaphong, PROSEA 8 (1993) 196. — *Luffa cylindrica* (L.) M.Roem. var. *leiocarpa* Naudin, Ann. Sci. Nat., Sér. 4, 12 (1859) 121. — *Luffa leiocarpa* (Naudin) F.Muell., Fragm. 3 (1862) 107. — Type: Specimen from cultivation (P, not seen).

*Tendrils* (unbranched or) 2- or 3-branched. *Fruit* globose, 3–5 cm diam., or ellipsoid, 5–8(–10) cm long; fruiting pedicel 1–3 cm long. *Seeds* brown-black, c. 7 by 4 mm. — **Fig. 36g, h, 37**.

Distribution — Known from Jemen, India, Australia and the Pacific, and elsewhere; in *Malesia*: East Java (possibly feral), Lesser Sunda Islands (Lombok, Flores), Moluccas (Kai Is.), New Guinea (Papua New Guinea (East New Britain; Morobe, Gulf (Purari delta), and Milne Bay Provinces)).

Habitat & Ecology — Common, often coastal.

Note — Forma *sylvestris* comprises all wild-growing and naturalized small-fruited feral forms. The precise area of occurrence of the wild form is unknown.

**22. MELOTHRIA**

*Melothria* L., Sp. Pl. ed. 1 (1753) 35; Naudin, Ann. Sci. Nat., Bot., Sér. 4, 6 (1859) 148; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 572, p.p.; in Engl., Pflanzenr. 66, 4.275.1 (1916) 75, p.p.; C.Jeffrey, Kew Bull. 15 (1962) 343; Wunderlin, Ann. Missouri Bot. Gard. 65 (1978) 332; W.J.de Wilde & Duyfjes, Blumea 51 (2006) 9, f. 1b, 2b; t. 1. — Type species: *Melothria pendula* L.

Low climbers, subannual, leafy stem 1–1.5(–2) mm diam., green on drying; monoecious. *Probract* absent. *Tendrils* unbranched, glabrescent. *Leaves* simple, unlobed or lobed, palminerved. *Flowers* small, 5(–8) mm diam., yellow; sepals minute, narrow, subpatent; petals free, ovate-elliptic, valvate in bud; receptacle-tube campanulate. *Male inflorescence* a slender peduncled raceme, with congested flowers, mostly with 1 female flower co-axillary. *Bracts* absent. *Male flowers*: receptacle-tube cup-shaped; stamens 3, inserted at c. 1/3 below the throat of the receptacle-tube, filaments free, short, dorsifixed

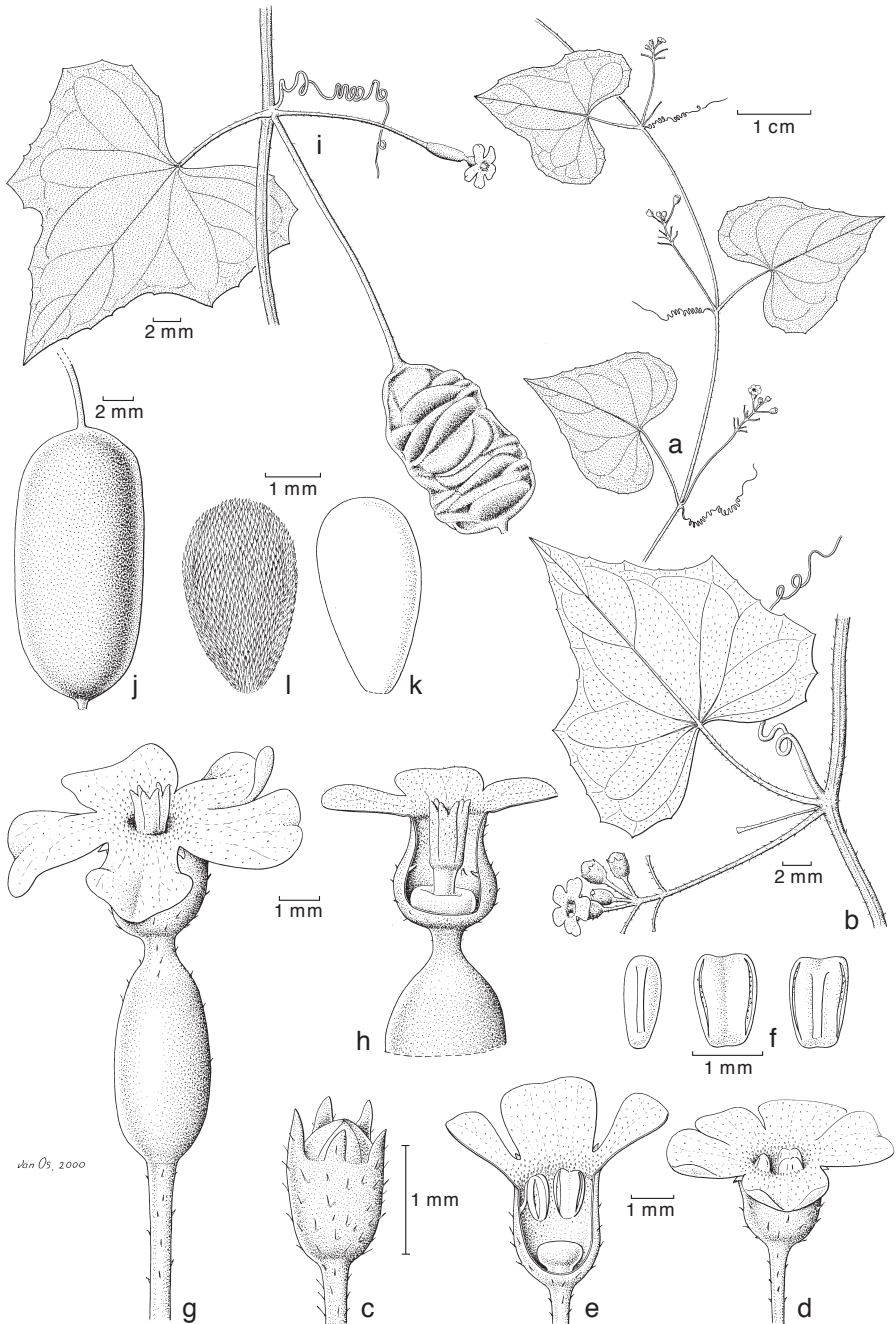


Fig. 38. *Melothria pendula* L. a. Twig with male inflorescences; b. node with one male inflorescence and one pedicel from fallen female flower; c. male bud; d, e. male flowers; f. anthers with short, narrow filaments; g, h. female flowers; i. node with dried fruit showing seeds; j. fruit (from spirit); k. seed; l. seed, membrane removed (all: *De Wilde & Duyfjes SAN 141901*).

near apex, anthers two 2-theous, one 1-theous, included, thecae lateral, straight, connective narrow, not produced; disc subglobose. *Female flowers* solitary or co-axillary with male raceme; pedicel long; ovary (ellipsoid-)narrowly ovoid, with a slender neck; stigma consisting of 3 erect carnoselobes, papillose; staminodes 3, minute; disc annular, free from the receptacle-tube. *Fruit* solitary, with long slender fruiting pedicel, ellipsoid, small, 1–1.5 cm long, glabrous, juicy. *Seeds* numerous, compressed, ovate-elliptic, not sculptured, margin absent, not winged, edge entire.

Distribution — About 10 species in the New World; 1 weedy species introduced in West Africa and Asia.

Note — The here presented genus description and the description of *M. pendula* are largely based on Asian material of that species.

### 1. *Melothria pendula* L.

*Melothria pendula* L., Sp. Pl. ed. 1 (1753) 35; Naudin, Ann. Sci. Nat., Bot., Sér. 4, 6 (1859) 148; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 586; in Engl., Pflanzenz. 66, 4.275.1 (1916) 87; Wunderlin, Ann. Missouri Bot. Gard. 65 (1978) 333; Correll & H.B. Correll, Fl. Bahamas Arch. (1982) 1429, f. 624; Diggs, Lipscomb & O'Kennon, Sida (1999) 570; T.-W. Hsu, J.-J. Peng & H.-Y. Liu, Taiwania (2001) 193, f. 1–3; W.J. de Wilde & Duyfjes, Blumea 51 (2006) 10, f. 4; pl. 3c, d. — Type: *Herb. LINN No. 51.1* (lecto LINN, designated by Wunderlin (1978)), "Habitat in Canada, Virginia, Jamaica". Taken from 'The Linnean Plant Name Typification Project', with Type Image. (See also C.E. Jarvis, Order out of chaos (2007) 664)).

*Bryonia filiformis* Roxb., Fl. Ind. 3 (1832) 727; Bot. Surv. India, fasc. 7 (1978) pl. 24, left-hand plant. — Type: not seen.

Annual creeper or climber, to 4 m long, sparsely hairy, glabrescent. *Leaves*: petiole 1.5–2.5 cm long, hairy, hairs 0.5 mm long; blade subcircular or ovate in outline, 3–6 by 3–6.5 cm, both surfaces (sparsely) scabrous-hairy, cystoliths minute, margin remotely dentate or shallowly undulate. *Male inflorescences*: hairy as the petiole; peduncle 1–2 cm long, 0.2 mm thick; raceme short, 0.1(–0.5) cm long, with 2–6(–10) crowded flowers. *Male flowers*: pedicel 3–5(–7) mm long; perianth 5(–8) mm diam.; receptacle-tube c. 2.5 by c. 2 mm, outside sparsely hairy, inside minutely glandular, especially in the throat; sepals c. 0.5 mm long; petals patent, 2.5–3 by (2.5–)3 mm, obtuse or retuse, finely glandular; filaments c. 0.5 mm long, slender, anthers ellipsoid, c. 1.5 mm long, connivent but free; disc c. 1 mm diameter. *Female flowers* 1 (or 2); pedicel 10–20 mm long; ovary c. 5 mm long, with a c. 1 mm long neck, glabrous; perianth as in male flower but larger; corolla c. 8 mm diam.; style c. 2 mm long; stigma-lobes 3, erect, each 2-lobed at apex, ± connivent, c. 2 mm long, carnoselobes, papillose, partly exerted; staminodes c. 0.5 mm long, inserted about halfway the receptacle-tube; disc a carnoselobes annulus, c. 1 mm high. *Fruit* solitary, ripening purple-black, (narrowly) ellipsoid, 0.8–1.5 by 0.7–1 cm; pericarp when ripe thin, when dry leaving the seeds shining through; fruiting pedicel 2–4 cm long. *Seeds* numerous, 3.5–4 by 2–2.5 mm, silvery whitish hairy. — **Fig. 38; Plate 16a, b.**

Distribution — A variable widespread species in America: from Texas south to Argentina; introduced into West Africa and tropical Asia: South China (Macau), Taiwan; in *Malesia*: Peninsular Malaysia (Selangor), Borneo (Sabah), Philippines, Sulawesi, Lesser Sunda Islands (Bali).

Habitat & Ecology — Roadsides, beach forest; in crop fields and oilpalm plantations; at low altitudes; flowering and fruiting throughout the year.

Note — In the material studied from Malesia the female flowers have minute staminodes. Naudin (1859), who knew the species well, cultivated it in the botanic garden at Paris from seeds sent by the French consul at Macau as well as from seeds from America. He commented on the often hermaphroditic condition of the female flowers.

### 23. MOMORDICA

*Momordica* L., Sp. Pl. ed. 1 (1753) 1009; Gen. Pl. ed. 5 (1754) 440; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 427; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 299; C.Jeffrey in Hanelt, Mansfeld's encycl. Agric. hort. crops 3 (2001) 1521; W.J.de Wilde & Duyfjes, Bot. Zhurn. (Moscow & St. Petersburg) 87, 3 (2002) 133; Fl. Thailand 9, 4 (2008) 464; H.Schaefer., Heibl & S.S.Renner, Proc. Roy. Soc. London, Ser. B, Biol. Sci. 276 (2009) 843; H.Schaefer. & S.S.Renner, Molec. Phylogen. Evol. 54, 2 (2010) 553. — Lectotype (Britton & Millsp., Bahama Fl. (1920) 425): *Momordica balsamica* L.

Small or large climbers, annual or perennial, glabrous or pubescent; monoecious or dioecious; wild or cultivated. *Probract* (in Asia) absent. *Tendrils* unbranched (or outside Malesia, rarely proximally 2-branched, or in Africa rarely spinose). *Leaves*: blade simple, unlobed or lobed, or (sub)pedately 3-foliolate (in Africa more-foliolate). *Flowers* medium or large, sometimes  $\pm$  zygomorphic, petals imbricate, white, cream(-white) or yellow, free, margin entire. *Inflorescences*: male flowers solitary or in loose pseudo-racemes, each flower stalk with small or large (sub)persistent hooded bract (see note); female flowers solitary, with bract lower on the stalk. *Male flowers*: pedicel short or long; receptacle-tube short, broad; sepals (narrowly) ovate; petals in 1–3 with an incurved scale inside at the base; stamens 3 (or 2, not in SE Asia), anthers one 1-thecous, two 2-thecous, filaments short, usually free, inserted in the throat or at base of the receptacle-tube; thecae plicate (in Africa sometimes little curved), free or mutually coherent, connective sometimes swollen; pistillode absent but disc at bottom of receptacle-tube may be obvious. *Female flowers*: perianth as in male; ovary ellipsoid or oblong-fusiform, smooth, ribbed, warty or papillose; ovules (in Asia) mostly numerous, horizontal; stigma deeply 3-lobed, lobes 2-fid or notched (also unlobed in Africa); staminodes absent or minute. *Fruit* solitary, pendulous, (ovoid-)ellipsoid, fusiform or subglobose,  $\pm$  fleshy, often ornamented with soft spines, warts or ridges, glabrous, indehiscent or  $\pm$  3-valved, with few or numerous seeds in orange or red pulp. *Seeds* little or distinctly compressed, smooth or sculptured, margin distinct or faint, edge often undulate, sometimes grooved.

Distribution — About 40 species in the Old World, most species in Africa; 10 species in Asia; in *Malesia* 5 species.

Uses — Young shoots and fruits of some species are used as vegetables, or used for medicinal purposes.

Note — Male inflorescences are axillary. The male flowers are solitary or in fascicles or in racemes. In Asia each stalked solitary flower represents a one-flowered inflorescence, in which the flower is subtended by a single smallish or large sessile bract. The portion below

the bract is the peduncle; the portion above the bract the pedicel. In Asia, the thence one-flowered peduncles are solitary, or (in *M. clarkeana*) arranged in loose fascicles or pseudo-racemes. Likewise this can be observed in female inflorescences and consequently the fruit stalk consists of the peduncle and the pedicel, usually with a bract scar at base of the pedicel.

## KEY TO THE SPECIES

- 1a. Plant monoecious. Leaves simple, deeply lobed. Male bract conspicuous, inserted below the middle of the flower stalk. — Often cultivated . . . . . **1. *M. charantia***
- b. Plant dioecious. Leaves simple, unlobed or lobed, or 3-foliolate. Male bract either inconspicuous, or conspicuous, inserted at the apex of the flower stalk. — Not or rarely cultivated . . . . . 2
- 2a. Petiole and/or lower blade margin (usually) with conspicuous glands. Plant vigorous. Male perianth c. 50 mm diam. or more . . . . . 3
- b. Petiole (and lower blade margin) without glands. Plant more slender. Male perianth less than 50 mm diameter. . . . . 4
- 3a. Leaf blade unlobed, at least c. 1.5 times longer than broad; not or hardly fetid when crushed; green on drying; tertiary venation sharp, with fine areoles. Fruit smooth or partly with sparse slender soft spines . . . . . **4. *M. denticulata***
- b. Leaf blade unlobed, or lobed, or 3-foliolate, in outline about as long as wide, always less than 1.5 times longer than broad; fetid when crushed; dull green or brown on drying; tertiary venation coarse. Fruit variously soft-spiny or tubercled (rarely nearly smooth) . . . . . **3. *M. cochinchinensis***
- 4a. Leaf blade 3-foliolate. — Seram, Ambon . . . . . **6. *M. trifolia***
- b. Leaf blade simple (unlobed or lobed) . . . . . 5
- 5a. Male flowers solitary on single, axillary peduncle; bract conspicuous, 10–30 mm long. Fruit ornamented (soft spiny or warted, or with lengthwise ribs, or both). Seeds numerous, 10–20, edge shallowly undulate. . . . . **5. *M. subangulata***
- b. Male flowers fascicled or in short raceme, the branches (peduncles) slender; bract minute, 1–2 mm long. Fruit ornamented (with few sparse minute spines) or smooth. Seeds few, c. 6, edge with c. 8 conspicuous undulations . . . . . **2. *M. clarkeana***

**1. *Momordica charantia* L.**

*Momordica charantia* L., Sp. Pl. ed. 1 (1753) 1009; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 436; Craib, Fl. Siam. 1 (1931) 757; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 299; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 42; I.Telford, Fl. Austr. 8 (1982) 167; M.E.C.Reyes, Gildemacher & G.J.Jansen, PROSEA 8 (1994) 207; W.J.de Wilde & Duyfjes, Bot. Zhurn. (Moscow & St. Petersburg) 87, 3 (2002) 135; Sandakania 17 (2008 ‘2007’) 72; Fl. Thailand 9, 4 (2008) 464; H.Schaefer, Heibl & S.S.Renner, Proc. Roy. Soc. London, Ser. B, Biol. Sci. 276 (2009) 843. — Type: *Herb. Clifford: 451, Momordica* 2, (lecto BM, barcode BM000647445, designated by Jeffrey in Milne-Redhead & Polhill, Fl. Trop. E Africa, Cucurbitaceae 31 (1967) (see C.E.Jarvis, Order out of chaos (2007) 680)), India.

*Momordica indica* L. (in Stickman), Herb. Amboin. (1754) 24. — Type: “*Amara indica*” in Rumph. Herb. Amboin. 5 (1747) 410, t. 151 (lecto, designated by Merr., Interpr. Herb. Amboin. 33 (1917) 495).

*Momordica muricata* Willd., Sp. Pl. 4 (1805) 602. — Type: Hort. Malab. 8 (1688) t. 10 (designated by Chakravarty, Fasc. Fl. India 11 (1982) 92).

Slender climber 2(–4) m long, annual, sparsely to densely hairy, partly glabrescent; monoecious. *Leaves*: petiole 1.5–5 cm long, without glands; blade usually deeply palmately 5–7(–9)-lobed, reniform or suborbicular in outline, 2.5–10 cm diam., glands minute, occasionally a few towards the blade base, lobes (ob)ovate, narrowed at base, margin sinuate-dentate, ± mucronate. *Flowers* solitary, ± hairy; petals yellow. *Male flowers*: stalk slender, with bract below middle; peduncle 0.5–3 cm long; bract reniform-suborbicular, 5–15 mm diam., apex ± mucronate, margin subentire; pedicel 20–60 mm long; receptacle-tube cup-shaped, 2–4 mm long and wide; sepals (narrowly) ovate-elliptic, 4–6 by 2–3 mm, acute, pale green; petals (narrowly) obovate, 10–20 by 7–15 mm, apex ± mucronate, basal scales 2; filaments 1.5–2 mm long, inserted in the throat of the receptacle-tube, anthers coherent; disc cup-shaped, c. 1.5 mm diameter. *Female flowers*: peduncle 0.5–5 cm long; bract 1–10 mm diam.; pedicel 10–50(–100) mm long; ovary 8–30 by 2–4 mm, narrowly rostrate, muricate-tuberculate; sepals narrow, oblong-lanceolate, 2–5 mm long; petals smaller than in male, 7–12 mm long; style c. 2 mm long; staminodes whitish, c. 0.5 mm long. *Fruit* ripening orange, (ovoid-)ellipsoid or narrowly ellipsoid, narrowed at the ends, at apex usually rostrate, 2–11(–40, cultivated) cm long, 2–4(–6) cm wide, soft, sharp or blunt tuberculate in 6–10 ridges, and usually soft spiny in between, splitting incompletely with 3 valves exposing orange-red pulp; fruitstalk 3.5–15 cm long. *Seeds* few (to numerous), pale brown, ± square, compressed, 8–11(–15) by 5–8 mm, sculptured, margin grooved.

Distribution — Tropical and subtropical Africa and South, East, and SE Asia, to Australia and the Pacific; also common in America where introduced; in *Malesia* throughout.

Habitat & Ecology — Scrub and secondary places, forest edges, at low and medium altitudes; also in seasonal climate.

Note — In the treatment of De Wilde & Duyfjes (2008), *M. charantia* was divided into two forms, viz. forma *charantia*, the cultivated form, and forma *abbreviata* (Ser.) W.J.de Wilde & Duyfjes, the wild form.

#### KEY TO THE FORMS

- 1a. Plant generally stouter. Fruit (narrowly) elliptic to oblong, 5–40 cm long, surface with bluntish soft thorn-like protuberances and/or rounded warts in more or less longitudinal rows. — Cultivated or escaped near villages . . . **a. forma *charantia***
- b. Plant more delicate. Fruit ± fusiform, 2–5 cm long, with c. 6 rows of few, low, broad-based soft prickles with acute apex. — Growing wild **b. forma *abbreviata***

#### **a. forma *charantia***

The forma *charantia* comprises all cultivated varieties, including plants with small as well as with larger fruits. It should be noted that therefore taxa with small densely muricate-tubercled fruits and named *Momordica muricata* (Willd., 1805; based on Rheede 1688: 19, t. 10) also belong under forma *charantia*. Most likely the cultivated

form originated from the wild form in India (Williams & Ng, Ann. Bogor. 6 (1976) 111, but Schaefer et al., 2009, conclude that it is of African origin). — **Plate 33b.**

Distribution — Widely cultivated.

Uses — Cultivated mostly in larger-fruited cultivars. Immature fruits and young shoots are used as vegetables (PROSEA 8 (1993) 207); the fruit is medicinal (PROSEA 12, 1 (1999) 357).

Vernacular names — Peria, Peria laut, Periok (Malay).

## b. forma *abbreviata* (Ser.) W.J.de Wilde & Duyfjes

*Momordica charantia* L. forma *abbreviata* (Ser.) W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 73, f. 8. — *Momordica charantia* L. var. *abbreviata* Ser. in DC., Prodr. 3 (1828) 311; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 437, p.p., excl. *M. muricata* Willd. — Type: not indicated, presumably in G, not seen.

This is the wild form, widespread in the Old World and already long-time naturalized in tropical America. It generally is more delicate than the cultivated varieties under forma *charantia*, the latter including, however, frequently cultivated plants with small fruits of only c. 5 cm long or more. — **Plate 15a, b.**

Distribution — As the species.

Note — The distinction between forma *abbreviata* and forma *charantia* seems rather sharp on the characters given in the key, but vegetatively and in the flowers both forms are similar, though forma *abbreviata* is more delicate in all parts.

## 2. *Momordica clarkeana* King

*Momordica clarkeana* King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 67 (1898) 35; Ridl., Fl. Malay Penin. 1 (1922) 848; Cogn. & Harms in Engl., Pflanzenz. 88, 4.275.2 (1924) 39; W.J.de Wilde & Duyfjes, Bot. Zhurn. (Moscow & St. Petersburg) 87, 3 (2002) 135, f. 1. — Type: *King's collector 8340* (lecto K, designated by De Wilde & Duyfjes (2002)), Perak.

Climber 6–8 m long, perennial; (sub)glabrous; dioecious. *Leaves*: petiole 2–8 cm long, at base often ± distorted on drying, without glands; blade unlobed, ovate in outline, 4–14 by 3–12 cm, without glands, base cordate, margin remotely dentate, apex acute-acuminate, short-mucronate. *Flowers* in male (solitary or) 2–4 fascicled, the fascicles subaxillary to reduced leaves, usually arranged in loose raceme-like lateral shoots to 10 cm long; petals pale yellow. *Male flowers*: peduncle (almost) absent; bract basal, spatulate, minute, 1–2 mm long, ± dentate, glandular; pedicel slender, 15–30 mm long; receptacle tube cup-shaped, c. 2 by 2.5 mm, brownish; sepals broadly ovate, c. 4 by (2–)3 mm, obtuse, brown, paler to the margin, glabrous, margin short-fimbriate; petals obovate-elliptic, c. 10 by 6 mm, apex obtuse (or subacute?), papillose-hairy; other details including androecium not investigated by lack of material. *Female flowers* not known. *Fruit* solitary (or rarely 2 per node), ripening orange or red, (broadly) ovoid, or pear-shaped, 4.5–7 by 3.5–5 cm, base and apex broadly rounded apex 2–3 mm beaked, smooth, glabrous or with few minute sharp tubercles; exocarp thin, hard-leathery; indehiscent; peduncle absent; bract not seen (absent?); fruiting pedicel (fruit stalk) slender, 3–5 cm long. *Seeds* few (c. 6), (black-)brown, elliptic or subcircular,

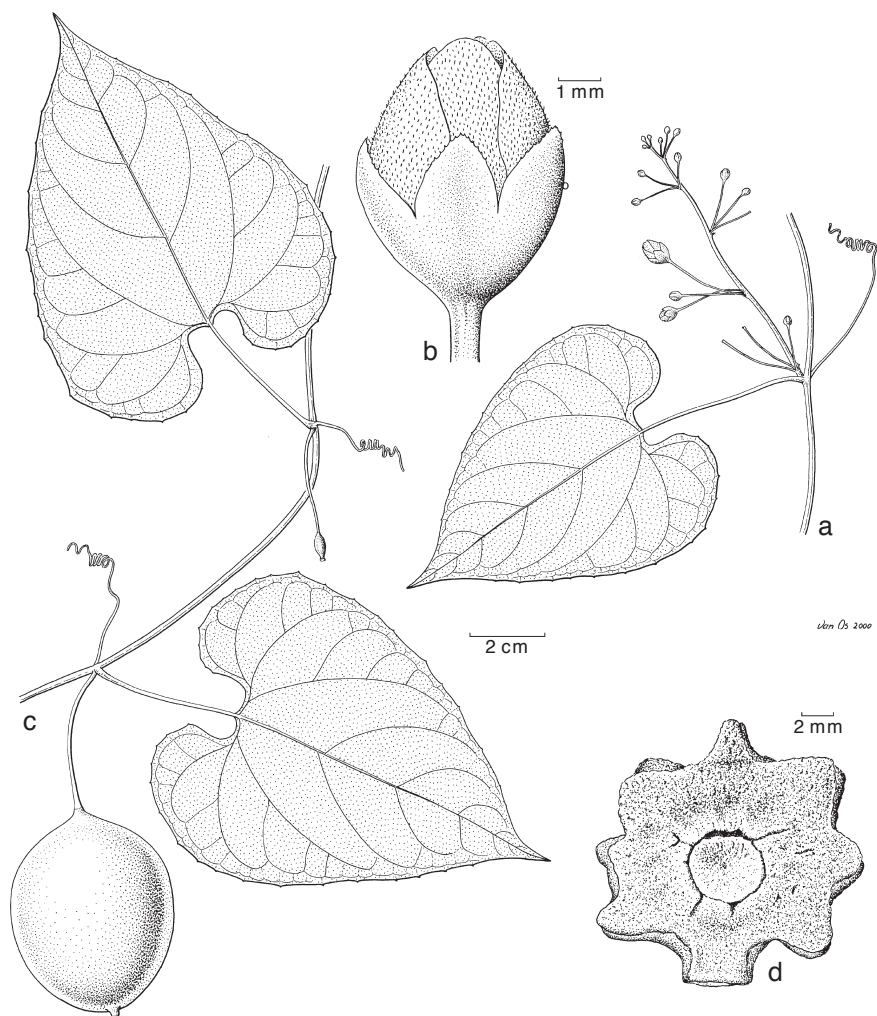


Fig. 39. *Momordica clarkeana* King. a. Male inflorescence; b. nearly mature male flower bud; c. portion of stem with mature, hardly ornamented fruit; d. seed (a, b: *Scortechini* 1605; c, d: *Rahim Ismail* KEP 98534).

thickish, 15–18 mm across; margin edges with c. 8 conspicuous undulations; faces sometimes sculptured. — **Fig. 39; Plate 15d.**

Distribution — Endemic to Peninsular Malaysia (Perak and Kelantan).

Habitat & Ecology — Open places in primary forest, hillsides, also on limestone, at low altitudes to c. 200 m.

Notes — 1. The cogwheel-shaped seeds of *M. clarkeana* resemble those of *M. cochinchinensis*, but the former are smaller.

2. This is a rare species characterized by its fruit. Male flowers, however, are poorly known and female flowers still unknown.



### 3. *Momordica cochinchinensis* (Lour.) Spreng.

*Momordica cochinchinensis* (Lour.) Spreng., Syst. Veg. 3 (1826) 14; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 444, incl. var. *villosa*; Ridl., Fl. Malay Penin. 1 (1922) 848; Craib, Fl. Siam. 1 (1931) 758; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 38, f. 8; I.Telford, Fl. Austr. 8 (1982) 167; M.E.C.Reyes, Gildemacher & G.J.Jansen, PROSEA 8 (1994) 206; W.J.de Wilde & Duyfjes, Bot. Zhurn. (Moscow & St. Petersburg) 87, 3 (2002) 137; Sandakania 17 (2008 '2007') 75; Fl. Thailand 9, 4 (2008) 466, f. 21. — *Muricia cochinchinensis* Lour., Fl. Cochinch. 2 (1790) 596. — Type: *Loureiro s.n.* (holo BM), from Cochinchina (Vietnam).

*Momordica cochinchinensis* (Lour.) Spreng. var. *minor* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 446. — Type: *Beccari PP 608* (lectotype FI, designated here), West Papua (Vogelkop Peninsula, Andai).

*Momordica macrophylla* Gage, Rec. Bot. Surv. India 3 (1908) 61; Gagnep., Fl. Indo-Chine 2 (1921) 1072; Craib, Fl. Siam. 1 (1931) 758. — Type (syntypes): *Gallatly s.n.*, (CAL, not seen), & *Mokim 253*, (CAL, not seen), both Myanmar.

*Momordica sphaeroidea* Blanco 1837, Fl. Filip. (1837) 771; ed. 2 (1845) 531; ed. 3, 3 (1879) 174, t. 380; Merr., Sp. Blancoan. (1918) 371. — Type: *Merrill: Species Blancoanae 818* (neotype US, designated here; iso L).

*Passiflora saponaria* Blanco 1837, Fl. Filip. (1837) 650. — *Modecca? saponaria* Blanco, Fl. Filip. ed. 2 (1845) 453; ed. 3, 3 (1879) 53; Merr., Sp. Blancoan. (1918) 371. — Type: *Merrill: Species Blancoanae 86* (neotype US, designated here; iso L).

*Momordica ovata* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 446; Cogn. & Harms in Engl., Pflanzenz. 88, 4.275.2 (1924) 34. — Type: *Cuming 1780* (lecto P, designated by De Wilde & Duyfjes (2002); iso L), Philippines.

*Momordica suringarii* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 434; Merr., Enum. Born. (1921) 584; Cogn. & Harms in Engl., Pflanzenz. 88, 4.275.2 (1924) 23. — Type: *Korthals s.n.* (*Cissus 987*) (lecto L, barcode L0125166, designated by De Wilde & Duyfjes (2002); iso L), Sumatra.

Stout perennial climber to 20 m long, all parts (sub)glabrous, older bark pale, warty and fissured; dioecious. *Leaves*: petiole (3–)5–12 cm long, with 1–6 conspicuous raised glands, but glands occasionally absent; blade entire or 3(–5)-palmately lobed, or 3-foliate (leaflets ± elliptic, with short petiolule), broadly ovate or subcircular in outline, (3–)7–16(–20) cm diam., margin entire or variously dentate, commonly with sessile or stalked glands, strongly foetid when crushed, brown on drying; venation with areoles 1–2 mm diam., the ultimate veinlets faint. *Flowers* somewhat hairy, in male solitary, or several in a bracteate raceme to 5(–10) cm long; petals creamy, the three inner ones with a dark blotch at base. *Male flowers*: stalk with bract subapical; peduncle 5–15 cm long; bract cucullate, suborbicular or reniform, 20–40(–60) mm wide, scabrous or pilose inside, base rounded or cordate, margin ± entire, apex sometimes subacute, sometimes with few glands at apex or towards base, sometimes woolly hairy; pedicel 3–10(–15) mm long; receptacle tube saucer-shaped, 4(–5) by 10(–15) mm, blackish; sepals (long)triangular or (narrowly) ovate-elliptic, (8–)10–16 by 4–8 mm, acute, blackish, scabrid or glabrous; petals (narrowly) elliptic, (25–)40–60(–70) mm long, subacute, conspicuously veined, scales broad, ligulate, 5–7 by 5 mm, yellow, directed to the base of the androecium, rendering the perianth somewhat irregular; filaments erect, fleshy, 5–7 mm long, broadly inserted at base of receptacle tube, anthers variable in length, connivent (but free), connective swollen, each theca with a fleshy downwards directed appendage; disc inconspicuous. *Female flowers*: stalk 3–10 cm long; bract

elliptic, 5 mm long or less,  $\pm$  median; ovary ellipsoid-oblong, 12–15 mm long, densely soft-muricate; receptacle tube small, narrow; sepals narrowly elliptic, 4–10 mm long; petals as in male; style (6–)10 mm long. *Fruit* ripening orange-red, irregularly bursting, ovoid, (broadly) ellipsoid or subglobose, (6–)10–15(–20) by (4–)6–10(–15) cm, apex  $\pm$  pointed, pericarp mostly densely soft tuberculate or soft-spiny (spines to 10 mm long), rarely almost smooth; fruit stalk 3–12 cm long, with bract (scar) median or above. *Seeds* numerous, brown or grey-black, circular, elliptic, or ovate, 15–30 mm across, 5–8 mm thick, margin coarsely undulate-tubercled; faces finely sculptured in a patchy pattern. — **Fig. 42e–g; Plate 14a, b, d.**

**Distribution** — Widespread, from NE India and South China, through Indo-China to North Australia and into the Pacific; absent from South India and Sri Lanka; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java (Kebun Raya, Bogor, probably an old introduction in a waste shrubby garden corner), Philippines, Sulawesi, Moluccas, New Guinea (West Papua, and Papua New Guinea); not known from Singapore.

**Habitat & Ecology** — Forest and (degraded) forest edges on a wide range of land forms and soils, usually in the lowlands to 1000 m altitude.

**Uses** — Fruits (unripe) are used as vegetable, or medicinal, especially by the Vietnamese.

**Vernacular name** — Teruah (Malay).

**Notes** — 1. The roots are tuberous.

2. *Momordica cochinchinensis* is accepted as a variable, widely distributed species. The species is particularly heterophyllous. Variable characters used as criteria for describing species now considered as synonyms concern the blade (either entire, lobed or unlobed, or foliolate), the presence or absence of glands on the petioles, the flowers being either solitary or grouped in short raceme-like inflorescences (short-shoots), and also the size (and shape) of the fruit and their mode of ornamentation with soft warts or spines. The length of the fruit stalk (peduncle plus fruiting pedicel) is very variable. How this relates to the Malesian populations needs further investigation. The synonym *M. suringarii* has mainly 3-foliate leaves.

#### 4. *Momordica denticulata* Miq.

*Momordica denticulata* Miq., Fl. Ned. Ind. 1, 1 (1858) 1090; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 447; Merr., Enum. Born. Pl. (1921) 583; Cogn. & Harms in Engl., Pflanzenr. 88, 4.275.2 (1924) 31; W.J.de Wilde & Duyfjes, Bot. Zhurn. (Moscow & St. Petersburg) 87, 3 (2002) 139. — Type: *Diepenhorst s.n.*, (lecto U, barcode U0249679, designated by De Wilde & Duyfjes (2002); iso BO), Sumatra (Priaman).

*Momordica racemiflora* (Miq.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 448; Merr., Enum. Born. Pl. (1921) 583; Cogn. & Harms in Engl., Pflanzenr. 88, 4.275.2 (1924) 39. — *Momordica denticulata* var. *racemiflora* Miq., Fl. Ned. Ind. 1, 1 (1858) 1091. — Type: *Teijsmann s.n.* (holo U) Sumatra, Bondjol.

*Momordica acuminata* Merr., J. Malayan Branch Roy. Asiat. Soc. 1, 87 (1923) 45; Cogn. & Harms in Engl., Pflanzenr. 88, 4.275.2 (1924) 32. — Type: *Ramos 1303* (holo PNH, not seen; iso K, L), Sabah.

Perennial climber to 8 m long, most parts (excluding inflorescences) glabrous, older bark whitish grey, fissured, not tuberculate; dioecious. *Leaves*: petiole 2–4 cm long,

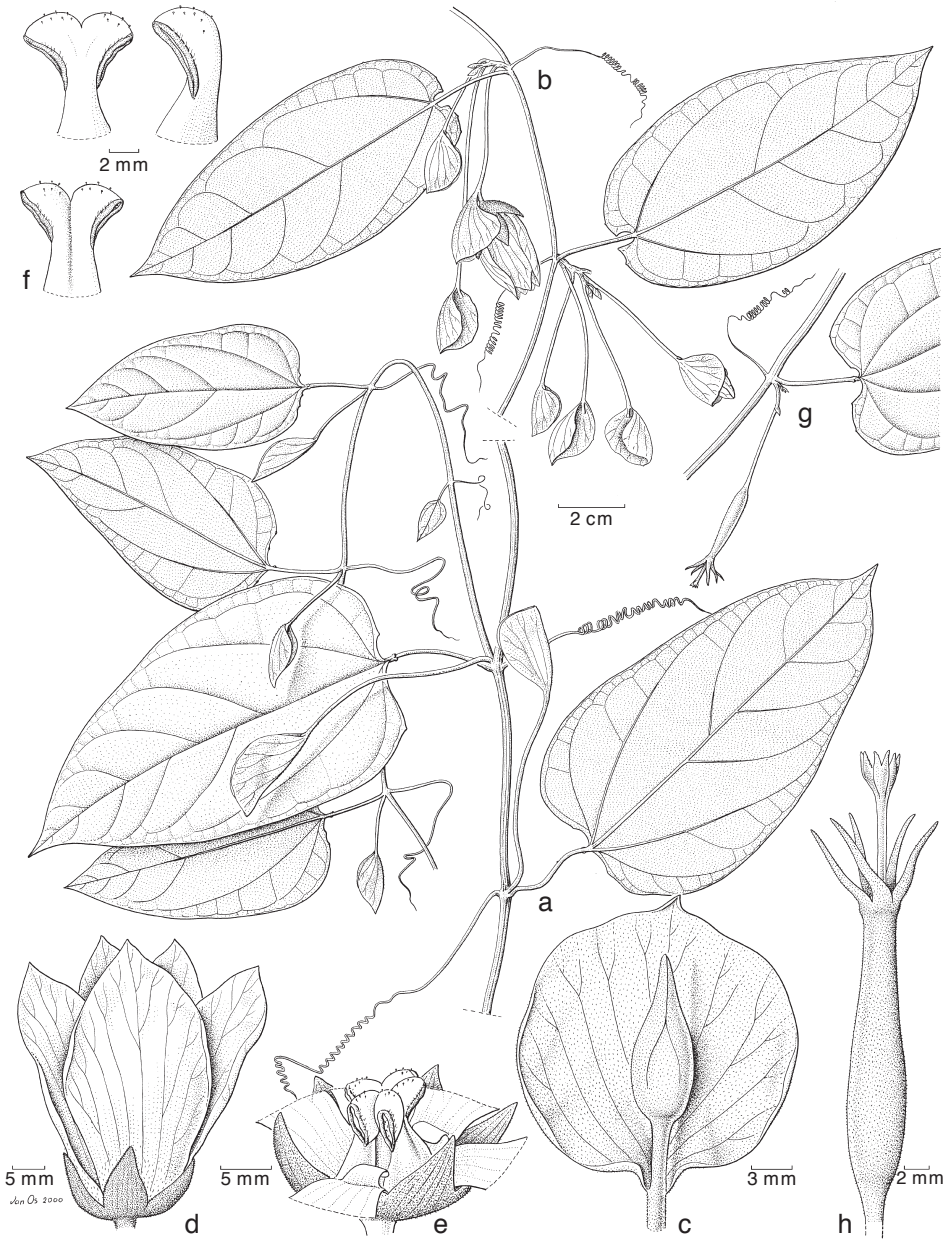


Fig. 40. *Momordica denticulata* Miq. a. Habit of male with single inflorescences; b. ditto, with inflorescences in short racemes; c. bract subtending young male flower bud; d. male flower; e. basal part of male flower, showing androecium (papillose hairs omitted); f. stamens; g. node with blown-over female flower; h. female flower, petals fallen off (a: De Wilde 21955; b–f: De Wilde 18079; g, h: Lorence Lugas 2775).

without or with few glands in the upper half; blade entire, sometimes coriaceous, hardly foetid when crushed, greenish on drying, (narrowly) ovate-elliptic, (7-)9-15(-20) by 4-9(-12) cm,  $\pm$  shiny on both sides, glands on blade surface absent, sometimes present on the basal blade margin, base truncate or cordate, margin entire or variously (sparsely) sharply dentate, sometimes only one sharp tooth on each basal lobe, apex subobtusely or acute-acuminate; veins 3(-5) palmate from base, ascending, and few pinnate from midrib, intercostal venation sharp, forming areoles c. 1 mm diameter. *Flowers* very like those of *M. cochinchinensis*, somewhat scabrous or hairy, in male solitary or up to 30 grouped in bracteate racemes to 5(-15) cm long; petals creamy-white, hairy or bearded towards the base, the three inner ones with or without a black blotch at base. *Male flowers*: stalk with bract subapical; peduncle 2-8 cm long, glabrous or minutely hairy; bract circular or broadly ovate, (15-)20-35(-50) mm diam., scabrid on both surfaces, base cordate, margin finely minutely hairy, apex obtuse or acute, with or without glands; pedicel 5(-15) mm long; receptacle tube saucer-shaped, 2-3 by 8-12(-15) mm,  $\pm$  blackish or not; sepals subcoriaceous, (narrowly ovate or) triangular, 10-15 by 5-8 mm, acute(-acuminate), blackish green or yellow-brown, somewhat scabrous; petals (narrowly) elliptic, 30-50 mm long, apex rounded or acute(-acuminate), distinctly veined, scales broad, lingulate, 5-7 by 5 mm, yellow, directed to the base of the androecium, rendering the perianth somewhat irregular; androecium 6-10 mm long; thecae with or without appendage. *Female flowers*: stalk (peduncle and pedicel) 4-6 cm long; bract acute, 2-3 mm long, inserted near the base of the stalk; ovary fusiform, narrowed in the apical part, 18-25 by 4-5 mm, densely minutely hairy; receptacle tube c. 3 mm wide; sepals linear, 7-8(-10) mm long, acute; style slender, 5-7 mm long. *Fruit* ripening green-yellow or red, (ovoid-)ellipsoid-oblong, 8-14 by 5-10 cm, apex narrowed into 10(-15) mm long beak, exocarp  $\pm$  leathery, without ornamentation, sometimes minutely scabrid; fruit stalk 5-10 cm long, with bract scar near the base. *Seeds* numerous, brown blackish, compressed, subcircular, cogwheel-shaped, 20-30 mm across, 6-7 mm thick; margin with a double row of c. 10 blunt wart-like bulges, faces finely sculptured in a blotchy pattern. — **Fig. 40, 42a-d; Plate 14c.**

*Distribution* — North and Central Sumatra, Peninsular Malaysia, most of Borneo (not known from South Kalimantan).

*Habitat & Ecology* — Forest edges and clearings, and along roadsides, to 1200 m altitude.

*Note* — *Momordica denticulata* is similar to *M. cochinchinensis*, especially in the male flowers, but is quite different in general appearance of the leaves, which are about twice as long as broad, somewhat chartaceous, glossy green with finer venation, the petioles shorter with the glands in the apical part, and in the fruit, which is ellipsoid, almost smooth.

## 5. *Momordica subangulata* Blume

*Momordica subangulata* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 928, excl. ref. to Rumph. 5, f. 150 = *Luffa cylindrica*; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 443, p.p.; Ridl., Fl. Malay Penin. 1 (1922) 848; Craib, Fl. Siam. 1: 758, p.p. 1931; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 299; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 41, pl. 7, f. 1, 2; W.J.de Wilde & Duyfjes, Bot. Zhurn. (Moscow & St. Petersburg) 87, 3 (2002) 145, f. 4;

Fl. Thailand 9, 4 (2008) 468. — Type: *Blume* '769' (lecto L, barcode L0001618, designated by De Wilde & Duyfjes (2002); iso L, barcodes L0001619 & L0001620), Java.

Note — De Wilde & Duyfjes (2002) distinguished in *M. subangulata* two subspecies, subsp. *renigera* (G. Don) W.J. de Wilde (North India, South China, Myanmar, and North Thailand) and subsp. *subangulata*; only subsp. *subangulata* occurs in Malesia.

### subsp. *subangulata*

Climber 1–2.5 m long, stem slender, possibly with subperennial rootstock, almost glabrous; dioecious. *Leaves*: petiole 2–6 cm long, without glands; blade unlobed or shallowly 3–5-lobed, ovate in outline, 3–20 by 2.5–8 cm, glands absent, margin variously dentate. *Flowers* solitary, minutely hairy; petals yellow. *Male flowers*: stalk with bract subapical; peduncle 4–8 cm long; bract subcircular or reniform, 10–30 by (10–)15–20 mm, apex rounded or ± acute-acuminate, margin entire or crenulate, finely hairy, inside glabrous or soft hairy; pedicel 3–5 mm long; receptacle tube saucer-shaped, c. 2 by 4 mm, green or blackish; sepals (ovate-)oblong, (4–)6–10 by 3–5 mm, obtuse or notched, blackish, apical portion not out-curved; petals obovate-elliptic, 20–30 by (10–)15–18 mm, broadly obtuse, of which three with a dark blotch at base (always?), scales 2, broadly rounded; filaments c. 3 mm long, inserted almost at the base of the receptacle tube, dark-coloured outside, papillose-hairy towards base, anthers coherent in a subglobose mass, with five coarsely papillose extensions corresponding with the thecae; disc as minute appendages near insertion of stamens. *Female flowers*: stalk 3–10 cm long; bract minute, at or below middle; pedicel 15–90 mm long; ovary fusiform, narrowed at apex, 8–12 mm long, 2–3 mm wide, (finely) densely pale brown papillose-hairy and with 8–10 lengthwise irregular (verrucose) low ridges; sepals linear, c. 4 mm long; petals obovate-oblong, 20–25 by 10(–15) mm, obtuse; style c. 5 mm long. *Fruit* ripening yellow-orange, ovoid or ellipsoid, narrowed at apex, 3–5 cm long, subglabrous or finely hairy, and with 8–10 irregular crested lengthwise ridges; fruit stalk 4–15 cm long. *Seeds* 10–20, grey-brown or blackish, somewhat compressed, 6–7 mm across, c. 6 mm thick, not sculptured, margin (edge) shallowly undulate. — **Fig. 41; Plate 15c.**

Distribution — Myanmar?, Thailand, Laos, and South China; in *Malesia*: Sumatra, Peninsular Malaysia, and West Java.

Ecology — Open scrub, forest edges, 50–1150 m altitude.

## 6. *Momordica trifolia* L.

*Momordica trifolia* L. ('Stickman'), Herb. Amboin. (1754) 24; Rugayah & W.J. de Wilde, Blumea 42 (1997) 481 (in note under *Trichosanthes wawrae*); C. Jeffrey & W.J. de Wilde, Taxon 48 (1999) 600 (see note); Brummitt, Taxon 53, 3 (2004) 814. — *Momordica trifoliolata* L., Sp. Pl. ed. 2 (1763) 1434; Willd., Sp. Pl. 4 (1805) 604. — Type: "*Poppya silvestris*", Rumph., Herb. Amboin. 5 (1747) t. 152, f. 2. Epitype: *Eyma 2794* (holo BO, here designated; iso L), Seram, Wae Tuba.

*Momordica rumphii* W.J. de Wilde, Bot. Zhurn. (Moscow & St. Petersburg) 87, 3 (2002) 144, f. 2h–j, nom. superfl. — Type: *Eyma 2794* (holo BO; iso L).

Slender perennial climber, roots not known, glabrous; dioecious. *Leaves*: petiole 2–4 cm long, glands absent; petiolules 0.6–0.8 cm long, glands absent; blade 3-foliolate,

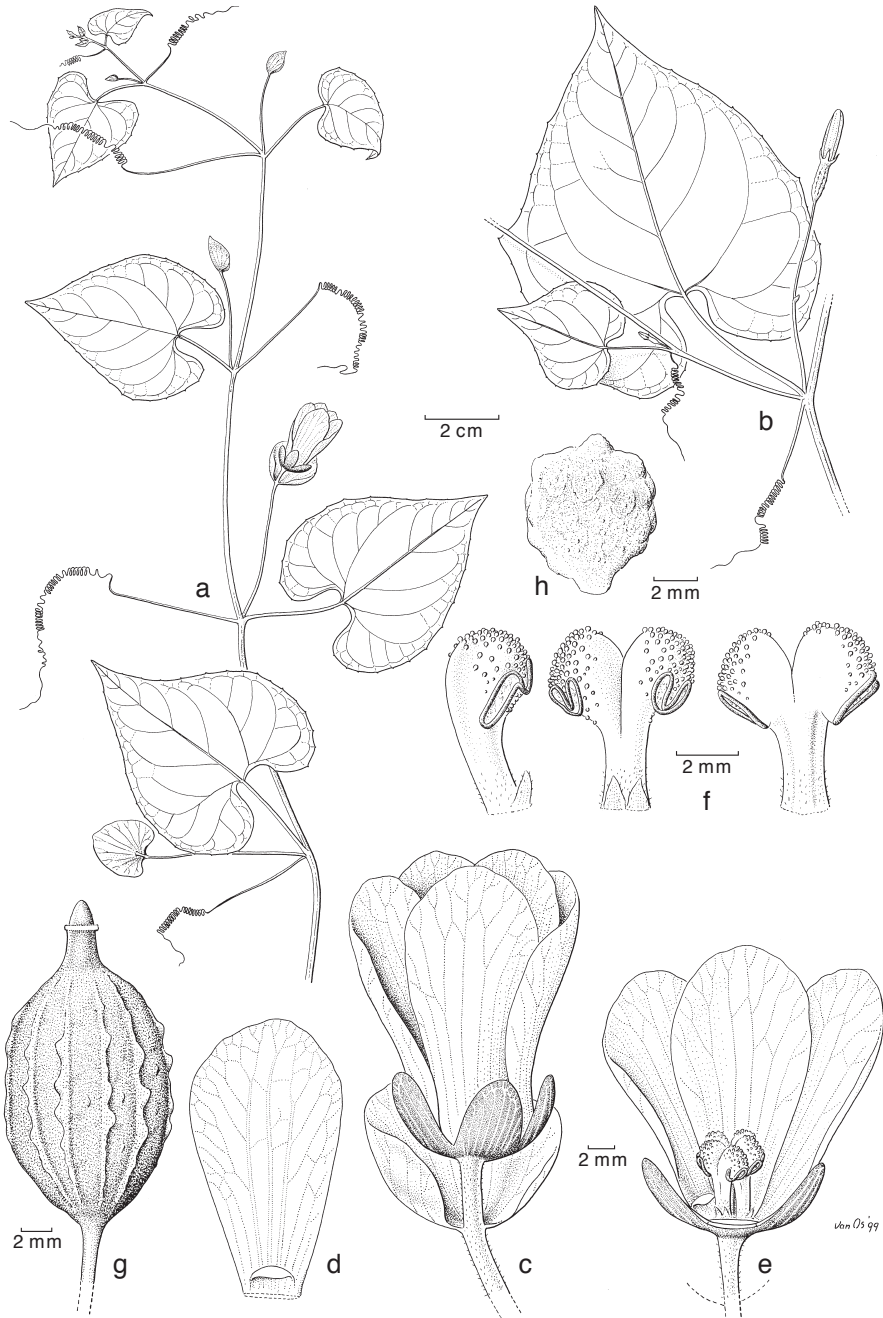


Fig. 41. *Momordica subangulata* Blume subsp. *subangulata*. a. Habit of male flowering twig; b. ditto, female; c. bract subtending male flower; d. outer petal, at base with in-curved scale; e. male flower opened, showing androecium bract removed; f. stamens; g. fruit; h. seed (a, c–f: De Wilde 21897; b: Kerr 7291; g, h: Grashoff 473).

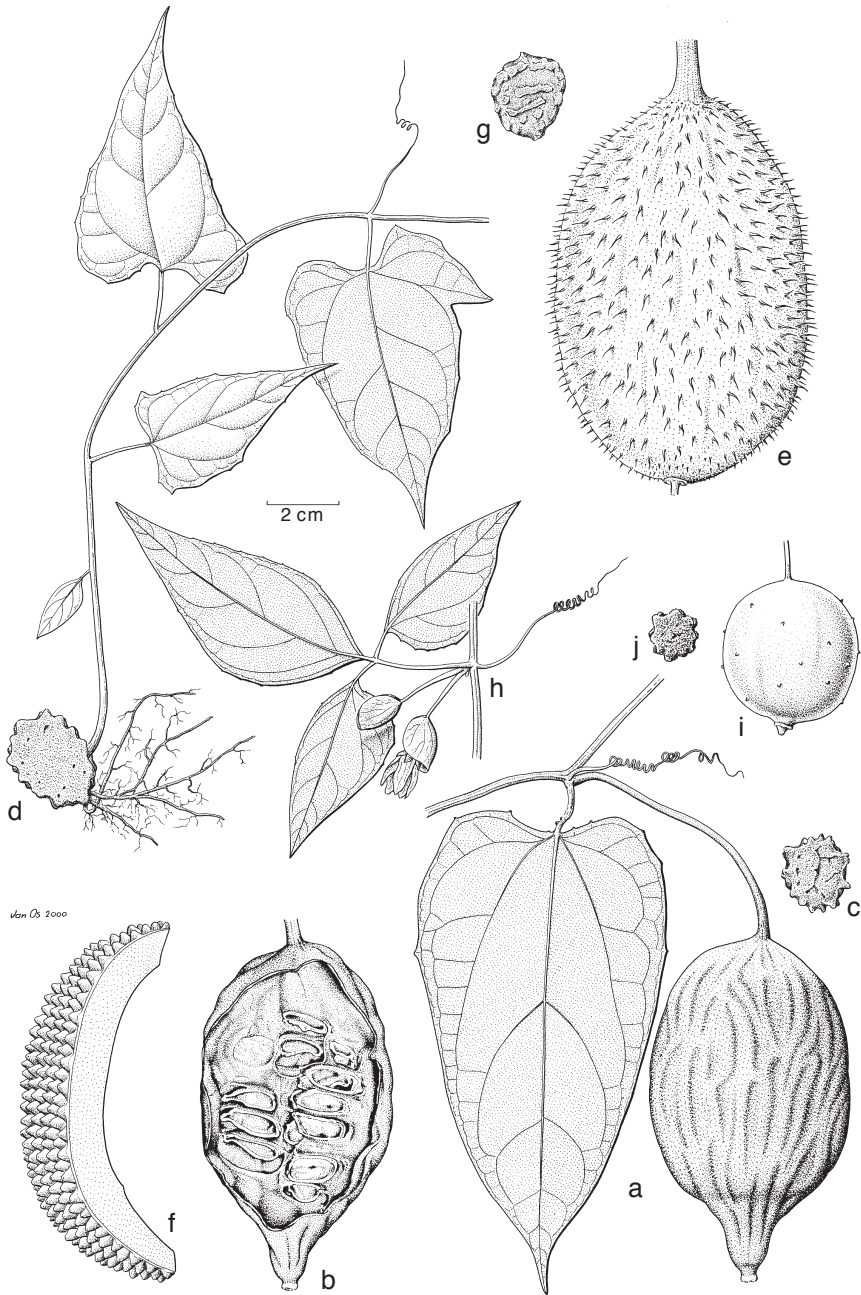


Fig. 42. *Momordica*, fruits and seeds. — a–d. *Momordica denticulata* Miq. a. Fruit; b. ditto, opened; c. seed; d. seedling with cotyledons remaining in the seed. — e–g. *Momordica cochinchinensis* (Lour.) Spreng. e. Fruit; f. portion of pericarp (ornamentation differing from that in e); g. seed. — h–j. *Momordica trifolia* L. h. Node with male inflorescence and male flower; i. fruit; j. seed (a, b: De Wilde 21951; c: Lorraine Lugas 2449; d: De Wilde 22055; e: Van Balgooy 4958; f, g: Van Balgooy 3017; h–j: Eyma 2794).

subcircular in outline, 8–11 cm diam., apex acuminate, leaflets (narrowly) ovate, the two outer ones unequal-sided, 5–7 by 2–3.5 cm, margin sparsely dentate (teeth c. 1 mm long). *Flowers* in male solitary or occasionally up to 3 per node, (sub)glabrous; petals pale yellowish(?). *Male flowers*: stalk with bract subapical; peduncle 1.5–2 cm long; bract rather closely subtending the flower, suborbicular, 10–15 mm diam., base  $\pm$  cordate, apex rounded with minute acuminate tip, margin greyish puberulous; pedicel 7–10 mm long; receptacle-tube cup-shaped, tapered, 2.5–3 by 3–4 mm, blackish; sepals narrowly elliptic, c. 5 by 2 mm, narrowly obtuse, pale (green-)brown, puberulous; petals  $\pm$  (narrowly) elliptic, 13–15 by 5–6 mm, base  $\pm$  clawed, apex obtuse or subacute, puberulous; inside of receptacle-tube and androecium not investigated. *Female flowers* not known. *Fruit* solitary, stalk slender, c. 2 cm long (Rumphius, t. 152, f. 2); fruit ripening orange, broadly ovoid-ellipsoid or subglobose, 1–2 mm beaked at apex, c. 4.5 by 4 cm, sparsely muricate (warts 1–2 mm high), pulp not known. *Seeds* few, c. 5 per fruit, brown-black, thick but flat, circular in outline, c. 15 mm diam., c. 8 mm thick; margin with a double row of 8 or 9 coarse warts or undulations, edge finely corrugated. — **Fig. 42h–j.**

Distribution — Moluccas (West Seram and Ambon).

Habitat & Ecology — Climbing and hanging vine in roadside at low altitude.

Note — *Momordica trifolia* is a local endemic species in West Seram and Ambon of which, beside *Eyma 2794* (male and separate fruit), no recent collections are known. In its area it occurs together with resembling but stouter *M. cochinchinensis*, a species with 3-foliolate forms known from outside the Moluccas, readily distinct by much larger flowers, larger fruits, and conspicuous glands on the petiole.

## 24. MUELLERARGIA

*Muellerargia* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 360; I.Telford, Fl. Australia 8 (1982) 188; Backer in Backer & Bakf.f., Fl. Java 1 (1964) 298. — Type species: *Muellerargia timorensis* Cogn.

Small herbaceous climber, annual, leafy stem c. 2 mm diam., green-brown on drying; monoecious. *Probract* conspicuous or not obvious. *Tendrils* unbranched. *Leaves* simple, unlobed or lobed, palmiveined. *Flowers* 4–5 mm diam.; petals imbricate, white, free. *Male inflorescences* few- to many-flowered long-peduncled umbelliform clusters or short racemes; *bracts* absent. *Male flowers*: pedicel long, persistent; receptacle-tube campanulate; sepals linear, minute; petals ovate-elliptic; stamens 3, included, inserted at c. 1/3(–1/2) from the base in the receptacle-tube, filaments short, anthers two 2-theous, one 1-theous, free but tightly connivent forming a subglobose androecium, thecae hook-like curved in the upper part (in Madagascar straight), connective rather broad, produced (in Madagascar not produced); disc consisting of 3 elongate parts, star-shaped arranged, adnate to the base of the receptacle-tube (in Madagascar disc absent). *Female flowers* solitary, coaxillary with male inflorescence or not; pedicel long; ovary ovoid, tapered into a narrow neck, tuberculate, or soft-bristly (or finely hairy), ovules many, horizontal, placentas 2 (or 3); stigma 2(or 3)-lobed (in Madagascar subglobose); staminodes 3, minute; disc absent. *Fruit* solitary, squirting the seeds; exocarp membranous, warty or soft-spiny; pulp juicy. *Seeds* numerous, compressed,  $\pm$  oblique or



curved, not or hardly ornamented, margin faint with entire, square edge (in Madagascar rounded).

Distribution — A genus of 2 species, of which 1 in Madagascar; in *Malesia*: 1 species.

### 1. *Muellerargia timorensis* Cogn.

*Muellerargia timorensis* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 630; in Engl., Pflanzenr. 66, 4.275.I (1916) 135; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 298; I.Telford, Fl. Australia 8 (1982) 188. — Type: *Bauer 56* (lecto W, designated here), Timor.

*Melothria subpellucida* Cogn., Bull. Acad. Roy. Sci. Belgique, sér. 3, 14 (1887) 356. — Type: *Persieh s.n.* [et comm. *F. von Mueller*] (BR, not seen), Australia, Endeavour River.

*Zehneria ejecta* F.M.Bailey, Queensl. Fl. 2 (1900) 699. — *Melothria ejecta* (Bailey) Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 108. — Type: *Cowly s.n.* (BRI, not seen), Australia, Thursday Island.

Herbaceous climber, 1–3 m long, hairy, hairs short or long. *Probract* not obvious or leaf-like, often obliquely curved and  $\pm$  clasping the stem, up to 15 mm long. *Leaves*: petiole (1–)2–4 cm long; blade membranous, in outline (broadly) ovate or subcircular, (3–)5-angular or up to halfway lobed, 2.5–10 by 2–9 cm, densely or sparsely fine hairy or long-pilose on both surfaces, often scabrous above with minute cystoliths, margin denticulate. *Male inflorescences*: peduncle 3–10 cm long, at apex with a 5–20(–40)-flowered subumbel or flowers in a dense 1–2 cm long raceme. *Male flowers*: pedicel (5–)8–15 mm long, finely hairy; receptacle-tube c. 2 by 2.5 mm, finely gland-hairy, throat inside with hairs c. 0.3 mm long; sepals linear, 0.4–0.6 mm long; petals elliptic (ob)ovate, 2–2.5 by 1.5–2 mm, densely 0.1 mm long gland-hairy on both surfaces; filaments c. 0.2 mm long, anthers connivent into a synandrium c. 1.5 mm diam., connective broad, with truncate apical c. 0.5 mm long extension, hairy at apex, thecae strongly curved, hook-like; disc consisting of three carnose  $\pm$  flat lobes, each c. 1 mm high, at base connate and adnate with the base of the receptacle tube. *Female flowers* solitary, pedicel 10–30 mm long; perianth as in male; ovary 4–7 by 3–4 mm, at apex with a 2–2.5 mm long neck, smooth or mostly with scattered or dense sometimes  $\pm$  upward curved protuberances to 1 mm long, all densely finely minutely hairy; style c. 1 mm long, stigma 1.5–2 mm long, irregularly 2-lobed, each lobe unequally 2- or 3-lobed again, lobes slender, finely papillose; staminodes minute, inserted at c. 1/4 from the base in the receptacle-tube, linear, truncate. *Fruits* ripening green, 1.5–2.5 by 1.5–2 cm, at apex tapering into a beak to 0.5 cm long with at apex the withered perianth persisting, tubercles or protuberances to 1 cm long; fruiting pedicel rather stout, straight, 1.5–3 cm long. *Seeds* narrowly ovate, c. 8 by 3 mm, base  $\pm$  narrowed, apex subtruncate, faces shallowly finely scrobiculate or smooth, margin faint, with square edge. — **Fig. 43.**

Distribution — Australia: Christmas Is., western Australia and Queensland; in *Malesia*: Java (Madura), near SW Sulawesi (Pasitaloe Is.), Lesser Sunda Islands (Lombok, Sumba, Flores, Timor), Moluccas (Wetar), New Guinea (Papua New Guinea (Central Province, Tavai Creek area)).

Habitat & Ecology — Found in the margin of low monsoon forest, in *Eucalyptus* savanna, along the coast in scrub and on rocky beaches, on loamy soil or limestone; from sea level to 60 m altitude; flowering and fruiting mostly in April.

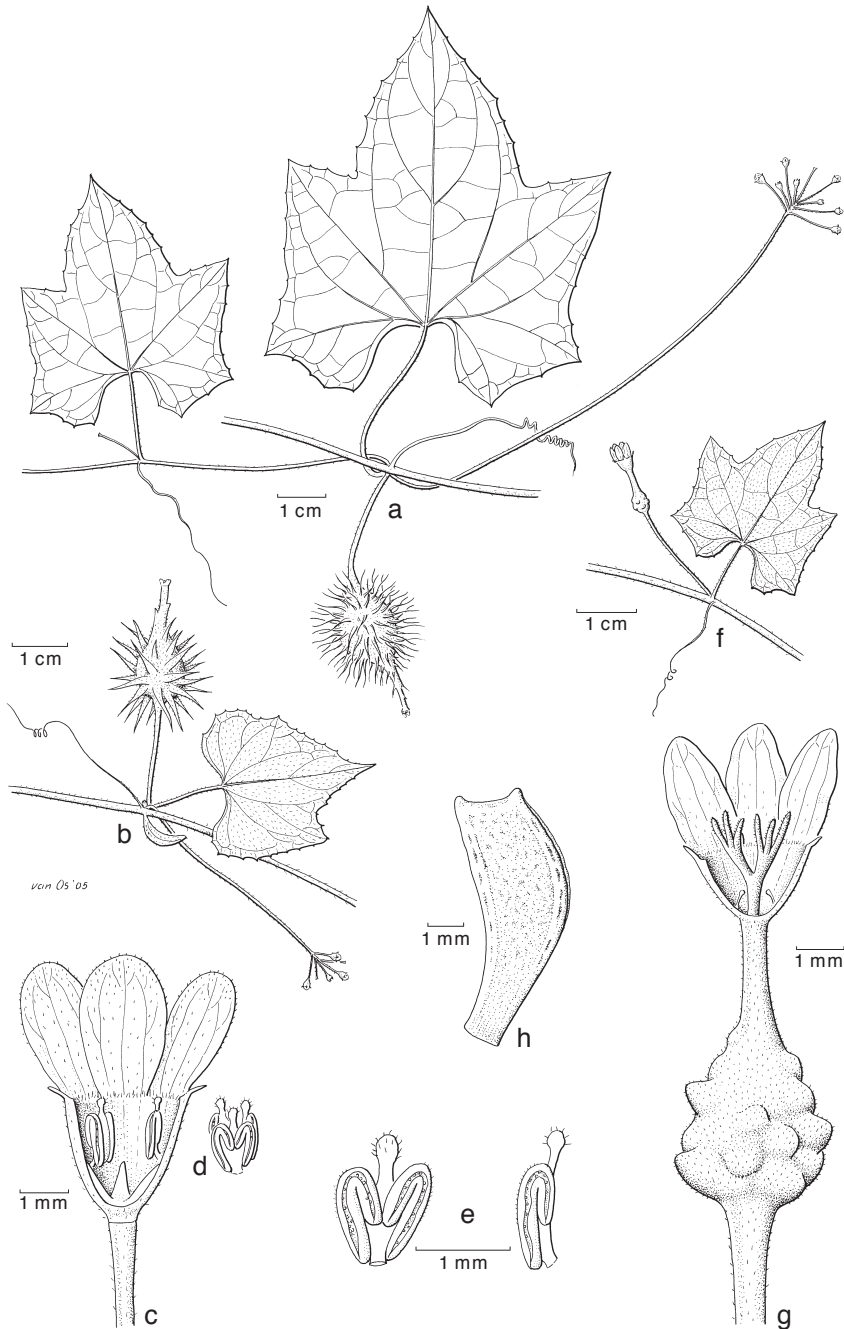


Fig. 43. *Muellerargia timorensis* Cogn. a. Habit of branch with male inflorescence and fruit; b. ditto, with probract at the node; c. male flower, openend; d. androecium, stamens connivent; e. stamens; f. node with female flower; g. female flower, perianth opened; h. seed (a, c–e, h: Pullen 6848; b: Schmutz 1491; f. Loeters 1377; g. Afriastini 1598).

Note — *Pullen 6848* (Tavai Creek) noted: ‘the fruits when ripe are easily dislodged from the vine, at which time they squirt seeds from the ruptured end for a considerable distance’. The synonym *Zehneria ejecta*, refers to the squirting fruits, like in the Mediterranean *Ecballium elaterium* (L.) A.Rich., the Squirting cucumber.

## 25. MUKIA

*Mukia* Arn., Madras J. Lit. Sci. 12 (1840) 50; C.B. Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 623; C. Jeffrey, Kew Bull. 15 (1962) 343; in Hooker’s Ic. Pl. 37, 3 (1969) 2, t. 3661–3664; Keraudren in Aubrév. & J.-F. Leroy, Fl. Camb., Laos, Viêt-Nam 15 (1975) 57; W.J. de Wilde & Duyfjes, Thai Forest Bull., Bot. 34 (2006) 38; Fl. Thailand 9, 4 (2008) 471. — *Melothria* L. sect. *Mukia* (Arn.) Cogn. in A. DC. & C. DC., Monogr. Phan. 3 (1881) 622. — Type species: *Mukia scabrella* (L.) Arn. (*Bryonia scabrella* L. = *Mukia maderaspatana* (L.) M. Roem.).

Small climbers, shoots herbaceous, (sub)annual or with a (thick) perennial root, leafy stem c. 2 mm diam., whole plant scabrid-hairy; monoecious. *Probract* absent. *Tendrils* unbranched. *Leaves*: blade simple, green on drying; apices of (lobes of) developing leaves distinct, broadened, glabrous, often brown on drying; petiole long or short (leaves subsessile). *Flowers* small; petals yellow, (almost) free, imbricate in bud; disc free from the receptacle-tube. *Male inflorescences* in a fascicle at the node, with few to 10(–20) short-pedicelled flowers; *bracts* absent. *Male flowers*: pedicel 2–10 mm long, slender; receptacle-tube urceolate-campanulate; sepals minute, long-triangular or linear, out-curved; petals elliptic or (ob)ovate, free or short-connate; stamens 3, inserted slightly above halfway the receptacle-tube, filaments short, glabrous, anthers one 1-theous and two 2-theous, included, thecae lateral, straight, connective narrow, ± hairy, at apex hardly or shortly produced; disc depressed globose. *Female flowers* 1–6 fascicled, usually separate from male flowers; pedicel short; ovary globose to narrowly elliptic, ovules few or many; perianth as in male; style thick, glabrous; stigma consisting of 3 elongate, carnose, papillose lobes, each lobe shallowly 2-lobed again; staminodes usually present; disc annular. *Fruits* 1–6, clustered, subsessile or short-pedicelled, ripening red, sometimes darker flecked, (sub)globose or ellipsoid, 0.5–3 cm long, juicy; exocarp membranous or cartilaginous, smooth. *Seeds* few or many, whitish or pale brown, subglobose or compressed, ornamented or not, margin distinct, edge subentire, sometimes grooved.

Distribution — A genus of about 9 species, including some 3 unpublished Australian species, distributed in the tropics of the Old World: Africa (1 species); in SE Asia from Pakistan east to China and south-east through Indo-China to Australia; in *Malesia*: 3 species.

Notes — 1. Molecular data (Ghebretinsae et al., Novon (2007) 176, and Schaefer, Blumea (2007) 165) indicate that *Mukia* is nested within *Cucumis*.

2. The broadened glabrous apices in immature leaves are also seen in various other genera, e.g. *Benincasa*, and *Cucumis*.

## KEY TO THE SPECIES

- 1a. Fruit ellipsoid, 2–4 cm long. — East Malesia: Moluccas & Vogelkop Peninsula . . . . . **3. *M. rumphiana***
- b. Fruit globose or ellipsoid, up to 1.5 cm long . . . . . 2
- 2a. Fruit ellipsoid; exocarp thin, collapsing about the seeds, translucent. Seed faces flat, not or hardly ornamented. Hairs of petiole spreading or curved downward. — Sumatra, Borneo, Java, Philippines . . . . . **1. *M. javanica***
- b. Fruit globose; exocarp thicker, wrinkling or not, not translucent. Seed faces convex, scrobiculate. Hairs of petiole spreading or curved upward. — Widespread. . . . . **2. *M. maderaspatana***

**1. *Mukia javanica* (Miq.) C.Jeffrey**

*Mukia javanica* (Miq.) C.Jeffrey in Hooker's Ic. Pl. 37, 3 (1969) 3, t. 3661: 1–10; Keraudren in Aubrév. & J.-F.Leroy, Fl. Camb., Laos, Viêt-Nam 15 (1975) 58, f. 10: 6–8; W.J.de Wilde & Duyfjes, Thai Forest Bull., Bot. 34 (2006) 40; Fl. Thailand 9, 4 (2008) 474. — *Karivia javanica* Miq., Fl. Ned. Ind. 1, 1 (1856) 661. — *Melothria javanica* (Miq.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 625; in Engl., Pflanzenr. 66, 4.275.1 (1916) 129; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 298. — *Cucumis javanicus* (Miq.) Ghebret. & Thulin, Novon 17 (2007) 177. — Type: *Horsfield s.n.* (holo U, barcode U0226804; iso BM, K), Java.

Climber or creeper to 3 m long, stem scabrous hairy. *Leaves*: petiole 2–5(–10) cm long, scabrid-hairy, hairs curved downward; blade 5-angular or variously (3–)5-lobed up to halfway deep, broadly ovate(-hastate), subcircular in outline, 2–10 cm diam., upper and lower surface subglabrous or variously (scabrid-)hairy, denser on the veins beneath, cystoliths not apparent, margin to 2 mm dentate. *Male flowers* 3–6, rarely with few female flowers mixed; pedicel 1–2(–4) mm long; receptacle-tube 1.5–3 by 1.5–2 mm, scabrid hairy; sepals 0.5–1.5 mm long; petals ovate, 1.5–2.5 mm long, apex subacute, glabrous except for few hairs on outer surface; filaments less than 0.5 mm long, anthers 1.5(–2) mm long; disc 1–1.5 mm diameter. *Female flowers* (1–)2–4; pedicel c. 1 mm long; ovary ellipsoid(-oblong), 4–5 mm long, (sub)glabrous or finely hairy, hardly constricted at apex; perianth as in male glabrous; disc c. 1 mm high. *Fruits* 1–3, fascicled, ellipsoid, 1–1.5 cm long, juicy, with filmy pericarp showing the seeds when dry, glabrous; fruiting pedicel 0.1–0.2 cm long. *Seeds* 8–18, (pale brown or) whitish, obovate, strongly compressed, c. 5 by 3.5–4 by 1–1.5 mm, faces flat, ± depressed, smooth or irregularly low-warted, with a broad 2-grooved margin. — **Plate 16c.**

*Distribution* — Northern India, east to China; in *Malesia*: Borneo, Java, Philippines; not known from Sulawesi, Lesser Sunda Islands, and New Guinea.

*Habitat & Ecology* — Roadsides, (disturbed) forest and scrub edges; to 1200 m altitude; flowering and fruiting throughout the year.

**2. *Mukia maderaspatana* (L.) M.Roem.**

*Mukia maderaspatana* (L.) M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 47; C.Jeffrey in Hooker's Ic. Pl. 37, 3 (1969) 5, p.p., excl. t. 3662: 1–8 (which concerns *Mukia gracilis* (Kurz) W.J.de Wilde & Duyfjes); Keraudren in Aubrév. & J.-F.Leroy, Fl. Camb., Laos, Viêt-Nam 15 (1975) 60, f. 10: 9; I.Telford, Fl. Australia 8 (1982) 183, f. 40: a–g; W.J.de Wilde & Duyfjes, Thai Forest Bull.,

Bot. 34 (2006) 43; Fl. Thailand 9, 4 (2008) 475, pl. 35: 2. — *Cucumis maderaspatanus* L., Sp. Pl. (1753) 1012; H.Schaeff., Blumea 52 (2007) 167. — *Melothria maderaspatana* (L.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 623; in Engl., Pflanzenz. 66, 4.275.1 (1916) 126; Craib, Fl. Siam. Enum. (1931) 764; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 298. — Type: “*Cucumis Maderaspatensis fructu minimo*” in Plukenet, Phytographia (1692) t. 170, f. 2. (lecto, designated by Meeuse, Bothalia 8 (1962) 14); type: *Herb. Sloane 95: 201* (BM-SL, not seen (see C.E.Jarvis, Order out of chaos (2007) 363)), “habitat in India”.

*Bryonia scabrella* L. in L.f., Suppl. Pl. (1781) 424; Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 926; Miq., Fl. Ned. Ind. 1, 1 (1856) 658. — *Mukia scabrella* (L.) Arn. in Hook., J. Bot. 3 (1841) 276; C.B.Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 623. — *Mukia maderaspatana* (L.) M.Roem. var. *scabrella* (L.) Kurz, J. Asiat. Soc. Bengal 46 (1877) 104. — Type: India, without collector, cult. Uppsala (holo LINN 1153/11, not seen).

*Bryonia althaeoides* Ser. in DC., Prodr. 3 (1828) 306. — *Mukia althaeoides* (Ser.) M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 47. — Type: without collector (G-DC holo, not seen, microphoto in K, L), Timor.

Climber to 4 m long, stem scabrous or stiff-hairy. *Leaves*: petiole (0.1–)0.5–9 cm long, scabrous and hispid with short or long, erect or upward curved hairs (but see note); blade unlobed or 3–5-lobed, broadly ovate, subcircular or broadly hastate in outline, 2–10 cm diam., upper and lower surface hispid or scabrous-hairy, more densely so on the veins, cystoliths dense and minute and not apparent, margin variously up to 5 mm dentate. *Male flowers* in fascicles of 2–20 (occasionally mixed with few female flowers); pedicel 2–5(–10) mm long; receptacle-tube 1.5–4 by 1–2 mm, with upward appressed hairs; sepals 1(–1.5) mm long; petals ovate, 1.5–3(–4) mm long, apex subacute, glabrous except for the mid-vein outside; filaments less than 0.5 mm long, anthers 1–2 mm long, the connective usually shortly produced; disc c. 1.5 mm diameter. *Female flowers* solitary or up to 8; pedicel 1–4 mm long; ovary subglobose or broadly ovoid, 3–3.5 by 1.5–2 mm, with scattered or dense (stiff) hairs. *Fruit* 1–5(–8) in axillary clusters, green and pale green striped, ripening red, darker striped or not, globose, 0.5–1.5 cm diam., glabrous or with few coarse hairs; exocarp thin but not filmy, coarsely wrinkled when dry, seeds not shining through; fruiting pedicel 0.2–0.5 cm long. *Seeds* 10–20, whitish or pale brown, obovoid, moderately compressed, 3–4 by 2–2.5 by 1.5–2 mm, margin narrow, ± rounded, faces not separated by a groove, faces convex, variously warted, or pitted or nearly smooth. — **Fig. 44, 45; Plate 16d.**

*Distribution* — Widespread: Africa, SW and SE Asia, including Yemen, Pakistan, India, Sri Lanka, north-east and east to China, Ryukyu Is., Indo-China to Australia (where very variable in indumentum, including villose); in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines, Sulawesi, Lesser Sunda Islands, New Guinea (West Papua and Papua New Guinea); no collections seen from Moluccas.

*Habitat & Ecology* — In a large variety of (degraded) scrub-land, among grasses, roadsides, forest (edges), in Papua New Guinea in *Eucalyptus* savanna; also on limestone; from sea level to 1200 m altitude; flowering and fruiting throughout the year.

*Notes* — 1. Specimens from savanna areas in eastern Papua New Guinea (e.g. *Heyligers 1176*, *Darbyshire 696*, *Henty & Katik NGF 38646*, and *Pullen 6804*) have comparatively large fruits, c. 1.5 cm diameter. *Pullen 6804* will be accommodated into a new species of *Cucumis* by Sebastian et al., PNAS (2010).

2. The discriminating character of the of curving of the hairs on the petiole, viz. upward in *M. maderaspatana* and downward in *M. javanica* works well in most material

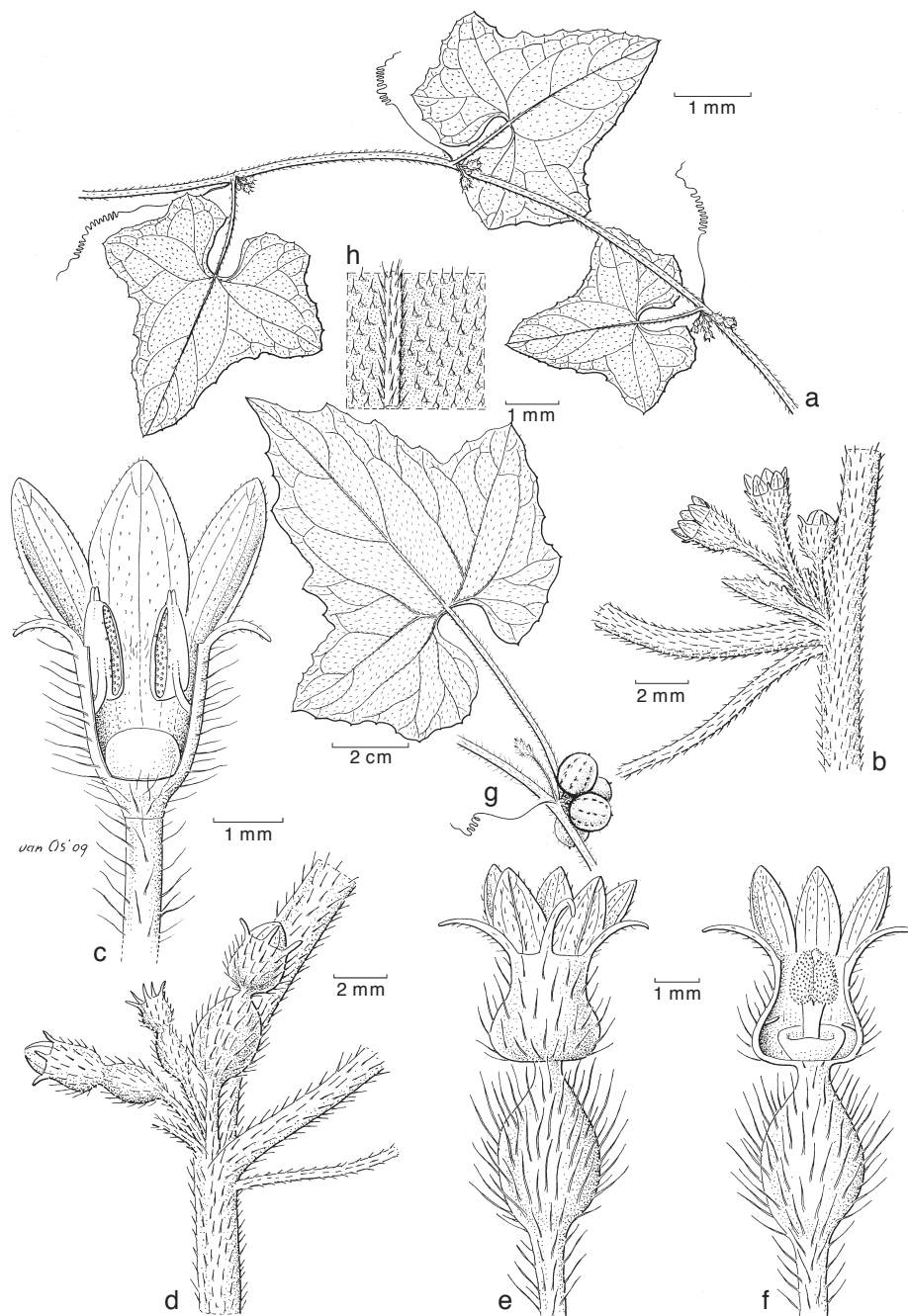


Fig. 44. *Mukia maderaspatana* (L.) M. Roem. a. Portion of twig with male inflorescences; b. detail of male inflorescence; c. male flower, opened; d. female inflorescence; e, f. female flower, from outside and opened respectively; g. infructescence; h. detail of lower leaf blade surface (a–f, h: De Wilde & Duyfjes SAN 141920; g: De Wilde & Duyfjes SAN141930).

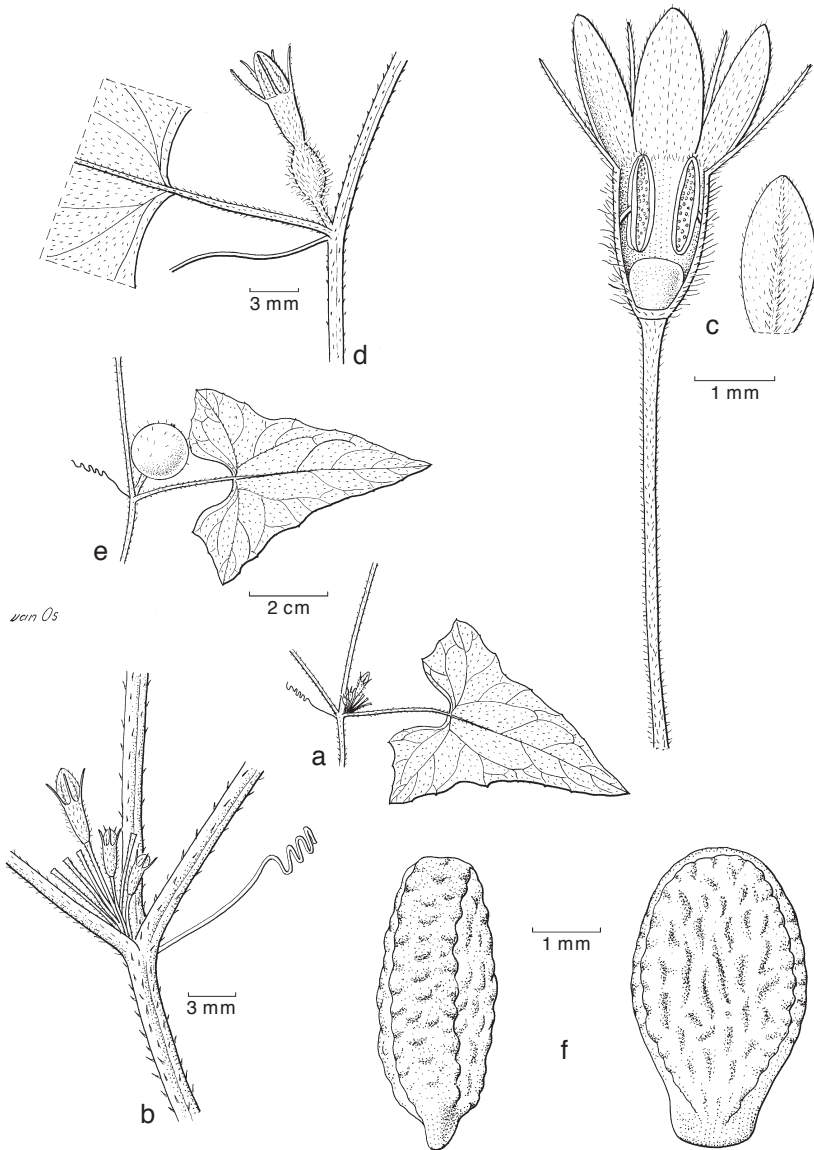


Fig. 45. *Mukia maderaspatana* (L.) M. Roem. a. Male inflorescence; b. ditto; c. male flower, opened and petal; d. female flower bud; e. fruit; f. seed, side view and face (all: *Henty NGF 49703*).

of SE Asia and West Malesia. However, one should be aware that in some specimens from East Malesia (where *M. javanica* does not occur) the position of the hairs may be ad variance: sometimes retrorse in Lesser Sunda Islands or often erect or curved to all directions in New Guinea.

3. The collection *Henty NGF 49703* (see Fig. 45), from savanna in East Papua New Guinea, differs in having a delicate habit, long-pedicelled, minute, slender male flowers,

a 5–10 mm long pedicel, the connective of anthers not produced, solitary female flowers and fruits, the fruit c. 1.2 cm diam., containing c. 25 scrobiculate seeds, and in not up-curved hairs on the petiole. Its determination as *M. maderaspatana* is provisional.

4. Plants may be perennial with a thick old woody rootstock or annual and soon flowering, with fibrous roots. The specimens *Raap 499* and *Insani SAN10* (Java) will be placed by Sebastian et al., l.c., into a separate species *Cucumis althaeoides*, but we cannot corroborate this on morphological grounds.

### 3. *Mukia rumphiana* (Scheff.) W.J.de Wilde & Duyfjes

*Mukia rumphiana* (Scheff.) W.J.de Wilde & Duyfjes, Thai Forest Bull., Bot. 34 (2006) 45. — *Melothria rumphiana* Scheff., Ann. Jard. Bot. Buitenzorg 1 (1876) 25. — *Cucumis rumphianus* (Scheff.) H.Schaeff., Blumea 52 (2007) 168. — Type: *Teijsmann 7496* (lecto L, barcode: L0589472, designated by De Wilde & Duyfjes (2006)), Ternate. (For synonyms see under the subspecies).

Climber 3–5 m long, roots perennial, leafy stem 2(–3) mm diam., with stiff hairs, ± upward directed. *Leaves*: petiole 1–3 cm long, scabrous by stiff upward directed hairs; blade 3–5-angular or -lobed up to c. halfway (rarely deeper), broadly ovate in outline, 4–8 by 4–11 cm, upper surface finely scabrous-punctate, lower surface grey scabrid-hairy, margin sinuate-dentate. *Male flowers* in fascicles of 3–15; pedicel 4–7 mm long; receptacle-tube long-campanulate, 3–4 by 1.5–2 mm; sepals 1–1.5 mm long, outside and inside densely fine-hairy; petals ovate-elliptic, 2–3 by 1.5–2 mm, apex acute(-acuminate), wholly finely-hairy at outside; filaments c. 0.5 mm long, anthers oblong, c. 2 mm long, at apex almost without or with one or two small exertions; disc depressed, c. 1 mm diameter. *Female flowers* solitary; pedicel 1–2 mm long; ovary ovoid, 4–6 by 2–3 mm, (densely) soft- or coarse-hairy, the hairs patent or ± upward directed; staminodes minute. *Fruit* solitary, whitish, ripening red, ellipsoid, 2–4 by 1.5–2.5 cm, either densely soft-hairy or sparsely hairy and later on glabrescent; exocarp thin, not or hardly translucent; fruiting pedicel 0.4–1 cm long. *Seeds* numerous, pyriform-ovoid, only little compressed, (4–)5–6 by 3–4 by 2 mm, margin narrow, with 2 grooves; faces flattish, shallowly verrucose-rugose.

Distribution — Sulawesi, Moluccas (Ternate, Bacan, Sula Islands, Buru, Ambon), New Guinea (West Papua (Vogelkop Peninsula)); 2 subspecies.

Habitat & Ecology — Forest edges, hedges, shrubberies near the coast; on limestone; at low altitudes. Flowering and fruiting throughout the year.

#### KEY TO THE SUBSPECIES

- 1a. Fruit sparsely long-hairy, hairs 1–2 mm long . . . . . **a. subsp. rumphiana**  
 b. Fruit densely short-hairy, hairs up to 0.5 mm long . . . . . **b. subsp. tomentosa**

#### **a. subsp. rumphiana**

*Mukia celebica* (Cogn.) F.M.Bailey, Queensl. Fl. 2 (1900) 700, for the type only; C.Jeffrey in Hooker's Ic. Pl. 37, 3 (1969) 11, t. 3664. — *Melothria celebica* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 625; in Engl., Pflanzenr. 66, 4.275.1 (1916) 128. — Type: *Forsten 96* (holo L), Sulawesi, Tondano. *Melothria javanica* auct. non (Miq.) Cogn.: Merr., Interpr. Herb. Amboin. (1917) 491. — *Cucumis murinus ruber* Rumph., Herb. Amboin. 5 (1750) 463, t. 171, f. 1 & a.



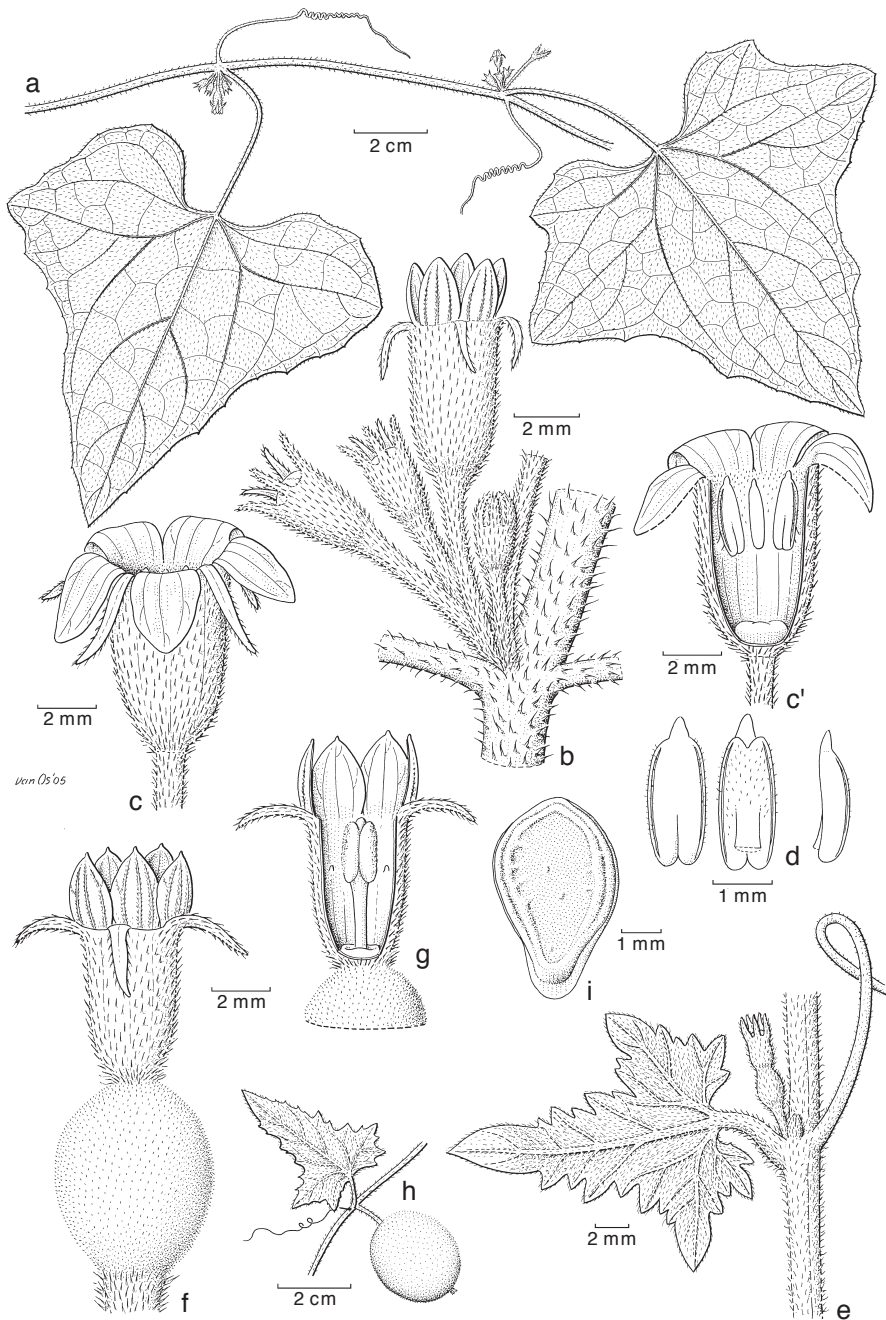


Fig. 46. *Mukia rumphiana* (Scheff.) W.J.de Wilde & Duyfjes subsp. *tomentosa* W.J.de Wilde & Duyfjes. a. Twig with male inflorescences; b. male inflorescence; c, c'. male flower, from outside and opened respectively; d. stamens; e. node with immature female flower; f, g. female flowers, from outside and opened respectively; h. node with fruit; i. seed (all: De Wilde & Duyfjes 21757).

Ovary (densely) hairy, hairs 1–2 mm long. Fruits ± glossy with sparse hairs 1–2 mm long.

Distribution — Sulawesi (Minahassa); northern Moluccas (Bacan, Ternate, Sula Islands, Buru, Ambon); New Guinea (West Papua (Vogelkop Peninsula)).

Habitat & Ecology — Sea level to 600 m altitude; flowering and fruiting throughout the year.

**b. subsp. *tomentosa* W.J.de Wilde & Duyfjes,**

*Mukia rumphiana* (Scheff.) W.J.de Wilde & Duyfjes subsp. *tomentosa* W.J.de Wilde & Duyfjes, Thai Forest Bull., Bot. 34 (2006) 47, f. 3, 4f. — Type: *Van Balgooy 4782* (holo BO; iso K, KYO, L), Buru.

Ovary and fruits densely velvety grey-hairy, hairs to 0.5 mm long. — **Fig. 46.**

Distribution — SW Sulawesi, Moluccas (Buru).

Habitat & Ecology — Limestone area; 500–1000 m altitude; flowering and fruiting August to January.

Note — The distribution of the subspecies *rumphiana* and *tomentosa* seem to exclude each other, but both subspecies are found on Buru.

## 26. NEOACHMANDRA

*Neoachmandra* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 12, f. 1c, 2c; t. 1. — Type species: *Neoachmandra japonica* (Thunb.) W.J.de Wilde & Duyfjes (*Melothria japonica* Thunb.).

*Achmandra* Arn., Madras J. Lit. Sci. 12 (1840) 49, p.p., not for the lectotype which is *Kedrostis*; Arn., J. Bot. 3 (1841, '*Aechmandra*') 274.

Small climbers, usually annual, leafy stem 0.5–2 mm diam., plant green on drying; monoecious. *Probract* absent. *Tendrils* unbranched. *Leaves* simple (seemingly 5-foliolate in *N. pentaphylla*, New Caledonia), palmiveined. *Flowers* 5(–10) mm diam., petals usually valvate in bud, (creamy-)white, free. *Male inflorescences* consisting of 1–4(–8) long-pedicelled flower(s) at the node, usually co-axillary with one (or more) long-pedicelled female flower(s); bracts absent. *Male flowers*: pedicel (3–)10–50 mm long, persistent; receptacle-tube campanulate; sepals minute, narrowly elliptic or linear, usually recurved; petals (narrowly) elliptic; stamens (2 or) 3, inserted in the upper half of the receptacle-tube, filaments short, anthers all 2-theous, included or ± exserted, thecae lateral, straight, ± divergent, connective broad, at apex truncate or acutely angular, or sometimes minutely produced; disc free, (depressed-)globose. *Female flowers* 1 or 2, frequently co-axillary with previously developed male flower(s); pedicel (short or) long; ovary globose or ellipsoid-fusiform, usually with slender neck at apex, glabrous; stigmas 3 or stigma consisting of (2 or) 3 almost free lobes, lobes entire or lobed, papillose-hairy; staminodes usually present; disc annular, free from receptacle-tube. *Fruit* 1 (or 2), usually with long fruiting pedicel, globose, ellipsoid, narrowly ellipsoid or fusiform, 0.5–7 cm long, apex beaked or not, glabrous, (pink-)white or red, juicy or pulpy; dry exocarp membranous or cartilaginous, smooth or minutely pustulate. *Seeds* few or numerous, pale, compressed (elsewhere also globose), ovate-elliptic, faces not or but little convex, not sculptured, margin absent or obscure, with entire rounded edge, base of seed without or with a short or long wing.

Distribution — A genus of c. 30 species distributed in the tropics of the Old World: Africa, Madagascar, and in SE Asia from India, China, Japan south-east to Australia and the Pacific; in *Malesia*: 12 species.

## KEY TO THE SPECIES

- 1a. Petals more than 5 mm long . . . . . 2  
 b. Petals less than 5 mm long . . . . . 4  
 2a. Leaf blade (narrowly) triangular, at base broadest and truncate . . . . . 3  
 b. Leaf blade narrowly elliptic, at base narrowed. — New Guinea . **7. N. lancifolia**  
 3a. Male flowers 2–4 on each node (female flowers not seen). Receptacle-tube 3.5 mm long. — Philippines . . . . . **9. N. macrantha**  
 b. Male flowers single (beside 1 female flower) on each node. Receptacle-tube c. 1.5 mm long. — New Guinea . . . . . **3. N. clemensiae**  
 4a. Leaf blade (3–)5-lobed, lobes to (1/5–)halfway deep or more . . . . . 5  
 b. Leaf blade lobed less than halfway deep or leaves hastate or unlobed. . . . . 6  
 5a. Fruit ellipsoid, 1(–1.5) cm long. — Philippines. . . . . **2. N. boholensis**  
 b. Fruit globose, 0.5(–1) cm diameter. — New Guinea . . . . . **4. N. filipes**  
 6a. Fruit fusiform, long-tapering at base and apex . . . . . 7  
 b. Fruit globose, ellipsoid or short-cylindrical, at base short-cuneate or more or less rounded . . . . . 8  
 7a. Fruit 5–6 cm long. — Papua New Guinea . . . . . **10. N. morobensis**  
 b. Fruit 2.5–4.5 cm long. — Java, Lesser Sunda Islands. . . . . **1. N. backeri**  
 8a. Fruit whitish. Seeds 5.5–7 mm long. — Submontane; South Sumatra, Java . . . . . **8. N. leucocarpa**  
 b. Fruit whitish or green. Seeds 2–5 mm long. — Lowlands . . . . . 9  
 9a. Leaf blade narrow, long-triangular, mostly conspicuously long-bristly hairy on the veins beneath, hairs 0.5–1.5 mm long. Ovary sparsely hairy. — Philippines . . . . . **12. N. scaberrima**  
 b. Leaf blade broader, less conspicuously hairy on veins beneath, hairs 1 mm long or less. . . . . 10  
 10a. Fruit 2–4 cm long, often irregularly speckled or blotched. — East Java, Lesser Sunda Islands, Philippines . . . . . **11. N. nesophila**  
 b. Fruit 1–2 cm long, not speckled . . . . . 11  
 11a. Fruit ellipsoid, 1.5–2 cm long, green. Dry exocarp opaque, seeds not shining through. — Moluccas(?), Papua . . . . . **5. N. idenburgensis**  
 b. Fruit globose or short-ellipsoid, 1–1.5 cm long, whitish. Dry exocarp filmy, transparent, when dry seeds mostly shining through. — Widespread . . . . **6. N. indica**

**1. *Neoachmandra backeri* W.J.de Wilde & Duyfjes**

*Neoachmandra backeri* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 14. — Type: *Jaag 466* (holo L), East Moluccas, Alor Islands.

Annual (or subperennial) 1–2 m long climber, leafy stem 0.5–1 mm diam., sparsely finely woolly pubescent, glabrescent. *Leaves*: petiole 1–2(–3) cm long, sparsely scab-

rous-hairy; blade 3- or 5-angular, or (deeply) 3-lobed, 2–5(–7) cm long and nearly as wide, above scabrous-hairy or with cystoliths, base broadly rounded or (deeply) cordate, margin shallowly repand-dentate. *Male flowers* 1 (or 2) per node, co-axillary with later developing female flower; pedicel 8–15 mm long; expanded perianth 5–10 mm diam.; receptacle-tube 1.5–2 by 1.5–2.5 mm, inside at throat finely woolly-hairy; sepals 1–1.5 mm long; petals 2.5–5 mm long, subacute, the margin and upper surface minutely papillose-hairy; stamens inserted halfway in the receptacle-tube, filaments 1 mm long, anthers 1.5 mm long and wide, connective wide at apex, minutely produced in the middle; disc 1–1.5 mm diameter. *Female flowers* (subsp. *balinensis*): single; pedicel 10(–20) mm long; ovary narrowly ellipsoid-fusiform, 8–12 by 1–1.5 mm, glabrous; receptacle-tube broadly campanulate; style 1.5 mm long, stigma 2–5 mm diam., consisting of 3 deeply 2-lobed parts, densely (long-)lanose-papillose; staminodes lanceolate, c. 1.5 mm long; disc c. 1 mm high. *Fruit* solitary, narrowly ellipsoid-fusiform, 2.5–4.5 by 0.8–1 cm; dry pericarp (exocarp) cartilaginous, light brown, faintly or distinctly (5- or) 6-ribbed; fruiting pedicel 2–4.5 cm long. *Seeds* numerous, (narrowly) elliptic, 3–3.5 by 1.5–2 mm, with faint paler margin.

Distribution — Java (Kangean Archipelago), Sulawesi, Lesser Sunda Islands, Moluccas (see further under the subspecies).

#### KEY TO THE SUBSPECIES

- 1a. Expanded male corolla 5–7 mm diam.; petals 2.5–4 mm long. — Lowlands . . . . . **a. subsp. backeri**  
 . . . . .  
 b. Expanded male corolla 8–10 mm diam.; petals 4–5 mm long. — Montane . . . . . **b. subsp. balinensis**  
 . . . . .

#### **a. subsp. backeri**

Expanded corolla 5–7 mm diameter. Fruit 3–5 cm long. — **Fig. 3d.**

Field-notes — Fruits said to be red when ripe and edible (*Backer 28153*).

Distribution — Java (Kangean Archipelago), Sulawesi (Djampea Is.), Lesser Sunda Islands (Alor Kecil), Moluccas (Tanimbar Islands: Jamdena Is.).

Habitat & Ecology — Climber in open scrub and on beaches; sea level; flowering and fruiting March to June.

#### **b. subsp. balinensis** W.J.de Wilde & Duyfjes

*Neochmandra backeri* W.J.de Wilde & Duyfjes subsp. *balinensis* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 15. — Type: *De Wilde & Duyfjes 21732* (holo L; iso BO), Bali (Bedugul, growing wild in forest edges in the Botanical Garden).

Expanded corolla 8–10 mm diameter. Fruit c. 3 cm long.

Field-notes — Tiny climber. Fruits dark green, possibly red when ripe.

Distribution — Lesser Sunda Islands (Bali).

Habitat & Ecology — Climbing on tree trunks in forest edges; 1400–1800 m.

## 2. *Neoachmandra boholensis* (Merr.) W.J.de Wilde & Duyfjes

*Neoachmandra boholensis* (Merr.) W.J.de Wilde & Duyfjes, Blumea 51 (2006) 15. — *Melothria boholensis* Merr., Philipp. J. Sci. 29 (1926) 495. — Type: *Ramos BS 42779* (holo UC; iso K), Philippines, Bohol (Kalingohan).

Annual 1–2 m long climber, leafy stem c. 1 mm diam., sparsely fine-hairy, glabrescent. *Leaves*: petiole 1–1.5 cm long, bristly hairy; blade subcircular in outline, 2–6 cm diam., (3–)5-lobed to 1/5 deep to nearly to the base, segments narrowly elliptic or lanceolate, upper surface scabrous, with cystoliths, lower surface bristly hairy along the veins, base truncate or shallowly cordate, margin entire or coarsely shallowly repandentate, apex acute. *Male flowers* 1 (or 2) per node, usually co-axillary with 1 (or 2) longer-pedicelled female flowers; pedicel 10–12 mm long; expanded perianth c. 5 mm diam.; receptacle-tube 2–2.5 by 2.5–3 mm, at throat finely hairy; sepals 1 mm long (or less); petals 2–2.5 mm long, blunt or rounded, inside at apex papillose-hairy; stamens inserted close to the throat of the receptacle-tube, filaments c. 1/4 mm long, anthers c. 1 by 1 mm, connective broad, at apex truncate, faintly produced in the middle; disc (0.5–)1 mm diameter. *Female flowers*: pedicel 15–25 mm long; ovary narrowly ellipsoid, c. 5 by 2 mm, subglabrous (with sparse hairs); style 1(–1.5) mm long, with 3 style-arms c. 0.5 mm long, each with a subellipsoid papillose stigma-lobe of c. 1 mm diam.; staminodes less than 1 mm long. *Fruit* 1 (or 2), ellipsoid, 1.5–2 by 1–1.5 cm, base rounded, apex narrowly rounded; dry exocarp thin, cartilaginous, almost smooth, pale brown; fruiting pedicel slender, 2–2.5(–4) cm long. *Seeds* numerous, elliptic, c. 3 by 1.5–2 mm, margin faint.

Field-notes — Corolla white. Ripe fruits green.

Distribution — Philippines (Bohol, Mindanao, Sulu Archipelago).

Habitat & Ecology — Climber in recent clearings, also in mangrove forest; sea level to 600 m; flowering and fruiting throughout the year.

Note — Except for the deeply lobed leaves and rather large fruits, this species comes close to the widespread *N. indica* of which it is possibly only a regional form.

## 3. *Neoachmandra clemensiae* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes

*Neoachmandra clemensiae* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes, Blumea 51 (2006) 17. — *Melothria clemensiae* Merr. & L.M.Perry, J. Arnold Arbor. 29 (1948) 168. — Type: *M.S. Clemens 41287* (holo A, not seen; iso MICH), Papua New Guinea, Morobe (Sugu-Gaeng).

Annual or subperennial 2 m long climber, leafy stem c. 1 mm diam., sparsely fine-hairy, glabrescent; ?polygamous (see under female flowers). *Leaves*: petiole 0.9–1.4 cm long, densely bristly hairy; blade unlobed, narrowly triangular, 4–6 by 2–3 cm, upper surface scabrous with cystoliths, lower surface sparsely scabrous-hairy, on veins hairs longer and denser, base broadly truncate, margin entire, with short teeth less than 1 mm long. *Male flowers* single, or often co-axillary with 1 female flower, glabrous; pedicel c. 20 mm long; expanded perianth c. 15 mm diam.; receptacle-tube c. 1.5 by 3 mm, at throat hardly hairy; sepals 0.5(–1) mm long; petals 6–7 by 2–3(–4) mm, subacute, subglabrous; stamens inserted slightly below the throat of the receptacle-tube, filaments less than 0.5 mm long, anthers 1.5 mm long, 1.5 mm wide, connective broad, at apex truncate, not or slightly produced; disc depressed globose, less than

1 mm diameter. *Female flowers*: pedicel 30–40(–45) mm long; ovary much elongated, 12(–15) by 1–1.5 mm, at apex contracted into a narrow neck 2.5–3 mm long, glabrous; receptacle-tube c. 2.5 by 3.5 mm; style 1.5(–2) mm long, stigma-lobes each c. 1.5 mm diam.; staminodes c. 2 mm long, inserted slightly above the base of the receptacle-tube, each consisting of a 1–1.5 mm long filament with at apex a reduced 2-theous anther 0.5 mm long, lined with few hairs; disc nearly 1 mm high, the upper rim  $\pm$  undulating. *Fruit* unknown.

Distribution — New Guinea (Papua New Guinea, Sugu-Gaeng, Morobe Province); known only from the type.

Habitat & Ecology — Along mountain trail on wet place; 1000–1200 m; flowering in April.

Note — The type and only known collection *M.S. Clemens 41287* is a richly flowering specimen, with one male and one female flower at each node. The female flowers all seem to be hermaphroditic, as the staminodes bear well-developed anthers, though much smaller than those of the male flowers. The staminodes are much lower inserted in the receptacle-tube compared to the stamens in the male flowers. The thecae in the staminodes apparently do not open, and do not produce fertile-looking pollen.

#### 4. *Neoachmandra filipes* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes

*Neoachmandra filipes* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 18. — *Melothria filipes* Merr. & L.M.Perry, *J. Arnold Arbor.* 29 (1948) 167. — Type: *M.S. Clemens 11027* (holo A; iso MICH), Papua New Guinea, Morobe (Wantoat).

Annual or subperennial 1–2 m long climber; leafy stem 0.5–1 mm diam., sparsely hairy. *Leaves*: petiole 1–3 cm long, finely rigidly hairy; blade circular or broadly ovate in outline, 4–11 cm diam., palmately (3–)5-lobed to c. 3/4 deep to (nearly) to the base, lobes narrowly elliptic or lanceolate (or linear), mid-lobe usually largest, up to 8 by 1(–2) cm, upper surface densely  $\pm$  appressedly scabrous-hairy, lower surface bristly hairy on the veins, cystoliths not obvious, base truncate or widely shallowly emarginate, margin entire or widely minutely repand-dentate. *Male flowers* single, co-axillary with a single somewhat later developing longer-pedicelled female flower; pedicel 12–20 mm long; expanded perianth 6–8 mm diam.; receptacle-tube 1.5 by 2 mm, finely hairy in the throat; sepals 1 mm long; petals 3–4 mm long, subacute, inside very finely hairy; stamens inserted halfway the receptacle-tube, filaments slender, 1(–1.5) mm long, anthers 0.8 by 1 mm, thecae diverging to the apex, connective broad, at apex angularly protruding; disc depressed globose, 1 mm diameter. *Female flowers*: pedicel 15–25(–40) mm long, filiform; ovary nearly globose, 2 mm diam., glabrous, at apex contracted into a narrow neck 1 mm long; receptacle-tube 1.5 by 2 mm, finely hairy in the throat; sepals 0.5(–1) mm long; petals 2–2.5 mm long, inside papillose-hairy; style 1.5 mm long, stigma 3-lobed, depressed-globose, nearly 1 mm diam., papillose-hairy; staminodes 0.3 mm long; disc 0.5 mm high. *Fruit* solitary, subglobose, 0.5(–1) cm diam.; dry exocar thin, papery, smooth, pale brown; fruiting pedicel very slender, 1.5–6(–8) cm long. *Seeds* 4–10 per fruit, ovate, 5 by 3–3.5 mm, smooth, with thickened rounded margin.

Field-notes — Locally common. Flowers creamy or white and the ripe fruits pink or orange.

Distribution — New Guinea (Papua New Guinea (Central, Western Highlands, Eastern Highlands, Morobe, and Madang Provinces)).

Habitat & Ecology — In tall grassland, clearings and forest edges in montane area; 1000–2000 m; flowering and fruiting throughout the year.

### 5. *Neoachmandra idenburgensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes

*Neoachmandra idenburgensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 21. — *Melothria idenburgensis* Merr. & L.M.Perry, *J. Arnold Arbor.* 30 (1949) 57. — Type: *Brass* 14100 (holo A; iso BM, BO), West Papua, Idenburg River.

Annual c. 1 m long climber; leafy stem c. 1 mm diam., glabrescent. *Leaves*: petiole 1–2.5 cm long, (sparsely) hairy; blade ovate, (long) triangular or subhastate, 3.5–11 by 2–6 cm, upper surface finely scabrous with minute cystoliths, lower surface smooth, veins sparsely finely hairy, base with broadly angular sinus up to 2 cm deep, basal lobes subobtusate. *Male flowers* 1 or 2, frequently co-axillary with one equally long-pedicelled female flower (or fruit); pedicel 7–12 mm long, (sub)glabrous; expanded perianth c. 7 mm diam.; receptacle-tube 2 by 2 mm, glabrous, minutely hairy in the throat; sepals 1 mm long; petals 2.5–3 mm long, inside and on margin towards apex minutely glandular-hairy; stamens inserted close to the throat of the receptacle-tube, filaments 0.3 mm long, anthers 1.3 by 1.3 mm, connective truncate, faintly protruding in the middle; disc depressed globose, 1 mm diameter. *Female flowers* not seen (ovary described in original description as fusiform). *Fruit* solitary, co-axillary with pedicel of dropped male flower, ellipsoid, 1.5–1.7 by 1–1.2 cm, base rounded, apex (narrowly) rounded with minute point; dry exocarp thinly pergamentaceous, opaque, not transparent; fruiting pedicel c. 1 cm long. *Seeds* numerous, ovate-elliptic, 3.5–4 by 2–2.5 mm, with narrow paler margin, basal wing c. 2 mm long.

Distribution — New Guinea (West Papua, Idenburg River, Bernhard Camp); known only from the type.

Habitat & Ecology — The herbarium label mentions the plant as “occasional in fringe vegetation along stream in rainforest”; at 50 m altitude; flowering and fruiting in April.

### 6. *Neoachmandra indica* (Lour.) W.J.de Wilde & Duyfjes

*Neoachmandra indica* (Lour.) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 21. — *Melothria indica* Lour., *Fl. Cochinch.* (1790) 35; Backer in Backer & Bakh.f., *Fl. Java* 1 (1964) 297. — *Aechmandra indica* (Lour.) Arn., *J. Bot.* (1841) 274. — *Zehneria indica* (Lour.) Keraudren in Aubrév. & J.-F.Leroy, *Fl. Cambodge, Laos & Vietnam* 15 (1975) 52, pl. 9: 5–8; W.J.de Wilde & Duyfjes, *Thai Forest Bull. Bot.* 32 (2004) 19. — Type (Keraudren, 1975): *Loureiro s.n.*, Tourane, Vietnam; untraced. Neotype: *Squires 14* (BM, designated by Jeffrey, *Kew Bull.* 34 (1980); iso K, UC, W), Vietnam, Hue.

*Bryonia geminata* Blume, *Bijdr. Fl. Ned. Ind.* 15 (1826) 924. — Type: *Zippelius 1564* (lecto L, designated by De Wilde & Duyfjes (2006)), West Java.

*Cucumis luzonicus* Blanco, *Fl. Filip.* (1837) 861; Merr., *Sp. Blancoan.* (1918) 470. — Type: *Merrill: Species Blancoanae 848* (neo US, designated by De Wilde & Duyfjes (2006), not seen; iso K, L, W), Rizal Province, Luzon.

Subannual slender 0.5–1.5 m long creeper or climber, largely glabrescent, hairs less than 0.5 mm long. *Leaves*: petiole 1–3 cm long, finely hairy or glabrescent; blade triangular or (deeply) hastately 3(–5)-lobed, 2.5–7(–10) by 3–5.5(–7) cm, base broadly shallowly cordate or subtruncate, margin faintly dentate. *Flowers*: perianth 4–7 mm diam., male flowers solitary (or paired?), usually co-axillary with 1 or 2 previously developed, longer-pedicelled female flower(s), glabrous (but sparsely gland-dotted). *Male flowers*: pedicel slender, 10–15 mm long; receptacle-tube ± narrowly cup-shaped, 1.5–2 by 1.5–2 mm, glabrous, except for hairy fringe at throat inside; sepals (0.5–)1 mm long, glabrous, recurved; petals 2–3.5 by 1.5–2 mm, inner and outer surface minutely gland-hairy and papillose; filaments 0.5 mm long, glabrous, inserted 0.5(–1) mm below the throat of the receptacle-tube, anthers obovoid-rhomboid, 1–1.5 mm diam., thecae straight, 1 mm long, connective broad, broadest at apex, subtruncate with short 0.2 mm projection, (partly) finely hairy; disc elongated, ± obovate-elliptic, 1 mm long. *Female flowers*: pedicel (10–)15–30 mm long; ovary ellipsoid to narrowly ellipsoid, 3(–4) by 1.5–2 mm, glabrous, neck 0.5–1 mm long; perianth as in male flowers; style 1.5(–2) mm long, stigma 1 mm diam., composed of 3 apically deeply notched lobes, papillose; staminodes linear, 1 mm long, inserted halfway the tube; disc thick-carnose, 1 mm high. *Fruit* 1 or 2 per node, ripening whitish, subglobose or (short) ellipsoid, not apiculate, 0.8–1.2 by 0.8–1 cm; exocarp thinly leathery or membranous (when dry often leaving the seeds shining through); fruiting pedicel 1.5–3 cm long. *Seeds* 15–25 per fruit, ± obovate, 2–4 by 2.5–3 mm, smooth, unmarginated, with entire, rounded edge.

*Distribution* — Widespread: from South India and South China east to West Malesia; in *Malesia*: Borneo, Java, and the Philippines; not known from Sumatra and Peninsular Malaysia. In northern India the distinction with *N. odorata* is not sharp, as is the distinction with *N. japonica* in southern China.

*Habitat & Ecology* — In and along waste gardens, forest edges, shaded (damp) roadsides; 0–500(–1400) m; flowering and fruiting mainly July to December.

## 7. *Neoachmandra lancifolia* W.J.de Wilde & Duyfjes

*Neoachmandra lancifolia* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 22. — Type: *Paijmans 1107* (holo CANB; iso LAE), Papua New Guinea, south side of Goodenough Bay, Milne Bay Province.

Annual(?) herbaceous c. 2 m long climber; leafy stem c. 1 mm diam.; early glabrescent. *Leaves*: petiole 0.5–0.9 cm long, with dense, scabrous, upwards-directed hairs; blade lanceolate, parallel-5-nerved, 5–8 by 0.5–1 cm, both surfaces densely short-scabrous hairy, hairs directed towards the apex, base narrowed but ± rounded or subcordate, margin with sparse teeth 0.5 mm long or less, apex subacute with mucro. *Male flowers* 3–5 per node (female flowers not present), subglabrous; pedicel 20–25 mm long; expanded perianth c. 15 mm diam.; receptacle-tube narrowly campanulate, 3.5(–4) by c. 2.5 mm, inside at throat densely finely hairy; sepals 2.5–3 mm long, with an odd hair; petals 6–8 by 3–4 mm, along the margin minutely papillose; stamens inserted at c. 1/3 from the apex in the receptacle-tube, filaments slender, (1–)1.5 mm long, anthers c. 1.5 by 1 mm, exserted, hairy along the thecae, connective broad, with truncate apex, minutely produced in the middle; disc obovoid, c. 1.5 high, 1 mm wide. *Female flowers* and *fruits* not seen.



Distribution — New Guinea (Papua New Guinea: Milne Bay Province, south side of Goodenough Bay); known only from the type.

Habitat & Ecology — In grassland on plateau; at c. 250 m altitude.

Note — This species seems closely related to *N. scaberrima* which has much smaller flowers.

### 8. *Neoachmandra leucocarpa* (Blume) W.J.de Wilde & Duyfjes

*Neoachmandra leucocarpa* (Blume) W.J.de Wilde & Duyfjes, Blumea 51 (2006) 23. — *Bryonia leucocarpa* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 924. — *Bryonopsis? leucocarpa* (Blume) Miq., Fl. Ned. Ind. 1, 1 (1856) 657. — *Melothria leucocarpa* (Blume) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 601, p.p.; in Engl., Pflanzenr. 66, 4.275.I (1916) 101, p.p.; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 297. — Type: *Blume s.n.* (lecto L (barcode L0130099), designated by De Wilde & Duyfjes (2006)), Java.

*Zehneria deltoidea* Miq., Fl. Ned. Ind. 1, 1 (1856) 655. — *Melothria rauwenhoffii* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 597 (not *Melothria deltoidea* (Schumach.) Benth. in Hook., Niger Fl. (1849) 368). — Type: *Junghuhn s.n.* (holo U, barcode U0001468; iso L, barcode L0130089), Java, Gunung Merapi.

*Zehneria deltoidea* Miq. var. *subintegerrima* Miq., Fl. Ned. Ind. 1, 1 (1856) 655. — Type: *Horsfield s.n.* (holo U, barcode U0122933), Java.

*Melothria rauwenhoffii* Cogn. var. *pengalenganensis* Hochr., Candollea (1934) 287. — Type: *Hochreutiner 1316* (holo G; iso L), Java, Pengalengan Plateau.

Annual or subperennial to c. 5 m long climber, widely branched, leafy stem 1–2 mm diam.; minutely sparsely hairy, glabrescent. *Leaves*: petiole 1.5–3.5 cm long, scabrid short-hairy, blade broadly triangular or subhastate, 4–11 by 3–9.5 cm, upper surface glabrous except for the scabrid-hairy veins, with numerous cystoliths, lower surface glabrous, without cystoliths, base cordate, truncate or broadly emarginate, margin entire or shallowly dentate. *Male flowers* 1 or 2 per node, usually co-axillary with 1 or 2 longer-pedicelled female flower(s); pedicel 25–45 mm long, glabrous; expanded perianth 8–10 mm diam.; receptacle-tube c. 3.5 by 3 mm, densely minutely papillose-hairy in the throat; sepals 1 mm long; petals 3–5 mm long, subacute, inside minutely papillose-hairy; stamens inserted near the throat in the receptacle-tube, filaments 0.5 mm long, anthers c. 2 by 1.5 mm, connective broad, at apex truncate with a short mucro in the middle; disc ± globose, 1–1.5 mm diameter. *Female flowers* 1 or 2; pedicel (10–)30–60 mm long; ovary fusiform, c. 9 by 3 mm, glabrous, with a c. 2 mm long neck; style c. 4 mm long, stigma depressed globose, 1.5 by 1 mm, 3-lobed, and each lobe again 2-lobed, papillose; staminodes 0.5 mm long; disc 1 mm high, shallowly 3-lobed. *Fruit* 1 or 2, ripening pink-white, subglobose or ellipsoid, 1–2 by 0.8–1.5 cm, base subobtusate, apex (sub)obtusate, 1 mm beaked; dry exocarp thin, pale brown, smooth; fruiting pedicel (1–)4–6 cm long. *Seeds* 5–12 per fruit, elliptic, 6–7 by c. 4 mm, margin faint, without wing. — **Fig. 47; Plate 18a–c.**

Field-notes — Lower leaf surface very pale. Anthers dorsally with a ridge (as indicated in a drawing by *Kuhl & Van Hasselt s.n.*, barcode L0130076). Fruits at first greenish white, ripening pink-white. Cotyledons in the seedling measure c. 1.5 by 1 cm.

Distribution — Central and southern Sumatra (3 collections), all over Java.

Habitat & Ecology — Forest edges and damp or shady places in montane forest, often near streams; 850–1750 m; flowering and fruiting throughout the year.

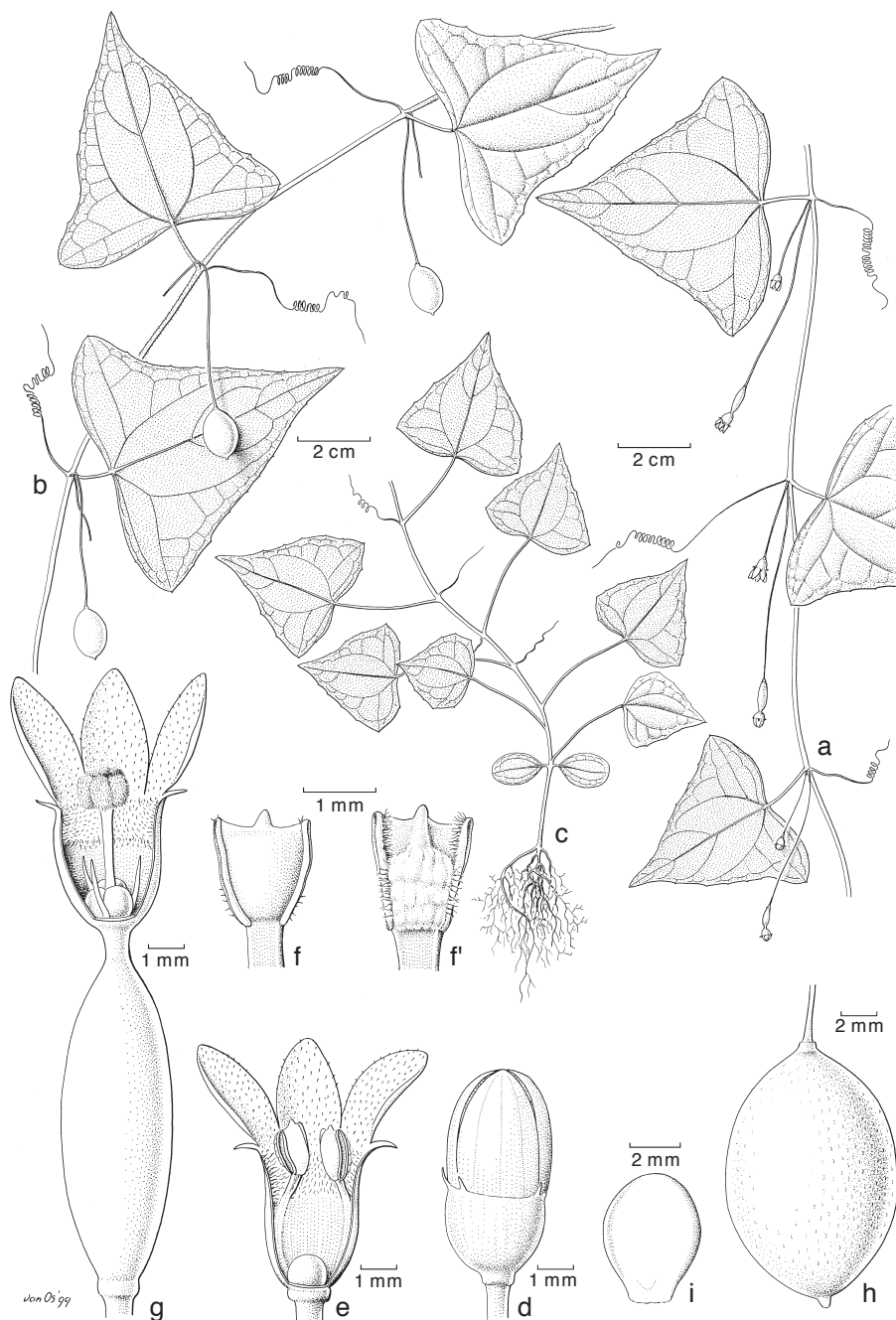


Fig. 47. *Neochandrantha leucocarpa* (Blume) W.J. de Wilde & Duyfjes. a. Twig with male and female flowers; b. twig with fruits; c. seedling; d, e. male flowers; f, f'. stamens, showing thecae with broad connective, ad- and abaxially respectively; g. female flower; h. fruit; i. seed (a, b, d–g: *De Wilde & Duyfjes 21843*; c, h, i: *De Wilde & Duyfjes 21946*).

**9. *Neoachmandra macrantha* W.J.de Wilde & Duyfjes**

*Neoachmandra macrantha* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 25. — Type: *Ramos & Edaño BS 40215* (holo P; iso K, UC), Philippines, Luzon, Mt Data.

Possibly annual 1–2 m long climber; leafy stem 0.5–1 mm diam.; sparsely hairy. *Leaves*: petiole 0.5–1.5 cm long, scabrous-hairy in upper midrib groove; blade entire, (narrowly) triangular, 4–6.5 by 2–3.5 cm, upper and lower surface scabrous with short hairs and cystoliths, veins with scabrid hairs, base truncate, margin shallowly sparsely repand-dentate, teeth 1–1.5 mm long, apex long-acuminate with short mucro. *Male flowers*: 2–4 (of different ages) at each node (female flowers not seen), subglabrous; pedicel 25–35 mm long; expanded perianth c. 15 mm diam.; receptacle-tube c. 3.5 by 3 mm, finely hairy in the throat; sepals 1–1.5 mm long; petals (6–)7 by (3–)4 mm, apex subacute, inside papillose-hairy; stamens inserted about halfway the receptacle-tube, filaments 1–1.5 mm long, anthers 1.5 by 1 mm, connective broad, at apex truncate and faintly produced in the middle; disc (depressed) globose, 1 mm diameter. *Female flowers* and *fruit* unknown.

Distribution — Philippines, Luzon, Mt Data; known only from the type; flowering in September.

**10. *Neoachmandra morobensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes**

*Neoachmandra morobensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 25. — *Melothria morobensis* Merr. & L.M.Perry, *J. Arnold Arbor.* 29 (1948) 167. — Type: *M.S. Clemens 11330bis* (holo MICH; iso A), Papua New Guinea, Morobe Province.

Subperennial 2–3 m long climber; leafy stem 1(–2) mm diam.; minutely hairy, glabrescent. *Leaves*: petiole (1.5–)2–4.5 cm long, densely harshly hairy, blade entire or 3-lobed up to halfway, broadly or narrowly triangular or subhastate, 4–10 by 5–14 cm, upper surface densely (appressed) grey hairy or scabrous, with or without cystoliths, lower surface sometimes less hairy, without cystoliths, base broadly rounded, truncate or broadly emarginate with shallow sinus, margin entire or shallowly repand-dentate, apex long-acuminate; 7 palmately veined. *Male flowers* 1–4 per node, usually co-axillary with 1 female flower; pedicel 15–25 mm long, sparsely hairy; expanded perianth 7–9 mm diam.; receptacle-tube 2–2.5 by 2.5–3 mm, minutely papillose-hairy in the throat (hairs less than 0.1 mm long); sepals 1.5–2.5 mm long; petals 2.5–3 mm long, minutely hairy inside; stamens inserted at about 1/3 from the apex in the receptacle-tube, filaments 0.5(–0.7) mm long, anthers 1.5 by 1 mm, connective broad, at apex slightly convex or straight; disc subglobose, flattened at apex, 1 by 1.5 mm. *Female flowers* single; pedicel 12–15 mm long; ovary narrowly ellipsoid; perianth immature. *Fruit* solitary, narrowly ellipsoid, fusiform, 4.5–5.5(–6) by (1–)1.5–2 cm, base acute, apex beaked; dry exocarp coriaceous, (faintly) 6-ribbed or -lined; fruiting pedicel very slender, c. 1.5 cm long. *Seeds* numerous, 3.5–4 by 2–2.5 mm, margin narrow, faint, at base with a wing. — **Fig. 48c, c'**.

Field-notes — Flowers white, creamy or pale yellow; androecium orange. Fruits glaucous, pale green, darker striped.

Distribution — New Guinea (Papua New Guinea: Central and Morobe Provinces).

**Habitat & Ecology** — In abandoned gardens, clearings in rainforest, disturbed forest, along creeks; at 50–1300 m altitude; flowering and fruiting throughout the year.

**Note** — The seeds in *Neoachmandra* have in the dried state often a wing-like appendage, possibly formed by the fruit pulp (endocarp), but in *N. morobensis* this is more obvious than in other species. The pale yellow colour mentioned on a field label needs further confirmation.

### 11. *Neoachmandra nesophila* W.J.de Wilde & Duyfjes

*Neoachmandra nesophila* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 26. — Type: *Soejatmi 10* (holo BO; iso A, K, L, SING, US), Java.

Annual or subperennial 1–3 m long climber; leafy stem 1–1.5 mm diam.; with sparse minute hairs or glabrous. *Leaves*: petiole 1–3(–5) cm long, subglabrous or sparsely or densely fine-hairy; blade ovate-triangular or (long-)triangular, 2.5–9 by 2.5–8 cm,

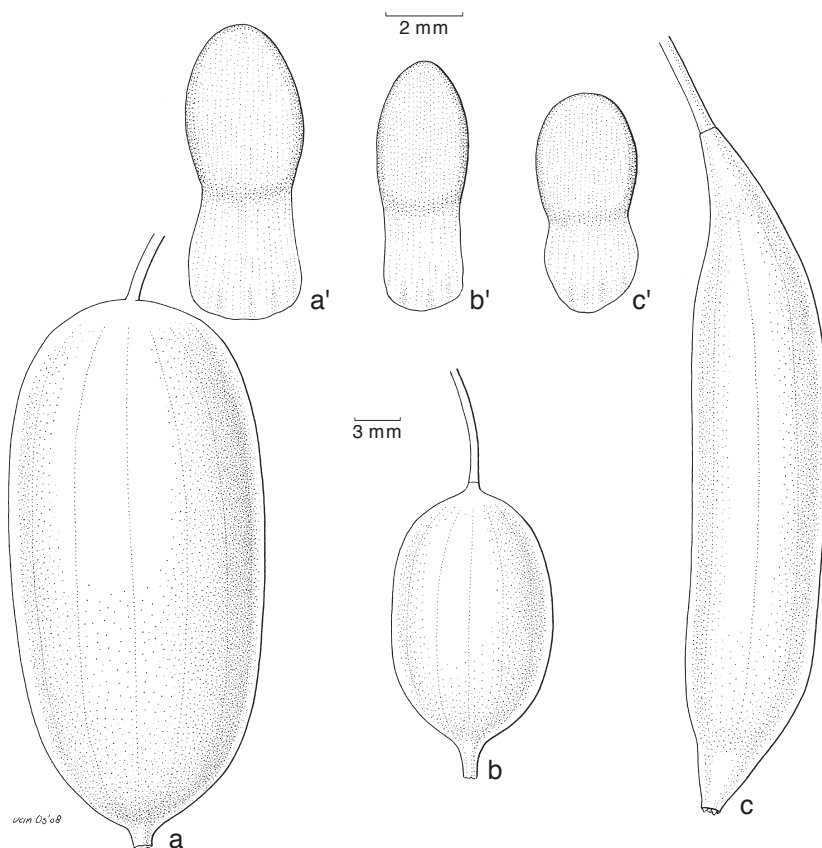


Fig. 48. Fruits and winged seeds of *Neoachmandra*. — a, a', b, b'. *Neoachmandra nesophila* W.J.de Wilde & Duyfjes. — c, c'. *Neoachmandra morobensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes (a, a': *Soejatmi 10*, Java, type; b, b': *De Wilde & Duyfjes 21935*, Lombok; c: *Takeuchi & Ama 16328*, Papua New Guinea; c': *Streimann & Kairo NGF 30905*, Papua New Guinea).

sometimes broadly hastately 3-lobed, lateral lobes to 3 by 5 cm, upper and lower surface (sub)glabrous, with or without (small) cystoliths and minute sparse hairs on the veins, base broadly rounded, truncate or widely cordate, margin entire or shallowly sparsely dentate. *Male flowers* 1(–3) per node, frequently co-axillary with a single female flower; pedicel 10–15 mm long, (sub)glabrous; expanded perianth 6–9 mm diam.; receptacle-tube 2–2.5 by c. 2.5 mm, outside glabrous, densely hairy in the throat (hairs 0.5 mm long); sepals 0.5–1 mm long; petals c. 3 mm long, outside glabrous or with some stout hairs, inside sparsely gland-hairy; stamens inserted close to the throat in the receptacle-tube, filaments 0.5 mm long, anthers 1–1.5 mm diam., exerted, connective ± truncate and at base with a conspicuous crest-like outward protrusion of c. 1 mm long (always?, see note 3); disc depressed obovoid, 1–1.5 mm long. *Female flowers* 1 (frequently co-axillary with male flower) or 2; pedicel usually much longer than in male, 25–45 mm long, (sub)glabrous; ovary narrowly ellipsoid, 8–10 by 1.5–2(–2.5) mm, base acutish, narrowed into a slender neck 2.5–3.5 mm long, glabrous; receptacle-tube 2–3.5 by 2.5–3.5 mm; style c. 2 mm long, stigma subglobose, c. 2 mm diam., 3-lobed, each lobe deeply 2-lobed, papillose; staminodes subulate, c. 1 mm long; disc less than 1 mm high. *Fruit* solitary (or 2), ripening green-red or green with darker stripes or yellow, narrowly ellipsoid, 2–4 by 1.2–1.5 cm, base rounded, apex ± narrowed into an acute-acuminate c. 5 mm long beak; dry exocarp usually with small darker patches and spots arranged in longitudinal rows; fruiting pedicel 2–6 cm long. *Seeds* numerous, 3.5–4.5 by 2–3 mm, margin faint, at base with a wing. — **Fig. 48a, a', b, b', 49; Plate 18d, 19a, b.**

**Distribution** — East Java; Philippines (Luzon, Mindoro); North Sulawesi; Lesser Sunda Islands (Lombok, Sumbawa, Flores, Timor (deviating, see note 1)); Moluccas (Halmahera, Banda).

**Habitat & Ecology** — Damp thickets and forest edges, near streams; at low altitudes to 500(–2100) m; flowering and fruiting mainly from January to July.

**Notes** — 1. Two collections from Timor, *Forbes 3919 & 3957*, from c. 700 m altitude, deviate in the petiole and lower leaf surface, bearing rather dense and soft hairs, and in the much longer male pedicels which are 20–60 mm long. The seeds are similar to those of *N. nesophila*. More material is needed to elucidate whether we are dealing with a separate taxon.

2. *Neoachmandra nesophila*, as it is conceived here, comprises specimens with an unusual variation in fruit size: 2–4 cm long. A number of specimens from the same distributional area, mostly rather incomplete, resemble *N. nesophila* but have smaller fruits, 1.5–2 cm long, without the ornamentation of fine darker-coloured patches and dots. These specimens also resemble the type and only collection of *N. idenburgensis*, from West Papua, although the latter is so much different in other characters from *N. nesophila* that it is retained here as a distinct species. The true status of the smaller-fruited specimens alluded to above remains uncertain. A choice of these specimens is: *Clemens 18282* (Luzon); *Conklin & Del Rosario PNH 72640* (Mountain Province, 2000 m); *Ramos & Edaña BS 44466* (Sulu Islands); *Gaerlan PPI 23101* (Mindanao, 2110 m); *De Haan 1769* (Halmahera, 20 m).

3. In *De Wilde & Duyfjes 21935*, in spirit, from Lombok, the connective is of a firm but watery texture and bears the described protrusion. This protrusion was not seen in

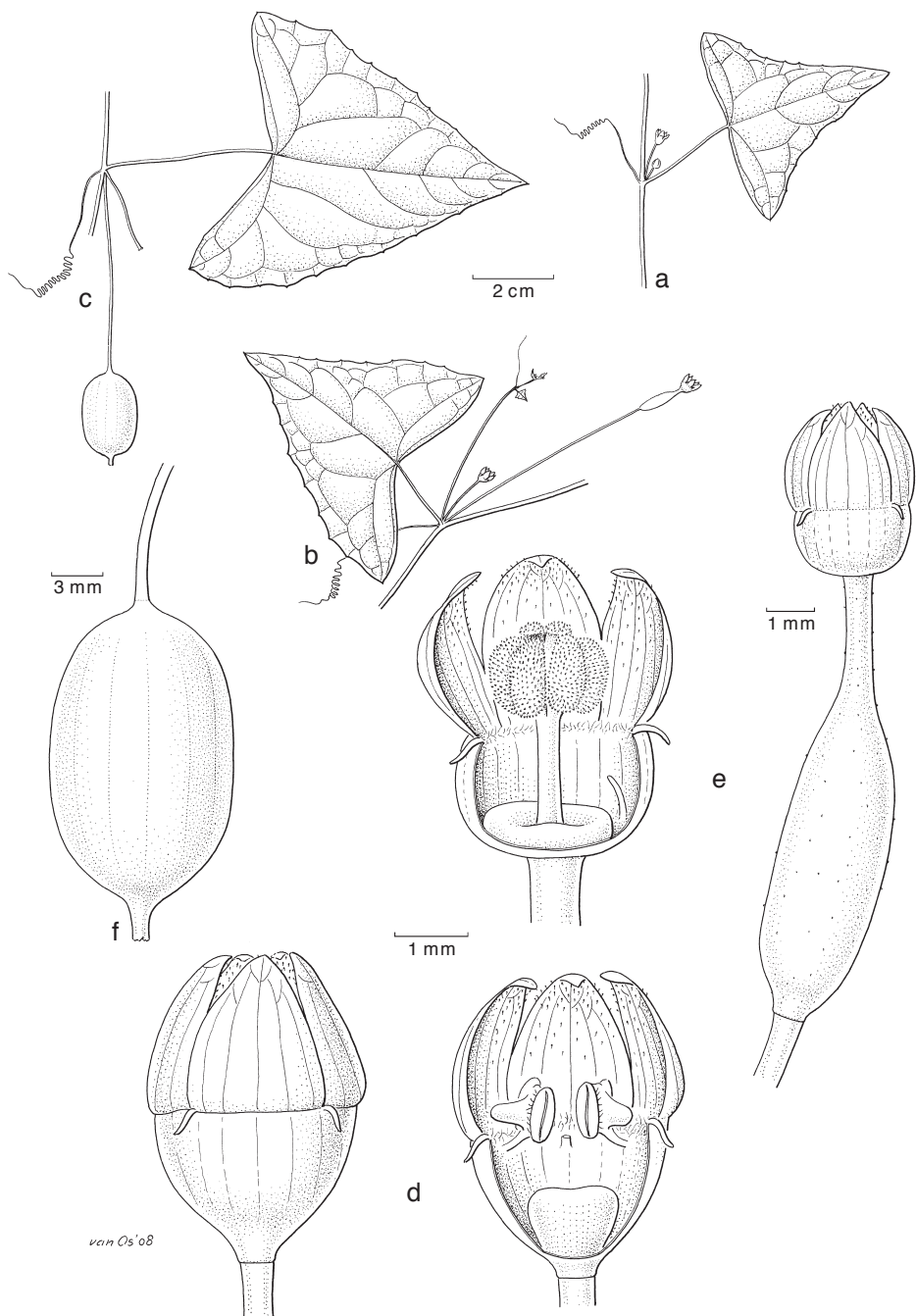


Fig. 49. *Neochamandra nesophila* W.J.de Wilde & Duyfjes. a, b, c. Male flowering, female flowering, and fruiting node, respectively; d. male flower mature bud, from outside and opened; e. female flower from outside and opened; f. fruit (all: *De Wilde & Duyfjes 21935*).

boiled dried flowers in other collections. Probably the details of the connective largely get lost during the drying process.

## 12. *Neoachmandra scaberrima* (Merr.) W.J.de Wilde & Duyfjes

*Neoachmandra scaberrima* (Merr.) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 29. — *Melothria scaberrima* Merr., *Philipp. J. Sci.*, C (1909) 330. — Type: *Elmer* 5862 (lecto L, designated by De Wilde & Duyfjes (2006); iso BO, K, PNH<sup>†</sup>), Philippines, Luzon, Benguet.

Annual or subperennial 1–3 m long climber; leafy stem 1–1.5 mm diam.; with sparse hairs, glabrescent. *Leaves*: petiole 1–2.5 cm long, shortly scabrid or harshly hairy; blade narrowly triangular or sublanceolate, 4–10 cm long, unlobed, or base short or long hastately lobed (see also the note), basal lobes up to 5 by 1 cm, upper surface scabrous by dense coarse appressed hairs, with or without cystoliths, lower surface less densely hairy, but on the veins with conspicuous grey bristly patent hairs 0.5–1.5 mm long, rarely shorter, base (sub)truncate, apex (long-)acute, margin entire, minutely sparsely denticulate. *Male flowers* 1 or 2 per node, frequently co-axillary with 1 much longer-pedicelled female flower; pedicel 8–10 mm long, with scattered 0.2–0.3 mm long hairs; expanded perianth 6–7 mm diam.; receptacle-tube by 2 mm, outside with few hairs, minutely hairy in the throat; sepals 0.5 mm long; petals 2–2.5 mm long, outside frequently with few hairs, inside densely glandular-hairy; stamens inserted at c. 1/4 from the apex in the receptacle-tube, filaments 0.5 mm long, anthers 1.5 by 1 mm, connective broad, truncate, with short mucro in the middle; disc subglobose, 1–1.5 mm diameter. *Female flowers* 1 (and then frequently co-axillary with male flower) or 2 per node, larger than male flowers; pedicel 20–40 mm long, sparsely hairy, glabrescent; ovary narrowly ellipsoid, 5–7(–10) by 1–1.5(–2.5) mm, gradually narrowed into a slender neck c. 2 mm long, sparsely hairy; receptacle-tube 3–3.5 by 3–3.5 mm; sepals 1 mm long; petals 2.5–4 mm long; style c. 3 mm long, with 3 short arms each bearing a subglobose pilose-hairy stigma of c. 1.5 mm diam.; staminodes 0.5–1 mm long; disc 1 mm high, ± 3-lobed or not. *Fruit* solitary (or 2), ripening yellow, (narrowly) ellipsoid, 3–3.5 by 1.5–2 cm, base shortly acute or subobtusate, apex acute or up to 0.5 cm beaked; dry exocarp faintly 6-lined near apex; fruiting pedicel 2–4.5 cm long. *Seeds* numerous, 4–5 by 2.5–3.5 mm, margin faint, at base with a short wing.

*Distribution* — Philippines: Luzon (Benguet, Rizal); one deviating collection from Mindanao (see note).

*Habitat & Ecology* — Thickets, shrubbery, along streams, grassy roadsides; at 300–1000 m altitude; flowering and fruiting throughout the year.

*Note* — Two deviating specimens are: *Ramos BS 14608*, the only collection from Mindanao, and *Loher 2136*, from Central Luzon. *Ramos BS 14608* deviates in having broader triangular or 3–5-lobed leaves, and *Loher 2136* in having narrow, hastate leaves with the veins only shortly scabrous hairy, short female pedicels, only 5–10 mm long, and smaller fruits, only c. 2 cm long. The latter is likely a local variety, or both may belong to the specimens discussed under *N. nesophila* (see there).

## 27. NEOALSOMITRA

*Neoalsomitra* Hutch., Ann. Bot. N-S, 6 (1942) 97; W.J.de Wilde & Duyfjes, Blumea 48 (2003) 100; Fl. Thailand 9, 4 (2008) 484. — Type species: *Neoalsomitra sarcophylla* (Wall.) Hutch. (= *Zanonia sarcophylla* Wall.).

*Alsomitra* auct. non (Blume) Spach: M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 117, p.p. (non *Zanonia* sect. *Alsomitra* Blume); Hook.f. in Benth. & Hook.f., Gen. Pl. 1 (1867) 840; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 928; in Engl., Pflanzenr. 66, 4.275.1 (1916) 11.

Tiny or stout climbers, annual or perennial, with or without tuberous rootstock; dioecious or monoecious. *Probract* absent. *Tendrils* 2-branched at apex. *Leaves*: blade simple or (pedately) foliolate, subcircular in outline, lateral leaflets sometimes smaller and unequal sided, margin mostly entire. *Flowers* small; sepals free; petals imbricate in bud, white or cream, free (or very short-connate at base). *Inflorescences* lateral (and terminal), in male mostly many-flowered, paniculate with ultimate branches fine, raceme-like, pedicels persistent; in female paniculate or raceme-like, fewer-flowered; bracts present, small. *Male flowers* rotate or broadly bowl-shaped; receptacle small, flat or shallow; disc absent or in *N. schultzei* inconspicuous; stamens 5, inserted centrally, ± out-curved, filaments free or partially or wholly fused, anthers small, 1-thecous, extrorse, often with a minute dark dot adaxially; disc absent. *Female flowers*: ovary cylindrical-clavate, imperfectly 3-locular, ovules 5(–10) per placenta, pendulous, styles 3, short, stigma 2-lobed (deeply lunate); staminodes absent (present in *N. plena*, Thailand). *Fruits* few or several, green, ripening brown, small- or medium-sized cylindrical-clavate *capsules*, apex truncate, 3-valvate, perianth-scar 0.5–2(–3) mm from orifice. *Seeds* alternate in each row (wings imbricate), compressed, faces (finely) tubercled or smooth, margin narrow or broad, sometimes double because of deep circumferential groove (not or hardly so in *N. sarcophylla*), edge subentire or finely or coarsely dentate, with apically a ± oblique membranous translucent wing.

Distribution — A genus of 11 species, distributed from NE India and South China to Australia and into the Pacific, 1 species, *N. clavigera*, covering the whole area of the genus; 6 species in *Malesia*.

## KEY TO THE SPECIES

- 1a. Leaf blade (of adult or fertile shoots) simple, unlobed or lobed . . . . . 2
- b. Leaf blade (of adult or fertile shoots) foliolate . . . . . 4
- 2a. Dioecious(?). Plant tuberous. Inflorescences (infructescences) twice branched. Petals adaxially papillose. Filaments almost completely fused. Fruit glabrous. — Kangean Archipelago, Timor . . . . . **2. *N. hederifolia***
- b. Monoecious. Plant not tuberous(?). Inflorescences not or once-branched. Petals adaxially not papillose. Filaments connate in the lower half. Fruit glabrous or hairy. . . . . 3
- 3a. Plant, including fruit, densely soft-hairy, drying (dark) brown. — SE Papua New Guinea . . . . . **3. *N. pilosa***
- b. Plant subglabrous or sparsely hairy, drying green. Fruit glabrous . . . . . **6. *N. schultzei***



- 4a. Leaf blade 3-foliolate, petiole less than 0.5 cm long; leaflets carnose, wrinkled on drying, apex usually obtuse. Fruit 3–4 cm long. Seeds shortly 2-horned. — SE Continental Asia, East Malesia . . . . . **4. *N. sarcophylla***
- b. Leaf blade 3- or 5-foliolate, petiole 0.5–3(–5) cm long; leaflets membranous, not wrinkled on drying, apex (obtuse or) acute. Fruit 2–8 cm long. Seeds star-shaped by coarsely 5–7 (double) dentate margin (edge) . . . . . 5
- 5a. Filaments partly united. Fruit c. 2 cm long. Stem towards base thorny. Leaflets without marginal glands. — East Malesia . . . . . **5. *N. schefferiana***
- b. Filaments free. Fruit 4–8 cm long. Stem not thorny. Leaflets often with glands on margin at base of lateral leaflets. — SE Continental Asia including South China through East Malesia to Australia and the Pacific . . . . . **1. *N. clavigera***

### 1. *Neoalsomitra clavigera* (Wall.) Hutch.

*Neoalsomitra clavigera* (Wall.) Hutch., Ann. Bot. (Oxford) 6 (1942) 101; C.Jeffrey, Cucurbitaceae E. Asia (1980) 3; W.J.de Wilde & Duyfjes, Blumea, 48 (2003) 105, f. 1c; Fl. Thailand 9, 4 (2008) 487. — *Zanonia clavigera* Wall., Numer. List (1831) 3725, nom. nud.; Pl. Asiat. Rar. (1831) 28, pl. 133. — *Alsomitra clavigera* (Wall.) M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 118; C.B.Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 634; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881). — Type: *Wallich 3725A* (lecto K-Wall., excluding male inflorescence and seeds, designated by De Wilde & Duyfjes (2003)), Sylhet (Bangladesh).

*Melothria trifoliolata* F.Muell., Fragm. 5 (1866) 181. — *Alsomitra trifoliolata* (F.Muell.) K.Schum., Notizbl. Königl. Bot. Gart. Berlin 2, 13 (1898) 155; Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 15. — *Neoalsomitra trifoliolata* (F.Muell.) Hutch., Ann. Bot. N-S, 6 (1942) 100; I.Telford, Fl. Australia 8 (1982) 165. — *Alsomitra hookeri* F.Muell., Fragm. 6 (1868) 188, nom. illeg.; (1877) 107 (not seen); Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 933. — *Zanonia hookeri* F.Muell., Syst. Census Austral. Pl. (1882) 76, nom. illeg. — Type: *J. Dallachy? in herb. F. Mueller s.n.* (iso L, barcode L0128079), Australia (Rockingham Bay).

*Alsomitra beccariana* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 932. — *Neoalsomitra beccariana* (Cogn.) Hutch., Ann. Bot. (Oxford) 6 (1942) 101. — Type: *Beccari s.n.* (holo FI; iso BR), Moluccas (Kei Archipelago).

*Gynostemma integrifoliola* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 916. — *Alsomitra integrifoliola* (Cogn.) Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30 (1911) 121. — *Neoalsomitra integrifoliola* (Cogn.) Hutch., Ann. Bot. (Oxford) 6 (1942) 99; Merr. & L.M.Perry, J. Arnold Arb. 30 (1949) 56; M.Jacobs, Blumea 7 (1954) 622; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15, (1975) 12. — Type: *Cuming 517* (lecto K, designated by Keraudren (1975); iso L, P), Philippines.

*Gynostemma elongatum* Merr., Philipp. J. Sc., Bot. 3 (1908) 267. — *Hemsleya elongata* (Merr.) Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 26. — Type: *Curran FB 5474I* (B†; duplicates not seen), Philippines (Luzon).

*Alsomitra muelleri* Cogn., Bull. Acad. Roy. Sci. Belgique, Cl. Sci., sér. 3, 14 (1887) 363; in Engl., Pflanzenr. 66, 4.275.I (1916) 15. — *Neoalsomitra muelleri* (Cogn.) Hutch., Ann. Bot. (Oxford) 6 (1942) 100. — Type: *Armit s.n.* (herbarium not known, not seen), Papua New Guinea.

*Alsomitra rotundifolia* Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 13. — *Neoalsomitra rotundifolia* (Cogn.) Hutch., Ann. Bot. (Oxford) 6 (1942) 100; Peekel, Fl. Bismarck Archip., translated by E.E.Henty (1984) 541, f. 863 (2). — Type: *Peekel 471* (B†), Papua New Guinea. Neotype: *drawing f. 863 (2)* in Peekel (1984) (designated by De Wilde & Duyfjes (2003)).

*Alsomitra pubescens* Merr., Philipp. J. Sci., C. 13 (1918) 64. — *Neoalsomitra pubescens* (Merr.) Hutch., Ann. Bot. (Oxford) 6 (1942) 101. — Type: *Mabesa FB 26346* (PNH†), Philippines.

*Alsomitra pubigera* Prain var. *glauca* Craib, Fl. Siam. (1931) 768. — Type: *Curtis 2504* (not seen), Langkawi Island.

*Alsomitra schefferiana* auct. non Cogn.: Peekel, Fl. Bismarck Archip., translated by E.E.Henty (1984) 541, f. 863 (1), based on *Peekel* 328 (382) (B<sup>†</sup>); Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 16 (1916) 15, p.p., f. 3a–h; Harms, Bot. Jahrb. Syst. (1925) 152.

Herbaceous or (sub)woody perennial climber to 12 m long, hairy or (nearly) glabrous all over; dioecious. *Leaves*: petiole 0.5–3(–5) cm long; petiolules 0.4–2 cm long; blade membranous, blackish on drying; 3- or (pedately) 5-foliolate (i.e. the blade is primarily 3-foliolate and the lateral ones not divided or divided into 2 leaflets, the petiolule of the outer ones inserted on the petiolule of the inner), (5–)10–20 cm across, leaflets ovate or (narrowly) elliptic, 12(–15) by 5(–8) cm, glands 1 or 2, flat, 1–3 mm diam., usually towards the base of the outer margin of the outer leaflets, base (obtuse or) attenuate, apex obtuse or acute, 1–2 mm mucronate; midvein distinct, lateral veins 4–7 per side. *Male inflorescences* mostly many-flowered, broadly paniculate, axillary, 10–30 cm long, peduncle 1.5–4 cm long, branches (glandular-)pubescent or subglabrous, bracts linear, 0.5–2 mm long, the basal ones larger and 3(–5)-foliolate, to 1 cm long, flowers up to 5 (sub)fascicled, in condensed terminal racemes. *Male flowers*: pedicel slender, 5–10 mm long, (glandular-)pubescent or subglabrous; bud ovoid; perianth 5–8 mm diam., receptacle shallow, 1.5–2 mm diam., sometimes 5-saccate below sepals; sepals ovate-oblong, acuminate, c. 2 mm long; petals ovate, subobtusate or acute, 2.5–3 by (1.5–)2 mm, glabrous or puberulous; filaments free, c. 0.5 mm long; anthers less than 0.5 mm diameter. *Female inflorescences* paniculate, 2–10 cm long, up to 10-flowered. *Female flowers*: pedicel c. 10 mm, ovary subcylindrical, 7–8(–10) mm long, finely pubescent, styles short, stigma not lobulate. *Infructescence* 1- or several-fruited. *Fruit* 4–8 cm long, glabrous or pubescent, base narrowed or rounded, at apex 1.2–2.5(–3) cm wide; fruiting pedicel 1–2 cm long. *Seeds* many, ± unequal-sided star-shaped, 6–11 by 5–8 mm, margin (edge) of 5–7 coarse acute or blunt teeth, faces low tuberculate, wing 14–17 mm long to 8 mm wide. — **Fig. 8f, 53f; Plate 22.**

*Distribution* — NE India, Bhutan, Myanmar, South China (Yunnan, Hainan), Taiwan, Laos, Cambodia, Vietnam, Thailand, east to NE Australia (Queensland) and the Pacific (Solomon Islands, east to Fiji); in *Malesia*: North Sumatra, Peninsular Malaysia (Perlis, Kedah, and Selangor), Philippines (Luzon, Mindoro, Cebu), Moluccas (Morotai, Kei Archipelago), New Guinea (Papua New Guinea (East Sepik, Eastern Highlands, Madang, Morobe, Central, and Northern Provinces)); not known from Java and Borneo.

*Habitat & Ecology* — Shaded and open places in primary evergreen montane forest and evergreen seasonal forest along streams, clayey soils on limestone and granite bedrock; 200–1300 m altitude.

*Notes* — 1. A polymorphic species, varying in hairiness, number and shape of leaflets, and size and shape of fruit. The fruit varies in length from 4–8 cm and may be (sub)glabrous or hairy including densely pubescent (*N. pubigera*, from Myanmar). Fruit size varies especially in NE India and New Guinea, where large-fruited as well as smaller-fruited specimens have been collected; for example, fruits from New Guinea vary from 4–8 cm long, including fruits of c. 4 cm long with a comparatively broad apex, to nearly 3 cm diameter, and with a broad rounded base. The largest fruits contain the largest seeds. *Alsomitra pubigera* Prain var. *glauca* Craib is a limestone form with somewhat succulent leaves with rather short petioles.

2. Cogniaux's figure 3a–h (1916), apparently from *Peekel 328* (B†), was erroneously taken for the male flowers of *Alsomitra schefferiana* (a species not occurring in the Bismarck Archipelago in East New Guinea where Peekel collected), but represents *N. clavigera*; the collection *Peekel 328* was also depicted in Peekel (1984). The small apical appendage of the anther obviously is exaggerated in the drawing, as normally this is much smaller or absent.

## 2. *Neoalsomitra hederifolia* (Decne.) W.J.de Wilde & Duyfjes

*Neoalsomitra hederifolia* (Decne.) W.J.de Wilde & Duyfjes, *Blumea* 48 (2003) 108, f. 1i, 3. — *Sicyos hederifolius* Decne., *Nouv. Ann. Mus. Hist. Nat.* 3, 3 (1834) 450; M.Roem., *Fam. Nat. Syn. Monogr.* 2 (1846) 104; Span., *Linnaea* (1841) 206; Miq., *Fl. Ned. Ind.* 1, 1 (1856) 682, '*hederaefolius*'. — *Gynostemma* ? *hederifolia* (Decne.) Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 916, '*hederaefolia*'; M.Jacobs, *Blumea* 7 (1954) 617 (excluding material *Hort. Bot. Bog. sub XVIII A 45*); Steenis, *Webbia* 11 (1956) 192, f. 1a. — Type: *Anonymous 531* (3 sheets, see note 1) (lecto P, barcode P218602, designated by De Wilde & Duyfjes (2003)), Timor.

*Zanonia timorana* Span., *Linnaea* (1841) 205, Icon. 55 (plate not found); Miq., *Fl. Ned. Ind.* 1, 1 (1856) 683. — *Alsomitra timorana* (Span.) M.Roem., *Fam. Nat. Syn. Monogr.* 2 (1846) 117; Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 935; in Engl., *Pflanzenr.* 66, 4.275.I (1916) 13. — *Neoalsomitra timorana* (Span.) Hutch., *Ann. Bot. (Oxford)* 6 (1942) 98. — Type: *Spanoghe s.n.*, Timor; untraced. Neotype: *De Voogd 2323*, male fl. (L, designated by De Wilde & Duyfjes (2003)); iso BO, K, SING), Timor.

*Gynostemma spec.* C., de Voogd, *Trop. Natuur, Jubileum Uitg.* (1936) 71, f. 8, photo of habit; C.van Woerden, *Trop. Natuur* 29 (1940) 6, f. 7, photo of thickened stem base (no voucher specimen collected).

Low or medium climber, perennial, densely or sparsely glandular-hairy all over (except flowers), hairs 0.5–2 mm long, stem at base to 1 cm thick; dioecious; growing from a supra-terrestrial tuber to 30 by 15 cm and c. 2.5 kg in weight. *Leaves*: petiole 1.5–3 cm long; blade membranous, brown on drying, simple, unlobed or shallowly 3(–5)-lobed, broadly ovate or circular in outline, 5–6 by 4–7.5 cm, sparsely or densely (setose) hairy, especially so on margin and on veins beneath, glands absent, margin entire or coarsely remotely dentate, apices acute-acuminate, 1(–2) mm mucronate; palmately 5-veined, pale. *Male inflorescences* paniculate, pubescent, situated occasionally close to the base of the plant, once or twice branched, 5–17(–32) cm long including 1–2.5 cm long peduncle, ultimate branches raceme-like, 1–4 cm long, 5–10(–15)-flowered, with bracts and basal portion of pedicel (c. 1 mm long) persistent; bracts minute, narrowly elliptic, 0.5–1 mm long, lower bracts in the larger twice branched inflorescences leafy, 1–1.5 cm diameter. *Male flowers* solitary, (sub)glabrous; pedicel 3–4 mm long, articulate at c. 1 mm from the base; bud subglobose; perianth at anthesis bowl-shaped; receptacle shallowly bowl-shaped, 0.4–0.5 by c. 1.5 mm; sepals long-triangular, c. 1 mm long, with out-curved apiculus; petals broadly obovate or subcircular, c. 1.5 mm long, papillose adaxially, very minutely mucronate; filaments (0.7–)1 mm long, either completely or for 2/3 fused (column hollow), anthers elliptic or subcircular in outline, c. 0.5 mm long, adaxially with or without a faint brown spot. *Female inflorescences* and *flowers* not seen. *Infructescences* (sub)racemose, 3–5-fruited or a fruit solitary on the leafy node of lateral shoots. *Fruit* brittle, glabrescent, 2.5–3 cm long, at apex (0.8–)1 cm wide, base narrowly rounded, perianth scar (rim) at c. 2.5 mm distant from the flat apex; fruiting pedicel 0.7–1 cm long, glabrous with some vestigial minute hairs.

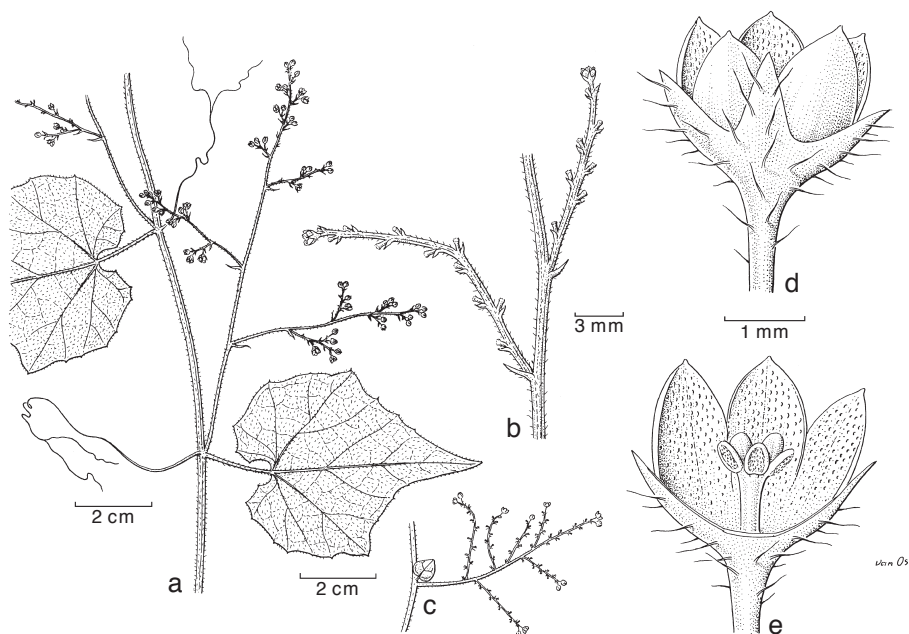


Fig. 50. *Nealsomitra hederifolia* (Decne.) W.J.de Wilde & Duyfjes. a. Habit with male inflorescences; b. detail of male inflorescence; c. male inflorescence; d, e. male flowers (a, b, d, e: *Backer 26948*; c: '*Decaisne*' P00218601, syntype).

*Seeds* 15–20, obovate with narrowed base, c. 6 by 4.5 mm, dark brown, margin (edge) coarsely 5-toothed, faces coarsely few-tubercled, wing 7 by 2.5 mm. — **Fig. 50, 53e.**

*Distribution* — Known from few collections: Java (Kangean Archipelago, east of Madura), Lesser Sunda Islands (Pulau Semau (near Timor) and Timor).

*Habitat & Ecology* — Lowland savanna and dry forest in monsoon climate on limestone; 0–200 m altitude; flowering: March (Kangean) and November (Timor).

*Notes* — 1. The three anonymous sheets with male flowers in P, syntypes of *Sicyos hederifolia*, were collected around 1801–1821, either by Sautier, Riedlé, Quichenot, or by Gaudichaud; see Van Steenis-Kruseman (*Fl. Males.*, Ser. 1, *Spermat* (1950)), and the introduction to Decaisne's enumeration (1834).

2. The infructescences and fruits of *Sicyos hederifolia* are known only from an anonymous single collection in P, a leafless specimen annotated *Zanonia indica* L., Timor, apparently collected in the same period as the type of *S. hederifolius*. Its assignment to *N. hederifolia* is not fully certain, but the old, dead twigs with leaf scars and tendrils agree, and the fruits and seed (one single seed only is preserved, Fig. 53e) differ from the fruits and seeds of the other *Nealsomitras* from Timor: *N. sarcophylla* differs in seed and *N. schefferiana* subsp. *podagrica* differs in fruiting pedicel c. 5 mm long against c. 10 mm long in *N. hederifolia*.

3. Jacobs (1954) cites a note by Van Steenis on living flowering material cultivated in Bogor, about 1939, not preserved or apparently lost, obviously not belonging to *N. hederifolia*. See also the note under *N. sarcophylla*.

### 3. *Neosalsomitra pilosa* W.J.de Wilde & Duyfjes

*Neosalsomitra pilosa* W.J.de Wilde & Duyfjes, *Blumea* (2003) 110, f. 1j. — Type: *Carr 12477*, fruit (holo CANB; iso BM, K, L, SING), Papua New Guinea (Rouna).

Herbaceous climber, possibly one or a few metres long, annual?, sparsely soft-woolly grey glandular-hairy; monoecious. *Leaves*: petiole 1–1.5 cm long; blade membranous, blackish on drying, simple, unlobed or shallowly (faintly) 3–5-lobed, ± ovate in outline, 4–7.5 by 3.5–7 cm, upper and lower surface sparsely villous, glands absent, margin entire, apex rather long acute-acuminate, minutely mucronate. *Inflorescences* glandular hairy, to 10 cm long (including 2–6 cm long peduncle), with few (uni)lateral 10–20-flowered male racemes, and with 1 (or 2 or 3) solitary female flowers (fruit) at the nodes of the lower branch(es), occasionally co-axillary with the panicle an additional male raceme; bracts lanceolate, c. 1 mm long, ± caducous. *Male flowers*: pedicel 1.5–2 mm long, sparsely hairy; perianth ± bowl-shaped; receptacle shallowly bowl-shaped, 0.7(–1) mm wide; sepals ± long-triangular, c. 1 mm long, sparsely hairy; petals (ovate-)elliptic, c. 1.5 mm long, glabrous, at apex with minute papillose mucro; filaments united into c. 0.5 mm long column; anthers broadly ellipsoid, c. 0.3 mm long, abaxially with minute dark dot. *Female flowers* not known (ovary hairy). *Fruit* 1(–3) per infructescence (in old otherwise male-flowered inflorescence); (2.5–)3–3.5 by 1–1.3 cm, sparsely whitish villous, hairs glandular, 3–4 mm long, base (narrowly) rounded, apex truncate, with 2–3 mm long styler processes; fruiting pedicel 0.4–0.8 cm long. *Seeds* 15–20, obovate, narrowed at base, 6–7 by (4–)5 mm including double 6–8-toothed margin (edge), faces ribbed towards margin, nearly smooth in the centre, wing c. 8 by 4 mm. — **Fig. 53b.**

*Distribution* — New Guinea (SE Papua New Guinea, in the mountains near Port Moresby); known from 2 collections: *Carr 12477* (male fl., fr.) and *Carr 15873* (male fl., immat. fr.).

*Habitat & Ecology* — Open places in woods on steep hillsides; 400–1500 m altitude; flowering and fruiting: March to June.

*Note* — This species is close to *N. capricornica* (Australia), which differs in a green drying colour, leaf shape and more coarsely hairy capsules.

### 4. *Neosalsomitra sarcophylla* (Wall.) Hutch.

*Neosalsomitra sarcophylla* (Wall.) Hutch., *Ann. Bot. (Oxford)* 6 (1942) 100; Keraudren in Aubrév. & J.-F.Leroy, *Fl. Cambodge, Laos & Vietnam* 15 (1975) 9, pl. 1. (p.p., excl. *Neosalsomitra balansae*); W.J.de Wilde & Duyfjes, *Blumea* 48 (2003) 111, f. 1b; *Fl. Thailand* 9, 4 (2008) 489. — *Zanonia sarcophylla* Wall., *Numer. List* (1831) 3724, nom. nud.; *Pl. Asiat. Rar.* (1831) 28, t. 133. — *Alsomitra sarcophylla* (Wall.) M.Roem., *Fam. Nat. Syn. Monogr.* 2 (1846) 118; Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 929; in Engl., *Pflanzenr.* 66, 4.275.I (1916) 13; Craib, *Fl. Siam.* (1931) 769. — Type: *Wallich 3724B* fruit (lecto K-Wall., designated by De Wilde & Duyfjes (2003)), Myanmar.

*Alsomitra philippinensis* Cogn. in Engl., *Pflanzenr.* 66, 4.275.I (1916) 15. — *Neosalsomitra philippinensis* (Cogn.) Hutch., *Ann. Bot. (Oxford)* 6 (1942) 100. — Type: *Copeland 255* (B<sup>+</sup>), Philippines, Luzon.

Climber 3–8 m long, perennial from woody rootstock, glabrous; dioecious. *Tendrils* often with adhesive pads. *Leaves*: petiole 0.5–1 cm long; petiolules 0.2–0.5(–1) cm

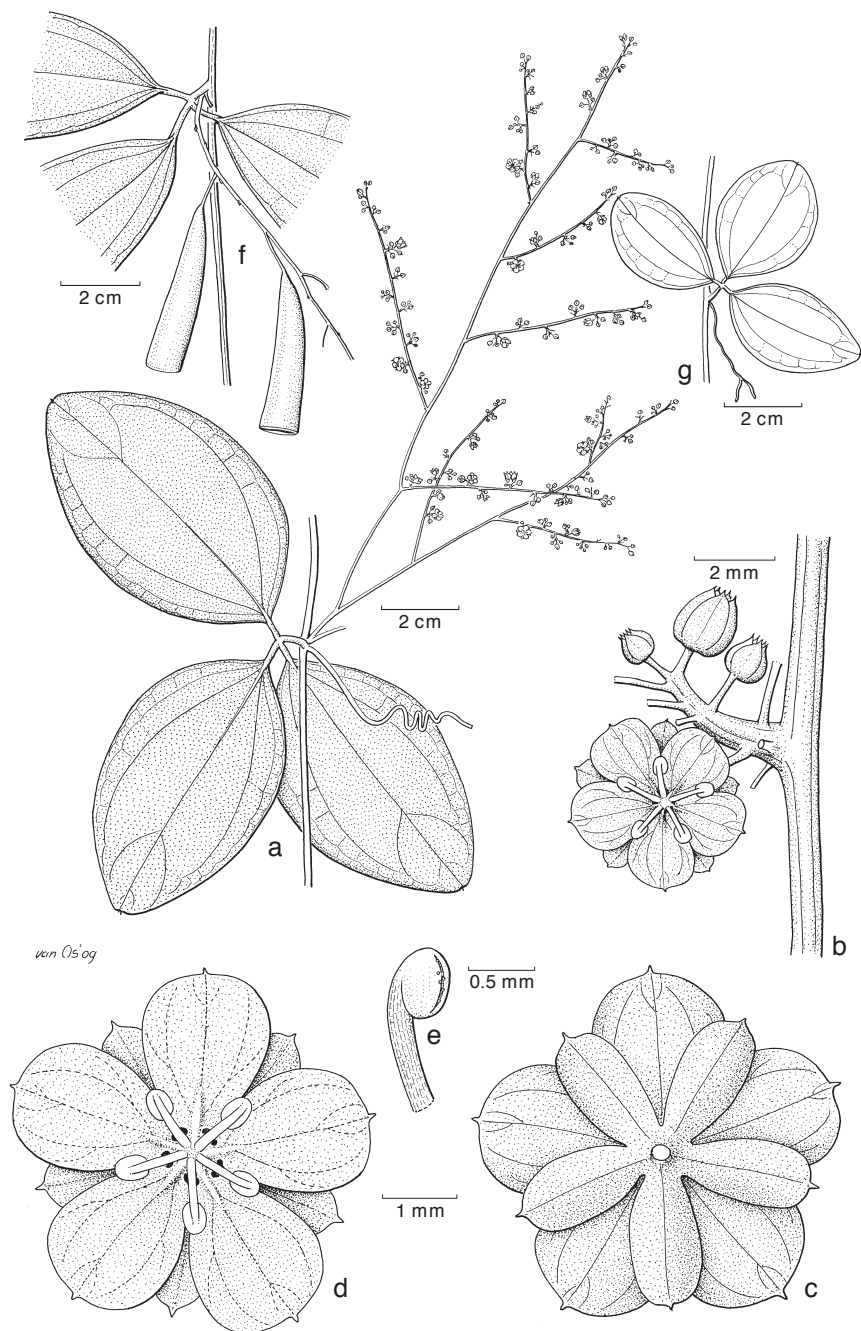


Fig. 51. *Nealsomitra sarcophylla* (Wall.) Hutch. a. Portion of male flowering twig; b. detail of male inflorescence; c, d. male flower, seen from below and above; e. stamen; f. infructescence; g. node with leaf and tendril, note tendril branched at apex. (a–e: *Phonsena et al.* 6342; f: *Poilane* 11767; g: *Van Steenis* 18015).

long, after abscission leaving raised flat scars; blade carnose-leathery ( $\pm$  succulent), wrinkled on drying, 3-foliolate, 5–20 cm diam., leaflets (broadly) ovate-elliptic to oblong-lanceolate, to 12 by 6 cm, glands absent, base rounded or  $\pm$  narrowed, apex (narrowly) rounded, minutely mucronate, basal veins 3–5, curving towards apex, mostly indistinct. *Male inflorescences* paniculate, little or much branched, sometimes branched from the base, 10–20(–30) cm long, pendent, glabrous; bracts linear, 1 mm long or less. *Female inflorescences* paniculate or  $\pm$  raceme-like, 5–10 cm long. *Male flowers* (1–)3 subfascicled; pedicel 2–5 mm long; perianth subtrotate, c. 5 mm diam., glabrous, minutely papillose; receptacle flattish, faintly 5-saccate, c. 1 mm diam.; sepals lanceolate, c. 2.5 mm long, acuminate; petals (ob)ovate, c. 3 by 1.5 mm, apex acuminate, midvein distinctly raised in lower portion, forming dissepiments between the stamens; filaments free, spreading, c. 1 mm long, anthers less than 0.5 mm long. *Female flowers*: ovary narrow, c. 8 by 1 mm, glabrous; staminodes 0.2–0.5 mm long; styles short, broad at base, stigma  $\pm$  lobulate-dentate, style and stigma together c. 1 mm long. *Infructescences* pendent, 5–10 cm long, with 5–10(–20) fruits. *Fruit* much narrowed to the base, glabrous, 3(–4) cm long, apex truncate, 0.8(–1) cm wide; fruiting pedicel slender, 1(–1.5) cm long. *Seeds* 12–15, subtriangular, 6–7 by 3–4 mm, 2-horned at apex, margined, edge smooth or verrucose, faces finely verrucose, wing suberect, 8–10 by 4 mm. — **Fig. 51, 53a; Plate 23.**

Distribution — Myanmar, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: rare and scattered in East Malesia: Philippines (Luzon, Palawan), Sulawesi (Central, SW, and Kabaena Is.), Lesser Sunda Islands (Timor). Sometimes cultivated in botanical gardens.

Habitat & Ecology — Mixed, (partly) deciduous evergreen lowland and montane forest, on basalt and granite bedrock and limestone; from sea level to 850 m altitude; flowering: March to September.

Notes — 1. In *Teijsmann 19765* (BR), Timor, the seeds lack the two horns; it is the only known collection with seeds from East Malesia.

2. In the Bogor Botanic Garden a sterile widely creeping vegetative persisting plant, possibly a remnant of old introduction, was still present in 1998.

### 5. *Neosalsomitra schefferiana* (Cogn.) Hutch.

*Neosalsomitra schefferiana* (Cogn.) Hutch., Ann. Bot. (Oxford) 6 (1942) 101, (excl. *Peekel 328* (B $\dagger$ ) = *Neosalsomitra clavigera*.); W.J.de Wilde & Duyfjes, Blumea 48 (2003) 112, f. 1g, h. — *Alsomitra schefferiana* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 932; in Engl., Pflanzenr. 66, 4.275. I (1916) 16, excl. descr. of male flower of *Peekel 328* and f. 3a–h. — Type: *Teijsmann 11854*, sheet 1 of 4 (holo BO; iso BO, 3 sheets, L), Sulawesi, Pangkadjena.

*Alsomitra schefferiana* Cogn. var. *minor* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 933; in Engl., Pflanzenr. 66, 4.275.I (1916) 16. — Type: *Teijsmann s.n.* (holo BO, not seen), SW Sulawesi, Pangkadjena.

Perennial climber to 8(–30) m long, with one or few green stems somewhat carnose-woody at base, either slightly thickened, or base flask- or spindle-shaped, swollen, lower portion of main stem with  $\pm$  hard green thorns 1–2(–4) cm long, apical shoots puberulous, glabrescent, with raised leaf scars; dioecious. *Tendrils* on innovation shoots, mostly caducous. *Leaves*: petiole 2–5 cm long; petiolules 0.3–2 cm long; blade

membranous (slightly fleshy when fresh), green on drying, (simple or) 3- or (pedately) 5-foliolate, 5–15(–20) cm diam., leaflets elliptic or (ob)ovate, apex roundish or acute, minutely acuminate, the middle leaflet largest, to 11(–15) by 7(–10) cm, glands absent. *Male inflorescences* paniculate, with numerous flowers, 8–20(–40) cm long, once or twice branched, ultimate branches raceme-like, pubescent, hairs c. 1 mm long; bracts minute, c. 1 mm long, lower bracts 3-foliolate, larger, hairy. *Male flowers*: pedicel c. 1.5 mm long, glabrous; perianth rotate, 2.5–3.5 mm diam., sparsely pubescent; receptacle shallow, c. 1 mm wide; sepals ovate-acute, c. 0.5 mm long; petals broadly ovate, acute, c. 1 mm long; filaments glabrous, fused into a partly hollow column c. 0.7 mm long, free parts c. 0.3 mm long, anthers broadly ellipsoid, c. 0.3 mm long, dark spot not obvious. Female inflorescences as in male, (widely) paniculate, 10–30 cm long, flowers ultimately in racemes. Female flowers: see under subsp. *podagrica*. *Fruit* many per infructescence, 1.5–2.5 by 0.7–0.9 cm, pubescent, glabrescent, base ± attenuate or rounded, apex truncate with minute style-remnants; fruiting pedicel 0.2–0.7 cm long, glabrous or pubescent. *Seeds* c. 15, obovate, 4–5 by 3–3.5 mm, base attenuate, finely or coarsely rugulose-warted, margin double 5–7-toothed or -tuberculate, wing 6–8 mm long.

Distribution — SW Sulawesi, Moluccas, eastern Lesser Sunda Islands, and New Guinea (West Papua (Vogelkop Peninsula)).

Habitat & Ecology — Limestone rocks and soil over limestone, in dry seasonal areas; lowland; flowering: February (Timor), May (Alor), June (Seram).

Notes — 1. *Neosalsomitra schefferiana* is characterized by its thorny stem-base, 3- or 5-foliolate leaves, and stamens of which the filaments are c. 3/4 connate.

2. The limited fertile material available suggests the existence of only one species, with 2 subspecies. The two subspecies chiefly differ in shape of the thorny stem-base and fruit size; the male perianths of a specimen from Seram (*Kornassi 1433*) are slightly larger than those from Timor. Because most collections are sterile and mostly the thorny base not recorded, such specimens are tentatively assigned to subsp. *schefferiana*. Subsp. *podagrica* is regarded as confined to Timor and the nearby islands of Semau and Alor.

The thorns are obviously homologous with leaves. Occasionally the bases of withered tendrils may resemble thorns. In the collections from Vogelkop of subsp. *schefferiana* (*Avé 4835*) some thorns are minutely furcate at apex.

#### KEY TO THE SUBSPECIES

- 1a. Main stem at base not or hardly thickened, 2–3 cm thick. Leaf blades of (fertile) upper branches 3-foliolate. Fruit c. 2.5 cm long. — SW Sulawesi, Seram, Vogelkop Peninsula . . . . . **a.** subsp. **schefferiana**
- b. Main stem at base swollen, 5–10 cm thick. Leaf blades of (fertile) upper branches 3- or 5-foliolate. Fruit 1.5–2 cm long. — Timor, Alor Is. . . . **b.** subsp. **podagrica**



**a. subsp. schefferiana**

Main stem base slender, 2–3 cm diam., thorns 1–2 cm long. *Leaf blades* 3-foliolate. *Female flowers* not known. *Infructescences* rather open, much branched, many-fruited, short-tomentose, 20–30 cm long. *Fruit* c. 2.5 by 0.7–0.9 cm, base shortly attenuate, when old glabrescent except at the very base; fruiting pedicel 0.3–0.7 cm long, tomentose. *Seeds* ovate, 4.5–5 by 3–3.5 mm, faces densely sharply, rather finely tuberculate, margin (edge) finely crenulate, wing 6–7 by c. 4 mm. — **Fig. 53c.**

Distribution — Known from one fruiting collection from SW Sulawesi (type); one male flowering specimen from Moluccas (Seram); sterile specimens from SW Sulawesi and New Guinea (Vogelkop Peninsula).

**b. subsp. podagrica** (Steenis) W.J.de Wilde & Duyfjes

*Neosalsmitra schefferiana* (Cogn.) Hutch. subsp. *podagrica* (Steenis) W.J.de Wilde & Duyfjes, *Blumea* 488 (2003) 114, f. 1h. — *Neosalsmitra podagrica* Steenis, *Webbia* 11 (1956) 192, f. 1b, 2, nom. prov.; *Blumea* 8 (1955) 171, f. 1; H.Jacobsen, *Sukkulenten Lex.* (1970) 267, t. 112, 1; L.E.Newton & Njoroge in Egli, *Ill. Handb. Succ. Pl.: Dicotyledons* (2002) 90, f. 13e. — Type: *Pleyte s.n.*, male (lecto L, barcode L0128004, designated by De Wilde & Duyfjes (2003)), culta, Hort. Bot. Bogor II-0-X-6, Timor (see note 1), 6 May 1954.

Base of main stem(s) fleshy, thickened, flask- or spindle-shaped up to 100 cm long, by 10 cm diam., sometimes with additional superposed thickened bases of lateral stems; thorns 1.5–5 cm long. *Leaves*: lower 3-foliolate, upper 3- or 5-foliolate. *Female inflorescences* paniculate, rather condensed, pubescent, the ultimate branches one-sided racemes with up-curved flowers; bracts minute. *Female flowers*: pedicel c. 1 mm long, glabrous; ovary tubular, terete, c. 3 mm long, (1–)1.5 mm wide, pubescent; sepals hardly 1 mm long; petals c. 2 by 1.5 mm, ± pubescent (some adaxially with minute appendages at base); styles including stigma c. 1 mm long. *Fruit* many per infructescence, almost glabrous, 1.5–2 by 0.7–0.8 cm, base narrowed or rounded; fruiting pedicel 0.2–0.5 cm long, almost glabrous. *Seeds* pear-shaped in outline, 4–5 by 3–3.5 mm, faces coarsely tuberculate and with irregular radial crests, wings 6.5–8.5 by 3.5–4.5 mm. — **Fig. 52, 53d.**

Distribution — Eastern Lesser Sunda Islands (Alor Is., Semau Is., and Timor).

Habitat & Ecology — Lowland and hilly country on limestone.

Uses — In Timor used medicinally for its extremely bitter resin with strong haemolytic action (Van Steenis, 1956). In Vogelkop the people are afraid to be hurt by the thorns (*Avé* 4835).

Notes. 1. Although the subspecies seems widespread in Timor it is noteworthy that this conspicuous plant was not seen by the old French and Dutch collectors, who collected the pachypodous *N. hederifolia* (syn. *N. timorana*) several times. In the wild, subsp. *podagrica* seems to flower or fruit at a not known period, under a strong seasonal climate, but apparently not frequently.

2. This subspecies was already, though unnamed, pictured and described in a manuscript by Father Alberti de San Tomé about 1750, in Lisbon (as was discovered there by Koster, postmaster at Kupang (see Van Steenis (1956), Van Steenis-Kruseman, *Fl. Males.*, Ser. 1, *Spermat* (1950) 298).

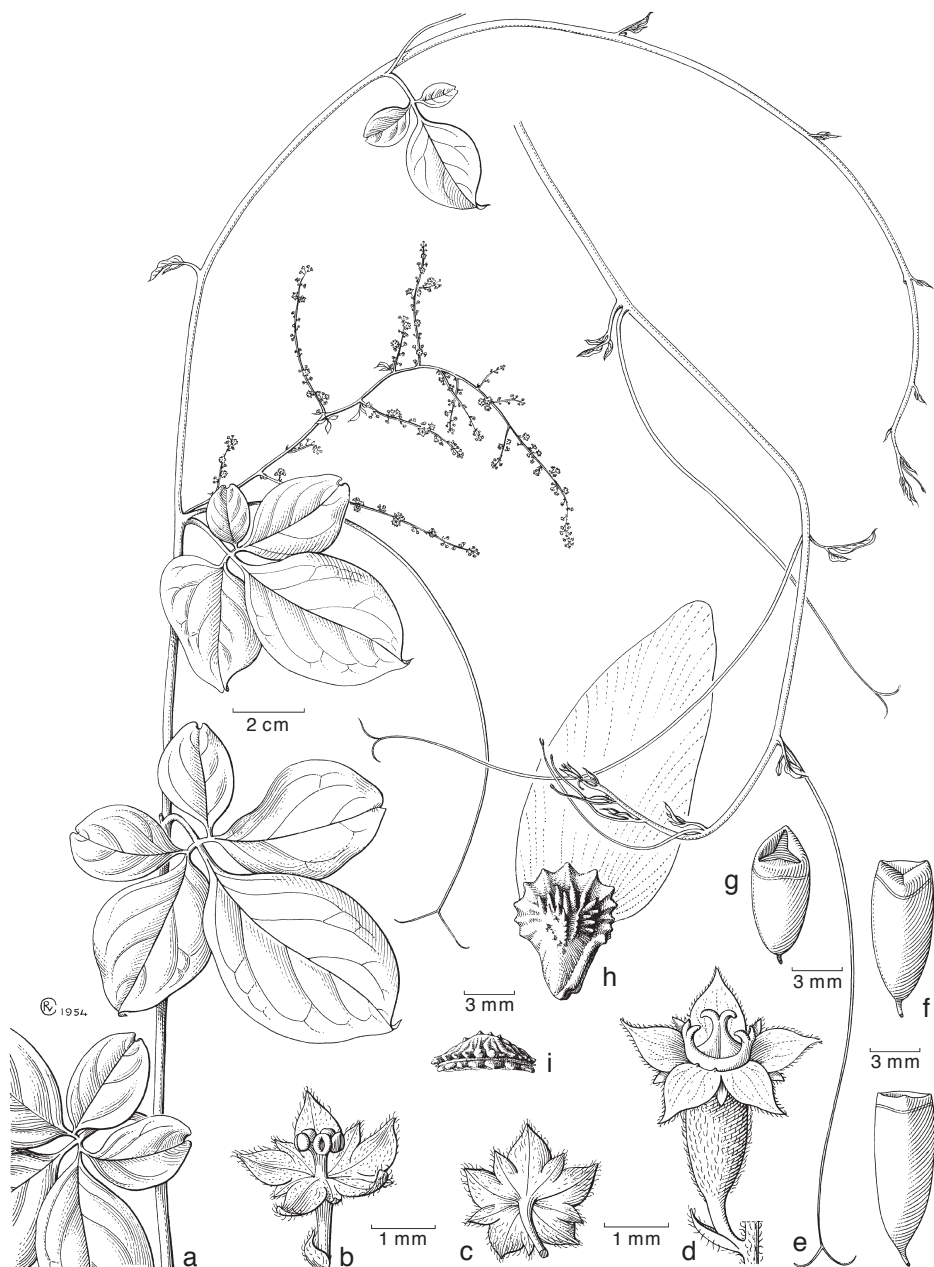


Fig. 52. *Nealsomitra schefferiana* (Cogn.) Hutch. subsp. *podagrica* (Steenis) W.J.de Wilde & Duyfjes. a. Apex of male flowering twig and apex of growing twig; b, c. male flower; d. female flower; e–g. fruits; h. seed; i. seed, apical view (a–c: *Cult. Hort. Bog. II.0.X.6*; d–i: *Cult. Hort. Bog. XVIII.A.45a*; drawn by Ruth van Crevel).

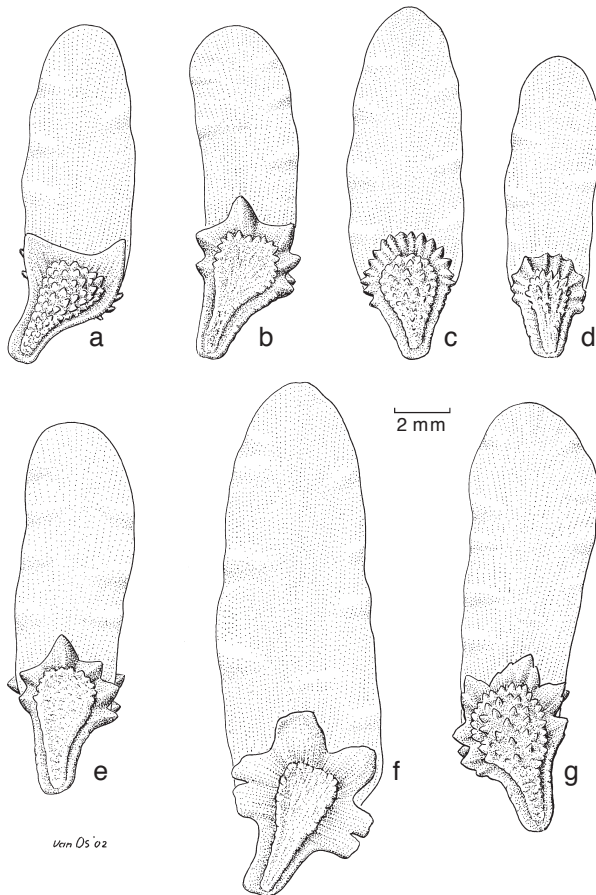


Fig. 53. Seeds of *Nealsomitra*. — a. *Nealsomitra sarcophylla* (Wall.) Hutch. — b. *Nealsomitra pilosa* W.J.de Wilde & Duyfjes. — c. *Nealsomitra schefferiana* (Cogn.) Hutch. subsp. *schefferiana*. — d. *Nealsomitra schefferiana* (Cogn.) Hutch. subsp. *podagrica* (Steenis) W.J.de Wilde & Duyfjes. — e. *Nealsomitra hederifolia* (Decne.) W.J.de Wilde & Duyfjes. — f. *Nealsomitra clavigera* (Wall.) Hutch. — g. *Nealsomitra schultzei* (Cogn.) Hutch. (a: Maxwell 00-163, Thailand; b: Carr 12477, type, Papua New Guinea; c: Teijsmann 11854, Celebes; d: Pleyte s.n., Bogor, garden number XVIII-A-45a, orig. Timor; e: Anonymous, barcode P218587, Timor; f: Chuang 3172, Taiwan; g: Brass 8149, Papua New Guinea).

## 6. *Nealsomitra schultzei* (Cogn.) Hutch.

*Nealsomitra schultzei* (Cogn.) Hutch., Ann. Bot. (Oxford) 6 (1942) 98; Merr. & L.M.Perry, J. Arnold Arbor. 30 (1949) 56; W.J.de Wilde & Duyfjes, Blumea 48 (2003) 114, f. 1k. — *Alsomitra schultzei* Cogn. in Engl., Pflanzenz. 66, 4.275.1 (1916) 12. — Type: *Schultze 170* (B<sup>†</sup>), Papua New Guinea (Augusta River).

Small climber, annual? stem slender, subglabrous; monoecious. *Leaves*: petiole 1–1.5 cm long, sparsely minutely pubescent; blade membranous, green on drying, simple, faintly to distinctly (3–)5-lobed (up to c. 2/3 deep), ovate in outline, 3.5–7 cm diam.,

glabrous except for a few hairs near insertion of petiole, base subtruncate or cordate, margin smooth or coarsely sinuate, apex acute-acuminate, 1–2 mm mucronate as are lobe-apices. *Inflorescences* glabrous, all or predominantly male-flowered, sometimes with a few female flowers co-axillary with lowermost branch(es), branches few, consisting of 5–10 male-flowered racemes; position of female flowers (from fruits) either mixed in otherwise male flowered panicle (see above) or solitary at leafy node; bracts oblong, 0.5–1 mm long, subsistent. *Male flowers*: pedicel c. 1.5 mm long, the lower half persistent; perianth bowl-shaped; receptacle-tube c. 1 by 1.5–2 mm, inside thickened into an inconspicuous disc; sepals (long-)triangular, c. 0.8(–1) by 0.7 mm, acute; petals ovate-broadly elliptic, minutely mucronate, dotted with glands; filaments united for 2/3 or completely united, c. 1 mm long, anthers ellipsoid, c. 0.6 mm long, without adaxial dark blotch. *Female flowers* not seen (ovary subclavate, 4–5 mm long, glabrous, corolla segments c. 2 mm long, see Cogniaux, 1916). *Fruit* 1(–6) per infructescence, solitary at leafy node, or peduncled, 2.5–3 cm long, glabrous, base rounded, 1–1.2 cm wide at truncate apex; fruiting pedicel c. 1 cm long. *Seeds* 15–20, obovate with narrowed base, 6–7 by 4–5 mm, margin 5–7 coarsely dentate or tuberculate, faces finely warty, wing c. 9 by 4–5 mm. — **Fig. 53g.**

*Distribution* — New Guinea (Papua New Guinea, known from a few collections only (Sepik, lower Fly River, Central Prov.)).

*Habitat & Ecology* — Lowland; margins of monsoon forest, in reed swamps. Flowering and fruiting: April and October.

*Notes* — 1. The present description of *N. schultzei*, drawn from the collections *Brass 8149* and *Pullen 6847*, is somewhat doubtful because the type, *Schultze 170*, got lost, but Cogniaux's protologue agrees very well. A designation of a neotype should wait for a good collection from the type locality, Sepik (Augusta River).

2. *Neoalsomitra schultzei* is characterised within the genus by a disc-like thickened receptacle. It forms together with *N. capricornica* (Australia), *N. hederifolia* and *N. pilosa* a group with fused filaments within *Neoalsomitra*.

## 28. PAPUASICYOS

*Papuasicyos* Duyfjes, *Blumea* 48 (2003) 124. — Type species: *Papuasicyos papuana* (Cogn.) Duyfjes (= *Melothria papuana* Cogn.).

Small climber, leafy stem c. 2 mm diam., plant subglabrous; monoecious. *Probract* absent. *Tendrils* unbranched. *Leaves*: blade simple, unlobed. *Flowers* small; petals imbricate, pale yellow, free, entire. *Male inflorescence* a simple pedunculate raceme. *Male flowers*: pedicel short, receptacle-tube bowl-shaped, expanded corolla 10(–15) mm across; stamens 3, free, inserted c. halfway up the receptacle-tube; filaments short, anthers all 2-thecous, free, appressed into a subglobose head, thecae sigmoid, connective broad; disc absent or minute. *Female flowers* solitary, not associated with male inflorescence; pedicel long; ovary oblong, ovules many, horizontal; perianth as in male; staminodes 3, inserted near the throat of the receptacle-tube; disc obscure or absent; style conspicuous with feather-like divided stigma. *Fruit* berry-like, (narrowly) ellipsoid, 2–2.6 cm long; fruiting pedicel slender. *Seeds* many, foveolate, margin narrow, edge entire.

*Distribution* — 1 species in New Guinea.

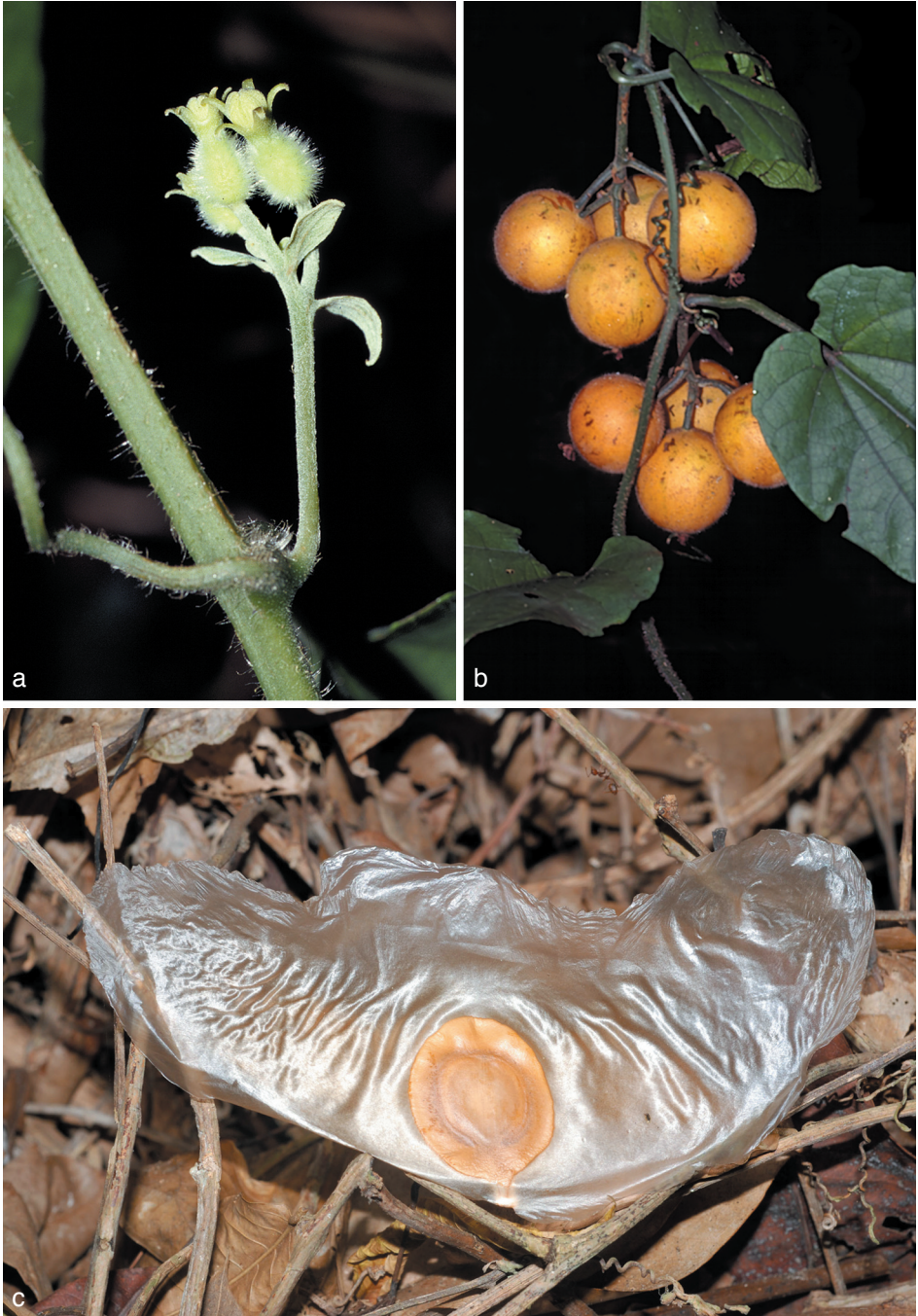


Plate 2. a, b. *Baijiania borneensis* (Merr.) A.M.Lu & J.Q.Li var. *borneensis*. a. Female inflorescence; b. infructescence. — c. *Alsomitra macrocarpa* (Blume) M.Roem. Winged seed (a, b: Sabah; c: Peninsular Thailand). Photos: a, b by De Wilde; c by Kanlaya Phattarahirankanok.



Plate 3. *Bayabusua clarkei* (King) W.J.de Wilde. a. Seedling; b. detail of male flowering twig; c, d. male flowers (all: Peninsular Malaysia, a, b. near Cameron Highlands; c. Kepong, FRIM, along canopy walk). Photos: all by De Wilde.

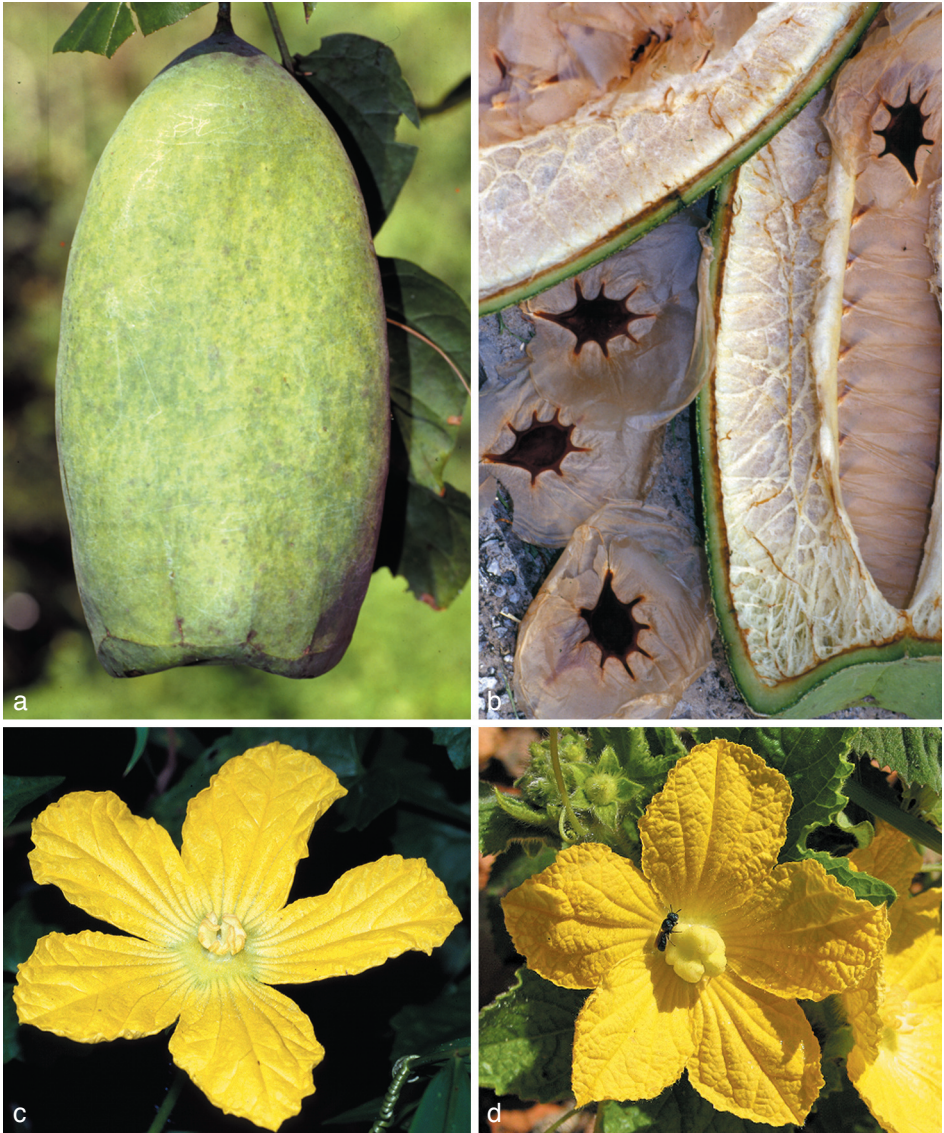


Plate 4. a, b. *Bayabusua clarkei* (King) W.J.de Wilde. a. Fruit; b. fruit longitudinally opened, showing winged seeds. — c, d. *Benincasa pruriens* (Parkinson) W.J.de Wilde & Duyfjes forma *hispida* (Thunb.) W.J.de Wilde & Duyfjes. c. Male flower; d. female flower (a, b: Peninsular Malaysia, near Cameron Highlands; c, d: Thailand). Photos: all by De Wilde.

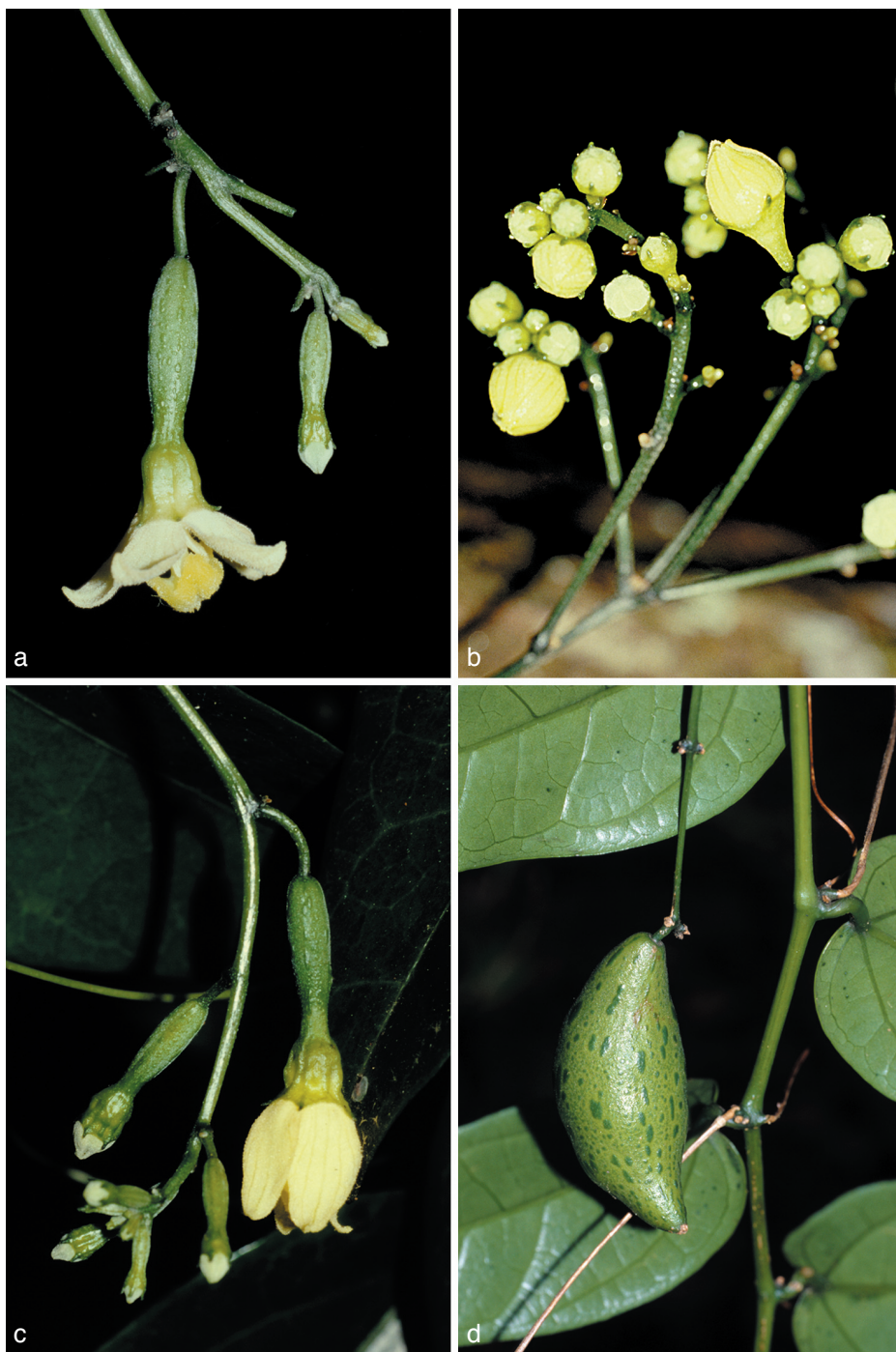


Plate 5. *Borneosicyos simplex* W.J.de Wilde. a, c. Female inflorescences; b. male inflorescence; d. fruit (all: Sabah, Kinabalu Park). Photos: all by De Wilde.



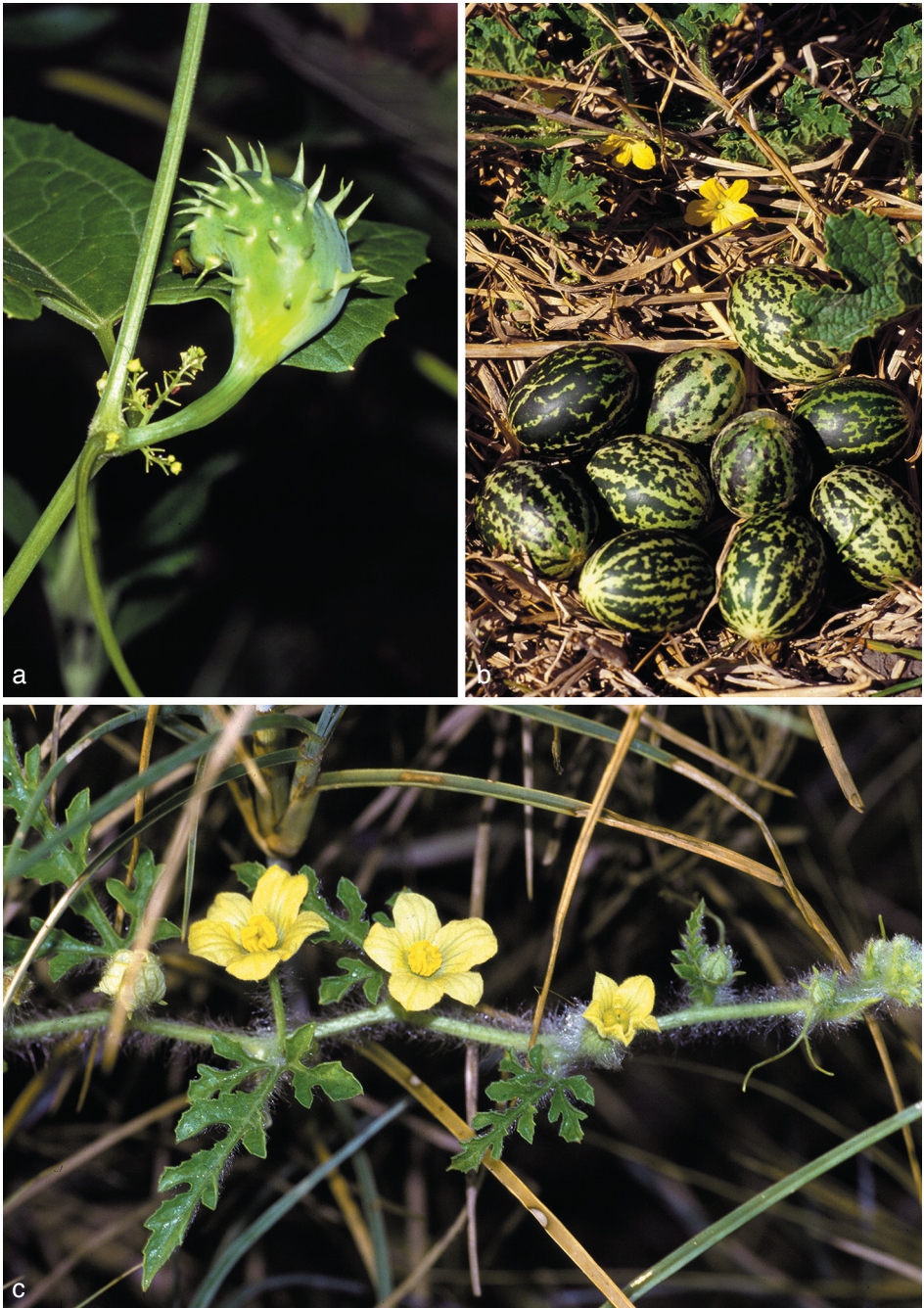


Plate 6. a. *Cyclanthera brachystachya* (Ser.) Cogn. Fruit and male inflorescence. — b. *Cucumis melo* L. forma *agrestis* (Naudin) W.J.de Wilde & Duyfjes. Dove egg-sized fruits and male flowers. — c. *Citrullus lanatus* (Thunb.) Matsum. & Nakai. Shoot with male flowers (a: Java, Cibodas Botanical Garden; b: Lombok; c: Java). Photos: all by De Wilde.



Plate 7. *Coccinia grandis* (L.) Voigt. a. Male flowers; b. female flower; c. fruits (all Thailand). Photos: all by De Wilde.

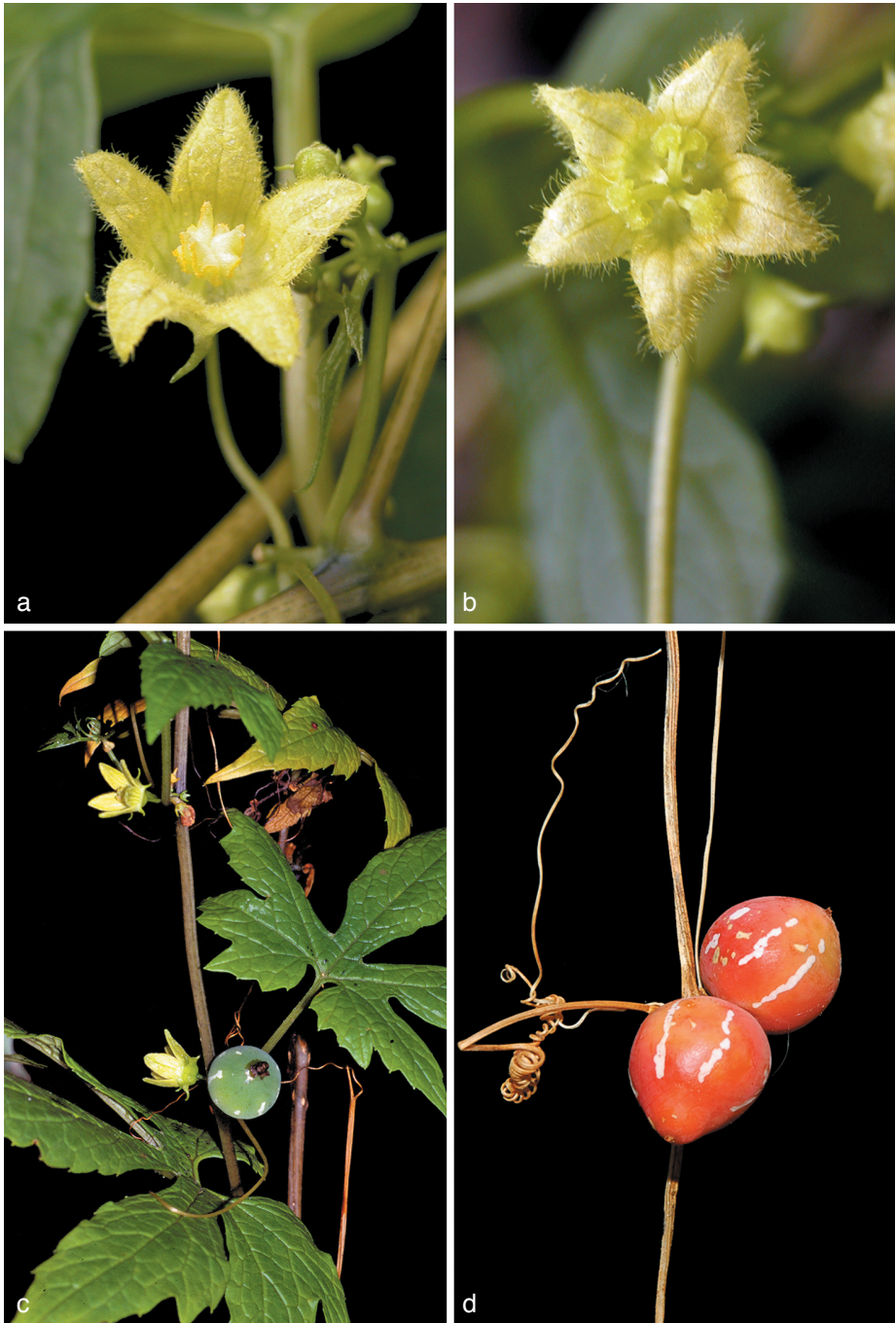


Plate 8. *Diplocyclos palmatus* (L.) C. Jeffrey var. *palmatus*. a. Male flower; b. female flower; c. fruit and male inflorescences; d. fruits (a, b, d: Thailand; c: Java, Cibodas Botanical Garden). Photos: a–c by De Wilde; d by D. Chusithong.



Plate 9. *Gymnopetalum chinense* (Lour.) Merr. a. Male flower; b. fruit; c. creeping shoot with male inflorescences (all: Bali). Photos: all by De Wilde.

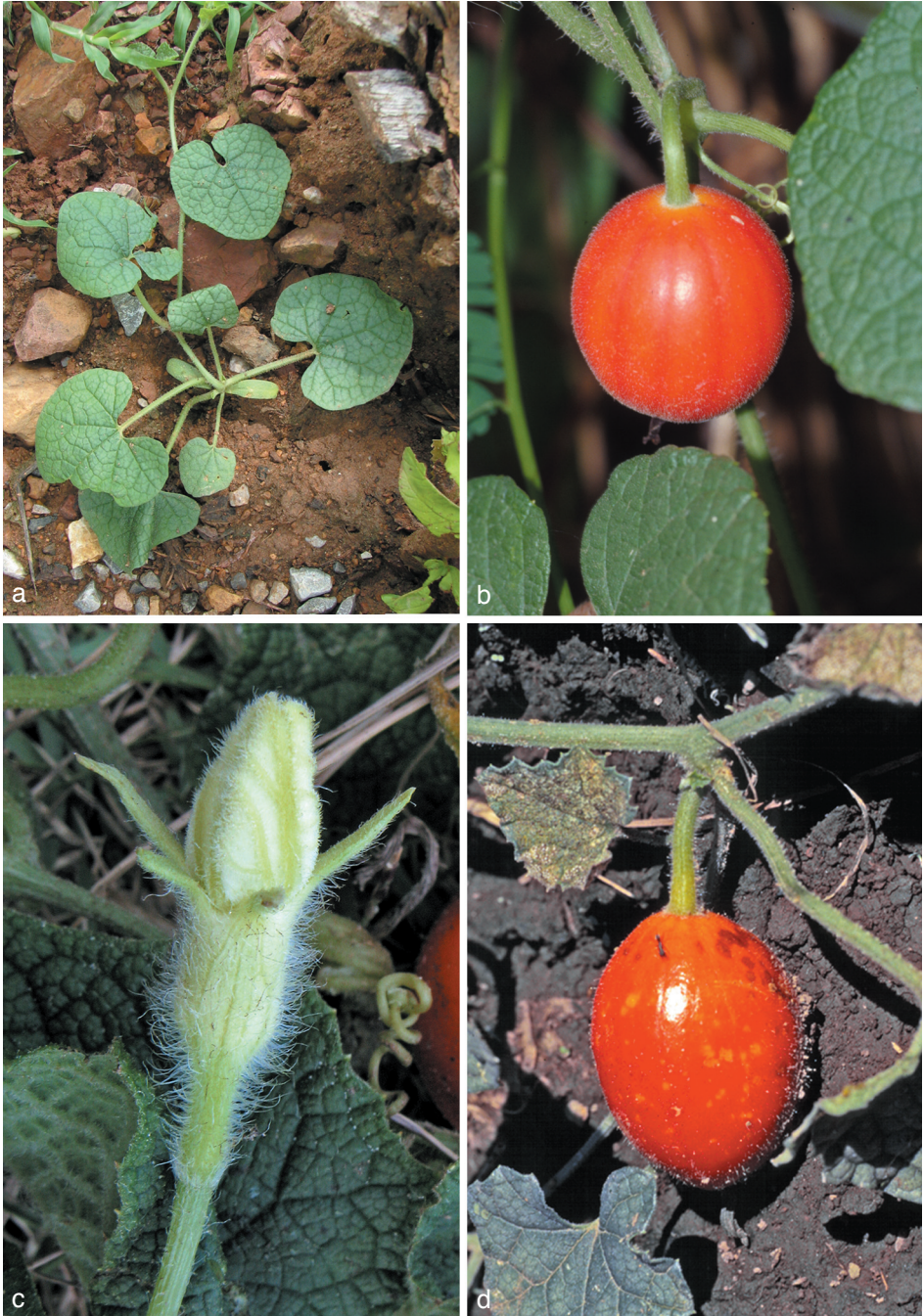


Plate 10. a–c. *Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes var. *scabrum*. a. Seedling; b. fruit; c. male bud. — d. *Gymnopetalum scabrum* (Lour.) W.J.de Wilde & Duyfjes var. *pectinatum* W.J.de Wilde & Duyfjes. Fruit (a, c: Thailand; b, d: Java). Photos: all by De Wilde.

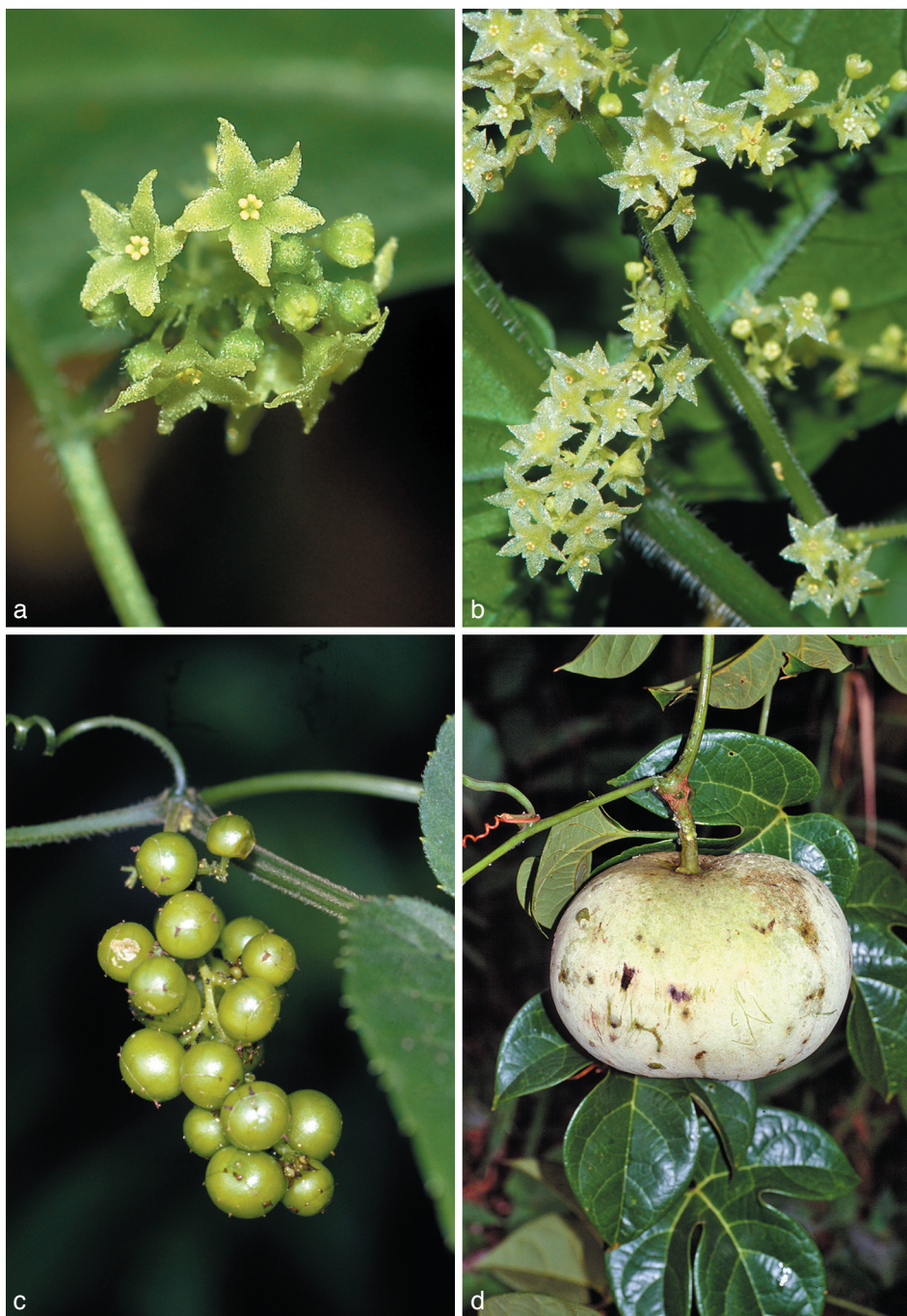


Plate 11. a–c. *Gynostemma pentaphyllum* (Thunb.) Makino forma *pentaphyllum*. a, b. Male inflorescences; c. infructescence. — d. *Hodgsonia macrocarpa* (Blume) Cogn. Fruit (a–c: Thailand; d: Sabah). Photos: a, b by T. Putthai; c, d by De Wilde.

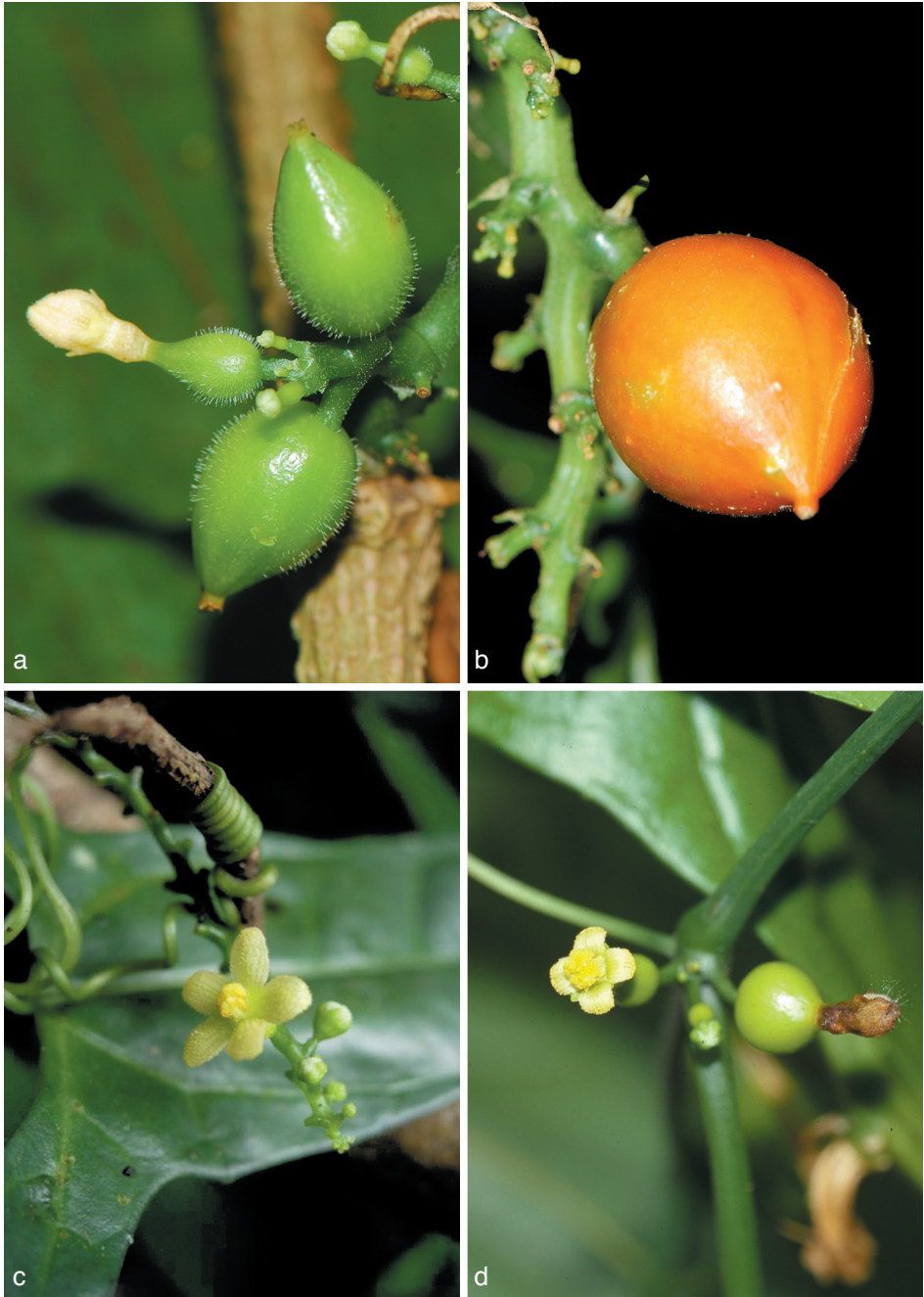


Plate 12. a, b. *Kedrostis monosperma* W.J.de Wilde & Duyfjes. a. Female inflorescence; b. fruit. — c, d. *Kedrostis bennettii* (Miq.) W.J.de Wilde & Duyfjes. c. Male inflorescence; d. female inflorescence and young fruit (a, b: Peninsular Malaysia, Pahang, Ulu Krau; c: Bali; d: Sabah, Gomantong). Photos: a, b, d by De Wilde; c by J. Bastmeijer.

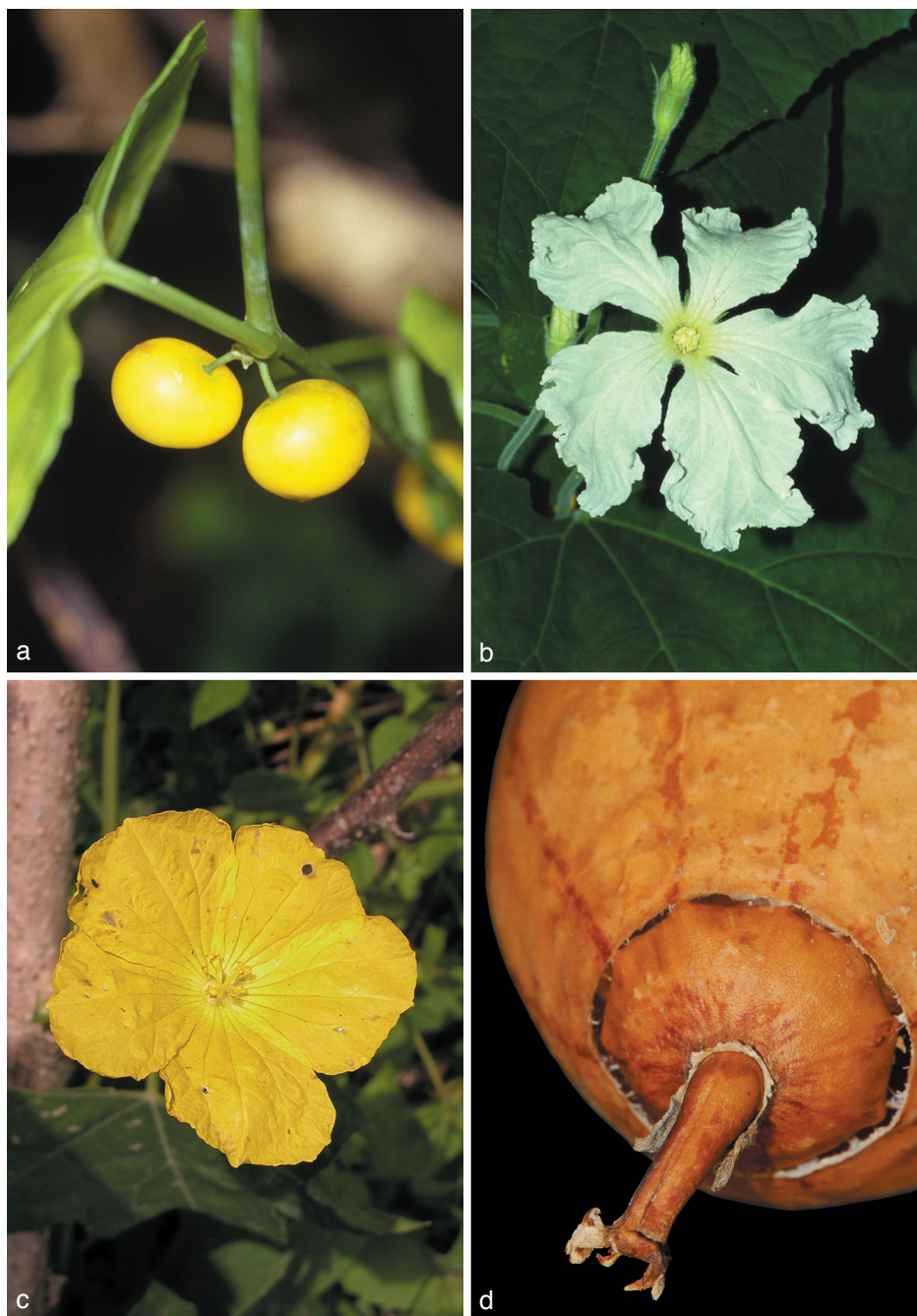


Plate 13. a. *Kedrostis bennettii* (Miq.) W.J.de Wilde & Duyfjes. Infructescence. — b. *Lagenaria siceraria* (Molina) Standl. Male flower. — c, d. *Luffa aegyptiaca* Mill. forma *aegyptiaca*. c. Male flower; d. apical part of fruit, showing operculum (a: Sabah, Gomantong; b–d: Thailand). Photos: all by De Wilde.



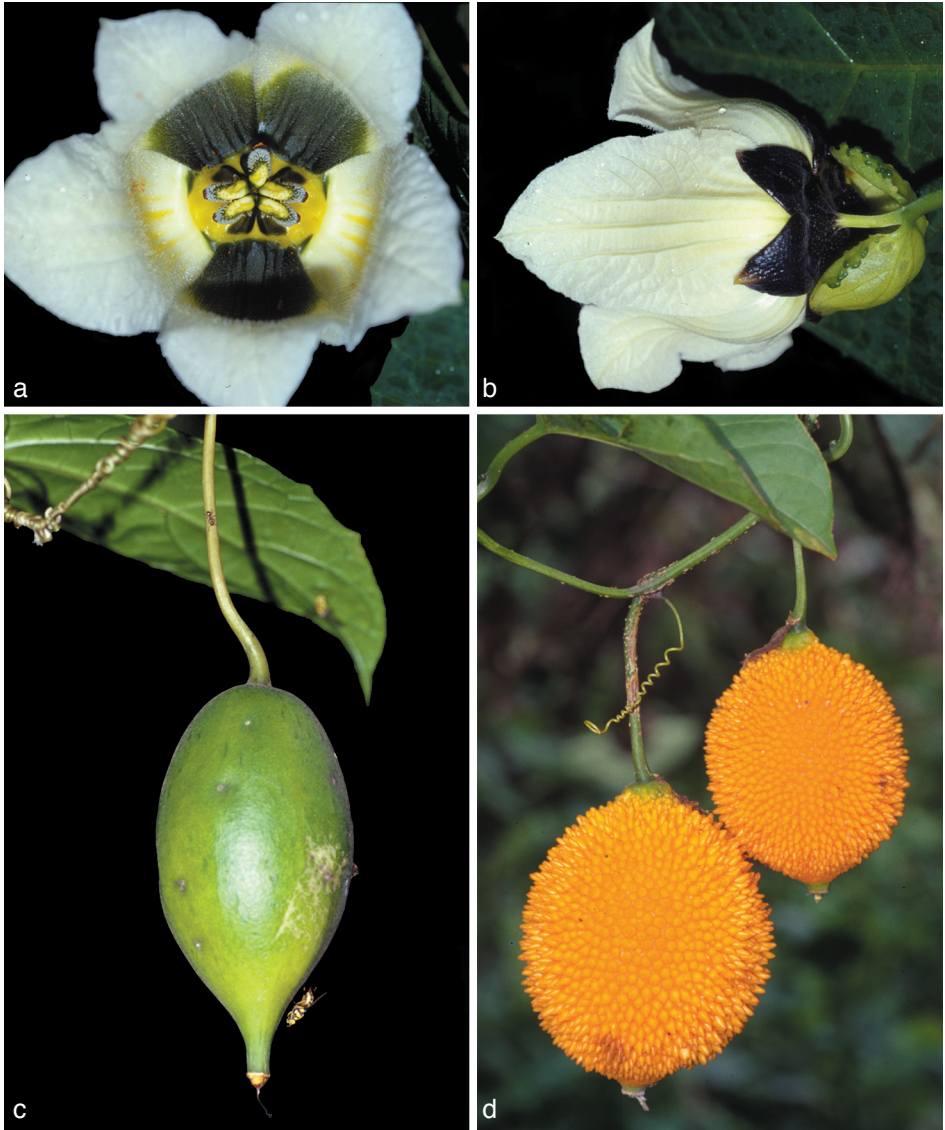


Plate 14. a, b, d. *Momordica cochinchinensis* (Lour.) Spreng. a, b. Male flowers; d fruits. — c. *Momordica denticulata* Miq. Fruit (a, b: Java, Bogor, Botanical Garden; c: Sabah; d: Sulawesi). Photos: all by De Wilde.



Plate 15. a, b. *Momordica charantia* L. forma *abbreviata* (Ser.) W.J.de Wilde & Duyfjes. a. Female flower; b. ripe fruit exposing seeds in red pulp. — c. *Momordica subangulata* Blume subsp. *subangulata*. Male flower. — d. *Momordica clarkeana* King. Fruit (a–c: Thailand; d: Peninsular Malaysia, Perak). Photos: a–c by De Wilde; d by Imin Kamin.

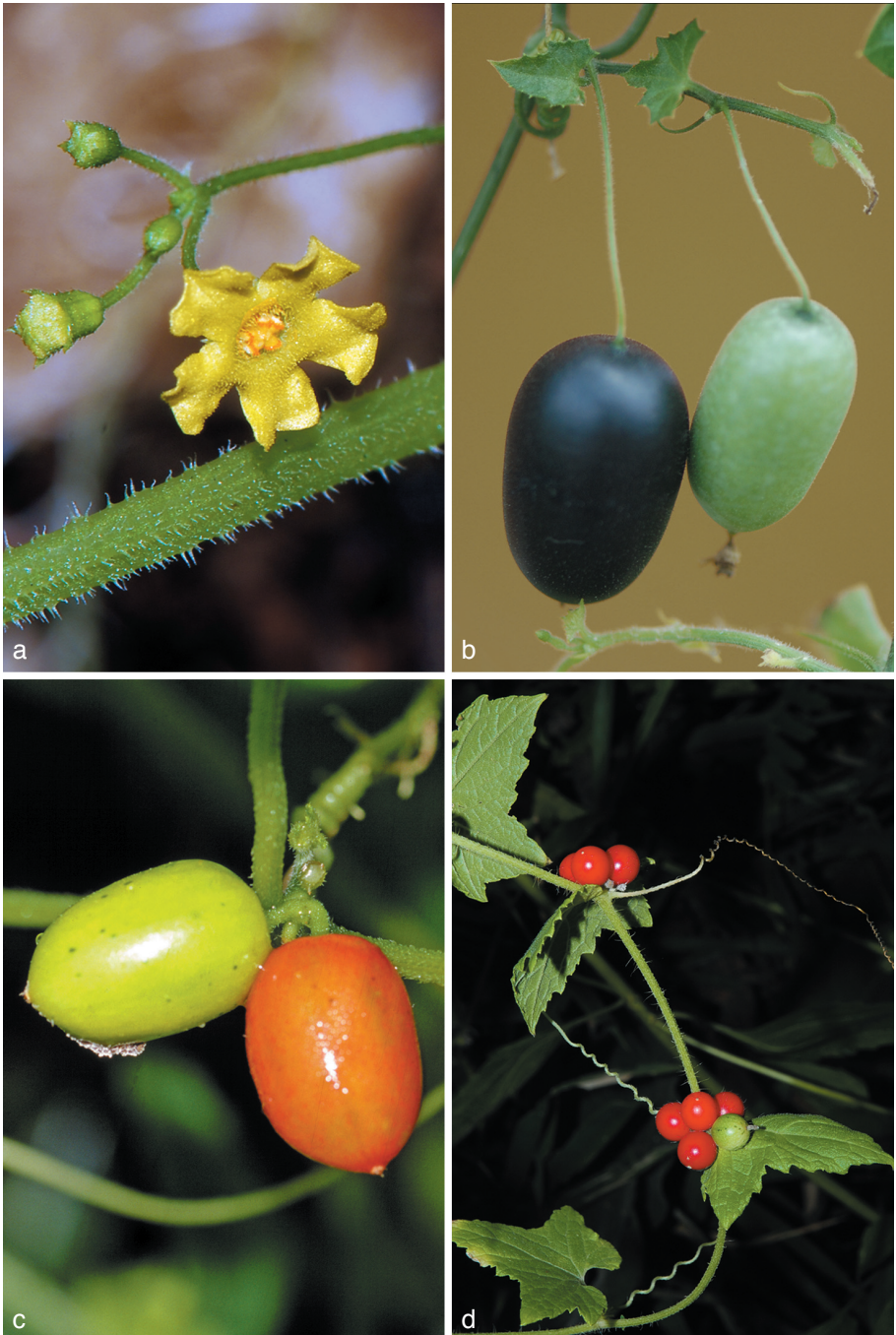


Plate 16. a, b. *Melothria pendula* L. a. Male inflorescence; b. fruits. — c. *Mukia javanica* (Miq.) C. Jeffrey. Fruits. — d. *Mukia maderaspatana* (L.) M. Roem. Fruits (a, b: Peninsular Malaysia, Kuala Lumpur; c: Java; d: Thailand). Photos: a–c by De Wilde; d by D. Chusithong.

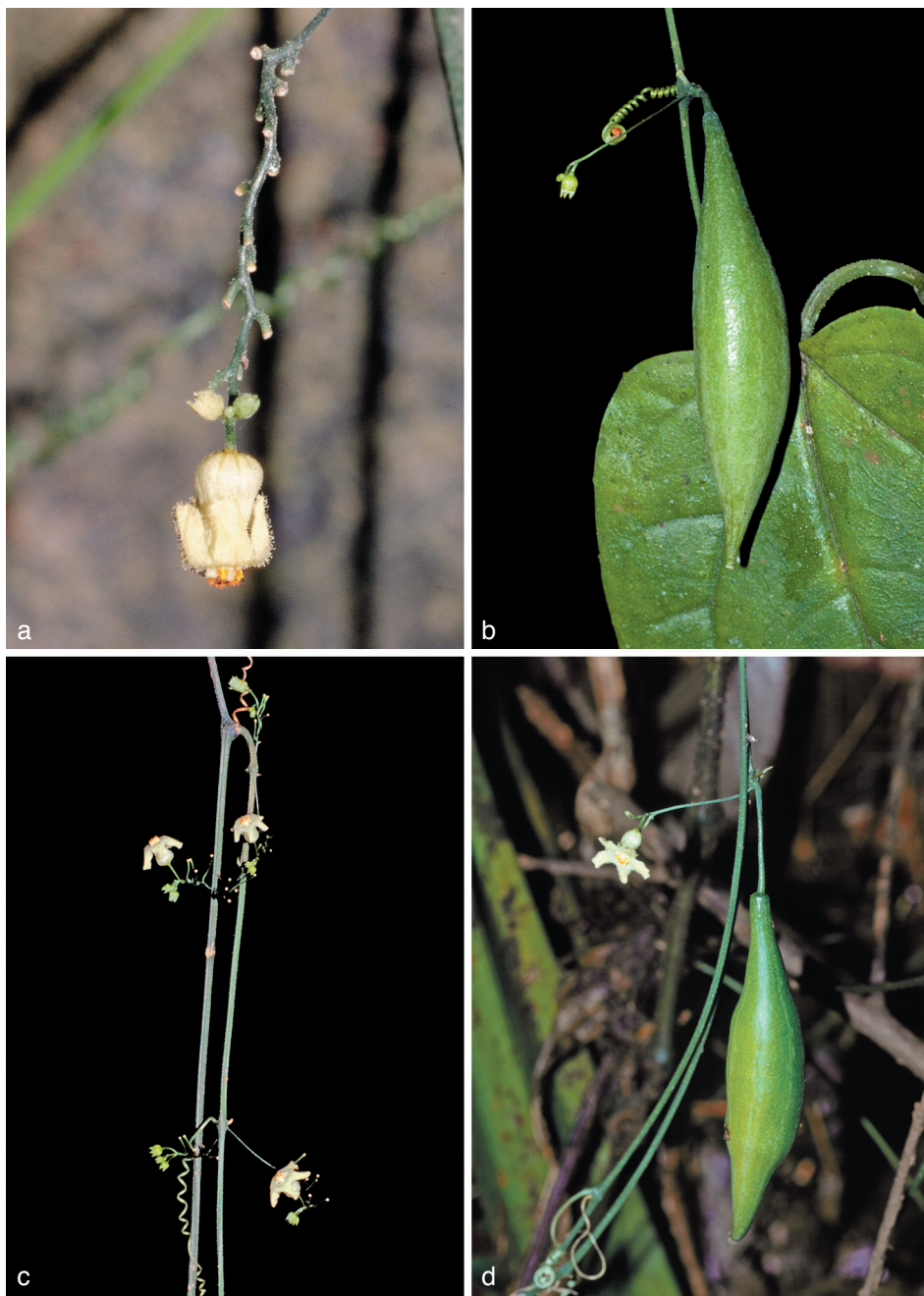


Plate 17. a, b. *Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes subsp. *chlorocarpa*. a. Male inflorescence; b. fruit. — c, d. *Indomelothria chlorocarpa* W.J.de Wilde & Duyfjes subsp. *halimunensis* W.J.de Wilde & Duyfjes. c. Male inflorescences; d. fruit and male inflorescence (a, b: Sabah; c, d: West Java, Gn Halimun). Photos: all by De Wilde.

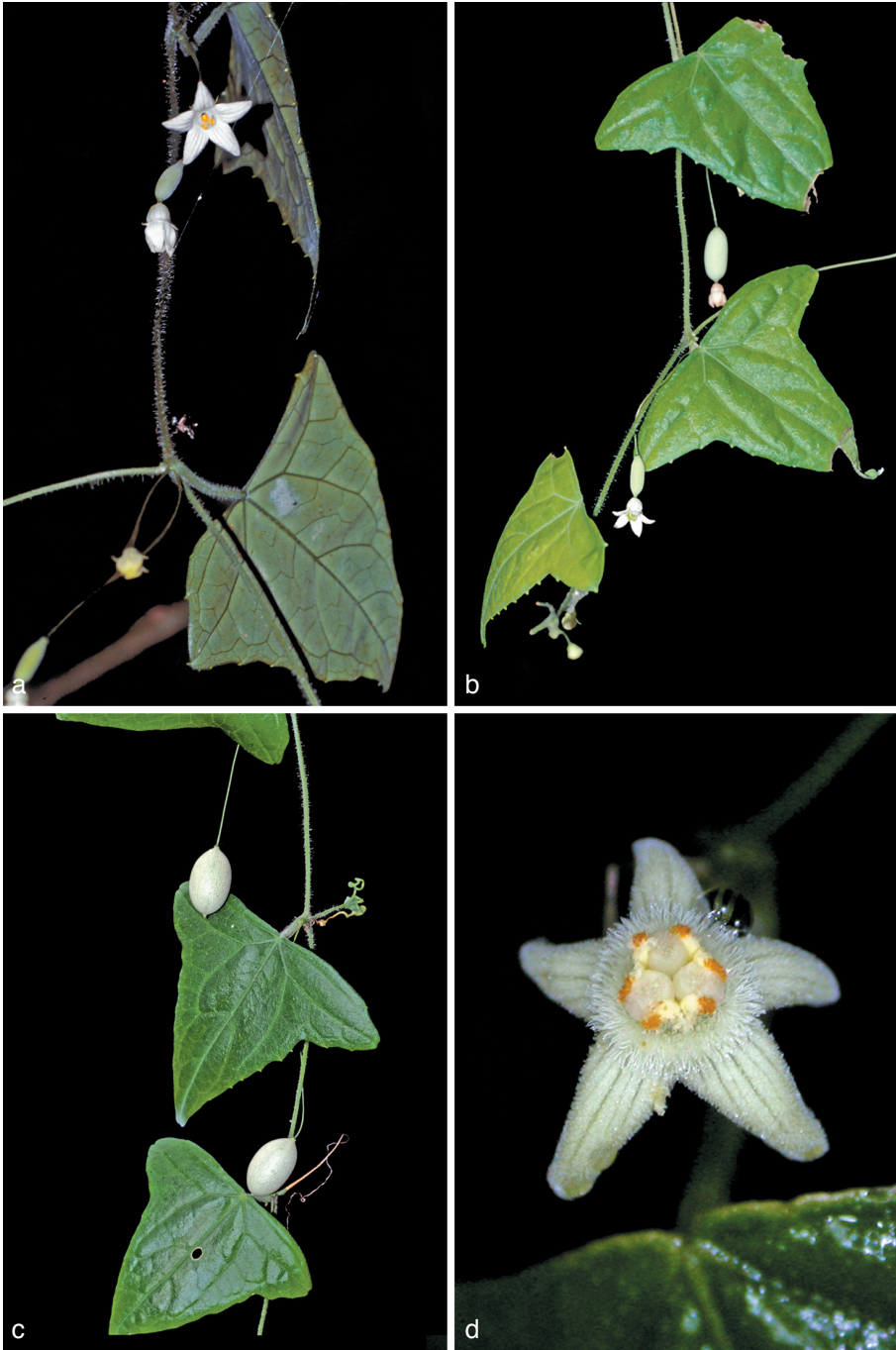


Plate 18. a–c. *Neoachmandra leucocarpa* (Blume) W.J.de Wilde & Duyfjes. a, b. Male and female flowers; c. fruits. — d. *Neoachmandra nesophila* W.J.de Wilde & Duyfjes. Male flower (a–c: Java, Cibodas; d: Philippines). Photos: a–c by De Wilde; d by P. Pelsler.

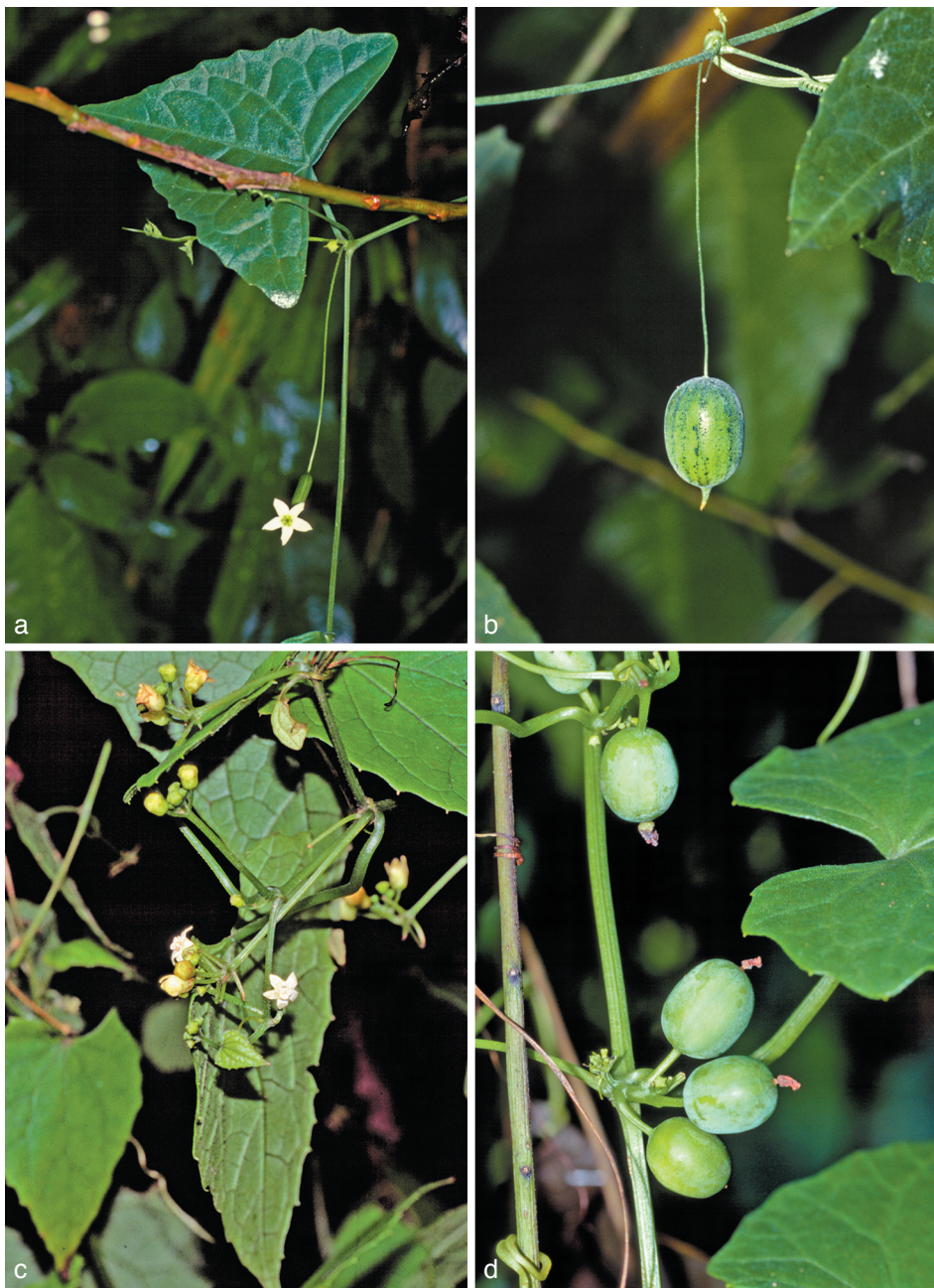


Plate 19. a, b. *Neochamandra nesophila* W.J.de Wilde & Duyfjes. a. Female flower; b. fruit. — c, d. *Pilogyne mucronata* (Blume) W.J.de Wilde & Duyfjes. c. Male inflorescences; d. fruits (a, b: Lombok; c, d: West Java). Photos: all by De Wilde.

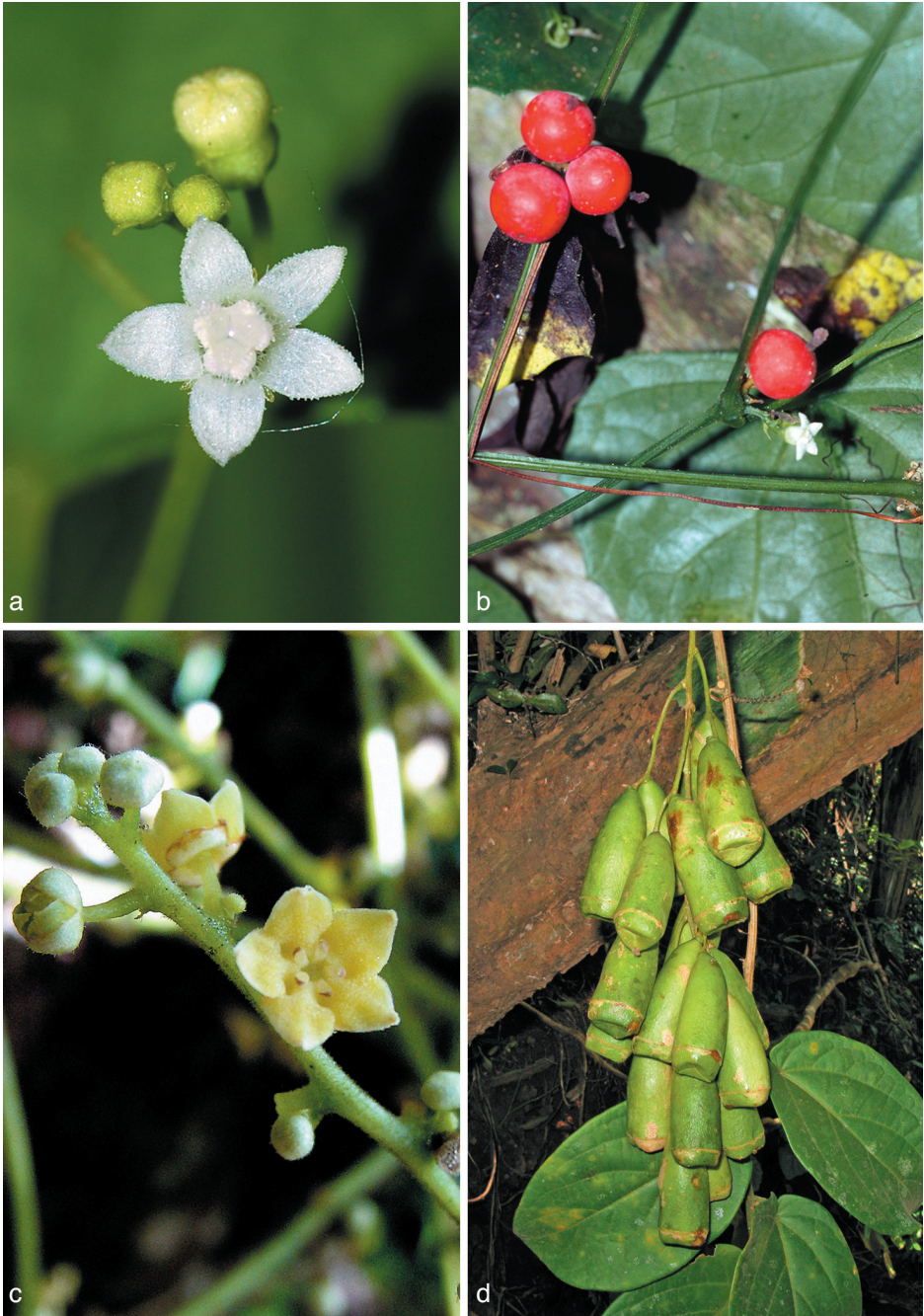


Plate 20. a, b. *Pilogyne bodinieri* (H.Lév.) W.J.de Wilde & Duyfjes. a. Male inflorescence; b. fruits and male inflorescence. — c, d. *Zanonía indica* L. subsp. *orientalis* W.J.de Wilde & Duyfjes var. *pubescens* Cogn. c. Detail of male inflorescence; d. infructescence (all: Thailand). Photos: a by D. Chusithong; b–d by De Wilde.



Plate 21. a, b. *Scopellaria marginata* (Blume) W.J.de Wilde & Duyfjes var. *marginata*. a. Male inflorescence; b. fruit and male inflorescence. — c, d. *Solena heterophylla* Lour. subsp. *heterophylla*. c. Male inflorescence; d. fruit (all: Thailand). Photos: a, b, d by De Wilde; c by T. Putthai.





Plate 22. *Nealsomitra clavigera* (Wall.) Hutch. a. Male inflorescence; b. male flower; c. fruits (all: Thailand). Photos: all by De Wilde.

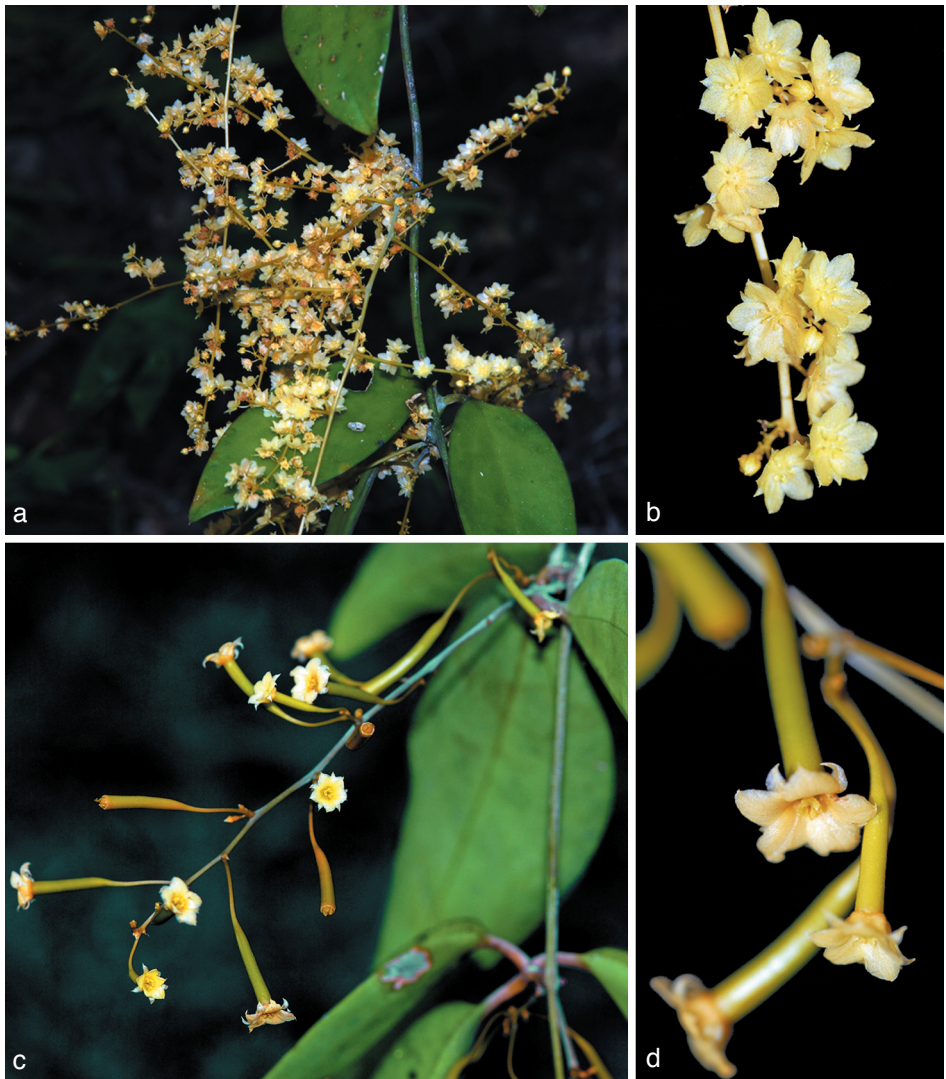


Plate 23. *Neosomitra sarcophylla* (Wall.) Hutch. a. Male inflorescences; b. detail; c. female inflorescence; d. detail (all: Thailand). Photos: a by De Wilde; b–d by P. Phonsena.

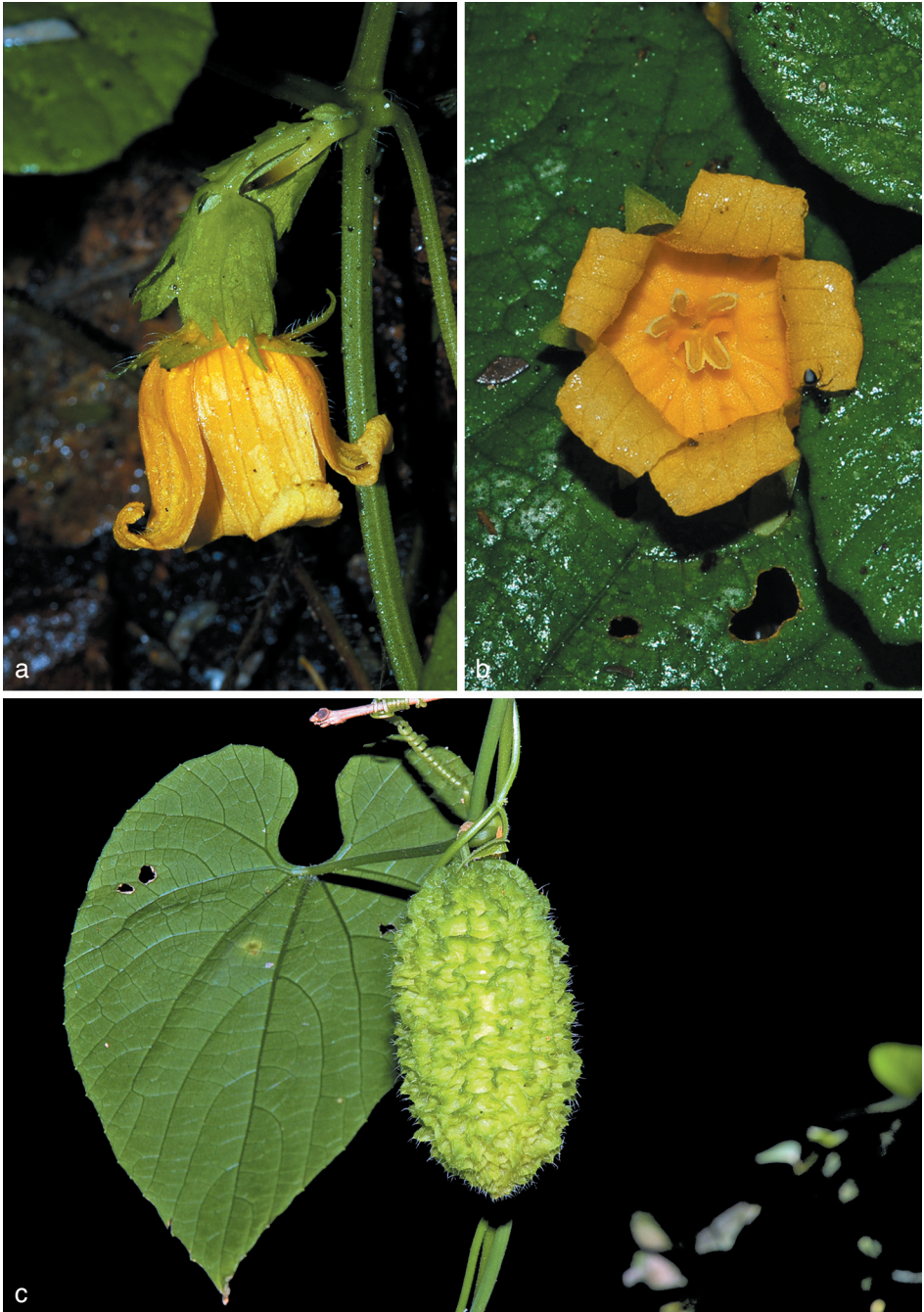


Plate 24. *Thladiantha cordifolia* (Blume) Cogn. a. Male inflorescence; b. male flower; c. fruit (all: Thailand). Photos: a, b by De Wilde; c by D. Chusithong.

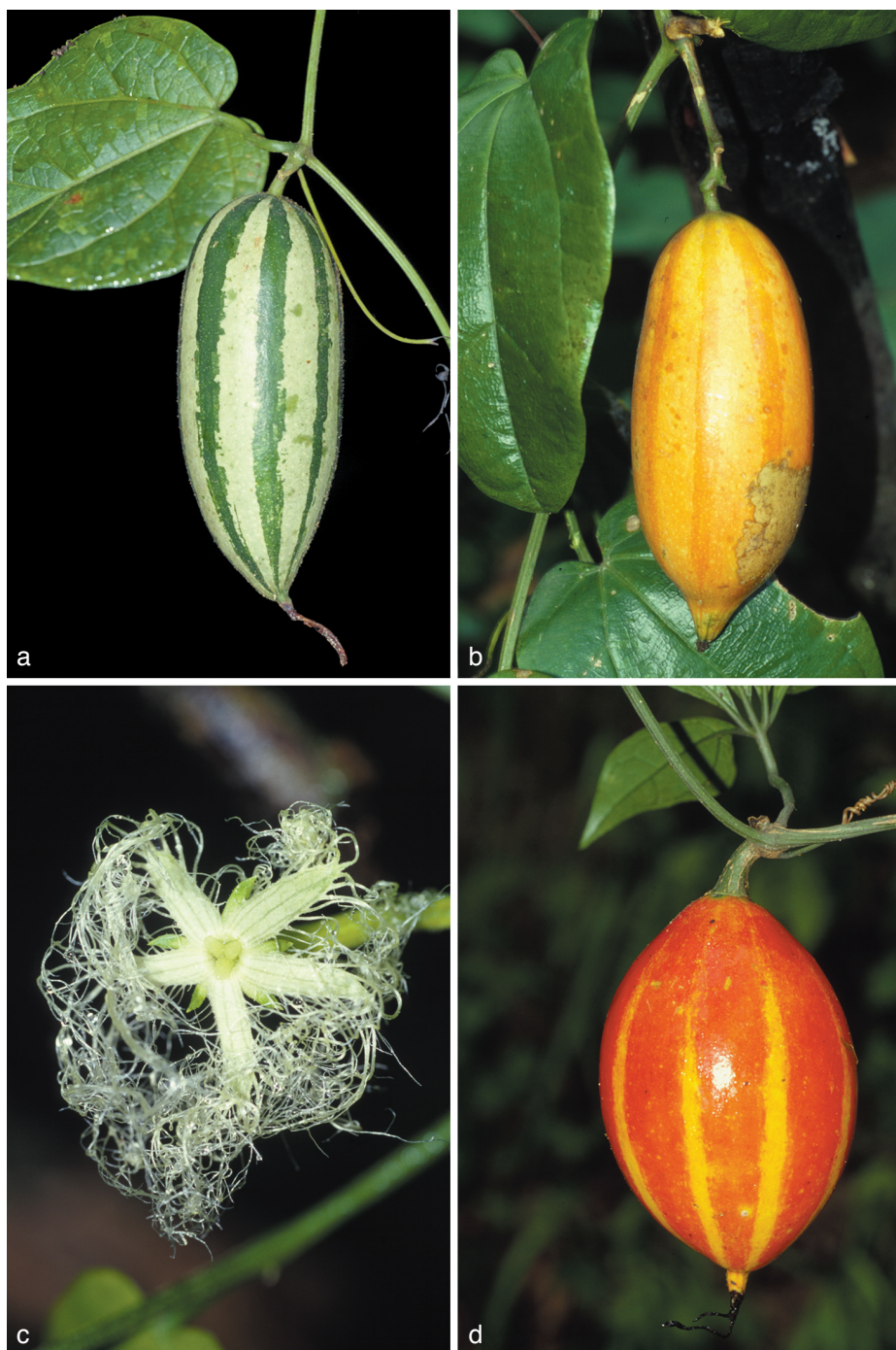


Plate 25. a–c. *Trichosanthes beccariana* Cogn. subsp. *beccariana*. a, b. Unripe and nearly ripe fruit; c. female flower. — d. *Trichosanthes elmeri* Merr. Fruit (all: Sabah). Photos: all by De Wilde.



Plate 26. a, b. *Trichosanthes elmeri* Merr. a, b. Fruits. — c, d. *Trichosanthes emarginata* Rugayah. c. Fruits; d. seeds (a, b: Sabah; c, d: Peninsular Malaysia, Pahang, Ulu Krau). Photos: a, b by De Wilde; c, d by C.K. Lim.

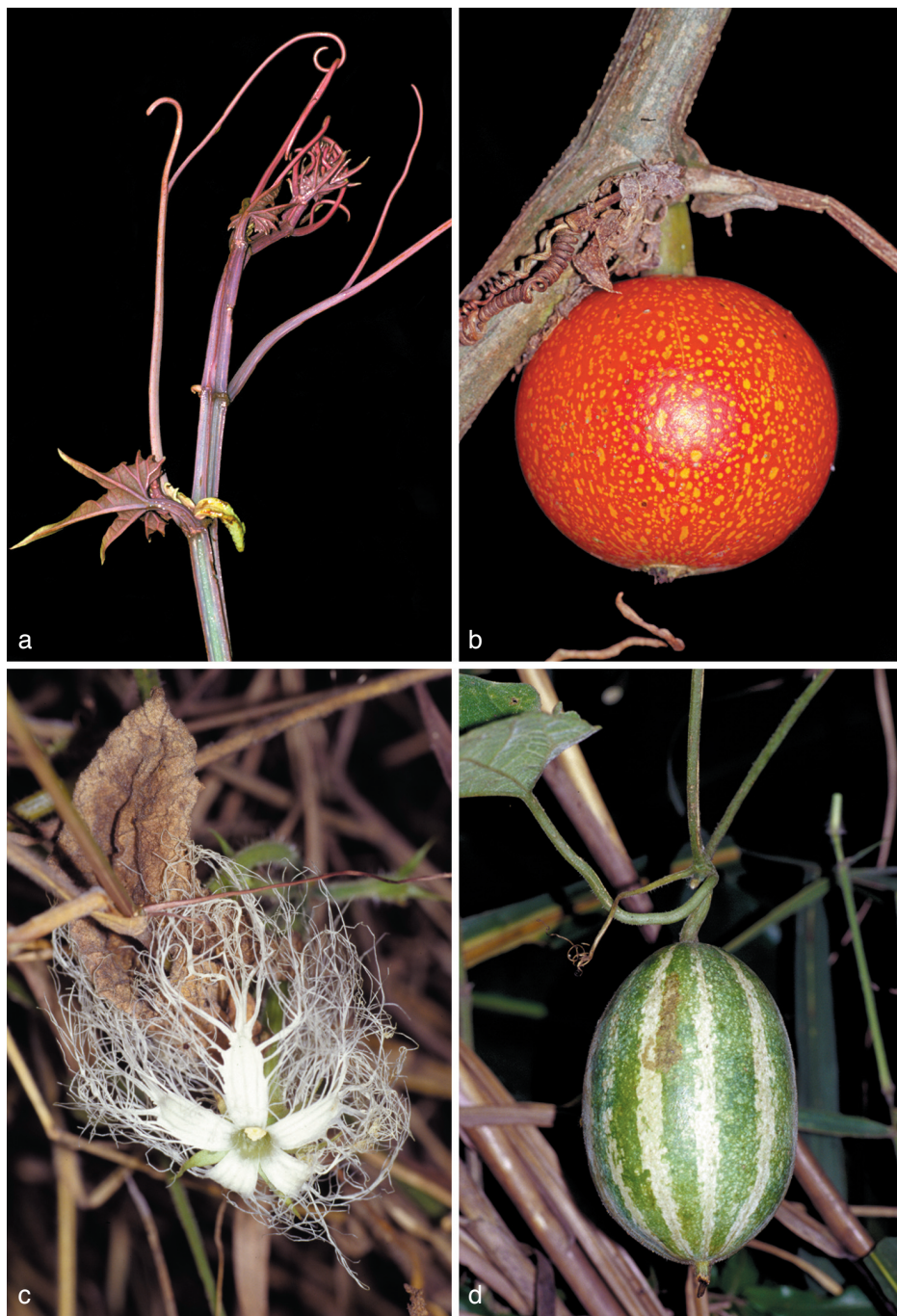


Plate 27. a, b. *Trichosanthes kinabaluensis* Rugayah. a. Young shoot with probract; b. ripe fruit. — c, d. *Trichosanthes mucronata* Rugayah. c. Male flower; d. ripe fruit (all: Sabah, near Kinabalu Park). Photos: all by De Wilde.



Plate 28. *Trichosanthes pendula* Rugayah. a. Male flower; b. apical portion of male inflorescence; c. ripe fruit in female inflorescence (all: Sabah, Sepilok Forest Reserve). Photos: all by De Wilde.

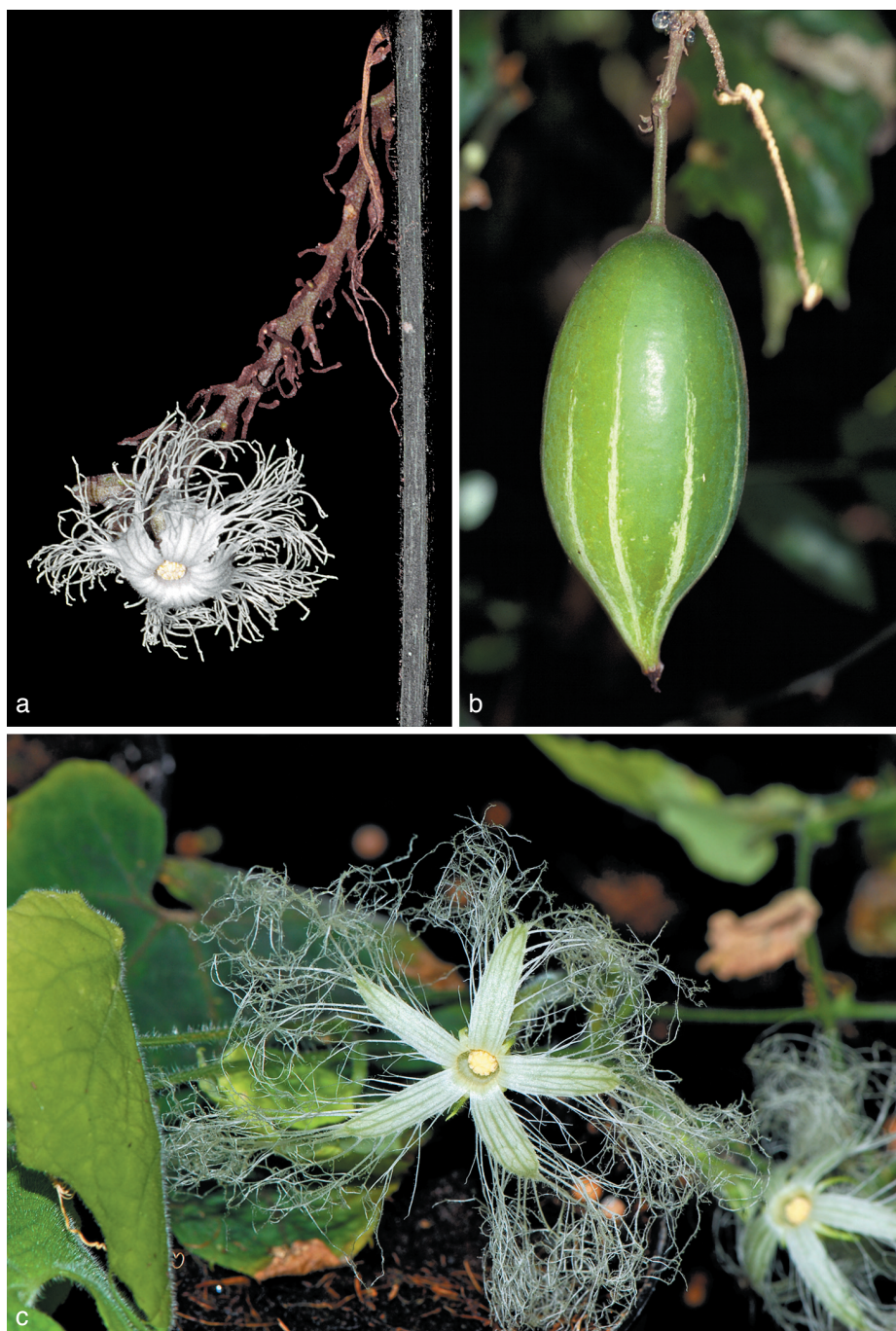


Plate 29. a, b. *Trichosanthes postarii* W.J.de Wilde & Duyfjes. a. Male inflorescence; b. ripe fruit. — c. *Trichosanthes pilosa* Lour. var. *pilosa*. Male flower (a, b: Sabah, near Poring; c: Thailand). Photos: all by De Wilde.



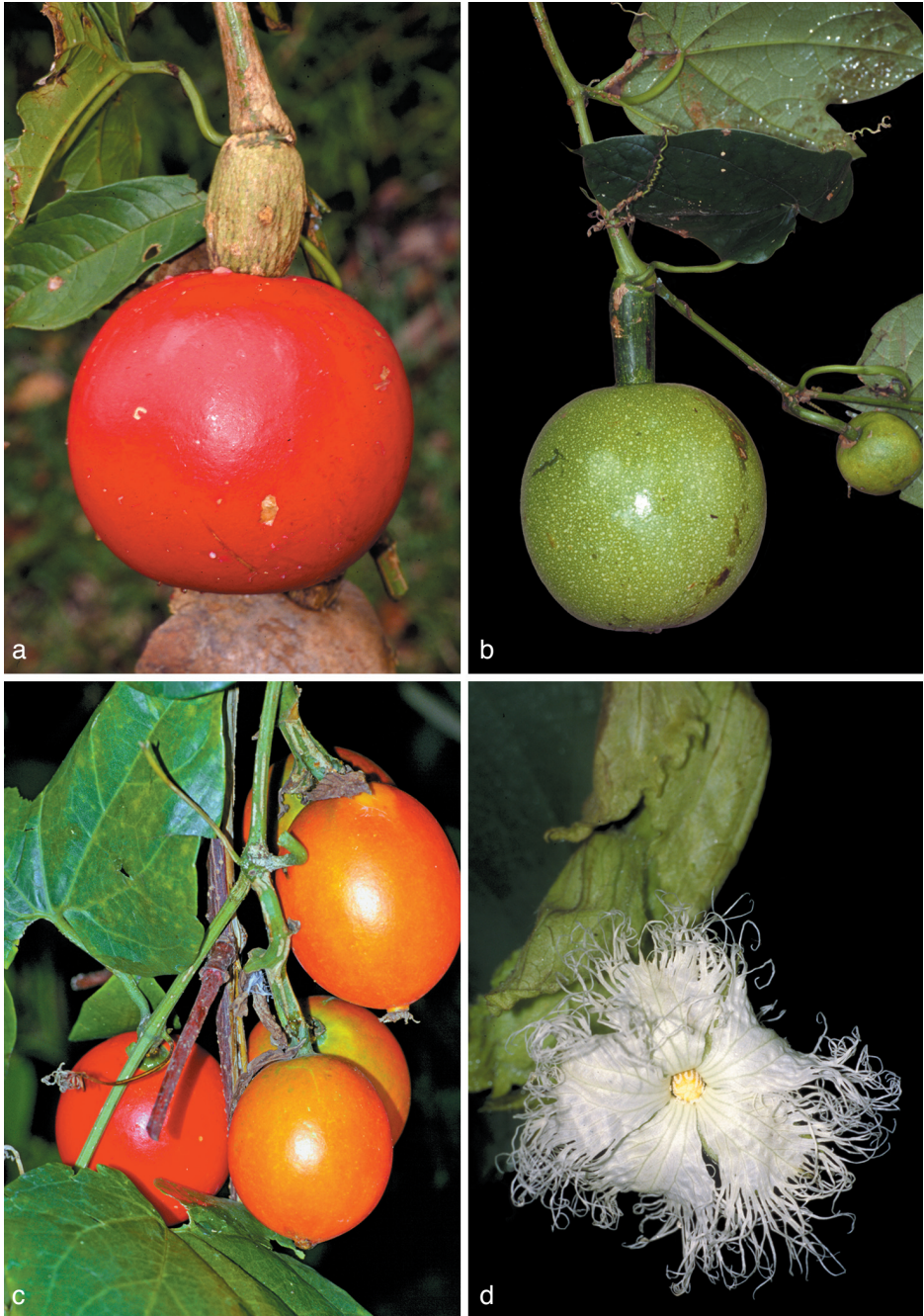


Plate 30. a. *Trichosanthes montana* Rugayah subsp. *crassipes* W.J.de Wilde & Duyfjes. Fruit. — b. *Trichosanthes sepilokensis* Rugayah. Full grown fruit, not yet red-coloured. — c. *Trichosanthes tricuspidata* Lour. subsp. *javanica* Duyfjes & Pruesapan. Infructescences. — d. *Trichosanthes villosa* Blume. Male inflorescence (a: Sabah, near Kinabalu Park; b: Sabah, near Sepilok; c, d: Thailand). Photos: all by De Wilde.

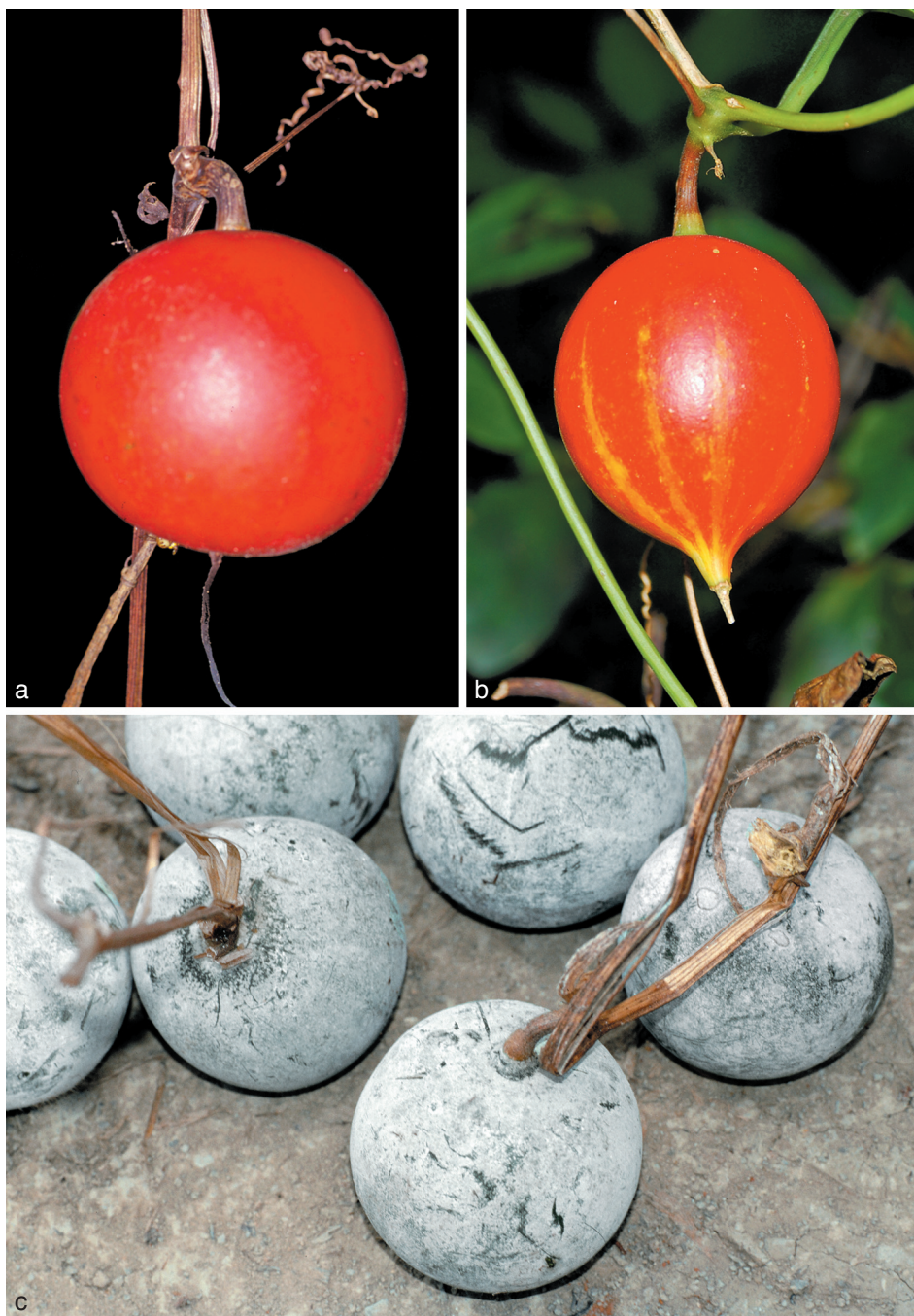


Plate 31. a. *Trichosanthes quinquangulata* A.Gray. Fruit. — b. *Trichosanthes wawrae* Cogn. forma *wawrae*. Fruit. — c. *Benincasa pruriens* (Parkinson) W.J.de Wilde & Duyfjes forma *pruriens*. Small-sized ripe fruits (a: West Java; b: Thailand; c: Sabah). Photos: all by De Wilde.



Plate 32. a, c. *Benincasa pruriens* (Parkinson) W.J.de Wilde & Duyfjes forma *hispidia* (Thunb.) W.J.de Wilde & Duyfjes. a. Depressed globose fruits; c. ellipsoid fruits. — b. *Lagenaria siceraria* (Molina) Standl. Pear-shaped immature fruits. — c. In the background *Cucurbita moschata* Duchesne. Fruits (all: Thailand, exposed on vegetable market). Photos: all by De Wilde.



Plate 33. a. *Luffa aegyptiaca* Mill. forma *aegyptiaca*. Fruits. — b. *Luffa acutangula* (L.) Roxb. (left), and *Momordica charantia* L. forma *charantia* (right) (a: Thailand, vegetable garden; b: Thailand, vegetable market). Photos: all by De Wilde.

### 1. *Papuasicyos papuana* (Cogn.) Duyfjes

*Papuasicyos papuana* (Cogn.) Duyfjes, *Blumea* 48 (2003) 124, f. 2, 3. — *Melothria papuana* Cogn., *Bull. Acad. Roy. Sci. Belgique, Cl. Sci., sér. 3, 14* (1887) 355; in Engl., *Pflanzenr.* 66, 4.275.1 (1916) 92; Harms, *Bot. Jahrb. Syst.* 60 (1925) 152. — Type: *Bäuerlen* 328 (holo B<sup>+</sup>; iso MEL), Papua New Guinea (Strickland River).

Subperennial climber, c. 6 m long, with minute sparse appressed grey hairs 0.1 mm long, glabrescent; monoecious; roots not known. *Leaves*: petiole 1–2 cm long; blade membranous, green on drying, (narrowly) ovate, 4–15 by 1.5–9.5 cm, glabrescent except for minute hairs on veins, densely set with small cystoliths above, glands absent, base rounded, truncate, or shallowly cordate, margin entire or occasionally with

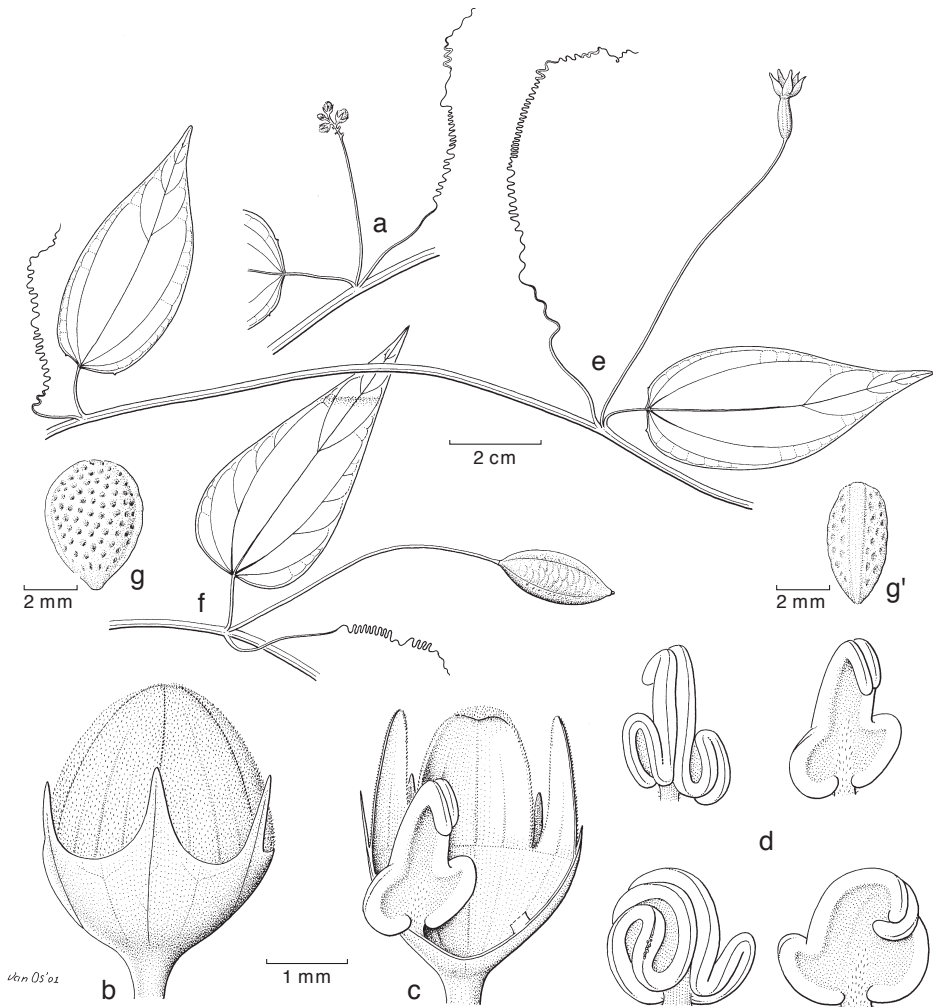


Fig. 54. *Papuasicyos papuana* (Cogn.) Duyfjes. a. Male inflorescence; b. nearly mature male flower bud; c. ditto, opened, showing position of stamens (disc absent); d. stamens; e. portion of branch with a female flower; f. fruit; g, g'. seed (all: *Bäuerlen* 328, type).

an odd tooth at base, apex acute-acuminate, mucronate; basal veins 3–5(–7). *Male inflorescence* a solitary pedunculate delicate 10(–20)-flowered raceme, 5–8 cm long, with minute papillose glands and appressed hairs, glabrescent; peduncle 1–4 cm long; flowers rather irregularly inserted; bracts absent. *Male flowers*: pedicel 3–8 mm long, sparsely hairy, inconspicuously articulated c. 0.5 mm below apex; receptacle-tube c. 2 by

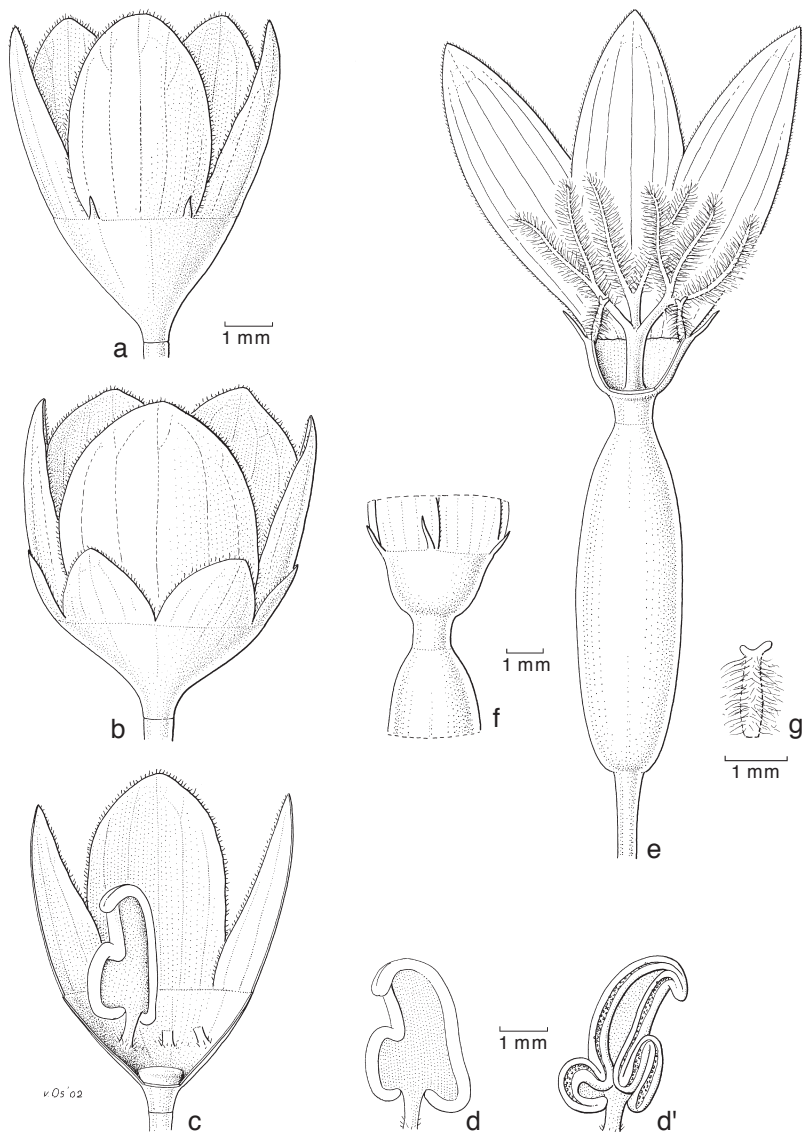


Fig. 55. *Papuasicyos pauana* (Cogn.) Duyfjes. a. Male flower, sepals small; b. male flower, sepals large; c. male flower (half-schematic, pilosity omitted), opened, showing position of stamens and minute disc?; d, d'. stamens; e. female flower (somewhat schematic), opened, note staminodes; f. female receptacle-tube and sepals; g. staminode (a, c–d': *Docters van Leeuwen* 9873; b: *Ridsdale* NGF 30335; e–g: *Bäuerlen* 328, type).

3.5 mm, outside subglabrous, inside pilose; sepals long triangular or elliptic, 0.5–2 by 0.3–2 mm, apex acute or  $\pm$  rounded, very minutely mucronate, margin minutely fringed; petals ovate-elliptic, 5–6.5 by 3–3.5(–5) mm, 3–5(–7)-veined, pilose (hairs c. 0.2 mm long), apex subacute or rounded, margin fimbriate; filaments c. 1 mm long, with pale shaggy hairs at base, inserted c. halfway up the receptacle, anthers closely appressed into a nearly globose head c. 3.5 mm long, 4.5 mm wide, thecae narrow, sigmoid,  $\pm$  bilateral-symmetrical at the edges of broad rather flat connective (Fig. 54c, d, 55c, d'); disc absent or inconspicuous. *Female flowers* solitary on the leafy nodes, (sub)glabrous; pedicel 40–100 by c. 0.5 mm; ovary oblong, c. 10 by 2.5(–3) mm, apex narrowed into a neck c. 1 mm long; receptacle-tube bowl-shaped, c. 1.5 by 2.5(–3) mm, throat hairy inside; sepals 1–1.5 by c. 0.3 mm; petals as in male flower but larger,  $\pm$  short-hairy, narrowly elliptic, c. 10 mm long, 5-veined; staminodes 3, inserted slightly below receptacle throat, terete, c. 1 mm long, densely fine-hairy, with hairs 0.5(–1) mm long, at apex with one or two minute transversal glabrous thickenings; receptacle below the insertion of the staminodes inside faintly thickened (disc?); style c. 1.5 mm long, (sub)glabrous, stigma 3-branched, with each branch 4–4.5 mm long, once (or twice) forked, wholly conspicuously densely (glandular?) hairy, with hairs c. 1 mm long. *Fruit* solitary, (narrowly) ellipsoid, narrowed at both ends, 2–2.6 by 0.9–1.2 cm, smooth, juicy; fruiting pedicel slender, 4–10 cm long, glabrous. *Seeds* c. 40, in dry fruits visible and pressed into the transparent pericarp, ovoid-ellipsoid, c. 5 by 3.5 by 1–2 mm, (light) brown. — **Fig. 54, 55.**

*Distribution* — New Guinea, north and south of the Main Range: New Guinea (West Papua and Papua New Guinea; known from 5 collections).

*Habitat & Ecology* — Lowland swamp forest, river banks; 0–500 m altitude; flowering and fruiting June to December.

*Notes* — 1. The sepals in the few male flowers available for study are remarkably different: those of *Docters van Leeuwen* 9873 (West Papua) are narrow and only c. 0.5 mm long; those of *Ridsdale NGF 30335* (Papua New Guinea, Morobe Distr.) are broad and rounded and c. 2 mm long; those of the other 3 collections are  $\pm$  intermediate. In *Docters van Leeuwen* 9873 possibly a small depressed central disc is present, but this cannot be determined with certainty; however, a disc is absent in the other specimens.

2. According to molecular phylogenetic analyses *Papuasicyos* is congeneric with *Urceodiscus* (H.Schaefer & S.S.Renner, Fam. Gen. Vasc. Pl. [Kubitzki], in press).

## 29. PILOGYNE

*Pilogyne* Schrad., Index Sem. (Gottingen) (1835) 5; Eckl. & Zeyh., Enum. Pl. Afric. Austral. 2 (1836) 408; W.J.de Wilde & Duyfjes, Reinwardtia 12 (2009) 405. — Type species: *Pilogyne suavis* Schrad. (Africa).

*Zehneria* Endl., Prodr. Fl. Norfolk. (1833) 69, p.p., & excl. the type, *Zehneria baueriana* Endl.

*Zehneria* auct. non Endl. p.p., excl. the type, *Zehneria baueriana* Endl.: W.J.de Wilde & Duyfjes, Blumea 51 (2006) 48; Fl. Thailand 9, 4 (2008) 544.

Small climbers, annual or (sub)perennial, leafy stem 1–2 mm diam., usually blackish on drying; usually dioecious. *Probract* linear, minute, 1–5 mm long, sometimes caducous. *Tendrils* unbranched. *Leaves*: blade simple. *Flowers* small, receptacle-tube

campanulate; sepals minute, narrow; petals valvate or imbricate in bud, white or creamy, free. *Male inflorescence* a short- or long-peduncled few- or many-flowered condensed raceme, when monoecious co-axillary with female flower(s) or not; bracts absent. *Male flowers*: pedicel short, 2–10(–15) mm long, persistent; stamens 3, inserted in the lower half of the receptacle-tube, usually near the base, filaments longer than the anther, anthers all 2-theous,  $\pm$  included or just exerted, thecae lateral, straight or curved, not divergent, connective narrow or broad and  $\pm$  thickened adaxially, not or little produced at apex; disc (depressed-)globose or 3-lobed. *Female flowers* solitary or few at the node, or few in a peduncled cluster, when monoecious co-axillary with a male raceme, or mixed with male flowers in a peduncled raceme; pedicel short (or long); ovary globose with slender neck, or ellipsoid; stigma (deeply 3-lobed or) 3 on short style-arms, papillose(-hairy); staminodes present; disc free, annular. *Fruit* 1 or several, green, ripening red or purplish blackish, usually with short fruiting pedicel, globose or ellipsoid, 0.5–3 cm long, juicy or pulpy; exocarp cartilaginous, minutely pitted or tessellate. *Seeds* several or numerous, whitish or pale brownish, compressed, ovate or elliptic, not sculptured, margin narrow but distinct (indistinct in *P. immarginata*), edge entire, usually square; base without wing.

Distribution — A genus of c. 25 species distributed in the tropics of the Old World: Africa and Madagascar and in SE Asia, from India, China, through Malesia, to North Australia and far into the Pacific; c. 18 species in Asia, Malesia and the Pacific, 1 species in Australia; *in Malesia* 14 species.

Note — Several species are weakly defined, sometimes only distinguishable by the colour of the ripe fruits. For convenience, of each species the geographical distribution is indicated as an aid. Further collecting and study is needed.

#### KEY TO THE SPECIES

- 1a. Leaf blade (narrowly) trullate, base  $\pm$  rounded or broadly cuneate. [Female flowers and fruits not known.] — Central Sulawesi . . . . . **13. *P. trullifolia***
- b. Leaf blade ovate, cordate or (sub)circular . . . . . 2
- 2a. Ovary and fruit globose, fruit c. 1 cm diam. or less, seeds margined. . . . . 3
- b. Ovary and fruit subglobose or ellipsoid, fruit 1 cm long or longer (if smaller, then seeds without margin) . . . . . 7
- 3a. Female flower and fruit solitary, with long pedicel; fruiting pedicel 1.5–2.5 cm long. — New Guinea; montane . . . . . **6. *P. pedicellata***
- b. Female flower(s) and fruit either solitary, or fascicled, or clustered in a peduncled raceme; fruiting pedicel c. 1.5 cm long or less . . . . . 4
- 4a. Monoecious with female flowers (and fruits) and male flowers often in one single raceme-like inflorescence. — New Guinea; montane . . . . . **8. *P. pisifera***
- b. Mostly dioecious, male flowers in a condensed (pedunculate) cluster . . . . . **???**
- 5a. Fruit mostly several on a long common peduncle (if solitary, then usually co-axillary with male peduncle). — Malesia, Taiwan, montane . . . . . **9. *P. repanda***
- b. Fruit single or few, in a sessile or short-pedunculate cluster. — Lower montane or lowland . . . . . 6



- 6a. Fruit 1 (rarely 2 or 3) per node, c. 1 cm diam., pedicelled, but without peduncle, red when ripe. — Widespread in South India, Sri Lanka and SE Continental Asia; rare in Malesia (N Sumatra, Peninsular Malaysia and Sabah); lowland and montane area . . . . . **1. *P. bodinieri***
- b. Fruit 1–5 per node, 0.6–0.8 cm diam., fruits on a common peduncle to 1 cm long, greenish when ripe. — Java, Sulawesi (Salayar Is.), Lesser Sunda Islands; lower montane area . . . . . **7. *P. perpusilla***
- 7a. Fruit hairy. — Philippines (Mindanao) . . . . . **12. *P. trichocarpa***
- b. Fruit glabrous. — Widespread (incl. Philippines) . . . . . 8
- 8a. Fruiting pedicel in solitary fruit about as long as or (much) longer than the fruit, c. 1.5 cm long or more (or fruit few fascicled on a peduncle). Stamens inserted somewhat above the base or at about halfway in the receptacle-tube, thecae straight with connective  $\pm$  narrow or thecae curved with connective broad in the middle. [Fruit 1–3 cm long.] . . . . . 10
- b. Fruiting pedicel shorter than the fruit, c. 1 cm long or less. Stamens inserted at the base of the receptacle-tube, thecae straight, with connective  $\pm$  narrow. (Flowers not known in *P. rizalensis*). . . . . 9
- 9a. Fruit less than 1 cm long, several in a cluster on a long peduncle. Seeds 3 mm long. Dioecious? — Philippines (Luzon) . . . . . **10. *P. rizalensis***
- b. Fruit 1–1.5 cm long, 1–6 in a cluster on the node. Seeds (3–)4–5 mm long. Mostly dioecious. — Widespread: Malesia, east to New Guinea, Queensland(?), Christmas Is. . . . . **5. *P. mucronata***
- 10a. Fruit 2–3 cm long . . . . . 11
- b. Fruit less than 2 cm long . . . . . 12
- 11a. Fruit solitary (or with 2). Seeds c. 4 mm long. [Male inflorescences not known.] — Lesser Sunda Islands: Lombok . . . . . **2. *P. elbertii***
- b. Fruit solitary or few-fascicled on a common peduncle. Seeds 5–6 mm long. Thecae  $\pm$  straight, vertical. Disc simple, more or less 3-lobed. Style at apex not armed, with deeply 3-lobed stigma. — Widespread: Bismarck Archipelago, Solomon Islands, New Hebrides, Fiji, Samoa . . . . . **11. *P. samoensis***
- 12a. Fruit (1.3–)1.5–2 cm long. Seeds 4–5 mm long, narrowly margined. — New Guinea; lowland up to 1000(–1750) m altitude . . . . . **3. *P. erythrobacca***
- b. Fruit c. 1 cm long. . . . . 13
- 13a. Plant drying brown. Seeds c. 3 mm long, unmargined, edge rounded. — Lesser Sunda Islands: Lombok, Flores; at 1500–3000 m altitude . . . . . **4. *P. immarginata***
- b. Plant drying green. Seeds 5 mm long, with conspicuous broad square edge, not obviously margined. — East Papua New Guinea; at 200 m altitude . . . . . **14. *P. viridifolia***

### 1. *Pilogyne bodinieri* (H.Lév.) W.J.de Wilde & Duyfjes

*Pilogyne bodinieri* (H.Lév.) W.J.de Wilde & Duyfjes, Reinwardtia 12, 5 (2009) 410. — *Melothria bodinieri* H.Lév., Fl. Kouy-Tcheou (1914) 122. — *Zehneria bodinieri* (H.Lév.) W.J.de Wilde & Duyfjes, Thai Forest Bull. Bot. 32 (2004) 17; Blumea 51 (2006) 51; Fl. Thailand 9, 4 (2008) 545. — Type: *Bodinier 1957* (lecto E, designated by De Wilde & Duyfjes (2004); iso P), China, Kouy-Yang.

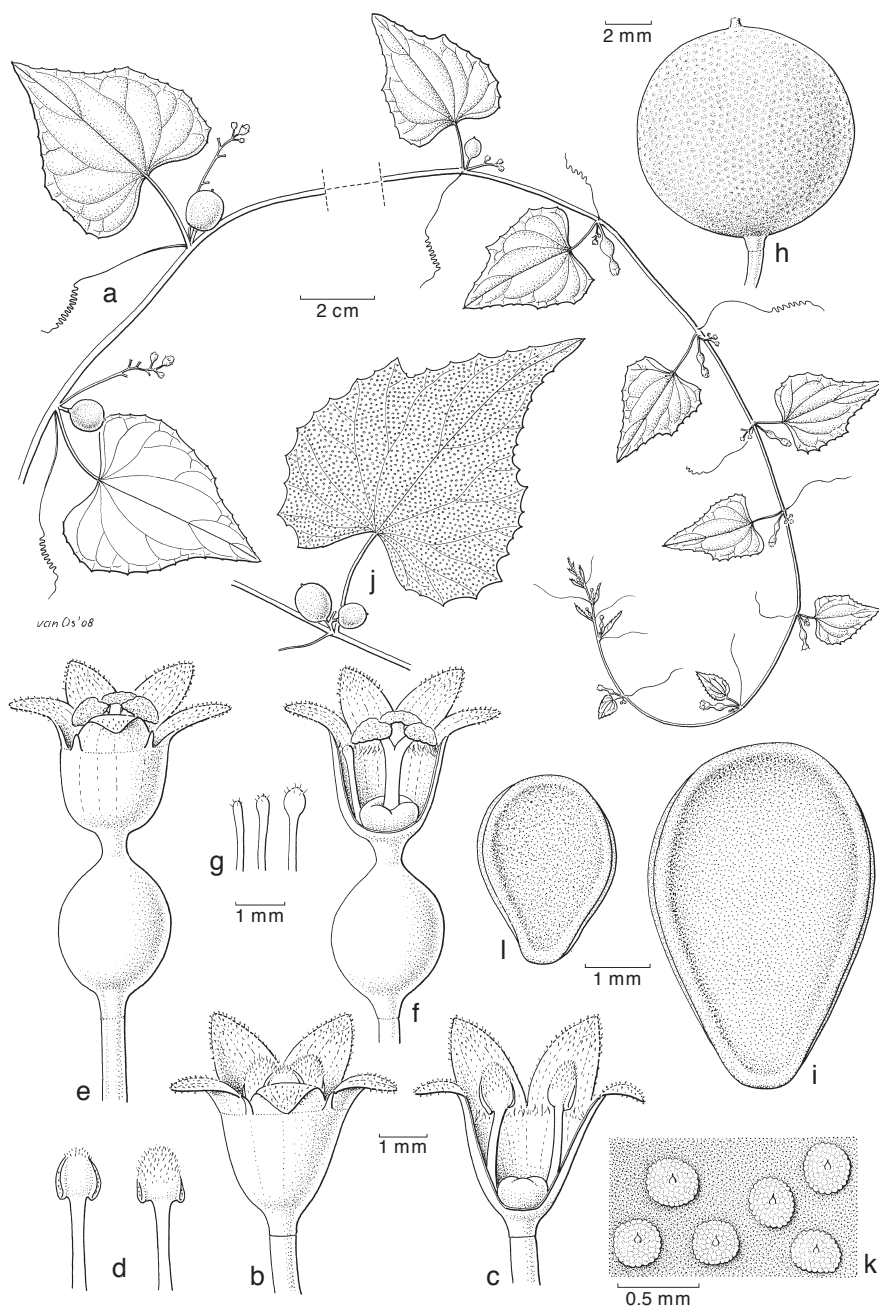


Fig. 56. *Pilogyne bodinieri* (H.Lév.) W.J.de Wilde & Duyfjes. a. Shoot with male and female inflorescences and fruits; b, c. male flower, from outside and opened; d. stamens; e, f. female flower, from outside and opened; g. staminodes; h. fruit; i. seed; j. node with two fruits; k. detail of upper leaf blade surface; l. seed (a–i: *De Wilde & Duyfjes 21968* (Peninsular Malaysia); j–l: *Madulid et al. PPI 11592* (Philippines, Palawan)).

*Melothria perpusilla* (Blume) Cogn. var. *subtruncata* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 608. — Type: *Thwaites CP 1613* (lecto K, designated by De Wilde & Duyfjes (2004); iso L), Sri Lanka.

*Zehneria hookeriana* auct. non (Wight & Arn.) Arn.: C.B. Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 624, p.p.

*Melothria perpusilla* auct. non (Blume) Cogn.: Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 607, p.p.; in Engl., Pflanzenz. 66, 4.275.1 (1916) 106, p.p.; Craib, Fl. Siam. (1931) 764 (incl. var. *subtruncata*).

*Bryonia oxyphylla*, Wallich Cat. 6697, nom. nud.

*Bryonia cissoides*, Wallich Cat. 6698, nom. nud.

Subherbaceous 2–6 m long climber, leafy stem 1–2 mm diam., plant subglabrous, generally drying (dark) brownish; monoecious. *Leaves*: petiole 2–5 cm long; blade rarely shallowly lobed, ovate-triangular, 4–12 by 3–10 cm, base subtruncate or broadly shallowly cordate, margin denticulate. *Inflorescences* in male a peduncled 3–10-flowered short or sometimes ± spike-like proliferous raceme; peduncle 1–5 cm long, usually co-axillary with a previously developed single female flower; female flowers solitary or rarely few, subumbellate on the node. *Male flowers*: pedicel 1–4 mm long; receptacle-tube c. 3 by 2 mm, inside with long hairs, especially at the throat; sepals 0.5 mm long; petals ovate, c. 2 mm long, subacute, inner surface and apex hairy; stamens inserted halfway the receptacle-tube or lower (not at the base of the tube), filaments 1–2 mm long, subglabrous or long-haired about the middle, anthers circular in outline, 1 mm diam., thecae curved, the two nearly forming a ring, connective ± hairy, not produced; disc depressed globose, 1 mm diameter. *Female flowers*: pedicel slender, 2–5 mm long; ovary ovoid-globose, c. 3 by 2.5 mm, glabrous (except minute raised gland-dots), neck 1 mm long; perianth as in male flower but petals 2.5–3 mm long; style c. 3 mm long, glabrous, stigma 3-lobed, 1.5–2 mm diam., papillose; disc 0.5 mm high; staminodes slender, c. 2 mm long, the basal portion adnate with the receptacle-tube. *Fruit* solitary (rarely 2 or 3), green, ripening red, globose, 0.8–1.2 cm diam., glabrous, finely netted or pitted when dry; fruiting pedicel 0.3–1 cm long. *Seeds* several or many, pale brownish, (narrowly) elliptic, c. 5 by 3–3.5 mm, narrowly margined, smooth. — **Fig. 56; Plate 20a, b.**

**Distribution** — Widespread; in Sri Lanka and South India, and from northern India to China (including Taiwan), Indo-China, and Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Sabah, and Philippines (Palawan).

**Habitat & Ecology** — Disturbed places, forest edges, and scrub; at 500–1700 m altitude; flowering and fruiting throughout the year.

## 2. *Pilogyne elbertii* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes

*Pilogyne elbertii* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes. Reinwardtia 12, 5 (2009) 410. — *Zehneria elbertii* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 54. — Type: *Elbert 1637* (holo L; iso FR, not seen), Lesser Sunda Islands (Lombok).

Stoutish climber c. 5(?) m long, stem (1–)2 mm diam., glabrescent, plant greenish brown on drying; dioecious(?). *Probract* linear, c. 5 mm long. *Leaves*: petiole 3–6.5 cm long, glabrous; blade unlobed, broadly ovate, 6–10 by 6.5–8.5 cm, both surfaces glabrous but faintly scabrous above by minute cystoliths, base broadly shallowly cordate,

margin sparsely short-dentate. *Male inflorescences* and *male flowers* not known. *Female flowers* 1 (or 2) solitary at the node; pedicel c. 10 mm long; ovary ellipsoid to narrowly ellipsoid, c. 7 by 1.5 mm, glabrous, neck 1 mm long; receptacle-tube campanulate, c. 2.5 by 3 mm, throat densely woolly hairy, hairs 0.5–1 mm long; sepals 0.5(–1) mm; petals c. 3 mm long, outside glabrous, inside sparsely gland-hairy; style c. 2.5 mm long, at apex with 3 style-arms 0.3 mm long, stigmas down-curved, (narrowly) ovoid, thick, papillose, c. 1.5 mm long; staminodes c. 2 mm long, inserted towards the base of the receptacle-tube, densely long woolly hairy near the apex; disc large, 0.5(–1) mm high, c. 2 mm wide, margin somewhat irregularly sinuate. *Fruit* solitary (or 2), ripening red(?), narrowly ellipsoid, (2.5–)3 by c. 1 cm, apex apiculate; exocarp cartilaginous, smooth (not pitted); fruiting pedicel 1–1.5 cm long. *Seeds* numerous, palish, nearly flat, ovate, c. 4 mm long, smooth, unmarginated.

Distribution — Lombok: north-eastern flank of Mt Rinjani, Sembalun Highlands, known only from the type.

Habitat & Ecology — In scrub-forest; on loamy soil over volcanic breccia; at 1100–1300 m altitude; flowering and fruiting: May.

Notes — 1. This species, known only from one female flowering and fruiting collection, is of a stout habit and obviously belongs, on account of the basal insertion of the staminodes in the female flower, to *Pilogyne*. However, it also has traits of *Neoachmandra*, e.g. the solitary rather long-pedicelled fruits, the smooth (not pitted) pericarp, and the unmarginated seeds.

2. *Pilogyne elbertii* keys out beside the widespread *P. samoensis* from the Pacific. The sole specimen of *P. elbertii* differs in various minor characteristics, sometimes difficult to define and additional material is needed to prove its status as a distinct species.

### 3. *Pilogyne erythrobacca* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes

*Pilogyne erythrobacca* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes, Gard. Bull. Singapore 61, 1 (2009) 210. — *Zehneria erythrobacca* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 55, f. 13a–h.  
— Type: *Brass* 21720 (holo L.; iso A), Papua New Guinea (Menapi, Cape Vogel Peninsula).

*Melothria indica* auct. non Lour.: Peekel, Fl. Bismarck Archip., translated by E.E.Henty (1984) 543, f. 867.

*Diplocyclos palmatus* auct. non (L.) C.Jeffrey: Peekel, Fl. Bismarck Archip., translated by E.E.Henty (1984) 547, f. 873, p.p.

Climber or creeper, 1.5–5 m long, leafy stem 1(–3) mm diam., plant sparsely minutely hairy, glabrescent, brown on drying; monoecious. *Probract* minute. *Leaves*: petiole 1–5.5 cm long, glabrous or scabrous; blade unlobed or sometimes ± hastate or lobed to 1/5 deep, ovate, 3–9(–11) by 2.5–9(–14) cm, subglabrous or scabrous above, with minute cystoliths, glabrous beneath but veins sometimes ± hairy, base (narrowly or) broadly cordate, margin (sparsely) coarsely dentate, apex short or long acuminate. *Male inflorescences* subsessile or peduncled racemes; peduncle up to 3 cm long; racemes 0.1–0.5 cm long (rarely up to 2 cm long), 5–15-flowered, flowers dense or loose, with rather long pedicels, sometimes mixed with female flowers. *Male flowers*: pedicel 5–10 mm long; expanded perianth 4–6(–8) mm diam.; receptacle-tube 1.5–2.5 by 2–3 mm, outside glabrous, inside (especially at the throat) densely white woolly hairy, hairs to

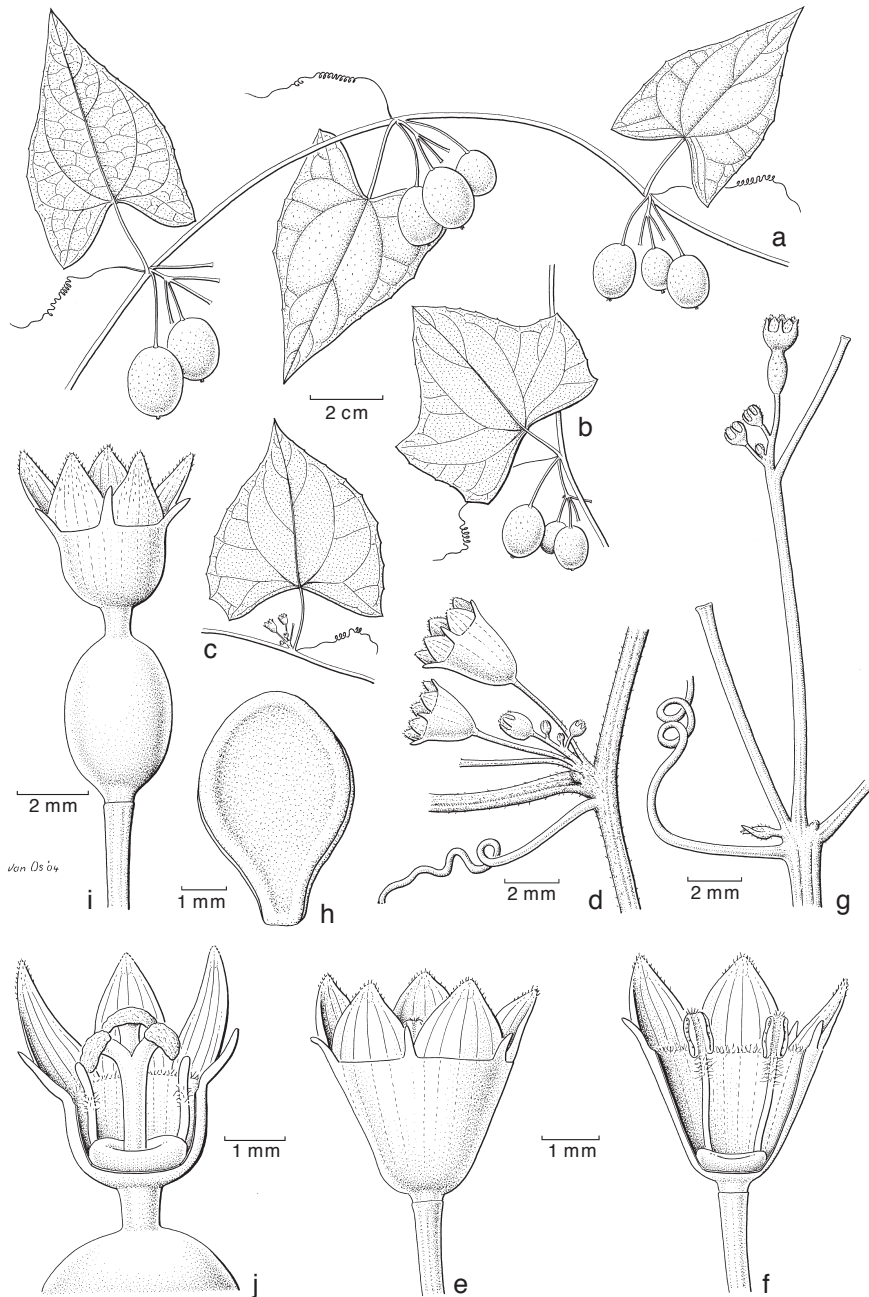


Fig. 57. a–h. *Pilogyne erythrobacca* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes. a. Branch with fruits; b. ditto; c, d. nodes with male inflorescences; e, f. male flowers; g. node with female inflorescence; h. seed. — i, j. *Pilogyne viridifolia* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes. i, j. Female flowers (a, g, h: *Widjaja* EAW 6961; b: *Brass* 21720, type; c–f: *Brass* 8104; i, j: *Brass* 23914, type).

1 mm long; sepals 0.5–1.5 mm long; petals 2–3(–4) mm long, minutely gland-hairy outside; stamens inserted towards the base of the receptacle-tube, filaments 1.5–2 mm long, woolly hairy in upper half, anthers partly exerted, ellipsoid, 1(–1.5) mm long, thecae ± straight, connective narrow; disc depressed globose or at apex ± concave, 0.5(–1) by 1–1.5 mm, not or faintly lobed. *Female flowers* few or several in a subsessile fascicle-like short raceme, or one female flower below male flowers in a short raceme; pedicel 5–10 mm long; ovary ellipsoid(–fusiform), 3.5–6 by 1.5–3 mm, glabrous (except for some glandular papillae), neck 0.5–1 mm long; style 1.5–3 mm long, stigma c. 2 mm diam., consisting of 3 parts on 0.2–0.3 mm long style-arms; disc 0.5 mm high; staminodes inserted about halfway in the receptacle-tube, 0.5–1.5 mm long, glabrous or woolly hairy at apex. *Fruit* 1–3(–5) in loose fascicles, ripening orange or red; (subglobose-)ellipsoid, (1.3–)1.5–2 by 1–1.5 cm; exocarp finely pitted or tessellated; fruiting pedicel 1–2.5 cm long. *Seeds* numerous, pale, ovate, 4–5 by 3–3.5 mm, not ornamented, margin narrow, edge square and often with a groove in the middle.

Field-notes — *Milliken 1315* records that the fruit is edible. — **Fig. 57a–h.**

Distribution — Throughout New Guinea and Bismarck Archipelago.

Habitat & Ecology — Secondary forest, riverbanks, scrub-land; lowland to 1000 (–1750) m altitude; flowering and fruiting throughout the year.

Notes — 1. *Pilogyne erythrobacca* is common in New Guinea where it largely seems to replace *P. mucronata*. The latter is a common lowland species in most of Malesia. The fruits of *P. mucronata*, which is a rare species in New Guinea, are green when ripe, turning red only when remaining for a longer time on the plant, a condition not mentioned on the field labels. The fruits of *P. erythrobacca* are orange or red when ripe, a condition often recorded on the labels.

2. Telford (Queensland), in litt., mentions on-going renewed studies in *Zehneria*-like plants from Australia and indicates an as yet undescribed species with female flowers on long pedicels and red fruit distributed within Australia in coastal North Queensland and the islands in the Torres Strait, including Dauan Is., close to Papua New Guinea. This taxon might be identical with *Pilogyne erythrobacca*. A better understanding of the present species and related taxa from Australia will call into dispute the occurrence of *Pilogyne mucronata* in this area as well.

#### 4. *Pilogyne immarginata* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes

*Pilogyne immarginata* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes, *Reinwardtia* 12, 5 (2009) 410. — *Zehneria immarginata* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 63. — Type: *Loeters 1580* (holo L), Lesser Sunda Islands (Flores).

Climber 1–3 m long, leafy stem 1–2 mm diam., plant subglabrous, dark on drying; monoecious or dioecious. *Leaves*: petiole 1–2.5 cm long, sparsely hairy; blade narrowly triangular or ovate-elliptic, 5–8 by 2–4.5 cm, glabrous above but scabrous by numerous small cystoliths, glabrous below or (scabrid-)hairy on veins, margin finely or coarsely dentate. *Male inflorescences* a peduncled raceme; peduncle 1–3 cm long; racemes short or long, sometimes with flowers ± tiered, to 15-flowered, up to 2 cm long. *Male flowers*: pedicel 4–6 mm long; expanded perianth 5–6 mm diam.; receptacle-tube c. 2 by 3 mm, outside glabrous, inside densely woolly hairy, especially in the

upper half, hairs 0.5–1 mm long; sepals c. 0.5 mm long; petals c. 2.5 mm long, outside papillose, inside hairy towards base; stamens inserted near the base of the receptacle-tube, filaments c. 2 mm long, glabrous, anthers just exerted, ellipsoid, 1–1.5 mm long, thecae somewhat curved, connective  $\pm$  narrow at apex; disc c. 1 mm diam., unlobed. *Female flowers* solitary or few in subsessile short raceme; pedicel (5–)10–15 mm long; ovary ellipsoid-fusiform, 2.5–3 mm long, glabrous, neck c. 0.5 mm long; perianth as in male flower but somewhat larger, subglabrous, style 2–3 mm long, style-arms c. 1 mm long, stigma-lobes longer than broad, c. 1 mm long, papillose; staminodes 2–3 mm long; disc c. 0.5 mm high. *Fruit* solitary or 2–5 in a subsessile fascicle, ripening pale yellowish, subglobose or ellipsoid, 0.8–1 by 0.6–0.8 cm, exocarp minutely pitted; fruiting pedicel (0.5–)1.5–2.5 cm long. *Seeds* numerous, ovate in outline, c. 3 by 2 mm, not sculptured, smooth but sometimes very short-hairy at the ends, margin not apparent, edge rounded.

Distribution — Lesser Sunda Islands: Lombok (Mt Rinjani), Flores (Mt Kelimoetoe, Mt Ranaha).

Habitat & Ecology — Edges of *Myrica* scrub, grassy places, margins of *Cusuarina* forest; volcanic (lapilli) soils; at 2000–3500 m altitude; flowering and fruiting: March to June.

Notes — 1. *Pilogyne immarginata* resembles in general habit the more widespread *P. repanda* from a similar habitat; the latter differs, e.g. in its short fruiting pedicel 0.3–0.6 cm long. *Pilogyne immarginata* is characterised by the long-stalked stigma lobes, by the long-pedicelled fruits and the unmarginated small seeds, with slightly convex faces. Unmarginated seeds and long-pedicelled fruits are characters of the genus *Neoachmandra*, but *P. immarginata* dries dark, and agrees furthermore in all traits, including details of the male flowers, with the genus *Pilogyne*. *Pilogyne immarginata* also resembles *P. pedicellata* from mountainous New Guinea, the latter differs in globose fruits and somewhat larger, narrowly marginated seeds.

2. The fruits of *Kostermans & Wirawan 733*, from Flores, deviate in being small, less than 1 cm long; the collection approaches *P. perpusilla* from the same area.

## 5. *Pilogyne mucronata* (Blume) W.J.de Wilde & Duyfjes

*Pilogyne mucronata* (Blume) W.J.de Wilde & Duyfjes, Reinwardtia 12, 5 (2009) 410. — *Bryonia mucronata* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 923 (incl. var.); Ser. in DC., Prodr. (1828) 304 (incl. var. *denticulata*). — *Zehneria mucronata* (Blume) Miq., Fl. Ned. Ind. 1, 1 (1856) 656; I.Telford, Fl. Australia 8 (1982) 182; C.M.Simmons & W.J.de Wilde, Blumea 45 (2000) 237, f. 1; W.J.de Wilde & Duyfjes, Blumea 51 (2006) 65, f. 14, pl. 8c, d. — *Melothria mucronata* (Blume) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 608; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 297. — Type: *Blume s.n.* “Pariagengie” (lecto L, barcode L0048324, designated by Simmons & De Wilde (2000); iso L, 2 sheets), Java.

*Zehneria alba* Ridl., J. Straits Branch Roy. Asiat. Soc. 45 (1906) 195. — *Melothria alba* (Ridl.) Cogn. in Engl., Pflanzenz. 66, 4.275.1 (1916) 109. — Type: *Ridley s.n.* (K, not seen), Christmas Is. (Indian Ocean).

*Melothria lobata* Merr., Philipp. J. Sci., C 7 (1912) 104. — Type: *Vanoverbergh 1241* (not seen), Philippines (Luzon).

*Bryonia arguta* Span., Linnaea (1841) 206, nom. nud. — Voucher specimen: *Zippelius s.n.*, barcode L0129472 (L), Timor.

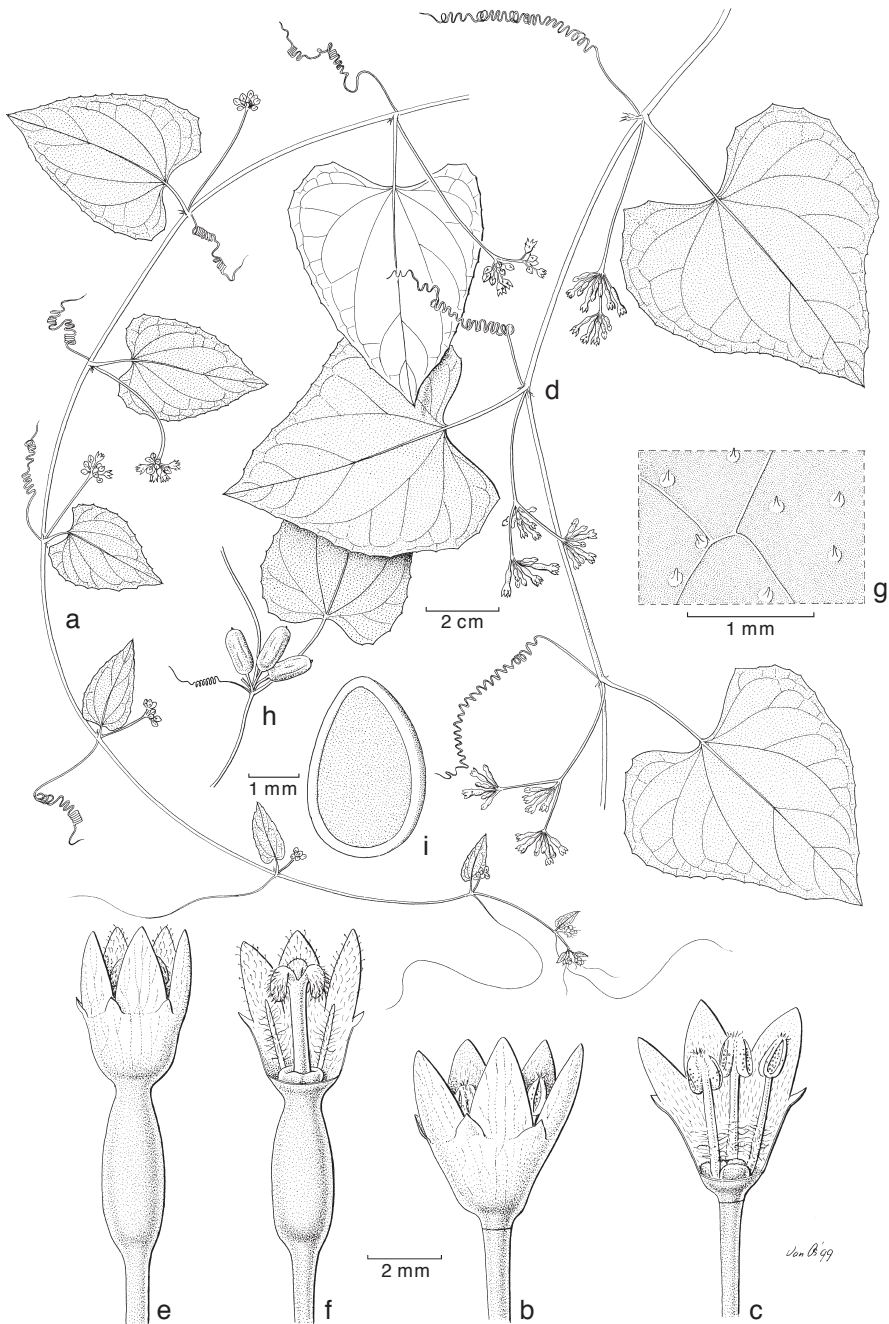


Fig. 58. *Pilogyne mucronata* (Blume) W.J.de Wilde & Duyfjes. a. Twig with male inflorescences; b, c. male flowers; d. twig with female inflorescences; e, f. female flowers; g. portion of upper leaf blade surface, with cystoliths; h. node with sessile infructescence; i. margined seed (a–c: *De Wilde & Duyfjes* 21727; d–g: *De Wilde & Duyfjes* 21728; h, i: *Backer* 36679).



Climber to 5 m long, leafy stem 1–2 mm diam., plant finely hairy, glabrescent, dark on drying; usually dioecious, sometimes monoecious. *Leaves*: petiole 1–5 cm long, (sparsely) scabrid; blade unlobed or shallowly (deeply) lobed, triangular or ovate, or  $\pm$  5-angular, (2–)4–8 by (2–)4–7 cm, subglabrous with cystoliths above, subglabrous beneath, but variously hairy on the veins, margin subentire or shallowly dentate. *Male inflorescences* peduncled, densely or loosely flowered racemes, occasionally proliferating; peduncle to 5 cm long. *Male flowers*: pedicel 2–5 mm long; expanded perianth 3–5 mm diam.; receptacle-tube 2.5–4 by 2–3.5 mm, outside glabrous or with sparse hairs, inside variously hairy; sepals 0.5–1 mm long; petals 2–3 mm long, minutely hairy inside; stamens inserted near the base of the receptacle-tube, 2(–3) mm long, filaments completely hairy or at least in the lower half, anthers somewhat longer than broad, c. 1 mm diam., thecae straight or  $\pm$  curved, connective narrow,  $\pm$  hairy, not produced; disc depressed globose, sometimes faintly 3-lobed, c. 1 mm diameter. *Female flowers* in few- (or many-) flowered, sessile or peduncled clusters, occasionally mixed with male flowers; pedicel 1–2(–5) mm long; ovary narrowly ovoid-ellipsoid, 2–3 mm long, at apex narrowed into a neck c. 1 mm long, glabrous; style 2–2.5 mm long, stigma c. 2 mm diam., consisting of 3 papillose-hairy lobes; staminodes linear, variously hairy; disc c. 0.5 mm high. *Fruit* (1–)2–6 per cluster, green, ultimately ripening red, subglobose, ellipsoid or narrowly ellipsoid, 1–1.5 cm long, apex rounded with minute point; exocarp minutely pitted, glabrous; fruiting pedicel 0.2–0.5(–1) cm long. *Seeds* numerous, whitish or pale brown, ovate-elliptic, (2–)3–4(–5) mm long, smooth, margin narrow but distinct. — **Fig. 58; Plate 19c, d.**

*Distribution* — West Malesia to NE Australia (Telford, 1982, no specimens seen); in *Malesia*: Sumatra, Java (also Christmas Is.), Philippines, Sulawesi, Lesser Sunda Islands, Moluccas, New Guinea (West Papua and Papua New Guinea); no records from Peninsular Malaysia and Borneo.

*Habitat & Ecology* — In scrub and forest edges, lowland to 1600(–2000) m altitude; flowering and fruiting throughout the year.

*Notes* — 1. *Pilogyne mucronata* resembles *P. maysorensis*, an insufficiently known species from South India, similar in ellipsoid fruits. The latter differs in its usually single fruit, co-axillary with the male inflorescence. However, this latter condition is occasionally also found in *P. mucronata* from Papua New Guinea, e.g. in *Darbyshire 197*.

2. *Zehneria alba* was described as endemic to Christmas Is., distinct by large 4 mm long male petals, and glabrous filaments. We have not seen the type, but in two other collections from Christmas Is., *Andrews s.n.* (BO) and *Mitchell M 21* (KEP), the male flowers are smaller (petals only 2 mm long) and the filaments hairy.

## 6. *Pilogyne pedicellata* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes

*Pilogyne pedicellata* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes, Reinwardtia 12, 5 (2009) 410. — *Zehneria pedicellata* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 69. — Type: *Brass 30732* (holo L; iso K), Papua New Guinea, Eastern Highlands Province (Mt Wilhelm).

Creeper or climber, 2–4 m long, leafy stem 1(–2) mm diam., plant sparsely fine-hairy, glabrescent, blackish brown on drying; dioecious. *Leaves*: petiole 0.5–1(–2) cm long, subglabrous; blade unlobed, narrowly triangular or (narrowly) ovate, 4–7 by

1.5–3.5 cm, both surfaces glabrous or the veins variously scabrid-hairy, upper surface with cystoliths, base shallowly cordate with broad sinus, margin shallowly (deeply) dentate, apex long acuminate. *Male inflorescences* peduncled racemes; peduncle slender, 3–7 cm long, raceme 2–3 mm long, with up to 10 flowers, clustered in a condensed subumbel. *Male flowers*: pedicel 5–10 mm long; expanded perianth c. 4 mm diam.; receptacle-tube c. 1.5 by 2–2.5 mm, glabrous but throat minutely sparsely hairy; sepals 0.5 mm long, suberect; petals (long-)triangular, c. 1.5 mm long, outside minutely papillose-hairy; stamens inserted at the base of the receptacle-tube, filaments c. 1.5 mm long, glabrous, anthers subglobose, c. 1.5 mm diam., thecae half-circular, almost touching at both ends, nearly horizontal, connective broad in the middle, convex, minutely hairy along the thecae; disc c. 1.5 mm diam., deeply 3-lobed, lobes half-globose. *Female flowers* solitary; pedicel 10–25 mm long; ovary globose, 2–3 mm diam., glabrous, neck c. 2 mm long; perianth as in male flower but longer, receptacle-tube c. 2 by 3.5(–4) mm, throat finely woolly hairy; style c. 2.5 mm long, glabrous, stigma c. 1.5 mm diam., consisting of 3 arms 0.3 mm long, each bearing a subglobose papillose stigma-lobe 0.5–0.7 mm diam.; staminodes distinct, subulate, c. 2 mm long, glabrous; disc c. 1 mm high, deeply 3-lobed. *Fruit* solitary at the node, ripening blackish, globose, 0.6–0.8 cm diam., exocarp faintly minutely pitted, glabrous; perianth not persistent but flower-neck remaining as a minute beak at apex; fruiting pedicel 1.5–2.5 cm long. *Seeds* rather numerous, ovate-elliptic, c. 4 by 3 mm, not ornamented, margin narrow but distinct.

Distribution — New Guinea (Papua New Guinea (Western and Eastern Highlands Provinces)).

Habitat & Ecology — Forest edges and secondary growth; riverbanks; at 2000–2700 m altitude; flowering and fruiting throughout the year.

Notes — 1. *Pilogyne pedicellata* is in habit similar to *P. pisifera*. The latter differs in a shorter fruiting pedicel, c. 1.5 cm long or less.

2. In *Vinas UPNG 4874* (L) the leaves are more conspicuously dentate compared to the rest of the collections.

3. Female specimens, with solitary, long-pedicelled flowers or fruits may be confused with members of the genus *Neoachmandra*; the latter genus is monoecious, with the male flowers few or solitary, not as in the present species in a peduncled raceme.

## 7. *Pilogyne perpusilla* (Blume) W.J.de Wilde & Duyfjes

*Pilogyne perpusilla* (Blume) W.J.de Wilde & Duyfjes, Reinwardtia 12, 5 (2009) 410. — *Cucurbita perpusilla* Blume, Cat. Gew. Buitenzorg (1823) 105. — *Bryonia perpusilla* (Blume) Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 926; Miq., Fl. Ned. Ind. 1, 1 (1856) 660. — *Melothria perpusilla* (Blume) Cogn. in A.D.C. & C.D.C., Monogr. Phan. 3 (1881) 607; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 297, p.p. — *Zehneria perpusilla* (Blume) Bole & M.R.Almeida, J. Bombay Nat. Hist. Soc. 79, 2 (1983) 315, for the type only; C.M.Simmons & W.J.de Wilde, Blumea 45 (2000) 238; W.J.de Wilde & Duyfjes, Blumea 51 (2006) 70. — *Bryonia stipulacea* Willd. var. *perpusilla* (Blume) Ser. in C., Prodr. 3 (1828) 307. — *Zehneria scabra* auct. non (L.f.) Sond.: C.Jeffrey, Kew Bull. 15 (1962 ('1961')) 369, p.p., for the synonym *Melothria perpusilla* (Blume) Cogn. only. — Type: *Blume s.n.*, (lecto L, barcode L0048312, designated by Simmons & De Wilde (2000); iso L, 4 sheets), Java.

*Cucurbita scabra* Blume, Cat. Gew. Buitenzorg (1823) 105, non *Bryonia scabra* L.f., 1781. — *Bryonia scabrata* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 923; Ser. in DC., Prodr. 3 (1828) 304; Miq., Fl. Ned. Ind. 1, 1 (1856) 659. — Type: *Blume s.n.* “Korreg Kottok” (lecto L, barcode L0048319, designated by Simmons & De Wilde (2000); iso L), Java, Salak.

Climber 2–3 m long, leafy stem 1(–2) mm diam., plant subglabrous, brownish blackish on drying; monoecious or dioecious. *Leaves*: petiole 1–5 cm long, subglabrous; blade unlobed or 3(–5)-lobed and irregular in shape with the lobes up to halfway, triangular or ovate, 4–10 by 3–7 cm, scabrous with cystoliths above, (sub)glabrous beneath, margin coarsely or finely (serrate-)dentate. *Male inflorescences* subsessile or to 1 cm (in Lesser Sunda Islands to 3 cm) long peduncled short racemes, rather few-flowered (sometimes proliferating in Lesser Sunda Islands), mixed with few female flowers or not, and often with a single female flower co-axillary. *Male flowers*: pedicel 3–5 mm long; expanded perianth 3–4 mm diam.; receptacle-tube c. 1.5 by 1.5 mm, outside glabrous, throat and inside woolly hairy; sepals less than 0.5 mm long, erect; petals (narrowly) triangular, 1.5–2 mm long, ± hairy at both surfaces; stamens inserted near the base of the receptacle-tube, filaments c. 1.5 mm long, long-woolly hairy at and below the middle, anthers subglobose, c. 1 mm diam., thecae curved, connective rather broad in the middle, hairy; disc 1 mm diam., deeply 3-lobed, lobes half-globose. *Female flowers* in the same way disposed as male flowers; pedicel 2–5 mm long; ovary globose, c. 2 mm diam., glabrous, neck 1 mm long; style c. 2.5 mm long, slender, glabrous, stigma 1 mm diam., deeply 3-lobed; staminodes c. 1.5 mm long, woolly hairy in upper half; disc 0.5 mm high, 3-parted. *Fruit* solitary or 2–5 in a sessile or to 1 cm long peduncled cluster, ripening greenish, globose, 0.6–0.8 cm diam., faintly finely pitted; fruiting pedicel c. 0.5 cm long. *Seeds* 5–10, flat, elliptic, 2.5–3.5 mm long, with narrow margin.

Distribution — West Java, Sulawesi (Salayar Is.), Lesser Sunda Islands: (?Bali, Lombok, Sumbawa, Flores).

Habitat & Ecology — Lower montane area, in forest edges and low scrub; at (300–) 500–1000 m altitude; flowering and fruiting throughout the year.

Note — In a previous publication on *Zehneria* in Java (Simmons & De Wilde, 2000) *Pilogyne perpusilla* was accepted as a not well-defined species beside *P. mucronata* and *P. repanda*. *Pilogyne perpusilla* seems closer to *P. repanda* because both have rounded anthers with curved more or less horizontal thecae, and a more or less convex connective. In the Lesser Sunda Islands a division of *Pilogyne* into 3 taxa can be made, viz. *P. mucronata*, *P. repanda*, and a more or less intermediate form. This intermediate form differs in details from the limited material available of *P. perpusilla* from West Java (Mt Salak), but still warrants its inclusion in that species. It is likely that the differences of these 3 feebly defined species are (at least partly) ecotypic, and they may hybridize as well. Consequently, a part of the collections cannot be determined with certainty. Similar specimens, but with thickish (not flat) unmargined seeds have been described as a separate species, *P. immarginata* (Lesser Sunda Islands).

## 8. *Pilogyne pisifera* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes

*Pilogyne pisifera* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes, Reinwardtia 12, 5 (2009) 410.

— *Zehneria pisifera* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 71, f. 16, 17. — Type: Brass 29609 (holo L; iso K), Papua New Guinea, Morobe Province (Kaindi).

*Melothria cissybium* M.Jacobs, Blumea 7 (1954) 617, f. 2, p.p., excluding the type which is *Urceodiscus belensis*.

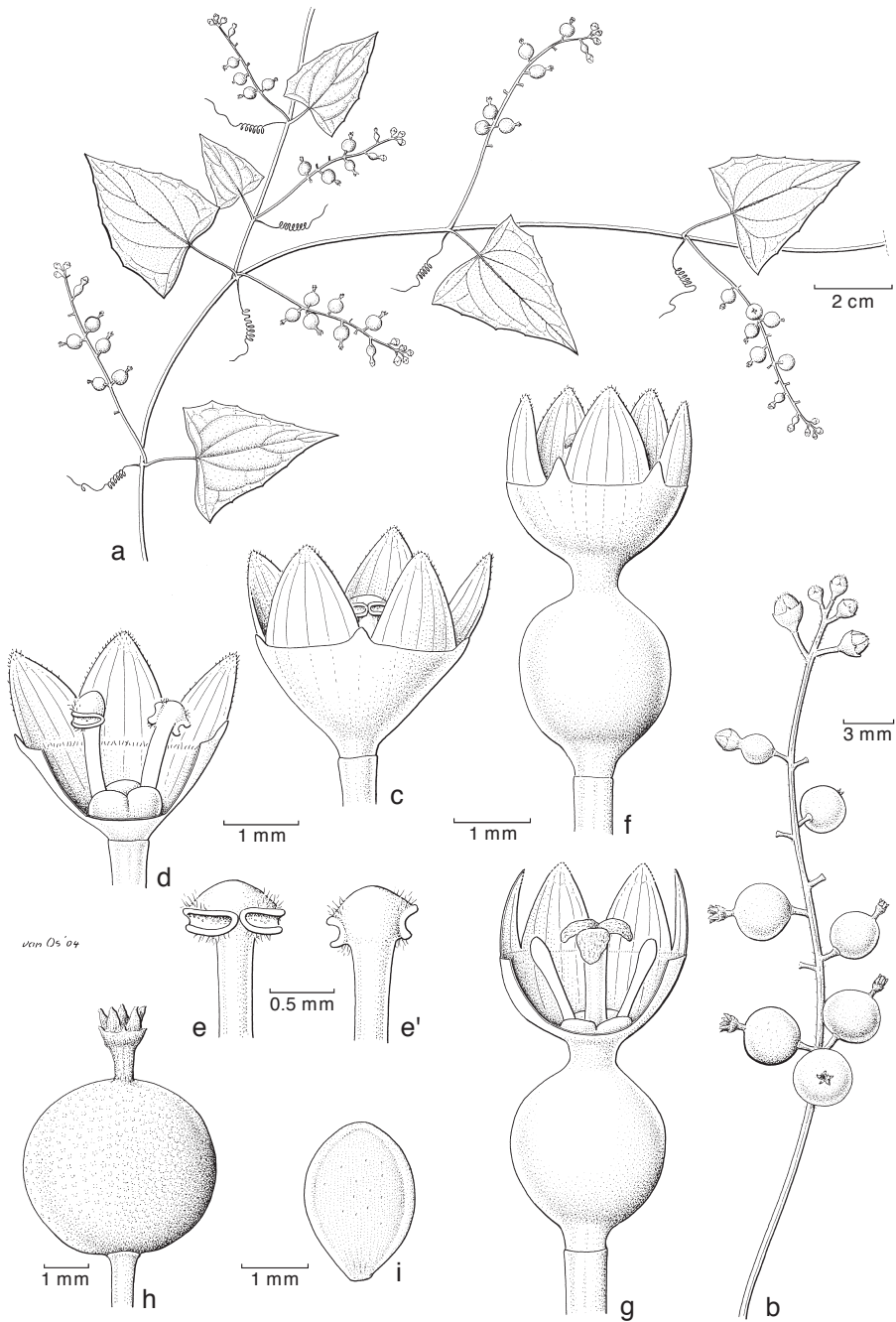


Fig. 59. *Pilogyne pisifera* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes. a. Twig with inflorescences; b. inflorescence, enlarged, showing fruits, and at apex one female flower and male flowers; c, d. male flowers; e, e'. stamens, ab- and adaxially respectively; f, g. female flowers; h. fruit with withered perianth; i. seed (all: Hoogland & Pullen 5926).

Climber 0.5–2 m long, leafy stem 1 mm diam., plant sparsely hairy, early glabrescent, blackish on drying; monoecious. *Leaves*: petiole 1–3.5 cm long, scabrid or subglabrous; blade triangular or ovate, 3–8 by 1.5–5 cm, (sub)glabrous with cystoliths above, variously scabrid along the veins or subglabrous beneath, base subtruncate or cordate, with broad sinus, margin entire, variously dentate, rarely (shallowly) lobed-dentate, apex (long) acuminate. *Male inflorescences* 2–5 cm long peduncled, slender, spike-like racemes 3–4 cm long (flowers in young inflorescences few-fascicled at the end of the peduncle but later proliferating), flowers frequently 2–5-tiered, but also dispersed, commonly mixed with female flowers. *Male flowers*: pedicel 2–3 mm long, perpendicular to the rachis; expanded perianth 3–4 mm diam.; receptacle-tube 1.2–1.5 by 2.2–3 mm, glabrous, throat minutely hairy inside; sepals 0.3–0.5 mm long, erect, at base connected by a line or low rim; petals triangular, 1–1.5 by 1–1.5 mm, outside minutely hairy; stamens inserted near the base of the receptacle-tube, filaments 1–1.5 mm long, glabrous, anthers subglobose, 0.5 mm diam., thecae curved, nearly horizontal, connective broad in the middle, convex and with minute hairs adaxially; disc 1 by 1.5 mm, consisting of 3 rounded lobes. *Female flowers* in the same way disposed as the male flowers, and frequently mixed with them; pedicel 3–5(–7) mm long; ovary globose, 1.5–2 mm diam., glabrous, neck 0.5(–1) mm long; style 1(–1.5) mm long, glabrous, stigma consisting of 3 down-curved papillose lobes, in all 1 mm diam.; staminodes distinct, inserted near the base of the receptacle-tube, subulate, 1 mm long, glabrous; disc 0.3 mm high, faintly lobed. *Fruit* 1 (or 2) at the node or usually several in the spike-like inflorescence, often when still proliferating and producing flowers at the apex, green, ripening pale yellow or red, globose, 0.5–0.7 cm diam., glabrous, withered perianth persisting; exocarp not or faintly pitted; fruiting pedicel 0.2–0.6 cm long. *Seeds* c. 10, pale brown, elliptic, c. 2.5 by 1.5 mm, not ornamented, margin narrow, faint. — **Fig. 59.**

Field-notes — Corolla valvate, yellow. Fruits spherical, said to be edible; exocarp red when ripe (*Takeuchi 10518*). Flowers yellow (*Pullen 427*).

Distribution — New Guinea (eastern part of mountainous Papua New Guinea: Central, Eastern Highlands, Morobe, Southern Highlands, and Western Highlands Provinces).

Habitat & Ecology — Grassy places, scrub and open *Nothofagus* forest; at 1400–2700 m altitude; flowering and fruiting: May to December.

Note — Fruits have been recorded as pale yellow or red, also as unripe and green, but such green fruits appear to contain mature seeds. The persistent perianth dries blackish. The recorded yellow flower colour (*Pullen 427*), an aberrant colour in *Pilogyne*, needs further confirmation.

## 9. *Pilogyne repanda* (Blume) W.J.de Wilde & Duyfjes

*Pilogyne repanda* (Blume) W.J.de Wilde & Duyfjes, Reinwardtia 12, 5 (2009) 410. — *Zehneria repanda* (Blume) C.M.Simmons, Blumea 45 (2000) 240, f. 2. — *Bryonia repanda* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 923; Ser. in DC., Prodr. (1828) 305. — *Melothria punctata* (Thunb.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 615, p.p. — *Zehneria scabra* auct. non (L.f.) Sond.: C.Jeffrey, Kew Bull. 15 (1962 ('1961')) 369, p.p., for the synonym *Bryonia repanda* Blume only. — Type: *Blume s.n.* (lecto L, barcode L0048320, designated by Simmons & De Wilde (2000)), Java.

*Zehneria exasperata* Miq., Fl. Ned. Ind. 1, 1 (1856) 655. — Type: *Horsfield s.n.* (lecto U, barcode U0122777, designated by Simmons & De Wilde (2000)), Java.

*Melothria cordata* auct. non (Thunb.) Cogn.: Backer in Backer & Bakh.f., Fl. Java 1 (1964) 297, p.p. *Zehneria maysoorensis* auct. non (Wight & Arn.) Arn.: C. Jeffrey, Kew Bull. 15 (1962 ('1961')) 371, p.p., for the Sumatra record only.

Climber 2–4 m, leafy stem 1–2 mm diam., plant glabrous or sparsely (or densely) hairy, dark on drying; mostly dioecious. *Leaves*: petiole 1–3 cm long, glabrous or hairy; blade unlobed or irregularly 3(–5)-angular, with lobes to c. 1/4 deep, triangular, ovate(-elliptic) in outline, 3–8 by 2–6 cm, scabrous with cystoliths above, lower surface (almost) glabrous, but veins subglabrous or conspicuously bristly hairy, base truncate or broadly cordate, margin entire or coarsely serrate-dentate (to 5 mm deep, including mucro 0.5 mm), apex acute-acuminate. *Male inflorescences* 1–2.5(–5) cm long peduncled few- or many-flowered clusters, or flowers dispersed or ± tiered in racemes to 1.5 cm long, sometimes co-axillary with a shorter second inflorescence. *Male flowers*: pedicel ± patent, 2–4(–7) mm long; expanded perianth 4–8 mm diam.; receptacle-tube 1.5–2.5 by 2–3 mm, (sub)glabrous but throat usually densely woolly hairy; sepals c. 0.5 mm long, patent; petals 1.5–2.5 mm long, outside minutely papillose-hairy; stamens inserted at the base of the receptacle-tube, filaments 1–2 mm long, glabrous or (woolly) hairy at the middle, anthers ± globose, 1–1.5 mm diam., thecae half-circular, nearly horizontal, connective broad in the middle, convex, (partly) hairy; disc depressed globose, c. 1.5 mm diam., shallowly 3-lobed. *Female flowers* in the same way disposed as male flowers but peduncle shorter, up to 1.5 cm long; pedicel 2–6 mm long; ovary globose, c. 1.5 mm diam., glabrous, neck (1–)1.5 mm long; style 2–2.5 mm long, glabrous, stigma deeply 3-lobed, c. 1 mm diam., papillose; staminodes subulate, c. 1.5 mm long, glabrous; disc 0.5 mm high, 3-lobed or 2- or 3-parted. *Fruit* in (short) peduncled clusters of up to 6, sometimes with a single fruit co-axillary, glaucous-green, ultimately ripening purplish black, globose, 0.5–0.8(–1) cm diam., glabrous; exocarp finely pitted; fruiting pedicel 0.3–0.6 cm long. *Seeds* numerous, elliptic, c. 3 by 2 mm, not ornamented, margin absent or narrow and faint. — **Fig. 60.**

Field-notes — Perennial creeper; stem partly lianescent, at base to c. 1 cm diam., often widely branched and covering several square metres. Flowers white fading to pale yellowish.

Distribution — Taiwan (1 collection, *Van Steenis 20752*); in *Malesia*: Sumatra, Java, Philippines (Luzon, Visayas, Mindoro), Sulawesi, Lesser Sunda Islands (Bali); not known from Borneo.

Habitat & Ecology — Scrub and forest edges; at 1400–2700 m altitude; flowering and fruiting throughout the year.

Note — Several collections tend to be intermediate with *Pilogyne mucronata*, e.g. in female flowers having a relatively short neck, or margined seeds. It is possible that such specimens, from higher altitudes, are hybrids or ecotypes of *P. mucronata* which are much resembling *P. repanda*, sharing the same harsh montane climate in the more open places.

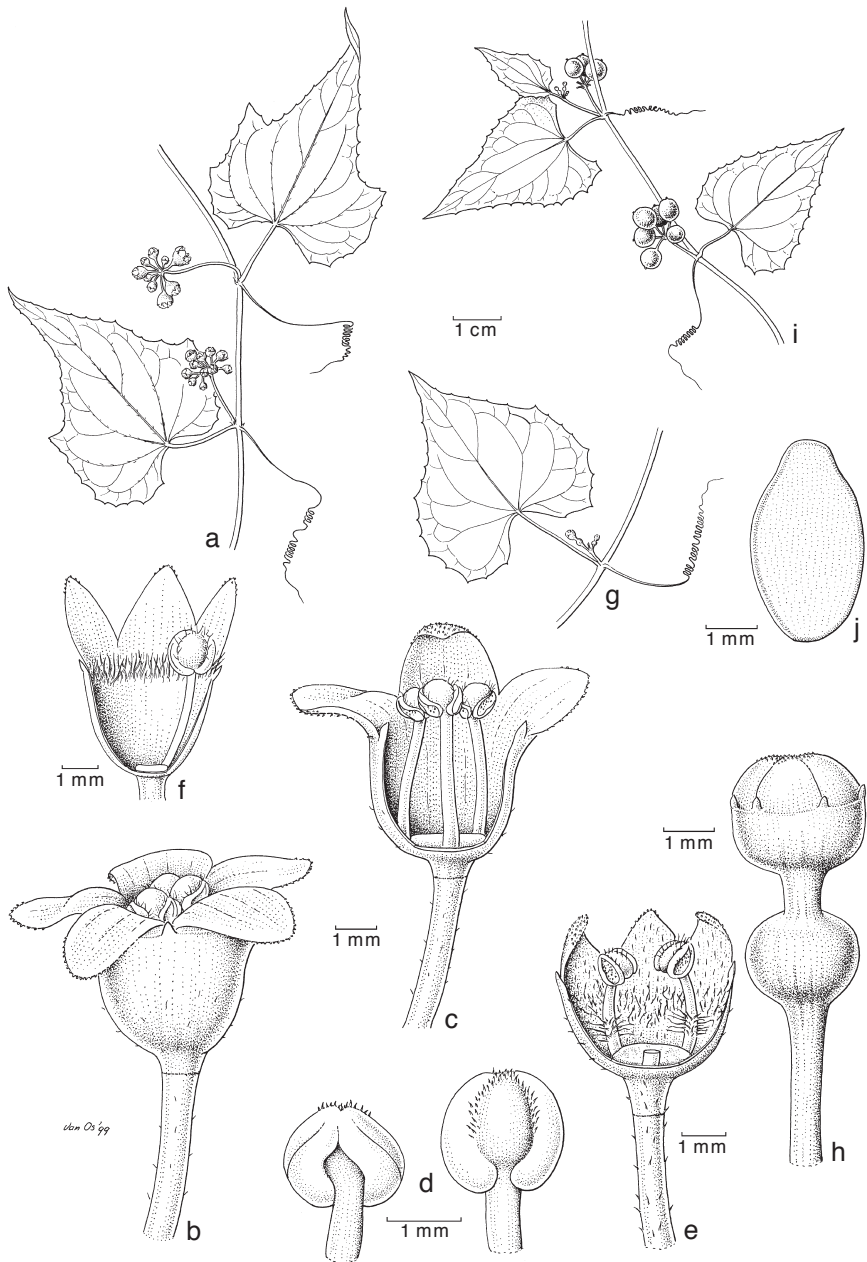


Fig. 60. *Pilogyne repanda* (Blume) W.J.de Wilde & Duyfjes. a. Portion of twig with male inflorescences; b, c. male flowers; d. apex of stamens, anthers about as long as wide; e. opened male flowers of different specimens, somewhat schematic; g. node with female inflorescence; h. nearly mature female bud; i. portion of twig with infructescences; j. seed, without clear margin (a–d: *Kleinhoonte* 388; e: *Kleinhoonte* 231; f: *Anon.*, *Herb. J.J. Smith* 134; g, h: *De Wilde & Duyfjes* 21764; i, j: *Korthals s.n.*, barcode L 0048302).

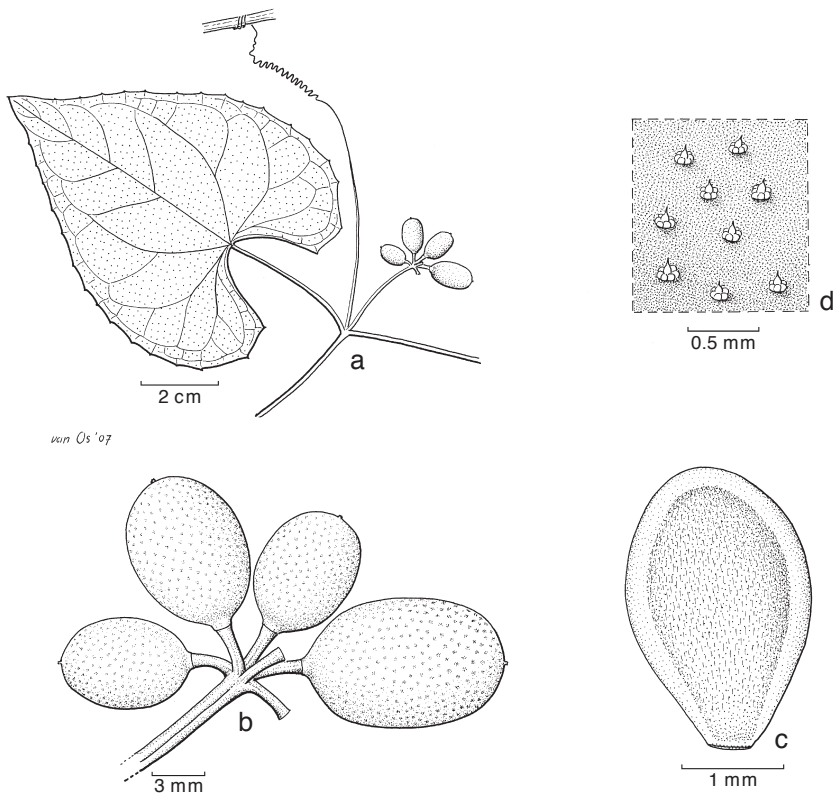


Fig. 61. *Pilogyne rizalensis* W.J.de Wilde & Duyfjes. a. Node with infructescence; b. detail of infructescence; c. seed, faintly hairy; d. detail of upper leaf blade surface (all: Ramos 2023, type).

### 10. *Pilogyne rizalensis* W.J.de Wilde & Duyfjes

*Pilogyne rizalensis* W.J.de Wilde & Duyfjes, Reinwardtia 12, 5 (2008) 410. — Type: Ramos BS 2023 (holo BM; iso BRI, PNH (not seen)), Luzon.

Herbaceous climber to 3 m long, leafy stem 1–2 mm diam., plant largely glabrous, dark on drying; dioecious. *Leaves*: petiole 3–4.5 cm long, sparsely hairy; blade unlobed, upper surface glabrous, veins sparsely hairy below, ovate, 5–10 by 4–8 cm, base cordate, margin (coarsely) shallowly dentate, apex acute-acuminate. *Male inflorescences, male and female flowers* not known. *Infructescences* with (2–)5–12 fruits in a cluster on a (1–)2–7 cm long peduncle. *Fruit* ellipsoid, 0.7–0.9 cm long, 0.6–0.7 cm wide, apex round with a narrow c. 0.5 mm long beak; exocarp minutely pitted, glabrous; fruiting pedicel 0.2–0.3 cm long. *Seeds* numerous, pale brown, ovate-elliptic, 3 by 2 mm, smooth or faintly appressed-hairy by partly detached cells of translucent membrane (possibly of the mesocarp), margin narrow but distinct, forming a square edge. — **Fig. 61.**

*Distribution* — Philippines, Luzon (Rizal Province), where only known from the type. *Habitat & Ecology* — Unknown; fruiting in November.



Note — *Pilogyne rizalensis* is close to the widespread *P. mucronata*. The sole collection on which the present species is based possibly represents a local ecotype. However, it is at variance with all specimens reckoned to *P. mucronata*, especially in its long-peduncled dense infructescence, small ellipsoid fruit and extremely small seeds, which are among the smallest in the whole family Cucurbitaceae.

The type, *Ramos BS 2023* has already been depicted in De Wilde & Duyfjes (2008), and was discussed there in a note under *P. trichocarpa*.

### 11. *Pilogyne samoensis* (Cogn.) W.J.de Wilde & Duyfjes

*Pilogyne samoensis* (A. Gray) W.J.de Wilde & Duyfjes, Gard. Bull. Singapore 61 (2009) 210. — *Kavirivia samoensis* A. Gray, U.S. Expl. Exped., Phan. (1854) 643. — Homotypic synonyms (see note 2): *Zehneria grayana* (Cogn.) Fosberg & Sachet, Smithsonian Contr. Bot. 47 (1981) 12; W.J.de Wilde & Duyfjes, Blumea 51 (2006) 59. — *Melothria grayana* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 591, p.p., excluding specimens from Tahiti. — Type: *US exploring expedition s.n.* (lecto US, barcode US00147706, designated by Fosberg & Sachet, 1981), Samoa, without further locality.

Stout 4–10 m long vine, leafy stem 2(–3) mm diam., plant (sub)glabrous, brown, blackish, or obscurely green on drying; dioecious. *Leaves*: petiole 2–4 cm long, (sub)glabrous; blade ovate or subcircular, 5–15 by 3.5–11 cm, unlobed or rarely shallowly 3-lobed to c. 1/5 deep, upper surface scabrous or not, (sub)glabrous, cystoliths present or absent, lower surface glabrous, base shallowly or deeply cordate, with broad (rarely narrow, in New Ireland and New Britain) sinus, margin shallowly or deeply dentate, teeth up to 3 mm long, apex acute-acuminate, mucronate; veins glabrous or with minute sparse hairs. *Male inflorescences*: a subsessile or short- or long-peduncled dense short raceme, 2–5 mm long, with flowers clustered as in a subumbel, rarely branched; peduncle 0.4–5 cm long. *Male flowers*: pedicel 4–8(–10) mm long, with a joint up to 1.5 mm below the receptacle-tube; expanded perianth 5–7 mm diam.; receptacle-tube (2–)2.5–3.5 by 3–4 mm, outside glabrous, at throat and inside in the upper-half densely hairy, hairs 0.2–0.5 mm long; sepals suberect (patent), 0.5–1 mm long (sometimes larger and petal-like, up to 2 by 1.5 mm, Solomon Islands), glabrous or sparsely hairy; petals narrowly triangular or elliptic, 2–3 by 1.5–2 mm, subacute or blunt, densely (papillose-)hairy outside at apex and wholly hairy inside (hairs 0.5–1 mm long); stamens inserted about halfway in the receptacle-tube, filaments 1.5–2 mm long, glabrous at apex and base but densely hairy over most of their lengths, hairs 0.5–1 mm long, anthers subcircular or broadly or narrowly elliptic in outline, 1.5–2 mm long, thecae curved and nearly touching at apex (Samoa) or ± straight, connective broad (Samoa) or narrow, with stiff hairs lining the thecae; disc depressed half-globose, large, (0.5–)1 by (1–)1.5–2.5 mm, entire or faintly 3-lobed. *Female flowers* solitary or up to 5 in a loose fascicle, sessile or up to 3 cm peduncled; pedicel 10–50 mm long when flowers solitary, 5–20 mm long when flowers fascicled; ovary (only seen in *Green RSNH 1281*(L), Vanuatu) narrowly ellipsoid, 8–10 by 3 mm, glabrous, neck short and broad, c. 2 mm long, perianth as in male flower but sepals longer, long-triangular, c. 1.5 mm long, ± papillose-hairy; style c. 2.5 mm long, glabrous, stigma c. 2.5 mm diam., consisting of 3 papillose lobes c. 2 mm long, curved downwards, shortly connate at base; staminodes inserted halfway the receptacle-tube, 1–1.5 mm long, densely hairy, hairs 1 mm long,

but apex glabrous; disc conspicuous, c. 1.5 mm high, irregularly shallowly 3-lobed. *Fruit* solitary with long pedicel (New Ireland) or 2–4 fruits in a peduncled fascicle and sometimes co-axillary with a solitary fruit, ripening red, (narrowly) ellipsoid, 2–4 by 1–1.5 cm, base and apex rounded or short-attenuate, glabrous; exocarp not or faintly pitted; fruiting pedicel 0.5–5 cm long. *Seeds* numerous, whitish or pale brown, 5–6 by 3.5–4.5 mm, not ornamented, margin rather distinct, broad with rounded edge.

*Distribution* — Papua New Guinea east to Vanuatu, Fiji (no specimens seen), and Samoa; in *Malesia*: New Guinea (Papua New Guinea (New Britain, New Ireland)), and Solomon Islands.

*Habitat & Ecology* — Scrub and (shore) forest, rainforest edges, disturbed forest on slopes and in gullies; up to 1000 m altitude; flowering: mainly August to October; fruiting throughout the year.

*Notes* — 1. The sole specimen known from New Britain (*Frodin NGF 26539*) has male inflorescences but no flowers. It somewhat deviates in the narrow cordate leaf base. The sepals of *Powell BSIP 19393* (Solomon Islands, San Cristóbal) are, possibly as an exception, very large and petal-like.

2. The epithet *samoensis* could not be used at the time by Cogniaux (1881) in *Melothria*, because the combination was already preoccupied by *M. samoensis* A. Gray, a different species, now *Neoachmandra samoensis* (A. Gray) W.J.de Wilde & Duyfjes.

## 12. *Pilogyne trichocarpa* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes

*Pilogyne trichocarpa* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes, *Reinwardtia* 12, 5 (2009) 411. — *Zehneria trichocarpa* W.J.de Wilde & Duyfjes, *Reinwardtia* 12, 4 (2008) 271, f. 2. — Type: Ramos & Edaño BS 84954 (holo GH), Philippines, Mindanao.

Small climber, leafy stem 1–1.5 mm diam., all parts hairy, dark on drying, monoecious(?). *Leaves*: petiole 1.5–2.5 cm long; blade (subcircular-) 5-angular in outline or (3–)5-lobed, 1/4–1/2-way deep, 3–7 by 4–8 cm, appressed-hairy above, lower surface more densely so, cystoliths not apparent, margin coarsely dentate. *Male inflorescences*: 5–10 flowers in a dense head (condensed raceme) on a 1–1.5 cm long peduncle, and with a persistent pedicel of a solitary flower at base. *Male flowers*: pedicel 3 mm long; expanded perianth 7–8 mm diam.; receptacle-tube c. 2 by 3.5(–4) mm, outside (sparingly) hairy, inside subglabrous but sparse-hairy at the throat; sepals narrowly triangular(-linear), c. 1 mm long; petals c. 3 by 2 mm, acute, glandular-hairy in upper part; stamens inserted at base of the receptacle-tube, filaments c. 2.5 mm long, subglabrous, anthers somewhat longer than broad, c. 1.5 mm long, the thecae slightly curved, nearly touching each other at apex, connective broad at base and in the middle, coarsely hairy, not produced at apex; disc subglobose, c. 1 mm diameter. *Female flowers* 1 or 2 subsessile on the nodes; pedicel 1–1.5 mm long; ovary narrowly ellipsoid, c. 5 by 2 mm, densely hairy; perianth as in male flowers; style, stigmas, and disc not examined. *Fruit* solitary (or 2), colour of ripe fruit not recorded, ellipsoid, c. 1.5 by 1 cm, base and apex rounded; exocarp faintly tessellated (not pitted), sparsely hairy, hairs c. 0.5 mm long; fruiting pedicel 0.2–0.4 cm long. *Seeds* numerous, pale, ovate-elliptic, c. 2.5 by 1.8 by 0.5 mm, smooth or possibly faintly hairy, faces flat, not ornamented, narrowly margined. — **Fig. 62.**

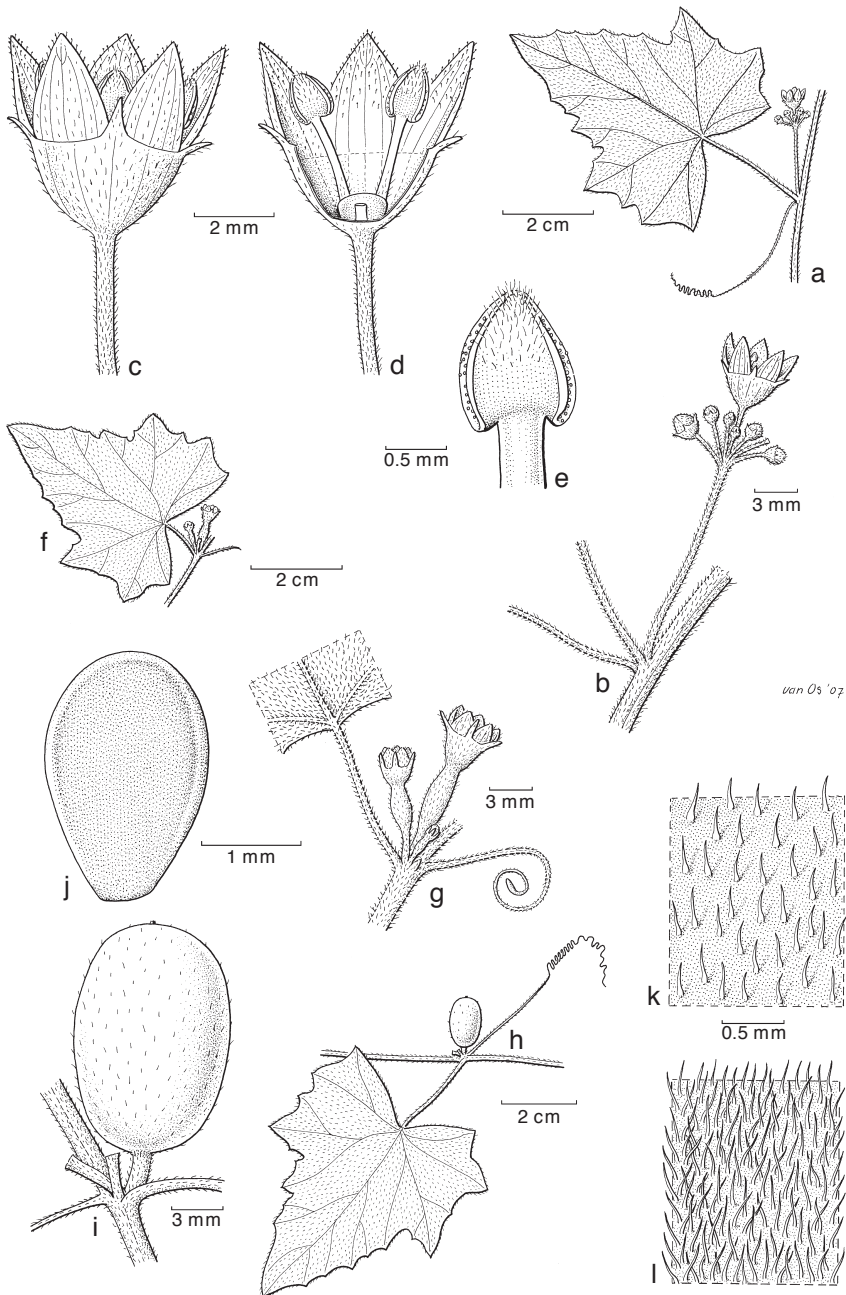


Fig. 62. *Pilogyne trichocarpa* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes. a, b. Node with male inflorescence; c, d. male flower, from outside and opened respectively; e. detail of stamen, showing the slightly curved thecae, mark coarsely hairy connective; f, g. node with female inflorescence; h, i. node with one hairy fruit; j. seed, faintly hairy; k, l. detail of upper and lower leaf blade surface respectively (all: Ramos & Edaño BS 84954, type).

Distribution — Philippines (Mindanao, Cotabato Province, Nutol) where only known from the type, collected March–April 1932.

Notes — 1. *Pilogyne trichocarpa* belongs to a group of similar species, among which *P. mucronata* (Blume) Miq. and *P. repanda* (Blume) C.M.Simmons, which are all related to what is known in Africa as the widespread, variable *Zehneria scabra* (L.f.) Sond. *Pilogyne trichocarpa* is unique in SE Asia by its densely hairy overall habit, including a hairy ovary and fruit, and by its small seeds, all traits which occur regularly in Africa, but which are absent or very rare in Asia.

2. The seeds of both *Pilogyne trichocarpa* and *P. rizalensis* belong to the smallest of all Cucurbitaceae of SE Asia.

### 13. *Pilogyne trullifolia* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes

*Pilogyne trullifolia* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes, Reinwardtia 12, 5 (2009) 411. — *Zehneria trullifolia* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 77. — Type: *De Vogel 5618* (holo L; iso BO, K), Central Sulawesi (Sopu Valley).

Climber to 6 m long, leafy stem 1–1.5 mm diam., plant subglabrous, (green-)brown on drying; dioecious(?). *Probract* less than 1 mm long. *Leaves*: petiole 1–3 cm long, glabrous; blade trullate (or narrowly ovate), 5–8 by 3–4.5 cm, broadest at about 1/4 from the base, base broadly rounded or broadly cuneate, both surfaces glabrous but somewhat scabrous with small cystoliths, margin finely sparsely dentate, occasionally coarsely dentate. *Male inflorescences* 1–1.5 cm long peduncled 3–10-flowered short racemes, 0.1–0.3 cm long. *Male flowers*: pedicel 1.5–2 mm long; perianth ± succulent, when expanded c. 4 mm diam., early caducous; receptacle-tube c. 2.5 by 3 mm, outside glabrous, inside in upper half and at throat finely woolly hairy, hairs less than 0.5 mm long; sepals 0.3 mm long, glabrous; petals c. 1.5 mm long, ± acute, both surfaces minutely papillose-hairy; stamens inserted near the base in the receptacle-tube, filaments c. 1.5 mm long, glabrous, anthers subglobose, (1–)1.5 mm diam., thecae curved, connective broad but narrow at apex; disc depressed, irregular in outline, large, (0.5–)1 by c. 2 mm. *Female flowers* and *fruits* not known.

Distribution — Central Sulawesi, near Sopu, SSE of Palu; known only from 2 collections.

Habitat & Ecology — In sloping primary mountain forest with sparse undergrowth on clayey soil derived from granite; at 1000–1500 m altitude; flowering in May.

### 14. *Pilogyne viridifolia* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes

*Pilogyne viridifolia* (W.J.de Wilde & Duyfjes) W.J.de Wilde & Duyfjes, Gard. Bull. Singapore 61 (2009) 210. — *Zehneria viridifolia* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 77, f. 13i, j. — Type: *Brass 23914* (holo A; iso CANB, L), Papua New Guinea, Milne Bay Province.

Climber 1–2 m long, leafy stem 1–1.5 mm diam., plant sparsely hairy, glabrescent, green on drying; monoecious. *Probract* c. 1 mm long. *Leaves*: petiole 1.5–3 cm long, rough-hairy; blade (ovate or) circular in outline, 5–9 cm diam., ± hastate or deeply 3(–5)-lobed to c. halfway, short-scabrous hairy with minute cystoliths above, subglabrous but veins hairy beneath, base broadly shallowly cordate, margin (sparsely) dentate. *Male*

*inflorescences*: flowers in peduncled short racemes; peduncle 0.5–1 cm long; racemes 0.1–0.5 cm long, up to 15-flowered. *Male flowers*: pedicel 4(–5) mm long; expanded perianth c. 5 mm diam.; receptacle-tube 1.5–2 by 2.5–3 mm, outside (sub)glabrous, in and below the throat densely woolly hairy, hairs to 0.5 mm long; sepals c. 1 mm long; petals 2–2.5 mm long, both surfaces minutely finely gland-hairy; stamens inserted at or slightly above halfway the receptacle-tube, filaments 0.5–1 mm long, glabrous, anthers ± exserted, broad ellipsoid, c. 1.3 by 1 mm, thecae ± curved, connective broad, but narrow and truncate at apex; disc (depressed-)globose, c. 1.5 mm diameter. *Female flowers* 1 or 2 at the nodes, sometimes co-axillary with male inflorescences; pedicel 5–10 mm long; ovary ellipsoid-fusiform, 3.5–4 by c. 2 mm, glabrous, neck 1(–2) mm long; perianth as in male flower; style c. 2 mm long, with 3 style-arms 0.5 mm long, each with an ovoid-ellipsoid 1 mm long stigma, papillose; staminodes inserted at c. 1/4 from the base of the receptacle-tube, 1.5(–2) mm long, slender, ± hairy in the upper half; disc large, 1 by 1.8 mm. *Fruit* 1 or 2; ellipsoid, 1 by 0.8 cm, recorded as unripe (but see note); exocarp smooth, not finely pitted; fruiting pedicel 2–3 cm long. *Seeds* few, 1(–5?), ovate, c. 5 by 4 mm, not obviously margined, with a conspicuous broad square edge nearly 2 mm wide. — **Fig. 57i, j.**

*Distribution* — New Guinea (Papua New Guinea, Milne Bay Province, Gwariu River; Biniguni Camp (see Brass, Bull. Amer. Mus. Nat. Hist. 111 (1956) pl. 17)); known only from the type.

*Habitat & Ecology* — Along second growth rainforest, near river; at c. 200 m altitude; flowering and fruiting in August.

*Note* — This species is tentatively treated under *Pilogyne*, but it is not sure whether the remarkable sole collection on which the present species is based belongs in that genus. It deviates from most *Pilogyne*s in its green drying colour. Within *Pilogyne* it comes closest to *P. erythrobacca* (distributed all over New Guinea), the latter being distinct by a brown drying colour, by the leaf blade which is hardly lobed and not or hardly scabrous, and by the stamens which are inserted towards the base of the receptacle-tube.

### 30. SCOPELLARIA

*Scopellaria* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 297. — *Scopella* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 34, nom. illeg. — Type species: *Scopellaria marginata* (Blume) W.J.de Wilde & Duyfjes.

Climbers to 6 m long, annual or (sub)perennial, leafy stem 1.5–2(–3) mm diam., green on drying; monoecious. *Probract* absent. *Tendrils* unbranched, hairy (see note). *Leaves* simple, unlobed or lobed, margin entire or dentate, palmiveined. *Flowers*: expanded corolla 5–10 mm diam., yellow; sepals minute, narrowly elliptic or linear, subpatent; petals imbricate in bud, free, (ob)ovate-elliptic; receptacle-tube campanulate; disc present. *Male inflorescence* 1(–3) slender peduncled short raceme(s) with the flowers (pedicels) crowded at apex, co-axillary with 1 (or 2) female flower(s) or not; bracts absent. *Male flowers*: pedicel short, persistent; stamens 3, exserted, inserted in the throat of the receptacle-tube, erect, filaments long, anthers all 2-thecous, thecae lateral, straight, connective narrow, not produced; disc free, (depressed-)globose. *Female*

flowers 1 or 2 co-axillary with peduncle of male inflorescence or not; pedicel usually long; ovary globose or ellipsoid, without slender neck; stigma consisting of 3 rather long flat lobes, cleft or notched at apex, fringed on the margin; staminodes present; disc annular, free from receptacle-tube. *Fruit* 1 (or 2), ripening red, with short or long fruiting pedicel, globose, ellipsoid, or narrowly ellipsoid (fusiform), 1–1.5(–3) cm long, juicy or pulpy; exocarp filmy, membranous or cartilaginous, smooth. *Seeds* numerous, moderately compressed, ovate-elliptic, faces ± convex, scrobiculate, margin distinct, edge (sub)entire, not winged

Distribution — A genus with 2 species ranging from South China through Indo-China to West Malesia; not known from Myanmar and Taiwan; in *Malesia*: east to Sulawesi, and Philippines.

Note — In *Scopellaria* the tendrils are completely hairy (although sometimes sparingly so); in resembling genera the tendrils are glabrous or hairy only below the first spiral.

#### KEY TO THE SPECIES

- 1a. Leaf blade coriaceous, margin hard-spiny. Seeds 7(–8) mm long. — Borneo (Sabah) . . . . . **1. *S. diversifolia***  
 b. Leaf blade membranous or chartaceous, margin denticulate. Seeds 2.5–6 mm long. — Widespread . . . . . **2. *S. marginata***

#### 1. *Scopellaria diversifolia* (Merr.) W.J.de Wilde & Duyfjes

*Scopellaria diversifolia* (Merr.) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 297. — *Melothria diversifolia* Merr., *J. Malayan Branch Roy. Asiat. Soc.* 1 (1923) 44. — *Scopella diversifolia* (Merr.) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 34, nom. illeg. — Type: *Ramos 1896* (holo PNH†; lecto BO, designated by De Wilde & Duyfjes (2006); iso UC), Sabah, near Sandakan.

Subherbaceous 2–6 m long climber, leafy stem 1.5–3 mm diam., glabrescent. *Leaves*: petiole 1–2(–4) cm long, short scabrid-hairy, hairs 0.5 mm long; blade (sub)coriaceous, narrowly ovate to narrowly elliptic, 7–14(–20) by 2–8(–12) cm, upper surface coarsely scabrous by conspicuous (white) cystoliths, lower surface subglabrous, base truncate, shallowly cordate or sagittate with acute lobes to 1.5 cm long, margin entire or faintly dentate with sparse, small but coarse 1 mm long hard teeth. *Male inflorescences* solitary; peduncle 2–3.5 cm long, subglabrous; raceme short, rarely 2-branched, with 5(–10) flowers; male pedicel 1–2(–5) mm long, female pedicel 10–20 mm long. Mature *male* and *female* flowers not seen, presumably similar to those of *S. marginata* (see note): anthers c. 1.5 mm long; ovary ovoid, c. 3 mm long; sepals lanceolate, c. 1.5 mm long; petals ovate-elliptic, acuminate, c. 5 mm long; staminodes 1.2 mm long; stigma-lobes deeply cleft, c. 2 mm long. *Fruit* solitary or co-axillary with (previously) developed male inflorescence, globose, 1–1.5 cm diam.; exocarp cartilaginous, glabrous; fruiting pedicel 2–4.5 cm long, subglabrous. *Seeds* numerous, pale yellowish brown, elliptic or obovate in outline, 6–8 by 4–4.5 by 1–1.5 mm, base narrowed, faces almost smooth or indistinctly scrobiculate, margin narrow but distinct.

Distribution — Borneo (Central and East Sabah).

Habitat & Ecology — In thickets and forest edges; from sea level to 250 m altitude; flowering and fruiting throughout the year.

Note — According to Merrill (1923) who examined *Ramos 1175, 1210, 1896* (material now partly lost), the male flowers are similar to female flowers; the flower details given are his.

## 2. *Scopellaria marginata* (Blume) W.J.de Wilde & Duyfjes

*Scopellaria marginata* (Blume) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 297; *Fl. Thailand* 9, 4 (2008) 493. — *Bryonia marginata* Blume, *Bijdr. Fl. Ned. Ind.* 15 (1826) 924; *Ser. in DC., Prodr.* (1828) 305; M.Roem., *Fam. Nat. Syn. Monogr.* 2 (1846) 36; Miq., *Fl. Ned. Ind.* 1, 1 (1856) 660. — *Melothria marginata* (Blume) Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 593; Backer in Backer & Bakh.f., *Fl. Java* 1 (1964) 296. — *Zehmeria marginata* (Blume) Keraudren in Aubrév. & J.-F.Leroy, *Fl. Cambodge, Laos & Vietnam* 15 (1975) 55, pl. 9: 4; W.J.de Wilde & Duyfjes, *Thai Forest Bull. Bot.* 32 (2004) 21, f. 2. — *Scopella marginata* (Blume) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 35, f. 9, nom. illeg. — Type: *Blume 920* (holo L), Java.

*Bryonia epigaea* auct. non Rottl.: Blume, *Bijdr. Fl. Ned. Ind.* 15 (1826) 925. — *Aechmandra blumeana* M.Roem., *Fam. Nat. Syn. Monogr.* 2 (1846) 33, p.p; Miq., *Fl. Ned. Ind.* 1, 1 (1856) 657, p.p. (a new name for *Bryonia epigaea* auct. non Rottl.: Blume). — Type: *Blume s.n.* (holo L, barcode L0130057; iso L, 3 sheets), Java.

?*Cerasiocarpum maingayi* C.B.Clarke in Hook.f., *Fl. Brit. Ind.* 2 (1879) 629. — Type: *Maingay 1268* (holo K), Peninsular Malaysia (male flower with reduced androecium; see note under var. *marginata*).

*Melothria affinis* King, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 67 (1898) 38; Cogn. in Engl., *Pflanzenr.* 66, 4.275.I (1916) 94. — Type: *Scortechini 495* (lecto K, designated by De Wilde & Duyfjes (2006)), Peninsular Malaysia, Perak.

*Melothria gracilipes* Merr., *Pap. Michigan Acad. Sci.* 19 (1934) 199. — Type: *Bartlett 7228* (holo NY; iso MICH), Sumatra.

Annual or biennial, (sub)herbaceous, creeping or climbing, (0.5–)1–5 m long, variously scabrid-hairy, leafy stem 1–2 mm thick; glabrescent. *Leaves*: petiole (compared to resembling species short) 1–5 cm long, with soft or coarse 0.5–1(–2) mm long hairs; blade unlobed or shallowly or deeply (hastately) 3- or 5-lobed, variable in shape, (long) triangular, ovate, or cordiform, 4–16 by 3–10 cm, upper surface rough-hairy and/or scabrous by (coarse) cystoliths, lower surface coarsely hairy mostly only on the veins, base truncate, rounded, or (deeply) cordate, margin entire with minute teeth or dentate, apex acute-acuminate. *Male inflorescences* 1(–3), glabrescent, usually co-axillary with 1 (or 2) previously developed female flower(s); peduncle 1.5–6 cm long, 0.5 mm thick; raceme 0.3–1(–2) cm long, (3–)5–10(–25)-flowered; pedicels half-patent, persistent. *Male flowers*: pedicel 2–7 mm long; receptacle-tube 1.5–2 mm diam., sparsely coarsely hairy outside, throat hairy; sepals patent or ± out-curved, 1 mm long, with sparse hairs; petals (2–)3–4 by 2.5–3 mm, rounded or (sub)obtuse-acuminate, (papillose) hairy; filaments 1–1.5 mm long, glabrous, anthers ellipsoid, 1 mm long, thecae 1 mm long; disc c. 1 mm diameter. *Female flowers*: pedicel (5–)10–30 mm long; ovary ellipsoid, 3–5 mm long, with sparse hairs, glabrescent; receptacle-tube shallow; perianth as in male flower but petals larger, 4–5 mm long; style c. 2 mm long, glabrous; stigma consisting of 3 feather-like arms, shallowly forked at apex, each c. 2 mm long; staminodes linear, 1 mm long, inserted at the base of the receptacle-tube; disc less than 1 mm high. *Fruit* (remarkably variable in shape and texture, see note under var. *marginata*), either globose or ellipsoid, 1–1.5 cm long with base and apex rounded, or fruits narrowly

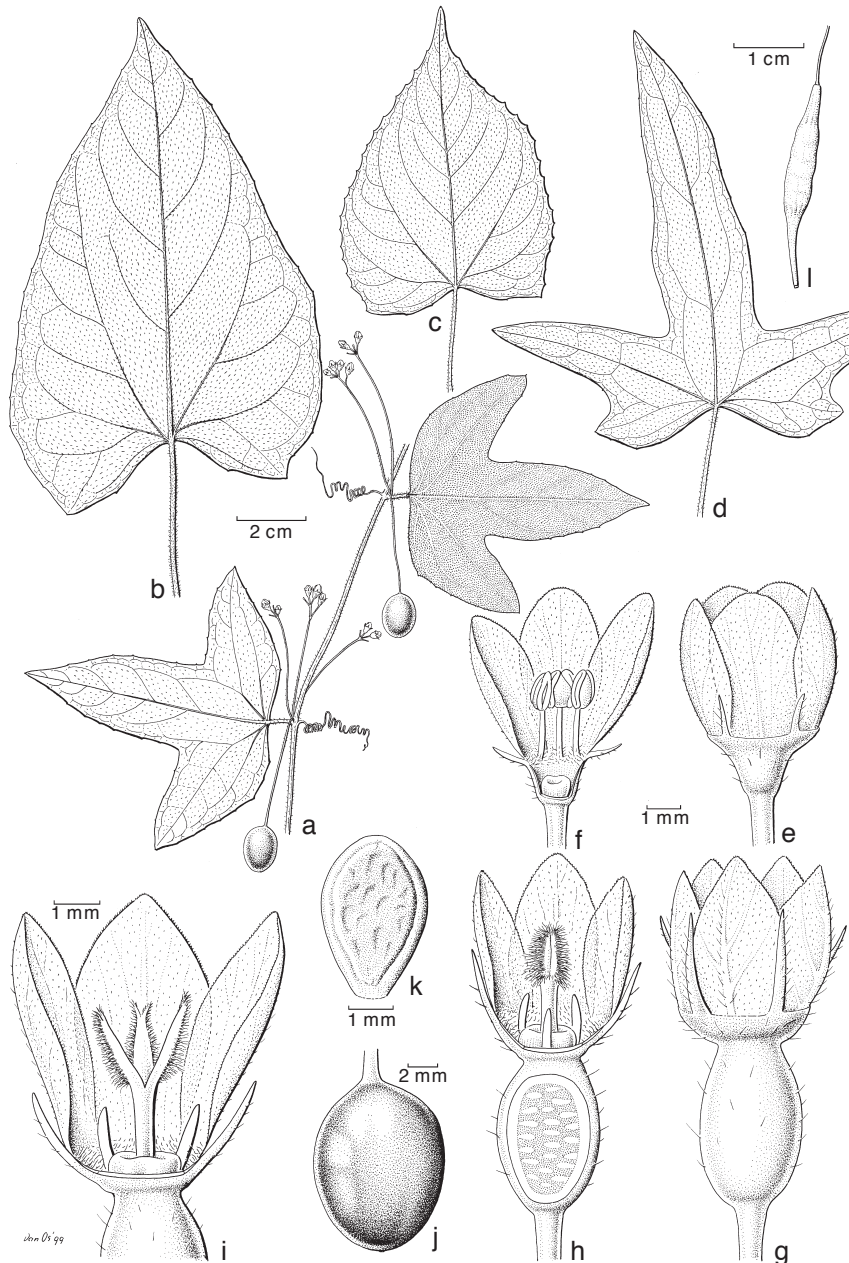


Fig. 63. *Scopellaria marginata* (Blume) W.J.de Wilde & Duyfjes var. *marginata*. a. Habit; b, c, d. leaves; e, f. male flowers; g, h, i. female flowers, from outside, opened, and with expanded stigma respectively; j. fruit (form with globose fruit); k. seed; l. fruit (form with fusiform fruit) (a: *Awong Kaya s.n.*, barcode L0130026 (Brunei); b: *De Wilde & Duyfjes 12614* (Sumatra); c: *De Wilde & Duyfjes 21794* (Sumatra); d: *Iwatsuki c.s. 1732* (Sumatra); e–j: *De Wilde & Duyfjes 21756* (Sulawesi); k: *De Wilde & Duyfjes 21699* (Java); l: *De Wilde & Duyfjes 22182* (Thailand)).



ellipsoid, tapering at base and apex, 1.5–2(–3) by c. 0.5 cm, glabrescent; exocarp membranous or ± leathery, leaving the seeds visible or not on drying; ripe fruits juicy or with yellowish pulp; fruiting pedicel short or long, (0.5–)1–5 cm long (short when fruit narrowly ellipsoid). *Seeds* 5–35 per fruit, whitish, (somewhat) compressed or faces ± convex, narrowly ovate in outline, 3–5(–6) by 1.5–3.5 by c. 1.5 mm, faces (deeply) finely or coarsely scrobiculate, margined, edge distinctly square.

*Distribution* — East Myanmar (*Wallich Cat.* 6713, only photo seen), China (Yunnan, no material seen), Thailand, Laos, Cambodia, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo (mainly Sabah), West Java, Philippines, and Central Sulawesi.

*Habitat & Ecology* — Open and shaded places, damp sites, mostly in forest edges, roadsides; sea level to 1500 m altitude; flowering and fruiting mostly June to December.

*Note* — Both Cogniaux (1881) and King (1898) described the fruits as velvety, but this aspect obviously is caused by drying; in fact the fruits are early glabrescent.

#### KEY TO THE VARIETIES

- 1a. Leaf blade unlobed, narrowly ovate, base cordate or short-sagittate. *Seeds* 4–5(–6) mm long. . . . . **b. var. penangense**  
 b. Leaf blade ± unlobed, or shallowly or deeply 3(–5)-lobed, ovate or triangular, base rounded, cordate or hastate. *Seeds* 2.5–4 mm long . . . . . **a. var. marginata**

#### **a. var. marginata**

Climber 0.5–3 m long. *Leaves*: blade usually angular or lobed. *Fruit* globose, ellipsoid or long-fusiform. *Seeds* few or numerous, small, 2.5–4 mm long, the faces flat or somewhat convex, coarsely scrobiculate. — **Fig. 63; Plate 21a, b.**

*Distribution* — As the species.

*Note* — Apart from a variable habit of the plant, mainly due to variation in leaf-shape and indumentum, the variety *marginata* exhibits a remarkable variation in fruit-shape and length of fruiting pedicel. Most specimens have globose fruits (as the type of *Melothria affinis*) with long pedicels, some have (narrowly) ellipsoid-fusiform fruits (as the type of *Bryonia marginata*) with short pedicels (see Fig. 63a, j, l). Although most herbarium specimens have a constant fruit form, there are several collections indicating that both forms may occur in one plant. The type-specimen of the present species is the less frequent form with the slender fusiform fruits. The form with elongate, fusiform fruits with comparatively small male flowers, often with reduced petals and stamens, may be related to small plants from poor soils that flower precociously.

#### **b. var. penangense** (C.B. Clarke) W.J. de Wilde & Duyfjes

*Scopellaria marginata* (Blume) W.J. de Wilde & Duyfjes var. *penangense* (C.B. Clarke) W.J. de Wilde & Duyfjes, *Blumea* 51 (2006) 296. — ?*Cerasiocarpum penangense* C.B. Clarke in Hook.f., *Fl. Brit. Ind.* 2 (1879) 629. — *Scopella marginata* (Blume) W.J. de Wilde & Duyfjes var. *penangense* (C.B. Clarke) W.J. de Wilde & Duyfjes, *Blumea* 51 (2006) 38, nom. illeg. — *Bryonia heterophylla* auct. non Blume: *Wallich Cat.* 6704. — Type: *Wallich Cat.* 6704 (holo K-W), Peninsular Malaysia, Penang.

Climber 1–5 m long. *Leaves*: blade entire, ovate or narrowly ovate, base sometimes sagittate. *Fruit* short-ellipsoid or globose, 1–1.5 cm long. *Seeds* numerous, 4–5(–6) mm long, the faces flat, finely scrobiculate.

Distribution — In the western half of the species area where it occurs beside the type-variety: South China, Myanmar (see note), Thailand, Laos, ViêtNam, Cambodia; in *Malesia*: Sumatra and Peninsular Malaysia.

Note — The specimen *Wallich Cat. 6713* (photo seen only) is mentioned under *Kedrostis (Rhynchosarpa)* by various previous authors; it is the only collection from Myanmar known to us which may represent the present species.

### 31. SECHIUM

*Sechium* P.Browne, Civ. Nat. Hist. Jamaica (1756) 355., nom. cons.; C.Jeffrey in Hanelt, Mansfeld's encycl. agric. hort. crops 3 (2001) 1555. — Type species: *Sechium edule* (Jacq.) Sw. (*Sicyos edulis* Jacq.), typ. cons.

Medium or stout climbers, perennial, plants (almost) glabrous; monoecious. *Probract* absent. *Tendrils* 2–5-branched. *Leaves*: blade simple, angular or shallowly lobed, base cordate. *Flowers* rather small, short-pedicelled; male flowers in racemes, female flowers solitary, or 2 or 3, often co-axillary with male inflorescence; petals pale greenish yellow, free. *Male flowers*: receptacle-tube shallow; sepals linear; petals elliptic-oblong, (sub)acute, margin entire; stamens 3, filaments united into a column, inserted at base of receptacle-tube, ± free at apex, anthers two 2-theous, one 1-theous, thecae plicate; disc (pistillode) absent. *Female flowers* short- or long-pedicelled; perianth as in male flowers; ovary ovoid(-oblong), smooth or with few (coarse) hairs, unilocular, ovule one, style slender, short, stigma capitate, 2-lobed, lobes entire or lobulate, recurved; staminodes absent, but base of receptacle-tube sometimes with 10 shallow pouches. *Fruit* indehiscent, fleshy (or fibrous, not in Asia), ± obovoid, smooth or sulcate, glabrous, setose or with soft spines. *Seed* one, large, ovoid, sometimes ± compressed, testa woody, glabrous, margin absent, edge entire, sharp.

Distribution — About 5 species in 2 sections in tropical America. One species, *Sechium edule*, widely cultivated.

Note — Schaefer & Renner (Fam. Gen. Vasc. Pl. [Kubitzki], in press) found with molecular analysis that the genus is nested in *Sicyos*.

#### 1. *Sechium edule* (Jacq.) Sw.

*Sechium edule* (Jacq.) Sw., Fl. Ind. Occid. (1800) 1150; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 901; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 306; C.Jeffrey, Cucurbitaceae E. Asia (1980) 59; J.M.M.Engels & C.Jeffrey, PROSEA 8 (1993) 246; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 77, f. 10; Fl. Thailand 9, 4 (2008) 496. — *Sicyos edulis* Jacq., Enum. Syst. Pl. (1760) 32. — *Chayota edulis* (Jacq.) Jacq., Select. Stirp. Amer. Hist., ed. 2 (1780) 245. — Type: *Jacquin* (BM?, not seen, designated by Jeffrey (1980)), Cuba.

Stout perennial herb, 5–10(–15) m long, leafy stem 2–5 mm diam., plant almost glabrous with tuber-like rootstock; cultivated. *Leaves*: petiole 5–15 cm long; blade usually 5-angular or shallowly lobed, subcircular in outline, 10–20 cm diam., finely

scabrous especially on upper surface, margin finely sparsely dentate, lobes acute; distinctly reticulately veined. *Male racemes* 8–30 cm long, 10–30-flowered, with flowers 2(–6) subfasciculate. *Male flowers*: pedicel 1–6 mm long; receptacle-tube c. 5 mm wide; sepals narrowly elliptic to linear, 5–7 mm long; petals subglabrous, 10–17 mm long; staminal column 1–2 mm long, spreading free parts c. 1 mm long, anthers c. 2 mm diameter. *Female flowers*: ovary c. 5 mm long, glabrous or ± hairy, style 3–4 mm long, stigma c. 3 mm diam., papillose. *Fruit* solitary, ripening green or whitish, 7–15(–20) cm long, often with irregular surface, low-warted or irregularly sulcate, smooth or (soft) spiny; later on the embryo germinating within the seed and emerging at apex of fruit; fruiting pedicel 2–3 cm long. *Seed* 50–100 mm long.

Distribution — Originally wild and cultivated in Central America, now widely cultivated (usually over trellis) in the tropics and subtropics all over the world, and commonly running wild.

Vernacular name — Chayote.

Uses — The shoots and fruits are used as a vegetable. The nectariferous male flowers attract bees.

Note — *Sechium edule* was already known cultivated in pre-Columbian times and is now known from numerous cultivars or land-races.

### 32. SIRAITIA

*Siraitia* Merr., Pap. Michigan Acad. Sci. 19 (1934) 200; W.J.de Wilde & Duyfjes, Blumea 51 (2006) 499. — Type species: *Siraitia silomaradjae* Merr.

Perennial herbaceous climbers with sub or supra-terranean tuber (always?), leaves and stems with blackish glandular hairs; dioecious. *Probract* absent or not obvious. *Tendrils* distally 2-branched, spiralling both below and above point of branching, although basal portion straight. *Leaves*: blade ovate, simple, unlobed, green on drying. *Flowers*: petals yellow, free. *Male flowers* in racemes or panicles; bracts absent or present; receptacle-tube rather shallow, conspicuously coarsely anastomosing-veined externally; without obvious disc, although receptacle-tube with thickened bottom; pedicels articulate towards apex; sepals ± triangular; petals (narrowly) elliptic or (narrowly) ovate, two or all with an incurved basal adaxial scale; stamens 5, inserted near the throat of shallow receptacle-tube, in two pairs and one solitary, filaments long, anthers 1-thecous, thecae sigmoid, the connective frequently with conspicuous papillae. *Female flowers* solitary (or elsewhere few in a short raceme); style-arms largely free, stigmas ± 2-lobed or reniform; staminodes 5, glandular. *Fruit* ± fleshy, indehiscent, subglobose to cylindrical, rather large (5–11 cm long), smooth; pulp sometimes sweet. *Seeds* numerous, broadly ovate or subcircular in outline, compressed, faces smooth, with broad finely radiatingly ribbed, corky, double or 3-ridged margin, edge (sub)entire.

Distribution — A genus of three or four species distributed in NE India, South & Central China, Thailand, Indochina and West Malesia; in *Malesia* 1 species.

Note — *Siraitia grosvenorii* (Swingle) A.M.Lu & Zhi Y.Zhang does not occur in our region, but its fruits are sold in Chinese shops and local markets in Malesia for its sweet medicinally used fruits (Fig. 65c–e). The female flowers depicted are taken from Chinese material, because female flowers of the genus from the Malesian area are not known.

### 1. *Siraitia siamensis* (Craib) S.Q.Zhong & D.Fang

*Siraitia siamensis* (Craib) S.Q.Zhong & D.Fang, *Guihaia* 4 (1984) 23; C.Jeffrey, *Cucurbitaceae E. Asia* (1980) 26, comb. nov. provis.; W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 501; *Fl. Thailand* 9, 4 (2008) 501. — *Thladiantha siamensis* Craib, *Bull. Misc. Inform. Kew* (1914) 7; *Fl. Siam.* (1931) 759; *Cogn. in Engl., Pflanzenr.* 66, 4.275.I (1916) 51; Keraudren in Aubrév. & J.-F.Leroy, *Fl. Cambodge, Laos & Vietnam* 15 (1975) 34, f. 10: 5–7. — Type: *Kerr 1171* (holo K; iso E), Thailand, Doi Suthep.

Climber with one (or few) shoots to 5(–10) m long from a supra-terrestrial club-shaped or ovoid tuber to 25 cm diam.; leafy stem subterete or ± angular, c. 3 mm diam., with long or short hairs. *Tendrils* finely pubescent. *Leaves*: petiole 4–10 cm long, long-hairy; blade ovate, 9–30 by 8–22 cm, upper surface sparsely appressed-hairy, lower surface variously hairy and with many blackish glandular hairs, cystoliths not obvious, base deeply cordate, margin sparsely minutely dentate, apex acute-acuminate. *Male inflorescences*: a simple or once branched raceme, (10–)20 cm long, the flowers ± crowded at the apex of the inflorescence branches; bracts minute, 1(–2) mm long or mostly absent; peduncle 5–13 cm long; all parts finely hairy; female flowers solitary (or 2 in a reduced raceme to 1 cm long). *Male flowers* finely hairy; pedicel 15–30 mm long; receptacle-tube bowl-shaped, c. 10 by 5 mm; disc not obvious, but base of receptacle-tube ± thickened; sepals triangular, c. 5 mm long, 5 mm wide at base, apex obtuse or subacute, receptacle and sepals outside with conspicuous anastomosing-netted veins; petals broadly elliptic, (10–)15 mm long, 4–8 mm wide at base, apex rounded, inner surface finely papillose, at base with 2 large and 2 or 3 smaller scales, these together with the thickened bases of the filaments concealing a hollow in the basal portion of the receptacle-tube; stamens erect or ± curved, filaments 5–7 mm long, anthers c. 4 mm long, thecae curved with one arm shorter. *Female flowers*: pedicel 10(–20) mm long; ovary ovoid-ellipsoid, c. 10 mm long, hairy; perianth as in male flowers; style (China) 4–5 mm long, 3-armed. *Fruit* solitary (or 2), ripening greenish yellow, subglobose, 5–8 cm diam., hairy, partly glabrescent; pericarp thin, c. 1 mm thick, woody; fruit pulp whitish, enclosing numerous densely packed seeds. *Seeds* c. 15 mm diam., pale brown, corky, with broad 3-layered margin, the middle layer largest, the proper seed (excluding margin) elliptic in outline, c. 8 mm long.

Field-notes — Young leaves and twig apices purplish reddish.

Distribution — Widespread, from South China through Indochina into West Malesia; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, and Java; rare and seldom flowering.

#### KEY TO THE VARIETIES

- 1a. Male inflorescences 2 (or 3) times branched, c. 20 cm long. Sepals of male flowers acute-acuminate, rather open in bud. Petals narrowly triangular, c. 4 mm wide at base. — North Sumatra . . . . . **b. var. silomaradjae**
- b. Male inflorescences simple or once branched, 10–20 cm long. Sepals of male flowers obtuse or subacute, connivent and closing the bud before anthesis. Petals elliptic, 4–8 mm wide at base with rounded or blunt apex. — Widespread. . . . .  
 . . . . . **a. var. siamensis**

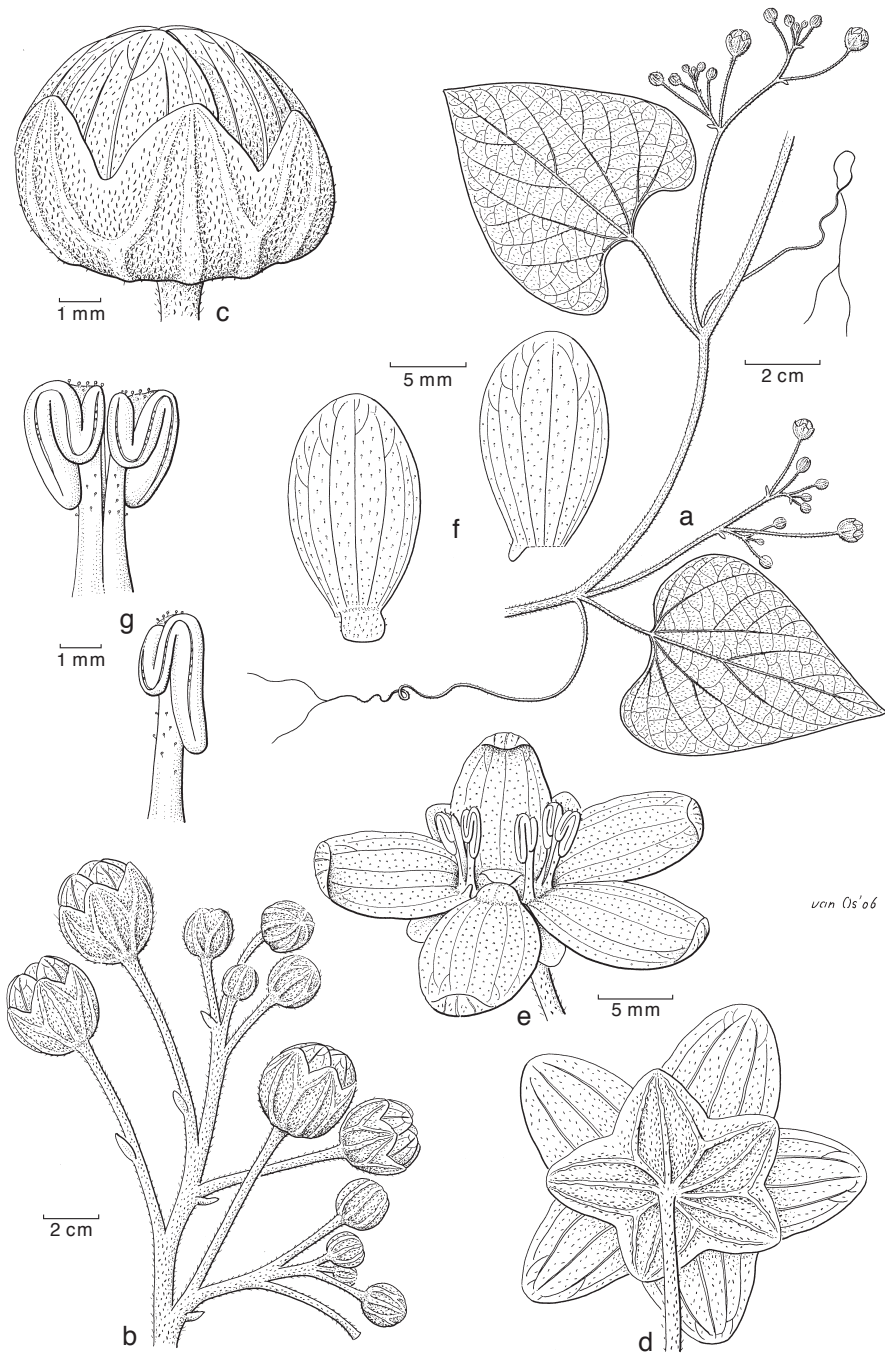


Fig. 64. *Siraitia siamensis* (Craib) S.Q.Zhong & D.Fang var. *siamensis*. a. Male flowering branch; b. apex of male inflorescence; c. male flower bud; d, e. open male flower, seen from beneath and above respectively; f. inner petals with petal-scale at base; g. stamens (all: *Phonsena* 4225 (Thailand)).

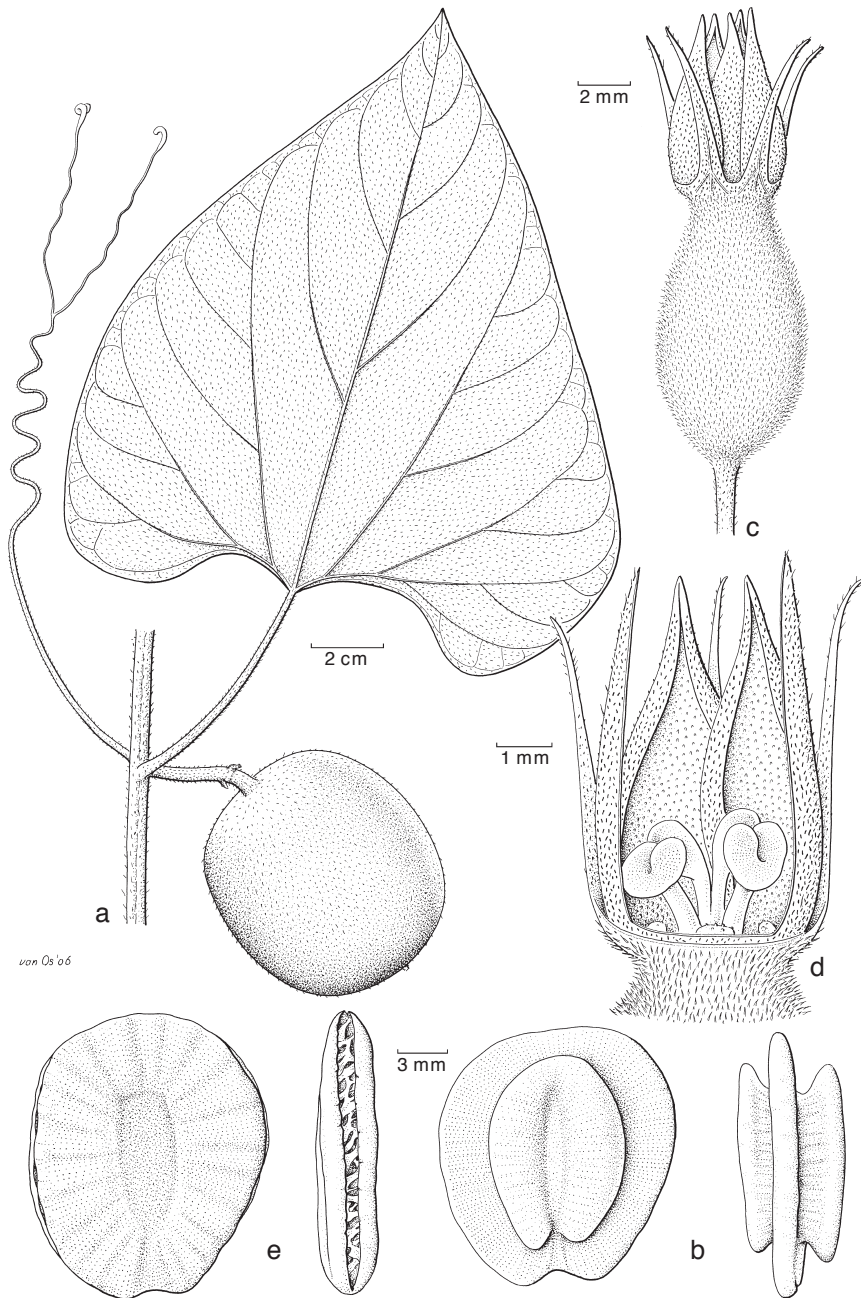


Fig. 65. a, b. *Siraitia siamensis* (Craib) S.Q.Zhong & D.Fang var. *siamensis*. a. Portion of branch with fruit; b. seed, face and side view. — c–e. *Siraitia grosvenorii* (Swingle) A.M.Lu & Zhi Y.Zhang. c. Immature female flower; d. ditto, opened; e. seed, face and side view (a: Larsen *et al.* 32487 (Thailand); b: Van Beusekom & Phengklai 918 (Thailand); c, d: G. Zhang 445 (China); e: De Wilde *et al.* 22306 (from fruit imported from China)).

**a. var. siamensis**

Male inflorescences simple, or once-branched, 10–20 cm long. Sepals of male flowers obtuse (rounded) or subacute at apex; petals broadly elliptic, apex rounded. — **Fig. 64, 65a, b.**

Field-notes — Mature fruits green. *Lörzing 5595* gives the following observations (translated): “Climbing herb 8 m, profusely branched; rare; male flowers: calyx bright red-brown, with bright green veins, when in flower the red colour vanishes for the greater part; corolla deeply 5-lobed, yellow, with pale yellow-green veins; anthers two with each 2 free thecae, and one with 1 theca and with two scale-like staminodia; always 1 stamen or staminodia basally adnate to a petal; stamens bright yellow or green-yellow, at the base yolk-yellow; 5 petals, all the same size, broadly obovoid, dorsally somewhat rounded; upper surface of leaves green, somewhat glossy, lower surface dull pale green; lower surface of young leaves chocolate with grey-green veins.”

Distribution — Possibly as the species, but see the note under var. *silomaradjae*.

Habitat & Ecology — Open or disturbed places in lowland forest, forest edges, scrub; also on limestone; from sea level to 800 m altitude. It is extremely rarely collected fertile. From Java one fruiting collection from 1912 is only known (*Backer 5937*, BO). From Peninsular Malaysia and Borneo sterile collections are only known.

**b. var. silomaradjae** (Merr.) W.J.de Wilde & Duyfjes

*Siraitia siamensis* (Craib) S.Q.Zhong & D.Fang var. *silomaradjae* (Merr.) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 503. — *Siraitia silomaradjae* Merr., *Pap. Michigan Acad. Sci.* 19 (1934) 200; A.M.Lu & J.Q.Li in Li, *Acta Phytotax. Sin.* 31 (1993) 54, f. 2. — Type: *Bartlett 8702a* (holo US; iso L), male flowers in June 1927, Sumatra.

Male inflorescences long-peduncled, 15–25 cm long, (1 or) 2 (or 3) times branched panicles. Sepals of male flowers long-acute-acuminate, the apices in bud free and slightly out-curved; petals narrow, long-triangular, at base c. 4 mm wide, apex long-acute (see Lu & Li, 1993: f. 2).

Distribution — Northern Sumatra, Asahan area. Only known from the type.

Notes — 1. The only other flowering collection of the species known from the Malesian area is *Lörzing 5595* (BO, L) from Sibolangit, not far from Asahan. Although the flowers of *Lörzing 5595* are in a bad state of conservation, they are more similar to those of var. *siamensis* than to those of var. *silomaradjae*.

2. We cannot decide on the distribution of var. *silomaradjae* beyond the type-locality as all other collections from Malesia (Sumatra, Peninsular Malaysia, Java, Borneo) are sterile, except the old collection from Java in fruit.

**33. SOLENA**

*Solena* Lour., *Fl. Cochinch.* 2 (1790) 514; Keraudren in Aubrév. & J.-F.Leroy, *Fl. Cambodge, Laos & Vietnam* 15 (1975) 62. — *Melothria* sect. *Solena* (Lour.) Cogn. in A.D.C. & C.D.C., *Monogr. Phan.* 3 (1881) 604, p.p.; in Engl., *Pflanzenr.* 66, 4.275.1 (1916) 104, p.p. — Type species: *Solena heterophylla* Lour.

*Karivia* Arn., *Madras J. Lit. Sci.* 12 (1840) 50; *J. Bot. (Hooker)* 3 (1841) 275; Miq., *Fl. Ned. Ind.* 1, 1 (1856) 660. — Type species: *Karivia amplexicaulis* (Lam.) Arn. (*Bryonia amplexicaulis* Lam.).

Herbaceous or at base subwoody climbers, with perennial rootstock or tubers, in Malesia largely glabrous; dioecious (elsewhere monoecious). *Probract* minute, linear, often caducous or absent. *Tendrils* unbranched. *Leaves*: petiole usually short, rendering the leaves frequently semi-amplexicaul; blade simple, variable in shape. *Flowers*: petals valvate-induplicate, white or cream, free. *Male flowers* in sessile or peduncled condensed racemes; pedicel suberect, persistent, often with bract at base or inserted about halfway; receptacle-tube cup-shaped; sepals minute; petals small, hairy; stamens 3, two 2-theous, one 1-theous, filaments free, long, inserted at base of the receptacle-tube, anthers with swollen connective (elsewhere with narrow connective), not produced, thecae oblique and (slightly) curved, or somewhat sigmoid (elsewhere erect and straight); disc 3- (or 4-)lobed, conspicuous, carnose. *Female flowers* single, solitary or co-axillary with male raceme; perianth as in male. *Ovary* narrowly ellipsoid, glabrous or hairy; ovules few or several; staminodes 3 (or 4), inserted on the receptacle; disc a deeply lobed cup or consisting of 3(-5) lobes, at base of style. *Fruit* carnose, glabrous, hairy or scabrous. *Seeds* several, little compressed or nearly globose, smooth (elsewhere sculptured).

Distribution — An Asian genus of 3 species; in *Malesia*: 1 species.

### 1. *Solena heterophylla* Lour.

*Solena heterophylla* Lour., Fl. Cochinch. 2 (1790) 514; ed. 2, 2 (1793) 629; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 63, pl. 10, f. 1-5; W.J.de Wilde & Duyfjes, Blumea 49 (2004) 73; Fl. Thailand 9, 4 (2008) 504. — *Bryonia heterophylla* (Lour.) Rausch., Nomencl. bot. (1797) 282; Steud., Nomencl. bot., ed. 1 (1821) 123; ed. 2 (1841) 232. — *Melothria heterophylla* (Lour.) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 618; Backer in Backer & Bakh. (1964) 297. — Type: *Loureiro s.n.* (BM), Cochinchina and China.

*Bryonia hastata* Lour., Fl. Cochinch. 2 (1790) 594; Merr., Trans. Amer. Philos. Soc. 24 (1935) 377. — Type: *Loureiro s.n.*, China.

*Bryonia rheedii* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 925; Ser. in DC., Prodr. (1828) 306. — *Karivia rheedii* (Blume) M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 45; Miq., Fl. Ned. Ind. 1, 1 (1856) 661. — Type: *Blume s.n.* (holo L, barcode L0127474), Java.

*Bryonia sagittata* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 925; Ser. in DC., Prodr. (1828) 305. — Type: *Blume s.n.* (holo L, barcode L0127475), Java.

*Zehneria connivens* Miq., Fl. Ned. Ind. 1, 1 (1856) 656. — Type: *Horsfield s.n.* (holo U, barcode U0226802; iso K), Java.

*Zehneria hastata* Miq., Fl. Ned. Ind. 1, 1 (1856) 656, nom. illeg. — Voucher specimens: *Zollinger 669* (L), *Horsfield s.n.* (K), both Java.

*Melothria ovata* Cogn. in Engl., Pflanzenr. 66, 4.275.I (1916) 114. — Type: *Anon.* (? Thomson) (G, not seen), Sikkim.

*Zehneria umbellata* auct. non (Willd.) Thwaites: C.B.Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 625, p.p.; Ridl., Fl. Malay Penin. (1922) 851.

Note — De Wilde & Duyfjes (Blumea, 2004) distinguished in *Solena heterophylla* two subspecies, subsp. *napaulensis* (Ser.) W.J.de Wilde & Duyfjes (northern India, Nepal, China (Yunnan) and Myanmar) and subsp. *heterophylla*; only subsp. *heterophylla* occurs in Malesia.



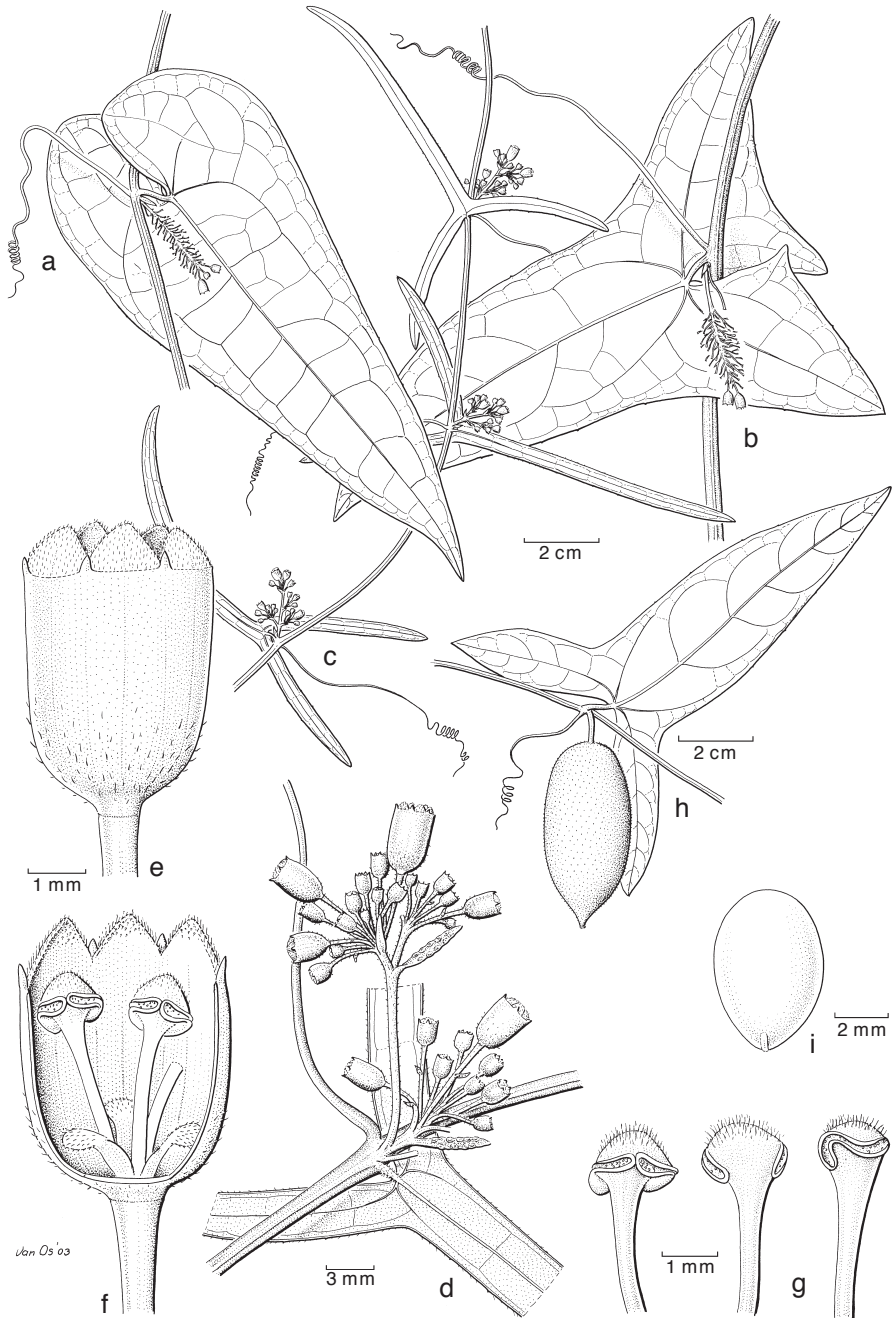


Fig. 66. *Solena heterophylla* Lour. subsp. *heterophylla*. a, b. Habit of male flowering specimens; c. ditto, a specimen with atypical more or less compound inflorescences resulting from axillary short-shoots; d. ditto, note gland-bearing bracts and bracteoles; e, f. male flower; g. stamens; h. fruit; i. seed (a: Koorders 41273; b: Zollinger 669; c–g: Garrett 1192; h–i: Whitmore FRI 20266).

subsp. **heterophylla**

Climber 2–6 m long, perennial, leafy stem 2–3 mm diam., plant sparingly pubescent in younger parts, glabrescent; dioecious. *Probract* 1–5(–10) mm long, caducous. *Leaves*: petiole 0.5–1(–1.5) cm long; blade subcoriaceous, either unlobed, or 3- or 5-angular, or (deeply) 3- or 5-lobed, the lobes broad or (very) narrow, the lower ones frequently hastate, ovate or hastate, 3–10(–22) cm long, to 15 cm wide, glands several or many, small, scattered, but most glands near the insertion of the petiole, margin sparsely 1–2 mm mucronate-dentate; palmately 3- or 5-veined, reticulation distinct on both surfaces. *Male inflorescences* 1 (or 2) sessile or to 4 cm peduncled, persistent subumbellate dense raceme(s), sparsely hairy, pedicels persistent; bracts persistent or caducous, narrowly elliptic or linear, 2–5 mm long, inserted on the pedicel (sometimes towards the apex), ± carnose, with or without glands, often a single (abortive) flower co-axillary. *Male flowers*: pedicel 3–6(–10) mm long, articulate at apex; 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, thecae in an oblique or (sub)horizontal position, forming a nearly closed ring below the broad convex, papillose-hairy connective; disc lobes papillose-hairy, 1–2 mm long. *Female flowers* solitary (rarely a few in a short-shoot); pedicel 3–5(–10) mm long; ovary c. 10 mm long, (densely) short hairy, sometimes with few irregular blotches; perianth resembling male but slightly larger, (to 2.5 mm long) ± 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. *Fruit* green, paler striped, ripening yellow or red, (narrowly-)ellipsoid, 2–5 by 1.5–2.5 cm, velutinous or scabrous; pulp yellowish; fruiting pedicel 0.5–1.5 cm long. *Seeds* (5–)10–20, grey, nearly globose or somewhat elongate, little compressed, (5–)6–7 mm long, c. 5 mm thick, smooth, margin faint, edge entire. — **Fig. 66; Plate 21c, d.**

**Distribution** — Widely distributed, from NE Afghanistan, the Himalayas, through northern India to South & East China, and SE to Myanmar, Thailand, and Indochina; in *Malesia*: Peninsular Malaysia (Perak, Terengganu, and Pahang), and Java; not in Sumatra, Borneo, and East Malesia.

**Habitat & Ecology** — Prefers a seasonal climate, in open forest, scrub, and along streams; on sandstone and granite derived soils; lower and medium altitudes.

**Notes** — 1. The forms according to leaf shape, as proposed by Cogniaux (1916), and repeated by Keraudren (1975) have no taxonomic value.

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

### 34. THLADIANTHA

*Thladiantha* Bunge, Enum. Pl. Chin. Bor. (1833) 29; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 421; in Engl., Pflanzn. 66, 4.275.I (1916) 40; Craib, Fl. Siam. (1931) 759; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 296; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 29. — Type species: *Thladiantha dubia* Bunge.

Perennial herbaceous climbers, usually with tuberous rootstock, stem and leaf blades without black glandular hairs; dioecious. *Probract* absent in sterile shoots, in inflorescences present or absent. *Tendrils* unbranched or 2-branched and spiralling only above the point of branching. *Leaves*: blade simple, unlobed (elsewhere palmately lobed or 3–9-foliolate), ovate, green or brown on drying. *Flowers*: petals yellow, free. *Male inflorescences*: bracteate racemes or panicles, rarely flowers solitary. *Male flowers*: receptacle-tube shallow, with eccentric half-globose basal disc; sepals linear to (narrowly) ovate; petals 1–3 with an adaxial basal scale; stamens (3–)5, inserted near base or throat of receptacle-tube, often in two pairs and one solitary, filaments long, anthers 1-thecous, thecae short, not curved, erect. *Female flowers* solitary (or few in short racemes or panicles), perianth as in male; style single with 3 style arms, stigmas subglobose; staminodes 5. *Fruits* solitary, (narrowly) ellipsoid, carnose, indehiscent, ribbed or verrucose, or smooth, hairy. *Seeds* numerous, ovoid or ellipsoid, finely sculptured, with or without narrow margin, edge entire.

Distribution — A genus of about 25 species in SE Asia; in *Malesia*: 2 species.

#### KEY TO THE SPECIES

- 1a. Male raceme bracteate, bracts 10–15 mm long, incised. Fruit fenestrately pitted.  
— Java, Sumatra . . . . . **1. *T. cordifolia***
- b. Male raceme without bracts, bracts absent or minute, caducous. Fruit smooth.  
— Mindanao . . . . . **2. *T. nudiflora***

#### 1. *Thladiantha cordifolia* (Blume) Cogn.

*Thladiantha cordifolia* (Blume) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 424; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 296; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 30, p.p.; W.J.de Wilde & Duyfjes, Blumea 51 (2006) 508, f. 6a–d, 7, pl. 2a; Fl. Thailand 9, 4 (2008) 508. — *Luffa cordifolia* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 929; Ser. in DC., Prodr. (1828) 302; Miq., Fl. Ned. Ind. 1, 1 (1856) 666. — Type: *Blume 1464*, fruit (lecto L, barcode L0001624, designated by De Wilde & Duyfjes (2006); iso L), Java.

*Thladiantha cordifolia* (Blume) Cogn. forma *glabrescens* Hochr., Candollea (1934) 287. — Type: *Hochreutiner 1255* (iso L), Java.

*Thladiantha calcarata* Cogn. in Hook.f., Fl. Brit. India 2, 3 (1880) Errata, without page; in A.DC. & C.DC., Monogr. Phan. 3 (1881) 423; Craib, Fl. Siam. (1931) 759; C.Jeffrey, Kew Bull. 34 (1980) 790. — Type: *Wallich Cat. 6740A* collection *Gomez* ('*Momordica calcarata*') (lecto K-W, designated by Jeffrey, Kew Bull. 34 (1980)), Sylhet.

*Trichosanthes javanica* Miq., Fl. Ned. Ind. 1, 1 (1856) 678. — Type: *Junghuhn 875* (holo U; iso L), Java.

*Gymnopetalum piperifolium* Miq., Fl. Ned. Ind. 1, 1 (1856) 680. — Type: *Horsfield s.n.* (K, not seen), Java.

*Gymnopetalum horsfieldii* Miq., Fl. Ned. Ind. 1, 1 (1856) 680. — Type: *Horsfield s.n.* (K, not seen), Java.

Perennial climber to 6 m long, leafy stem 2(–3) mm diam., subglabrous or hairy. *Probract* usually present. *Tendrils* spiralling throughout their length or only in the upper part. *Leaves*: petiole 3–6 cm long, finely hairy or subglabrous; blade simple, ovate, 6–10 by 4–9 cm, upper surface appressed-hairy, scabrous by cystoliths, lower surface

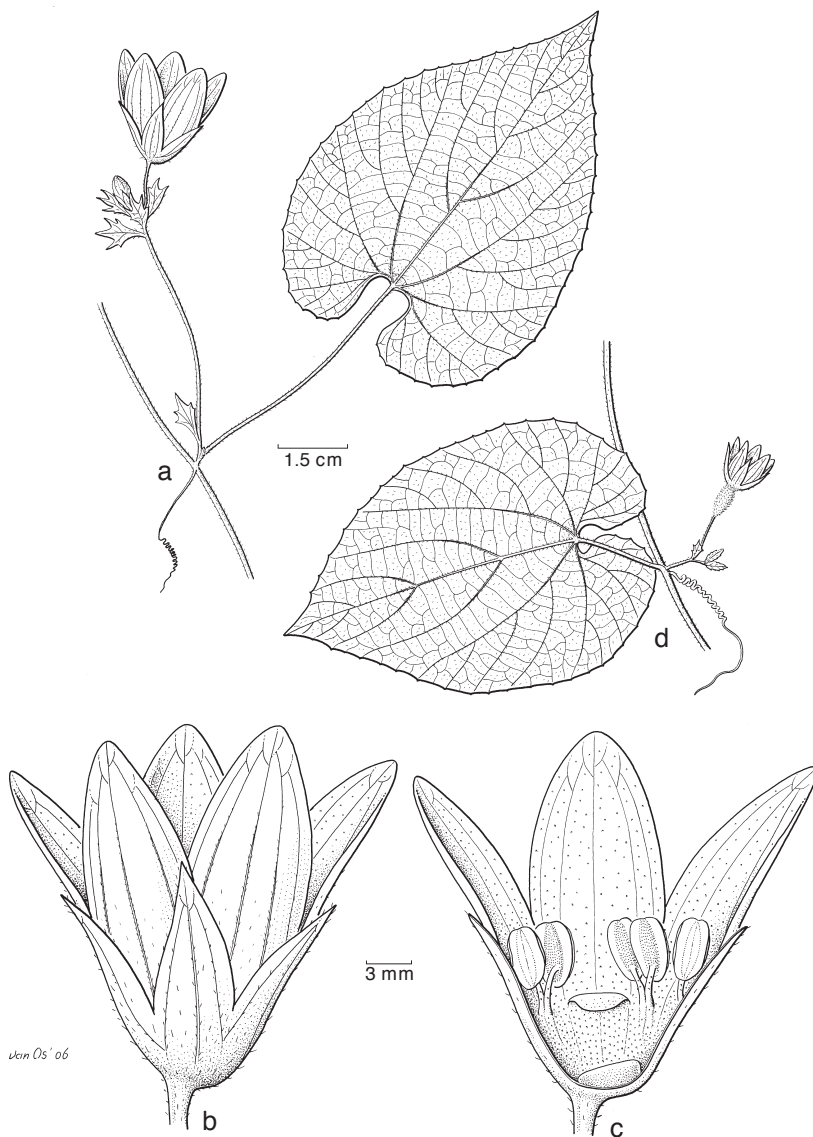


Fig. 67. *Thladiantha cordifolia* (Blume) Cogn. a. Node with male inflorescence; b. male flower; c. idem, opened, partly schematic, note eccentrically situated disc-gland; d. node with 1-flowered female inflorescence (a–c: Wiering & Janzen 3417; d: Docters van Leeuwen s.n., 28-09-1910).

hairy or subglabrous, base deeply cordate, margin coarsely or finely dentate. *Male inflorescence* a 5–10 cm long peduncled bracteate raceme (sometimes with a previously developed solitary flower at base), sparsely minutely pubescent; peduncle 2–5 cm long, at or close to the base with a rhombiform or subelliptic (5–)10 mm long irregularly incised probract; flower bracts conspicuous, close together, in older inflorescences the rachis thickened by the scars of fallen flowers and bracts; bracts obovate or obtriangular,

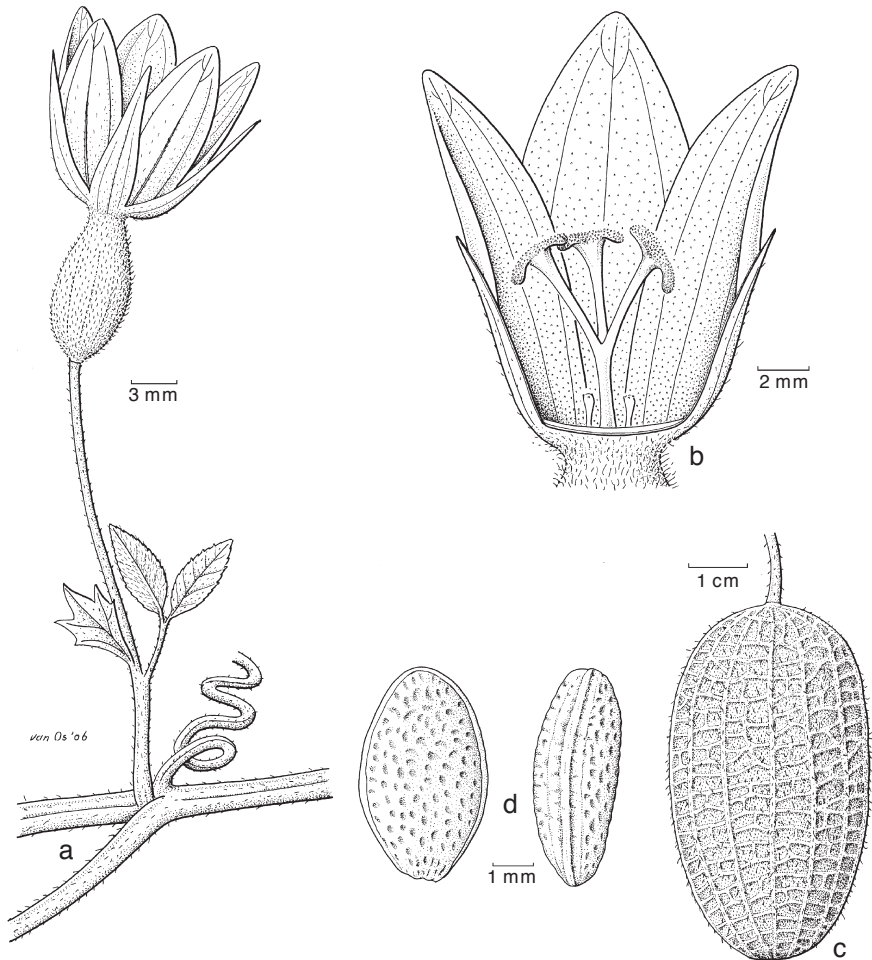


Fig. 68. *Thladiantha cordifolia* (Blume) Cogn. a. Node with 1-flowered female inflorescence; b. female flower, perianth partly removed, disc absent; c. fruit, note fenestrately pitted outer surface; d. seeds (a: *Docters van Leeuwen s.n.*, 28-09-1910; b: *Wongprasert s.n.* (SN 120885); c, d: *Maxwell 99-96*).

10–15 mm long, in the apical half (irregularly) dentate or incised to c. 1/4 deep. *Male flowers*: pedicel c. 10 mm long; receptacle-tube obliquely cup-shaped, tapering, 3–4 mm diam., throat short-hairy; sepals long-triangular or narrowly elliptic, 8–12 by 3–5 mm, acute, 3(–5)-veined, sometimes reflexed; petals obovate-elliptic, 15–20 by c. 15 mm, apex rounded and faintly dentate; filaments 3–5 mm long,  $\pm$  curved,  $\pm$  dilated towards the base, anthers 3–5 mm long, slightly curved, the median(?) petal with conspicuous curved scale, c. 4 mm long, concealing the disc at base of the receptacle-tube; disc inserted slightly laterally, large, ellipsoid, c. 4 mm long. *Female flowers*: solitary; pedicel 10–40 mm long, with probract at or near base; perianth as in male flowers; ovary ovoid-ellipsoid, densely woolly grey-hairy, c. 10 mm long; style-column c. 2 mm long, arms 4–5 mm long, stigmas broadly reniform, each c. 3 mm diam.; staminodes

c. 1.5 mm long, erect, disc not obvious. *Fruit* solitary; narrowly ellipsoid, (2–)3–6 by 2–2.5 cm, broadly rounded at both ends, sparsely or densely bristly hairy, outer surface fenestrately pitted in c. 15 rows; fruiting pedicel 1.5–4 cm long. *Seeds* ovoid, 5–6 mm long, somewhat flattened, rugose, edge shallowly 2-grooved. — **Fig. 67, 68;**

**Plate 24.**

Distribution — [Eastern?] East India, Myanmar, Thailand to South China; in *Malesia*: Sumatra and Java; not known from Peninsular Malaysia.

Habitat & Ecology — Primary forest and forest edges, open places in disturbed forest, scrub, along rivers and near waterfalls; to 1500 m altitude.

**2. *Thladiantha nudiflora* Hemsl.**

*Thladiantha nudiflora* Hemsl. in F.B.Forbes & Hemsl., J. Linn. Soc. Bot. 23 (1887) 316, pl. 8; C.Jeffrey, Cucurbitaceae E. Asia (1980) 28; W.J.de Wilde & Duyfjes, Reinwardtia 12 (2009) 412. — Type (syntype, Jeffrey 1980): *Henry 3253, 2937, 2208, 2937A, 2005* (all K, lectotype not designated), China (Hupeh and Nanto).

*Thladiantha formosana* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25, Art. 19 (1908) 100, pl. 11. — Type: *Nakahara s.n., October 1906* (holo TI?, not seen), Taiwan (Tozan).

Perennial climber to 5(?) m long, leafy stem 2–3 mm diam., plant pubescent-hispid. *Probract* absent. *Tendrils* 2-branched or unbranched, spiralling in the upper 2/3. *Leaves*: petiole 3–5(–12) cm long, hispid or soft hairy; blade simple, broadly ovate, 6–13(–15) by 5.5–10(–13) cm, upper surface scabrous hairy and with minute cystoliths, lower surface densely yellowish or grey hispid, especially on the veinlets, margin serrate, sometimes faintly lobed. *Male inflorescences* a simple raceme or few-branched, with small leaves at base of ramifications, 4–10 cm long, pubescent; peduncle 2–3 cm long, raceme 1.5–5 cm long, (5–)10-flowered, pedicels persistent, bracts minute, caducous. *Flowers* densely yellowish grey long-pubescent. *Male flowers*: pedicel 3–5 mm long (to 10 mm in solitary flower at base of raceme); receptacle tube shallow, 4(–5) mm wide; sepals oblong, acute, 3–5(–6) mm long, 3-nerved; petals ovate-oblong, acute, 8–12(–15) by 6–7 mm, basal petal scale distinct; stamens free, inserted at base of receptacle, filaments c. 4 mm long, anthers c. 2.5 mm long; basal disc globose, not seen. *Female flowers* solitary; pedicel 10–20 mm long, villose; probract not seen; perianth as in male flowers; ovary oblong, 12–15 by 4–5 mm, villose-hispid; style 3-armed, stigmas large, reniform (2-lobed); staminodes small. *Fruit* (brown-)red, oblong, 3–5 by 3–3.5(–4) cm, apex obtuse, smooth, pubescent, glabrescent. *Seeds* c. 5 by 3.5–4 mm, reticulate.

Distribution — South China, Taiwan; in *Malesia*: Philippines (Mindanao), where known from one collection, *Schwabe s.n.* (B), of which the precise location and habitat are unknown.

Habitat & Ecology — (In Taiwan) montane.

Note — In the original description (Hemsley in Forbes & Hemsley, 1887) the inflorescences are described as racemose, but figured (plate. 8) as paniculate and glabrous. Hayata (1908, plate 11), for the synonym *T. formosana*, depicts a good habit and male flower details.

### 35. TRICHOSANTHES

*Trichosanthes* L., Sp. Pl. 1 (1753) 1008; Lour., Fl. Cochinch. (1790) 588; Blume, Bijdr. 15 (1826) 932; Miq., Fl. Ned. Ind. 1, 1 (1856) 674; C.B. Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 606; Cogn. in A.D.C. & C.D.C., Monogr. Phan. 3 (1881) 351; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 302; Keraudren in Aubrév. & J.-F. Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 75; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999); W.J. de Wilde & Duyfjes, Fl. Thailand 9, 4 (2008) 514. — Lectotype (Green, Prop. Brit. Bot. (1929) 190): *Trichosanthes anguina* L.

*Cucumeroides* Gaertn. Fruct. Sem. 2 (1791) 485, t. 4.

*Involucraria* Ser., Mém. Soc. Phys. Genève. 3, 1 (1825) 25, t. 5.

Climber, wild or cultivated, perennial (annual), 3–30 m long, leafy stem 2–5 mm diam.; dioecious, less frequently monoecious *Probract* present or absent. *Tendrils* unbranched or 2–5(–9)-branched below halfway. *Leaves*: membranous or coriaceous, glabrous, glabrescent, scabrous, or hairy; blade simple or foliolate, unlobed or lobed, margin entire or dentate. Petals white, sometimes reddish veined, free, long-fringed, the fringes sometimes reddish or yellow. *Male inflorescences*: bracteate racemes. *Male flowers*: receptacle-tube elongate; sepals much shorter than petals; stamens 3, inserted in the receptacle-tube mostly towards the throat, included; filaments short, free, mostly shorter than anthers; anthers two 2-thecous, one 1-thecous, mostly united into an elongate truncate synandrium, the thecae narrow, S-shaped; disc present as 3 mostly linear bodies at base of receptacle-tube. *Female inflorescences*: flowers solitary (sometimes co-axillary with male raceme). *Female flowers*: style one, slender, stigmas 1 (deeply) lobed, or 3, entire or 2-lobed. *Fruits* solitary (or few), ripening (orange-)red or green, often lighter striped, berry-like, exocarp leathery or woody, indehiscent, ellipsoid, globose or fusiform, 5–20 cm long (elongate, 100 cm long, in cultivated *T. cucumerina* var. *anguina*), smooth, hairy or glabrous; pulp (mesocarp) green-black, or white or (orange-)red, bitter or sweet of taste, sometimes fibrous. *Seeds* numerous, light or dark brown, grey (or black), compressed or tumid (with inflated sides), variable of shape, faces not or little sculptured, margin usually present, edge usually smooth, or crenate or undulate.

Distribution — About 100 species, throughout subtropical and tropical eastern Asia: from India, South China and Japan, east to tropical Australia and Fiji; in *Malesia* 43 species in 6 not well-defined sections.

Notes — 1. *Flower characters*: detailed characteristics of the flowers are sometimes left out because frequently only incomplete material is available. Moreover, the flowers are fragile, and not easy to analyse from boiled dry material. In *Trichosanthes* the general shape of the petals is either narrowly elliptic with long fringes all along the margins, in bud folded spherical, e.g. in *T. pilosa*; in other species general shape of the petals is obtriangular with the fringes shorter to the top, and the petals in bud folded in a more elongate body, e.g. in *T. quinquangulata*. We feel that this character state could be used for the distinction of sections.

2. *Sepals*: these are free, narrowly triangular, ovate, narrowly ovate, or narrowly elliptic, often with a long-acute apex; the margin is entire, or dentate, or (coarsely) lacinate, or lobed. These characters are of important taxonomic value, but one should be aware that in some species the sepals of female flowers are entire, whereas in male flowers they are dentate or lacinate.

3. *Receptacle-tube and pseudo-ovary*: the receptacle is of a tubular shape, widened towards the apex, usually with white (long) hairs inside. In some species, e.g. *T. villosa*, and *T. intermedia*, the receptacle-tube of the male flowers forms a pseudo-ovary, the swollen base of the tube, which contains disk-like structures.

4. *Peduncle*: the male racemes are pedunculate, and the peduncle may be slender or (very) stout. In older male inflorescences the rachis may be thickened, bearing persistent old bracts and pedicels or pedicel scars. In some species the rachis is zigzag, e.g. in *T. refracta*.

5. *Straw-like appendage*: in the description of several *Trichosanthes* species from New Guinea a 'straw-like appendage' at the node is mentioned. This appendage originates either from the peduncle of the male raceme or from the pedicel of a solitary co-axillary male flower.

#### NOTE TO THE KEYS

Eleven keys are presented. The general keys 1 and 2 are for male flowering and female flowering/fruitletting specimens respectively. The remaining keys, 3–11, are regional keys applicable for all collections.

#### 1 – GENERAL KEY TO THE SPECIES

(for male flowering specimens, also based on vegetative characters and distribution)

- 1a. Leaf blade foliolate (in *T. celebica* and *T. wawrae* leaves sometimes partly or all simple). The 5 species normally with foliolate leaves are insufficiently known in the male flowering state, and hence cannot be keyed out.
  - Plants stout. Probract concave. — a. Peninsular Malaysia, Singapore, Sumatra, Borneo, Palawan: **13. T. elmeri**; b. Moluccas, New Guinea: **27. T. papuana**
  - Plants more delicate. Probract ± flat. — a. Peninsular Malaysia, Sumatra, Borneo, Java: **43. T. wawrae** (2 forms); b. Sulawesi, Moluccas: **5. T. celebica**; c. Lesser Sunda Islands: **15. T. floresana**
- b. Leaf blade simple. . . . . 2
- 2a. Plant monoecious. Bracts 1(–2) mm long, caducous. Flowering diurnal. Corolla 20(–30) mm diameter. — Widespread . . . . . **7. T. cucumerina** (2 varieties)
- b. Plant usually dioecious. Bracts 1 mm long or (much) longer, (late) caducous or persistent. Flowering nocturnal. Corolla 30 mm diam. or more. . . . . 3
- 3a. Younger twig and leaves densely soft-hairy, hairs 2 mm long or more . . . . . 4
- b. Younger twig and leaves scabrous, (sparsely) short-hairy or glabrous (glabrescent). . . . . 5
- 4a. Bracts large, 20–50(–60) mm long. — Borneo, Java, Philippines, Lesser Sunda Islands . . . . . **42. T. villosa** (2 subspecies)
- b. Bracts small, c. 1 mm long. — Sabah . . . . . **25. T. mucronata**
- 5a. Blade base at transition to the petiole with 2 bulgings or auricles with glands beneath (sect. *Asterosperma*). . . . . 6
- b. Blade base at transition to the petiole without gland-bearing bulgings or auricles 8
- 6a. Flowers solitary, axillary to leaves, conspicuously brown-hairy. — Sabah . . . . . **16. T. fusca**



- b. Flowers in peduncled racemes, minutely grey- or brown-hairy. . . . . 7
- 7a. Inflorescences inserted on older stems, far below the leaves. Bracts narrowly elliptic, entire. — Sabah. . . . . **32. *T. postarii***
- b. Inflorescences axillary to leaves. Bracts elliptic, dentate. — Borneo (Sarawak, Sabah, West, Central, and East Kalimantan) . . . . . **2. *T. auriculata***
- 8a. Leafy stem sharply ridged or winged. . . . . 9
- b. Leafy stem striate or grooved . . . . . 10
- 9a. Inflorescences axillary to leaves. Bracts large, broad. — Sabah . . . . . **20. *T. kinabaluensis***
- b. Inflorescences pendent, mostly below the leaves. Bracts small, narrow. — Sabah . . . . . **28. *T. pendula***
- 10a. Plant *not* from New Guinea. [Specimens with simple unlobed leaves may belong to a species usually with foliolate leaves, **5. *T. celebica***, or **43. *T. wawrae***; see lead 1] . . . . . 11
- b. Plant from New Guinea (including widespread **30. *T. pilosa***, **35. *T. quinquangulata***; see the regional key for New Guinea) . . . . . 32
- 11a. Bracts large, (10–)15 mm long or more . . . . . 18
- b. Bracts small, 1–15 mm long . . . . . 12
- 12a. Leaf blade unlobed, in outline circular, glabrous. — Sumatra **37. *T. rotundifolia***
- b. Leaf blade unlobed or lobed, in outline broadly ovate, glabrous or hairy . . . . 13
- 13a. Leaf blade finely hairy beneath, at least along the (finer) veins. [Bracts (2–)5–15 mm long.] — Widespread . . . . . **30. *T. pilosa***
- b. Leaf blade scabrous-hairy or (sub)glabrous beneath . . . . . 14
- 14a. Leaf blade unlobed, large, (8–)12–23 cm long, when older coriaceous, with recurved margin. [Bracts 5–7 mm long.] — Sumatra, West Java . . . **6. *T. coriacea***
- b. Leaf blade unlobed and often smaller, or (deeply) lobed . . . . . 15
- 15a. Veins raised beneath. Bracts minute, 1–3 mm long, caducous . . . . . 16
- b. Veins not or hardly raised beneath. Bracts larger, persistent . . . . . 17
- 16a. Leaf blades almost adherent to supporting tree trunk, scabrous. — Sabah . . . . . **1. *T. adhaerens***
- b. Leaf blades free (plant climbing freely), faintly scabrous or glabrous. . . . . **3. *T. beccariana*** (2 subspecies)
- 17a. Leaf blade unlobed or deeply 3(–5)-lobed. Pedicel remnants on rachis short, shorter than the bracts, bracts 6–15 mm long. — Sabah . . . . **19. *T. intermedia***
- b. Leaf blade deeply 5-lobed. Pedicel remnants on rachis about as long as bracts, bracts 7–12 mm long. — Northern Kalimantan, Sarawak, and Sabah . . . . . **23. *T. longispicata***
- 18a. Raceme including bracts finely yellowish soft-hairy; bracts entire, 35–70 mm long. Blade base cuneate-decurrent. Tendrils simple . . . . . **17. *T. globosa***
- b. Raceme including bracts brown-rusty hairy, glabrous or glabrescent. Tendrils branched . . . . . 19
- 19a. Bracts (ob)ovate, margin (sub)entire. — Widespread . . **35. *T. quinquangulata***
- b. Bracts incised. . . . . 20
- 20a. Leaf blade unlobed, margin coarsely dentate, blade glands few, large, 2–3 mm diameter. — Philippines . . . . . **31. *T. planiglans***

- b. Leaf blade unlobed or lobed, margin finely remotely denticulate, blade glands smaller . . . . . 21
- 21a. Rachis zigzag. — Borneo, Philippines; peat swamp forest . . . . . **36. T. refracta**
- b. Rachis straight . . . . . 22
- 22a. Bracts broad, deeply fan-shaped incised. Plant dull blackish on drying. — Borneo . . . . . **26. T. obscura**
- b. Bracts variously incised, but not deeply fan-shaped incised. Plant green, (reddish) brown or blackish on drying . . . . . 23
- 23a. Younger parts reddish on drying . . . . . 24
- b. Younger parts green, brown or blackish on drying . . . . . 25
- 24a. Probract narrowly elliptic or linear, 10–20 by c. 2 mm. Leaf blade finely hairy beneath. — Western Malesia . . . . . **33. T. pubera**
- b. Probract obovate or narrowly elliptic, 10–15 by 5–8 mm. Leaf blade ± scabrous beneath. — North Sumatra . . . . . **22. T. leuserensis**
- 25a. Bracts (deeply) finely incised. Leaf blade 3-lobed to about halfway deep, greenish on drying. — Philippines . . . . . **29. T. philippinensis**
- b. Bracts coarsely incised, i.e. at apex dentate. Leaf blade unlobed or variously lobed, greenish (brown) or brown on drying . . . . . 26
- 26a. Rachis stout, 3–7 mm diameter . . . . . 27
- b. Rachis more slender, 1.5–3 mm diameter . . . . . 29
- 27a. Leaf blade unlobed or shallowly (2- or)3-lobed, to 1/3 deep **39. T. sepilokensis**
- b. Leaf blade deeply 3–7-lobed . . . . . 28
- 28a. Blade glands scattered or at base only, 1–2 mm diameter. Peduncle 9–18 cm long. Bracts 40–50 mm long. — East Malesia . . . . . **41. T. valida**
- b. Blade glands absent or few near blade base, 1–3 mm diameter. Peduncle 2–6 cm long. Bracts 40–60 mm long. — West Malesia. **24. T. montana** (2 subspecies)
- 29a. Leaf blade unlobed. — Sarawak, Philippines . . . . . **12. T. ellipsoidea**
- b. Leaf blade lobed . . . . . 30
- 30a. Leaf blade 3-lobed, to 1/3–2/3 deep (leaves unlobed in forma *siberutensis*). — Widespread in West Malesia [Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Sulawesi, Lesser Sunda Islands, and Moluccas] . **40. T. tricuspидata** (4 forms)
- b. Leaf blade more deeply 5-lobed. . . . . 31
- 31a. Probract c. 4 by 2 mm, with few glands. — North Sumatra, Peninsular Malaysia . . . . . **14. T. emarginata**
- b. Probract 5–18 by 1–2 mm, glands absent. — Sumatra, Peninsular Malaysia, Singapore, Borneo . . . . . **4. T. borneensis**
- 32a. Leaf blade finely hairy beneath, especially along the smaller veins. Petals (excluding fringes) (narrowly) elliptic or (narrowly) ovate. — Widespread **30. T. pilosa**
- b. Leaf blade variously hairy or glabrous beneath. Petals obtriangular (cuneate) **33**
- 33a. Bracts entire, 10–30 mm long. — Widespread . . . . . **35. T. quinquangulata**
- b. Bracts dentate (incised), sometimes at very apex only, *or* bracts much smaller. Eight species endemic to New Guinea (male flowers not known in *T. dentifera*; see regional key for New Guinea, lead 11 onwards: *T. dentifera*, *T. dieniensis*, *T. densiflora*, *T. edulis* (3 varieties), *T. hastata*, *T. laeoica* (4 forms), *T. pulleana*, *T. schlechteri*).

## 2 – GENERAL KEY TO THE SPECIES

(applicable for *fruiting specimens* with emphasis on *seed characters*, also based on vegetative characters and distribution)

Note — Excluded from this key are 5 species of which fruit and seeds are not known: *T. adhaerens* (Sabah), *T. dieniensis* (Papua New Guinea), *T. fusca* (Sabah), *T. longispicata* (Sarawak), and *T. pulleana* (Moluccas, West Guinea).

- 1a. Leaf blade (2–)3–5-foliolate (in *T. celebica* and *T. wawrae* blades occasionally simple) . . . . . 2
- b. Leaf blade simple, lobed or unlobed . . . . . 6
- 2a. Probract chartaceous, ± flat. Texture of leaf blade various. Fruit 10 cm long or less, when fruit larger, then exocarp woody. . . . . 4
- b. Probract thick, ± concave. Leaf blade chartaceous or coriaceous. Fruit (narrowly) elliptic, (9–)10 cm long or more . . . . . 3
- 3a. Probract with glands. Exocarp leathery. Seeds 16–20 mm long. — West Malesia . . . . . **13. T. elmeri**
- b. Probract without glands. Exocarp woody. Seeds 20–27 mm long. — Moluccas, New Guinea. . . . . **27. T. papuana**
- 4a. Seeds ± ovate, 15–21 by 8–14 mm. — Sumatra, Peninsular Malaysia, Borneo, Java . . . . . **43. T. wawrae**
- b. Seeds narrower, (narrowly) elliptic, 9–17 by 3–6 mm . . . . . 5
- 5a. Fruiting pedicel 5–7 cm long; seeds elliptic, 9–10 by 4–4.5 mm. — Sulawesi, Moluccas . . . . . **5. T. celebica**
- b. Fruiting pedicel 1–1.5 cm long; seeds (narrowly) obovate, 11–16 by 6–10 mm. — Flores . . . . . **15. T. floresana**
- 6a. Plant (sub)annual; monoecious; diurnal. [Male bracts 1(–2) mm long, caducous.] Corolla 20(–30) mm diam. or less. Seeds thickish, compressed, with coarsely sinuate (undulate) edge. [Fruit small, or very much elongated in cultivated var. *anguina*.] — Widespread . . . . . **7. T. cucumerina** (2 varieties)
- b. Plant (sub)perennial; monoecious or dioecious; largely nocturnal. Corolla 30 mm diam. or more. Seeds either tumid, with median belt, or seeds compressed with edge smooth or ± crenulate (sometimes ± truncate or notched at one or both ends) . . . . . 7
- 7a. Seeds tumid (i.e. as if 3-parted, with the embryo in the middle) . . . . . 8
- b. Seeds compressed . . . . . 11
- 8a. Seeds fusiform (barrel-shaped), lateral sides ± conical (Fig. 91b). — Widespread. . . . . **30. T. pilosa**
- b. Seeds butterfly-like, with inflated sides. . . . . 9
- 9a. Stem angular. [Leaf blade scabrous, apex cuspidate. Seeds 10–12 by 17–20 by c. 5 mm.] — Sabah . . . . . **28. T. pendula**
- b. Stem terete. . . . . 10
- 10a. Apex of leaf blade (obtuse or) acute-acuminate, often with a short mucro. Seeds 6–10 by 7–12 by 2–3 mm. — Sumatra, Borneo. . . . . **3. T. beccariana** (2 subspecies)
- b. Apex of leaf blade acute-acuminate, with a 13–20(–25) mm long acumen. Seeds c. 10 by 18 by 4 mm. — Sabah. . . . . **25. T. mucronata**

- 11a. Seeds subcircular, with broad margin, radiately striate or not. Leaf blade unlobed. . . . . 12
- b. Seeds (ob)ovate or (narrowly) elliptic, margin narrower or absent. Leaf blade lobed or unlobed. . . . . 14
- 12a. Leaf blade subcircular in outline, auricles absent. — Sumatra. **37. *T. rotundifolia***
- b. Leaf blade (narrowly) ovate in outline, with at transition to petiole 2 gland-bearing bulges or auricles. — Borneo. . . . . 13
- 13a. Fruiting among or close to the leaves. . . . . **2. *T. auriculata***
- b. Fruiting far below the leaves . . . . . **32. *T. postarii***
- 14a. Seeds notched or undulate-truncate at one or two ends. . . . . 15
- b. Seeds neither notched nor undulate-truncate . . . . . 21
- 15a. Fruiting pedicel 2-coloured (with a smooth portion to the fruit). Seeds embedded in green-black pulp. — North Sumatra, Peninsular Malaysia . . . . **14. *T. emarginata***
- b. Fruiting pedicel evenly coloured; seeds embedded in white or pink pulp (fruit of *T. pulleana* not known). — New Guinea [sect. *Edulis*] . . . . . 16
- 16a. Leaf blade unlobed, subcoriaceous, ± hastate, mostly with some spines towards the base. . . . . **38. *T. schlechteri***
- b. Leaf blade unlobed or lobed, ± membranous, chartaceous or (sub)coriaceous, margin not spiny . . . . . 17
- 17a. Seeds with cuneate (acute) base, margin faint. Leaf blade unlobed, margin entire. Fruit with exocarp longitudinally grooved, ± woody, smooth. — Papua New Guinea (Woodlark Is., Bougainville Is.) . . . . . **9. *T. dentifera***
- b. Seeds truncate, without margin. Leaf blade lobed or unlobed. Fruit with exocarp leathery, drying ± wrinkled . . . . . 18
- 18a. Seeds subtriangular, at apex much broader than at base . . . . . 19
- b. Seeds narrowly elliptic, ± parallel-sided, ± equally broad at both ends (resembling seeds of the genus *Lagenaria*) . . . . . 20
- 19a. Fruit smooth on drying; fruiting pedicel 1.5–2.5 cm long, 2–3 mm thick. Seeds 8–10 mm long. [Male rachis not thickened; bracts dentate.] . . . . **18. *T. hastata***
- b. Fruit rough on drying; fruiting pedicel c. 3 cm long, 3 mm thick, finely brown-hairy. Seeds 10–13 mm long. [Male rachis thickened; bracts (sub)entire.] **8. *T. densiflora***
- 20a. Leaf blade chartaceous or coriaceous, glabrous. Fruiting pedicel 3–10 cm long . . . . . **11. *T. edulis*** (3 varieties)
- b. Leaf blade membranous or chartaceous, rough hairy on upper surface. Fruiting pedicel 1.5–3 cm long. . . . . **21. *T. laeocica*** (4 forms)
- 21a. Seeds at base chisel-shaped pointed. . . . . 22
- b. Seeds not pointed (base rounded or truncate) . . . . . 24
- 22a. Leaf blade broadly ovate in outline, unlobed, but margin coarsely dentate. Blade glands large, 2–5 mm diameter . . . . . **31. *T. planiglans***
- b. Leaf blade subcircular in outline, 5(–7)-angular or shallowly lobed. Blade glands small, c. 1 mm diam. or absent . . . . . 23
- 23a. Stem sharply angular; young shoots reddish. Leaf blade brown or greenish on drying. Fruit ripening orange, paler speckled. — Sabah . . . **20. *T. kinabaluensis***
- b. Stem grooved; young shoots green. Leaf blade blackish on drying. Fruit ripening evenly red. — Widespread. . . . . **35. *T. quinquangulata***

- 24a. Seeds, at least partly, (8–)10 mm wide or more . . . . . 25  
 b. Seeds less than (8–)10 mm wide . . . . . 27
- 25a. Plant villose all over. Fruit pulp white. Tendril 3–9-branched . . . . .  
 . . . . . **42. *T. villosa*** (2 subspecies)  
 b. Plant subglabrous. Fruit pulp green-black. Tendril 2- or 3-branched . . . . . 26
- 26a. Leaf blade sometimes simple, shallowly or deeply lobed (usually 3–5-foliolate). Fruit ovoid, evenly orange-red or yellow-striped; pericarp c. 5 mm thick . . . . .  
 . . . . . **43. *T. wawrae*** (2 forms)  
 b. Leaf blade 3–5-lobed. Fruit globose, whitish green-striped or not; pericarp 10–18 mm thick. — North Sumatra . . . . . **22. *T. leuserensis***
- 27a. Seeds (13–)15–21(–25) mm long . . . . . 28  
 b. Seeds less than 15 mm long . . . . . 35
- 28a. Fruiting pedicel 2-coloured, with a smooth part at the side of the fruit, the remaining part grooved . . . . . **4. *T. borneensis***  
 b. Fruiting pedicel evenly coloured and smooth overall . . . . . 29
- 29a. Fruiting pedicel 3–5 mm thick. Leaf blade drying dull, ± scabrous . . . . . 30  
 b. Fruiting pedicel 10 mm thick or more. Leaf blade not scabrous . . . . . 31
- 30a. Fruit globose . . . . . **26. *T. obscura***  
 b. Fruit ovoid . . . . . **19. *T. intermedia***
- 31a. Tendril simple. Blade base at transition to petiole ± cuneate . . . . . **17. *T. globosa***  
 b. Tendril 2–4-branched . . . . . 32
- 32a. Seeds ± rounded at both ends, 17–18 by 5–6 mm . . . . . **41. *T. valida***  
 b. Seeds subtruncate at base . . . . . 33
- 33a. Leaf blade deeply (3–)5-lobed (in juvenile stages entire). — Sumatra, Borneo, Java . . . . .  
 . . . . . **24. *T. montana*** (2 subspecies)  
 b. Leaf blade entire or 3-lobed . . . . . 34
- 34a. Fruit ellipsoid, c. 5 cm long, fruiting pedicel c. 2 cm long. — Sarawak, Philippines . . . . .  
 . . . . . **12. *T. ellipsoidea***  
 b. Fruit subglobose, 10–13 cm long, fruiting pedicel c. 4 cm long. — Sabah . . . . .  
 . . . . . **39. *T. sepilokensis***
- 35a. Leaf blade unlobed, ± coriaceous, margin recurved. — Central & South Sumatra and West Java . . . . . **6. *T. coriacea***  
 b. Leaf blade lobed (or unlobed), chartaceous or (sub)coriaceous, margin flat . . . . . 36
- 36a. Leaf blade reddish brown on drying. Probract narrowly elliptic or linear, 10–20 by c. 2 mm . . . . . 37  
 b. Leaf blade green-brown on drying. Probract (ob)ovate-elliptic, 3–15 by 4–8 mm . . . . . 38
- 37a. Fruit ovoid-ellipsoid; seeds 1–2 mm thick . . . . . **33. *T. pubera***  
 b. Fruit subglobose; seeds 3–4 mm thick . . . . . **22. *T. leuserensis***
- 38a. Fruit more than 10 cm long. — Sulawesi, Timor, Philippines, Moluccas . . . . .  
 . . . . . **41. *T. valida***  
 b. Fruit (much) less than 10 cm long . . . . . 39
- 39a. Fruiting pedicel 5–7 cm long. [Leaf blade simple, but usually 5-foliolate.] — Sulawesi, Moluccas . . . . . **5. *T. celebica***  
 b. Fruiting pedicel 1.5–2.5 cm long . . . . . 40

- 40a. Fruit ripening (possibly) green. — Borneo, Philippines; peat swamp forest . . . . . **36. *T. refracta***  
 b. Fruit ripening red. . . . . 41
- 41a. Fruit broadly ovoid, 6–7 cm long; dry pericarp 10–15 mm thick; fruiting pedicel  
 c. 2 mm thick. Leaf blade green on drying, margin usually conspicuously dentate.  
 — Philippines. . . . . **29. *T. philippinensis***
- b. Fruit (narrowly) ovoid, 7–9 cm long; dry pericarp 5–10 mm thick; fruiting pedicel  
 3–9 mm thick. Leaf blade (green-)brown on drying, margin usually entire or shallowly dentate (dentate in Sulawesi). — Widespread, not in the Philippines. . . . .  
 . . . . . **40. *T. tricuspidata*** (4 forms)

### 3 – KEY TO THE SPECIES OF SUMATRA (15 species)

- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| 3. <i>T. beccariana</i> Cogn.     | 24. <i>T. montana</i> Rugayah       |
| 4. <i>T. borneensis</i> Cogn.     | 30. <i>T. pilosa</i> Lour.          |
| 6. <i>T. coriacea</i> Blume       | 33. <i>T. pubera</i> Blume          |
| 7. <i>T. cucumerina</i> L.        | 35. <i>T. quinquangulata</i> A.Gray |
| 13. <i>T. elmeri</i> Merr.        | 37. <i>T. rotundifolia</i> Rugayah  |
| 14. <i>T. emarginata</i> Rugayah  | 40. <i>T. tricuspidata</i> Lour.    |
| 17. <i>T. globosa</i> Blume       | 43. <i>T. wawrae</i> Cogn.          |
| 22. <i>T. leuserensis</i> Rugayah |                                     |
- 1a. Leaf blade foliolate (sometimes partly or all simple). . . . . 2  
 b. Leaf blade simple (unlobed or lobed) . . . . . 3
- 2a. Plant slender, 2–5 m high. Leaf blade 3 foliolate, chartaceous; probract membranous, flat (sometimes caducous). Tendrils simple or 2-branched. Fruit 6–9 cm long . . . . . **43. *T. wawrae***  
 b. Plant stouter. Leaf blade 3–5 foliolate, coriaceous; probract chartaceous, incurved-concave. Tendrils 2- or 3-branched. Fruit more than 10 cm long. . . . .  
 . . . . . **13. *T. elmeri***
- 3a. Leaf blade unlobed. [Leaf blade subcircular or ovate, margin entire, minute sparse dents excepted.] . . . . . 4  
 b. Leaf blade lobed . . . . . 9
- 4a. Blade margin ± recurved . . . . . **6. *T. coriacea***  
 b. Blade margin flat . . . . . 5
- 5a. Leaf blade (usually) minutely hairy beneath, at least along the veinlets **30. *T. pilosa***  
 b. Leaf blade glabrous beneath . . . . . 6
- 6a. Veinlets raised beneath . . . . . **3. *T. beccariana***  
 b. Veinlets not or but little raised beneath . . . . . 7
- 7a. Leaf blade chartaceous, ovate; venation ± raised, distinct. Seeds 8–10 mm long.  
 — Siberut Is. . . . . **40. *T. tricuspidata*** forma **siberutensis**  
 b. Leaf blade ± membranous; venation flat, faint beneath. Seeds 15–20 mm long 8
- 8a. Leaf blade subcircular . . . . . **37. *T. rotundifolia***  
 b. Leaf blade ovate-hastate . . . . . **43. *T. wawrae***
- 9a. Plant with fruit (and female flowers). . . . . 10  
 b. Plant with male flowers . . . . . 22

- 10a. Fruit ovoid. Seeds tumid . . . . . 11  
 b. Fruit globose, ellipsoid, (ob)ovoid, or long-cylindrical. Seeds compressed . . 12
- 11a. Fruit pulp not fibrous. Seeds  $\pm$  fusiform (barrel-shaped) (Fig. 91b). **30. T. pilosa**  
 b. Fruit pulp fibrous. Seeds butterfly-shaped with inflated lateral parts. (Lobed leaf blades not seen in Sumatra) . . . . . **3. T. beccariana**
- 12a. Seed margin undulate or coarsely notched. Fruit  $\pm$  ellipsoid, 2.5–5 cm long, or long-cylindrical in cultivated var. *anguina* . . . . . **7. T. cucumerina**  
 b. Seed margin entire. Fruit globose, ellipsoid, or (ob)ovoid. . . . . 13
- 13a. Fruiting pedicel with 2 parts with differing surface colour and texture . . . . . 14  
 b. Fruiting pedicel evenly coloured . . . . . 15
- 14a. Fruit ellipsoid. Seeds notched at one end. . . . . **14. T. emarginata**  
 b. Fruit globose. Seeds not notched . . . . . **4. T. borneensis**
- 15a. Fruit (sub)globose . . . . . 16  
 b. Fruit longer than wide . . . . . 19
- 16a. Fruiting pedicel thick, 10–20 mm thick. . . . . 17  
 b. Fruiting pedicel c. 5 mm thick . . . . . 18
- 17a. Tendrils simple. Fruit globose, 5.5–12 cm diameter . . . . . **17. T. globosa**  
 b. Tendrils 2- or 3-branched. Fruit ellipsoid, more than 10 cm diameter . . . . .  
 . . . . . **24. T. montana** subsp. *montana*
- 18a. Leaf blade deeply 3–5-lobed. Seeds 3–4 mm thick, base and apex rounded . . .  
 . . . . . **22. T. leuserensis**  
 b. Leaf blade shallowly 5-lobed or  $\pm$  5-angular. Seeds 1–2 mm thick, chisel-shaped pointed at base . . . . . **35. T. quinquangulata**
- 19a. Fruit more than 10 cm long; fruiting pedicel c. 10 mm thick . . . . .  
 . . . . . **24. T. montana** subsp. *montana*  
 b. Fruit less than 10 cm long; fruiting pedicel 5 mm thick or less . . . . . 20
- 20a. Pericarp thin, less than 5 mm thick. Seeds (narrowly or) broadly ovate, 15–20 mm long, 2–3 mm thick . . . . . **43. T. wawrae**  
 b. Pericarp thick, c. 5 mm or more. Seeds obovate, 10–13 mm long, less than 2 mm thick . . . . . 21
- 21a. Leaf blade hairy beneath. Stem and leaf blade in young state reddish, reddish brown on drying. Probract narrowly elliptic or linear . . . . . **33. T. pubera**  
 b. Leaf blade glabrous. Stem and leaf blade green, (dark) brown on drying. Probract obovate or elliptic . . . . . **40. T. tricuspida**
- 22a. Bracts 1(–2) mm long, often caducous (including cultivated var. *anguina*) . . . .  
 . . . . . **7. T. cucumerina**  
 b. Bracts more than 2 mm long . . . . . 23
- 23a. Rachis 1–2 mm thick. . . . . 24  
 b. Rachis 2–10 mm thick. . . . . 25
- 24a. Persistent basal part of pedicel (1–)2–15 mm long. Leaf blade beneath finely hairy, at least along the veins. . . . . **30. T. pilosa**  
 b. Persistent basal part of pedicel usually (nearly) absent. Leaf blade scabrous . . .  
 . . . . . **43. T. wawrae**
- 25a. Rachis of raceme 5–10 mm thick . . . . . 26  
 b. Rachis of raceme 2–5 mm thick . . . . . 27

- 26a. Tendrils simple. Bracts membranous, with short soft yellowish hairs, margin entire . . . . . **17. *T. globosa***  
 b. Tendrils 3-branched. Bracts chartaceous, with minute brown hairs, apical part coarsely dentate . . . . . **24. *T. montana* subsp. *montana***
- 27a. Younger parts of shoots reddish tinged on drying . . . . . 28  
 b. Whole plant green, brown, or blackish on drying . . . . . 29
- 28a. Leaf blade glabrous. Petals white . . . . . **22. *T. leuserensis***  
 b. Leaf blade hairy beneath. Petals with pinkish veining and/or fringes . . . . .  
 . . . . . **33. *T. pubera***
- 29a. Leaf blade  $\pm$  5-angular, with several minute glands close to the insertion of the petiole. Bracts entire. [Sepals with slender sidelobes.] . . . . . **35. *T. quinquangulata***  
 b. Leaf blade (deeply) 3–5 lobed, c. 1/3 or deeper; glands fewer, not close to the insertion of the petiole. Bracts dentate . . . . . 30
- 30a. Leaf blade 3-lobed to c. 1/2-way deep, lobes  $\pm$  ovate-triangular. Bracts without glands. . . . . **40. *T. tricuspidata***  
 b. Leaf blade deeply 5-lobed, lobes narrowly ellipsoid. Bracts with glands . . . . 31
- 31a. Probract  $\pm$  elliptic, c. 4 mm long. [Seeds notched at apex] . . . . . **14. *T. emarginata***  
 b. Probract narrowly elliptic, 5–18 mm long. [Seeds  $\pm$  rounded at both ends] . . . .  
 . . . . . **4. *T. borneensis***

4 – KEY TO THE SPECIES OF PENINSULAR MALAYSIA & SINGAPORE (7 species)

- |                               |                                     |
|-------------------------------|-------------------------------------|
| 4. <i>T. borneensis</i> Cogn. | 35. <i>T. quinquangulata</i> A.Gray |
| 7. <i>T. cucumerina</i> L.    | 40. <i>T. tricuspidata</i> Lour.    |
| 13. <i>T. elmeri</i> Merr.    | 43. <i>T. wawrae</i> Cogn.          |
| 30. <i>T. pilosa</i> Lour.    |                                     |
- 1a. Leaf blade foliolate (in *T. wawrae* sometimes partly or all simple) . . . . . 2  
 b. Leaf blade simple. . . . . 3
- 2a. Leaf blade 3-foliolate, membranous or chartaceous. Probract membranous, flat, sometimes caducous. Tendrils 1- or 2-branched. Rachis of male raceme 1–1.5 mm thick. Fruit ovoid, 6–9 cm long. . . . . **43. *T. wawrae***  
 b. Leaf blade 3–5-foliolate, chartaceous or coriaceous. Probract chartaceous, concave. Tendrils 2- or 3-branched. Male rachis 2–3 mm thick. Fruit narrowly ovoid, more than 10 cm long . . . . . **13. *T. elmeri***
- 3a. Plant (sub)annual; monoecious. Leaf blade membranous, green-yellow on drying. Corolla 20(–30) mm diameter. Male bract 0.5–2 mm long, persistent or caducous. [Fruit small, ovoid, or much elongated, cylindrical in cultivated var. *anguina*.] Seeds with undulate margin . . . . . **7. *T. cucumerina***  
 b. Plant (sub)perennial; monoecious or dioecious. Leaf blade membranous or chartaceous, green, brown, or blackish on drying. Corolla more than 30 mm diameter. Male bract 3 mm long or more. Seeds without undulate margin . . . . . 4
- 4a. Plant with fruit (and female flowers) . . . . . 5  
 b. Plant with male racemes . . . . . 9
- 5a. Fruit globose . . . . . 6  
 b. Fruit ovoid or ellipsoid . . . . . 7



- 6a. Fruiting pedicel of 2 differently structured and coloured parts. Leaf blade deeply 5(–7)-lobed. Seeds  $\pm$  rounded at both ends . . . . . **4. *T. borneensis***  
 b. Fruiting pedicel of even colour and structure. Leaf blade  $\pm$  5-angular. Seeds chisel-shaped pointed at base . . . . . **35. *T. quinquangulata***  
 7a. Seeds tumid (barrel-shaped or (sub)fusiform) (Fig. 91b) . . . . . **30. *T. pilosa***  
 b. Seeds compressed, rounded at both ends . . . . . 8  
 8a. Leaf blade 3-lobed, (1/4–)1/2 deep. Fruit ripening evenly red. Seeds 10–13 mm long . . . . . **40. *T. tricuspidata***  
 b. Leaf blade variously lobed. Fruit ripening red, mostly yellow striped. Seeds 15–20 mm long . . . . . **43. *T. wawrae***  
 9a. Rachis 1–2 mm thick . . . . . 10  
 b. Rachis 2–4 mm thick or more . . . . . 11  
 10a. Leaf blade usually finely hairy beneath. [Seeds tumid (barrel-shaped or (sub)fusiform) (Fig. 91b).] . . . . . **30. *T. pilosa***  
 b. Leaf blade glabrous beneath. [Seeds compressed.] . . . . . **43. *T. wawrae***  
 11a. Leaf blade  $\pm$  5-angular, with small glands near the insertion of the petiole. Bracts entire. Sepals (mostly) with narrow lateral lobes . . . . . **35. *T. quinquangulata***  
 b. Leaf blade unlobed or variously lobed. Bracts incised. Sepals entire, rarely few-lobed . . . . . 12  
 12a. Leaf blade deeply 5–7-lobed, usually with few glands 1–3 mm diameter . . . . . **4. *T. borneensis***  
 b. Leaf blade 3-lobed, 1/4–1/2 deep; glands scattered, less than 1 mm diameter . . . . . **40. *T. tricuspidata***

## 5 – KEY TO THE SPECIES OF BORNEO (25 species)

- |   |  |
|---|--|
| 1. <i>T. adhaerens</i> W.J.de Wilde & Duyfjes   | 25. <i>T. mucronata</i> Rugayah              |
| 2. <i>T. auriculata</i> Rugayah                 | 26. <i>T. obscura</i> Rugayah                |
| 3. <i>T. beccariana</i> Cogn.                   | 28. <i>T. pendula</i> Rugayah                |
| 4. <i>T. borneensis</i> Cogn.                   | 30. <i>T. pilosa</i> Lour.                   |
| 7. <i>T. cucumerina</i> L.                      | 32. <i>T. postari</i> W.J.de Wilde & Duyfjes |
| 12. <i>T. ellipsoidea</i> Merr.                 | 33. <i>T. pubera</i> Blume                   |
| 13. <i>T. elmeri</i> Merr.                      | 35. <i>T. quinquangulata</i> A.Gray          |
| 14. <i>T. globosa</i> Blume                     | 36. <i>T. refracta</i> C.H.Yueh              |
| 16. <i>T. fusca</i> W.J.de Wilde & Duyfjes      | 39. <i>T. sepilokensis</i> Rugayah           |
| 19. <i>T. intermedia</i> W.J.de Wilde & Duyfjes | 40. <i>T. tricuspidata</i> Lour.             |
| 20. <i>T. kinabaluensis</i> Rugayah             | 42. <i>T. villosa</i> Blume                  |
| 23. <i>T. longispicata</i> Rugayah              | 43. <i>T. wawrae</i> Cogn.                   |
| 24. <i>T. montana</i> Rugayah                   |  |
- 1a. Leaf blade foliolate (in *T. wawrae* sometimes, in *T. elmeri* rarely, partly or all simple) . . . . . 2  
 b. Leaf blade simple (unlobed or lobed) . . . . . 3  
 2a. Leaf blade 3-foliate, membranous or chartaceous; probract membranous, flat (sometimes caducous). Tendrils simple or 2-branched. Male rachis 1–1.5 mm thick. Fruit 6–9 cm long . . . . . **43. *T. wawrae***

- b. Leaf blade 3–5-foliolate, chartaceous or coriaceous; probract chartaceous, concave. Tendrils 2- or 3-branched. Male rachis 2–3 mm thick. Fruit more than 10 cm long . . . . . **13. T. elmeri**
- 3a. Plant (sub)annual; monoecious. [Leaf blade membranous, green-yellow on drying.] Corolla 20(–30) mm diameter. Male bracts 1(–2) mm long, often caducous. [Fruit ovoid, or long-cylindrical in cultivated var. *anguina*.] Seeds with undulate margin . . . . . **7. T. cucumerina**
- b. Plant (sub)perennial; monoecious or dioecious. Corolla usually more than 30 mm diam. (smaller in *T. postari*). Male bract 3 mm long or more. Seeds tumid or compressed, not with undulate margin . . . . . 4
- 4a. Whole plant conspicuously (densely) soft hairy; hairs 1 mm long or more . . . 5
- b. Whole plant glabrous or (sparsely) hairy; hairs less than 1 mm long. . . . . 6
- 5a. Indumentum grey-rusty villose. Tendrils 5–15-branched, point of branching 1–2 cm from the base. Leaf blade without conspicuous mucro. Fruit broad ellipsoid (-globose), 9–15 cm long. Seeds compressed . . . . . **42. T. villosa**
- b. Indumentum grey, hirsute. Tendrils 3–5-branched, point of branching 2–4 cm from the base. Leaf blade with conspicuous mucro, 13–25 mm long. Fruit ellipsoid, 9–10 cm long. Seeds tumid . . . . . **25. T. mucronata**
- 6a. Leaf blade at transition to petiole with 2 gland-bearing auricles. [Male bracts linear. Fruit in a raceme, globose.] Seeds subcircular with broad radially striate margin . . . . . 7
- b. Leaf blade at base without auricles. Seeds tumid or compressed, without radially striate margin. . . . . 9
- 7a. Flowers conspicuously brown hairy (fruit and seed not known) . . . **16. T. fusca**
- b. Flowers greyish hairy or glabrous . . . . . 8
- 8a. Inflorescences borne on leafy twigs. . . . . **2. T. auriculata**
- b. Inflorescences borne on older stems . . . . . **32. T. postari**
- 9a. Stem sharply angular or ridged . . . . . 10
- b. Stem striate or grooved . . . . . 11
- 10a. Stem and leaf blade brown on drying, reddish tinged. Leaf apex without acumen. Probract narrowly elliptic. Male raceme solitary. Seeds compressed, with ± cuneate base, and broadly rounded apex . . . . . **20. T. kinabaluensis**
- b. Stem and leaf blade green on drying, not reddish tinged. Leaf apex often with a 10–25 mm long acumen. Probract absent. Male (and female) racemes mostly fascicled, pendent. Seeds tumid . . . . . **28. T. pendula**
- 11a. Plant with fruit (and/or female flowers). Fruit of *T. longispicata* not known . 12
- b. Plant with male flowers . . . . . 25
- 12a. Seeds tumid . . . . . 13
- b. Seeds compressed . . . . . 15
- 13a. Leaf venation ± flat beneath, usually minutely hairy. Fruit pulp not fibrous. Seeds barrel-shaped or (sub)fusiform (Fig. 91b) . . . . . **30. T. pilosa**
- b. Leaf venation much raised beneath, glabrous or hairy. Fruit pulp coarsely fibrous. Seeds butterfly-shaped. . . . . **14**
- 14a. Plant free-climbing . . . . . **3. T. beccariana**
- b. Plant growing adherent to tree trunks. (Fruit not known) . . . . . **1. T. adhaerens**

- 15a. Fruit globose . . . . . 16  
 b. Fruit ovoid or ellipsoid . . . . . 21
- 16a. Fruiting pedicel with two parts of different surface and colour. **4. T. borneensis**  
 b. Fruiting pedicel evenly coloured . . . . . 17
- 17a. Fruiting pedicel less than 10 mm thick . . . . . 18  
 b. Fruiting pedicel 10–15 mm thick. . . . . 19
- 18a. Leaf blade  $\pm$  5-angular, blackish on drying; glands several, 0.5–1 mm diam., close to the insertion of the petiole. Seeds 9–14 by 4–5 mm, chisel-shaped pointed at base . . . . . **35. T. quinquantulata**  
 b. Leaf blade unlobed or (deeply) lobed, brown-blackish on drying; glands absent or few, 1–2 mm diam., scattered but mainly towards the base of the blade. Seeds 18–22 by 7–8 mm, rounded at both ends . . . . . **26. T. obscura**
- 19a. Leaf blade pale green on drying. Tendrils simple . . . . . **17. T. globosa**  
 b. Leaf blade green or brown on drying. Tendrils (usually) 2–4(–5)-branched . 20
- 20a. Leaf blade unlobed or shallowly 3-lobed, green on drying. Fruiting pedicel c. 4 cm long. Seeds 13–18 by 7–9 mm . . . . . **39. T. sepilokensis**  
 b. Leaf blade deeply 5–7-lobed, greenish brown or blackish on drying. Fruiting pedicel c. 3 cm long. Seeds 17–20 mm long . . **24. T. montana** subsp. **crassipes**
- 21a. Plant slender, leafy stem 2–3 mm diameter. Pericarp  $\pm$  leathery, thin. . . . . 22  
 b. Plant stouter, leafy stem 3–4 mm diameter or more. Pericarp carnosose, c. 5 mm thick when dry. [Seeds c. 10 mm long. Leaf blade 3- or 5-lobed.] . . . . . 23
- 22a. Leaf blade ovate-hastate, usually  $\pm$  lobed; glands c. 0.5 mm diameter. Fruit 6–10 cm long, yellow striped. Seeds 15–18 mm long . . . . . **43. T. wawrae** and **19. T. intermedia**  
 b. Leaf blade (narrowly) ovate, unlobed; glands 1–2 mm diameter. Fruit c. 5 cm long (ripening colour not known). Seeds c. 13 mm long . . . . . **12. T. ellipsoidea**
- 23a. Fruit (possibly) ripening green. — Peat swamp forest. . . . . **36. T. refracta**  
 b. Fruit ripening red. . . . . 24
- 24a. Leaf blade ( $\pm$ ) hairy, 3–5-lobed, margin (coarsely) dentate. Young parts of shoots reddish brown on drying. Probract narrowly elliptic or linear, 10–20 mm long. Petal fringes tinged pinkish. Fruiting pedicel (1.5–)2–5 cm long. **33. T. pubera**  
 b. Leaf blade glabrous or early glabrescent, 3-lobed to 1/4–1/2 deep, margin entire or dentate. Young parts of shoots brown on drying. Probract obovate or elliptic, 5(–10) mm long. Petals fringes white. Fruiting pedicel 0.5–2.5 cm long . . . . . **40. T. tricuspida**
- 25a. Rachis of male raceme 1–1.5(–2) mm thick. Leaf blade frequently unlobed . 26  
 b. Rachis of male raceme 2–10 mm thick. Leaf blade mostly lobed . . . . . 29
- 26a. Blade glands c. 2 mm diameter . . . . . **12. T. ellipsoidea**  
 b. Blade glands less than 1 mm diameter, or absent. . . . . 27
- 27a. Leaf blade glabrous beneath (hairy in forma *hirsuta*). Persistent part of pedicel almost absent (sometimes persistent) . . . . . **43. T. wawrae**  
 b. Leaf blade  $\pm$  hairy beneath. Persistent part of pedicel 2 mm long or more . . . 28
- 28a. Venation on lower leaf surface raised. Peduncle short, 0.5–3 cm long . . . . . **3. T. beccariana**

- b. Venation on lower leaf surface  $\pm$  flat. Peduncle longer, (2-)5-8(-17) cm long  
 ..... **30. *T. pilosa***
- 29a. Leaf blade  $\pm$  5-angular. Bracts entire. Sepals mostly with narrow sidelobes . . . .  
 ..... **35. *T. quinquangulata***
- b. Leaf blade various. Bracts incised. Sepals entire or lobed. . . . . 30
- 30a. Persistent part of pedicel 5-10 mm long. Bracts 7-12 mm long . . . . .  
 ..... **23. *T. longispicata***
- b. Persistent part of pedicel shorter or absent. Bracts usually larger . . . . . 31
- 31a. Rachis 2-4 mm thick. . . . . 32
- b. Rachis 5-10(-20) mm thick . . . . . 37
- 32a. Rachis  $\pm$  zigzag . . . . . **36. *T. refracta***
- b. Rachis straight . . . . . 33
- 33a. Bracts less than 15 mm long . . . . . **19. *T. intermedia***
- b. Bracts more than 15 mm long . . . . . 34
- 34a. Bracts broad, deeply fan-shaped incised. Plant dull blackish on drying . . . . .  
 ..... **26. *T. obscura***
- b. Bracts incised, but not fan-shaped. Plant green or (reddish) brown on drying. 35
- 35a. Leaf blade  $\pm$  hairy. Shoots reddish tinged. Petal fringes tinged pinkish . . . . .  
 ..... **33. *T. pubera***
- b. Leaf blade glabrous or early glabrescent. Shoots green or brown on drying. Petal  
 fringes white . . . . . 36
- 36a. Leaf blade deeply 5-7-lobed. Blade glands few (or absent), near the insertion of  
 the petiole, 1-3 mm diameter. Probract narrowly elliptic, without glands. . . . .  
 ..... **4. *T. borneensis***
- b. Leaf blade 3-lobed to 1/4-1/3 of the blade. Blade glands scattered, less than 1 mm  
 diameter. Probract  $\pm$  (ob)ovate or elliptic, with conspicuous glands . . . . .  
 ..... **40. *T. tricuspida***
- 37a. Bracts entire, pale yellow soft hairy. Tendrils simple . . . . . **17. *T. globosa***
- b. Bracts incised. Tendrils 2-4-branched . . . . . 38
- 38a. Leaf blade unlobed or shallowly (2- or) 3-lobed. — Lowland **39. *T. sepilokensis***
- b. Leaf blade deeply 5(-7)-lobed. — Lowland and montane. . . . .  
 ..... **24. *T. montana* subsp. *crassipes***

## 6 – KEY TO THE SPECIES OF JAVA (10 species)

- |                               |                                     |
|-------------------------------|-------------------------------------|
| 6. <i>T. coriacea</i> Blume   | 33. <i>T. pubera</i> Blume          |
| 7. <i>T. cucumerina</i> L.    | 35. <i>T. quinquangulata</i> A.Gray |
| 17. <i>T. globosa</i> Blume   | 40. <i>T. tricuspida</i> Lour.      |
| 24. <i>T. montana</i> Rugayah | 42. <i>T. villosa</i> Blume         |
| 30. <i>T. pilosa</i> Lour.    | 43. <i>T. wawrae</i> Cogn.          |
- 1a. Leaf blade 3-foliolate. . . . . **43. *T. wawrae***
- b. Leaf blade simple, lobed or unlobed . . . . . 2
- 2a. Leaf blade (membranous) coriaceous, unlobed, margin entire, somewhat recurved.  
 [Male bracts small, 5-7 mm long, shifted upwards on the pedicel.] **6. *T. coriacea***

- b. Leaf blade (except in old stages) generally not coriaceous, unlobed or lobed, margin various, flat . . . . . 3
- 3a. Leaf blade and young stem conspicuously villose . . . . . **42. T. villosa**
- b. Leaf blade and stem hairy, or scabrous, not villose . . . . . 4
- 4a. Plant mostly annual. Leaf blade membranous. Flowers monoecious, nocturnal and diurnal; corolla small, 20(–30) mm diameter. Bracts of male inflorescences minute, 2 mm long or less, mostly caducous. Probract absent. Seeds compressed with undulate edge. (Fruit much elongated in cultivated var. *anguina*) . . . . . **7. T. cucumerina**
- b. Plant (sub)perennial. Leaf blade generally thicker. Flowers mostly dioecious (sometimes monoecious in *T. quinquangulata*), nocturnal; corolla 30 mm diameter or more. Bracts of male inflorescences 3 mm long or more, persistent or caducous. Probract present. Seeds tumid or compressed, edge not undulate . . . . . 5
- 5a. Bracts of male inflorescences less than 15 mm long. Seeds tumid (barrel-shaped or (sub)fusiform) (Fig. 91b); fruit ± ellipsoid-fusiform . . . . . **30. T. pilosa**
- b. Bracts of male inflorescences generally much larger. Seeds (rather) compressed, obovate or narrowly elliptic with truncate or cuneate base; fruit ovoid, ellipsoid or globose . . . . . 6
- 6a. Tendrils unbranched. Blade base mostly cuneate at transition to the petiole. Rachis of male inflorescences conspicuously thickened, bracts large, finely hairy. Fruit globose; fruiting pedicel stout. . . . . **17. T. globosa**
- b. Tendrils 3–5-branched. Blade base cordate. Rachis of male inflorescences thickened or not. Fruit (ob)ovoid or globose; fruiting pedicel generally more slender
- 7a. Rachis of male (or hermaphroditic) inflorescences conspicuously thickened and set with persistent dark-drying bracts. Leaf blade glabrous, deeply lobed. — Montane . . . . . **24. T. montana** subsp. **montana**
- b. Rachis not thickened. Leaf blade finely hairy beneath and deeply lobed, or glabrous and shallowly lobed. — Lowland or montane . . . . . 8
- 8a. Growing twig tinged reddish at apex. Leaf blade ± scabrid-hairy beneath, lobed to ± halfway or more. Probract narrowly elliptic or linear, entire or ± incised at apex. [Male bracts finely incised. Sepals mostly few-lobed. Fruit ovoid.] . . . . . **33. T. pubera**
- b. Growing twig green. Leaf blade glabrous (glabrescent) or scabrous, lobed to c. 1/3 deep. Probract (narrowly) ovate. . . . . 9
- 9a. Male bracts incised. Sepals in male flowers (sub)entire. Fruit ovoid. Leaf blade 3-lobed, glands scattered . . . . . **40. T. tricuspidata**
- b. Male bracts (almost) entire. Sepals in male flowers usually with few slender lobes. Fruit (depressed) globose. Leaf blade 5-angular or shallowly 5-lobed, glands usually several, close to the insertion of the petiole . . . . . **35. T. quinquangulata**





- 13a. Leaf blade usually  $\pm$  hairy beneath. Corolla c. 30 mm diameter . . . **30. T. pilosa**  
 b. Leaf blade glabrous (early glabrescent). Corolla larger . . . . . 14  
 14a. Raceme zigzag; bracts 10–40 mm long, shallowly incised to 3 mm deep, without glands . . . . . **36. T. refracta**  
 b. Raceme straight; bracts 25–45 mm long, deeply finely incised, 5–15 mm deep, with few glands . . . . . **29. T. philippinensis**

9 – KEY TO THE SPECIES OF LESSE SUNDA ISLANDS (7 species)

7. *T. cucumerina* L. . . . . 40. *T. tricuspidata* Lour.  
 15. *T. floresana* Rugayah . . . . . 41. *T. valida* Rugayah  
 30. *T. pilosa* Lour. . . . . 42. *T. villosa* Blume  
 35. *T. quinquangulata* A.Gray (not yet recorded for Lesser Sunda Islands)
- 1a. Leaf blade 3(–5)-foliolate (or partly unlobed ?) . . . . . **15. T. floresana**  
 b. Leaf blade simple (unlobed or lobed) . . . . . 2  
 2a. Plant (sub)annual; monoecious; diurnal. Male bracts 1(–2) mm long, mostly caducous. Corolla 20(–30) mm diameter. [Fruit small, ovoid, or long-cylindrical in cultivated var. *anguina*.] Seeds compressed, pale, with coarsely undulate edge . . . . . **7. T. cucumerina**  
 b. Plant (sub)perennial. Corolla c. 30 mm diam. or more. Seeds tumid or compressed, edge not undulate . . . . . 3  
 3a. Whole plant densely (grey-)brown villose . . . . . **42. T. villosa**  
 b. Plant thinly hairy or glabrous (glabrescent) . . . . . 4  
 4a. Plant with fruit (or female flowers) . . . . . 5  
 b. Plant with male flowers . . . . . 8  
 5a. Fruit globose. Seeds narrowly elliptic, chisel-shaped pointed at base. [Leaf blade  $\pm$  5-angular, blackish on drying; with several small glands close to the insertion of the petiole.] (Not yet recorded for Lesser Sunda Islands.) **35. T. quinquangulata**  
 b. Fruit ovoid(-ellipsoid). Seeds tumid or compressed, not pointed. [Leaf blade unlobed or (deeply) lobed.] . . . . . 6  
 6a. Seeds tumid (barrel-shaped or (sub)fusiform) (Fig. 91b). Leaf blade (sub)glabrous or hairy, at least on smaller veins beneath . . . . . **30. T. pilosa**  
 b. Seeds compressed, (narrowly) ovate, rounded at both ends. Leaf blade glabrous 7  
 7a. Fruit large, 10 cm long or more. Leaves not scabrid . . . . . **41. T. valida**  
 b. Fruit smaller. Leaf blade scabrid . . . . . **40. T. tricuspidata** forma **asperifolia**  
 8a. Leaf blade glabrous,  $\pm$  5-angular [blackish on drying, with several small glands near the insertion of the petiole.] Bracts c. 20 mm long, entire. Sepals with narrow sidelobes . . . . . **35. T. quinquangulata**  
 b. Leaf blade glabrous, hairy, or scabrous, unlobed or (deeply) lobed. Bracts (coarsely) indented, or much smaller, (sub)entire. Sepals (mostly) entire . . . . . 9  
 9a. Leaf blade subglabrous or hairy, at least on smaller veins beneath, not scabrous. Bracts 15 mm long or less, coarsely dentate or entire, without glands . **30. T. pilosa**  
 b. Leaf blade scabrous. Bracts c. 20 mm long, deeply indented, with glands . . . . . **40. T. tricuspidata** forma **asperifolia**





- 11a. Leaf margin finely dentate. Bracts and flowers (inflorescence) densely brown short-hairy. — Aru Islands. . . . . **34. *T. pulleana***  
 b. Leaf margin entire. Bracts and flowers (sub)glabrous. . . . . 12  
 12a. Persistent part of pedicel 2 mm long or more . . . . . **30. *T. pilosa***  
 b. Persistent part of pedicel less than 2 mm long or absent (flowers from Moluccas not seen) . . . . . **5. *T. celebica*** (Buru), **27. *T. papuana*** (Aru Islands)

11 – KEY TO THE SPECIES OF NEW GUINEA (13 species)

(see note at the end of this key)

- |  |                                     |
|--|-------------------------------------|
| 7. <i>T. cucumerina</i> L.                   | 27. <i>T. papuana</i> F.M.Bailey    |
| 8. <i>T. densiflora</i> Rugayah              | 30. <i>T. pilosa</i> Lour.          |
| 9. <i>T. dentifera</i> Rugayah               | 34. <i>T. pulleana</i> Harms        |
| 10. <i>T. dieniensis</i> Merr. & L.M.Perry   | 35. <i>T. quinquangulata</i> A.Gray |
| 11. <i>T. edulis</i> Rugayah                 | 38. <i>T. schlechteri</i> Harms     |
| 18. <i>T. hastata</i> Harms                  | 41. <i>T. valida</i> Rugayah        |
| 21. <i>T. laeoica</i> C.Y.Cheng & Lu Q.Huang |                                     |

- 1a. Leaf blade 3–5-foliolate (sometimes simple in juvenile stages) . **27. *T. papuana***  
 b. Leaf blade simple (unlobed or lobed) . . . . . 2  
 2a. Plant (sub)annual; monoecious; diurnal. Probract absent. Male bracts 1(–2) mm long, mostly fugacious. Corolla 20(–30) mm diameter. Seeds compressed, pale, with coarsely undulate edge. [Fruit small, ovoid, or long-cylindrical in cultivated var. *anguina*.] . . . . . **7. *T. cucumerina***  
 b. Plant (sub)perennial; monoecious or dioecious; largely nocturnal. Male bracts 5 mm long or more. Corolla 30 mm diam. or more. Seeds compressed (tumid in *T. pilosa*), not with undulate edge . . . . . 3  
 3a. Entire portion of petal narrowly elliptic. Seeds tumid (barrel-shaped or (sub)fusi-form) (Fig. 91b) . . . . . **30. *T. pilosa***  
 b. Entire portion of petal broader, ± obovate (apex ± truncate). Seeds compressed 4  
 4a. Male bracts c. 20 mm long, entire. Fruit depressed globose; [seeds embedded in green-black pulp, (narrowly) elliptic, chisel-shaped pointed at base. Leaf blade ± 5-angular.] . . . . . **35. *T. quinquangulata***  
 b. Male bracts longer or shorter, usually dentate. Fruit subglobose or ellipsoid . . . 5  
 5a. Male bracts 40–50 mm long, entire or shallowly lobed. Fruit pulp green-black. Seeds elliptic, rounded at both ends. . . . . **41. *T. valida***  
 b. Male bracts smaller, dentate (sometimes only at very apex), or bracts much smaller. Fruit subglobose (*T. laeoica*, p.p.) or (narrowly) ellipsoid; pulp not green-black; seeds various, usually densely packed. Leaf blade of various shape, unlobed or (deeply) lobed. [Old peduncles and/or pedicels often persistent, straw-like. Sect. *Edulis* (see note at the end of this key).] . . . . . 6  
 6a. Plant with fruit (or female flowers) (fruit not known in *T. dieniensis*, *T. pulleana*) . . . . . 7  
 b. Plant with male flowers (male flowers not known in *T. dentifera*). . . . . 14

- 7a. Leaf blade entire or lobed, broadly ovate or circular in outline . . . . . 12  
 b. Leaf blade entire, ovate-hastate or triangular in outline . . . . . 8
- 8a. Plant delicate. Leaf blade membranous, margin entire . . . . . **10. *T. dieniensis***  
 b. Plant stouter. Leaf blade various, margin (very) finely or coarsely dentate . . . . . 9
- 9a. Petiole hairy, at least in apical part near the base of the blade . . . . . **18. *T. hastata***  
 b. Petiole glabrous . . . . . 10
- 10a. Plant from montane area, 1700–2500 m altitude. Blade base cordate . . . . .  
 . . . . . **8. *T. densiflora***  
 b. Plant from lowland or lower montane area, up to 1500 m altitude. Blade base truncate or subhastate . . . . . 11
- 11a. Margin of leaf blade dentate, usually with some prickly teeth towards the base only. Blade base truncate or with shallow sinus . . . . . **38. *T. schlechteri***  
 b. Margin of leaf blade dentate with minute teeth only. Blade base with deep sinus . . . . . **34. *T. pulleana***
- 12a. Leaf blade entire. Young twig apices minutely sparsely hairy, early glabrescent. Seeds not truncate or but faintly notched at apex, cuneate at base. — Papua New Guinea (Woodlark Is., Bougainville Is.), and western Pacific . . . . . **9. *T. dentifera***  
 b. Leaf blade entire or (deeply) lobed. Young twig apices and male inflorescences hairy. Seeds truncate or notched at apex. — Whole of New Guinea . . . . . 13
- 13a. Leaf blade often scabrous above, short hairy or glabrescent beneath . . . . .  
 . . . . . **21. *T. laeoica***  
 b. Leaf blade glabrous, not scabrous, above, glabrous beneath (densely brown hairy in *T. edulis* var. *septemloba*) . . . . . **11. *T. edulis***
- 14a. Inflorescences (and flowers) densely hairy . . . . . 15  
 b. Inflorescences (sub)glabrous (glabrescent) . . . . . 17
- 15a. Hairs of inflorescences and flowers woolly, ± curly, dark brown, more than 2 mm long . . . . . **11. *T. edulis***  
 b. Hairs of inflorescences and flowers ± straight, light brown, 1–2 mm long . . . . . 16
- 16a. Leaf blade (narrowly) ovate or subhastate, unlobed, (sub)glabrous, not scabrous . . . . . **34. *T. pulleana***  
 b. Leaf blade ovate, unlobed or 3-lobed, hairy or glabrescent, scabrous above . . . . .  
 . . . . . **21. *T. laeoica***
- 17a. Plant delicate. Leaf blade membranous, ovate, margin entire. Bracts about 10 mm long . . . . . **10. *T. dieniensis***  
 b. Plant stouter. Leaf blade chartaceous or coriaceous, ± hastate, margin usually ± dentate. Bracts 10 mm long or more . . . . . 18
- 18a. Rachis 3–5 mm thick. Bracts 30–45 mm long. — Montane at 1500–2000 m . . . . .  
 . . . . . **8. *T. densiflora***  
 b. Rachis c. 2 mm thick. Bracts smaller. . . . . 19
- 19a. Leaf blade (sub)coriaceous, margin usually with some prickles towards the base. Petiole glabrous. Leafy stem and rachis ± zigzag. Bracts 8–13 mm long . . . . .  
 . . . . . **38. *T. schlechteri***  
 b. Leaf blade chartaceous, margin remotely (minutely) dentate. Petiole hairy or late glabrescent. Leafy stem and rachis straight. Bracts 8–20 mm long . . . . .  
 . . . . . **18. *T. hastata***

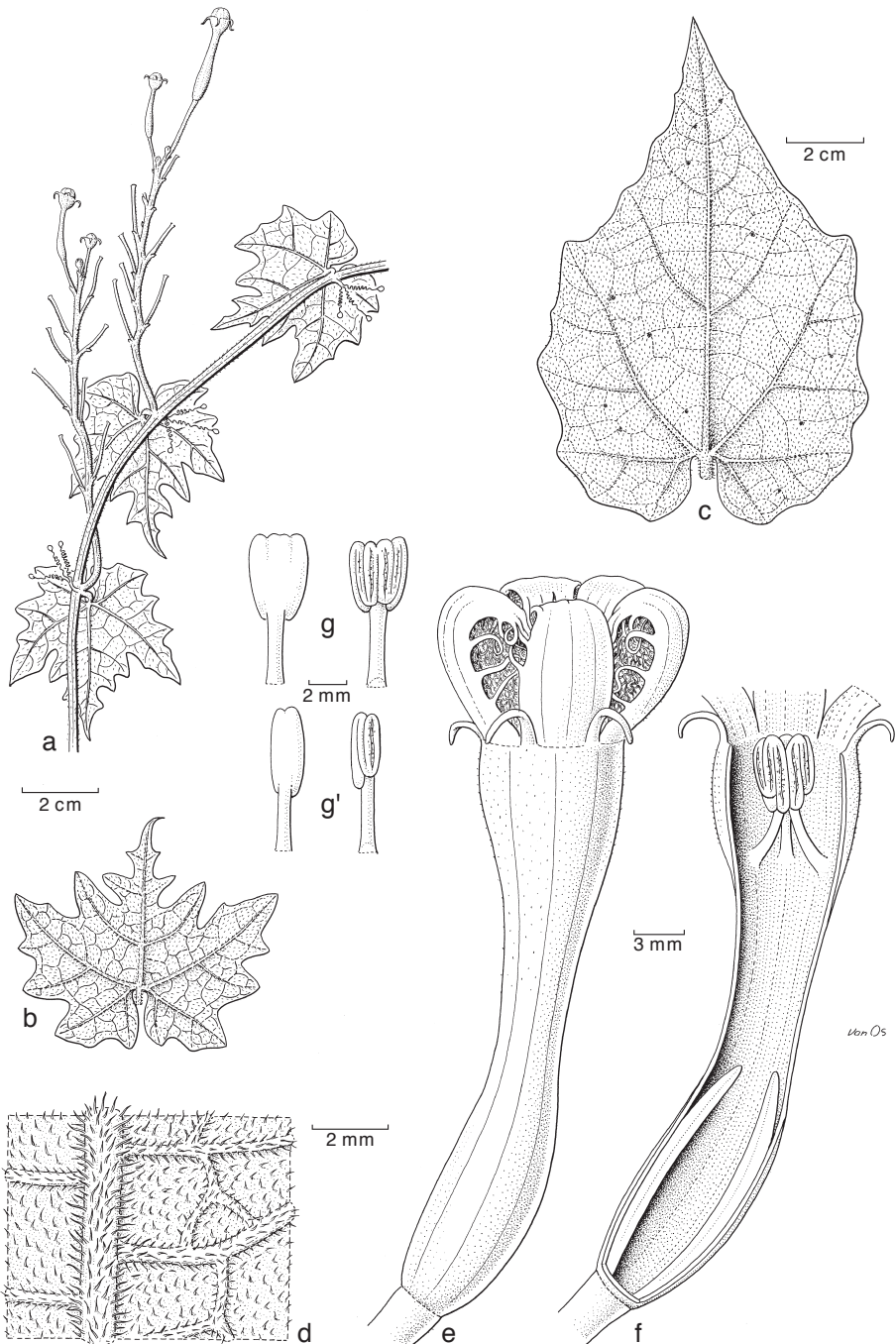


Fig. 69. *Trichosanthes adhaerens* W.J.de Wilde & Duyfjes. a. Male flowering leafy twig. b, c. leaves; d. detail of lower leaf blade surface; e. male flower; f. ditto, opened, showing disc elements and stamens; g. stamen, 2-thecous; g'. stamen, 1-thecous (all: *Lim, Postar & Markus SAN 143273*, type).

*Note on section Edulis Rugayah*

This section consists of 8 species mainly in New Guinea, of which 6 species seem to be mutually more closely related. The species are inadequately defined: *T. densiflora*, *T. dieniensis*, *T. hastata*, *T. laeovica*, *T. pulleana* (also in Moluccas), and *T. schlechteri*, largely due to lack of complete material. Especially the species circumscriptions of *T. hastata* and *T. schlechteri* are unclear. Both species were described by Harms (in Bot. Jahrb. Syst. 60 (1925) 159, 160), largely based on material collected by Schlechter, lost in Berlin. The present description of both species is composed from extant material and differs in some characters from the descriptions by Harms, notably the length of the bracts (in *T. schlechteri* according to Harms 20–30 mm long, in the present treatment 8–13 mm long) and the margin of the male sepals (in *T. hastata* according to Harms entire, in the present treatment entire or incised, or usually slenderly lobed or dentate). Of recent years only few new collections are known, but more material is needed to explain the discrepancies. Moreover, the available fruits of all species in the group are too scanty to frame a key based on fruit and seed characters; instead, for fruiting specimens, a provisional key mainly based on vegetative characters is presented.

**1. *Trichosanthes adhaerens* W.J.de Wilde & Duyfjes**

*Trichosanthes adhaerens* W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 11, f. 1. — Type: *Lim, Postar & Markus SAN 143273* (holo SAN; iso L), Borneo (Sabah, Sipitang, Sg Melabid).

Climber, 4–6 m long, clinging to tree trunk with adhesive pads on the tips of short tendrils, plant green-white harshly hairy, hairs 1–2 mm long, leafy stem 2–4 mm diam.; dioecious. *Probract* absent. *Tendrils* hairy, 5- or 6-branched. *Leaves*: petiole c. 0.5 cm long; blade green on drying, coriaceous, simple, shallowly or deeply 3(–5)-lobed, in outline broadly ovate or circular, 4–12 by 4–8 cm, scabrous, coarsely rough hairy, hairs c. 2 mm long, with glands scattered above and beneath, c. 0.5 mm diam., cystoliths absent, margin coarsely lobulate-dentate to c. 1 cm deep, apex acuminate-mucronate, 2–4 mm long mucronate; veins distinctly raised beneath. *Male raceme* erect; peduncle 1.5–2 cm long, 1–1.5 mm thick; rachis not thickened, 4–8 cm long, 8–10(–15)-flowered; bracts to 2 mm shifted upwards on the pedicel, caducous, (narrowly) elliptic, 1–2 mm long, entire, glands absent. *Male flowers*: pedicel 10–12 mm long, persistent, thickened and somewhat longer, c. 15 mm, when perianth is shed; receptacle-tube c. 30 mm long, faintly curved, slightly constricted in the middle, at throat c. 8 mm wide; sepals linear, ± recurved, c. 5 mm long, margin entire; petals ± elliptic, c. 15 mm long, threads 10(–15) mm long; synandrium c. 4 by 3 mm, anthers connivent (not fused), filaments free, slender, glabrous, c. 4 mm long; disc consisting of 3 firm-carnose elements, c. 15 by 2.5 mm, partly connate with the tube. *Female flowers* and *fruit* not known. — **Fig. 69.**

Distribution — *Malesia*: Borneo (Sabah; known only from the type collection).

Habitat & Ecology — Open disturbed area in lower montane fagaceous forest; flowering April.

Notes — 1. This species is close to *T. beccariana*, especially to subsp. *pusilla*, but the latter differs in leaves with shorter hairs, smaller male flowers with a c. 15 mm long receptacle-tube.

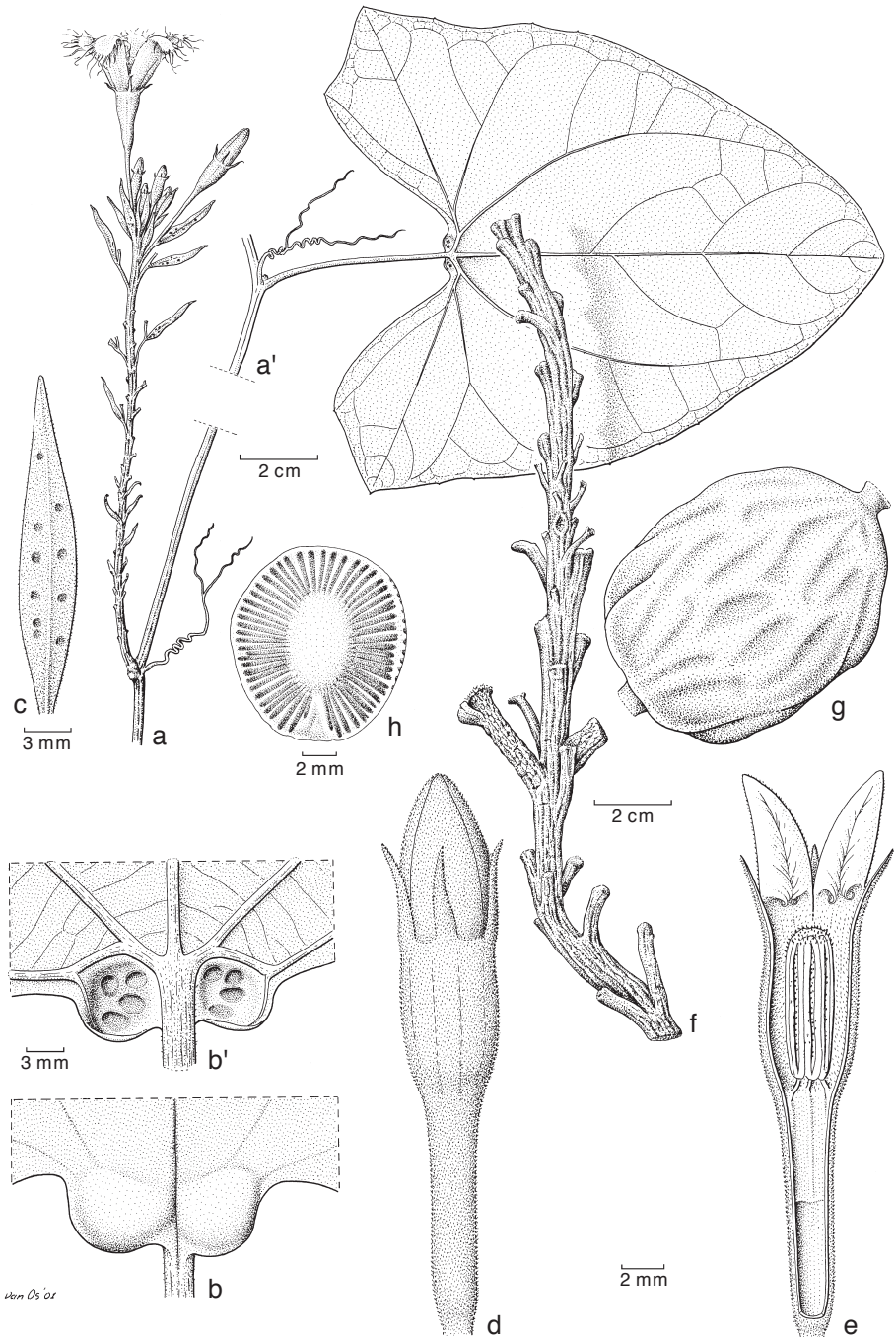


Fig. 70. *Trichosanthes auriculata* Rugayah. a, a'. Male flowering leafy twig; b, b'. base of leaf blade showing auricles, note glands on lower surface; c. male bract; d. male flower bud; e. ditto, opened; f. infructescence; g. fruit; h. seed (a–e: Church *et al.* 702; f–h: Chai S 36193, type).

2. Deeply divided leaves more or less appressed to a substrate occur commonly in juvenile stages of several *Trichosanthes* species, e.g. *T. tricuspidata*. The growth habit of *T. adhaerens* is possibly typical and unique for the species, and could be a neotenic trait.

## 2. *Trichosanthes auriculata* Rugayah

*Trichosanthes auriculata* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 3 (1998) 216; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 251; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 159, pl. 21; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 14, f. 2. — Type: *Chai S 36193* (holo L; iso K, KL, S), Borneo (Sarawak, Sg Apa).

Climber, sometimes creeping and rooting at the nodes, 15 m long, at first with minute hairs, glabrescent, leafy stem 3–5 mm diam.; dioecious or monoecious. *Probract* absent. *Tendrils* 2-branched. *Leaves*: petiole (3–)4.5–8 cm long; blade green on drying, membranous, or chartaceous, simple, unlobed, in outline (narrowly) ovate, (5.5–)10–26 by 9–19.5 cm, scabrous above, glands several, scattered, 0.5–1 mm diam., base with 2 concave auricles c. 5 mm diam. laterally at apex of petiole, each with 2–7 glands, margin entire or shallowly sinuate towards the base, with few small teeth c. 0.5 mm long, apex sometimes rounded. *Male raceme* shortly brown hairy, partly glabrescent; peduncle 1–5 cm long, 2–3 mm thick; rachis not thickened, 10–14 cm long, 15–35-flowered; bracts subsistent, to halfway shifted upwards on the pedicel, lanceolate, 10–20 mm long, entire, glands few, small. *Male flowers*: pedicel 10–20 mm long, persistent or caducous; receptacle-tube 5-ribbed, lower part tapered to the base, 18–27 mm long, at throat c. 5 mm wide; sepals linear, 4–7 mm long, c. 1 mm wide at base, entire; petals in bud forming an 8–12 mm long elongate body, petals at anthesis obovate, 15–22 mm long, threads 7–10 mm long; synandrium 6–7 mm long, anthers fused in the upper part only, filaments glabrous, free, slender, 1–1.5 mm long, inserted at c. 1/3 of the tube below the throat, each continuing into a rib ending in a low 3-lobed ring in the basal part of the tube; disc absent. *Female flowers*: in a raceme (always?); pedicel c. 20 mm long; ovary ellipsoid, c. 8 mm long; perianth incompletely known. *Fruit* 1–4 per infructescence, ripening green with paler or yellowish streaks, broad-ellipsoid, c. 10 by 7 cm, apex c. 6 mm beaked; dry pericarp leathery, c. 6 mm thick, smooth; pulp white, finely fibrous; fruiting pedicel c. 2.5 cm long, 7 mm thick. *Seeds* brown, compressed, subcircular, 8–10 by c. 1 mm, margin broad, radiately ribbed, entire. — **Fig. 70.**

Distribution — *Malesia*: Borneo (Sarawak; Sabah; West, Central, East Kalimantan).

Habitat & Ecology — Forest edges and recently disturbed places; to 600 m altitude. Flowering & fruiting throughout the year.

Notes — 1. The limited material available suggests that this species may be (partly) monoecious. There is one collection of a twig with male racemes and a detached fruit, and one other collection with stout racemes with two fruits and numerous persistent pedicels possibly of male flowers. The elongate shape of the folded petals in male buds and the habit of creeping and rooting at the nodes are reminiscent of the genus *Gymnopetalum*.

2. The present species occupies an isolated position within the genus *Trichosanthes*, particularly by its seeds with radiately ribbed margin, and the gland-bearing auricles at the blade base; the latter characters are also found in *T. postarii*.

### 3. *Trichosanthes beccariana* Cogn.

*Trichosanthes beccariana* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 380; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 251; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 77; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 15. — Type: *Beccari 802 bis* (lecto FI, designated by Rugayah (1999); iso K, MEL), West Sumatra, Padang Province, Ajer Mantjoer.

Climber to 12 m long, grey-brown short-hairy, mostly glabrescent, leafy stem 1.5–3 mm diam.; dioecious or monoecious. *Probract* absent. *Tendrils* unbranched or 2- or 3-branched. *Leaves*: petiole 1–3 cm long; blade green on drying, membranous, thinly chartaceous or (sub)coriaceous, simple, unlobed or 3–5-lobed to 1/2 deep, in outline ovate-oblong, 4–21 by 2.5–9 cm, not or faintly scabrous above and beneath, glands few to many, scattered, 0.5 mm diam., cystoliths sometimes on veins beneath, margin entire or irregularly coarsely sinuate, rarely ± dentate, apex rarely obtuse, often with a short mucro; veins 3–5, curved, veinlets raised beneath. *Male raceme* grey-rusty pubescent, sometimes mixed with a few female flowers towards the base; peduncle 0.5–3 cm long, c. 1 mm thick; rachis not thickened, 3.5–12.5 cm long, 3–25-flowered; bracts subsistent or caducous, on the rachis or to 5 mm shifted upwards on the pedicel, elliptic, 2–3 by 0.5–2 mm, entire, with minute glands. *Male flowers*: pedicel 3–10 mm long, persistent; receptacle-tube 15–20 mm long, at throat 3–4 mm wide; sepals narrowly triangular or linear, c. 2 mm long, 1–2 mm wide at base, entire; petals narrowly elliptic, c. 10 mm long, threads c. 10 mm long; synandrium c. 3 mm long, filaments glabrous, 1.5 mm long. *Female flowers*: pedicel 10–20 mm long (when solitary at the node), 5–10 mm long (when mixed in male raceme); ovary hairy, oblong-fusiform, c. 10 mm long, stigma 4- or 5-lobed (always?). *Fruit* ripening orange-red, paler striped, ovoid-ellipsoid or (narrowly) ellipsoid, 2–10 by 2–6.5 cm, apex subacute and shortly beaked; exocarp leathery or papery, 0.5–1 mm thick; pericarp ± carnosous, when dry 5 mm thick; pulp orange-red, conspicuously fibrous; fruiting pedicel 2–3 cm long (at the nodes), 0.5–2 cm long (in the raceme), c. 2 mm thick. *Seeds* dark brown, tumid, with two lateral inflated parts, 6–10 by 7–12 by 2–3 mm, edge entire.

Distribution — *Malesia*: West Central Sumatra and all over Borneo; 2 subspecies.

#### KEY TO THE SUBSPECIES

- 1a. Leaves glabrous above (except the 1 mm long hairy midrib); fruit 6–10 by 3.5–6.5 cm; seeds 8–10 by 10–12 mm. . . . . **a. subsp. beccariana**
- b. Leaves usually short soft-hairy above; fruit 2–4.5(–6) by 2–3 cm; seeds 6–7 by 7–10 mm . . . . . **b. subsp. pusilla**

#### **a. subsp. beccariana**

Climber to 12 m long. *Leaves*: blade chartaceous, unlobed, in outline ovate-elliptic, 7–19 by 4–12 cm, glabrous above (except hairy midrib), glabrescent beneath. *Male raceme* 3–9 cm long; peduncle 1.5–2.5 cm long. *Fruit* ovoid or narrowly ellipsoid, 6–10 by 3.5–6.5 cm; exocarp leathery. *Seeds* 8–10 by 10–12 mm. — **Plate 25a–c.**



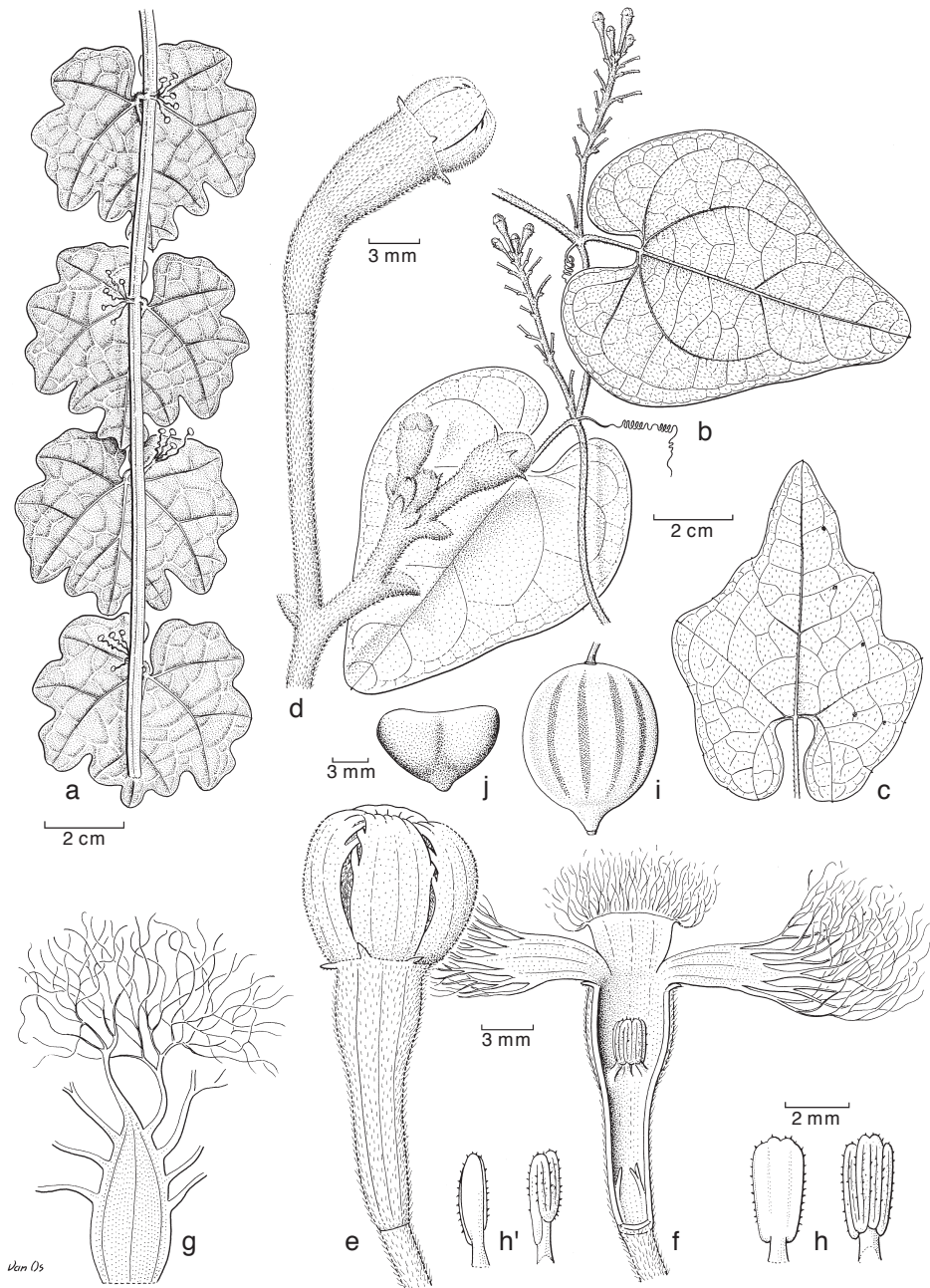


Fig. 71. *Trichosanthes beccariana* Cogn. subsp. *pusilla* Rugayah. a. Juvenile leafy twig, note adhesive discs at apex of tendrils; b. male flowering leafy twig; c. leaf; d. part of male inflorescence; e. male flower bud; f. male flower opened showing disc elements and androecium; g. petal of male flower; h. stamen, 2-thecous; h'. stamen, 1-thecous; i. fruit; j. seed (a: De Wilde, Postar & Ubaldus SAN 144010; b-h': De Wilde, Postar & Ubaldus SAN 144006; i, j: Fedilis Krispinus SAN 95877).

Distribution — West Central Sumatra (where only known from the type); North Borneo (Kalimantan and Sabah).

Habitat & Ecology — Primary forest edges, lower montane forest, roadsides; 300–1500 m altitude.

**b. subsp. *pusilla* Rugayah**

*Trichosanthes beccariana* Cogn. subsp. *pusilla* Rugayah in Rugayah & W.J.de Wilde, *Reinwardtia* 11, 3 (1998) 217; 11, 4 (1999) 251; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 79. — Type: *Mogea & de Wilde 4372* (holo BO; iso K, L), Central Kalimantan.

Climber to 15 m long. *Leaves*: blade membranous, unlobed or 3(–5)-lobed, or margin deeply sinuate, in outline (narrowly) ovate, 4–11 by 1.5–6 cm, usually densely soft-hairy above. *Male raceme*: wholly grey soft-hairy, 1.5–5 cm long; peduncle 0.5–3 cm long. *Fruit* ovoid or ellipsoid, 2–4.5(–6) cm long, 2–3 cm wide; exocarp papery. *Seeds* 6–7 by 7–10 mm. — **Fig. 71.**

Distribution — *Malesia*: Borneo (Sarawak, Sabah, and Central & East Kalimantan).

Habitat & Ecology — Primary forest, hill forest, forest edges, logged over areas, open areas in newly disturbed forest, roadside scrub, along riversides, on yellow clay soil; from sea level to 350 m altitude. Flowering and fruiting throughout the year.

**4. *Trichosanthes borneensis* Cogn.**

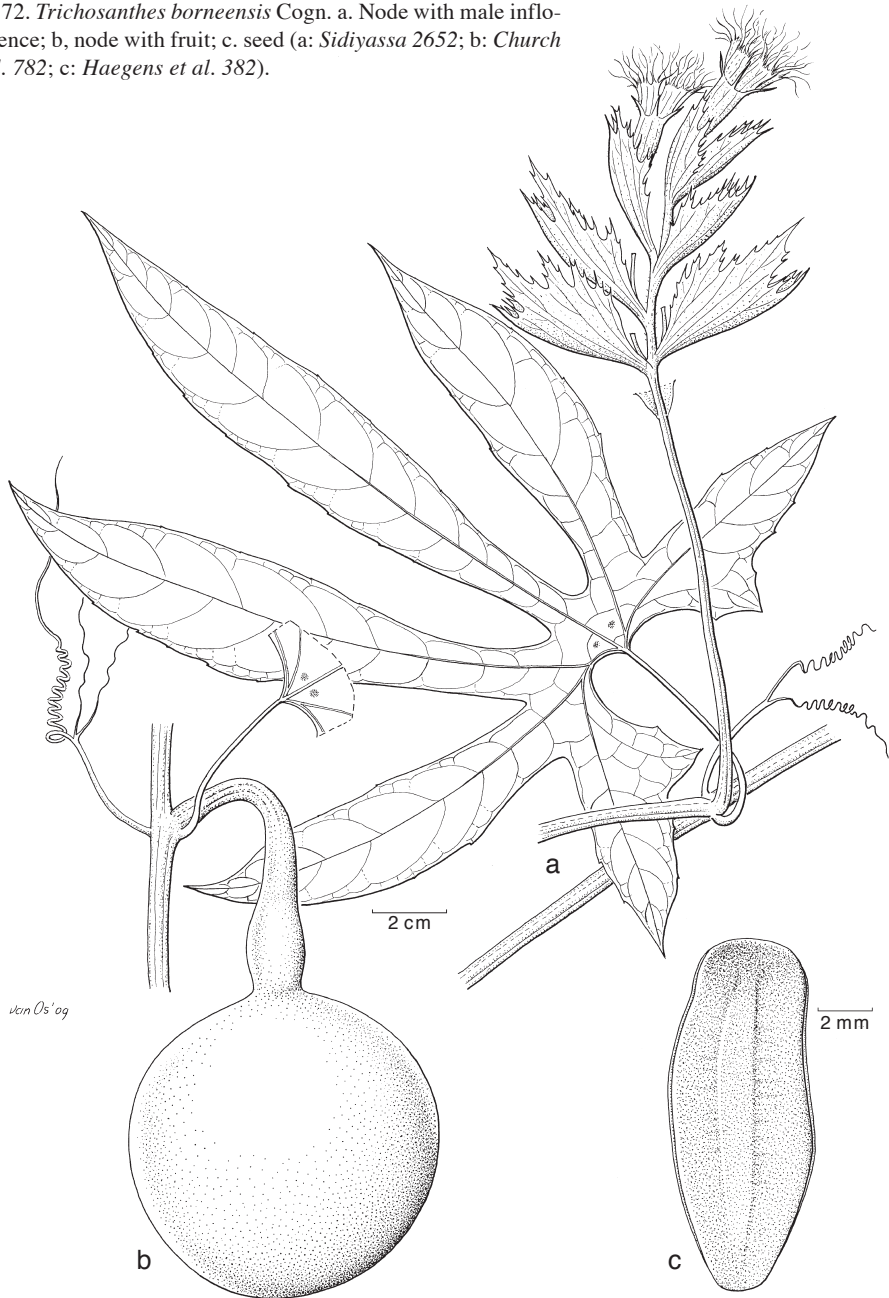
*Trichosanthes borneensis* Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 369; Rugayah & W.J.de Wilde, *Reinwardtia* 11, 4 (1999) 251; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 135; W.J.de Wilde & Duyfjes in Beaman et al., *Pl. Mt. Kinabalu* (2001) 210; Sandakania 14 (2004) 17. — Type: *Korthals s.n.* ('54') (holo L, barcode L0130152), Borneo (Kalimantan, Mt Sakoembang).

*Trichosanthes sumatrana* Cogn. in A.DC. & C.DC., *Monogr. Phan.* 3 (1881) 373, excluding var. *obtusiloba*. — Type: *Beccari s.n.* (lecto FL, acq. no. FL 4427, designated by De Wilde & Rugayah (*Reinwardtia* 11 (1999))), West Sumatra, Padang Province, Ajer Mantjoer.

*Trichosanthes wallichiana* auct. non (Ser.) Wight: Ridl., *Fl. Malay Penin.* I (1922) 845.

Climber, 6(–20) m long, finely brown hairy, early glabrescent, leafy stem 2–5 mm diam.; dioecious. *Probract* narrowly elliptic, 5–18 by 1–2 mm, glands absent. *Tendrils* 2- or 3-branched. *Leaves*: petiole 2.5–8 cm long; blade brown or green on drying, membranous, simple, deeply 3–5(–7)-lobed, (1/2–)9/10 deep, in outline broadly ovate or circular, 7–23 by 7.5–23 cm, scabrous above, usually smooth beneath, glands few (sometimes absent), situated at the base near the insertion of the petiole, 1–3 mm diam., cystoliths obvious, margin entire or towards the base of the outer lobes coarsely dentate or dentate-sinuate; veins 3–5(–7), straight. *Male raceme* occasionally with a single male flower co-axillary at the node, finely pubescent; peduncle 2–11(–13) cm long, 3–5 mm thick; rachis somewhat thickened, 6–30 cm long, 3–5(–10) mm thick, including thickened bract-scars, 10–20(–50)-flowered; bracts late-caducous, narrowly or broadly ovate, or rhomboid, (10–)20–50 by 6–30 mm, margin irregularly sharply incised or dentate to 5 mm deep, glands absent. *Male flowers*: pedicel 3–5 mm long (c. 25 mm long in solitary flowers), caducous; receptacle-tube 40–70 mm long, at throat 5–9 mm wide; sepals narrowly triangular or lanceolate, 6–16 mm long, 1.5–3 mm wide at base,

Fig. 72. *Trichosanthes borneensis* Cogn. a. Node with male inflorescence; b, node with fruit; c. seed (a: Sidiyassa 2652; b: Church et al. 782; c: Haegens et al. 382).



entire or minutely narrowly lobed; petals obovate or rhomboid, c. 15 mm long, threads 7–11 mm long; synandrium 7–11 mm long, anthers fused, filaments glabrous, 3–4 mm long. *Female flowers* not known. *Fruit* ripening orange-red, paler speckled or faintly striped, (depressed-)globose, 3.5–10 by 5–9 cm, apex obtuse (not beaked); exocarp

woody, c. 1 mm thick, smooth; pericarp juicy, c. 10 mm thick (dry pericarp  $\pm$  vanished); pulp green-black, bitter; fruiting pedicel (2.5–)3.5–8 cm long, 5–15 mm thick, 2-coloured, the distal part orange-red and smooth, (0.5–)1(–2) cm long, the remaining part green and grooved. *Seeds* black, compressed, (narrowly) elliptic, 13–20 by 5–7 by 3 mm, base truncate or  $\pm$  obtuse, apex obtuse, margin faint, edge entire. — **Fig. 72.**

Field-notes — Flowers white with highly divided petals. Fruits yellowish green to yellow or bright orange to red when ripe, fruit stalk thick, orange for the distal 1 cm, green below, pulp green, with cucumber smell, very bitter and foetid.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo (Kalimantan, Sarawak, Sabah).

Habitat & Ecology — Open places and edges of primary and degraded forest, on sandy clay; lowland to 900 m altitude.

Uses — Used as a medicine (*Gimlette s.n.*, Peninsular Malaysia); the tuberous root is incorporated in dart poison (*Gadoh anak Umbai KL 1771*).

Note — The distal part of the fruiting pedicel apparently belongs morphologically to the fruit.

### 5. *Trichosanthes celebica* Cogn.

*Trichosanthes celebica* Cogn. in A.D.C. & C.D.C. Monograph. Phan. 3 (1881) 385; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 251; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 99. — Type: *Beccari 51* (holo FI), SE Sulawesi, near Kendari, Lepo-Lepo.

Climber to 10 m long, early glabrescent, at first with sparse minute hairs, leafy stem 1.5–3 mm diam.; dioecious. *Probract* ovate,  $\pm$  flat, 3–5 by 3 mm, glands present. *Tendrils* (unbranched or) 2-branched. *Leaves*: petiole 2–5 cm long; petiolules 0.3–0.7 cm long; blade green on drying, subchartaceous or membranous, simple and unlobed or 3-foliolate; unlobed blade in outline ovate-oblong or hastate, 10–20 by 6–10 cm, foliolate blade in outline circular, middle leaflet 10–12 by 3–3.5 cm, base cuneate, faintly scabrous above, glands several, scattered, 0.5(–1) mm diam., cystoliths obvious, margin entire or sparsely minutely dentate; unlobed blades with 3(–5) curved veins, leaflets pinniveined. *Male raceme* minutely rust-hairy; peduncle 2.5–4 cm long, c. 3 mm thick; rachis somewhat thickened, with bract-scars, 7–11 cm long, 8–15-flowered; bracts subpersistent, narrowly elliptic, 15–25 mm long, margin deeply incised to c. 1/3 deep, with glands. *Male flowers* (from buds): pedicel 2–3 mm long; sepals narrowly triangular, 5–7 mm long, entire. *Female flowers* not known. *Fruit* ripening red (possibly not paler striped), ovoid, 6.5 by 4.5 cm, apex c. 2 mm beaked; exocarp thick-leathery, smooth; dry pericarp c. 5 mm thick; pulp greenish black; fruiting pedicel 2–7 cm long, 3–4 mm thick. *Seeds* blackish, compressed, elliptic, 12–13 by 4–7 by 2–3 mm, margin absent, edge entire.

Distribution — *Malesia*: Sulawesi (Kendari and Lake Matano area), Moluccas (NW Buru).

Habitat & Ecology — Open areas in secondary forest or disturbed primary forest, river sides, on limestone and clayey soil; 50–400 m altitude.

Notes — 1. The fruits of *T. celebica* resemble those of *T. wawrae*, but in the latter species the exocarp is thinner and the seed larger, 15–20 by 8–15 mm.

2. The few specimens on which the present description of *T. celebica* is based are variable, e.g. in the leaf blade glands, fruiting pedicel, and seeds, so possibly a second species may be involved; a redescription is in preparation..

## 6. *Trichosanthes coriacea* Blume

*Trichosanthes coriacea* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 935; Miq., Fl. Ned. Ind. 1, 1 (1856) 674; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 355; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 303; Rugayah & W.J.de Wilde, Blumea 42, 2 (1997) 477; Reinwardtia 11, 4 (1999) 252; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 162, pl. 22. — Type: *Blume s.n.* (holo L, barcode L0130310; iso L, barcode L0130311), West Java, Gunung Salak.

Climber to 10 m long, short brown hairy, partly glabrescent, leafy stem 2–4 mm diam.; dioecious (or monoecious?). *Probract* obovate, 3 by 2 mm, glands absent. *Tendrils* 2-branched (the second branch reduced). *Leaves*: petiole 1.5–3 cm long; blade brown on drying, (membranous-)coriaceous, simple, unlobed, in outline (narrowly) or broadly ovate, (8–)12–23 by (6.5–)10–18 cm, finely bullate and somewhat shiny above, glands few, 0.5–1 mm diam., cystoliths not obvious, base shallowly cordate-truncate, margin entire, somewhat recurved; veins (3–)5 from the base, curved, and few smaller veins from the midrib, ± sunken above. *Male raceme* densely short-hairy; peduncle (1.5–)3–4 cm long; rachis not thickened, 6–21 cm long, 3–4 mm thick, (10–)20–35-flowered, with conspicuously thickened persistent pedicels; bracts caducous or subpersistent, somewhat shifted upwards the pedicel, (ob)ovate, 5–7 by c. 3 mm, obtuse, entire, with glands. *Male flowers* (from buds): pedicel c. 2 mm long, persistent (after the flowers are shed becoming thicker and longer, giving the raceme a branched aspect); sepals narrowly triangular, c. 3 mm long, entire. *Female flowers* not known. *Fruit* ripening evenly orange-red, ovoid-ellipsoid, c. 10 by 7 cm, apex shortly beaked; dry pericarp possibly c. 10 mm thick; exocarp thick-leathery, smooth; pulp not known; fruiting pedicel c. 1.5 cm long, 5 mm thick. *Seeds* brown, compressed, obovate, 13–15 by 8–9 by 1–2 mm, base cuneate, apex broadly rounded, margin c. 1.5 mm broad, edge entire.

Distribution — *Malesia*: Sumatra, Java (where known only from the type collection).

Habitat & Ecology — Primary hill forest; 400 m altitude.

Note — *Trichosanthes coriacea* is a rare species. Only 8 collections are known, of which 7 were made in the 19th century; *Laumonier TFB 2170* is the only recent one, collected in 1983, in Bukit Sebelah Nature Reserve, Sumatra.

## 7. *Trichosanthes cucumerina* L.

*Trichosanthes cucumerina* L., Sp. Pl. 2 (1753) 1008; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 91; Rugayah & W.J.de Wilde, Blumea 42 (1997) 478; Reinwardtia 11, 4 (1999) 252; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 66; Duyfjes & Pruesapan, Thai Forest Bull, Bot. 32 (2004) 82; W.J.de Wilde & Duyfjes, Fl. Thailand, 9, 4 (2008) 516. — Type: “*Padavalam*” in Rheede, Hort. Malab. 8 (1688) 39, t. 15 (lecto, designated by Keraudren (1975)), habitat in India.

*Trichosanthes reniformis* Miq., Fl. Ned. Ind. 1, 1 (1856) 675. — Type: *Horsfield s.n.* Java (holo BM; iso U, barcode U0008346), Java.

*Trichosanthes pedatifolia* Miq., Fl. Ind. Bat. 1, 1 (1856) 677. — Type: *Horsfield s.n.* (holo BM; iso U, barcode U0008345), Java.

Climber, 5–8 m long, with sparse (dense) minute hairs, partly glabrescent, leafy stem 1.5–2(–5) mm diam.; monoecious. *Probract* absent. *Tendrils* 2- (or 3-) branched. *Leaves*: petiole 2–12 cm long; blade green on drying, membranous, simple, unlobed, or shallowly or deeply 3–7-angular or -lobed, 2/3 deep, in outline subcircular, or broadly reniform, 5–12(–20) by 9–12(–25) cm, finely hairy, sometimes faintly scabrous, without or with few scattered minute glands, cystoliths not obvious, margin entire or sparsely shallowly dentate-undulate; veins 3(–5). *Male raceme* sometimes with co-axillary a solitary male flower or a solitary female flower (the female flower developing before the male raceme), hairy or glabrescent; peduncle 5–15 cm long, 1(–2) mm thick; rachis not thickened, 3–10 cm long, 5–10 (or more)-flowered; bracts subpersistent or caducous, elliptic, 0.5–2 mm long, margin (sub)entire, glands absent. *Male flowers*: pedicel 5–20 mm long, persistent; receptacle-tube 15–20 mm long, at throat 3–4(–5) mm wide; sepals linear, 2–3 mm long, c. 1 mm wide at base, entire; petals (narrowly) ovate, 6–10 mm long, threads c. 10 mm long; synandrium 2–3 mm long, filaments short. *Female flowers*: pedicel 5–12 mm long or longer; ovary hairy, (narrowly) ellipsoid, 3–10(–30) mm long. *Fruit* ripening bright orange, paler speckled or striped, ellipsoid or long-cylindrical, 2.5–5(–150) by 1.5–4 cm, apex beaked; exocarp (thinly) leathery, smooth; pericarp ± juicy, dry pericarp 3–5 mm thick; pulp orange, not fibrous, slightly bitter; fruiting pedicel 1–2 cm long, 2 mm thick. *Seeds* pale or dark brown, compressed, (narrowly) elliptic, 6–18 by 4–9 by 2.5–3.5 mm, margin broad, distinct or faint, edge undulate.

Distribution — Widely distributed from India, Sri Lanka, South China, and Thailand, through Malesia into West, North and NE Australia; in *Malesia*: Java, Philippines, Sulawesi, Lesser Sunda Islands; 2 varieties.

Note — The two varieties flower during daytime.

#### KEY TO THE VARIETIES

- 1a. Plant delicate, growing wild. Leaves 5–14 cm diameter. Fruit (2.5–)4–6 cm long, containing to 10 seeds; seeds 6–8(–10) mm long . . . . . **a. var. cucumerina**
- 1b. Plant more robust in all parts, cultivated. Leaves to 25 cm diameter. Fruit much elongated, snake-like, 35–100(–150) cm long, containing many seeds; seeds 14–18 mm long. . . . . **b. var. anguina**

#### **a. var. cucumerina**

Climber, annual, growing wild; leafy stem delicate, 1–2 mm diam., with or without scattered pale coarse hairs, 1 mm long. *Leaves*: petiole 2–6 cm long; blade 5–14 cm diameter. *Fruit* (2.5–)4–6 cm long, containing few (to 10) seeds; pulp bitter (always?). *Seeds* 6–8(–10) mm long. — **Fig. 91a.**

Distribution — The variety *cucumerina* is the wild variety and is widely distributed from India through Malesia into West, North and NE Australia; in *Malesia*: most collections from Java and Madura, one from Philippines (Luzon), one from Sulawesi (Maros), few from Lesser Sunda Islands (Flores, Sumbawa, and Sumba).

Habitat & Ecology — Forest edges, scrub, disturbed areas; apparently solely in areas with a seasonal climate; sea level to 1200 m altitude. Flowering and fruiting in and after the wet season.

**b. var. *anguina* (L.) Haines**

*Trichosanthes cucumerina* L. var. *anguina* (L.) Haines, Bot. Bihar Orissa (1922) 388; Rugayah & W.J.de Wilde, Blumea 42, 2 (1997) 478; W.J.de Wilde & Duyfjes, Sandakania 17 (2008 '2007') 79. — *Trichosanthes anguina* L., Sp. Pl. 2 (1753) 1008; Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 933; A.D.C. & C.D.C., Mon. Phan. Prodr. 3 (1881) 359; Backer in Backer & Bakh.f., Fl. Java 1 (1963) 304. — Type: "*Anguina Sinensis, flore albo, elegantissimo, capillamentis tenuissimis ornato, fructu longo intorto, sub initium ex albo, & viridi variegato, per maturitatem prorsus rubro*" in Micheli, Nov. Pl. Gen., 12, t. 9, 1729 (lecto, designated by Jeffrey in Jarvis & al. (ed.), *Regnum Veg.* 127 (1993) 95), habitat in China.

Climber, subperennial, cultivated, leafy stem 2–5 mm diameter. *Leaves*: petiole 2–12 cm long; blade to 25 cm diameter. *Fruit* snake-like, 30–100(–150) cm long, containing to 50 seeds; pulp rather sweet. *Seeds* 14–18 mm long.

Distribution — Widespread in cultivation; immature fruit used as vegetable.

**8. *Trichosanthes densiflora* Rugayah**

*Trichosanthes densiflora* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 252; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 180. pl. 25. — Type: *Von Roemer 706* (holo BO), south-western West Papua.

*Trichosanthes bracteata* auct. non Voigt: Pulle, Nova Guinea 8 (1912) 689; Harms, Bot. Jahrb. Syst. 60 (1925) 160, p.p.

Climber to 6 m long, at first with short hairs, glabrescent, leafy stem 2–4 mm diam.; dioecious. *Probract* ± ovate, 5 mm long, coarsely dentate, glands absent. *Tendrils* 2-branched. *Leaves*: petiole 2.5–6 cm long; blade green on drying, subcoriaceous, simple, unlobed, in outline (narrowly) ovate, 9–12 by 6.5–10.5 cm, glands several, at the base towards the insertion of the petiole, 0.5 mm diam., cystoliths present, base cordate, margin shallowly spiny dentate; veins 5, curved. *Male raceme* glabrescent; peduncle 3–6 cm long, 2(–3) mm thick; rachis stout, thickened, with thickened bract-scars, 11–13 cm long, 3–5 mm thick, to 30-flowered; bracts distinctly veined, (narrowly) obovate, 30–45 by 15–20 mm, margin entire, sometimes shallowly lobed, glands scattered in upper half, 0.5–1 mm diameter. *Male flowers*: pedicel 2 mm long, caducous; receptacle-tube c. 27 mm long, at throat 6–8 mm wide; sepals, petals and stamens not known. *Female flowers* not known. *Fruit* ripening green, (narrowly) ellipsoid, 6–8 by c. 4.5 cm, apex c. 5 mm beaked; exocarp papery; pericarp possibly carnos, drying thin and firm, irregularly ornamented (see note 2), pulp possibly creamy, not red; fruiting pedicel c. 3 cm long, 3 mm thick, finely brown hairy. *Seeds* brown, densely packed, compressed, (narrowly) elliptic, 10–13 by (4–)5–6 by c. 1 mm, apex shallowly notched, margin faint, edge entire.

Distribution — *Malesia*: New Guinea (south-western West Papua (Lorenz River); Papua New Guinea (Western Highlands and West Sepik Provinces)).

Habitat & Ecology — Secondary growth and regrowth; 1500(?)–2400 m altitude.

Notes — 1. *Trichosanthes densiflora* is known only from three collections, identical on vegetative characters, although found wide apart. A fourth collection, *Eyma 5123*, from Wissel lake region, West Papua, has immature female flowers with a coarse woolly rufous indumentum. It seems most related to *T. densiflora* but may represent a separate species.

2. In *Henty NGF 41616*, the dried fruit has a narrowed base, apparently caused by the drying of the thick juicy-carnose pericarp, becoming thin when dry; the irregularly ornamented surface indicates the presence of the seeds underneath.

### 9. *Trichosanthes dentifera* Rugayah

*Trichosanthes dentifera* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 253; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 182. — Type: *McGregor s.n.*, anno 1890 (holo MEL), Papua New Guinea.

Tall climber, with sparse minute grey hairs, early glabrescent, leafy stem 3–4 mm diam.; dioecious. *Probract* ovate or elliptic, 3–4 by c. 2 mm, without glands. *Tendrils* 2- or 3-branched. *Leaves*: petiole 2–4 cm long; blade greenish brown on drying, chartaceous, simple, unlobed, in outline broadly ovate, 8–15 by 8–12 cm, glands several to many, at the blade base or scattered, 0.5 mm diam., cystoliths occasionally on old stem, petiole and veins, margin entire or sparsely minutely dentate; veins 5(–7), arching. *Male raceme* and *male flowers* not known. *Female flowers* (from bud): sparsely brown hairy; pedicel c. 15 mm long; ovary narrowly ellipsoid, with c. 10 ribs; sepals linear, c. 12 mm long, 0.5 mm wide at base, margin entire; mature petals not seen (see note). *Fruit* ripening red, ellipsoid or (sub)globose, 10–12 by 5.5–7 cm, apex c. 2 mm beaked; exocarp woody, c. 1 mm thick, smooth with c. 10 shallow grooves; fruiting pedicel 2–2.5 cm long, c. 5 mm thick. *Seeds* brown, densely packed, compressed, ± narrowly elliptic, ± parallel-sided, 12–13 by 5 by 2 mm, base cuneate, apex ± notched, margin faint, edge (sub)entire.

Field-notes — Mature female flowers 6–7 cm long, corolla 6–7 cm diam.; petals fimbriate, dirty white. Fruits round, red when ripe.

Distribution — Vanuatu; in *Malesia*: New Guinea (Papua New Guinea (Woodlark Is., Bougainville Is.)).

Habitat & Ecology — Rain forest, riverside forest, climbing over the topmost branches of tall forest trees; to 240 m altitude.

Uses — The oily seeds are edible, roasted or cooked.

Notes — 1. The pericarp is possibly juicy and shows on drying 15–18 vascular strands.

2. *Trichosanthes dentifera* seems related to the Australian *T. subvelutina* F.Muell. ex Cogn. and *T. species A*, both treated by Telford (Fl. Austr. 8, 1982), having also grooved fruits.

### 10. *Trichosanthes dieniensis* Merr. & L.M.Perry

*Trichosanthes dieniensis* Merr. & L.M.Perry, J. Arnold Arbor. 30 (1949) 59; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 254; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 172, pl. 23. — Type: *Brass 3898* (holo A), Papua New Guinea, Dieni, Ononga Road.



Climber, early glabrescent, leafy stem 1–1.5 mm diam.; dioecious. *Probract* absent(?). *Tendrils* 2-branched. *Leaves*: petiole 2–4.5 cm long; blade green on drying, membranous, simple, unlobed, in outline ovate, 4.5–12 by 2.5–8 cm, scabrous above, but at apex minutely hairy, glands few, along the margin of the basal sinus, c. 0.5 mm diam. or less, cystoliths obvious, margin sparsely minutely dentate; veins 3(–5), curved. *Male raceme* glabrous; peduncle 3–5.5 cm long, c. 1 mm thick; rachis slender, not thickened, 3.5–6 cm long, 5–12-flowered; bracts narrowly or broadly (ob)ovate, 5–13 by 2–10 mm, margin shallowly lobed or dentate, glands few, c. 0.5 mm diameter. *Male flowers*: in the raceme and one solitary at base of the raceme; pedicel in raceme 2–7 mm long, persistent or caducous, when solitary 40–50 mm long, withering into a straw-like persistent appendage; receptacle-tube c. 40 mm long, at throat c. 6 mm wide; sepals narrowly triangular or linear, c. 10 mm long, entire or few-dentate at base; petals obovate-rhomboid, c. 10 mm long, threads 10–20 mm long; synandrium c. 6 mm long, filaments short. *Female flowers, fruit and seeds* not known.

Distribution — *Malesia*: New Guinea (Papua New Guinea (Central Province, Dieni, known only from the type collection).

Habitat & Ecology — Massed on dead tree trunk; 500 m altitude.

Note — *Trichosanthes dieniensis* is similar to *T. hastata*, and possibly only a tiny form of this. The latter differs in having flowers with larger petals (c. 2.5 cm long, excluding threads), larger male bracts without glands, and rough-hairy petioles (glabrous in *T. dieniensis*).

### 11. *Trichosanthes edulis* Rugayah

*Trichosanthes edulis* Rugayah in Rugayah & W.J.de Wilde, *Reinwardtia* 11, 4 (1999) 254, f. 2; Rugayah, *Trichosanthes* (Cucurbitaceae) in *Malesia*, thesis (1999) 184, pl. 26. — Type: *Streimann NGF 30731* (holo L; iso BRI, CANB, LAE), Papua New Guinea, Morobe Province.

*Trichosanthes trifida* Lu Q.Huang, B. Yang & C.H. Yueh, *Act. Phytotax. Sin.* 35, 2 (1997) 130, pl. 3: 45–47, nom. nud. — Voucher specimen: *Kalkman 4401*, West Papua.

Climber or creeper, sometimes rooting at the nodes, to 10 m long, brown hairy, late glabrescent, leafy stem 3–5 mm diam.; dioecious. *Probract* sometimes caducous, (narrowly) elliptic, 5–15 by 1–8 mm, apex subacute, with many glands. *Tendrils* 2–4-branched. *Leaves*: petiole 3–9 cm long; blade brown-green or blackish brown on drying, (thinly) chartaceous-coriaceous, simple, shallowly or deeply 3–5-lobed or -angular, lobes to 1/2–5/6 deep, rarely unlobed, in outline broadly ovate or circular, 9–25 by 9–23 cm, above and beneath glabrous or (densely) brown hairy, glands few or many, scattered, 0.5–1 mm diam., or absent, cystoliths sometimes obvious on stem and leaves, margin entire, or sparsely minutely spiny-dentate or (coarsely) dentate; veins 3–7, straight. *Male raceme* occasionally with a solitary male flower at base, dark brown woolly-hairy, hairs dark brown, curly, more than 2 mm long, partly glabrescent; peduncle 4.5–16(–20) cm long; rachis not thickened or thickened in var. *septemloba*, at base with thickened bract-scars, 5–20(–35) cm long, 2–5(–7) mm thick, (3–)5–30-flowered or more; bracts broadly ovate-rhomboid, 10–40 by (5–)12–25 mm, margin entire or undulate-dentate, with small glands. *Male flowers*: pedicel 5–10 mm long, in solitary flowers much longer, caducous; receptacle-tube 30(–50) mm long, at throat

7–15 mm wide; sepals narrowly triangular or ovate, acute, 5–15 mm long, 2–5 mm wide at base, entire or incised; petals obovate-rhomboid, c. 20 mm long, threads c. 20 mm long; synandrium c. 10 mm long, filaments glabrous, 1–2 mm long. *Female flowers*: pedicel 30–50 mm long; ovary (narrowly) ellipsoid, 20–35 by 6–8 mm, densely brown hairy; receptacle-tube 30–50(–60) mm long; sepals 5–10 mm long, 2–5 mm wide at base, incised (or entire); petals as in male; style c. 45 mm long. *Fruit* ripening evenly orange or red, narrowly ellipsoid or (long) pyriform, 10–25 by 5–7 cm, apex ± acute; pericarp carnos, smooth, dry pericarp woody, rough; pulp red; fruiting pedicel 3–10 cm long, (4–)5–10 mm thick. *Seeds* densely packed, compressed, narrowly elliptic and ± parallel-sided or obtriangular (broad at apex), 10–15 by 4–8 by 1–2 mm, ± truncate or notched at one or both ends, with or without a longitudinal depression in the middle, margin broad, edge entire or sometimes finely crenulate.

Distribution — *Malesia*: New Guinea; 3 varieties; also Philippines (see note).

Note — One out-reaching collection from the Philippines, Luzon, *PPI 3044*, with immature male flowers belongs to *T. edulis* as at present defined. It seems to link up with deviating specimens from Vogelkop as discussed under var. *edulis*, and its status needs further study.

#### KEY TO THE VARIETIES

- 1a. Leaves deeply (5–)7-lobed, densely brown hairy on both surfaces . . . . . **c. var. septemloba**  
 b. Leaves 3–5-lobed, glabrous or glabrescent . . . . . 2  
 2a. Leaves shallowly 3-lobed or 3–5-angular, to halfway deep, rarely unlobed, drying dark brown . . . . . **b. var. sativa**  
 b. Leaves deeply 3–5-lobed, 1/2–3/4 deep, drying brown-green . . . . **a. var. edulis**

#### **a. var. edulis**

Plant glabrescent. *Probract* 5–10 mm long. *Leaves*: blade chartaceous-coriaceous, drying brown-green, 3–5 lobed, lobes 1/2–3/4 deep, blade subcircular in outline, to 25 cm diam., glabrous or glabrescent above and beneath, margin entire or minutely spiny-dentate. *Male raceme* dark brown woolly hairy, partly glabrescent, 20–25(–55) cm long; peduncle 5–20 cm long; bracts broadly obovate-rhomboid, c. 20 by 15–25 mm, entire or undulate. *Female flowers* not known. *Fruit* long-ellipsoid or pyriform, 15–22 by 5–7 cm; fruiting pedicel 6–9 cm long. *Seeds* brown-black, narrowly oblong, ± parallel-sided, 12–15 by 4–5 by 1–2 mm, notched on one or both ends, narrowly lengthwise grooved in the middle, edge entire or sometimes faintly crenulate.

Field-notes — Leaves coriaceous, slightly glossy dark green above, light green beneath. Fruit red when ripe; pulp bright red; seeds black. Cooked fruit edible.

Distribution — *Malesia*: New Guinea (West Papua and Papua New Guinea).

Habitat & Ecology — Secondary growth, degraded forest in logging areas, swampy places, river side forest; to 1500 m altitude.

Note — *Kalkman 4401* (West Papua) differs in smaller male flowers and in thin chartaceous densely arranged male bracts. *Vink 17576*, *Avé 4076* and *Polak 850*, all

from low altitude in West Papua, Vogelkop, differ in  $\pm$  obtriangular seeds, truncate at apex, resembling those of var. *sativa*.

**b. var. *sativa* Rugayah**

*Trichosanthes edulis* Rugayah var. *sativa* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia, 11, 4 (1999) 256; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 188. — Type: *Vink 16350* (holo L; iso CAN, LAE), Papua New Guinea, Western Highlands Province.

Plant glabrescent. *Probract* 5–10 mm long. *Leaves*: blade chartaceous, drying dark brown, shallowly 3-lobed or 3–5-angular, to halfway deep, rarely unlobed, broadly ovate or subcircular in outline, to 20 cm long, glabrous or glabrescent above and beneath, margin entire, or finely or coarsely dentate; veins 5. *Male raceme* to 20 cm long, dark brown short-woolly hairy; peduncle not seen; bracts narrowly elliptic or rhomboid, 10–20 mm long, irregularly dentate. *Female flowers*: as the species. *Fruit* pyriform-ellipsoid, to c. 25 cm long when fresh; fruiting pedicel c. 4.5 cm long, c. 5 mm thick. *Seeds* brown, compressed, narrowly (elliptic) or obtriangular, 10–12 by 5–8 by c. 1 mm, shallowly or deeply notched on one or both ends, edge entire or finely crenulate, not grooved in the middle.

Field-notes — Fruit apex dark green, base orange, bright red when ripe. Fruit edible, cooked in ashes of fire.

Distribution — *Malesia*: New Guinea (montane areas of Central West Papua and Papua New Guinea (Western Highlands, Eastern Highlands, and Simbu Provinces, and Bismarck Archipelago)).

Habitat & Ecology — Cultivated in gardens or running wild in secondary forest edges; 1000–2500 m altitude.

Vernacular name — Gin bogl (Kuma language), Kisang.

**c. var. *septemloba* Rugayah**

*Trichosanthes edulis* Rugayah var. *septemloba* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 256; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 189. — Type: *Stevens LAE 54823* (holo L; iso CAN, LAE), Papua New Guinea (Morobe Province).

Plant densely brown hairy. *Probract* 10–15 mm long. *Leaves*: blade thinly chartaceous, drying brown-green, 5–7-lobed, to 3/4–5/6 deep, subcircular in outline, to 22 cm diam., densely brown hairy above and beneath, margin coarsely dentate. *Male raceme* (immature) 10–17 cm long; peduncle to 15 cm long, rachis 3–7 mm thick, sometimes with a solitary woolly hairy male flower at base, hairs c. 1 mm long; bracts (narrowly) elliptic, 20–30(–40) by 15–20 mm, entire. *Female flowers* and *fruit* not known.

Field-notes — Leaves dark green above, paler beneath, venation very clear. Flowers large.

Distribution — *Malesia*: Papua New Guinea (Morobe, Southern Highlands, and Central Provinces).

Habitat & Ecology — Open places in rain forest, regrowth brush, in old farm land; 800–1600 m altitude.

## 12. *Trichosanthes ellipsoidea* Merr.

*Trichosanthes ellipsoidea* Merr., Philipp. J. Sc., C 13 (1918) 332; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 258; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 113, pl. 8. — Type: *Ramos BS 30364* (holo PNH, lost; iso K, US), Philippines, Catanduanes, slopes of Mt Mariguidon.

Climber to 5 m long, early glabrescent, at first with minute powdery hairs, leafy stem 1.5–3 mm diam.; dioecious. *Probract* (narrowly) elliptic, c. 5 mm long, entire. *Tendrils* unbranched or 2-branched. *Leaves*: petiole 3–4.5 cm long; blade greenish on drying, membranous or chartaceous, simple, unlobed, in outline (narrowly) ovate, 10–15 by 6–9.5 cm, ± scabrous above, glands few or several, scattered at about the centre or towards the base, 1–2 mm diam., margin entire but at base faintly repand, apex slenderly acute-acuminate; veins (3–)5, curved. *Male raceme* finely hairy; peduncle 3–6 cm long, c. 2 mm thick; rachis not thickened, c. 10 cm long, c. 2 mm thick, 20–25-flowered; bracts rhomboid or broadly (ob)ovate, 15–20 by c. 15 mm, margin deeply incised or dentate, to 1/3–1/2 deep, sometimes with 3 main lobes, glands present. *Male flowers*: pedicel 1–3 mm long, persistent or caducous; receptacle-tube (from large bud) somewhat swollen at base, 30 mm long, at throat 7–8 mm wide; sepals narrowly ovate, 7 mm long, 3 mm wide at base, entire; synandrium c. 7 mm long, filaments sparsely hairy, c. 3 mm long. *Female flowers*: pedicel 15–20(–30) mm long; receptacle-tube 60–70 mm long; sepals lanceolate, 6–7 mm long; petals obovate, including threads 30 mm long. *Fruit*: ripening colour not known, ellipsoid, c. 5 cm long; exocarp thick-leathery, smooth, dark brown when dry; pericarp and pulp not known; fruiting pedicel 1.5–2 cm long, 2–3 mm thick. *Seeds* compressed, c. 13 by 6–7 by 1.5–2 mm, base narrowly truncate, apex pointed, not margined, edge entire.

Field-notes — The two collections known from Sarawak (*Ashton S 17757* and *Chai S 34116*) are annotated as having dark green leaves, variegated with pale silvery patches.

Distribution — *Malesia*: Borneo (Sarawak: Bt Raya (Kapit District) and Ulu Sg Engkari (Lubok Antu District)), Philippines, Luzon (Catanduanes, where known from 3 collections).

Habitat & Ecology — Mixed dipterocarp forest on yellow clay rich soil, secondary forest along river banks; 200–800 m altitude.

## 13. *Trichosanthes elmeri* Merr.

*Trichosanthes elmeri* Merr., Univ. Calif. Publ. Bot. 15 (1929) 299; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 258; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 105; W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 210; Sandakania 14 (2004) 17. — Type: *Elmer 20298* (holo PNH, not seen; iso BR, L, NSW, U), Borneo, Sabah, Sandakan.

Climber, 5–10 m long, early glabrescent, at first minutely brown hairy, stem 2–4 mm diam.; dioecious. *Probract* concave, 5–7 by 3–6 mm, glands present. *Tendrils* 2- (or 3-) branched. *Leaves*: petiole 3–6 cm long; petiolules 0.3–1 cm long; blade greenish on drying, chartaceous or subcoriaceous, rarely simple, 3- or 5-foliolate, middle leaflet obovate-oblong, 8.5–18 by 3.5–8.5 cm, scabrous above, glands few or several, scattered, c. 0.5 mm diam., cystoliths obvious, base cuneate, margin ± recurved, entire or obscurely or sometimes coarsely dentate, lateral leaflets ± smaller and unequal-sided;

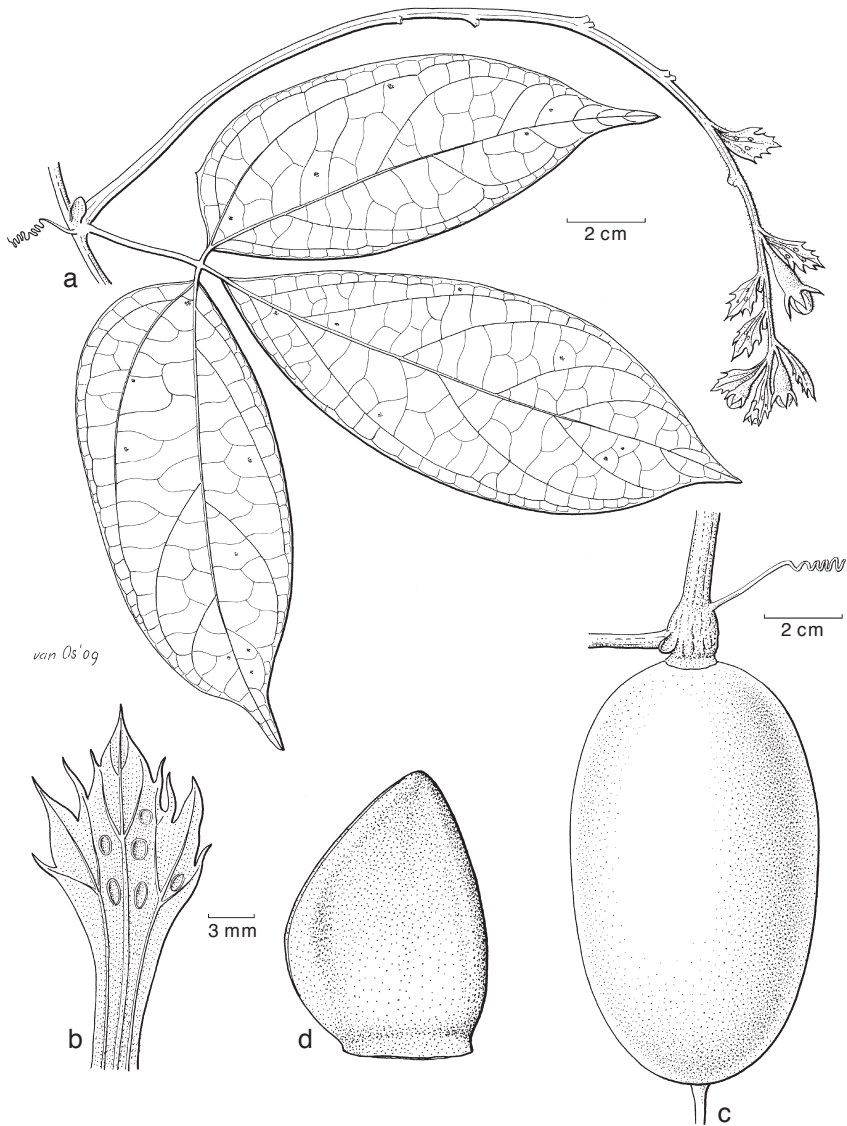


Fig. 73. *Trichosanthes elmeri* Merr. a. Leafy node with male inflorescence, note probract at base of peduncle; b. male bract; c. fruit; d. seed (a, b: Amin & Donggop SAN 113625; c, d: De Wilde, Postar & Ubaldus SAN 144005).

veins few, pinnate, or in simple leaves 3–5 from the base. *Male raceme* 10–30 cm long, minutely brown hairy; peduncle 3–10 cm long, 2–3 mm thick; rachis not thickened (except enlarged nodes), 7–20 cm long, 5–15-flowered; bracts late-caducous, (ob)ovate, 15–30 by (5–)8–12 mm, margin coarsely incised to c. 1/4 deep, glands present. *Male flowers*: pedicel 3–5 mm long, caducous; receptacle-tube c. 50 mm long, at throat 7–8 mm wide; sepals narrowly elliptic, 10–14 mm long, 3–4 mm wide at base, entire;

expanded petals not seen; synandrium 13–14 mm long, filaments glabrous, c. 3 mm long. *Female flowers*: pedicel 2–10 mm long; ovary glabrous, (narrowly) ellipsoid,  $\pm$  fusiform, c. 25 by 6 mm; receptacle-tube c. 30 mm long, at throat 6 mm wide; sepals narrowly elliptic, c. 10 mm long, 2–3 mm wide at base, entire; expanded petals not seen. *Fruit* ripening orange-red, often paler striped, (narrowly) ovoid or ovoid-ellipsoid, 12–20 by 5–10 cm, apex c. 4 mm beaked; exocarp leathery, smooth; pericarp firm-carnose, dry pericarp c. 10 mm thick; pulp blackish green, bitter; fruiting pedicel 0.5–1.5(–3) cm long, 4–9 mm thick. *Seeds* blackish brown, compressed, (narrowly) or broadly ovate, or subcircular, 16–20 by 11–20 by 3–4.5 mm, base subtruncate, apex  $\pm$  acute or obtuse, margin broad but obscure, edge entire. — **Fig. 73; Plate 25d, 26a, b.**

*Distribution* — *Malesia*: Sumatra, whole of Peninsular Malaysia, Singapore, whole of Borneo, and Philippines (Palawan).

*Habitat & Ecology* — Edges of primary and secondary forests, margins of swamp forests, river sides; on limestone and clay soil; from sea level to 900 m altitude.

*Note* — *Trichosanthes elmeri* is a variable species, with less robust specimens sometimes linking up with *T. wawrae*. The collections *Chai S 34181*, *Mamit S 32647* and *Othman et al. S 37534*, all from West Sarawak, have thinner leaves and long fruiting pedicels, 1.5–3 cm long.

#### 14. *Trichosanthes emarginata* Rugayah

*Trichosanthes emarginata* Rugayah in Rugayah & W.J.de Wilde, *Reinwardtia* 11, 4 (1999) 258, f. 4; Rugayah, *Trichosanthes* (Cucurbitaceae) in *Malesia*, thesis (1999) 138, pl. 15; C.K.Lim, *Folia Malaysiana* 10, 2 (2009) 153, pl. 1–5. — Type: *De Wilde & Duyffes 14862* (holo L; iso BO, K), Sumatra, Aceh (Ketambe).

Climber, 5–20 m long, finely brown hairy, glabrescent, leafy stem 5 mm diam.; dioecious(?). *Probract* narrowly elliptic, c. 4 by 2 mm, with few glands. *Tendrils* 2-branched. *Leaves*: petiole 5–7 cm long; blade brown on drying, membranous or (sub)chartaceous, simple, deeply 5-lobed to 3/4–4/5 deep (in juvenile stage unlobed), in outline circular, 18–22 by 20–23 cm, puberulent beneath, glands few, at leaf base, 1 mm diam. or absent, cystoliths not obvious, margin entire; veins 5(–7), straight (curved in juvenile leaves). *Male raceme* brown puberulous; peduncle 13–18 cm long, c. 5 mm thick; rachis not thickened, 2–5 cm long, 3 mm thick, at least 10-flowered; bracts persistent, membranous, broadly obovate-rhomboid, 40–55 mm long, margin shallowly irregularly dentate, glands absent. *Male flowers*: pedicel c. 10 mm long, caducous; receptacle-tube 55–60 mm long, at throat 10(–12) mm wide; sepals narrowly elliptic, 13–15 mm long, entire; petals broadly ovate (size not known); synandrium c. 12 mm long, filaments possibly glabrous, c. 4 mm long. *Female flowers* not known. *Fruit* green, whitish striped, ripening evenly red, broad-ellipsoid, 10–14 by 6–8 cm; exocarp woody-leathery, smooth; pericarp carnose, dry pericarp (5–)10–15 mm thick; pulp green-black; fruiting pedicel 2-coloured, 3.5–5 cm long, 10 mm thick, with a slightly narrower smooth red part, c. 1 cm long, towards the fruit. *Seeds* brown-black,  $\pm$  compressed, narrowly elliptic, often  $\pm$  parallel-sided, 15–18 by 7–10 by 3–5 mm, base irregularly truncate, apex conspicuously notched, margin faint, edge entire. — **Fig. 74; Plate 26c, d.**

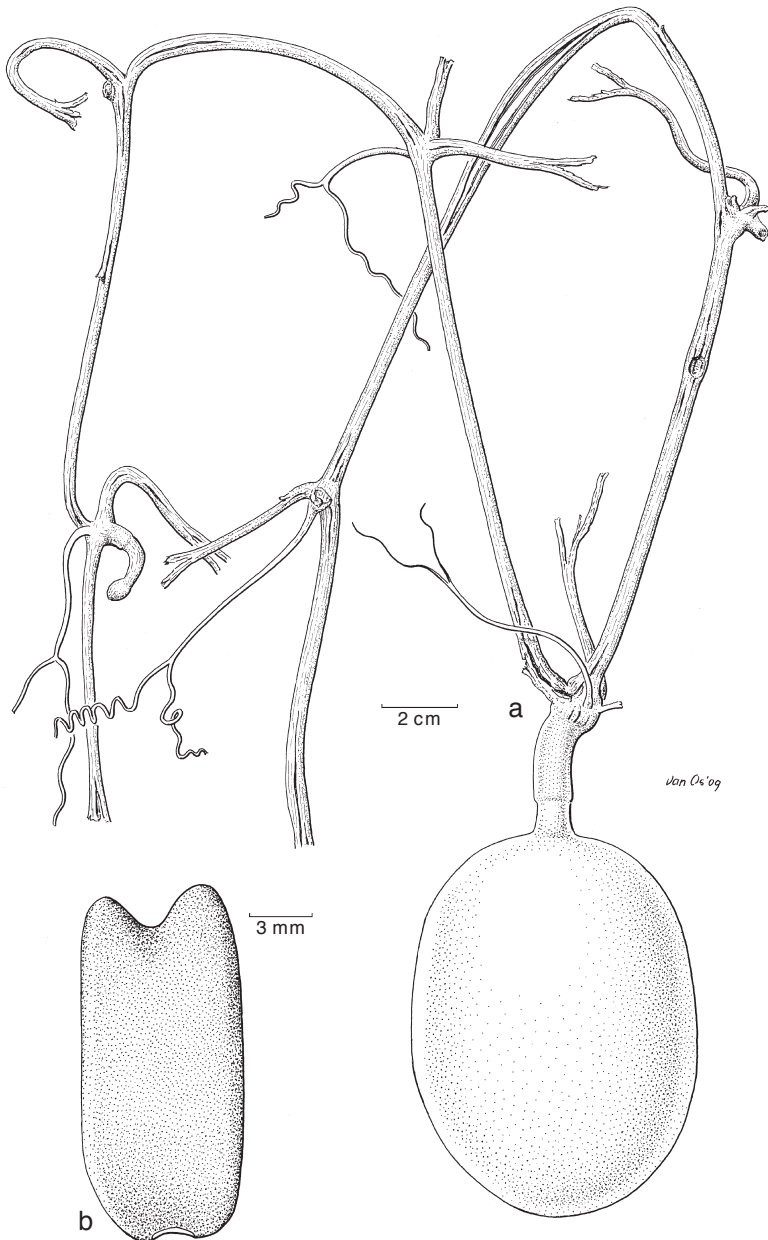


Fig. 74. *Trichosanthes emarginata* Rugayah. a. Died off plant with fruit; b. seed (both: *De Wilde & Duyfjes 14862*, type).

Distribution — *Malesia*: Sumatra (North Sumatra (Sibolangit) and Aceh (Ketambe)) and Peninsular Malaysia (Pahang, Krau).

Habitat & Ecology — Secondary forest, and forest edges; 200–500 m altitude.

Notes — 1. Known from three collections: the type-collection, *de Wilde & Duyffjes 14862*, is monocarpous, with mature fruits on a died off plant; the second collection, *Lörzing 8347*, is a leafy plant with male flowers; the third collection (Peninsular Malaysia) consists of fruit on leafy twigs; the seeds were erroneously drawn as emarginate at both sides.

2. *Trichosanthes emarginata* superficially resembles *T. montana*, the latter differing in a shorter peduncle, 2.5–3 cm long, subcoriaceous bracts, and a thickened rachis.

3. The 2-coloured fruiting pedicel reminds that of *T. borneensis*, a species with globose fruit, with seeds not notched at apex.

### 15. *Trichosanthes floresana* Rugayah

*Trichosanthes floresana* Rugayah in Rugayah & W.J.de Wilde, *Reinwardtia* 11, 4 (1999) 260, f. 5; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 101, pl. 6. — Type: *Schmutz 4614* (holo L), Flores.

Climber, early glabrescent, leafy stem 2–4 mm diam.; dioecious. *Probract* ovate-elliptic, ± flat, 5–10 mm long, glands absent. *Tendrils* 2- or 3-branched. *Leaves*: petiole 4–7 cm long; petiolules 0.2–0.5 cm long; blade greenish brown on drying, chartaceous-coriaceous, 3- or 5-foliolate, ± scabrous with minute pale dots, glands not obvious, cystoliths abundant, especially on stem, petioles and veins beneath, middle leaflet (obovate-)oblong, 9–12 by 4–6 cm, lateral leaflets smaller, sometimes 2-lobed and unequal-sided, base cuneate, margin entire; veins ± pinnate. *Male raceme* sparsely short brown hairy, glabrescent; peduncle 8 cm long; rachis not thickened, 2–8 cm long, 3 mm thick, 10–15-flowered; bracts obovate-rhomboid, 20–35 by 10–15 mm, margin entire or with few dents or slender lobes to 5 mm long, glands present. *Male flowers* (from immature bud): pedicel c. 1 mm long, caducous; receptacle-tube c. 7 mm long; sepals narrowly triangular, 15 mm long, 2–3 mm wide at base, margin entire (once with a narrow sidelobe); petals and synandrium not seen. *Female flowers* not known. *Fruit* ripening evenly orange-red, subglobose-ovoid, 4–8 by 3.5–6 cm, apex c. 3 mm beaked; exocarp ± leathery, or thinly woody; pericarp firm-carnose, dry pericarp 8–10 mm thick; pulp green-black; fruiting pedicel (incompletely known) 1–1.5 cm long, 3–4 mm thick. *Seeds* blackish brown, rather compressed, (narrowly) obovate, 11–16 by 6–10 by 3–5 mm, base and apex ± obtuse, margin absent, edge entire.

Distribution — *Malesia*: Lesser Sunda Islands (Flores).

Habitat & Ecology — Secondary scrub; 400–650 m altitude.

Notes — 1. The dry fruit in the herbarium shows up as ± ovoid, but on the fieldlabels it is described as globose.

2. The three fruiting collections known vary markedly in size of the mature fruits and seeds. The fruit of *Schmutz 4385* is c. 8 cm long, with seeds 15–16 by 8–10 mm, whereas the fruit of *Schmutz 4614* is only 4 cm long, with seeds 10–11 by 6–7 mm; the fruit and seeds of the third specimen, *Verheijen 4285*, are intermediate.

3. According to Telford (in litt.) *T. floresana* may be identical to *T. pentaphylla* Benth. from Australia (Telford, *Fl. Australiana* 8 (1982) 198). Further collecting is necessary to make a decision.

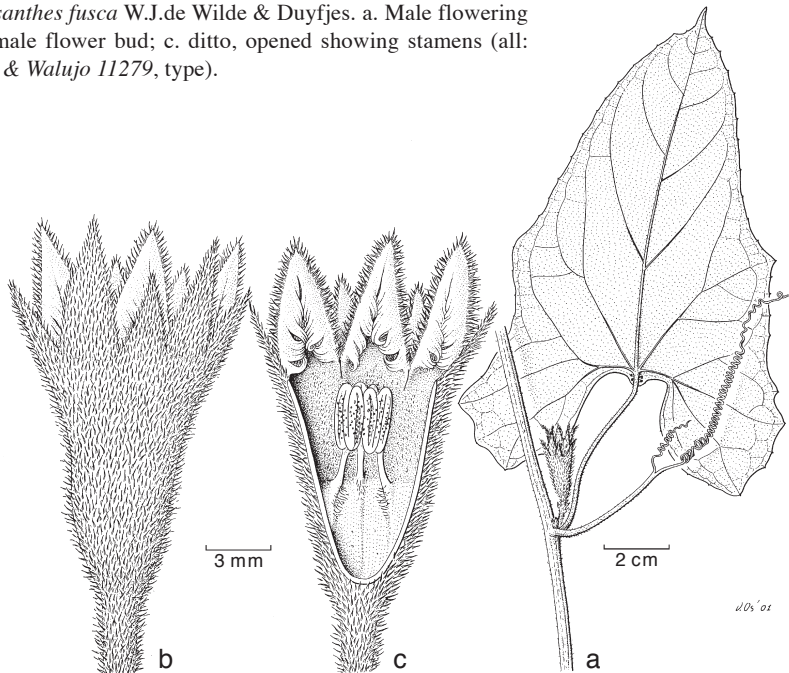


**16. *Trichosanthes fusca* W.J.de Wilde & Duyfjes**

*Trichosanthes fusca* W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 17, f. 4. — Type: *Kato, Okamoto & Walujo 11279* (holo L), Kalimantan, Mt Buduk Rakit, north of Long Bawan, Krayan, 115°47' E, 4°3' N (close to the Sabah border).

Scrambler, wholly sparsely rusty hairy, hairs 0.5 mm long, leafy stem 4–5 mm diam.; dioecious(?). *Probract* absent (or inconspicuous?). *Tendrils* hairy, 2-branched. *Leaves*: petiole (3–)4–8 cm long; blade green on drying, membranous, simple, unlobed, in outline (narrowly) ovate or (faintly) hastate, c. 15 by 8–12 cm, scabrous, glands absent or few and minute beneath, cystoliths not obvious, base with at the transition to the petiole at each side a small shallowly bulging auricle, each with 1–3 crowded glands, margin irregularly shallowly lobulate-dentate or sinuate, apex acuminate-mucronate. *Male raceme* with a single flower, terminal of a short branch 1–1.5 cm long with a few scattered bracts, co-axillary with the initial of a lateral sterile shoot or possibly a male raceme; bracts 2–3 mm long, conspicuously densely harshly hairy, hairs c. 1 mm long, dark rusty-brown. *Male flowers* (from mature bud): pedicel c. 6 mm long; receptacle-tube long-cupshaped, narrowed in the lower half, c. 10 mm long, 8 mm wide at throat; sepals long-triangular, c. 8 mm long, 1 mm wide at base, margin entire; petals in bud folded into a conical body with free apices, at anthesis presumably c. 8 by 6 mm, threads c. 10 mm long; synandrium subtruncate at both ends, c. 4 by 3.5(–4) mm, consisting of 3 free anthers, tightly appressed, but not fused, filaments c. 1 mm long, slender, terete, inserted halfway the tube where passing into strongly brown hairy thickenings of the tube c. 2 mm long; disc absent. *Female flowers* and *fruit* not known. — **Fig. 75.**

Fig. 75. *Trichosanthes fusca* W.J.de Wilde & Duyfjes. a. Male flowering leafy twig; b. male flower bud; c. ditto, opened showing stamens (all: *Kato, Okamoto & Walujo 11279*, type).



Distribution — *Malesia*: Borneo (Kalimantan).

Habitat & Ecology — On gravel river bank; 1200 m altitude. Flowering in August.

Note — The flower of *Trichosanthes fusca*, with free anthers, is quite unique. It seems most related to *T. postarii* and more distantly to *T. auriculata*. All three species are similar in their leaves having two more or less well-developed auricles, with small glands inside, at both sides of the blade base at the transition to the petiole. *Trichosanthes fusca* lacks the narrowing in the receptacle-tube below the insertion of the filaments as present in both *T. auriculata* and *T. postarii*. The three species are placed in section *Asterosperma* W.J.de Wilde & Duyfjes (2004). The collection *Clemens 21110* (sterile, BO) from Sarawak, Kapit, upper Rejan River, obviously belonging in sect. *Asterosperma*, differs in having much coarser, brittle stiff hairs and cystoliths all over, and may represent a fourth species in this section. *SAN (Postar et al.) 144100*, sterile, from Sabah, Luasong, possibly belongs here as well.

### 17. *Trichosanthes globosa* Blume

*Trichosanthes globosa* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 936; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 936; Rugayah & W.J.de Wilde, Blumea 42 (1997) 478; Reinwardtia 11, 4 (1999) 260; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 140, pl. 16; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 19. — *Involucraria globosa* (Blume) M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 99. — Type: *Blume 717* (holo L; iso BR, L, P), Java.

*Trichosanthes grandiflora* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 934; Miq., Fl. Ned. Ind. 1, 1 (1856) 674; Cogn. in A.DC. & C.DC., Monogr. Prodr. 3 (1881) 364. — Type: *Blume s.n.* (holo L, barcode L0130288; iso BR, P), Java.

*Trichosanthes sumatrana* Cogn. var. *obtusiloba* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 373. — Type: *Beccari FI 4428, FI 4428A, FI 4428B, FI s.n.* (syntype, all FI, lectotype not indicated), all Sumatra.

Climber to 10 m long, at first with sparse grey-brown hairs, early glabrescent (except male bracts), leafy stem 2–5 mm diam.; dioecious. *Probract* (narrowly) ovate, 4–7 by 1.5–2.5 mm, glands absent. *Tendrils* unbranched. *Leaves*: petiole 3–8 cm long; blade pale greenish brown on drying, (sub)chartaceous, simple, deeply (2–)3–5-lobed to 9/10 deep, or unlobed (variously lobed in young stages), in outline broadly (ob)ovate or subcircular, 10–20(–30) by 5–15(–40) cm, glabrous above and beneath, sometimes scabrous, glands few to several, scattered, 0.5 mm diam., cystoliths not obvious, base cuneate-decurrent near the insertion of the petiole, margin entire, rarely undulate-dentate, apex (sub)obtuse or acute-acuminate; 3–5(–7) subpalmately veined, veins (nearly) straight; lobes triangular or (lanceolate) oblong. *Male raceme*: peduncle 3–13 cm long, 3–5 mm thick; rachis thickened, 7–9 cm long, 10–20 mm thick, including conspicuous bract scars, many-flowered; bracts caducous, pale yellow on drying, membranous, obovate, (35–)50–70 by 25–30 mm, densely soft hairy, margin entire or shallowly few-lobed at apex, glands minute. *Male flowers*: pedicel (10–)30–45 mm long, caducous; receptacle-tube 60–70 mm long, at throat 7–8 mm wide; sepals narrowly ovate-triangular, 10–15 mm long, 2–3(–5) mm wide at base, margin entire, apex long-acuminate; petals broadly obovate-rhomboid, 13–20 mm long, threads (yellow in Sabah, once seen), 11–15 mm long, synandrium 8–11 mm long, filaments glabrous, 2–3.5 mm long. *Female flowers*: pedicel 20–22 mm long; ovary glabrous, ellipsoid,

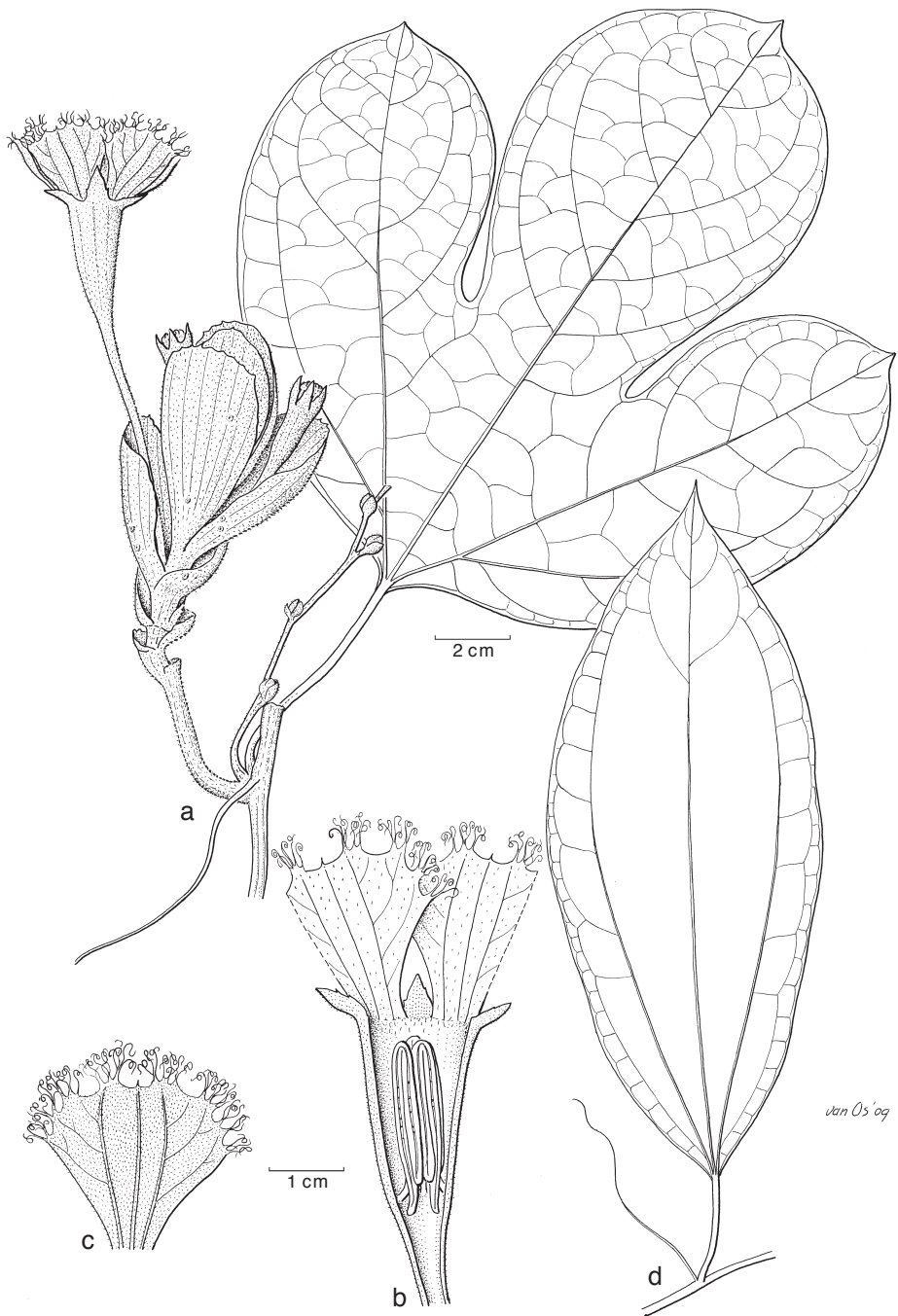


Fig. 76. *Trichosanthes globosa* Blume. a. Stem node with tendril, leaf, lateral shoot, and male inflorescence; b. apical part of male flower; c. petal; d. leaf of immature plant (a–c: SAN 144003; d: SAN 159462).

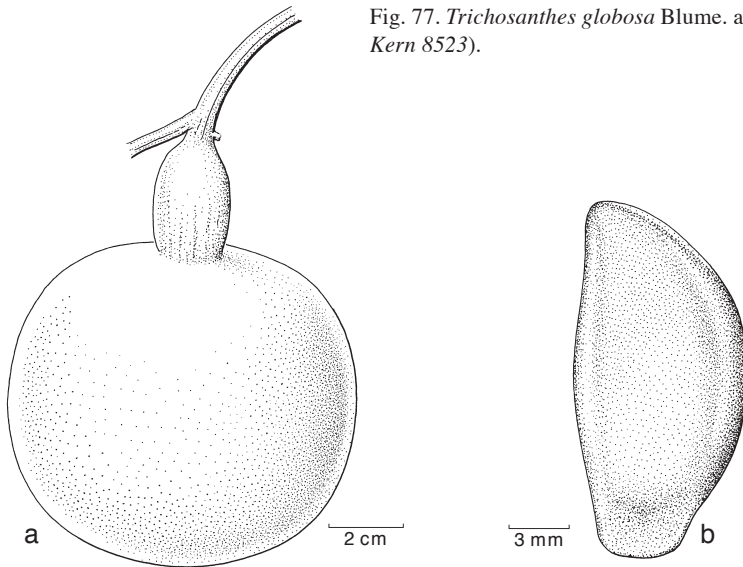


Fig. 77. *Trichosanthes globosa* Blume. a. Fruit; b. seed (both: Kern 8523).

c. 15 by 7.5 mm; perianth not known. *Fruit* ripening evenly bright red, globose, 5.5–12 by 6–12 cm, apex not beaked; exocarp thinly woody, smooth; dry pericarp 10 mm thick; pulp green-black; fruiting pedicel 2–6.5 cm long, 10–20 mm thick. *Seeds* brown or black, compressed, ovate or narrowly elliptic, 15–20 by 7–9 by c. 3 mm, base and apex rounded, margin present but inconspicuous, edge entire. — **Fig. 76, 77.**

*Distribution* — *Malesia*: Sumatra (Aceh, Padang, Bengkulu), Borneo (Sabah), West and Central Java.

*Habitat & Ecology* — Primary and degraded forest edges, riverine forest; 100–900 m altitude.

### 18. *Trichosanthes hastata* Harms

*Trichosanthes hastata* Harms, Bot. Jahrb. Syst. 60 (1925) 160; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 262; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 169. — Type: *Schlechter 19286* (holo B, lost; iso BR, drawing and fragment of stem), Papua New Guinea, Kaiser Wilhelmsland, along Waria River, near Jaduna.

Climber, 5–10 m long, late glabrescent or with (sparse) rigid pale hairs, leafy stem 1–4 mm diam.; dioecious. *Probract* (sometimes caducous), ovate or narrowly elliptic, 3–7 by 1–5 mm, glands absent. *Tendrils* unbranched or 2-branched. *Leaves*: petiole 2–6 cm long, hairy; blade greenish on drying, chartaceous, simple, unlobed, in outline (narrowly) ovate or sagittate, 6–18 by 4–14 cm, scabrous and sometimes finely bullate above, glabrous beneath, glands few, c. 0.5 mm diam. or absent, cystoliths usually obvious, margin remotely (minutely) dentate; veins 3–5 from the base, curved, also a few pinnate ones. *Male raceme* thinly hairy, flowers solitary at the node, or in the raceme and often with a solitary flower at base, its pedicel often later on showing as a persistent straw-like appendage; peduncle 1–5 cm long, 1–2 mm thick; rachis not thickened, 4–10(–15) cm long, 5–15-flowered; bracts (narrowly) obovate or (narrowly)

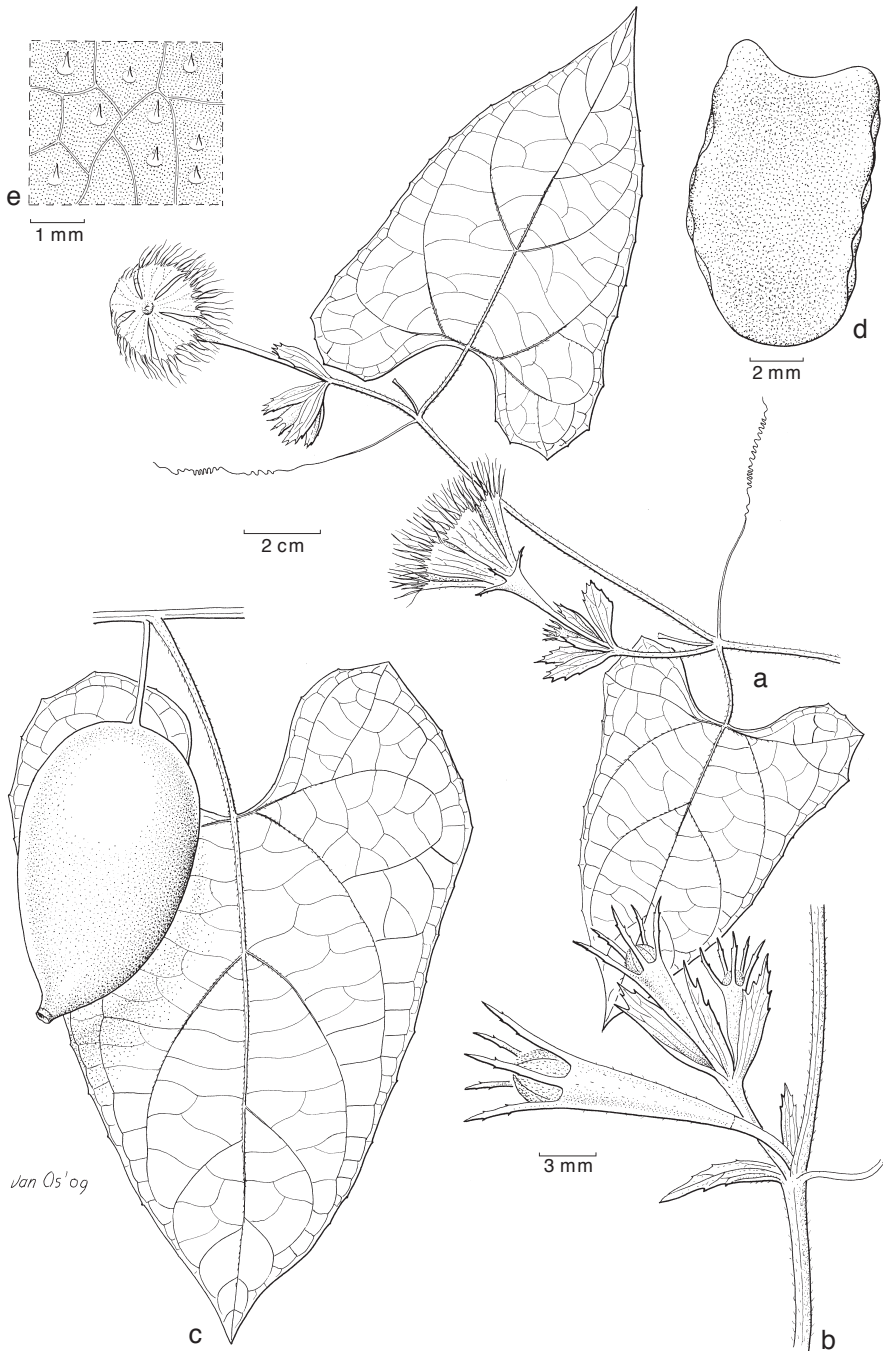


Fig. 78. *Trichosanthes hastata* Harms. a. Branch with male inflorescences; b. node with male inflorescence in an early stage; c. node with leaf and fruit; d. seed; e. detail of upper leaf blade surface (a, b: Van Royen NGF 16077; c–e: Womersley NGF 19152).

rhomboid, 8–20 by 6–15 mm, margin sharply dentate to 1/3 deep (or entire), glands absent or few, 0.5 mm diameter. *Male flowers*: pedicel 2–5 mm long, caducous, in solitary flowers 10–30 mm long, subsistent; receptacle-tube 25–45 mm long, at throat 5–10 mm wide; sepals long-triangular or narrowly elliptic, 6–10 mm long, 1–2 mm wide at base, entire or incised, or usually slenderly lobed or dentate, lobes 1–2 mm long; petals obovate-rhomboid, 15–25 by 10–25 mm, threads 10–20 mm long; synandrium 5–7 mm long, filaments glabrous, 2–3 mm long. *Female flowers*: pedicel 15–25 mm long; ovary (sub)glabrous, (narrowly) ellipsoid, 15–25 by 3–6 mm. *Fruit* ripening evenly orange-red, but greenish at apex, (narrowly) ovoid, c. 7.5 by 4.5 cm, apex subacute; exocarp thin, woody, smooth; dry pericarp not seen; pulp red; fruiting pedicel 1.5–2.5 cm long, 2–3 mm thick. *Seeds* brown, compressed,  $\pm$  parallel-sided, 8–10 by 5–7 by 1–2 mm, base subacute or narrowly notched, apex broadly notched, margin broad but faint, edge  $\pm$  grooved, coarsely crenulate. — **Fig. 78.**

Distribution — *Malesia*: New Guinea (West Papua (Freeport); Papua New Guinea (Morobe, Northern, and Central Provinces)).

Habitat & Ecology — Riversides, swampy and regrowth forests, forest edges, shrubbery and old gardens, on yellow sandy clay soil and river gravel; lowland to 600 m altitude. Flowering throughout the year.

Notes — 1. Because most herbarium specimens show expanded flowers, it is supposed that *T. hastata* is mainly diurnal.

2. *Ridsdale NGF 31736* and *Carr 16334* deviate in having leaves not or hardly scabrous above, petioles short-hairy only at apex, and hardly incised male bracts.

3. See also the note under the regional key.

### 19. *Trichosanthes intermedia* W.J.de Wilde & Duyfjes

*Trichosanthes intermedia* W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 19, f. 5, 6. — *Type*: Wood SAN 16077 (holo SAN; iso A, BO, BRI, K, KEP, L, SING), Borneo (Sabah).

*Trichosanthes* sp. 2, W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 212.

Subherbaceous climber, 2–8 m long, minutely hairy (except inflorescences), glabrescent, leafy stem 1.5–3.5 mm diam.; dioecious or monoecious. *Probract* absent or very small. *Tendrils* unbranched (rarely 2-branched). *Leaves*: petiole (1.5–)4 cm long; blade brown-green on drying, simple, unlobed or 3(–5)-lobed occasionally to the base, never foliolate, in outline (narrowly) ovate, subcircular when lobed, 8–15 by 4–7(–19) cm, faintly scabrous, glands several to many, scattered, cystoliths abundant, but small, base cordate, margin entire, apex of lobes acute-acuminate. *Inflorescences*: either racemes male, or racemes of male flowers mixed with some female ones, or few female flowers in a short raceme (1–3.5 cm long) or female flowers single at the nodes, wholly densely hairy, especially bracts and flowers, hairs 0.1 mm long, brown. *Male raceme*: peduncle 5–20 cm long; rachis 4–16.5 cm long, 2–3 mm thick, 5–40-flowered; bracts persistent, (narrowly) ovate, 6–15 mm long, margin coarsely dentate, apex acute, glands several to many. *Male flowers*: pedicel 3–6 mm long, persistent; receptacle-tube 30–40 mm long, at throat 6–7 mm wide, at base broadened into a semi-globose pseudo-ovary 3–5 mm diam.; sepals narrowly elliptic, 6–8 by 2–2.5 mm, entire; petals  $\pm$  obdeltoid, 10 mm long, threads 10 mm long; synandrium slightly exerted, truncate at apex,  $\pm$  narrower at base

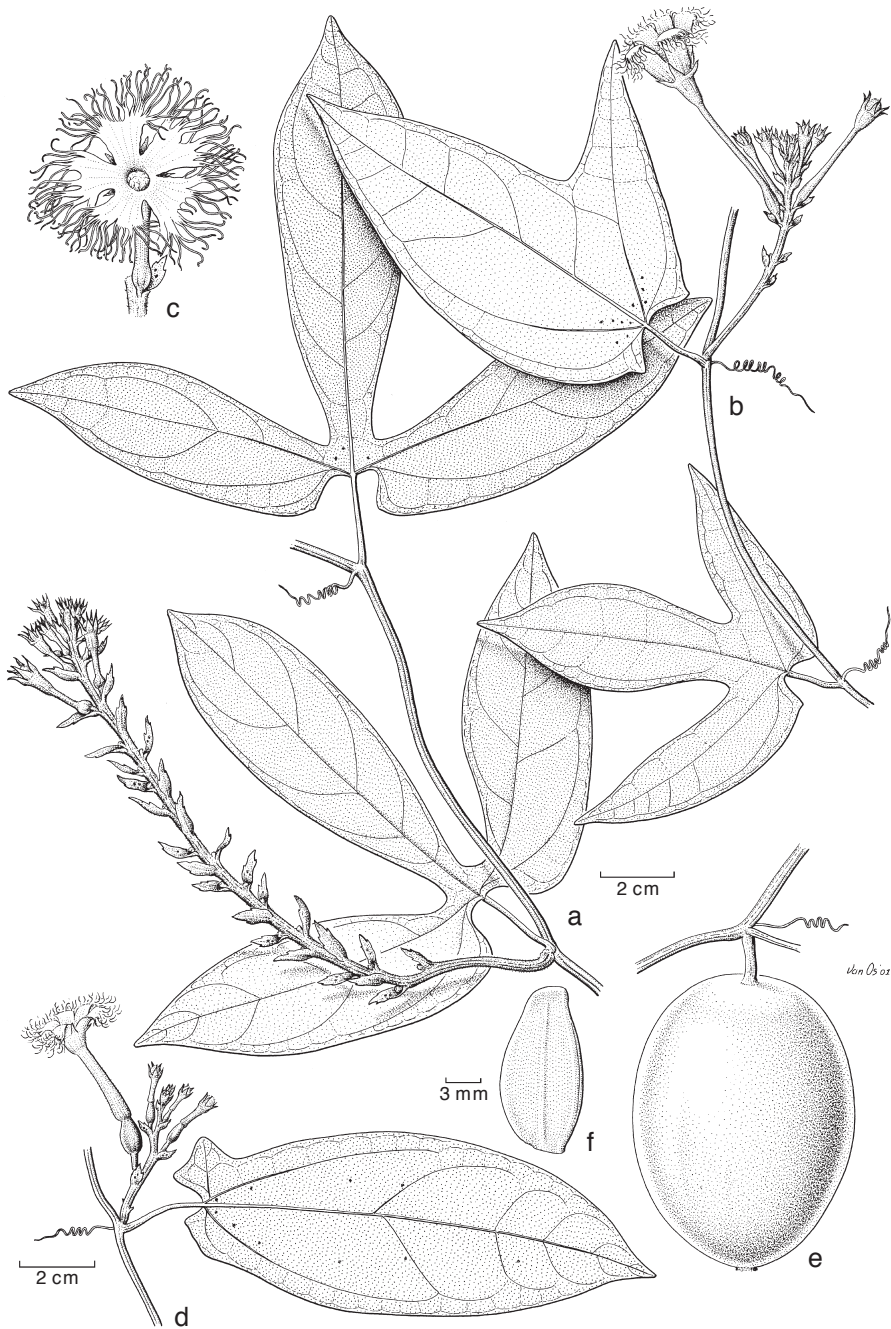


Fig. 79. *Trichosanthes intermedia* W.J.de Wilde & Duyfjes. a, b. Male flowering leafy twigs, note flowers with pseudo ovaries; c. male flower; d. female flowering leafy twig (flowers exceptionally in short raceme); e. fruit; f. seed (a–c: De Wilde SAN 116493; d: De Wilde & Postar SAN 141936; e, f: Lissan & Ampon SAN 71525).

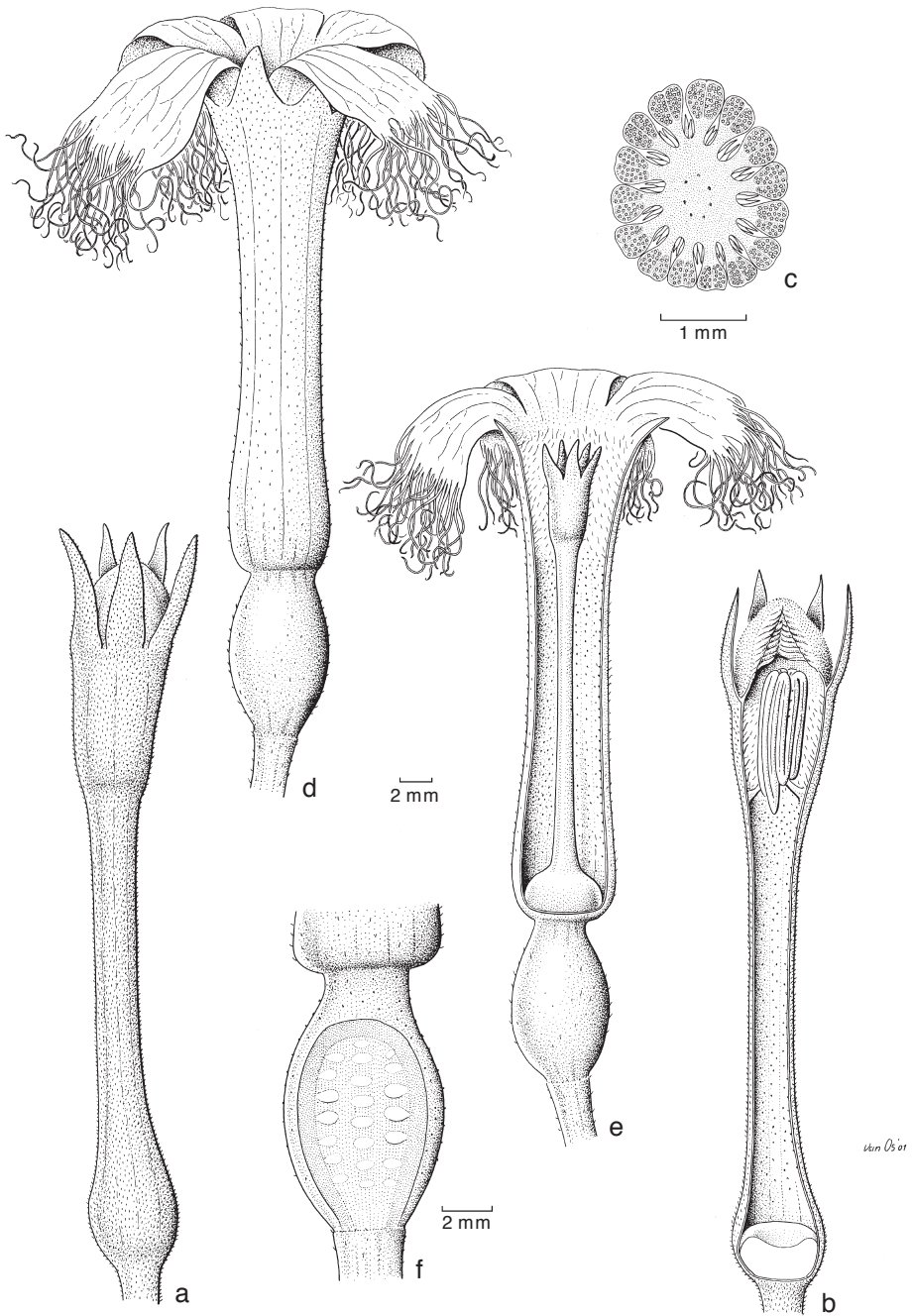


Fig. 80. *Trichosanthes intermedia* W.J.de Wilde & Duyfjes. a. Male flower bud; b. ditto, opened, note synandrium and semiglobose disc at base; c. synandrium, cross section; d. female flower; e. ditto, opened; f. ditto, ovary, longitudinal section (a–c: *Asik Mantor* SAN 115882; d–f: *De Wilde & Postar* SAN 141936).



and entering into the narrowed portion of the receptacle-tube, c. 9 by 3.5 mm, anthers fused, filaments glabrous, c. 1 mm long, inserted c. 5 mm below the receptacle-throat (attached to the synandrium well above its base); disc c. 3 by 3–4 mm, largely fused with the receptacle-tube, in dry specimens causing the pseudo-ovary (see note 2). *Female flowers*: pedicel 6–10 mm long, ovary (sub)glabrous, c. 9 by 5 mm; receptacle-tube c. 30 mm long; sepals narrow, 5 mm long. *Fruit* mostly solitary, green, ripening evenly red, ovoid or globose, 6–9 by 6–7 cm, pericarp when fresh 5(–10) mm thick, much thinner when dry; fruiting pedicel 1.5(–4) cm long, c. 3 mm thick. *Seeds* brown, compressed, (narrowly) elliptic, 15(–20) mm long (see note 3), 7–9 mm wide, base truncate-rounded, margin narrow and a low ridge in the middle, edge entire. — **Fig. 79, 80.**

Distribution — *Malesia*: Borneo (Sarawak (Sg Sipayan) and Sabah).

Habitat & Ecology — Open forest and forest edges, often on damp sites; sea level to 1300 m altitude. This species starts flowering already in the late afternoon.

Notes — 1. *Trichosanthes intermedia* can be confused with *T. wawrae*, *T. longispicata*, and *T. refracta*. The latter, a species from peaty forest in Brunei and Philippines, differs in sinuate male racemes and lack of glands on the bracts. *Trichosanthes longispicata* from Sarawak is similar, but stouter, and differs in larger 5–7-lobed leaves and male pedicels about as long as the bracts. In *T. wawrae* (Peninsular Malaysia, Sumatra, West Java, not known with certainty from Sabah) the leaves may be entire, lobed or compound, the leaflets distinctly petioluled, its male racemes are generally more slender and the male flowers lack the pseudo-ovary, its seeds are generally broader. The differences between *T. intermedia* and *T. wawrae* need more study, however.

2. The phenomenon of a pseudo-ovary in male flowers is caused by the presence of a thick cup- or cushion-shaped disc at the bottom of the receptacle-tube, and becomes apparent on drying, resembling an ovary, which in the female flowers, of course, is inferior below the receptacle-tube. A pseudo-ovary is absent in the resembling *T. longispicata*, but occurs in *T. refracta*, and in the non-resembling *T. villosa*.

3. The collection *Chew, Corner & Stainton RSBN 1204* (Kinabalu) differs in having a long fruiting pedicel, c. 4 cm long, and larger seeds, c. 20 mm long.

## 20. *Trichosanthes kinabaluensis* Rugayah

*Trichosanthes kinabaluensis* Rugayah, Reinwardtia 11, 5 (2000) 419; Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 262, f. 6, nom. inval.; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 90, pl. 2; W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 211, pl. 16: d, e; Sandakaniana 14 (2004) 23. — Type: *Chew, Corner & Stainton RSBN 2830* (holo BO; iso K, L, SAN), Borneo, Sabah, Tenompok.

Climber or creeper, 5–10 m long, glabrous, leafy stem 3–5 mm diam., sharply angular or winged, young shoots reddish; dioecious. *Probract* somewhat succulent, entire, narrowly elliptic, 10–15 mm long, glands few or absent. *Tendrils* 2- (or 3-) branched. *Leaves*: petiole 5–12 cm long; blade brown or greenish on drying, membranous or chartaceous, simple, 3–5-lobed or 5-angular, in outline circular, 6–22 by 6–21 cm, scabrous, glands few, towards the base of the midrib, (0.5–)1–2 mm diam., cystoliths present, margin entire or somewhat undulate-dentate; veins 5, straight, prominent on both surfaces. *Male raceme* sparsely minutely hairy, glabrescent, peduncle 7–16 cm

long, 2–4 mm thick; rachis not thickened, 4–12 cm long or more, 10–20-flowered; bracts obovate-rhomboid, 30–45 by 20–45 mm, margin irregularly deeply incised to c. 1/3 deep, glands few or absent. *Male flowers*: pedicel 10–35 mm long, caducous; receptacle-tube 50–70 mm long, at throat 10–12 mm wide; sepals long-triangular, 10–17 mm long, 3–5 mm wide at base, margin usually coarsely dentate or entire; petals obovate-rhomboid, c. 25 mm long, threads c. 20 mm long; synandrium 10–12 mm long, with spine-like hairs between the thecae, filaments glabrous, 3–4 mm long. *Female flowers*: pedicel c. 20 mm long, ovary glabrous, ellipsoid, 10–14 mm long; receptacle-tube narrow, 60–65 mm long, at throat 7–9 mm diam., style hairy, c. 60 mm long, stigma c. 5 mm long. *Fruit* ripening orange, paler speckled, globose, 5.5–7.5 cm diam.; exocarp leathery, or thinly woody; dry pericarp 5–10 mm thick; pulp green-black, bitter; fruiting pedicel 1.5–2.5 cm long, 4–7 mm thick. *Seeds* dark brown, compressed, elliptic, c. 10 by 3–4(–5) by 1–2 mm, base  $\pm$  cuneate, apex broadly rounded, margin faint, edge entire. — **Plate 27a, b.**

Distribution — *Malesia*: Borneo (Sabah (Kinabalu and northern Crocker Range area)).

Habitat & Ecology — Moist places in secondary roadside vegetation, forest and scrub edges; 1000–1600 m altitude.

Note — Young shoots in living plants are reddish purplish.

## 21. *Trichosanthes laeioica* C.Y.Cheng & Lu Q.Huang

*Trichosanthes laeioica* C.Y.Cheng & Lu Q.Huang, Bull. Bot. Res., Harbin 16, 4 (1996) 503, f. 2; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 262; Rugayah, *Trichosanthes* (Cucurbitaceae) in *Malesia*, thesis (1999) 173. — Type: *Coode et al. NGF 32585* (holo CANB; iso BO, K, L, LAE), Papua New Guinea, Eastern Highlands Province, Kassam Pass.

Climber, 3–6 m long, glabrescent or pale brown hairy, leafy stem 3–5 mm diam.; dioecious. *Probract* elliptic or linear, 2–5 mm long, glands present. *Tendrils* unbranched or 2-branched. *Leaves*: petiole (3–)5–12 cm long; blade (brown) or green on drying, membranous or chartaceous, simple, unlobed, or shallowly or deeply 3–7-lobed to 1/3(–2/3) deep, or 3–5-angular, in outline subcircular or broadly ovate, 10–22 by 8–20 cm, often scabrous, especially above, short hairy or glabrescent beneath, glands few to several, scattered but usually close to the insertion of the petiole, 0.5–1(–2) mm diam., margin entire, or sparsely minutely dentate or sinuate; veins 5(–7), straight or arching. *Male raceme* usually with co-axillary a solitary male flower or a straw-like appendage, brown hairy, hairs 1–2 mm long, peduncle 5–16 cm long, c. 2 mm thick; rachis not thickened, 5–10 cm long, 5–10-flowered; bracts ovate or (narrowly) obovate, 4–10 by 3–5 mm, acute, margin entire or finely dentate, glands present. *Male flowers*: pedicel in the raceme c. 5 mm long and caducous, in solitary flower c. 75 mm long and persisting as a straw-like appendage; receptacle-tube 35–80 mm long, at throat 8–12 mm wide; sepals narrowly triangular, 4–5 mm long, 1–2 mm wide at base, margin entire; petals obovate or rhomboid, 10–25 mm long, threads c. 10 mm long; androecium not seen. *Female flowers*: mature flowers not known; ovary finely hairy, (narrowly) ellipsoid; sepals as in male. *Fruit* ripening evenly red, (sub)globose, (narrowly) ellipsoid or pyriform, 10–20 by 5–9.5 cm, glabrous or sparsely hairy; exocarp woody and smooth or leathery and wrinkled, pericarp carnos, dry pericarp (2–)5–10 mm thick;

pulp orange-red or yellow; fruiting pedicel 1.5–3.5 cm long, 4–8 mm thick. *Seeds* pale or dark brown, compressed, narrowly elliptic or  $\pm$  parallel-sided, 12–17 by 4–6(–7) by 2 mm, notched at one or both ends, margin faint, edge entire or faintly undulate.

Distribution — *Malesia*: New Guinea; 4 forms.

#### KEY TO THE FORMS

- 1a. Leaves unlobed, glabrous beneath. Fruit (narrowly) pyriform. — eastern Papua New Guinea . . . . . **b. forma *sicyocarpa***
- b. Leaves unlobed or shallowly 3-lobed or 3-angular, densely hairy or glabrescent beneath. Fruit globose or (narrowly) ellipsoid . . . . . 2
- 2a. Fruit (sub)globose or short-ellipsoid; exocarp woody, smooth. — West Papua, Sorong area . . . . . **c. forma *sorongensis***
- b. Fruit (narrowly) ellipsoid; exocarp wrinkled (not completely known in forma *laeoica*). . . . . 3
- 3a. Male receptacle-tube 40–80 mm long. — Papua New Guinea, Eastern Highlands Province . . . . . **a. forma *laeoica***
- b. Male receptacle-tube c. 35 mm long. — Western West Papua **d. forma *yapenensis***

#### **a. forma *laeoica***

*Leaves*: blade unlobed, 3–5-angular or 3-lobed, greenish brown on drying, hairy beneath. *Male raceme* with a solitary flower at the node, the pedicel often as a straw-like remnant at base. *Male flowers*: pedicel in raceme c. 5 mm long, in solitary flowers c. 75 mm long; receptacle-tube (40–)50–80 mm long. *Fruit* (incompletely known): c. 5 cm wide; exocarp finely wrinkled, glabrous.

Field-notes — Petals white with a green line abaxially. The flowers probably are open at night only, wilting quickly at sunrise. Fruit said to be red when ripe, edible.

Distribution — *Malesia*: New Guinea (Papua New Guinea (Eastern Highlands Province)).

Habitat & Ecology — Secondary forest; c. 1400 m altitude.

#### **b. forma *sicyocarpa* Rugayah**

*Trichosanthes laeoica* C.Y.Cheng & Lu Q.Huang forma *sicyocarpa* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 264; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 176. — Type: *Brass* 5347 (holo BO; iso BRI), Papua New Guinea (Central Province, Mafulu).

*Leaves*: blade unlobed, green or dark brown on drying, broadly ovate, glabrous beneath, margin entire or shallowly undulate. *Male raceme*, *male* and *female flowers* not known. *Fruit* (narrowly) pyriform, c. 20 by 3 cm; exocarp thinly woody, smooth; fruiting pedicel c. 3 cm long, c. 8 mm thick.

Field-notes — Fruit green, ripening orange to red, cucumber-like, edible; sometimes cultivated.

Distribution — *Malesia*: New Guinea (Papua New Guinea (Western Highlands, Morobe, and Central Provinces)).

Habitat & Ecology — Secondary regrowth forest, along logging roads; 900–1400 m altitude.

Note — The precise size and shape of the fruit is not known.

**c. forma *sorongensis* Rugayah**

*Trichosanthes laeica* C.Y.Cheng & Lu Q.Huang forma *sorongensis* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 265; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 177. — Type: *Avé 4782* (holo L), West Papua, Sorong (Ayawasi).

*Leaves*: blade unlobed or 3-lobed to 1/4 deep, greenish on drying, densely hairy beneath, glands many, scattered. *Male raceme*, *male* and *female flowers* not known. *Fruit* (sub)globose or short-ellipsoid, 7.5–12.5 by 8–10 cm (spirit); exocarp thin, woody, smooth, sparsely hairy; fruiting pedicel 1.5–3 cm long, 4–6 mm thick.

Field-notes — Climber 6 m long Fruit c. 12.5 cm long; inside orange red, edible.

Distribution — *Malesia*: New Guinea (West Papua: Vogelkop (Sorong: Ayawasi)).

Habitat & Ecology — Secondary forest, margin of gardens; on deep brown-grey clay; c. 450 m altitude.

**d. forma *yapenensis* Rugayah**

*Trichosanthes laeica* C.Y.Cheng & Lu Q.Huang forma *yapenensis* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 265; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 178. — Type: *Widjaja 6882* (holo BO; iso L), West Papua, Yapen Is.

*Leaves*: blade unlobed or 3-lobed, 1/3–2/3 deep, green or brown on drying, scabrous hairy or glabrous beneath, scabrous above. *Male raceme* at base with a straw-like appendage (withered peduncle or pedicel of solitary flower). *Male flowers*: pedicel c. 5 mm long; receptacle-tube c. 35 mm long. *Fruit* (narrowly) ellipsoid, c. 10 by 5 cm; exocarp leathery, finely wrinkled; fruiting pedicel c. 3.5 cm long, 4 mm wide.

Field-notes — Creeping on the ground, leaves rough; fruit ripening red, edible.

Distribution — *Malesia*: New Guinea (West Papua (Yapen Is.)).

Habitat & Ecology — Primary and secondary forest, creeping along roadsides; sea level to 1000 m altitude.

Note — Known only from a few incomplete collections; the fruit in spirit is 12 cm long and 6 cm wide.

**22. *Trichosanthes leuserensis* Rugayah**

*Trichosanthes leuserensis* Rugayah, in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 265; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 127. — Type: *de Wilde & Duyffjes 18605* (holo BO; iso K, L), Aceh, Gunung Leuser Park, Ketambe.

Climber, 10–20 m long, glabrous (minute powdery hairs on growing shoots excepted), leafy stem 3–6 mm diam.; monoecious. *Probract* obovate or narrowly elliptic, 10–15 by 5–8 mm. *Tendrils* 2- or 3-branched. *Leaves*: petiole 3–10 cm long; blade reddish brown on drying, membranous or chartaceous, simple, deeply 3–5-lobed, in outline subcircular, 8–18 by 7–18 cm, ± scabrous, glands few or several, towards the

insertion of the petiole and sometimes scattered, 0.5–1 mm diam., cystoliths present, margin (minutely) serrate-dentate, more coarsely so towards the base; veins 5(–7), straight. *Male raceme* thinly minutely brown hairy, glabrescent; peduncle 6–11 cm long, 2–4 mm thick; rachis not thickened, 4–10 cm long, up to 20-flowered; bracts persistent, broadly ovate-rhomboid, 30–45 by 15–20 mm, margin finely dentate or incised 2–5(–10) mm deep, glands absent. *Male flowers*: pedicel 5(–10) mm long, caducous; receptacle-tube c. 50 mm long, at throat 8 mm wide; sepals narrowly elliptic, 12–15 mm long, 3–4 mm wide at base, margin dentate, rarely entire; petals obovate-rhomboid, c. 10 mm long, papillose hairy, threads short; synandrium c. 10 mm long, filaments c. 2 mm long, glabrous. *Female flowers* (from bud): solitary or 1 or 2 at base in male raceme, with smaller bract; pedicel 5–10 mm long; ovary glabrous, (narrowly) ellipsoid, c. 10 by 3 mm. *Fruit* ripening orange, with or without whitish greenish stripes, subglobose, 6.5–8 by 5–7.5 cm, apex c. 2 mm beaked; exocarp leathery, smooth; pericarp firm-carnose, dry pericarp 10–18 mm thick; pulp greenish black, bitter; fruiting pedicel in the raceme 0.5–1.5 cm long, when solitary on the node c. 2 cm long, c. 4 mm thick. *Seeds* dark brown, ± compressed, (narrowly) elliptic, base and apex broadly rounded, 15–18 by 8–10 by 3–4 mm, margin absent, edge entire.

Field-notes — Herbaceous climber 8–15 m tall. Fruit (sub)globose, 9–10 cm diam., bright orange, with or without whitish greenish stripes, pericarp 2.5 cm thick, pale yellow to yellowish green inside, seeds brown, imbedded in blackish pulp. Immature fruit when cut smelling of cucumber.

Distribution — *Malesia*: Sumatra: Aceh (Kluet, Ketambe); North Sumatra (Sibolangit).

Habitat & Ecology — Rain forest, along rivers; on yellow-red loamy soil; 60–600 m altitude.

Notes — 1. *Trichosanthes leuserensis* is similar to *T. pubera*; the latter is dioecious, and differs in reddish tinged shoots, a much more elongated probract, leaves hairy beneath, and ellipsoid (not subglobose) fruits always at the nodes, generally with a less thick pericarp, and smaller and compressed seeds.

2. *Trichosanthes leuserensis* is probably entirely or mostly monoecious, because the collections contain male and fruiting (or female flowering) elements, although the fruit is sometimes mounted detached on the sheets.

### 23. *Trichosanthes longispicata* Rugayah

*Trichosanthes longispicata* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 266, f. 7, p.p., for the type only; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 96, pl. 4, p.p., for the type only. — Type: *Yii & Othman S 46270* (holo L; iso K, SAR), Borneo, Sarawak, 1st Div., Mt Hujan.

Climber to 5 m long, minutely brown hairy, glabrescent, leafy stem 4–6 mm diam.; dioecious. *Probract* not seen. *Tendrils* 2- or 3-branched. *Leaves*: petiole 4–5 cm long; blade greenish brown on drying, membranous or chartaceous, simple, deeply 5(–7)-lobed 7/8 deep, in outline circular, c. 20 by 23 cm, faintly scabrous above, glands few or absent, situated towards the insertion of the petiole, c. 1 mm diam., cystoliths inconspicuous or absent, margin entire; veins 5(–7), straight. *Male raceme* finely brown

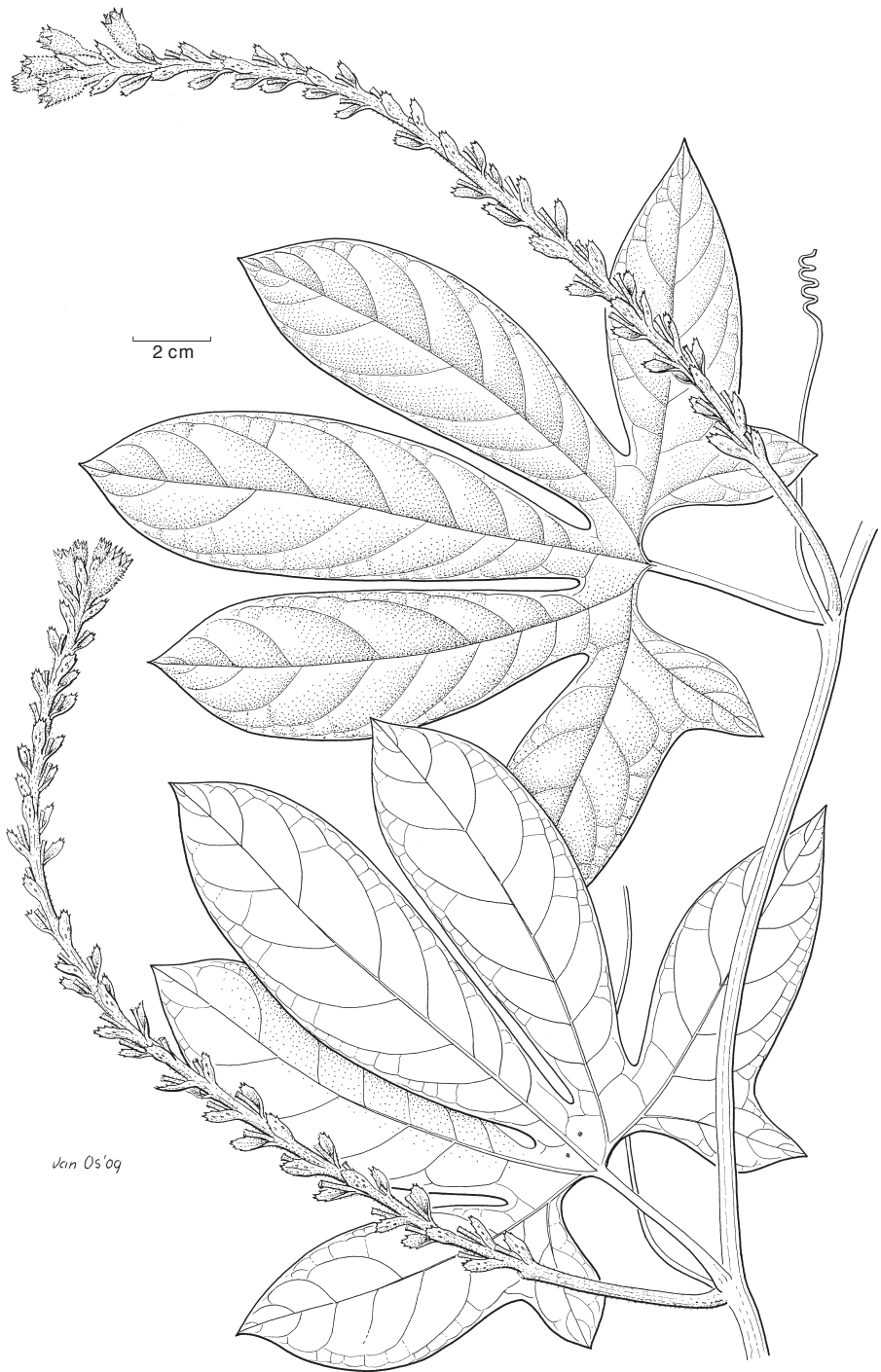


Fig. 81. *Trichosanthes longispicata* Rugayah. Twig with male racemes (Yii & Othman S 46270, type).

(-yellow) hairy, glabrescent, peduncle 4–5 cm long, c. 3 mm thick; rachis not thickened, 20–27 cm long, 25–50-flowered or more; bracts persistent, (narrowly) (ob)ovate, 9–12 by 3–7 mm, margin conspicuously dentate, glands numerous, obscure. *Male flowers* (from buds): pedicel 9–12 mm long, persistent; receptacle-tube c. 10 mm long, at throat 5 mm wide, at base without a pseudo-ovary (see note under *T. intermedia*); sepals narrowly triangular, 4–5 mm long, c. 1.5 mm wide at base, entire; petals and androecium not seen. *Female flowers* and *fruit* not known. — **Fig. 81.**

Distribution — *Malesia*: Borneo (Sarawak, where known only from the type).

Habitat & Ecology — Logged over dipterocarp forest; at low altitude.

## 24. *Trichosanthes montana* Rugayah

*Trichosanthes montana* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 3 (1998) 218; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 268; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 143, pl. 17. — Type: *De Wilde & Duyffjes 21841* (holo BO; iso L), West Java, Telaga Warna near Cibodas.

*Trichosanthes sumatrana* auct. non Cogn.: Rugayah & W.J.de Wilde, Blumea 42, 2 (1997) 479, f. 4, p.p.

Climber to 12 m long, minutely brown hairy, hairs 1 mm long, glabrescent, leafy stem 3–6 mm diam.; monoecious or dioecious. *Probract* membranous or somewhat fleshy, (narrowly) elliptic, 5–10(–15) mm long, glands absent or present. *Tendrils* 2–4-branched. *Leaves*: petiole 3.5–14 cm long; blade greenish brown on drying, membranous, chartaceous or subcoriaceous, simple, 5–7-lobed to c. 3/4 deep (unlobed in juvenile stages), in outline circular, 10–28 by 11–26 cm, not or little scabrous, often finely bullate above, glands few or absent, generally towards the base, 1–3 mm diam., cystoliths not obvious, margin sometimes recurved, entire or irregularly shallowly dentate; veins 5–7, straight,  $\pm$  sunken above. *Male raceme* thinly brown hairy; peduncle 2–6 cm long, 3–7 mm thick; rachis thickened, 13–35 cm long, 5–20 mm thick, 20-flowered (or more); bracts late-caducous or persistent, subcoriaceous, rhomboid or broadly obovate, 40–60 by 20–30 mm, margin coarsely dentate, sometimes with 3 main lobes, glands absent. *Male flowers*: pedicel 3–10 mm long, caducous; receptacle-tube 30–45 mm long, at throat 7–8(–10) mm wide; sepals narrowly triangular, 10(–17) mm long, 3–4 mm wide at base, entire or with few narrow lobes; petals obovate-rhomboid, 17–20 mm long, threads 5–10 mm long; synandrium 12–15 mm long, inserted at c. 15 mm below throat, filaments 3–4 mm long, hairy; disc close to the base of the receptacle-tube, consisting of 3 transverse pads. *Female flowers*: sometimes monoecious with flower co-axillary with the male raceme, or some flowers mixed in the male raceme; pedicel 15–30 mm long (when in male raceme shorter), ovary short brown hairy or subglabrous, subglobose or ovoid, 10–15 by 8–10 mm; receptacle-tube and perianth as in male. *Fruit* solitary at the nodes or in old male raceme, ripening evenly orange or bright red, (depressed) globose or ellipsoid, 10–14 by 8–14 cm, apex rounded; exocarp woody, c. 1 mm thick, smooth; dry pericarp firm-carnose, 15 mm thick; pulp green-black, bitter; fruiting pedicel 3–5 cm long, 10–20(–25) mm thick. *Seeds* brown-black, compressed, ovate-oblong, 17–20 by 6–8 by 2–3 mm, base and apex narrowly rounded, margin present, distinct or faint, edge entire.

Distribution — *Malesia*: Sumatra, Borneo, and Java; 2 subspecies.

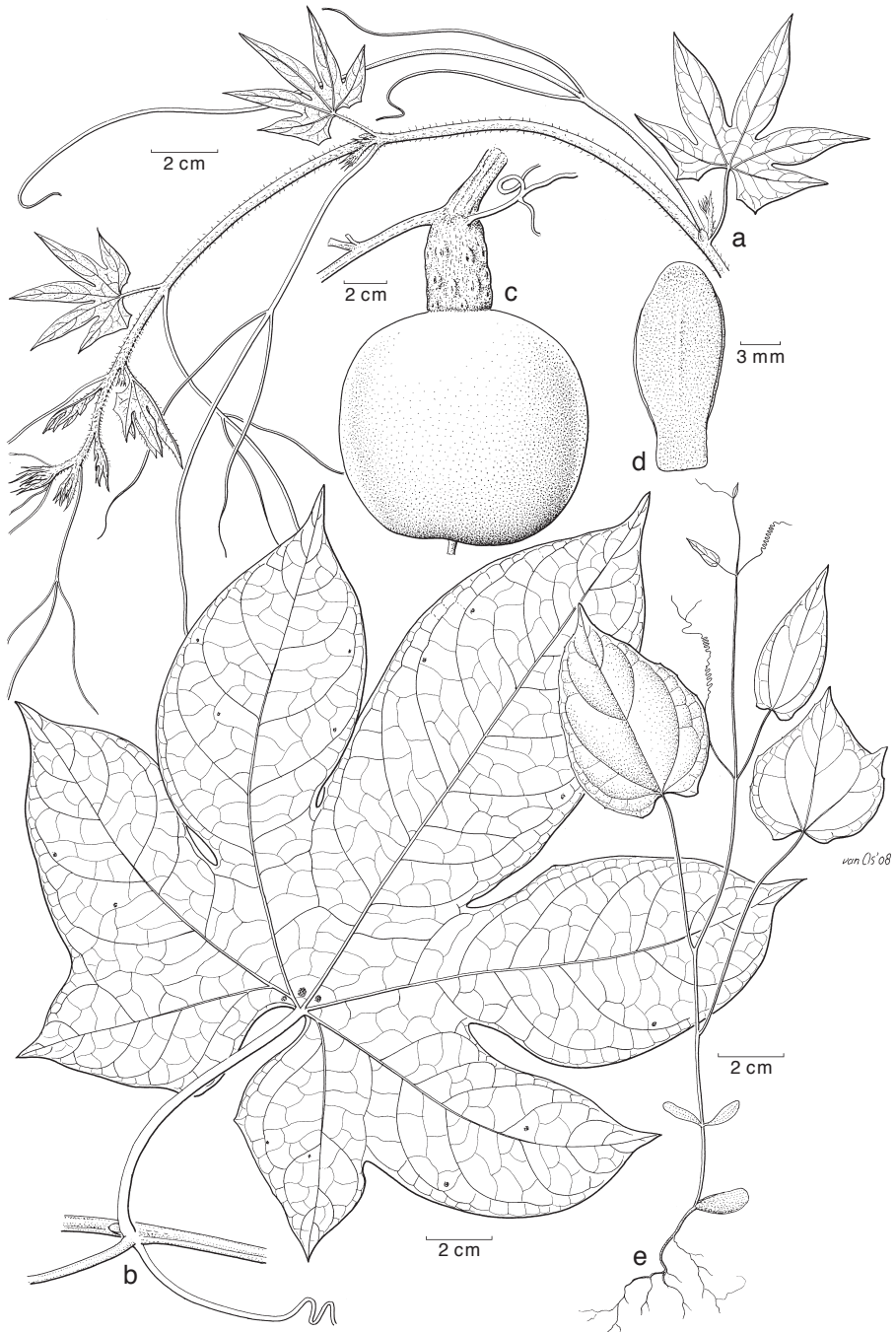


Fig. 82. *Trichosanthes montana* Rugayah subsp. *crassipes* W.J.de Wilde & Duyfjes. a. Apex of growing shoot; b. node with mature leaf; c. fruit; d. seed; e. young plant, cotyledons still present (a, b: *De Wilde & Duyfjes* 21997; c, d: *Sugau* JBS 106; e: *De Wilde, Postar & Pereira* SAN 141925).



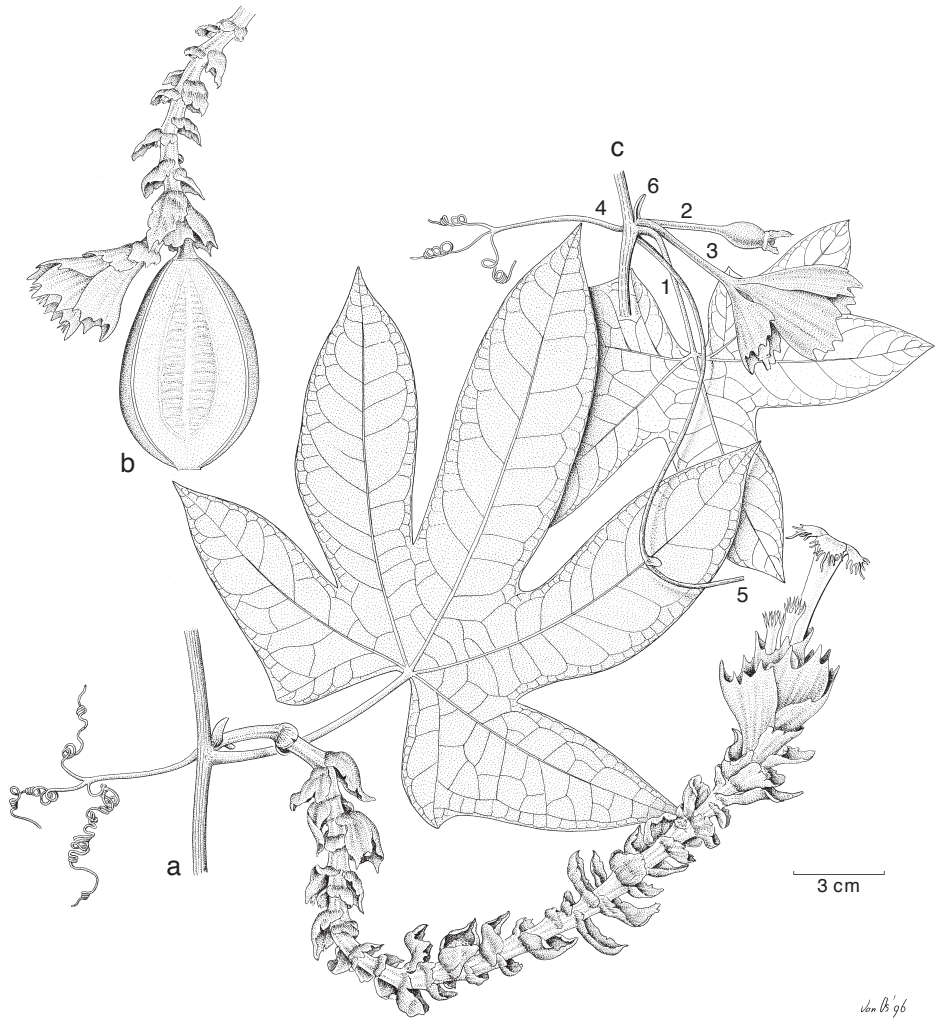


Fig. 83. *Trichosanthes montana* Rugayah subsp. *montana*. a. Node with male inflorescence in its natural up-curved position; b. detail of male inflorescence with also a half-grown fruit; c. node, showing 1: leaf, 2: female flower, perianth removed, 3: developing male inflorescence, 4: tendril; 5: sterile lateral shoot, 6: probract (a, b: De Wilde & Duyffjes 21841; c. De Wilde & Duyffjes 21865).

KEY TO THE SUBSPECIES

- 1a. Fruits solitary at the node or in old male raceme, ripening orange, ellipsoid. Fruiting pedicel 4–5 cm long, c. 10 mm thick, smooth or shallowly fissured. — Sumatra, Java . . . . . **a. subsp. montana**
- b. Fruits solitary at the node, ripening bright red, (depressed) globose. Fruiting pedicel c. 3 cm long, 15–20(–25) mm thick, deeply fissured and brown corky. — Borneo . . . . . **b. subsp. crassipes**

**a. subsp. montana**

*Fruit* solitary or developed in the male raceme, ripening orange, ellipsoid, 10–14 cm long, c. 8 cm wide; fruiting pedicel 4–5 cm long, c. 10 cm thick, smooth or shallowly fissured. — **Fig. 83.**

Distribution — *Malesia*: West Sumatra (Gn Sago); South Sumatra (Lampung (Gn Tanggamus)); West Java.

Habitat & Ecology — Primary montane forest; 900–1350 m altitude.

**b. subsp. crassipes** W.J.de Wilde & Duyfjes

*Trichosanthes montana* subsp. *crassipes* W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 23. — Type: *De Wilde, Tajuddin & Good SAN 143916* (holo SAN; iso L), Sabah (Tongod: Imbak River).

*Fruit* solitary at the node, ripening bright red, (depressed)globose, 10–14 cm diam.; fruiting pedicel c. 3 cm long, 15–20(–25) mm thick, deeply fissured and brown corky. — **Fig. 82; Plate 30a.**

Distribution — *Malesia*: Borneo (Sarawak: 1st Division (Gn Pueh); Sabah: Tenompok (near Ranau), Tawau Hill Forest Reserve, and Lungmanis Forest Reserve; East Kalimantan (near Balikpapan and Berau)).

Habitat & Ecology — Along roadsides and forest edges; 100–1600 m altitude.

**25. Trichosanthes mucronata** Rugayah

*Trichosanthes mucronata* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 268; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 80, pl. 1; W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 211, pl. 17: a, b; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 25. — Type: *De Wilde & Duyfjes SAN 139464* (holo SAN; iso BO, L), Borneo, Sabah, Mt Kinabalu area.

Climber to 5 m long, whitish or brown soft hairy, hairs 1–2 mm long, leafy stem 2–4 mm diam.; dioecious. *Probract* absent. *Tendrils* 3–5-branched, point of branching 2–4 cm from the base. *Leaves*: petiole 3–7 cm long; blade green on drying, membranous, simple, unlobed, in outline broadly ovate, 6–19(–21) by 5–13 cm, finely scabrous above and beneath, glands several, scattered, 0.5 mm diam. or less, cystoliths present but indistinct, margin minutely dentate or dentate-serrate, apex acute-acuminate, with a 13–20(–25) mm long acumen; veins 5 (or 7), ± arching. *Male raceme* (sparsely or) densely brown soft hairy; peduncle 4–8(–9) cm long, 2–3 mm thick; rachis not thickened, 4–7 cm long, 5–12-flowered, occasionally male flowers single; bracts caducous, on the rachis, c. 1 mm long. *Male flowers* densely dark brown hairy, including small gland-hairs; pedicel 20–40 (in single flowers to 45) mm long, (sub)persistent, peduncle or solitary pedicel often straw-like withering; receptacle-tube narrow, tubular, 35–65 mm long, at throat 5–6(–7) mm wide; sepals narrowly triangular or linear, 11–16 mm long, (1.5–)2–2.5 mm wide at base, entire; petals narrowly elliptic, c. 15 mm long, threads much longer; synandrium 7–8 mm long, at apex with 3 processes 1–1.5 mm long, filaments 4–5 mm long, glabrous; disc consisting of 3 fleshy, line-shaped elements, c. 25 mm long. *Female flowers* solitary, resembling male flowers; pedicel 15–25 mm long; ovary densely hairy, narrowly ellipsoid, 10–15 by c. 5 mm. *Fruit* ripening

(yellow-)green with whitish stripes, ellipsoid, 9–10 by c. 6 cm, apex shortly beaked; exocarp leathery, thin, smooth; pericarp carnose, dry pericarp 5 mm thick; pulp whitish, slightly bitter; fruiting pedicel c. 2 cm long, 4 mm thick. *Seeds* tumid, broad, with two inflated lateral parts, c. 10 by 18 by 4 mm, margin absent, edge entire, smooth. — **Plate 27c, d.**

Field-notes — The male flowers open at night and stay open until noon. The space between the anthers is densely set with stiff white hairs, c. 0.5 mm long.

Distribution — *Malesia*: Borneo (endemic to Sabah, in a restricted area below the entrance of Kinabalu Park).

Habitat & Ecology — Wet places in forest edges and shrubby roadsides; 1000–1400 m altitude. Flowering in December; fruiting December to March.

## 26. *Trichosanthes obscura* Rugayah

*Trichosanthes obscura* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 269; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 92, pl. 13; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 25. — Type: *Hansen 968* (holo L; iso C, S), Borneo, Sarawak, Ulu Belaga, Sepakau logging camp.

Climber, 6–8 m long, finely greyish brown hairy, glabrescent, leafy stem 3–4 mm diam.; dioecious. *Probract* (ob)ovate, 4–8 mm long, subentire, minutely papillose hairy, glands absent. *Tendrils* 2- or 3-branched. *Leaves*: petiole 3–6 cm long; blade dull blackish on drying, membranous, simple, unlobed or 3-lobed, 1/3–2/3 deep, in outline ovate or circular, 7–20 by 8–18 cm, finely scabrous above or papillose hairy, glands few or absent, mainly towards the base, 1–2 mm diam., cystoliths occasionally on petiole and veins, margin entire or undulate-dentate, apex slenderly acuminate; veins 5(–7), straight or curved. *Male raceme* finely brown hairy, to 30 cm long, including the 8–14 cm long and 2–3 mm thick peduncle; rachis not thickened, c. 4 cm long, 5–10-flowered; bracts broadly rhomboid or obovate, 15–20 by c. 15 mm, margin finely fan-shaped incised to nearly halfway, glands absent. *Male flowers* (from bud): pedicel c. 5 mm long, caducous; receptacle-tube c. 15 mm long, at throat 5–7 mm wide; sepals narrowly ovate, 5–7 mm long, c. 3 mm wide at base, margin narrowly lobed; petals and stamens not seen. *Female flowers*: pedicel c. 15 mm long; ovary glabrescent, subglobose, 10–15 mm long; receptacle-tube c. 20 mm long; sepals narrowly elliptic, 5 mm long. *Fruit* pale green with whitish dots, ripening evenly bright orange, (depressed-)globose, c. 7 by 9 cm; exocarp woody, smooth, c. 1 mm thick; pericarp juicy, dry pericarp 1 mm thick; pulp green-black; fruiting pedicel 2–3 cm long, c. 5 mm thick. *Seeds* compressed, (narrowly) elliptic, with a faint lengthwise ridge in the middle, 18–22 by 7–8 by 2 mm, base and apex obtuse-truncate, margin broad but faint, edge entire.

Field-notes — Mature fruit globose, green, spotted with light green. *Bygrave 49* (Brunei: Belait) noted: “Climber growing through the lower canopy. Leaves covered in glandular hairs giving them a sticky texture. Fruit bright orange on short, green stalk.”

Distribution — *Malesia*: Borneo (Brunei (Labi Hills Forest Reserve and Belait); Sarawak (4th Div.: Bintulu, 7th Div.: Ulu Belaga); Sabah (Pensiangan Kayu Forest Reserve, Mendalom Forest Reserve) and North Kalimantan (Sg Magne)).

Habitat & Ecology — Mixed dipterocarp forest, riversides and hillsides, also kerangas forest; at low altitudes.

## 27. *Trichosanthes papuana* F.M.Bailey

*Trichosanthes papuana* F.M.Bailey, Queensland Agric. J. 7 (1900) 349; Harms, Bot. Jahrb. Syst. 60 (1925) 161; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 271; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 103, pl. 7. — Type: *Le Hunte s.n.* (holo BRI), south-eastern Papua New Guinea.

Large climber, glabrous, leafy stem 2–5 mm diam., sometimes lenticellate; dioecious. *Probract* rather thick, broadly ovate, concave, 3–8 by 2–5 mm, glands absent. *Tendrils* 2- or 3-branched. *Leaves*: petiole 3–6.5 cm long; petiolules 0.5–1.5 cm long; blade green on drying, membranous or chartaceous, 3–5-foliolate (simple and hastate in juvenile plants), in outline circular, c. 30 cm diam., not or little scabrous, with minute pale or dark dots, glands few or absent, scattered, 0.5 mm diam., cystoliths obvious; middle leaflet 9–18 by 3.5–10 cm, base rounded or cuneate, margin (sub)entire, apex acute-acuminate. *Male raceme* minutely brown hairy, glabrescent; peduncle 5–10 cm long, c. 2 mm thick; rachis not thickened, c. 15 cm long, c. 10-flowered; bracts persistent, rhomboid or broadly ovate, 20–30 by 15–25 mm, margin irregularly sharply incised to 4 mm deep, glands not obvious. *Male flowers* (from subsessile bud): sepals long-triangular, c. 5 mm long, 2 mm wide at base, subentire. *Female flowers* not known. *Fruit* ripening bright red, possibly somewhat striped at apex, broadly ovoid-ellipsoid, 9–16(–20) by 7–13(–17) cm; exocarp woody, smooth, 2–3 mm thick; pulp green-black; fruiting pedicel 1–3 cm long, 7–15 mm thick. *Seeds* blackish, compressed, ovate or narrowly elliptic, 20–27 by 11–15 by 4–6 mm, base subtruncate, apex narrowly rounded, margin broad but faint, edge entire.

Field-notes — Fruit large, orange or bright scarlet. The plant is propagated by cuttings. *Takeuchi & Ama 17069* (Morobe Province, Lae) noted: “Fruits 16 cm long, 12 cm wide; pulp yellow, seeds flat, black. Fruits are roasted in open fire and eaten by local settlers.”

Distribution — *Malesia*: Moluccas (Aru Islands, Pulau Wokam); New Guinea (West Papua (Jayapura Province: Waisiniwai), and Papua New Guinea (Morobe Province: Lae and Western Province)).

Habitat & Ecology — Primary and secondary forest, scrambling in deep roadside vegetation and in margins of old gardens; at low altitudes.

Notes — 1. The yellow colour of the pulp as mentioned in *Takeuchi & Ama 17069* is at variance with the fruit in the herbarium collection and also with the pulp colour in related species, e.g., *T. elmeri*. Possibly the yellow pulpy pericarp is meant, whereas the blackish seeds are embedded in green blackish watery pulp.

2. *Trichosanthes papuana* is similar to the Australian *T. pentaphylla* as well as to the Malesian *T. celebica*, *T. elmeri* and *T. floresana*. The fruit in *T. papuana* is large and has a thin, woody pericarp. In the resembling species the pericarp is leathery, collapsing on drying.

## 28. *Trichosanthes pendula* Rugayah

*Trichosanthes pendula* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 3 (1998) 219, f. 1–3; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 271; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 83; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 25. — Type: *Joseph B. et al.* SAN 120771 (holo SAN; iso KEP, L), Borneo, Sabah, Lahad Datu.

Climber, 10–20 m long, harshly grey or rusty hairy, hairs 0.5–2 mm long, partly late-glabrescent, leafy stem 2–5(–15) mm diam., conspicuously 4- or 5-angular or ribbed, the ribs green and hairy; dioecious or possibly monoecious. *Probract* absent. *Tendrils* 2–5-branched. *Leaves*: petiole 3.5–6 cm long; blade green on drying, membranous, simple, shallowly 3–5-lobed or -angular or unlobed, in outline subcircular or broadly ovate, 8–20 by 7–20 cm, scabrous above and beneath, glands several, scattered, 0.5 mm diam. or less, margin sparsely minutely dentate-serrate, apex acute-acuminate, often with a 10–25 mm long acumen; veins 5(–7), straight. *Inflorescences* unisexual or possibly sometimes male and female flowers mixed. *Male raceme* pendent, among the leaves or on the older stem close to the forest floor, single, unbranched or branched at the base forming several racemes in a bundle, dark brown hairy; peduncle 0.3(–2) cm long, 1.5–3 mm thick; rachis not thickened, to 7 cm long, to 30-flowered; bracts caducous, inserted on the pedicel towards the base, c. 1 mm long. *Male flowers*: conspicuously rusty hairy (pale when living); pedicel 20–40 mm long, persistent, above the insertion of the bract withering into straw-like appendages; receptacle-tube tubular, 50–60 mm long, at throat 5(–7) mm wide; sepals linear, 10–15 mm long, c. 1 mm wide at base, entire; petals narrowly elliptic, c. 20 mm long, threads c. 25 mm long; synandrium 5–6 mm long, with c. 0.5 mm long coarse white acute hairs between the thecae, filaments 3–4 mm long, glabrous; disc consisting of 3 line-shaped thickenings at base of the tube. *Female flowers*: solitary or several in a simple or compound raceme to 12 cm long; pedicel c. 25 mm long; ovary hairy, (narrowly) fusiform, 10–12 by 3–4 mm, style c. 35 mm long, glabrous, stigma (4- or) 5-lobed, c. 3 mm long. *Fruit* solitary, ripening yellow-green, whitish striped, (narrowly) ovoid, 10–11.5 by 6–7 cm, apex c. 2 mm beaked; exocarp leathery; pericarp carnosose (c. 15 mm thick when fresh), dry pericarp 5 mm thick; pulp white, finely fibrous, not bitter; fruiting pedicel 3–5 cm long, c. 3 mm thick. *Seeds* whitish, pink, cream or pale brown, tumid, with two inflated lateral parts, 10–12 by 17–20 by c. 5 mm, margin absent, edge entire. — **Plate 28.**

Field-notes — Flowers white, pendent, in female flowers the receptacle-tube is horizontally curved at anthesis.

Distribution — *Malesia*: Borneo, endemic to Sabah: Sandakan (Sepilok Forest Reserve), near Tawau (Lahat Datu), Luasong).

Habitat & Ecology — In primary and disturbed lowland forest, in depressions, damp slopes and forest edges; on clayey soil; 50–600 m altitude. The flowers open at night and stay open until noon; flowering and fruiting January to February, and July to August.

Notes — 1. *Trichosanthes pendula* is isolated within *Trichosanthes* because of the prominently ribbed stem, the absent probract, the flowers which are in both male and female borne in compound, pendulous racemes, forming tassels, the synandrium with many whitish hairs between the thecae (also in *T. mucronata*), the (4- or) 5-lobed stigma, the presence of a disk consisting of 3 line-shaped thickenings adnate to the base of the receptacle tube, and the broad tumid seeds with inflated lateral parts (also in *T. mucronata*).

2. The older tassel-like pendulous inflorescences frequently appear densely bunched caused by numerous persistent pedicels, which are withered into straw-like appendages. Similar appendages, derived from peduncle or pedicel, are found in *T. mucronata* and in some species from New Guinea.

3. The whole inflorescence, including the flowers, dries dark rusty brown, but in living plants all parts, including the hairs, are whitish and the petals pure white.

### 29. *Trichosanthes philippinensis* Rugayah

*Trichosanthes philippinensis* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 271, f. 8; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 115, pl. 9. — Type: *Elmer 11067* (holo L; iso BM, K, U), Philippines, Mindanao, Mt Apo.

Climber to 5 m long, glabrescent, leafy stem 2–5 mm diam.; dioecious. *Probract* ovate or elliptic, 5–8 mm long, subentire, glands present. *Tendrils* 2- or 3-branched. *Leaves*: petiole 3–7 cm long; blade greenish on drying, membranous or chartaceous, simple, 3(–5)-lobed, 1/3–3/4 deep, in outline ovate or subcircular, 10–18 by 10–20 cm, sometimes faintly scabrous above and beneath, glands few, scattered or towards the insertion to the petiole, 0.5–1.5 mm diam., cystoliths obvious, base deeply cordate(-hastate), margin inconspicuously or coarsely serrate-dentate; veins 5(–7), ± straight, venation conspicuous beneath. *Male raceme* at first densely brown hairy; peduncle 5–7.5 cm long, 2–3 mm thick; rachis not thickened but sometimes stout, 5–12 cm long, 10–20-flowered; bracts persistent, broadly obovate-rhomboid, 25–45 by 20–25 mm, margin irregularly and finely incised, 5–15 mm deep, glands numerous, of different size. *Male flowers*: pedicel c. 5 mm long, caducous; receptacle-tube c. 30 mm long, at throat 7–10 mm wide; sepals (narrowly) ovate, 10–14 mm long, 2–5 mm wide at base, finely and deeply irregularly incised, with few glands; petals (including threads) c. 30 mm long; synandrium not seen. *Female flowers* not known. *Fruit* ripening evenly red or red and yellow striped, broadly ovoid, 6–7.5 by 5–6 cm, apex c. 1 mm beaked; exocarp leathery, thin, smooth; pericarp fleshy, dry pericarp 10–15 mm thick; pulp green-black; fruiting pedicel 2–2.5 cm long, 2–3 mm thick. *Seeds* (from PPI 5024) compressed, obovate or narrowly elliptic, 10–12 by 4.5–7 by 2(–3) mm, base narrowly truncate with small midlobe, apex pointed, margin faint or absent, edge entire.

Field-notes — Fruit apple-like, red and yellow.

Distribution — *Malesia*: Philippines: Luzon (Sorsogon; Albay (Mayon Volcano); Benguet); Panay; Mindanao (Davao (Mt Apo)).

Habitat & Ecology — (Degraded) forest, secondary growth; on clay, clay loam, and limestone; 500–1280 m altitude.

Note — *Trichosanthes philippinensis* vegetatively resembles *T. tricuspidata* (not in the Philippines); in *T. tricuspidata* the male bracts are less deeply incised and the sepals entire.

### 30. *Trichosanthes pilosa* Lour.

De Wilde & Duyfjes (Reinwardtia, 2008) distinguished in *T. pilosa* two varieties, var. *roseipulpa* W.J.de Wilde & Duyfjes (Thailand) and var. *pilosa*; only var. *pilosa* occurs in Malesia.

var. **pilosa**

*Trichosanthes pilosa* Lour., Fl. Cochinch. 1 (1790) 588; W.J.de Wilde & Duyfjes, Reinwardtia 12 (2008) 270; Fl. Thailand 9, 4 (2008) 526. — Type lost, Vietnam. Neotype: *Bon 4019* (holo P, designated by De Wilde & Duyfjes, Reinwardtia (2008)), Vietnam.

*Trichosanthes ovigera* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 934; Miq., Fl. Ned. Ind. 1, 1 (1856) 674; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 380; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 303; Rugayah & W.J.de Wilde, Blumea 42, 2 (1997) 478; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 72; W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 211; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 25; Duyfjes & Pruesapan, Thai Forest Bull., Bot 32 (2004) 89. — Type: *Blume s.n.* (holo L, barcode L0130442; iso L (barcode L0130439), P), Java, Gunung Salak.

*Trichosanthes horsfieldii* Miq., Fl. Ned. Ind. 1, 1 (1856) 677. — Type: *Horsfield s.n.* (holo BM; iso K, U (barcode U0001472)), Java.

*Trichosanthes vanoverberghii* Merr., Philipp. J. Sci., C 9 (1915) 458. — Type: *Vanoverbergh 3662 bis* (iso K), Luzon, subprovince of Bontoc, Bauco.

*Trichosanthes mafuluensis* Merr. & L.M.Perry, J. Arnold Arbor. 30 (1949) 58. — Type: *Brass 5257* (iso BO), Papua New Guinea, Central Province, Mafulu.

Climber to 10 m long, variably hairy to various degree (see note 1 and 2), rarely glabrous, leafy stem 1–3(–5) mm diam., grooved; dioecious (occasionally monoecious). *Probract* absent. *Tendrils* 2- (or 3-)branched. *Leaves*: petiole 3–8 cm long; blade green on drying, membranous or chartaceous, simple, unlobed or 3–5(–7)-lobed, to 3/4 deep, in outline subcircular, or (broadly) ovate or  $\pm$  triangular, 5.5–21 by 4–20 cm, short-hairy beneath, at least along the (finer) veins (rarely glabrous), glands several or absent, scattered, 0.5 mm diam., cystoliths sometimes obvious on petiole and veins beneath, base rarely hastate, margin entire, finely sparsely dentate, or coarsely dentate or undulate, apex obtuse or acute-acuminate; veins 5, straight or curved. *Male raceme* sometimes with a solitary male flower co-axillary at the node, densely or sparsely short hairy; peduncle (2–)5–8(–17) cm long, 1–2 mm thick; rachis not thickened, 3–4(–8) cm long, 5–10-flowered; bracts (sub)persistent, linear, or narrowly or broadly (ob)ovate or narrowly elliptic, (2–)5–15 by (1–)5–10 mm (or larger), margin entire, few-lobed or dentate, glands absent. *Male flowers*: pedicel (1–)2–15 mm long, (in solitary flowers much longer), usually persistent; receptacle-tube 20–25(–30) mm long, at throat 3–5(–6) mm wide; sepals narrowly triangular, 3–7(–9) mm long, 1–2 mm wide at base, entire; petals (narrowly) ovate or (narrowly) elliptic, c. 10 by 4 mm, threads 7–11(–17) mm long; synandrium 3–4 mm long, filaments glabrous (always?), 1–2 mm long. *Female flowers*: resembling male flowers, solitary, rarely in a short female raceme; pedicel 5–17 mm long; ovary hairy, (narrowly) ellipsoid, 10(–15) by c. 3 mm. *Fruit* ripening red, usually paler striped, (subglobose to) usually (narrowly) ovoid or narrowly ellipsoid, 3–10(–14) by 2.5–3.5(–6) cm, apex acute and 3–5 mm beaked; exocarp leathery, rarely woody, smooth or hispid, c. 0.5 mm thick; pericarp firm-carnose, dry pericarp 5–8 mm thick; pulp white (or bright orange-red, not in Malesia), not bitter; fruiting pedicel 1.5–4.5 cm long, 1–3 mm thick. *Seeds* tumid by lateral swellings, variously barrel-shaped, 7–11 by 6–8 by 3–4 mm, margin absent. — **Fig. 91b; Plate 29c.**

Distribution — Widespread in SE Asia from NE India and China south-east to Australia and the Solomon Islands; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo (Sabah, eastern Kalimantan), Java, Philippines (Luzon, Mindoro), Sulawesi,

Lesser Sunda Islands (Bali, Flores, Timor), Moluccas (few collections), and all over New Guinea.

**Habitat & Ecology** — Primary and secondary forest edges, on hillsides, in grassland, along riverbanks, in neglected gardens, growing in soil over a variety of bedrock, including limestone; lowland to 2000 m altitude.

**Uses** — Young fruits are edible.

**Notes** — 1. *Trichosanthes pilosa* is widespread and particularly variable in indument, leaf shape, size of bract, male raceme and fruit. The variation is largest in eastern Malesia and culminates in New Guinea. In general this species is easily recognised by the tumid seeds and the hairy lower leaf surface (rarely glabrous). The specimens *Vanoverbergh 3662-bis*, and *Merrill 4864* (both from Luzon and in fruit) have the fruits in short racemes. These fruits are almost globose, 3–3.5 by 2.5–3 cm, with only c. 2 mm long fruiting pedicels. *Kooy 1359*, from Timor, has scabrous leaves, and small fruits with a rather woody and partly hispid-hairy exocarp.

2. The variability of *T. pilosa* in New Guinea is unusually large, but extremes appear not readily to be segregated. Some are represented by the following choice of specimens:

*Karenga & Baker LAE 56930* from high altitude (1960 m) is illustrative of specimens with very scabrous, deeply lobed leaves, and large elongate fruit, 10–14 cm long.

*Höft 2104*, *Streimann 8301* and *Streimann & Kairo NGF 27797* (1250, 850, and 1500 m respectively) are illustrative of similar plants, with smaller fruits which are ± hispid hairy.

*Koster BW 4326* from lowland Jayapura area, West Papua, deviates by large, densely packed, coarsely dentate, male bracts, measuring 25 by 25 mm.

*Henty & Lelean NGF 49912*, from lowland (400 m), has remarkably crenate-dentate leaf margins.

*Brass 5257* from eastern Papua New Guinea, 1250 m altitude, is the type of *T. mafuluensis*, and represents a form with unlobed leaves and very narrow male bracts. Similar linear male bracts have e.g. *Stevens & Veldkamp LAE 55741* or *Womersley & Millar NGF 8472*, both from high altitudes (c. 1700 m), but with deeply lobed leaves.

3. The root is sometimes tuberous.

### 31. *Trichosanthes planiglans* Rugayah

*Trichosanthes planiglans* Rugayah in Rugayah & W.J.de Wilde, *Reinwardtia* 11, 4 (1999) 273, f. 9; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 133, pl. 14. — Type: *Ramos & Edaño BS 29110* (holo US; iso K), Philippines, Luzon, Mt Tulaog.

Climber, glabrous, leafy stem 2–3 mm diam.; dioecious. *Probract* ovate, somewhat concave, c. 5 mm long, entire, with few glands. *Tendrils* 2-branched. *Leaves*: petiole 2.5–5 cm long; blade green on drying, membranous, simple, unlobed, in outline broadly ovate, 9–20 by 8–16 cm, glands 4–8, large, 2–5 mm diam., situated towards the insertion of the petiole, cystoliths on stem, petioles and veins beneath, margin conspicuously coarsely serrate-dentate, teeth 5–12 mm long, apex with slender acumen to 5 mm long; veins 5, arching. *Male raceme* and *female flowers* not known. *Fruit* ovoid? (precise shape and size not known); exocarp ± leathery, smooth; pericarp rather thin, pulp



possibly green-black; fruiting pedicel c. 2 cm long, c. 4 mm thick. *Seeds* light brown, compressed, narrowly elliptic, 13–16 by 6–7 by 1.5 mm, base cuneate, apex rounded, margin faint, edge entire or indistinctly crenulate.

Distribution — *Malesia*: Philippines (Luzon, where known only from the type collection).

Habitat & Ecology — Unknown. The specimen was collected in May.

Notes — 1. *Trichosanthes planiglans* seems related to *T. quinquangulata*, with similar seeds with a cuneate base, but the latter differs in the leaves with  $\pm$  an entire margin, smaller and more numerous glands, and a blackish drying colour.

2. *Ramos & Edaño BS 49161* from Mindanao, which apparently belongs to *T. quinquangulata* resembles *T. planiglans* in its coarsely dentate leaf margin; the specimen also deviates from *T. quinquangulata* in  $\pm$  lobed bracts.

### 32. *Trichosanthes postarii* W.J.de Wilde & Duyfjes

*Trichosanthes postarii* W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 26, f. 7–9. — Type: *Postar et al. SAN 144066* (holo SAN; iso L), Borneo, Sabah, Maliau Valley.

*Trichosanthes* sp. 1, W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 212, pl. 17: C.

Much branched spacious liana, 10–20 m long, scabrous pale brown hairy, hairs 1 mm long; leafy stem 5 mm diam.; dioecious. *Probract* absent. *Tendrils* 2- (or 3-) branched, finely harshly hairy. *Leaves*: petiole 4–4.5 cm long; blade green on drying, membranous, simple, unlobed or in juvenile or shooting leaves 5-angular or -lobed, to c. 1/4 deep, in outline ovate-oblong, 9–22 by 6–13 cm, finely scabrous, glands many, small, scattered, cystoliths often present, base at the transition to the petiole at each side with a small bulging auricle, 3–4 mm diam., each inside with 3–5 crowded glands, blade margin finely dentate, teeth 0.5–1 mm long; basal veins 5(–7). *Inflorescences* on leafless shoots hanging down close to the forest floor. *Male inflorescence* usually formed below the leaves, consisting of 1 or 2 (or 3) racemes, fascicled, horizontal or drooping, peduncle short, rachis slender, 4.5–12 cm long, 1(–1.5) mm thick, 10–20-flowered; bracts subpersistent, shifted upwards on the pedicel for 1–3 mm, narrowly elliptic, 5–8 mm long, margin coarsely shallowly dentate, glands several, near the margin. *Male flowers*: pedicel 6–10 mm long, persistent; receptacle-tube  $\pm$  urceolate, 15(–20) mm long, at throat 6(–8) mm wide, consisting of a  $\pm$  campanulate upper half and a swollen lower half, inside demarcated by a diaphragm-like raised rim; sepals (long-)triangular, 2–3 mm long; petals in bud folded into a  $\pm$  conical body with free apices, 10–12 mm long, expanded petals broadly cuneate, c. 10 mm long, threads 6–8 mm long; syandrium truncate, c. 3.5 by 2.5 mm, anthers tightly appressed, but not fused, filaments glabrous, with few hairs on thickened base, inserted halfway on the receptacle-tube where it is  $\pm$  contracted; disc absent. *Female flowers* 1 or 2 in short raceme; pedicel c. 10 mm long; ovary subglabrous, ellipsoid, c. 15 by 6 mm; receptacle-tube c. 12 mm long; sepals triangular, c. 2 mm long. *Fruit* on leafless shoots, one or two per infructescence, ripening green, white-striped, narrowly ellipsoid, 13–16 by 4.5–5.5 cm, base subobtuse, apex acute, pericarp thin, pulp white, bitter; fruiting pedicel 2.5–3 cm long, 4–5 mm thick. *Seeds* compressed, circular, 10 mm diam., margin broad, radiately ribbed. — **Fig. 84, 85; Plate 29a, b.**

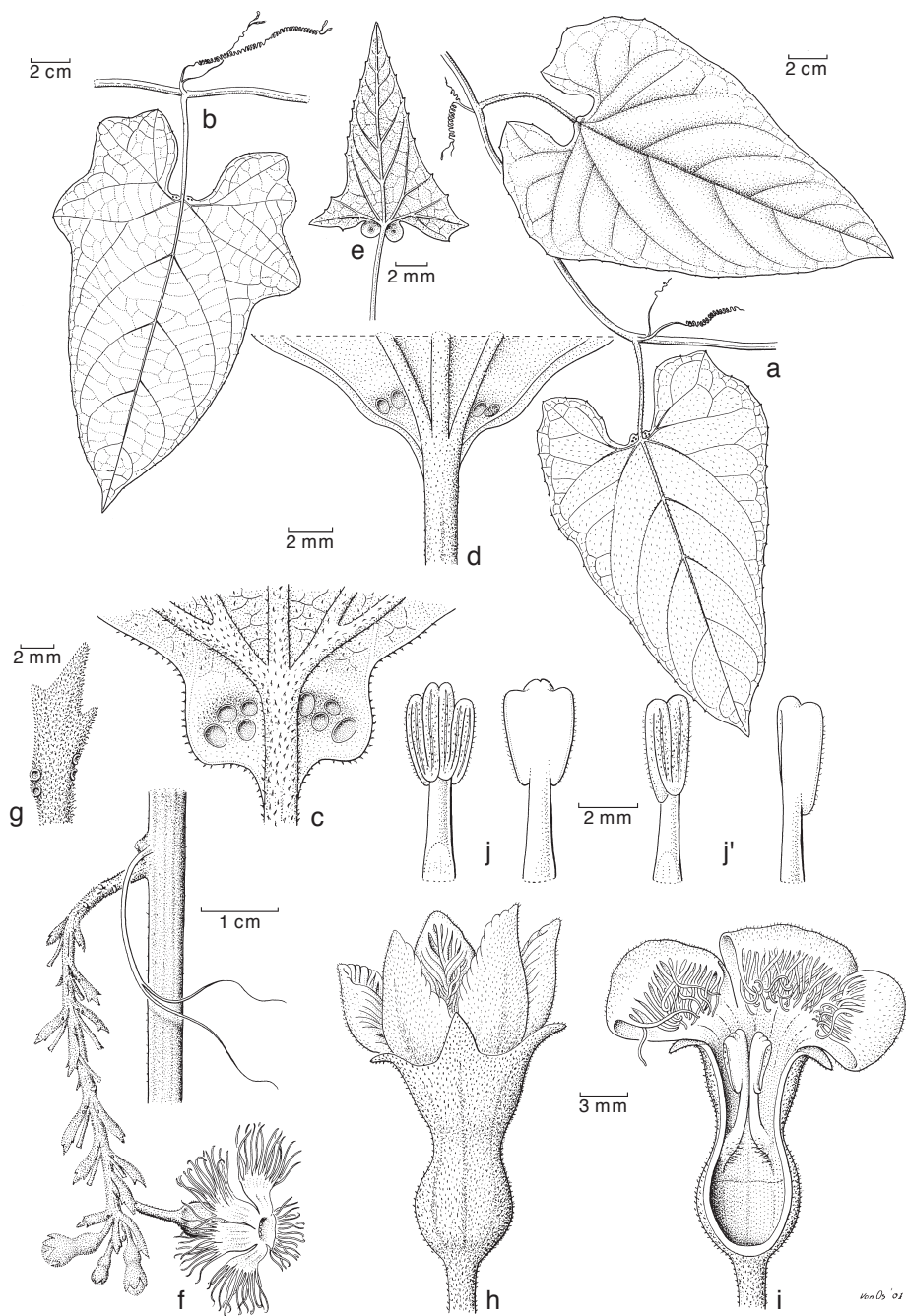


Fig. 84. *Trichosanthes postarii* W.J.de Wilde & Duyfjes. a, b. Leafy twigs; c, d. base of leaf blades showing auricles, note glands on lower surface; e. young developing leaf; f. male inflorescences on older twig; g. male bract; h. male flower; i. ditto, opened showing free stamens; j. stamen, 2-thecous; j'. stamen, 1-thecous (all: *De Wilde & Duyfjes SAN 139470*).

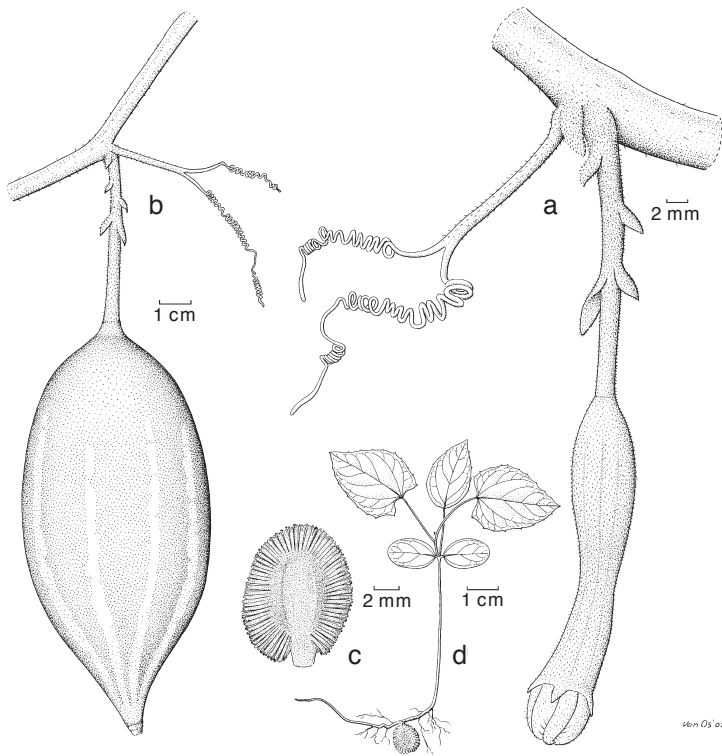


Fig. 85. *Trichosanthes postarii* W.J.de Wilde & Duyfjes. a. Female inflorescences; b. infructescence; c. seed; d. seedling (a, c–d: *Postar, Ubaldus & De Wilde SAN 144110*; b: *Postar, Ubaldus & De Wilde SAN 144066*, type).

Distribution — *Malesia*: Borneo (endemic to Sabah where known from Poring (Langanan Waterfall) and Maliau Valley).

Habitat & Ecology — A species of primary forest and stony slopes with half open forest on wet soil; 50–1300 m altitude. Flowering specimens were collected in July and December, fruiting specimens in July.

Notes — 1. Pendulous shoots, mostly without leaves but with only flowers, are found in the shady zone near the forest floor. Sterile shoots often creep for some distance over the ground, a habit also known from other species, e.g. *T. villosa*.

2. The single or 2- (or 3-)fascicled male racemes at a node indicate that these racemes actually may be borne on a very short lateral shoot, similar to that in *T. pendula*. In most *Trichosanthes* species there is only one single male raceme at a node, with or without a single co-axillary male flower.

### 33. *Trichosanthes pubera* Blume

Duyfjes & Pruesapan (2004) distinguished in *T. pubera* two subspecies, subsp. *rubiflos* (Cayla) Duyfjes & Pruesapan (Indochina) and subsp. *pubera*; only subsp. *pubera* occurs in *Malesia*.

subsp. **pubera**

*Trichosanthes pubera* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 936; Rugayah & W.J.de Wilde, Blumea 42, 2 (1997) 479, f. 1c, 2c, 3c; Reinwardtia 11, 4 (1999) 273; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 117, map 14; Duyfjes & Pruesapan, Thai Forest Bull. Bot. 32 (2004) 92; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 30; Fl. Thailand, 9, 4 (2008) 531. — *Trichosanthes bracteata* (Lam.) Voigt var. *pubera* (Blume) Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 377. — Type: *Blume s.n.* (lecto L, barcode L0130546, here designated; iso P), Java.

Climber to 20 m long, grey-rusty hairy, partly glabrescent, leafy stem 2–5 mm diam., 5–7-ribbed, growing stem apex reddish tinged; dioecious. *Probract* narrowly elliptic or linear, 10–20 by c. 2 mm, at apex entire or finely lobed and ± hooded, glands absent. *Tendrils* 2- or 3-branched. *Leaves*: petiole 3–9.5 cm long; blade reddish brown on

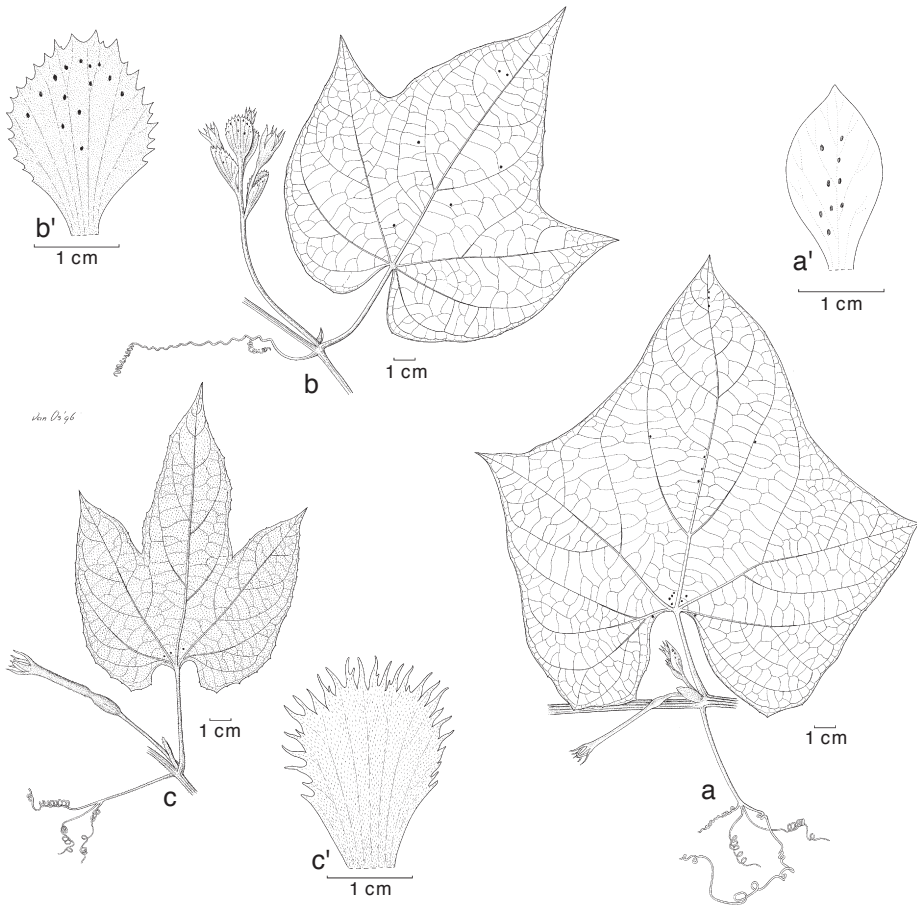


Fig. 86. Leafy stem nodes and corresponding flower bracts of male inflorescences of three species of *Trichosanthes* in Java. — a, a'. *T. quinquangulata* A.Gray; b, b'. *T. tricuspidata* Lour. subsp. *javanica* Duyfjes & Pruesapan; c, c'. *T. pubera* Blume subsp. *pubera* (a, a': *De Wilde & Duyfjes* 21772; b, b': *De Wilde & Duyfjes* 21777; c, c': *Blume s.n.*, barcode L0130546).

drying, membranous, simple, shallowly or deeply 3–5(–7)-lobed to 1/3–4/5 deep, in outline circular or broadly ovate, 9–23 by 8–22 cm, scabrous above, finely grey-rusty hairy beneath, glands few or several, towards the insertion of the petiole, 0.5–1 mm diam., cystoliths abundant on petiole and blade, margin sparsely minutely dentate, occasionally at base coarsely dentate; veins 5(–7), palmate, straight. *Male raceme* rusty hairy; peduncle 7–15 cm long, 2–3 mm thick; rachis not thickened, 7–8 cm long, 5–15-flowered; bracts subpersistent, obovate-rhomboid, (20–)30–50 by 20–35 mm, margin irregularly incised or slenderly lobed to (2–)5–10 mm deep, glands absent. *Male flowers*: pedicel 5–10 mm long, subpersistent; receptacle-tube 40–50 mm long, at throat 8–10 mm wide; sepals long-triangular or narrowly elliptic, 15–22 mm long, 5–7 mm wide at base, with few sidelobes to 5 mm long (entire in female flowers); petals white, ± obovate, 15–20 mm long, threads pinkish at apex, 5–10 mm long; synandrium 10–13 mm long, filaments glabrous, c. 4 mm long. *Female flowers*: pedicel (10–)25–50 mm long; ovary densely hairy, (narrowly) ellipsoid, c. 15 by 4–5 mm; receptacle-tube 30–40 mm long, at throat 6–7 mm wide; sepals narrowly triangular, (10–)15 mm long, entire; petals 12–14 mm long, threads c. 5 mm long; style c. 25 mm long, glabrous, stigma c. 15 mm long. *Fruit* ripening evenly orange-red, early glabrescent, broadly ovoid-ellipsoid, 5–10 by 4–6(–8) cm, apex 2–5 mm beaked; exocarp leathery; pericarp firm-carnose, dry pericarp 5–10 mm thick; pulp green-black, bitter; fruiting pedicel (1.5–)2–5.5 cm long, 3–4 mm thick. *Seeds* blackish, compressed, (narrowly) elliptic, or obliquely obovate, 8–13 by 4–5.5(–8) by 1–2 mm (but see note), base rounded or slightly cuneate, apex rounded, margin absent, edge entire. — **Fig. 86c, c'**.

Field-notes — Young shoots purple-red, stem angular, leaves bright green. Flowers open at night, strongly fragrant; petals white with pale-pink threads. Fruit pendent, ellipsoid, orange-red, seeds surrounded by greenish black pulp.

Distribution — *Malesia*: Sumatra, Borneo (Sabah (Maliau Valley) and East Kalimantan), Java.

Habitat & Ecology — Primary or secondary forest edges, ravines, riversides, scrub in wet sites; 50–1200 m altitude. Flowering throughout the year.

Notes — 1. The collection *Koorders 23006* (East Java), is strongly deviating. It consist of one large fruit (c. 10 by 8 cm with a 5.5 cm long fruiting pedicel), with exceedingly large seeds (18–19 by 8–10 by c. 4 mm). It may represent a separate taxon.

2. The collections *Korthals 23* (slender plants from Central Sumatra), and *Korthals 97* (stout plants from East Kalimantan), somewhat deviate in having glabrous leaves.

### 34. *Trichosanthes pulleana* Harms

*Trichosanthes pulleana* Harms, Bot. Jahrb. Syst. 60 (1925) 160; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 273; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 179, pl. 24. — *Trichosanthes papuana* Pulle, Nova Guinea 8 (1910) 406, nom. inval. (non *T. papuana* F.M.Bailey); Ridl., Trans. Linn. Soc. London Bot. 9 (1916) 58 (record based on *Boden Kloss s.n.*, not seen). — Type: *Versteeg 1116* (holo L; iso BO, K, U), West Papua, Noord Rivier.

Climber, possibly few metres long only, at first with short brown hairs, glabrescent, leafy stem 2–4 mm diam.; dioecious. *Probract* elliptic, 2–3 mm long, with or without glands. *Tendrils* 2-branched. *Leaves*: petiole 2.5–5 cm long; blade green on drying,

chartaceous or subcoriaceous, simple, unlobed, in outline (narrowly) ovate or subhastate, 12–22 by 8–14 cm, finely scabrous above, glands several, scattered, small, at the leaf base and near the midrib or apex, cystoliths obvious but small, base with deep sinus, margin finely dentate; veins 5, basally, and few curved ones from the midrib. *Male raceme* densely short brown hairy, hairs 1–2 mm long; peduncle 2–5 cm long, 2–3 mm thick; rachis not thickened but stout, with bract-scars, 8–13 cm long, 3 mm thick, more than 20-flowered; bracts late-caducous ovate or narrowly elliptic, 6–10 by 3–5 mm, entire, glands present. *Male flowers* in the raceme and usually with one solitary flower at base; pedicel 2–5(–10) mm long (in solitary flower 25–40 mm long and withering into a straw-like appendage), subsistent or caducous; receptacle-tube 40–55 mm long, at throat 7–8 mm wide; sepals (narrowly) triangular, 4–6 mm long, 2–3 mm wide at base, acute, entire; petals obovate- rhomboid, strongly nerved, c. 13 by 6–10 mm, threads 7–10 mm long; synandrium 7 mm long, filaments glabrous, 1 mm long. *Female flowers* and *fruit* not known.

Distribution — *Malesia*: Moluccas (Aru Islands), New Guinea (West Papua).

Habitat & Ecology — Primary forest, on coral stone; at low altitudes.

### 35. *Trichosanthes quinquangulata* A.Gray

*Trichosanthes quinquangulata* A.Gray, U.S. Expl. Exped., Phan. 1 (1854) 645; Rugayah & W.J.de Wilde, Blumea 42, 2 (1997) 479, f. 1a, 2a, 3a; Reinwardtia 11, 4 (1999) 273; Rugayah, *Trichosanthes* (Cucurbitaceae) in *Malesia*, thesis (1999) 130, pl 3; W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 212; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 30; Duyfjes & Pruesapan, Thai Forest Bull., Bot. 32 (2004) 96; W.J.de Wilde & Duyfjes, Fl. Thailand, 9, 4 (2008) 532. — Type: *Wilkes s.n.* (holo GH-A), Philippines, Mangsi Is., Sulu Sea.

*Trichosanthes longiflora* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 374. — Type: *Beccari* 223 (holo FI), West Papua (Sorong).

*Trichosanthes reineckeana* Cogn., Bot. Jahrb. 25 (1898) 691. — Type: *Reinecke* 84 (lecto W, here designated), Samoa, Upolu.

Climber to 20 m long, glabrous, leafy stem 2–5 mm diam., young shoots green; dioecious or occasionally monoecious. *Probract* (narrowly) obovate, 5–10(–20) mm long, entire, glands present. *Tendrils* (2–)3–5-branched. *Leaves*: petiole 2.5–11 cm long; blade blackish on drying, membranous, simple, unlobed or shallowly 5(–7)-angular or (shallowly) lobed, lobes (shallowly) triangular, blade in outline subcircular, 8.5–24 by 8–21 cm, ± scabrous above, glands several to many, close to the vein axils, particularly several in the axils of the main veins at the very base of the blade, 0.5–1 mm diam., cystoliths sometimes obvious above, margin entire or coarsely remotely dentate; veins 5–7, straight. *Male raceme* sometimes at base with 1 or 2 female or hermaphroditic flowers (see note in Rugayah 1999), glabrescent; peduncle 2–8(–12) cm long, 2–3 mm thick; rachis not thickened, 3–10 cm long, 2–3 mm thick, 5–10-flowered; bracts subsistent, (ob)ovate-elliptic or ± rhomboid, 10–30 mm long, margin (sub)entire (rarely ± dentate in East Malesia), with glands near the midrib. *Male flowers*: pedicel 2–5(–25) mm long, (sub)caducous; receptacle-tube 40–50 mm long, at throat 10 mm wide; sepals long-triangular, 12–20(–30) mm long, 2–3 mm wide at base, usually with few slender sidelobes; petals obovate or broadly cuneate, 20(–30) mm long, threads 10(–15) mm long; synandrium 8 mm long, filaments glabrous, 3 mm long. *Female*

*flowers*: pedicel (5–)10–20 mm long; ovary glabrous, (ovoid-)ellipsoid, 8–10 by 5–6 mm; receptacle-tube 50–60 mm long; sepals smaller and narrower than in male, entire. *Fruit* ripening evenly red, (depressed) globose, rarely slightly ellipsoid, (4.5–)6–8.5 cm diam., apex not beaked; exocarp leathery; pericarp firm-carnose, dry pericarp 8–15 mm thick; pulp green-black, bitter; fruiting pedicel 1.5–2.5 cm long, 3–5 mm thick, usually curved. *Seeds* light brown, compressed, (narrowly) elliptic, 9–14 by 4–5 by 1–2 mm, base cuneate (chisel-shaped), apex rounded or acute, margin absent, edge entire. — **Fig. 86a, a', 91c; Plate 31a.**

Field-notes — Flowers with sweet smell, calyx green, bracts pale green, fruit globose, juicy, red-orange when ripe, frequently found hanging on the already died-off trailing shoots.

Distribution — South China, Myanmar, Thailand, Vietnam, Cambodia, Laos; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Philippines, Moluccas, New Guinea (West Papua and Papua New Guinea where known from 1 collection, *Morren 68*).

Habitat & Ecology — Secondary or disturbed forest edges, scrub, open area in mixed dipterocarp forest, logged over forest, along lake shores, in swampy areas, on loamy and sandy soil and beaches, also on limestone; from sea level to 1250 m altitude. Flowering and fruiting throughout the year.

Notes — 1. *Ramos & Edaño BS 49161*, from Mindanao, somewhat resembles *T. plaignans*; see the note under that species.

2. In most *Trichosanthes* species the corolla in bud is hemi-globose, but in *T. quinquangulata*, and in some other species, it is  $\pm$  elongate, like in the related genus *Gymnopetalum*.

3. Specimens from limestone area West of Sandakan (Sabah) deviate by having larger probracts (15–20 mm long), and slightly elongate fruit.

### 36. *Trichosanthes refracta* C.H.Yueh

*Trichosanthes refracta* C.H.Yueh, Bull. Bot. Res., Harbin 10, 4 (1996) 500, f. 1; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 275; Rugayah, *Trichosanthes* (Cucurbitaceae) in *Malesia*, thesis (1999) 94. — Type: *Ramos BS 43279* (holo UC; iso K, L), Philippines, Bohol, Valencia.

Climber to 4 m long, glabrous, leafy stem 2–4 mm diam.; dioecious. *Probract* linear, 5 mm long, glands absent. *Tendrils* 2-branched. *Leaves*: petiole 3–4 cm long; blade green on drying, membranous, simple, deeply 5–7-lobed, in outline subcircular, 7–21 by 8–22 cm, not or little scabrous above, glands few (1–3),  $\pm$  close to the insertion of the petiole, 0.5–3 mm diam., cystoliths absent, margin entire or remotely shallowly or coarsely dentate; veins 5(–7), straight. *Male raceme* minutely brown hairy; peduncle 5–10 cm long, 2–3 mm thick; rachis not thickened, zigzag between the bracts, 4–13 cm long, 1.5–3 mm thick, 10–15-flowered or more; bracts persistent or caducous, obovate-rhomboid, 10–40 by 8–15 mm, margin sharply incised to 3 mm deep, glands absent. *Male flowers*: pedicel 1–3 mm long, persistent; receptacle-tube 40–70 mm long, at throat 10–13 mm wide, at base with an ovary-like swelling c. 5 mm long (pseudo-ovary, see note under *T. intermedia*); sepals narrowly elliptic, 4.5–7 mm long, 1.5–2 mm wide at base, entire or with few narrow sidelobes; petals short, fully expanded not

seen; synandrium c. 9 mm long, filaments glabrous, c. 3 mm long. *Female flowers*: pedicel c. 20 mm long; ovary glabrous, ellipsoid, c. 8 by 6 mm; perianth not known. *Fruit* ripening (possibly) green, paler or yellowish striped, ellipsoid, c. 6 by 4.5–5 cm, apex not beaked; exocarp leathery, colour of fruit pulp not known; fruiting pedicel c. 1.4 cm long, 2–3 mm thick. *Seeds* compressed, elliptic, c. 12 by 6 by 2 mm, base truncate, apex rounded, margin faint, edge entire.

Distribution — *Malesia*: Borneo (Brunei (Belait, Tutong); Sarawak (Daro Forest Reserve)), Philippines (Bohol).

Habitat & Ecology — Peat swamp forest, edges of swampy forest; lowland.

### 37. *Trichosanthes rotundifolia* Rugayah

*Trichosanthes rotundifolia* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 3 (1998) 223; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 275, f. 10; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 156, pl. 20. — Type: *Lörzing 5284* (holo BO; iso L) North Sumatra, Sibolangit.

Climber, 5–15 m long, glabrescent, at first with few hairs, leafy stem 2–3 mm diam.; dioecious. *Probract* narrowly elliptic, 5–7 mm long, acute, subentire, glands present. *Tendrils* 2-branched. *Leaves*: petiole 3.5–8 cm long; blade (green-)brown on drying, membranous, simple, unlobed, in outline subcircular or broadly ovate, 6–21 by 6–18 cm, faintly scabrous, glands few or several, scattered at the blade base and towards the midrib, c. 0.5 mm diam., cystoliths obvious on blade and veins, margin entire or sparsely minutely dentate. *Male raceme* at first minutely grey-brown hairy, glabrescent; peduncle 3–6.5 cm long, 1.5 mm thick; rachis not thickened, 1–4 cm long, 5–10-flowered; bracts subpersistent, (narrowly) obovate, (3–)7–10 mm long, margin entire or shallowly few-lobed, glands present. *Male flowers* in the raceme and sometimes one solitary flower co-axillary; pedicel 5–15 mm long, (in solitary flower 50–80 mm long), persistent; receptacle-tube 15–25 mm long, at throat c. 5 mm wide; sepals narrowly triangular, c. 4 mm long, entire; petals obovate-rhomboid, c. 10 mm long, threads c. 5 mm long; synandrium 3–4 mm long, filaments glabrous, c. 1.5 mm long. *Female flowers*: resembling male, pedicel 10–30 mm long; ovary minutely hairy, c. 10 by 3 mm, style c. 13 mm long, stigma c. 2 mm long. *Fruit* green, pale yellow striped and speckled, ripening evenly(?) red, (narrowly) ovoid, 8–10 by 5–6 cm, apex c. 3 mm beaked; exocarp thick-leathery, smooth; pericarp firm-carnose, dry pericarp c. 10 mm thick; pulp not known; fruiting pedicel 1–3.2 cm long, 2–3 mm thick. *Seeds* pale brown, compressed, subcircular or broadly elliptic, c. 20 by 15 by 4 mm, base and apex broadly rounded, margin faint, inside hollow, chambered, edge entire. — **Fig. 87.**

Field-notes — Fruit ovoid, with green or pale lengthwise stripes and many bright green speckles; eaten by orang utan.

Distribution — *Malesia*: Sumatra.

Habitat & Ecology — Primary forest, river sides, scrub, in foot hill and lower montane forest; 250–1200 m altitude. Flowering March–September; fruiting July & December.



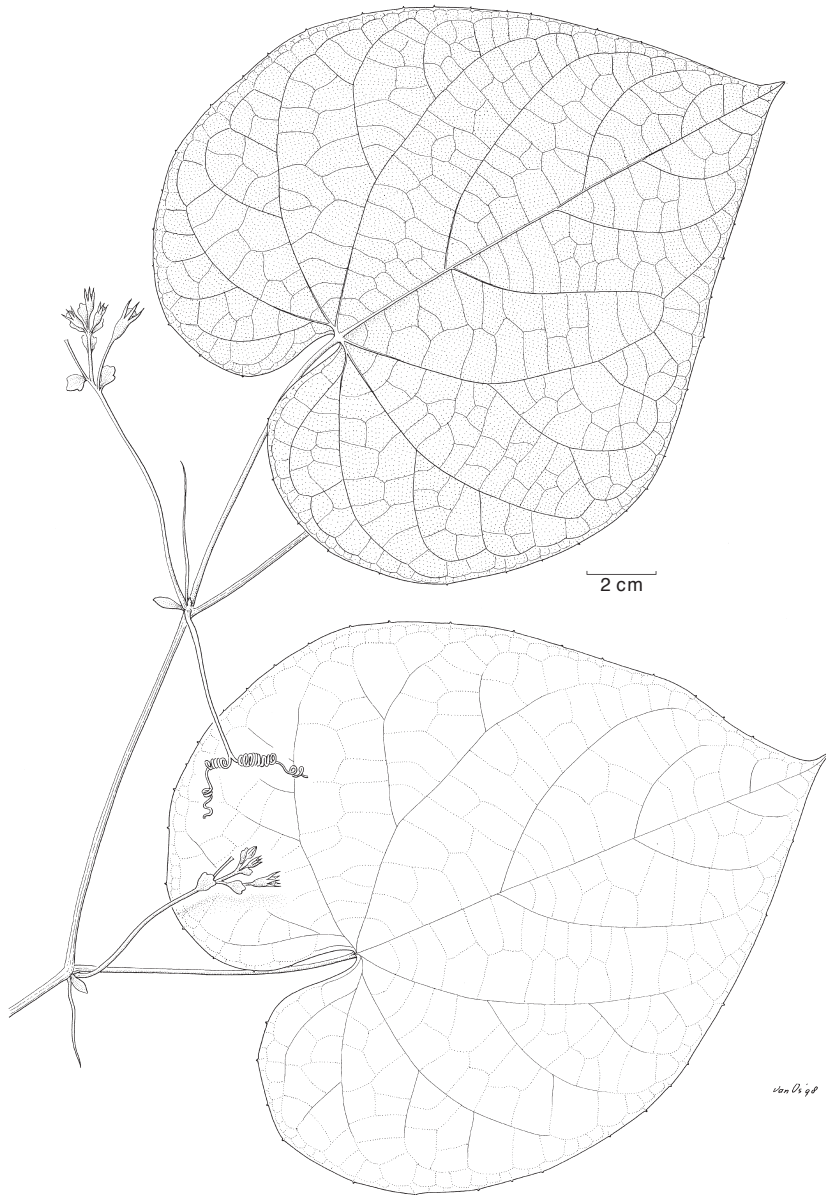


Fig. 87. *Trichosanthes rotundifolia* Rugayah. Portion of twig with male inflorescences, mark the probracts at the nodes (*De Wilde & Duyfjes 12412*).

### 38. *Trichosanthes schlechteri* Harms

*Trichosanthes schlechteri* Harms, Bot. Jahrb. Syst. 60 (1925) 159; Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 275; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 166, map 25. — Type: *Gjellerup 718* (lecto BO, designated by Rugayah & De Wilde (1999); iso L), West Papua, River Tor.

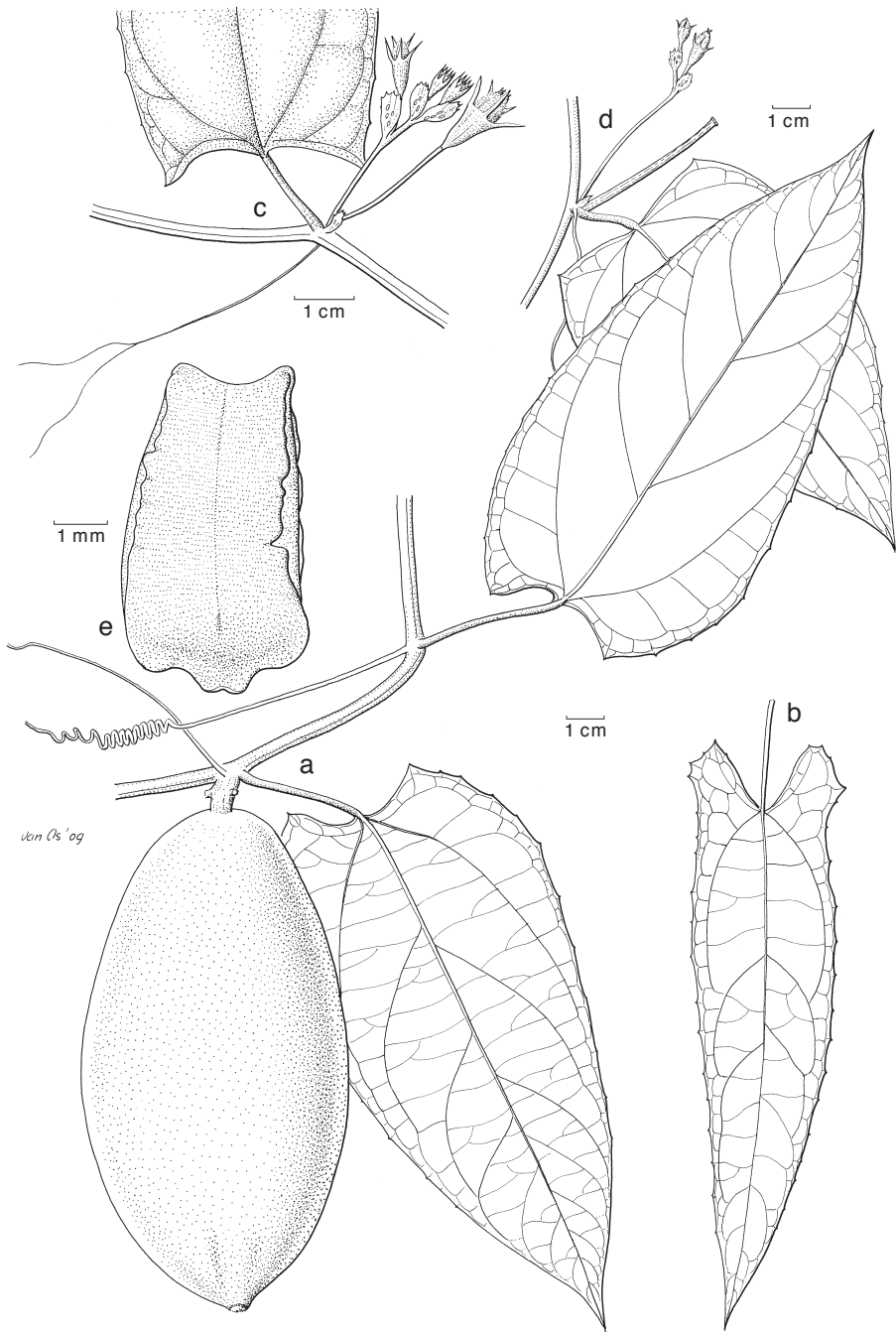


Fig. 88. *Trichosanthes schlechteri* Harms. a. Portion of leafy stem with fruit; b. leaf; c. node with male inflorescence, with co-axillary a male flower; d. ditto, with co-axillary a male flower pedicel developed into a straw-like appendage; e. seed (a, e: Takeuchi & Ama 16269; b: Takeuchi & Ama 15663; c: Shea 1464; d: Van Royen & Sleumer 6183).

Climber, 4–7 m long, glabrous, leafy stem 2–4 mm diam.; dioecious. *Probract* (narrowly) obovate, 4–7 by 2–4 mm, dentate or entire, glands present. *Tendrils* (unbranched) or 2-branched. *Leaves*: petiole (1–)2–3(–5) cm long; blade green on drying, chartaceous or coriaceous, simple, unlobed, in outline (narrowly) ovate or hastate, (6–)9–20 by 9(–11) cm, scabrous above, glands absent or few at the leaf base, 0.5 mm diam., cystoliths obvious or not, base broadly rounded, or truncate or hastate, margin spiny dentate, especially towards the base; veins 3(–5), basal, and few from the midrib, curved, veins raised beneath. *Male raceme* with a solitary flower co-axillary, glabrous (corolla bud minutely hairy); peduncle 1.5–4 cm long, 1–2 mm thick, together with the long pedicel of the solitary flower withering into straw-like appendages, 2–4 mm thick; rachis somewhat zig-zag, not thickened, 3–4 cm long, 1 mm thick, 5–8-flowered; bracts obovate-rhomboid or narrowly elliptic, 8–13 by 5–8 mm, margin sharply toothed or irregularly few-lobed, glands present. *Male flowers*: pedicel 3–10 mm long, caducous; receptacle-tube c. 50 mm long, at throat 7(–10) mm wide; sepals narrowly triangular or narrowly elliptic, 3–10 mm long, 1–3 mm wide at base, entire; petals obovate, 15–20 mm long, threads short, c. 5 mm long; synandrium c. 8 mm long, filaments not seen. *Female flowers* not known. *Fruit* green, paler striped, ripening orange-red, ovoid or ellipsoid, 6.5–20 by 4.5–7.5 cm; exocarp leathery or woody, smooth; pericarp firm-carnose, dry pericarp 10–13 mm thick; pulp red; fruiting pedicel c. 2 cm long, 3–5 mm thick. *Seeds* blackish, compressed, (narrowly) elliptic, 16–18 by 8–10 by 3–4 mm, base and apex subtruncate, sometimes ± notched or undulate, margin broad, c. 3 mm wide, edge entire. — **Fig. 88.**

Field-notes — Leaves yellowish green above, light green beneath. Flowers large, open at night only. Fruit orange or red when ripe, smooth, ellipsoid, pericarp inside yellow. Seeds blackish, immersed in scarlet pulp.

Distribution — *Malesia*: New Guinea (West Papua (Bird's Head, Cycloop Mts, PT. Freeport); Papua New Guinea (Morobe, East Sepik and Central Provinces)).

Habitat & Ecology — Rain and riverine forests, lowland regrowth forest, open stream sides, hill forest, secondary forest, roadside vegetation, muddy and sandy soils; lowland up to 1300 m altitude.

Uses — Fruits edible.

Notes — 1. The shape of the corolla in bud is elongated, like in *T. quinquangulata* and in the related genus *Gymnopetalum*; in other *Trichosanthes* species the corolla in bud is hemi-globose.

2. See also the footnote under the regional key.

### 39. *Trichosanthes sepilokensis* Rugayah

*Trichosanthes sepilokensis* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 275; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 146; W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 212; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 30. — Type: *De Wilde & Duyfjes SAN 139042* (holo SAN; iso L), Borneo, Sabah, Sepilok area.

Climber, 15–30 m long, thinly grey-brown hairy, early glabrescent, leafy stem 2–4 mm diam.; monoecious (always?). *Probract* chartaceous, (narrowly) elliptic, 3–4 by c. 2 mm, with few glands. *Tendrils* 2–6-branched. *Leaves*: petiole 5–8 cm long; blade (dark) brown on drying, membranous, finely bullate above, simple, shallowly 3-lobed

to 1/3 deep or unlobed, in outline ovate, 11–15 by 6–11 cm, glands few, scattered, 0.5 mm diam., base cordate, sometimes cordate-hastate, margin entire; veins 5(–7), arching or straight. *Male raceme* thinly brown hairy; peduncle 3–6 cm long, c. 3 mm thick; rachis thickened, 12–15 cm long, 5–6 mm thick, 5–20-flowered or more; bracts subpersistent, withering, ± obovate, 25–30 by c. 20 mm, apex coarsely irregularly incised, glands absent. *Male flowers*: pedicel 2 mm long, caducous; receptacle-tube (30–)40 mm long, at throat 10 mm wide; sepals narrowly triangular, 10(–12) mm long, 4–5 mm wide at base, acute, entire; petals ± obovate, c. 15 mm long, with slender threads; synandrium and filaments not seen. *Female flowers*: pedicel c. 20 mm long; ovary glabrous, ellipsoid, c. 8 mm long; receptacle-tube slender; sepals and petals as in male. *Fruit* yellow-green, finely paler speckled, ripening evenly red, subglobose, 10–13 cm long; exocarp woody, nearly 1 mm thick, smooth; pericarp firm-carnose, creamy, dry pericarp c. 15 mm thick; pulp green-black, bitter; fruiting pedicel 3.5–4.5 cm long, 15–20 mm thick. *Seeds* brown or blackish, compressed, (narrowly) elliptic, 13–18 by 7–9 by 3–4 mm, margin absent, edge entire. — **Plate 30b.**

Field-notes — Tall climber, main stem to 2.5 cm diameter. Foliage dense, drooping in festoons high-up from the supporting tree. Leaves with dull greyish haze, finely bullate. Fruits bright red when ripe. Seeds near-black, embedded in black pulpy very bitter mass. In Maliau Valley a tree, bordering an old logging road and supporting this climber with ripe fruits, was blown down in a thunderstorm and all fruits were eaten by banteng according to the footprints.

Distribution — *Malesia*: Borneo (Sabah (Sepilok Forest Reserve and Maliau Valley)).

Habitat & Ecology — Climber in tall primary forest trees, where flowering and fruiting high-up in the canopy; at low altitudes. Fruiting in January, February and July, flowering in July.

#### 40. *Trichosanthes tricuspidata* Lour.

*Trichosanthes tricuspidata* Lour., Fl. Cochinch. 2 (1790) 589; Keraudren in Aubrév. & J.-F.Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 81, p.p. (excl. *T. pubera*, *T. bracteata*, *T. palmata*, *T. quin-quangulata*), pl. 14, f. 1, 4–7. — Type: *Loureiro s.n.*, lost, Vietnam. Neotype: *J. & M.S. Clemens* 3267 (holo P, designated by Keraudren (1975); iso BM), Vietnam, Quang Nam, Da Nang.

Duyfjes & Pruesapan (Thai Forest Bull, Bot. (2004) distinguished in *T. tricuspidata* two subspecies, subsp. *tricuspidata* (Indochina) and subsp. *javanica* Duyfjes & Pruesapan; only subsp. *javanica* occurs in Malesia.

subsp. ***javanica*** Duyfjes & Pruesapan

*Trichosanthes tricuspidata* Lour. subsp. *javanica* Duyfjes & Pruesapan, Thai Forest Bull., Bot. 32 (2004) 99; W.J.de Wilde & Duyfjes, Fl. Thailand 9, 4 (2008) 535. — Type: *De Wilde & Duyfjes* 21777 (holo L; iso BO, K, L), Java, Gunung Bunder.

*Trichosanthes tricuspidata* Lour., p.p. (excluding subsp. *tricuspidata*): Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 935; Miq., Fl. Ned. Ind. 1, 1 (1856) 676; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 374; Ridl., Fl. Malay Penins. 1 (1922) 844; Rugayah & W.J.de Wilde, Blumea 42, 2 (1997) 481, f. 1c & c', 2b, 3b; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 120, pl. 10;

*Trichosanthes tricuspis* Miq., Fl. Ned. Ind. 1, 1 (1856) 679. — Type: *Horsfield s.n.* (holo K), Java.

*Trichosanthes bracteata* auct. non (Lam.) Voigt: Backer in Backer & Bakh.f., Fl. Java 1 (1964) 304, p.p.

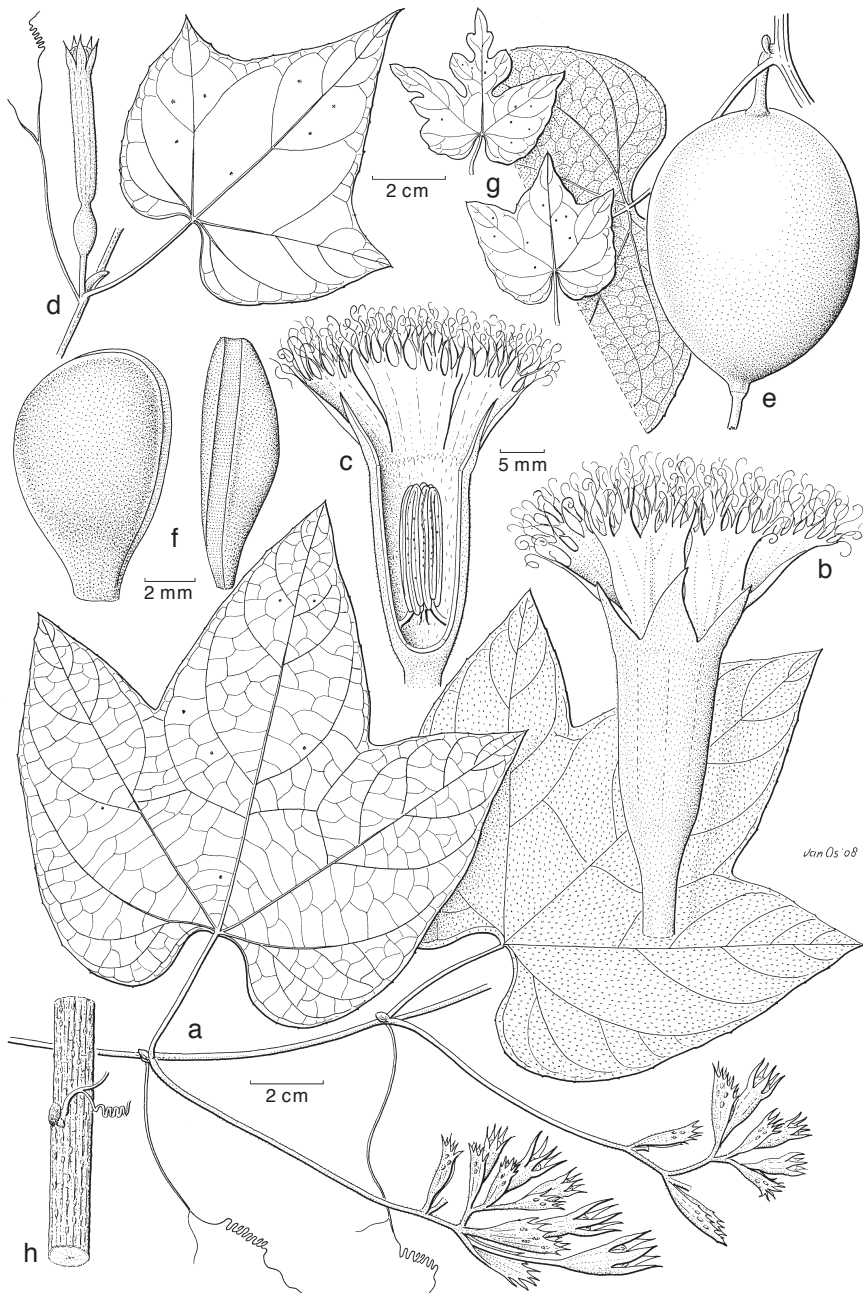


Fig. 89. *Trichosanthes tricuspidata* Lour. subsp. *javanica* Duyfjes & Pruesapan forma *javanica*. a. Portion of branch with male inflorescences; b, c. male flower from outside and opened; d. node with female flower bud; e. node with fruit; f. seed, face and side view; g. leaves of juvenile branch; h. portion of older stem (a: De Wilde & Duyfjes 21944 (Lombok); b, c: De Wilde & Duyfjes 21811 (Java); d: De Wilde & Duyfjes 21863 (Java); e, f, h: De Wilde & Duyfjes 21660 (Java); g: Korthals s.n., barcode L0130970 (Java)).

Climber to 20 m long, glabrous, leafy stem 2–4 mm diam.; dioecious or occasionally monoecious. *Probract* obovate or elliptic, 5(–10) mm long, glands present. *Tendrils* 2- or 3-branched. *Leaves*: petiole 2–7.5 cm long; blade (dark) brown on drying, membranous or chartaceous, simple, 3(–5)-lobed, 1/3–3/4 deep (unlobed in forma *siberutensis*), in outline circular or broadly ovate, 4–17 by 4–18.5 cm, glabrous, usually scabrous above, glands several, scattered, 0.5–1 mm diam., cystoliths obvious or not, margin entire, sparsely with very small dents or ± coarsely dentate; veins 3(–5), straight; lobes generally triangular, lateral lobes often somewhat out-curved. *Male raceme* thinly brown hairy, partly glabrescent; peduncle 5–10 cm long; rachis not thickened, 10–15 cm long, 1.5–3 mm thick, 3–20-flowered; bracts late-caducous, obovate-elliptic or rhomboid, (10–)20–30 mm long, margin dentate or coarsely shallowly (deeply) lacinate, 2–7 mm deep, glands present. *Male flowers*: pedicel c. 5 mm long, caducous; receptacle-tube 40–60 mm long, at throat 6–10 mm wide; sepals narrowly triangular, 8–12 mm long, 3–4 mm wide at base, (sub)entire, rarely (Peninsular Malaysia) with narrow sidelobes or broadly triangular (see note); petals broadly obovate-rhomboid, 20 mm long, threads 20–25 mm long; synandrium (Java) c. 15 mm long, filaments subglabrous, c. 5 mm long. *Female flowers* occasionally some in the male raceme; pedicel 5–12 mm long; ovary glabrescent, (narrowly) ellipsoid, 10–12 by 4–5 mm; sepals and petals as in male, but shorter. *Fruit* ripening evenly (orange-)red, (narrowly) ovoid, (5–)7–9 by (4–)5–6 cm, apex c. 5 mm beaked; exocarp leathery or woody, smooth; pericarp firm-carnose, dry pericarp 5–10 mm thick; pulp green-black, bitter; fruiting pedicel 0.5–2.5 cm long, 3–9 mm thick. *Seeds* dark brown, compressed, obovate or narrowly elliptic, smooth, 10–13 by (4–)5–10 by 1–3 mm, margin absent, edge entire.

Field-notes — Fruit bright orange-red, pericarp inside pale creamy yellow, c. 1 cm thick. Seeds black in green-black bitter pulp.

Distribution — Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, Sulawesi, Lesser Sunda Islands, and Moluccas; to allow for regional variation 4 forms are accepted.

Habitat & Ecology — Secondary forest, forest edges, ravines, also in shrubby marshland; sea level to 1400 m altitude. Flowering and fruiting throughout the year.

Note — *De Wilde & Duyffjes 21971* (Peninsular Malaysia) has exceptionally broad, broadly triangular, male sepals, c. 10 by 6 mm. *Henderson 19550*, also from Peninsular Malaysia, has exceptionally large male sepals with narrow sidelobes, like in *T. quinquangulata*. The collection *De Wilde & Duyffjes 21848* (SW Sulawesi) deviates from the Java material by coarsely dentate leaf margins, and smaller fruit (c. 5.5 cm long) with small seeds.

#### KEY TO THE FORMS

- 1a. Leaves 3(–5)-lobed ..... 2  
 b. Leaves unlobed, ovate-cordate. — Siberut Is. .... **d. forma *siberutensis***  
 2a. Leaves deeply 3(–5)-lobed, 2/3–3/4 deep, conspicuously scabrous. — Lesser Sunda Islands. .... **b. forma *asperifolia***  
 b. Leaves 3-lobed to 2/3 deep ..... 3

- 3a. Seeds c. 3 mm thick. Exocarp woody. — Seram. . . . . **c. forma seramensis**  
 b. Seeds 1–2 mm thick. Exocarp leathery. — Western and central Malesia. . . . .  
 . . . . . **a. forma javanica**

**a. forma javanica**

*Leaves*: petiole 3–7 cm long; blade chartaceous, 3-lobed to 2/3 deep, in outline broadly ovate or circular, to 17 cm long, glands many, scattered, 0.5–1 mm diam., margin entire or coarsely dentate; veins 3–5, straight. *Male raceme* to 20 cm long, peduncle to 10 cm long. *Fruit* (narrowly) ovoid, 7–9 by 5–6 cm; exocarp leathery; fruiting pedicel 1.5–2.5 cm long, 3–4 mm thick. *Seeds* (narrowly) obovate, 10–12 by 5–6 by 1–2 mm. — **Fig. 86 b, b', 89; Plate 30c.**

Distribution — *Malesia*: as the subspecies, but not in Siberut Is., Timor and Seram.

**b. forma asperifolia** Rugayah

*Trichosanthes tricuspidata* Lour. forma *asperifolia* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 276; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 125, pl. 11. — Type: *Zippel 14* (holo L), Lesser Sunda Islands (Timor).

*Leaves*: petiole 3–3.5 cm long; blade chartaceous, 3(–5)-lobed, 2/3(–3/4) deep, in outline broadly ovate or circular, 5–7 by 4–8 cm, conspicuously scabrous with whitish cystoliths above, glabrous beneath, glands few, scattered, c. 0.5 mm diam., margin shallowly dentate; veins 3–5, straight. *Male raceme* 6–8.3 cm long; peduncle 5–6 cm long. *Fruit* not known.

Distribution — *Malesia*: Lesser Sunda Island (Flores, Timor).

**c. forma seramensis** Rugayah

*Trichosanthes tricuspidata* Lour. forma *seramensis* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 277; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 125, pl. 10. — Type: *Mogea & Ramlanto 803* (holo BO; iso L), Moluccas (Seram).

*Leaves*: petiole 5–6.5 cm long; blade subcoriaceous, 3 lobed to 2/3 deep, in outline broadly ovate or circular, 14–17 by c. 15–18.5 cm, smooth or hardly scabrous above, glands c. 0.5 mm diam., few, scattered, margin minutely dentate; veins 3–5, straight; lobes (narrowly) ovate. *Flowers* not known. *Fruit* short-ellipsoid, 6.5–7 by 5.5–6 cm; exocarp c. 1 mm thick, woody; dry pericarp c. 8 mm thick; fruiting pedicel c. 2.5 cm long, 8–9 mm thick. *Seeds* broadly obovate, 10–13 by 8–10 by c. 3 mm.

Distribution — *Malesia*: Moluccas (Seram, known only from the type collection).

**d. forma siberutensis** Rugayah

*Trichosanthes tricuspidata* Lour. forma *siberutensis* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 277; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 126, pl. 10. — Type: *Wiradinata 6874* (holo BO; iso L), Sumatra (Siberut Is.).

*Leaves*: petiole 2–3 cm long; blade unlobed, chartaceous, in outline ovate-cordate, 6.5–9 by 4–7 cm, glands few or several, scattered, 0.5–1 mm diam., margin obscurely

minutely dentate; veins 3(–5), curved. *Flowers* not known. *Fruit* (broadly) ovoid, 5–6 by 4–5 cm; exocarp leathery; pericarp c. 7 mm thick; fruiting pedicel c. 0.5 cm long, c. 4 mm thick. *Seeds* obovate 8–10 by 5–6 by c. 2 mm.

Distribution — *Malesia*: Sumatra (Siberut Is., known only from the type collection).

#### 41. *Trichosanthes valida* Rugayah

*Trichosanthes valida* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 277; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999)148, pl. 18. — Type: *Koorders 16611* (holo BO; iso L), Sulawesi, Minahasa.

Climber to 10 m long, minutely grey-brown hairy, late glabrescent, leafy stem 4–9 mm diam.; dioecious. *Probract* (narrowly) elliptic, 3–4 mm long, subentire, with few small glands. *Tendrils* 2- or 3-branched. *Leaves*: petiole 4–9 cm long; blade greenish on drying, membranous or chartaceous, simple, deeply 3–5(–7)-lobed to 3/4–4/5 deep, in outline circular, 14–25 by 15–22 cm, glands several, scattered or towards the base only, 1–2 mm diam., cystoliths absent, margin (sub)entire; veins 5(–7), straight. *Male raceme* occasionally with a solitary male flower co-axillary, minutely brown hairy; peduncle 9–13(–18) cm long, 3–5 mm thick; rachis thickened, 5–12 cm long, 5–10 mm thick, with coarse bract-scars, 10-flowered or more; bracts persistent, broadly obovate-rhomboid, 43–50 by 15–22 mm, margin entire or somewhat shallowly lobed at apex, with few obscure glands. *Male flowers*: pedicel c. 10 mm long or less, caducous, in solitary flowers to 100 mm long; receptacle-tube c. 45 mm long, at throat 7–10 mm wide; sepals long-triangular, 8–12 mm long, 2–3 mm wide at base, entire; petals c. 12 mm long (excluding threads); synandrium c. 10 mm long, filaments not seen. *Female flowers*: pedicel 15–20 mm long; ovary short brown hairy, on drying at apex with a cap-shaped thickening originating from the base of the receptacle-tube, (narrowly) ellipsoid, c. 15 by 7 mm; perianth as in male. *Fruit* green with pale yellow markings, ripening evenly(?) red, ellipsoid, 10–18 by 8–9 cm; exocarp woody, c. 0.5 mm thick, smooth; pericarp firm-carnose, dry pericarp 15–20 mm thick; pulp green-black; fruiting pedicel 4–7 cm long, 10–20 mm thick. *Seeds* dark brown, compressed, obovate or elliptic, (8–)9–11(–25) by (5–)6–9 by 2 mm, base and apex rounded, margin absent, edge entire.

Field-notes — Male corolla lobes with prominent green veins below. Fruit dark red, shiny, ovoid, 10 by 8 cm, seeds black or brown, c. 15 by 5 mm, pulp dark green, pericarp hard, yellow-white.

Distribution — *Malesia*: Philippines (Luzon, Cebu), Sulawesi (Gn Masarang; Dumoga Bone National Park; Kendari), Lesser Sunda Islands (Timor Leste), Moluccas (Halmahera: Dodinga), New Guinea (West Papua (Vogelkop: Andai Forest Reserve)).

Habitat & Ecology — Primary forest remnants, secondary scrub, on muddy soil of secondary roadside forest, deep clayey volcanic soil and fertile volcanic sand; sea level to 1200 m altitude.

Notes — 1. *Bicknell 666* (with fruit, reported as 6 cm long (only photo seen)) and *1344* (male flowers), both from Cebu, may represent a different yet undescribed taxon.



2. Besides the leaf blade glands, the lower leaf surface has in all specimens very minute regularly spaced pale brown to blackish points, possibly of a glandular nature.

3. *Trichosanthes valida* is close to *T. montana*, a species confined to West Malesia in mountainous area, differing in e.g. globose (or ellipsoid, Java) fruit, and shorter male peduncles. The taxonomy of both species needs further study.

#### 42. *Trichosanthes villosa* Blume

*Trichosanthes villosa* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 934; Miq., Fl. Ned. Ind. 1, 1 (1856) 675; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 366; Backer in Backer & Bakh.f., Fl. Java 1 (1964) 304; Rugayah & W.J.de Wilde (1997) 481, (1999) 278; Rugayah, *Trichosanthes* (Cucurbitaceae) in Malesia, thesis (1999) 152; W.J.de Wilde & Duyfjes in Beaman et al., Pl. Mt. Kinabalu (2001) 212; Duyfjes & Pruesapan, Thai Forest Bull., Bot. 32 (2004) 101, f. 4, 5D; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 31; Fl. Thailand 9, 4 (2008) 539. — Type: *Blume s.n.* (holo L, barcode L0130803; iso P), West Java.

Climber to 24 m long, (grey-)brown or yellowish brown villose, hairs on stem and flowers to 3 mm long, leafy stem 3–5 mm diam.; dioecious. *Probract* absent. *Tendrils* 5–15-branched, point of branching 1–2 cm from the base. *Leaves*: petiole 3–11 cm long; blade (dark) brown on drying, membranous, simple, shallowly 3–5-lobed or angular, or unlobed, in outline subcircular or broadly ovate, 8–20(–26) by 8–19 cm, densely villose, particularly beneath, glands few to several, scattered, 0.5–1 mm diam., margin entire or sparsely minutely dentate, apex acute-acuminate, with a slender apiculum to 12 mm long; veins 5(–7), straight. *Male raceme* sometimes co-axillary with a solitary male flower, hairy; peduncle 5–12 cm long, 2–3 mm thick; rachis not thickened, 5–18 cm long, c. 10-flowered; bracts subpersistent, inserted on the rachis or to 20 mm shifted upwards on the pedicel, broadly rhomboid or obovate, 20–50(–60) by 30–40 mm, margin entire or shallowly few-dentate, mostly with small glands. *Male flowers*: pedicel 30–90 mm long, to 120 mm in solitary flowers, persistent; receptacle-tube 20–30 mm long, at throat 8–10 mm wide, at base often swollen, forming a pseudo-ovary (see note under *T. intermedia*); sepals narrowly triangular, 10–16 mm long, 2–3(–5) mm wide at base, entire; petals obovate-rhomboid, 15–20 mm long, threads 7–15 mm long; synandrium c. 10 mm long, filaments glabrous, c. 2 mm long. *Female flowers*: pedicel 30–60 mm long; ovary brown hairy, ellipsoid, c. 10 mm long; receptacle-tube and perianth as in male. *Fruit* ripening green, whitish or pale yellow striped, ellipsoid-globose, 9–15 by 8–11 cm; exocarp woody-leathery, less than 1 mm thick, smooth; pericarp firm-carnose, dry pericarp 10 mm thick; pulp white, fibrous, sweet; fruiting pedicel 3.5–5 cm long, 3–5(–10) mm thick, possibly sometimes thickened at the distal end. *Seeds* brown, compressed, (narrowly) ovate, 14–25 by 8–15 by 2–5 mm, base truncate, apex narrowly rounded, margin 2–3 mm broad, edge entire.

Distribution — South China (Yunnan, no material seen), Indochina (no material seen), Thailand; in *Malesia*: Borneo, Java, Philippines, Lesser Sunda Islands; not known from Peninsular Malesia and Sumatra; 2 subspecies.

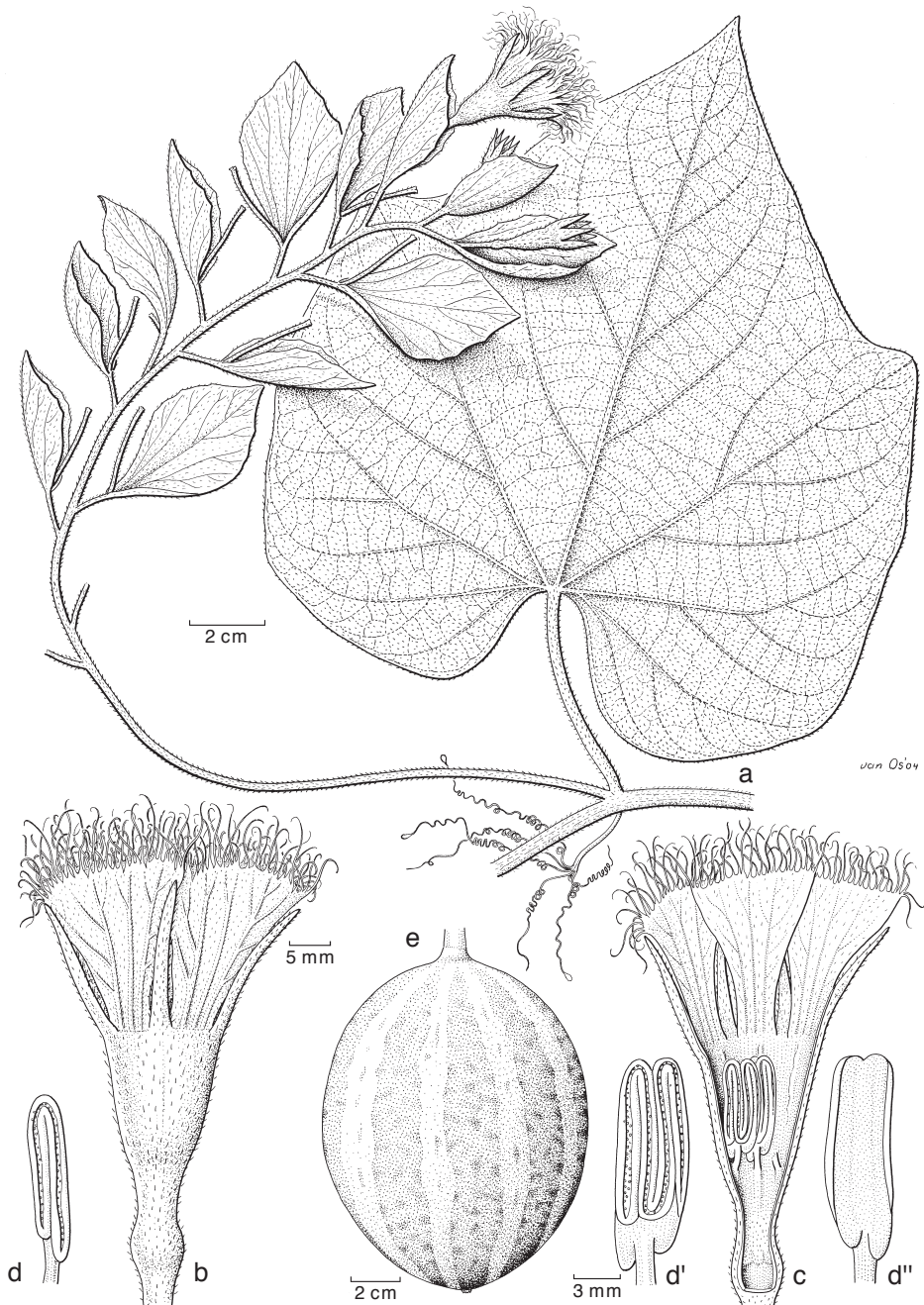


Fig. 90. *Trichosanthes villosa* Blume. a. Part of twig with male inflorescence; b. male flower; c. opened male flower; d. stamen, 1- theous; d', d'', stamens, 2-theous, showing ab- and adaxial side respectively; e. fruit (a–d'': Phonsena et al. 4000; e: Phonsena et al. 3518).

## KEY TO THE SUBSPECIES

- 1a. Fruiting pedicel slender, c. 3 mm thick. Seeds 14–18 by 8–9 by 2–3 mm . . . . .  
 . . . . . **b.** subsp. **mindorensis**
- b. Fruiting pedicel stout, 5(–10) mm thick. Seeds 20–25 by 10–15 by 5 mm. . . . .  
 . . . . . **a.** subsp. **villosa**

**a.** subsp. **villosa**

*Bracts* c. 60 mm long. *Fruit* broadly ellipsoid, 9–13 by 8–10 cm; fruiting pedicel c. 5 cm long, 5(–10) mm thick. *Seeds* 20–25 by 10–15 by (3–)5 mm. — **Fig. 90, 91e; Plate 30d.**

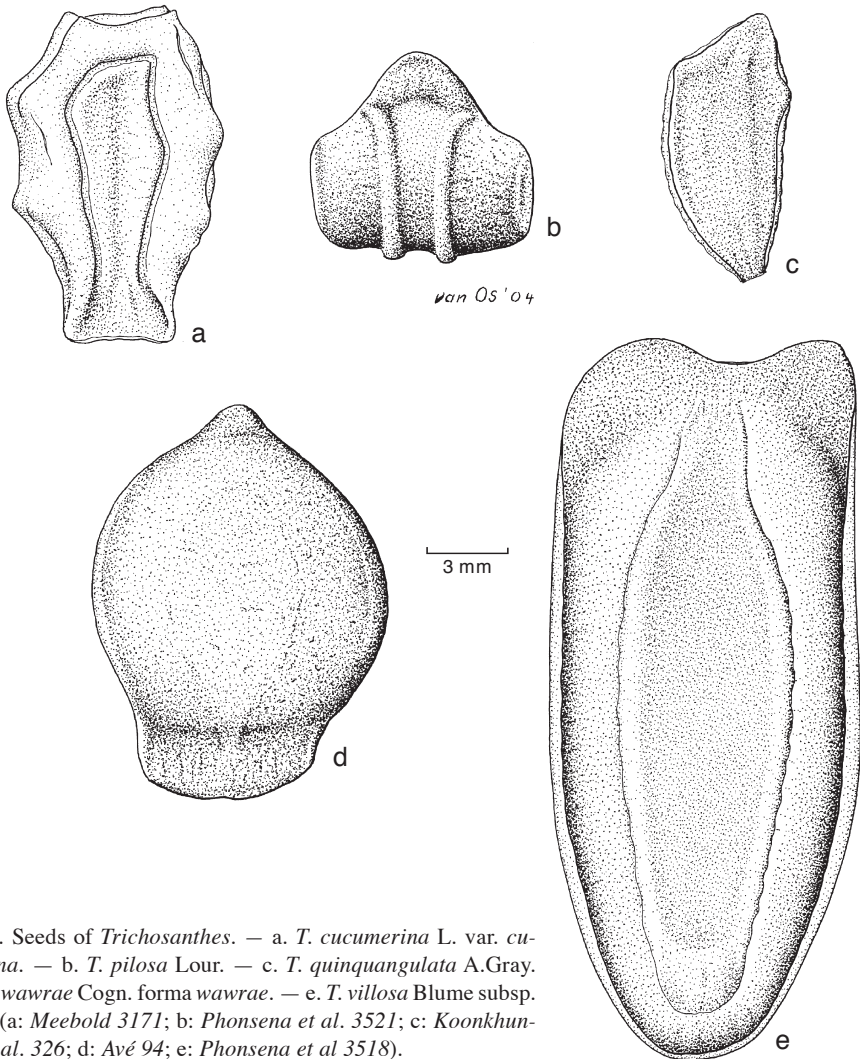


Fig. 91. Seeds of *Trichosanthes*. — a. *T. cucumerina* L. var. *cucumerina*. — b. *T. pilosa* Lour. — c. *T. quinquangulata* A.Gray. — d. *T. wawrae* Cogn. forma *wawrae*. — e. *T. villosa* Blume subsp. *villosa* (a: Meebold 3171; b: Phonsena et al. 3521; c: Koonkhunthod et al. 326; d: Avé 94; e: Phonsena et al 3518).

Field-notes — Climber to 24 m long.

Distribution — South China (Yunnan, no material seen), Indochina (no material seen), Thailand; in *Malesia*: Borneo (Sabah (Kinabalu area); Kalimantan (one doubtful collection)), all over Java, Lesser Sunda Islands (Bali, Lombok, Sumba, and Flores).

Habitat & Ecology — Forest edges, secondary growths, often in damp places; sea level to 1500 m altitude.

**b. subsp. *mindorensis* Rugayah**

*Trichosanthes villosa* Blume subsp. *mindorensis* Rugayah, in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 278; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 155, pl. 19. — Type: *Conklin PNH 19132* (holo L), Philippines (Mindoro).

*Bracts* c. 20 mm long. *Fruit* subglobose, c. 8 cm diam.; fruiting pedicel c. 3.5 cm long, 3(–5) mm thick. *Seeds* 14–18 by 8–9 by 2–3 mm.

Field-notes — Herbaceous climber, 3–4 m high. Fruit globose, melon-like, dark green with longitudinal white stripes, white inside.

Distribution — *Malesia*: Philippines (Luzon, Mindoro, Palawan, Cebu, Leyte, and Bohol).

Habitat & Ecology — Secondary forest; 300–700 m altitude.

**43. *Trichosanthes wawrae* Cogn.**

*Trichosanthes wawrae* Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 384 ('*wawraei*'); Ridl., Fl. Malay Penin. I (1922) 845; Rugayah & W.J.de Wilde, Blumea 42 (1997) 481; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 108; Duyfjes & Pruesapan, Thai Forest Bull., Bot. 32 (2004) 103; W.J.de Wilde & Duyfjes, Sandakania 14 (2004) 31; Fl. Thailand 9, 4 (2008) 539. — Type: *Wawra 241* (holo W), Singapore.

*Trichosanthes trifolia* auct. non (L.) Blume: Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 936 ('*trifoliata*'); Ser. in A.DC., Prodr. 3 (1828) 316; Miq. Fl. Ned. Ind. 1, 1 (1856) 679; Cogn. in A.DC. & C.DC., Monogr. Phan. 3 (1881) 383; Merr., Interpr. Herb. Amboin. (1917) 494; Backer in Backer & Bakh. f., Fl. Java 1 (1964) 303. — *Involucraria trifolia* auct. non (L.) M.Roem.: M.Roem., Fam. Nat. Syn. Monogr. 2 (1846) 99 ('*trifoliata*'), based on *Blume s.n.*, "Crescit in provincia, Krawang juxta Tjiradjas" (L, barcode L0130880), West Java.

*Trichosanthes azurea* C.K.Lim & Theseira, Folia Malaysiana 8, 1 (2007) 35. — Type: *Lim L8602* (holo UKMB; iso SING), Peninsular Malaysia, Pahang (Tekam Forest Reserve).

*Trichosanthes azurea* C.K.Lim & Theseira var. *merahputih* C.K.Lim & Theseira, Folia Malaysiana 10 (2009) 42, pl. 1, 2, 4–7. — Type: *Lim L10061/FRI56671* (holo KEP; iso UKMB), Peninsular Malaysia, Pahang (Tekam Forest Reserve).

Climber, 5–10 m long, glabrescent or densely brown short hairy, leafy stem 1.5–3 mm diam.; dioecious, occasionally monoecious. *Probract* (narrowly) ovate, flat, 3–5 by 1.5–3 mm, entire or somewhat dentate, glands present. *Tendrils* (simple or) 2-branched. *Leaves*: petiole (1.5–)2.5–7 cm long; petiolules 0.5–1 cm long; blade green on drying, membranous or chartaceous, simple or 3-foliolate, ± finely scabrous above, glands few to several, scattered, 0.5 mm diam., cystoliths obvious or not; simple blade shallowly or deeply lobed, grading into leaflets, in outline (narrowly) ovate or ± hastate, 7–17 by 4.5–9 cm, base cordate; veins 3–5, ± arched; middle leaflet (narrowly) obovate, 4.5–10 by 2–5 cm, base cuneate, margin entire, or sparsely minutely dentate or distinctly

serrate-dentate (Java); pinnately veined. *Male raceme* thinly hairy; peduncle 1–5 cm long, (1.5–)2–3 mm thick; rachis not or hardly thickened, 6–12 cm long, 1.5–2 mm thick, 5–30-flowered or more; bracts subsistent, (ob)ovate-rhomboid, variable in size (see note 1 under forma *wawrae*), 7–25 by 4–12 mm, margin shallowly or deeply dentate-laciniate, sometimes with 3(–5) deep main lobes, glands present. *Male flowers*: pedicel 2–5(–10) mm long, sometimes persistent; receptacle-tube (20–)40–70 mm long, at throat 5–7 mm wide; sepals narrowly triangular, 4–6 mm long, 1–2 mm wide at base, entire or few-dentate (lobed); expanded petals not seen; synandrium 6–8 mm long, filaments glabrous, 3.5 mm long. *Female flowers*: occasionally in the male raceme; pedicel c. 15 mm long; ovary glabrous, ovoid, c. 10 by 5 mm; receptacle-tube, sepals and petals as in male. *Fruit* ripening (orange-)red, mostly yellow-striped, ovoid, 6–8(–9) by 5–7 cm, apex 2–5 mm beaked; exocarp mostly leathery, smooth; pericarp juicy-fleshy, dry pericarp c. 5 mm thick; pulp green-black, bitter; fruiting pedicel 1–2.5 cm long, 2–3 mm thick. *Seeds* brown or black, compressed, (narrowly or) broadly ovate, 15–20 by 8–15 by 2–3 mm, base  $\pm$  truncate, apex obtuse or subacute, margin broad but faint, edge entire.

Distribution — Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, and Java; 2 forms.

#### KEY TO THE FORMS

- 1a. Plant densely brown short hairy. Fruiting pedicel c. 1 cm long. — Sarawak . . . . . **b. forma *hirsuta***  
 b. Plant glabrous (early glabrescent). Fruiting pedicel 1.5–2.5 cm long. — Sumatra, Peninsular Malaysia, Singapore, Borneo, Java . . . . . **a. forma *wawrae***

#### **a. forma *wawrae***

Plant glabrous (glabrescent). *Probract* (narrowly) ovate, 3–5 by 1.5–3 mm, entire. *Leaves*: petiole (1.5–)2.5–7 cm long; blade membranous or chartaceous, simple or 3-foliolate. *Fruiting pedicel* 1.5–2.5 cm long, 2–3 mm thick. — **Fig. 91d; Plate 31b.**

Field-notes — Fruit ovoid, (orange-)red with yellow blotches or stripes; fruit eaten by birds. Tuber elongate.

Distribution — *Malesia*: Thailand and Laos; in *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo (Central and East Kalimantan; Sabah (Kinabalu area, only sterile specimens seen)), and Java.

Habitat & Ecology — Primary and degraded forest, swamp forest, montane forest; lowland to 1300(–1700) m altitude.

Notes — 1. In Peninsular Malaysia two groups of specimens can be recognized, viz. lowland specimens, from Singapore and lowland Malaya, with large male bracts (c. 20 mm long), deeply and finely laciniate, and montane specimens with small male bracts (c. 10 mm long or less), which are more shallowly laciniate. The taxonomic significance of these differences is still unclear.

2. All specimens from Java are from (lower) montane area in the western part and differ from the remainder of the material by a slender habit (stem 1–2 mm diam.), thin

leaves, mostly with rather distinct serrate-dentate margin. The male bracts are 10–15 mm long, deeply and slenderly incised, and approach the larger (stouter) deeply incised bracts as found in lowland specimens from Singapore and Peninsular Malaysia, which match the type-collection. In Java the sepals seem to be frequently  $\pm$  lobed. All Javan specimens have truly 3-foliolate leaves, apparently simple leaves never have been found there.

Some collections from lowland Sabah, discussed under *T. longispicata*, with short male bracts, come close to specimens at present treated under *T. wawrae* from montane area in Peninsular Malaysia.

Lack of material from all areas prevents a satisfactory further subdivision of *T. wawrae*.

3. The type specimens of *T. azurea* (incl. varieties) agree with *T. wawrae*; the bluish or red and white colours of the fruit are possibly due to some infection.

#### **b. forma *hirsuta* Rugayah**

*Trichosanthes wawrae* Cogn. forma *hirsuta* Rugayah in Rugayah & W.J.de Wilde, Reinwardtia 11, 4 (1999) 279; Rugayah, Trichosanthes (Cucurbitaceae) in Malesia, thesis (1999) 113. — Type: *Bayeng S 44194* (holo L), Borneo (Sarawak, 1st Division, Gn Buri).

Plant densely brown short hairy. *Probract* elliptic, c. 4 mm long, somewhat dentate. *Leaves*: petiole c. 2 cm long; blade chartaceous, 3-foliolate. *Fruiting pedicel* c. 1 cm long, 3 mm thick.

Field-notes — Creepers along logging road. Fruits green with green stripes, turning red when ripe.

Distribution — *Malesia*: Borneo (Sarawak, known only from the type collection).

Habitat & Ecology — Mixed dipterocarp forest.

### **36. URCEODISCUS**

*Urceodiscus* W.J.de Wilde & Duyfjes, Blumea 51 (2006) 38. — Type species: *Urceodiscus belensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes (*Melothria belensis* Merr. & L.M.Perry).

Small annual or subperennial climbers, leafy stem 1–2 mm diam., green on drying; monoecious. *Probract* absent. *Tendrils* unbranched. *Leaves* simple, unlobed or lobed. *Flowers* small or medium, 5–20 mm diam.; petals (light green or) yellow, free or to 1/3 connate; the segments imbricate in bud; receptacle-tube urceolate or campanulate; disc in both sexes urceolate, carnose, wholly or largely fused with the base of the receptacle-tube. *Male inflorescence* a peduncled raceme, with flowers arranged zigzag or not, without or with co-axillary a solitary male or female flower. *Bracts* absent or minute. *Male flowers*: pedicel short or long, 2–20(–30) mm long, persistent; stamens 3, inserted at or to halfway below the throat of the receptacle-tube, filaments much longer than the anther, anthers all 2-theous,  $\pm$  exserted, thecae lateral, straight (or  $\pm$  curved), parallel or  $\pm$  divergent, connective narrow or broad and then at apex broad, produced or not. *Female flower* solitary, single at the node or co-axillary with male raceme; pedicel long; ovary subglobose or short-ellipsoid or fusiform, with a narrow neck, glabrous; stigma deeply 3-lobed or 3, papillose-hairy; staminodes present; disc more shallow than

in male. *Fruit* solitary, with long fruiting pedicel, globose or ellipsoid, 0.8–3 cm long, glabrous, red, juicy; exocarp ± membranous, ± translucent, minutely pustulate. *Seeds* c. 10 or numerous, little compressed or almost spherical, ovoid, scrobiculate or pitted, margin faint or narrow, edge entire.

Distribution — A genus of 7 species confined to New Guinea.

Note — The species much resemble each other vegetatively, but they are distinct by characters of the male inflorescences and male flowers.

#### KEY TO THE SPECIES

- 1a. Male pedicels 1–3 mm long; rachis usually straight . . . . . 2
- b. Male pedicels 5 mm long or more; rachis frequently zigzag. [Male inflorescences and flowers not known in *U. arfakensis*.] . . . . . 6
- 2a. Male perianth 5–6 mm long; filaments hairy, in-curved at apex. Leaves lobed to 1/3 to nearly to the base . . . . . **6. U. scabridula**
- b. Male perianth 5–15 mm long; filaments glabrous, straight. Leaves finely or coarsely dentate or up to 1/3 lobed . . . . . 3
- 3a. Male receptacle-tube shorter than broad or about as long as broad, 2–3 mm long . . . . . 4
- b. Male receptacle-tube longer than broad, c. 4 mm long. [Fruit not known.] — West Papua, Vogelkop; lowland . . . . . **7. U. viridis**
- 4a. Male petals 10 mm long or more . . . . . **2. U. belensis** var. **conferta**
- b. Male petals 6–9 mm long . . . . . 5
- 5a. Male perianth c. 6 mm diameter. — Eastern Papua New Guinea; at c. 2000 m altitude . . . . . **3. U. carrii**
- b. Male perianth c. 4 mm diameter. — Northern West Papua, Cycloop Mountains; at c. 1200 m altitude . . . . . **5. U. parviflora**
- 6a. Fruit 2–3 cm long (flowers not known). — West Papua, Arfak Mountains; at 850 m altitude . . . . . **1. U. arfakensis**
- b. Fruit 1–1.5(–2) cm long (fruit not known in *U. hippocrepicus*). Flowers large, petals (5–)6 mm long or more . . . . . 7
- 7a. Receptacle-tube inside and filaments glabrous; anthers not cordate at base. — Whole of New Guinea, but not known from Vogelkop; at 1900–2900 m altitude . . . . . **2. U. belensis**
- b. Receptacle-tube inside hairy (filaments glabrous); anthers deeply cordate at base. — West Papua, Baliem Valley; at 2000 m altitude . . . . . **4. U. hippocrepicus**

#### **1. *Urceodiscus arfakensis* W.J.de Wilde & Duyfjes,**

*Urceodiscus arfakensis* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 40. — Type: *Sands MJS 6809* (holo K; iso L), West Papua, Arfak Mountains.

Climber to 3 m long, leafy stem 1–1.5 mm diam., plant sparsely stiff-hairy (hairs less than 0.5 mm long), green on drying. *Leaves*: petiole c. 0.5 cm long, densely finely stiff-hairy; blade unlobed, ovate-elliptic, 5–9 by 2–4 cm, both surfaces ± bullate, scabrous by sparse stiff 0.5 mm long hairs, cystoliths distinct, veins scabrid-hairy,

base subtruncate or broadly rounded (hardly cordate), margin sparsely inconspicuously dentate (teeth less than 1 mm long), apex (long) acute-acuminate, minutely mucronate. *Male and female flowers* not known. *Fruit* ripening scarlet, ellipsoid, 2–3 by 1.5–2 cm; fruiting pedicel slender, 6–7.5 cm long. *Seeds* numerous, whitish or pale brown, ovoid, 4.5–5.5 by 3–3.5 by 2 mm, margin narrow.

Distribution — New Guinea (West Papua, Vogelkop (Arfak Mountains)); known only from the type.

Habitat & Ecology — Montane forest; climbing near river in shade; at 850 m altitude; fruiting in April.

## 2. *Urceodiscus belensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes

*Urceodiscus belensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 40, f. 10, 11.  
— *Melothria belensis* Merr. & L.M.Perry, *J. Arnold Arbor.* 30 (1949) 57. — Type: *Brass 11082* (holo A; iso BO, L), New Guinea (West Papua, Bele River).

*Melothria cissybium* M.Jacobs, *Blumea* 7 (1954) 617 (for the male flowering material only). — Type: *Womersley 5343* (sphalm. 5543) (holo L; iso LAE), Papua New Guinea, Western Highlands Province, Al River.

Herbaceous climber to c. 4 m long, leafy stem 1(–1.5) mm diam., plant finely hairy, glabrescent, green on drying. *Leaves*: petiole 0.5–2 cm long, (appressed-)hairy; blade unlobed or towards the base lobed to 1/2 deep (blade then ± hastate), ovate to elliptic, 3.5–14 by 2–5.5 cm, upper surface with stiff hairs and cystoliths, the veins more densely hairy, lower surface somewhat hairy or subglabrous, base subtruncate or broadly shallowly (or deeply) cordate, margin sparsely finely or coarsely dentate (sometimes shallowly undulate), apex long acute-acuminate, mucronate. *Male inflorescences* a 2–5 cm long peduncled few- to many-flowered condensed or zigzag raceme 0.5–5 cm long, without or with co-axillary a single male or female flower. *Male flowers*: pedicel 2–20 mm long, minutely appressed-hairy; perianth 10–15 mm long, expanded perianth 12–30 mm diam.; receptacle-tube urceolate-campanulate, sometimes faintly constricted in the middle, 4–7 by 3–5 mm, glabrous, throat glabrous; sepals 1–2 mm long, glabrous; petals free or up to 1/3 connate, yellow, (narrowly) elliptic, 6–9 by 4–5 mm, finely hairy on both surfaces, obtuse or rounded; stamens inserted at c. 1/3 from the throat in the receptacle-tube, filaments 4–5 mm long, straight, glabrous, anthers subcircular or ovate(-elliptic) in outline, c. 1.5 mm diam., thecae c. 1 mm long, divergent, connective broad, at apex truncate or broadly up to 1 mm produced, obtuse, hairy at both sides; disc 1–2(–3) by 2 mm, entire or sometimes 3-parted by grooves and with 1–3 small nipples c. halfway. *Female flowers* solitary or co-axillary with a (later developing) male inflorescence; pedicel 20–40 mm long; ovary ellipsoid, 2–4 mm long, glabrous, with short or long neck 0.5–1.5 mm long; corolla as in male flowers; style c. 4 mm long, glabrous, stigma c. 4 mm diam., 3-lobed, the lobes half-patent, ± narrowly ovoid, c. 3 mm long, densely papillose; staminodes 1 mm long, glabrous; disc 0.5 mm high. *Fruit* ripening bright shiny red, short-ellipsoid, 1–2 cm long; fruiting pedicel 3–5 cm long. *Seeds* numerous, ovoid, 4–5 by 3.5–4 by 3 mm, margin narrow.

Field-notes — Petals (orange-)yellow. Anthers orange, pollen yellow. Fruits edible.

Distribution — In the main range of New Guinea, except Vogelkop.



Habitat & Ecology — Edges of (*Nothofagus*) forest, scrub, secondary mixed (oak) forest; climbing in tree fern; at 1900–2900 m altitude; flowering and fruiting mainly April to December.

## KEY TO THE VARIETIES

- 1a. Male raceme less than 0.5 cm long, with few subfascicled flowers; pedicels 2–3 mm long. . . . . **b. var. conferta**  
 b. Male raceme 1–4(–5) cm long, flowers more spaced; pedicels 5–20 mm long . . 2  
 2a. Male raceme c. 10-flowered; pedicels 5–10(–15) mm long. . . . . **a. var. belensis**  
 b. Male raceme lax, c. 5-flowered; pedicels (5–)10–20 mm long . . . . . **c. var. laxa**

**a. var. belensis**

*Male raceme* 1–5 cm long, c. 10-flowered; pedicels 5–10(–15) mm long; receptacle-tube 4–5 mm long; disc 1–1.5 mm high. *Female flowers* and *fruit* as in the species. — **Fig. 92.**

Distribution — In the main range of the whole of New Guinea, except Vogelkop.

**b. var. conferta** W.J.de Wilde & Duyfjes

*Urceodiscus belensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes var. *conferta* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 34. — Type: *Hoogland & Schodde 7537* (holo L; iso CANB), Papua New Guinea, Western Highlands Province, Yobobos.

*Male raceme* less than 0.5 cm long, with 1–5 clustered flowers; pedicels 1–3 mm long; receptacle-tube 4–5 mm long; disc 1–1.5 mm high. *Female flowers* not known. *Fruit* as in the type-variety.

Distribution — New Guinea (Papua New Guinea, known from 2 collections: Morobe Province (*Schodde & Craven 4943*) and Western Highlands Province (*Hoogland & Schodde 7537*)).

**c. var. laxa** W.J.de Wilde & Duyfjes

*Urceodiscus belensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes var. *laxa* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 43, f. 11b–g. — Type: *Hoogland & Schodde 6798* (holo L; iso CANB), Papua New Guinea, Western Highlands Province, Poio.

*Male raceme* lax, 2–5 cm long, 5–10-flowered; pedicels 10–20 mm long; receptacle-tube 5–7 mm long; disc 1–3 mm high. *Female flowers* not known. *Fruit* as in the type-variety.

Distribution — New Guinea (Papua New Guinea: Western, Eastern and Southern Highlands Provinces and Morobe Province).

**3. Urceodiscus carrii** W.J.de Wilde & Duyfjes

*Urceodiscus carrii* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 44, pl. 1c, d. — Type: *Carr 13647* (holo BM; iso CANB, K, L, SING), East Papua New Guinea, Northern Province, Alola.

Small vine, leafy stem 1 mm diam., plant sparsely hairy, glabrescent, green on drying. *Leaves*: petiole 1–2 cm long, minutely appressed-hairy; blade unlobed or at base irregularly 3–5-lobed to c. 1/3 deep, narrowly ovate, 7–14 by 3–8 cm, upper surface sparsely stiff-hairy, with cystoliths, more densely hairy on veins, lower surface (sub)glabrous, base shallowly cordate or subtruncate, margin sparsely short-dentate, apex long acute-acuminate, mucronate. *Male inflorescences* in (5–)10–20-flowered (non-zig-zag) spike-like racemes of 0.5–2 cm long; peduncle 1–1.5 cm long. *Male flowers*: pedicel 1–3 mm long, minutely appressed-hairy; perianth c. 5 mm long, expanded

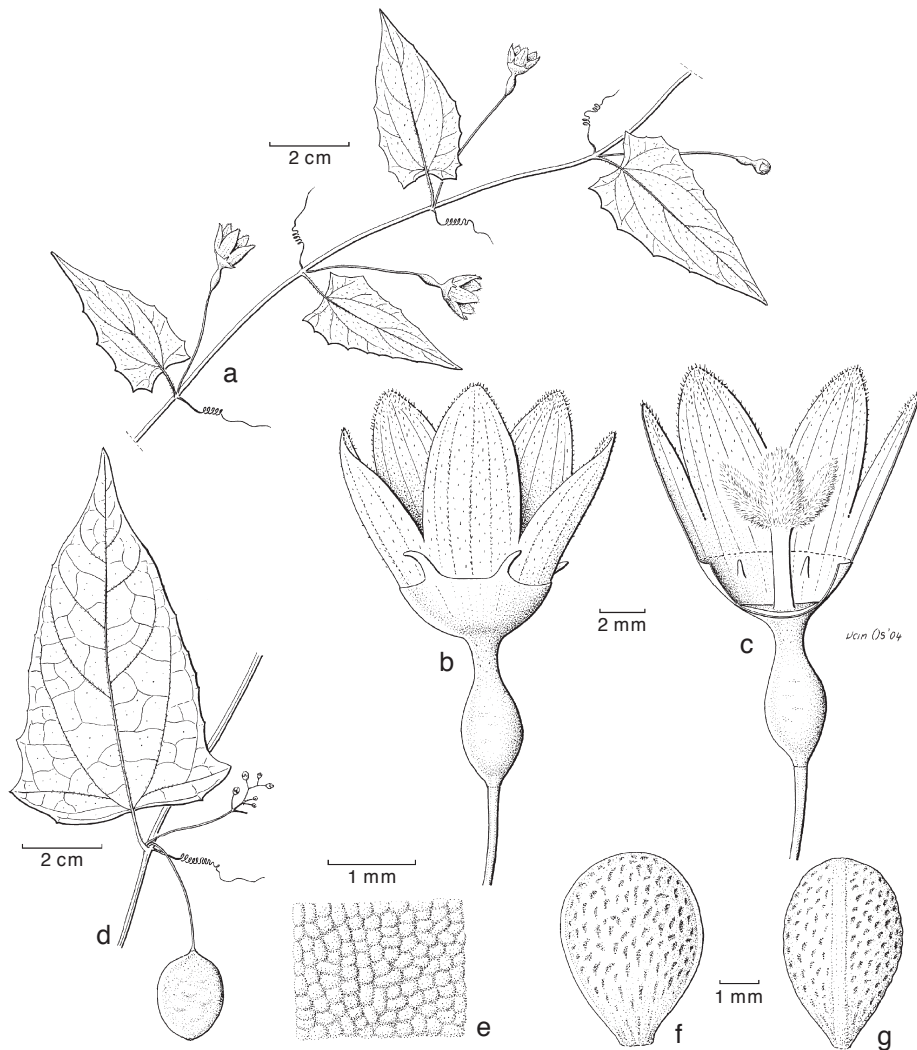


Fig. 92. *Urceodiscus belensis* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes var. *belensis*. a. Twig with female flowers; b, c. female flowers; d. node with male inflorescence and one fruit; e. fruit surface, enlarged; f, g. seed showing narrow margin (a–c: Borgmann 210; d–g: Kiprianus, Lawong & Gideon LAE 69127).

perianth 5–6 mm diam.; receptacle-tube shallowly campanulate, 1–1.5 by 2(–2.5) mm, glabrous, throat glabrous; sepals 0.5 mm long; petals free, 2.5–3 mm long, rounded, both surfaces gland-hairy; stamens inserted c. halfway the receptacle-tube, filaments 1.5–2 mm long, glabrous, straight, anthers subcircular in outline, 1 mm diam., thecae 0.5 mm long, situated lateral in the basal part, divergent, connective broad, at apex broadly protruding, sparsely hairy; disc saucer-shaped, 0.5 by 2 mm. *Female flowers* (solitary or) co-axillary with male raceme (which develops after the female flower); pedicel 3–5 mm long; ovary ellipsoid, 3–3.5 mm long; corolla as in male flower; style and stigma not investigated (see note). *Fruit* solitary, ripening glossy red, subglobose, 1–1.5 cm diam.; fruiting pedicel 3–6 cm long. *Seeds* numerous, pale brownish yellow, ovoid, 4–4.5 by 2–3 by 2–2.5 mm, margin narrow.

Field-notes — Flowers cream, off-white or yellowish green.

Distribution — New Guinea (eastern Papua New Guinea).

Habitat & Ecology — Short-statue forest, rock faces of escarpment; at 1700–2500 m altitude; flowering and fruiting: July to December.

Note — The female flowers were not fully studied as *Carr 13892* (BM) bears the only female flower known.

#### 4. *Urceodiscus hippocrepicus* W.J.de Wilde & Duyfjes

*Urceodiscus hippocrepicus* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 44. — Type: *Kostermans & Soegeng 655* (holo L; iso A, BO, K), West Papua, Baliem Valley.

Small climber to 4? m long, leafy stem 1–1.5 mm diam., plant sparsely minutely scabrous-hairy, brown-green on drying. *Leaves*: petiole 0.5–1 cm long, minutely appressed-hairy; blade unlobed or hardly lobed, (narrowly) ovate, 6–10 by 2–4.5 cm, upper and lower surface ± bullate, scabrid by sparse minute stiff hairs and inconspicuous cystoliths, veins more densely minutely appressed-hairy, base shallowly or deeply cordate, often ± hastate, margin indistinctly sparsely dentate (teeth less than 0.5 mm long), blade gradually narrowed towards the long acute-acuminate apex. *Male inflorescences* a 5- or 6-flowered short ± zigzag raceme c. 1 cm long; peduncle 2–3 cm long, finely appressed-hairy. *Male flowers*: pedicel c. 10 mm long; perianth c. 10 mm long, expanded perianth 10–12 mm diam.; receptacle-tube 3–4 by 2–3 mm, sparsely appressed-hairy, throat and inside hairy, hairs 0.5 mm long; sepals 1 mm long; petals almost free, (narrowly) elliptic, 5–6 mm long, obtuse, densely hairy at both surfaces; stamens inserted c. halfway in the receptacle-tube, filaments c. 2 mm long, glabrous, anthers subelliptic in outline, 1.5–2 by c. 1.5 mm, apex rounded, base deeply cordate, forming an 1 mm deep sinus, thecae 1.5(–2) mm long, ± curved and nearly touching at apex, extending downwards on the connective-lobes, connective ± narrow at apex (where attached to the filament), densely hairy; disc thick-carnose, 1 by 2 mm, faintly 3-lobed. *Female flowers* and *fruit* not known.

Field-notes — Flowers yellow. Flowering in August.

Distribution — New Guinea (West Papua, Baliem Valley); known only from the type.

Habitat & Ecology — Wet places in low, open scrub; at 2000 m altitude.

Note — Because of the deeply cordate anther the two thecae are shaped like a horse-shoe.

### 5. *Urceodiscus parviflora* W.J.de Wilde & Duyfjes

*Urceodiscus parviflora* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 45. — Type: *Van Royen & Sleumer 6002* (holo L; iso BO), West Papua, Cycloop Mountains.

Low climber; leafy stem c. 1 mm diam., plant sparsely hairy, largely glabrescent, green on drying. *Leaves*: petiole 1–1.5 cm long, minutely hairy; blade unlobed, (ovate-)narrowly elliptic, 5–9 by 2–3 cm, both surfaces sparsely hairy, hairs minute, stiff, cystoliths inconspicuous, veins more densely hairy, base subtruncate or shallowly broadly cordate, margin (sparsely) repand-dentate, teeth 1–2 mm long, apex acute-acuminate, minutely mucronate. *Male inflorescences* arranged in a tiny and slender 10–15-flowered spike-like 0.5–1 cm long raceme; peduncle c. 1 cm long, sparsely minutely appressed-hairy. *Male flowers*: pedicel 1–2 mm long, sparsely minutely appressed-hairy; perianth c. 3 mm long, expanded perianth (as judged from well-advanced bud) c. 4 mm diam.; receptacle-tube shallow, 0.5(–1) by 2–2.5 mm, throat sparsely minutely hairy; sepals 0.5(–1) mm long; petals free, 1.5(–2) by 1 mm, obtuse, densely minutely hairy outside, glabrous inside; stamens inserted about halfway in the receptacle-tube, filaments (immature) 0.5 mm long, densely hairy in upper half, anthers ellipsoid, 1 by 0.7 mm, thecae somewhat curved, 1 mm long, connective narrow, hairy, not produced; disc 0.2–0.5 by c. 2 mm. *Female flowers* and *fruit* not known.

Field-notes — Leaves dark green above, greyish green beneath. Flowers pale orange-yellow. Flowering in June.

Distribution — New Guinea (West Papua, Cycloop Mountains, path from Ifar to Ormoe, at the camp-site); known only from the type.

Habitat & Ecology — In secondary regrowth; at 1220 m altitude.

### 6. *Urceodiscus scabridula* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes,

*Urceodiscus scabridula* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 45. — *Melothria scabridula* Merr. & L.M.Perry, *J. Arnold Arbor.* (1949) 56. — Type: *Brass 10621* (holo A, not seen; iso BO, L), West Papua, Lake Habbema.

Small (extensively scrambling) few meters long climber, leafy stem 1–2 mm diam., plant densely or sparsely hairy, (partly) glabrescent, green-brown on drying. *Leaves*: petiole 1–2.5 cm long, short-hairy; blade (3- or 5- (or 7–10)-lobed to 1/3 to nearly to the base (then the segments narrowly elliptic, to 8 cm long), (narrowly) ovate in outline, 4–9 by 3–8 cm, upper surface with sparse stiff hairs especially on the veins, scabrous, cystoliths present, lower surface (sub)glabrous, base shallowly broadly cordate, margin sparsely coarsely serrate-dentate, teeth to 5 mm long, apex long-acuminate, mucronate. *Male inflorescences* 2–5-flowered short (non-zigzag) 0.2–0.5 cm long racemes; peduncle 1–1.5 cm long. *Male flowers*: pedicel 1–4 mm long, minutely appressed-hairy; perianth 5–6 mm long, expanded perianth 5–6 mm diam.; receptacle-tube 2–4 by 3–4 mm, glabrous, throat minutely hairy inside; sepals 0.5–1 mm long, glabrous; petals almost free or to c. 1.5 mm connate, (narrowly) elliptic, (3–)4–5 by 1.5–2(–3) mm, subobtuse or rounded, papillose or (gland-)hairy outside, glabrous or papillose inside; stamens inserted at c. 1/3 from the throat in the receptacle-tube, filaments c. 2 mm long, glabrous or (densely) hairy, hairs 0.3–0.5 mm long, at apex ± thickened and

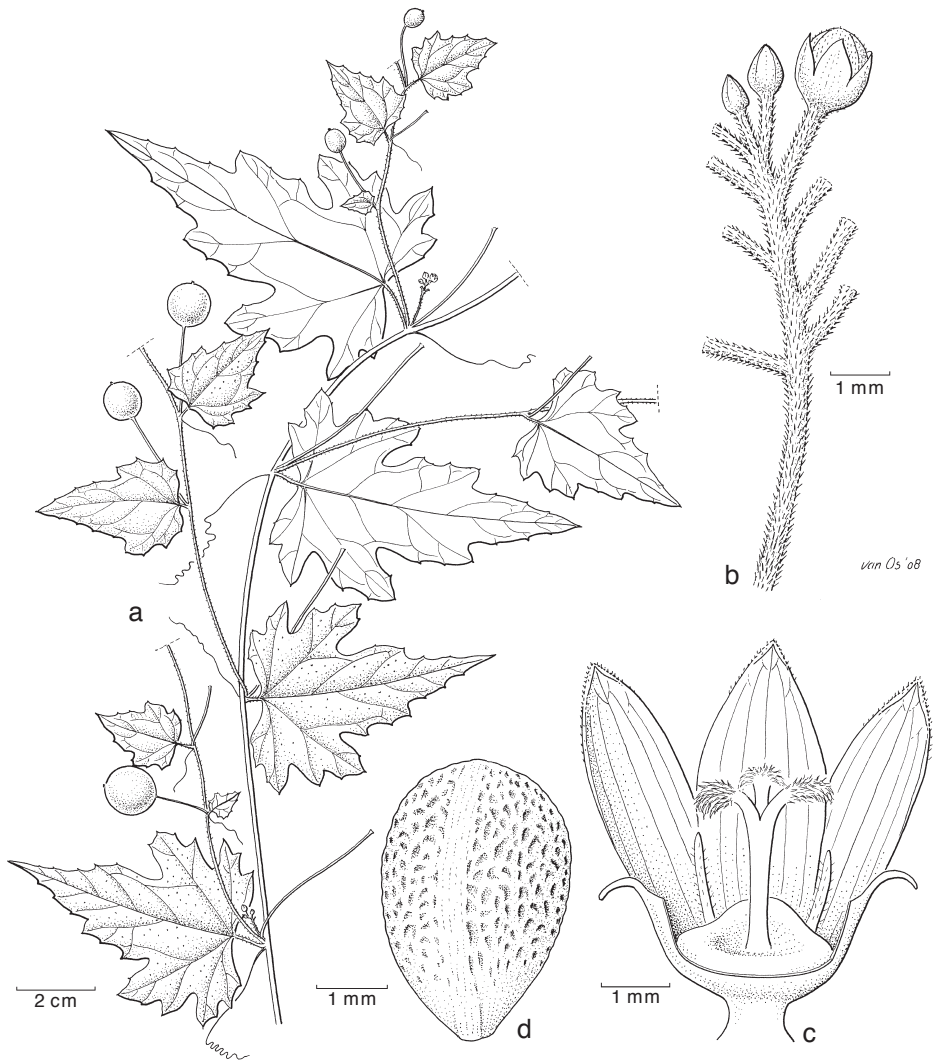


Fig. 93. *Urceodiscus scabridula* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes. a. Habit with fruit and immature male inflorescences; b. apex of male inflorescence; c. female flower, opened; d. seed (all: Sands 7143).

c. 90° curved inwards, anthers dorsally attached to the filaments, ellipsoid, c. 1.5 by 1–1.5 mm, thecae vertical, straight, 1 mm long, connective narrow or broad with (few) sparse minute hairs; disc a thick-carnose cupule, 0.5–1.5(–2) by 2(–3) mm, margin smooth or ± wavy. *Female flowers* solitary or co-axillary with male inflorescence; pedicel 20–30 mm long; ovary subglobose-ellipsoid, c. 1.5 by 1 mm, neck 0.5 mm long, perianth as in male flower; receptacle-tube c. 2 by 4 mm; style c. 2 mm long, at apex 3-armed, each arm c. 1.5 mm long, with elongated stigma-lobe c. 1.5 mm long, out-curved, densely hairy; staminodes subulate, c. 1.5 mm long, hairy. *Fruit* ripening red,

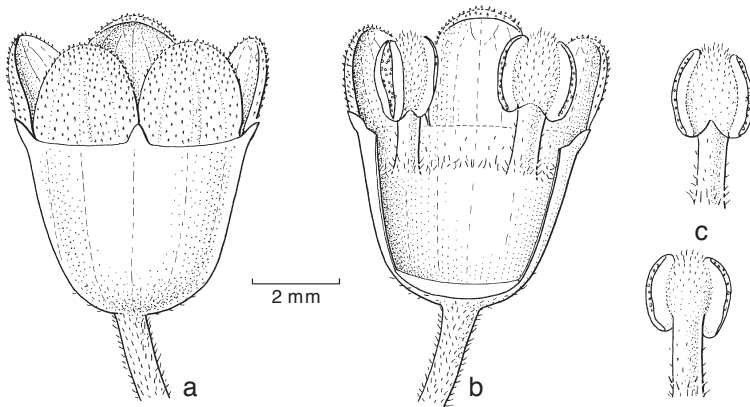


Fig. 94. *Urceodiscus scabridula* (Merr. & L.M.Perry) W.J.de Wilde & Duyfjes. a, b. Male flower; c. stamens (all: Willis FR 296).

blackish brown when dry, subglobose, 1–2 cm diam.,  $\pm$  smooth or minutely pustulate; fruiting pedicel 2.5–5 cm long. *Seeds* 10–20, pale brown, ovoid, 4–4.5 by 3–3.5 by c. 2.5 mm, margin faint. — **Fig. 93, 94.**

Field-notes — Flowers yellow.

Distribution — New Guinea (south-western West Papua: near Lake Habbema; Valentijn Mountains; P.T. Freeport Indonesia Concession Area).

Habitat & Ecology — Mossy forest, on tree stumps; undergrowth in disturbed montane forest; forest clearings; at 2200–2800 m altitude; flowering and fruiting: August to December.

Note — This species is remarkable by its filaments which are thickened at apex and abruptly in-curved for c. 90°.

### 7. *Urceodiscus viridis* W.J.de Wilde & Duyfjes

*Urceodiscus viridis* W.J.de Wilde & Duyfjes, *Blumea* 51 (2006) 46, f. 12; pl. 1a. — Type: *W. & M. Vink BW 15396* (holo L; iso CANB, K), West Papua, Lake Ajamaru.

Small vine, leafy stem 1(–1.5) mm diam.; plant sparsely minutely hairy, glabrescent, green on drying. *Leaves*: petiole 0.5–1 cm long, partly appressed-hairy; blade unlobed or at base with an odd lobe to 1/3 deep, (narrowly) ovate, 4–8 by (1.5–)2–5 cm, upper surface glabrous except for minute soft hairs on veins, cystoliths sparse, inconspicuous, lower surface glabrous, base broadly rounded, subtruncate or shallowly cordate, margin sparsely short serrate-dentate, teeth 1–2(–3) mm long, apex acute(–acuminate), minutely mucronate. *Male inflorescences* 3–7 in a short (non-zigzag) spike-like 0.5–1 cm long raceme; peduncle 2–3 cm long. *Male flowers*: pedicel 1–2 mm long, glabrous; perianth 7–10 mm long, expanded perianth c. 10 mm diam.; receptacle-tube c. 5 by 2.5 mm, subglabrous, throat and upper half of tube minutely hairy inside; sepals c. 0.5 mm long; petals free, 4–5 by 2.5 mm, subobtuse, minutely hairy outside, glabrous inside; stamens inserted at c. 1/4 from the apex in the receptacle-tube, filaments c. 2 mm long, straight, glabrous, anthers  $\pm$  connivent, ellipsoid, c. 2 by 1 mm, thecae straight, c. 2 mm

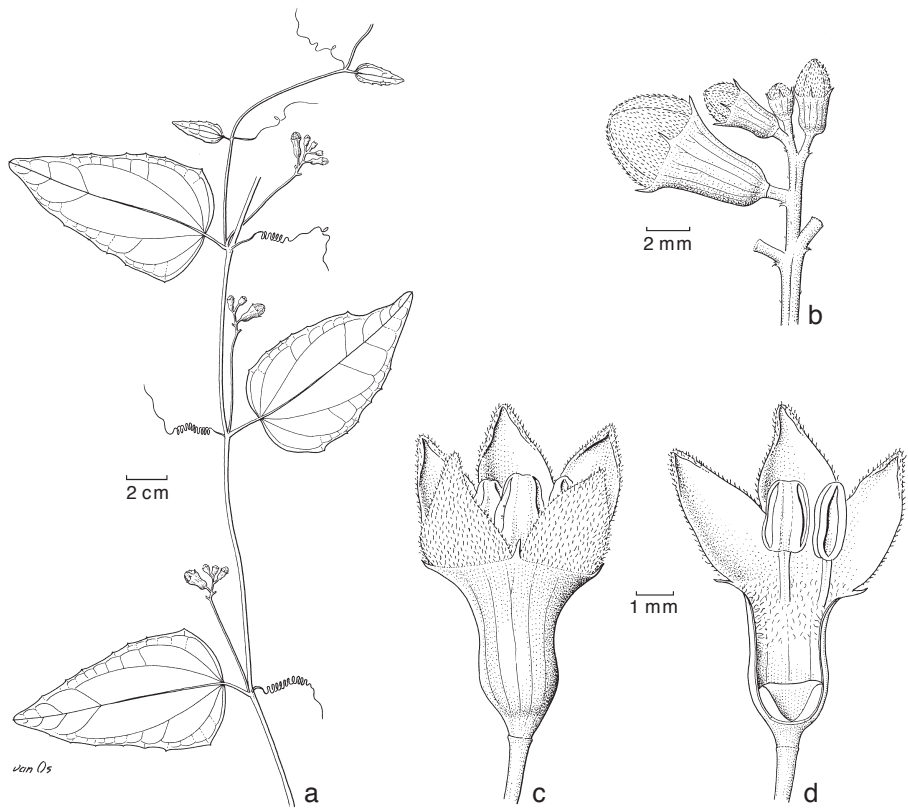


Fig. 95. *Urceodiscus viridis* W.J.de Wilde & Duyfjes. a. Twig with male inflorescences; b. detail of male inflorescence, showing 4 buds; c, d. male flowers (all: W. & M. Vink BW 15396, type).

long, connective narrow, not produced; disc c. 1.5 by 2 mm. *Female flowers and fruit not known.* — **Fig. 95.**

*Field-notes* — Rather common climber. Calyx green; corolla, connective and filaments light green; anthers yellow; flowering in March.

*Distribution* — New Guinea (West Papua, Vogelkop, Tanah Merah, west side of Lake Ajamaru, 1°8' S, 132°13' E), known only from the type.

*Habitat & Ecology* — Young secondary forest on strongly humified limestone silt; at 220 m altitude.

### 37. ZANONIA

*Zanonia* L. Sp. Pl. ed. 1 (1753) 1028; C.B. Clarke in Hook.f., Fl. Brit. Ind. 2 (1879) 633, p.p.; Cogn. in A. DC. & C. DC., Monogr. Phan. 3 (1881) 925, excl. *Z. macrocarpa* = *Alsomitra* (Blume) M. Roem.; in Engl., Pflanzenr. 66, 4.275.I (1916) 27; Keraudren in Aubrév. & J.-F. Leroy, Fl. Cambodge, Laos & Vietnam 15 (1975) 15, pl. 4; W.J. de Wilde, Blumea 52 (2007) 282; Fl. Thailand 9, 4 (2008) 540. — Type species: *Zanonia indica* L.

*Jussiaea* Merr., J. Straits Branch Roy. Asiat. Soc. 85 (1922) 170. — Type species: *Jussiaea borneensis* Merr.

Medium-sized liana to 15 m long, woody at base, leafy stem 3(–5) mm diam., dioecious. *Probract* absent. *Tendrils* (unbranched or) 2-branched at apex. *Leaves*: petiole short, older twigs with raised leaf scars; blade simple, unlobed, (narrowly) ovate-elliptic, cystoliths absent, margin entire. *Flowers* small, creamy-white; buds globose; perianth rotate; sepals 3 (but see note 1), concave, valvate in bud; petals 5, free, ± fleshy, conduplicate-valvate with tips inflexed in bud; receptacle shallow. *Male inflorescences* paniculate, many-flowered, ± pendulous; bracts small, linear, 1(–2) mm long, glabrous or hairy. *Male flowers*: pedicel short; receptacle (disc) broad, low; stamens 5, free, inserted on the disc, filaments short, anthers all 1-theous, opening with apical transverse slit; pistillode absent. *Female flowers* in (raceme-like) panicles; pedicel short or absent; ovary clavate, imperfectly 3-locular, each locule with apically 2 pendulous ovules; styles 3, short, horizontally two-horned, separate, inserted on slightly raised truncate apex of ovary; staminodes absent or small (see note 2). *Fruit* rather large, capsular, elongate-cylindrical, claviform, with truncate apex opening by 3 inward curving apical valves. *Seeds* compressed, longitudinally winged all around the seed, faces smooth, margin faint, edge entire.

Distribution — One species with two subspecies. South and NE India, South China, Indochina, through Malesia east to New Guinea.

Notes — 1. The globose calyx in bud is membranous, and closed at apex, but mostly the very apex shows 5 minute appendages proving that the calyx is morphologically 5-merous. However, at anthesis the globose bud splits into (2 or) 3 triangular ± concave sepals. The five petals are thick-fleshy and drop off after anthesis.

2. In the female flowers of *Giesen 76* (*Zanonia indica* subsp. *orientalis* var. *paludosa*) the staminodes are distinctly stamen-like, each with a small anther, including an indication of the apical slit at apex. It could not be verified whether they contain viable pollen.

### 1. *Zanonia indica* L.

*Zanonia indica* L., Syst. Nat. ed. 10, 2 (1759) 1292; Sp. Pl. ed. 2, 2 (1763) 1457; Miq., Fl. Ned. Ind. 1, 1 (1856) 658; C.B. Clarke in Hook. f., Fl. Brit. Ind. 2 (1879) 633; Cogn. in A. DC. & C. DC., Monogr. Phan. 3. (1881) 926; Backer in Backer & Bakh. f., Fl. Java 1 (1964) 295; W.J. de Wilde & Duyfjes, Blumea 52 (2007) 283. — Type: “*Penar-valli mas*” in Rheede, Hort. Malab. (1688) 8: 93 (‘39’), t. 49 (lecto, designated by Chakravarty, Fasc. Fl. India 11 (1982) 126).

Distribution — South India, Sri Lanka, NE India, South China, Indochina, through Malesia east to New Guinea; in *Malesia*: 1 subspecies.

Note — De Wilde & Duyfjes (Blumea 2007) distinguished in *Zanonia indica* two subspecies, subsp. *indica* (South India and Sri Lanka) and subsp. *orientalis* W.J. de Wilde & Duyfjes; only subsp. *orientalis* occurs in Malesia.

subsp. ***orientalis*** W.J. de Wilde & Duyfjes

*Zanonia indica* L. subsp. *orientalis* W.J. de Wilde & Duyfjes, Blumea 52 (2007) 284, f. 1, 2a–d; Fl. Thailand 9, 4 (2008) 541, pl. 43, 1, 2. — Type: *Phonsena 5192* (holo BKF; iso L), Thailand, Chon Buri, Bo Thong, Khao Cha-ang On.

*Zanonia indica* L. var. *angustifolia* Cogn. in A. DC. & C. DC., Monogr. Phan. 3 (1881) 927. — Type: *Hooker f. & Thomson s.n.* (holo K; iso P), East India, Chittagong.



*Tinospora curtisii* Ridl., J. Bot. 58 (1920) 148. — Type: *Curtis 3464*, male (holo K), Peninsular Malaysia, Penang, Batu Feringhi, near the sea.

*Alsomitra simplicifolia* Merr., Philipp. J. Sci. 20 (1922) 470. — Type: *Ramos & Edaño BS 37397* (holo PNH†; iso BO, K, L, P), Philippines, Mindanao, Malangas.

*Jussia borneensis* Merr., J. Straits Branch Roy. Asiat. Soc. 85 (1922) 170. — Type: *Ramos 1593* (holo PNH†; iso K, L) Malaysia, Sabah, near Sandakan.

Liana 4–15 m tall; leafy stem 3–5 mm diam., glabrous or hairy, often with lenticels. *Tendrils* 5–15 cm long, in juvenile plants at apices with irregularly shaped adhesive pads to c. 5 mm diameter. *Leaves*: petiole 1.5–3 cm long; blade membranous or subcoriaceous, (broadly) ovate-elliptic, 8–15 by 5–12 cm, both surfaces glabrous or hairy, base broadly rounded or cordate or sometimes somewhat hastate, apex (sub)obtusely mucronate; 2–5-pinnately veined and one pair of basal veins, reticulation distinct on lower surface. *Male inflorescences* glabrous or hairy, (10–)15–60 cm long, little or much branched (sometimes also branched from the base), lateral branches to 15 cm long, flowers often in bundles of up to 5, the bundles ± spaced, the larger inflorescences often from the older wood. *Male flowers*: pedicels rather thick, 1–3(–5) mm long, articulate at ± halfway; buds c. 2 mm diam.; corolla 5–7 mm diam.; sepals membranous, almost free, subtriangular, c. 2 mm long; petals (narrowly) ovate-elliptic, 2.5–3.5 long, apex narrowed, subacute, adaxially papillose; stamens inserted on a carnosous disc, leaving the centre free, filaments 0.5–1 mm long, fleshy, anthers transversely ellipsoid, (0.5–)1 mm long. *Female inflorescences* 5–40 cm long, raceme-like or branched panicles, few- or many-flowered, flowers solitary (or 2). *Female flowers*: sepals triangular, 2–4 mm long; petals (narrowly) ovate-elliptic, 3–8 mm long, subacute, finely papillose-hairy; ovary subcylindrical-obconical, 5–12 by 2–3 mm, glabrous or hairy; styles short, stigmas with 2 incurved horizontal horns, papillose. *Fruit* pendulous, few to many per infructescence, variable in size, (4–)5–10 by 1.5–4.5(–5) cm, glabrous, glabrescent or hairy. *Seeds* 6, pale, elliptic, not ornamented, 15(–20) by 8(–10) mm, winged all around, the wings leathery, elongated and rounded at both ends, 4–6(–8) by 1.3–1.5(–2) cm.

Distribution — NE India, South China, Indochina, Thailand; in *Malesia*: Sumatra, Peninsular Malaysia (Kedah, Perak, Penang, and Johor), Borneo (Kalimantan, Sarawak, Sabah), Java, Philippines (Sulu Archipelago, Negros, and Mindanao), Sulawesi, Moluccas (Aru Islands), New Guinea (West Papua, Papua New Guinea (Kaiser Wilhelmsland, Morobe Province)); 2 varieties.

Habitat & Ecology — Forest edges, riversides, open forest on mountain slopes; (0–)20–800 m altitude; flowering and fruiting throughout the year.

Notes — 1. The size of the fruits shows a considerable variety in its length, varying from 6–9 cm, but strikingly small fruits, c. 4 by 2(–2.5) cm, seem usual in New Guinea.

2. Sterile material of *Z. indica* may resemble sterile *Alsomitra macrocarpa*. The latter generally has longer petioles, and a characteristic short-hairy spot in the leaf axil; also, the adhesive pads which may develop at the end of the tendril-branches are larger and more elongate, to 1.3 cm long. Furthermore, the bark of twigs in *Alsomitra* is not or but finely striate (coarsely striate in *Zanonia*), and without or with few small lenticels.

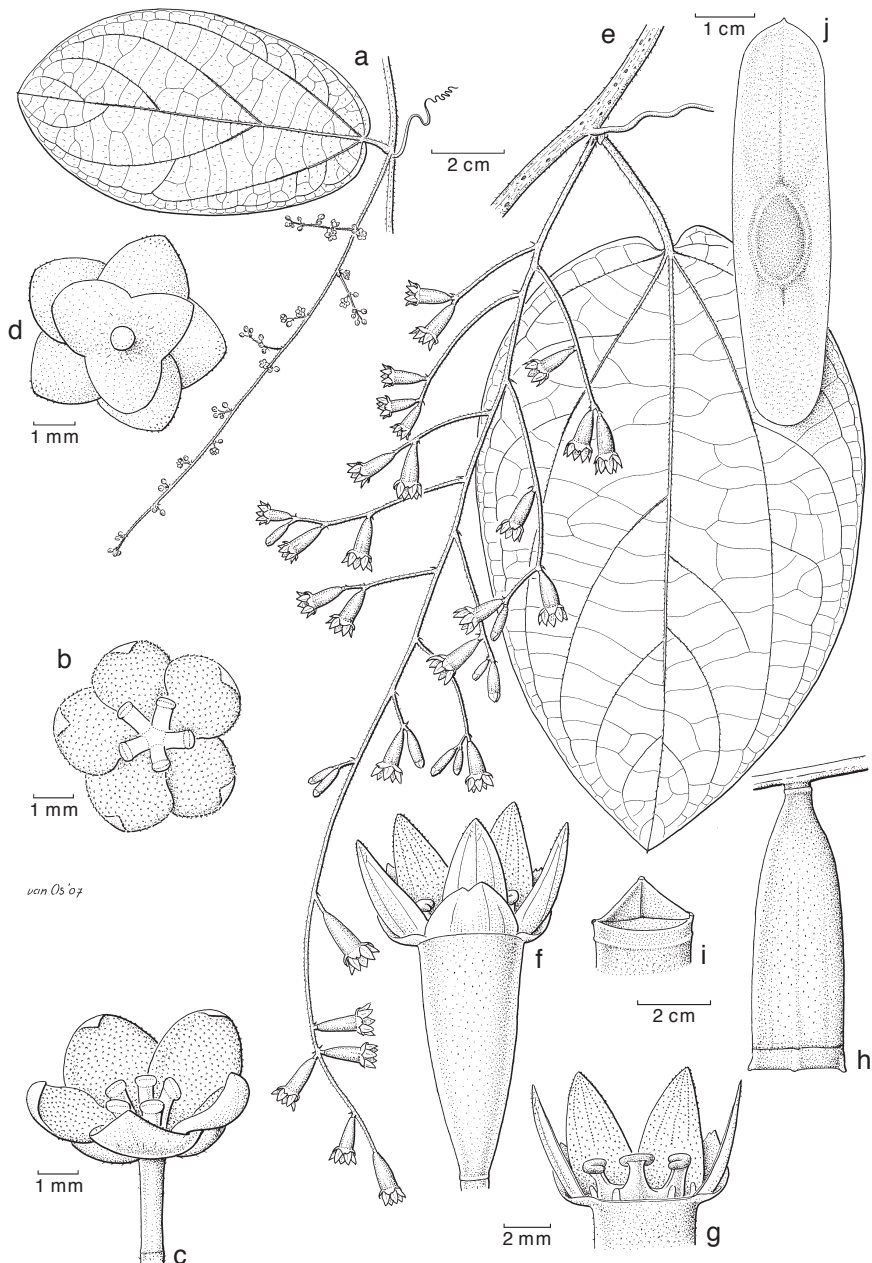


Fig. 96. *Zania indica* L. subsp. *orientalis* W.J.de Wilde & Duyfjes var. *pubescens* Cogn. a. Node with male inflorescence; b, c. male flower; d. ditto, seen from below showing 3-lobed calyx; e. node with female inflorescence; f. female flower; g. apex of female flower, part of perianth removed showing styles and stigmas; h, i. fruit and apex of fruit respectively; j. seed (a: Kerr 2048; b–d: Phonsena, De Wilde & Duyfjes 5192 (from spirit); e–g: Ramos & Edaño BS 37397 (type of *Alsomitra simplicifolia*); h–j: Geesink 8384).

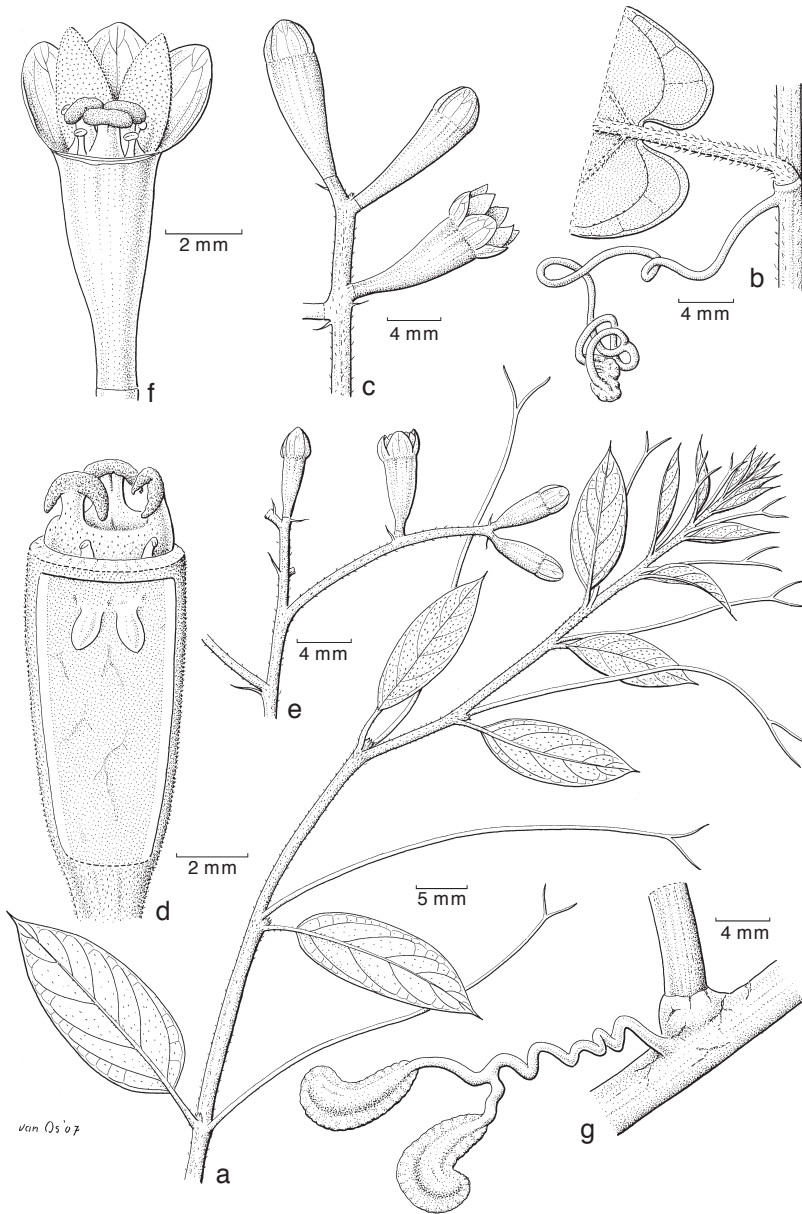
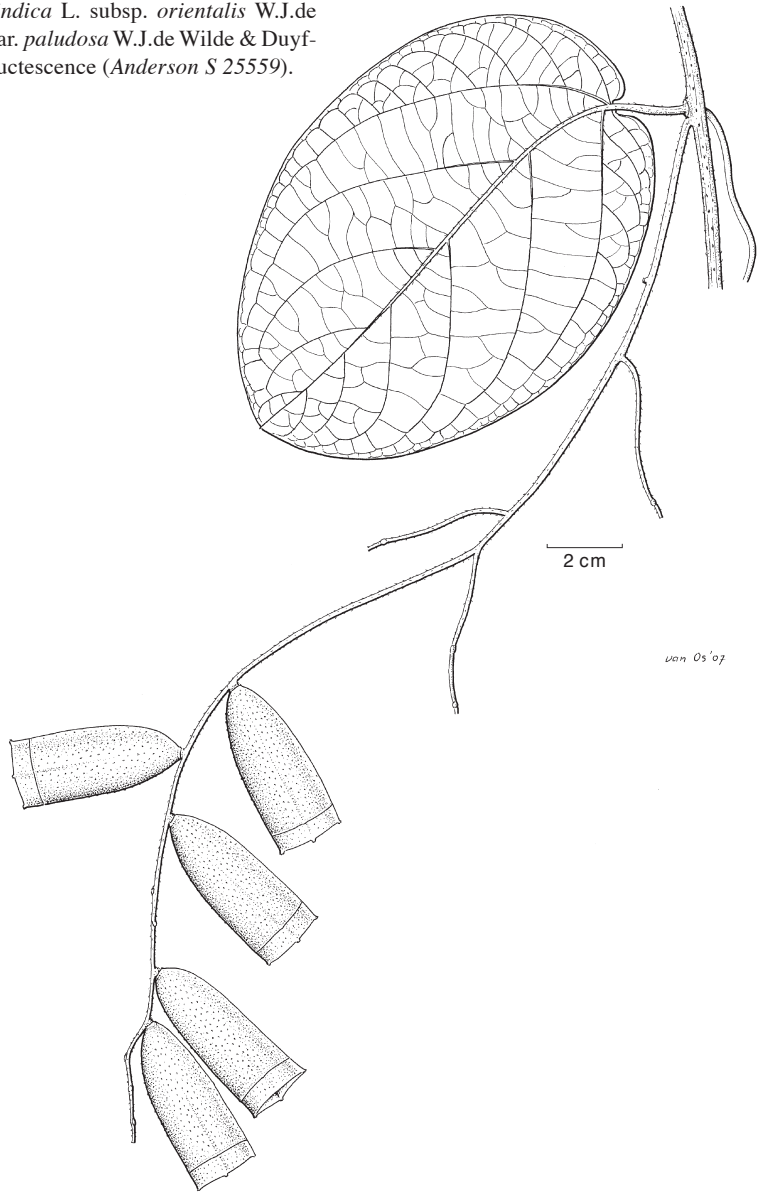


Fig. 97. a–d. *Zanonía indica* L. subsp. *orientalis* W.J.de Wilde & Duyfjes var. *pubescens* Cogn. a. Growing shoot apex; b. node of sterile shoot, note adhesive pads at apex of tendril; c. apex of female inflorescence; d. female flower, perianth removed and ovary longitudinally opened to show position of the ovules. — e, f. *Zanonía indica* L. subsp. *orientalis* W.J.de Wilde & Duyfjes var. *paludosa* W.J.de Wilde & Duyfjes. e. Apex of female inflorescence; f. female flower. — g. *Alsomitra macrocarpa* (Blume) M.Roem. Node with base of petiole and tendril with at apex adhesive pads (a: De Wilde & Duyfjes 21759; b: Phonsena 3522; c. Korthals s.n. (33); d: De Wilde & Duyfjes 22125; e, f: Giesen 76 (type); g: McDonald BS 18711).

Fig. 98. *Zanonia indica* L. subsp. *orientalis* W.J.de Wilde & Duyfjes var. *paludosa* W.J.de Wilde & Duyfjes. Twig with infructescence (*Anderson S 25559*).



KEY TO THE VARIETIES

- 1a. Ovary 8–10 mm long; petals 4–5 mm long. Fruit 4–10 cm long, pubescent, glabrescent or glabrous; pericarp finely wrinkled or irregularly pustulate . . . . . **a. var. pubescens**
- b. Ovary c. 5 mm long; petals c. 3 mm long. Fruit c. 5 cm long, glabrous; pericarp smooth or finely regularly pustulate. . . . . **b. var. paludosa**

**a. var. pubescens** Cogn.

*Zanonia indica* L. var. *pubescens* Cogn. in A.DC. & C. DC., Monogr. Phan. 3 (1881) 927. — Type: *Griffith 2521* (lecto K; iso P, designated by Chakravarty, Fasc. Fl. India 2 (1982) 126), India, Khasia Hills.

*Zanonia indica* L. subsp. *orientalis* W.J.de Wilde & Duyfjes var. *orientalis*, nom. superfl. (De Wilde & Duyfjes, Blumea 52 (2007) 288).

Climber 6–15 m long, glabrous or hairy. *Female flowers*: ovary 8–10(–12) mm long; sepals 2–3 mm long; petals 3–5 mm long. *Fruit* 4.5–9(–10) cm long; pericarp irregularly set with low wrinkles or pustules. — **Fig. 8g, 96, 97a–d; Plate 20c, d.**

Distribution — As the subspecies.

Note — Although the majority of the collections has (sub)glabrous leaves the name of the variety, var. *pubescens*, had to be used because of taxonomic priority.

**b. var. paludosa** W.J.de Wilde & Duyfjes

*Zanonia indica* L. subsp. *orientalis* W.J.de Wilde & Duyfjes var. *paludosa* W.J.de Wilde & Duyfjes, Blumea 52 (2007) 288, f. 2e, f. 3. — Type: *Giesen 76* (holo L; iso BO, not seen), Kalimantan, Negara River, Barito delta.

Climber 4–6 m tall, (sub)glabrous. *Female flowers*: ovary subglabrous, c. 5 mm long, 1.5–2 mm wide; sepals c. 2 mm long; petals c. 3 mm long. *Fruit* 4.5–5 cm long, 2 cm wide, glabrous, smooth or very finely pustulate. Male flowers not known. — **Fig. 97e, f, 98.**

Distribution — *Malesia*: Borneo: Sarawak, Rejang delta; South Kalimantan, Barito delta.

Habitat & Ecology — In riparian forest or transitional forest between mangrove and peat swamp forest at sea level; flowering and fruiting: December & January.