

## EUPHORBIACEAE

大戟科 da ji ke

Li Bingtao (李秉滔 Li Ping-tao)<sup>1</sup>, Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing)<sup>2</sup>, Ma Jinshuang (马金双)<sup>3</sup>, Zhu Hua (朱华)<sup>4</sup>; Michael G. Gilbert<sup>5</sup>, Hans-Joachim Esser<sup>6</sup>, Stefan Dressler<sup>7</sup>, Petra Hoffmann<sup>8</sup>, Lynn J. Gillespie<sup>9</sup>, Maria Vorontsova<sup>10</sup>, Gordon D. McPherson<sup>11</sup>

Trees, shrubs, or herbs, rarely woody or herbaceous lianas, monoecious or dioecious, indumentum of simple, branched, stellate, or gland-tipped hairs, peltate or glandular scales or stinging hairs, latex often present, clear, white, or colored; roots woody, rarely roots tuberous and stems succulent, sometimes spiny. Leaves alternate or opposite, rarely whorled; stipules usually present, often free, sometimes modified into spines or glands, deciduous or persistent; petioles long to short, sometimes with glands at apex or base; leaf blade simple, sometimes palmately lobed, rarely compound, or reduced to scales, margins entire or toothed, sometimes with distinct glands along margin and/or on surface, venation pinnate or palmate. Inflorescences axillary or terminal, flowers in cymes or fascicles, these often arranged along an elongated axis, branched or unbranched, forming a thyrse, in congested heads, or in a flowerlike cyathium with very reduced flowers enclosed within a ± cupular involucre; bracts sometimes petaloid. Flowers unisexual, within same inflorescence or in separate inflorescences, actinomorphic. Sepals (1–)3–6(–8), free or connate into calyx tube, valvate or imbricate, rarely absent (*Euphorbia*). Petals free, often reduced or absent. Disk present or absent. Male flowers with disk intrastaminal or extrastaminal, entire to dissected. Stamens one to very many, hypogynous; filaments free or connate; anthers 2(–4)-locular, mostly dehiscent longitudinally, rarely transversely or by pores, introrse or extrorse; rudimentary ovary sometimes present. Female flowers rarely with staminodes; ovary superior, (1–)2–5(–20)-locular; placentation axile; ovules 1 or 2 per locule, anatropous or hemitropous; styles free or connate, entire or lobed, or multifid, lobes erect, horizontal or curved; stigma capitate, linear, fimbriate, fan-shaped or pinnatilobate. Fruit typically a capsule elastically dehiscent into 2-valved cocci from a persistent columella, sometimes a berry or drupe. Seeds 1 or 2 per locule; seed coat thin to indurate, sometimes fleshy to form a sarcotesta; caruncle sometimes present; aril sometimes present; endosperm present or absent; embryo straight to curved or folded; cotyledons usually broader than radical.  $x = 6–14$ .

About 322 genera and 8910 species: widespread throughout the world, primarily in the tropics and subtropics, more poorly represented in temperate regions; 75 genera (one endemic, nine introduced) and 406 species (99 endemic, 27 introduced) in China, nearly 95% of which are found in the S and SW parts of the country.

The Euphorbiaceae as treated here include the following families that have been proposed for segregation: *Androstachyaceae*, *Antidesmataceae*, *Bischofiaceae*, *Hymenocardiaceae*, *Phyllanthaceae*, *Pedilanthaceae*, *Picrodendraceae*, *Porantheraceae*, *Putranjivaceae*, *Ricinocarpaceae*, *Scepaceae*, *Stilaginaceae*, *Trewiaceae*, and *Uapacaceae*. The *Pandaceae* and *Buxaceae*, formerly included here, are now well established as separate families.

Molecular data has shown that the traditional concept of Euphorbiaceae includes three major lineages that are relatively distantly related to each other: the Phyllanthoids (genera 1–16 in this account), the Putranjivoids (genera 17 and 18), and the Euphorbioids (genera 19–75).

Many species of Euphorbiaceae are of economic importance, probably most importantly as the main source of rubber (*Hevea*) but also as sources of medicine; foods, both as a staple starch source (*Manihot*) and fruits (e.g., *Phyllanthus emblica*); seed oils (*Ricinus*, *Vernicia*); and insecticides.

Li Ping'ao. 1994. Euphorbiaceae. *In*: Li Ping'ao, ed., *Fl. Reipubl. Popularis Sin.* 44(1): ii–viii, 1–217; Kiu Huashing, Hwang Shumei & Chang Yongtian. 1996. Euphorbiaceae (2). *In*: Kiu Huashing, ed., *Fl. Reipubl. Popularis Sin.* 44(2): ii–ix, 1–212; Ma Jinshuang & Tseng Yungchien. 1997. Euphorbiaceae (3). *In*: Ma Jinshuang, ed., *Fl. Reipubl. Popularis Sin.* 44(3): ii–vi, 1–150.

- 1a. Ovules 1 per locule; indumentum of simple, stellate, scalelike, glandular, or stinging hairs; latex present or absent; leaves mostly spiral, less often distichous, blade sometimes lobed (palmately compound in *Hevea*), margin entire or variously toothed, often with glands/extra-floral nectaries on petiole apex/leaf base and/or margins; inflorescence axillary or terminal, often thyrseoid or cymose, sometimes pseudanthial, rarely sessile clusters; seeds sometimes carunculate ..... Key 3. Euphorbioid genera
- 1b. Ovules 2 per locule; indumentum of simple, very rarely branched, hairs; latex absent; leaves often strongly distichous, blade never lobed, margin entire or finely serrulate (3-foliolate and toothed in *Bischofia*), usually without glands (present in *Aporosa*); inflorescence mostly axillary, often without visible axis; seeds not carunculate, sometimes arillate.

<sup>1</sup> Department of Forestry, South China Agricultural University, Guangzhou, Guangdong 510642, People's Republic of China.

<sup>2</sup> South China Botanical Garden, Chinese Academy of Sciences, Longdong, Shahe, Guangzhou, Guangdong 510650, People's Republic of China.

<sup>3</sup> Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225-1099, U.S.A.

<sup>4</sup> Laboratory of Plant Phylogenetics and Conservation Biology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, 88 Xuefu Road, Kunming, Yunnan 650223, People's Republic of China.

<sup>5</sup> Missouri Botanical Garden c/o Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, United Kingdom.

<sup>6</sup> Botanische Staatssammlung, Menzinger Straße 67, D-80638 München, Germany.

<sup>7</sup> Forschungsinstitut Senckenberg, Senckenberganlage 25, D-60325 Frankfurt am Main, Germany.

<sup>8</sup> Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, United Kingdom.

<sup>9</sup> Research Division, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, Ontario K1P 6P4, Canada.

<sup>10</sup> Department of Botany, The Natural History Museum, Cromwell Road, London SW7 5BD, United Kingdom.

<sup>11</sup> Missouri Botanical Garden, P.O. Box 299, Saint Louis, Missouri 63166-0299, U.S.A.

- 2a. Stigmas usually bifid, not dilated; fruit a capsule or berry or if a drupe then relatively small and/or with 2 or more seeds and without persistent flaplike stigmas; base of leaf blade symmetrical ..... Key 1. Phyllanthoid genera  
 2b. Stigmas dilated, peltate or reniform; fruit a relatively large 1-seeded drupe, usually crowned by persistent flaplike stigmas; base of leaf blade often asymmetrical ..... Key 2. Putranjivoid genera

### Key 1. Phyllanthoid genera

Trees, shrubs, or herbs, usually without latex (present in *Bischofia*); indumentum of simple hairs (branched in *Phyllanthus reticulatus*), often absent. Leaves alternate, often distichous, sometimes scalelike on main stems; petiole usually short, usually without glands (present in *Aporosa*); leaf blade simple, margin entire or minutely serrulate (long petioles, 3(–5)-foliolate with toothed margins in *Bischofia*); venation pinnate, rarely obscurely 3-veined from base. Inflorescences mostly axillary, without visible axis (present in *Antidesma*, *Aporosa*, *Baccaurea*, *Bischofia*, *Richeriella*). Male flowers with 2–8 stamens, anthers longitudinally dehiscent (variable in *Phyllanthus*); female flowers with 2 ovules per locule. Seeds without caruncle, sometimes with fleshy aril or fleshy testa.

Fifty-nine genera and over 1700 species: mostly tropical, the greatest diversity in SE Asia; 16 genera and 138 species (41 endemic, four introduced) in China.

- 1a. Leaves 3-foliolate, margin distinctly serrate; plant with red or reddish juice; styles entire ..... 16. *Bischofia*  
 1b. Leaves simple, margin entire or minutely serrulate; plant without red juice; styles usually bifid, sometimes connate (*Glochidion*).  
 2a. Inflorescences in spikes, racemes, or pseudoracemes, with visible inflorescence axis; plants dioecious; petals absent.  
 3a. Disk present; ovary and fruit 1- or 3-celled; petioles and leaf margins without glands; stamens longer than sepals.  
 4a. Anthers U-shaped with an enlarged connective; fruit indehiscent; ovary and fruit 1-celled, often laterally flattened; male disk annular, in distinct parts, or cushion-shaped, enclosing stamens and pistillode, never lobed ..... 13. *Antidesma*  
 4b. Anthers with parallel thecae and without an enlarged connective; fruit dehiscent, never flattened; ovary and fruit 3-celled; male disk 5-lobed ..... 6. *Richeriella*  
 3b. Disk absent; ovary and fruit 2–4-celled; petioles and leaf margins sometimes glandular; stamens shorter to longer than sepals.  
 5a. Leaves evenly distributed along branches, usually distichously arranged; leaf margin undulate to denticulate; petiole apex usually glandular ..... 14. *Aporosa*  
 5b. Leaves clustered toward branch tips, usually spirally arranged; leaf margin entire; petiole apex without glands ..... 15. *Baccaurea*  
 2b. Inflorescences in glomerules or fascicles, inflorescence axis not visible or no longer than 1 cm; plants monoecious or dioecious; petals absent or present.  
 6a. Flowers with petals (sometimes minute and hidden under disk, rarely absent in *Actephila*) and disk; stamens usually 5; rudimentary ovary present.  
 7a. Sepals imbricate; petals much shorter than to nearly as long as sepals or absent; disk surrounding ovary base at most; female sepals often enlarged.  
 8a. Leaves leathery, rarely papery; disk annular; fruit 13–25 mm in diam., exocarp free from endocarp; seed without endosperm ..... 1. *Actephila*  
 8b. Leaves membranous to papery (leathery in *L. pachyphyllus*); disk 5(or 6)-parted, lobes each deeply 2-lobed in male flowers; fruit 5–8 mm in diam., exocarp adnate to endocarp; mature seed with copious endosperm .. 2. *Leptopus*  
 7b. Sepals valvate (rarely female sepals imbricate); petals much smaller than sepals but always visible between sepals; disk enclosing half or more of ovary in young flowers; female sepals never enlarged.  
 9a. Ovary and fruit usually 3-celled; fruit woody, breaking up at maturity; female sepals caducous in fruit .... 3. *Cleistanthus*  
 9b. Ovary usually 2-celled; fruit fleshy and indehiscent, 1- or 2-celled; female sepals persistent ..... 4. *Bridelia*  
 6b. Flowers without petals; stamens 2–8, sometimes connate; rudimentary ovary absent or present.  
 10a. Flowers without disk (male flowers of *Sauropus* and *Breynia* with a whorl of scales inserted adaxially at base of calyx lobes).  
 11a. Male calyx of free sepals, without adaxial scales; stamens 3–8; ovary 3–15-celled, styles connate into a terete, conical, clavate, or ovoid structure with a usually lobed or toothed apex; fruits longitudinally grooved ..... 10. *Glochidion*  
 11b. Male calyx disk-shaped, cup-shaped, funnel-shaped, or turbinate, entire or shallowly lobed, with whorl of scalelike lobes inserted at base of lobes where discernable; stamens 3; ovary 3-celled, styles 3, free or connate at base only; fruits not longitudinally grooved.  
 12a. Male flowers with anthers widely separated on short arms or angles of flat triangular apex of filament column, not overtopped by connective; female calyx with 2 overlapping whorls of sepals, sometimes thicker in fruit; styles spreading and recurved; fruit dehiscent; leaves drying green to brown ..... 11. *Sauropus*

- 12b. Male flowers with anthers closely parallel along sides of filament column, or on underside of triangular head; female calyx lobes fused, turbinate or hemispheric, campanulate, cup-shaped, or rotate, not thickened in fruit; styles erect; fruit indehiscent or tardily or incompletely dehiscent; leaves usually drying blackish adaxially ..... 12. *Breynia*
- 10b. Flowers with a prominent, usually fleshy disk.
- 13a. Male flowers with prominent pistillode; stamens 4–7, free; female disk annular; branchlets sometimes spine-tipped; leaves often fascicled on short shoots, shoots never resembling pinnate leaves; fruit regularly dehiscent or a white berry ..... 5. *Flueggea*
- 13b. Male flowers without pistillode; stamens 2–8, free or connate; female disk annular or in distinct parts; branchlets never spine-tipped; leafy branches often resembling pinnate leaves (“phyllanthoid branching”); fruit regularly or irregularly dehiscent, if fleshy and indehiscent, fruit a green to yellow drupe and shoots clearly resembling pinnate leaves or fruit a purplish berry.
- 14a. Dioecious; sepals and stamens 4; disk adnate to receptacle; stamens free; ovary 3-celled; fruit irregularly fragmenting, with brittle, papery endocarp; seeds with thin, fleshy, blue or purplish testa ..... 7. *Margaritaria*
- 14b. Monoecious (rarely dioecious); sepals and stamens 2–6; disk not adnate to receptacle; stamens free or connate; fruit dehiscent regularly, with woody endocarp or indehiscent and fleshy; seed coat not fleshy, not blue or purplish.
- 15a. Sepal apex never caudate-acuminate; disk annular to cup-shaped or if of separate glands then these  $\pm$  round; anther connectives not protruding; capsula to 7 mm or fruit fleshy ..... 8. *Phyllanthus*
- 15b. Sepal apex distinctly caudate-acuminate; disk glands linear; anther connectives produced into subulate appendage; fruit usually larger, (5–)8–15 mm, never fleshy ..... 9. *Phyllanthodendron*

### Key 2. Putranjivoid genera

Trees to shrubs. Leaf blade leathery, grayish when dry, base often asymmetrical. Ovules 1 per locule; stigmas dilated, peltate or reniform. Fruit a relatively large 1-seeded drupe, usually crowned by persistent flaplike stigmas. Seeds without caruncle.

Four genera and ca. 210 species: throughout the tropics; two genera and 13 species (three endemic) in China.

The Putranjivoid genera resemble phyllanthoids by their 2-ranked leaves, frequently rather small fasciculate flowers, and ovules 2 per locule. They can be distinguished by their leaf blades, stigmas, and fruit. Also, the leaves contain mustard oils and so frequently taste peppery when fresh, although the taste may take a little time to develop.

- 1a. Disk present; stamens mostly 4 or more; styles stigmatiform ..... 17. *Drypetes*  
 1b. Disk absent; stamens mostly 2 or 3(or 4); styles petaloid-dilated ..... 18. *Putranjiva*

### Key 3. Euphorbioid genera

Plants with or without latex; indumentum of simple, stellate, scalelike, stinging, or glandular hairs, sometimes absent. Leaves alternate or opposite; leaf blade simple or compound, sometimes deeply divided, margin entire or variously toothed, often with sessile glands near junction with petiole and/or along margins; venation pinnate or palmate. Inflorescences basically thyrsoid, very variable, often with well-defined main axis and/or distinct cymes, rarely a sessile axillary fascicle. Ovules 1 per locule of ovary. Seed sometimes carunculate, sometimes arillate.

Two hundred and eighteen genera and over 5700 species: widespread throughout the world, primarily in the tropics and subtropics, more poorly represented in temperate regions; 54 genera (one endemic, nine introduced) and 255 species (55 endemic, 23 introduced) in China.

- 1a. Lianas or subshrubs, stems twining or scandent, stinging hairs often present.
- 2a. Inflorescences capitata, long pedunculate, subtended by 2 large involucre bracts; male flowers 3 to many per bract; stamens more than 10 ..... 44. *Dalechampia*
- 2b. Inflorescences racemelike; male flowers 1 per bract; stamens 2 or 3.
- 3a. Male calyx lobes 4(–6); stamens 2(or 3), anthers subsessile; styles partly connate into a stout column, free tips recurved ..... 43. *Pachystylidium*
- 3b. Male calyx lobes 3; stamens 3, anthers on short stout filaments; styles not as above.
- 4a. Connectives of stamens with inflexed, linear appendages; styles mostly free, spreading, and plumose ..... 41. *Cnesmone*
- 4b. Connectives of stamens without appendage; styles connate into a massive subglobose or clavate structure, 3-lobed at apex, not plumose ..... 42. *Megistostigma*
- 1b. Trees, shrubs, or herbs, stems not twining, stinging hairs never present.
- 5a. Indumentum with stellate hairs, peltate scales, and/or T-shaped hairs, sometimes also with simple hairs and/or glandular hairs or scales.
- 6a. Male petals present; inflorescence usually bisexual (unisexual in *Deutzianthus*), usually racemelike, sometimes a conical panicle.

- 7a. Filaments incurved in bud; leaves with glands at junction of petiole and leaf blade and also often on leaf margin ..... 45. *Croton*
- 7b. Filaments erect in bud; leaves often without such glands.
- 8a. Herbs, stems woody at base; leaves less than 10 cm; stamens 5–15.
- 9a. Inflorescences terminal; male flowers 1–4 per bract; filaments free ..... 20. *Speranskia*
- 9b. Inflorescences axillary; male flowers 1 per bract; filaments connate ..... 21. *Chrozophora*
- 8b. Trees; leaves large, (7–)10–20(–24) × (4–)7–17(–20) cm; stamens 15–70.
- 10a. Stamens 50–70; inflorescence spikelike with female flowers proximal to male; fruit dehiscent ..... 19. *Sumbaviopsis*
- 10b. Stamens 7–20; inflorescence a conical panicle with female flowers distal to male, or inflorescences unisexual; fruit indehiscent.
- 11a. Evergreen trees; young branches and leaves stellate-hairy; stamens 15–32; ovary 2(or 3)-locular; exocarp fleshy ..... 47. *Aleurites*
- 11b. Deciduous trees; young branches and leaves glabrous or puberulent; stamens 7–12; ovary 3-locular; exocarp crustaceous.
- 12a. Petiole with 2 apical disciform glands; plants dioecious; male calyx 5-fid ..... 50. *Deutzianthus*
- 12b. Petiole without glands; plants monoecious; male calyx 2- or 3-lobed.
- 13a. Inflorescences and fruits stellate-tomentose, bracts conspicuous; flowers smaller, densely flowered; petals uniformly crimson-red; anthers extrorse; pedicels of fruits very short ..... 48. *Reutealis*
- 13b. Inflorescences and fruits glabrous or puberulent, hairs simple or T-shaped, bracts inconspicuous; flowers larger, sparsely flowered; petals white with red veins; anthers introrse; pedicels of fruits longer ..... 49. *Vernicia*
- 6b. Male petals absent; inflorescences variable, bisexual or unisexual.
- 14a. Plants usually dioecious; stamens 15–250.
- 15a. Leaves and inflorescences lacking glandular scales, only stellate or scale hairs present; leaves alternate; capsule smooth, often 2-lobed ..... 26. *Melanolepis*
- 15b. Lower leaf surface and/or inflorescences with glandular scales (whitish to yellowish, orangish, or reddish dots), sometimes hidden by dense stellate hairs; leaves opposite or alternate; capsule smooth or softly spiny, mostly 3-lobed ..... 24. *Mallotus*
- 14b. Plants monoecious, rarely dioecious (*Endospermum*); stamens 3–15.
- 16a. Leaves palmately veined, petiole insertion sometimes narrowly peltate; shrubs to 2.5 m tall; female sepals 6–13 mm ..... 35. *Cladogynos*
- 16b. Leaves pinnately veined, never peltate; large shrubs or trees 3–35 m tall; female sepals 2–5 mm.
- 17a. Stems tomentose; trees or shrubs 3–15 m tall; leaf base without glands or stipels, broadly cuneate, obtuse, or cordate.
- 18a. Inflorescence terminal, branched; stamen filaments slender, free; calyx glabrous ..... 36. *Epiprinus*
- 18b. Inflorescence axillary, unbranched; stamen filaments as wide as anthers, joined at base; calyx stellate hairy ..... 37. *Koilodepas*
- 17b. Stems pubescent or densely puberulent, glabrescent; trees 10–25 m tall; leaf base with a pair of glands or minute stipels, cuneate or truncate.
- 19a. Petiole 0.3–0.5 cm; fruit a densely tuberculate-spiny capsule ..... 38. *Cephalomappa*
- 19b. Petiole 1–9 cm; fruit an unarmed drupe.
- 20a. Petiole 1–4 cm; drupe puberulent, 3–5 cm in diam.; plants usually monoecious ..... 39. *Cleidiocarpon*
- 20b. Petiole 4–9 cm; drupe ca. 1 cm in diam.; plants usually dioecious ..... 62. *Endospermum*
- 5b. Indumentum with simple and/or glandular hairs.
- 21a. Latex white, usually copious.
- 22a. Leaves palmately 3–5-foliolate or deeply 3–9-lobed; plants usually cultivated.
- 23a. Leaves palmately 3–5-foliolate, not peltate; inflorescences axillary, sometimes at leafless nodes ..... 46. *Hevea*
- 23b. Leaves palmately 3–9-lobed, petiole insertion often peltate; inflorescences terminal or leaf-opposed ..... 59. *Manihot*
- 22b. Leaves entire, rarely shallowly lobed; plants mostly wild.
- 24a. Inflorescence a cyathium, resembling a single flower, true flowers very reduced: perianth extremely reduced, mostly absent, male flowers reduced to single stamen, female to bare ovary, these enclosed within a cupular involucre, usually with a single terminal female flower and 4 or 5 lateral groups of male flowers and with conspicuous cyathial glands near margin; styles mostly bifid.
- 25a. Cyathium radially symmetrical, glands inserted on outside of cyathium ..... 74. *Euphorbia*
- 25b. Cyathium distinctly bilaterally symmetrical, glands hidden within a well-developed nectar spur ..... 75. *Pedilanthus*
- 24b. Inflorescences elongated, usually with female flowers at base and male flowers toward apex, never enclosed within involucre; male calyx usually present; styles often simple.
- 26a. Perennial herbs; stems and leaves sparsely puberulent; fruit a capsule, each lobe with 2 lines of conical spines ..... 66. *Microstachys*

- 26b. Trees or shrubs; stems and leaves glabrous; fruit a drupe or capsule, not spiny.
- 27a. Fruit a many-loculed woody schizocarp, 8–9 cm in diam., eventually breaking into curved segments; female flower with dark purple stigma 1.5–2.5 cm wide; anthers connate; trunk and branches spiny ..... 73. *Hura*
- 27b. Fruit a 2- or 3-loculed capsule or drupe, up to 1.5 cm in diam., female flower with stigma much smaller; anthers free, filaments connate; spines absent.
- 28a. Male sepals distinct, oblong-lanceolate; inflorescences bisexual or unisexual, axillary or terminal, if all female then axillary and plants growing on or near sea coast; leaves opposite or alternate .... 65. *Excoecaria*
- 28b. Male calyx shallowly 2–5-lobed; inflorescences bisexual, always terminal or leaf-opposed; leaves always alternate.
- 29a. Stipules large, concealing apical bud, deciduous; male calyx laterally compressed, free; leaves with petiolar glands ..... 64. *Homalanthus*
- 29b. Stipules small or absent; male calyx not laterally compressed; leaves with or without petiolar glands.
- 30a. Leaf blade margin conspicuously serrate or undulate.
- 31a. Petiole apex with 2 distinct adaxial glands; axis of inflorescence glabrous; exocarp slightly fleshy ..... 67. *Falconeria*
- 31b. Petiole apex without glands; axis of inflorescence pilose; exocarp thick and hard ..... 70. *Shirakiopsis*
- 30b. Leaf blade margin entire or serrulate.
- 32a. Petiole not winged and without glands.
- 33a. Inflorescence 4–12 cm; fruit an indehiscent berry ..... 68. *Balakata*
- 33b. Inflorescence ca. 2 cm; fruit a capsule ..... 71. *Gymnanthes*
- 32b. Petiole winged and/or with apical glands.
- 34a. Petiole winged; seeds without aril; leaf blade with lowermost pair of veins originating distinctly above base, not forming basal margin ..... 72. *Neoshirakia*
- 34b. Petiole not winged; seeds enclosed by thin waxy aril; leaf blade with lowermost pair of veins originating at very base, forming basal margin ..... 69. *Triadica*
- 21b. Latex absent or watery or colored, never white.
- 35a. Leaf blade with dense hyaline spots; inflorescence a small leaf-opposed cyme ..... 60. *Suregada*
- 35b. Leaf blade without hyaline spots; inflorescence axillary or terminal.
- 36a. Leaves abaxially and often ovary and fruit with glandular scales or gland-tipped hairs.
- 37a. Leaves opposite but with one member of each pair much smaller and stipulelike; styles 10–25 mm; indumentum with gland-tipped hairs ..... 22. *Hancea*
- 37b. Leaves alternate or if opposite then similar in form; styles 1.5–7(–10) mm; indumentum with sessile glandular scales, often brightly colored.
- 38a. Inflorescences terminal or leaf-opposed, rarely axillary; anthers 2-locular; styles stout ..... 24. *Mallotus*
- 38b. Inflorescences axillary; anthers 3- or 4-locular; styles short or long and slender ..... 25. *Macaranga*
- 36b. Leaves apparently without glandular scales and gland-tipped hairs.
- 39a. Leaves opposite.
- 40a. Paired leaves equal; indumentum without glandular hairs, hairs not tufted.
- 41a. Herbs, 0.3–1 m tall; fruit a 2-lobed capsule, lobes abaxially 2–4-muricate or verruculose ..... 31. *Mercurialis*
- 41b. Trees or shrubs, 3–11 m tall; fruit a globose capsule, not ornamented ..... 58. *Erismanthus*
- 40b. Paired leaves unequal; indumentum with glandular hairs and/or tufted hairs.
- 42a. Fruit indehiscent; styles 20–25 mm; anther connective narrow ..... 23. *Trevisia*
- 42b. Fruit dehiscent; styles 1.5–7(–10) mm; anther connective often broad and conspicuous ..... 24. *Mallotus*
- 39b. Leaves alternate, sometimes congested into whorls.
- 43a. Stamens very many, filaments connate for most of their lengths into several phalanges; if plant dioecious (*Homonoia*), then female flowers in axillary spikes and plant growing in riverbeds.
- 44a. Plants glabrous; leaves palmately lobed; inflorescences terminal, bisexual; male and female flowers clustered in bract-axils ..... 34. *Ricinus*
- 44b. Young branches pubescent; leaves entire; inflorescences axillary, unisexual; male flowers solitary in bract-axils, female flowers solitary or in spikes.
- 45a. Plants monoecious; female flowers solitary; fruits tuberculate; leaf blade oblong-oblongate or elliptic, 5–17 × 2–5 cm; trees or shrubs growing on forested slopes, often over limestone ..... 32. *Lasiococca*
- 45b. Plants dioecious; female flowers in spikes; fruits pubescent, not tuberculate; leaf blade linear-oblong or narrowly lanceolate, 6–20 × 1.2–2.5 cm; shrubs growing in riverbeds ..... 33. *Homonoia*
- 43b. Filaments free or connate only at base or plant dioecious and plant female.
- 46a. Leaves with 2 or more glands near junction between petiole and leaf blade.
- 47a. Leaf blade with stipels at base, palmately veined.
- 48a. Stamens 25–60, thecae free; female calyx lobes valvate; styles bifid ..... 27. *Discocleidion*
- 48b. Stamens usually 8, thecae connate; female sepals imbricate; styles undivided ..... 28. *Alchornea*

- 47b. Leaf blade without stipels at base, palmately or pinnately veined.
- 49a. Leaf blade palmately veined; male flowers with petals; plants mostly monoecious (*Ostodes paniculata* dioecious).
- 50a. Inflorescence a pedunculate cyme, bisexual; stamens 8–12, inner ones with fused filaments ..... 52. *Jatropha*
- 50b. Inflorescence a thyrse, branched or unbranched, sometimes unisexual (plant dioecious); stamens 20–40, free ..... 55. *Ostodes*
- 49b. Leaf blade pinnately veined; male flowers without petals; plants dioecious.
- 51a. Stamens 4–8, filaments joined at base; male disk absent; styles undivided, filiform ..... 28. *Alchornea*
- 51b. Stamens 10–20, or more, filaments free; male disk present; styles bifid or plumose.
- 52a. Male sepals (2 or)3 or 4, imbricate; male disk annular; styles papillose or plumose; seeds globose or subglobose ..... 30. *Claoxylon*
- 52b. Male sepals (4 or)5 or 6, valvate; male disk with many short, erect glands; styles bifid; seeds ellipsoidal or ovoid ..... 61. *Baliospermum*
- 46b. Leaves without glands at junction between petiole and leaf blade.
- 53a. Inflorescence a unisexual axillary sessile fascicle; fruit densely spinescent; stamen (5–)8–15, filaments connate ..... 63. *Chaetocarpus*
- 53b. Inflorescence elongated with distinct main axis; fruit smooth, tuberculate, or sparsely spiny; stamens mostly free (filaments connate in *Dimorphocalyx*).
- 54a. Inflorescences with terminal female flower with prominent clavate pedicels; stamens 3(–5) ..... 57. *Trigonostemon*
- 54b. Inflorescences unisexual or with proximal female flowers and distal male flowers; stamens (7 or)8 or more.
- 55a. Stamens (7 or)8; anther locules long and slender, flexuous-contorted; female flowers often hidden within large bracts; styles lacinate ..... 40. *Acalypha*
- 55b. Stamens 10–200; anther locules ellipsoid to oblong, straight; styles bifid.
- 56a. Stamens 25–80(–100); male flowers without petals; plants monoecious ..... 29. *Cleidion*
- 56b. Stamens 10–30; male flowers with petals; plants monoecious or dioecious.
- 57a. Female petals present; stamen filaments connate or free.
- 58a. Filaments connate; inflorescence ca. 1 cm, few flowered ..... 56. *Dimorphocalyx*
- 58b. Filaments free; inflorescence 8–30 cm, many flowered ..... 51. *Codiaeum*
- 57b. Female petals absent; stamen filaments free.
- 59a. Female sepals with very conspicuously glandular-fimbriate margins; seed with caruncle ..... 54. *Strophoblachia*
- 59b. Female sepals without fimbriate margins; seed without caruncle ..... 53. *Blachia*

## 1. ACTEPHILA Blume, Bijdr. 581. 1826.

喜光花属 xi guang hua shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Anomospermum* Dalzell.

Trees or shrubs, monoecious or sometimes dioecious; indumentum of simple hairs, sometimes absent. Leaves alternate, rarely subopposite; stipules 2 in bilateral base of petioles; leaf blade simple, margin often entire, pinnately veined. Flowers axillary, fascicled or solitary; pedicels usually elongated. Male flowers: sepals 4–6, imbricate, slightly connate at base; petals 4–6, rarely absent, shorter than sepals; disk annular, entire or rarely divided at apex; stamens (3–)5(or 6); filaments distinct or connate at base; anthers introrse, longitudinally dehiscent; pistillode apex 3-fid. Female flowers: pedicels longer than male ones; sepals and petals as in male; disk annular surrounding base of ovary; ovary 3-locular; ovules 2 per locule; style short, free or connate at base, apex bifid or entire. Fruit a capsule, dehiscent into 3 2-valved cocci when mature; exocarp distinct from endocarp; columella persistent. Seeds without caruncle and endosperm; cotyledons thickened and fleshy; radical minute.

About 35 species: Oceania to the tropics and subtropics of Asia; three species (one endemic) in China.

- 1a. Trees to 15 m tall; lateral leaf veins 16–21 pairs; petiole 2–6 mm; seeds subglobose ..... 1. *A. subsessilis*
- 1b. Shrubs to 4 m tall; lateral leaf veins 9–12 pairs; petiole 6–40 mm; seeds 3-angled.
- 2a. Leaf blade apex long acuminate, abaxially puberulent; female sepals ca. 2 mm; female petals ca. 1.5 mm ..... 2. *A. excelsa*
- 2b. Leaf blade apex obtuse or shortly acuminate, abaxially glabrous; female sepals 5–6 mm; female petals 0.8–1.2 mm ..... 3. *A. merrilliana*

**1. *Actephila subsessilis*** Gagnepain, Bull. Soc. Bot. France 71: 569. 1924.

短柄喜光花 duan bing xi guang hua

Trees, to 15 m tall, glabrous except for sepals; branches terete, gray-brown, lenticellate. Stipules ovate-triangular, 1.5–4 mm, brown; petiole 2–6 mm; leaf blade oblong-elliptic, oblong, or obovate-lanceolate, 6–12 × 2–4.6 cm, papery, base broadly cuneate, apex acuminate; midrib elevated abaxially, lateral veins 16–21 pairs, nearly parallel, anastomosing near margin. Inflorescences with several male and/or 1 female flowers. Male flowers: pedicel shorter than in female; sepals 5, oblong-elliptic, 3–3.5 × 1–1.5 mm, green; petals spatulate, ca. 2 mm; disk glands 5, distinct, oblong; stamens 5, free. Female flowers: pedicel filamentous, 3–3.5 cm, white; disk annular, thickened, entire; ovary globose, glabrous; styles 3, bifid, lobes recurved. Fruiting pedicel ca. 4 cm, apically dilated; capsule subglobose, ca. 1.5 × 1.3–2 cm in diam. Seeds subglobose, ca. 8 mm in diam., gray-yellow, with reticulate stripes. Fl. Jun–Aug, fr. Aug–Oct.

Forests; 500–800 m. S Yunnan [Vietnam].

**2. *Actephila excelsa*** (Dalzell) Müller Argoviensis, Linnaea 32: 78. 1863.

毛喜光花 mao xi guang hua

*Anomospermum excelsum* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 228. 1851; *Actephila dolichantha* Croizat.

Shrubs, 1–4 m tall; branches angular, pubescent, glabrescent, lenticellate with age. Leaves alternate, rarely subopposite; stipules nearly triangular, ca. 2 mm, puberulent; petiole 6–30 mm, sparsely pubescent; leaf blade oblong-lanceolate, 8–20 × 3–3.5 cm, abaxially paler, pubescent to glabrous, adaxially glabrous, base cuneate to obtuse, apex usually long acuminate; midrib elevated on both surfaces, lateral veins 9–12 pairs, obliquely ascendant, anastomosing near margin. Inflorescences with several male and/or 1 female flowers. Male flowers: pedicel to 2 mm; sepals 5, oblong, ca. 2.5 × 1 mm; petals spatulate, ca. 2 × 1 mm, greenish; disk 5-lobed; stamens 5, ca. 2 mm. Female

flowers: pedicels 4–7 cm, lower part delicate, apically slightly thickened; sepals 5, elliptic or oblong, 2–3 mm, outside and margin puberulent, with minute adaxial basal hyaline appendages; petals 5, obovate or spatulate, ca. 1.5 × 1 mm; disk annular, thickened, entire; pistil 4–6 mm; ovary ovate, glabrous; styles 3, bifid. Fruiting pedicel 4–7.5 cm; persistent sepals to 4 mm; capsule oblate, ca. 1.5 × 2–2.5 cm in diam., exocarp brown, glabrous, endocarp yellowish white. Seeds 3-angled, ca. 10 × 0.9 cm. Fl. Feb–Sep, fr. Jul–Oct.

Sparsely forested slopes, thickets on limestone; 100–1500 m. Guangxi, Yunnan [India, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**3. *Actephila merrilliana*** Chun, Sunyatsenia 3: 26. 1935.

喜光花 xi guang hua

*Actephila inopinata* Croizat.

Shrubs, 1–2 m tall; branchlets sparsely pubescent, glabrescent, lenticellate. Stipules triangular-lanceolate, 1–2 mm, brown, abaxially puberulent; petiole 10–40 mm, puberulent; leaf blade oblong-elliptic or obovate-lanceolate, 7–20 × 2–5.5 cm, thinly leathery, abaxially paler, glabrous, adaxially glossy, base cuneate or broadly so, apex obtuse; midrib elevated on both surfaces, lateral veins 6–10 pairs, delicate, obliquely ascendant, anastomosing near margin. Inflorescences with 1 to few male and/or 1 female flowers. Male flowers: pedicels 1–8 mm; sepals 5, broadly ovate, ca. 3 × 2 mm; petals 5, 5–9 mm in diam., spatulate or linear, smaller than sepals, entire; stamens 5, distinct; pistillode apex 2- or 3-lobed. Female flowers: pedicels 2–4 cm, delicate; sepals 5, obovate or oblong-obovate, 5–6 × 2–5 mm, yellow-green, membranous, with 4–5 longitudinal striations; petals 5, linear or lanceolate, 0.8–1.2 mm, ca. 1.5 cm in diam.; disk annular, thickened, entire; ovary ovate, smooth and glabrous; styles 3, bifid. Fruiting pedicel to 5 cm; sepals persistent; capsules oblate-spherical, ca. 2 cm in diam., exocarp brown, glabrous, crustaceous, endocarp yellow-white. Seeds 3-angled, ca. 10 mm. Fl. Apr–Oct, fr. Jul–Dec.

• Slopes, valleys, scrub; 300–800 m. Guangdong, Hainan.

## 2. LEPTOPUS Decaisne in Jacquemont, Voy. Inde 4(Bot.): 155. 1835–1844.

雀舌木属 que she mu shu

Li Bingtao (李秉滔 Li Ping-tao); Maria Vorontsova

*Andrachne* [unranked] *Arachne* Endlicher; *Arachne* (Endlicher) Pojarkova; *Archileptopus* P. T. Li; *Thelypetalum* Gagnepain.

Herbs to shrubs, monoecious; indumentum of simple hairs, sometimes absent. Leaves alternate, petiolate; stipules small, usually membranous, glabrous or ciliate, persistent; leaf blade simple, membranous to leathery, margin entire, venation pinnate. Inflorescences axillary, 1-flowered or fascicled, male flowers sometimes on short densely bracteate inflorescences. Male flowers: pedicels usually filiform; sepals 5(or 6), free or connate at base, imbricate; petals 5(or 6), usually shorter than sepals, mostly membranous; disk with 5(or 6) contiguous regular segments bilobed for 1/3–4/5 of their length; stamens 5(or 6), opposite sepals; filaments free; anthers introrse or extrorse, longitudinally dehiscent; pistillode composed of 3 free segments or 3-lobed. Female flowers: pedicels apically dilated; sepals larger than male; petals membranous, minute and often hidden under disk lobes; disk annular, regularly divided into 5(or 6) emarginate segments; ovary 3–6-locular; ovules 2 per locule; styles 3–6, apex bifid to base or nearly so, recurved; stigmas apically dilated to capitate. Fruit a capsule, dehiscent into 3(–6) 2-valved cocci when mature, smooth, sometimes with faint reticulate venation. Seeds without caruncle, rounded triquetrous to almost reniform, smooth, rugose or pitted, dull; endosperm fleshy; embryo curved; cotyledons flattened and broad.

Nine species: China, India, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Thailand, Vietnam; SW Asia (Caucasus, Iran); six species (three endemic) in China.

Some authors treated *Leptopus* as part of a more widely circumscribed *Andrachne* Linnaeus, but that view is not accepted here (see Vorontsova et al., Amer. J. Bot. 94: 2026–2040. 2007; Vorontsova & Petra Hoffmann, Kew Bull., in press).

*Andrachne cavaleriei* H. Léveillé (Repert. Spec. Nov. Regni Veg. 12: 187. 1913) is the basionym of *Lysimachia capillipes* Hemsley var. *cavaleriei* (H. Léveillé) Handel-Mazzetti in the Primulaceae (see Fl. China 15: 52. 1996). *Andrachne millietii* H. Léveillé (Bull. Géogr. Bot. 24: 146. 1914) is the basionym of *Lysimachia millietii* (H. Léveillé) Handel-Mazzetti in the Primulaceae (see Fl. China 15: 50. 1996).

“*Arachne* Necker” (Elem. Bot. 2: 348. 1790) was not validly published because the work in which it appeared is among the Opera Utique Opressa.

- 1a. Leaves leathery, almost succulent, petioles 2–4 × 0.8–1 mm ..... 1. *L. pachyphyllus*  
 1b. Leaves membranous to papery, petioles either longer and/or thinner.  
 2a. Ascendant herbs to subshrubs up to 0.5 m tall; leaf base attenuate to cuneate; plants densely hirsute; female pedicels 2–5 mm in flower, 5–9 mm in mature fruit ..... 2. *L. australis*  
 2b. Erect to procumbent shrubs 0.5–4 m tall; leaf base rounded to cuneate; plants glabrous to sparsely hirsute, rarely densely hirsute; female pedicels 5–30 mm in flower, 7–36 mm in mature fruit.  
 3a. Branchlets white or near white; male pedicels less than 2 mm ..... 3. *L. hainanensis*  
 3b. Branchlets light green to brown; male pedicels 3–22 mm.  
 4a. Plants ascendant or procumbent, stem flexuous; female flowers predominantly narrowly cupular, female sepals apically acute to acuminate; branches strongly ribbed ..... 4. *L. clarkei*  
 4b. Plants erect, stem straight; female flowers rotate, female sepals apically rounded to cuspidate, rarely acute; branches terete to moderately ribbed.  
 5a. Petiole less than 1/10 as long as leaf blade; fruit 4–6-locular; male disk lobes divided for 4/5 of their length ..... 5. *L. fangdingianus*  
 5b. Petiole more than 1/10 as long as leaf blade; fruit 3-locular; male disk lobes divided for 1/2–2/3 of their length ..... 6. *L. chinensis*

**1. *Leptopus pachyphyllus*** X. X. Chen, Guihaia 8: 233. 1988.

厚叶雀舌木 hou ye que she mu

*Andrachne pachyphylla* (X. X. Chen) Govaerts.

Erect shrubs, up to 2 m tall, monoecious. Branchlets flattened, reddish. Stipules triangular, base not auriculate, apex acute, almost black; petiole 2–4 × 0.8–1 mm; leaf blade ovate to elliptic or orbicular, (1.7–)2–3.5(–4) × (1.2–)1.5–2.5(–2.7) cm, leathery, almost succulent, both surfaces drying reddish brown, glabrous, base acute to rounded, apex obtuse; secondary veins 4–6 pairs. Inflorescences unisexual, always fasciculate. Male flowers solitary, ca. 5 mm in diam.; pedicel ca. 17 mm; sepals ovate, 3–4 × 2.5–3 mm, apex acute to obtuse, eglandular; petals obovate, apex acute, 0.7–2 × 0.5–0.7 mm; disk bilobed for 1/3 of length. Female flowers solitary, 4–5 mm in diam., widely cupular; pedicel 20–28 mm; sepals ovate to elliptic, 3–5 × 2–2.5 mm, apex obtuse to acuminate, eglandular; petals linear, ca. 1.8 × 0.6 mm, apex acute; disk bilobed for 1/3–1/2 of length; ovary 3-locular, glabrous; styles 3, glabrous. Capsule glabrous.

- Guangxi.

*Leptopus pachyphyllus* is clearly distinct; its thick leathery leaves, almost succulent receptacle, and long female pedicels are unlike any other *Leptopus*. It is only known from two collections.

**2. *Leptopus australis*** (Zollinger & Moritzi) Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 20: 270. 1960.

薄叶雀舌木 bao ye que she mu

*Andrachne australis* Zollinger & Moritzi in Zollinger, Natuur- Geneesk. Arch. Ned.-Indië 2: 17. 1845; *Agyneia tenera* Zollinger & Moritzi ex Miquel; *Andrachne australis* var.

*angustifolia* Müller Argoviensis; *A. calcarea* Ridley; *A. hirta* Ridley; *A. lanceolata* Pierre ex Beille; *A. polypetalata* Kuntze; *A. tenera* Miquel; *Leptopus calcareus* (Ridley) Pojarkova; *L. hirtus* (Ridley) Pojarkova; *L. lanceolatus* (Pierre ex Beille) Pojarkova; *L. philippinensis* Pojarkova; *L. polypetalus* (Kuntze) Pojarkova; ?*L. sanjappae* Sumathi et al.; *Thelypetalum pierrei* Gagnepain.

Ascendant to erect herbs to subshrubs, 0.1–0.5 m tall, monoecious. Branchlets terete to flattened, light green to brown. Stipules triangular to subulate, base not auriculate, apex acute, ferruginous to almost black; petiole 5–20 × 0.5–0.8 mm; leaf blade ovate to lanceolate or obovate, (1.5–)2.5–7(–10) × (0.7–)1.2–2(–3.2) cm, membranous to thinly papery, drying discolorous to concolorous reddish to yellowish or grayish green, abaxially hirsute, adaxially glabrous to hirsute, base long attenuate to acute, sometimes obtuse, apex acute; secondary veins 4–6 pairs. Inflorescences unisexual or bisexual, male inflorescence axis 0–3 mm. Male flowers 1–4(–6) per fascicle, 1.5–2.5 mm in diam.; pedicel 4–8 mm; sepals obovate to oblong, apex rounded, 1–1.6 × 0.6–1 mm, eglandular; petals obovate to linear, apex rounded, 0.6–1.2 × 0.2–0.3 mm; disk bilobed for 4/5–5/6 of length. Female flowers 1–4 per fascicle, 3–6 mm in diam., rotate; pedicel 2–5 mm; sepals ovate to obovate or oblong, 1.5–3 × 1–2 mm, apex acute to cuspidate, eglandular; petals linear to obovate, 0.1–0.5 × 0.1–0.2 mm, apex rounded; disk bilobed for 1/2–3/4 of length; ovary 3-locular, densely hirsute; styles 3, glabrous to basally hirsute. Fruiting pedicel 5–9 mm; sepals accrescent to 2–6 × 1–3.5 mm; capsule smooth to faintly reticulate, hirsute, drying red-brown to orange-brown. Seed transversely to irregularly ridged, orange to brown.

Evergreen forest understories on sand or limestone. Hainan [India (Andaman Islands), Indonesia, Malaysia, Philippines, Thailand, Timor, Vietnam].



The variable and widespread *Leptopus australis* can be immediately distinguished from other species of *Leptopus* by its smaller stature, dense indumentum, short female pedicels, small orange-brown fruit, and often attenuate leaf bases. *Leptopus australis* is the only Chinese species of *Leptopus* with a deeply ridged seed. J. D. Hooker (Icon. Pl. 18: t. 1704. 1887) treated material of this species as *Andrachne fruticosa*.

**3. *Leptopus hainanensis*** (Merrill & Chun) Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 20: 271. 1960.

海南雀舌木 hai nan que she mu

*Andrachne hainanensis* Merrill & Chun, Sunyatsenia 5: 102. 1940; *A. hainanensis* var. *nummulariifolia* Merrill & Chun.

Erect shrubs, 0.5–3 m tall, monoecious (often apparently dioecious). Branchlets terete, white to light brown, much lighter than leaves. Stipules triangular, base not auriculate, apex acute, almost black; petiole 1.5–4 × 0.3–0.4 mm; leaf blade ovate to elliptic, sometimes orbicular or obovate, (0.2–)0.4–1.5(–2) × (0.2–)0.3–0.8(–1.5) cm, thickly papery, drying slightly to strongly discolored gray, dark red or brown, abaxially glabrous to sparsely hirsute, adaxially glabrous, base acute, sometimes obtuse or rounded, apex acute, sometimes rounded; secondary veins not visible or 2 or 3 pairs. Inflorescences unisexual, male inflorescence axis 0–3 mm. Male flowers 1–3 per fascicle, 1.5–2.5 mm in diam.; pedicel 1–2 mm; sepals obovate to oblong, apex rounded, 1.2–2 × 0.7–0.8 mm, eglandular; petals linear to narrowly obovate, 0.8–1.2 × 0.15–0.25 mm, apex acute to rounded; disk bilobed for 1/2–2/3 of length. Female flowers solitary, 3.5–6 mm in diam., rarely 6-merous, rotate; pedicel 7–14 mm; sepals rarely 6, obovate, 2–4 × 1–2 mm, apex obtuse to cuspidate, eglandular; petals linear, 0.2–1 × ca. 0.1 mm, apex acute; disk bilobed for 1/3–1/2 of length; ovary 3(or 4)-locular, hirsute; styles 3(or 4), basally hirsute. Fruiting pedicel 9–14 mm; sepals not accrescent; capsule smooth to faintly reticulate, hirsute, drying red-brown. Seed smooth, orange.

- Riverine forests. Hainan.

*Leptopus hainanensis* is easily distinguishable by its whitish stems, small leaves, and short male pedicels. It is most likely affiliated with *L. chinensis*.

**4. *Leptopus clarkei*** (J. D. Hooker) Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 20: 272. 1960.

缘腺雀舌木 yuan xian que she mu

*Andrachne clarkei* J. D. Hooker, Fl. Brit. India 5: 285. 1887; *A. attenuata* Handel-Mazzetti; *A. attenuata* var. *microcalyx* Handel-Mazzetti; *A. esquirolii* H. Léveillé; *A. esquirolii* var. *microcalyx* (Handel-Mazzetti) Rehder; *A. hypoglauca* H. Léveillé; *A. persicariifolia* H. Léveillé; *Leptopus attenuatus* (Handel-Mazzetti) Pojarkova; *L. esquirolii* (H. Léveillé) P. T. Li; *L. esquirolii* var. *villosus* P. T. Li; *L. kwangsiensis* Pojarkova.

Procumbent to ascending herbs to subshrubs, up to 1.5 m tall, monoecious. Branchlets longitudinally strongly ribbed, white to light green, rarely reddish. Stipules triangular, base not auriculate, apex acute, ferruginous; petiole 1.5–10 × 0.4–0.7 mm; leaf blade ovate to lanceolate, (1.5–)2–6.5(–10) × (0.8–)1–2(–3) cm, papery, sometimes membranous, drying concolorous to slightly discolored light whitish green to yellowish or grayish light green, abaxially glabrous to sparsely hirsute, adaxially

glabrous, base rounded, sometimes obtuse, rarely acute, apex acuminate; secondary veins 3–6 pairs, sometimes not visible. Inflorescences unisexual or bisexual, male inflorescence axis 0–0.1(–3) mm. Male flowers 1–3 per fascicle, 2–4 mm in diam.; pedicel 5–17 mm; sepals obovate to oblong, apex rounded, 1.2–3 × 0.7–1.4 mm, eglandular; petals obovate, apex rounded, 0.8–1.5 × 0.25–1 mm; disk bilobed for 4/5–5/6 of length. Female flowers 1–2 per fascicle, 2.5–6 mm in diam., mostly narrowly cupular; pedicel 10–20 mm; sepals ovate to elliptic, 1.5–5 × 0.7–1.8 mm, apex acute to acuminate, eglandular; petals obovate, 0.2–0.5 × 0.2–0.3 mm, apex rounded; disk bilobed for 3/4 of length; ovary 3-locular, glabrous to sparsely hirsute; styles 3, glabrous. Fruiting pedicel 14–35 mm; sepals not accrescent; capsule smooth to faintly reticulate, glabrous to sparsely hirsute, drying red-brown to brown. Seed smooth, orange to brown.

Mixed forest understories on sand, granite, or limestone; 500–2500 m. Guangxi, Guizhou, Sichuan, Yunnan [India (Assam), Myanmar, Vietnam].

*Leptopus clarkei* is an ascending creeper. Plants of this species have a lax habit, generally with longer thinner sepals and acuminate leaves. Leaf size, sepal size, and indumentum all vary.

The distinction between *Leptopus clarkei* and *L. esquirolii* has caused much confusion, partly due to inaccessibility of type specimens. Type collections of both names are strikingly similar in their habit and long-acuminate, papery leaf blades. Accordingly, *L. clarkei* and *L. esquirolii* are here considered conspecific.

**5. *Leptopus fangdingianus*** (P. T. Li) Vorontsova & Petra Hoffmann, Kew Bull., in press.

方鼎木 fang ding mu

*Archileptopus fangdingianus* P. T. Li, J. S. China Agric. Univ. 12(3): [see Kew Bull. for page number]. 1991.

Erect shrubs, 1–2 m tall, monoecious. Branchlets terete, green-brown. Stipules triangular, base not auriculate, apex acute, ferruginous to almost black; petiole 4–8 × 0.7–0.9 mm; leaf blade elliptic, (3–)6–10(–12) × (2–)2.5–4(–4.5) cm, thickly papery, drying slightly discolored yellowish green, both surfaces glabrous to sparsely hirsute, base acute, apex acute to acuminate; secondary veins 4 or 5 pairs. Inflorescences unisexual, always fasciculate. Male flowers 1 or 2 per fascicle, 2.5–3 mm in diam.; pedicel 4–5 mm; sepals obovate to oblong, 1–1.8 × 0.7–0.9 mm, apex rounded, eglandular; petals obovate to linear, 0.5–0.7 × 0.15–0.3 mm, apex acute to rounded; disk bilobed for ca. 4/5 of length. Female flowers 1 or 2 per fascicle, ca. 4.5 mm in diam., rotate; pedicel 20–25 mm; sepals oblong to elliptic, 2–3.5 × 1–1.5 mm, apex acute, eglandular; petals linear, 0.5–0.8 × ca. 0.1 mm, apex rounded; disk bilobed for 3/4 of length; ovary 4–6-locular, glabrous; styles 4 or 6, glabrous. Fruiting pedicel 17–25 mm; sepals not accrescent; capsule smooth to faintly reticulate, glabrous, drying brown. Seed smooth, brown.

- Evergreen forest understories on limestone. Guangxi.

This narrow endemic was originally described as the unispecific genus *Archileptopus* P. T. Li (loc. cit.), based on its extrorse anthers and 4 or 5 ovary locules, as distinct from the introrse anthers and 3 locules of *Leptopus*. However, the anthers were found to be anatomically identical to those of *Leptopus* species in bud. Increased locule number can be observed in *L. hainanensis* and *L. pachyphyllus* as well as in *Archileptopus*.

Molecular phylogenetic analysis of tribe Poranthereae using ITS and *matK* sequences places *Archileptopus* within *Leptopus* with high bootstrap support (Vorontsova et al., Amer. J. Bot. 94: 2026–2040. 2007). *Archileptopus* is affiliated with *L. clarkei*.

**6. *Leptopus chinensis*** (Bunge) Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 20: 274. 1960.

雀儿舌头 que er she tou

*Andrachne chinensis* Bunge, Enum. Pl. China Bor. 59. 1833; *A. bodinieri* H. Léveillé; *A. capillipes* (Pax) Hutchinson; *A. capillipes* var. *pubescens* Hutchinson; *A. chinensis* var. *pubescens* (Hutchinson) Handel-Mazzetti; *A. colchica* Fischer & C. A. Meyer ex Boissier; *A. cordifolia* Hemsley; *A. hirsuta* Hutchinson; *A. lolonum* Handel-Mazzetti; *A. montana* Hutchinson; *A. nana* (P. T. Li) Govaerts; *A. yunnanensis* (P. T. Li) Govaerts; *Flueggea capillipes* Pax; *Leptopus capillipes* (Pax) Pojarkova; *L. chinensis* var. *hirsutus* (Hutchinson) P. T. Li; *L. chinensis* var. *pubescens* (Hutchinson) S. B. Ho; *L. colchicus* (Fischer & C. A. Meyer ex Boissier) Pojarkova; *L. hirsutus* (Hutchinson) Pojarkova; *L. lolonum* (Handel-Mazzetti) Pojarkova; *L. montanus* (Hutchinson) Pojarkova; *L. namus* P. T. Li; *L. yunnanensis* P. T. Li.

Erect shrubs, 0.5–4 m tall, monoecious (rarely dioecious). Branchlets longitudinally ribbed, sometimes terete, light green to brown. Stipules ovate to triangular, base truncate to cordate or auriculate, apex acute to acuminate, ferruginous to almost black; petiole 0.5–8 × 0.15–0.4 mm; leaf blade ovate to lanceolate, sometimes oblong or orbicular, (0.5–)0.8–3(–5) × (0.3–)0.4–1.5(–2.3) cm, membranous to papery, drying concolorous to discolorous green to yellow-green, brown, gray, or dark red, both surfaces glabrous to densely hirsute, base acute to truncate,

rarely cordate, apex obtuse to acuminate, usually acute, sometimes mucronate; secondary veins 3–6 pairs. Inflorescences unisexual or bisexual, male inflorescence axis 0–0.1(–3) mm. Male flowers 1–4 per fascicle, 2–5 mm in diam.; pedicel 3–12 mm; sepals obovate to oblong, apex rounded, 1.8–3.5 × 0.8–1.8 mm, rarely with 1 or 2 digitate glands at base; petals obovate to spatulate or elliptic, 1–1.8 × 0.3–1 mm, apex rounded to truncate; disk bilobed for 1/3–2/3 of length. Female flowers 1 or 2 per fascicle, 3–6 mm in diam., rotate; pedicel 6–14 mm; sepals ovate to obovate or oblong, 1–3.5 × 0.8–2.5 mm, apex rounded to cuspidate, often with 1 or 2 digitate glands at base; petals obovate, 0.2–0.6 × 0.2–0.3 mm, apex rounded; disk bilobed for 1/3–1/2 of length; ovary 3-locular, glabrous to hirsute; styles 3, glabrous. Fruiting pedicel 7–22 mm; sepals not accrescent; capsule smooth to faintly reticulate, glabrous to hirsute, drying red-brown to brown. Seed smooth, yellow to red-brown.

Stony slopes, open scrub or mixed forest understories on a variety of substrates; sea level to 3000 m. Gansu, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [Myanmar, Pakistan, Russia (N Caucasus); SW Asia (Abkhazia, Georgia, Iran)].

*Leptopus chinensis* encompasses a great variety of flexible phenotypes, several of which have been described as separate species. Leaf size and overall appearance can also vary with plant age. *Leptopus chinensis* is cultivated in many botanic gardens in Europe and North America, usually labeled as *L. colchicus*.

*Leptopus yunnanensis* falls within the polymorphic species *L. chinensis*. The type of *L. yunnanensis* has cordate leaf blade bases, wide acuminate female sepals with digitate glands at the base, and a yellowish drying color. However, these characters vary independently from one another over a wide geographic range, and many plants have intermediate characteristics.

### 3. CLEISTANTHUS J. D. Hooker ex Planchon, Icon. Pl. 8: t. 779. 1848.

闭花木属 bi hua mu shu

Li Bingtao (李秉滔 Li Ping-tao); Stefan Dressler

*Leiopyxis* Miqel; *Paracleisthus* Gagnepain.

Trees or shrubs, monoecious or dioecious; indumentum of simple hairs. Leaves alternate, petiolate; stipules persistent or caducous; leaf blade simple, entire, venation pinnate. Flowers in axillary glomerules or spikes, small, sessile or sometimes shortly pedicellate. Male flowers: sepals 4–6, valvate; petals 4–6, small, scalelike; disk cupular or cushionlike; stamens 5; filaments connate up to half their length, topped with rudimentary ovary; anthers usually ovoid, dorsifixed, extrorse, anther bilocular, longitudinally dehiscent. Female flowers: sepals and petals as in male; disk cup-shaped or conical, surrounding basal ovary, sometimes as long as ovary, tearing into lobes during fruit development, rarely absent; ovary 3(or 4)-celled; ovules 2 in each cell; styles 3, bifid at apex. Fruit a capsule, subglobose, (bi- or) trivalvate when mature, sometimes stipitate (carpopodium), epicarp thin, endocarp bony, inside fibrous; columella and sepals persistent. Seeds (1 or)2 in each cell; cotyledons broad, thinly to thickly fleshy; endosperm copious to submembranous. *x* = 11.

About 141 species: tropical Africa, Asia, and Australia; seven species in China.

1a. Ovary and capsules pubescent or hirsute.

2a. Branchlets and petioles rusty tomentose; leaves pubescent abaxially ..... 1. *C. tomentosus*

2b. Branchlets (except *C. sumatranus* young branchlets puberulent), petioles, and leaves abaxially glabrous.

3a. Leaf blade 3–10(–15) × 2–5(–7) cm, apex caudate-acuminate; lateral veins usually obscure; bract margins glabrous; petal apex entire ..... 2. *C. sumatranus*

3b. Leaf blade 14–30 × 8–15 cm, apex obtuse; lateral veins prominent; bracts ciliate at margin; petal apex crenulate ..... 3. *C. macrophyllus*

1b. Ovary and capsules glabrous.

4a. Female disk as long as or longer than ovary.

5a. Leaf blade apex long acuminate; male pedicels 5–10(–13) mm; female disk apex pubescent ..... 4. *C. pedicellatus*

- 5b. Leaf blade apex shortly acuminate; male flowers sessile; female disk apex glabrous ..... 6. *C. petelotii*  
 4b. Female disk much shorter than ovary, only to base of ovary.  
 6a. Leaf blade apex long acuminate, lateral veins 8–10 pairs; disk margin entire ..... 5. *C. tonkinensis*  
 6b. Leaf blade apex obtuse or retuse, lateral veins 7–9 pairs; disk margin erose or with 5 crenulations ..... 7. *C. concinnus*

**1. *Cleistanthus tomentosus*** Hance, J. Bot. 15: 337. 1877.

锈毛闭花木 xiu mao bi hua mu

*Cleistanthus eburneus* Gagnepain; *C. eburneus* var. *sor-didus* Gagnepain.

Treelets, rusty tomentose or pubescent except adaxial leaf surface, petals, disk, stamens, and styles glabrous. Petiole up to 5(–6) mm; leaf blade elliptic, oblong-elliptic, or lanceolate, 5–14 × (1.5–)2–5 cm, papery to thickly papery, abaxially gray-green, adaxially dark green and glossy when dried, base obtuse to rounded, rarely acute, apex acuminate or caudate-acuminate; lateral veins 8–11 pairs, obliquely ascending, anastomosing near margin. Dense glomerules axillary or inserted on smaller-leaved or leafless branches; peduncles very short (ca. 1 mm) or almost absent; bracts small, ca. 1 × 1 mm, triangular. Male flowers subsessile or pedicels 0–3 mm; sepals 5, oblong-ovate to ovate-lanceolate, ca. 2 mm; petals 5, obovate, ca. 1 mm; disk annular, entire, ca. 1 mm high; stamens 5; filaments ca. 0.6 mm; anthers ovate, ca. 0.5 mm; rudimentary ovary ovoid-trigonal, ca. 0.5 mm. Female flowers: pedicels short but extending to ca. 5 mm in fruit; sepals 5, oblong-ovate to ovate-lanceolate, ca. 8 mm; petals and disk as in male; ovary ovoid; styles 3, apex bifid. Fruiting pedicel to 8 mm; capsule ovoid-trigonal, ca. 9 mm in diam., 3-valved when mature; carpodium up to 8 mm. Seeds obovoid-trigonal, ca. 6 mm. Fl. Mar–Jun, fr. Jun–Sep.

Dry evergreen forests, tropical rain forests; 100–400 m. Guangdong, Hainan [Cambodia, Thailand, Vietnam].

**2. *Cleistanthus sumatranus*** (Miquel) Müller Argoviensis in A. Candolle, Prodr. 15(2): 504. 1866.

闭花木 bi hua mu

*Leiopyxis sumatrana* Miquel, Fl. Ned. Ind., Eerste Bijv. 446. 1861; *Cleistanthus saichikii* Merrill; *Kaluhaburunghos sumatranus* (Miquel) Kuntze; *Paracleisthus subgracilis* Gagnepain.

Evergreen trees up to 18 m tall, to 40 cm d.b.h.; bark red-brown, smooth; plants glabrous except for sparsely pubescent young branches and juvenile fruits and densely hirsute ovary. Stipules ovate-triangular, ca. 0.5 mm, often caducous; petiole 2–7 mm; leaf blade ovate or elliptic, 3–10(–15) × 2–5(–7) cm, papery or stiffly papery, abaxially glaucous or dull, base obtuse to rounded, apex caudate; lateral veins (4 or)5–7(–8) pairs, slightly obscure. Flowers in axillary few-flowered fascicles (up to ca. 7), subtended by normal leaves, or on smaller-leaved or spikelike leafless axes; bracts triangular. Male flowers: sepals 5, ovate-lanceolate, ca. 2 mm; petals 5, obovate, ca. 0.8 mm; disk annular; rudimentary ovary 3-angled. Female flowers: sepals 5, ovate-lanceolate, 2–3 mm; petals 5, obovate, ca. 1 mm; disk cylindrical, nearly as long as ovary; ovary ovoid to globose; styles 3, bifid. Capsules red, ovoid-trigonal, ca. 1 × 1 cm; carpoderms thin, 3-valved when mature. Seeds usually 1, subglobose to ovoid, up to 6 mm. Fl. Mar–Aug, fr. Apr–Oct.

Dense deciduous or evergreen forests; sea level to 500(–700) m.

Guangdong, Guangxi, Hainan, Yunnan [Brunei, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam].

**3. *Cleistanthus macrophyllus*** J. D. Hooker, Fl. Brit. India 5: 278. 1887.

大叶闭花木 da ye bi hua mu

*Kaluhaburunghos macrophyllus* (J. D. Hooker) Kuntze.

Trees ca. 6 m tall; branches stouter; plants glabrous except for hispid bracts and ovary. Stipules caducous; petiole 6–7 mm, stouter; leaf blade ovate, oblong-ovate, or elliptic, 14–30 × 8–15 cm, leathery, abaxially glossy, base obtuse to rounded, lucid abaxially, margin slightly revolute, apex obtuse, mucronulate; lateral veins 7 or 8 pairs, elevated above, reticulate veins prominent. Glomerules axillary. Male flowers: sepals 5, lanceolate; petals 5, obovate, margin crenulate; disk annular, smooth, entire. Female flowers: bracts small, margin ciliate; pedicels very short or almost sessile; sepals 5, broadly ovate, ca. 5 × 3.5 mm, leathery dried; petals obovate, smaller than sepals, margin crenulate; disk cylindrical, margin 5-crenulate, as high as or higher than ovary; ovary ovoid, hispid, 3-celled; styles 3, bifid, recurved, flabellate. Fruiting pedicel 1–8 mm; capsules ovoid-trigonal, 1.5–2 cm in diam.; carpoderms thickened, brown; carpodium long. Fl. Apr–Jun, fr. Jun–Aug.

Open forests; 400–700 m. SE Yunnan (Hekou, Jinping) [Indonesia, Malaysia (peninsular), Singapore, Thailand].

**4. *Cleistanthus pedicellatus*** J. D. Hooker, Fl. Brit. India 5: 281. 1887.

米咀闭花木 mi ju bi hua mu

*Cleistanthus integer* C. B. Robinson; *C. monocarpus* R. I. Milne; *C. quadrifidus* C. B. Robinson; *Kaluhaburunghos pedicellatus* (J. D. Hooker) Kuntze.

Treelets or trees, up to ca. 16 m tall; bark gray; plants glabrous except for puberulent pedicel, disk of male flowers, ovary, and young fruits. Stipules triangular, shorter than petiole; petiole 3–7 mm; leaf blade elliptic-ovate or elliptic, 4–11(–14.5) × 2–5(–6.5) cm, leathery, base obtuse to rounded, apex long acuminate; lateral veins 4–8 pairs, reticulate venation prominent. Glomerules axillary, sometimes on smaller-leaved or leafless shoots; peduncles short; flowers monoecious, distinctly pedicelled; pedicels 5–10(–13) mm. Male flowers ca. 7 mm in diam.; pedicel more slender than female ones; receptacle flattened; sepals 5, lanceolate; petals 5, ovate, lanceolate, or spatulate, emarginate and crenulate; disk annular; staminal column 1–1.5 mm; free filaments ca. 1 mm; anthers ellipsoid to ovoid, up to 1 mm; rudimentary ovary longer. Female flowers: receptacle cup-shaped; sepals 5, narrowly triangular; petals 5, obovate, shorter than sepals; disk urceolate, membranous, puberulent, covering base of ovary; ovary globose; styles 3, bifid. Fruiting pedicel 12–15 mm; capsule globose-trigonal, 3-celled, 3-valved when mature, 5–8 × 7–10 mm in diam.; carpoderms reticulate when young, later smooth. Seeds semiglobose, up to 4.5 mm. Fl. Apr–May, fr. Jun–Aug.

Primary lowland forests; below 300 m. Guangxi (Longgang) [Indonesia, Malaysia, New Guinea, Philippines].

**5. *Cleistanthus tonkinensis*** Jablonsky in Engler, Pflanz. 65(IV. 147. VIII): 16. 1915.

馒头果 man tou guo

*Paracleisthus tonkinensis* (Jablonsky) Gagnepain.

Shrubs or treelets usually ca. 3 m tall; branchlets green, lenticellate; plants glabrous except for puberulent young inflorescences, bracts, and male sepals. Stipules linear-oblong [not seen] or ovate-triangular, (1.5–)2–3 mm; petiole 4–8 mm; leaf blade ovate or elliptic, 5–13 × 2–5 cm, leathery, adaxially glossy, base obtuse or rounded, sometimes slightly cordate, apex long acuminate; lateral veins 8–10 pairs. Inflorescences axillary glomerulate spikes, 1.5–4 cm; bracts ovate-triangular, margin membranous and ciliate, abaxially pubescent; buds acuminate. Male flowers: sepals 5, lanceolate, ca. 3 mm, puberulent to glabrous; petals 5, spatulate, ca. 1 mm, margin denticulate and emarginate; disk cup-shaped; stamens 5; filaments connate into a cylinder and surrounding rudimentary ovary; anthers oblong, ca. 1 mm; rudimentary ovary trigonous-ovoid, ca. 0.7 mm, papillose. Female flowers: pedicels to 1 mm or almost absent; sepals 5, ovate-triangular, ca. 3 mm; petals 5, rhomboid or obliquely quadrate, ca. 2 × 2 mm; disk annular, surrounding base of ovary; ovary globose; styles 3, bifid. Fruiting pedicel very short to almost absent; capsules trigonous, purplish red, ca. 1 cm, 3-valved when mature. Seeds ovoid, ca. 7 mm. Fl. Apr–Jun, fr. Jun–Aug.

Forested slopes; 100–800 m. S Guangdong, SE Guangxi, S Yunnan [Vietnam].

**6. *Cleistanthus petelotii*** Merrill ex Croizat, J. Arnold Arbor. 23: 40. 1942.

假肥牛树 jia fei niu shu

Trees 7–18 m tall, glabrous throughout. Petiole 5–8 mm, transversely striate when dry; leaf blade ovate, elliptic, or oblong, 8–19 × 3–8 cm, leathery, base obtuse or rounded, margin revolute, apex shortly acuminate; lateral veins 6 or 7 pairs, curved-ascending, anastomosing near margin, reticulate veins prominent. Flowers ca. 5 × 4.5 mm in diam., several grouped into axillary glomerules. Sepals 5, ovate-triangular, ca. 3 × 1 mm. Petals 5, obovate, ca. 0.5 mm. Stamens 5, ca. 2 mm; filaments connate below middle into a cylinder surrounding rudimentary ovary; anthers ovate-triangular, ca. 0.6 mm, connective

triangular; disk scales obovate, ca. 1 mm. Rudimentary ovary with trifid apex. Female flowers: sepals and petals as in male; disk urceolate or cylindrical, ca. 2 mm high, surrounding ovary, apex with minute ligules; ovary globose, smooth; styles 3. Capsules subglobose, 11–15 × ca. 15 mm, epicarps reticulate-rugose; carpodium 3–5 mm. Seeds ovate. Fl. Apr–Jun, fr. May–Nov.

Limestone forests; 200–400 m. W Guangxi [N Vietnam].

**7. *Cleistanthus concinnus*** Croizat, J. Arnold Arbor. 23: 41. 1942.

东方闭花木 dong fang bi hua mu

*Cleistanthus dongfangensis* (P. T. Li) H. S. Kiu; *Phyllanthus dongfangensis* P. T. Li.

Erect shrubs up to 4 m tall; stem and branches terete; branchlets pubescent when young, glabrous at maturity. Stipules angular or subulate, 1–3 mm inserted at bilateral base of petiole, brown; petiole 1–4 mm, pubescent to glabrous; leaf blade papery, elliptic or ovate, 1–7 × 0.5–3 cm, base acute, rounded, obtuse, or slightly cordate, apex acute, obtuse, or retuse, rarely shortly acuminate, glabrous on both surfaces, dark green adaxially, greenish abaxially; lateral veins 7–9 pairs, obliquely ascending, anastomosing near margin, slightly elevated on both surfaces. Flowers androgynous, often grouped into glomerules; inflorescences axillary or inserted at middle or lower part of aphyllous branchlets, 5–7-flowered; bracts small, broadly ovate, lanate inside. Male flowers: calyx ca. 4 mm, red, glabrous; sepals 5, oblong, acute, valvate; petals 5, small, rhombic, ca. 0.4 mm, membranous, glabrous; disk annular, with 5 crenulations; stamens 5, ca. 3 mm; filaments connate; anthers ca. 2 mm, 2-celled, longitudinally dehiscent. Female flowers: calyx ca. 3 mm, glabrous; sepals 5, triangular, acute; petals 5, spatulate, ca. 1 mm, glabrous; disk cup-shaped, ca. 1 mm, erose at apex; ovary ovoid, ca. 1 mm, glabrous; styles 3, ca. 1 mm, free or connate at base, shallowly bifid. Capsules sessile, oblate-spherical, 7–8 mm in diam., gray-brown, septicidal and loculicidal, reticulate-elevated outside when mature, endocarp yellowish. Seeds subangular, ca. 3 mm. Fl. Jan–Mar, fr. Apr–Jun.

Open forests or scrub on sandy or clayey soils; 200–500 m. Hainan (Changjiang, Dongfang, Ledong) [Vietnam].

“*Cleistanthus anomalus* Merrill & Metcalf” (Croizat, J. Arnold Arbor. 23: 39. 1942) lacks a validating description but seems to belong here.

#### 4. **BRIDELIA** Willdenow, Sp. Pl. 4: 978. 1806 [*Briedelia*], nom. cons.

土蜜树属 tu mi shu shu

Li Bingtao (李秉滔 Li Ping-tao); Stefan Dressler

*Gentilia* Beille.

Trees, shrubs, rarely woody lianas. Leaves simple, alternate, entire, pinnately veined, petiolate, stipulate. Flowers small, unisexual, monoecious, few to many flowers grouped into axile glomerules, pedicellate or sessile. Sepals 5, valvate. Petals 5, scale-shaped. Male flowers: stamens 5; filaments connate at base, forming staminal column, apical free and extended filaments surrounding rudimentary ovary; anthers dorsifixed, introrse, 2-loculed, parallel, longitudinally dehiscent; rudimentary ovary terete or obovate, sometimes conical, 2–4-fid at apex; disk cup-shaped or discoid. Female flowers: disk pulvinate or saucer-shaped lining flower with a conical or urceolate part, surrounding ovary, tearing as ovary expands; ovary 2-loculed; ovules 2 in each cell; styles 2, free or connate

at base, bifid or entire at apex. Drupes or rarely capsules with fleshy epicarp, 1- or 2-celled (putamens). Seeds 1 or 2, with longitudinal groove; embryo curved; endosperm copious; cotyledons thin, large.  $x = 13$ .

About 60 species: tropical Africa, Asia, and Australia; seven species in China.

- 1a. Leaves brochidodromous (without a distinct fimbrial vein, secondary veins arching near margin); drupes 1-locular; seeds ellipsoid with longitudinal groove (*B. subg. Gentilia* (Beille) Jablonsky).
- 2a. Flowers pedicelled, many (up to 50); branchlets, abaxial surface of leaves, and petioles usually pubescent; leaves membranous or papery, stipules more than 3.5 mm ..... 6. *B. glauca*
- 2b. Flowers (sub)sessile, fewer (up to 12); branchlets, leaves, and petioles glabrous; leaves stiffly papery or nearly leathery, margin often slightly revolute, stipules less than 3.5 mm ..... 7. *B. balansae*
- 1b. Leaves craspedodromous (with a distinct fimbrial vein with secondary veins joining it); drupes 2-locular; seeds plano-convex (*B. subg. Bridelia*).
- 3a. Woody lianas or scandent shrubs; calyx usually more than 6 mm in diam. .... 1. *B. stipularis*
- 3b. Shrubs or trees; calyx usually less than 6 mm in diam.
- 4a. Lateral veins in more than 15 pairs; inflorescence usually terminal, spikelike without normal leaves ..... 2. *B. retusa*
- 4b. Lateral veins in less than 15 pairs; inflorescence axillary, subtended by normal leaves.
- 5a. Lateral veins usually 5–8 pairs; small sparingly branched shrubs; leaves broadly elliptic or slightly obovate, small, drying blackish ..... 3. *B. parvifolia*
- 5b. Lateral veins usually more than 8 pairs; erect shrubs or treelets; leaves lanceolate-elliptic, sometimes broadly elliptic, drying brownish and conspicuously bicolored with a lighter glaucous abaxial surface.
- 6a. Calyx usually less than 4 mm in diam., greenish; leaf blade thinly papery; young branches often “whip-like” drooping ..... 4. *B. tomentosa*
- 6b. Calyx usually more than 4 mm in diam., reddish; leaf blade stiffly papery ..... 5. *B. affinis*

### 1. *Bridelia stipularis* (Linnaeus) Blume, Bijdr. 597. 1826.

土蜜藤 tu mi teng

*Clutia stipularis* Linnaeus, Mant. Pl. 1: 127. 1767; *Bridelia scandens* (Roxburgh) Willdenow; *Clutia scandens* Roxburgh.

Woody climbers or scandent shrubs, branches up to 15(–20) m, rarely small trees; branchlets usually markedly softly rufous tomentose or fulvous pubescent except for glabrous older branches, petals, ovary, and drupes. Stipules ovate-triangular, 3–9 × 2–4 mm, apex long acuminate, usually caducous; petiole 6–13 mm; leaf blade elliptic, obovate, or rotund, 4–17 × 2–11 cm, subleathery, base obtuse to rounded, apex acute or obtuse, rarely retuse; lateral veins 10–14 pairs. Inflorescences axillary, usually 2–6-flowered, sometimes grouped into many-flowered spikes or on terminal small-leaved branches. Male flowers 0.6–1 cm in diam.; pedicels very short, up to 1 mm; receptacle cup-shaped; sepals ovate-triangular, ca. 4 × 2.5 mm; petals spatulate, ca. 2 mm, 3–5-dentate; disk shallowly cup-shaped, 5–6 mm in diam.; staminal column ca. 2 mm; free filaments ca. 1.5 mm; anthers ovoid, ca. 1 × 0.5 mm; rudimentary ovary terete, apex bipartite. Female flowers up to 12 mm in diam.; pedicels short and stout; receptacle nearly funnel-shaped; sepals ovate-triangular, ca. 4 × 2–3 mm; petals rhombic-spatulate, entire or shallowly bifid at apex; disk urceolate to lacerate when ovary expands, ca. 1.5 mm, hairy inside; ovary ovoid, 2–3 mm; styles 2, apex bifid, lobes linear. Drupes ovoid, 0.7–1.3 × 0.6–1.1 cm, bilocular. Seeds semiovoid, 6–8 × 3–6 mm, yellow to brown, smooth, adaxial surface flattened or slightly concave, abaxial surface slightly convex. Fl. and fr. almost throughout year.

Primary or secondary forests or riverside scrub; 100–1500 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bhutan, Brunei, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Singapore, Sri Lanka, Thailand, Timor, Vietnam].

The roots are used as medicine for reducing inflammation and as an

astringent antidiarrheal; the fruits are used to induce vomiting and as an antitoxic.

### 2. *Bridelia retusa* (Linnaeus) A. Jussieu, Euphorb. Gen. 109. 1824.

大叶土蜜树 da ye tu mi shu

*Clutia retusa* Linnaeus, Sp. Pl. 2: 1042. 1753; *Bridelia cambodiana* Gagnepain; *B. fordii* Hemsley; *B. pierrei* Gagnepain; *B. spinosa* (Roxburgh) Willdenow; *Clutia spinosa* Roxburgh.

Trees up to 15 m tall, to 35 cm d.b.h.; branches fulvous pubescent, later glabrous except for pubescent to pilose abaxial leaf surface, bracts on both surfaces, pedicels and sepals exterior, sometimes with spines. Stipules ovate-triangular, ca. 2 mm, caducous, but linear stipular traces persistent at lateral base of petiole; petiole 0.7–1.2 cm, slightly stout; leaf blade obovate, sometimes elliptic, 8–25 × 4–13 cm, papery or thinly leathery, base obtuse, rounded, or shallowly cordate, apex rounded or truncate, rarely acute, sometimes with short acumen; lateral veins (13–)16–23 pairs, subparallel, reticulate veins prominent, subparallel, anastomosing lateral veins. Inflorescences many flowered, grouped into axillary spikes or 3–9-spiked and grouped into panicles at apex of branchlets, 10–20 cm; bracts ovate-triangular, 1.5–3 mm. Male flowers small, 4–6 mm in diam., yellow-green to reddish brown; pedicels ca. 1 mm; sepals ovate-triangular, ca. 2 × 1 mm; petals obovate to spatulate, 0.8–1.6 mm, 3–5-toothed; disk cup-shaped, up to 1.5 mm in diam.; staminal column ca. 1.2 mm; free filaments ca. 1 mm; anthers broadly ovoid; rudimentary ovary terete, apex undivided. Female flowers: sepals as in male but slightly larger; petals spatulate, ca. 1 mm at apex; disk pulvinate and urceolate, enclosing and as long as ovary; ovary globose to ovoid, up to 2 mm tall; styles 2, bifid. Drupes ovoid or depressed globose, 7–8 × 5–9 mm, black, 2-celled. Seeds semiglobose with an adaxial

groove, ca. 5 mm in diam., reddish brown, smooth. Fl. Apr–Sep, fr. Aug–Jan.

Deciduous to evergreen primary or secondary forests; 100–1400 m. Guangdong, Guangxi, Guizhou, Hainan, Hunan, Yunnan [Bhutan, Cambodia, India, Indonesia (Sumatra), Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

The durable wood is used in various ways; the bark contains up to 40% tannin.

### 3. *Bridelia parvifolia* Kuntze, Revis. Gen. Pl. 594. 1891.

圆叶土蜜树 *yuan ye tu mi shu*

*Bridelia poilanei* Gagnepain.

Small shrubs, 1–2(–3) m tall; branches lenticellate, glabrous throughout, shortly and sparingly branched, with some spines. Stipules lanceolate or oblong, ca. 2.5 mm, early caducous; petiole 2–5 mm; leaf blade usually broadly elliptic, sometimes rotund, 2–6 × 1.5–4 cm, leathery, glabrous, base shallowly cordate or rounded, apex rounded; lateral veins 5–8 pairs. Flowers axillary, solitary or fascicled; bracts triangular, 1–1.5 mm. Male flowers 2–5 mm in diam.; pedicels very short to absent; sepals triangular, ca. 2 × 1–1.5 mm; petals spatulate, apex rounded or lobulate; staminal column ca. 1 mm; anthers rotund or ovate; disk cup-shaped, surrounding staminal column and rudimentary ovary, 1.6–2 mm in diam. Female flowers: sepals triangular, 2–2.5 × 1.5–2 mm; petals rhomboid to spatulate, 0.8–1.2 × 0.6–1 mm, entire at apex; disk annular, ca. 0.5 mm high; ovary (semi)globose; styles 2, bifid. Drupes globose, 5–6 mm in diam., blackish, 2-celled. Seeds semiglobose with deep adaxial furrow, ca. 4.5 mm in diam., brown, pusticulate. Fl. May–Nov, fr. Sep–Dec.

Dune thickets, sandy soil. Hainan [Vietnam].

### 4. *Bridelia tomentosa* Blume, Bijdr. 597. 1826.

土蜜树 *tu mi shu*

*Bridelia tomentosa* var. *chinensis* Müller Argoviensis.

Erect shrubs or treelets, usually 2–5(–12) m tall, monoecious or dioecious; branches slender and elongate, “whip-like,” often overhanging, pubescent when young, glabrescent, older branches with some spines. Stipules ovate to linear-lanceolate, 2–7 mm, usually caducous, pubescent; petiole 3–5.5 mm, pubescent; leaf blade elliptic, lanceolate-elliptic, or obovate-elliptic, 3–9(–14) × 1.5–5(–6) cm, (thinly) papery, abaxially light greenish and usually pubescent, adaxially scabrous, base obtuse, rarely broadly cuneate or rounded, apex acute to obtuse; lateral veins 7–12(–15) pairs. Flowers axillary, yellow-green, up to 10(–20)-fascicled, sessile. Male flowers: sepals triangular, 0.8–1.2 × 0.5–1 mm; petals spatulate or obovate, entire or 3–5-toothed, ca. 1 × 0.8 mm; disk shallowly cup-shaped, 1–1.2 mm in diam.; staminal column ca. 0.7 mm; free filaments ca. 0.5 mm; rudimentary ovary conical. Female flowers usually 3–5-fascicled, subsessile; sepals triangular, 1–1.5 × 0.8–1.2 mm, glabrous to pubescent outside; petals as in male, shorter than sepals; disk pulvinate and urceolate, enclosing ovary for ca. 0.6 mm; ovary globose to ovoid, ca. 1 mm in diam.; styles 2, bipartite, lobes linear. Drupes subglobose, 4–7 × ca. 5 mm, 2-celled. Seeds semiovoid, 3–4 × 2–3 mm, brown-red, rugulate,

adaxial surface compressed with longitudinal groove, abaxial surface slightly elevated with longitudinal stripes. Fl. and fr. almost throughout year.

Deciduous to evergreen primary or secondary forests or thickets; near sea level to 1000(–1500) m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, Bhutan, Cambodia, E India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Singapore, Thailand, Vietnam; N Australia].

Since indumentum density varies widely, no varieties should be recognized based on this character (see Forster, *Austrobaileya* 5: 416. 1999). Merrill identified *Clusia monoica* Loureiro as this species and published the combination *Bridelia monoica* (Loureiro) Merrill, but Loureiro’s plant is not this species. The name “*Bridelia chinensis* Müller Argoviensis” also belongs here but was never validly published.

The leaves are used as medicine for traumatic injury; the roots are used to treat epidemic influenza and neurasthenia. The bark yields up to 8% tannin.

### 5. *Bridelia affinis* Craib, Bull. Misc. Inform. Kew 1911: 456. 1911.

硬叶土蜜树 *ying ye tu mi shu*

*Bridelia colorata* Airy Shaw; *B. henryana* Jablonsky.

Shrubs or small trees up to 5 m tall; young branches rufous puberulent. Stipules narrowly triangular, 4–5 × ca. 1 mm; petiole 4–6 mm, puberulent; leaf blade elliptic or rarely obovate, 4–9(–15) × 2–4.5(–6) cm, papery, abaxially puberulent to pubescent, adaxially glabrous, base obtuse to acute, apex acute to obtuse; lateral veins 9–11(–15) pairs. Flowers axillary, up to 10-fascicled, (sub)sessile. Calyx conspicuously reddish; bracts small, triangular. Male flowers 4–6 mm in diam.; sepals triangular, 1.5–3 × 1–1.5 mm, pilose; petals irregularly rounded, base spatulate, apex lobulate, ca. 1 mm in diam.; staminal column ca. 1 mm; anthers ellipsoid, ca. 0.6 × 0.3 mm; rudimentary ovary cylindrical; disk cup-shaped, ca. 3 mm in diam. Female flowers: sepals and petals as in male; disk urceolate, enclosing ovary for ca. 1 mm; ovary ovoid, ca. 1.3 × 1 mm, 2-celled, tapering into 2 styles. Drupes depressed globose, apically bilobed, 5–7 mm tall, 2-celled.

Montane forest and thickets; [300–]1000–1500 m. Yunnan [Thailand].

This species is sometimes misidentified in Chinese herbaria as “*Bridelia yunnanensis* Pax & K. Hoffmann,” a name that was never validly published. W. Y. Chun and C. C. Chang (Fl. Hainanica 2: 143. 1965) recorded this species (as *B. henryana*) for Hainan but it has not been possible to confirm this record. Records of *B. montana* (Roxburgh) Willdenow in Chinese literature (e.g., Fl. Yunnan. 10: 74. 2006; Higher Pl. China 8: 22. 2001) are possibly based on material of this species.

### 6. *Bridelia glauca* Blume, Bijdr. 597. 1826.

膜叶土蜜树 *mo ye tu mi shu*

*Bridelia pubescens* Kurz.

Trees up to 15 m tall, glabrous except for rufous pubescent branchlets, stipules, abaxial leaf surface, pedicels, and sepals. Stipules linear-lanceolate to triangular, 4–6(–10) mm; petiole 4–10 mm; leaf blade elliptic-ovate, oblong, or obovate, 5–15 × 2.5–7.5 cm, membranous or thickly papery, base acute, obtuse, or often truncate, apex acute to acuminate; lateral veins

7–12(–18) pairs. Flowers monoecious, many-flowered fascicles with up to 50 flowers, axillary; bracts very small; pedicel distinct 1.5–5 mm. Male flowers white, 3.5–5 mm in diam., sepals lanceolate to triangular, up to 2 mm; petals obovate, lanceolate, or spatulate, ca. 0.8 mm, margin 3–5-toothed; disk pulvinate or saucer-shaped, to 2 mm in diam.; staminal column ca. 1 mm; filaments free for ca. 1 mm; anthers ovoid, 0.5–0.6 × 0.3–0.4 mm; rudimentary ovary conical. Female flowers: sepals triangular, up to 2.3 mm; petals obovate, shorter than sepals; disk urceolate enclosing ovary for ca. 0.5 mm, apex lacinate; ovary globose to ovoid; styles 2, ca. 1.2 mm, connate at base, bifid. Drupes ellipsoidal, 6–11 mm, base with persistent sepals, apex with mucro, 1-celled, stalk usually slender. Seeds ellipsoid with shallow lateral groove, 4–7 × 3–4.5 mm, light brown, rugulate. Fl. Mar–Sep, fr. Sep–Dec.

Sparsely forested slopes; 500–1600 m. Guangdong, Guangxi, Taiwan, Yunnan [India, Indonesia, Laos, Malaysia, Myanmar, New Guinea, Philippines, Thailand].

**7. *Bridelia balansae*** Tutcher, J. Linn. Soc., Bot. 37: 66. 1905.

禾串树 he chuan shu

Trees up to 17 m tall, ca. 30 cm in d.b.h., monoecious; bark fulvous, nearly smooth; branchlets glabrous with elevated lenticels. Stipules linear-lanceolate, 2–3 mm, yellowish or brownish puberulent; petiole 3–8 mm; leaf blade elliptic or elliptic-lanceolate, 5–15 × 1.5–5.5 cm, leathery or nearly so, abaxially glabrous or only puberulent, adaxially glossy when dried, base cuneate, rarely obtuse, margin slightly revolute, apex acute, acuminate, or caudate-acuminate; lateral veins (5–)8–11(or 12) pairs. Glomerules axillary, up to 12-flowered, glabrous except for yellowish pubescent sepals and petals. Male flowers 3–4 mm in diam.; pedicel up to 2 mm; sepals triangular, 1.5–2 × 1.2–2 mm; petals elliptic to spatulate, 0.3–0.5 mm; disk shallowly

cup-shaped, 2–3 mm in diam.; staminal column ca. 1 mm; free filaments ca. 1 mm; anthers ovoid, 0.6–0.8 × 0.4–0.5 mm; rudimentary ovary ovoid-conical. Female flowers 4–5 mm in diam.; pedicels ca. 1 mm; sepals as in male; petals rhomboid-rounded, ca. 1 mm; disk urceolate ca. 1 mm enclosing ovary, lacerate when ovary expands; ovary globose to ovoid; styles 2, free, ca. 1.5 mm, bifid, lobes linear. Fruiting pedicel very stout, up to 3 mm; drupes oblong-ovoid, 8–12 × 5–8 mm, purple-black when mature, 1-celled. Seeds ellipsoid with deep lateral groove, 6–8 × 4–5 mm, brownish, smooth. Fl. May–Aug, fr. Sep–Nov.

Montane dense or sparse forests; 200–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Japan (Ryukyu Islands), Laos, Vietnam].

*Bridelia balansae* has often been misidentified in Chinese floras as *B. insulana* Hance, which occurs from S Myanmar and S Thailand southward.

Collections from Yunnan tend to have wider and more chartaceous leaves and often more flowers per glomerule. Thus they intergrade morphologically with *Bridelia glauca*, which has many conspicuously pedicelled flowers and a more truncate leaf base, but is rarely collected in China.

The name “*Bridelia pachinensis* Hayata” belongs here but was never validly published.

Zhang and Qiu (Guihaia 19(3): 195. 1999) reported first records of *Bridelia harmandii* Gagnepain from China (Hainan). The second author (Dressler) has seen one of their cited vouchers (*S. K. Lau 4920*, A!, E!) which is *B. tomentosa*. Nevertheless, the species might occur in China given that it grows in nearby Indochina and Thailand. It resembles a small-leaved *B. stipularis* but differs by the much smaller flowers and being a small decumbent shrub; it also resembles a broad-leaved *B. tomentosa* but has stiffer, more leathery leaves, a strong indumentum in most parts, persistent subulate stipules, and fewer flowers per glomerule (see Dressler, Blumea 41: 281. 1996).

**5. FLUEGGEA** Willdenow, Sp. Pl. 4: 637, 757. 1805.

白饭树属 bai fan shu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Geblera* Fischer & C. A. Meyer.

Erect shrubs or small trees, dioecious, rarely monoecious; branchlets sometimes spine-tipped, indumentum of simple hairs, often absent. Leaves alternate, often distichous; petiole short; leaf blade simple, margin entire or serrulate, venation pinnate. Inflorescences axillary, 1-flowered, fascicled, or cymose; bracts obscure. Male flowers: pedicels long and slender; sepals 4–7, imbricate, margins entire or serrulate; petals absent; disk of 4–7 segments, these sometimes connivent or fused; stamens 4–7, inserted at base of disk, longer than sepals; filaments free; anthers 2-locular, erect, extrorse, longitudinally dehiscent; pistillode small, 2- or 3-lobed. Female flowers: pedicels terete or angular; sepals as in male; disk saucer-shaped or patelliform, sometimes thickened, entire or lobed; ovary (2 or 3)(or 4)-locular; ovules 2 per locule; styles free, spreading, apex bifid or entire. Fruit a capsule, globose or trigonous, dehiscent into 3 cocci or indehiscent and ± berrylike; columella and sepals persistent; locules usually 2-seeded. Seeds usually 3-angled; testa thin, crustaceous, smooth to reticulate or verruculose, sometimes adaxially invaginated at hilum; endosperm copious; embryo straight to distinctly curved, lacking chlorophyll; cotyledons broader and much longer than radical.

About 13 species: widespread in tropical to warm temperate regions; four species (one endemic) in China.

1a. Plants without spine-tipped branchlets.

2a. Leaf blade margins entire or sometimes irregularly serrate or undulate-toothed, abaxially greenish; fruit a

3-angled reddish brown capsule ..... 1. *F. suffruticosa*

2b. Leaf blade margins entire, abaxially whitish green; fruit a subglobose white berry ..... 2. *F. virosa*

1b. Plants with spine-tipped branchlets.

- 3a. Branches angular; young stems, branchlets, leaves, pedicels, ovary, and capsules pubescent or puberulent; leaf blade 3–7 × 2–5 mm; flowers solitary or clustered; male sepals, stamens, and disk glands 6 ..... 3. *F. acicularis*  
 3b. Branches terete; plant glabrous throughout; leaf blade 13–25 × 10–15 mm; flowers in cymes; male sepals, stamens, and disk glands 5 ..... 4. *F. leucopyrus*

**1. *Flueggea suffruticosa*** (Pallas) Baillon, Étude Euphorb. 502. 1858.

一叶萩 yi ye qiu

*Pharnaceum suffruticosum* Pallas, Reise Russ. Reich. 3(2): 716. 1776; *Acidoton fluggeoides* (Müller Argoviensis) Kuntze; *A. ramiflorus* (Persoon) Kuntze; *Flueggea fluggeoides* (Müller Argoviensis) Webster; *F. ussuriensis* Pojarkova; *Geblera chinensis* Ruprecht; *G. suffruticosa* (Pallas) Fischer & C. A. Meyer; *G. sungariensis* Ruprecht; *Phyllanthus argyi* H. Léveillé; *P. fluggeoides* Müller Argoviensis; *P. ramiflorus* (Aiton) Persoon; *Securinega fluggeoides* (Müller Argoviensis) Müller Argoviensis; *S. japonica* Miquel; *S. microcarpa* B. C. Ding & Y. Wang; *S. ramiflora* (Aiton) Müller Argoviensis; *S. suffruticosa* (Pallas) Rehder; *S. suffruticosa* f. *japonica* Hurusawa; *S. suffruticosa* var. *japonica* (Miquel) Hurusawa; *S. suffruticosa* var. *umamiensis* Hurusawa; *Xylophylla ramiflora* Aiton.

Shrubs 1–3 m tall, densely branched, glabrous; branchlets ± distinctly angular when young, greenish, smooth, later subterete, yellow-brownish, not conspicuously lenticellate; ultimate branchlets not spine-tipped. Stipules ovate-lanceolate, ca. 1 mm, persistent; petiole 2–8 mm; leaf blade elliptic or oblong-elliptic, rarely obovate, 1.5–8 × 1–3 cm, papery, base obtuse to cuneate, margin entire or sometimes irregularly serrate or undulate-toothed, apex acute to obtuse, greenish abaxially; lateral veins 5–8 pairs, raised on both surfaces, reticulate veins slightly prominent. Plants dioecious. Inflorescences axillary, cymose. Male flowers 3–18-clustered; pedicels 2.5–5.5 mm; sepals usually 5, elliptic, ovate, or rotund, 1–1.5 × 0.5–1.5 mm, margins entire or obscurely serrulate; disk glands 5; stamens 5; filaments 1–2.2 mm; anthers ovate, 0.5–1 mm; rudimentary ovary terete, 0.6–4 mm high, apex 2- or 3-lobed. Female flowers: pedicels 2–15 mm; sepals 5, elliptic to ovate, 1–1.5 mm, subentire, 1-veined and carinate on back; disk patelliform, entire or subentire; ovary ovoid, (2 or)3-locular; styles 1–1.8 mm, free or connate at base, erect or recurved. Fruiting pedicels 2–15 mm; sepals persistent; capsule triquetrous-oblate, 2–5 mm in diam., reddish brown when ripe, prominently reticulate veined, 3-lobed. Seeds plano-convex, ca. 3 mm, minutely granular-verruculose. Fl. Mar–Aug, fr. Jun–Nov.

Scrubby slopes, forest margins; 500–2500 m. Throughout China except Gansu, Qinghai, Xinjiang, Xizang [Japan, Korea, Mongolia, Russia].

The leaves and flowers of *Flueggea suffruticosa* are used as medicine for the treatment of infantile paralysis, neurasthenia, and facial paralysis.

**2. *Flueggea virosa*** (Roxburgh ex Willdenow) Voigt, Hort. Suburb. Calcutt. 152. 1845.

白饭树 bai fan shu

*Phyllanthus virosus* Roxburgh ex Willdenow, Sp. Pl. 4: 578. 1805; *Acidoton obovatus* (Willdenow) Kuntze; *A. virosus*

(Roxburgh ex Willdenow) Kuntze; *Cicca obovata* (Willdenow) Kurz; *Flueggea microcarpa* Blume; *F. monticola* Webster; *F. obovata* (Willdenow) Baillon; *F. sinensis* Baillon; *Securinega multiflora* S. B. Liang; *S. obovata* (Willdenow) Müller Argoviensis; *S. virosa* (Roxburgh ex Willdenow) Baillon; *Xylophylla obovata* Willdenow.

Shrubs 1–6 m tall, glabrous; branchlets sharply angular when young, reddish brown, smooth, later darker and lenticellate; ultimate branchlets not spine-tipped. Stipules lanceolate, 1.5–3 mm, entire or margins minutely lacerate; petiole 2–9 mm; leaf blade elliptic, oblong, obovate, or rotund, 2–5 × 1–3 cm, papery, base obtuse to cuneate, margin entire, slightly revolute when dry, apex rounded to acute, mucronulate, white-green abaxially; lateral veins 5–8 pairs. Plants dioecious. Inflorescences axillary, fascicled; bracts scarious, mostly less than 1 mm. Male flowers: pedicels slender, 3–6 mm; sepals 5, ovate, 0.8–1.5 × 0.6–1.2 mm, yellowish, margins entire or obscurely serrulate; disk segments 5, angular, free; stamens 5; filaments 1–3 mm; anthers ellipsoid, 0.4–0.7 mm, exerted from sepals; rudimentary ovary 0.8–1.4 mm high, usually 3-partite, recurved at apex. Female flowers: inflorescence (1–)3–10-flowered; pedicels 1.5–12 mm; sepals 5, as in male; disk annular, entire; ovary ovoid, 3-locular; styles 0.7–1.1 mm, connate at base, bifid at apex, lobes spreading or reflexed. Berry subglobose to oblate, 3–5 mm in diam., whitish when ripe, indehiscent. Seeds chestnut brown, often shiny, faintly reticulate or verruculose; testa thickened; hilum rounded, with a pronounced adaxial invagination. Fl. Mar–Aug, fr. Jun–Nov.

Scrub on slopes; 100–2000 m. Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hunan, Shandong, Taiwan, Yunnan [widespread in Africa, E and SE Asia, and Oceania].

All parts of *Flueggea virosa* are used as medicine for eczema, rheumatoid arthritis, etc.

**3. *Flueggea acicularis*** (Croizat) Webster, Allertonia 3: 304. 1984.

毛白饭树 mao bai fan shu

*Securinega acicularis* Croizat, J. Arnold Arbor. 21: 491. 1940.

Shrubs 1–4 m tall, erect; bark brownish, at first pubescent; branches angular, prominently lenticellate; ultimate branchlets spine-tipped, hirtellous, recurved. Stipules lanceolate, 0.7–2 mm; petiole 1–3 mm, hirtellous; leaf blade obovate, obdeltoide at tip with a minute apiculum in notch, 3–7 × 2–5 mm, papery, puberulent; lateral veins 4 or 5 pairs. Plants dioecious. Inflorescences axillary or clustered on short shoots, fascicled. Male flowers: pedicels slender, 4.5–7 mm; sepals 6, oblong or elliptic, 1.2–1.6 × 0.7–1.3 mm, margins irregularly denticulate; disk segments 6, angled, coherent; stamens 6; filaments 1.5–2 mm; anthers 0.6–1 mm; rudimentary ovary 2–3 mm high, 3-lobed to middle or beyond, lobes recurved. Female flowers: pedicels ca. 3



mm; sepals 5, obovate or elliptic, ca. 1 mm; ovary ovoid. Berry globose, 6–7 mm in diam., 3-locular. Fl. Mar–May, fr. Jun–Oct.

- Scrub on slopes; 300–400 m. Hubei, Sichuan, Yunnan.

**4. *Flueggea leucopyrus*** Willdenow, Sp. Pl. 4: 757. 1805.

聚花白饭树 ju hua bai fan shu

*Acidoton leucopyrus* (Willdenow) Kuntze; *Cicca leucopyrus* (Willdenow) Kurz; *Flueggea wallichiana* Baillon; *F. xerocarpa* A. Jussieu; *Phyllanthus leucopyrus* (Willdenow) J. Koenig ex Roxburgh; *Securinega leucopyrus* (Willdenow) Müller Argoviensis.

Shrubs 1.5–4 m tall, erect; branches terete or obtusely angular when young, gray, prominently lenticellate; ultimate branchlets spine-tipped, terete, rigid. Stipules triangular, 0.5–1 mm; petiole 2–8 mm, grooved adaxially; leaf blade elliptic,

obovate, or rotund, 13–25 × 10–15 mm, papery to thinly leathery, base cuneate to obtuse, margin entire, apex rounded; lateral veins 5–7 pairs. Inflorescences axillary, appearing with expanding leaves or at leafless nodes, cymose. Male flowers: pedicels 2–5 mm; sepals 5, ovate or rotund, 0.6–1.2 × 0.6–1.2 mm, margins entire or denticulate; disk segments 5, angular; stamens 5; filaments 0.8–1.8 mm; anthers 0.3–0.5 mm; rudimentary ovary 0.6–1.2 mm high, 2- or 3-lobed, lobes erect or recurved. Female flowers: pedicels 1.2–2.8 mm; sepals 5, elliptic or ovate, 0.6–0.8 mm; disk annular, subentire at apex; ovary ovoid, 2- or 3-locular; styles 0.6–0.9 mm, connate at base, bifid at apex. Berry subglobose, ca. 4 mm in diam., whitish when ripe. Seeds brownish, 1.9–2.5 mm, smooth; hilum invaginated. Fl. Apr–Jul, fr. Jul–Oct.

Scrub on slopes; 1000–1400 m. Sichuan (Dêrong), Yunnan (Dêqên, Mojiang, Zhongdian) [India, Sri Lanka; Africa, Arabia].

**6. RICHERIELLA** Pax & K. Hoffmann in Engler, Pflanzenr. 81(IV. 147. XV): 30. 1921.

龙胆木属 long dan mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Shrubs to trees, dioecious; indumentum usually absent. Leaves alternate, spirally arranged; stipules broad, caducous; petiole short; leaf blade simple, thinly leathery, margin entire, venation pinnate. Inflorescences axillary, on leafless axillary shoots, shoots slender, spikelike, often branched. Male flowers in fascicles: sepals 5, imbricate; petals absent; disk segments 5, small, alternating with sepals; stamens 5; filaments free; anthers extrorse, longitudinally dehiscent; pistillode 2- or 3-lobed. Female flowers in short racemes; pedicels very short; sepals 5, imbricate; petals absent; disk annular; ovary 3-locular; ovules 2 per locule; styles 3, free, apex shallowly bifid. Fruit a capsule, 3-lobed, dehiscent into 3 2-valved cocci; exocarp papery, distinct from endocarp. Seeds without caruncle; hilum hollow; endosperm thin; cotyledons flattened and broad.

About two species: China, India, Malaysia, Philippines, Thailand; one species in China.

Molecular analysis shows *Richeriella*, though superficially very different in inflorescence structure, to be nested within *Flueggea*.

**1. *Richeriella gracilis*** (Merrill) Pax & K. Hoffmann in Engler, Pflanzenr. 81(IV. 147. XV): 30. 1921.

龙胆木 long dan mu

*Baccaurea gracilis* Merrill, Philipp. J. Sci. 1(Suppl.): 203. 1906; *Flueggea gracilis* (Merrill) Petra Hoffmann.

Shrubs to trees, up to 8[–17] m tall, evergreen, glabrous; bark gray. Petiole 4–8 mm; leaf blade papery, oblong-elliptic, obovate, or oblanceolate, 9–16 × 2.5–6 cm, base cuneate, apex shortly acuminate; lateral veins 10–12 pairs, elevated abaxially.

Male flowers: inflorescence 2–9 cm; rachis slightly angular; bracts small, ovate-triangular, acute; pedicels very short to absent; sepals ovate, ca. 1 mm, apex obtuse; stamens longer than sepals; filaments ca. 2 mm; rudimentary ovary 2-lobed. Female flowers: inflorescence 1–1.5 cm, racemelike; sepals as in male; disk annular; ovary ovoid, 3-locular; styles 3, free, apex shallowly bifid. Capsules broadly ovoid, ca. 5 × 6–8 mm; exocarp yellowish, brown when dried, with reticular lines. Seeds ca. 3.5 mm. Fl. and fr. almost throughout year.

Moist broad-leaved woodlands; 200–600 m. Hainan [Philippines, Thailand].

**7. MARGARITARIA** Linnaeus f., Suppl. Pl. 66. 1782.

蓝子木属 lan zi mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Calococcus* Kurz ex Teijsmann & Binnendijk; *Prosoros* Dalzell.

Trees or shrubs, dioecious; indumentum of simple hairs, often absent. Leaves alternate, usually distichous; stipules entire or denticulate, usually caducous; petiole short; leaf blade simple, margin entire, venation pinnate. Inflorescences axillary, solitary or several in clusters or on condensed short shoot. Male flowers: pedicels slender; sepals 4, biseriolate, unequal, often outer ones narrower, membranous or papery, entire or denticulate, with midrib and branching veinlets; petals absent; disk annular, entire or shallowly lobed, adnate at base of sepals; stamens 4; filaments free or connate at base; anthers extrorse, longitudinally dehiscent; pistillode absent. Female flowers: pedicels terete or flattened; sepals and disk as in male; ovary 2–6-locular; ovules 2 per locule, transverse; styles 2–6,

free or connate at base, apex bifid. Fruit a capsule, globose or subglobose, dehiscent into 3 2-valved cocci or  $\pm$  irregularly dehiscent when mature; exocarp green, reticulate, and fleshy, usually separating from pale, papery, smooth or rugose endocarp; locules 2-seeded. Seeds angled; outer testa fleshy, dark blue to purplish, glossy, inner layer bony, smooth or intravaginated at chalazal end; endosperm abundant, white; embryo erect or slightly recurved; cotyledon thinner and flattened, longer than radical.

About 14 species: Africa, America, SE Asia, Oceania; one species in China.

**1. *Margaritaria indica*** (Dalzell) Airy Shaw, Kew Bull. 20: 387. 1966.

藍子木 lan zi mu

*Prosurus indicus* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 346. 1852; *Calococcus sundaicus* Kurz; *Cicca sinica* Baillon; *Glochidion longipedicellatum* Yamamoto; *Phyllanthus indicus* (Dalzell) Müller Argoviensis; *P. sinicus* (Baillon) Müller Argoviensis.

Large, glabrous trees up to 25 m tall; branches terete, brownish, lenticellate. Stipules triangular-lanceolate, ca. 3 mm, caducous; petiole 4–10 mm, channeled adaxially; leaf blade thinly papery, elliptic, elliptic-ovate, or oblong-lanceolate, apex acute, obtuse, or rounded, usually pale gray abaxially; lateral veins 8–12 pairs, elevated beneath. Male flowers axillary, several in clusters; pedicels 4–6 mm; sepals spreading, outer ovate,

1–1.5  $\times$  0.6–1 mm, inner obovate, 1.3–1.8  $\times$  1–1.5 mm; disk annular, 0.6–1.5 mm wide, adnate at base of sepals, smooth; stamens free; filaments 0.7–1.5 mm; anthers ellipsoid or oblong, 0.6–0.9 mm. Female flowers 1–3, axillary; pedicels 8–21 mm, slender; sepals ovate to oblong, 1.5–2 mm, entire; disk annular, 1.8–2.8 mm wide, entire; ovary 3- or 4-celled, ovoid; ovules 2 in each cell; styles 3, free or connate at base, spreading, 1.5–2 mm, bifid at apex. Capsules subglobose or depressed globose, 3-furrowed, 7–12 mm in diam., at maturity dehiscent into 3 2-valved cocci or breaking up irregularly into cocci when dry, endococci papery. Seeds flabellate-triangular, 3.5–6  $\times$  2.7–6 mm, with thickened, blue or bluish, shiny testa; endotesta rugose or furrowed on back. Fl. May–Aug, fr. Aug–Dec.

Broad-leaved woodlands; ca. 400 m. SW Guangxi (Longzhou), Taiwan (Gaoxiong, Pingdong, Yilan) [India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam, Australia].

## 8. PHYLLANTHUS Linnaeus, Sp. Pl. 2: 981. 1753.

叶下珠属 ye xia zhu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Cathetus* Loureiro; *Cicca* Linnaeus; *Diasperus* Kuntze; *Emblia* Gaertner; *Epistylum* Swartz; *Eriococcus* Hasskarl; *Hemicicca* Baillon; *Kirganelia* Jussieu; *Macraea* Wight; *Niruri* Adanson; *Nymphanthus* Loureiro.

Trees, shrubs, or herbs, mostly monoecious, less often dioecious; branching often “phyllanthoid”: main stems with spiral phyllotaxy, ultimate branchlets sometimes clustered on short shoots, resembling pinnate leaves and often deciduous as a unit, less often stems all similar with spiral or distichous phyllotaxy; hairs simple, often absent, rarely branched. Leaves alternate, often reduced and scalelike on main stems, strongly distichous on leafy stems; stipules small, deciduous or persistent; petiole short; leaf blade simple, margin entire, venation pinnate. Inflorescences axillary, sometimes at leafless nodes, solitary or in fascicles, cymes, glomerules, racemes, or panicles; pedicels delicate. Male flowers: sepals (2 or)3–6, in 1 or 2 series, free, imbricate, margin entire, eroded, denticulate or fimbriate; petals absent; disk glands 3–6, usually free; stamens 2–6; filaments free or connate; anthers 2-locular, extrorse, thecae 2, connectives obscure, longitudinally or horizontally dehiscent, rarely obliquely so; pistillode absent. Female flowers: sepals as in male or more; disk glands usually small, free or connate into an annulus or urn-shape, surrounding ovary; ovary smooth or less commonly roughened, bullate, or hairy, 3(–12)-locular; ovules 2 per locule; styles 3(–12), apex 2-lobed or 2-branched, rarely entire, erect, spreading, or recurved. Fruit usually a capsule, globose or depressed globose, smooth or warty, dehiscent into 3 2-valved cocci when mature, less often a fleshy berry or drupe; columella persistent. Seeds without caruncle or aril, trigonous, surface smooth, sculptured or striate; seed-coat dry crustaceous, endosperm whitish, cartilaginous; embryo straight or slightly curved; cotyledons usually considerably broader than radical.  $x = 13$ .

About 750–800 species: primarily in the tropics and subtropics, poorly represented in temperate regions; 32 species (13 endemic, one introduced) in China.

Molecular studies have shown that several long-established genera nest within *Phyllanthus*, including *Breynia*, *Phyllanthodendron*, *Glochidion*, and *Sauropus*.

*Phyllanthus acidus* (Linnaeus) Skeel is recorded from Taiwan and Hong Kong, where it is presumably cultivated for its edible fruits.

1a. Plant dioecious, with either male or female flowers; leaf blade 1–10 cm.

2a. Leaf blade 1–2  $\times$  0.6–1.3 cm; inflorescences mostly 1-flowered; male sepals 6; female pedicel

2–3 mm ..... 24. *P. cochinchinensis*

2b. Leaf blade 2.5–10  $\times$  1.5–4 cm; inflorescences many flowered; male sepals 4; female pedicel 10–15 mm ..... 9. *P. gracilipes*

1b. Plant monoecious, with both male and female flowers; leaf blade often less than 1 cm.

3a. Fruits indehiscent, fleshy.

4a. Leaf base oblique; fruit a drupe, pale green or yellowish white, 10–13 mm in diam.; stamens 3 or 4.

5a. Leaves linear-oblong, 0.8–2.3  $\times$  0.15–0.6 cm; stamens 3, fused ..... 1. *P. emblica*

- 5b. Leaves ovate or oblong-ovate, 2.4–10 × 1.9–4.5 cm; stamens 4, free ..... *P. acidus* (see note above)
- 4b. Leaf base symmetrical; fruit a berry, purple-black when mature, 6–10 mm in diam.; stamens (3–)5(or 6).
- 6a. Fruits 3-celled.
- 7a. Fruiting sepals persistent; male sepals 6; fruit ca. 10 mm in diam. .... 2. *P. glaucus*
- 7b. Fruiting sepals deciduous; male sepals 5; fruit ca. 6 mm in diam. .... 3. *P. flexuosus*
- 6b. Fruits 4–12-celled.
- 8a. Stamens 4 or 5(–7), filaments all free; fruit ca. 8 mm in diam., 4-seeded ..... 4. *P. oligospermus*
- 8b. Stamens 5, filaments 3 connate and 2 free; fruit ca. 6 mm in diam., 8–16-seeded ..... 5. *P. reticulatus*
- 3b. Fruit a dehiscent capsule, not fleshy, brown or brownish when mature.
- 9a. Male sepal margins fimbriate, serrulate, or erose.
- 10a. Ovary with dense, rugose-undulate or curved pubescence or densely setose.
- 11a. Ovary with dense, rugose-undulate or curved pubescence; leaf blade 3–7 mm wide, base oblique ... 6. *P. chekiangensis*
- 11b. Ovary and fruits with very dense, soft prickles; leaf blade 6–10 mm wide, base symmetrical ..... 10. *P. forrestii*
- 10b. Ovary smooth or tuberculate.
- 12a. Female sepals 5.
- 13a. Stipules 3–5 mm; female pedicel ca. 10 mm; stamens 4 ..... 8. *P. fimbriicalyx*
- 13b. Stipules 1–1.5 mm; female pedicel 20–35 mm; stamens 2 ..... 11. *P. hainanensis*
- 12b. Female sepals 6.
- 14a. Stamens 4.
- 15a. Branchlets glabrous; female sepals 1.2–2(–3.8) mm, obscurely erose or subentire; fruiting pedicel 1–1.5(–2.5) cm ..... 7. *P. sootepensis*
- 15b. Branchlets rufous puberulent; female sepals ca. 3.5 mm; fruiting pedicel ca. 5 cm ..... 9. *P. gracilipes*
- 14b. Stamens 2.
- 16a. Young branchlets puberulent; leaf blade 18–30 × 8–13 mm; inflorescence a bisexual axillary fascicle, usually with several male and 1 female flowers ..... 12. *P. pulcher*
- 16b. Branchlets glabrous; leaf blade 3–13 × 3–7 mm; inflorescence 1-flowered.
- 17a. Branchlets terete, glabrous; pedicels 2–8 mm; styles connate at base ..... 13. *P. franchetianus*
- 17b. Branchlets angular, minutely papillate along upper side; pedicels 10–15 mm; styles free ..... 14. *P. leptoclados*
- 9b. Male sepal margins entire.
- 18a. Stamens 3, filaments ± free.
- 19a. Shrubs; leaf blades thinly papery or membranous; male disk cup-shaped ..... 17. *P. clarkei*
- 19b. Herbs, branching mainly near base; leaf blades leathery or thinly leathery; male disk of separate glands.
- 20a. Leaves ± distichous; stems usually ascending; female pedicel ca. 5 mm, disk orbicular, undivided; capsule with scalelike protuberances ..... 15. *P. virgatus*
- 20b. Leaves spiral; stems spreading; female pedicel 1.5–2 mm, disk of separate glands; capsule smooth ..... 16. *P. maderaspatensis*
- 18b. Stamens 2–4, filaments 2 free, others connate.
- 21a. Leaf blade margin hispidulous; ovary and fruits tuberculate ..... 18. *P. urinaria*
- 21b. Leaf blade not hispidulous; ovary and fruits smooth.
- 22a. Male sepals 5 or 6; stamens 3.
- 23a. Herbs.
- 24a. Perennial herbs; leaf blade elliptic or obovate, lateral veins 3 pairs; male sepals and disk glands 6 ..... 19. *P. arenarius*
- 24b. Annual herbs; leaf blade oblong-elliptic, lateral veins 4–7 pairs; male sepals and disk glands 5 ..... 20. *P. amarus*
- 23b. Shrubs.
- 25a. Branchlets terete; male sepals and disk glands 5 ..... 21. *P. myrtifolius*
- 25b. Branchlets angular; male sepals and disk glands 6.
- 26a. Branchlets usually clustered at apex of erect main stem; leaf blade base oblique; filaments connate at base only ..... 22. *P. rheophyticus*
- 26b. Branchlets more evenly distributed along main stems; leaf blade base symmetrical; filaments connate into a column.
- 27a. Leaf blade 3–14 × 1.5–3.5 cm; inflorescences on specialized racemelike leafless shoots, 2–10 cm; female disk cup-shaped, apex ± lacerate ..... 23. *P. pachyphyllus*
- 27b. Leaf blade 0.2–2 × 0.1–1.3 mm; inflorescence 1-flowered or a 4–6-flowered fascicle, subtended by normal leaves; female disk urceolate or disk-shaped, apex entire.
- 28a. Leaf blade obovate or spatulate, apex obtuse or rounded, lateral veins obscure; stipule margins ciliate; bract margins lacerate; flowers usually solitary ..... 24. *P. cochinchinensis*
- 28b. Leaf blade oblong or lanceolate, apex apiculate, lateral veins prominent; stipule margins glabrous; bract margins entire; flowers 4–6-fascicled ..... 25. *P. tsarongensis*

- 22b. Male sepals 4; stamens 2.  
 29a. Branchlets, petioles, ovary, and fruits with stellate tufts of brown hairs; ovary 4–6-celled ..... 26. *P. tsiangii*  
 29b. Branchlets, petioles, ovary, and fruits glabrous; ovary 3-celled.  
 30a. Annual herbs; stamen filaments free ..... 27. *P. ussuriensis*  
 30b. Shrubs; stamen filaments connate.  
 31a. Leaf blade linear-oblong; flowers in glomerules ..... 28. *P. taxodiifolius*  
 31b. Leaf blade not linear-oblong; flowers solitary or fascicled.  
 32a. Leaf blade 4–5 × ca. 2 mm, base oblique; flowers solitary ..... 29. *P. nanellus*  
 32b. Leaf blade 20–45 × 7–17 mm, base symmetrical; flowers fascicled.  
 33a. Branchlets terete; leaf blade elliptic-ovate, lateral veins 6–9 pairs; male pedicels 5–7 mm ..... 30. *P. guangdongensis*  
 33b. Branchlets angular-winged; leaf blade ovate-lanceolate or lanceolate, lateral veins 3–5 pairs; male pedicels 1–8 cm.  
 34a. Sepals purple; male pedicels 0.3–0.8 cm; female pedicels 0.6–1 cm ..... 31. *P. bodinieri*  
 34b. Sepals whitish; male pedicels 1–1.5 cm; female pedicels 2–2.3 cm ..... 32. *P. fangchengensis*

**1. *Phyllanthus emblica*** Linnaeus, Sp. Pl. 2: 982. 1753.

余甘子 yu gan zi

*Diasperus emblica* (Linnaeus) Kuntze; *Dichelactina nodicaulis* Hance; *Embllica officinalis* Gaertner; *Phyllanthus mairei* H. Lévillé.

Trees 3–8(–23) m tall, to 50 cm d.b.h., monoecious, deciduous; bark brownish; main stems terete, sparsely lenticellate, with very reduced short shoots producing groups of leafy shoots; leafy shoots angular, tawny pubescent, at start of growing season often with poorly developed leaves and densely flowered, later with fewer flowers and better-developed leaves. Leaves distichous; stipules triangular-ovate, 0.8–1.5 mm, brown, margins entire or denticulate, ciliate; petiole 0.3–0.7 mm; leaf blade oblong or linear-oblong, 8–23 × 1.5–6 mm, papery to leathery, paler abaxially, green adaxially, drying reddish or brownish, base shallowly cordate and slightly oblique, margin narrowly revolute, apex truncate, rounded or obtuse, mucronate or retuse at tip; lateral veins 4–7 pairs. Fascicles with many male flowers and sometimes 1 or 2 larger female flowers. Male flowers: pedicels 1–2.5 mm; sepals 6, membranous, yellow, obovate or spatulate, subequal, 1.2–2.5 × 0.5–1 mm, apex obtuse or rounded, margin entire or shallowly denticulate; disk glands 6, subtriangular; stamens 3; filaments coherent into column, 0.3–0.7 mm; anthers erect, oblong, 0.5–0.9 mm, longitudinally dehiscent, apex mucronate. Female flowers: pedicels ca. 0.5 mm; sepals 6, oblong or spatulate, 1.6–2.5 × 0.7–1.3 mm, apex obtuse or rounded, thicker, margin membranous, ± lobate; ovary ovoid, ca. 1.5 mm, 3-celled; styles 3, (1–)2.5–4 mm, connate at base, deeply bifid, lobes divided at tip. Fruit a drupe, globose, 1–1.3 cm in diam., exocarp fleshy, pale green or yellowish white, endocarp crustaceous. Seeds reddish, 5–6 × 2–3 mm. Fl. Apr–Jun, fr. Jul–Sep.

Dry open sparse forests or scrub, village groves; 200–2300 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Sichuan, Taiwan, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand; South America (cultivated)].

The mature fruits are very sour and contain 1%–1.8% Vitamin C. They are eaten raw or sweetened or preserved. The seeds, roots, and leaves are used as medicine. The dried leaves are sometimes used as fillings in pillows.

**2. *Phyllanthus glaucus*** Wallich ex Müller Argoviensis, Linnaea 32: 14. 1863.

青灰叶下珠 qing hui ye xia zhu

*Phyllanthus flueggeiformis* Müller Argoviensis.

Shrubs up to 4 m tall, monoecious, glabrous throughout; branches terete; branchlets delicate. Stipules ovate-lanceolate, membranous; petiole 2–4 mm; leaf blade elliptic or oblong, 2.5–5 × 1.5–2.5 cm, membranous, slightly glaucous abaxially, base obtuse to rounded, apex acute, apiculate; lateral veins 8–10 pairs. Inflorescence an axillary fascicle, usually with several male and 1 female flowers; pedicels filamentous, slightly stout at apex, calyx ca. 3 mm wide. Male flowers: pedicels ca. 8 mm; sepals 6, ovate; disk glands 6; stamens 5; filaments free; anthers longitudinally dehiscent. Female flowers: pedicels ca. 9 mm; sepals 6, ovate, persistent in fruit; disk cupular; ovary ovoid, 3-celled; styles 3, connate at base. Fruit a berry, globose to obovate, ca. 1 cm in diam., black-purple. Seeds tawny. Fl. Apr–Jul, fr. Jul–Oct.

Scrub, open forests; 200–1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan, India, Nepal].

The roots are used medicinally for infantile malnutrition due to intestinal parasites.

**3. *Phyllanthus flexuosus*** (Siebold & Zuccarini) Müller Argoviensis in A. Candolle, Prodr. 15(2): 324. 1866.

落萼叶下珠 luo e ye xia zhu

*Cicca flexuosa* Siebold & Zuccarini, Abh. Math.-Phys. Cl. Konigl. Bayer. Akad. Wiss. 4(2): 143. 1845; *Glochidion flexuosum* (Siebold & Zuccarini) Müller Argoviensis; *Hemicicca flexuosa* (Siebold & Zuccarini) Hurusawa; *H. japonica* Baillon; *Phyllanthus japonicus* (Baillon) Müller Argoviensis.

Shrubs up to 3 m tall, monoecious, glabrous throughout; main branches slightly zigzag, with distinct short shoots; leafy branchlets 8–15 cm, brownish. Leaves progressively larger along shoot, distichous; stipules ovate-triangular, caducous; petioles 2–3 mm, rugulose when dried; leaf blade elliptic to ovate, 2–4.5 × 1–2.5 cm, papery, slightly white-green abaxially, base obtuse to rounded, apex acuminate or obtuse; lateral veins

5–7 pairs. Inflorescence an axillary fascicle with up to 5 male and 1 female flowers. Male flowers: pedicels short; sepals 5, broadly ovate or rounded, ca. 1 mm, dark purple; disk glands 5; stamens 5; filaments free; anthers 0.3–0.4 mm, longitudinally dehiscent. Female flowers ca. 3 mm in diam.; pedicels ca. 1 cm; sepals 6, ovate or elliptic, ca. 1 mm, caducous; disk glands 6; ovary ovoid, 3-celled; styles 3, bifid at apex, exerted from calyx. Fruit a berry, oblate, ca. 6 mm wide, 3-celled. Seeds subtriangular, ca. 3 mm. Fl. Apr–May, fr. Jun–Sep.

Open forests or scrub; 700–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Sichuan, Yunnan, Zhejiang [Japan].

**4. *Phyllanthus oligospermus*** Hayata, Icon. Pl. Formos. 9: 93. 1920.

少子叶下珠 shao zi ye xia zhu

Deciduous shrubs, monoecious, glabrous throughout; branchlets slender, purplish. Stipules lanceolate or linear, 2–3 mm; petiole ca. 2 mm; leaf blade oblong-elliptic or elliptic, 1.8–4.3 × 1–1.6 cm, papery, glaucescent abaxially, green adaxially, base cuneate or acute, apex obtuse, cuspidate at tip; lateral veins 7–11 pairs, raised on both surfaces. Inflorescence an axillary fascicle with 10–25 male flowers and 1 (rarely more) female flower. Male flowers: pedicels filamentous 3–5 mm; sepals 5(–7), spreading, yellow, ovate to elliptic, apex obtuse; disk 5(–7)-lobed, lobes alternate with stamens; stamens 4 or 5(–7); filaments free, ca. 1.5 mm; anthers reniform. Female flowers: pedicels 3–5 mm; sepals 5, green or greenish white, oblong-lanceolate, ca. 2.5 mm; disk annular or shallowly lobed; ovary broadly ovate, ca. 1.5 × 1 mm; styles 3, ca. 0.3 mm, connate at base, spreading, sometimes reflexed. Fruit a succulent berry, globose, 4–6 mm in diam., red to purplish black, ca. 4- or 5-seeded. Seed trigonous, 2.5–3 mm, smooth or nearly so. Fl. Jun–Jul, fr. Jul–Aug.

- Montane shrub fields. Taiwan (Hualian, Pingdong, Taoyuan).

**5. *Phyllanthus reticulatus*** Poirlet in Lamark, Encycl. 5: 298. 1804.

小果叶下珠 xiao guo ye xia zhu

*Cicca microcarpa* Benth; *C. reticulata* (Poirlet) Kurz; *Glochidion microphyllum* Ridley; *Kirganelia multiflora* Baillon; *K. reticulata* (Poirlet) Baillon; *K. sinensis* Baillon; *Phyllanthus dalbergioides* Wallich ex J. J. Smith; *P. erythrocarpus* Ridley; *P. microcarpus* (Benth) Müller Argoviensis; *P. multiflorus* Poirlet; *P. multiflorus* Willdenow (1805), not Poirlet (1804); *P. reticulatus* var. *glaber* Müller Argoviensis; *P. sinensis* Müller Argoviensis; *P. takaensis* Hayata.

Shrubs to 4 m tall, monoecious; branches brownish; young branchlets, leaves, and pedicels yellowish pubescent or puberulent or glabrous. Stipules subulate-lanceolate, brown, 1–3 mm, hard and spiny when dry; petiole 2–5 mm; leaf blade varying in shape, mostly elliptic to ovate, 1–5(–6.5) × 0.7–3 cm, membranous to papery, base obtuse to rounded, apex acute or obtuse to rounded; lateral veins 5–7 pairs, usually prominent on both surfaces. Inflorescence an axillary fascicle, rarely a cyme, with 2–10 male and 1 or 2 female flowers. Male flowers: pedicels

delicate, 5–10 mm; sepals 5 or 6, in 2 series, ovate or obovate, unequal, 0.7–1.5 × 0.5–1.2 mm, entire; disk glands 5, scalelike, ca. 0.5 mm wide; stamens 5, erect, 3 with longer filaments coherent in a central column, 2 with shorter filaments, free; anthers triangular, longitudinally dehiscent. Female flowers: pedicels 4–8 mm, delicate; sepals 5 or 6, in 2 series, unequal, broadly ovate, 1–1.6 × 0.9–1.2 mm, puberulent inside at base; disk glands 5 or 6, oblong or obovate; ovary 4–12-celled, smooth; styles free, bifid at apex, lobes linear, revolute and connivent over top of ovary. Fruit a berry, globose to oblate, 4–6 mm wide, black and dark purplish at maturity, 4–12-celled, 8–16-seeded. Seeds trigonous, 1.6–2 mm, brown. Fl. Mar–Jun, fr. Jun–Oct.  $x = 13$ .

Open forests, scrub; 200–800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; W Africa, NE Australia].

Glabrous plants have been recognized as var. *glaber*, but such forms occur sporadically throughout the range of the species and are of dubious taxonomic value.

**6. *Phyllanthus chekiangensis*** Croizat & F. P. Metcalf, Lingnan Sci. J. 20: 194. 1942.

浙江叶下珠 zhe jiang ye xia zhu

*Phyllanthus kiangsiensis* Croizat & F. P. Metcalf; *P. leptocladus* Benth var. *pubescens* P. T. Li & D. Y. Liu.

Shrubs up to 1 m tall, glabrous except for pubescent ovary and fruits; stem terete, brownish; branches brownish; branchlets usually grouped in upper part of branches, delicate, 6–20(–30) cm, with longitudinal stripes. Leaves distichous, along branchlets arranged into 15–30 pairs; stipules lanceolate; petiole 5–10 mm; leaf blade elliptic or elliptic-lanceolate, 8–15 × 3–7 mm, papery or thinly papery, base ± oblique, margin revolute when dry, apex acute; lateral veins 3 or 4 pairs, delicate. Inflorescence an axillary fascicle, 1- to several flowered. Male flowers 2–3 mm in diam.; pedicels 4–6 mm; sepals 4, ovate-triangular, 1–1.5 × 0.6–1 mm, purple, margin fimbriate or erose; disk slightly fleshy, unlobed, margin thickened, crenate; stamens 4. Female flowers 3–4.5 mm in diam.; pedicels 6–12 mm; sepals 6; ovary oblate, ca. 1 × 1.5 mm, 3-celled, densely curved or rugose-undulate pubescent; styles 3, bifid at apex. Capsules oblate, ca. 5 × 7 mm, 3-loculed, densely curved pubescent. Seeds reniform-triangular, 2–2.5 × 1.25–1.75 mm, tawnyish. Fl. Apr–Aug, fr. Jul–Oct.

- Montane sparse forests or scrub; 300–800 m. Anhui, Fujian, Guangdong, Guangxi, Hubei, Hunan, Jiangxi, Zhejiang.

**7. *Phyllanthus sootepensis*** Craib, Contrib. Fl. Siam. 185. 1911.

云泰叶下珠 yun tai ye xia zhu

*Phyllanthus subpulchellus* Croizat.

Shrubs 0.3–2 m tall, monoecious, glabrous throughout; stem gray-brown; branches terete, branchlets alternate or 2- or 3-fascicled on short shoots, delicate, 5–15 cm. Leaves distichous; stipules lanceolate, ca. 2 mm, brown; petiole ca. 1 mm; leaf blade broadly elliptic, 5–17 × 4–8 mm, papery, base rounded or obtuse, margin slightly revolute, brownish when dry,

apex acute; lateral veins 4–6 pairs, bifurcate at apex. Inflorescences axillary, unisexual, proximal axils with fascicles of male flowers, distal axils with solitary female flowers. Male flowers: pedicels filamentous, 4–12 mm; sepals 4, broadly ovate, ca. 1.5 × 1 mm, margin erose or irregularly serrulate; disk glands 4, elliptic; stamens 4, filaments connate into a short column. Female flowers: pedicels delicate, 7–15(–20) mm; sepals 6, obovate to orbicular, 1.2–2(–3.8) × 0.7–1.3(–2.5) mm, margin obscurely erose or subentire, reflexed and persistent in fruit; disk glands 6, as high as middle of ovary; ovary globose; styles 3, bifid at apex. Fruiting pedicels 1–1.5(–2.5) cm; capsule globose, ca. 3 mm in diam., 3-celled. Seeds trigonous, ca. 1.5 × 1 mm. Fl. and fr. Jul–Oct.

Montane scrub, wastelands; 500–1300 m. S Yunnan [Thailand].

**8. *Phyllanthus fimbricalyx*** P. T. Li, Acta Phytotax. Sin. 25: 380. 1987.

穗萼叶下珠 sui e ye xia zhu

Shrubs, ca. 1 m tall, monoecious; stem gray-brown, hispid; branches terete, to 70 cm, hispid. Stipules ovate-lanceolate, 3–5 mm; petiole ca. 3 mm, hispid; leaf blade oblong or oblong-ovate, 7–12 × 3–4.5 cm, papery, abaxially scurfy-hairy, adaxially glabrous, base rounded, oblique, apex shortly acuminate; lateral veins 7 or 8 pairs. Inflorescence an axillary cyme, 3–7-flowered, those along proximal part of branchlet male, distal inflorescences female; peduncle short; bracts lanceolate, membranous. Male flowers: pedicels filamentous, 1–1.5 cm, sparsely pubescent; sepals 4, oblong-ovate, ca. 2 mm, purple, puberulent outside, glabrous inside, margin fimbriate; disk glands 4; stamens 4; filaments connate; anthers transversely dehiscent. Female flowers: pedicels ca. 1 cm, thicker at apex, pubescent; sepals 5, oblong-elliptic, ca. 3 × 1.5 mm, both surfaces puberulent, margin fimbriate; disk cup-shaped, as long as ovary and enclosing it, apex slightly undulate; ovary subglobose, 3-celled; styles 3, deeply bifid at apex, lobes erect, linear. Fl. Jun–Sep, fr. Aug–Oct.

• Valley scrub, sparse forests; 1000–1100 m. SW Yunnan.

**9. *Phyllanthus gracilipes*** (Miquel) Müller Argoviensis, Linnaea 32: 47. 1863.

毛果叶下珠 mao guo ye xia zhu

*Reidia gracilipes* Miquel, Fl. Ned. Ind. 1(2): 374. 1859; *Eriococcus gracilis* Hasskarl; *Phyllanthus concinnus* Ridley; *P. discofractus* Croizat; *P. gracilis* Roxburgh; *P. hullettii* Ridley; *R. gracilis* (Hasskarl) Miquel.

Shrubs up to 3 m tall, ?dioecious; stem in upper part and branches rufous puberulent. Leaves distichous; stipules ovate-lanceolate, to 1.5 mm; petiole 2–3 mm, puberulent; leaf blade elliptic to obliquely oblong-lanceolate, 2.5–10 × 1.5–4 cm, membranous to thinly papery, ash gray adaxially when dry, brown-reddish abaxially, glabrous or puberulent beneath, base rounded, apex acute or acuminate; lateral veins ca. 6 pairs, delicate. Inflorescence an axillary cyme, many flowered. Male flowers ca. 4 mm in diam.; pedicels ca. 10 mm; sepals 4, ovate-triangular, 2–3 × 1.5–2 mm, purplish, margin irregularly serrate; disk urn-shaped; stamens 4; filaments connate. Female

flowers ca. 7 mm; pedicels 1–1.5 cm; sepals 6, 2-seriate, ovate-triangular, 2–3.5 × 1.5–2 mm, ribbed, margin fimbriate; disk cup-shaped, subentire or shallowly 6-lobed, enclosing base of ovary; ovary subglobose, longitudinally angular, tuberculate; styles 3, erect, deeply bifid. Fruiting pedicels to 5 cm; capsules oblate, ca. 6 mm in diam., 3-celled, densely rufous crispate lanate. Fl. May–Aug, fr. Aug–Nov.

Open forests; ca. 900 m. W Guangxi [Indonesia, Thailand, Vietnam].

**10. *Phyllanthus forrestii*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 195. 1914.

刺果叶下珠 ci guo ye xia zhu

*Phyllanthus echinocarpus* T. L. Chin.

Shrubs ca. 20 cm tall, monoecious, glabrous except for hispidulous female pedicels; branchlets terete, delicate. Leaves distichous; stipules membranous, ovate-lanceolate, 1.2–2 mm; petiole ca. 1 mm; leaf blade suborbicular to oblong, 1–2 × 0.6–1 cm, usually largest along middle of branchlet, smaller toward base and apex, thinly papery, adaxially green, abaxially glaucous-green, base rounded or obtuse, apex rounded and apiculate; lateral veins 4–7 pairs, obscure. Inflorescence an axillary fascicle, male flowers several, female solitary. Male flowers: pedicels ca. 2 mm; sepals 4, ovate-lanceolate, ca. 2.5 mm, purple, margin irregularly serrulate; disk glands 4, linear-oblong; stamens 2; filaments very short, connate; anthers free, connectives slightly elevated. Female flowers: pedicels 1–2 cm; sepals 6, 2-seriate, ovate-lanceolate, ca. 6 mm, apex with awn-shaped acumen, margin irregularly serrulate; disk disk-shaped, 6-lobed at apex, lobes rounded; ovary ovoid, with dense, soft, ca. 0.5 mm prickles; styles 3, connate at base, bifid at apex, lobes subulate. Capsules globose, ca. 7 mm in diam., with dense, soft prickles. Fl. Jun–Aug, fr. Aug–Oct.

• Scrub; 300–3300 m. Guizhou, Hubei, Sichuan, Yunnan.

**11. *Phyllanthus hainanensis*** Merrill, Lingnan Sci. J. 14: 20. 1935.

海南叶下珠 hai nan ye xia zhu

Shrubs to 2 m tall, erect, monoecious, glabrous throughout; stem gray-brown; branchlets angular, 10–25 cm. Stipules linear-lanceolate, 1–1.5 mm, hard when dry; petiole very short; leaf blade nearly oblong, 10–25 × 4–8 mm, membranous, abaxially greenish or glaucous-green, adaxially green, base obliquely broadly cuneate, margin slightly revolute, apex acute, apiculate; midrib purple, lateral veins 4 or 5 pairs. Male inflorescences along middle to lower axils of branchlets, usually 2- or 3-flowered. Male flowers: pedicels 3–10 mm; sepals 4, red, ovate-elliptic, ca. 1.2 × 1 mm, midrib slightly thicker abaxially, margin lacerate, apex acuminate; disk glands 4, patelliform; stamens 2; filaments connate at base; anthers free, transversely dehiscent. Female flowers: pedicels 20–35 mm; sepals 5, red, lanceolate, ca. 2.5 mm, nearly equal, midrib slightly thicker abaxially, margin membranous, deeply lacerate; disk glands 6, ± square, ca. 0.5 × 0.5 mm, margin entire or obscurely undulate; ovary subglobose, ca. 1 mm in diam., 3-celled; styles 3, free, bifid nearly to base, horizontal. Fruiting sepals persistent; capsules

oblong-ovate, ca. 3 × 2 mm. Seeds small, ca. 2 × 0.8 mm, reddish. Fl. and fr. almost throughout year.

- Scrub, open forests; 200–400 m. S Hainan.

**12. *Phyllanthus pulcher*** Wallich ex Müller Argoviensis, *Linnaea* 32: 49. 1863.

云桂叶下珠 *yun gui ye xia zhu*

*Diasperus pulcher* (Wallich ex Müller Argoviensis) Kuntze; *Epistylum pulchrum* Baillon; *Phyllanthus asteranthos* Croizat.

Shrubs 0.5–1.5 m tall, monoecious, glabrous except for puberulent or ciliate young branches and bracts; stem and branches terete; branches to 40 cm, puberulent. Leaves distichous, 15–30 pairs along each branchlet; stipules triangular-lanceolate, 3–4 × 1.5–2 mm, reddish brown, entire or obscurely serrulate; petiole 0.8–1.5 mm; leaf blade obliquely oblong to ovate-oblong, 1.8–3 × 0.8–1.3 cm, membranous, abaxially gray-green, adaxially green, margins slightly revolute; lateral veins 4–6 pairs, obscure. Inflorescence a bisexual axillary fascicle, usually with several male and 1 female flower, flowers with ciliate bracts at base. Male flowers: pedicels delicate, 5–10 mm; sepals 4, ovate-triangular, 2–3 × 1–2 mm, dark red, margins lacerate; disk glands 4, ± square or reniform, 0.5–0.7 mm wide, flat, membranous; stamens 2; filaments short, connate; anthers longitudinally dehiscent. Female flowers: pedicels filamentous, 15–23 mm; sepals 6, ovate-triangular, 3.5–4 × ca. 1.5 mm, margins lacerate, midrib thicker abaxially; disk disk-shaped, fleshy, surrounding ovary at base, apex 6-lobed; ovary subglobose, smooth, 3-celled; styles 3, spreading, bifid at apex. Fruiting pedicels ca. 2.5 cm; sepals persistent; capsules subglobose, ca. 3 mm in diam., brownish, smooth. Fl. May–Sep, fr. Aug–Nov.

Open forests, riverside scrub; 700–1800 m. Guangxi, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Vietnam].

**13. *Phyllanthus franchetianus*** H. Léveillé, *Bull. Géogr. Bot.* 25: 23. 1915.

云贵叶下珠 *yun gui ye xia zhu*

*Phyllanthus leiboensis* T. L. Chin.

Shrubs 1–2 m tall, monoecious, glabrous throughout; stems red-brown; branches terete; branchlets delicate, gray-green, usually 1 to several clustered on short shoots. Leaves densely distichous, 12–20 pairs per branchlet; stipules linear-lanceolate, 1–2 mm; petiole ca. 0.5 mm; leaf blade obliquely elliptic, slightly falcately inflected, 3–7 × ca. 3 mm, papery, base obliquely rounded, apex apiculate, abaxially pale greenish; lateral veins 3 or 4 pairs, obscure. Male inflorescences axillary along lower part of branchlet, usually 1-flowered. Male flowers: pedicels 2–4 mm, filamentous; sepals 4, oblong-ovate, ca. 1.2 mm, red, margins irregularly lacerate-serrate; disk glands 4, oblong; stamens 2; filaments very short, connate; anthers free, reniform, transversely dehiscent. Female flowers solitary, axillary on upper part of branchlet; pedicel 5–8 mm, thicker apically; sepals 6, persistent in fruit, oblong-ovate, ca. 2 mm, margins lacerate-serrate; disk disk-shaped, apex shallowly undulate;

ovary subglobose, smooth, 3-celled; styles 3, connate at base, bifid at apex, lobes subulate. Capsules globose, ca. 5 mm in diam., smooth. Seed ovoid, ca. 1.5 mm. Fl. Feb–Jul, fr. Jun–Sep.

- Scrub, open forests; 400–1000 m. Guizhou, Sichuan (Jinyang, Leibo), Yunnan (Daguan, Gengma, Yanjin, Yuanjiang, Yuanyan).

**14. *Phyllanthus leptoclados*** Benth, *Fl. Hongk.* 312. 1861.

细枝叶下珠 *xi zhi ye xia zhu*

*Epistylum leptocladon* Hance; *Phyllanthus glabrocapsulus* F. P. Metcalf.

Shrubs ca. 1 m tall, monoecious, glabrous except for branchlets; branchlets delicate, angular, pubescent along 1 line. Stipules lanceolate or linear-lanceolate; petiole ca. 1 mm; leaf blade membranous, obovate or elliptic, slightly falcate, 6–13 × 4–7 mm, abaxially glaucous-green, sometimes whole plant suffused red, base oblique, apex with deciduous 1.5–3 mm mucro, later acute; lateral veins ca. 5 pairs. Male inflorescences 1-flowered, axillary. Male flowers: pedicels to 1 cm; sepals 4, oblong-ovate, ca. 2 × 1 mm, acute, margins lacerate-serrate; disk glands 4, rotund, truncate at apex; stamens 2; filaments short, connate. Female flowers: pedicels to 1.5 cm; sepals 6, lanceolate, margins lacerate-serrate; disk urn-shaped, apex entire or slightly crenate; ovary globose, smooth; styles 3, free, horizontal. Capsules oblate, ca. 5 mm in diam. Seeds tuberculate. Fl. May–Sep, fr. Jul–Nov.

- Scrub; 100–600 m. Fujian, Guangdong, Yunnan.

**15. *Phyllanthus virgatus*** G. Forster, *Fl. Ins. Austr.* 65. 1786.

黄珠子草 *huang zhu zi cao*

*Phyllanthus simplex* Retzius; *P. simplex* var. *virgatus* (G. Forster) Müller Argoviensis.

Annual herbs, usually erect, sometimes prostrate, to 60(–100) cm tall, monoecious, glabrous throughout; stem usually slightly woody at base; branchlets angled. Stipules membranous, ovate-triangular, ca. 1 mm, brown; petiole short, nearly absent; leaf blade thinly leathery, linear-lanceolate, oblong, or narrowly elliptic, 5–25 × 2–7 mm, base slightly obliquely rounded, apex obtuse or acute; midrib raised abaxially, flattened adaxially, lateral veins obscure. Plants monoecious. Inflorescences bisexual axillary fascicles usually with 2–4 male and 1 female flower. Male flowers: pedicels ca. 2 mm; sepals 6, broadly ovate or rotund, ca. 0.5 mm; disk glands 6, oblong; stamens 3; filaments free; anthers subglobose. Female flowers: pedicels ca. 5 mm; sepals 6, ovate-oblong, ca. 1 mm, reflexed, purple with whitish membranous margins, persistent in fruit; disk orbicular, undivided; ovary globose, 3-celled, with raised scales, rarely smooth; styles 3, bifid nearly to base, usually recurved. Fruiting pedicels 5–12 mm; capsules oblate, 2–3 mm in diam., purple, with raised scales or smooth. Seeds trigonous, 1.2–1.5 mm, finely warty. Fl. Apr–May, fr. Jun–Nov.

Montane grass-slopes or mixed deciduous forests, savannas; 200–1400 m. Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Shaanxi, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Nepal, Sri Lanka, Thailand, Vietnam; Pacific islands (Polynesia)].

All parts are used medicinally for infantile malnutrition caused by intestinal parasites.

**16. *Phyllanthus maderaspatensis*** Linnaeus, Sp. Pl. 2: 982. 1753.

麻德拉斯叶下珠 ma de la si ye xia zhu

Herbs, perennial but often flowering in first year, 0.15–0.9(–1.2) m tall, monoecious, glabrous throughout; stem usually woody at base; branching mostly basal, all similar, erect or ascending. Leaves spiral; stipules ovate, 1.5–2(–4) mm, petiole very short; leaf blade linear-lanceolate to obovate, (7–)10–30(–60) × (1–)2–7(–17) mm, leathery, gray-green, base rounded, apex shortly acuminate; lateral veins obscure. Inflorescences axillary fascicles, most axils with 1 female flower, distal axils with 1–4 male flowers. Male flowers: pedicels ca. 1 mm; sepals 6, suborbicular, ca. 1 × 0.8 mm, margins entire; disk glands 6, small and smooth; stamens 3; filaments connate at base; anthers longitudinally dehiscent. Female flowers: pedicels 1.5–2 mm; sepals 6, suborbicular to subspatulate, ca. 2 × 1.5 mm, margin entire; persistent in fruit; disk glands 6, ± square; ovary globose, 3-celled, smooth; styles 3, ± free. Fruit a capsule, oblate, 1.2–2 × ca. 3 mm, olive green, smooth. Seed 3-sided, ca. 1.3 mm, light brown, with rows of minute tubercles on back and sides.

Slopes with scrub, elsewhere often in disturbed areas. Hong Kong [India, Indonesia, Pakistan, Sri Lanka; Africa, SW Asia, Australia].

*Phyllanthus maderaspatensis* is known from the Flora area from a single 19th-century collection from Hong Kong. Elsewhere it is a very successful adventive in drier regions. The description is based largely on material from outside China.

**17. *Phyllanthus clarkei*** J. D. Hooker, Fl. Brit. India 5: 197. 1887.

滇藏叶下珠 dian zang ye xia zhu

*Phyllanthus simplex* Retzius var. *tongkinensis* Beille.

Shrubs up to 1.5 m tall, monoecious, glabrous throughout; stems terete, brown, much branched; branches 9–26 cm, slightly angular at upper part. Stipules triangular, brown; petiole ca. 1 mm; leaf blade obovate, sometimes elliptic, 5–15 × 4–8 mm, thinly papery or membranous, base broadly cuneate or rounded, apex rounded or obtuse; lateral veins 4–6 pairs, flattened adaxially, slightly elevated. Inflorescences axillary, 1-flowered; pedicels with several bracteoles at base. Male flowers: pedicels ca. 3 mm; sepals 6, oblong, ca. 1 mm, margin entire, membranous, midrib thicker abaxially, persistent in fruit; disk cupular, shallowly undulate at apex; stamens 3; filaments free. Female flowers: pedicels ca. 8 mm; sepals and disk as in male; ovary globose; styles 3, spreading, deeply bifid. Fruiting pedicels 5–10 mm, delicate; capsules globose, 3–4(–5) mm in diam., red, smooth, 3-locular. Seeds trigonous, 2–2.5 × 1.5–2 mm. Fl. Jun–Sep, fr. Jul–Nov.

Open forests, riverside scrub; 800–3000 m. Guangxi, Guizhou, Xizang, Yunnan [India, Myanmar, Pakistan, Thailand, Vietnam].

**18. *Phyllanthus urinaria*** Linnaeus, Sp. Pl. 2: 982. 1753.

叶下珠 ye xia zhu

*Diasperus urinaria* (Linnaeus) Kuntze; *Phyllanthus alatus* Blume; *P. cantoniensis* Hornemann; *P. cantoniensis* Schweigger (1812), not Hornemann (1807); *P. chamaepeuce* Ridley; *P. lepidocarpus* Siebold & Zuccarini; *P. leprocarpus* Wight; *P. nozeranii* Rossignol & Haicour.

Annual herbs, erect or procumbent, up to 80 cm tall; stem much branched at base; branches prostrate to ascending, winged, hispidulous along one side. Leaves distichous; stipules ovate-lanceolate, ca. 1.5 mm, base conspicuously auriculate; petiole very short; leaf blade papery, oblong or oblong-obovate or nearly linear, sometimes slightly falcate, 4–10 × 2–5 mm, abaxially gray-green or pale, or sometimes reddish tinged, adaxially bright or dark green, base mostly obtuse, sometimes conspicuously oblique, margin ciliate, apex rounded, obtuse, or acutely mucronulate; lateral veins 4 or 5 pairs, conspicuous. Plants monoecious. Flower fascicles male along distal part of branchlets, 2–4-flowered, female along middle and lower part of branchlets, 1-flowered; pedicel ca. 0.5 mm, with 1–2 bracteoles at base. Male flowers: sepals 6, elliptic to oblong-obovate, 0.3–0.6 × 0.2–0.4 mm, yellowish white, apex obtuse; disk glands 6, green; stamens 3; filaments completely united into a slender column. Female flowers: pedicels ca. 0.5 mm; sepals 6, ovate to ovate-lanceolate, subequal, ca. 1 mm, margin membranous, yellowish white, persistent in fruit; disk orbicular, entire; ovary ovoid or spherical, with conspicuous raised scales; styles 3, free, bifid at apex, lobes revolute. Capsules globose, 2–2.5 mm in diam., with reddish blotches, scurfy-tuberculate. Seed 3-sided, 1–1.2 × 0.9–1 mm, light grayish brown, with 12–15 sharp transverse ridges on back and sides, often with 1–3 deep circular pits on side. Fl. Apr–Jun, fr. Jul–Nov.

Dry fields, roadsides, wastelands, forest margins; below 100–600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Laos, Malaysia, Nepal, Sri Lanka, Thailand, Vietnam; South America].

**19. *Phyllanthus arenarius*** Beille in Lecomte, Fl. Indo-Chine 5: 587. 1927.

沙地叶下珠 sha di ye xia zhu

Perennial herbs, glabrous throughout; stem erect or slightly prostrate to ascending, up to 30 cm tall, woody at base, purplish. Stipules narrowly triangular, less than 1 mm, deep purple; petiole very short; leaf blade elliptic or obovate, 3–15 × 2.5–10 mm, thinly leathery or papery, base broadly cuneate or obtuse, slightly oblique, margin slightly revolute when dry, apex rounded, mucronate; lateral veins ca. 3 pairs. Plants monoecious. Inflorescences axillary, unisexual, with many bracteoles at base; bracteoles many, ovate, apex acute, brown; male inflorescences along upper parts of branchlets, 2-flowered, usually only 1 flower developed, female inflorescences along middle to lower part of branchlets, 1-flowered. Male flowers: pedicels short; sepals 6, oblong or obovate, subequal, ca. 0.5 mm, margin membranous; disk glands 6, small; stamens 3; filaments connate at base; anthers longitudinally dehiscent. Female flowers: pedicels very short; sepals 6, shape as in male, ca. 0.7 mm, apex obtuse, purple; disk patelliform, margin entire; ovary globose, 3-celled; styles 3, free, bifid at apex, lobes revolute. Capsules



globose-triangular, 2.5–3 mm in diam. Seed brownish; testa granular. Fl. May–Jul or Aug, fr. Jun–Oct.

Coastal sandy loam soil, montane open forests; below 100–1300 m. Guangdong, Hainan, SW Yunnan [Vietnam].

- 1a. Leaf blade 3–9 × 2.5–4.5 mm ..... 19a. var. *arenarius*  
1b. Leaf blade ca. 15 × 10 mm ..... 19b. var. *yunnanensis*

**19a. *Phyllanthus arenarius* var. *arenarius***

沙地叶下珠(原变种) sha di ye xia zhu (yuan bian zhong)

Leaf blade 3–9 × 2.5–4.5 mm. Fl. May–Jun, fr. Jun–Oct.

Coastal sandy loam soil; below 100–200 m. Guangdong, Hainan [Vietnam].

**19b. *Phyllanthus arenarius* var. *yunnanensis* T. L. Chin, Acta Phytotax. Sin. 19: 350. 1981.**

云南沙地叶下珠 yun nan sha di ye xia zhu

Leaf blade larger, ca. 15 × 10 mm. Fl. Aug.

- Open forests; ca. 1300 m. SW Yunnan.

**20. *Phyllanthus amarus* Shumacher & Thonning, Kongl. Danske Vidensk. Selsk. Skr. 4: 195. 1829.**

苦味叶下珠 ku wei ye xia zhu

Annual or biennial, rarely perennial, herbs, 10–170 cm tall or long, erect or prostrate, glabrous throughout; stem simple, base woody, or slightly so and yellowish, straw yellow, or brownish, branched, terete, green at upper part, leaves reduced to lanceolate or triangular scales. Leaves distichous; stipules linear or linear-lanceolate, green; petioles ca. 0.5 mm; leaf blade oblong or elliptic-oblong, 3–8 × 2–4.5 mm, membranous or thinly papery, base rounded, apex obtuse or rounded and often apiculate; lateral veins 4–7 pairs, slightly conspicuous abaxially, obscure adaxially. Plants monoecious. Flower fascicles along lower part of leafy shoots usually male, those in middle usually often bisexual with 1 female and 1 male flower, those toward branchlet apex often female. Male flowers: pedicel 0.5–1 mm; sepals 5, elliptic or ovate, ca. 0.5 × 0.2 mm, yellowish green, margin membranous, apex abruptly acute; disk glands 5, orbicular or obovate, or spatulate, apex truncate or retuse, ca. 0.1 mm in diam., entire; stamens (2 or) 3; filaments completely connate into a column, 0.2–0.3 mm high; anthers sessile, 1 often reduced to a single anther sac (or sometimes only 2 functional anthers present), anther sacs divergent, slits completely confluent, dehiscence oblique to less commonly horizontal. Female flowers: pedicels 0.6–1 mm; sepals 5, obovate-oblong or ovate, 0.8–1 × 0.4–6 mm, margin membranous, apex obtuse or acute; disk flat or subulate, deeply 5-lobed; ovary globose-triangular, ca. 0.5 × 0.5 mm, smooth; styles free, erect or ascending, apex shallowly bifid. Fruiting pedicels 1–1.5 mm, dilated at apex; capsules smooth. Seed sharply 3-angled, 0.9–1 × 0.7–0.8 mm, light brown or yellowish brown, radially and with 5 or 6 straight parallel longitudinal ribs on back, minutely transversely striate with hygroscopic cells which project as hyaline setae with a pronounced notching of lumen. Fl. and fr. throughout year.

Dry fields, roadsides, wastelands, forest margin, scrubby woods; below 100–600 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [pantropical weed possibly originating in the Americas].

- 1a. Herbs annual, erect, to 50 cm tall; branches alternate; male disk orbicular, not glandular, flattened, connate at base; female disk as in male ..... 20a. subsp. *amarus*  
1b. Herbs biennial or perennial, erect to trailing or prostrate, to 170 cm tall; branches fascicled at upper part of stem; male disk glands obovate; female disk glands subulate ..... 20b. subsp. *sanyaensis*

**20a. *Phyllanthus amarus* subsp. *amarus***

苦味叶下珠(原亚种) ku wei ye xia zhu (yuan ya zhong)

*Phyllanthus nanus* J. D. Hooker; *P. swartzii* Kostelezky.

Herbs annual, erect, up to 50 cm tall; branches alternate. Male and female disk orbicular, not glandular, flattened, connate at base. Pollen grains ellipsoid, not smooth, finely reticulate. Fl. and fr. throughout year.

Dry fields, roadsides, wastelands, forest margins, scrubby woods; below 100–600 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [pantropical weed possibly originating in the Americas].

*Phyllanthus amarus* was initially misidentified as *P. niruri* Linnaeus (P. T. Li, Fl. Reipubl. Popularis Sin. 44(1): 101. 1994); it has also been confused with *P. urinaria* Linnaeus.

All parts are used as medicine for hepatitis.

**20b. *Phyllanthus amarus* subsp. *sanyaensis* P. T. Li & Y. T. Zhu, J. S. China Agric. Univ. 17(3): 118. 1996.**

三亚叶下珠 san ya ye xia zhu

Herbs biennial or perennial, erect to trailing or prostrate, up to 170 cm tall; branches alternate, but fascicled at upper part of stem. Male disk glands obovate, female disk glands subulate. Pollen grains prolate, smooth, not reticulate. Fl. Apr–Aug, fr. Jun–Nov.

- Wastelands, dry fields, scrubby woods; below 100–300 m. S Guangdong, Hainan.

**21. *Phyllanthus myrtifolius* (Wight) Müller Argoviensis in A. Candolle, Prodr. 15(2): 396. 1866.**

瘤腺叶下珠 liu xian ye xia zhu

*Macraea myrtifolia* Wight, Icon. Pl. Ind. Orient. 5: 27. 1852; *Phyllanthus myrtifolius* Moon ex J. D. Hooker.

Shrubs ca. 0.5(–3) m tall; branches terete, upper parts puberulent; branchlets wing-angled, angles scabridulous or hispidulous. Stipules small, ovate, 0.5–0.7 mm; petiole 0.7–1.7 mm; leaf blade oblanceolate, (10–)12–16(–25) × (2–)3.5–4.5(–8) mm, leathery, glabrous, base shallowly cordate, apex acute or obtuse; lateral veins numerous, subhorizontally spreading. Plants monoecious. Inflorescence an axillary several-flowered fascicle; pedicels filamentous, unequal, 3–5 mm. Male flowers ca. 3 mm in diam.; sepals 5, oblong; disk glands 5, orbicular; stamens 3; filaments connate at middle part to base. Female flowers: pedicel 6–8 mm; sepals 6, 0.8–1 × 0.3–0.5 mm; disk cup-shaped, entire; ovary globose, 3-celled; styles 3, short, bifid at apex, recurved. Capsules obovate, ca. 2 × 3 mm, glabrous, valves crustaceous. Seed 3-angled, 1.7–2 mm, brown, reticu-

late-striped. Fl. May–Aug, fr. Aug–Nov.

Cultivated for medicine. S Guangdong, Hainan (Haikou, Wanning), Taiwan (Taibei) [native to Sri Lanka].

**22. *Phyllanthus rheophyticus*** M. G. Gilbert & P. T. Li, *sp. nov.*

水油甘 shui you gan

Type: China. Hainan: Changjiang Xian, Ngo Ko Shan, near Tsat Cha village, 9 Jun 1933, *S. K. Lau 1901* (holotype, BM; isotype, IBSC); Lingshui Xian, Bai Shui Ling, 18°42'15"N, 109°50'12"E, 600 m, 30 Nov 2000, *MO-IBSC expedition to Hainan 272* (paratype, BM).

*Species* *Phyllanthi parvifolii Buchanan-Hamilton ex D. Don adhuc inclusa sed caulibus lignosis rigidis erectis vel ascendentibus, caulibus foliis ad apicibus congestibus semper solitaribus, brachyblastis non vidit, foliis majoribus (6–11 × 2–4 mm, non ca. 2 × 4 mm) manifeste differt.*

Erect shrubs, up to 2 m tall, glabrous throughout; stem gray-brown; branchlets usually clustered at tips of stems, to 16 cm, transversely compressed, slightly quadrangular, adaxially flattened to grooved. Stipules ovate-triangular, ca. 1 mm, brownish red; petiole ca. 1 mm, transversely wrinkled abaxially; leaf blade oblong or elliptic, 6–11 × 2–4 mm, thinly leathery, glossy dark green when fresh, drying gray-green, slightly paler abaxially, base slightly obliquely cuneate to rounded, margin revolute, apex acute with brown-reddish mucro; lateral veins 4–7 pairs, abaxially raised in dried material. Plants monoecious. Inflorescence an axillary fascicle, usually bisexual with 2–4 male flowers and 1 female flower. Male flowers: pedicels 1–2 mm; sepals 6, ovate-lanceolate or obovate, 1–2 mm, yellow-white or white-green, margins membranous; disk glands 6, globose; stamens 3; filaments connate for ca. half length; anthers oblong, ca. 0.2 mm, thecae parallel, longitudinally dehiscent, connectives slightly mucronate. Female flowers: pedicels ca. 2 mm; sepals as in male, ca. 1.2 × 0.8–1 mm, thickened and persistent in fruit; disk annular, thin, shallowly 6-lobed, dark and reflexed in fruit; ovary globose, ca. 1 mm in diam., 3-locular; styles 3, connate at base, bifid at apex, lobes slightly revolute. Capsule globose, ca. 3 mm in diam. Seeds brown, segmentiform, ca. 1.5 mm, initially yellowish buff becoming light brown minutely speckled red. Fl. Jun–Sep, fr. Aug–Nov.

• Among rocks in riverbeds, open forests, scrub on moist slopes; 300–600 m. Guangdong, Hainan.

Material of this species, which is locally abundant along some rivers, has been named as the Himalayan species *Phyllanthus parvifolius* Buchanan-Hamilton ex D. Don. It differs most obviously by the habit, with the leafy branchlets congested toward the apices of the stiffly erect or ascending long shoots, whereas in *P. parvifolius* leafy stems are produced along the length of the more slender and spreading long shoots and mostly in groups from short shoots. Other differences are the larger leaves (nearly always ca. 4 × 2 mm in *P. parvifolius*) and the broader stipules. No material available shows both good flowers and mature fruits. The holotype, *S. K. Lau 1901* (BM), has the best flowers, whereas the paratype, *MO-IBSC expedition to Hainan 272* (BM), has the best fruits. Michael Gilbert has not seen any material from Guangdong. Records of *P. parvifolius* from Yunnan seem better placed in *P. cochinchinensis*.

**23. *Phyllanthus pachyphyllus*** Müller Argoviensis in A. Candolle, *Prodr.* 15(2): 353. 1866.

崖县叶下珠 ya xian ye xia zhu

*Phyllanthus annamensis* Beille; *P. campanulatus* Ridley; *P. coriaceus* Wallich ex J. D. Hooker; *P. frondosus* Wallich ex Müller Argoviensis var. *rigidus* Ridley; *P. klossii* Ridley; *P. sciadiostylus* Airy Shaw.

Erect shrubs up to 4 m tall, glabrous throughout; stem gray-brown; branchlets sharply 4-angled. Stipules ovate-triangular, ca. 1 mm; petiole 2–3 mm; leaf blade ovate-lanceolate or rhombic, 3–14 × 1.5–3.5 cm, thinly leathery, base broadly cuneate, margin revolute when dry, apex acuminate, slightly caudate; lateral veins (4–)6–8 pairs. Plants monoecious. Inflorescence a bisexual fascicle, axillary or along specialized leafless branchlets, 2–10 cm, usually with 1–3 female and 2–6 male flowers, with many 2–3 mm scaly bracts. Male flowers ca. 4 mm in diam.; pedicels 1–2(–3) mm; sepals 6, obovate, subequal, ca. 1.5 mm, apex obtuse or acute, margin membranous; stamens 3; filaments connate, ca. 1 mm; thecae parallel, longitudinally dehiscent; pollen grain spherical or oblate-spherical, 6-colporate, rarely 4- or 5-colporate or forate-colpate; disk glands 6. Female flowers ca. 4 mm in diam.; pedicels 1–3.5 mm; sepals 6, obovate, ca. 1.5 × 1.5 mm, margin membranous, persistent in fruit; disk cup-shaped, membranous, slightly lacerate at apex; ovary ovoid, ca. 1.3 mm in diam., 3-celled; styles 3, ca. 1 mm, connate at base, bifid at apex, lobes recurved and slightly appressed to apex of ovary. Fruiting pedicel ca. 4 mm; capsule globose, ca. 4 mm in diam., red. Seed red, ca. 2 mm in diam. Fl. Mar–Jun, fr. May–Sep.

Open montane forests, disturbed scrub, riversides; 100–600 m. S Hainan (Sanya) [Malaysia, Thailand, Vietnam].

**24. *Phyllanthus cochinchinensis*** (Loureiro) Sprengel, *Syst. Veg.* 3: 21. 1826.

越南叶下珠 yue nan ye xia zhu

*Cathetus cochinchinensis* Loureiro, *Fl. Cochinch.* 2: 608. 1790; *Phyllanthus cinerascens* Hooker & Arnott; *P. embergeri* Haicour & Rossignol; *P. fasciculatus* Müller Argoviensis; *P. roeperianus* Müller Argoviensis; *P. urinaria* Linnaeus subsp. *rudicarpus* Rossignol & Haicour.

Shrubs up to 3 m tall; stem yellowish brown or gray-brown; branchlets 10–30 cm, yellowish brown pubescent when young, glabrescent. Leaves spirally arranged or 3–5-fascicled on cushion-shaped short branches; stipules reddish brown, ovate-triangular, ca. 2 mm, base cordate, margin ciliate, apex caudate-acuminate, persistent; petiole 1–2 mm, velvety-papillate [pubescent to glabrous]; leaf blade obovate, oblong-obovate, or spatulate, 1–2 × 0.6–1.3 cm, leathery, base attenuate, margin narrowly revolute when dry, apex obtuse or rounded, rarely retuse; midrib slightly raised on both surfaces, lateral veins obscure. Plants dioecious or monoecious. Inflorescence a 1( or 2)-flowered axillary fascicle; bracts many, membranous, densely yellow-brown hairy, margins fimbriate. Male flowers: pedicels ca. 3 mm; sepals 6, obovate or spatulate, ca. 1.3 × 1–1.2 mm, thicker at base, margin membranous; disk glands 6, obconical, ±

confluent into ring; stamens 3; filaments connate to middle; thecae parallel, longitudinally dehiscent. Female flowers: pedicels 2–3 mm; sepals 6, ovate or ovate-rhombic, 1.5–1.8 × ca. 1.5 mm, margin membranous, thicker at base; disk suburceolate; ovary globose, ca. 1.2 mm in diam., 3-celled; styles 3, ca. 1.1 mm, connate at middle to base, bifid at apex, recurved. Capsules globose, ca. 5 mm in diam. Seeds ovoid-segmentiform, ca. 2 × 2 mm; testa thin, cells with prominent dark, domed centers. Fl. and fr. Jun–Dec.

Montane sparse forests, forest margins, scrub on slopes, wastelands; 500–800(–3000) m. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Xizang, Yunnan [Cambodia, India, Laos, Vietnam].

*Phyllanthus cochinchinensis* has been confused with *P. acidus* (Linnaeus) Skeels. The gathering *G. Forrest 11181* is tentatively placed here but is only up to 30 cm high, grows at 3000 m, and has purple-black fruits.

**25. *Phyllanthus tsarongensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 177. 1921.

西南叶下珠 xi nan ye xia zhu

Shrubs up to 3 m tall; branches robust, gray-brown; branchlets slender, 5–10 cm, angular, green, puberulent when young, glabrescent. Stipules linear-lanceolate, ca. 1 mm, persistent; petiole ca. 0.5 mm; leaf blade oblong or lanceolate, usually largest on flowering branches and middle parts of branchlets, ca. 10 × 5 mm, 2–5 × 1–3 mm at upper and lower parts of branchlets, papery to thickly so, base shallowly cordate, margin revolute, apex obtuse and mucronulate; midrib and lateral veins flattened adaxially, raised abaxially, lateral veins 5 or 6 pairs. Plants monoecious. Inflorescence a 4–6-flowered axillary fascicle; pedicels ca. 1 mm, with scaly bracteoles at base. Male flowers: sepals 6, oblong, ca. 1 mm, yellowish, entire; disk glands 6, round; stamens 3, nearly as long as sepals; filaments connate; anthers oblong, thecae longitudinally dehiscent. Female flowers: sepals 6, as in male; disk disk-shaped, slightly fleshy, entire; ovary obovate, smooth, 3-celled; styles 3, free, enlarged and shallowly bifid at apex, lobes revolute. Capsules obovate, ca. 2.5 × 3.5 mm, smooth. Seed triangular, 1.5–2 mm, yellowish, smooth. Fl. Jul–Oct, fr. Oct–Dec.

• Open montane forests or scrub; 1500–4000 m. Sichuan, Xizang, Yunnan.

All parts are used as medicine for urolithiasis.

**26. *Phyllanthus tsiangii*** P. T. Li, Acta Phytotax. Sin. 25: 375. 1987.

红叶下珠 hong ye xia zhu

*Nymphanthus ruber* Loureiro, Fl. Cochinch. 2: 544. 1790 [“*rubra*”]; *Phyllanthus ruber* (Loureiro) Sprengel (1826), not Noroña (1790).

Shrubs or treelets, 1–3(–6) m tall, monoecious; stem brown-reddish, usually branching at apex; branchlets 10–20 cm, with anchor-shaped hairs. Stipules triangular, ca. 2 mm, brown-reddish; petiole 2–3 mm, with anchor-shaped hairs; leaf blade elliptic, ovate, or ovate-lanceolate, 2.5–7.5 × 1–3.5 cm, papery, glabrous except for pubescent base of midrib, base broadly cuneate or obtuse, sometimes oblique, margin revolute when dry, apex acuminate or caudate-acuminate; lateral veins 5 or 6 pairs.

Plants monoecious. Inflorescence an axillary fascicle, male usually 2–6-flowered along proximal part of branchlets. Male flowers: pedicels filamentous, 3–6 mm; sepals 4, elliptic or ovate, subequal, 2–2.5 × ca. 1.2 mm, yellow-green, adaxially keeled; disk glands 4, spherical; stamens 2; filaments connate into column; anthers connivent, divergent at base, longitudinally dehiscent. Female flowers ca. 4 mm; pedicels 18–25 mm, thicker at apex; sepals 6, as in male, persistent in fruit; disk cup-shaped, thickened, crenate at apex, base with 6 triangular glands, alternating with sepals; ovary globose, ca. 2.5 mm, 4–6-celled; styles 4–6, free, erect, 1–1.5 mm, bifid at apex. Capsules globose, ca. 6 mm in diam., reddish brown, with 4–6 longitudinal grooves. Seeds yellowish brown, ca. 2 × 1 mm. Fl. Apr–Oct, fr. Jul–Apr.

Open montane forests, valley scrub; 200–600 m. S Hainan [Vietnam].

**27. *Phyllanthus ussuriensis*** Ruprecht & Maximowicz, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 15: 222. 1856.

蜜柑草 mi gan cao

*Phyllanthus matsumurae* Hayata; *P. simplex* Retzius var. *chinensis* Müller Argoviensis; *P. simplex* var. *ussuriensis* (Ruprecht & Maximowicz) Müller Argoviensis; *P. wilfordii* Croizat & F. P. Metcalf.

Annual herbs, up to 60 cm tall, monoecious, glabrous throughout; stem erect, usually branched at base; branches delicate; branchlets angular. Stipules ovate-lanceolate; petiole very short to almost absent; leaf blade elliptic to oblong, 5–15 × 3–6 mm, papery, abaxially white-green, base rounded, apex acute to obtuse; lateral veins 5 or 6 pairs. Inflorescence an axillary fascicle, 1- to several flowered; pedicels ca. 2 mm, filamentous, with several bracteoles. Male flowers: sepals 4, broadly ovate; disk glands 4, free; stamens 2; filaments free; thecae longitudinally dehiscent. Female flowers: sepals 6, oblong-elliptic, reflexed in fruit; disk glands 6, oblong; ovary ovate, 3-celled; styles 3, bifid at apex. Fruiting pedicels short; capsules obovate, ca. 2.5 mm in diam., smooth. Seeds ca. 1.2 mm, tawny, brown tuberculate. Fl. Apr–Jul, fr. Jul–Oct.

Montane slopes, grasslands, wastelands, pathsides. Anhui, Fujian, Guangdong, Guangxi, Heilongjiang, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shandong, Taiwan, Zhejiang [Japan, Korea, Mongolia, SE Russia].

All parts are used medicinally as an astringent or antidiarrheal.

**28. *Phyllanthus taxodiifolius*** Beille in Lecomte, Fl. Gen. Indo-Chine 5: 605. 1927.

落羽杉叶下珠 luo yu shan ye xia zhu

Shrubs up to 2 m tall, monoecious, glabrous throughout; branches 4-angled, up to 5 cm. Leaves densely distichous; stipules lanceolate, ca. 2 mm; petiole very short; leaf blade linear-oblong, (3–)5–6 × (0.5–)1–2 mm, thickly papery to thinly leathery, base and apex obtuse; lateral veins obscure. Inflorescences axillary, along proximal part of branchlets, 1-flowered. Male flowers: pedicels filamentous, ca. 2 mm; sepals 4, obovate, ca. 1 mm, valvate; disk glands 4, membranous, obovate; stamens 2; filaments ca. 0.1 mm, connate. Female flowers: pedicels ca. 2 mm; sepals 6, ovate, ca. 1.5 mm, entire; disk cup-shaped, surrounding ovary base, apex irregularly sinuate; ovary ovoid;

styles 3, bifid at apex. Fruiting pedicel 2.7–3 mm; capsules globose, 4–5 mm in diam., pericarp thin, brownish, 3-locular. Seeds 3-angled, 2.5–2.7 × 1–1.5 mm, papillate. Fl. Jul–Sep, fr. Sep–Dec.

Montane scrub forests or forest margins; 500–800 m. SW Guangxi, S Yunnan [Cambodia, Thailand, Vietnam].

**29. *Phyllanthus nanellus*** P. T. Li, Acta Phytotax. Sin. 25: 376. 1987.

单花水油甘 dan hua shui you gan

Shrubs up to 1 m tall, monoecious, glabrous throughout; stem terete, gray-brown; branches angular; branchlets alternate or 2–4-fascicled, flattened, 2-winged. Leaves distichous; stipules triangular, margin membranous; petiole very short to almost absent; leaf blade ovate or oblong-ovate, 4–5 × ca. 2 mm, thinly leathery, base oblique, apex acute; lateral veins 3 pairs, obscure abaxially, slightly conspicuous adaxially. Inflorescences axillary, usually 1-flowered; pedicels ca. 2 mm. Male flowers: sepals 4, rounded, ca. 1 mm, margin membranous; disk glands 4, oblong-ovate; stamens 2; filaments connate into column; anthers parallel, thecae transversely dehiscent. Female flowers: sepals 6, broadly ovate, ca. 1.2 mm, persistent in fruit; disk discoid, surrounding ovary base; ovary globose, 3-celled; styles 3, bifid at apex. Capsule globose, ca. 3 mm in diam., brownish. Fl. and fr. throughout year.

• Montane sparse forests, rivulets, scrub; 300–400 m. S Hainan.

**30. *Phyllanthus guangdongensis*** P. T. Li, Acta Phytotax. Sin. 25: 375. 1987.

广东叶下珠 guang dong ye xia zhu

Shrubs ca. 1 m tall, monoecious, glabrous throughout; stem and branches terete. Stipules broadly ovate, ca. 1 mm; petiole 2–3 mm; leaf blade elliptic or ovate, 3–4.5 × 1.3–1.7 cm, papery, base rounded, apex shortly acuminate; lateral veins 6–9 pairs, usually obscure. Inflorescences axillary, 1- or 2-flowered, male along proximal part of branchlets, female distal. Male flowers: pedicels delicate, 5–7 mm; sepals 4, broadly ovate, ca. 2 × 1.5 mm, red, entire; disk 4-lobed, lobes semiorbicular; stamens 2; filaments connate into short column; thecae longitudinally dehiscent. Female flowers: pedicels 2–5 cm; sepals 6, broadly ovate, ca. 3 × 2 mm, persistent in fruit; disk discoid, surrounding ovary base; ovary globose, 3-celled; styles 3, spreading, adnate to ovary at apex, bifid at apex, lobes revolute. Fruiting pedicels 2.5–5 cm; capsules globose, to 7 mm in diam. Fl. Oct–Nov, fr. Nov–Dec.

• Montane sparse forests; 300–500 m. SW and W Guangdong.

**31. *Phyllanthus bodinieri*** (H. Léveillé) Rehder, J. Arnold Arbor. 18: 212. 1937.

贵州叶下珠 gui zhou ye xia zhu

*Sterculia bodinieri* H. Léveillé, Fl. Kouy-Tchéou, 406. 1914–1915.

Shrubs up to 1 m tall, monoecious, glabrous throughout; branches grayish, lenticellate; branchlets angular-winged. Leaves distichous; petiole ca. 1 mm; leaf blade ovate-lanceolate, 2–3.5 × 0.8–1.2 cm, thinly leathery, abaxially brownish, adaxially yellowish green, base broadly cuneate, margin revolute when dry; midrib elevated on both surfaces, lateral veins 4 or 5 pairs, obscure. Plants monoecious. Inflorescence an axillary fascicle, ca. 7-flowered. Male flowers ca. 4 mm in diam.; pedicels delicate, 3–8 mm; sepals 4, broadly ovate, purple-red, entire; disk glands 4, broadly elliptic, free, horizontal, middle concave inside; stamens 2, connate; thecae 2, transversely dehiscent. Female flowers 4–4.5 mm in diam.; pedicels 6–10 mm; sepals 6, broadly ovate; disk cup-shaped; ovary globose, 3-celled; styles 3, bifid at apex. Capsules globose. Fl. Sep–Oct, fr. Oct–Nov.

• Montane sparse forests; 500–1000 m. SE Guangxi, SE Guizhou.

The roots and leaves are used as medicine for traumatic injury.

**32. *Phyllanthus fangchengensis*** P. T. Li, Acta Phytotax. Sin. 25: 377. 1987.

尖叶下珠 jian ye xia zhu

Shrubs ca. 1 m tall, glabrous throughout; stem terete, brownish; branchlets gray-green, winged, lenticellate. Leaves distichous; stipules triangular, ca. 2 mm, brown, margin membranous; petiole 1–2 mm; leaf blade lanceolate, 2–6 × 0.7–1.3 cm, papery, abaxially greenish, adaxially dark green, base rounded or obtuse, margin revolute when dry. Plants monoecious. Inflorescence an axillary fascicle, bisexual with 1 male and 2 or 3 female flowers. Male flowers: pedicels delicate, 1–1.5 cm; sepals 4, broadly ovate, ca. 2 × 1.7 mm, whitish, apex rounded; disk glands 4, reniform or semiorbicular, entire; stamens 2; filaments connate; thecae 2-celled, longitudinally dehiscent. Female flowers: pedicels 2–2.3 cm; sepals 6, in 2 series of 3, ovate to broadly so, 2–2.5 × 1.5–2 mm, entire, persistent in fruit; disk discoid, fleshy, apex subentire, surrounding ovary at base; ovary globose, ca. 2 mm in diam., 3-celled; styles 3, free, bifid at apex, lobes linear, inflected. Capsule globose, ca. 5 mm in diam., reddish, 3-valved when mature. Fl. Apr–Jul, fr. Jul–Oct.

• Valleys, rivulets, scrub; 200–400 m. SE Guangxi.

## 9. PHYLLANTHODENDRON Hemsley, Hooker's Icon. Pl. 26: ad t. 2563, 2564. 1898.

珠子木属 zhu zi mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Trees or shrubs, monoecious or dioecious, hairs simple, often absent. Leaves alternate, usually distichous; stipules small, caducous; petiole short; leaf blade simple, margin entire, venation pinnate. Inflorescences axillary, 1-flowered; pedicels often slender. Male flowers: sepals (4 or) 5 or 6, free, in 2 series, imbricate, oblong-elliptic, midrib elevated abaxially, apex caudate-acuminate; petals absent; disk segments (4 or) 5 or 6, shorter than sepals, ligulate or oblong, entire; stamens 3(or) 4; filaments connate into a terete

column; anthers 2-locular, longitudinally dehiscent, connectives subulate-acuminate at apex. Female flowers: sepals and disk segments 5 or 6; ovary 3-locular; ovules 2 per locule; styles 3, apex usually not lobed, often erect. Fruit a capsule, subglobose, septicidally and loculicidally dehiscent into 3 2-valved cocci when mature. Seeds 3-angled.

About 16 species: Peninsular Malaysia to China; ten species (nine endemic) in China.

*Phyllanthodendron* is a very easily identifiable segregate that nests within *Phyllanthus*, retained here for convenience. It can be easily distinguished by the distinctly caudate-acuminate sepals, linear to spatulate disk glands, and extended anther connectives.

1a. Branches terete.

2a. Branches, ovaries, and fruits pubescent or hispidulous; leaves abaxially brown or brown-red when dry.

3a. Young leaves and stipules abaxially puberulent, glabrescent; midrib and lateral veins raised on both surfaces ..... 1. *P. yunnanense*

3b. Leaves and stipules abaxially glabrous; midrib and lateral veins adaxially flattened ..... 2. *P. roseum*

2b. Branches, ovaries, and fruits glabrous; leaves abaxially glaucous when dry.

4a. Leaf blade obovate, papery, base cuneate or broadly so; lateral and reticulate veins abaxially flattened; disk segments spatulate; ovary globose, styles short, bifid to middle ..... 3. *P. petraeum*

4b. Leaf blade rounded, leathery, base rounded or shallowly cordate; lateral and reticulate veins abaxially raised; disk segments ligulate or oblong; ovary ovoid, styles longer, bifid to nearly base ..... 4. *P. orbicularifolium*

1b. Branches angular to prominently winged.

5a. Branchlets angular, pubescent.

6a. Leaf blade base oblique; male sepals 6 ..... 5. *P. breynioides*

6b. Leaf blade base symmetrical; male sepals 5.

7a. Pedicels 1–2 mm; branches usually apically clustered; leaves of fertile branches 1–3 × 0.5–1.5 cm, leaf blade abaxially glaucous, lateral veins 6–8 pairs; veins of leaves, petioles, and stipules pilose; fruits glabrous ..... 6. *P. anthopotamicum*

7b. Pedicels 10–25 mm; branches not clustered; leaves of fertile branches 6–12 × 2.5–4.5 cm, leaf blade abaxially greenish, lateral veins 8–12 pairs; veins of leaves, petioles, and stipules glabrous; fruits pubescent ..... 7. *P. lativenium*

5b. Branchlets prominently winged, glabrous.

8a. Male sepals, disk segments, and stamens 4; ovaries and fruits pubescent ..... 8. *P. moi*

8b. Male sepals and disk segments 5 or 6, stamens 3; ovaries and fruits glabrous.

9a. Leaf blade apex caudate, acumen ca. 1.2 cm, base cuneate or obtuse, lateral veins 10–14 pairs; male sepals and disk segments 6 ..... 9. *P. caudatifolium*

9b. Leaf blade apex acute or acuminate, base rounded, lateral veins 6–8 pairs; male sepals and disk segments 5 ..... 10. *P. dunnianum*

**1. *Phyllanthodendron yunnanense*** Croizat, J. Arnold Arbor. 23: 36. 1942.

云南珠子木 *yun nan zhu zi mu*

*Phyllanthus yunnanensis* (Croizat) Govaerts & Radcliffe-Smith.

Shrubs or treelets 2–7 m tall, monoecious; bark brown; branches terete, brown pubescent when young, glabrescent. Stipules ovate-lanceolate, puberulent outside; petiole 2–5 mm, puberulent when young, glabrous at maturity; leaf blade elliptic or oblong, 6–12 × 2.5–4 cm, thinly leathery, both surfaces glabrous or glabrescent, base obtuse to rounded, apex acuminate; midrib and lateral veins slightly elevated on both surfaces, lateral veins in 8–10 pairs, obliquely ascending, arcuately anastomosing before margins. Inflorescences 1–4-flowered; with several bracteoles at base. Male flowers: pedicel filamentous, 15–40 mm, glabrous; sepals 5, ovate-lanceolate, 3–5 × 1.5–1.8 mm, glabrous midrib elevated abaxially; disk segments 5, ca. 0.8 mm; stamens 3; filaments connate into a terete column; anthers oblong, connectives subulate. Female flowers as in male but larger; pedicel glabrous; sepals and disk segments 6, persistent in fruit; ovary globose, ca. 2.5 mm in diam., 3-locular, hispidulous; styles 3, spreading, entire. Fruiting pedicels 3–4 cm; capsules globose, hispidulous. Fl. Apr–Jul, fr. Jul–Oct.

• Open montane forests; 1600–2300 m. Guizhou, Yunnan.

**2. *Phyllanthodendron roseum*** Craib & Hutchinson, Bull. Misc. Inform. Kew 1910: 23. 1910.

玫花珠子木 *mei hua zhu zi mu*

*Phyllanthodendron album* Craib & Hutchinson; *P. roseum* var. *glabrum* Craib ex Hosseus; *Phyllanthus roseus* (Craib & Hutchinson) Beille.

Shrubs or treelets 3–6 m tall, monoecious; branches terete, puberulent when young. Stipules ovate-lanceolate, ca. 4 mm; petiole 5–8 mm; leaf blade oblanceolate, oblong, or elliptic, 7–16 × 2–5 cm, subleathery, both surfaces glabrous, brown-red when dried, base cuneate or rounded, apex acuminate; midrib and lateral veins flattened adaxially, elevated abaxially, lateral veins in 9–12 pairs, anastomosing before margin. Inflorescences 3–6-flowered. Male flowers: pedicel ca. 10 mm; sepals 5, lanceolate, ca. 3 × 1.5 mm, margins membranous, midrib elevated abaxially; disk segments 5, linear, ca. 1.5 × 0.25 cm, flattened; stamens 3; filament column ca. 0.5 mm; anthers ca. 0.75 mm, connectives acuminate, ca. 1 mm. Female flowers: pedicel ca. 4 cm, slender; sepals 6, oblong-lanceolate, ca. 3.5 × 2 mm; disk segments 6, linear, ca. 1.7 mm; ovary subglobose, 3-locular; styles 3, ca. 0.5 mm. Capsules subglobose, ca. 1.5 cm in diam.,

reddish, exocarp membranous, endocarps horny. Seed ca.  $8 \times 3-3.5$  mm. Fl. Jun–Sep, fr. Sep–Nov.

Montane evergreen broad-leaved woodlands; ca. 1600 m. Yunnan (Menghai) [Laos, Malaysia, Thailand, Vietnam].

**3. *Phyllanthodendron petraeum*** P. T. Li, Bull. Bot. Res., Harbin 7(3): 4. 1987.

岩生珠子木 *yan sheng zhu zi mu*

*Phyllanthus guangxiensis* Govaerts & Radcliffe-Smith (1996), not *Phyllanthus petraeus* Beille (1908).

Shrubs ca. 3 m tall, monoecious, glabrous throughout; stem gray-brown; branches usually apically clustered, terete. Stipules caducous; petiole 3–7 mm; leaf blade obovate,  $3-5 \times 2-3.5$  cm, papery, base cuneate or broadly so, apex rounded, mucronulate; midrib flattened adaxially, slightly elevated abaxially, lateral veins in 6 or 7 pairs, raised above, flattened beneath, anastomosing before margins. Inflorescences 1-flowered. Male flowers: pedicel ca. 2 mm; sepals 6, oblong-lanceolate, ca.  $5.5 \times 2$  mm, midrib elevated abaxially; disk segments 6, spatulate; stamens 3; filaments connate into a terete column; anthers oblong, connectives subulate. Female flowers: pedicel ca. 5 mm; sepals and disk as in male; persistent in fruit; ovary globose, 3-locular; styles 3, short, bifid to middle. Fruiting pedicels ca. 5 mm; capsules globose, ca. 5 mm in diam., smooth. Fl. May–Aug, fr. Jul–Nov.

• Limestone scrub; ca. 1000 m. SW Guangxi.

**4. *Phyllanthodendron orbicularifolium*** P. T. Li, Bull. Bot. Res., Harbin 7(3): 5. 1987.

圆叶珠子木 *yuan ye zhu zi mu*

*Phyllanthus orbicularifolius* (P. T. Li) Govaerts & Radcliffe-Smith.

Shrubs ca. 3.5 m tall, monoecious, glabrous throughout; stem dark brown; branches terete. Stipules oblong, 3–5 mm, caducous; petiole ca. 5 mm; leaf blade orbicular or rotund,  $3.5-6.5 \times 3-5.5$  cm, leathery, red when young, lucid green at maturity, base shallowly cordate or rounded, apex rounded, mucronulate; midrib flattened or slightly retuse adaxially, elevated abaxially, lateral veins in 5 or 6 pairs, reticulate veins raised on both surfaces, anastomosing before margins. Inflorescences 1-flowered. Male flowers: pedicel ca. 2 mm; sepals 5 or 6, oblong-lanceolate, ca.  $4 \times 1.5$  mm, yellow-white, slightly concave inside, midrib elevated abaxially; disk segments 5 or 6, ligulate; stamens 3; filaments connate into a terete column; anthers oblong-ellipsoid, connectives lanceolate. Female flowers: sepals and disk segments 6, shaped as in male; persistent in fruit; ovary ovoid, 3-locular; styles 3, bifid to near base. Fruiting pedicels ca. 7 mm; capsules subglobose, ca. 1.3 cm in diam., brownish, smooth, endocarp yellowish. Seed obscurely 3-angled, ca.  $5 \times 3$  mm, chestnut. Fl. and fr. Aug–Dec.

• 700–800 m. Guangxi.

**5. *Phyllanthodendron breynioides*** P. T. Li, Bull. Bot. Res., Harbin 7(3): 6. 1987.

龙州珠子木 *long zhou zhu zi mu*

*Phyllanthus breynioides* (P. T. Li) Govaerts & Radcliffe-Smith.

Erect shrubs 1–3 m tall, monoecious; branches angular, dark gray, pubescent, internodes shorter than leaf blade. Leaves distichous; stipules lanceolate, ca. 2 mm; petiole 1–2 mm, pubescent; leaf blade ovate to oblong,  $1-3 \times 0.5-1.5$  cm, papery to thickly so, abaxially greenish, adaxially dark green, base obliquely rounded to shallowly cordate; midrib slightly elevated on both surfaces, lateral veins in 5–7 pairs, flattened on both surfaces. Inflorescences 1-flowered, with many bracteoles at base. Male flowers: pedicel ca. 5 mm; sepals 6, oblong-lanceolate, ca.  $3.5 \times 1-1.5$  mm, yellow, apex caudate, midrib elevated abaxially; disk segments 6, linear, ca. 2 mm; stamens 3; filaments connate into a terete column; anthers oblong, connectives lanceolate, as long as thecae. Female flowers: pedicel ca. 6 mm, bracteolate at base; sepals and disk as in male; ovary globose, ca. 1 mm in diam., 3-locular; styles 3, connate at base. Capsules globose, ca. 1 cm in diam. Fl. Jul–Aug, fr. Aug–Dec.

• Sparse lowland forests, limestone scrub; 400–600 m. SW and W Guangxi (Debao, Longzhou).

**6. *Phyllanthodendron anthopotamicum*** (Handel-Mazzetti) Croizat, J. Arnold Arbor. 23: 37. 1942.

珠子木 *zhu zi mu*

*Phyllanthus anthopotamicus* Handel-Mazzetti, Symb. Sin. 7(2): 223. 1931.

Erect shrubs ca. 3 m tall, monoecious; stem gray-brown; branches usually apically clustered, angular, up to 20 cm, gray-green, pubescent when young, glabrescent. Stipules lanceolate 2–4 mm, chestnut, membranous, usually caducous; petiole 2–5 mm, pubescent; leaf blade elliptic, ovate, to broadly ovate, usually smaller,  $1-3 \times 0.5-1.5$  cm, and denser on flowering or fruiting branches, but larger,  $5-13 \times 3-6$  cm, and more distant on sterile shoots, papery to leathery, abaxially glaucous, adaxially green, base broadly cuneate to obtuse, margins slightly revolute, apex acuminate, acute, or obtuse; lateral veins in 6–8 pairs, flattened adaxially, elevated abaxially. Inflorescences 2–4-flowered, with several imbricate bracteoles at base; bracteoles ovate, ca. 1.5 mm. Male flowers: pedicel 1–2 mm; sepals 5, elliptic-lanceolate,  $3-4 \times$  ca. 1.5 mm, slightly concave inside, margins membranous, apex caudate-acuminate, midrib keeled abaxially; disk segments 5, ca. 1 mm; stamens 3, ca. 1.2 mm; filament column ca. 0.6 mm; anthers ellipsoid, ca. 0.3 mm, connectives subulate, ca. 0.3 mm. Female flowers: sepals 6, shaped as in male, persistent in fruit; disk segments 6, ca. 0.5 mm; ovary ovoid, 3-locular; styles 3, shallowly bifid. Capsules globose, 0.5–0.8 cm in diam., brown, endocarp tawny. Seed trigonous-ovoid, ca.  $3 \times 1.5$  mm, tawny. Fl. May–Sep, fr. Sep–Dec.

• Montane sparse forests or scrub; 800–1300 m. Guangdong, Guangxi, Guizhou, Yunnan.

**7. *Phyllanthodendron lativenium*** Croizat, J. Arnold Arbor. 23: 36. 1942.

宽脉珠子木 *kuan mai zhu zi mu*

*Phyllanthus lativenius* (Croizat) Govaerts & Radcliffe-Smith.

Erect shrubs to 3 m tall, monoecious; branches angular, pubescent. Stipules ovate-lanceolate, ca.  $3.5 \times 2$  mm, base cordate; petiole 1–2 mm; leaf blade oblong-elliptic or obovate, 6–12  $\times$  2.5–4.5 cm, papery to thinly leathery, both surfaces glabrous, base cuneate, apex acuminate or obtuse; midrib and lateral veins in 8–12 pairs, elevated on both surfaces. Male flowers: pedicel filamentous, ca. 10 mm; sepals 5, oblong-elliptic, ca.  $3 \times 1$  mm, yellow, apex caudate, midrib elevated abaxially; disk segments 5, ca. 1.5 mm; stamens 3, ca. 2 mm; filaments connate into a terete column. Female flowers: pedicel filamentous, 20–25 mm, slightly thick at apex; sepals 6, oblong, ca.  $5 \times 2$  mm, acute at apex; persistent in fruit; ovary ovoid, 3-locular, pubescent; styles 3. Fruiting pedicels solitary, 3–3.5 cm, slender; capsules globose, pubescent. Fl. May–Jul, fr. Jul–Aug.

• Montane scrub on slopes or sparse forests; 800–1000 m. S and SW Guizhou (Anlong, Ceheng, Wangmo, Xingyi).

**8. *Phyllanthodendron moi*** (P. T. Li) P. T. Li, Bull. Bot. Res., Harbin 7(3): 9. 1987.

弄岗珠子木 nong gang zhu zi mu

*Phyllanthus moi* P. T. Li, Guihaia 3(3): 167. 1983.

Erect shrubs usually ca. 3 m tall, monoecious; stem nearly gray, striped; branchlets angular-winged, glabrous. Stipules narrowly triangular, 3–4 mm, base subauriculate; petiole less than 2 mm, glabrous; leaf blade elliptic to ovate-oblong, 5–10  $\times$  2.5–4.5 cm, thinly papery, both surfaces glabrous, base rounded, apex caudate-acuminate; midrib and lateral veins in 5–7 pairs, slightly elevated on both surfaces, anastomosing before margins. Inflorescences 1- or 2-flowered. Male flowers: pedicel filamentous, 30–35 mm, pubescent at base; sepals 4, lanceolate, ca.  $4.5 \times 1.5$  mm, midrib elevated abaxially; disk segments 4, obovate, ca. 1 mm, membranous; stamens 4, ca. 5 mm; filaments connate into a terete column; anthers oblong, connectives lanceolate, elongated at apex; pistillode terete, shortly 3-fid at apex. Female flowers: pedicel 35–40 mm, pubescent at base; sepals 6, spatulate, ca.  $3.5 \times 1.5$  mm, midrib elevated abaxially; disk segments 6, obovate, ca. 1 mm; ovary globose, 3-locular, pubescent. Capsules subglobose, ca. 0.8 cm in diam., pericarp with convex triangular-reticulate pattern, endocarp horny. Seed broadly ovoid, ca.  $4 \times 3$  mm. Fl. May–Aug, fr. Aug–Nov.

• Montane slopes, valley scrub or thickets; 500–800 m. W Guangxi.

**9. *Phyllanthodendron caudatifolium*** P. T. Li, Bull. Bot. Res., Harbin 7(3): 7. 1987.

尾叶珠子木 wei ye zhu zi mu

*Phyllanthus lii* Govaerts & Radcliffe-Smith (1996), not *Phyllanthus caudatifolius* Merrill (1926).

Erect shrubs ca. 3 m tall, monoecious, glabrous throughout; branches angular-winged. Stipules lanceolate, ca. 4 mm; petiole 2–4 mm; leaf blade obovate or oblong, 5.5–12  $\times$  2–3.5 cm, thickly papery, base broadly cuneate or obtuse, apex caudate-acuminate, acumen ca. 1.2 cm; midrib and lateral veins in 10–14 pairs, slightly elevated on both surfaces, subparallel, ascending to margins, curved anastomosing. Inflorescences 1–3-flowered, with several bracteoles at base; bracteoles ovate-triangular. Male flowers: pedicel filamentous, 20–25 mm; sepals 6, lanceolate, ca. 4 mm, white, midrib elevated abaxially; disk segments 6, linear, ca.  $2 \times 0.2$  mm; stamens 3; filaments connate into a terete column; anthers oblong, connectives subulate. Female flowers: sepals 6, lanceolate, ca. 5 mm, midrib elevated abaxially, persistent in fruit; disk segments 6, linear, ca. 2 mm; ovary globose, 3-locular; styles 3, bifid. Fruiting pedicels to 4 cm, enlarged at apex; capsules globose, ca. 1.5 cm in diam. Fl. May–Jul, fr. Jul–Sep.

• 800–1300 m. Guangxi, Guizhou.

**10. *Phyllanthodendron dunnianum*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 9: 324. 1911.

枝翅珠子木 zhi chi zhu zi mu

*Phyllanthodendron cavaleriei* H. Léveillé; *P. dunnianum* var. *hypoglaucum* H. Léveillé; *Phyllanthus dunnianus* (H. Léveillé) Handel-Mazzetti.

Shrubs or treelets 2–6 m tall, monoecious, glabrous throughout; stem terete; branches  $\pm$  2-winged. Stipules ovate-lanceolate, ca. 3 mm; petiole ca. 2 mm; leaf blade elliptic, ovate, oblong, or ovate-lanceolate, 2.5–10  $\times$  1.5–4 cm, leathery or thickly papery, base rounded, apex acute or shortly acuminate; lateral veins in 6–8 pairs, anastomosing before margins. Inflorescences 1- or 2-flowered. Male flowers: pedicel 3–4 mm; sepals 5, ovate-elliptic, ca. 5 mm, with reticular lines, apex aristate-apiculate; disk segments 5, linear; stamens 3; filaments connate into a terete column; anthers oblong, connectives subulate at apex. Female flowers: pedicel ca. 5 mm; sepals 6, shaped as in male; disk segments 6; ovary ovoid, 3-locular; styles 3. Fruiting pedicels 5–6 mm; capsules globose, 1–1.5 cm in diam. Fl. May–Jul, fr. Jul–Oct.

• Montane broad-leaved forests or limestone scrub; 500–1000 m. Guangxi, Guizhou, Yunnan.

## 10. GLOCHIDION J. R. Forster & G. Forster, Char. Gen. Pl. 57. 1775, nom. cons.

算盘子属 suan pan zi shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Agyneia* Linnaeus; *Bradleia* Banks ex Gaertner [“*Bradleja*”].

Trees or shrubs, monoecious, rarely dioecious; indumentum of simple hairs, often absent. Leaves alternate, distichous, or spiral; stipules thick, mostly persistent; petiole short; leaf blade simple, margin entire, venation pinnate. Flowers axillary or supra-axillary, fascicled or in short cymes or umbels, proximal axils with male flowers, distal axils usually with female flowers, usually distinctly

pedicellate. Male flowers: pedicels slender or almost absent; sepals 5 or 6, imbricate; petals absent; disk absent; stamens 3–8, connate into an oblong or ellipsoid column, shorter than sepals; anthers 2-locular, extrorse, linear, longitudinally dehiscent, connectives prolonged into an erect acumen; pistillode absent. Female flowers: pedicels stout and short or subsessile; sepals as in male, but slightly thicker; ovary globose, 3–15-locular; ovules 2 per locule; styles connate into a short, thick, cylindrical column, apex lobed or toothed, rarely free. Fruit a capsule, globose or depressed globose, ± prominently longitudinally grooved, sunken at apex, dehiscent into 3–15 2-valved cocci when mature, rarely unlobed; exocarp leathery or papery; endocarp crustaceous; styles usually persistent. Seeds not strophiolate, hemispheric or laterally compressed; endosperm fleshy; cotyledon flattened.

About 200 species: chiefly in tropical Asia, the Pacific islands, and Malaysia, a few in tropical America and Africa; 28 species (seven endemic, one introduced) in China.

*Glochidion* is noteworthy for its pollination mechanism, which involves a symbiotic relationship with moths of the genus *Epicephala* closely paralleling that found in *Yucca* (Kato et al., Proc. Natl. Acad. Sci. U.S.A. 100: 5264–5267. 2003).

*Glochidion cavaleriei* H. Léveillé (Repert. Spec. Nov. Regni Veg. 12: 183. 1913) is a synonym for *Illicium majus* J. D. Hooker & Thomson in the Illiciaceae (see Fl. China 7).

- 1a. Stamens 4–6.
  - 2a. Branchlets and leaf blade glabrous.
    - 3a. Leaf blade apex acuminate to caudate-acuminate, adaxially glaucous; stamens 4; sepals sparsely pubescent; style column long cylindrical ..... 1. *G. lanceolatum*
    - 3b. Leaf blade apex acute, obtuse, or rounded, adaxially green to dark green; stamens 5 or 6; sepals glabrous; style column ovoid or conical.
      - 4a. Leaf blade base acute or broadly cuneate; flowers in axillary clusters; male sepals obovate or oblong-obovate; ovary densely pubescent ..... 2. *G. lanceolarium*
      - 4b. Leaf blade base shallowly cordate, truncate, or rounded; flowers in supra-axillary cymes or umbels; male sepals ovate or broadly ovate; ovary glabrous ..... 3. *G. zeylanicum*
  - 2b. Branchlets and leaf blade densely pubescent or tomentose.
    - 5a. Flowers in axillary clusters.
      - 6a. Leaf blade base symmetrical, both surfaces glabrous to sparsely pubescent only on veins, lateral veins prominent; ovary 10-locular ..... 4. *G. coccineum*
      - 6b. Leaf blade base asymmetrical, adaxially glabrous, abaxially pubescent, lateral veins obscure; ovary 4- or 5-locular ..... 5. *G. oblatum*
    - 5b. Flowers usually in supra-axillary cymes.
      - 7a. Male sepals ca. 1 mm; female pedicels to 7 mm; capsules to 8.5 mm in diam., puberulent ..... 6. *G. arborescens*
      - 7b. Male sepals 3–4 mm; female pedicels to 3 mm; capsules to 12 mm in diam., strongly pubescent ..... 7. *G. hirsutum*
- 1b. Stamens 3.
  - 8a. Leaf blade hairy at least on veins.
    - 9a. Leaf blade base asymmetrical.
      - 10a. Sepals 6, ovary pubescent.
        - 11a. Leaf blade abaxially puberulent only on veins; sepals abaxially glabrous ..... 8. *G. rubrum*
        - 11b. Leaf blade abaxially white pubescent; sepals abaxially pubescent ..... 9. *G. triandrum*
      - 10b. Sepals 5, ovary glabrous.
        - 12a. Leaf blade with only midvein and lateral veins pubescent abaxially; male pedicels, sepals outside, and capsules glabrous ..... 10. *G. medogense*
        - 12b. Leaf blade sparsely pubescent on both surfaces; male pedicels, sepals outside, and capsules pubescent ..... 11. *G. nubigenum*
    - 9b. Leaf blade base symmetrical.
      - 13a. Leaves and capsules spreading villous, leaf blade base obtuse, truncate to rounded; style column ca. 3 × as long as ovary ..... 12. *G. eriocarpum*
      - 13b. Leaves and capsules pubescent or tomentose; leaf blade base cuneate, acute, or obtuse; style column not longer than ovary.
        - 14a. Sepals adaxially pubescent; style column shorter than ovary ..... 13. *G. heyneanum*
        - 14b. Sepals adaxially glabrous; style column as long as ovary.
          - 15a. Trees; leaf blade 3–7 cm wide; male sepals elliptic, female sepals ovate; style column cylindrical or subconical ..... 14. *G. lutescens*
          - 15b. Shrubs; leaf blade 1–2.5 cm wide; male and female sepals narrowly oblong or oblong-obovate; styles connate into an annulus ..... 15. *G. puberum*
  - 8b. Leaf blade glabrous.
    - 16a. Leaf blade base asymmetrical.
      - 17a. Outer male sepals larger than inner.



- 18a. Leaf blade oblong or obovate; male pedicels sparsely strongly hispid; anthers linear ..... 16. *G. chademenosocarpum*  
 18b. Leaf blade lanceolate; male pedicels glabrous; anthers not linear ..... 17. *G. kusukusense*  
 17b. Outer male sepals as large as inner.  
 19a. Young branches, ovary, and capsules pubescent ..... 18. *G. philippicum*  
 19b. Young branches, ovary, and capsules glabrous.  
 20a. Leaf blade abaxially greenish, gray-brown when dry; style column depressed globose, ca. 2 mm wide, ca. 2 × wider than ovary ..... 19. *G. sphaerogynum*  
 20b. Leaf blade abaxially white powdery to green, not gray-brown when dry; style column obovoid or cylindrical, less than ca. 1 mm wide, not wider than ovary.  
 21a. Leaf blade abaxially green-gray when dry; lateral veins reddish; male sepals elliptic; style column obovate; capsule 10–15 mm in diam. .... 20. *G. thomsonii*  
 21b. Leaf blade abaxially glaucous when dry; lateral veins not reddish; male sepals oblong; style column cylindrical; capsule 6–8 mm in diam. .... 21. *G. wrightii*  
 16b. Leaf blade base symmetrical.  
 22a. Male pedicels 13–20 mm, pubescent ..... 22. *G. ellipticum*  
 22b. Male pedicels less than 9 mm, glabrous.  
 23a. Branchlets angular; petiole pubescent; leaf blade abaxially gray-glaucous.  
 24a. Midrib of leaf not raised adaxially; ovary puberulent when young; style column clavate ..... 23. *G. daltonii*  
 24b. Midrib of leaf raised adaxially; ovary glabrous; style column cylindrical ..... 24. *G. wilsonii*  
 23b. Branchlets terete; petiole glabrous; leaf blade abaxially not gray-glaucous.  
 25a. Branches pubescent; leaf blade obovate or oblong-obovate; outer sepals equaling inner ones ..... 25. *G. obovatum*  
 25b. Branches glabrous; leaf blade usually ovate, elliptic, or oblong; outer sepals larger than inner ones.  
 26a. Leaf apex caudate-acuminate; male sepals broadly ovate; ovary 5- or 6-locular; style column cylindrical ..... 26. *G. ramiflorum*  
 26b. Leaf apex acuminate to acute; male sepals obovate or oblong-obovate; ovary 3- or 4-locular; style column obconical or subclavate.  
 27a. Leaf blade ovate, obovate, or oblong, apex acute; sepal margins minutely serrate or entire; style column obconical ..... 27. *G. suishaense*  
 27b. Leaf blade oblong or ovate-lanceolate, apex acuminate; sepal margins entire; style column subclavate, apex unequally 3-toothed ..... 28. *G. khasicum*

**1. *Glochidion lanceolatum*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 20(3): 16. 1904.

披针叶算盘子 pi zhen ye suan pan zi

*Glochidion kotoense* Hayata; *G. zeylanicum* (Gaertner) A. Jussieu var. *lanceolatum* (Hayata) M. J. Deng & J. C. Wang.

Treelets ca. 6 m tall, monoecious; branchlets glabrous. Petiole ca. 4 mm; leaf blade lanceolate or oblong-ovate, 5–7 × 2–3 cm, papery or subleathery, glaucous adaxially, brownish green abaxially, glabrous on both surfaces, base acute or rounded, inequilateral, apex acuminate to caudate-acuminate; lateral veins 6 or 7 pairs. Flowers in axillary or supra-axillary cymes. Male flowers: sepals 6, oblong, imbricate; stamens 4(–6), connate; anthers oblong, connectives lanceolate. Female flowers: sepals 6, oblong, sparsely pubescent on both surfaces; ovary subglobose, pubescent, 5-locular; ovules 2 per locule; styles connate into a long cylindrical column, exerted past sepals, 6-lobed at apex. Capsules depressed globose, 8–10 mm in diam., glabrous, 8–10-grooved. Fl. Apr–Jun, fr. Jun–Oct.

- Open forests at low altitudes. Taiwan.

**2. *Glochidion lanceolarium*** (Roxburgh) Voigt, Hort. Suburb. Calcutt. 153. 1845.

艾胶算盘子 ai jiao suan pan zi

*Bradleya lanceolaria* Roxburgh, Fl. Ind., ed. 1832, 3: 697. 1832; *Diasperus benthamianus* Kuntze; *D. lanceolaris* (Roxburgh) Kuntze; *Glochidion cantoniense* Hance; *G. macrophyll-*

*lum* Benth; *G. subsessile* N. P. Balakrishnan & Chakrabarty var. *birmanicum* Chakrabarty & M. Gangopadhyay; *Glochidion acuminata* Wight; *Phyllanthus lanceolaris* (Roxburgh) Müller Argoviensis.

Evergreen shrubs or trees, usually 1–3 m tall, rarely 7–12 m tall, monoecious, glabrous throughout except for hairy ovary and capsule. Stipules triangular-lanceolate, 2.5–3 mm; petiole 3–5 mm; leaf blade elliptic, oblong, or oblong-lanceolate, 6–16 × 2.5–6 cm, leathery, dark green adaxially, yellowish green when dry, base acute or broadly cuneate, slightly decurved, subequilateral; lateral veins 5–7 pairs. Flowers in axillary clusters. Male flowers: pedicels 8–10 mm; sepals 6, obovate or obovate-oblong, ca. 3 mm, yellow; stamens 5 or 6. Female flowers: pedicels 2–4 mm; sepals 6, biseriate, outer larger than inner, outer ones ovate, inner narrowly ovate, 2.5–3 mm; ovary globose, 6–8-locular, densely pubescent; styles connate into an ovoid column, less than 1 mm, subtruncate at apex. Capsules subglobose, 12–18 × 7–10 mm, apex usually concave and puberulent to glabrous, 6–8-grooved. Fl. Apr–Sep, fr. Jul–Feb.

Open forests or scrub; 500–1200 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India, Laos, Thailand, Vietnam].

**3. *Glochidion zeylanicum*** (Gaertner) A. Jussieu, Euphorb. Gen. 107. 1824.

香港算盘子 xiang gang suan pan zi

*Bradleya zeylanica* Gaertner, Fruct. Sem. Pl. 2: 128. 1791; *Agyneia flexuosa* B. Heyne ex Wallich; *A. obliqua* Willdenow;

*B. nitida* Roxburgh; *B. obliqua* (Willdenow) Sprengel; *B. timoriensis* Steudel; *Diasperus brunneus* (J. D. Hooker) Kuntze; *D. hongkongensis* (Müller Argoviensis) Kuntze; *D. nitidus* (Roxburgh) Kuntze; *D. obliquus* (Willdenow) Kuntze; *D. perakensis* (J. D. Hooker) Kuntze; *D. subscandens* (Zollinger & Moritzi) Kuntze; *D. zeylanicus* (Gaertner) Kuntze; *Glochidion brunneum* J. D. Hooker; *G. canaranum* (Müller Argoviensis) Beddome; *G. glaberrimum* Ridley; *G. hongkongense* Müller Argoviensis; *G. lanceolatum* var. *liukiense* (Hayata) Hurusawa; *G. littorale* Benthams; *G. liukiense* Hayata; *G. nitidum* (Roxburgh) Voigt; *G. obliquum* (Willdenow) Decaisne; *G. pedunculatum* Merrill; *G. perakense* J. D. Hooker; *G. subscandens* Zollinger & Moritzi; *G. sumatranum* Miquel; *G. zeylanicum* var. *malayanum* J. J. Smith; *G. zeylanicum* var. *nitidum* (Roxburgh) Haines; *Phyllanthus canaranus* Müller Argoviensis; *P. hongkongensis* (Müller Argoviensis) Müller Argoviensis; *P. nitidus* (Roxburgh) Reinwardt ex Blume; *P. obliquus* (Willdenow) Müller Argoviensis; *P. subscandens* (Zollinger & Moritzi) Müller Argoviensis; *P. zeylanicus* Müller Argoviensis.

Shrubs or treelets, 1–6 m tall, monoecious, glabrous throughout. Stipules triangular, persistent; petioles 5–8 mm; leaf blade oblong, ovate-oblong, or ovate, sometimes oblong-elliptic, 6–18 × 4–8 cm, leathery, base cordate, subcordate, truncate, or rounded, slightly oblique; lateral veins 5–7 pairs. Flowers in axillary clusters or in short, supra-axillary, pedunculate cymes, usually female flowers inserted at upper part of branchlets, male flowers inserted at lower part of branchlets, or female inflorescence with 1–3 flowers. Male flowers: pedicels 6–9 mm; sepals 5 or 6, connate into a column. Female flowers: sepals as in male; ovary globose, 5- or 6-locular; styles very short, connate into a very brief column. Capsules depressed globose, 8–10 × ca. 5 mm, 8–12-grooved. Seeds hemispheric, red. Fl. Mar–Aug, fr. Jul–Nov.

Humid valleys, scrub on stream banks; 100–600 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, India, Indonesia, Japan, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands (Solomon Islands)].

The roots are used as medicine for coughs and pneumonia; the stem and leaves are used for treating abdominal pain and traumatic injury. The bark contains up to 6.4% tannin.

**4. *Glochidion coccineum*** (Buchanan-Hamilton) Müller Argoviensis, *Linnaea* 32: 60. 1863.

红算盘子 hong suan pan zi

*Agyneia coccinea* Buchanan-Hamilton in Symes, *Embassy Ava*, 479. 1800; *Bradleya coccinea* (Buchanan-Hamilton) Wallich; *Diasperus coccineus* (Buchanan-Hamilton) Kuntze; *Epi-steira coccinea* (Buchanan-Hamilton) Rafinesque; *Phyllanthus coccineus* (Buchanan-Hamilton) Müller Argoviensis.

Evergreen shrubs or trees, usually 1–4(–10) m tall, monoecious; branches angular, pubescent; branchlets shortly rufous pubescent and sinuous when young. Stipules triangular-lanceolate, pubescent; petiole 3–5 mm, pubescent; leaf blade oblong, oblong-elliptic, or acuminate, leathery, green adaxially, glaucous-green abaxially, brown when dry, nerves sparsely pubescent to glabrous on both surfaces; lateral veins 6–8 pairs.

Flowers in axillary clusters, usually male inserted at lower part of branchlets, female inserted at upper part of branchlets. Male flowers: pedicels 5–15 mm, pubescent; sepals 6, biseriate, outer larger than inner, obovate or oblong-ovate, 2.5–4 mm, yellow, sparsely pubescent outside; stamens 4–6. Female flowers: pedicels very short or flowers sessile; sepals 6, obovate or obovate-lanceolate, slightly shorter than in male; connate styles subconical, ca. 1 mm. Capsules depressed globose, 6–7 × ca. 15 mm, puberulent, 10-grooved. Fl. Apr–Oct, fr. Aug–Dec.

Open forests or valley scrub, sometimes on limestone rocks; 400–1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Yunnan [Cambodia, India, Laos, Myanmar, Thailand, Vietnam].

**5. *Glochidion oblatum*** J. D. Hooker, *Fl. Brit. India* 5: 312. 1887.

宽果算盘子 kuan guo suan pan zi

Shrubs or treelets, 4–6 m tall; branchlets slender, tomentulose. Stipules lanceolate; petiole short, pubescent; leaf blade oblong or oblong-lanceolate, 5–10 × 2–4.5 cm, leathery, glaucous and glabrous adaxially, pubescent abaxially, brown when dry, base rounded or subacute, inequilateral, apex obtuse or acute; nerves very slender, nervules obscure. Flowers in axillary clusters. Male flowers: pedicels short; sepals 6, biseriate, outer larger, obovate or subspatulate, pubescent outside, inner narrower, spatulate, pubescent outside; stamens 4–6, connate, connectives free. Female flowers subsessile; sepals as in male, but inner ones pubescent on both surfaces; ovary broadly ovoid, tomentulose, 4- or 5-locular; connate styles shortly conical. Capsules depressed, 13–17 mm in diam., pubescent, 4–6-grooved; styles persistent at apex; fruiting pedicels short. Fl. May–Aug, fr. Aug–Nov.

Broad-leaved forests, scrub; 1000–2000 m. Yunnan [India, Myanmar, N Thailand].

**6. *Glochidion arborescens*** Blume, *Bijdr.* 584. 1826.

白毛算盘子 bai mao suan pan zi

*Glochidion sclerophyllum* J. D. Hooker; *G. silheticum* (Müller Argoviensis) Croizat; *Phyllanthus arborescens* (Blume) Müller Argoviensis; *P. silheticus* Müller Argoviensis.

Trees ca. 8 m tall; branches, leaves abaxially, and flowers ferruginous tomentulose or pubescent. Stipules oblong; petiole 3–5 mm, robust; leaf blade obliquely ovate or oblong, 5–15 × 3–7.5 cm, leathery, adaxially green, greenish when dry, pubescent or only midvein pubescent, abaxially greenish, reddish brown when dry, base rounded to shallowly cordate, obliquely inequilateral, apex acute or shortly acuminate; midvein and 7–12-paired lateral veins robust. Flowers in pedunculate supra-axillary cymes. Male flowers golden, ca. 3 mm in diam.; pedicels 4–7 mm; sepals 6, oblong, ca. 1 mm; stamens 6, connate into a subcylindric column. Female flowers: pedicels and sepals as in male; ovary ovoid-globose, pubescent; style column shortly conical, ca. 0.5 mm; stigma 3–5-lobed, lobes conical or subulate, erect. Capsules depressed globose, 5–6 × 8–8.5 mm, minutely 8-grooved; fruiting pedicels 6–8.5 mm. Fl. Apr–Jun, fr. Jun–Oct.

Evergreen forests; 800–2200 m. Yunnan [India (Assam), Indonesia, Malaysia, Thailand].

**7. *Glochidion hirsutum*** (Roxburgh) Voigt, Hort. Suburb. Calcutt. 153. 1845.

厚叶算盘子 hou ye suan pan zi

*Bradleya hirsuta* Roxburgh, Fl. Ind., ed. 1832, 3: 699. 1832; *Agyneia hirsuta* Miquel; *Diasperus arnottianus* (Müller Argoviensis) Kuntze; *D. hirsutus* (Roxburgh) Kuntze; *D. mishmiensis* (J. D. Hooker) Kuntze; *D. tomentosus* (Dalzell) Kuntze; *Glochidion arnottianum* Müller Argoviensis; *G. dasyphyllum* K. Koch; *G. dasyphyllum* var. *iriomatense* Hurusawa; *G. hongkongense* Müller Argoviensis var. *puberulum* Chakrabarty & M. Gangopadhyay; *G. mishmiense* J. D. Hooker; *G. molle* Hooker & Arnott (1837), not Blume (1826); *G. sphaerostigmum* Hayata; *G. tomentosum* Dalzell; *G. tomentosum* var. *talbotii* J. D. Hooker; *G. zeylanicum* (Gaertner) A. Jussieu var. *talbotii* (J. D. Hooker) Haines; *G. zeylanicum* var. *tomentosum* Trimen; *G. zeylanicum* var. *tomentosum* (Dalzell) Chakrabarty & M. Gangopadhyay (1995), not Trimen (1885); *Phyllanthus arnottianus* (Müller Argoviensis) Müller Argoviensis; *P. hirsutus* (Roxburgh) Müller Argoviensis; *P. tomentosus* (Dalzell) Müller Argoviensis.

Shrubs or treelets, 1–8 m tall; branchlets densely villous. Stipules lanceolate, 3–4 mm; petiole 5–7 mm, pubescent; leaf blade ovate, oblong-ovate, or oblong, 7–15 × 4–7 cm, leathery, densely pubescent along nerves, adaxially glabrous at maturity, abaxially densely pubescent, base shallowly cordate, truncate, or rounded, obliquely inequilateral, apex obtuse or acute; lateral veins 6–10 pairs. Flowers usually in pedunculate supra-axillary cymes but apparently sometimes sessile and axillary; peduncle 5–7 mm, pubescent. Sepals 6, biseriate, pubescent outside, outer broader than inner. Male flowers: pedicels 6–10 mm; sepals oblong or obovate; stamens 5–8. Female flowers: pedicels 2–3 mm; sepals ovate or broadly ovate, ca. 2.5 mm; ovary globose, ca. 2 mm in diam., pubescent, 5- or 6-locular; style column subconical, truncate at apex. Capsules depressed globose, 8–12 mm in diam., pubescent, 5- or 6-grooved; styles of fruiting pedicels inconspicuous. Fl. and fr. almost throughout year.

Open moist forests, scrub on stream banks; 100–1800 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Xizang, Yunnan [India].

This species is included within *Glochidion zeylanicum* (as var. *talbotii* Trimen) by some authors (Govaerts et al., World Checkl. Euphorbiaceae 3: 967. 2000).

The roots of *Glochidion hirsutum* are used as medicine for rheumatism and pneumonia; the leaves are used for treating toothaches.

**8. *Glochidion rubrum*** Blume, Bijdr. 586. 1826.

台闽算盘子 tai min suan pan zi

*Diasperus coronatus* (Müller Argoviensis) Kuntze; *D. leiostylus* (Kurz) Kuntze; *D. wightianus* Kuntze; *Glochidion coronatum* J. D. Hooker; *G. diversifolium* (Miquel) Merrill; *G. foliosum* S. Moore; *G. grave* S. Moore; *G. insulare* J. D. Hooker; *G. leiostylum* Kurz; *G. penangense* (Müller Argoviensis) Airy Shaw; *G. rubrum* f. *longistylis* J. J. Smith; *G. thorelii* Beille; *G. versicolor* S. Moore; *Phyllanthus diversifolius* Miquel; *P. penangensis* Müller Argoviensis.

Shrubs or treelets, 2–6 m tall; branches terete, gray, len-

ticellate; branchlets angular, glabrous or sparsely pubescent when young. Stipules triangular, ca. 1 mm; petiole 1.5–4 mm; leaf blade ovate, elliptic, oblong, or oblong-lanceolate, 5–13 × 2–4.5 cm, papery to submembranous, glabrous or only nerves puberulent on both surfaces, base acute to obtuse, inequilateral; lateral veins 5 or 6 pairs. Flowers in axillary glomerules, sessile, with linear bracts at base. Male flowers: pedicels 3–4 mm, slender, glabrous; sepals 6, ovate or oblong, ca. 2 mm, glabrous or sometimes sparsely pubescent at base inside; stamens 3, connate. Female flowers: pedicels very short or sessile; sepals 6, ovate-triangular, ca. 2 mm, glabrous on both surfaces; ovary ovoid, 3–4 mm, 3–5-locular, pubescent; style column conical, 1–3.5 mm, sometimes 3-fid at apex, glabrous. Capsules depressed globose, 3.5–4 × 6–10 mm, pubescent, 3–5-grooved. Fl. and fr. almost throughout year.

Broad-leaved evergreen forests; 200–600 m. Fujian, Taiwan [Cambodia, India, Indonesia, Japan, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam].

**9. *Glochidion triandrum*** (Blanco) C. B. Robinson, Philipp. J. Sci., C, 4: 92. 1909.

里白算盘子 li bai suan pan zi

Shrubs or treelets, 3–7 m tall, monoecious; branchlets angular, fulvous pubescent. Stipules ovate-triangular, 1–1.5 mm, fulvous pubescent; petiole 2–4 mm, sparsely pubescent; leaf blade oblong-elliptic or lanceolate, 4–13 × 2–4.5 cm, papery, membranous, or thickly papery, adaxially green, only midvein sparsely pubescent when young, glabrous at maturity, abaxially glaucous and white pubescent or densely so, base broadly cuneate or obtuse, slightly inequilateral, apex acuminate, acute, or obtuse; midvein and 5–7-paired lateral veins slightly elevated adaxially, prominently elevated abaxially. Flowers in axillary clusters, 5 or 6 per cluster, male inserted at lower part of branchlets, female at upper part of branchlets. Male flowers: pedicels 6–7 mm, slender, with ovate-triangular ca. 1 mm bracteoles at base; sepals 6, biseriate, obovate, ca. 2 mm, pubescent; stamens 3, connate. Female flowers subsessile; sepals as in male, ca. 1.5 mm, concave inside; ovary ovoid, pubescent, 4- or 5-locular; style column cylindrical, dilated at apex. Capsules depressed globose, ca. 4 × 5–10 mm, sparsely pubescent, usually styles persistent, 8–10-grooved; fruiting pedicels 5–6 mm. Seeds triangular, ca. 3 mm, brown-red, lucid. Fl. Mar–Jul or Aug, fr. Jul–Dec.

Evergreen broad-leaved forests, open forests, valleys, stream banks; 500–2600 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Sichuan, Taiwan, Yunnan [Cambodia, India, Japan, Nepal, Philippines, N Thailand].

- 1a. Leaf blade papery or membranous, pubescent abaxially; capsules 5–7 mm in diam., fruiting pedicels 6–7 mm ..... 9a. var. *triandrum*
- 1b. Leaf blade thickly papery, densely pubescent abaxially; capsules ca. 10 mm in diam., fruiting pedicels robust, very short ..... 9b. var. *siamense*

**9a. *Glochidion triandrum* var. *triandrum***

里白算盘子(原变种) li bai suan pan zi (yuan bian zhong)

*Kirganelia triandra* Blanco, Fl. Filip. 711. 1837; *Diasperus*

*triandrus* (Blanco) Kuntze; *Glochidion acuminatum* Müller Argoviensis; *G. bicolor* (Müller Argoviensis) Hayata; *G. eleutherostylum* Müller Argoviensis; *G. hayatae* Croizat & H. Hara; *G. hypoleucum* Hayata (1920), not Boerlage (1900); *G. quinquestylum* Elmer; *Phyllanthus bicolor* Müller Argoviensis; *P. triandrus* (Blanco) Müller Argoviensis.

Leaf blade papery or membranous, pubescent abaxially. Capsules smaller, 5–7 mm in diam.; fruiting pedicels 6–7 mm, slender. Fl. Mar–Jul, fr. Jul–Dec.

Open forests, valleys, stream banks; 500–2600 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Sichuan, Taiwan, Yunnan [Cambodia, India, Japan, Nepal, Philippines].

**9b. *Glochidion triandrum* var. *siamense*** (Airy Shaw) P. T. Li, Acta Phytotax. Sin. 26: 62. 1988.

泰云算盘子 tai yun suan pan zi

*Glochidion acuminatum* Müller Argoviensis var. *siamense* Airy Shaw, Kew Bull. 26(2): 273. 1972.

Leaf blade thickly papery, densely pubescent abaxially. Capsules larger, ca. 10 mm in diam.; fruiting pedicels robust, very short. Fl. May–Aug, fr. Aug–Oct.

Evergreen broad-leaved forests; 1700–1800 m. Yunnan (Gengma, Simao) [N Thailand].

**10. *Glochidion medogense*** T. L. Chin, Acta Phytotax. Sin. 18: 251. 1980.

墨脱算盘子 mo tuo suan pan zi

Trees to 10 m tall, monoecious; branchlets terete and pubescent when young. Stipules ovate-subulate, ca. 5 mm, ciliate on margin; petiole ca. 5 mm; leaf blade oblong or ovate, 8–16 × 4–7.5 cm, thinly leathery, smooth and glabrous adaxially, only midvein and 7–9-paired lateral veins elevated and pubescent abaxially, base slightly obtuse or rotund, inequilateral, apex acute to acuminate or shortly so. Flowers axillary. Male flowers: pedicels filamentous, ca. 5 mm, glabrous; sepals 5, ovate, ca. 1.5 × 1 mm; stamens 3, connate. Female flowers: pedicels 6–12 mm; ovary globose, glabrous, 5-locular; styles 5-fid. Capsules depressed globose, 7–9 mm in diam., concave at apex, 10-grooved; style column cylindrical, persistent, 5-fid at apex, lobes linear; fruiting pedicels 1–2 cm. Fl. Jun–Aug, fr. Aug–Nov.

- Broad-leaved forests; 1500–1900 m. SE Xizang.

**11. *Glochidion nubigenum*** J. D. Hooker, Fl. Brit. India 5: 315. 1887.

云雾算盘子 yun wu suan pan zi

*Diasperus nubigenus* (J. D. Hooker) Kuntze; *Glochidion velutinum* Wight var. *nubigenum* (J. D. Hooker) Chakrabarty & M. Gangopadhyay; *G. metanubigenum* Hurusawa & Yu. Tanaka.

Trees to 10 m tall, monoecious; branchlets angular, brown, pubescent. Stipules ovate-triangular, ca. 3 × 2 mm; petiole 8–10 mm, pubescent; leaf blade broadly elliptic, ovate, oblong, or oblong-lanceolate, 12–20 × 4.5–7.5 cm, papery, abaxially pu-

berulent on nerves, base obtuse or rounded, usually inequilateral, apex acuminate or caudate-acuminate; midvein and 8–11-paired lateral veins elevated on both surfaces. Flowers in sessile axillary clusters with 6–10 female and 2 male flowers. Male flowers: pedicels short; sepals 5, oblong, apex acute; stamens 3, connate. Female flowers: pedicels 1.5–2.3 cm; sepals 5, broadly ovate; ovary broadly ovoid, 6–8-lobed, concave at apex; styles persistent, apex lobed. Pericarp thinly crustaceous. Seeds ovoid or globose, red. Fl. Jul–Sep, fr. Sep–Dec.

Broad-leaved forests, slopes of steep rocky ridges; 900–2000 m. SE Xizang (Médog) [Bhutan, India (Sikkim), Nepal, N Thailand].

**12. *Glochidion eriocarpum*** Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 6: 6. 1854.

毛果算盘子 mao guo suan pan zi

*Diasperus anamiticus* Kuntze; *D. eriocarpus* (Champion ex Benth) Kuntze; *D. villicaulis* (J. D. Hooker) Kuntze; *Glochidion anamiticum* Kuntze; *G. annamense* Beille; *G. esquirolii* H. Léveillé; *G. villicaule* J. D. Hooker; *Phyllanthus eriocarpus* (Champion ex Benth) Müller Argoviensis.

Shrubs or treelets to 5 m tall, monoecious; branchlets densely spreading yellowish or gray-yellow villous. Stipules subulate, 3–4 mm; petiole 1–2 mm, villous; leaf blade ovate, narrowly ovate, or broadly ovate, 4–8 × 1.5–3.5 cm, papery, densely yellowish or gray-villous, but denser abaxially, base obtuse, truncate, or rounded, zygomorphic, apex acuminate or acute; lateral veins 4 or 5 pairs. Flowers axillary, solitary or in 2–4-flowered clusters. Male flowers inserted along lower parts of branchlets; pedicels 4–6 mm; sepals 6, oblong-obovate, 2.5–4 mm, apex acute, sparsely pubescent outside; stamens 3, connate. Female flowers inserted at upper part of branchlets, subsessile; sepals 6, oblong, 2.5–3 mm, villous on both surfaces; ovary depressed globose, densely pubescent, 4- or 5-locular; style column cylindrical, erect, ca. 1.5 mm, 4- or 5-lobed. Capsules depressed globose, 8–10 mm in diam., densely yellowish or gray-villous, 4- or 5-grooved, with a cylindrical, persistent style column. Fl. and fr. almost throughout year.

Slopes, valley scrub, grassy areas, sometimes at forest margins; 100–1700 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Taiwan, Yunnan [Thailand, Vietnam].

All parts or roots and leaves are used as medicine for urticaria, mastitis, toothache, menorrhagia, dysentery, skin eczema, enteritis, etc.

**13. *Glochidion heyneanum*** (Wight & Arnott) Wight, Icon. Pl. Ind. Orient. 5(2): t. 1908. 1852.

绒毛算盘子 rong mao suan pan zi

*Gyноon heyneanum* Wight & Arnott, Edinburgh New Philos. J. 14: 300. 1833; *Diasperus asperus* (Müller Argoviensis) Kuntze; *D. heyneanus* (Wight & Arnott) Kuntze; *D. nepalensis* (Müller Argoviensis) Kuntze; *D. velutinum* (Wight) Kuntze; *Eriococcus glaucescens* Zollinger; *Glochidion asperum* (Müller Argoviensis) Beddome; *G. nepalense* (Müller Argoviensis) Kurz; *G. velutinum* Wight; *Phyllanthus asperus* Müller Argoviensis; *P. heyneanus* (Wight & Arnott) Müller Argoviensis; *P. nepalensis* Müller Argoviensis; *P. velutinum* (Wight) Müller Argoviensis.

Trees 6–10 m tall, monoecious, tomentose or pubescent except for glabrous adaxial leaf surface, stamens, and styles; branchlets angular. Stipules triangular, ca. 3 mm; petiole 3–4 mm; leaf blade orbicular, ovate, elliptic, oblong, or ovate-lanceolate, rarely obovate, 3.5–12 × 3–6 cm, papery or thinly leathery, base acute, apex obtuse or acute to acuminate, with a mucro; lateral veins 4–6 pairs. Flowers in bisexual axillary clusters. Male flowers: pedicels 2–6 mm; sepals 6, ovate or narrowly ovate, biseriate, outer 3 pubescent on both surfaces, inner 3 pubescent outside only; stamens 3, connate into a cone. Female flowers: pedicels ca. 1 mm; sepals as in male; ovary globose, 4–7-locular; style column obconical, shallowly 4-fid at apex. Fruiting pedicels ca. 1 cm; capsules depressed globose, ca. 4 × 8 mm, 4–7-locular, usually with persistent styles. Seeds triangular, red. Fl. Jun–Sep, fr. Sep–Nov.

Open forests; 1000–2500 m. Yunnan [Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**14. *Glochidion lutescens*** Blume, Bijdr. 585. 1826.

山漆茎 shan qi jing

*Anisonema hypoleucum* Miquel; *Bradleia laevigata* Wallich; *B. lutescens* (Blume) Steudel; *Diasperus glaucifolius* (Müller Argoviensis) Kuntze; *D. kollmannianus* (Müller Argoviensis) Kuntze; *D. lutescens* (Blume) Kuntze; *Glochidion breynioides* C. B. Robinson; *G. glaucifolium* Müller Argoviensis; *G. hypoleucum* (Miquel) Boerlage; *G. kollmannianum* (Müller Argoviensis) J. J. Smith; *G. laevigatum* (Müller Argoviensis) J. D. Hooker; *Phyllanthus fraxinifolius* Loddiges; *P. hypoleucus* (Miquel) Müller Argoviensis; *P. kollmannianus* Müller Argoviensis; *P. laevigatus* Müller Argoviensis; *P. lutescens* (Blume) Müller Argoviensis.

Shrubs to trees to 10 m tall, monoecious, glabrous except for puberulent abaxial leaf surface and fruits; branches 1–1.5 mm thick. Petiole 3–5 mm; leaf blade elliptic, ovate-lanceolate, or obliquely ovate, 6–14 × 3–7 cm, papery to leathery, abaxially gray-white and puberulent to glabrous, adaxially green, base acute-obtuse to rounded, apex shortly acuminate to obtuse. Flowers in axillary, many-flowered, unisexual or bisexual clusters. Male flowers: pedicels ca. 5 mm; sepals 6, elliptic, ca. 2 mm; stamens 3, connate into a cylindrical column. Female flowers: pedicels 2–3 mm, or sessile; sepals 6, ovate, outer ones 0.9–2.3 × 0.6–1.2 mm, inner ones 0.9–1.8 × 0.5–1.1 mm; ovary ovoid, 6-locular; style column cylindrical or subconical, apex truncate, as long as ovary. Fruiting pedicels 1.5–5 mm; capsules depressed globose, 5–6 × 10–18 mm in diam., reddish, 6-grooved, puberulent. Fl. Jun–Sep, fr. Aug–Dec.

Open forests; 700–1000 m. Guangdong, Guizhou, Sichuan, Yunnan [India (?Assam), Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam].

**15. *Glochidion puberum*** (Linnaeus) Hutchinson in Sargent, Pl. Wilson. 2: 518. 1916.

算盘子 suan pan zi

*Agyneia pubera* Linnaeus, Mant. Pl. 2: 296. 1771; *A. impubes* Linnaeus; *A. pinnata* Miquel; *A. sinica* Miquel; *Bradleia pubera* (Linnaeus) Roxburgh; *B. sinica* Gaertner; *Glochidion bodinieri* H. Léveillé; *G. distichum* Hance; *G. fortunei* Hance; *G.*

*fortunei* var. *megacarpum* H. Keng; *G. hayatae* Croizat & H. Hara var. *tsushimense* Hurusawa; *G. pseudo-obscurum* Pampanini; *G. pseudo-obscurum* var. *glabrum* Pampanini; *G. pseudo-obscurum* var. *lanceolatum* Pampanini; *G. sinicum* (Gaertner) Hooker & Arnott; *Nymphanthus chinensis* Loureiro; *Phyllanthus puberulus* (Linnaeus) Müller Argoviensis; *P. puberulus* var. *sinicus* (Gaertner) Müller Argoviensis; *P. villosus* Poir.

Erect shrubs 1–5 m tall, monoecious, much branched; branchlets gray-brown, densely pubescent. Stipules triangular, ca. 1 mm; petiole 1–3 mm; leaf blade oblong, oblong-ovate, or obovate-oblong, rarely lanceolate, 3–8 × 1–2.5 cm, papery or subleathery, gray-green and midvein sparsely pubescent or glabrescent adaxially, greenish and densely pubescent abaxially, base cuneate to obtuse, apex obtuse, acute, shortly acuminate, or rounded; lateral veins 4–8 pairs, elevated abaxially, reticulate nerves prominent. Flowers in axillary clusters, 2–5-flowered, proximal axils mostly to all male flowers, distal axils mostly to all female flowers. Male flowers: pedicels 4–15 mm; sepals 6, narrowly oblong or oblong-obovate, 2.5–3.5 mm, spreading, green to yellowish, densely pubescent outside; stamens 3, connate into a cylindrical column. Female flowers: pedicels ca. 1 mm; sepals 6, as in male, but shorter and thicker, green; ovary globose, densely pubescent, 5–10-locular; ovules 2 per locule; style column annular, shortly lobed in summit. Capsules depressed-globose, 8–15 mm in diam., 8–10-grooved, densely pubescent, reddish when mature, apex with persistent annular styles. Seeds subreniform, 3-angled, ca. 4 mm, red. Fl. Apr–Aug, fr. Jul–Nov.

Slopes, scrub on stream banks, forest margins; 300–2200 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Japan].

All parts are used as medicine for dysentery, diarrhea, rupture, coughs, etc. The seeds contain up to 20% oil, which is used for the manufacture of soap and as a lubricant.

**16. *Glochidion chademenosocarpum*** Hayata, Icon. Pl. Formos. 9: 94. 1920.

线药算盘子 xian yao suan pan zi

Shrubs ca. 1 m tall, monoecious; branchlets slender, glabrous. Stipules triangular, ca. 2.5 × 1.5 mm, slightly thick, glabrous; petiole 2–3 mm; leaf blade oblong to obovate, 5–8 × 2.5–4 cm, papery, glabrous on both surfaces, base acute, inequilateral, apex obtuse. Flowers in bisexual axillary clusters. Male flowers: pedicels ca. 1 cm, slender, sparsely hispid; sepals 6, biseriate, outer obovate, ca. 2.5 × 1 mm; stamens 3, connate; anthers linear. Female flowers sessile; sepals 6, biseriate, oblanceolate, ca. 1.5 × 0.5 mm, glabrous outside, sparsely hispid inside, apex obtuse; ovary depressed globose, ca. 0.5 × 1 mm; style column cylindrical, ca. 1 mm, slightly thick, 8-grooved at apex. Fruits not seen. Fl. Oct.

• Taiwan.

**17. *Glochidion kusukusense*** Hayata, Icon. Pl. Formos. 9: 96. 1920.

台湾算盘子 tai wan suan pan zi

Shrubs ca. 3 m tall, glabrous throughout; branchlets slender. Petiole ca. 5 mm; leaf blade lanceolate, 4–6.5 × 1.5–2 cm,

papery, base acute, oblique, apex acuminate, mucronulate. Male flowers several in axillary clusters; pedicels slender, ca. 5 mm; sepals 6, biseriate, outer oblong, ca. 1.5 × 1 mm, apex acute, inner smaller than outer; stamens 3, connate into a cone, ca. 0.7 mm. Female flowers and fruits not seen. Fl. May–Jul.

• Open forests; ca. 300 m. Taiwan.

**18. *Glochidion philippicum*** (Cavanilles) C. B. Robinson, Philipp. J. Sci., C, 4: 103. 1909.

甜叶算盘子 tian ye suan pan zi

*Bradleya philippica* Cavanilles, Icon. 3: 48. 1797; *Actinodaphne sieboldiana* Miquel; *B. philippensis* Willdenow; *Diasperus compressicaulis* (Kurz ex Teijsmann & Binnendijk) Kuntze; *D. kurzianus* (Müller Argoviensis) Kuntze; *D. philippinensis* (Müller Argoviensis) Kuntze; *D. quercinus* (Müller Argoviensis) Kuntze; *Glochidion album* (Blanco) Boerlage; *G. compressicaule* Kurz ex Teijsmann & Binnendijk; *G. ferdinandii* (Müller Argoviensis) F. M. Bailey var. *molle* (Bentham) F. M. Bailey; *G. formosanum* Hayata; *G. philippinense* Bentham; *G. quercinum* (Müller Argoviensis) Boerlage; *Phyllanthus albus* (Blanco) Müller Argoviensis; *P. compressicaulis* (Kurz ex Teijsmann & Binnendijk) Müller Argoviensis; *P. ferdinandii* Müller Argoviensis var. *mollis* Bentham; *P. kurzianus* Müller Argoviensis; *P. philippinensis* (Bentham) Müller Argoviensis; *P. quercinus* Müller Argoviensis; *Zarcoa philippica* (Cavanilles) Llanos.

Trees to 12 m tall, monoecious; branchlets pubescent when young, glabrescent. Stipules ovate-triangular, 1–1.5 mm; petiole 4–6 mm; leaf blade ovate-lanceolate or oblong, 5–15 × 2.5–5.5 cm, papery or subleathery, shining dark green adaxially, brown when dry, paler abaxially, glabrous on both surfaces, base acute or broadly cuneate, usually oblique, apex acuminate to obtuse; lateral veins 6–8 pairs. Inflorescence an axillary cluster, 4–10-flowered. Male flowers: pedicels 6–7 mm; sepals 6, oblong or obovate-oblong, 1.5–2.5 mm, glabrous, yellowish green; stamens 3, connate into a cylindrical column. Female flowers: pedicels 2–4 mm; sepals 6, as in male; ovary globose, pubescent, 5- or 6-locular; style column shortly conical, 5–7-fid at apex. Capsules depressed globose, 4.5–5.5 × 8–12 mm, apex with much-impressed and persistent styles, deeply 10–14-grooved, densely to sparsely pubescent; fruiting pedicels 3–8 mm. Seeds red, hemispheric, 3–3.5 mm. Fl. Mar–Aug, fr. Jul–Dec.

Evergreen broad-leaved forests; 100–1500 m. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Yunnan [Indonesia, Malaysia, Philippines].

**19. *Glochidion sphaerogynum*** (Müller Argoviensis) Kurz, Prelim. Rep. Forest Pegu, App. A, cv; App. B, 77. 1875.

圆果算盘子 yuan guo suan pan zi

*Phyllanthus sphaerogynus* Müller Argoviensis, Flora 48: 375. 1865; *Glochidion fagifolium* (Müller Argoviensis) Miquel ex Beddome; *P. fagifolius* Müller Argoviensis.

Trees to 15 m tall, monoecious; bark gray-white; branchlets angular, glabrous. Stipules subtriangular, 2–3 mm; petiole 5–8 mm; leaf blade ovate-lanceolate, lanceolate, or oblong-lanceolate, often slightly falcate, 7–10 × 1.5–3.5 cm, papery or thinly leathery, abaxially greenish, gray-brown when dry, gla-

brous or glabrescent on both surfaces, adaxially green, base acute, usually inequilateral; lateral veins 6–8 pairs. Flowers monoecious, in axillary clusters, male in proximal axils, female in distal axils, male and female mixed in central axils. Male flowers: pedicels 6–8 mm; sepals 5 or 6, obovate or elliptic, ca. 2 mm, yellowish; stamens 3, connate, connectives acute. Female flowers: pedicels 2–3 mm; sepals 6, ovate or ovate-triangular, outer larger than inner, ca. 1 mm; ovary ovoid, 4–6-locular, glabrous, ca. 1 mm in diam.; style column depressed globose, ca. 2 mm wide. Capsules depressed globose, ca. 4 × 8–10 mm, apex concave and with a persistent depressed globose style column, 8–12-grooved. Fl. Dec–Apr, fr. Apr–Oct.

Mixed forests; 100–1600 m. Guangdong, Guangxi, Hainan, Yunnan [Bhutan, India, Myanmar, N Thailand, Vietnam].

The branches and leaves are used as medicine for influenza, eczema, etc.

**20. *Glochidion thomsonii*** (Müller Argoviensis) J. D. Hooker, Fl. Brit. India 5: 318. 1887.

青背叶算盘子 qing bei ye suan pan zi

*Phyllanthus thomsonii* Müller Argoviensis, Flora 48: 375. 1865; *Diasperus thomsonii* (Müller Argoviensis) Kuntze; *Glochidion rubidulum* T. L. Chin.

Shrubs ca. 3 m tall, monoecious, glabrous throughout; branchlets terete, ± angular. Stipules ovate-triangular, ca. 3 mm, thick, hard when dry; petiole 2–3 mm; leaf blade oblong or elliptic, 5–13 × 2.5–4 cm, leathery, green and smooth adaxially, bluish glaucous abaxially when dry, base obtuse, inequilateral, apex acuminate to obtuse; midvein and 6–9-paired lateral veins slightly elevated and reddish. Flowers in bisexual clusters, male 1–3 and female many mixed in axils. Male flowers: pedicels slender; sepals 6, elliptic, equal; stamens 3, connate. Female flowers: pedicels shorter; sepals 6, elliptic-ovate; ovary depressed globose, 3- or 4-locular; style column obovate, ca. 2 mm. Fruiting pedicels ca. 5 mm; capsules depressed globose, 1–1.5 cm in diam., apex depressed and with a persistent obovate style column; style columns shallowly 4- or 5-fid at apex. Seeds red. Fl. Aug–Oct, fr. Oct–Dec.

Secondary forests, roadside scrub; 1200–1700 m. SE Xizang [NE India].

**21. *Glochidion wrightii*** Bentham, Fl. Hongk. 313. 1861.

白背算盘子 bai bei suan pan zi

*Diasperus wrightii* (Bentham) Kuntze; *Phyllanthus wrightii* (Bentham) Müller Argoviensis.

Shrubs or treelets 1–8 m tall, monoecious, glabrous throughout. Petiole 3–5 mm; leaf blade oblong or oblong-lanceolate, often obliquely falcate, 2.5–5.5 × 1.5–2.5 cm, papery, green adaxially, farinose-greenish abaxially, gray-glaucous when dry, base acute, inequilateral, apex acuminate; lateral veins 5 or 6 pairs. Flowers in bisexual clusters. Female flowers subsessile; sepals 6, biseriate, outer wider and thicker than inner, ovate, elliptic, or oblong, ca. 1 mm; ovary globose, 3- or 4-locular; style columns cylindrical, less than 1 mm. Capsules tri-

angular, depressed globose, 6–8 mm in diam., red, with a persistent style column. Fl. May–Sep, fr. Jul–Nov.

• Open forests or scrub; 200–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Yunnan.

**22. *Glochidion ellipticum*** Wight, Icon. Pl. Ind. Orient. 5: t. 1906. 1852.

四裂算盘子 si lie suan pan zi

*Phyllanthus assamicus* Müller Argoviensis, Flora 48: 378. 1865; *Diasperus ellipticus* (Müller Argoviensis) Kuntze; *D. malabaricus* (Müller Argoviensis) Kuntze; *D. wightianus* Kuntze; *Glochidion assamicum* (Müller Argoviensis) J. D. Hooker; *G. assamicum* var. *magnicapsulum* Croizat & H. Hara; *G. balakrishnanii* Jothi et al.; *G. diversifolium* (Miquel) Merrill var. *wightianum* (Müller Argoviensis) Beddome; *G. ellipticum* var. *wightianum* (Müller Argoviensis) J. D. Hooker; *G. malabaricum* (Müller Argoviensis) Beddome; *P. andersonii* Müller Argoviensis; *P. diversifolius* Miquel var. *wightianus* Müller Argoviensis; *P. malabaricus* Müller Argoviensis.

Trees to 10 m tall, monoecious; branches glabrous. Stipules triangular, ca. 2 mm; petiole 2–3 mm; leaf blade broadly elliptic, ovate to lanceolate, 9–15 × 3.5–4.5 cm, papery or subleathery, both surfaces glabrous, abaxially brownish when dried, base obtuse, apex acuminate or shortly so; lateral veins 6–8 pairs. Flowers in bisexual axillary clusters, with many male flowers and few female flowers. Male flowers ca. 3 mm in diam.; pedicels slender, 13–20 mm, pubescent; sepals 6, oblong or obovate-oblong, pubescent outside; stamens 3; connate anthers oblong-ovoid, connectives cuspidate. Female flowers subsessile; sepals as in male; ovary globose, 3- or 4-locular, pubescent to glabrous; style column conical, glabrous. Fruiting pedicels short; capsules depressed globose, 2–3 × 6–8 mm, usually 4-locular, pericarp thinner. Seeds hemispheric, red. Fl. May–Aug, fr. Jul–Nov.

Evergreen broad-leaved forests, scrub on stream banks; 100–1700 m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

**23. *Glochidion daltonii*** (Müller Argoviensis) Kurz, Prelim. Rep. Forest Pegu, App. A, cv; App. B, 77. 1875.

革叶算盘子 ge ye suan pan zi

*Phyllanthus daltonii* Müller Argoviensis in A. Candolle, Prodr. 15(2): 310. 1866; *Diasperus daltonii* (Müller Argoviensis) Kuntze.

Shrubs or trees 3–10 m tall, monoecious, glabrous except for petioles and ovary pubescent to glabrous; branches angular, brown when dry; branchlets slender, spreading. Stipules triangular, ca. 1 mm; petiole 2–4 mm, puberulent to glabrous; leaf blade lanceolate or elliptic, sometimes falcate, 3–12 × 1.5–3 cm, papery or subleathery, abaxially gray-white, adaxially gray-green, base broadly cuneate, apex acuminate or shortly so; lateral veins 5–7 pairs, elevated below. Flowers in axillary clusters, with 2 bracts at base, male in proximal axils, female in distal axils. Male flowers: pedicels 5–8 mm, connate. Female flowers subsessile; sepals as in male; ovary depressed globose, puberulent to glabrous, 4–6-locular; style column prominently clavate, 3–6-fid at apex. Capsules depressed globose, 1–1.5 cm in diam.,

brown when dry, 4–6-grooved, with persistent sepals at base. Fl. Mar–May, fr. Apr–Oct.

Open forests, scrub on slopes; 200–1700 m. Anhui, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Yunnan, Zhejiang [India, Malaysia, Myanmar, Thailand, Vietnam].

The bark, leaves, and fruits contain copious tannins.

**24. *Glochidion wilsonii*** Hutchinson in Sargent, Pl. Wilson. 2: 518. 1916.

湖北算盘子 hu bei suan pan zi

Shrubs 1–4 m tall, monoecious, glabrous throughout except sometimes for pubescent petiole; branches angular, gray-brown; branchlets spreading. Stipules ovate-lanceolate, 2–2.5 mm; petiole 2–5 mm, puberulent to glabrous; leaf blade lanceolate or obliquely lanceolate, 3–10 × 1.5–4 cm, papery, green adaxially, gray-white abaxially, base obtuse or broadly cuneate, apex acute or shortly acuminate; midvein elevated on both surfaces, lateral veins 5 or 6 pairs, raised abaxially. Flowers green, in axillary clusters, male in proximal axils, female in distal axils. Male flowers: pedicels ca. 8 mm; sepals 6, oblong or obovate, 2.5–3 × ca. 1 mm, apex obtuse, margin thinly membranous; stamens 3, connate. Female flowers: pedicels short; sepals as in male; ovary globose, 6–8-locular; style column cylindric, lobed at apex. Capsules depressed globose, ca. 1.5 cm in diam., 6–8-grooved, usually with persistent sepals at base. Seeds obscurely 3-angular, red lucid. Fl. Apr–Jul, fr. Jun–Sep.

• Scrub on slopes; 600–1600 m. Anhui, Fujian, Guangxi, Guizhou, Hubei, Jiangxi, Sichuan, Zhejiang.

The bark, leaves, and fruits contain copious tannins.

**25. *Glochidion obovatum*** Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(2): 143. 1845.

倒卵叶算盘子 dao luan ye suan pan zi

*Bradleia sinensis* Siebold ex Miquel; *Diasperus obovatum* (Siebold & Zuccarini) Kuntze; *Phyllanthus obovatus* (Siebold & Zuccarini) Müller Argoviensis (1865), not Muhlenberg ex Willdenow (1805).

Shrubs or shrublets 0.5–1 m tall; branches pubescent. Stipules ovate-triangular; petiole 1.5–2 mm; leaf blade obovate or oblong-obovate, 3.5–8 × 2–2.5 cm, thinly leathery, base cuneate, apex obtuse or shortly acuminate. Flowers in cymes. Male flowers: pedicels 6–9 mm; sepals 6, obovate, 1.5–2 mm; stamens 3, connate. Female flowers: pedicels 3–6 mm; sepals as in male; ovary ovoid, 4–6-locular, glabrous; style column cylindric, 6-lobed at apex. Capsules depressed globose, ca. 4.5 × 7 mm, 8–12-grooved. Fl. May–Jul, fr. Jul–Oct.

Montane scrub on slopes; 300–600 m. Fujian, Taiwan, Zhejiang [Japan].

**26. *Glochidion ramiflorum*** J. R. Forster & G. Forster, Char. Gen. Pl. 114. 1776.

茎花算盘子 jing hua suan pan zi

*Phyllanthus ramiflorus* (J. R. Forster & G. Forster) Müller Argoviensis.

Shrubs or treelets 1–6 m tall, monoecious; branches gray; branchlets green at apex, usually purplish in lower 1/2, glabrous. Stipules broadly triangular, midrib elevated abaxially; petiole 4–5 mm, glabrous; leaf blade oblong, elliptic to oblong-ovate, 10–15 × 4–5 cm, papery, dark green adaxially, green abaxially, brown-black when dry, glabrous on both surfaces, base obtuse, apex caudate-acuminate; midvein elevated on both surfaces, lateral veins 6–9 pairs. Flowers yellowish, in axillary clusters, 4–9 flowers per cluster, branchlets with proximal clusters male, distal clusters female, sometimes male and female mixed. Male flowers: pedicels 4–6 mm, glabrous; sepals 6, biseriata, broadly ovate, ca. 2 × 1.2 mm, glabrous; stamens 3, connate into a cylinder. Female flowers: pedicels short; sepals as in male, but smaller, ca. 1 × 0.7 mm; ovary ovoid, 5- or 6-locular, glabrous. Capsules depressed globose, ca. 6 mm in diam., 10–12-grooved. Fl. Apr–Jun, Aug–Dec, fr. Jul–Feb.

Cultivated for medicine. C Guangdong [native to Fiji].

The leaves are used as a contraceptive.

**27. *Glochidion suishaense*** Hayata, *Icon. Pl. Formos.* 9: 97. 1920.

水社算盘子 shui she suan pan zi

Shrubs ca. 1 m tall, monoecious, glabrous throughout; branchlets slender. Petiole ca. 3 mm; leaf blade ovate or obovate to oblong, 4.5–8.5 × 3–4.5 cm, thinly leathery, base cuneate, obtuse, or rounded, apex acute. Flowers in axillary clusters. Male flowers: pedicels slender; sepals 6, obovate, biseriata, outer ca. 3 × 1.5 mm, apex very obtuse, inner ca. 2.5 × 1 mm; stamens

3, connate. Female flowers: pedicels 1–1.5 mm; sepals 6, oblong, biseriata, outer ca. 2 × 1.5 mm, apex obtuse, entire or obscurely dentate, inner ca. 2 × 0.6 mm, entire or dentate; ovary depressed globose, 4-locular, ca. 0.6 × 1 mm; style column obconical, lobed at apex. Capsules depressed globose, ca. 8 × 15 mm, 8-grooved. Seeds red. Fl. Apr–Jul, fr. Aug–Sep.

• Scrub on slopes; ca. 300 m. Taiwan (Nantou: Shuishe).

**28. *Glochidion khasicum*** (Müller Argoviensis) J. D. Hooker, *Fl. Brit. India* 5: 324. 1887.

长柱算盘子 chang zhu suan pan zi

*Phyllanthus khasicus* Müller Argoviensis, *Flora* 48: 389. 1865.

Shrubs or treelets 1–6 m tall, monoecious, glabrous throughout; branchlets angular. Stipules ovate-triangular, ca. 2.5 mm; petiole 4–6 mm, stout; leaf blade oblong, elliptic-ovate, or ovate-lanceolate, 7–10 × 2.5–4 cm, leathery, greenish when dry, base acute, decurrent into petiole; lateral veins 5 or 6 pairs. Male flowers in few-flowered axillary clusters; pedicels short; sepals 6, oblanceolate, unequal, 3–3.5 mm; stamens 3, connate, connectives umbonate. Female flowers subsessile; sepals 6, ovate-oblong, unequal, 3.5–4 mm; ovary globose, 3- or 4-locular; style column elongate, stout, subclavate, unequally 3-toothed at apex. Fruiting pedicels short; capsules depressed globose, ca. 8 mm in diam., intruded at apex and base, 3–6-locular, lobes rounded. Seeds hemispheric. Fl. Jun–Sep, fr. Sep–Nov.

Open forests, valley scrub; 900–1300 m. Guangxi, Yunnan [Bhutan, India, Thailand].

## 11. SAUROPUS Blume, *Bijdr.* 595. 1826.

守宫木属 shou gong mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Aalius* Rumphius ex Kuntze; *Breyniopsis* Beille; *Ceratogynum* Wight; *Diplomorpha* Griffith (1854), not Meisner (1841); *Synostemon* F. Mueller.

Erect shrubs, rarely herbs or climbers, monoecious or dioecious; indumentum of simple or gland-tipped hairs, often absent. Leaves alternate; stipules small, paired, inserted at bilateral base of petiole; leaf blade simple, entire, pinnately veined or rarely obscurely 3-veined from base, petiolate. Flowers smaller, apetalous. Male flowers axillary or cauliflorous, clustered or solitary, rarely in racemelike thyrses or short cymes; pedicels usually bracteolate at base; calyx discoid, cup-shaped, or turbinate, entire or 6-lobed, lobes obscurely biseriata, imbricate, erect, or spreading, margins slightly thick, with a whorl of scalelike adaxial lobes at bases of calyx lobes, rarely absent; petals absent; stamens 3, opposite outer sepals; filaments usually connate into a short cylinder; anthers free, bilocular, thecae 2, extrorse, longitudinally dehiscent; pistillode absent. Female flowers axillary, solitary or paired or with males, rarely inserted at base of male inflorescence; calyx usually 6-parted; sepals biseriata, imbricate, sometimes thickened at fruiting; disk absent; ovary ovoid or depressed globose, truncate or retuse at apex, 3-locular; ovules 2 per locule; styles 3, free or connate at base, much divergent, 2-branched at apex, arms recurved. Fruit a capsule, depressed or ovoid, breaking into 3 2-valved cocci when mature. Seeds not carunculate; endosperm fleshy; cotyledon flattened and broad.

About 56 species: Mascarenes, India, and Sri Lanka to Indo-Malaysia, Philippines, Indonesia, and Australia; 15 species (four endemic, one introduced) in China.

The dividing line between *Sauropus* and the following genus, *Breynia*, is for the most part rather clear-cut but there are a few species that seem to mix characters of the two genera.

- 1a. Creeping or obliquely ascending herbs; sepals with adaxial gland-pits, male sepal margins distally irregularly crenate; stipules awned ..... 1. *S. bacciformis*  
 1b. Erect shrubs; sepals without gland-pits, male sepal margins entire or shallowly undulate; stipules without awns.  
 2a. Leaf blade 3-veined.  
   3a. Male inflorescence a raceme; calyx 6-fid to middle, lobes ovate-triangular; female sepals obovate ..... 2. *S. trinervis*  
   3b. Male inflorescence an axillary cluster; calyx entire, margins undulate; female sepals broadly ovate ..... 3. *S. repandus*



- 2b. Leaf blade pinnately veined.
- 4a. Inflorescence with distinct main axis, cauliflorous, arising from base or lower part of stem or main branches at ground level; anther connectives forming triangular head with anthers at angles.
- 5a. Branches, petioles, and base of leaf blade abaxially pubescent when young; leaves pendent, usually crowded toward stem apex; leaf blade usually spatulate, apex rounded; sepals red or purple ..... 4. *S. spatulifolius*
- 5b. Branches, leaf blade abaxially, and petioles glabrous; leaves not pendent, never clustered at stem apex; leaf blade oblong-elliptic, ovate-lanceolate, or oblanceolate, apex acuminate or shortly so; sepals yellow-green with red streaks ..... 5. *S. bonii*
- 4b. Inflorescence without distinct axis, in upper axils of branches; anther connectives not enlarged.
- 6a. Leaf blade leathery, reticulate veins prominent ..... 6. *S. reticulatus*
- 6b. Leaf blade membranous to papery, reticulate veins  $\pm$  obscure.
- 7a. Female pedicels 2–6 cm, to 13 cm in fruit ..... 7. *S. macranthus*
- 7b. Female pedicels 0.1–1.5 cm.
- 8a. Lateral veins 10–12 pairs, base of midrib on both surfaces and of leaf blade margin equally densely stiffly papillate ..... 8. *S. yanhuianus*
- 8b. Lateral veins 4–8 pairs, midrib and leaf blade margin more sparsely papillate.
- 9a. Leaf blade papery or thickly papery.
- 10a. Leaf apex rounded, mucronulate ..... 11. *S. similis*
- 10b. Leaf apex acuminate or caudate-acuminate.
- 11a. Leaf apex acuminate, lateral veins slightly raised on both surfaces; male sepals broadly or obliquely ovate; female sepals ovate ..... 9. *S. pierrei*
- 11b. Leaf apex caudate-acuminate, lateral veins adaxially flattened, elevated abaxially; male sepals oblong-lanceolate; female sepals spatulate ..... 10. *S. tsiangii*
- 9b. Leaf blade membranous or thinly papery.
- 12a. Branchlets 4-sided; leaf blade 0.2–2  $\times$  0.2–1.2 cm, apex obtuse, rounded, truncate, or retuse, lateral veins obliquely ascendant; male calyx deeply 6-partite.
- 13a. Branches glabrous; leaf blade apex rounded, not mucronulate, base rounded or broadly cuneate, lateral veins slender ..... 12. *S. quadrangularis*
- 13b. Branches pubescent; leaf blade apex rounded, truncate, or retuse, mucronulate, base shallowly cordate, truncate, or rounded, lateral veins more robust, forked at apex, reticulate nerves prominent ..... 13. *S. delavayi*
- 12b. Branchlets obscurely angular when young, terete with age; leaf blade 2–13  $\times$  1–3.5 cm, apex usually acuminate, rarely acute, lateral veins curved-ascendant; male calyx shallowly 6-fid.
- 14a. Branchlets and veins of young leaves puberulent; female sepals ovate or elliptic; leaf blade glaucous; capsules obovoid to ovoid ..... 14. *S. garrettii*
- 14b. Branchlets and veins of leaves glabrous; female sepals obovate; leaf blade yellowish green; capsules depressed globose or globose ..... 15. *S. androgynus*

**1. *Sauropus bacciformis*** (Linnaeus) Airy Shaw, Kew Bull. 35: 685. 1980.

艾堇 ai jin

*Phyllanthus bacciformis* Linnaeus, Mant. Pl. 2: 294. 1771; *Agyneia affinis* Kurz ex Teijsmann & Binnendijk; *A. bacciformis* (Linnaeus) A. Jussieu; *A. bacciformis* var. *angustifolia* Müller Argoviensis; *A. bacciformis* var. *oblongifolia* Müller Argoviensis; *A. gonioclada* (Merrill & Chun) H. Keng; *A. phyllanthoides* Sprengel; *A. taiwaniana* H. Keng; *Diplomorpha bacciformis* (Linnaeus) Kuntze; *D. herbacea* Griffith; *Emblica annua* Rafinesque; *E. grandis* Gaertner; *E. racemosa* (Linnaeus f.) Sprengel; *Phyllanthus goniocladus* Merrill & Chun; *P. racemosus* Linnaeus f.; *Synostemon bacciformis* (Linnaeus) G. L. Webster.

Herbs or subshrubs to 60 cm tall, erect, diffuse or prostrate, monoecious, glabrous throughout; stem solitary or several branched arising from base; branches acutely 4-angled or with narrow membranous wing. Stipules narrowly triangular to fal-

cate, 1.7–3  $\times$  0.5–1.5 mm, apex awned, persistent; petiole to 1 mm; leaf blade oblong, elliptic-obovate, rotund, or lanceolate, (0.7–)1–2.5  $\times$  0.2–1.2 cm,  $\pm$  fleshy, membranous when dried, abaxially somewhat papillate and glaucous, base rounded, rarely cuneate, margin flat, without asperities, apex obtuse or acute, mucronulate; venation pinnate, lateral veins obscure. Inflorescences axillary, flowers in clusters, green to light purple. Sepals with adaxial gland-pits. Male flowers several in lower axils, 1–2 mm in diam.; pedicels (0.6–)1–1.5 mm; sepals 6, broadly ovate or obovate, 0.4–0.6  $\times$  0.3–0.4 mm, apex irregularly crenate; disk lobes fleshy, at bases of sepals, yellow-green; stamens 3–4 mm; filament column ca. 0.2 mm. Female flowers in distal axils, solitary, 3–4[–5.5] mm in diam.; pedicel 1–1.5[–4] mm; sepals oblong-lanceolate, 2–2.8  $\times$  1–1.4 mm, apex [acute or] acuminate; disk absent. Fruiting sepals reflexed; capsules broadly ovoid, 0.5–0.6  $\times$  0.4–0.5 cm, purple when mature, with rim around styles, endocarp and exocarp separating. Seeds yellowish, 3-angled, slender and curved, 3–4[–4.9]  $\times$  [1.2–]2 mm, surface strobiculate. Fl. Apr–Jul, fr. Jul–Nov.  $x = 13$ .

Seashore sandy tracts, especially on brackish clayey soil; near sea level to below 100 m. Guangdong, Guangxi, Hainan, Taiwan [Bangladesh, India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Indian Ocean islands (Mauritius, Réunion)].

**2. *Sauropus trinervius*** J. D. Hooker & Thomson ex Müller Argoviensis, *Linnaea* 32: 72. 1863.

三脉守宫木 san mai shou gong mu

*Aalius trinervia* (J. D. Hooker & Thomson ex Müller Argoviensis) Kuntze.

Erect shrubs to 4 m tall, monoecious, glabrous except for glandular-pubescent branches; branches angular. Stipules lanceolate, 5–8 mm; petiole ca. 3 mm; leaf blade ovate or ovate-lanceolate, 4–12.5 × 2–3.5 cm, base obtuse or rounded, apex acute; basal veins 3, lateral veins 4–6 pairs, slender. Inflorescence axillary. Male flowers in racemes on short peduncles, with minute bracts; pedicels slender, 7–10 mm; calyx enlarging, ca. 5 mm in diam., 6-lobed to middle; sepals ovate-triangular, ca. 4 mm, reflexed; disk segments 6, biseriate, outer shorter and wider than inner, apex obtuse; stamens 3; filaments connate into a cylinder. Female flowers solitary, axillary; pedicel ca. 7 mm; calyx 4–6 mm in diam., 6-lobed; sepals 6, biseriate, usually unequal, obovate, outer 2 × as long as inner; ovary oblong-ovoid, apex truncate; styles short. Fruiting pedicel absent; capsule globose, ca. 2.5 cm in diam., exocarp thinly crustaceous stellate, 6-valved, cocci with a large adaxial hollow. Fl. May–Sep, fr. Aug–Nov.

Open forested slopes or valley scrub; 1000–1300 m. Yunnan (Huize, Kaiyuan) [Bangladesh, India].

The epithet was based on the not validly published name "*Phyllanthus trinervius*" (Wallich, Numer. List, no. 7922. 1847).

**3. *Sauropus repandus*** Müller Argoviensis, *Flora* 65: 2. 1872.

波萼守宫木 bo e shou gong mu

Erect shrubs ca. 1 m tall, monoecious; stem terete, brown; branches compressed and angular, gray-yellow. Stipules lanceolate, 2–3 mm; petiole ca. 3 mm; leaf blade ovate, elliptic, or ovate-lanceolate, 3–9 × 1.5–3 cm, membranous, abaxially greenish, dark green adaxially, base broadly cuneate or obtuse to rounded, apex acuminate or shortly so; basal veins 3, midrib slightly raised on both surfaces, lateral veins 3–5 pairs. Inflorescence in axillary clusters. Male flowers: pedicels filamentous, 5–6 mm; calyx discoid, 5–6 mm in diam., margins shallowly undulate, greenish; disk segments 6, obcordate, flattened, membranous, depressed at apex, adnate to calyx inside; stamens 3; filaments connate into a short cylinder. Female flowers: pedicels 6–13 mm; calyx 7–9 mm in diam., 6-lobed to base; sepals biseriate, outer broadly ovate, apex obtuse, inner shorter than outer, rotund; ovary turbinate, apex truncate; styles 3, bifid at apex, lobes recurved. Fruit not seen. Fl. Sep–Oct.

Open forested slopes; 800–1300 m. S Yunnan (Menghai) [Bhutan, India (Sikkim)].

**4. *Sauropus spatulifolius*** Beille in Lecomte, *Fl. Gen. Indo-Chine* 5: 652. 1927.

龙脷叶 long li ye

*Sauropus changianus* S. Y. Hu.

Evergreen shrublets 10–40 cm tall, monoecious; stem scabrous; branches terete, 2–5 mm in diam., scorpioid-curved, rugose. Leaves usually clustered apically, often recurved or pendulous; stipules 4–8 × 3–4 mm wide at base, glandular-pubescent when young, persistent; petiole 2–5 mm, glandular-pubescent when young, glabrescent; leaf blade spatulate, obovate-oblong, or ovate, sometimes oblong, 4.5–16.5 × 2.5–6.3 cm, ± fleshy when fresh, thinly leathery or thickly papery when dry, dark green and nerves gray-white adaxially when live, yellow-white when dry, usually glabrous, sometimes abaxially glandular-pubescent at base, glabrescent, base cuneate or obtuse, rarely rounded, apex rounded or obtuse, rarely retuse; venation pinnate, midrib flat when live, raised on both surfaces when dry, lateral veins 6–9 pairs, flat on both surfaces. Inflorescence cauliflorous, 2–5-flowered clusters or leafless branches at middle or lower part, sometimes in short cymes to 15 mm; peduncles short and robust, with many bracts; bracts lanceolate, ca. 2 mm. Male flowers: pedicels filamentous, 3–5 mm; calyx red or purple; sepals 6, biseriate, subequal, obovate, 2–3 × ca. 1.5 mm; disk segments 6, opposite sepals; stamens 3; filaments connate into a short cylinder. Female flowers: pedicels 2–3 mm; sepals as in male; disk absent; ovary subglobose, ca. 1 mm in diam., 3-locular; styles 3, bifid at apex. Fruit not seen. Fl. Feb–Oct.

Cultivated for medicine. Fujian, Guangdong, Guangxi [native to N Vietnam; cultivated in Malaysia, Philippines, Thailand].

The leaves are used as medicine for coughs, sore throat, and acute bronchitis.

**5. *Sauropus bonii*** Beille in Lecomte, *Fl. Indo-Chine* 5: 651. 1927.

茎花守宫木 jing hua shou gong mu

Shrubs to 3 m tall, monoecious, glabrous throughout; stem gray; branches angular, green. Stipules triangular, 3–5 mm; petiole 3–6 mm; leaf blade oblong-elliptic, ovate-lanceolate, or oblanceolate, 7–14 × 2.5–5 cm, papery, abaxially greenish, dark green adaxially, base broadly cuneate, apex acuminate or shortly so; venation pinnate, lateral veins 7–11 pairs, obliquely ascending, arcuately anastomosing to before margins. Inflorescences cauliflorous, from base to lower part of stem, narrow racemelike thyrses, usually pendent, 6–15 cm, bisexual; peduncles and pedicels with imbricate bracts and bracteoles. Male flowers: pedicels filamentous, 2–34 mm; calyx cup-shaped, 3–5 mm in diam., margins undulate, membranous, yellowish, with red streak; disk shallowly 6-fid, adnate to calyx; stamens 3; filaments connate into a cylinder; anthers oblong. Female flowers: pedicels 2–3 mm; calyx campanulate, 3–5 mm in diam., 6-lobed; sepals biseriate, spatulate or obovate, outer 3–5 mm, inner 2–4 mm; ovary ovoid or globose, 3-locular; styles 3, free, bifid at apex, arms recurved. Capsules subglobose, ca. 1.5 × 2 cm, prominently 6-valved when mature. Fl. Apr–Aug, fr. Jun–Oct.

Forests or scrubby slopes on limestone; 200–500 m. NW and SW Guangxi (Longzhou, Tian'e) [Vietnam].

Records of *Sauropus bonii* from Thailand seem to be based on a misidentification of *S. disciflorus* Welzen, which has much shorter inflorescences.

**6. *Sauropus reticulatus*** X. L. Mo ex P. T. Li, Acta Phytotax. Sin. 25: 133. 1987.

网脉守宫木 wang mai shou gong mu

Shrubs ca. 2 m tall, erect, glabrous throughout. Stipules triangular, caducous; petiole ca. 5 mm; leaf blade oblong, oblong-elliptic, or elliptic-lanceolate, 10–16 × 4–5 cm, leathery, base broadly cuneate to obtuse, apex acuminate; venation pinnate, lateral veins 8–10 pairs, reticulate veins raised on both surfaces. Flowers not seen. Inflorescence axillary, 1-fruited. Fruiting pedicel ca. 3 cm; persistent sepals 6, broadly obovate, ca. 5 × 2.5 mm, thick; capsule depressed globose, ca. 1.5 × 2 cm; persistent styles 3, free, bifid. Fr. Aug–Nov.

• Open forests or scrubby slopes on limestone; 500–800 m. W Guangxi (Jingxi), W Yunnan (Luxi).

Flowers are needed to confirm the generic placement of this plant.

**7. *Sauropus macranthus*** Hasskarl, Retzia 1: 166. 1855.

长梗守宫木 chang geng shou gong mu

*Alius macrantha* (Hasskarl) Kuntze; *A. macrophylla* (J. D. Hooker) Kuntze; *Sauropus grandifolius* Pax & K. Hoffmann; *S. grandifolius* var. *tonkinensis* Beille; *S. longipedicellatus* Merrill & Chun; *S. macrophyllus* J. D. Hooker.

Shrubs 3–4 m tall, erect, monoecious, glabrous throughout; branchlets angular. Stipules subulate-lanceolate, 3–6 mm, gray-brown; petiole 2.5–7 mm; leaf blade ovate-oblong, ovate-elliptic, or elliptic-lanceolate, 4–20 × 3.5–8 cm, papery, conspicuously white-margined, base cuneate to rounded, apex shortly acuminate; venation pinnate, lateral veins 6–10 pairs, nearly flattened. Inflorescence axillary, 1-flowered or several male and female per cluster. Male flowers: pedicels 2–6.5 mm; calyx discoid, 3.5–4.5 mm in diam., shallowly 6–8-fid, with red stripes; sepals narrowly triangular; disk segments 6–8, opposite sepals. Female flowers solitary or several and male mixed in axillary cluster; pedicels 2–6 cm; calyx yellow-green, 6-lobed; sepals slightly thick, biseriate, outer obovate or subspatulate, ovate-elliptic, 6–7 × 3–4 mm, inner shorter, obovate, ca. 5 mm, with purple stripes; disk absent; pistil depressed globose, ca. 2 × 2.7 mm, 3-locular; styles 3, bifid at apex, arms recurved. Fruiting pedicel 9–13 cm; persistent sepals obovate, hooked, ca. 1 cm; capsules subglobose or depressed globose, lobed, ca. 1.5 × 1.5–2.5 cm, red or red-brown, styles persistent at apex. Fl. May–Sep, fr. Aug–Dec.

Broad-leaved forests, valley scrub; 500–1500 m. Guangdong, Hainan, Yunnan [NE India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam; N Australia].

**8. *Sauropus yanhuianus*** P. T. Li, Acta Phytotax. Sin. 25: 134. 1987.

多脉守宫木 duo mai shou gong mu

Shrubs ca. 1.5 m tall, erect, glabrous throughout; branches angular, gray-green. Stipules triangular, ca. 1.5 mm; petiole ca. 3 mm; leaf blade oblong or oblong-lanceolate, 10–14 × 3–4 cm, thinly papery; lateral veins 10–12 pairs, arcuately anastomosing to before margins. Male flowers not seen. Female flowers axillary, solitary or paired, bracteolate at base; pedicels 6–10 mm,

swollen near apex; calyx yellow-green, 6-lobed; sepals oblong-obovate, 2.5–4 × 1.5–3 mm; ovary globose, ca. 3.5 mm in diam., 3-locular; styles 3, free, short. Fruit not seen. Fl. Jun.

• Dense forests; 1000–1100 m. S Yunnan (Cangyuan).

**9. *Sauropus pierrei*** (Beille) Croizat, J. Arnold Arbor. 21: 494. 1940.

盈江守宫木 ying jiang shou gong mu

*Breyniopsis pierrei* Beille, Bull. Soc. Bot. France 72: 158. 1925.

Erect shrubs 1–4 m tall, monoecious, glabrous throughout; stem brownish, rugose; branches angular when young, later terete. Stipules ovate-lanceolate, ca. 2 mm; petiole 3–4 mm; leaf blade ovate-lanceolate, 7.5–10.5 × 2.5–3.5 cm, papery or thickly papery, abaxially gray-green, adaxially dark green, base attenuate to obtuse; venation pinnate, midrib elevated abaxially, lateral veins 5–8 pairs, slightly elevated on both surfaces. Inflorescence subtended by leaves. Male flowers in clusters; pedicels slender, 3–4 mm, with many overlapping membranous bracteoles below middle; sepals broadly ovate or obliquely ovate, ca. 1.5 × 2 mm; stamen filaments connate to below middle; anthers ovoid. Female flowers 1 or 2; pedicels ca. 5 mm; sepals ovate, ca. 2 mm; ovary ovoid, ca. 1.5 mm. Capsules globose, 1–1.5 cm in diam.; sepals and styles usually persistent. Fl. Jun–Sep, fr. Sep–Nov.

Open forests; 200–300 m. Yunnan (Yingjiang) [Cambodia, Laos, Malaysia (Borneo), Vietnam].

**10. *Sauropus tsiangii*** P. T. Li, Acta Phytotax. Sin. 25: 135. 1987.

尾叶守宫木 wei ye shou gong mu

Shrubs ca. 1 m tall, erect, monoecious, glabrous throughout; stem terete; branchlets angular. Stipules caducous; petiole 3–4 mm; leaf blade ovate to ovate-lanceolate, 6.5–9.5 × 3.5–4.5 cm, papery, base rounded, apex caudate-acuminate; venation pinnate, midrib elevated on both surfaces, lateral veins 6 or 7 pairs, flattened adaxially, elevated abaxially. Inflorescence axillary, usually 3-flowered. Male flowers: pedicels filamentous, 5–8 mm; sepals 6, oblong-lanceolate, ca. 2 mm; disk segments 6, semiorbicular, shorter and opposite to sepals; stamens 3; filaments connate for less than 1/2 length; anthers oblong. Female flowers: sepals 6, spatulate, ca. 5 mm, apex obtuse; ovary depressed-triangular, ca. 2 mm in diam., 3-locular; styles 3, bifid at apex, arms recurved. Fruit not seen. Fl. May–Sep.

• Limestone forests; 500–800 m. SW Guangxi (Longzhou).

**11. *Sauropus similis*** Craib, Bull. Misc. Inform. Kew 1911: 457. 1911.

短尖守宫木 duan jian shou gong mu

Shrubs to 3 m tall, monoecious, glabrous throughout; branches 4-angled. Stipules triangular to basally auriculate to falcate 1–1.5 × 0.4–1.7 mm; petiole 1.2–2 mm; leaf blade ovate, 0.7–3.7 × 0.5–1.9 cm, ± thickly papery, abaxially paler, adaxially with lighter midrib, base cordate to cuneate, apex rounded,

mucronulate; venation pinnate, midrib often papillate, lateral veins 5–8 pairs. Inflorescence subtended by leaves, small clusters of male flowers or solitary female flowers. Male flowers: pedicels 4.9–6 mm; calyx discoid, 4.2–4.5 mm in diam., shallowly lobed, lobes  $0.4\text{--}0.7 \times 1.6\text{--}2.3$  mm, apex entire; anthers ca.  $0.3 \times 0.6$  mm. Female flowers: pedicel 1.5–3.7 mm; calyx yellow to red, 3.6–8.2 mm in diam.; sepals spatulate,  $1\text{--}2.1 \times 1\text{--}3.3$  mm; ovary 1.3–2 mm in diam. Fruiting pedicel to 1.25 cm; persistent calyx to 12.5 mm in diam.; capsule ovoid, ca.  $5.5 \times 3.5\text{--}4.2$  mm, apex with low rim. Seeds 3-angled,  $3\text{--}3.3 \times 2.1\text{--}2.3 \times 2.4\text{--}2.6$  mm.

Yunnan [Myanmar, Thailand].

*Sauropus similis* is included on the basis of the Flora of Thailand account (see [http://www.nationaalherbarium.nl/ThaiEuph/ThSpecies/ThSauropusT.htm#Sauropus\\_similis](http://www.nationaalherbarium.nl/ThaiEuph/ThSpecies/ThSauropusT.htm#Sauropus_similis)).

**12. *Sauropus quadrangularis*** (Willdenow) Müller Argoviensis, *Linnaea* 32: 73. 1863.

方枝守宫木 fang zhi shou gong mu

*Phyllanthus quadrangularis* Willdenow, Sp. Pl. 4: 585. 1805; *Aalius ceratogynum* Kuntze; *A. compressa* (Müller Argoviensis) Kuntze; *A. pubescens* (J. D. Hooker) Kuntze; *A. quadrangularis* (Müller Argoviensis) Kuntze; *A. rigida* (Thwaites) Kuntze; *Ceratogynum rhamnoides* Wight; *P. leschenaultii* Müller Argoviensis var. *tenellus* Müller Argoviensis; *P. rhamnoides* Roxburgh (1832), not Retzius (1788); *Sauropus ceratogynum* Baillon; *S. compressus* Müller Argoviensis; *S. concinnus* Collett & Hemsley; *S. pubescens* J. D. Hooker; *S. quadrangularis* Müller Argoviensis var. *compressus* (Müller Argoviensis) Airy Shaw; *S. rigidus* Thwaites.

Erect shrubs to 1 m tall, monoecious, glabrous [to hirsute] throughout; stem gray-brown; branchlets 4-angled or compressed. Stipules lanceolate [to sometimes strongly falcate],  $1\text{--}2\text{--}[2.7] \times 0.7\text{--}1.2\text{--}[3.5]$  when falcate] mm; petiole 1–1.3 mm; leaf blade ovate, elliptic, or rounded,  $5\text{--}20\text{--}(25) \times 3\text{--}12$  mm, membranous or thinly papery, base rounded or obtuse, apex rounded or obtuse, mucronate; venation pinnate, lateral veins 4 or 5 pairs, slender, obliquely ascending, not raised. Inflorescence subtended by leaves, 1- or 2-flowered. Male flowers 2–3 mm; calyx discoid, ca. 1.5 mm in diam., 6-lobed; sepals apex obtuse or retuse; disk scales very short; anthers spreading. Female flowers: pedicels 2.3–4.3 mm; sepals subobovate, apex acute; disk 6-lobed; ovary small, apex concave, with crenulate rim; stigmas erect. Capsules ovoid,  $5\text{--}5.5 \times$  ca. 4 mm, rather woody when dry, with lobed rim around stigmas, exocarp thin, spreading,  $\pm$  stellate when dry. Seeds 3-angled, ca.  $3.5 \times 2 \times 2$  mm. Fl. Jun–Oct, fr. Sep–Dec.

Open forests or valley scrub, broad-leaved forests; 100–2100 m. Guangxi, Xizang, Yunnan [Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

*Sauropus quadrangularis* has distinctive ovaries and fruits, longer than wide and with usually erect stigmas inserted in an apical depression delineated by a distinct rim. Varieties based on variation in stem morphology, whether the branchlets are 4-angled or compressed and only 2-angled (var. *compressus*), and in indumentum (var. *pubescens*), are not well-founded as these characters can vary within populations.

**13. *Sauropus delavayi*** Croizat, J. Arnold Arbor. 21: 496. 1940.

石山守宫木 shi shan shou gong mu

Erect shrubs to 1 m tall, more branched, monoecious, glabrous except for glandular-pubescent branchlets; stem gray; branches 4-angled, red-brown. Stipules linear, 0.5–1 mm; petiole 0.5–1 mm; leaf blade orbicular,  $0.2\text{--}0.8 \times 0.2\text{--}0.8$  cm, papery, base rounded or shallowly cordate, apex rounded, truncate, or retuse, sometimes mucronate; venation pinnate, midrib and lateral veins 4 or 5 pairs, elevated on both surfaces, reticulate veins prominent. Inflorescence axillary, usually 1-flowered. Male flowers: pedicels ca. 3 mm; calyx discoid, ca. 2 mm in diam., red; sepals ovate, ca. 1 mm; disk segments 6; stamen filaments connate. Female flowers: pedicels ca. 2 mm; calyx ca.  $2 \times 3$  mm in diam.; sepals obovate, ca. 1.5 mm; ovary ovoid, apex shallowly undulate. Persistent sepals ovate, ca. 3 mm; capsule globose, 0.5–0.8 cm in diam. Fl. May–Sep, fr. Aug–Dec.

• Scrub; 500–1800 m. Guangxi (Longgang), NW Yunnan (Binchuan, Heqing).

**14. *Sauropus garrettii*** Craib, Bull. Misc. Inform. Kew 1914: 284. 1914.

苍叶守宫木 cang ye shou gong mu

*Sauropus chorisepalus* Merrill & Chun; *S. yunnanensis* Pax & K. Hoffmann.

Shrubs to 4 m tall, erect, glabrous except for puberulent young branchlets and veins of leaf blade; branches sometimes compressed, usually sharply 2-keeled; branchlets obscurely angular when young, terete with age, slender. Stipules oblong-lanceolate, 2.5–4 mm; petiole ca. 2 mm; leaf blade rhombic-ovate, ovate-lanceolate, rarely oblong or ovate,  $2\text{--}13 \times 1\text{--}3.5$  cm, membranous or thinly papery, abaxially glaucous or glaucescent, adaxially dark green when dry, base broadly cuneate, rounded, or truncate, apex usually acuminate, rarely acute; venation pinnate, lateral veins 5 or 6 pairs. Plants monoecious. Inflorescence axillary, 1- or 2-flowered, or male and female mixed in axillary clusters. Male flowers: pedicels slender, 3–10 mm, with dense bracteoles at base; calyx disk-shaped, 3–5 mm in diam., shallowly 6-fid, segments ovate or subelliptic, apex acute or acuminate, membranous; stamens 3; filaments connate. Female flowers: pedicels slender, 6–15 mm; calyx turbinate; ovary apex truncate, 3-locular; styles 3, bifid at apex, arms recurved. Capsules obovate or subovoid, 1–2.5 cm in diam. Seeds black, triquetrous. Fl. Apr–Aug, fr. Aug–Nov.

Evergreen forests on slopes or in valleys, moist scrub; 500–2000 m. Guangdong, Guangxi, Guizhou, ?Hainan, Hubei, Sichuan, Yunnan [Laos, Myanmar, Thailand].

**15. *Sauropus androgynus*** (Linnaeus) Merrill, Bull. Bur. Forest. Philipp. Islands 1: 30. 1903.

守宫木 shou gong mu

*Clutia androgyna* Linnaeus, Mant. Pl. 1: 128. 1767; *Aalius androgyna* (Linnaeus) Kuntze; *A. retroversa* (Wight) Kuntze; *A. sumatrana* (Miquel) Kuntze; *Agyneia ovata* Poiret; *Andrachne ovata* Lamarck ex Poiret; *Phyllanthus strictus* Roxburgh; *Sauropus albicans* Blume; *S. albicans* var. *gardnerianus* (Wight) Müller Argoviensis; *S. albicans* var. *intermedius* Müller Argoviensis; *S. albicans* var. *zeylanicus* (Wight) Müller Argoviensis;

*S. convexus* J. J. Smith; *S. gardnerianus* Wight; *S. indicus* Wight; *S. parviflorus* Pax & K. Hoffmann; *S. retroversus* Wight; *S. scandens* C. B. Robinson; *S. sumatranus* Miquel; *S. zeylanicus* Wight.

Shrubs 1–3 m tall, erect, monoecious, glabrous throughout; branchlets angular when young, terete with age, slender, green. Stipules lanceolate or linear-lanceolate, 1.5–3 mm; petiole 2–4 mm; leaf blade ovate-lanceolate, oblong-lanceolate, or lanceolate, 3–10 × 1.5–3.5 cm, submembranous or thinly papery, base cuneate, rounded, or truncate, apex acuminate; venation pinnate, lateral veins 5–7 pairs, elevated abaxially, flattened adaxially, reticulate veins obscure. Inflorescence axillary, 1- or 2-flowered, or several male and female per cluster. Male flowers: pedicels slender, 5–7.5 mm; calyx shallowly disk-shaped, 5–12 mm in diam., shallowly 6-fid; sepals obovate; disk segments 6, opposite to sepals, incurved distally, covering anthers; stamens 3; fila-

ments connate; anthers extrorse. Female flowers usually solitary, axillary; pedicel 6–8 mm; calyx red, 6-lobed; sepals obovate or obovate-triangular, 5–6 × 3–5.5 mm, base attenuate into a short claw; disk absent; ovary depressed globose, ca. 0.7 × 1.5 mm, 3-locular; styles 3, bifid. Fruiting pedicel 0.5–1 cm; persistent calyx red; capsule white, depressed globose or globose, ca. 1.2 × 1.7 cm, thinly crustaceous. Seeds black, triquetrous, ca. 7 × 5 mm. Fl. Apr–Jul, fr. Jul–Dec.

Slopes with brushwood, sunny forest margins; 100–400 m. Guangdong, Guangxi, Hainan, Yunnan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

*Sauropus androgynus* is widely cultivated. The leaves are used as a medicine for coughs and to soothe the lungs, as a tonic, and as a febrifugal to relieve internal fever; they are also used as a vegetable ("Sweet Leaf Bush").

## 12. BREYNIA J. R. Forster & G. Forster, Char. Gen. Pl. 73. 1775, nom. cons., not Linnaeus (1753).

黑面神属 hei mian shen shu

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Melanthesa* Blume; *Melanthesopsis* Müller Argoviensis.

Shrubs or trees, monoecious; indumentum of simple hairs or absent. Leaves simple, alternate, distichous, petiolate; stipules triangular, ± caducous; leaf blade entire, abaxially drying dirty brownish and often glaucous-papillate, adaxially often drying blackish, pinnately veined. Inflorescences axillary, male flowers in few-flowered clusters in proximal axils, sometimes in small bracteate racemes, female flowers solitary in distal axils. Male flowers: calyx turbinate, funnelform, or hemispheric, fleshy, apex usually shortly 6-lobed, lobes usually incurved and concealing stamens; petals absent; disk lobes scalelike, at base of calyx lobes; stamens 3; filaments connate into cylindrical column with parallel sessile anthers along sides; anthers 2-locular, longitudinally dehiscent; pistillode absent. Female flowers: calyx turbinate, hemispheric, campanulate, radial, or cup-shaped, 6-dentate to (5 or)6-fid, persistent, accrescent into saucer-shape or disk; ovary globose, truncate, or depressed, 3-locular; styles 3, bifid at apex, inserted within apical depression with lobed margin; ovules 2 per locule. Fruit usually a berry, globose or depressed globose, red, indehiscent, exocarp ± fleshy, harder when dry, with 3–6 trigonous cocci when mature. Seeds sharply 3-angled, yellow or reddish, smooth; testa thinner; caruncle absent; endosperm copious, fleshy; embryo curved; cotyledon slightly broad and flattened. *n* = 13, 16.

Between 26 and 30 species: tropical Asia, Australia, Pacific islands; five species in China.

*Breynia disticha* J. R. Forster & G. Forster f. *nivosa* (W. Bull) Croizat ex Radcliffe-Smith, the "snow bush," is a widely grown ornamental shrub, often as a low hedge plant, with membranous, green-white-red variegated leaves and otherwise similar to *B. retusa* but never setting fruits in China.

Initial observations (Kawakita & Kato, Amer. J. Bot. 91: 1319–1325. 2004) suggested that there is a symbiotic relationship between species of *Breynia* and moths of the genus *Epicephala* similar to that observed in *Glochidion*.

- 1a. Leaves leathery; female flowers and fruits often several per axil; fruiting stigmas longer than 1 mm, deeply bifid ..... 4. *B. fruticosa*
- 1b. Leaves papery to thinly leathery; female flowers and fruits solitary per axil; fruiting stigmas not longer than 1 mm, bifid or not.
- 2a. Stamens connate into a 3-angled head with anthers on underside; female flowers and fruits with fused style; fruiting calyx enlarged, to 12 mm in diam. .... 3. *B. retusa*
- 2b. Stamens connate into a cylindrical head with anthers parallel along sides; female flowers and fruits with free stigmas, not fused at base; fruiting calyx hardly enlarging, less than 8 mm in diam.
- 3a. Leaves papery to thinly leathery, with acuminate apex; fruits 6–7 mm in diam., with beaked apex ..... 5. *B. rostrata*
- 3b. Leaves papery, with rounded to acute apex; fruits 4–5 mm in diam., with smooth apex.
- 4a. Leaf apex rounded; ovaries and fruits often stipitate above calyx ..... 1. *B. officinalis*
- 4b. Leaf apex acute; ovaries and fruits always sessile in calyx ..... 2. *B. vitis-idaea*

1. *Breynia officinalis* Hemsley, J. Linn. Soc., Bot. 26: 427. 1894.

红仔珠 hong zi zhu

*Breynia accrescens* Hayata; *B. formosana* (Hayata) Ha-

yata; *B. officinalis* var. *accrescens* (Hayata) M. J. Deng & J. C. Wang; *B. stipitata* Müller Argoviensis var. *formosana* Hayata.

Erect shrubs 1–3(–5) m tall, glabrous throughout, much branched; branches terete, slender. Stipules ovate-triangular, ca.

1 mm; petiole 2–3 mm; leaf blade elliptic or broadly elliptic, 2–4.5 × 1–3 cm, membranous, distichous, abaxially pruinose-green or glaucous, adaxially green, base acute to obtuse, apex obtuse to rounded; midvein and (3–)5–7 pairs lateral veins flattened adaxially, elevated abaxially. Flowers small, green, solitary or 2 or 3 in axillary fascicle. Male flowers: pedicels slender, 3–6 mm; sepals 6, broadly ovate, ca. 2 mm, subtruncate at apex; stamens 3, connate into capitate column. Female flowers solitary; pedicels 2–4 mm, hardly lengthening in fruit; sepals as in male, but shorter, 1–2 mm, slightly enlarged in fruit; ovary ovoid; stigmas short, ca. 0.25 mm, free, undivided. Fruiting pedicel 3–4 mm; fruits often elevated by stalk of ca. 2 mm above calyx, ovoid, compressed at apex, ca. 5 mm in diam., apex sometimes obscurely beaked, with shallow apical rim, black-purple when fully mature, red and drying shiny brown. Seeds 3–4.5 × 1.8–2.5 × 1.7–2.5 mm, yellow-brown. Fl. year-round, fr. Jan, Oct.

Thickets, scrub; below 500 m. Fujian, Taiwan [Japan].

All parts are used as medicine for asthma, sore throat, and eczema.

*Breynia officinalis* has been included within the following, much more widespread species, *B. vitis-idaea*, but it can be distinguished by the differences in leaf shape (rounded, not acute, apex) and the presence of a basal stalk on the fruits.

**2. *Breynia vitis-idaea*** (N. L. Burman) C. E. C. Fischer, Bull. Misc. Inform. Kew 1932: 65. 1932.

小叶黑面神 xiao ye hei mian shen

*Rhamnus vitis-idaea* N. L. Burman, Fl. Indica, 61. 1768; *Breynia rhamnoides* Müller Argoviensis, nom. illeg. superfl.; *Melanthesa rhamnoides* Blume, nom. illeg. superfl.; *Phyllanthus rhamnoides* Retzius, nom. illeg. superfl.

Erect shrubs to 3 m tall, glabrous throughout, much branched; branches terete, slender. Stipules ovate-triangular, ca. 1.5–2 mm; petiole 2–3 mm; leaf blade elliptic (rarely ovate or broadly ovate), 2–5 × 1.5–3 cm, membranous, distichous, abaxially pruinose-green or glaucous, adaxially green, base obtuse, apex acute; midvein and 5–7 pairs lateral veins flattened adaxially, elevated abaxially. Flowers small, green, solitary or several in axillary racemes. Male flowers: pedicels slender, 2.5–4 mm; sepals 6, broadly ovate, ca. 2 mm, subtruncate at apex; stamens 3, connate into capitate column. Female flowers solitary; pedicels 3–4 mm, not lengthening in fruit; sepals as in male, but shorter, 1–2 mm, not enlarged in fruit; ovary ovoid; stigmas short, ca. 0.25 mm, free, undivided. Fruiting pedicel 3–4 mm; fruits ovoid, compressed at apex, 3.5–5 × 4–5 mm, apex sometimes obscurely beaked, without apical rim, red and turning black-purple when fully mature, drying shiny brown. Seeds 3–4.5 × 1.8–2.5 × 1.7–2.5 mm, yellow-brown. Fl. Mar–Sep, fr. May–Dec [elsewhere fl. and fr. ± year-round]. *n* = 16.

Montane slopes, scrub; 100–1000 m. Guangdong, Guizhou, Yunnan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam].

Plants from E China (Fujian and Taiwan) and Japan are here included in the previous species, *Breynia officinalis*.

**3. *Breynia retusa*** (Dennstedt) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11: 204. 1929.

钝叶黑面神 dun ye hei mian shen

*Phyllanthus retusus* Dennstedt, Schlüssel Hortus Malab. Register 1: 15; Register 2: 24; Register 3: 31. 1818; *Breynia hyposauropus* Croizat; *B. patens* (Roxburgh) Rolfe; *Melanthesopsis patens* (Roxburgh) Müller Argoviensis; *P. patens* Roxburgh.

Erect shrubs 0.5–3.5 m tall, glabrous throughout; branches slender. Stipules small, 1–2 × 0.6–0.7 mm; petiole 1–2.5 mm; leaf blade elliptic to slightly obovate, 1.5–3 × 0.7–1.5 cm, papery or thinly papery, abaxially grayish green or pruinose, adaxially green, base obtuse to rounded, apex rounded to subacute, mucronulate; lateral veins 3–7 pairs, slender, obscure. Flowers solitary or rarely 2 in axillary clusters. Male flowers: pedicels slender, ca. 1.5 mm; calyx campanulate to turbinate, 2–3 mm in diam., 6-lobed; sepals rounded to oblong; stamens 3, connate into 3-angled head, ca. 2 mm. Female flowers solitary; pedicels 0.5–1.5 mm; calyx campanulate, 6-lobed, ca. 4–6 mm in diam., ca. 1.5–3 mm high; sepals ovate-oblong, enlarged to ca. 12 mm in diam. in fruit; ovary globose; style present, very stout; stigmas with 3 short forked arms, ca. 0.5 mm. Fruiting pedicel 2–6 mm; capsules globose, 5–6 × 8–10 mm, exocarp fleshy, tardily dehiscent, red and ripening brown, apex smooth or with a shallow ring. Seeds 3.6–4 × 2.2–2.8 × 2.2–2.8 mm, yellow to red. Fl. Mar–Oct, fr. Feb–Mar, Jul–Aug.

Open forests, valley scrub; 300–2000 m. Guangxi, Guizhou, Xizang, Yunnan [Bangladesh, Bhutan, Cambodia, India, Laos, Malaysia (peninsular), Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

The roots are used as a medicine for meningitis; its leaves are used to relieve skin inflammation. The 3-angled anther head is somewhat similar to that of some *Sauropus*.

**4. *Breynia fruticosa*** (Linnaeus) Müller Argoviensis in A. Candolle, Prodr. 15(2): 237. 1866.

黑面神 hei mian shen

*Andrachne fruticosa* Linnaeus, Sp. Pl. 2: 1014. 1753; *Melanthesa chinensis* Blume; *M. glaucescens* Miquel; *Melanthesopsis fruticosa* (Linnaeus) Müller Argoviensis; *M. lucens* (Poir.) Müller Argoviensis; *Phyllanthus lucens* Poir.; *P. turbinatus* Sims.

Erect shrubs 1–3(–5) m tall, glabrous throughout; stem gray-brown; branches compressed at upper part, purple; branchlets green. Stipules triangular-lanceolate, ca. 2 mm; petiole 3–4 mm; leaf blade ovate, broadly ovate, or rhombic-ovate, 3–7 × 1.8–3.5 cm, leathery, abaxially pruinose-green, adaxially dark green, base obtuse or acute, apex (obtuse or) acute to subacuminate; lateral veins 3–8 pairs. Flowers small, solitary or 2–4-flowered in axillary clusters, male in proximal axils, female in distal axils, sometimes male and female apart, inserted in different branchlets. Male flowers: pedicels 2–3 mm; calyx turbinate, ca. 2 mm, thickened, 6-dentate at apex; stamens 3, connate into a column. Female flowers usually several per axil; pedicels ca. 2 mm; calyx campanulate, shallowly 6-fid at apex, ca. 4 mm in diam.; sepals subequal, subtruncate and apiculate at apex, much enlarged in fruit to ca. 8 mm in diam., upper part radial-spreading into disk; ovary ovoid; stigmas 3, to ca. 0.6 mm, distinctly bifid at apex, lobes recurved, elongating in fruit to 1–2 mm. Fruiting pedicel ca. 5 mm; capsules globose, 5–6 × 6–8 mm, apex rounded, without apical rim, yellowish to orange;

stigmas free, undivided or apically slightly bifid. Seeds 4.6–5 × ca. 3 × 3 mm, red. Fl. year-round, fr. May–Dec.

Montane slopes, scrub, sunny forest margins; 100–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Yunnan, Zhejiang [Laos, Thailand, Vietnam].

The roots and leaves are used as medicine for inflammation of intestine and stomach, sore throat, eczema, etc. The branches, leaves, and stem contain up to 12% tannins.

**5. *Breynia rostrata*** Merrill, Philipp. J. Sci. 21: 346. 1922.

喙果黑面神 hui guo hei mian shen

Evergreen shrubs or rarely trees, 4–5(–12) m tall, glabrous throughout; branches and leaf blade black when dry. Stipules triangular-lanceolate, slightly shorter than petioles; petiole 2–3 mm; leaf blade ovate- or oblong-lanceolate, 3–7 × 1.5–3 cm,

papery or thinly leathery, abaxially gray-green, adaxially green, base acute to obtuse, apex acuminate; lateral veins 3–7 pairs. Flowers male and female mixed in axillary clusters. Male flowers: pedicels ca. 3 mm; calyx funnelform, 2.5–3 mm in diam., 6-dentate at apex. Female flowers: pedicels ca. 3 mm; calyx 6-lobed; sepals unequal, biseriate, outer sepals broadly ovate, ca. 3 mm, inner sepals ovate, ca. 1 mm, apex acute, enlarged and reflexed in fruit; ovary globose, 2–3 mm; stigmas 3, bifid at apex, lobes erect. Capsules globose, 6–7 mm in diam., apex beaked, with persistent stigmas. Seeds ca. 3 mm. Fl. May–Dec, fr. Aug–Dec.

Montane forests or scrub-covered slopes; 100–1500 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan, Zhejiang [Vietnam].

*Breynia rostrata* has been reported to be hepatotoxic.

### 13. *ANTIDESMA* Burman ex Linnaeus, Sp. Pl. 2: 1027. 1753.

五月茶属 wu yue cha shu

Li Bingtao (李秉滔 Li Ping-tao); Petra Hoffmann

*Rhytis* Loureiro; *Stilago* Linnaeus.

Trees or erect shrubs, dioecious; indumentum of simple hairs. Leaves alternate, eglandular; stipules small; petiole usually short; leaf blade simple, margin entire, venation pinnate. Inflorescences axillary, sometimes apparently terminal, or cauline, spikes or racemes, sometimes much branched. Male flowers: calyx 3–5(–8)-lobed, cup-shaped, lobes imbricate; petals absent; disk extrastaminal, annular or cushion-shaped (enclosing bases of stamens and pistillode), or consisting of free lobes; stamens (1–)3–5(–7), inserted inside/within disk or sinus of disk lobes, incurved in bud, afterward straight; filaments longer than sepals; anthers 2-locular, connectives U-shaped; thecae separate from each other, resembling swollen ends of U, raised at anthesis, dehiscing longitudinally; pistillode usually present. Female flowers: sepals as in male; disk annular surrounding ovary, entire; ovary longer than sepals, usually 1-locular; ovules 2 per locule, pendent; styles 2–4, short, terminal to lateral, apex usually bifid. Fruit a drupe, ovoid, ellipsoid, or lens-shaped, with many areoles when dry, crowned with persistent styles, usually 1-seeded. Seeds small, endosperm fleshy, cotyledon flattened and broad.  $x = 13$ .

About 100 species: mainly the tropics and subtropics of Asia but also in Africa (8 species), the Pacific islands (5–8 species), and Australia (5–7 species); 11 species (two endemic) in China.

Material of species no. 11, *Antidesma hontaushanense*, described from Taiwan (Lan Yu), has not been seen and the available description is too poor to include this taxon within the key to species.

- 1a. Leaf apex rounded, retuse, or obtuse.
  - 2a. Sepals free, pubescent outside; petiole 0.7–1 mm wide; fruiting pedicel 0–1 mm; male disk consisting of free pubescent lobes; leaf base cordate to rounded, rarely obtuse; ovary pubescent ..... 1. *A. ghaesembilla*
  - 2b. Sepals fused for at least 2/3 of their length, glabrous or pubescent outside; petiole 1–2 mm wide; fruiting pedicel 1.5–3(–9) mm; male disk various but never consisting of free pubescent lobes; leaf base acute to rounded; ovary glabrous or pubescent.
    - 3a. Leaves papery, dull, (2–)5–10(–21) cm; domatia present; disk pubescent, at least in male flowers; stamens (1 or)2(or 3); rudimentary ovary absent or small; fruit 4–6 × 3–4 mm; female inflorescence and infructescence 2–5(–9) cm ..... 2. *A. acidum*
    - 3b. Leaves leathery or thickly papery, shiny, (5–)10–18(–32) cm; domatia absent; disk glabrous; stamens 3 or 4(or 5); rudimentary ovary ca. 1 mm; fruit 5–11 × 4–7 mm; female inflorescence and infructescence (4–)10–18 cm ..... 3. *A. bunius*
- 1b. Leaf apex acute, acuminate, or caudate.
  - 4a. Stipules 2–5(–7) mm wide, persistent; bracts subtending inflorescences and inflorescence branches conspicuous, resembling stipules; most of plant densely yellowish tomentose ..... 4. *A. fordii*
  - 4b. Stipules 0.2–2(–3) mm wide or caducous; bracts subtending inflorescences and inflorescence branches inconspicuous, not resembling stipules; indumentum various.
    - 5a. Petiole 15–35 × 2–3 mm; sepals free, males 1–1.2 mm, females 1.5–1.8 mm; infructescence robust and usually unbranched, up to 17 cm ..... 5. *A. nienkui*
    - 5b. Petiole 0–15(–20) × 0.5–1.5 mm; sepals free or partially fused, either less than 1 mm (males) or ca. 1.5 mm (females), or fused for at least 2/3 of their length; infructescence unbranched or branched, mostly much shorter than 17 cm.

- 6a. Fruit with lateral styles inserted at ca. 1/4 of fruit length; stipules needlelike, ca. 0.2 mm wide, persistent; leaves usually bullate; disk and ovary hairy ..... 6. *A. hainanense*
- 6b. Fruit and ovary with terminal styles (rarely subterminal in *A. japonicum*); stipules triangular-lanceolate, at least 0.5 mm wide or caducous; leaves not bullate; disk and ovary various.
- 7a. Sepals fused for more than 1/2 of their length.
- 8a. Fruit 5–11 × 4–7 mm, laterally compressed; male calyx 1–1.5 mm, flowers sessile; leaf blade (5–)10–23(–32) cm, without domatia, completely glabrous or abaxially pubescent; inflorescence axes robust, usually unbranched ..... 3. *A. bunius*
- 8b. Fruit 3–6 × 2–4 mm, laterally compressed or terete; male calyx 0.3–0.5 mm, flowers sessile to pedicellate; leaf blade (2–)5–10(–21) cm, usually with domatia, pilose at least along major veins; inflorescence axes moderately thick to slender, usually branched.
- 9a. Leaf blade obovate to elliptic-oblong, drying yellowish green, whitish pubescent to glabrous, higher venation not conspicuously tessellated; calyx glabrous outside; male pedicel 1–1.5 mm; male disk cushion-shaped, enclosing filaments, pubescent; stamens (1 or)2(or 3); rudimentary ovary absent or minute; stigmas 3 or 4 ..... 2. *A. acidum*
- 9b. Leaf blade oblong to lanceolate, drying reddish brown, grayish, or olive green, yellowish pilose at least along veins abaxially, higher venation finely tessellated; calyx ± pubescent outside; male pedicel 0–1 mm; disk annular, sometimes divided into free alternistaminal lobes, glabrous; stamens 3 or 4; rudimentary ovary clavate to terete; stigmas 4–8 ..... 7. *A. sootepense*
- 7b. Sepals free to fused for up to 1/2 of their length.
- 10a. Ovary and fruit pubescent, laterally compressed; disk, at least in male flowers, pubescent; male disk consisting of free alternistaminal glands; stamens (4 or)5(–7); indumentum especially of young plant parts and inflorescences reddish to yellowish ..... 1. *A. ghaesembilla*
- 10b. Ovary and fruit glabrous; disk glabrous; male disk cushion-shaped, fully or partially enclosing bases of filaments and pistillode; stamens 3–5; indumentum lacking or variously colored.
- 11a. Leaf blade ovate, apically long attenuate-acute; petiole (5–)8–15(–20) mm, not wider than 1 mm; female inflorescence and infructescence 2–5(–8) cm, axes reddish pubescent; Hainan ..... 8. *A. maclurei*
- 11b. Leaf blade oblong or elliptic, apically acuminate; petiole 2–10(–20) mm, 0.5–2 mm wide; male inflorescence (1–)3–13 cm, female inflorescence 3–10 cm, infructescence 6–20 cm, axes whitish or yellowish pubescent; mainland China.
- 12a. Higher leaf venation finely tessellated, leaf blade often with domatia, yellowish pubescent at least along veins abaxially; calyx lobed for 1/4–1/2 of its length, margin never glandular-fimbriate, in female flowers pitcher-shaped; male disk annular, sometimes divided into free lobes alternating with stamens; fruit terete ..... 7. *A. sootepense*
- 12b. Higher leaf venation not conspicuously tessellated, leaf blade without domatia, usually glabrous except for whitish pubescence along major veins, or completely glabrous; calyx lobed for at least 1/2 of its length to sepals free, margin often glandular-fimbriate, cup-shaped; male disk cushion-shaped, fully or partially enclosing bases of filaments and pistillode or annular and 3–5-lobed, lobes extending inward between filaments to pistillode; fruit laterally compressed or terete.
- 13a. Fruit distinctly laterally compressed; inflorescence, pedicels, and flowers slender, usually very regular; petiole 0.5–1 mm wide; sepals often free; leaves papery to subleathery, often conspicuously flat and shiny, to 13 × 4.5 cm, elliptic or oblong-elliptic to oblong-lanceolate ..... 9. *A. japonicum*
- 13b. Fruit terete; inflorescence, pedicels, and flowers of moderate to robust build; petiole 0.7–2 mm wide; sepals nearly free to halfway fused; leaves membranous to leathery, not conspicuously shiny or flat, to 25 × 10 cm, of variable shape ..... 10. *A. montanum*

**1. *Antidesma ghaesembilla*** Gaertner, Fruct. Sem. Pl. 1: 89. 1788.

方叶五月茶 fang ye wu yue cha

Trees up to 20 m tall; young twigs pubescent. Stipules needlelike, 3–6 × 0.5–1 mm, pubescent, caducous; petiole

4–10(–20) mm, pubescent; leaf blade oblong, more rarely ovate or obovate, (2–)3–7(–16) × (2–)3–5(–9) cm, papery to thinly leathery, pubescent to glabrous especially adaxially, often only major veins and margin pubescent, dull or shiny adaxially, dull abaxially, drying olive green to reddish green, base rounded to cordate, rarely obtuse, apex rounded, more rarely obtuse or



acute, sometimes mucronate or retuse; domatia sometimes present; midvein flat adaxially, lateral veins 5–7 pairs, tertiary veins reticulate to weakly percurrent. Inflorescences axillary and terminal, axes reddish pubescent, males 4–8 cm, 10–20-branched, females 2–3 cm, (1–)10–20-branched; fruiting 4–7 cm. Male flowers sessile; sepals (4 or)5(–7), free, 0.5–1 mm, deltoid to oblong, pubescent outside, ± glabrous inside, apex acute to obtuse; disk consisting of 4–7 free alternistaminal obconical lobes, pubescent; stamens (4 or)5(–7), 2–2.5 mm; rudimentary ovary obconical. Female including fruiting pedicels 0–1 mm; sepals as in male; disk glabrous to pubescent especially at margin; ovary pubescent; stigmas (2 or)3(–5). Drupes ellipsoid, laterally compressed, 3–4(–5) × 2.5–3(–3.5) mm, sparsely pubescent; style terminal to more rarely subterminal. Fl. Mar–Sep, fr. Jun–Dec.  $x = 13$ .

Sparse forests, open scrub, deciduous, evergreen, or mixed dry forests; 200–1100 m. Guangdong, Guangxi, Hainan, Yunnan [Bangladesh, ?Bhutan, Cambodia, India (including Nicobar Islands), Indonesia, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia].

The leaves are used as a medicine for headaches; the stem is used as a medicine to stimulate the menstrual flow. The fruit is eaten locally or used as a purgative.

**2. *Antidesma acidum* Retzius, Observ. Bot. 5: 30. 1789.**

西南五月茶 xi nan wu yue cha

*Antidesma diandrum* (Roxburgh) Roth; *A. lanceolarium* (Roxburgh) Wallich; *A. wallichianum* C. Presl; *Stilago diandra* Roxburgh; *S. lanceolaria* Roxburgh.

Shrubs or treelets, up to 6(–10) m tall; young twigs pubescent. Stipules linear, 3–8 × 1–2 mm, pubescent; petiole 2–7(–10) mm, pubescent; leaf blade obovate to elliptic-oblong, (2–)5–10(–21) × (1.5–)2.5–4(–9) cm, papery, glabrous or rarely pilose adaxially, pubescent and rarely glabrous abaxially, dull, drying yellowish green, base acute to obtuse, rarely attenuate, apex rounded to acute or acuminate, sometimes mucronate; domatia present; midvein flat to impressed adaxially, lateral veins 4–9 pairs, tertiary veins reticulate. Inflorescences terminal to axillary, axes glabrous to pubescent, simple to branched twice at base, males 5–14 cm, females and fruiting 2–9 cm. Male flowers: pedicels 1–1.5 mm; calyx ca. 0.5 mm, cupular to globose, (3 or)4-lobed, divided for ca. 1/3, glabrous outside, pubescent inside with hairs often exceeding beyond calyx, margin erose, apex mainly rounded; disk cushion-shaped or annular and lobed between stamens, pubescent; stamens (1 or)2(or 3), 1.5–2 mm; rudimentary ovary terete or absent. Female flowers: pedicels 0.2–1.5 mm, 1.5–4 mm in fruit; calyx ca. 1 mm, cupular to nearly urceolate, 4- or 5-lobed, otherwise as in male; disk glabrous outside, glabrous to pilose inside; ovary glabrous; stigmas 3 or 4. Drupes ellipsoid, nearly terete to laterally compressed, 4–6 × 3–4 mm, glabrous; style terminal to slightly subterminal. Fl. May–Jul, fr. Jun–Nov.  $x = 13$ .

Open forests; 100–1500 m. Guizhou, Sichuan, Yunnan [Bangladesh, Bhutan, Cambodia, India (including Andaman and Nicobar Islands), Indonesia (Java), Laos, Myanmar, Nepal, Thailand, Vietnam].

In the southern part of the distribution range, pistillodes are always absent from the male flowers.

**3. *Antidesma bunius* (Linnaeus) Sprengel, Syst. Veg. 1: 826. 1824.**

五月茶 wu yue cha

Trees, rarely shrubs, up to 30 m tall; young twigs glabrous to very shortly pubescent. Stipules linear, 4–6 × 1.5–2 mm, caducous; petiole 3–10(–17) mm, glabrous to pubescent; leaf blade oblong, elliptic, or obovate, (5–)10–23(–32) × (2–)3–10 cm, leathery or thickly papery, glabrous except sometimes midvein pilose, or abaxially reddish pubescent, shiny, usually drying dark green (sometimes grayish or reddish) adaxially, slightly lighter abaxially, base acute to rounded, apex acute to rounded, sometimes slightly emarginate or acuminate, usually mucronate; domatia absent; midvein flat to impressed adaxially, lateral veins (5–)7–11 pairs, tertiary veins reticulate. Inflorescences axillary or terminal, axes glabrous to pubescent, robust, males 6–17(–25) cm, 3–8(–14)-branched, females and fruiting (4–)10–18 cm, unbranched or more rarely up to 4-branched. Male flowers sessile; calyx 1–1.5 mm, cup-shaped, 3- or 4(or 5)-lobed, divided for 1/4–1/3, glabrous to pubescent outside, reddish long pubescent at base inside, margin fimbriate, apex of lobes obtuse to rounded; disk annular, consisting of free lobes or enclosing stamens and pistillode, glabrous; stamens 3 or 4(or 5), 2–3 mm; rudimentary ovary clavate to cylindrical. Female flowers: pedicels 0.5–1(–2) mm, 2–4(–9) mm in fruit; calyx 3-lobed, otherwise as in male; disk glabrous; ovary glabrous or pilose; stigmas 3 or 4(–6). Drupes ellipsoid, laterally compressed, 5–11(–?18) × 4–7 mm, glabrous or pilose, red to black when ripe; style (sub)terminal. Fl. Mar–May, fr. Jun–Nov.  $x = 13$ .

Forests; 200–1800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Yunnan, Xizang [India (including Andaman and Nicobar Islands), Indonesia, Laos, Myanmar, Nepal, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, Vietnam; NE Australia (including Christmas Island), Pacific islands (Hawaii, Tahiti)].

*Antidesma bunius* var. *bunius* is widely cultivated as a fruit tree, especially in Java and the Philippines. The fruits are used in syrups, jams, and jellies; made into wine, liqueur, or brandy; and used in sauces eaten with fish. The leaves are eaten as a vegetable, and the leaves and roots are used as medicine for traumatic injury.

The species is absent in Peninsular Malaysia and nearly absent from Borneo.

- 1a. Indumentum lacking or whitish; abaxial leaf surface glabrous or pilose only along midvein; ovary and fruit glabrous ..... 3a. var. *bunius*
- 1b. Indumentum reddish; abaxial leaf surface pubescent all over; ovary and fruit pilose ..... 3b. var. *pubescens*

**3a. *Antidesma bunius* var. *bunius***

五月茶(原变种) wu yue cha (yuan bian zhong)

*Stilago bunius* Linnaeus, Mant. Pl. 1: 122. 1767; *Antidesma collettii* Craib; *A. thorelium* Gagnepain.

Young twigs, petioles, and inflorescence axes glabrous to very shortly whitish pubescent. Leaf blade glabrous, or pilose only along midvein, often minutely white pustulate. Calyx glabrous to pubescent outside, reddish pubescent at base inside, hairs often exceeding calyx. Ovary and fruit glabrous.

Open forests; 200–1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Xizang [India (including Andaman and Nicobar Islands), Indonesia, Laos, Myanmar, Nepal, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, Vietnam; NE Australia (including Christmas Island), Pacific islands (Hawaii, Tahiti)].

**3b. *Antidesma bunius* var. *pubescens*** Petra Hoffmann, Kew Bull. 54: 350. 1999.

毛叶五月茶 *mao ye wu yue cha*

Young twigs, petioles, and inflorescence axes densely reddish pubescent. Leaf blade adaxially glabrous, or reddish pubescent only along midvein, abaxially reddish pubescent, especially along veins. Calyx reddish pubescent on both sides. Ovary and fruit ± pilose.

Evergreen mixed forests; 700–1800 m. Yunnan [N Thailand].

See note under *Antidesma nienkui*.

**4. *Antidesma fordii*** Hemsley, J. Linn. Soc., Bot. 26: 430. 1894.

黄毛五月茶 *huang mao wu yue cha*

*Antidesma yunnanense* Pax & K. Hoffmann.

Treelets up to 7 m tall; young twigs, petioles, and inflorescence axes densely yellow tomentose. Stipules ovate to lanceolate, 5–10(–18) × 2–5(–7) mm, yellow villous, usually persistent; petiole 10–30 mm; leaf blade oblong, sometimes elliptic, slightly ovate or obovate, 7–20(–25) × 3–10.5 cm, papery, adaxially sparsely yellow villous except for densely pubescent midvein to completely glabrous, abaxially more densely villous especially along veins, dull, drying olive green, base rounded to obtuse, sometimes truncate, apex acuminate to caudate; domatia sometimes present; midvein impressed adaxially, lateral veins (7–)9–11 pairs, tertiary veins mainly percurrent. Inflorescences terminal and axillary, 2–5(–15)-branched, rarely unbranched, males 10–15 cm, females and fruiting 5–15 cm. Male flowers: pedicels 0.5–1.5 mm; sepals (3 or)4–6, free, 0.7–0.8 mm, narrowly triangular to slightly ovate, pubescent on both sides, apex acute; disk annular and 4-lobed, lobes extending between filaments inward to pistillode, glabrous; stamens 4 or 5, 2–2.5 mm; rudimentary ovary terete, apically sometimes divided. Female flowers: pedicels ca. 0.5 mm (to 2 mm in fruit); sepals as in male; disk glabrous or pubescent; ovary pubescent; stigmas 3–5, variously divided, thicker relative to ovary than in other species. Drupes ellipsoid, laterally compressed, 5.5–7 × 3–4 mm, sparsely villous; style terminal. Fl. Mar–Jul, fr. Jul–Jan.

Dense forests; 200–2300 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [Laos, Vietnam].

**5. *Antidesma nienkui*** Merrill & Chun, Sunyatsenia 2: 263. 1935.

大果五月茶 *da guo wu yue cha*

Trees up to 10 m tall; young twigs densely yellowish tomentose. Stipules lanceolate, ca. 7 mm, caducous; petiole 15–35 mm, densely yellowish tomentose; leaf blade oblong, more rarely oblong-elliptic or -obovate, (9–)11–19(–27) × (4–)5.5–7.5(–12) cm, papery, adaxially glabrous except for ±

pubescent midvein, abaxially pubescent, particularly along veins, adaxially shiny or dull, drying reddish, abaxially dull, drying reddish or olive green, base obtuse, more rarely rounded or acute, apex acuminate or acute; domatia absent; midvein impressed adaxially, lateral veins 5–7(–9) pairs, tertiary veins mainly reticulate. Inflorescences terminal or axillary, axes yellowish tomentose, males 10–14 cm, 1- to 3-branched, females and fruiting 9–17(–28) cm, unbranched or 1-branched. Male flowers: pedicels 0.5–0.8 mm; sepals (3 or)4, free, 1–1.2 mm, deltoid, entire, pubescent on both sides, apex acute; disk annular and 4-lobed, lobes extending between filaments inward to pistillode, glabrous; stamens 4, ca. 2.5 mm. Female flowers: sepals 4, 1.5–1.8 mm, otherwise as in male; disk glabrous; stigmas (3 or)4. Fruiting pedicels (3–)5–7 mm; drupes ellipsoid, laterally compressed, 10–12 × 6–7 mm, sparsely pilose; style terminal. Fl. May–Aug, fr. Oct–Nov.

• Valley forests; 600–900 m. Guangdong, Hainan.

The second author has not seen any female flowering specimens, stipules, or any material from Guangdong province.

Specimens from Thailand referred to by Airy Shaw (Kew Bull. 26: 359. 1972) as *Antidesma* cf. *nienkui* Merrill & Chun are *A. bunius* var. *pubescens*. Apart from the considerable geographic disjunction, *A. bunius* var. *pubescens* differs from *A. nienkui* in the shorter petioles and fused sepals. Both taxa, however, have a similar dense reddish indumentum in most parts, which distinguishes them from the nearly glabrous *A. bunius* var. *bunius*.

**6. *Antidesma hainanense*** Merrill, Philipp. J. Sci. 21: 347. 1922.

海南五月茶 *hai nan wu yue cha*

*Antidesma fleuryi* Gagnepain.

Shrubs up to 4 m tall; young twigs tomentose. Stipules needlelike, (3–)4–6 × ca. 0.2 mm, pubescent, persistent; petiole 3–6(–10) mm, tomentose; leaf blade oblong, more rarely elliptic, 7–15(–23) × 2.5–5.5(–6) cm, papery, glabrous adaxially (rarely with pubescent midvein), hirsute along veins abaxially, dull on both sides, drying grayish green to reddish adaxially, reddish or olive green abaxially, base obtuse, more rarely acute or rounded, apex acuminate, with a mucro; domatia sometimes present; midvein clearly impressed adaxially, all veins very strongly prominent abaxially so adaxial surface often bullate, lateral veins 7 or 8(–10) pairs, tertiary veins reticulate. Inflorescences and infructescences axillary, 2–3 cm, unbranched, axes pubescent. Male flowers: pedicels 0.3–0.4 mm; sepals 4, rounded, ca. 0.7 mm in diam.; stamens 4; filaments inserted at disk; disk cushion-shaped, pubescent [in bud: filaments inserted very close to rudimentary ovary, either embedded or surrounded by disk]; rudimentary ovary terete. Female flowers: pedicels ca. 0.7 mm, fruiting 1–1.5 mm; sepals 4(or)5, oblong to triangular, 1–1.2 mm; disk pubescent at margin; ovary pubescent; stigmas 3 or 4. Drupes ellipsoid, moderately compressed laterally with distinct abaxial and adaxial ridges, 4–6 × 3–5 mm; style lateral, inserted at ca. 1/4 fruit length. Fl. Apr–Jul, fr. Aug–Nov.

Dense forests; 300–1000 m. Guangdong, Guangxi, Hainan, Yunnan [Laos, Vietnam].

The second author has not seen mature male flowers and has seen only material from Hainan and Vietnam.

**7. *Antidesma sootepense*** Craib, Bull. Misc. Inform. Kew 1911: 463. 1911.

泰北五月茶 tai bei wu yue cha

Trees or shrubs up to 9 m tall; young twigs usually densely yellowish tomentose. Stipules needlelike, 1–3 × 0.2–0.5 mm, caducous; petiole 2–4(–11) mm, pubescent, glabrescent; leaf blade oblong to lanceolate, (3–)5–10(–12.5) × (1–)1.5–3(–4.2) cm, papery, glabrous except along midvein adaxially, yellowish pilose to glabrous all over but pubescent along veins abaxially, dull to moderately shiny, drying reddish brown, grayish green, or olive green, base acute, rarely obtuse or rounded, apex acuminate-mucronate; domatia often present; major veins impressed adaxially, lateral veins (5 or)6 or 7(–9) pairs, tertiary veins reticulate to weakly percurrent, highest venation finely tessellated. Inflorescences axillary and terminal, axes pubescent, males 4–11 cm, unbranched to 4-branched, females 3–8 cm, unbranched (to 2-branched), fruiting 6–14 cm. Male flowers: pedicels 0–1 mm; calyx 0.3–0.5 mm, cup- to bowl-shaped, 3- or 4-lobed, divided for 1/4–1/2 length, ± pubescent outside, glabrous to pubescent inside, with hairs especially at base, margin fimbriate, apex of lobes acute to rounded; disk annular, sometimes divided into free alternistaminal lobes, glabrous; stamens 3 or 4, 1.5–2.5 mm; rudimentary ovary clavate to terete. Female flowers: pedicels 0.2–1 mm, (1–)2–4 mm in fruit; calyx ca. 0.8 mm, cup- to pitcher-shaped, (3 or)4(or 5)-lobed, ± pubescent outside, glabrous inside but with long hairs at base, margin erose, otherwise as in males; disk glabrous; ovary glabrous; stigmas 4–8. Drupes ellipsoid, terete, abaxially and adaxially ridged, 3–5 × 2–3.5 mm, glabrous; style (sub)terminal. Fl. May–Jul, fr. Aug–Oct.

Mixed deciduous forests; 800–1200 m. S Yunnan [Laos, Myanmar, Thailand (not peninsular)].

**8. *Antidesma maclurei*** Merrill, Philipp. J. Sci. 23: 248. 1923.

多花五月茶 duo hua wu yue cha

Trees up to 10 m tall; young twigs pubescent, glabrescent. Stipules caducous; petiole (5–)8–15(–20) mm, pubescent to glabrous; leaf blade lanceolate or oblong-lanceolate, 7–10(–12) × (1.5–)2–4 cm, thinly papery, glabrous on both surfaces or only veins slightly pubescent abaxially, shiny and drying grayish or reddish on both sides, base rounded or obtuse, apex long acuminate to long acute, mucronate; domatia sometimes present; midvein slightly impressed to flat adaxially, lateral veins 4–7 pairs, tertiary veins mainly reticulate. Inflorescences axillary or terminal, 3–8 cm, 2–6-branched, axes reddish pubescent. Male flowers: sepals 4, triangular, apex acute or more rarely obtuse to rounded, 0.5–0.7 mm, sparsely pubescent outside, margins ciliate, pubescent at base inside, otherwise glabrous inside; stamens 4, filaments ca. 1.5 cm, inserted inside disk; disk annular. Female flowers: fruiting pedicels 0.5–1.5 mm; sepals as in male; disk glabrous; ovary glabrous; stigmas 3 or 4. Drupes ellipsoid, terete, 5–6 × 3–4 mm, glabrous; styles (sub)terminal. Fl. Mar–Jun, fr. May–Oct.

Dense evergreen forests; 300–800 m. Hainan [Vietnam].

The second author has not seen any male material of this species.

**9. *Antidesma japonicum*** Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 212. 1846.

酸味子 suan wei zi

*Antidesma acutisepalum* Hayata; *A. ambiguum* Pax & K. Hoffmann; *A. delicatulum* Hutchinson; *A. filipes* Handel-Mazetti; ?*A. gracillimum* Gage; *A. hiiranense* Hayata; *A. japonicum* var. *acutisepalum* (Hayata) Hurusawa; *A. japonicum* var. *densiflorum* Hurusawa; *A. neriifolium* Pax & K. Hoffmann; *A. pentandrum* Merrill var. *hiiranense* (Hayata) Hurusawa.

Shrubs or small trees 2–8 m tall; young twigs delicate, pubescent when young, glabrescent. Stipules linear, 2–5 × 0.7–1 mm, caducous; petiole 2–10 mm, pubescent to glabrous; leaf blade elliptic or oblong-elliptic to oblong-lanceolate, rarely obovate, 3.5–13 × (1–)1.5–4.5 cm, papery to subleathery, glabrous except for midvein sometimes pubescent, shiny and drying light olive to grayish green on both sides, base acute, obtuse, or rounded, apex acuminate or acute, sometimes caudate, mucronulate; midvein impressed or flat adaxially, lateral veins 5–12 pairs, tertiary veins weakly percurrent to reticulate. Inflorescences terminal or axillary, slender, lax-flowered, 2–6 cm, fruiting 4–10 cm, males unbranched to 6-branched, females unbranched or 2-branched at most, axes glabrous to puberulent. Male flowers: pedicels (0.5–)1–1.5 mm, fruiting (2–)3–6 mm, puberulent to glabrous; sepals 3–5, free or nearly so, 0.4–0.7 mm, ovate to triangular, glabrous; disk cushion-shaped, fully or partially enclosing bases of filaments and pistillode, glabrous; stamens 3–5, 1–2 mm; rudimentary ovary absent, flat, clavate, cylindrical, or 3-fid. Female flowers: calyx as in male; disk glabrous; ovary glabrous; stigmas 2–5. Drupes ellipsoid, laterally compressed, 5–6(–8) × 4–6(–8) mm; style (sub)terminal. Fl. Apr–Aug, fr. Jun–Sep.

Open forests in humid valleys, rarely in scrub on limestone; 300–1700 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Qinghai, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Japan, Malaysia, Thailand, Vietnam].

The seeds yield up to 48% oil.

*Antidesma ambiguum* is a new synonym here. In the key accompanying the protologue, the two species are solely distinguished by pubescent vs. glabrescent young twigs; both of these occur in *A. japonicum*.

The concept of *Antidesma pentandrum* (here treated as a synonym of *A. montanum*) in some respects bridges the gap between *A. japonicum* and *A. montanum*. Further studies in the northern geographic range of the genus might show the need to subsume *A. japonicum* under *A. montanum*.

Sometimes 1 or 2 staminodes may be found in female flowers. This occurs in some other species of *Antidesma* but is very rare.

The Chinese material all belongs to *Antidesma japonicum* var. *japonicum*; *A. japonicum* var. *robustius* Airy Shaw differs most obviously by the midrib which is distinctly raised adaxially; it is endemic to Thailand.

**10. *Antidesma montanum*** Blume, Bijdr. 1124. 1826–1827.

山地五月茶 shan di wu yue cha

Shrubs or trees up to 15(–20) m tall; young branches pubescent, glabrescent. Stipules linear to lanceolate, 2–7(–13) × 0.5–1.5 mm, pubescent, caducous or persistent; petiole

2–10(–20) mm, pubescent, glabrescent; leaf blade elliptic, oblong, lanceolate, or linear, more rarely slightly ovate or obovate, (1.5–)3–25 × (0.4–)1.5–10 cm, membranous to leathery, glabrous except midvein and lateral veins pubescent on one or both surfaces, sometimes pubescent along margin, rarely abaxially slightly pubescent throughout, shiny and drying olive green to grayish green on both sides, often lighter abaxially, base acute or obtuse, rarely rounded, apex acuminate, acute, or obtuse, mucronate or not; domatia sometimes present; major veins impressed or flat adaxially, lateral veins 6–12 pairs, tertiary venation weakly percurrent or reticulate. Inflorescences axillary or terminal, males 1–13 cm, unbranched to 10(–40)-branched, females 1–10 cm, unbranched to 6-branched, fruiting 2.5–20 cm, axes glabrous or pubescent. Male flowers sessile to pedicellate; pedicels to 1.5(–2) mm, glabrous to pubescent; calyx shallowly cup-shaped; sepals 3 or 4(or 5), free to fused for ca. 1/2 of their length, 0.5–0.8 mm, broadly ovate or rounded to obtuse, rarely acute, pubescent to glabrous outside, glabrous inside but often with long hairs at base, margin usually glandular-fimbriate to lacerate; disk cushion-shaped, fully or partially enclosing bases of filaments and pistillode or annular and 3–5-lobed, lobes extending inward between filaments to pistillode, glabrous, very rarely with some hairs; stamens 3–5(or 6), 1–2 mm; rudimentary ovary clavate, hemispheric, or terete, apex obtuse, sometimes obscurely lobed. Female flowers: pedicel 0.2–1.5 mm, fruiting 1–4 mm, glabrous to pubescent; calyx cup-shaped; sepals 3–5(or 6), 0.3–1 mm, triangular to ovate, otherwise as in males; disk glabrous, very rarely with some hairs; ovary glabrous, very rarely with some hairs; stigmas 2–6. Drupes ellipsoid, terete, (3–)5–6(–8) × 2.5–4(–6) mm, glabrous; styles terminal, very rarely slightly subterminal.

Forests, along rivers; 100–1500 m. Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan, Taiwan, Xizang, Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam; Australia].

- 1a. Plants not growing along rivers; leaf blade (2–)2.5–3.5(–6.6) × longer than wide, elliptic to oblong, average size 9–25 × 3–10 cm, apex mostly acuminate ..... 10a. var. *montanum*  
 1b. Plants growing along rivers; leaf blade 4–10 × longer than wide or less than 2 cm wide, lanceolate to linear, average size 3–6 × 0.4–1.5 cm, apex acute or obtuse ..... 10b. var. *microphyllum*

#### 10a. *Antidesma montanum* var. *montanum*

山地五月茶(原变种) shan di wu yue cha (yuan bian zhong)

*Antidesma apiculatum* Hemsley; *A. barbatum* C. Presl; *A. calvescens* Pax & K. Hoffmann; *A. chonnon* Gagnepain; *A. costulatum* Pax & K. Hoffmann; *A. gracile* Hemsley; *A. henryi* Hemsley; *A. henryi* Pax & K. Hoffmann (1922), not Hemsley (1894); *A. kotoense* Kanehira; *A. moritzii* (Tulasne) Müller Argoviensis; *A. paxii* F. P. Metcalf; *A. pentandrum* (Blanco) Merrill; *A. pentandrum* var. *barbatum* (C. Presl) Merrill; *A. pentandrum* var. *rotundisepalum* (Hayata) Hurusawa; *A. pubescens* Roxburgh var. *moritzii* Tulasne; *A. rotundisepalum* Hayata.

Petiole (2–)5–10(–20) mm; leaf blade elliptic to oblong, more rarely slightly ovate or obovate, (6–)9–25 × (2–)3–10 cm,

papery or membranous, glabrous except midvein and lateral veins pubescent on one or both surfaces, rarely abaxially slightly pubescent throughout, shiny and drying olive green on both surfaces but often lighter abaxially, base acute or obtuse, rarely rounded, apex acuminate, more rarely acute, mucronate; domatia sometimes present; major veins impressed, rarely flat adaxially, lateral veins 7–10 pairs, tertiary venation weakly percurrent. Male inflorescences 3–13 cm, unbranched to 10(–40)-branched, females 4–10 cm, unbranched to 6-branched, fruiting 6–20 cm. Fl. Apr–Sep, fr. Jul–Nov.

Forests; 100–1500 m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Xizang, Yunnan [Bangladesh, Bhutan, Cambodia, India (including Andaman and Nicobar Islands), Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam; Australia (Prince of Wales Island, N Queensland)].

This is the most variable, common, and widespread taxon in the entire genus.

*Antidesma costulatum* is a new synonym here. The syntype *Henry 13690* at Kew stands out only by its long petiole (up to 20 mm). There are several other specimens from Yunnan and Szechuan with similarly long petioles.

#### 10b. *Antidesma montanum* var. *microphyllum* (Hemsley) Petra Hoffmann, Kew Bull. 54: 357. 1999.

小叶五月茶 xiao ye wu yue cha

*Antidesma microphyllum* Hemsley, J. Linn. Soc., Bot. 26: 432. 1894; *A. pseudomicrophyllum* Croizat; *A. seguinii* H. Léveillé; *Myrica darrisii* H. Léveillé.

Petiole 2–3(–5) mm; leaf blade lanceolate to linear, (1.5–)3–6(–10) × 0.4–1.5(–2) cm, papery or leathery, glabrous except for pubescent midvein on one or both surfaces and sometimes along margin, shiny and drying grayish green on both sides, base acute or obtuse, apex obtuse or acuminate, margins revolute when dry; domatia absent; major veins flat adaxially, lateral veins 6–12 pairs, nearly straight and parallel, tertiary venation reticulate. Inflorescences and infructescences 1–4 cm, males unbranched to 6-branched, females unbranched to 2-branched. Fl. Apr–Jun, fr. Jun–Nov.

Along rivers; 100–1200 m. Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan, Yunnan [Laos, Thailand, Vietnam].

Records of *Antidesma venosum* E. Meyer ex Tulasne from China (e.g., in FRPS 44(1): 63. 1994) are based on misidentifications of *A. montanum* var. *microphyllum*.

#### 11. *Antidesma hontaushanense* C. E. Chang, Forest. J. For. Assoc. Taiwan Prov. Inst. Agric. Pintung 6: 2. 1964.

河头山五月茶 he tou shan wu yue cha

Shrubs; branches terete, gray-brown; branchlets, terminal bud, midvein, petioles, inflorescences, and sepals outside pubescent. Petiole 1–1.5 cm; leaf blade elliptic or ovate-elliptic, 8–13 × 3–7 cm, papery, glabrous on both surfaces, base rounded to obtuse, apex acuminate; midvein concave adaxially, convex abaxially, lateral veins 6 or 7 pairs, elevated on both surfaces, reticulate veins prominent. Flowers dioecious. Male flowers grouped into axillary, 8–12 cm paniculate spikes; bractlets obovate, ca. 0.5 mm, apex obtuse; sepals 3 or 4, broadly ovate, ca. 1 mm wide; stamens 4; filaments ca. 0.8 mm, inserted outside disk; rudimentary ovary puberulent. Female flowers: sepals and

disk as in male; ovary pubescent. Drupes subglobose, ca. 3 mm in diam., puberulent. Fl. May–Jul, fr. Aug–Oct.

• Sparse forests or scrub; ca. 300 m. Taiwan (Hetao Shan, Lan Yu).

*Antidesma hontaushanense* is known only from the type collection, which has not been seen. It is possible that it is conspecific with *A. pleuricum* Tulasne from the Philippines but the available information is inadequate to confirm that it is this or one of another, rather similar, species recorded from the Philippines.

## 14. APOROSA Blume, Bijdr. 514. 1825–1826.

银柴属 yin chai shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Scepa* Lindley.

Trees or shrubs, dioecious, rarely monoecious; indumentum of simple hairs. Leaves alternate; stipules caducous; petiole apex usually glandular; leaf blade simple, margin entire or sparsely denticulate, venation pinnate. Inflorescences axillary, solitary or clustered spikes or racemes, many flowered, male inflorescences longer than female, bracteate; pedicels short. Male flowers apetalous, without disk; sepals 3–6, nearly equal, membranous, imbricate; stamens 2 or 3, rarely 5 or 8; filaments free, as long as or longer than sepals; anthers small, longitudinally dehiscent; pistillode very small or absent. Female flowers: sepals 3–6, shorter than ovary; ovary 2(–4)-locular; ovules 2 per locule; styles 2(–4), apex shallowly bifid, rarely papillate or fringed. Fruit a drupelike capsule, irregularly dehiscent when mature and dry, 1- or 2-seeded. Seeds not strophiolate; endosperm fleshy; cotyledon flattened and broad.  $x = 13$ .

About 80 species: India and Sri Lanka to SW China, Indonesia, and Malaysia; four species in China.

1a. Ovary and fruits pubescent or tomentose.

2a. Leaves mostly broadly ovate or elliptic, base truncate or cordate, sometimes obtuse, abaxially uniformly hairy; bracts semiorbicular; male sepals obovate; capsule tomentose ..... 1. *A. villosa*

2b. Leaves mostly narrowly ovate or elliptic, base usually  $\pm$  cuneate, abaxially glabrous or pilose only along veins; bracts ovate-triangular; male sepals oblong-ovate; capsule thinly pubescent ..... 2. *A. dioica*

1b. Ovary and fruits glabrous.

3a. Branches pubescent when young; leaf blade papery to leathery, margin entire; female sepals 4 ..... 3. *A. planchoniana*

3b. Branches glabrous when young; leaf blade membranous to thinly papery, margin sparsely glandular-crenulate; female sepals usually 3 ..... 4. *A. yunnanensis*

**1. *Aporosa villosa*** (Lindley) Baillon, Étude Euphorb. 645. 1858.

毛银柴 mao yin chai

*Scepa villosa* Lindley, Nat. Syst. Bot., ed. 2, 441. 1836; *Aporosa dioica* (Roxburgh) Müller Argoviensis var. *yunnanensis* (Pax & K. Hoffmann) H. S. Kiu; *A. glabrifolia* Kurz; *A. microcalyx* (Hasskarl) Hasskarl var. *yunnanensis* Pax & K. Hoffmann.

Shrubs or treelets 2–7 m tall, densely tomentose or pubescent throughout, but leaves sometimes glabrescent, especially adaxially. Stipules obliquely ovate; petiole 1–2 cm, 2-glandular at apex; leaf blade mostly broadly ovate or broadly elliptic, sometimes rotund to oblong-ovate, 8–13  $\times$  4.5–8 cm, leathery, base often truncate or cordate, sometimes obtuse, margin entire or sparsely repand-dentate, apex rounded or obtuse; lateral veins 6–8 pairs, prominent on both surfaces. Male flowers axillary in 1–2 cm spikes; bracts semiorbicular, 2–3 mm; sepals 3–6, ovate-triangular or ovate; stamens 2 or 3. Female flowers axillary in 2–7 mm long spikes; bracts narrower than male ones; sepals 3–6, ovate-triangular, apex acute; ovary ovoid, bilocular. Capsules ellipsoid, ca. 1 cm, shortly rostrate at apex, 1-seeded. Seeds elliptic, ca. 9 mm. Fl. and fr. almost throughout year.

Montane dense forests, valley scrub; 100–1500 m. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India, Laos, Myanmar, Thailand, Vietnam].

**2. *Aporosa dioica*** (Roxburgh) Müller Argoviensis in A. Candolle, Prodr. 15(2): 472. 1866.

银柴 yin chai

*Alnus dioica* Roxburgh, Fl. Ind., ed. 1832, 3: 580. 1832; *Aporosa aurita* (Tulasne) Miquel; *A. chinensis* (Champion ex Benth) Merrill; *A. leptostachya* Benth; *A. microcalyx* (Hasskarl) Hasskarl; *A. microcalyx* var. *chinensis* (Champion ex Benth) Müller Argoviensis; *A. microcalyx* var. *intermedia* Pax & K. Hoffmann; *A. roxburghii* Baillon; *Scepa aurita* Tulasne; *S. chinensis* Champion ex Benth; *S. stipulacea* Lindley; *Tetractinostigma microcalyx* Hasskarl.

Trees to 9 m tall, usually shrubby in secondary forest, ca. 2 m tall; branchlets hirtellous to glabrous. Stipules ovate-lanceolate, 4–6 mm; petiole 5–12 mm, sparsely pubescent, apex bilateral with 2 glands; leaf blade elliptic, narrowly ovate, oblong-elliptic, obovate, or oblanceolate, 6–12  $\times$  3.5–6 cm, leathery, glabrous and lucid adaxially, sparsely pubescent along nerves abaxially, base rounded or cuneate, margin entire or sparsely shallowly dentate, apex rounded to acute. Male flowers axillary in ca. 2.5  $\times$  0.4 cm spikes; bracts ovate-triangular, ca. 1 mm, pubescent outside; sepals usually 4, oblong-ovate; stamens 2–4, longer than sepals. Female flowers: sepals 4–6, triangular, margins ciliate; ovary ovoid, densely pubescent, bilocular; ovules 2 per locule. Capsules ellipsoid, 1–1.3 cm, pubescent, 2-seeded. Seeds subovate, ca. 9  $\times$  5.5 mm. Fl. and fr. almost throughout year.

Montane sparse forests or scrub; 200–1000 m. Guangdong, Guangxi, Hainan, Yunnan [Bhutan, India, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**3. *Aporosa planchoniana*** Baillon ex Müller Argoviensis in A. Candolle, *Prodr.* 15(2): 475. 1866.

全缘叶银柴 *quan yuan ye yin chai*

*Aporosa lanceolata* Hance var. *murtonii* F. N. Williams.

Shrubs to 4 m tall; stem gray; branches slender, pubescent when young, glabrous at maturity. Stipules broadly ovate, caducous; petiole 7–10 mm, apex bilateral with 2 glands; leaf blade oblong-ovate, 6–9 × 2–3 cm, papery to leathery, glabrous on both surfaces, yellowish mottled, dull yellowish green when dry, maculate, base rounded to obtuse, margin entire, apex acuminate; lateral veins 6 or 7 pairs, curved ascending, anastomosing before margins. Male flowers ca. 0.7 mm in diam., 2–5-clustered into axillary spikes, 1–2 × ca. 0.2 cm; bracts obliquely elliptic, ca. 1 mm, concave inside, puberulent at base outside; sepals 4, slightly unequal, ovate, 0.5–0.8 mm, margins ciliate; stamens 2; anthers rotund, ca. 0.4 mm wide, introrse. Female flowers often in few-flowered clusters combined into spikes; peduncles axillary, 2–6 mm; sepals 4, triangular, ca. 1 mm, puberulent at base inside; ovary obovoid, ca. 6 mm, bilocular, glabrous; styles 2, bipartite. Capsules ovoid or ellipsoid, 9–10 × ca. 5 mm, usually 1-seeded. Fl. May–Sep, fr. Aug–Nov.

Montane sparse forests; 100–800 m. Guangxi, Hainan, Yunnan [Cambodia, India, Laos, Myanmar, Thailand, Vietnam].

**4. *Aporosa yunnanensis*** (Pax & K. Hoffmann) F. P. Metcalf, *Lingnan Sci. J.* 10: 486. 1931.

云南银柴 *yun nan yin chai*

*Aporosa wallichii* J. D. Hooker f. *yunnanensis* Pax & K. Hoffmann in Engler, *Pflanzenr.* 81(IV. 147. XV): 90. 1921.

Treelets up to 8 m tall; branches smooth, glabrous. Stipules caducous; petiole 1–1.3 cm, apex bilateral with 2 glands; leaf blade oblong, oblong-elliptic, or oblong-ovate to lanceolate, 6–20 × 2–8 cm, membranous to thinly papery, adaxially dark green, glabrous, and densely black-mottled, abaxially greenish and glabrous, or only young nerves puberulent, base obtuse or broadly cuneate, margin entire or sparsely glandular-dentate, apex caudate-acuminate; lateral veins 5–7 pairs, curved and anastomosing to before margins, elevated below. Male flowers in axillary 2–4 cm spikes; bracts triangular, ca. 1.2 mm wide, pubescent outside; sepals 3–5, oblong-obovate, pubescent outside; stamens 2. Female flowers in few-flowered to 8 mm spikes; sepals usually 3, triangular, pubescent outside; ovary ellipsoid, glabrous, bilocular; ovules 2 per locule; styles 2, bifid at apex. Capsules subglobose, 8–13 × 6–8 mm, red-yellow when mature, glabrous; styles usually persistent at apex. Seeds elliptic, black-brown. Fl. and fr. Jan–Oct.

Densely forested slopes, scrub; 200–1500 m. Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Yunnan [India, Myanmar, Thailand, Vietnam].

## 15. *BACCAUREA* Loureiro, Fl. Cochinch. 2: 661. 1790.

木奶果属 *mu nai guo shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Gatnaia* Gagnepain; *Pierardia* Roxburgh ex Jack.

Trees or shrubs, dioecious; indumentum of simple hairs. Leaves alternate, usually clustered apically; stipules caducous; leaf blade simple, margin entire or crenate-serrate, venation pinnate. Inflorescences axillary, often cauliflorous, compound spikelike or raceme-like panicles, pendent, many flowered. Male flowers: sepals 4–8, usually unequal, imbricate; petals absent; disk absent or obscurely glandular and between stamens (sometimes interpreted as staminodes); stamens 4–8, as long as or longer than sepals; filaments free; anthers 2-locular, introrse or extrorse, longitudinally dehiscent; pistillode usually enlarged at apex, depressed and bifid, usually pubescent. Female flowers: sepals 4–8, larger than male, pubescent on both surfaces; petals absent; disk absent; ovary shorter than sepals, 2- or 3(–5)-locular; ovules 2 per locule; styles 2–5, very short. Fruit a berry or tardily loculicidally dehiscent fleshy capsule, ovoid, fusiform, or globose. Seeds enclosed by fleshy edible aril; endosperm fleshy or thick; embryo curved; cotyledon broad and flattened.

About 80 species: Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Thailand, Vietnam; Pacific islands; two species (one introduced) in China.

- 1a. Leaf blade obovate-oblong, oblanceolate, or oblong, 9–15 cm, base cuneate, abaxially glabrous, lateral veins 5–7 pairs, petiole 3–5 cm ..... 1. *B. ramiflora*  
 1b. Leaf blade elliptic or elliptic-lanceolate, 20–35 cm, base rounded or shallowly cordate, abaxially pubescent, lateral veins 12–16 pairs, petiole 5–10 cm ..... 2. *B. motleyana*

**1. *Baccaurea ramiflora*** Loureiro, Fl. Cochinch. 2: 661. 1790.

木奶果 *mu nai guo*

*Baccaurea cauliflora* Loureiro; *B. oxycarpa* Gagnepain; *B. sapida* (Roxburgh) Müller Argoviensis; *B. wrayi* King ex J. D. Hooker; *Gatnaia annamica* Gagnepain; *Pierardia sapida* Roxburgh.

Evergreen trees to 20 m tall, to 60 cm d.b.h.; stem gray-brown; branchlets hispid, glabrescent at maturity. Petiole 3–5 cm, glabrous; leaf blade obovate-oblong, oblanceolate, or oblong, 9–15 × 3–8 cm, papery, green adaxially, yellowish green abaxially, glabrous on both surfaces, base cuneate, margin entire or shallowly repand, apex shortly acuminate to acute; lateral veins 5–7 pairs, flattened above, elevated below. Flowers small,

dioecious, apetalous, many flowered, compound into racemelike panicles. Male inflorescences densely papillose, often fascicled on branchlets as well as on trunk, to 15 cm; bracts ovate-lanceolate, 2–3 mm, chestnut-yellowish, puberulent outside. Male flowers: sepals 4 or 5, oblong, 5–6 mm, puberulent outside; stamens 4–8; pistillode terete, bipartite. Female inflorescences to 35 cm; bracts as in male. Female flowers: sepals 4–6, oblong-lanceolate, ca. 6 mm, puberulent outside; ovary ovoid or globose, 3-celled, densely ferruginous hispid; styles very short, ca. 0.5 mm; stigma depressed, bifid at apex. Capsules baccate, ovoid or subglobose, 2–2.5 × 1.5–2 cm, red-yellow to purple when mature, indehiscent, or 3-valved when dry; arils white. Seeds flat-elliptic or rotund, 1–1.3 cm. Fl. May–Apr, fr. Mar–Oct.

Evergreen forests; 100–1300 m. Guangdong, Guangxi, Hainan, Yunnan [Bhutan, Cambodia, India, Laos, Malaysia (peninsular), Myanmar, Nepal, Thailand, Vietnam].

The fruits are edible; the pulpy, yellow aril is somewhat acid with an agreeable taste. The wood is used for furniture and cabinetwork.

**2. *Baccaurea motleyana*** (Müller Argoviensis) Müller Argoviensis in A. Candolle, Prodr. 15(2): 461. 1866.

多脉木奶果 duo mai mu nai guo

*Pierardia motleyana* Müller Argoviensis, Flora 47: 516. 1864.

Trees 6–10 m tall; branches terete, ferruginous pubescent. Stipules lanceolate, ca. 8 mm, usually caducous; petiole 5–10 cm, pubescent; leaf blade elliptic or elliptic-lanceolate, 20–35 × 7.5–17 cm, papery, pubescent abaxially and on midvein adaxially, base rounded to shallowly cordate, apex acute to shortly acuminate; lateral veins 12–16 pairs, parallel, reticulate veins trapeziform. Racemelike panicles axillary or cauliflorous, 13–35 cm; bracts lanceolate. Male flowers: pedicels to 1.5 mm, pubescent; sepals oblong-ovate, 1–1.5 mm, acute at apex, gray papillose-puberulent; stamens 4–6; pistillode retuse at apex, pubescent. Female flowers: pedicels to 2 mm; sepals oblong, 4–5 mm, gray papillose-puberulent; ovary ovoid or globose, 3-locular, sericeous. Capsules baccate, ovoid or globose, 2.5–3 cm, indehiscent, pubescent, 1-seeded. Seeds ca. 1.5 cm. Fl. May–Jul, fr. Jul–Oct.

Cultivated. S Yunnan [native to Indonesia, Malaysia (peninsular), and Thailand].

The fruits are edible; the aril is sweet to acid and eaten raw, cooked, or preserved. The bark is rich in tannins and is used in dyeing.

## 16. BISCHOFIA Blume, Bijdr. 1168. 1826–1827.

秋枫属 qiu feng shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Microelus* Wight & Arnott; *Stylodiscus* Bennett.

Large trees, dioecious, rarely monoecious, with red or reddish latex; indumentum of simple hairs, often absent. Leaves alternate, usually crowded at stem apex, palmately 3(–5)-foliolate; stipules small, falcate, caducous; petiole long; leaflet margins crenulate-serrate. Inflorescences axillary or lateral, produced with young leaves, paniculate or racemose, pendent, flowers 1 per bract. Male flowers: pedicel articulated at base; sepals 5, free, valvate, initially curved around stamens, later reflexed; petals and disk absent; stamens 5, free, inserted at bases of sepals; filaments short; anthers larger, thecae 2, parallel, introrse, dehiscence longitudinal; pistillode short and broad, peltate. Female flowers: pedicel articulated at middle; sepals imbricate, flat, free; petals and disk absent; staminodes sometimes present, soon lost; ovary 3(or 4)-locular; ovules 2 per locule; styles 3 or 4, long, stout, entire, erect or recurved. Fruits small, baccate, globose, indehiscent, exocarp fleshy, endocarp papery to thinly woody, 3- or 4-locular. Seeds 3–6, oblong-obovoid, rather crescent-moon-shaped, smooth, not carunculate; testa crustaceous; endosperm fleshy; embryo erect; cotyledon broad and flattened.  $x = 7$ .

Two species: Bhutan, Cambodia, China, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands (Polynesia); two species (one endemic) in China.

1a. Evergreen; leaflet base broadly cuneate or obtuse, margins with 2 or 3 denticles per cm; inflorescence branched .... 1. *B. javanica*

1b. Deciduous; leaflet base rounded or shallowly cordate, margins with 4 or 5 denticles per cm; inflorescence

unbranched ..... 2. *B. polycarpa*

**1. *Bischofia javanica*** Blume, Bijdr. 1168. 1826–1827.

秋枫 qiu feng

*Andrachne trifoliata* Roxburgh; *Bischofia cumingiana* Decaisne; *B. leptopoda* Müller Argoviensis; *B. oblongifolia* Decaisne; *B. roeperiana* Decaisne; *B. toui* Decaisne; *B. trifoliata* (Roxburgh) Hooker; *Microelus roeperianus* (Decaisne) Wight & Arnott; *Stylodiscus trifoliatus* (Roxburgh) Bennett.

Trees to 40 m tall, to 2.3 m d.b.h., evergreen; stem straight, branching lower; bark gray-brown to brown, ca. 1 cm thick, with red latex; branchlets glabrous. Leaves palmately 3(–5)-foliolate;

stipules membranous, lanceolate, ca. 8 mm, caducous; petiole 8–20 cm; terminal petiolule 2–5 cm, lateral petiolules 5–20 mm; leaflet blades ovate, elliptic, obovate, or elliptic-ovate, 7–15 × 4–8 cm, papery, sparsely pubescent only on nerves, glabrescent, base broadly cuneate to obtuse, margins with 2 or 3 teeth per cm, apex acute or caudate-acuminate. Plants dioecious. Inflorescence axillary, paniculate; male peduncle 8–13 cm, puberulent to glabrous, female peduncle 15–27 cm, pendent. Male flowers to 2.5 mm in diam.; sepals membranous, semiobovate, adaxially concave, ladle-shaped, abaxially puberulent outside; filaments short; pistillode small, peltate, pubescent. Female flowers: sepals similar to male but oblong-ovate, margins membranous;

ovary smooth, glabrous, 3- or 4-locular; styles 3 or 4, linear, entire. Fruits globose or subglobose, 6–13 mm in diam., brownish. Seeds oblong, ca. 5 mm. Fl. Apr–May, fr. Aug–Oct.

Evergreen forests, open valley woodlands, widely planted on stream banks, cultivated in gardens and along avenues; below 800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific Islands (Polynesia)].

The dark reddish brown wood of *Bischofia javanica* is heavy and very hard, with a fine structure, and is used for bridges, vehicles, and structural timbers. The bark is a source of a red dye, used to stain rattan baskets. The fruits are mostly used for making wines. The seeds yield 30%–54% oil. The roots are used as a medicine for rheumatism and malaria.

**2. *Bischofia polycarpa*** (H. Léveillé) Airy Shaw, Kew Bull. 27: 271. 1972.

重阳木 chong yang mu

*Celtis polycarpa* H. Léveillé, Repert. Spec. Nov. Regni Veg. 2: 296. 1912; *Bischofia racemosa* Cheng & D. Chu.

Trees to 15 m tall, 50(–100) cm d.b.h., deciduous, glabrous

throughout; bark brown, ca. 6 mm thick, longitudinally fissured; older branches brown, lenticels rusty; branchlets green, lenticels gray-white. Leaves palmately 3-foliolate; stipules small, caducous; petiole 9–13.5 cm; terminal petiolule 1.5–4(–6) cm, lateral petiolules 3–14 mm; terminal leaflets usually larger than bilateral ones; leaflet blades ovate or elliptic-ovate, sometimes oblong-ovate, 5–9(–14) × 3–6(–9) cm, papery, base rounded or shallowly cordate, apex acute or shortly acuminate, margins with 4 or 5 teeth per cm. Plants dioecious. Inflorescences pendent racemes, on lower parts of previous year branches, generally appearing in spring, male inflorescences 8–13 cm, female 3–12 cm. Male flowers: sepals semiorbicular, membranous, spreading; filaments short; pistillode prominent. Female flowers: sepals as in male, with white membranous margin; ovary 3- or 4-locular; styles 2 or 3, entire. Fruits globose, 5–7 mm in diam., brown-red when mature. Fl. Apr–May, fr. Oct–Nov.

• Evergreen forests, often widely planted; 200–1000 m. Anhui, Fujian, N Guangdong, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Shaanxi, Yunnan, Zhejiang.

The wood of *Bischofia polycarpa* is used for furniture, vehicles, bridges, and structural timbers. The fruits are mostly used for the production of distilled liquors. The seeds yield 30% oil, which is used for lubrication.

## 17. DRYPETES Vahl, Eclogae Amer. 3: 49. 1810.

核果木属 he guo mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Cyclostemon* Blume.

Trees or shrubs, dioecious; indumentum of simple hairs, often absent. Leaves alternate; stipules 2; petioles short; leaf blade simple, base often asymmetrical, margin entire or serrate, venation pinnate. Inflorescences axillary, sometimes grouped into glomerules, racemes, or panicles. Male flowers pedicellate or sessile; sepals 4–6, distinct, usually unequal, imbricate; petals absent; stamens 1–25, 1 to several whorls surrounding disk or outer ones inserted at margin or sinus of disk, inner ones inserted on disk; filaments free; anthers bilocular, usually introrse, rarely extrorse, longitudinally dehiscent; disk flattened or concave, margin shallowly or deeply fimbriate; rudimentary ovary very small or absent. Female flowers solitary, axillary, sometimes on older branches; sepals as in male; petals absent; disk annular; ovary 1- or 2(or 3)-loculed; ovules 2 per locule; style short, stigmatiform; stigmas 1 or 2(or 3), usually dilated, peltate or reniform. Fruit a drupe, subglobose or ovoid, 1- or 2(or 3)-celled, seeds 1 per locule; exocarp leathery or nearly so; mesocarp fleshy or woody; endocarp woody, papery, or crustaceous. Seeds without caruncle; endosperm fleshy; cotyledons larger and flattened.

About 200 species: tropical and subtropical Africa, America, and Asia; 12 species (two endemic) in China.

The timber from several species is valued.

### Key to fruiting material

1a. Ovary and drupe 1-locular.

2a. Fruits glabrous.

3a. Branchlets and petioles puberulent when young; lateral veins 6–8 pairs; stipules linear, persistent; stamens ca. 25; fruits 1.8–2.5 cm ..... 1. *D. perreticulata*

3b. Branchlets and petioles glabrous when young; lateral veins 9–13 pairs; stipules small, caducous; stamens 12–15; fruits 1–2 cm ..... 2. *D. hoensis*

2b. Fruits pubescent.

4a. Leaf blade acuminate at apex, margin sparsely obtuse-serrate, lateral veins prominent ..... 3. *D. arcuatineria*

4b. Leaf blade shortly acuminate at apex, margin entire or sometimes obscurely obtuse-serrate at upper part, lateral veins obscure.

5a. Trees; branchlets and petioles pubescent when young; fruits angular and rugose ..... 4. *D. obtusa*

5b. Shrubs; branchlets and petioles glabrous; fruits rounded and smooth ..... 5. *D. integrifolia*

1b. Ovary and drupe 2(or 3)-locular.



- 6a. Leaf margins serrate.  
 7a. Branchlets and petioles pubescent; pedicels 2–4 mm; stamens 13–15; fruits globose, glabrous ..... 6. *D. congestiflora*  
 7b. Branchlets and petioles glabrous; pedicels 13–18 mm; stamens 10; fruits oblong or ellipsoid, pubescent ... 7. *D. cumingii*
- 6b. Leaf margins entire.  
 8a. Fruits ellipsoid-ovoid; leaf blade slightly falcate ..... 8. *D. littoralis*  
 8b. Fruits globose or subglobose; leaf blade not falcate.  
 9a. Leaf apex obtuse.  
 10a. Fruiting pedicels stout, ca. 0.5 cm; leaf blade with 8–10 pairs of lateral veins; fruits 2–2.5 cm in diam. .... 9. *D. hainanensis*  
 10b. Fruiting pedicels slender, 1.5–2 cm; leaf blade with 4 or 5 pairs of lateral veins; fruits ca. 1 cm in diam. .... 10. *D. longistipitata*
- 9b. Leaf apex caudate-acuminate or acuminate.  
 11a. Female pedicels to 2 cm, 2.5–4 cm in fruit; leaf blade elliptic-oblong to lanceolate; stamens 4–8 ..... 11. *D. indica*  
 11b. Female pedicels 0.2–0.4 cm in fruit; leaf blade linear-oblong; stamens 12 ..... 12. *D. salicifolia*

**Key to material with male flowers** (not known for *D. integrifolia*, *D. littoralis*, *D. longistipitata*, and *D. obtusa*)

- 1a. Male pedicels 13–18 mm ..... 7. *D. cumingii*  
 1b. Male pedicels to 5 mm.  
 2a. Stamens 4–8, inserted in sinuses between disk lobes; flowers in elongated inflorescences, branched or unbranched.  
 3a. Leaf blade margin toothed, reticulate veins distant; filaments short and slightly flattened; shrub to 4 m ..... 3. *D. arcuatineria*  
 3b. Leaf blade margin entire, reticulate veins dense and prominent; filaments terete; trees to 15 m ..... 11. *D. indica*
- 2b. Stamens 10–25, disk annular; flowers in sessile clusters.  
 4a. Stamens 18–25, filaments flattened, wider at base.  
 5a. Petiole 8–10 mm; leaf apex obtuse, margin entire ..... 9. *D. hainanensis*  
 5b. Petiole 3–6 mm; leaf apex acute, margin obtusely serrate ..... 1. *D. perreticulata*
- 4b. Stamens 10–15, filaments slender, terete.  
 6a. Branchlets pubescent; leaf blade 4.5–6 cm, lateral veins 7–9 pairs ..... 6. *D. congestiflora*  
 6b. Branchlets glabrous; leaf blade 6–11 cm, lateral veins 8–14 pairs.  
 7a. Flowers 1–3 per cluster, with cup-shaped rudimentary ovary ..... 12. *D. salicifolia*  
 7b. Flowers 3–5 per cluster, without rudimentary ovary ..... 2. *D. hoensis*

**1. *Drypetes perreticulata*** Gagnepain, Bull. Soc. Bot. France 71: 260. 1924.

网脉核果木 wang mai he guo mu

Trees up to 16 m tall, to 30 cm d.b.h.; bark gray-yellowish, smooth; branchlets angulate, brown pubescent when young, glabrescent. Stipules linear; petiole 3–6 mm, puberulent, glabrescent; leaf blade ovate, elliptic, or oblong, 4.5–12 × 2.5–6 cm, leathery, mostly glabrous, sometimes midrib pubescent when young, base broadly cuneate or rounded, oblique, margin with distal 1/2 sparsely obtusely serrate, apex acute; lateral veins 6–8 pairs, reticulate veins dense and prominent. Male flowers axillary, usually 2 or 3 together, with several bractlets at base; pedicels very short; sepals 4, obovate or oblong, 4.5–6.5 mm, slightly unequal, slightly thickened; disk flattened; stamens ca. 25; filaments flattened, slightly wider at base; anthers oblong; rudimentary ovary absent. Female flowers axillary, usually solitary; sepals and disk as in male; ovary ovoid, 1-celled. Drupes ovoid or ellipsoid, 1.8–2.5 × 1.4–1.8 cm, smooth, glabrous, dark red when ripe; exocarp leathery; mesocarp fleshy; endocarp woody, thinner than mesocarp, 1-seeded. Seeds ovoid, ca. 15 mm; testa crustaceous. Fl. Jan–Mar, fr. May–Oct.

Evergreen forests; below 800 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [Thailand, Vietnam].

The wood is used for making vehicles, machinery, building timber, etc.

**2. *Drypetes hoensis*** Gagnepain, Bull. Soc. Bot. France 71: 259. 1924.

勐腊核果木 meng la he guo mu

Trees up to 20 m tall; branches ash gray, glabrous. Stipules small, ovate-triangular, 1.2–1.5 × ca. 0.8 mm, usually caducous; petiole 5–10 mm; leaf blade ovate to elliptic, 6–11 × 2–5 cm, leathery, base broadly cuneate to rounded, oblique, margin sparsely shallowly crenate, apex shortly caudate, sometimes obtuse; lateral veins 9–13 pairs, obliquely ascending to margins, reticulate veins prominent on both surfaces. Male flowers 3–5-clustered; pedicels ca. 4 mm; sepals 4, unequal, elliptic, 2–3 mm, margins ciliate; stamens 12–15; filaments filamentous; anthers oblong; rudimentary ovary absent. Female flowers solitary or paired; sepals as in male; ovary ovoid, 1-celled. Fruiting pedicels ca. 6 mm; drupes ovoid, 1–2 × 0.8–1.5 cm, glabrous, 1-celled, 1-seeded. Fl. May–Aug, fr. Jul–Oct.

Open evergreen forests on rocky limestone hills; ca. 500 m. S Yunnan [Thailand, Vietnam].

Material from Thailand appears to differ from Yunnan material by the inconspicuous reticulate veins.

**3. *Drypetes arcuatineria*** Merrill & Chun, *Sunyatsenia* 5: 95. 1940.

拱网核果木 gong wang he guo mu

*Drypetes arcuatineria* var. *elongata* Merrill & Chun.

Erect shrubs up to 4 m tall, glabrous except for pubescent fruits; branches densely lenticellate; branchlets slightly flattened or terete. Petiole 2–5 mm; leaf blade oblong, oblong-lanceolate, or lanceolate, rarely elliptic, 6–15 × 2–6 cm, papery or thinly leathery, base obtuse, margin with sparse obtuse teeth, apex acuminate; lateral veins 7 or 8 pairs, reticulate veins distant. Flowers in racemes or panicles, to 7 cm, sometimes clustered. Male flowers: pedicels ca. 2 mm; sepals 4 or 5 (or 6), elliptic or rounded, margins eroded-lacerate; disk 4–6-fid; stamens 4–6, inserted at sinus of disk; filaments short and slightly flattened; anthers rounded, without rudimentary ovary. Female flowers: sepals and disk as in male; ovary ovoid, 1-celled. Fruiting pedicels ca. 2 mm; drupes solitary or 2–5 grouped in racemose infructescences, axillary or alternate at upper part of branchlets, ovoid, ca. 1 cm, apex acute, sometimes rostrate, 1-celled, 1-seeded; exocarp thinly leathery, pubescent; mesocarp woody; endocarp hard-crustaceous. Seeds ovate, 7–8 mm, apex mucronulate; testa thin, with several, slightly elevated longitudinal ribs. Fl. Apr–Oct, fr. Aug–Apr.

Open forests on slopes; 300–800 m. Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

**4. *Drypetes obtusa*** Merrill & Chun, *Sunyatsenia* 5: 96. 1940.

钝叶核果木 dun ye he guo mu

Treelets, ca. 7 m tall; branches gray-white, rugged when dry; branchlets terete or sometimes slightly flattened, shallowly striate, glabrous or slightly pubescent when young. Petiole 6–8 mm; leaf blade oblong, 4–8 × 1.5–3.5 cm, papery or subleathery, abaxially greenish, adaxially green, base cuneate, margin entire, apex obtuse, sometimes retuse; lateral veins 8–10 pairs, obscure. Flowers not seen. Drupes solitary, subellipsoid, ca. 1.5 × 1 cm, usually rugose, angular, pubescent, 1-celled, 1-seeded; epicarp leathery; mesocarp woody, ca. 1 mm thick; endocarp hard-crustaceous; fruiting style very short; stigma 2-lobed, flexed-flabellate. Fr. Jun–Aug.

Evergreen forests; 200–600 m. Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

**5. *Drypetes integrifolia*** Merrill & Chun, *Sunyatsenia* 5: 97. 1940.

全缘叶核果木 quan yuan ye he guo mu

Erect shrubs. Petiole 6–9 mm, robust, glabrous; leaf blade elliptic to oblong, 8–16 × 3–6.5 cm, papery or subleathery, both surfaces glabrous, base broadly cuneate, margin entire or obscurely toothed toward leaf apex, apex obtuse to shortly acuminate; lateral veins 10–12 pairs, obscure. Flowers not seen. Fruits paired, along upper parts of branchlets; fruiting pedicels ca. 2 mm; persistent sepals 6, ovate or elliptic-ovate, ca. 3.5 mm, margins ciliate; drupes oblong, ca. 12 × 7 mm, pubescent, not angular, apex attenuate, 1-celled, 1-seeded; exocarp leathery when dry; mesocarp woody; endocarp crustaceous; persistent

style very short; stigma bifid, nearly flexed-flabellate. Seeds ellipsoid, ca. 8 × 5 mm. Fr. Aug–Sep.

• Open riverine forests or scrub; 200–500 m. Guangdong, Guangxi, Hainan.

**6. *Drypetes congestiflora*** Chun & T. Chen, *Acta Phytotax. Sin.* 8: 175. 1963.

密花核果木 mi hua he guo mu

*Drypetes confertiflora* Merrill & Chun, *Sunyatsenia* 2: 259. 1935, not (J. D. Hooker) Pax & K. Hoffmann (1922).

Trees up to 12 m tall, to 35 cm d.b.h.; bark yellowish, glabrous except for pubescent branchlets, petioles, and bractlets. Petiole 4–10 mm; leaf blade oblong or oblong-ovate, 4.5–6 × 2–4 cm, leathery, base rounded, oblique, margin prominently serrate, apex acuminate; lateral veins ca. 7 pairs, prominent. Male flowers densely clustered; pedicels 2–4 mm; bractlets broadly ovate, ca. 1 mm; sepals 4, obovate or elliptic, 2–3 mm, apex rounded, incurved, slightly unequal, margins ciliate; stamens 13–15; filaments 1–1.5 mm; anthers elliptic, ca. 1.8 mm, connectives broader and red-brown; rudimentary ovary absent. Female flowers: sepals as in male; ovary ovoid, 2-celled. Capsule globose, ca. 1 cm in diam.; exocarp thinly leathery when dry, brownish yellow, smooth; endocarp woody, thin, 2-celled, 1-seeded in each cell. Fl. Feb–Jul, fr. Jun–Oct.

Forested slopes; 300–800 m. Guangdong, Guangxi, Hainan, Yunnan [Philippines].

**7. *Drypetes cumingii*** (Baillon) Pax & K. Hoffmann in Engler, *Pflanzenr.* 81(IV. 147. XV): 238. 1921.

青枣核果木 qing zao he guo mu

*Cyclostemon cumingii* Baillon, *Étude Euphorb.* 562. 1858; *C. iwahigensis* Elmer.

Trees 9–20 m tall, to 50 cm d.b.h.; branchlets yellow pubescent when young, lenticellate. Stipules caducous; petiole 4–8 mm; leaf blade ovate or oblong to ovate-lanceolate, 6–17 × 2.5–6.5 cm, leathery, both surfaces glabrous, adaxially glossy, base cuneate to obtuse, slightly oblique, margin irregularly undulate-serrate or obscurely obtusely so, apex acute to long acuminate; lateral veins 7–9 pairs, reticulate veins prominent. Male flowers clustered, 5–6 mm in diam.; pedicels 13–18 mm, pubescent; sepals 4, broadly ovate, extrorsely flexed, pubescent at base on both surfaces; disk annular, apex lobed; stamens ca. 10. Female flowers: pedicels 10–12 mm; sepals 4, obovate, apex obtuse, densely pubescent; disk margin crenellate; ovary ovoid, 2-locular; stigma obtriangular. Drupes oblong to ellipsoid, 14–16 mm, pubescent; endocarp crustaceous, 2-celled, 1-seeded. Fl. May–Jun, fr. Aug–Dec.

Forested slopes; 300–800 m. Guangdong, Guangxi, Hainan, Yunnan [Philippines].

**8. *Drypetes littoralis*** (C. B. Robinson) Merrill, *Philipp. J. Sci.* 29: 380. 1926.

滨海核果木 bin hai he guo mu

*Cyclostemon littoralis* C. B. Robinson, *Philipp. J. Sci.*, C, 3:

198. 1908; *C. mindorensis* Merrill; *C. yamadae* Kanehira & Sasaki; *Drypetes falcata* (Merrill) Pax & K. Hoffmann var. *yamadae* (Kanehira & Sasaki) Hurusawa; *D. yamadae* (Kanehira & Sasaki) Kanehira & Sasaki.

Trees; branches terete, glabrous. Petiole stout, 3–6 mm; leaf blade oblong to oblong-ovate, falcate, 6–10 × 3.5–5 cm, leathery, base acute or broadly cuneate, margin entire, apex obtuse or acute. Flowers not seen. Drupes solitary or 3- or 4-clustered, ellipsoid-ovoid, 12–15 × 8–10 mm; exocarp leathery, appressed-pubescent. Fr. May–Jun.

Seashore forests. Taiwan (Hengchun peninsula, Lan Yu) [Indonesia, Philippines].

**9. *Drypetes hainanensis*** Merrill, J. Arnold Arbor. 6: 134. 1925.

海南核果木 hai nan he guo mu

Trees up to 20 m tall; bark gray to gray-brown; branchlets angulate, with prominent lenticels. Petiole 8–10 mm, usually transversely wrinkled; leaf blade oblong or elliptic to ovate, 5–9 × 2–4 cm, papery or subleathery, base obliquely cuneate or broadly so, margin entire, apex obtuse; lateral veins 8–10 pairs, reticulate veins dense and prominent. Male flowers clustered, axillary; pedicels ca. 4 mm; sepals 4, membranous, ovate or rounded, 6–8 mm, concave, abaxially puberulent; stamens ca. 18; filaments flattened and broad; anthers oblong, ca. 2 mm; disk annular. Female flowers usually solitary, axillary; sepals and disk as in male; ovary ovoid, 2-locular. Fruiting pedicels ca. 5 mm; drupes globose, 2–2.5 cm in diam., scurfy-hairy; exocarp leathery; mesocarp fleshy; endocarp woody, thinner than mesocarp, 2-celled, 1-seeded in each cell. Seeds subelliptic, ca. 1.2 cm. Fl. Feb–Apr, fr. Jun–Aug.

Evergreen forests, among limestone rocks; 200–900 m. Hainan [Thailand, Vietnam].

The timber from *Drypetes hainanensis* is straight, hard, non-splintering, and fine-grained; it is used for vehicle construction, agricultural implements, machinery, etc.

The description given for material from Thailand shows a number of possibly significant differences and the identity of these plants needs investigation.

**10. *Drypetes longistipitata*** P. T. Li, J. S. China Agric. Univ. 21(4): 59. 2000.

细柄核果木 xi bing he guo mu

Treelets 3–5 m tall; branchlets pubescent to glabrous. Petiole 3–5 mm, puberulent; leaf blade oblong-ovate, oblong, or lanceolate, 5.5–7.5 × 2–3 cm, papery, both surfaces glabrous, base cuneate or broadly so, margin entire, apex obtuse or shortly acuminate; lateral veins 4 or 5 pairs, delicate. Male flowers not seen. Female flowers solitary or paired; sepals 4, caducous; ovary ovoid, 2-celled, puberulent; styles 2, ca. 1 mm; stigma flabellate. Fruiting pedicels delicate, 1.5–2 cm, puberulent; drupe solitary or paired, subglobose or globose, ca. 1 cm in diam.; exocarp thin and puberulent. Fr. Aug–Sep.

• Forests; 200–500 m. Hainan (Baoting, Sanya).

*Drypetes longistipitata* is most closely related to *D. hainanensis*

and *D. rhakodiskos* (Hasskarl) Bakhuizen f. in habit. It differs by the delicate, longer fruiting pedicels, fewer lateral veins, and smaller fruits.

This taxon was first published as "*Drypetes hainanensis* var. *longistipitata*" (P. T. Li, Acta Phytotax. Sin 26(1): 58. 1988), but that name was not validly published as two types were cited.

**11. *Drypetes indica*** (Müller Argoviensis) Pax & K. Hoffmann in Engler, Pflanzenz. 81(IV. 147. XV): 278. 1921.

核果木 he guo mu

*Cyclostemon indicus* Müller Argoviensis, Linnaea 32: 81. 1863; *C. griffithii* J. D. Hooker; *C. hieranensis* Hayata; *C. karapinensis* Hayata; *C. lancifolius* J. D. Hooker; *Drypetes griffithii* (J. D. Hooker) Pax & K. Hoffmann; *D. hieranensis* (Hayata) Pax & K. Hoffmann; *D. karapinensis* (Hayata) Pax & K. Hoffmann; *D. karapinensis* var. *hieranensis* (Hayata) Hurusawa; *D. lancifolia* (J. D. Hooker) Pax & K. Hoffmann; *D. longipes* X. H. Song; *D. nienkui* Merrill & Chun.

Trees to 15 m tall, rarely monoecious, glabrous except for pubescent sepals, ovary, and fruits; branchlets densely lenticellate. Petiole 3–10 mm, usually transversely rugose when dry; leaf blade elliptic-oblong, ovate-oblong, oblong-lanceolate, or lanceolate, 8–15 × 3–6 cm, leathery or thickly papery, base cuneate to rounded, usually oblique, margin entire, apex caudate-acuminate; lateral veins 6–8 pairs, reticulate veins dense and prominent. Inflorescences on slender, leafy, axillary shoots. Male flowers: pedicels 2–10 mm; sepals 4, ca. 2 mm; disk rounded-discoid, entire or margin slightly elevated and shallowly divided; stamens 4–8, inserted at sinus of disk; filaments terete. Female flowers: ovary globose, 2- or 3-celled; styles 2 or 3, elongate; stigma peltate or flabellate, entire. Fruiting pedicels 2.5–4 cm; drupes solitary, globose, 12–22 mm in diam., 2- or 3-celled, 1-seeded; exocarp subleathery-dry; endocarp papery. Fl. and fr. Nov–Feb.

Evergreen forests; 400–1600 m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Bhutan, India, Myanmar, Sri Lanka, Thailand].

**12. *Drypetes salicifolia*** Gagnepain, Bull. Soc. Bot. France 71: 261. 1924.

柳叶核果木 liu ye he guo mu

Trees up to 10 m tall, glabrous except pubescent sepals, ovary, fruits, and fruiting pedicels; branchlets angular. Stipules oblong, ca. 1 mm; petiole 5–8 mm; leaf blade linear-oblong, 8–16 × 1.5–3 cm, papery, usually with dark spots abaxially, base cuneate, margin entire, apex acuminate; midvein and lateral veins elevated on both surfaces, lateral veins 8–14 pairs, obliquely ascendant, anastomosing before margin, reticulate veins slightly prominent. Male flowers 1–3 together; pedicels short; sepals 4, obovate, inner narrower than outer; stamens ca. 12; filaments free; anthers oblong; rudimentary ovary cup-shaped, apex 4-fid. Female flowers solitary; pedicels very short; sepals 4, outer oblong, ca. 5 mm, inner elliptic; disk annular, obtusely 4- or 5-lobed; ovary ovoid, 2-celled; styles 2, apex peltate or plano-concave. Fruiting pedicels 2–4 mm; drupe globose, to 2 cm in diam., fulvous, usually 1-celled, 1-seeded. Fl. May–Jun, fr. Aug–Oct.

Evergreen forests; 400–600 m. S Yunnan [Laos, Vietnam].

**18. PUTRANJIVA** Wallich, Tent. Fl. Nepal. 61. 1826.假黄杨属 *jia huang yang shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Liodendron* H. Keng.

Trees or shrubs. Leaves simple, alternate, margin entire or crenulate-serrulate, petiolate, penninerved. Flowers dioecious, apetalous; disk absent. Male flowers in axillary racemes or spikes; calyx 4–6-parted; sepals imbricate; stamens 2–4; pistillodes absent. Female flowers solitary, axillary; calyx 5-parted; sepals narrow, imbricate; ovary ovoid or oblong-ovoid, 2-celled; ovules 2 per cell; styles petaloid-dilated, 2- or 3-branched at upper portion, papillose. Drupes indehiscent, long pedicellate, 1-locular, 1-seeded; mesocarp fleshy; pyrene stone-hard. Seed testa membranous or crustaceous; endosperm fleshy.

About four species: China, India, Japan (Ryukyu Islands), Sri Lanka; one species (endemic) in China.

*Putranjiva* is included within *Drypetes* by some authors. The record in FRPS of the Japanese species *P. matsumurae* Koidzumi (*D. matsumurae* (Koidzumi) Kanehira) from Taiwan is not accepted in either Fl. Taiwan or Fl. Japan.

*Putranjiva roxburghii* Wallich (*Drypetes roxburghii* (Wallich) Hurusawa) is cultivated in Hong Kong. The leaves and fruits are used medicinally for the treatment of rheumatism.

- 1a. Leaves glabrous; inflorescences racemose, 6–8 mm, velutinous ..... 1. *P. formosana*  
 1b. Leaves glabrescent; inflorescences densely glomerulose, glabrous ..... *P. roxburghii* (see note above)

**1. Putranjiva formosana** Kanehira & Sasaki ex Shimada, Trans. Nat. Hist. Soc. Formosa 24: 83. 1934.

台湾假黄杨 *tai wan jia huang yang*

*Drypetes formosana* (Kanehira & Sasaki ex Shimada) Kanehira; *Liodendron formosanum* (Kanehira & Sasaki ex Shimada) H. Keng.

Small trees; branchlets sulcate or angular, glabrescent or glabrous. Petiole ca. 7 mm; leaf blade elliptic to oblong-ovate, 5–8 × 3–5 cm, thinly coriaceous, glabrous on both surfaces, base unequally obtuse, apex acuminate, margin entire to crenulate-

serrulate. Racemes axillary, 6–8 mm, velutinous, with bracts. Male flowers apetalous: sepals 4–6, imbricate; stamens 2; disk and rudimentary ovary absent. Female flowers: sepals 5, narrowly elliptic; ovary ovoid, 2-celled; ovules 2 per cell. Drupes ovoid-ellipsoid, 10–13 × 7–8 mm, appressed, gray pubescent, 1-locular, 1-seeded. Fl. May–Jul, fr. Jul–Sep.

• Primary coastal forests and thickets at low altitudes. Guangdong (Zhuhai), Hong Kong, Taiwan (Taidong, Yilan).

*Putranjiva formosana* is restricted to a series of small isolated populations and is considered to be endangered.

**19. SUMBAVIOPSIS** J. J. Smith, Med. Dep. Landbouw 10: 357. 1910.白叶桐属 *bai ye tong shu*

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Trees, monoecious; indumentum with stellate hairs. Leaves alternate; stipules small; petiole insertion narrowly peltate; leaf blade simple, margin repand-dentate or subentire, palmately 3-veined. Inflorescences terminal, unbranched, bisexual, male flowers distal, female flowers 1 to few at base. Male flowers: calyx 5-lobed, valvate; petals 5 or 10; stamens many; filaments free; anthers 2-locular; receptacle convex, pubescent. Female flowers apetalous; calyx 5-lobed, lobes imbricate; disk annular; ovary 3-locular; ovules 1 per locule; styles recurved, 2-lobed. Fruit a capsule, 2- or 3-locular. Seeds subglobose.

One species: tropical regions in SE Asia to NE India and China.

N. P. Balakrishnan (Bull. Bot. Surv. India 9: 56–58. 1967) proposed that *Sumbaviopsis* be combined with the otherwise unispecific SE Asian genus *Doryxylon* Zollinger. Van Welzen (Blumea 44: 411–436. 1999) did not follow this as there was a possibility of further taxonomic changes.

**1. Sumbaviopsis albicans** (Blume) J. J. Smith, Med. Dep. Landbouw 10: 357. 1910.

白叶桐 *bai ye tong*

*Adisca albicans* Blume, Bijdr. 611. 1826; *Doryxylon albicans* (Blume) N. P. Balakrishnan; *Sumbavia macrophylla* Müller Argoviensis.

Trees, 5–8 m tall; branchlets white- or ochraceous tomentulose when young. Petiole 3–8 cm; leaf blade ovate-oblong to oblong, 10–30 × 5–15 cm, thickly papery, abaxially white- or ochraceous tomentulose, adaxially glabrous, base obtuse, nar-

rowly peltate, apex acuminate or acute. Racemes 6–30 cm, tomentulose; bracts subovate, 2.5–3 mm. Male flowers 2- or 3-fascicled; pedicels 4–5 mm; calyx 5-lobed, ca. 5 mm, stellate-tomentose; petals obovate, 2.5–3 mm; disk absent; stamens 50–70. Female flowers: sepals ovate-oblong or lanceolate, ca. 3 mm, stellate-tomentose; ovary stellate-tomentose; styles 3, 2–3 mm. Fruiting pedicels ca. 1 cm; capsule 2.5–3 cm in diam., ochraceous tomentose. Seeds subglobose, 1.2–1.4 cm in diam., marbled. Fl. and fr. Mar–Dec.

Forested limestone valleys and hills; 400–900 m. S Yunnan [NE India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**20. SPERANSKIA** Baillon, *Étude Euphorb.* 388. 1858.地构叶属 *di gou ye shu*

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Herbs, monoecious; indumentum of simple hairs. Leaves alternate; stipules small, deciduous; leaf blade simple, venation pinnate. Inflorescences terminal, racemelike thyrses, bisexual, male flowers distal, female flowers proximal; bracts often ovate. Male flowers: sepals 5, valvate, closed in bud; petals 5; disk 5-dissected; stamens 10–15; filaments free; anthers 2-locular; pistillode absent. Female flowers: sepals 5, valvate; petals 5 or absent; disk annular; ovary 3-locular, verrucose, sometimes smooth, pilose; style free, 2-lobed, stigmatic surface plumose-lacerate; ovules 1 per locule. Fruit a capsule, 3-locular. Seeds globose.

- Two species: China.

- 1a. Leaf blade margins usually incised-dentate or lobulate, petiole less than 5 mm; female petals present, ovary and capsule sparsely verrucose ..... 1. *S. tuberculata*  
 1b. Leaf blade margins usually coarsely crenate, petiole 10–35 mm; female petals absent, ovary and capsule densely tuberculate ..... 2. *S. cantonensis*

**1. *Speranskia tuberculata*** (Bunge) Baillon, *Étude Euphorb.* 389. 1858.

地构叶 *di gou ye*

*Croton tuberculatus* Bunge, *Enum. Pl. China Bor.* 60. 1833; *Argyrothamnia tuberculata* (Bunge) Müller Argoviensis; *Speranskia pekinensis* Pax & K. Hoffmann; *S. tuberculata* var. *pekinensis* (Pax & K. Hoffmann) Hurusawa.

Perennial herbs, 25–50 cm tall, few branched; stems appressed pubescent. Stipules ovate-lanceolate, ca. 1.5 mm; petiole 1–4 mm; leaf blade lanceolate to ovate-lanceolate, 1.5–5.5 × 0.5–2.5 cm, papery, abaxially pubescent or pilose along veins, adaxially pilose, base broadly cuneate or obtuse, margin crenate or incised-dentate, apex acuminate, rarely acute. Inflorescence 6–15 cm, pubescent; bracts ovate or ovate-lanceolate, 1.5–3 mm. Male flowers 2–4 per bract; pedicels ca. 1 mm; sepal ovate, ca. 1.5 mm; petals orbicular-obovate or obcordate, ca. 0.5 mm; stamens 8–15; filaments pilose; disk glands 5. Female flowers 1 or 2 per bract, sometimes with 1 or 2 male flowers; sepals ovate-lanceolate, ca. 1.5 mm, pubescent; petals orbicular-obovate or obovate, ca. 0.5 mm; ovary pubescent, verrucose; styles 3, short, 2-lobed, plumose-lacerate. Fruiting pedicels 3–5 mm; capsule 3-lobed, ca. 6 mm in diam., usually sparsely verrucose and pilose. Seeds ovoid, 2–2.5 mm, brownish. Fl. and fr. May–Sep.

- Grassy slopes, grasslands, thickets, usually in dry places; 300–1900 m. Anhui, Gansu, Hebei, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan.

**2. *Speranskia cantonensis*** (Hance) Pax & K. Hoffmann in Engler, *Pflanzenr.* 57(IV.147.VI): 15. 1912.

广东地构叶 *guang dong di gou ye*

*Argyrothamnia cantonensis* Hance, *J. Bot.* 16: 14. 1878; *Mercurialis acanthocarpa* H. Léveillé; *Speranskia henryi* Oliver; *S. yunnanensis* S. M. Hwang.

Perennial herbs, 50–70(–100) cm tall, few branched; branchlets appressed pubescent. Stipules lanceolate, ca. 0.5 mm, often absent; petiole 1–3.5 cm; leaf blade ovate, broadly elliptic, or ovate-lanceolate to lanceolate, 2–9 × 1–4 cm, papery, abaxially pubescent or pilose along veins, adaxially pilose, base broadly cuneate to obtuse, margin coarsely crenate or dentate, apex acute, sometimes acuminate. Inflorescence 4–8 cm, infructescence 10–12 cm, pubescent; bracts ovate, ovate-lanceolate, or lanceolate, 1–3 mm, pilose. Male flowers 1–3 per bract; pedicels 1–2 mm; sepals ovate, ca. 1.5 mm, pilose; petals obovate or obcordate, ca. 1 mm; disk glands 5; stamens 10(–12); filaments glabrous. Female flowers 1 per bract; sepals ovate-lanceolate, 1–1.5 mm, pilose; petals absent; disk annular, sinuate; ovary densely tuberculate and pilose; styles ca. 1.5 mm, deeply 2-lobed, plumose-lacerate. Fruiting pedicels 5–6 mm; capsule 3-lobed, 6–7 mm in diam., pilose, usually tuberculate. Seeds globose, ca. 2 mm in diam., brownish. Fl. Feb–Jul, fr. May–Dec.

- Grassy slopes or mountain thickets, usually on limestone; 200–1000(–2600) m. N Guangdong, Guangxi, Guizhou, Hebei, Hubei, Hunan, Jiangxi, S Shaanxi, S Shanxi, Sichuan, Yunnan.

**21. CHROZOPHORA** Necker ex A. Jussieu, *Euphorb. Gen.* 27. 1824 [“*Crozophora*”], **nom. cons.**沙戟属 *sha ji shu*

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Tournefortia* Adanson.

Herbs or subshrubs; indumentum of stellate hairs and/or peltate scales, usually dense. Leaves alternate; stipules subulate; leaf blade margin entire or repand-dentate, base usually with 2 glands. Inflorescences axillary, racemelike thyrses, bisexual, male flowers distal, female flowers proximal. Male flowers: sepals 5, valvate; petals 5; disk absent, rarely present; stamens 5–15; filaments connate into a column; anthers 2-locular. Female flowers: sepals 5, valvate; petals 5, rarely absent; disk 5-glandular; ovary 3-locular; styles 3, 2-lobed, papillose. Fruit a capsule, stellate-pubescent or scaly, sometimes tuberculate, 3-locular. Seeds ovoid, smooth or warty.

- About 12 species: C and S Asia, S Europe to E Africa, often in drier habitats; one species in China.

**1. *Chrozophora sabulosa*** Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 446. 1842.

沙戟 sha ji

Herbs, annual, 10–30 cm tall, grayish stellate-tomentose. Stipules subulate, ca. 1.5 mm, deciduous; petiole 3–9 cm; leaf blade broadly ovate, 2–6 × 1.5–5 cm, papery, abaxially stellate-tomentose, adaxially pilose, base obtuse, glandless, margin repand, apex acute. Inflorescence 1–1.5 cm, with 10–12 male flowers and 5 or 6 female flowers; bracts subulate, 2–3 mm. Male flowers: pedicels ca. 2 mm; calyx ellipsoid in bud; sepals

lanceolate, ca. 3 × 0.7 mm, pubescent; petals lanceolate, ca. 3.5 × 0.5 mm, yellow, pilose; glands 5; stamens 5; filaments ca. 2 mm, half connate; anthers 1.2–1.4 mm. Female flowers: pedicels 6–7 mm; sepals lanceolate, 2–3 × ca. 0.5 mm, pubescent; petals narrowly lanceolate, 1.5–2.5 mm; glands 5; ovary globose, tomentose; style ca. 1 mm, 2-lobed. Fruiting pedicels 1.3–4 cm; capsule subglobose, ca. 7 mm in diam., stellate-pubescent, tuberculate. Seeds ovoid, ca. 4 mm, smooth. Fl. Jun–Jul, fr. Jul–Aug.

Sand dunes, sandy riverbanks; 500–600 m. N Xinjiang [Kazakhstan].

## 22. *HANCEA* Seemann, Bot. Voy. Herald, 409. 1857.

粗毛野桐属 cu mao ye tong shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Cordemoya* Baillon.

Shrubs or trees, monoecious or dioecious; indumentum of simple hairs and gland-tipped hairs or sessile peltate-stellate hairs with central cells. Leaves [alternate or] opposite; stipules present, sometimes interpetiolar; leaf blade simple, base not glandular, margin entire, pinnately or palmately 3-veined. Inflorescences terminal or axillary, sometimes ramiflorous, [branched or] unbranched, male flowers 1–3 per bract, female 1 per bract. Male flowers: sepals 2–4, valvate; petals absent; disk absent; anthers 2-locular, extrorse, longitudinally dehiscent; pistillode absent. Female flower: sepals (3 or) 4–6 (or 7), imbricate or valvate; petals absent; disk absent; ovary [3-locular] with 1 ovule per locule; styles short; stigmas erect, adaxially shortly papillose. Fruit a capsule, spiny, spines sometimes gland-tipped. Seeds ± globose, 3-angled, without aril or carunculate.

About 17 species: Madagascar, Mascarenes, S China to Malaysia, Indonesia to New Guinea; one species in China.

Both morphological and molecular analyses (Slik & Welzen, Blumea 46: 3–66. 2001; Sierra et al., Blumea 51: 519–540. 2006; Sierra et al., Blumea 52: 361–366. 2007) have demonstrated that *Hancea* (as *Cordemoya*) is sister to *Mallotus* and *Macaranga*. There are no easy characters to reliably separate the genus as a whole from *Mallotus*, mostly because of convergence with aberrant species within *Mallotus*. The most reliable characters are pollen morphology and the very characteristic indumentum, lacking stellate hairs and glandular scales but with gland-tipped hairs or sessile stellate scales with central cells. In practice, the easiest character is the absence of obvious glands on the adaxial leaf surface in *Hancea*, which are always present in the Chinese species of *Mallotus*.

**1. *Hancea hookeriana*** Seemann, Bot. Voy. Herald, 409. 1857.

粗毛野桐 cu mao ye tong

*Cordemoya hookeriana* (Seemann) Müller Argoviensis; *Mallotus hookerianus* (Seemann) Müller Argoviensis.

Shrubs or small trees, 1.5–10 m tall. Branchlets and inflorescences hispid. Leaves opposite, each pair very unequal; stipules linear-lanceolate, ca. 1 cm, hispid, persistent; petiole 1–1.5 cm; larger leaves oblong-lanceolate, 8–16 × 2–6 cm, thinly leathery, abaxially hispid along midrib, base obtuse, sometimes with 2 glands, margins entire or repand-denticulate, apex acuminate; veins 8 or 9 pairs; smaller leaves subulate, 1–1.2 cm.

Male inflorescences axillary, racemelike, 4–10 cm. Male flowers solitary or paired; bracts lanceolate, 4–5 mm; pedicel 4–5 mm; calyx lobes 4, elliptic, ca. 4 mm, purplish; stamens 60–70. Female inflorescences racemelike, 2–2.5 cm, 1–3-flowered; bracts lanceolate, 7–8 mm. Female flower: sepals 5, lanceolate, 5–7 mm, pilose; ovary pilosulose and softly spiny; styles 3, 1–2.5 cm, basally connate, long papillose. Fruiting pedicel 4–5 cm; capsule 3-locular, 1.2–1.4 cm in diam., pilosulose and densely softly spiny, spines filiform, ca. 3 mm. Seeds globose, ca. 5 mm in diam., brown marbled. Fl. Apr–Aug, fr. Jun–Dec.

Mountain valleys or ravines, forests; 100–900 m. Guangdong, S Guangxi, Hainan [N Vietnam].

## 23. *TREVIA* Linnaeus, Sp. Pl. 2: 1193. 1753.

滑桃树属 hua tao shu shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Trees; indumentum of simple or tufted hairs, sometimes with glandular hairs. Leaves opposite, entire, 3–5-plinerved; stipules 2. Inflorescences axillary, racemose. Plants dioecious. Inflorescence axillary, unbranched, male flowers 2 or 3 per bract. Male flowers: calyx closed in bud, valvate, 3–5-partite, reflexed; petals absent; disk absent; stamens 75–95; filaments free; anthers dorsifixed, 2-locular, connective sometimes widened; pistillode absent. Female inflorescence much shorter, 1–4-flowered. Female flowers: calyx 2–4-lobed, caducous; petals absent; disk absent; ovary 2–4-locular; ovules 1 per locule; styles 2–4, long, entire, conspicuously papillose. Fruit a drupe, indehiscent; endocarp crustaceous. Seeds ovoid; testa hard.

One, possibly two, species: S and SE Asia; one species in China.

The genus name is most often given as “*Trewia*” but this is merely an orthographical variant of the original “*Trevia*” and there is no justification for its use without formal conservation.

Kulju et al. (Blumea 52: 115–136. 2007) showed that *Trevia* is embedded within *Mallotus*, from which it differs only by the indehiscent fruit, and they transferred it to that genus, along with *T. polycarpa* Benthams, which they regarded as distinct. However, the name *Trevia* (1753) has priority over *Mallotus* (1790). For the sake of nomenclatural continuity, *Mallotus* should be formally conserved against *Trevia* because the former name is better known and has traditionally been applied to a much larger genus than the latter. The alternative would be many new combinations in *Trevia*. We are maintaining here the name *Mallotus*, which applies to a very easily recognized entity, until this nomenclatural issue is resolved.

### 1. *Trevia nudiflora* Linnaeus, Sp. Pl. 2: 1193. 1753.

滑桃树 hua tao shu

*Mallotus cardiophyllus* Merrill; *M. nudiflorus* (Linnaeus) Kulju & Welzen; *M. polycarpus* (Benthams) Kulju & Welzen; *Pseudotrewia macrophylla* Miquel; *Rottlera hoperiana* Blume ex Müller Argoviensis; *R. indica* Willdenow; *R. operiana* Blume ex Baillon; *Trevia integerrima* Stokes; *T. macrophylla* Roth; *T. macrostachya* Klotzsch; *T. nudiflora* var. *dentata* Susila & N. P. Balakrishnan; *T. nudiflora* var. *polycarpa* (Benthams) Susila & N. P. Balakrishnan; *T. nudiflora* var. *tomentosa* Susila & N. P. Balakrishnan; *T. polycarpa* Benthams.

Trees, up to 25 m tall, deciduous; branchlets tomentose or villous. Stipules lanceolate, ca. 5 mm, deciduous; petiole 5–12 cm; leaf blade ovate or oblong-ovate, 10–15 × 8–14 cm, papery, abaxially villous, adaxially pilose along veins, base

cordate, rarely broadly rounded, with 2 or 4 glands, apex acuminate. Male inflorescences 6–25(–30) cm, densely villous; bracts ovate-lanceolate, ca. 3 mm. Female inflorescence 1.5–11 cm, often 1-flowered; peduncle to 3 cm, pilose. Female flowers: pedicel 1–9 mm; calyx 5–6 mm; ovary tomentulose; styles often 3, basally connate, 2–2.5 cm. Drupe globose, 2–4-locular, [1–]2–3.5 cm in diam., glabrous [or hairy]; exocarp thick and fleshy [or very thin]. Fl. Jan–Apr, fr. Jun–Dec.

River valleys, by forest streams; 100–800 m. SE Guangxi, Hainan, S Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

Balakrishnan and Chakrabarty (Fam. Euphorbiaceae India, 155–156. 2007) recognized four varieties within India, with *Trevia nudiflora* var. *nudiflora* extending ± throughout the range of the species, including China, and var. *tomentosa* Susila & N. P. Balakrishnan extending to Myanmar and Indochina and possibly to China. The other two varieties are endemic to central and S India.

## 24. MALLOTUS Loureiro, Fl. Cochinch. 2: 635. 1790.

野桐属 ye tong shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Coelodiscus* Baillon; *Echinus* Loureiro; *Rottlera* Roxburgh.

Trees or shrubs, rarely climbers, usually dioecious; indumentum usually of simple and stellate hairs, and whitish to reddish glandular scales. Leaves alternate or opposite with one member of pair smaller; stipules usually subulate; leaf blade undivided or lobate, sometimes peltate, abaxially often glandular-scaly, adaxially often distinctly glandular, base usually with 2 or more glands, venation palmate or pinnate. Inflorescences terminal or axillary, mostly unbranched, less often branched, usually many flowered. Male flowers usually several per bract; calyx 3–5-partite, valvate; petals and disk absent; stamens 15–250; filaments free; anthers 2-locular, connective often broad; pistillode absent [or rarely present]. Female flowers 1(or 2) per bract; calyx 3–5-lobed, sometimes spathaceous and caducous; ovary (2 or)3(or 4)-locular; styles simple, plumose or long papillose; ovules 1 per locule. Capsule (2 or)3(or 4)-locular, smooth or softly spiny. Seeds subglobose or ovoid, smooth, sometimes with aril.

About 150 species: tropical and subtropical regions in Asia, a few species in Africa and Australia; 28 species (seven endemic) in China.

Phylogenetic studies (Sierra et al., Blumea 51: 519–540. 2006; Kulju et al., Blumea 52: 115–136. 2007) have revealed that *Mallotus* and *Macaranga* are closely related and that the species of *Cordemoya* are distinct from both. These also show that *Trevia* is embedded within *Mallotus* but its inclusion has serious nomenclatural consequences and so this is not followed here until the situation is resolved.

Govaerts et al. (World Checkl. Euphorbiaceae: <http://www.kew.org/wcsp/home.do>) indicated that *Mallotus dispar* (Blume) Müller Argoviensis, recorded from Indonesia, Malaysia, Myanmar, Thailand, Philippines, and Vietnam, occurs in Hainan and Taiwan, but we have not seen the support for this statement. It most closely resembles *M. decipiens* and *M. yunnanensis* but differs by the larger stipules, 5–6 mm, longer petiole, 4–5 cm, and more densely softly spiny capsule.

*Mallotus neocavaleriei* H. Léveillé (Fl. Kouy-Tchéou, 165. 1914–1915) is a synonym of *Deeringia amaranthoides* (Lamarck) Merrill in the Amaryllidaceae (see Fl. China 5: 416. 2003).

1a. Leaves always opposite, sometimes very unequal, or with one member stipulelike [or even obsolete].

2a. Leaves palmately 3-veined.

3a. Petiole 3–12 cm, stipules obsolete; male inflorescence 6–15 cm; stamens 80–100 ..... 1. *M. tiliifolius*

3b. Petiole 0.5–3 cm, stipules 2–4 mm; male inflorescence 4–6 cm; stamens 30–40.

4a. Branchlet indumentum dull yellow; leaf blade thinly leathery ..... 2. *M. decipiens*

4b. Branchlet indumentum densely brownish; leaf blade stiffly papery ..... 3. *M. yunnanensis*

- 2b. Leaves pinnately veined, basal lateral veins similar to distal lateral veins.
- 5a. Female inflorescence 10–18 cm; male inflorescence 5–15 cm; capsule densely softly spiny, spines 2–3 mm ..... 5. *M. esquirolii*
- 5b. Female inflorescence 2–8 cm; male inflorescence 2–6 cm; capsule sparsely shortly softly spiny, spines ca. 1 mm.
- 6a. Leaf blade abaxially gray pubescent along veins, and barbate in vein-axils, lateral veins 4–6 pairs ..... 3. *M. yunnanensis*
- 6b. Leaf blade abaxially ferruginous stellate-pubescent, lateral veins 7–9 pairs ..... 4. *M. anomalus*
- 1b. At least some leaves alternate.
- 7a. Leaves alternate and opposite on same branch; dried plant smelling of fenugreek; female calyx spathaceous; capsule softly spiny.
- 8a. Leaves adaxially sparsely glandular-scaly; capsule gray tomentulose, densely and shortly softly spiny ..... 6. *M. thorelii*
- 8b. Leaves adaxially not glandular-scaly; capsule pilose or glandular-scaly, more laxly softly spiny.
- 9a. Leaf blade oblong or elliptic, base obtuse or narrowly cordate, abaxially stellate-hirsute only along midrib ..... 7. *M. peltatus*
- 9b. Leaf blade ovate or orbicular, base often rotund.
- 10a. Leaves clearly peltate, apex caudate-acuminate, abaxially stellate-pilose, palmately 7–9-veined ..... 8. *M. roxburghianus*
- 10b. Leaves not or only obscurely peltate, apex acuminate, abaxially glaucous, palmately 3-veined ..... 9. *M. garrettii*
- 7b. Leaves either strictly alternate or strictly opposite; plant not smelling of fenugreek; female calyx not spathaceous; capsule smooth or softly spiny.
- 11a. Capsule smooth, densely brightly colored glandular-scaly, or tomentose.
- 12a. Erect shrubs or trees.
- 13a. Leaf blade abaxially, ovary, and fruit with red or crimson gland-scales; seed ca. 4 mm in diam. .... 10. *M. philippensis*
- 13b. Leaf blade abaxially, ovary, and fruit with golden-yellow gland-scales; seed ca. 6 mm in diam. .... 11. *M. pallidus*
- 12b. Climbing shrubs.
- 14a. Leaf blade longer than wide, thickly papery or leathery; ovary and fruit 3-locular, densely orange-yellow stellate-tomentose; seed ca. 6 mm in diam. .... 12. *M. milletii*
- 14b. Leaf blade about as long as wide, papery or membranous, abaxially sparsely yellowish glandular-scaly; ovary and fruit 2- or 3-locular, yellowish-brownish tomentulose; seed ca. 5 mm in diam. .... 13. *M. repandus*
- 11b. Capsule softly spiny.
- 15a. Leaves always peltate, palmately veined.
- 16a. Leaves adaxially sparsely glandular-scaly and villous; capsule sparsely shortly softly spiny and densely yellowish glandular-scaly ..... 14. *M. dunnii*
- 16b. Leaves adaxially not glandular-scaly; capsule densely stellate-pubescent and softly spiny, forming a continuous uniform layer.
- 17a. Leaves undivided, narrowly peltate or peltate.
- 18a. Branchlets ferruginous tomentose; stipules triangular, 3–5 mm; capsule setae 6–8 mm ..... 15. *M. metcalfeanus*
- 18b. Branchlets brown pulveraceous-tomentose; stipules obsolete; capsule setae ca. 3 mm ..... 16. *M. conspurcatus*
- 17b. Leaves often tricuspidate or 1- or 2-lobed, broadly peltate.
- 19a. Female inflorescence branched or unbranched (var. *croizatiamus*, var. *pedicellaris*); branchlets densely floccose or tomentose; stipules subulate, 5–15 mm ..... 17. *M. barbatus*
- 19b. Female inflorescence unbranched; branchlets densely stellate-tomentose; stipules filiform or lanceolate, 3–8 mm.
- 20a. Branchlets reddish brown tomentose; stipules filiform, 6–8 mm; capsule ca. 20 mm in diam. .... 18. *M. luchenensis*
- 20b. Branchlets yellowish brown tomentose; stipules narrowly lanceolate, 3–4 mm; capsule 12–15 mm in diam. .... 19. *M. lotingensis*
- 15b. At least some leaves not peltate, sometimes also narrowly peltate on same branch.
- 21a. Capsule ca. 10 mm in diam., densely softly spiny; female inflorescence branched or unbranched; leaf blade 3-veined from base.
- 22a. Female inflorescence branched; capsule 4-locular, spines subulate; leaf base with 2–4 glands ..... 20. *M. tetracoccus*



- 22b. Female inflorescence unbranched; capsule 3(or 4)-locular, spines not subulate; leaf base with 2 conspicuous glands.
- 23a. Female inflorescence and infructescence pendulous, more than 15 cm, whitish tomentose; capsule setae filiform, yellowish when dried ..... 21. *M. apelta*
- 23b. Female inflorescence or infructescence erect, 8–20 cm, gray or yellowish tomentose or pilosulose; capsule setae linear, brown when dried.
- 24a. Female inflorescence 8–15 cm, peduncle ca. 5 mm thick ..... 22. *M. tenuifolius*
- 24b. Female inflorescence 10–20 cm, peduncle ca. 3 mm thick ..... 23. *M. nepalensis*
- 21b. Capsule 10–20 mm in diam., sparsely softly spiny, subulate; female inflorescence branched; leaf blade 3- or 5-veined from base.
- 25a. Branchlet indumentum whitish; capsule ca. 6 mm in diam., setae ca. 2 mm ..... 24. *M. microcarpus*
- 25b. Branchlet indumentum brownish, yellowish-brownish, or reddish; capsule 8–12 mm in diam., setae 3–7 mm.
- 26a. Branchlets tomentose; styles 6–7(–10) mm, partly connate; capsule setae 5–7 mm ..... 28. *M. lianus*
- 26b. Branchlets tomentulose; styles 3–5 mm, almost free; capsule setae 3–4 mm.
- 27a. Leaf blade 3-veined from base; capsule 10–12 mm in diam.; leaves never peltate; branchlet indumentum yellowish-brownish ..... 25. *M. oreophilus*
- 27b. Leaf blade 3–5-veined from base; capsule less than 10 mm in diam.; some leaves narrowly peltate; branchlet indumentum dull brown or reddish.
- 28a. Branchlets dull brownish tomentulose; ovary and capsule densely orange-reddish glandular-scaly ..... 26. *M. japonicus*
- 28b. Branchlets reddish tomentulose; ovary and capsule tomentulose ..... 27. *M. paniculatus*

**1. *Mallotus tiliifolius*** (Blume) Müller Argoviensis, Linnaea 34: 190. 1865 [*“tiliaefolius”*].

椴叶野桐 duan ye ye tong

*Rottlera tiliifolia* Blume, Bijdr. 607. 1826 [*“tiliaefolia”*]; *Mallotus playfairii* Hemsley.

Shrubs or small trees, 3–7 m tall. Branchlets and inflorescences grayish ochraceous tomentulose. Leaves opposite, each pair slightly unequal; stipules obsolete; petiole 3–12 cm; leaf blade triangular, triangular-ovate, or rhombic-ovate, 5–20 × 4.5–20 cm, chartaceous, adaxially sparsely stellate-pubescent, abaxially tomentulose, sparsely reddish glandular-scaly, base rounded to cordate, with 2–4 maculate glands, margin entire or repand, apex acute or acuminate; basal veins 3. Male inflorescences terminal, unbranched, 6–15 cm; bracts subulate, 1.5–2 mm. Male flowers 3–9-fascicled; pedicel 2–3 mm; calyx lobes 3–5, oblong or lanceolate, 2–3 mm; stamens 80–100. Female inflorescences 3–15 cm. Female flowers: sepals 3–5, ovate-lanceolate, 2.5–3 mm, tomentulose; ovary tomentose and softly spiny; styles 3, 4–5 mm, connate at middle, plumose. Fruiting pedicel ca. 5 mm; capsule 3-locular, ca. 12 mm in diam., tomentulose and sparsely shortly softly spiny. Seeds subglobose, ca. 5 mm in diam. Fl. Apr–Jun, fr. Aug–Oct.

Coastal regions, thickets; below 100 m. Hainan, Taiwan [Indonesia, Malaysia, Philippines, Thailand; N Australia, Pacific islands (Fiji)].

**2. *Mallotus decipiens*** Müller Argoviensis, Linnaea 34: 194. 1865.

短柄野桐 duan bing ye tong

Shrubs or small trees, 2–6 m tall. Branchlets densely dull yellow stellate-pubescent. Leaves opposite, each pair unequal; stipules oblong, 3–4 mm, leathery, pubescent; petiole 5–10 mm, tomentose; leaf blade obovate or oblong-ovate, 5–16 × 3–8 cm,

thinly leathery, adaxially glabrescent, abaxially pubescent and yellowish granular-glandular, base cuneate, with 2 glands, margin repand-denticulate, apex acute or acuminate; basal veins 3. Male inflorescences terminal or axillary, unbranched, 4–6 cm, tomentulose; bracts lanceolate, small. Male flowers 3–5-fascicled; calyx lobes 3, ovate, ca. 2 mm, puberulent; stamens 30–40. Female raceme 5–11 cm, tomentulose; bracts lanceolate, ca. 2 mm. Female flowers: sepals 4 or 5, oblong, ca. 3 mm, pubescent; ovary tomentose; styles 3, ca. 3 mm, base connate, ca. 1 mm, plumose. Capsule 3-locular, 8–9 mm in diam., puberulent and sparsely shortly softly spiny. Seeds globose, ca. 3.5 mm in diam. Fl. Mar–Apr, fr. May–Jun.

Mountain valleys, forests; 400–800 m. SW Yunnan [Myanmar, Thailand].

**3. *Mallotus yunnanensis*** Pax & K. Hoffmann in Engler, Pflanzenr. 63(IV. 147. VII): 188. 1914.

云南野桐 yun nan ye tong

*Mallotus hainanensis* S. M. Hwang.

Shrubs 1–3 m tall. Branchlets densely brownish stellate-pubescent. Leaves opposite, each pair somewhat unequal; stipules subulate to lanceolate, 2–4 mm, deciduous; petiole 0.5–3 cm; leaf blade elliptic, broadly ovate, or rhombic-ovate, 4–15 × 2–5 cm, chartaceous, adaxially glabrous, abaxially gray pubescent along veins, and barbate in vein axils, scattered glandular-scaly, base cuneate or obtuse, sometimes slightly cordate, with 2–4 glands, margin repand-denticulate or subentire, apex acute or acuminate; basal veins 3, lateral veins 4–6 pairs. Male inflorescences axillary, sometimes terminal, unbranched, 2–6 cm, pubescent; bracts lanceolate or triangular, 2–4 mm. Male flowers 3-fascicled; pedicel 1–2 mm; calyx lobes 3 or 4, ovate, ca. 2 mm, pubescent; stamens 35–40. Female raceme 2–8 cm, with 2–9 flowers, pubescent. Female flowers: sepals 3–5, lan-

ceolate or oblong-lanceolate, ca. 3 mm, pubescent; styles 3, ca. 3 mm, base connate, plumose. Capsule 3-locular, ca. 8 mm in diam., yellowish pubescent, sparsely shortly softly spiny and glandular-scaly; pedicel ca. 2 mm. Seeds globose, ca. 3.5 mm in diam., brown. Fl. and fr. Apr–Dec.

Mountain slopes or limestone, thickets; below 100–1400 m. Guangxi, S Guizhou, Hainan, Yunnan [N Vietnam].

**4. *Mallotus anomalus*** Merrill & Chun, *Sunyatsenia* 5: 99. 1940.

锈毛野桐 xiu mao ye tong

Shrubs 1–3 m tall. Branchlets and inflorescences densely ferruginous stellate-pubescent. Leaves opposite, each pair slightly unequal; stipules triangular, 4–5 mm; petiole 1–7 cm; leaf blade broadly elliptic, obovate, or oblong-obovate, 5–30 × 3–18 cm, chartaceous, adaxially pubescent along veins, abaxially ferruginous tomentulose, base obtuse, sometimes subcordate, with 2–4 glands, margin repand-serrate, apex acute; lateral veins 7–9 pairs. Male inflorescences axillary, unbranched, 2.5–4 cm; bracts lanceolate, 3–5 mm. Male flowers 3–5-fascicled; pedicel ca. 3 mm; calyx lobes 3, long ovate, ca. 4 mm, pubescent; stamens 25–30. Female racemes 2–4 cm, with 3–8 flowers; bracts triangular or ovate-lanceolate, ca. 3 mm. Female flowers: sepals 3, lanceolate, 4–7 mm, pubescent; ovary densely pubescent; styles 3, 3–4 mm, base connate, plumose. Capsule 3-locular, ca. 12 mm in diam., pubescent and sparsely shortly softly spiny; pedicel 1–1.5 cm. Seeds ovoid, 4–6 mm, brown. Fl. and fr. Mar–Dec.

• Mountain slopes or valleys, forests, thickets; below 100–400 m. S Hainan.

**5. *Mallotus esquirolii*** H. Léveillé, *Repert. Spec. Nov. Regni Veg.* 9: 327. 10 May 1911 (not H. Léveillé, 15 Aug 1911).

长叶野桐 chang ye ye tong

*Mallotus eberhardtii* Gagnepain; *M. grossedentatus* Merrill & Chun.

Shrubs or small trees, 2–10 m tall. Branchlets and inflorescences densely gray stellate-pubescent. Leaves opposite, each pair somewhat unequal or exceedingly unequal, rarely alternate; stipules lanceolate, 3–4 mm; petiole 1.5–8 cm, pubescent; leaf blade oblong-obovate, elliptic, rarely oblanceolate, 10–22 × 5–10 cm, papery or thinly leathery, adaxially glabrous, abaxially stellate pubescent along veins, very sparsely or scarcely yellow glandular-scaly, base cuneate, sometimes broadly cuneate, with basal glands 2–4, margin repand-dentate or denticulate, apex acuminate or subcaudate; smaller leaves elliptic or ovate, 6–10 × 4–6.5 cm, sometimes sessile; lateral veins 8–12 pairs. Male inflorescences terminal or axillary, unbranched, 5–15 cm; bracts triangular, ca. 1.5 mm. Male flowers 2–5-fascicled; pedicel 2–5 mm; calyx lobes 3, elliptic, ca. 3 mm, tomentulose; stamens 40–50. Female inflorescences 10–18 cm, unbranched; bracts triangular, 1.5–2.5 mm. Female flowers: pedicel 4–5 mm; sepals 4 or 5, lanceolate, ca. 3 mm; ovary densely softly spiny; styles 3, ca. 4 mm, base connate, plumose. Capsule 3-locular, 12 mm in diam., pubescent, densely softly spiny, 2–3 mm. Seeds subglobose, brownish, ca. 6 mm in diam. Fl. Apr–Oct, fr. Jun–Dec.

Limestone mountain valleys or mountain slopes, forests; 300–1500 m. Guangxi, Guizhou, Hainan, E Yunnan [N Vietnam].

**6. *Mallotus thorelii*** Gagnepain, *Notul. Syst.* (Paris) 4: 53. 1923.

灰叶野桐 hui ye ye tong

Shrubs or small trees, 3–5 m tall. Branchlets densely gray stellate-pubescent. Leaves alternate or subopposite; stipules triangular, ca. 4 mm, pubescent; petiole 5–8 cm, tomentose; leaf blade orbicular-ovate or triangular-ovate, 10–14 × 9–13 cm, papery, adaxially pubescent, scattered glandular-scaly, abaxially gray tomentose, densely glandular-scaly, base rotund, broadly peltate, margin sinuous-denticulate or subentire, apex abruptly caudate; basal veins 5. Male inflorescences usually terminal, unbranched, 8–10 cm, tomentulose. Female inflorescences unbranched, 15–18 cm, tomentulose; bracts long ovate, ca. 4 mm. Female flowers: pedicel ca. 5 mm; calyx lobes 4 or 5, lanceolate, ca. 2 mm, deciduous; ovary tomentose; style 3 mm, plumose. Capsule 3-locular, ca. 10 mm in diam., gray tomentulose, densely shortly softly spiny. Fl. Jun–Jul, fr. Aug–Sep.

Mountain valleys, forests; 1200–1300 m. S Yunnan [Cambodia, Laos, Thailand, N Vietnam].

The dried material smells of fenugreek.

**7. *Mallotus peltatus*** (Geiseler) Müller Argoviensis, *Linnaea* 34: 186. 1865.

山苦茶 shan ku cha

*Aleurites peltata* Geiseler, *Croton*. Monogr. 81. 1807; *Hancea muricata* Bentham; *Mallotus furetianus* Müller Argoviensis; *M. maclurei* Merrill; *M. oblongifolius* (Miquel) Müller Argoviensis; *Rottlera oblongifolia* Miquel.

Shrubs or small trees, 2–8 m tall. Branchlets stellate-hirsute and pubescent. Leaves alternate, sometimes subopposite; stipules oblong, ca. 3 mm, deciduous; petiole 0.5–4.5 cm; leaf blade oblong-obovate or elliptic, 5–18 × 2–6 cm, papery, abaxially stellate-hirsute along midvein, sparsely yellowish glandular-scaly, base obtuse or narrowly cordate, sometimes peltate, with 4 basal glands, margin subentire or repand-denticulate, apex acuminate; lateral veins 8–10 pairs. Male inflorescences racemose, terminal, 6–12 cm; bracts ovate-lanceolate, 2–3 mm. Male flowers 2–5-fascicled; pedicel 2–3 mm; calyx lobes 3, ovate, ca. 1.5 mm, glabrous; stamens 25–45. Female inflorescences racemose, 5–8 cm, with 4–7 flowers; bracts subulate, ca. 2 mm. Female flowers: calyx urceolate, 5–7 mm, stellate-pubescent, 3-denticulate, spathaceous, deciduous; ovary densely pubescent and softly spiny; styles 3, ca. 8 mm, connate at middle, plumose. Capsule 3-locular, 14 mm in diam., pubescent and glandular-scaly, sparsely softly spiny; pedicel ca. 5 mm. Seeds globose, ca. 5 mm in diam., brown marbled. Fl. Feb–Jun, fr. Jun–Nov.

Mountain slopes or valleys, forests, thickets; 200–1000 m. Guangdong, Hainan [India, Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam].

The dried material smells of fenugreek.

**8. *Mallotus roxburghianus*** Müller Argoviensis, *Linnaea* 34: 186. 1865.

圆叶野桐 yuan ye ye tong

Shrubs ca. 3 m tall. Branchlets yellow stellate-pubescent

and villous. Stipules linear, 5–7 mm; petiole 5–10 cm; leaf blade orbicular-ovate, 8–20 × 7–18 cm, papery, adaxially villous, abaxially stellate-pilose and villous along veins, glandular-scaly, base rotund, broadly peltate, with 2–4 basal glands, margin repand-denticulate, apex caudate-acuminate; basal veins 7–9. Male inflorescences terminal, unbranched, 4–12 cm, tomentose; bracts linear, ca. 5 mm. Male flowers 3–5-fascicled; sepals 4, oblong, ca. 2 mm, pubescent; stamens 25–35. Female inflorescences 10–15 cm, tomentose. Female flowers: calyx urceolate, 6-lobed, lanceolate, ca. 3 mm, pubescent; ovary densely pilose; style 3–4 mm, base connate, plumose. Capsule 3-locular, ca. 12 mm in diam., pilose and shortly softly spiny; pedicel 5–7 mm. Seeds subglobose, ca. 4.5 mm, brownish. Fl. Jul–Aug, fr. Aug–Sep.

Mountain slopes, forests; 800–1000 m. Yunnan (Yingjiang) [NE India].

The dried material smells of fenugreek.

**9. *Mallotus garrettii*** Airy Shaw, Kew Bull. 21: 387. 1968.

粉绿野桐 *fen lü ye tong*

Small trees 4–8 m tall. Branchlets and leaves glabrous. Stipules triangular, ca. 3 mm, deciduous; petiole slender, 2–9 cm; leaf blade ovate or oblong-ovate, 7–15 × 3.5–8.5 cm, papery, abaxially glaucous, sparsely glandular-scaly, base rotund or narrowly cordate, with 2 basal glands, margin entire or repand, apex acuminate; basal veins 3, lateral veins 4 or 5 pairs. Male inflorescences terminal or axillary, unbranched, 5–12 cm; bracts ovate, ca. 3 mm. Male flowers 3–5-fascicled; pedicel 1–3 mm; calyx lobes 3, ovate, ca. 2 mm, pilose; stamens 30–40. Female inflorescences 11–13 cm, pilose. Capsule 3-locular, coccus subglobose, ca. 8 mm in diam., sparsely glandular-scaly and shortly softly spiny; persistent style ca. 4 mm, connate at middle, plumose. Seeds globose, ca. 5 mm in diam., brownish marbled. Fl. Jun–Oct, fr. Oct–Dec.

Mountain valleys, forests; 1000–1500 m. S Yunnan [Laos, N Thailand].

The dried material smells of fenugreek.

**10. *Mallotus philippensis*** (Lamarck) Müller Argoviensis, Linnaea 34: 196. 1865.

粗糠柴 *cu kang chai*

Shrubs or small trees, 2–15 m tall. Branchlets, petiole, and inflorescences yellow-brownish stellate-tomentose. Stipules small, ca. 1 mm; petiole 2–9 cm; leaf blade ovate to lanceolate, 5–20 × 3–6 cm, leathery, adaxially glabrescent, abaxially gray-yellow tomentulose and sparsely red glandular-scaly, base cuneate or obtuse, with 2–4 basal glands, margin subentire, apex acuminate; basal veins 3. Male inflorescences unbranched, 5–10 cm; bracts triangular, ca. 1 mm. Male flowers 1–5-fascicled; pedicel 1–2 mm; calyx lobes 3 or 4, oblong, ca. 2 mm, tomentulose; stamens 15–30. Female inflorescences 3–8 cm, 10–15 cm in fruit; bracts triangular, ca. 1 mm. Female flowers: pedicel ca. 2 mm; calyx lobes 3–5, subovate, ca. 3 mm, tomentose; ovary tomentose and red glandular-scaly; styles 3, 3–4 mm, plumose. Capsule subglobose, 8–10 mm in diam., (2 or) 3-locular, covered with a red glandular-scaly layer. Seeds subglobose, ca. 4 mm in diam., black. Fl. Mar–May, fr. Jun–Aug.

Mountain slopes or valleys, limestone hills or river valleys, forests; 300–1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Laos, Malaysia, Myanmar, Nepal, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; N Australia].

- 1a. Leaf blade ovate, oblong, or lanceolate, leathery, margin subentire, abaxially tomentulose; capsule crimson glandular-scaly ..... 10a. var. *philippensis*
- 1b. Leaf blade elliptic-ovate or ovate-lanceolate, thinly leathery, margin repand-dentate, abaxially tomentose, veins elevated; capsule red glandular-scaly ..... 10b. var. *reticulatus*

**10a. *Mallotus philippensis* var. *philippensis***

粗糠柴(原变种) *cu kang chai (yuan bian zhong)*

*Croton philippensis* Lamarck, Encycl. 2: 206. 1786; *Euonymus hypoleucus* H. Léveillé; *Rottlera aurantiaca* Hooker & Arnott; *R. tinctoria* Roxburgh.

Branchlets and inflorescences yellow-brownish stellate-tomentose. Leaf blade ovate, oblong, or lanceolate, 5–20 × 3–6 cm, leathery, adaxially glaucescent, gray-yellow tomentulose, sparsely red glandular-scaly, margin subentire. Capsule crimson glandular scaly. Seeds subglobose, ca. 4 mm in diam. Fl. Mar–May, fr. Jun–Aug.

Mountain slopes or valleys, forests; 300–1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Laos, Malaysia, Myanmar, Nepal, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; N Australia].

**10b. *Mallotus philippensis* var. *reticulatus*** (Dunn) F. P. Metcalf, J. Arnold Arbor. 22: 207. 1941.

网脉粗糠柴 *wang mai cu kang chai*

*Mallotus reticulatus* Dunn, J. Linn. Soc., Bot. 38: 365. 1908.

Shrubs 2–7 m tall. Branchlets and inflorescences gray-yellowish tomentose. Leaf blade elliptic-ovate or ovate-lanceolate, 10–23 × 5–10 cm, thinly leathery, abaxially gray-tomentose, orange-red glandular-scaly, margin repand-dentate; veins elevated. Capsule 3-locular, ca. 10 mm in diam., densely red glandular-scaly. Seeds subglobose, black, ca. 5 mm in diam. Fl. Apr–Jun, fr. Sep–Nov.

• Limestone hills or river valleys; 100–700 m. Fujian, Guangdong, E Guangxi, S Jiangxi.

**11. *Mallotus pallidus*** (Airy Shaw) Airy Shaw, Kew Bull. 32: 78. 1977.

樟叶野桐 *zhang ye ye tong*

*Mallotus philippensis* (Lamarck) Müller Argoviensis var. *pallidus* Airy Shaw, Kew Bull. 26: 300. 1972; *M. philippensis* var. *menglianensis* C. Y. Wu.

Small trees 5–15 m tall. Branchlets gray stellate-tomentulose. Petiole 2–4 cm; leaf blade oblong-lanceolate, 8–16 × 3–5 cm, thinly leathery, adaxially glabrescent, abaxially tomentulose, base cuneate, with 2 basal glands, margin subentire, apex acuminate. Flowers 1–3-fascicled; flower buds ovoid, ca. 1.5 mm, tomentulose. Infructescence 5–14 cm; bracts triangular, ca. 1 mm. Fruiting pedicel 2–3.5 mm; persistent sepals 5, triangular, ca. 1.5 mm; capsule subglobose, 3-locular, ca. 12 mm in diam., densely golden yellow glandular-scaly. Seeds subglobose, ca. 6 mm in diam., black. Fl. Jun–Jul, fr. Aug–Dec.

Mountain valleys or limestone ranges, forests; 1200–1400 m. W Hainan, S Yunnan [Thailand].

**12. *Mallotus millietii*** H. Léveillé, Fl. Kouy-Tchéou, 165. 1914–1915.

贵州野桐 *gui zhou ye tong*

Climbing shrubs, often 3–5 m tall. Branchlets, petioles, and inflorescences yellow stellate-tomentose and villous. Petiole 1.5–7 cm; leaf blade oblong-ovate, elliptic-ovate, or ovate, 5–17 × 3–10 cm, chartaceous or leathery, adaxially along veins stellate-pilose, abaxially dull yellow tomentose, scattered yellow glandular-scaly, base broadly cuneate, obtuse, or cordate, with 2–4 small basal glands, margin entire or repand-denticulate, apex acute, sometimes acuminate; basal veins 3. Male inflorescences unbranched, 5–16 cm; bracts subulate, ca. 2 mm. Male flowers 2–5-fascicled; pedicel 2–3 mm; calyx lobes 4, oblong or sub lanceolate, 3–4 mm, tomentose; stamens 40–50. Female inflorescences 4–9 cm; peduncle 1–3 cm; bracts sublanceolate, ca. 2 mm. Female flowers: pedicel ca. 1.5 mm; sepals 4, triangular-lanceolate, ca. 3 mm, tomentose; ovary densely orange-yellow tomentose; styles 3, ca. 4 mm, base connate, ca. 1 mm, plumose. Fruiting pedicel 1.5–2 mm; capsule 3-locular, 1.2–1.5 cm in diam., densely orange-yellow tomentose. Seeds subglobose, ca. 6 mm in diam., black. Fl. May–Jun, fr. Aug–Oct.

• Limestone regions, hill slopes, forests, thickets; 500–1400 m. Guangxi, Guizhou, Hubei, Hunan, Yunnan.

- 1a. Branchlets, petiole, and inflorescences yellow stellate-tomentose and villous; leaves abaxially dull yellow tomentose; capsule densely orange-yellow tomentose, pedicel less than 2 mm ..... 12a. var. *millietii*  
 1b. Branchlets brownish stellate-tomentulose when young; leaves both surfaces glabrous; capsule densely brownish tomentose, pedicel 3–4 mm ..... 12b. var. *atrichus*

**12a. *Mallotus millietii* var. *millietii***

贵州野桐(原变种) *gui zhou ye tong* (yuan bian zhong)

*Mallotus kweichowensis* Lauener & W. T. Wang; *Phytolacca esquirolii* H. Léveillé.

Branchlets, petiole, and inflorescences yellow stellate-tomentose and stellate-villous. Leaf blade chartaceous or leathery, abaxially dull yellow tomentose. Infructescences 4–5 cm. Fruiting pedicel 1.5–2 mm; capsule densely orange-yellow tomentose. Fl. May–Jun, fr. Jul–Oct.

• Limestone regions, forests, thickets; 500–1400 m. Guangxi, Guizhou, SE Yunnan.

**12b. *Mallotus millietii* var. *atrichus*** Croizat, J. Arnold Arbor. 19: 147. 1938.

光叶贵州野桐 *guang ye gui zhou ye tong*

Branchlets brownish stellate-tomentulose when young, becoming glabrous. Leaf blade chartaceous, both surfaces glabrous. Infructescence 5–6 cm. Fruiting pedicel 3–4 mm; capsule densely brownish tomentose. Fl. May–Jun, fr. Jul–Oct.

• Limestone regions, thickets; 700–1000 m. Guangxi, Guizhou, W Hubei, W Hunan, E Yunnan.

**13. *Mallotus repandus*** (Willdenow) Müller Argoviensis, Linnaea 34: 197. 1865.

石岩枫 *shi yan feng*

Climbing shrubs, often 5–10 m tall. Branchlets, petioles, and inflorescences dull yellowish-brownish stellate-tomentulose. Stipules triangular, ca. 1 mm; petiole 1.5–6 cm; leaf blade triangular-ovate, oblong-ovate, or ovate, 3.5–10 × 2.5–7 cm, papery, adaxially glabrous, abaxially stellate-pubescent, scattered yellowish granular-glandular, base broadly cuneate, sometimes slightly peltate, with 4 basal glands, margin entire or repand, apex acute or acuminate; basal veins 3. Male inflorescences terminal, rarely axillary, branches few or absent, 5–15 cm; bracts subulate, ca. 1.5 mm. Male flowers 2–5-fascicled; pedicel 2–4 mm; calyx lobes 3 or 4, oblong, ca. 3 mm, tomentulose; stamens 40–75. Female inflorescences 5–8 cm; bracts lanceolate, ca. 2 mm. Female flowers: pedicel 2–3 mm; sepals 4 or 5, lanceolate, 2–3 mm, tomentulose; ovary 2- or 3-locular, dull yellow tomentulose; style 3–5 mm, almost free, plumose. Fruiting pedicel 8–12 mm; capsule 2-locular, ca. 10 mm in diam., yellowish-brownish tomentulose, scattered glandular-scaly. Seeds subglobose, ca. 5 mm in diam., black. Fl. Mar–May, fr. Jun–Sep.

Thickets, forests, forest fringes, hill or mountain valleys; below 100–1000 m. Anhui, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, S Jiangxi, S Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands (New Caledonia)].

- 1a. Male inflorescence often branched; ovary 2-locular, style ca. 3 mm, almost free; leaf blade abaxially dull yellowish-brownish tomentulose ..... 13a. var. *repandus*  
 1b. Male inflorescence unbranched; ovary 3-locular; style 3.5–5 mm, base connate 1–1.5 mm; leaf blade abaxially pubescent or glabrescent.  
 2a. Leaves ovate, orbiculate-ovate, or lanceolate-ovate, base cordate or subtruncate, abaxially glabrescent; style ca. 5 mm, base connate for ca. 1.5 mm ..... 13b. var. *scabrifolius*  
 2b. Leaves elliptic-lanceolate or ovate, base cuneate or obtuse, abaxially pubescent or glabrescent; style ca. 3.5 mm, base connate for ca. 1 mm ..... 13c. var. *chrysocarpus*

**13a. *Mallotus repandus* var. *repandus***

石岩枫(原变种) shi yan feng (yuan bian zhong)

*Croton repandus* Willdenow, Neue Schriften Ges. Naturf. Freunde Berlin 4: 206. 1803.

Climbing shrubs, often 5–10 m tall. Branchlets dull yellowish-brownish tomentulose. Leaf blade triangular-ovate to ovate, 3.5–10 × 2.5–7 cm, papery, abaxially pubescent and scattered yellowish glandular-scaly, base broadly cuneate, sometimes slightly peltate, apex acute or acuminate. Inflorescences unbranched or loosely branched, 5–15 cm, dull yellowish-brownish tomentulose. Male flowers: calyx lobes 3 or 4, oblong, ca. 3 mm, almost free; stamens 40–75. Female flowers: ovary 2-locular, yellowish-brownish tomentulose; style ca. 3 mm, almost free, plumose. Capsule 2-locular, yellowish-brownish tomentulose, scattered glandular-scaly; pedicel 8–12 mm. Fl. Mar–May, fr. Jun–Sep.

Scattered in thickets or forest fringes; below 100–500 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands (New Caledonia)].

**13b. *Mallotus repandus* var. *scabrifolius*** (A. Jussieu) Müller Argoviensis in A. Candolle, Prodr. 15(2): 982. 1866.

卵叶石岩枫 luan ye shi yan feng

*Rottlera scabrifolia* A. Jussieu, Euphorb. Gen. 111. 1824; *Mallotus contubernalis* Hance; *M. repandus* var. *megaphyllum* Croizat, p.p.; *R. cordifolia* Benth.

Climbing shrubs. Branchlets densely dull yellow stellate-tomentulose when young, becoming glabrous. Leaf blade ovate, orbicular-ovate, or lanceolate-ovate, 7–15 × 4–11 cm, sub-papery, adaxially glabrous, abaxially glabrescent, vein axils puberulent, sometimes along veins puberulent, scattered yellowish glandular-scaly, base cordate or subtruncate, apex acuminate. Inflorescences unbranched, 2–10 cm, dull yellow tomentulose. Male flowers: calyx lobes 4 or 5, ca. 3 mm; stamens 40–55. Female flowers: ovary 3-locular, yellow-brownish tomentose; styles 3, ca. 5 mm, connate for ca. 1.5 mm, plumose. Capsule 3-locular, yellowish tomentulose; pedicel 5–7 mm. Fl. Apr–May, fr. Jun–Jul.

• Hill or mountain valleys, thickets, forests; below 100–600 m. S Fujian, Guangdong, Guangxi, Hunan, S Jiangxi, S Yunnan, Zhejiang.

**13c. *Mallotus repandus* var. *chrysocarpus*** (Pampanini) S. M. Hwang, Acta Phytotax. Sin. 23: 297. 1985.

杠香藤 gang xiang teng

*Mallotus chrysocarpus* Pampanini, Nuovo Giorn. Bot. Ital., n.s., 17: 413. 1910; *M. contubernalis* var. *chrysocarpus* (Pampanini) Handel-Mazzetti; *M. illudens* Croizat.

Climbing shrubs, 2–5 m tall. Branchlets brownish tomentose. Leaf blade ovate or elliptic-lanceolate, 6–10 × 1.5–4.5 cm, papery, abaxially pubescent and scattered yellowish glandular-scaly, or glabrescent, base cuneate or obtuse, apex shortly acuminate. Inflorescences unbranched, 5–7 cm, yellowish brown

tomentulose. Male flowers: calyx lobes 3, ca. 2.5 mm; stamens 35–45. Female flowers: ovary 3-locular, yellow-brown tomentose; styles 3, ca. 3.5 mm, connate for ca. 1 mm, plumose. Fruiting pedicel 3–5 mm; capsule 3-locular, brownish tomentulose. Fl. May–Jun, fr. Aug–Sep.

• Mountain valleys, thickets; 500–1000 m. Anhui, S Gansu, E Guizhou, Henan, Hubei, Hunan, S Shanxi, Sichuan.

**14. *Mallotus dunnii*** F. P. Metcalf, J. Arnold Arbor. 22: 205. 1941.

南平野桐 nan ping ye tong

*Mallotus roxburghianus* Müller Argoviensis var. *glabrus* Dunn, J. Linn. Soc., Bot. 38: 365. 1908.

Shrubs 1–4 m tall. Branchlets slender, sparsely stellate-pubescent and villous when young, becoming glabrous, brown. Leaves alternate, sometimes subopposite; stipules oblong, 6–7 mm, deciduous; petiole 10–17 cm; leaf blade triangular-ovate to broadly ovate, 10–25 × 8–21 cm, membranous, both surfaces sparsely villous and yellow glandular-scaly, brownish when dry, base rounded, rarely cordate, narrowly or broadly peltate, with 2–4 basal glands, margin denticulate, undivided or 1–3-lobate, apex long acuminate; basal veins 5–9, lateral veins 4 or 5 pairs. Inflorescences terminal, not or few branched, 10–32 cm, sparsely villous or glabrescent; bracts lanceolate, 3–10 mm. Male flowers 3–11-fascicled; pedicel 5–10 mm; calyx lobes 4 or 5, ovate, ca. 2 mm, glabrous; stamens 40–50. Female flowers: pedicel 1.5–3.5 cm, slender; sepals 4 or 5, lanceolate, 2–3 mm, glabrous; ovary softly spiny and glandular-scaly; styles 3, ca. 4 mm, base connate, plumose. Capsule 3-locular, ca. 10 mm in diam., densely yellowish glandular-scaly and sparsely shortly softly spiny, 2–3 mm. Seeds ovoid, 4–5 mm, dull brown. Fl. Jun–Jul, fr. Jul–Sep.

• Mountain valleys, thickets, forests; 300–500 m. Fujian, Guangdong, Guangxi, S Hunan.

**15. *Mallotus metcalfianus*** Croizat, J. Arnold Arbor. 21: 501. 1940.

褐毛野桐 he mao ye tong

Small trees 5–10 m tall. Branchlets densely ferruginous stellate-tomentose with candelabra-like hair. Stipules triangular, 3–5 mm; petiole 5–10 cm; leaf blade ovate or triangular-ovate, 10–25 × 9–20 cm, papery, adaxially glabrescent, abaxially ferruginous tomentulose, base broadly cuneate or obtuse, slightly peltate, with 2–4 basal glands, margin repand-denticulate or coarsely serrate, apex acute or acuminate; basal veins 5–7. Male inflorescences branched, 10–25 cm, tomentulose; bracts subulate, ca. 3 mm. Male flowers 2–5-fascicled; pedicel 5–7 mm; calyx lobes 4 or 5, long ovate, ca. 3 mm, tomentulose; stamens 50–60. Female inflorescences with few or no branches; infructescence 15–25 cm, cylindric, brown tomentose. Female flowers: pedicel 2–3 mm; calyx lobes 4, triangular, ca. 3 mm, tomentulose; ovary 3-locular, stellate-pubescent; style 3–5 mm, plumose. Capsule subglobose, ca. 1.7 cm in diam., pubescent and densely stellate-pubescent and softly spiny, 6–8 mm. Seeds ovoid, ca. 5 mm, brown. Fl. Jul–Aug, fr. Sep–Dec.

Mountain valleys, forests; 100–1900 m. S Guangxi, S Yunnan [Vietnam].

**16. *Mallotus conspurcatus*** Croizat, J. Arnold Arbor. 21: 501. 1940.

桂野桐 *gui ye tong*

Shrubs 2–3 m tall. Branchlets densely brown stellate pulveraceous tomentose when young. Stipules even obsolete; petiole 5–10 cm, tomentose; leaf blade broadly ovate, undivided, 11–25 × 9–17 cm, papery, adaxially glabrescent, abaxially brown tomentose, sparsely reddish granular-glandular, base obtuse, peltate, with 8 or 9 small basal glands, margin subentire or denticulate, apex acute or acuminate; basal veins 5–7. Flowers not known. Infructescence 15–17 cm, tomentose; bracts subtriangular, 2–3 mm. Fruiting pedicel 3–6 mm; capsule 3-locular, ca. 15 mm in diam., densely stellate-pubescent and softly spiny, forming a continuous uniform layer, spines short, subulate, ca. 3 mm. Seeds ovoid, ca. 5 mm, brown, verruculose. Fr. Aug–Sep.

- Limestone hills, forests; 400–500 m. W Guangxi (Jingxi).

**17. *Mallotus barbatus*** Müller Argoviensis, Linnaea 34: 184. 1865.

毛桐 *mao tong*

Shrubs or small trees, 1.5–6 m tall. Branchlets, petioles, and inflorescences densely brownish floccose-tomentose or brownish or yellowish pulveraceous tomentose. Stipules subulate, 5–15 mm; petiole 5–20 cm; leaf blade suborbicular or broadly ovate, often tricuspidate or shortly and acutely 1- or 2-lobed, 8–35 × 6–28 cm, papery, adaxially stellate-villous along nerves, abaxially stellate-tomentose, scattered yellow glandular-scaly, base rounded, broadly peltate, with up to 4 basal glands, margin repand-denticulate, apex acuminate; basal veins 5–7. Male inflorescences terminal, branched or unbranched, 15–34 cm; bracts subulate, 5–7 mm. Male flowers 3–5-fascicled; pedicel 3–4 mm; calyx lobes 4 or 5, oblong, 3–3.5 mm, stellate-pubescent; stamens 75–85. Female inflorescences branched or unbranched; peduncle stout; infructescence erect, 10–20 cm; bracts subulate, 4–5 mm. Female flowers: pedicel 2–3 mm; calyx 4- or 5-lobed, 4–5 mm, tomentose; ovary 3–5-locular, densely setose, tomentose; style 3–4 mm, plumose. Fruiting pedicel 5–30 mm; capsule subglobose, 12–20 mm in diam., densely stellate-tomentose and softly spiny, forming a continuous uniform layer, spines linear, 6–7 mm. Seeds ovoid, ca. 5 mm, black, verruculose. Fl. Apr–May, fr. Sep–Oct.

Mountain slopes or valleys, forests, thickets, limestone hills, roadsides, often in clearings; 200–1300 m. Guangdong, Guangxi, Guizhou, W Hubei, Hunan, Sichuan, Yunnan [India, Malaysia, Myanmar, Thailand, Vietnam].

The concept of *Mallotus barbatus* is sometimes extended to include *M. lotingensis* (see Govaerts et al., World Checkl. Euphorbiaceae: <http://www.kew.org/wcsp/home.do>). *Mallotus luchenensis* is also closely related. This complex needs more detailed study.

- 1a. Branchlets and petiole densely brownish or yellowish pulveraceous-tomentose when young, female inflorescence unbranched ..... 17c. var. *croizatianus*
- 1b. Branchlets and petiole densely brownish floccose-tomentose; female inflorescence branched or unbranched.

- 2a. Female inflorescence branched, 10–20 cm; fruiting pedicel 5–10 mm ..... 17a. var. *barbatus*
- 2b. Female inflorescence unbranched, 15–32 cm; fruiting pedicel 15–30 mm, often with 1 or 2 subulate bracteoles, ca. 1.5 mm ..... 17b. var. *pedicellaris*

**17a. *Mallotus barbatus* var. *barbatus***

毛桐(原变种) *mao tong* (yuan bian zhong)

Small trees or shrubs, 2–6 m tall. Branchlets, petiole, and inflorescences densely brownish floccose-tomentose. Female inflorescences branched, 10–20 cm; infructescence erect. Fruiting pedicel 5–10 mm; capsule 15–20 mm in diam. Fl. Apr–May, fr. Sep–Nov.

Mountain slopes, roadsides, thickets, often in clearings; 300–1300 m. W Guangdong, Guangxi, Guizhou, Yunnan [India, Malaysia, Myanmar, Thailand, Vietnam].

**17b. *Mallotus barbatus* var. *pedicellaris*** Croizat, J. Arnold Arbor. 19: 135. 1938.

长梗毛桐 *chang geng mao tong*

*Mallotus barbatus* var. *hubeiensis* S. M. Hwang.

Small trees 3–6 m tall. Branchlets, petiole, and inflorescences densely brownish floccose-tomentose. Female inflorescences unbranched, 15–32 cm; infructescence erect. Fruiting pedicel often 15–30 mm, sometimes with 1 or 2 bracteoles, subulate, ca. 1.5 mm, deciduous; capsule ca. 20 mm in diam. Fl. May–Jul, fr. Aug–Nov.

Mountain valleys, forests; 200–700 m. N Guangdong, Guangxi, Guizhou, W Hubei, Hunan, Sichuan, Yunnan [N Thailand].

**17c. *Mallotus barbatus* var. *croizatianus*** (F. P. Metcalf) S. M. Hwang, Acta Phytotax. Sin. 23: 295. 1985.

石山毛桐 *shi shan mao tong*

*Mallotus croizatianus* F. P. Metcalf, J. Arnold Arbor. 22: 204. 1941; *M. esquirolii* H. Léveillé (15 Aug 1911), not H. Léveillé (10 May 1911); *M. leveilleanus* Fedde.

Shrubs 1.5–3 m tall. Branchlets and petiole densely brownish or yellowish pulveraceous-tomentose. Leaf blade 8–24 × 6–20 cm, abaxially yellowish or whitish stellate-tomentose and slightly yellowish glandular-scaly, base with 1 or 2 basal glands. Female inflorescences unbranched, 8–15 cm. Female flowers: pedicel 5–6 mm; styles 3 or 4, long papillate or plumose. Fruiting pedicel 5–8 mm; capsule 12–18 mm in diam. Fl. Jun–Sep, fr. Jul–Oct.

- Limestone hills or mountain slopes and valleys; 300–1200 m. Guangxi, S Guizhou.

**18. *Mallotus luchenensis*** F. P. Metcalf, J. Arnold Arbor. 22: 206. 1941.

罗城野桐 *luo cheng ye tong*

Small trees or shrubs, 3–7 m tall. Branchlets densely ferruginous stellate-tomentose. Stipules filiform, 6–8 mm, stellate pubescent; petiole 5–15 cm, brown tomentose; leaf blade subovate-rotund or long ovate, 15–23 × 10–18 cm, often tricuspidate or shortly 1- or 2-lobed, papery, adaxially along nerves stellate-pubescent, abaxially densely white stellate-pubescent, scattered orange glandular-scaly, base rounded or obtuse, broadly peltate, with 4 basal glands, margin sparsely denticulate, apex acuminate or caudate; basal veins 7–9. Inflorescences terminal, branches few or absent, (10–)18–28 cm, brownish tomentose; bracts filiform, 8–10 mm. Male flowers 2- or 3-fascicled; pedicel 6–7 mm; calyx lobes 4 or 5, ovate, ca. 3 mm, pubescent; stamens 60–80. Female flowers: pedicel 4–6 mm; sepals 3–5, 4–5 mm, tomentulose; ovary tomentose; style 4, ca. 6 mm, plumose. Infructescence elongated, 10–27 cm. Fruiting pedicel 6–12 mm; capsule subglobose, ca. 20 mm in diam., densely white stellate-pubescent and softly spiny, forming a continuous uniform layer, spines linear, 7–8 mm. Seeds ellipsoid, ca. 6 mm, black. Fl. May–Sep, fr. Jun–Oct.

Mountain valleys or slopes, limestone hills, forests, thickets; 200–1300 m. Guangxi, Guizhou [N Vietnam].

*Mallotus luchenensis* was treated as part of *M. barbatus* by S. M. Hwang (Acta Phytotax. Sin. 23: 295. 1985).

**19. *Mallotus lotingensis*** F. P. Metcalf, J. Arnold Arbor. 22: 206. 1941.

罗定野桐 *luo ding ye tong*

*Mallotus barbatus* Müller Argoviensis var. *congestus* F. P. Metcalf, Lingnan Sci. J. 10: 487. 1931.

Shrubs 1–2 m tall. Branchlets, petiole, and inflorescences densely yellowish-brownish stellate-tomentose. Stipules narrowly lanceolate, 3–4 mm, tomentose; petiole 10–14 cm; leaf blade ovate-rounded, often tricuspidate or shortly 1-lobed, 15–18 × 13–15 cm, papery, abaxially stellate-tomentose, base obtuse, broadly peltate, with 4 basal glands, margin repand-denticulate, apex acute or acuminate; basal veins 5–7. Inflorescences terminal or axillary, branched or unbranched, 15–30 cm; peduncle 7–8 cm, stout; bracts linear, 3–5 mm. Male flowers 2- or 3-fascicled; pedicel 3–4 mm; calyx lobes 3–5, ovate, 3.5–4 mm, pubescent; stamens 35–40. Female flowers: pedicel 1–2 mm; sepals 5, triangular, ca. 2 mm, tomentulose; ovary tomentose; styles 3, ca. 4 mm, plumose. Infructescence elongated, 28–45 cm. Fruiting pedicel 1–3 mm; capsule subglobose, 12–15 mm in diam., stellate-pubescent and softly spiny, forming a continuous uniform layer, spines subulate, 3–5 mm, with white stellate-pubescent. Seeds ovoid, ca. 6 mm, black, smooth. Fl. May–Nov, fr. Jun–Dec.

• Mountain valleys or slopes, hills, forests, thickets; 200–500 m. NW Guangdong, SE Guangxi.

**20. *Mallotus tetracoccus*** (Roxburgh) Kurz, Forest Fl. Burma 2: 382. 1877.

四果野桐 *si guo ye tong*

*Rottlera tetracocca* Roxburgh, Fl. Ind., ed. 1832, 3: 826. 1832.

Trees 5–15 m tall. Branchlets brownish stellate-tomentose. Stipules ovate-triangular, 1.5–3 mm, pubescent; petiole 6–15 cm, tomentose; leaf blade triangular-ovate or ovate, sometimes 1- or 2-lobate, 10–25 × 9–20 cm, leathery, abaxially brownish tomentose, adaxially glabrous, base obtuse or truncate, sometimes slightly peltate, with 2–4 basal glands, margin repand or entire, apex acute or acuminate; basal veins 3, lateral veins 4–6 pairs. Male inflorescences terminal, branched, 12–20 cm, tomentose; peduncle stout; bracts triangular, 1–1.5 mm. Male flowers 3–9-fascicled; pedicel ca. 4 mm; calyx lobes 3 or 4, oblong, 2.5–3 mm; stamens 60–80. Female inflorescences paniculate, 9–14 cm, tomentose; bracts lanceolate, 3–5 mm. Female flowers: sepals 4 or 5, unequal, ovate, 3–4 mm; ovary tomentose, often 4-loculed; style often 4, ca. 3 mm, plumose. Fruiting pedicel ca. 5 mm; capsule depressed globose, ca. 1 cm in diam., gray tomentose and densely shortly softly spiny, spines stellate-pubescent. Seeds subovoid, ca. 6 mm, verruculose. Fl. Jun–Aug, fr. Aug–Dec.

Mountain slopes, forests; 800–1300 m. SE Xizang, SW Yunnan [Bhutan, India, Myanmar, Nepal, Sri Lanka].

**21. *Mallotus apelta*** (Loureiro) Müller Argoviensis, Linnaea 34: 189. 1865.

白背叶 *bai bei ye*

Shrubs or small trees 1–6 m tall. Branchlets whitish and brownish stellate-tomentulose when young. Stipules subulate, 2.5–4 mm, deciduous; petiole 5–15 cm, whitish tomentulose; leaf blade broadly ovate, 5–60 × 4–20 cm, papery, abaxially whitish tomentulose and scattered orange glandular-scaly, adaxially glabrescent or sparsely stellate-pilosulose, base truncate or contracted cuneate, rarely slightly cordate, with 2 basal glands, margin repand-denticulate, apex acute or acuminate; basal veins 3. Male inflorescences terminal, branched or unbranched, 15–50 cm, whitish tomentulose; bracts triangular, ca. 2.5 mm. Male flowers 1–5-fascicled; pedicel ca. 3 mm; calyx lobes 4, ovate, ca. 3 mm, tomentulose; stamens 50–75. Female inflorescences unbranched; peduncle 5–10 cm; bracts linear ca. 3 mm; infructescence 15–60 cm, densely cylindric, whitish tomentose. Female flowers: pedicel 1.5–2 mm; calyx lobes 3–5, ovate to triangular, 2.5–3 mm, tomentose; ovary 3(or 4)-locular, with stellate-tomentulose hairs; style ca. 3 mm, plumose. Capsule subglobose, densely softly spiny, spines filiform, 3–8 mm, whitish stellate-pubescent. Seeds ovoid, ca. 4 mm, often black, verruculose. Fl. May–Sep, fr. Aug–Nov.

Hill slopes, mountain valleys, thickets, forests; below 100–1000 m. SW Fujian, Guangdong, Guangxi, Hainan, S Hunan, S Jiangxi, S Yunnan [Vietnam].

- 1a. Branchlets whitish and brownish tomentulose; leaf blade 5–20 cm; male inflorescence racemose or paniculate, 15–30 cm; infructescence 15–30 cm; capsule spines 3–5 mm ..... 21a. var. *apelta*
- 1b. Branchlets white tomentulose; leaf blade 35–60 cm; male inflorescence branched, 30–50 cm; infructescence 35–60 cm; capsule spines 6–8 mm ..... 21b. var. *kwangsiensis*

**21a. *Mallotus apelta* var. *apelta***

白背叶(原变种) bai bei ye (yuan bian zhong)

*Ricinus apelta* Loureiro, Fl. Cochinch. 2: 585. 1790; *Croton chinensis* Geiseler; *Mallotus apelta* var. *chinensis* (Geiseler) Pax; *Rottlera cantoniensis* Sprengel; *R. chinensis* A. Jussieu.

Shrubs 1–4 m tall. Branchlets whitish and brownish stellate-tomentulose when young. Leaf blade 5–20 × 4–20 cm. Male inflorescence branched or unbranched, 15–30 cm. Infructescence drooping, 15–30 cm, whitish tomentose. Capsule spines 3–5 mm. Fl. May–Sep, fr. Aug–Nov.

Hill slopes, mountain valleys, thickets; below 100–1000 m. SW Fujian, Guangdong, Guangxi, Hainan, S Hunan, S Jiangxi, SE Yunnan [Vietnam].

**21b. *Mallotus apelta* var. *kwangsiensis*** F. P. Metcalf, J. Arnold Arbor. 22: 204. 1941.

广西白背叶 guang xi bai bei ye

Small trees 5–6 m tall. Branchlets white stellate-tomentulose. Leaf blade 35–60 × 30–58 cm, abaxially white tomentulose. Male inflorescence laxly branched, 30–50 cm. Infructescence 35–60 cm, white tomentose. Capsule spines 6–8 mm. Fl. and fr. Jul–Oct.

• Thickets or forests on limestone; 200–1000 m. N Guangdong, Guangxi, S Yunnan.

**22. *Mallotus tenuifolius*** Pax, Bot. Jahrb. Syst. 29: 429. 1900.

野桐 ye tong

Shrubs or small trees, 3–6 m tall. Branchlets and inflorescences densely stellate-pilosulose or grayish-yellowish stellate-tomentose. Stipules subulate, 3–5 mm, caducous; petiole 6–14 cm, glabrescent; leaf blade triangular-ovate or broadly ovate, undivided or shortly 1- or 2-lobed, 12–17 × 14–19 cm, membranous or papery, greenish, abaxially sparingly stellate-pilosulose or subglabrescent and scattered yellowish or orange glandular-scaly, or gray or white tomentulose and sparsely reddish glandular scaly, adaxially glabrescent, base subtruncate, broadly cuneate, sometimes slightly cordate, with 2 basal glands, margin entire, apex abruptly acuminate; basal veins 3. Male inflorescences unbranched, 5–15 cm; bracts subulate, ca. 4 mm. Male flowers 2–9-fascicled; pedicels 2–4 mm; calyx lobes 3 or 5, ovate, 3–4 mm, pubescent; stamens 50–60. Female inflorescences unbranched, 5–15 cm; peduncle ca. 5 mm thick; bracts lanceolate-subulate, ca. 2.5 mm. Female flowers: pedicel 2–4 mm; sepals 5, triangular, 2.5–3 mm, pubescent; ovary densely pubescent and softly spiny; styles 3, 3–4 mm, almost free, long papillose. Fruiting pedicel 3–5 mm; capsule subglobose, ca. 10 mm in diam., tomentose and densely softly spiny, spines linear, 5–15 mm, stellate-pilosulose when young, glabrescent. Seeds subglobose or ovoid, 4–5 mm in diam., blackish, verruculose or smooth. Fl. Jun–Jul, fr. Jul–Aug.

• Mountain valleys or slopes, forests, thickets, rocky hills, roadsides; 200–1700 m. Anhui, Fujian, S Gansu, N Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, E Sichuan, Zhejiang.

*Mallotus tenuifolius* and its varieties are included within the preceding species, *M. apelta*, by some authors (see Govaerts et al., World Checkl. Euphorbiaceae: <http://www.kew.org/wcps/home.do>).

- 1a. Leaf blade drying greenish or yellowish green, abaxially subglabrescent or sparingly stellate-pilosulose, gland-scales yellowish or orange; male calyx lobes 3 or 5; capsule tomentose.
- 2a. Leaves membranous, abaxially greenish, gland-scales yellowish; male calyx lobes 3, ca. 3 mm ..... 22a. var. *tenuifolius*
- 2b. Leaves papery, abaxially yellowish green, gland-scales orange; male calyx lobes 5, ca. 4 mm ..... 22b. var. *subjaponicus*
- 1b. Leaf blade drying dull brown or reddish brown, abaxially gray or white tomentulose with sparse red gland-scales; male calyx lobes 4; capsule stellate-pilose or tomentulose.
- 3a. Leaves abaxially gray tomentulose, gland-scales scattered; styles ca. 4 mm; capsule stellate-pilose, spines 5–8 mm ..... 22c. var. *paxii*
- 3b. Leaves abaxially densely white tomentulose, gland-scales obscure; styles ca. 3 mm; capsule white tomentulose, spines 10–15 mm ..... 22d. var. *castanopsis*

**22a. *Mallotus tenuifolius* var. *tenuifolius***

野桐(原变种) ye tong (yuan bian zhong)

*Mallotus apelta* (Loureiro) Müller Argoviensis var. *tenuifolius* (Pax) Pax.

Branchlets and inflorescences densely stellate-pilosulose. Leaf blade triangular-ovate or broadly ovate, membranous, greenish when dry, abaxially sparingly stellate-pilosulose or subglabrescent, sparsely yellowish glandular-scaly. Male inflorescences 8–12 cm. Male flowers 2–5-fascicled; calyx lobes 3, ca. 3 mm. Female inflorescences or infructescences 8–15 cm. Female flowers: styles 3, ca. 4 mm, almost free. Capsule tomentose, spines 5–7 mm. Seeds subglobose, ca. 5 mm in diam., blackish, verruculose. Fl. Jun–Jul, fr. Jul–Aug.

• Mountain valleys or slopes, forests, thickets; 700–1700 m. Anhui, Fujian, S Gansu, E Guizhou, Henan, Hubei, Hunan, Jiangxi, E Sichuan.

**22b. *Mallotus tenuifolius* var. *subjaponicus*** Croizat, J. Arnold Arbor. 19: 138. 1938.

黄背野桐 huang bei ye tong

*Mallotus nepalensis* Müller Argoviensis var. *kwangtungensis* Croizat; *M. subjaponicus* (Croizat) Croizat.

Branchlets and inflorescences grayish-yellowish stellate-tomentose. Leaf blade ovate or broadly ovate, papery, yellowish green when dry, abaxially yellowish, scattered stellate-pilose and orange glandular-scaly. Male inflorescences 5–10 cm. Male flowers 2- or 3-fascicled; calyx lobes 5, unequal, ca. 4 mm.



Female inflorescences or infructescences 8–12 cm. Female flowers: styles 3, ca. 6 mm, base connate for ca. 1 mm. Capsule stellate-pilose, spines 5–7 mm. Seeds ovoid, 4–5 mm, black. Fl. May–Jun, fr. Jun–Aug.

• Mountain valleys, forests, thickets; 500–1500 m. Anhui, Fujian, N Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang.

**22c. *Mallotus tenuifolius* var. *paxii* (Pampanini) H. S. Kiu, comb. et stat. nov.**

红叶野桐 hong ye ye tong

Basionym: *Mallotus paxii* Pampanini, Nuovo Giorn. Bot. Ital., n.s., 17: 414. 1910; *M. stewardii* Merrill ex F. P. Metcalf.

Branchlets and inflorescences gray stellate-tomentulose and scattered stellate-pilose. Leaf blade triangular-ovate, sometimes ovate, papery, abaxially gray stellate-tomentulose, scattered reddish glandular-scaly, adaxially dull brown or reddish-brownish when dry, scattered stellate-pilose. Male inflorescences 5–15 cm. Male flowers 3–9-fascicled; calyx lobes 4, ca. 3 mm. Female inflorescences or infructescences 5–14 cm. Female flowers: styles 3 (or 4), ca. 4 mm. Capsule stellate-pilose, spines 5–8 mm. Seeds subglobose, ca. 4 mm in diam., black, verruculose. Fl. May–Jul, fr. Jul–Sep.

• Mountain valleys or slopes, thickets, secondary forests, roadsides; 300–1200 m. Anhui, Fujian, NE Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, E Sichuan, Zhejiang.

This taxon is based on material misidentified as *Mallotus albus* Müller Argoviensis by Pax (Bot. Jahrb. Syst. 29: 429. 1900).

**22d. *Mallotus tenuifolius* var. *castanopsis* (F. P. Metcalf) H. S. Kiu, comb. et stat. nov.**

乐昌野桐 le chang ye tong

Basionym: *Mallotus castanopsis* F. P. Metcalf, Lingnan Sci. J. 10: 487. 1931; *M. paxii* Pampanini var. *castanopsis* (F. P. Metcalf) S. M. Hwang.

Branchlets and inflorescences white stellate-tomentulose. Leaf blade ovate or broadly ovate, papery, abaxially densely white tomentulose, obscurely reddish glandular-scaly, adaxially dull brown when dry, scattered stellate-pilosulose. Male inflorescences 8–13 cm. Male flowers 2–7-fascicled; calyx lobes 4, ca. 3 mm. Female inflorescences or infructescences 5–12 cm. Female flowers: styles 3, ca. 3 mm. Capsule white tomentulose, softly spiny, spines 10–15 mm. Seeds ovoid, ca. 4 mm in diam., black, smooth. Fl. May–Aug, fr. Oct–Nov.

• Rocky hills, thickets; 200–300 m. N Guangdong, E Guangxi, S Hunan, E Jiangxi.

**23. *Mallotus nepalensis* Müller Argoviensis, Linnaea 34: 188. 1865.**

尼泊尔野桐 ni bo er ye tong

*Mallotus japonicus* (Linnaeus f.) Müller Argoviensis var. *floccosus* (Müller Argoviensis) S. M. Hwang; *M. oreophilus* Müller Argoviensis var. *floccosus* Müller Argoviensis; *M. tenuifolius* Pax var. *floccosus* (Müller Argoviensis) Croizat.

Shrubs or small trees, 3–6 m tall. Branchlets and inflo-

rescences brownish-yellowish stellate-tomentulose. Petiole 5–15 cm, tomentulose; leaf blade orbiculate-ovate or triangular-ovate, 10–23 × 8–24 cm, papery, abaxially brownish or gray stellate-pilose, sparsely orange glandular-scaly, adaxially glabrescent, base truncate or slightly cordate, sometimes slightly peltate, with 2 maculate glands, margin entire, sometimes shortly 3-lobed, apex acuminate; basal veins 3. Male inflorescences unbranched, 10–15 cm; bracts lanceolate-subulate, ca. 1 mm. Male flowers 2- or 3-fascicled; pedicel 1–1.5 mm; sepals 4, oblong, ca. 3 mm, tomentulose; stamens ca. 100. Female inflorescences unbranched, 10–20 cm; peduncle 2–5 cm, ca. 3 mm thick; bracts sublanceolate, ca. 1.5 mm. Female flowers: pedicel ca. 1.5 mm; sepals 5 or 6, lanceolate, 2.5–3 mm, tomentulose; ovary densely softly spiny, stellate-pilose; styles 3, free, ca. 3 mm, plumose. Infructescence erect. Fruiting pedicel ca. 1.5 mm; capsule ca. 1.5 cm in diam., densely softly spiny, brownish, ca. 5 mm, stellate-pilose. Seeds subglobose, blackish, ca. 5 mm in diam., verruculose. Fl. and fr. Jun–Jul.

Mountain valleys or slopes, thickets; 1700–2500 m. Xizang, Yunnan [Bhutan, NE India, Myanmar, Nepal].

**24. *Mallotus microcarpus* Pax & K. Hoffmann in Engler, Pflanzenr. 63(IV. 147. VII): 172. 1914.**

小果野桐 xiao guo ye tong

Shrubs 1–3.5 m tall. Branchlets slender, densely whitish pubescent, becoming glabrescent. Stipules triangular, ca. 2 mm; petiole 3–20 cm; leaf blade broadly to narrowly ovate, sometimes 1–3-lobed, 5–22 × 3.5–18 cm, papery, abaxially pubescent, sparsely yellowish glandular-scaly, adaxially pilosulose and sparsely stellate-pilosulose, base obtuse or truncate, rarely shallowly peltate and cordate, with 2–4 basal glands, margin denticulate, apex acuminate or acute; basal veins 3–5. Male inflorescences terminal, unbranched, 7–20 cm, puberulent; bracts ovate. Male flowers 3–9-fascicled; pedicel ca. 3 mm; calyx lobes 3 or 4, ovate, pilosulose; stamens 50–60. Female inflorescences unbranched, 12–14 cm, puberulent; bracts subulate, 1–2 mm. Female flowers: sepals 4 or 5, triangular, ca. 1.5 mm, puberulent; ovary puberulent and scabrous; styles 3, ca. 3 mm, basally connate, plumose. Fruiting pedicel 2.5–3 mm; capsule 3-locular, ca. 6 mm in diam., sparsely shortly softly spiny, puberulent and glandular-scaly. Seeds ovoid, ca. 2.5 mm, dull brownish. Fl. Aug–Oct.

Mountain slopes or roadsides, thickets, sometimes on limestone hills; 200–1000 m. Guangdong, Guangxi, S Guizhou, S Hunan, S Jiangxi [N Vietnam].

**25. *Mallotus oreophilus* Müller Argoviensis, Linnaea 34: 188. 1865.**

山地野桐 shan di ye tong

Shrubs or small trees, 1.5–13 m tall. Branchlets and inflorescences yellowish-brownish stellate-tomentulose. Stipules ± obsolete; petiole 6–15 cm, gray-yellowish tomentulose; leaf blade ovate, broadly ovate, rhombic-ovate, subreniform, or oblong, sometimes shortly 1- or 2-lobed, 6–15 × 6.5–20 cm, papery, abaxially densely gray-yellowish tomentulose and sparsely yellowish glandular-scaly, adaxially glabrescent, base truncate or obtuse, sometimes broadly cuneate, with 2 basal glands, mar-

gin entire, apex abruptly acute or acuminate, or rounded to subtruncate; basal veins 3. Male inflorescences unbranched, 14–30 cm; bracts subulate to lanceolate, 4–5 mm. Male flowers 3–5-fascicled; pedicel 4–7 mm; sepals 5, oblong, ca. 5 mm, tomentulose; stamens 75–85. Female inflorescences unbranched, 12–18 cm; peduncle 1.5–3 cm, strong; bracts sublanceolate, 3–5 mm. Female flowers: pedicel 1.5–4 mm; sepals 6, lanceolate, 3.5–4 mm, tomentose; ovary tomentose and sparsely spiny, stellate-pilose; styles 3, 4–5 mm, almost free, long papillose. Fruiting pedicel 2–3 mm; capsule subglobose, 1–1.2 cm in diam., tomentose and sparsely softly spiny, spines subulate, ca. 5 mm, stellate-pilose. Seeds subglobose, ca. 5 mm in diam., black, verruculose. Fl. and fr. Jun–Aug, or fl. May–Jun.

Mountain valleys or slopes, forests, roadsides; 600–2000 m. Sichuan, Xizang, Yunnan [Bhutan, India (W Bengal, Sikkim)].

- 1a. Leaves ovate, broadly ovate, or rhombic-ovate, longer than wide, apex abruptly acute to acuminate; pedicel of female flower less than 2 mm ..... 25a. var. *oreophilus*  
 1b. Leaves subreniform or oblong, wider than long, apex rounded or subtruncate, abruptly shortly acuminate; pedicel of female flower 2.5–4 mm ..... 25b. var. *latifolius*

**25a. *Mallotus oreophilus* var. *oreophilus***

山地野桐(原变种) shan di ye tong (yuan bian zhong)

*Mallotus japonicus* (Linnaeus f.) Müller Argoviensis var. *ochraceoalbidus* (Müller Argoviensis) S. M. Hwang; *M. japonicus* var. *oreophilus* (Müller Argoviensis) S. M. Hwang; *M. nepalensis* Müller Argoviensis var. *ochraceoalbidus* (Müller Argoviensis) Pax & K. Hoffmann; *M. oreophilus* var. *ochraceoalbidus* Müller Argoviensis.

Shrubs or small trees, 3–8 m tall. Leaf blade ovate, broadly ovate, or rhombic-ovate, 10–15 × 8–14 cm, apex abruptly acute or acuminate. Male pedicels 4–5 mm; females ca. 1.5 mm. Fl. and fr. Jun–Aug.

Mountain valleys or slopes, forests; 1400–2000 m. SW Sichuan, S Xizang, Yunnan [Bhutan, India (W Bengal, Sikkim)].

**25b. *Mallotus oreophilus* var. *latifolius* (Boufford & T. S. Ying) H. S. Kiu, stat. nov.**

肾叶野桐 shen ye ye tong

Basionym: *Mallotus oreophilus* Müller Argoviensis subsp. *latifolius* Boufford & T. S. Ying, J. Arnold Arbor. 71: 575. 1990.

Shrubs or small trees, 1.5–13 m tall. Leaf blade subreniform to transversely oblong, 6–14 × 6.5–20 cm, apex rounded to subtruncate, abruptly shortly acuminate. Male pedicels 6–7 mm; females 2.5–4 mm. Fl. May–Jun, fr. Jun–Aug.

• Mountain valleys, roadsides, forests; 600–2000 m. W Sichuan, NE Yunnan.

**26. *Mallotus japonicus* (Linnaeus f.) Müller Argoviensis, Linnaea 34: 189. 1865.**

野梧桐 ye wu tong

*Croton japonicus* Linnaeus f., Suppl. Pl. 422. 1782 [“*ia-ponicum*”].

Shrubs 2–4 m tall. Branchlets dull brownish stellate-tomentulose when young. Petiole 3–17 cm; leaf blade suborbicular-ovate or rhombic-ovate, sometimes repand-tricuspidate, 8–20 × 5–15 cm, papery, abaxially sparsely stellate-pilosulose, sparsely yellowish glandular-scaly, adaxially glabrous, base cuneate, obtuse, or slightly cordate, sometimes slightly peltate, with 2(or 4) glands, margin entire, apex acuminate; basal veins 3–5. Male inflorescences branched or unbranched, 7–18 cm, gray or brownish tomentulose; bracts sublanceolate, ca. 1 mm. Male flowers 2- or 3-fascicled; pedicels 2–3 mm; calyx lobes 3 or 4, ovate, ca. 3 mm, densely stellate-pilosulose; stamens 70–100. Female inflorescences branched or unbranched, 5–15 cm; bracts lanceolate, 2–3 mm. Female flowers: pedicel ca. 3 mm; sepals 4 or 5, triangular, 2–3 mm, tomentulose; ovary densely glandular-scaly, softly spiny and stellate-pilosulose; styles 3 or 4, ca. 4 mm, base connate for ca. 1 mm, long papillate. Fruiting pedicel ca. 3 mm; capsule ca. 8 mm in diam., reddish orange glandular-scaly and sparsely softly spiny, spines subulate, ca. 4 mm, sparsely stellate-pilosulose and glandular-scaly. Seeds subglobose, ca. 4 mm in diam., brown or black, verrucate. Fl. Apr–Jun, fr. Jul–Aug.

Valleys, forests, forest margins; 100–600 m. Jiangsu (cultivated), Taiwan, S Zhejiang [Japan, Korea].

**27. *Mallotus paniculatus* (Lamarck) Müller Argoviensis, Linnaea 34: 189. 1865.**

白楸 bai qiu

*Croton paniculatus* Lamarck, Encycl. 2: 207. 1786; *Echinus trisulcus* Loureiro; *Mallotus chinensis* Müller Argoviensis; *M. cochinchinensis* Loureiro; *M. formosanus* Hayata; *M. paniculatus* var. *formosanus* (Hayata) Hurusawa; *Rottlera paniculata* (Lamarck) A. Jussieu.

Shrubs or trees, 3–15 m tall. Branchlets reddish stellate-tomentulose. Stipules small; petiole 2–15 cm; leaf blade rhombic, ovate, or triangular-ovate, often 1–3-lobed or 3-cuspidate, 5–15 × 3–12 cm, thickly papery, adaxially glabrescent, abaxially grayish tomentulose, base cuneate, sometimes slightly peltate, with 2 large basal glands, apex acuminate; basal veins 3–5. Male and female inflorescences often branched, 10–25 cm, tomentulose; bracts ovate, 1–2 mm. Male flowers 2–7-fascicled; pedicel 2–3 mm; calyx lobes 3 or 4, ovate, 2–2.5 mm, stellate-puberulent; stamens 50–60. Female flowers: sepals 4 or 5, oblong, 2–3 mm, tomentulose; ovary tomentulose; styles 3, ca. 3 mm, plumose. Fruiting pedicel ca. 2.5 mm; capsule 3-locular, ca. 10 mm in diam., tomentulose, sparsely softly spiny, spines subulate, 4–5 mm. Seeds subglobose, ca. 4 mm in diam., blackish, verruculose or smooth. Fl. Jul–Oct, fr. Oct–Dec.

Mountain slopes, thickets, secondary forests; below 100–1300 m. S Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; NE Australia].

**28. *Mallotus lianus* Croizat, J. Arnold Arbor. 19: 140. 1938.**

东南野桐 dong nan ye tong

*Mallotus japonicus* (Linnaeus f.) Müller Argoviensis var. *austrorhynchensis* Hurusawa.

Shrubs or small trees, 2–15 m tall. Branchlets and petioles dull ferruginous stellate-tomentose. Stipules subtriangular, ca. 1 mm, deciduous; petiole 5–14 cm; leaf blade broadly ovate or orbicular-ovate, 9–18 × 7–15 cm, papery, abaxially reddish stellate-pubescent, sparsely orange or reddish glandular-scaly, adaxially glabrescent, base obtuse or subtruncate, sometimes slightly cordate, narrowly peltate or not peltate, with 2–4 glands, margin entire, apex acute or acuminate; basal veins 3–5. Male inflorescences often branched, 10–30 cm, reddish tomentulose; bracts ovate, ca. 1.5 mm. Male flowers 3–9-fascicled; pedicel

4–5 mm; calyx lobes 3 or 4, subovate, 2.5–3 mm, tomentulose; stamens 50–80. Female inflorescences branched or unbranched, (10–)15–32 cm, tomentulose; bracts subovate, 1.5–2 mm. Female flowers: pedicel 2–3 mm; sepals 4 or 5, triangular, 1.5–2 mm, tomentulose; ovary subglobose, densely stellate-pubescent and softly spiny; styles 3, 6–7(–10) mm, basally connate, plumose. Capsule globose, 1–1.2 cm in diam., tomentose and softly spiny, spines subulate, 5–7 mm, stellate-pubescent. Seeds ovoid or subglobose, ca. 5 mm, black, sparsely verrucose or verruculose. Fl. Aug–Sep, fr. Nov–Dec.

• Mountain valleys, forests; 200–1000 m. Fujian, Guangdong, Guangxi, S Hunan, S Jiangxi, S Zhejiang.

## 25. MACARANGA Du Petit-Thouars, Gen. Nov. Madagasc. 26. 1806.

血桐属 *xue tong shu*

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Trees or shrubs, mostly dioecious (some forms of *M. andamanica* monoecious); indumentum usually of simple hairs and whitish to reddish glandular scales. Leaves alternate; stipules small or enlarged; petiole insertion often peltate; leaf blade undivided or lobed, base with glands, abaxially glandular-scaly; venation palmate or pinnate. Inflorescences axillary, sometimes at old leafless nodes, unbranched, branched, or females capitate or 1-flowered, unisexual, very rarely bisexual (*M. andamanica*); bracts sometimes with glands. Flowers 1 or few to many per bract. Male flowers: calyx closed in bud; sepals 2–4, valvate; petals absent; disk absent; stamens [1–]2–22[–30]; filaments free or shortly connate; anthers 3- or 4-locellate; pistillode absent. Female flowers: calyx cup-shaped or urceolate, apex denticulate or lobed, sometimes truncate, caducous or persistent; petals absent; disk absent; ovary 1–6-locular; styles simple, free, rarely shortly connate, stigmatic surface papillose. Fruit a capsule, (1 or)2- or 3(–6)-locular, smooth or spiny, often glandular scaly. Seeds subglobose, smooth.

About 260 species: Africa, tropical Asia, Australia, Madagascar, Pacific islands; ten species in China.

This account has been revised in line with the posthumous “Prodrum of *Macaranga*” of T. C. Whitmore, which was in press at the time of writing.

- 1a. Stipules subulate, erect, crowded at branchlet tips; male inflorescences spicate.
  - 2a. Stipules and budscales chocolate brown, with sparsely spreading white hairs; female spikes with terminal flowers and fruits; male spikes threadlike, flower clusters 1–1.5 mm wide, never malformed ..... 1. *M. andamanica*
  - 2b. Stipules and budscales chestnut brown, glabrous; female flowers and fruits spaced along top of spike; male spikes with ca. 1 mm in diam. axis, flower clusters 3–4 mm wide, often malformed as witches’ brooms ..... 2. *M. lowii*
- 1b. Stipules broadly lanceolate to ovate; male inflorescences paniculate with 2 or 3(or 4) orders of branching.
  - 3a. Leaves peltate, petiole inserted (0.3–)1–4 cm from margin; branchlets often 8–10 mm thick.
    - 4a. Twigs strongly angled and ridged, densely fawn-furfuraceous; stipules lanceolate, 7–8 mm ..... 3. *M. denticulata*
    - 4b. Twigs terete, furfuraceous, glabrescent; stipules ovate to broadly ovate or triangular, 1.5–3 mm.
      - 5a. Stipules ovate, erect, subpersistent; leaves without glands near petiole insertion ..... 4. *M. tanarius*
      - 5b. Stipules broadly ovate, sometimes recurved, soon caducous; leaves nearly always with a few conspicuous glands on main veins near petiole insertion ..... 5. *M. indica*
  - 3b. Leaves not or only narrowly peltate with petiole inserted 0.1–0.3 cm from margin; branchlets 2–4 mm thick.
    - 6a. Leaf apex caudate, sometimes tricuspid; stipules filiform, 3–4 mm; styles ca. 10 mm, threadlike ..... 6. *M. kurzii*
    - 6b. Leaf apex acute to acuminate or broadly cuspidate-acuminate; stipules ovate-oblong or lanceolate, 5–14 × 2–4 mm; styles to 7 mm.
      - 7a. Leaf blade 10–25 × 3.5–7 cm; male inflorescences 6–10 cm, branches ca. 3 cm; fruiting pedicel 7–15 mm ..... 7. *M. henryi*
      - 7b. Leaf blade 8–16 × 4–15 cm; male inflorescences 8–14 cm, branches 3–8 cm; fruiting pedicel 2–7 mm.
        - 8a. Twigs glabrous; stipules glabrous, somewhat persistent ..... 8. *M. sinensis*
        - 8b. Twigs yellowish brown tomentose when young; stipules furfuraceous or tomentose, sometimes caducous.
          - 9a. Stipules ovate-lanceolate or triangular, 4–6 mm wide, tomentose, recurved, subpersistent; leaf margin repand or subentire ..... 9. *M. pustulata*
          - 9b. Stipules lanceolate, 2–3 mm wide, pubescent, erect, soon caducous; leaf margin repand or coarsely serrate ..... 10. *M. sampsonii*

**1. *Macaranga andamanica*** Kurz, Forest Fl. Burma 2: 389. 1877.

轮苞血桐 lun bao xue tong

*Macaranga bracteata* Merrill; *M. brandisii* King ex J. D. Hooker; *M. esquirolii* (H. Léveillé) Rehder; *M. kampoensis* Gagnepain; *M. rosuliflora* Croizat; *M. trigonostemonoides* Croizat; *Morinda esquirolii* H. Léveillé.

Shrubs 1–5 m tall. Branchlets pubescent, glabrescent. Stipules elliptic, 3–5[–8] mm, chocolate brown, apex subulate, deciduous; petiole 2–4 cm, pilose; leaf blade oblong-lanceolate or oblong, 7–14 × 2.5–5.5 cm, thickly papery, often drying dull brown, abaxially sparsely dark glandular-scaly, midrib pilose, base slightly auriculate-cordate, with 2 glands, margin sparsely glandular-denticulate, apex acuminate; veins 5–8 pairs. Male inflorescences very slender, (1.5–)4–9 cm; peduncle slender, 0.5–2 cm; axis glabrous or pilose; bracts deltoid, ca. 1 mm. Male flowers tiny, 3–5 per bract, surrounded by persistent whorl of 3 or 4 hooded bracteoles; pedicel ca. 1 mm, pilose; sepals 3, ovate, ca. 1.5 mm, glabrous; stamens 20–22. Female inflorescences often 1-flowered, sometimes inflorescence bisexual, with 1 or 2 male flowers; peduncle slender, 3–9 cm; flower subtended by pair of leafy bracts. Female flowers: pedicel 1–2 mm; sepals 4, lanceolate, 2–3 mm, pilose; ovary 2-locular; styles 2, filiform, 1.2–1.4 cm, basally connate. Capsule 2-lobed, ca. 5 × 11–12 mm wide, densely glandular-scaly, with sparse long sinuous caducous spines. Seeds subglobose, ca. 5 mm in diam., brownish, marbled. Fl. and fr. year-round.

Hills, mountain valleys, thickets; 100–400 m. Guangdong, Guangxi, Guizhou, Hainan, S Yunnan [India (Andaman Islands), Malaysia, Myanmar, Thailand, N Vietnam].

**2. *Macaranga lowii*** King ex J. D. Hooker, Fl. Brit. India 5: 453. 1887.

刺果血桐 ci guo xue tong

*Macaranga auriculata* (Merrill) Airy Shaw; *M. lowii* var. *kostermansii* Airy Shaw; *M. poilanei* Gagnepain; *Mallotus affinis* Merrill; *M. auriculatus* Merrill; *M. tsiangii* Merrill & Chun.

Trees 5–15 m tall. Branchlets pubescent when young, glabrescent. Stipules subulate, 2.5–3 mm, deciduous; petiole 2–3.5 cm, sparsely villous; leaf blade elliptic to broadly lanceolate, 8–16 × 3–6 cm, thickly papery, abaxially sparsely glandular-scaly, pilose along midrib, base rounded to cuneate, minutely auriculate-cordate, with 2 or 4 glands, margin entire or repand, apex acuminate; veins 8–10 pairs. Male inflorescences unbranched or sparsely branched, 6–9 cm, pilose; bracts ovate, 2–3 mm, pilose, rarely some bracts lanceolate, filiform, 1–2 cm. Male flowers 5–7 per bract; pedicel ca. 1.5 mm, pubescent; sepals 3 or 4, ovate, pilose; stamens 12–16. Female inflorescences unbranched, 4–6 cm, pilose; bracts 4–7, lower bracts leaflike, lanceolate to ovate, 1–1.2 cm, glabrous, other bracts deltoid-ovate, ca. 1 mm, pilose. Female flower solitary; pedicel 1–2(–6) mm, pubescent; sepals 3 or 4, lanceolate, ca. 2 mm, pilose, persistent; ovary softly spiny; styles 2, filiform, 7–12 mm, basally connate. Fruiting pedicel 2–4 mm; capsule 2-lobed,

to 12 mm wide, sparsely softly spiny and blackish glandular scaly. Seeds subglobose, ca. 5 mm in diam., black-brownish, marbled. Fl. Jan–May, fr. May–Jun.

Mountain slopes, forests; 100–500 m. S Fujian, Guangdong, S Guangxi, Hainan [Indonesia, Malaysia, Philippines, Thailand, Vietnam].

**3. *Macaranga denticulata*** (Blume) Müller Argoviensis in A. Candolle, Prodr. 15(2): 1000. 1866.

中平树 zhong ping shu

*Mappa denticulata* Blume, Bijdr. 625. 1826; *Macaranga chatiniana* (Baillon) Müller Argoviensis; *M. denticulata* var. *zollingeri* Müller Argoviensis; *M. gummiflua* (Miquel) Müller Argoviensis; *M. henricorum* Hemsley; *M. perakensis* J. D. Hooker; *Mappa chatiniana* Baillon [“*chantiniana*”]; *M. gummiflua* Miquel; *M. truncata* Müller Argoviensis; *M. wallichii* Baillon; *Rottlera glauca* Hasskarl.

Small trees 3–15 m tall. Branchlets ferruginous or yellowish brown tomentose when young; branches glabrous, sometimes glaucous. Stipules lanceolate, 7–8 mm, tomentose, caducous; petiole 5–20 cm; leaf blade deltoid-ovate or broadly ovate, 12–30 × 11–28 cm, thinly leathery or thickly papery, abaxially pubescent, densely glandular scaly, adaxially glabrescent, base obtuse or subtruncate, narrowly peltate, rarely subcordate, with 2 or 4 glands, margin repand or subentire, apex cuspidate-acuminate, palmately 7–9-veined. Male inflorescences branched, 5–10 cm, tomentose; bracts suboblong, 2–3 mm, margin 2–4-glandular, or triangular, ca. 1 mm. Male flowers 3–7 per bract; pedicel ca. 0.5 mm; calyx 2- or 3-lobed, ca. 1 mm; stamens 9–16(–21). Female inflorescence branched, 4–8 cm, tomentose; bracts oblong or ovate, leaflike, 5–7 mm, margin 2–6-glandular, or triangular. Female flower solitary; calyx cup-shaped, 2-lobed, ca. 1.5 mm; ovary 2(or 3)-locular, puberulent; styles 2(or 3), ca. 1 mm. Fruiting pedicel 3–5 mm; capsule 2-lobed, 5–6 mm in diam., densely glandular-scaly; persistent calyx 3- or 4-lobed. Fl. Apr–Jun, fr. May–Oct.

Low hills, slopes, forests, secondary forests; below 100–1300 m. Guangxi, S Guizhou, Hainan, SE Xizang (Médog), S and SE Yunnan [Bhutan, NE India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**4. *Macaranga tanarius*** (Linnaeus) Müller Argoviensis var. ***tomentosa*** (Blume) Müller Argoviensis in A. Candolle, Prodr. 15(2): 997. 1866.

血桐 xue tong

*Mappa tomentosa* Blume, Bijdr. 624. 1826; *Croton laccifer* Blanco (1837), not Linnaeus (1753); *Macaranga molliuscula* Kurz; *M. tanarius* var. *brevibracteata* Müller Argoviensis; *Rottlera tomentosa* (Blume) Hasskarl.

Trees 5–10 m tall. Branchlets yellowish brown pubescent when young; branches stout, glabrous, glaucous. Stipules ovate, acuminate, 1.5–3 × 0.7–2 cm, pubescent, deciduous; petiole 10–30 cm; leaf blade ovate-orbicular or suborbicular, 17–30 × 14–24 cm, papery, abaxially glandular-scaly, pubescent along veins, adaxially glabrous, base rounded and broadly peltate, margin entire or serrulate, apex acuminate; palmate veins 7–11. Male inflorescences branched, 5–14 cm; axes slender, pubescent or glabrous; bracts broadly ovate, 3–5 × 3–4.5 mm, fimbriate,

pubescent. Male flowers ca. 11 per bract; pedicel ca. 0.5 mm; sepals 3, ca. 1 mm, pilose; stamens (4 or)5 or 6(–10). Female inflorescences branched, 5–15 cm, pilose; bracts ovate, leaflike, 1–1.5 cm, margin fimbriate, pubescent. Female flower solitary; calyx 2- or 3-lobed, pubescent; ovary 2- or 3-locular, sparsely softly spiny; styles 2 or 3, sublingulate, ca. 6 mm. Capsule 2- or 3-locular, ca. 12 mm in diam., densely glandular scaly, scattered softly spiny, ca. 8 mm. Seeds subglobose, ca. 5 mm. Fl. Apr–Jun, fr. Jun–Jul.

Maritime areas, forests, also cultivated in gardens; below 100 m. S Guangdong, Taiwan [E India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Philippines, Thailand, Vietnam; N Australia].

The distribution of *Macaranga tanarius* var. *tanarius* is India (Andaman and Nicobar Islands), Indonesia, Myanmar, Philippines, Thailand, Vietnam; N Australia, Pacific islands (Solomon Islands, Vanuatu).

**5. *Macaranga indica*** Wight, Icon. Pl. Ind. Orient. 5: 23. 1852.

印度血桐 yin du xue tong

*Macaranga adenantha* Gagnepain.

Trees 10–25 m tall. Branchlets yellowish brown pubescent when young; branches stout, glabrous, slightly glaucous. Stipules broadly ovate, acuminate, 1.5–2 × ca. 1 cm, pubescent, recurved, deciduous; petiole 11–14 cm; leaf blade ovate-orbicular, 14–25 × 13–23 cm, thinly leathery, abaxially pubescent and glandular-scaly, adaxially glabrous or pilose along veins, base rounded and broadly peltate, with glands, margin serrulate, apex acuminate; palmate veins 9. Male inflorescences branched, 10–15 cm, branchlets zigzag; bracts linear-spatulate, 4–7 mm, with 1–3 elliptic glands, or bracts minute, triangular. Male flowers many per bract; pedicel ca. 1 mm, pilose; sepals 3, ovate, ca. 1 mm, glabrous; stamens 5–7. Female inflorescences branched, 5–6 cm; bracts triangular, ca. 1 mm, pubescent. Female flower solitary; sepals 4, ca. 1.5 mm, pilose, persistent; ovary 1-locular; style 1, subulate, ca. 1.5 mm. Capsule globose, ca. 4 mm in diam., sparsely glandular-scaly; pedicel 3–4 mm, pubescent. Seeds smooth, black. Fl. Aug–Oct, fr. Oct–Nov.

Valleys, riverbanks, primary or secondary forests; 300–1900 m. Guangdong, Guangxi, SW Guizhou, SE Xizang (Médog), S Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

The type of *Trewia hernandiifolia* Roth (Nov. Pl. Sp. 374. 1821) has not been located. The protologue suggests that it could provide an earlier epithet for *Macaranga indica*, which was published more than 30 years later.

**6. *Macaranga kurzii*** (Kuntze) Pax & K. Hoffmann in Engler, Pflanzenr. 63(IV. 147. VII): 360. 1914.

尾叶血桐 wei ye xue tong

*Tanarius kurzii* Kuntze, Revis. Gen. Pl. 619. 1891, based on *Macaranga membranacea* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42: 246. 1873, not Müller Argoviensis (1866); *M. andersonii* Craib.

Shrubs or small trees, 1–7 m tall. Branchlets yellowish brown pubescent and villous; branches glabrous. Stipules filiform, ca. 3 mm, pilose, caducous; petiole 3.5–6 cm; leaf blade rhombic-ovate or triangular-ovate, sometimes shortly 3-cuspid,

8–14 × 5–8 cm, membranous, abaxially pubescent and sparsely glandular-scaly, adaxially pubescent along veins, base slightly cordate, with 2 or 4 glands, margin entire or minutely denticulate, apex caudate; basal veins 3, lateral veins 5 or 6 pairs. Male inflorescences paniculate, 5–11 cm, pubescent; bracts leaflike, ovate, 1–2.5 × ca. 1 cm, or triangular-ovate, 1–1.5 mm. Male flowers ca. 10, glomerate; sepals 3 or 4, 1.5–2 mm, pubescent; stamens 18–20. Female inflorescences capitate; peduncle 6–12 cm; bracts 2, large, subovate, 1.7–2.5 × 1–1.4 cm, margin serrate, upper part with 4–6 patelliform glands, pilose, or bracts 2 or 3, often lanceolate, ca. 2 mm. Female flower solitary; pedicel ovary 2-locular, sparsely softly echinate; style 2, filiform, 1–2 cm, base connate. Capsule 2-lobed, ca. 12 mm in diam., sparsely softly echinate and glandular-scaly. Fl. Mar–Oct, fr. May–Dec.

Mountain slopes, valleys, forests, dry thickets; 300–1600 m. SW Guangxi, Yunnan [Laos, Myanmar, N Thailand, N Vietnam].

**7. *Macaranga henryi*** (Pax & K. Hoffmann) Rehder, Sunyatsenia 3: 340. 1936.

草鞋木 cao xie mu

*Mallotus henryi* Pax & K. Hoffmann in Engler, Pflanzenr. 63(IV. 147. VII): 177. 1914.

Shrubs or trees, 2–16 m tall. Branchlets ferruginous tomentulose; branches glabrous, often glaucous. Stipules lanceolate, 5–8 mm, pilose, caducous; petiole 2.5–10 cm; leaf blade oblong-ovate or oblong-lanceolate, 10–25 × 3.5–7 cm, papery to thickly papery, abaxially sparsely glandular-scaly, puberulent along veins, becoming glabrous, base rounded to subtruncate, narrowly peltate or slightly cordate, with 2 or 4 glands, margin repand or subentire, apex acuminate or caudate; veins 7–10 pairs. Male inflorescences branched, 6–10 cm, glabrescent; bracts triangular, ca. 1.5 mm. Male flowers 3–5 per bract; pedicel ca. 1 mm; sepals 3, ca. 1 mm; stamens 6–12. Female inflorescences unbranched or with a few branches, 5–12 cm, glabrous; bracts triangular, ca. 2 mm, sometimes lowermost 1 or 2 bracts leaflike, 1–3 cm. Female flower solitary; pedicel 3–10 mm; calyx urceolate, ca. 3 mm, 4-denticulate or subtruncate, basally pilose, deciduous; ovary 2-locular, sparsely softly spiny; style 2, 6–10 mm, base or half of length connate. Fruiting pedicel 7–15 mm; capsule 2-lobed, ca. 8 mm wide, sparsely glandular-scaly and with a few spines. Fl. Mar–May, fr. Jul–Sep.

Mountain slopes, limestone hills, forests; 300–1400 m. Guangxi, S Guizhou, S and SE Yunnan [N Vietnam].

**8. *Macaranga sinensis*** Baillon ex Müller Argoviensis in A. Candolle, Prodr. 15(2): 1001. 1866.

台湾血桐 tai wan xue tong

*Macaranga dipterocarpifolia* Merrill.

Shrubs or small trees. Branches glabrous. Stipules lanceolate, ca. 8 mm, deciduous; petiole 5–10 cm; leaf blade ovate, 13–20 × 8–12 cm, thinly leathery, abaxially sparsely glandular scaly, base subtruncate, shallowly peltate, or slightly cordate, with 2 glands, margin repand-serrulate, apex acuminate, glabrous; veins palmate. Male inflorescences branched, 10–15 cm, glabrous; bracts triangular-lanceolate, 6–8 mm, with 5–7 disci-

form glands, or spatulate, 3–4 mm, with 1 disciform gland. Male flowers many per bract; sepals 4; stamens 5–7. Female inflorescences branched, 10–14 cm; bracts spatulate, with paired disciform gland. Female flower 1–3 per bract; sepals 3 or 4, ca. 1 mm; ovary 2-locular; styles 2, ca. 1 mm, basally connate. Capsule 2-locular, sparsely glandular-scaly. Fl. May–Jun.

Littoral forests; below 100 m. Taiwan (Huoshao Dao, Lan Yu) [Indonesia, Philippines].

**9. *Macaranga pustulata*** King ex J. D. Hooker, Fl. Brit. India 5: 445. 1887.

泡腺血桐 pao xian xue tong

*Macaranga denticulata* (Blume) Müller Argoviensis var. *pustulata* (King ex J. D. Hooker) Chakrabarty & M. Gangopadhyay; *M. gmelinifolia* King ex J. D. Hooker; *Tanarius gmelinifolius* (King ex J. D. Hooker) Kuntze; *T. pustulatus* (King ex J. D. Hooker) Kuntze.

Small trees or shrubs, 3–12 m tall. Branchlets yellowish brown tomentose when young, glabrescent. Stipule ovate-lanceolate or triangular, 7–10 × 4–6 mm, tomentose, upper part recurved; petiole 5–12 cm, pilosulose or glabrous; leaf blade subdeltoid, orbicular-ovate, or ± rhombic, 10–21 × 9–20 cm, papery or thickly papery, abaxially glabrescent, sparsely glandular scaly, adaxially glabrous, base broadly cuneate, truncate, or subcordate, very narrowly peltate or not, with 2 large glands, margin repand or subentire, apex cuspidate-acuminate; palmate veins 3(–5). Male and female inflorescences branched, 4–8 cm, pubescent, soon glabrescent; bracts lanceolate or deltoid, 1–3.5 mm, margin sometimes 2-glandular. Male flowers 5–9 per axil; pedicel ca. 0.5 mm; sepals 3, oblong, ca. 2 mm, pilose or glabrous; stamens 15–20. Female flowers 1 per bract; calyx ca. 1

mm, 3-lobed, tomentose, deciduous; ovary tomentose; styles 2, lingulate, ca. 1 mm, recurved. Fruiting pedicel 1–2 mm, pilose; capsule 2-lobed, ca. 8 mm wide, tomentose, sparsely glandular-scaly, coccus with 2 abaxial glands. Fl. Oct–Dec, fr. following Apr–May.

Secondary forests, mountain slopes, valleys, clearings; 1100–2100 m. S Xizang (Médog, Nyalam), SW Yunnan [Bhutan, India, Nepal].

**10. *Macaranga sampsonii*** Hance, J. Bot. 9: 134. 1871.

鼎湖血桐 ding hu xue tong

*Macaranga balansae* Gagnepain; *M. hemsleyana* Pax & K. Hoffmann; *Mallotus populifolius* Hemsley (1894), not (Miquel) Müller Argoviensis (1866).

Small trees or shrubs, 2–7 m tall. Branchlets yellowish brown tomentose when young, becoming glabrous, sometimes glaucous. Stipules lanceolate, 7–10 × 2–3 mm, pubescent, deciduous; petiole 5–13 cm, pilose; leaf blade deltoid-ovate or orbicular-ovate, 12–17 × 11–15 cm, thinly leathery, abaxially pubescent and sparsely glandular-scaly, base subtruncate or broadly cuneate and narrowly peltate, with 2 glands, margin repand or coarsely serrate, apex acuminate; palmate veins 7–9. Male and female inflorescences paniculate, 7–14 cm, pubescent; bracts ovate-lanceolate, 5–12 mm, apex caudate, margin 1–3-dentate. Male flowers 5 or 6 per bract; pedicel ca. 1 mm; sepals 3, ca. 1 mm, puberulent; stamens (3 or)4(or 5). Female flower solitary; sepals (3 or)4, ovate, ca. 1.5 mm, pubescent; ovary 2-locular; style 2, ca. 2 mm. Fruiting pedicel 2–4 mm; capsule 2-lobed, ca. 8 mm wide, glandular-scaly. Fl. May–Jun, fr. Jul–Aug.

Mountain slopes, valleys, forests; 200–800 m. SW Fujian, Guangdong, Guangxi, Hainan, Yunnan [N Vietnam].

## 26. MELANOLEPIS H. G. Reichenbach ex Zollinger, Acta Soc. Regiae Sci. Indo-Neêrl. 1(4): 22. 1856.

墨鳞属 mo lin shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Trees, usually dioecious; indumentum with stellate hairs. Leaves alternate; stipules small; leaf blade shallowly 3(–5)-lobed; veins palmate. Inflorescences terminal or axillary, branched or unbranched, unisexual; flowers solitary or in small fascicles. Male flowers: calyx 3–5-partite, valvate; petals absent; disk absent; stamens very many; filaments free; anthers 2-locular, connective with appendage; receptacle convex, pilose; pistillode absent. Female flowers: calyx 5-lobed; petals absent; disk annular; ovary 2(or 3)-locular; style short, papillose. Capsule 2(or 3)-locular, thin walled. Seeds subglobose, arillate.

Two species: tropical Asia extending to Pacific islands; one species in China.

**1. *Melanolepis multiglandulosa*** (Reinwardt ex Blume) H. G. Reichenbach & Zollinger, Acta Soc. Regiae Sci. Indo-Neêrl. 1(4): 22. 1856.

墨鳞 mo lin

*Croton multiglandulosus* Reinwardt ex Blume, Catalogus, 105. 1823; *Mallotus multiglandulosus* (Reinwardt ex Blume) Hurusawa.

Trees, 5–10 m tall. Branchlets loosely floccose-stellate-tomentose when young. Petiole 5–15 cm; leaf blade ovate-orbicular or ovate-triangular, 10–35 × 8–35 cm, membranous,

usually acutely 3-lobed, base cordate to truncate, margin repand-dentate, apex acute. Inflorescences branched or unbranched, 5–40 cm, tomentose; bracts subulate, 1–3 mm. Male flowers 2–4 per bract; pedicel 5–10 mm; calyx 4–6 mm; stamens 150–250. Female flowers: pedicel ca. 3 mm; calyx ca. 2 mm; ovary 2(or 3)-locular; styles 2(or 3), ca. 2 mm. Capsule often 2-lobed, 8–10 mm wide. Seeds subglobose, ca. 4 mm, aril purplish. Fl. and fr. Apr–Aug.

Mountain valleys, riverine forests; 100–400 m. Taiwan [Indonesia, Japan (Ryukyu Islands), New Guinea, Philippines, Thailand; Pacific islands].

**27. DISCOCLEIDION** (Müller Argoviensis) Pax & K. Hoffmann in Engler,  
Pflanzenr. 63(IV. 147. VII): 45. 1914.

丹麻杆属 dan ma gan shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Cleidion* sect. *Discocleidion* Müller Argoviensis, Flora 47: 481. 1864.

Small trees or shrubs; indumentum of simple hairs. Leaves alternate; stipules small, deciduous; petiole long; leaf blade margin dentate, base with 1 or 2 pairs of glands, stipellate; palmate veins 3 or 4(or 5). Plants dioecious. Inflorescences terminal or axillary, branched or unbranched; bracts small. Male flowers fascicled; sepals 3–5, valvate; petals absent; disk glands small; stamens 25–60; filaments free; anthers basifixed, 4-locellate, nearly 2-lobed; pistillode absent. Female flowers 1 or 2 per bract; calyx lobes 5, valvate; disk annular, crenulate; ovary 3-locular; styles 3, almost free, 2-lobed, papillose; ovule 1. Capsule 3-locular. Seeds ovoid, verrucate.

Two species: China, Japan (Ryukyu Islands); two species (one endemic) in China.

- 1a. Adult leaves glabrous; stamens 25–30; ovary and fruit glabrous ..... 1. *D. ulmifolium*  
1b. Adult leaves pubescent; stamens 35–60; ovary and fruit villous ..... 2. *D. rufescens*

**1. Discocleidion ulmifolium** (Müller Argoviensis) Pax & K. Hoffmann in Engler, Pflanzenr. 63(IV. 147. VII): 46. 1914.

丹麻杆 dan ma gan

*Cleidion ulmifolium* Müller Argoviensis, Flora 47: 481. 1864; *Discocleidion glabrum* Merrill.

Shrubs 1.5–3 m tall. Branchlets reddish, yellowish pubescent when young, becoming glabrous. Stipules lanceolate, 3–5 mm; petiole 2–10 cm; leaf blade ovate or oblong-ovate, 6–15 × 3–10 cm, papery, drying purplish, base subtruncate or slightly cordate, with 1 or 2 pairs of glands, stipels lanceolate, 2–3 mm, with small marginal glands, margins serrulate, apex acuminate; basal veins 3. Inflorescences few branched, 10–22 cm; bracts narrowly ovate, 1.5–2 mm. Male flowers 3–11 per bract; pedicel ca. 2 mm; calyx globose, ca. 2 mm in diam., lobes 4; stamens 25–30. Female flowers 1 per bract; pedicel ca. 7 mm; calyx lobes (4 or)5, narrowly triangular, ca. 3 mm; disk annular; ovary glabrous; styles ca. 2 mm, 2-lobed. Capsule 6–7 mm in diam., glabrous. Seeds ovoid, ca. 4 mm, brownish, verrucate. Fl. May–Sep, fr. Jul–Oct.

Forests or thickets in valleys or on streamsides; 100–500 m. Fujian (Chong'an), Guangdong (Renhua), Jiangxi (Dexing, Wuyuan), Zhejiang (Kaihua, Yongjia) [Japan (Ryukyu Islands)].

**2. Discocleidion rufescens** (Franchet) Pax & K. Hoffmann in Engler, Pflanzenr. 63(IV. 147. VII): 45. 1914.

毛丹麻杆 mao dan ma gan

*Alchornea rufescens* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 7: 75. 1884; *Acalypha giraldii* Pax; *Mallotus cavaleriei* H. Léveillé.

Shrubs or small trees, 1.5–5 m tall. Branchlets, leaves, inflorescences, and flowers densely yellowish or whitish pubescent. Stipules lanceolate, 3–5 mm; petiole 4–10 cm; leaf blade ovate or triangular-ovate 5–14 × 3–12 cm, papery, abaxially tomentose, adaxially pilose, base obtuse, subtruncate, or slightly cordate, with 2 or 3 pairs of glands, stipels linear, 2–3 mm, with marginal glands, margin serrulate, apex acuminate; palmate veins 3(or 5). Panicles (8–)15–20 cm; bracts ovate or lanceolate, ca. 2 mm. Male flowers 3–15 per bract; pedicel ca. 3 mm; calyx globose, ca. 2.5 mm in diam.; sepals 3–5; stamens 35–60. Female flowers 1 or 2 per bract; pedicel 7–12 mm; calyx lobes 5, triangular, ca. 3 mm, outside pilose; disk 5-crenulate; ovary densely villous; style 2–3 mm, 2-lobed. Capsule 6–8 mm in diam., villous. Seeds ovoid, ca. 5 mm, verrucate. Fl. May–Oct, fr. Jul–Nov.

• Mountain slopes, usually in limestone forests or thickets; 200–1000 m. W Anhui, Gansu, N Guangdong, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Shanxi, E Sichuan.

**28. ALCHORNEA** Swartz, Prodr. 6: 98. 1788.

山麻杆属 shan ma gan shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Caturus* Loureiro; *Cladodes* Loureiro; *Stipellaria* Benthham (1854), not Klotzsch (1848).

Trees or shrubs, dioecious or monoecious; indumentum of simple hairs. Leaves alternate; stipules small, deciduous; leaf blade simple, junction with petiole usually with 2–4 glands, mostly with 2 stipels, margin crenate or dentate; pinnately veined and shortly petiolate or palmately veined and long petiolate. Inflorescences terminal and/or axillary, branched or unbranched, male often axillary, female and bisexual terminal; bracts small, usually with 2 basal glands; flowers sometimes sessile. Male flowers fascicled; calyx closed in bud, 2–5-partite, valvate; petals absent; disk absent; stamens 4–8; filaments shortly connate; anthers 2-locular, introrse; pistillode absent. Female flowers usually 1 per bract; sepals 4–8, imbricate, sometimes 1–4-glandular; ovary 2- or 3-locular; ovules 1 per locule; styles 2 or 3, free or basally connate, simple, usually long. Fruit a capsule, 2- or 3(or 4)-locular, smooth or muricate. Seed globose, usually tuberculate.

About 50 species: tropical and subtropical regions; eight species (three endemic) in China.

- 1a. Leaves pinnately veined, stipels absent, petiole 0.5–3 cm; male inflorescence terminal, paniculate ..... 1. *A. rugosa*  
 1b. Leaves with 3 basal veins, stipels present at base of leaf blade, petiole 2–20 cm; male inflorescence cauliflorous or at leafless node, unbranched, or if terminal then bisexual.  
 2a. Capsules verrucate or tuberculate.  
 3a. Branchlets villous; female sepals lanceolate, 2–2.5 mm; capsule subglobose, villous, verrucate ..... 7. *A. huananensis*  
 3b. Branchlets densely pubescent; female sepals subovate, 3–4 mm; capsule ellipsoid, puberulent, tubercled .... 8. *A. tiliifolia*  
 2b. Capsules smooth, not verrucate or tuberculate.  
 4a. Plants monoecious; inflorescences often bisexual.  
 5a. Inflorescence branched, terminal; styles filiform, ca. 8 mm; ovary tomentulose ..... 5. *A. androgyna*  
 5b. Inflorescence not branched, axillary; styles thick, sublanceolate, 4–5 mm; ovary puberulent ..... 4. *A. kelungensis*  
 4b. Plants dioecious; male inflorescence spicate; female inflorescence racemose, terminal.  
 6a. Male inflorescence 1.5–3.5 cm; bracts ovate, ca. 2 mm ..... 2. *A. davidii*  
 6b. Male inflorescence more than 5 cm; bracts triangular.  
 7a. Leaves abaxially puberulent; capsule subglobose, tomentulose ..... 6. *A. mollis*  
 7b. Leaves abaxially puberulent only along veins; capsule strongly 3-lobed, puberulent ..... 3. *A. trewioides*

**1. *Alchornea rugosa*** (Loureiro) Müller Argoviensis, *Linnaea* 34: 170. 1865.

羽脉山麻杆 *yu mai shan ma gan*

Shrubs or small trees, 1.5–5 m tall, dioecious. Branchlets pubescent when young, becoming glabrous. Stipules subulate, 5–7 mm; petiole 0.5–3 cm; leaf blade cuneate-obovate or elliptic to broadly lanceolate, 10–21 × 4–10 cm, thickly papery, base obtuse or slightly cordate, with 2 glands, stipels absent, margins serrulate, apex acuminate; venation pinnate, lateral veins 8–12 pairs. Inflorescence terminal, branched, 7–25 cm, puberulent or glabrous; bracts triangular, ca. 1.5 mm, base usually with 2 glands. Male flowers 5–11 per bract; pedicel ca. 0.5 mm; buds globose, ca. 1 mm in diam., pilose; sepals 2–4; stamens 4–8. Female flowers: pedicel ca. 1 mm, pubescent; sepals 5, triangular, pubescent; ovary densely puberulent; styles 3, filiform. 3.5–7 mm. Fruiting pedicel ca. 2 mm; capsule 3-lobed, ca. 8 mm in diam., subglabrous. Seeds ovoid, ca. 5 mm, brownish, verrucate. Fl. and fr. year-round.

Forests; below 600 m. Guangdong, Guangxi, Hainan, Yunnan [India (Nicobar Island), Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Thailand; N Australia].

- 1a. Leaf blade abaxially pubescent only in axils of veins, adaxially glabrous; styles 6–7 mm ..... 1a. var. *rugosa*  
 1b. Leaf blade uniformly densely yellowish pubescent; styles 3.5–4 mm ..... 1b. var. *pubescens*

**1a. *Alchornea rugosa* var. *rugosa***

羽脉山麻杆(原变种) *yu mai shan ma gan (yuan bian zhong)*

*Cladodes rugosa* Loureiro, *Fl. Cochinch.* 2: 574. 1790; *Adelia glandulosa* Blanco; *Alchornea hainanensis* Pax & K. Hoffmann; *A. hainanensis* var. *glabrescens* Pax & K. Hoffmann; *A. javanensis* Müller Argoviensis; *A. rugosa* var. *macrocarpa* Airy Shaw; *Aparisthium javanense* (Blume) Hasskarl; *A. javanicum* Baillon; *Conceveiba javanensis* Blume; *Croton apetalus* Blume; *Tragia innocua* Blanco (1845), not Walter (1788).

Leaf blade abaxially pubescent only in axils of veins, adaxially glabrous. Styles 6–7 mm. Fl. and fr. year-round.

Forests; below 600 m. E Guangdong, S and SW Guangxi, Hainan,

S Yunnan [India (Nicobar Island), Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Thailand; N Australia].

**1b. *Alchornea rugosa* var. *pubescens*** (Pax & K. Hoffmann) H. S. Kiu, *Fl. Reipubl. Popularis Sin.* 44(2): 69. 1996.

海南山麻杆 *hai nan shan ma gan*

*Alchornea hainanensis* var. *pubescens* Pax & K. Hoffmann in Engler, *Pflanzer.* 63(IV. 147. VII): 243. 1914.

Leaf blade uniformly densely yellowish pubescent. Styles 3.5–4 mm. Fl. and fr. Mar–Nov.

- Forests on limestone hills; 100–300 m. SW Guangxi, Hainan.

**2. *Alchornea davidii*** Franchet, *Pl. David.* 1: 264. 1884.

山麻杆 *shan ma gan*

*Acalypha silvestrii* Pampanini.

Deciduous shrubs, 1–5 m tall. Branchlets gray tomentulose, becoming puberulent. Stipules lanceolate, 6–8 mm, pubescent; petiole 2–10 cm, pubescent; leaf blade broadly ovate or subrounded, 8–15 × 7–14 cm, papery, abaxially puberulent, adaxially puberulous along veins, base cordate to subtruncate, with 2–4 glands, stipels filiform, 3–4 mm, margins dentate or serrulate, apex acuminate; basal veins 3. Plants dioecious. Male inflorescences 1–3 at leafless node, unbranched, catkinlike, 1.5–3.5 cm; peduncle subsessile; bracts ovate, ca. 2 mm, pubescent, overlapping in bud. Male flowers 3–5 per bract; pedicel ca. 2 mm; bud globose, ca. 2 mm in diam., glabrous; sepals 3(or 4); stamens 6–8. Female inflorescences terminal, unbranched, 4–8 cm, pubescent; bracts triangular, ca. 3.5 mm. Female flowers: pedicel ca. 0.5 mm; sepals 5, triangular, 2.5–3 mm, pubescent; ovary subglobose, tomentose; styles 3, filiform, 10–12 mm, connate for 1.5–2 mm. Capsule subglobose, 3-lobed, 10–12 mm, densely pubescent. Seeds ovoid, ca. 6 mm, brownish or gray, tuberculate. Fl. Apr–May, fr. Jun–Jul.

- Valleys, slopes of streams or rivers, deciduous forests; 300–2000 m. Fujian, NE Guangdong, N Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shanxi, Sichuan, NE Yunnan, Zhejiang.

**3. *Alchornea trewioides*** (Bentham) Müller Argoviensis, *Linnaea* 34: 168. 1865.

红背山麻杆 *hong bei shan ma gan*



Shrubs, 1–3 m tall, dioecious. Branchlets puberulent or almost glabrous. Stipules subulate, 3–5 mm, pilose; petiole 7–12 cm; leaf blade broadly ovate, 8–15 × 7–13 cm, papery, abaxially puberulent along veins, base subcordate or subtruncate, with 4 glands, stipels lanceolate, 2–5 mm, margins serrulate or obscurely serrulate, apex acuminate or acute; basal veins 3. Male inflorescences axillary, often at leafless nodes, unbranched, 7–15 cm, puberulent; bracts triangular. Male flowers 3–15-fascicled; pedicel ca. 2 mm, glabrous; sepals 4, ca. 1.5 mm, glabrous; stamens (7 or)8. Female inflorescences terminal, unbranched, 5–6 cm, puberulent; bracts narrowly triangular, ca. 4 mm, base with 2 glands. Female flowers: pedicel ca. 1 mm; sepals 5–8, lanceolate, 2.5–4 mm, pubescent, sometimes one with basal gland; ovary globose, tomentulose; styles 3, filiform, connate at base. Capsule subglobose, 8–10 mm in diam., puberulent. Seeds compressed-ovoid, ca. 6 mm, brownish, tuberculate. Fl. Apr–May, fr. Jun–Aug.

Plains, mountains, slopes, thickets, open scrub, limestone hills; below 1200 m. Fujian, Guangdong, Guangxi, Hainan, S Hunan, S Jiangxi, Sichuan, SE Yunnan [Cambodia, Japan (Ryukyu Islands), Laos, N Thailand, N Vietnam].

- 1a. Female flowers: sepals 5(or 6), 3–4 mm, 1 with basal gland, ovary tomentulose, styles 12–15 mm, connate for less than 1 mm ..... 3a. var. *trewioides*  
 1b. Female flowers: sepals 6–8, 2.5–3 mm, all eglandular, ovary yellowish tomentose, styles 7–9 mm, connate for 1.5–2 mm ..... 3b. var. *sinica*

### 3a. *Alchornea trewioides* var. *trewioides*

红背山麻杆(原变种) hong bei shan ma gan (yuan bian zhong)

*Stipellaria trewioides* Benth, Hooker's J. Bot. Kew Gard. Misc. 6: 4. 1854; *Alchornea coudercii* Gagnepain; *A. liukiuensis* Hayata.

Leaf blade adaxially puberulent along midrib, stipels 2–3.5 mm. Female flowers: sepals 5(or 6), 3–4 mm, 1 with basal gland; ovary tomentulose; styles 12–15 mm, connate for less than 1 mm. Fl. Apr–May, fr. Jun–Aug.

Plains, mountains, slopes, thickets, open scrub, sometimes on limestone hills; below 1000 m. Fujian, Guangdong, Guangxi, Hainan, S Hunan, S Jiangxi [Cambodia, Japan (Ryukyu Islands), Laos, N Thailand, N Vietnam].

### 3b. *Alchornea trewioides* var. *sinica* H. S. Kiu, Acta Phytotax. Sin. 26: 460. 1988.

绿背山麻杆 lü bei shan ma gan

Leaf blade abaxially pubescent, stipels 2–5 mm. Male inflorescence bracts usually with one gland. Female flowers: sepals 6–8, 2.5–3 mm, all eglandular; ovary yellowish tomentose; styles 7–9 mm, connate for 1.5–2 mm. Fl. Apr–May, fr. Jun–Sep.

• Open thickets, limestone hills; 500–1200 m. NW and SW Guangxi, Sichuan (Gulin), SE Yunnan.

### 4. *Alchornea kelungensis* Hayata, Icon. Pl. Formos. 9: 102. 1920.

厚柱山麻杆 hou zhu shan ma gan

*Alchornea formosae* Müller Argoviensis ex Pax & K. Hoffmann; *A. liukiuensis* Hayata var. *formosae* (Pax & K. Hoffmann) Hurusawa; *A. trewioides* var. *formosae* (Pax & K. Hoffmann) Pax & K. Hoffmann.

Shrubs, 1–2 m tall, monoecious. Branchlets puberulent or glabrous. Stipules lanceolate, 3–6 mm; petiole 3–7 cm; leaf blade broadly ovate or triangular-ovate, 9–12 × 6–11 cm, papery, abaxially pilose along midrib, base broadly cuneate or subcordate, with 4 glands, stipels subulate, ca. 2 mm, margins remotely serrulate, apex acuminate; basal veins 3. Inflorescence axillary or terminal, unbranched, usually bisexual, 7–10 cm, pilose; bracts triangular-ovate, 3–4 mm. Male flowers 9–11 per bract; pedicel 1–2 mm; sepals 3 or 4, ca. 2.5 mm, glabrous; stamens 8. Female flowers: pedicel ca. 1 mm; sepals 5, triangular-ovate, unequal, 2.5–3.5 mm, pilose; ovary puberulent; styles 3, sublanceolate, thick, 4–5 mm, connate for ca. 1 mm. Capsule globose, 3-lobed, ca. 10 mm in diam., subglabrous. Fl. Mar–Apr, fr. Jun–Jul.

• Secondary forests; 100–200 m. N Taiwan.

### 5. *Alchornea androgyna* Croizat, J. Arnold Arbor. 23: 47. 1942.

同序山麻杆 tong xu shan ma gan

Shrubs, 2–3 m tall, monoecious. Branchlets gray tomentulose. Stipules subulate, ca. 2 mm; petiole 2.5–13 cm; leaf blade ovate or broadly ovate to elliptic, 10–15 × 6–12 cm, papery, abaxially pilose along veins, base obtuse to subtruncate, with 4 glands, stipels subulate, ca. 3 mm, margins remotely serrulate, apex acuminate to caudate-acuminate; basal veins 3. Inflorescences terminal, branched, bisexual; peduncle tomentulose; bracts lanceolate, ca. 3 mm. Male flowers 5–7 per bract; pedicel ca. 1 mm; sepals 3, ovate, ca. 1.5 mm; stamens 5 or 6. Female flowers: pedicel ca. 0.5 mm; sepals 5, lanceolate, 2–2.5 mm, pubescent, 1 with basal gland; ovary globose, tomentulose; styles 3, filiform, ca. 8 mm, connate for ca. 1 mm. Fl. Sep–Oct.

Hills, thickets; below 100 m. Hainan (Wanning) [N Vietnam].

### 6. *Alchornea mollis* Benth, ex Müller Argoviensis, Linnaea 34: 168. 1865.

毛果山麻杆 mao guo shan ma gan

*Stipellaria mollis* Benth, Hooker's J. Bot. Kew Gard. Misc. 6: 3. 1854, not Klotzsch (1848).

Shrubs or small trees, 3–5 m tall, dioecious. Branchlets gray puberulent. Stipules lanceolate, 5–6 mm, pilose; petiole 8–20 cm; leaf blade broadly ovate, 9–20 × 8–20 cm, papery, abaxially puberulent, base subcordate, with 4 glands, stipels filiform, ca. 3 mm, pilose, margins serrulate, apex acuminate or cuspidate; basal veins 3. Male inflorescences 1–3 at leafless node, unbranched, puberulent; bracts triangular, 1–2 mm. Male flowers 9–11 per bract; pedicel ca. 1.5 mm; sepals 3, ovate, ca. 1.5 mm, subglabrous; stamens 8. Female inflorescences terminal, unbranched, 6–8 cm, puberulent; bracts lanceolate, 3–5 mm. Female flowers: pedicel ca. 2 mm; sepals 5 or 6, lanceolate, 2.5–3 mm, puberulent, one with basal gland; ovary globose, to-

mentulose; styles 3, filiform, 6–8 mm, connate for ca. 1 mm. Capsule subglobose, ca. 10 mm in diam., tomentulose. Seeds compressed-ovoid, ca. 7 mm, rugose. Fl. Apr–Aug.

Valleys, streamside forests; 1200–1900 m. Sichuan (Luding), NW Yunnan [Bhutan, NE India, Nepal].

**7. *Alchornea hunanensis*** H. S. Kiu, Acta Phytotax. Sin. 26: 458. 1988.

湖南山麻杆 hu nan shan ma gan

Shrubs ca. 2 m tall, dioecious. Branchlets villous. Stipules lanceolate, 6–8 mm; petiole 5–8 cm; leaf blade broadly ovate, 10–12 × 8–19 cm, membranous or papery, abaxially villous, adaxially pilose along veins, base slightly cordate to subtruncate, with 4 glands, stipels subulate, 2–5 mm, margins serrulate, apex acuminate; basal veins 3. Male inflorescences axillary, unbranched, 9–15 cm, pilose; bracts broadly ovate, ca. 2 mm. Male flowers 5–7 per bract; pedicel 1.5–2 mm; sepals 3, ovate, ca. 2 mm; stamens 6–8. Female inflorescences terminal, unbranched, 3–4 cm, puberulent; bracts triangular, 4–4.5 mm. Female flowers: sepals 5, lanceolate, 2–2.5 mm, puberulent; ovary globose, densely villous; styles 3, filiform, 10–15 mm, connate for 1.5–3 mm. Fruiting pedicel 1–1.5 mm, pilose. Capsule subglobose, ca. 10 mm in diam., villous, verrucose. Seeds compressed-ovoid, ca. 8 mm, brownish, tuberculate. Fl. Apr–May, fr. Jun–Jul.

• Limestone slopes, valleys, forests, thickets; 300–900 m. NW Guangxi, E Hunan.

**8. *Alchornea tiliifolia*** (Bentham) Müller Argoviensis, Linnaea 34: 168. 1865.

椴叶山麻杆 duan ye shan ma gan

*Stipellaria tiliifolia* Bentham, Hooker's J. Bot. Kew Gard. Misc. 6: 4. 1854.

Shrubs or small trees, 2–8 m tall, dioecious. Branchlets densely pubescent. Stipules lanceolate, 6–7 mm; petiole 6–20 cm; leaf blade ovate-rhombic to broadly ovate, 10–17 × 6–16 cm, papery, abaxially pubescent, adaxially pubescent along veins, base cuneate or subtruncate, with 4 glands, stipels lanceolate, 2.5–4 mm, margins serrate, apex acuminate to caudate; basal veins 3. Plants dioecious. Male inflorescences ± cauliflorous, unbranched, 5–9 cm, pubescent; bracts ovate, 2–2.5 mm. Male flowers 7–11-fascicled; pedicel ca. 1 mm; sepals 3, ca. 1.5 mm; stamens 8. Female inflorescences terminal, unbranched or few branched, 8–15 cm, pubescent; bracts triangular, ca. 6 mm. Female flowers: sepals 5 (or 6), subovate, unequal, 3–4 mm, puberulent, one with basal gland; ovary globose, tomentose; styles 3, filiform, 7–11 mm, connate for 1.5–3 mm. Capsule ellipsoid, 6–8 mm in diam., puberulent, tubercled. Seeds subcylindric, ca. 8 mm, brown, rugose. Fl. Mar–Jun, fr. Jun–Sep.

Forested or scrubby slopes or valleys; 200–1300 m. W Guangxi, S Guizhou, S Yunnan [Bangladesh, Bhutan, NE India, Malaysia (peninsular), Myanmar, Thailand, Vietnam].

## 29. CLEIDION Blume, Bijdr. 612. 1826.

棒柄花属 bang bing hua shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Trees or shrubs, monoecious or dioecious. Branchlets frequently glabrous. Leaves alternate, glandular-crenulate, penninerved; stipule small, deciduous. Inflorescences spicate or racemose, axillary; bracts eglandular. Male flowers fascicled to glomerulose, rarely solitary along axis; calyx closed in bud; sepals 3 or 4, valvate; petals absent; disk absent; stamens 25–80(–100); filaments free; anthers dorsifixed, 4-locellate, connective shortly produced; pistillode absent. Female inflorescences frequently 1-flowered. Female flowers: pedicel long, thickened at tip; sepals 3–5, imbricate, accrescent or scarcely enlarged in fruit; ovary 2- or 3-locular; styles 2 or 3, base often connate, deeply 2-cleft, filiform, stigmatic surface papillose; ovules 1 per locule. Fruit a capsule, 2- or 3-locular; pedicels rigid, club-shaped. Seeds subglobose, smooth, marbled.

About 25 species: Old- and New-World tropics and subtropics; three species in China.

1a. Male flowers available.

2a. Male flowers 1 per bract; sepals unequal, ca. 4 mm; stamens 100–200 ..... 3. *C. bracteosum*

2b. Male flowers 3–15 per bract; sepals equal, 2–2.5 mm; stamens 40–70.

3a. Plants monoecious; pedicel 1–1.5 mm; petiole 0.3–3 cm ..... 1. *C. brevipetiolatum*

3b. Plants dioecious; pedicel 2–3 mm; petiole 2–7 cm ..... 2. *C. spiciflorum*

1b. Female flowers or fruits available.

4a. Ovary 2 (or 3)-locular, styles 1.5–3 cm; fruit often 2-lobed, 2.5–3 cm in diam. .... 2. *C. spiciflorum*

4b. Ovary 3-locular, styles 1–1.5 cm; fruit 3-lobed, 1.2–1.5 cm in diam.

5a. Female sepals unequal, larger, 6–7(–20) mm, accrescent 9–15(–30) mm in fruit; petiole 0.3–3 cm ... 1. *C. brevipetiolatum*

5b. Female sepals 2–4 mm, scarcely enlarged in fruit; petiole 2–7 cm ..... 3. *C. bracteosum*

**1. *Cleidion brevipetiolatum*** Pax & K. Hoffmann in Engler, Pflanzenr. 63(IV. 147. VII): 292. 1914.

棒柄花 bang bing hua

Small trees, 5–12 m tall, monoecious. Branchlets glabrous. Stipules lanceolate, ca. 3 mm; petiole 3–8 mm or 1–3 cm; leaf blade obovate or obovate-lanceolate to lanceolate, 7–21 × 3.5–7

cm, thinly leathery, abaxially bearded in vein axils, base obtuse, with 2–4 maculate glands, apex acuminate; veins 5–9 pairs. Male inflorescences unbranched, 5–20 cm, puberulent; bracts broadly triangular, ca. 1.5 mm. Male flowers 3–7 per bract, clusters widely spaced; pedicel 1–1.5 mm; sepals 3, 2–2.5 mm; stamens (40–)55–65. Female flowers axillary; pedicel thick, 2–3.5(–7) cm; bracts 2 or 3 at base, triangular, 1.5–2 mm; sepals

5, unequal, 3 lanceolate, 6–7(–20) × 2–3(–6) mm, 2 triangular, 2–4 × 0.5–1.5 mm; ovary globose, densely yellow villous; styles 3, ca. 1 cm, deeply 2-cleft, filiform. Fruiting sepals: 3 or 4 oblong, 9–15(–30) × 4–6(–10) mm; 1 or 2 shorter, 3–5 mm. Capsule 3-lobed, 1.2–1.5 cm in diam., pilose. Seeds subglobose, 6–7 mm, brownish marbled. Fl. and fr. Mar–Oct.

Evergreen forests, on limestone hills; 200–800(–1000) m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [Laos, N Thailand, N Vietnam].

**2. *Cleidion spiciflorum*** (N. L. Burman) Merrill, *Interpr. Herb. Amboin.* 322. 1917.

长棒柄花 chang bang bing hua

*Acalypha spiciflora* N. L. Burman, *Fl. Indica*, 203. 1786;  
*Cleidion javanicum* Blume.

Trees, 5–30 m tall, dioecious. Branchlets glabrous. Stipules triangular, 2–5 mm; petiole 2–7 cm; leaf blade elliptic to oblong-lanceolate or ovate, (7–)9–30 × (2.5–)4–14 cm, thinly leathery, abaxially bearded in vein axils, base obtuse or cuneate, margin sinuate-toothed or subentire, apex acute or acuminate; lateral veins 5–9 pairs. Male inflorescences unbranched, (5–)12–21 cm, puberulent; bracts ovate, ca. 1 mm. Male flowers (3–)5–15 per bract, clusters widely spaced; pedicel 2–3 mm; sepals 3, ca. 2.5 mm; stamens 40–70. Female flower axillary, solitary; pedicel 1–7 cm, base with some bracts; sepals 4 or 5, ovate-triangular, 1.5–3 mm, scarcely enlarged in fruit; ovary 2(or 3)-locular, densely villous; styles 2(or 3), deeply 2-cleft, 1.5–3 cm. Fruiting

pedicel 3.5–15 cm, ca. 5 mm in diam. at tip; capsule often 2-lobed, 2.5–3 cm wide, smooth. Seeds subglobose, 9–12 mm in diam., brownish marbled. Fl. Apr–Jun, fr. May–Oct.

Valleys in evergreen or monsoon forests; 600–800(–1400) m. SE Xizang (Mêdog), SW Yunnan [Bhutan, India, Malaysia, Myanmar, Nepal; N Australia, Pacific islands].

**3. *Cleidion bracteosum*** Gagnepain, *Bull. Soc. Bot. France* 71: 569. 1924.

灰岩棒柄花 hui yan bang bing hua

Small trees, 5–15 m tall, dioecious. Branchlets glabrous. Petiole 2–7 cm; leaf blade oblong-ovate or ovate, (5–)9–19 × 4–9 cm, thinly leathery, abaxially bearded in vein axils, base obtuse, with 2–4 maculate glands, margin serrate, apex acute or acuminate; veins 5–7 pairs. Male inflorescences axillary or subterminal, 6–14 cm, puberulent; bracts triangular, 2–2.5 mm. Male flower solitary, remote along axis; pedicel 1–2 mm; sepals 2 or 4, ca. 4 mm; stamens 100–200. Female flower solitary, axillary; pedicel 2–4 cm; bracts at base triangular, ca. 1.5 mm; sepals 5, triangular, unequal, 2–4 mm, scarcely enlarged in fruit; ovary ovoid, 3-locular, densely yellow villous; styles ca. 1.5 cm, deeply 2-cleft. Fruiting pedicel 6–7 cm in fruit, club-shaped; capsule 3-lobed, ca. 1.5 cm in diam., smooth. Seeds ovoid, ca. 7 mm in diam., brownish marbled. Fl. Dec–Feb, fr. Apr–May.

Evergreen forests, commonly on limestone hills. Guangxi, S Guizhou, E and S Yunnan [N Vietnam].

### 30. **CLAOXYLON** A. Jussieu, *Euphorb. Gen.* 43, t. 14, f. 43. 1824.

白桐树属 bai tong shu shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Shrubs or trees, dioecious, rarely monoecious. Branchlets puberulent. Leaves alternate; stipules small or minute, deciduous; leaf blade mostly ± dentate; venation pinnate. Inflorescences axillary, unbranched; bracts small. Male flowers 1 to many per bract; sepals (2 or)3 or 4, valvate, closed in bud; petals absent; stamens (10–)20–30(–200); filaments free; anthers basifixed, 2-locular, theca almost free, erect; juxtastaminal glands many, short, erect, apex pilose; pistillode absent. Female flowers mostly 1 per bract; sepals 2–4; petals absent; disk annular or dissected; ovary 2- or 3(or 4)-locular; ovule 1 per locule; styles short, stigmatic surface papillose or plumose, recurved. Fruit a capsule, 2- or 3(or 4)-lobed. Seeds globose; testa fleshy, inner layer hard, foveolate-reticulate.

About 75 species: Old World tropics; six species in China.

1a. Ovary and capsule glabrous; disk with 3 separate glands.

2a. Leaves membranous; male inflorescences 11–13 cm; stamens 40–50; female inflorescences 4–5 cm ..... 1. *C. hainanense*

2b. Leaves thickly papery; male inflorescences 6–7 cm; stamens 30; female inflorescences 1.5–3 cm ..... 2. *C. brachyandrum*

1b. Ovary and capsule pubescent to tomentose; disk sinuous to 3-lobed.

3a. Leaves papery, adaxially pilose, often purplish; stamens 15–25; cocci tomentulose, sutures raised ..... 3. *C. indicum*

3b. Leaves membranous, adaxially almost glabrous; stamens more than 25; cocci pilose or tomentulose, sutures not raised.

4a. Stamens ca. 27; infructescence 2–3 cm ..... 6. *C. subsessiliflorum*

4b. Stamens 35–50; infructescence 4–10 cm.

5a. Male flowers 7–9 per bract; capsule tomentulose ..... 4. *C. longifolium*

5b. Male flowers 3–5 per bract; capsule pilose or glabrous ..... 5. *C. khasianum*

**1. *Claoxylon hainanense*** Pax & K. Hoffmann in Engler, *Pflanzenr.* 63(IV. 147. VII): 128. 1914.

海南白桐树 hai nan bai tong shu

*Mercurialis indica* Loureiro (1790), not *Claoxylon indicum* (Reinwardt ex Blume) Hasskarl (1844).

Shrubs, 1–5 m tall, dioecious. Branchlets pilose. Stipules subulate, 4–5 mm; petiole 1.5–5 cm, apex with 2 glands; leaf blade oblong-lanceolate or lanceolate, 9–16 × 1.5–5 cm, membranous, base cuneate, glandular-crenulate, apex acuminate, glabrous. Male inflorescences 11–13 cm; bracts ovate-triangular, 1–1.5 mm. Male flowers 2 or 3 per bract; pedicel 3–4 mm;

sepals 3, ca. 2 mm; stamens 40–50; interstaminal glands ca. 0.5 mm. Female inflorescences 4–5 cm; bracts triangular, ca. 1 mm. Female flowers 1 per bract; pedicel ca. 3 mm; sepals 3, subtriangular, ca. 1 mm; disk glands 3, ovate; ovary subglobose, glabrous; styles 3, ca. 1.5 mm, basally connate, plumose. Capsule 3-lobed, ca. 9 mm in diam. Seeds subglobose, ca. 4.5 mm in diam. Fl. and fr. Feb–Nov.

Plains, mountain slopes, thickets, monsoon forests; below 100–700 m. Guangdong (Xuwen), S Guangxi, Hainan [N Vietnam].

**2. *Claoxylon brachyandrum*** Pax & K. Hoffmann in Engler, Pflanzenr. 63(IV. 147. VII): 115. 1914.

台湾白桐树 tai wan bai tong shu

*Claoxylon kotoense* Hayata.

Shrubs, 4–5 m tall, dioecious. Branchlets pilose. Stipules minute; petiole 3.5–6 cm, with 2 glands; leaf blade oblong or oblong-lanceolate, 15–20 × 5–8 cm, thickly papery, base cuneate, crenate apex acuminate, glabrous. Male inflorescences 6–7 cm. Male flowers 1–3 per bract; pedicel ca. 3 mm; sepals 3(or 4), ca. 2.5 mm; stamens ca. 30; interstaminal glands ca. 0.5 mm. Female inflorescences 1.5–3 cm; bracts ovate, minute. Female flowers 1(or 2) per bract; pedicel 1–2 mm; sepals 3, subtriangular, ca. 1 mm; disk glands 3, rounded; ovary glabrous; styles 3, ca. 2 mm, base connate, papillose. Capsule 3-lobed, ca. 7 mm in diam. Seeds globose, ca. 3 mm. Fl. and fr. Apr–Dec.

Hills, seashores, thickets; below 100 m. Taiwan [Malaysia (Sabah), Philippines].

**3. *Claoxylon indicum*** (Reinwardt ex Blume) Hasskarl, Cat. Hort. Bot. Bogor. 235. 1844.

白桐树 bai tong shu

*Erytrochilus indicus* Reinwardt ex Blume, Bijdr. 615. 1826; *Claoxylon parviflorum* Hooker & Arnott (1837), not A. Jussieu (1824).

Shrubs or small trees, 3–12 m tall, dioecious. Branchlets gray tomentulose. Petiole 5–15 cm, with 2 glands; leaf blade ovate to broadly ovate, 10–22 × 6–13 cm, papery, both surfaces pilose, base cuneate to obtuse or slightly oblique, margin crenulate or dentate, apex acute or obtuse. Male inflorescences 10–30 cm, tomentulose; bracts triangular, ca. 2 mm. Male flowers 3–7 per bract; pedicel ca. 4 mm; sepals 3 or 4, ca. 3 mm, pilose; stamens 15–25; interstaminal glands ca. 0.5 mm. Female inflorescences 5–20 cm. Female flowers often 1 per bract; sepals 3, subtriangular, tomentulose; disk 3-lobed or sinuous; ovary globose, tomentose; styles 3, ca. 2 mm, plumose. Capsule 3-lobed, 7–8 mm in diam., tomentulose, sutures raised. Seeds subglobose; testa red. Fl. and fr. Mar–Dec.

Plains, mountain valleys, forests, scrub; below 100–500(–1500) m. Guangdong, Guangxi, Hainan, S Yunnan [India, Indonesia, Malaysia, New Guinea, Thailand, Vietnam].

Merrill incorrectly interpreted *Croton polot* N. L. Burman as this species and introduced the name *Claoxylon polot* (N. L. Burman) Merrill.

**4. *Claoxylon longifolium*** (Blume) Endlicher ex Hasskarl, Cat. Hort. Bot. Bogor. 235. 1844.

长叶白桐树 chang ye bai tong shu

*Erytrochilus longifolius* Blume, Bijdr. 616. 1826.

Shrubs or small trees, 2–7 m tall, dioecious. Branchlets gray puberulent. Stipules small; petiole 5–12 cm; leaf blade ovate-oblong or broadly lanceolate, 17–40 × 6–15 cm, membranous, glabrous or abaxially pilose, base cuneate, margin serrulate, apex abruptly acuminate. Male inflorescences 15–22 cm, puberulent; bracts triangular, ca. 1 mm. Male flowers 7–9 per bract; pedicel ca. 3 mm; sepals 3, ca. 3 mm; stamens 35–50; interstaminal glands ca. 1 mm. Female inflorescences 3.5–6 cm, puberulent; bracts triangular, ca. 1 mm. Female flowers 1 per bract; pedicel ca. 1 mm; sepals 3, ovate-triangular, ca. 1 mm, tomentulose; disk cup-shaped, sinuous or lobed; ovary tomentulose; styles 3, ca. 1 mm, papillose. Capsule 3-lobed, ca. 1.5 cm, tomentulose, sutures not conspicuously raised. Seeds globose, 6–7 mm in diam. Fl. and fr. Feb–Nov.

Valleys, river valleys, evergreen forests; 200–1000 m. S Yunnan [Cambodia, NE India, Indonesia, Laos, Malaysia, New Guinea, Thailand, Vietnam].

**5. *Claoxylon khasianum*** J. D. Hooker, Fl. Brit. India 5: 411. 1887.

膜叶白桐树 mo ye bai tong shu

Shrubs or small trees, 3–5 m tall, dioecious. Branchlets pubescent. Stipules small; petiole 3.5–7 cm; leaf blade ovate to elliptic, 18–30 × 6–14 cm, membranous, glabrous, base obtuse or broadly cuneate, margin sinuous or subentire, apex acuminate. Male inflorescences 10–20 cm, pubescent; bracts lanceolate, ca. 1 mm. Male flowers 3–5 per bract; pedicel ca. 1 mm; sepals 3, ca. 2 mm, pilose; stamens 35–50; interstaminal glands ca. 0.3 mm. Female inflorescences 5–10 cm, pubescent; bracts triangular, ca. 1.5 mm. Female flowers 1 per bract; sepals 3, triangular, ca. 1.2 mm, tomentulose; disk cup-shaped, sinuous; ovary tomentulose; styles 3, ca. 1 mm, plumose. Fruiting pedicel ca. 3 mm; capsule 3-lobed, ca. 1.2 cm, pilose or glabrous. Seeds globose, 6–7 mm in diam. Fl. and fr. Mar–Nov.

Valleys, river valleys, evergreen forests; 200–2000 m. S Guangxi, Yunnan [NE India, Myanmar, N Vietnam].

**6. *Claoxylon subsessiliflorum*** Croizat, J. Arnold Arbor. 23: 506. 1942.

短序白桐树 duan xu bai tong shu

Shrubs, 3–5 m tall, dioecious. Branchlets gray pilose, or glabrous. Stipules lanceolate, 4–5 mm; petiole 4–7 cm, often with 2 glands; leaf blade oblong to broadly lanceolate, 10–17 × 2–5 cm, membranous or thickly papery, adaxially pilose or subglabrous, base cuneate, margin serrulate or sinuous, apex acuminate. Male inflorescences (3–)10–12 cm, pilose; bracts subtriangular, ca. 1 mm. Male flowers 3–5 per bract; pedicel 2–2.5 mm; sepals 3, ca. 3 mm; stamens ca. 27; interstaminal glands ca. 0.5 mm. Female inflorescences 2–3 cm, pilose; peduncle ca. 1 cm. Female flowers few to 9; sepals 3, subtriangular, ca. 1 mm, pubescent; disk 3-lobed; ovary pubescent; styles 3, ca. 1 mm, papillose. Fruiting pedicels ca. 1 mm; capsule 3-lobed, ca. 8 mm, pilose, sutures not raised. Fl. May, fr. Jun–Jul.

Mountain forests; 1500–1800 m. S Yunnan [N Vietnam].

**31. MERCURIALIS** Linnaeus, Sp. Pl. 2: 1035. 1753.

山靛属 shan dian shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Herbs, mostly dioecious, monoecious in Flora area, with slender rhizomes. Leaves opposite; stipules small; leaf blade venation pinnate. Male inflorescence axillary, unbranched, flowers in clusters, usually widely spaced; pedicel very short. Male flowers: calyx lobes 3, valvate, closed in bud, membranous; petals absent; disk absent; stamens 8–20; filaments free; anthers 2-locular, anther-thecae pendulous, base distinct; pistillode absent. Female flowers axillary, solitary or in few-flowered spikes, sometimes with male flowers; sepals 3, imbricate; petals absent; disk segments 2, subulate; ovary 2-locular; styles 2, short, simple, free or basally connate, papillose. Fruit a capsule, 2-lobed. Seeds ovoid or globose, carunculate.

About eight species: Europe and Mediterranean Africa, temperate and subtropical regions in E Asia; one species in China.

**1. *Mercurialis leiocarpa*** Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(2): 145. 1845.

山靛 shan dian

*Mercurialis leiocarpa* var. *transmorrisonensis* (Hayata) H. Keng; *M. leiocarpa* var. *trichocarpa* W. T. Wang; *M. transmorrisonensis* Hayata.

Perennial herbs, 0.3–1 m tall, monoecious. Stem simple, glabrous. Stipules ca. 2.5 mm, reflexed; petiole 1.5–4.5 cm; leaf blade oblong-ovate or ovate-lanceolate, 3–13 × 2–5.5 cm, membranous, adaxially pilose, base obtuse or cuneate, margin crenate, apex acuminate. Male inflorescences unbranched, 5–12

cm, glabrous; bracts ovate, ca. 1.5 mm, widely spaced. Male flowers 5–11 per bract; pedicel ca. 0.5 mm; calyx lobes 3, ovate, ca. 2 mm; stamens 12–20; filaments ca. 2 mm. Female inflorescences unbranched, 3–9 cm. Female flowers 3–5 per bract, often together with a few male flowers; pedicel 1–2 mm; sepals 3, ovate, ca. 2 mm; disk glands 2, subulate, ca. 2 mm; ovary subglobose, abaxially 2–4-muricate or sparsely setulose; style 2, ca. 1 mm. Capsule 5–6 mm in diam., lobes abaxially 2–4-muricate or verruculose. Seeds globose, ca. 2.5 mm in diam., foveolate. Fl. Dec–Apr, fr. Apr–Jul.

Mountain slopes or valleys, forests; 300–2800 m. Anhui, N Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, NE India, Japan, Korea, Nepal, N Thailand].

**32. LASIOCOCCA** J. D. Hooker, Hooker's Icon. Pl. 16: t. 1587. 1887.

轮叶戟属 lun ye ji shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Small trees or shrubs, monoecious; indumentum of simple hairs. Leaves alternate or subwhorled; stipules small; deciduous leaf blade entire, pinnately veined. Inflorescences axillary, unisexual, male unbranched. Male flowers: calyx 3-lobed, valvate; petals absent; disk absent; stamens many; filaments united into phalanges; anthers 2-locular, subglobose, divaricate, connective arching; pistillode absent. Female flowers solitary, long pedicelled; sepals 5–7, unequal, imbricate, persistent; ovary 3-locular, muricate; styles 3, filiform, base connate, papillose. Capsule 3-locular, muricate or with dense, rigid bristles. Seeds subglobose.

Three species: disjunct distribution in China, E India, Malaysia, and N Vietnam; one species in China.

**1. *Lasiococca comberi*** Haines var. ***pseudoverticillata*** (Merrill) H. S. Kiu, Acta Phytotax. Sin. 20: 108. 1982.

轮叶戟 lun ye ji

*Mallotus pseudoverticillatus* Merrill, Lingnan Sci. J. 14: 23. 1935; *Homonoia pseudoverticillata* (Merrill) Merrill.

Trees or shrubs, 3–10 m tall. Branchlets gray-yellowish pubescent when younger; branches grayish, glabrous. Leaves alternate, opposite or subwhorled; stipules ovate, ca. 1.5 mm; petiole 2–8 mm; leaf blade oblong-obovate or elliptic, 5–17 × 2–5 cm, leathery, glabrous, base narrowly cordate, apex acuminate. Male inflorescences 2–4.5 cm, pubescent; bracts ovate,

ca. 1.5 mm. Male flowers: pedicel ca. 0.5 mm; sepals 3, ovate, 3–4 mm, glabrous; stamens many; filaments united into ca. 10 phalanges. Female flowers solitary, axillary; sepals unequal, oblong-ovate or narrowly ovate, 3–4 × 1.5–2 mm, acute or acuminate, recurved; ovary densely setose-muricate; styles 3, 2.5–3 mm, base connate, ca. 1 mm. Capsule subglobose, ca. 1.2 cm in diam., muricate. Seeds globose, ca. 6 mm, brownish, smooth. Fl. Mar–Jun, fr. Jun–Jul.

Forested slopes or valleys, rocky limestone hills; 300–1000 m. Hainan, S Yunnan [N Vietnam].

*Lasiococca comberi* var. *comberi* is distributed in India and Thailand.

**33. HOMONOIA** Loureiro, Fl. Cochinch. 2: 636. 1790.

水柳属 shui liu shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Shrubs or small trees, dioecious; indumentum of simple hairs or peltate scales. Leaves alternate; stipules 2, deciduous; venation pinnate. Inflorescences axillary, unbranched. Male flowers: calyx 3-lobed, valvate, closed in bud; petals absent; disk absent; stamens

many; filaments united into ca. 10 phalanges; anthers 2-locular, anther-thecae subglobose, divaricate, connective obscure; pistillode absent. Female flowers: sepals 5–8, imbricate, deciduous; petals absent; disk absent; ovary 3-locular; ovules 1 per locule; styles 3, simple, plumose. Capsule 3-locular, tomentose. Seeds ovoid; testa crustaceous, with thin fleshy coat.

Two species: tropical S and SE Asia; one species in China.

**1. Homonoia riparia** Loureiro, Fl. Cochinch. 2: 637. 1790.

水柳 shui liu

Shrubs, 1–3 m tall. Branchlets pubescent. Stipules subulate, 5–8 mm; petiole 5–15 mm; leaf blade linear-oblong or narrowly lanceolate, 6–20 × 1.2–2.5 cm, papery, abaxially densely scaly, pubescent, base cuneate or obtuse, margin entire or sparsely glandular-serrulate, apex acuminate. Inflorescences 5–10 cm, puberulent; bracts subovate, 1.5–2 mm. Male flowers: pedicel

ca. 0.2 mm; calyx 3-lobed, 3–4 mm, pubescent. Female flowers: sepals 5, oblong, acuminate, 1–2 mm, pubescent; ovary puberulent; style 4–7 mm, base connate. Capsule subglobose, 3–4 mm in diam., pubescent. Fl. Mar–May, fr. Apr–Jul.

Rheophytic on riverbanks, rocky and gravelly stream beds, sandbars; below 1000 m. Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**34. RICINUS** Linnaeus, Sp. Pl. 2: 1007. 1753.

蓖麻属 bi ma shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Annual herbs or herbaceous shrubs; indumentum absent; stems hollow. Leaves alternate; stipules united, deciduous, leaving circular scar around node; petiole long, apex with 2 glands, insertion peltate; leaf blade palmately lobed. Inflorescences terminal, branched or unbranched, bisexual; bracts broadly triangular, deciduous; male flowers proximal, female flowers distal. Male flowers: calyx 3–5-lobed, valvate, closed in bud; petals absent; disk absent; stamens very many; filaments united into ca. 25 phalanges; anthers 2-locular, subglobose. Female flowers: sepals 5, valvate, deciduous; petals absent; ovary 3-locular, softly spiny, sometimes tuberculate; styles 3, 2-lobed. Fruit a capsule, 3-locular, usually echinate. Seeds large, compressed-ovoid, smooth, marbled, carunculate.

One species: widely cultivated in tropical to temperate regions and frequently occurring as a ruderal weed; fossil remains suggest that it is perhaps native to NE Africa.

**1. Ricinus communis** Linnaeus, Sp. Pl. 2: 1007. 1753.

蓖麻 bi ma

Herbs erect, often single-stemmed but sometimes bushlike or treelike, 2–5(–10) m tall; younger parts glaucous, whole plant often reddish or purplish. Stipules connate, 2–3 cm; petiole 20–40 cm; leaf blade palmately 7–11-lobed, 30–50(–100) × 30–50(–100) cm, margin serrate. Inflorescence to 30 cm. Male flowers: pedicels 5–17 mm; calyx lobes 5–8 × 3–5 mm; stamens 7–8 mm. Female flowers: pedicels 5–10 mm; sepals ca. 5 mm;

styles 2–5 mm. Fruiting pedicel to 45 mm; capsule ellipsoid or ovoid, 1.5–2.5 cm, echinate, spines to ca. 5 mm, sometimes smooth. Seed 7–12 mm, grayish, silvery, or beige with darker markings; caruncle depressed-conical, 2–3 mm wide. Fl. Jun–Sep, or Jan–Dec.

Cultivated, ruderal weed, sometimes naturalized in riverbeds; below 100–500(–2300) m. Throughout China [cultivated worldwide].

The seeds yield castor oil, used medicinally and as an industrial lubricant. The seeds are highly toxic.

**35. CLADOGYNOS** Zippelius ex Spanoghe, Linnaea 15: 349. 1841.

白大风属 bai da feng shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Shrubs, monoecious; indumentum of white stellate hairs, dense. Leaves alternate; stipules small; leaf blade margin double-dentate; venation palmate. Inflorescence axillary, 1 or 2 together, bisexual, male flowers in terminal cluster, female flowers 1 or 2, proximal on inflorescence. Male flowers: calyx lobes 4, valvate; petals absent; disk absent; stamens 3–5; filaments free, upper part incurved; anthers 2-locular; pistillode columnar, small, glabrous. Female flowers larger than male; sepals 6 or 7, filiform, or somewhat leaflike, imbricate, base contracted; petals absent; disk glands alternating with sepals; ovary 3(or 4)-locular, tomentose; ovules 1 per locule; styles connate at base, upper part 3- or 4-lobed, lobes 2-lobed, filiform, papillose. Fruit a capsule, 3(or 4)-locular, stellate pubescent. Seed subglobose, marbled, smooth; aril or caruncle absent.

One species: tropical SE Asia.

**1. Cladogynos orientalis** Zippelius ex Spanoghe, Linnaea 15: 349. 1841.

白大风 bai da feng

Shrubs 0.5–2.5 m tall. Branchlets white stellate-tomentose.

Stipules lanceolate, ca. 3 mm, base with 1 gland; petiole 1.5–5 cm, white tomentose; leaf blade ovate-elliptic or long ovate, 11–18 × 5–8 cm, thickly papery, abaxially white tomentose, adaxially glabrous, base auriculate-cordate or narrowly peltate, margin repand-dentate or coarsely serrate, apex shortly acumi-

nate; palmate veins 5–7, lateral veins 4 or 5 pairs. Inflorescences ca. 2.5 cm, often once branched, tomentulose; peduncle ca. 1 cm, with 1 female flower and 1 or 2 male glomerules. Male flowers: calyx lobes 4, 1.5–2 mm, stellate pubescent; stamens 4; filament 2–3 mm; anthers ca. 0.5 mm; pistillode ca. 0.5 mm. Female flowers: pedicel ca. 1.3 cm; bracts 2, 1 leaflike, ca. 9 mm, 1 linear, ca. 4 mm, deciduous; sepals 6 or 7, linear, 6–13 × ca. 1

mm, tomentulose, margin sparsely glandular, persistent; ovary subglobose, tomentose; styles 3, ca. 7 mm. Capsule ca. 8 mm in diam., white tomentulose. Seeds ca. 5 mm in diam., marbled. Fl. and fr. Mar–Nov.

Thickets or forests on limestone; 200–500 m. E and SE Guangxi [Cambodia, Indonesia, Laos, N Malaysia, Philippines, Thailand, Vietnam].

### 36. EPIPRINUS Griffith, Notul. Pl. Asiat. 4: 487. 1854.

风轮桐属 feng lun tong shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Symphyllia* Baillon.

Trees or shrubs, monoecious; indumentum of tiny stellate hairs. Leaves alternate, sometimes grouped into whorls; stipules small; leaf blade with 2 basal glands; venation pinnate. Inflorescences terminal or subterminal, panicles of clustered spikes, large and showy, bisexual, lower bracts sterile, male flowers in distal clusters, female flowers few, solitary. Male flowers subsessile; calyx lobes 2–6, valvate; petals absent; disk absent; stamens 4–15; filaments free; anthers 2-locular, subbasifixed; pistillode columnar or turbinate. Female flowers long pedicellate; epicalyx present, lobes small, alternating with sepals, bases sometimes with 2 glands; sepals 5 or 6, valvate, sometimes accrescent; petals absent; disk absent; ovary 3-locular; styles partly connate into a column, arms spreading, 2-lobed, papillose. Fruit a capsule, 3-locular, tomentulose. Seeds subglobose, smooth, marbled; caruncle and aril absent.

About four to six species: tropical SE Asia, from Assam to Malaysia; one species in China.

**1. *Epiprinus siletianus*** (Baillon) Croizat, J. Arnold Arbor. 23: 53. 1942.

风轮桐 feng lun tong

*Symphyllia siletiana* Baillon, Étude Euphorb. 474. 1858; *Adenochlaena siletensis* (Baillon) Benth; *Epiprinus hainanensis* Croizat; *S. siletiana* var. *trichantha* Müller Argoviensis; *S. silhetense* Benth.

Trees or shrubs, 3–10 m tall. Branchlets yellowish stellate tomentose. Leaves often ± clustered in whorls; stipules lanceolate, 2–4 mm, deciduous, basal glands black; petiole 3–5 mm, hairy; leaf blade panduriform-elliptic or spatulate-lanceolate, [6–]8–24 × 2–7[–9] cm, thickly papery, glabrous, base narrowly

cordate or auriculate-cordate, margin entire or slightly repand, apex acuminate; lateral veins 9–15 pairs. Inflorescences 3–11 cm, tomentose; bracts lanceolate, 1–3 mm. Male flowers: calyx lobes 4, ca. 1 mm, glabrous; stamens 3–6; filaments ca. 2 mm; pistillode columnar, ca. 0.5 mm. Female flowers 1–3; epicalyx lobes small, triangular, sometimes with basal glands; sepals 5 or 6, lanceolate, 2.5–3 mm, stellate tomentulose, not accrescent; ovary tomentose; styles 3, ca. 3 mm. Fruiting pedicel ca. 4 mm, tomentose; capsule 1.2–1.8 cm in diam., lobes subglobose, tomentulose, valves thickly leathery. Seeds subglobose, ca. 7 mm in diam., marbled. Fl. Jan–Jun, fr. Jun–Oct.

Mountain slopes or riverbanks, forests; 100–1000 m. Hainan, S Yunnan [India (Assam), Laos, Myanmar, Thailand, Vietnam].

### 37. KOILODEPAS Hasskarl, Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch. 4: 139. 1856.

白茶树属 bai cha shu shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Calpigyne* Blume.

Shrubs or small trees, monoecious or dioecious, most parts stellate-pubescent. Leaves alternate, simple; stipules small, persistent; petiole short; leaf blade margin entire or crenate-serrulate; venation pinnate. Plants monoecious [or dioecious]. Inflorescences axillary, spikelike thyrses, rarely with a few short branches, male flowers in clusters, sparsely spaced along axis, female flowers few at base. Male flowers: calyx lobes 3 or 4, short, valvate; petals absent; disk absent; stamens 3–8(–10); filaments thick, ± triangular-ovate; anthers small, thecae indistinct, introrse; pistillode small. Female flowers: sepals 4–10, often connate into shortly lobed cup, imbricate; petals absent; disk absent; ovary [2 or]3-locular, tomentose; styles 3, connate below, 2- to many lobed, plumose. Fruiting calyx sometimes accrescent; capsule splitting into [2 or]3 2-valved cocci, stellate-pubescent. Seeds subglobose, smooth, marbled; aril or caruncle absent.

About ten species: India, Indonesia, Malaysia, Thailand, Vietnam; one species in China.

**1. *Koilodepas hainanense*** (Merrill) Airy Shaw, Kew Bull. 14: 384. 1960.

白茶树 bai cha shu

*Calpigyne hainanensis* Merrill, J. Arnold Arbor. 6: 135. 1925; *Koilodepas hainanense* (Merrill) Croizat.

Trees or shrubs, 3–15 m tall, monoecious. Branchlets gray-

yellowish stellate-tomentose. Stipules lanceolate, 5–7 mm; petiole 5–10 mm, tomentose; leaf blade elliptic or elliptic-lanceolate, 8–32 × 2–8.5 cm, thickly papery or thinly leathery, glabrous, drying dull brown, base broadly cuneate, obtuse, or slightly cordate, margin crenate-serrulate or crenate, apex acuminate. Inflorescence 4–10 cm, axis slender, tomentose; bracts broadly ovate, 1.5–2.5 mm; male glomerules well spaced, 5–11-flowered; female flowers 1–3, at base, sometimes absent. Male flowers: calyx 3- or 4-lobed, ca. 1 mm, stellate-pubescent; stamens 3–5; filaments short, base connate; pistillode globose, small. Female flowers: calyx 5- or 6-lobed, 3–4 mm, cup-shaped, lobes lanceolate or subovate, tomentose; ovary turbi-

nate, tomentose; styles ca. 2.5 mm, upper part spreading, flattened, shortly 5-lobed, plumose. Fruiting pedicel 3–4 mm, tomentose; persistent calyx membranous, ca. 1.7 cm in diam., lobes unequal, sparsely stellate-pubescent; capsule subglobose, brownish, tomentose, ca. 1.7 cm in diam. Seeds subglobose, ca. 8 mm in diam., brown marbled. Fl. Mar–Apr, fr. Apr–May.

Mountain slopes or valleys, forests, thickets, sometimes limestone hills; below 100–400 m. Hainan [N Vietnam].

The inclusion by Croizat of *Nephrostylus poilanei* Gagnepain within his concept of *Koilodepas hainanense* is not accepted.

### 38. CEPHALOMAPPA Baillon, Adansonia 11: 130. 1874.

肥牛树属 fei niu shu shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Muricococcum* Chun & F. C. How.

Trees, monoecious; indumentum with simple hairs and usually scales and stellate hairs. Leaves alternate; stipules small, soon lost; petiole base and apex swollen; leaf blade abaxially hairy or glabrous, with 1–4 glands at base, adaxially glabrous or nearly so, margin entire to crenate or dentate; venation pinnate. Inflorescences axillary, usually few branched, bisexual, male flowers in mostly terminal clusters, female flowers 1 to few at base. Male flowers: calyx lobes 2 or 3(–5), valvate; petals absent; disk absent; stamens 2–5; filaments connate at base; anthers 2-locular, dorsifixed; pistillode small, columnar. Female flowers: sepals 5 and joined, or 8 and free, imbricate, caducous; petals absent; disk absent; ovary 3- or 4-locular, ± spiny; styles terete, connate below; stigmas 3 or 4, 2- to many lobed, papillose. Fruit a capsule, deeply lobed, muricate or verrucose. Seeds subglobose, smooth, marbled; aril and caruncle absent.

About five species: tropical regions in SE Asia; one species in China.

**1. *Cephalomappa sinensis*** (Chun & F. C. How) Kostermans, Reinwardtia 5: 413. 1961.

肥牛树 fei niu shu

*Muricococcum sinense* Chun & F. C. How, Acta Phytotax. Sin. 5: 15. 1956.

Trees, to 25 m tall. Branchlets pubescent when young, glabrescent. Stipules lanceolate, 1–2 mm; petiole 3–5 mm, pubescent; leaf blade elliptic or oblong-obovate, 6–15 × 3–9 cm, leathery, base broadly cuneate, with 2 small glands, margin repand or remotely serrulate, purplish, apex acuminate; lateral veins 5 or 6 pairs. Inflorescences unbranched or with 1 or 2 short

branches, 1.5–2.5 cm; peduncle short, pubescent, with 1–3 female flowers and 1–3 9–13-flowered male glomerules. Male flowers subsessile; calyx lobes 3 or 4, ca. 3.5 mm, glabrous; stamens (3 or)4(or 8); filaments ca. 3 mm, base connate; pistillode columnar, 2-lobed. Female flowers: calyx deeply 5-lobed, ca. 2.5 mm; ovary globose, muricate; styles basally connate, upper part spreading, 2-lobed. Fruiting pedicel 2–3 mm; capsule 3-locular, ca. 1.5 cm in diam., densely prismatic muricate-echinate. Seeds subglobose, ca. 8 mm in diam., brownish marbled. Fl. Mar–Apr, fr. May–Jul.

Forests on limestone; 100–500 m. E and SE Guangxi, S Yunnan [N Vietnam].

### 39. CLEIDIOPARON Airy Shaw, Kew Bull. 19: 313. 1965.

蝴蝶果属 hu die guo shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

*Sinopimelodendron* Y. Tsiang.

Trees, monoecious; indumentum of short stellate hairs, very sparse. Leaves alternate; stipules small; petiole flat above, base and apex slightly swollen, apex usually with 2 (indistinct) glands; leaf blade entire; venation pinnate. Inflorescence terminal and subterminal, unbranched, grouped into panicles, bisexual or unisexual, male flowers distal, in 1–13-flowered glomerules widely spaced along axis, female flowers 1–6 along lower part. Male flowers: calyx lobes 3–5, valvate; petals absent; disk absent; stamens 3–5; filaments free; anthers 4-locellate, dorsifixed; pistillode columnar, small, glabrous. Female flowers: epicalyx lobes small, alternating with sepals, caducous; sepals 5–8, imbricate, persistent; petals absent; disk absent; ovary 2-locular; ovules 1 per locule; styles connate below, spreading, 3–5-lobed above, lobes 2-lobed, papillose. Fruit a drupe, 1- or 2-locular, 1- or 2-lobed; style base persistent, stellate-tomentulose. Seeds subglobose; aril and caruncle absent.

Two species: China, Myanmar, W Thailand, N Vietnam; one species in China.



**1. Cleidiocarpum cavaleriei** (H. Léveillé) Airy Shaw, Kew Bull. 19: 314. 1965.

蝴蝶果 hu die guo

*Baccaurea cavaleriei* H. Léveillé, Fl. Kouy-Tchéou, 159. 1914–1915; *Sinopimelodendron kwangsiense* Y. Tsiang.

Trees, 10–25 m tall. Branchlets sparsely minutely stellate-pubescent when young, glabrescent. Stipules subulate, 1.5–2.5 mm, sometimes glandular; petiole 1–4 cm, swollen at both ends; leaf blade elliptic, oblong-elliptic, or lanceolate, 6–22 × 1.5–6 cm, thickly papery, base cuneate, with 2 subulate stipels, ca. 0.5 mm, base drying black, apex acuminate, rarely acute. Panicles bisexual, yellowish gray tomentulose; bracts lanceolate, 2–4(–8)

mm. Male flowers: glomerules 7–13-flowered; calyx lobes (3 or)4 or 5, 1.5–2 mm; stamens (3 or)4 or 5; filaments 3–5 mm; anthers ca. 0.5 mm; pistillode columnar, ca. 1 mm. Female flowers 1–6, at base or middle of inflorescence; epicalyx lobes 5–8, lanceolate or triangular, 1–4 mm, caducous; sepals 5–8, elliptic-ovate or broadly lanceolate, 3–5 mm, tomentulose; ovary ovoid, 2-locular, often 1-locular by abortion, tomentulose; style ca. 7 mm, thick, upper part spreading, 3–5-lobed, lobes 2- or 3-lobed, papillose. Drupes obliquely ovoid or 2-lobed, 3–5 cm wide, base contracted into stipe, 0.5–1.5 cm, grayish puberulent. Seeds subglobose, ca. 2.5 cm in diam.; testa bony, thick. Fl. and fr. May–Nov.

Forests on limestone or mountain slopes or in valleys; 100–1000 m. Guangxi, S Guizhou, SE Yunnan [N Vietnam].

#### 40. ACALYPHA Linnaeus, Sp. Pl. 2: 1003. 1753.

铁苋菜属 tie xian cai shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Herbs, shrubs or trees, mostly monoecious, sometimes dioecious; indumentum of simple or sometimes gland-tipped hairs. Leaves alternate; stipules lanceolate or subulate, sometimes minute, deciduous; leaf blade simple, margins crenate or dentate, rarely subentire; venation pinnate or palmate. Inflorescences axillary or terminal, mostly unbranched, bisexual or unisexual, sexes very diversely arranged, mostly bisexual with male flowers in fascicles distally along slender axis, base with 1 to few female flowers, mostly enclosed within prominent leafy bracts. Male flowers sessile; sepals 4, valvate, membranous; petals absent; disk absent; stamens often 8; filaments free; anthers 2-locular, anther-thecae pendulous and vermiform; pistillode absent. Female flowers 1–3 per bract, often sessile; bracts often dentate or lobed, accrescent in fruit; sepals 3–5, shortly connate, imbricate; ovary (2 or)3-locular; styles mostly free, lacinate. Fruit a capsule 2- or 3-lobed, small. Seeds subglobose or ovoid, smooth; caruncle and aril absent.

About 450 species: widely distributed in tropical and subtropical regions; 18 species (seven endemic, two introduced) in China.

- 1a. Inflorescences unisexual; plants monoecious or dioecious; shrubs.
- 2a. Female spikes elongated, pendulous; bracts small, entire, ca. 1 mm; plants dioecious.
- 3a. Female bracts ovate-rhombic, 3–7 flowers in each bract; styles 5–7 mm, exserted (cultivated) ..... 13. *A. hispida*
- 3b. Female bracts ovate, solitary flower in each bract; styles 2–5 mm, less conspicuous.
- 4a. Ovary and fruit often 2-locular, styles 2, 2–3 mm ..... 14. *A. caturus*
- 4b. Ovary 3-locular, styles 3, 2.5–5 mm ..... 15. *A. suirenbiensis*
- 2b. Females spikes less than 10 cm; bracts 3–5 mm, denticulate or serrate; plants monoecious.
- 5a. Female bracts broadly ovate, ca. 5 × 8 mm, 7–11-serrate; ovary pubescent, style 6–7 mm; leaves colored, or with red or purple spots (cultivated) ..... 18. *A. wilkesiana*
- 5b. Female bracts 10-denticulate; ovary hirsute or hirtellous, style 2.5–4 mm; leaves green.
- 6a. Stipule ovate, ca. 8 mm; female bracts half-orbicular, ca. 5 mm; style ca. 4 mm ..... 16. *A. angatensis*
- 6b. Stipule lanceolate, ca. 12 mm; female bracts broadly ovate, 3–3.5 mm; style 2.5–3 mm ..... 17. *A. akoensis*
- 1b. Inflorescences usually bisexual; plants monoecious; herbs or shrubs.
- 7a. Annual herbs; inflorescences with short slender male portion.
- 8a. Inflorescences less than 1 cm, subsessile; female bracts deeply 3–5-lobed ..... 4. *A. supera*
- 8b. Inflorescences more than 1 cm; female bracts not lobed, margin crenate or denticulate.
- 9a. Inflorescences with female bracts 1 or 2(–4), ovate-cordate, 14–25 mm; allomorphic female flower absent ..... 1. *A. australis*
- 9b. Inflorescences with female bracts 3–9, less than 5 mm; allomorphic female flower usually present near apex.
- 10a. Branchlets adpressed pubescent when young; female bracts ovate-cordate, crenulate ..... 2. *A. indica*
- 10b. Branchlets pubescent and sparsely hirsute when young; female bracts fan-shaped, denticulate ..... 3. *A. lanceolata*
- 7b. Shrubs; inflorescences with longer male portion, sometimes unisexual.
- 11a. Spikes bisexual, peduncle less than 4 mm; female bracts 1–5.
- 12a. Leaf blade ovate or narrowly ovate, puberulent along veins; female bracts ca. 2 × 3 mm, margin 4- or 5-toothed; ovary hairy and sparsely shortly echinate ..... 11. *A. kerrii*
- 12b. Leaf blade rhombic or ovate-rhombic, glabrous; female bracts ca. 6 mm, ca. 11-toothed; ovary densely echinate ..... 12. *A. siamensis*

- 11b. Spikes bisexual or unisexual, peduncle more than 5 mm; female bracts usually solitary.
- 13a. Leaf apex long acuminate or caudate-acuminate; female sepals (3 or)4(or 5).
- 14a. Adult leaves pilose only along veins; female bracts cupulate, ca. 5 mm; ovary hairy; capsule pilose and scattered tuberculate ..... 5. *A. acmophylla*
- 14b. Adult leaves uniformly pilose; female bracts suborbicular, 5–7 mm; ovary hairy and shortly echinate; capsule softly many echinate, with pilose hairs, ca. 1 mm ..... 7. *A. mairei*
- 13b. Leaf apex acute or acuminate; female sepals 3.
- 15a. Stipules subulate or triangular.
- 16a. Adult leaves pilose along midvein, 3-veined, stipules subulate, 1.5–3 mm; female bracts broadly ovate, subglabrous; ovary densely setulose; capsule scattered shortly softly setose ..... 6. *A. wui*
- 16b. Adult leaves uniformly pilose, venation pinnate, stipules narrowly triangular, ca. 1 mm; female bracts suborbicular, ciliate; ovary hairy; capsule sparsely shortly echinate, pilose ..... 10. *A. hainanensis*
- 15b. Stipules lanceolate, pilose.
- 17a. Female bracts 10–12 mm, dentate, pilose ..... 8. *A. schneideriana*
- 17b. Female bracts ca. 6 mm, denticulate, glabrous ..... 9. *A. matsudae*

### 1. *Acalypha australis* Linnaeus, Sp. Pl. 2: 1004. 1753.

铁苋菜 tie xian cai

*Acalypha australis* var. *lanceolata* Hayata; *A. chinensis* Roxburgh; *A. indica* Linnaeus var. *minima* (H. Keng) S. F. Huang & T. C. Huang; *A. minima* H. Keng; *A. pauciflora* Hornemann; *Urtica gemina* Loureiro.

Annual herbs, 0.2–0.5 m tall, monoecious. Branchlets pilose. Stipules lanceolate, 1.5–2 mm; petiole 2–6 cm; leaf blade oblong-ovate, ± rhombic-ovate, or broadly lanceolate, 3–9 × 1–5 cm, membranous, abaxially pilosulose along veins, adaxially glabrous, base cuneate, rarely obtuse, crenate, apex shortly acuminate. Inflorescences axillary, rarely terminal, unbranched, 1.5–5 cm, pilosulose, bisexual; peduncle 0.5–3 cm; female bracts proximal, 1 or 2(–4), ovate, cordate, accrescent to 1.4–2.5 × 1–2 cm in fruit, pilose, margin crenate; male portion distal, short to almost capitate, slender; bracts ovate, ca. 0.5 mm. Male flowers 5–7 per bract; pedicel ca. 0.5 mm; calyx segments 4, ca. 0.5 mm; stamens (7 or)8. Female flowers 1–3 per bract, sessile; sepals 3, narrowly ovate, 0.5–1 mm, pilose; ovary pilose; styles 3, ca. 2 mm, 5–7-laciniate. Capsule 3-locular, ca. 4 mm in diam., pilose and tuberculate. Seeds subovoid, 1.5–2 mm, smooth. Fl. and fr. Apr–Dec.

Grasslands, slopes, cultivated areas; below 100–1200(–1900) m. Throughout China except Nei Mongol and Xinjiang [Japan, Korea, Laos, Philippines, E Russia, Vietnam; naturalized in N Australia and E India].

### 2. *Acalypha indica* Linnaeus, Sp. Pl. 2: 1003. 1753.

热带铁苋菜 re dai tie xian cai

Annual herbs, 0.5–1 m tall, monoecious. Branchlets adpressed pubescent. Leaves often ± apically clustered into flat rosette; stipules triangular, ca. 1 mm; petiole slender, 1.5–3.5 cm; leaf blade rhombic-ovate or subovate, 2–3.5 × 1.5–2.5 cm, membranous, pilosulose along veins, base cuneate, margin serrate, apex acute; basal veins 5. Inflorescences axillary, unbranched, 2–7 cm, pilosulose, bisexual; peduncle short; female bracts proximal, 3–7, 1- or 2-flowered, ovate-cordate, ca. 5 mm, margin crenulate, longitudinally many veined, pilose or subglabrous; distal male portion short, slender; bracts ovate-triangular or broadly triangular, ca. 0.5 mm; allomorphic female flower at apex. Male flowers 5–7 per bract; pedicel ca. 0.5 mm;

sepals 4, ovate, ca. 0.4 mm; stamens 8. Female flowers subsessile; sepals 3, triangular, ca. 0.5 mm, ciliate; ovary pilose; styles 3, 2.5–3 mm, 5-laciniate. Capsule 3-locular, ca. 2 mm in diam., pilosulose. Seeds ovoid, ca. 1.5 mm, minutely punctulate. Fl. and fr. Mar–Oct.

Grasslands, wastelands, roadsides; below 100 m. E Hainan, S Taiwan [Cambodia, India, Indonesia, Japan, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa; naturalized in tropical America].

### 3. *Acalypha lanceolata* Willdenow, Sp. Pl. 4: 524. 1805.

麻叶铁苋菜 ma ye tie xian cai

*Acalypha boehmerioides* Miquel; *A. fallax* Müller Argoviensis; *A. wightiana* Müller Argoviensis; *Urtica pilosa* Lourero (1790), not *Acalypha pilosa* Cavanilles (1800).

Annual herbs, ca. 0.5 m tall, monoecious. Young branchlets yellow-brown pubescent and sparsely hirsute. Stipules lanceolate, ca. 4 mm; petiole 2–5.5 cm, pilose; leaf blade rhombic-ovate or oblong-ovate, 4–8 × 2–4 cm, membranous, both surfaces pilose, base cuneate or broadly cuneate, margin crenate, apex acuminate; basal veins 5. Inflorescences axillary, 1–3 together, 1–2.5 cm, bisexual, pubescent; peduncle short; female bracts 3–9, 1-flowered, fan-shaped, 2.5–4 × 5–6 mm, pubescent, margin denticulate, sparsely glandular-hairy, veins parallel; distal male portion short, slender; bracts lanceolate, ca. 0.5 mm; allomorphic female flowers 1–3, at apex or middle. Male flowers 5–7 per bract; pedicel ca. 1 mm; sepals 4, ca. 0.4 mm; stamens 8. Female flowers: sepals 3, triangular, ca. 0.5 mm; ovary pilose; styles 3, ca. 2 mm, 5-laciniate. Capsule 3-locular, ca. 2.5 mm in diam., pilose. Seeds ovoid, ca. 1.8 mm, smooth. Fl. and fr. Mar–Oct.

Grasslands, roadsides, maritime areas; near sea level to 100 m. Guangdong (Nansha Qundao, Xisha Qundao) [India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand; Australia, Pacific islands].

### 4. *Acalypha supera* Forsskål, Fl. Aegypt.-Arab. 162. 1775.

裂苞铁苋菜 lie bao tie xian cai

*Acalypha brachystachya* Hornemann; *A. conferta* Roxburgh; *Nanocnide closii* H. Léveillé & Vaniot.

Annual herbs, 0.2–0.8 m tall, monoecious. Stems slender, pubescent and sparsely hairy. Stipules lanceolate, ca. 5 mm; petiole 2.5–6 cm; leaf blade ovate or rhombic-ovate, 2–5.5 × 1.5–3.5 cm, membranous, base cordate, sometimes cuneate, margin crenate, apex acute to acuminate; basal veins 3–5. Inflorescences axillary, 1–3 together, 0.5–0.9 cm, bisexual, pilosulose; peduncle almost absent; female bracts 3–5, ca. 5 mm, 3–5-lobed, middle lobes oblong, lateral lobes smaller, 1-flowered; distal male portion short to almost capitate; bracts ovate, ca. 0.2 mm; apex sometimes with allomorphic female flower. Male flowers fascicled; pedicel ca. 0.5 mm; calyx ca. 0.3 mm in diam. in bud, pilose; stamens 7 or 8. Female flowers: pedicel short; sepals 3, suboblong, ca. 0.4 mm, ciliate; ovary pilose and hirtellous; styles 3, ca. 1.5 mm, 3–5-laciniate. Capsule 3-locular, ca. 2 mm in diam., pilose and tuberculate. Seeds ovoid, ca. 1.2 mm, minutely reticulate. Fl. May–Dec.

Grasslands on mountain slopes, roadsides, streamsides, terraced fields, usually in disturbed areas; 100–1900 m. Anhui, S Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan [Bhutan, India, Indonesia, Malaysia, Nepal, Sri Lanka, Vietnam; tropical Africa].

**5. *Acalypha acmophylla*** Hemsley, J. Linn. Soc., Bot. 26: 436. 1894.

尾叶铁苋菜 wei ye tie xian cai

*Acalypha szechuanensis* Hutchinson.

Deciduous shrubs, 1–1.5 m tall. Branchlets whitish pubescent; branches slender, reddish, glabrescent. Stipules triangular, 2–2.5 mm; petiole 1–5 cm, pilose; leaf blade ovate, narrowly ovate, or rhombic-ovate, 2.5–10 × 1.5–3.5 cm, membranous, both surfaces pilose along veins, base cuneate or obtuse, margin coarsely serrate, apex acuminate or caudate-acuminate; basal veins 3. Spikes axillary, commonly bisexual, 4–6 cm; slender peduncle 3–10 mm, pilosulose; base with 1 female flower, distally with male flowers, sometimes entirely male, or shortened inflorescence with only 1 female flower; female bracts cupulate, fruiting accrescent, ca. 5 × 8 mm, 11-denticulate, pilose; male bracts subovate, ca. 1 mm, pilose. Male flowers 3–9, fascicled; pedicel ca. 1 mm; sepals 4, ovate, ca. 0.8 mm; stamens 8. Female flowers sessile; sepals (3 or)4, subovate, 1–1.2 mm, acute, puberulent; ovary hairy; styles 3, 4–5 mm, lacinate. Capsule 3-locular, ca. 3 mm in diam., pilose and scattered tuberculate. Fl. Apr–Aug.

• Mountain valleys or slopes, gullies, thickets; 100–1700 m. S Gansu, Guangxi, Guizhou, W Hubei, S Shanxi, Sichuan, C and NE Yunnan.

**6. *Acalypha wui*** H. S. Kiu, J. Trop. Subtrop. Bot. 3(4): 17. 1995.

印禅铁苋菜 yin chan tie xian cai

Shrubs, 1–2 m tall. Younger branchlets pubescent; branches elongated, brownish, glabrous. Stipules subulate, 1.5–3 mm; petiole 3–6 cm; leaf blade ovate-oblong, 9–15 × 5–8.5 cm, lightly papyraceous, both surfaces pilose along midvein, base obtuse, margin coarsely serrate, apex acuminate or acute; basal veins 3. Spike 1, rarely 2, axillary, commonly bisexual, slender, 5–14 cm, pilosulose; peduncle 5–8 mm; base with 1(or)2 female flowers, distally with male flowers, sometimes entirely male;

female bracts broadly ovate, fruiting accrescent, 6–10 × 5–12 mm, 7–9-denticulate, subglabrous; male bracts narrowly ovate, ca. 1 mm. Male flowers 7–13, fascicled or glomerate; pedicel ca. 1.5 mm; sepals 4, ovate, ca. 1 mm, acute; stamens 8. Female flowers subsessile; sepals 3, narrowly ovate, ca. 1 mm, acute, somewhat ciliate; ovary subglobose, densely setulose; styles 3, ca. 6 mm, pectinate-lacinulate. Capsule 3-locular, ca. 4 mm in diam., scattered very short softly setiform. Seeds ovoid, ca. 3 mm, grayish, smooth. Fl. Apr–Dec, fr. Jun–Dec.

• Limestone hills, forests, thickets; below 100 m. NW Guangdong, SE Guangxi.

**7. *Acalypha mairei*** (H. Léveillé) Schneider in Sargent, Pl. Wilson. 301. 1916.

毛叶铁苋菜 mao ye tie xian cai

*Morus mairei* H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 265. 1914.

Deciduous shrubs, 1–4 m tall. Branchlets yellowish tomentose or sericeous when young; branches elongated, reddish, glabrous. Stipules lanceolate, 3–6 cm, pilose, deciduous; petiole 1.5–6 cm, pilose; leaf blade ovate or broadly ovate, 3–11 × 2–7 cm, membranous, both surfaces pilose, base cuneate, margin coarsely serrate, apex acuminate; basal veins 3. Spike axillary, often unisexual, rarely bisexual, slender, 3–6 cm, pubescent, peduncle 5–7 mm; flowers entirely male, rarely base with 1 female flower; female inflorescence abbreviated, with only 1 flower, peduncle often ca. 1 mm; female bracts suborbicular, 3–4 mm, fruiting accrescent, 5–7 mm, 7–11-denticulate, pilose; male bracts loose, lanceolate, ca. 1 mm, pilose. Male flowers 7–15, fascicled or glomerate; pedicel ca. 1 mm, pilose; sepals 4, subtriangular, ca. 0.7 mm, pilose; stamens 8. Female flower subsessile; sepals 4(–5), unequal, sublanceolate, 1–1.5 mm, pilose; ovary hairy and shortly echinate; styles 3, 2.5–3.5 mm, ca. 15-pectinate-lacinulate. Capsule 3-locular, ca. 2.5 mm in diam., softly many echinate, with pilose hairs, ca. 1 mm. Seeds ovoid, ca. 2 mm. Fl. Mar–Aug, fr. Jul–Sep.

Rocky limestone hills or ravine thickets; 700–2200 m. NW Guangxi, SW Sichuan, Yunnan [N Thailand].

**8. *Acalypha schneideriana*** Pax & K. Hoffmann in Engler, Pflanzenr. 85(IV. 147. XVI): 138. 1924.

丽江铁苋菜 li jiang tie xian cai

Deciduous shrubs, 1–3 m tall. Branchlets grayish pubescent when young; branches brownish, elongated, glabrous. Stipules lanceolate, 1.5–2.5 mm, pilose; petiole 0.4–2 cm, pilose; leaf blade oblong-ovate or subelliptic, 1.5–7 × 0.7–3.5 cm, papyraceous, both surfaces pilose, or adaxially pilose along midvein, base obtuse or broadly cuneate, margin serrate, apex acuminate; basal veins 3. Spike axillary, unisexual, rarely bisexual, slender, 2.5–4 cm, puberulent, peduncle ca. 5 mm; flowers entirely male, rarely base with 1 female flower; female inflorescence shorter, with 1(or)2 female bracts, peduncle ca. 5 mm, after flowering 1.5–2.5 cm, slender, puberulent; female bracts cordate or rounded-ovate, 10–12 mm, 7–15-dentate, pilose; male bracts loose, ovate, ca. 1 mm. Male flowers 5–7, fascicled; pedicel ca. 1 mm; sepals 4, ovate, ca. 1 mm, acute, glabrous; stamens 8. Female flower subsessile; sepals 3, ovate, ca. 1 mm, acute, pu-

berulent; ovary densely hairy; styles 3, 2–3 mm, ca. 11-lacinate. Capsule 3-locular, ca. 3 mm in diam., pilose, sometimes scattered verruciform-setaceous. Seeds ovoid, ca. 2 mm, smooth. Fl. May–Aug.

• Mountain valleys or river ravines, springsides, thickets, forest margins; 1700–2800 m. SW Sichuan, NW Yunnan [?N Thailand].

**9. *Acalypha matsudae*** Hayata, Icon. Pl. Formos. 9: 100. 1920 [*“matsudai”*].

恒春铁苋菜 heng chun tie xian cai

Shrubs, ca. 3 m tall. Branches purplish, glabrescent. Stipules lanceolate, ca. 2 mm, pilose; petiole 1–2 cm, pilose; leaf blade oblong-ovate or narrowly elliptic, 5–8 × 2–4 cm, lightly papyraceous, adaxially glabrescent, abaxially pilose along veins, base broadly cuneate or obtuse, margin serrulate, apex acuminate; basal veins 3. Spike axillary, bisexual, 3–5 cm; peduncle ca. 1.5 cm; base with 1 female flower, otherwise flowers male; female bracts suborbicular, fruiting accrescent, ca. 6 × 10 mm, ca. 10-denticulate, glabrous; male bracts ovate, ca. 0.2 mm. Male flowers 5 or 6, fascicled; pedicel ca. 0.5 mm; sepals 4, subovate, ca. 0.5 mm; stamens 8. Female flower subsessile; sepals 3, subtriangular, ca. 1 mm; ovary hairy; styles 3, lacinate. Capsule 3-locular, ca. 2.5 mm in diam., pilose. Seeds ovoid, ca. 2.5 mm, smooth. Fl. Jul–Aug.

• Hills, thickets; below 100 m. S Taiwan.

**10. *Acalypha hainanensis*** Merrill & Chun, Sunyatsenia 5: 91. 1940.

海南铁苋菜 hai nan tie xian cai

Shrubs, ca. 2 m tall. Branchlets appressed puberulent when young; branches brownish, pilose. Stipules narrowly triangular; petiole 5–12 mm, appressed pilose; leaf blade elliptic or subrhombic-oblong, 3.5–7.5 × 1.5–3 cm, lightly papyraceous, both surfaces pilose, base cuneate, margin crenate, apex obtuse; venation pinnate, lateral veins ca. 5 pairs. Spike axillary, bisexual or unisexual, 5–8 cm, slender; peduncle ca. 5 mm, puberulent; base with 1 female flower, distally with male flowers or entirely male, or female inflorescence abbreviated, only 1 flower, peduncle ca. 2 mm; female bracts suborbicular, 7–8 × ca. 10 mm, 5- or 6-denticulate, ciliate; male bracts subovate, ca. 0.5 mm. Male flowers 17–21, glomerate; pedicel ca. 1 mm; sepals 4, glabrous; stamens 8. Female flower subsessile; sepals 3; ovary hairy; style 3–4 mm, lacinate. Capsule 3-locular, ca. 3 mm in diam., sparsely shortly echinate, pilose. Fl. and fr. Aug–Nov.

• Streamsides, ravine thickets; below 100 m. S Hainan.

**11. *Acalypha kerrii*** Craib, Bull. Misc. Inform. Kew 1911: 465. 1911.

卵叶铁苋菜 luan ye tie xian cai

*Acalypha gagnepainii* Merrill; *A. heterostachya* Gagnepain; *A. siamensis* Gagnepain (1924), not Oliver ex Gage (1922).

Shrubs, 1–3 m tall. Branchlets yellowish pubescent when young; branches elongated, brownish, glabrescent. Stipules lanceolate, 2–4 mm, pilose; petiole 1–6 cm, villous; leaf blade ovate or long ovate, 4–13 × 2.5–7 cm, membranous, both surfaces puberulent along veins, base obtuse or broadly cuneate, margin coarsely serrate, apex acuminate; basal veins 3. Spike slender,

axillary, bisexual or unisexual, 4–11 cm; peduncle subsessile or ca. 3 mm, pilose; female flowers 1–5 at base and male flowers distal, or all males, sometimes 1 or 2 female flowers without males; female bracts subcordiform, ca. 2 × 3 mm, 4- or 5-denticulate, pilose; male bracts scattered, ovate, ca. 0.5 mm, pilose. Male flowers glomerate; pedicel ca. 1 mm, pilose; sepals 4, ca. 1 mm; stamens 8. Female flowers subsessile; sepals (3 or)4, subtriangular, ca. 1 mm; ovary hairy, sparsely shortly echinate; style 2–2.5 mm, ca. 11-lacinate. Capsule 3-locular, 2.5–3 mm in diam., pilose and shortly softly echinate. Seeds ovoid, ca. 2 mm. Fl. Mar–Aug.

Limestone forests, thickets; 200–500 m. SW Guangxi, S Yunnan [Myanmar, Thailand, N Vietnam].

**12. *Acalypha siamensis*** Oliver ex Gage, Rec. Bot. Surv. India 9: 238. 1922.

菱叶铁苋菜 ling ye tie xian cai

*Acalypha evrardii* Gagnepain.

Shrubs, 1–2 m tall. Branchlets puberulent when young; branches glabrous. Leaves alternate or subfascicled; stipules triangular, chartaceous, 1.5–3 mm; petiole 2–8 mm, pilose; leaf blade rhombic or ovate-rhombic, 2–6 × 1–3 cm, chartaceous, glabrous, base cuneate, margin crenate, proximal half subentire, apex obtuse; venation pinnate. Spike axillary, commonly bisexual, 1.5–5 cm, slender; peduncle subsessile or ca. 2 mm, puberulent; base with 2 or 3 female flowers, distally with male flowers, sometimes entirely male; female bracts subreniform, ca. 6 mm, ca. 11-denticulate; male bracts ovate, 0.5–1 mm, pilose. Male flowers 5–9, fascicled; pedicel ca. 0.5 mm; sepals 4, ca. 0.5 mm; stamens 8. Female flowers subsessile, solitary; sepals 3, ovate, ca. 1 mm; ovary densely with echinate hairs; style 2–3 mm, 7- or 8-lacinate. Capsule 3-locular, ca. 4 mm in diam., softly echinate, ca. 2 mm. Seeds ovoid, 2.5 mm. Fl. Jun–Aug.

Dry thickets; below 100 m. Fujian (cultivated), W Hainan [Laos, Malaysia (peninsular), S Myanmar, Thailand, Vietnam].

**13. *Acalypha hispida*** N. L. Burman, Fl. Indica, 303. 1768.

红穗铁苋菜 hong sui tie xian cai

Shrubs, 1–3 m tall. Branchlets grayish tomentulose when young. Stipules triangular, 6–10 mm, pilose; petiole 4–8 cm; leaf blade broadly ovate or ovate, 8–20 × 5–14 cm, papyraceous, base broadly cuneate, obtuse, or subcordate, margin coarsely serrate, apex acuminate or acute; basal veins 3–5. Plants dioecious. Only female flowers known. Female flowers 3–7 in each bract, fascicled, subsessile; spikes 15–30 cm, axillary, pendulous; peduncle short, pubescent; bracts scattered, ovate-rhombic, ca. 1 mm, entire; sepals (3 or)4, subovate, ca. 1 mm, acute, puberulent; ovary subglobose, densely hirtellous; styles 3, 5–7 mm, lacinate, crimson or red-purple. Fl. Feb–Nov.

Cultivated in gardens; below 100–200 m. Fujian, Guangdong, S Guangxi, Hainan, Taiwan, S Yunnan [widely cultivated; origin possibly Bismarck Archipelago].

This species is cultivated as an ornamental.

**14. *Acalypha caturus*** Blume, Bijdr. 629. 1826.

尖尾铁苋菜 jian wei tie xian cai

*Acalypha grandis* Benth var. *kotoensis* (Hayata) Huru-

sawa; *A. grandis* var. *longiacuminata* (Hayata) Hurusawa; *A. kotoensis* Hayata; *A. longiacuminata* Hayata.

Small trees, ca. 4 m tall. Young branchlets grayish tomentulose. Stipules narrowly lanceolate, 4–12 mm, pilose; petiole 5–10 cm, pilose; leaf blade broadly ovate or ovate, 8–20 × 5.5–12 cm, papyraceous, abaxially tomentulose along veins, and vein axils bearded, base obtuse or subtruncate, sometimes slightly cordate, margin crenate, apex acuminate or long acuminate; basal veins 3–5. Plants dioecious, rarely monoecious. Inflorescences axillary. Male flowers glomerate; spikes 10–20 cm, pilosulose; bracts lax, ovate, ca. 0.5 mm; pedicel ca. 1 mm; sepals 4, ca. 0.3 mm; stamens 8. Female flowers 1 in each bract; spikes 10–30 cm, slender; bracts lax, ovate, ca. 1 mm, acute, pilose; sepals 3, ovate, ca. 1 mm, pilose; ovary pubescent, often bilocular; styles 2(or 3), 2–3 mm, 15–20-laciniate. Capsule 2(or 3)-locular, 3–4 mm in diam. Seeds ovoid, ca. 2 mm. Fl. year-round.

Forests; below 100–200 m. S Taiwan [Indonesia, Philippines].

**15. *Acalypha suirenbiensis*** Yamamoto, J. Soc. Trop. Agric. 5: 178. 1935.

花莲铁苋菜 hua lian tie xian cai

*Acalypha hontauyuensis* H. Keng.

Shrubs, ca. 3 m tall. Branchlets pubescent. Petiole 8–20 cm, pilose; leaf blade ovate, 10–20 × 8–15 cm, slightly papyraceous, abaxially glabrescent, vein axils bearded, base obtuse, subtruncate to subcordate, margin crenate or subentire, apex caudate-acuminate; basal veins 5. Plants dioecious. Only female flowers known. Female flowers subsessile, 1 in each bract; spikes axillary, 10–25 cm; peduncle 1–5 cm; bracts lax, ovate, ca. 1 mm, pilose; sepals 3, ovate, ca. 1 mm; ovary 3-locular, pubescent; style 2.5–5 mm, lacinate. Capsule 3-locular, ca. 4 mm in diam. Seeds ovoid, ca. 2 mm. Fl. Jul–Aug.

• Near seashores, thickets; below 100 m. Taiwan (Hualian, Lan Yu).

**16. *Acalypha angatensis*** Blanco, Fl. Filip. 750. 1837.

台湾铁苋菜 tai wan tie xian cai

*Acalypha formosana* Hayata; *A. grandis* Benth. var. *formosana* (Hayata) Hurusawa.

Shrubs, ca. 3 m tall. Branchlets hirsute. Stipules ovate, ca. 8 mm, acuminate, pubescent; petiole 8–10 cm, pilose; leaf blade broadly ovate or orbicular-ovate, 18–23 × 13–15 cm, slightly papyraceous, both surfaces sparsely hirsute, base obtuse to subcordate, margin serrulate, apex caudate-acuminate; basal veins 5. Plants monoecious. Spikes unisexual, axillary. Male flowers glomerate; inflorescences pendulous, bracts small, lax; pedicel ca. 1 mm, pilose; sepals 4, pilose; stamens 8. Female flowers solitary; inflorescences ca. 8 cm; peduncle ca. 1 cm; bracts lax,

half-orbicular, ca. 5 × 7 mm, ca. 10-denticulate, pilose; sepals 3, ca. 0.7 mm, ciliate; ovary densely hirtellous; styles 3, ca. 4 mm, lacinate. Fruit unknown. Fl. Jul–Aug.

Mountain slopes, thickets; 400–500 m. Taiwan [Philippines].

**17. *Acalypha akoensis*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 266. 1911.

屏东铁苋菜 ping dong tie xian cai

*Acalypha grandis* Benth. var. *akoensis* (Hayata) Hurusawa.

Shrubs, ca. 3 m tall. Young branchlets densely pubescent; branches reddish, glabrescent. Stipules lanceolate, ca. 12 mm, pilose; petiole 6–9 cm, densely pubescent; leaf blade ovate, 12–16 × 8–11 cm, slightly papyraceous, abaxially pilose, abaxially pubescent along veins, base subcordate to cordate, margin serrulate, apex caudate-acuminate; basal veins 5. Plants monoecious. Spikes unisexual, axillary. Male flowers glomerate; inflorescences 16–20 cm; peduncle ca. 1 cm, pubescent; bracts lax, ovate, ca. 0.7 mm, pilose; sepals 4, ca. 0.5 mm, pilose; stamens 8. Female flowers sessile, 2 in each bract; inflorescences 5–9 cm; peduncle ca. 1 cm, densely pubescent; bracts broadly ovate, 3–3.5 × ca. 5 mm, 10-denticulate, pilose; sepals 3, ovate, ca. 0.5 mm, acute, pilose; ovary hirsute; styles 3, 2.5–3 mm, 5-laciniate. Capsule 3-locular, ca. 2.5 mm in diam., pilose. Fl. Jul–Oct.

• Mountain slopes, thickets; 100–200 m. Taiwan.

**18. *Acalypha wilkesiana*** Müller Argoviensis in A. Candolle, Prodr. 15(2): 817. 1866.

红桑 hong sang

Shrubs, 1–3 m tall, monoecious. Young branchlets pubescent. Stipules narrowly triangular, ca. 8 mm; petiole 2–3 mm, pilose; leaf blade broadly ovate, 10–18 × 6–12 cm, often colored or red- or purple spotted, abaxially pilose along veins, base obtuse, margin coarsely crenate, apex acuminate; basal veins 3–5. Inflorescences axillary, unbranched, unisexual. Male flowers 9–17, glomerate; inflorescences 10–20 cm, pilose; bracts lax, ovate, ca. 1 mm; pedicel ca. 1 mm; sepals 4, ovate, ca. 0.7 mm; stamens 8. Female flowers 1(or 2) in each bract, sessile; inflorescences 5–10 cm; peduncle ca. 2 cm; bracts broadly ovate, ca. 5 × 8 mm, 7–11-serrate; sepals 3 or 4, ovate-lanceolate, 0.5–1 mm, ciliate; ovary pubescent; styles 3, 6–7 mm, 9–15-laciniate. Capsule ca. 4 mm in diam., sparsely villous. Seeds globose, ca. 2 mm in diam., smooth. Fl. year-round.

Cultivated in gardens, parks; below 200 m. Most provinces of S China [widely cultivated as an ornamental; native to Melanesia].

Some cultivars of *Acalypha wilkesiana* are recognized, most notably 'Marginata' (金边红桑 jin bian hong sang), cultivated in S China, with leaf blades ranging to ovate-rhombic, red to pink at the margin.

## 41. CNESMONE Blume, Bijdr. 630. 1826 [“*Cnesmosa*”].

粗毛藤属 cu mao teng shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Lynn J. Gillespie

*Cnesmon* Gagnepain.

Subshrubs, twining or climbing, monoecious; indumentum of simple and stinging hairs. Leaves alternate; stipules conspicuous,

persistent; leaf blade simple, palmately 3–5-veined. Inflorescences terminal or leaf-opposed, unbranched, bisexual, male flowers distal, female flowers proximal. Male flowers: calyx base somewhat hollowed with raised rim, calyx lobes 3, valvate; petals absent; disk absent; stamens 3, erect, alternate with lobes; filaments free, short and thick; connective thickened, produced into a linear, reflexed appendage, locules distinct, divergent, introrse; pistillode absent. Female flowers: sepals 3 or 6, accrescent; ovary 3-locular, strigose; ovules 1 per locule; styles 3, base connate, upper parts spreading, plumose-papillose. Fruit a capsule, 3-locular. Seeds globose; testa crustaceous, with a fleshy coat.

Eleven species: Bangladesh, Cambodia, China, NE India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam; three species (two endemic) in China.

- 1a. Female sepals 3, equal; leaf blade base rounded, margin entire or repand ..... 3. *C. hainanensis*  
 1b. Female sepals 6, unequal; leaf blade base cordate, margin serrate.  
 2a. Leaf blade broadest at or below middle, 8–15 cm; stipules 4–7 mm; larger 3 female sepals 5–7 mm ..... 1. *C. tonkinensis*  
 2b. Leaf blade broadest well below middle, 3–6 cm; stipules less than 3 mm; female sepals all less than 5 mm ..... 2. *C. mairei*

**1. *Cnesmone tonkinensis*** (Gagnepain) Croizat, J. Arnold Arbor. 22: 429. 1941.

灰岩粗毛藤 hui yan cu mao teng

*Cnesmon tonkinense* Gagnepain, Bull. Soc. Bot. France 71: 869. 1925; *Cnesmone anisosepala* (Merrill & Chun) Croizat; *Tragia anisosepala* Merrill & Chun.

Subshrubs, stem twining or climbing, 5–7 m tall, most parts densely yellow villous and with stinging hairs. Stipules broadly triangular, 4–7[–10] mm, pilose; petiole 2–7.5[–9] cm, villous; leaf blade elliptic, oblong-ovate, or narrowly ovate, 8–15 × 4–9 cm, papery or membranous, adaxially villous, abaxially tomentose, base cordate, margin coarsely irregularly serrate, apex acute or acuminate; basal veins 3, lateral veins 3–5 pairs. Racemes 2–12 cm, villous; peduncle 1–6 cm; female flowers (1 or)2(or 3), male flowers many; bracts lanceolate, 1–4 mm. Male flowers: pedicel ca. 1.5 mm; calyx globose in bud, ca. 3 mm in diam., pilose; calyx lobes 3, broadly ovate, ca. 2 mm; stamens 0.6–1 mm, locule ca. 0.5 mm. Female flowers: pedicel ca. 1 mm; sepals 6, unequal, villous, larger 3 elliptic or obovate, 5–7 × 2–3 mm, smaller 3 lanceolate or oblanceolate, 2–5 × 0.5–1 mm, sepals slightly larger in fruit; ovary densely hispid and villous; styles thick, wide-spreading, 2–3 mm, plumose and ?papillose. Capsule ca. 10 mm in diam., villous. Seeds globose, 4–4.5 mm in diam., brownish marbled. Fl. Apr–Sep, fr. May–Oct.

Mountain valleys, limestone rocks, slopes, thickets, forests; 100–600 m. SW Guangxi, Hainan [Thailand, N Vietnam].

**2. *Cnesmone mairei*** (H. Léveillé) Croizat, J. Arnold Arbor. 22: 429. 1941.

粗毛藤 cu mao teng

*Alchornea mairei* H. Léveillé, Cat. Pl. Yun-Nan. 94. 1916; *Cnesmon mairei* (H. Léveillé) Gagnepain; *Tragia mairei* (H. Léveillé) Rehder.

Subshrubs, twining or climbing, 3–5 m tall, most parts densely yellowish villous and with stinging hairs. Stipules triangular, ca. 3 mm, pilose; petiole 1–4.5 cm, villous; leaf blade broadly ovate or triangular-ovate, often shortly 3-lobed, 3–6 ×

2–4 cm, papery, villous, more densely so abaxially and on major veins, base cordate, margin irregularly serrate, apex abruptly acuminate; basal veins 3–5, lateral veins 3–5 pairs. Racemes 6–10 cm, villous; peduncle 1–5 cm; female flowers 1–3, male flowers many; bracts narrowly ovate or lanceolate, 2–3 mm. Male flowers: pedicel ca. 2 mm; calyx globose in bud, 2.5–3 mm in diam., pilose; calyx lobes 3, broadly ovate or triangular-ovate, ca. 2 mm; stamens ca. 1 mm. Female flowers subsessile; sepals 6, unequal, pubescent, larger 3 obovate, 3.5–5 × 2.5–3 mm, margin dentate, smaller 3 oblanceolate, 1–3 × 0.5–1.5 mm, slightly larger in fruit; ovary densely hispid; styles thick, wide-spreading, plumose-papillose. Capsule hispid, 4–5 × 8–9 mm. Seeds globose, ca. 4 mm in diam. Fl. Jun–Jul, fr. Jul–Aug.

- Along river valleys, thickets; 700–1000 m. Yunnan.

**3. *Cnesmone hainanensis*** (Merrill & Chun) Croizat, J. Arnold Arbor. 22: 430. 1941.

海南粗毛藤 hai nan cu mao teng

*Cnesmon hainanense* Merrill & Chun, Sunyatsenia 5: 94. 1940.

Subshrubs, climbing or twining, 2–3 m tall, grayish pubescent and with stinging hairs. Stipules triangular, 2–3.5 mm; petiole 1–2 cm, pubescent; leaf blade oblong, 3–8 × 2–4 cm, papery, abaxially tomentulose, adaxially pubescent, glabrescent, base obtuse or rounded, slightly peltate, margin entire or repand, apex acute or abruptly acuminate; basal veins 3–5, lateral veins 3 or 4 pairs. Racemes 3–5 cm, pubescent; peduncle 2–2.5 cm; female flowers 1 or 2, male flowers 7–10; bracts lanceolate, 1.5–2 mm, pilose. Male flowers: pedicel 1–2 mm; calyx ca. 2.5 mm in diam., pilose, calyx lobes ovate-triangular, ca. 2 mm; stamens ca. 1 mm. Female flowers: pedicel 2–3 mm; sepals 3, subovate, 4–5 mm, villous, enlarged to 5–6 × 4–5 mm in fruit; ovary hispid; style spreading, ca. 3 mm, plumose. Capsule oblate, ca. 4 × 8–10 mm in diam., hispid. Seeds globose, ca. 4 mm in diam., brownish marbled. Fl. Apr–Nov, fr. Jun–Dec.

- Seashores, fields, wastelands, thickets; below 100 m. S Guangdong, S Guangxi, Hainan.

**42. MEGISTOSTIGMA** J. D. Hooker, Hooker's Icon. Pl. 16: t. 1592. 1887.

大柱藤属 da zhu teng shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Lynn J. Gillespie

Subshrubs, twining, monoecious; indumentum of simple and stinging hairs. Leaves alternate; stipules conspicuous; leaf blade

simple, margin entire or denticulate; basal veins 3. Inflorescences axillary, unbranched, usually bisexual, sometimes unisexual, female flowers few, proximal, male flowers distal. Male flowers: calyx base somewhat hollowed with raised rim, lobes 3, valvate; petals absent; disk absent; stamens 3, erect, alternate with calyx lobes; filament short and thick; connective thickened, triangular-ovate, apex obtuse and apiculate, thecae divergent, introrse; pistillode absent. Female flowers: sepals (3 or)5 or 6, imbricate, accrescent; petals absent; disk absent; ovary covered with stinging hairs, 3-locular; ovules 1 per locule; styles connate into a massive subglobose or clavate column, narrowed and sometimes stalklike at base, broadly 3-lobed at apex. Fruit a capsule, depressed globose. Seeds globose, mottled.

Five species: SE Asia; two species (one endemic) in China.

- 1a. Stipules oblong, 2.5–3 mm; leaf blade broadly cordate-ovate, margin denticulate or subentire; inflorescence 3–4 cm, with 1 female flower and 4–6 male flowers ..... 1. *M. burmanicum*  
 1b. Stipules triangular-lanceolate, 7–9 mm; leaf blade elliptic or obovate, margin entire; inflorescence 5–7 cm, with 1 female flower and 5–10 male flowers ..... 2. *M. yunnanense*

**1. *Megistostigma burmanicum*** (Kurz) Airy Shaw, Kew Bull. 23: 119. 1969.

缅甸大柱藤 mian dian da zhu teng

*Tragia burmanica* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42: 244. 1873.

Subshrubs, twining, 7–10 m tall, densely white puberulent when young, glabrescent, with stinging hairs. Stipules oblong, 2.5–3 mm; petiole 5–14 cm; leaf blade broadly cordate-ovate, 10–16 × 7–14 cm, membranous, abaxially sparsely appressed pubescent, with stinging hairs, adaxially glabrescent, base deeply cordate, margin sparsely denticulate or subentire, apex abruptly acuminate; lateral veins 4 or 5 pairs. Racemes 3–4 cm, densely white puberulent, with 1 female flower and 4–6 male flowers; bracts elliptic or ovate, 2–5 mm, margin pilose. Male flowers: calyx lobes 3, triangular-ovate, 2–3.5 mm, reddish; stamens ca. 1.3 mm. Female flowers: pedicel ca. 1 mm; sepals 6, oblong-lanceolate, 7–8[–9] mm, pubescent and with stinging hairs; ovary densely hirsute; styles connate into a subglobose to clavate column, narrowed and stalklike at base, 3-lobed at apex. Fruiting peduncle 2–3 cm; bract and bracteoles persistent; persistent sepals oblong-ovate, 1.5–2.5 cm; capsule ca. 2 cm in diam., setose. Seeds globose, 6–8 mm in diam., shortly papillose-tomentulose and white marbled. Fl. and fr. Oct–Dec.

Valleys, limestone rocks, forests, thickets; 700–1000 m. S Yunnan (Cangyuan, Mengla) [N Malaysia, Myanmar, Thailand].

**2. *Megistostigma yunnanense*** Croizat, J. Arnold Arbor. 22: 426. 1941.

云南大柱藤 yun nan da zhu teng

Subshrubs, twining, 5–10 m tall, pubescent when young, glabrescent, with stinging hairs. Stipules triangular-lanceolate, 7–9 mm; petiole 3–15 cm; leaf blade ovate, elliptic, or cordate-ovate, 8–16 × 4–14 cm, membranous, abaxially pubescent along veins, adaxially sparsely appressed pubescent, base shallowly to deeply cordate, margin entire, apex abruptly acuminate; lateral veins 3 or 4 pairs. Racemes 5–7 cm, puberulent, peduncle 2–3 cm, with 1 female flower and 5–10 male flowers; bracts sublanceolate or ovate, 3–5 mm, pubescent. Male flowers: pedicel ca. 1 mm; calyx lobes 3, triangular, ca. 3 mm; stamen locules ca. 1 mm. Female flowers: pedicel ca. 1 mm; sepals 5, lanceolate-ovate, ca. 6 mm, pubescent; ovary densely white hirsute; styles connate into a clavate to subglobose column, narrowed at base, 3-lobed at apex. Fruit not known. Fl. Jun–Sep.

• Forested slopes on limestone; 1000–1300 m. S Yunnan (Jinghong, Menghai).

### 43. **PACHYSTYLIDIUM** Pax & K. Hoffmann in Engler, Pflanzenr. 68(IV. 147. IX–XI): 108. 1919.

粗柱藤属 cu zhu teng shu

Li Bingtao (李秉滔 Li Ping-tao); Lynn J. Gillespie

Subshrubs, twining or climbing, monoecious; indumentum of simple and stinging hairs. Leaves alternate; stipules conspicuous, persistent; leaf blade simple, palmately 3-veined. Inflorescences terminal or leaf-opposed, unbranched, bisexual, male flowers distal, female flowers proximal. Male flowers: calyx lobes 4(–6), valvate; petals absent; disk annular, sometimes obscure; stamens 2(or 3); anthers subsessile, inserted in shallow depression, locules distinct; pistillode absent. Female flowers: sepals 6(–8), spreading; ovary 3-locular, hispid with stinging hairs; ovules 1 per locule; styles 3, mostly connate, free part undivided, recurved. Fruit a capsule, 3-locular, with stinging hairs. Seeds globose, without caruncle.

One species: tropical regions of SE Asia, NE India.

**1. *Pachystylidium hirsutum*** (Blume) Pax & K. Hoffmann in Engler, Pflanzenr. 68(IV. 147. IX–XI): 108. 1919.

粗柱藤 cu zhu teng

*Tragia hirsuta* Blume, Bijdr. 630. 1826; *T. delphyana* Gagnepain.

Subshrubs, twining, ca. 3 m tall, hirsute, with stinging hairs. Stems slender, woody. Stipules triangular, 1.5–4 mm; petiole 0.8–4 cm; leaf blade ovate or elliptic, 5–13 × 3–10 cm, thickly papery, sparsely hirsute to glabrescent with midrib mostly hirsute, base shallowly to moderately cordate, margin serrate, apex abruptly acuminate; lateral veins 3 or 5 pairs. In-

florescence 1–8 cm, hirsute and puberulent, peduncle 0.4–3 cm, with 1–5 female flowers and many male flowers; bracts narrowly lanceolate, 1–2.2 mm. Male flowers: pedicel 1.5–2.3 mm; calyx lobes ovate, ca. 1 mm; anther locules ca. 0.5 mm. Female flowers: pedicel ca. 1 mm; sepals lanceolate, elliptic, or ovate, 1.5–2.5 mm, sparsely pubescent or glabrescent; ovary densely hirsute; styles connate into a stout-cylindric or ellipsoid column,

free style tips recurved. Fruiting pedicel 3–5 mm; fruiting sepals persistent, reflexed; capsule ca. 1 cm in diam., drying dark brown, sparsely setose. Seeds subglobose, 3–5.5 mm in diam., mottled pale brown and dark reddish brown. Fl. and fr. Aug.

Seasonally dry open scrub. Yunnan ("Lam Ko District") [Cambodia, India, Indonesia, Laos, Philippines, Thailand, Vietnam].

#### 44. DALECHAMPIA Linnaeus, Sp. Pl. 2: 1054. 1753.

黄蓉花属 huang rong hua shu

Qiu Huaxing (丘华兴 Chiu Hua-hsing, Kiu Hua-shing, Kiu Hua-xing); Michael G. Gilbert

Subshrubs, often twining or climbing, monoecious; indumentum usually with simple and stinging hairs. Leaves alternate; stipules conspicuous, persistent; leaf blade entire or 3–5-lobed or 3–5-partite, base usually stipellate; basal veins 3–7. Inflorescence axillary, long peduncled, capitate, bisexual, enclosed between 2 subopposite, often showy, involucre bracts; lower bract subtending a cyme of female flowers in a contracted cyme subtended by a lower bract and 1 or 2 fused upper bractlets, male inflorescence terminal but apparently inserted between female cymule and upper involucre bract, 3- or 8–12-flowered, surrounded by involucre of bracts; bracteoles of male flowers all or partly producing resin. Male flowers pedicellate; sepals 4 or 5 (or 6), valvate, recurved at anthesis; petals absent; disk absent; stamens (8–)10–30(–100); filaments connate; anthers 2-locular, parallel; pistillode absent. Female flowers subsessile; sepals 5–12, imbricate, usually pinnatifid, accrescent; ovary 3-locular; styles connate in a column; stigma often lobed or discoid. Fruit a capsule, 3-locular, enclosed by accrescent calyx, often setose. Seeds globose, with or without caruncle.

About 120 species: chiefly in tropical regions of the Americas, also in tropical Africa and S and SE Asia; one species in China.

##### 1. *Dalechampia bidentata* Blume, Bijdr. 632. 1826.

黄蓉花 huang rong hua

*Dalechampia bidentata* var. *yunnanensis* Pax & K. Hoffmann.

Subshrubs, climbing and twining, to 10 m tall. Stem slender, appressed puberulent when young, glabrescent. Stipules lanceolate, 4–5[–10] mm; petiole [2–]5–15 cm, minutely puberulent; leaf blade deeply 3-lobed, 6–17 × 5–15[–20] cm, lobes narrowly ovate, membranous, both surfaces puberulent along veins, base cordate, stipels ovate-lanceolate, 2–3 mm, with 2 or 3 glands at base, margin glandular-serrulate, apex acuminate. Inflorescence solitary; peduncle 4–11 cm; involucre bracts leaf-like, subequal, broadly ovate, 3-lobed, 3–5.5 × (2–)3–4 cm, yel-

lowish, irregularly lobed, minutely puberulent; lower bracteoles broadly ovate, 5–8 mm; upper bract transversely oblong; resiniferous body lamellate, ca. 2 mm high. Male flowers 7–10; pedicel 5–10 mm, sepals 4 or 5 (or 6), 2–3 mm, puberulent; staminal column ca. 2 mm; free filaments ca. 0.5 mm; anthers ca. 15, slightly longer. Female flowers: pedicels up to 1.5 mm; sepals pinnatifid, 3–4 mm, lobes 10–12 on each side, linear, 4–5 mm, setose; ovary puberulent; stylar column cylindrical, 10–13 mm; stigma lobes 3. Fruiting pedicel ca. 8 mm; fruiting sepals accrescent to 1.5–2.5 cm, very densely setose; capsule 1–1.4 cm in diam., brownish, puberulent. Seeds globose, 3–5 mm in diam., blotched white and reddish brown, without caruncle. Fl. and fr. Jun–Dec.

Forests on limestone or in mountain valleys; 400–1500 m. SW Yunnan [Indonesia, Laos, Myanmar, Thailand].

#### 45. CROTON Linnaeus, Sp. Pl. 2: 1004. 1753.

巴豆属 ba dou shu

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Tridesmis* Loureiro.

Trees or shrubs, rarely subshrubs, monoecious or more rarely dioecious; latex clear or reddish, often scanty or apparently absent; indumentum of stellate hairs and/or peltate scales. Leaves alternate, rarely opposite or nearly verticillate; stipules present or absent; petiole with or without apical paired glands; leaf blade simple, margin entire or denticulate, often with glands; venation pinnate or palmate. Inflorescences terminal or axillary, racemelike thyrses, often with proximal solitary female flowers and distal male flowers, often in clusters. Male flowers: sepals mostly 5, imbricate to valvate, free; petals 5, smaller or nearly equal to sepals; disk glandular, usually 5, and opposite sepals; stamens 10–20; filaments free, inflexed in bud; anthers muticous; pistillode absent. Female flowers: sepals 5, often narrower than in male, imbricate to reduplicate-valvate, persistent, sometimes accrescent; petals 5, smaller than in male, mostly reduced or obsolete; disk annular or dissected, receptacle often villous; ovary 3-locular; ovules 1 per locule; styles 3, longer and slender, free or nearly so, once to several times bifid. Fruit a capsule dehiscing into 3 2-valved cocci, more rarely ± indehiscent and fleshy, drupelike or berrylike. Seeds usually smooth, carunculate; testa crustaceous; endosperm copious, fleshy; cotyledon broad and flattened.

Nearly 1300 species: tropics and subtropics of the world, most numerous in the neotropics; 23 species (15 endemic) in China.



Many species are used medicinally. Several are extremely toxic. *Croton moonii* Thwaites (瘤果巴豆 liu guo ba dou), native to Sri Lanka, is cultivated for medicine in S Guangdong.

- 1a. Young branches, inflorescences, and fruits with appressed membranous peltate scales.
- 2a. Leaf blade leathery; capsule ovoid-ellipsoid or oblong, 2.5–3.5 cm ..... 1. *C. joufra*
- 2b. Leaf blade papery or thinly papery; capsule subglobose, 0.4–1 cm.
- 3a. Leaf margins serrate, both surfaces olivaceous when dry, abaxially sparsely scaly ..... 2. *C. mangelong*
- 3b. Leaf margins entire, glaucous-gray to gray-brown when dry, abaxially densely scaly.
- 4a. Leaf blade 3-veined from base, adaxially sparsely hairy; styles bifid ..... 3. *C. kongensis*
- 4b. Leaf blade pinnately veined, adaxially glabrous; styles 4–8-fid ..... 4. *C. cascarilloides*
- 1b. Young branches stellate-hairy, stellate-scaled, or subglabrous.
- 5a. Leaf blade palmately 3–5(–7)-veined.
- 6a. Leaf blade palmately (3–)5(–7)-veined.
- 7a. Leaf blade papery, abaxially glabrescent, glands at apex of petioles stalked ..... 5. *C. euryphyllus*
- 7b. Leaf blade thinly leathery, abaxially persistently densely stellate-hairy, glands sessile or stalked.
- 8a. Leaf blade rotund to broadly ovate, glabrescent adaxially, basal glands sessile; fruits sparsely stellate-pubescent ..... 6. *C. yunnanensis*
- 8b. Leaf blade ovate, rarely ovate-elliptic, sparsely stellate-pubescent adaxially, glands at apex of petioles stalked; fruits with densely waxy-yellow scurfy hairs ..... 7. *C. yanhuai*
- 6b. Leaf blade palmately 3(–5)-veined.
- 9a. Bract margins with linear-lanceolate teeth, apex of teeth with capitulate glands; styles 4-lobed ..... 8. *C. crassifolius*
- 9b. Bract margins entire; styles 2-lobed.
- 10a. Glands of leaf base or petiole apex cupular, stalked.
- 11a. Young branches, leaves, and inflorescences with purple-brown or purplish waxy stellate pubescence, older leaves glabrous ..... 9. *C. purpurascens*
- 11b. Young branches, leaves, and inflorescences with yellow-gray stellate hairs, older leaves persistently so.
- 12a. Leaf margins denticulate, leaf blade petiolar glands short and broad ..... 10. *C. lachnocarpus*
- 12b. Leaf margins double-serrate, leaf blade basal glands longer and slender ..... 11. *C. cnidophyllus*
- 10b. Glands of leaf base or petiole apex discoid, sessile.
- 13a. Shrubs scandent; young branches and older leaves hispid; petiole to 1.5 cm, apex with glands; fruits globose ..... 12. *C. caudatus*
- 13b. Shrubs or treelets; young branches sparsely stellate-hairy, older leaves glabrous; petiole 2.5–10(–14) cm; fruits ellipsoidal.
- 14a. Leaves papery, 2–7 cm wide, glands on base; male sepals glabrous at apex ..... 13. *C. tigilium*
- 14b. Leaves thinly leathery, 7–14 cm wide; glands on petiole apex; male sepals woolly ..... 14. *C. damayeshu*
- 5b. Leaf blade pinnately veined.
- 15a. Ovary and fruits glabrous; leaf blade papery, basal glands sessile and cupular ..... 15. *C. chunianus*
- 15b. Ovary and fruits with stellate hairs or stellate scale-hairs; leaf blade basal glands sessile or cupular.
- 16a. Leaf blade base or petiole apex with sessile, flat, or cupular glands.
- 17a. Inflorescences glabrous; female petals filamentous or absent.
- 18a. Leaves thinly leathery, abaxially with scurfy stellate hairs; petioles with cupular glands at apex ..... 20. *C. laniflorus*
- 18b. Leaves papery, glabrous on both surfaces, base with flat glands ..... 21. *C. dinghuensis*
- 17b. Inflorescences hairy; female petals present, oblong.
- 19a. Young branches and inflorescences with densely scurfy stellate scale-hairs; leaves glaucous-gray, base with semiorbicular glands ..... 22. *C. laevigatus*
- 19b. Young branches and inflorescences densely stellate-pubescent; leaves yellow-brown when dry, base with cupular glands ..... 23. *C. laui*
- 16b. Leaf blade base or petiole apex with stalked and cupular glands.
- 20a. Leaf blade not olivaceous-green when dry, abaxially glabrous or tomentose.
- 21a. Young branches and inflorescences with stellate scale-hairs; leaves papery, oblong-lanceolate, glabrous on both surfaces; petiole short, less than 1 cm ..... 18. *C. hancei*
- 21b. Young branches and inflorescences stellate-tomentose; leaves thickly papery, long elliptic to oblong-elliptic, tomentose abaxially; petiole 1–6 cm ..... 19. *C. merrillianus*
- 20b. Leaf blade olivaceous-green when dry, abaxially glabrous.
- 22a. Young branches sparsely stellate-hairy; leaves smaller, 3–7 cm, margin entire, base with glands; petiole less than 1 cm ..... 16. *C. howii*

22b. Young branches with appressed stellate hairs; leaves 7–14 cm, margin denticulate; petiole more than 1 cm, with glands at apex.

23a. Leaf blade base cuneate, equilateral ..... 17. *C. lauioides*

23b. Leaf blade base rounded or unequally cordate ..... *C. moonii* (see note above)

**1. *Croton joufra*** Roxburgh, Fl. Ind., ed. 1832, 3: 685. 1832.

长果巴豆 chang guo ba dou

*Croton caryocarpus* Croizat.

Trees up to 18 m tall; indumentum with stellate scales; branches rather stout. Petioles 1.5–6 cm, apex with 2 cupular glands; leaf blade oblong, elliptic, or ovate-lanceolate, 10–25 × 2.5–8 cm, leathery, quite glabrous when old, base obtuse, margin entire or remotely repand-serrate, apex acuminate; lateral veins ca. 10. Inflorescence terminal, 10–25 cm, stellate-scaly. Male flowers: sepals 5, ovate-triangular, ca. 2 mm, stellate-scaly; petals 5, ovate-triangular, ca. 2 mm, puberulent; stamens 11 or 12; filaments villous. Female flowers: pedicels shorter; sepals 5, triangular, ca. 2.5 mm; petals reduced; disk annular; ovary ovoid; styles 3, 2-partite, slender. Capsules ovoid-ellipsoid or oblong, 2.5–3.5 cm, obscurely lobed. Seeds ca. 1.2 cm. Fl. and fr. almost throughout year.

Evergreen or mixed forests; below 1000 m. SE Yunnan (Jinping) [Bangladesh, Bhutan, India, Myanmar, Vietnam].

**2. *Croton mangelong*** Y. T. Chang, Guihaia 3: 172. 1983.

曼哥龙巴豆 man ge long ba dou

?*Croton oblongifolius* Roxburgh (1832), not Delile (1812); ?*C. roxburghii* N. P. Balakrishnan (1962), not Wallich (1840).

Trees up to 10 m tall; indumentum of appressed peltate scales; branches with dense scale-glands, these gradually deciduous. Petiole 1–3.5 cm; leaf blade elliptic, 10–14 × 4–6 cm, papery, both surfaces olivaceous, only abaxial surface with sparse scales, base broadly cuneate to rounded, base of midrib with 2 abaxial discoid glands, margins glandular-serrate, apex mucronate, mucro obtuse; lateral veins 10–13. Inflorescence terminal or axillary, 15–30 cm, many flowered. Male flowers to 5 mm in diam.; sepals 5, ovate, or ovate-oblong ca. 5 mm, with dense scale-glands; petals oblong, slightly larger than sepals, densely woolly; stamens 10–15, 2–3 × as long as sepals. Female flowers: sepals 5, long triangular, ca. 2 mm; petals 5, linear-oblong, ca. 2 mm; ovary ovoid, puberulent; styles 3, bifid almost to base and spreading. Capsules subglobose, ca. 1 × 0.9 cm. Fl. Jan–Mar, fr. Jul–Oct.

• Dense forests; 500–600 m. S Yunnan (Gengma) [see comment below].

*Croton mangelong* is very closely related to, possibly conspecific with, the widespread species currently known as *C. roxburghii* N. P. Balakrishnan, which otherwise lacks a legitimate name. If this is true it would extend the distribution of *C. mangelong* to Bangladesh, Cambodia, India, Laos, Myanmar, Thailand, and Vietnam.

There has been confusion with *Croton persimilis* Müller Argoviensis, a much smaller-leaved species restricted to S India and Sri Lanka, and both with species 22 of this account, *C. laevigatus*, and with *C. delpyi* Gagnepain, from Indochina, Malaysia, and Thailand, which have stellate hairs rather than the membranous scales characteristic of *C. mangelong*.

**3. *Croton kongensis*** Gagnepain, Bull. Soc. Bot. France 68: 555. 1922.

越南巴豆 yue nan ba dou

*Croton tonkinensis* Gagnepain.

Shrubs 1–5 m tall; indumentum of densely glaucous gray to grayish brown and appressed deeply fimbriate peltate scales/stellate hairs; older branches glaucous-gray, scales gradually deciduous. Petioles 1–3(–5) cm, apex with 2 cupular glands; leaf blade ovate to elliptic-lanceolate, 5–14 × 2–7 cm, papery, abaxially glaucous-gray to gray-brown, adaxially usually dark brown when dry, with smaller scale-glands, base rounded to broadly cuneate, margins entire, apex acuminate, rarely shortly acuminate; basal veins 3, lateral veins 3–5, arcuately ascending, anastomosing before margins. Inflorescence terminal, 5–15 cm; bracts ovate-lanceolate, 2–3 mm. Male flowers: sepals ovate, ca. 1.5 mm, with scale-glands; petals long elliptic to linear, ca. 2 mm, margins woolly; stamens 12; filaments with woolly lower parts. Female flowers: sepals lanceolate, ca. 2.5 mm, with scales; ovary subglobose, with scale-glands; styles 2-lobed. Capsules subglobose, 4–6 mm, ovoid, ca. 3.5 mm, dark red. Fl. and fr. almost throughout year.

Open forests; near sea level to 2000 m. Hainan (near sea level to 100 m), Yunnan (700–2000 m) [Laos, Myanmar, Thailand, Vietnam].

**4. *Croton cascarilloides*** Raeuschel, Nomencl. Bot. 280. 1797.

银叶巴豆 yin ye ba dou

*Croton punctatus* Loureiro, Fl. Cochinch. 2: 581. 1790, not Jacquin (1787); *C. cascarilloides* f. *pilosus* Y. T. Chang; *C. cochinchinensis* Smith; *C. cumingii* Müller Argoviensis; *C. pierrei* Gagnepain.

Shrubs 1–2 m tall; indumentum of appressed, rounded, subhyaline, and membranous peltate scales; branches with stouter wrinkles. Leaves usually densely clustered at apex of branchlets; stipules subulate, caducous; petiole 1.5–3 cm; leaf blade lanceolate, oblanceolate, or elliptic to obovate-elliptic, 8–14(–23) × 2–5(–10) cm, thinly papery, glaucous-gray or brownish scale-glands persistent abaxially, adaxial scales deciduous, base attenuate, obtuse, or slightly cordate, with 2 discoid glands, apex acuminate, acute, rotund, or retuse; venation pinnate, lateral veins 8–12, arcuately ascending, anastomosing before margins. Inflorescence terminal, 1–4 cm, spikelike; bracts caducous. Male flowers: sepals ovate, white ciliate; petals obovate, ca. 2 mm, white-ciliate; stamens 15–20; filaments white pubescent. Female flowers: sepals and petals as in male; ovary and styles with dense scales; styles 4–8-fid, lobes filamentous. Capsules subglobose, ca. 7 mm in diam. Seeds ellipsoidal, ca. 4 mm. Fl. and fr. almost throughout year.

Seashores, stream bank thickets, sparse forests; below 500 m. Fujian (Xiamen), Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**5. *Croton euryphyllus*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 159. 1921.

石山巴豆 shi shan ba dou

*Croton caudatifolius* Handel-Mazzetti; *C. cavaleriei* Gagnepain.

Shrubs or treelets 3–6 m tall; indumentum stellate-pubescent, mostly very quickly deciduous; branches yellowish brown. Stipules linear, 7–8 mm, caducous; petiole 1.5–7 cm, apex with 2 stalked glands; leaf blade rotund to broadly ovate, 6.5–8.5 × 6–8 cm, papery, base cordate, rarely broadly cuneate, margins with scabrous, obtuse serration, sometimes interserratures with stalked glands, apex shortly acuminate or obtuse, sometimes caudate; basal veins (3–)5(–7), lateral veins 3–5 pairs, arcuately ascending, anastomosing near margins. Inflorescences to 15 cm, sometimes branching at base; bracts linear-triangular, 2–3 mm, glabrescent, caducous; pedicels 1–3 mm; buds pubescent at apex. Male flowers: sepals lanceolate, ca. 2.5 mm; petals smaller than sepals, margins woolly; stamens ca. 15, glabrous. Female flowers: sepals lanceolate, ca. 3 mm; petals small, subulate; ovary densely stellate-pubescent; styles bifid, glabrescent. Capsules subglobose, 1.2–1.5 × ca. 1.2 cm, densely stellate-pubescent. Seeds ellipsoidal, dark gray-brown. Fl. Apr–May, fr. Jun–Sep.

• Open forests; 200–2400 m. Guangxi, S Guizhou, S Sichuan, Yunnan.

**6. *Croton yunnanensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 159. 1921.

云南巴豆 yun nan ba dou

*Croton duclouxii* Gagnepain; *C. yunnanensis* var. *megadontus* W. T. Wang.

Shrubs 1–3 m tall; indumentum grayish yellow stellate-tomentose; branches subglabrous, gray-brown. Petiole 1–4 cm, densely stellate-hairy; leaf blade rotund, 5–9 × 4–7 cm, thinly leathery, abaxially densely stellate-tomentose, adaxially glabrescent, margins irregularly serrulate, base of midrib with 2 sessile cupular glands; basal veins 5. Inflorescence terminal, 10–15 cm. Male flowers: sepals elliptic, pubescent outside; petals oblong, apex woolly; stamens 12; filament bases pubescent. Female flowers: sepals ovate-lanceolate, ca. 5 × 2 mm, stellate-hairy outside, glabrous inside; petals oblong, smaller than sepals, woolly; ovary subglobose, densely stellate-hairy. Capsules ovoid-globose, 7–8 × 6–7 mm, stellate-puberulent. Seeds ellipsoidal, 5–6 × ca. 4 mm, smooth, with brown spot-stripes. Fl. Aug–Sep, fr. Sep–Oct.

• Montane scrub or sparse forests; 1000–2200 m. SW Sichuan, W Yunnan.

**7. *Croton yanhui*** Y. T. Chang, Acta Phytotax. Sin. 24: 146. 1986.

延辉巴豆 yan hui ba dou

Shrubs or treelets to 5 m tall; indumentum of dense waxy-yellow scurfy hairs; older branches glabrous. Petiole 1–2.5 cm, apex with 2 stalked glands; leaf blade ovate, rarely ovate-elliptic, 8–12 × 4.5–6.5 cm, thinly leathery, both surfaces densely stel-

late-tomentose when young, abaxially persistent, adaxially later sparsely so, base rounded, rarely broadly cuneate, margin subentire, apex acuminate; basal veins (3–)5, lateral veins 2–4, arcuately ascending, anastomosing near margins. Flowers not seen. Infructescence 3–6-fruited; persistent sepals triangular, both surfaces stellate-hairy. Fruiting pedicel 1–2 mm; capsule ellipsoidal, 1.2–1.4 × 1–1.2 cm. Seeds ellipsoidal, ca. 8 × 6 mm, smooth, with brown spot-stripes. Fr. Sep.

• Densely forested slopes; ca. 1000 m. S Yunnan (Xishuangbanna).

**8. *Croton crassifolius*** Geiseler, Croton. Monogr. 19. 1807.

鸡骨香 ji gu xiang

*Croton chinensis* Benth (1861), not Geiseler (1807); *C. kroneanus* Miquel; *C. tomentosus* (Loureiro) Müller Argovien-sis (1865), not Link (1822); *Tridesmis hispida* Loureiro (1790), not *Croton hispidus* Kunth (1817); *T. tomentosa* Loureiro.

Shrubs 20–50 cm tall; indumentum stellate-tomentose; older branches subglabrous. Stipules subulate, 2–3 mm, caducous. Petiole 2–4 cm, apex or base of midrib with 2 stalked and cupular glands; leaf blade ovate, ovate-elliptic, or oblong, 4–10 × 2–6 cm, adaxial hairs gradually deciduous, but persistent hairs rugged, base rotund to slightly cordate, margins obscurely serrulate, sometimes glandular between teeth, apex obtuse to shortly acuminate; basal veins 3(–5), lateral veins (3 or)4 or 5. Inflorescence terminal, 5–10 cm; bracts linear, 2–4 mm, margins linear-lacerate, glandular-serrate. Male flowers: sepals ca. 2.5 × 1.5 mm, stellate-tomentose outside; petals oblong, about as long as sepals, margins woolly; stamens 14–20. Female flowers: sepals as in male; ovary densely yellow-tomentose; styles 4-parted, lobes linear. Capsule subglobose, ca. 1 cm in diam. Seeds ellipsoidal, brown, ca. 5 mm. Fl. Nov–Jun, fr. Feb–Sep.

Scrubby slopes, wastelands, hillside thickets; 100–800 m. Fujian, Guangdong, Guangxi, Hainan [Laos, Myanmar, Thailand, Vietnam].

The roots are used medicinally.

**9. *Croton purpurascens*** Y. T. Chang, Acta Phytotax. Sin. 24: 144. 1986.

淡紫毛巴豆 dan zi mao ba dou

*Croton yangchunensis* H. G. Ye & N. H. Xia.

Shrubs or treelets 1–6 m tall; indumentum purple-brown or purplish waxy stellate-pubescent; branches glabrous. Petiole 1.5–5 cm, apex with 2 stalked and cupular glands; leaf blade thinly leathery, oblong-elliptic or elliptic-ovate, 5–13 × 2.5–5 cm, black when dried young, major veins sparsely stellate-pubescent when young, glabrescent, base rounded, margin entire, apex acute to acuminate; basal veins 3, lateral veins 3–5 pairs, arcuately ascending, anastomosing near margins. Inflorescence terminal, 7–20 cm, proximal 4–6 flowers female, others male. Male flowers: bud ovoid, ca. 1.5 mm in diam., apex hairy. Female flowers: sepals 5, oblong-elliptic, ca. 2.5 mm; ovary densely yellow-tomentose; styles 3, bipartite, lobes linear. Capsule subglobose, ca. 8 mm in diam., stellate-hairy. Fl. May–Jun, fr. Jul–Sep.

• Open forest margins, limestone brushwood, rocks on hills and in valleys; 300–800 m. Guangdong (Ruyuan, Yangchun, Yangshan, Yingde).

**10. *Croton lachnocarpus*** Bentham, Hooker's J. Bot. Kew Gard. Misc. 6: 5. 1854.

毛果巴豆 mao guo ba dou

*Croton kwangsiensis* Croizat; *C. lachnocarpus* var. *kwangsiensis* (Croizat) H. S. Kiu; *Mallotus yifungensis* Hu & Chen.

Shrubs 1–3 m tall; indumentum densely stellate-pubescent, older branches subglabrous. Petiole (1–)2–4(–6) cm, densely stellate-pubescent, apex or base of leaf blade with 2 stalked and cupular glands; leaf blade oblong-elliptic to elliptic-ovate, rarely oblong-lanceolate, 4–10(–13) × 1.5–4(–5) cm, papery, glabrescent or only along nerves with stellate pubescence, slightly rugged adaxially, densely stellate-pubescent abaxially, base rounded to shallowly cordate, margin obscurely serrulate, usually with stalked and cupular glands, apex obtuse or acute to acuminate; basal veins 3, lateral veins 4–6. Inflorescences 1–3, terminal, 6–15 cm; bracts subulate, ca. 1 mm. Male flowers: sepals ovate-triangular, stellate-pubescent; petals oblong; stamens 10–12. Female flowers: sepals lanceolate, 2–4 mm, stellate-pubescent; ovary yellow tomentose; styles linear, 4–6 mm, bifid. Capsules slightly oblate, 6–12 mm in diam., hairy. Seeds ellipsoidal, dark brown, smooth. Fl. Apr–May, fr. Jun–Sep.

Sparsely forested slopes, thickets; 100–900 m. Guangdong, Guangxi, Guizhou, S Hunan, Jiangxi [Laos, Myanmar, Thailand, Vietnam].

**11. *Croton cnidophyllus*** Radcliffe-Smith & Govaerts, Kew Bull. 52: 186. 1997.

荨麻叶巴豆 qian ma ye ba dou

*Croton urticifolius* Y. T. Chang & Q. H. Chen, Guihaia 3: 172. 1983, not Lamarck (1786); *C. cnidophyllus* var. *dui* (Y. T. Chang) Radcliffe-Smith & Govaerts; *C. guizhouensis* H. S. Kiu; *C. urticifolius* var. *dui* Y. T. Chang.

Shrubs 1–2 m tall; indumentum of dense, flat stellate hairs; older branches glabrous. Stipules linear, caducous; petiole 1–1.5 cm; leaf blade ovate or elliptic-ovate, rarely ovate-oblong, 3–7.5 × 1.5–3.5 cm, papery, base rounded to subcordate or caudate, base of midrib with 2 abaxial long-stalked cupular glands, margins sparsely, sometimes coarsely, double-serrate, usually with stalked glands, apex caudate-acuminate or acute; basal veins 3(–5), lateral veins 2 or 3 pairs. Inflorescence terminal, 8–14 cm; bracts subulate, ca. 1.5 mm, deciduous. Male flowers: sepals oblong, stellate-hairy; petals oblong-elliptic, margins woolly; stamens 10–12. Female flowers: sepals oblong-lanceolate, stellate-tomentose, ca. 2.5 mm; ovary densely stellate-hirsute; styles 3, bifid, lobes linear. Capsules subglobose, ca. 1 cm in diam., stellate-tomentose. Fl. Jul–Sep, fr. Sep–Nov.

• Open forests on limestone; 400–700 m. Guangxi, S Guizhou, S Yunnan (Menglian).

**12. *Croton caudatus*** Geiseler, Croton. Monogr. 73. 1807.

卵叶巴豆 luan ye ba dou

*Croton caudatus* var. *harmandii* Gagnepain; *C. caudatus* var. *malaccanus* J. D. Hooker.

Scandent shrubs 2–3 m tall; indumentum densely stellate-hirsute; branches subglabrous. Petiole 0.5–1.5 cm, apex with 2 discoid glands; leaf blade ovate, 4–6 × 3.5–4.5 cm, papery, abaxially densely stellate hairy, adaxially sparsely ruggedly stellate hairy, base broadly cuneate to rounded, often with pair of stalked glands, margins obscurely serrulate, sometimes with glands, apex acute, sometimes caudate-acuminate; basal veins 3(–5), lateral veins 3(or 4) pairs. Inflorescence terminal, 8–16 cm; bracts linear, ca. 2 mm, densely stellate-hairy. Male flowers: sepals ovate, ca. 2.5 mm, densely stellate-hairy; petals oblong, as long as sepals, margins white woolly; stamens ca. 20; filament bases densely white woolly. Female flowers: sepals ovate, ca. 3 mm, densely stellate-hairy outside; petals oblong, smaller than sepals; ovary densely hispid; styles bifid, linear. Fruits globose, ca. 1 cm in diam., densely yellow-brown stellate-hispid. Fl. May–Aug, fr. Jul–Oct.

Montane sparse forests; 500–600 m. SW Yunnan [Bangladesh, Bhutan, Brunei, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Thailand, Singapore, Sri Lanka, Vietnam; N Australia].

**13. *Croton tiglium*** Linnaeus, Sp. Pl. 2: 1004. 1753.

巴豆 ba dou

*Alchornea vaniotii* H. Léveillé; *Croton birmanicus* Müller Argoviensis; *C. himalaicus* D. G. Long; *C. xiaopadou* H. S. Kiu.

Treelets up to 7 m tall; indumentum of stellate hairs; young branches green, sparsely stellate-hairy, glabrous at maturity. Stipules subulate, 1.5–4 mm, caducous; petiole 2.5–6 cm, subglabrous; leaf blade ovate, ovate-elliptic, or ovate-lanceolate, 5–15 × 2–7 cm, papery, glabrous or glabrescent, yellowish to brownish when dry, base cuneate or broadly so, rounded, rarely slightly cordate, with discoid glands, margins serrulate or subentire, apex acute or acuminate, sometimes long acuminate or caudate-acuminate; basal veins 3(–5), lateral veins 3 or 4. Racemes terminal, 8–20 cm; bracts subulate, ca. 2 mm. Male flowers: bud subglobose, sparsely stellate-hairy or glabrescent. Female flowers: sepals oblong-lanceolate, ca. 2.5 mm, glabrescent; ovary densely stellate-hairy; styles bipartite. Capsules ellipsoidal, oblong-ovoid, or subglobose, 1–2 × 1–2 cm, sparsely stellate-hairy or glabrescent. Seeds elliptic or oblong-ovate, 8–12 × 6–7 mm, gray-brown. Fl. Jan–Jul, fr. May–Sep.

Montane sparse forests, limestone shrublands; 300–700 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Philippines, Thailand, Sri Lanka, Vietnam].

The seed oil contains croton, tiglic and crotonic acid, and crotonoside, and is very poisonous, being a drastic purgative and often causing pustular eruptions on the skin. The seeds are used to stupefy fish. The root and leaves are used as an external medicine for rheumatism and also as an insecticide.

The name "*Croton tiglium* var. *xiaopadou*" (Y. T. Chang & S. Z. Huang, Wuyi Sci. J. 2: 23. 1982) was not validly published because two gatherings were indicated as types (*Vienna Code*, Art. 37.2). The name was later validated, at species rank, by H. S. Kiu (J. Trop. Subtrop. Bot. 6: 103. 1998).

**14. *Croton damayeshu*** Y. T. Chang, Acta Phytotax. Sin. 24: 143. 1986.

大麻叶巴豆 da ma ye ba dou

Treelets to 7(–10) m tall; young branches with sparse, very quickly deciduous stellate hairs. Petiole 4–10(–14) cm, apex with 2 discoid glands; leaf blade ovate-elliptic, (10–)14–20(–30) × 7–10(–14) cm, thinly leathery, both surfaces glabrous, base broadly cuneate or rotund, apex acute to acuminate or caudate-acuminate; basal veins 3, lateral veins 4 or 5. Inflorescence terminal, erect or slightly sloping, to 15 cm, sparsely stellate-pubescent, glabrescent; bracts narrowly ovate to linear, 1–3 mm, caducous; flowers usually 3–5(–9) per bract, proximal clusters bisexual with central female flower, distal clusters all male. Male flowers: pedicels slender, 2–4 mm, glabrous; sepals 5, 1.5–2 mm, woolly at apex; petals 5, as large as sepals, glabrous outside, woolly inside; stamens numerous. Female flowers: pedicels ca. 2 mm, stellate-tomentose; sepals and petals as in male; ovary densely yellow tomentose; styles 3, bifid, lobes linear, black when dry, glabrous. Capsules ellipsoidal, ca. 2 × 1.8 cm, with sparsely appressed stellate hairs. Seeds ellipsoidal, 1.4–1.6 × ca. 1 cm, smooth. Fl. Jun–Aug, fr. Aug–Oct.

• Montane sparse forests; 1000–1800 m. S Yunnan.

**15. *Croton chunianus*** Croizat, J. Arnold Arbor. 21: 497. 1940.

光果巴豆 guang guo ba dou

Shrubs ca. 2 m tall; indumentum of flattened stellate hairs; branches glabrous at maturity. Leaves clustered toward stem apex; petiole 5–10(–25) mm, with sparse stellate hairs; leaf blade elliptic-oblong to obovate-lanceolate, 8–14 × 2–4 cm, papery, glabrous except sometimes for sparsely stellate-hairy abaxial midrib when young, base attenuate to obtuse, base of midrib with sessile cupular glands, margin entire or with obscure serration, apex acuminate; venation pinnate. Inflorescence terminal, ca. 6 cm. Male flowers: sepals elliptic, 3–4 mm, stellate-hairy outside; petals obovate, ca. 3 mm, woolly; stamens ca. 14. Female flowers: sepals ovate-elliptic, ca. 3 mm, sparsely stellate-hairy or glabrescent; ovary subglobose, ca. 3 mm in diam., glabrous; styles bipartite. Capsules subglobose, ca. 8 mm in diam., glabrous. Seeds elliptic, ca. 6 mm. Fl. Jan–Jun, fr. May–Aug.

• Dense forests; 300–600 m. Hainan (Baoting, Ledong).

**16. *Croton howii*** Merrill & Chun ex Y. T. Chang, Acta Phytotax. Sin. 27: 147. 1987.

宽昭巴豆 kuan zhao ba dou

Shrubs 1–4 m tall; indumentum sparse, of spreading stellate hairs; branches glabrous. Petiole 2–10 mm, glabrescent; leaf blade ovate-lanceolate, lanceolate, or elliptic to obovate-elliptic, 3–7 × 1–2.5 cm, papery, usually olivaceous-green when young and dry, glabrous, base broadly cuneate, base of midrib usually with stalked glands, sometimes glands obscure, margin entire, apex acute to acuminate. Inflorescence terminal, 1–3 cm; bracts ovate-lanceolate. Male flowers: sepals ovate-oblong, ca. 2 mm, only woolly at apex; petals lanceolate, 2–2.5 mm, margins woolly; stamens 8–10; filaments woolly at base. Female flowers: sepals oblong-elliptic, ca. 2 mm, sparsely stellate-hairy or gla-

brescent; ovary stellate-hairy; styles bifid at apex. Capsules subglobose, ca. 8 mm in diam. Seeds ca. 6 mm, with brownish spot-stripes. Fl. and fr. almost throughout year.

• Dense forests or shrublands; 500–700 m. Hainan.

**17. *Croton lauioides*** Radcliffe-Smith & Govaerts, Kew Bull. 52: 187. 1997.

榄绿巴豆 lan lü ba dou

*Croton olivaceus* Y. T. Chang & P. T. Li, Guihaia 8: 54. 1988, not Müller Argoviensis (1866); *C. sanyaensis* Z. L. Xu, nom. illeg. superfl.

Shrubs or treelets ca. 5 m tall; indumentum of purplish brown appressed stellate hairs; young branches glabrous. Stipules linear, caducous; petiole 1–3.5 cm, apex with 2 stalked glands; leaf blade obovate-elliptic to oblanceolate, 7–14 × 2.5–5.5 cm, papery, both surfaces stellate hairy, quickly glabrescent, olivaceous-green adaxially and glaucous abaxially when dried, base cuneate, margins serrulate, apex acute to acuminate; lateral veins 7–9, arcuately ascending, anastomosing before margins. Inflorescence terminal, 3–5 cm, stellate hairy; bracts ovate-triangular, ca. 3 mm, caducous. Male flowers: sepals sparsely stellate-hairy or glabrescent; petals small; filaments white-woolly. Female flowers 1–3 on lower part of inflorescence; sepals ovate-triangular, ca. 3 mm, sparsely and appressed stellate-hairy; ovary yellow tomentose; styles 3, bifid. Fruits not seen. Fl. Jun–Dec.

• Shrublands; 100–300 m. SW Guangdong (Yangchun), S Hainan (Sanya).

**18. *Croton hancei*** Benth, Fl. Hongk. 308. 1861.

香港巴豆 xiang gang ba dou

Shrubs or treelets, ca. 5 m tall; indumentum of appressed stellate hairs; branches glabrous. Leaves clustered at stem apex; petiole 2–5 mm, puberulent; leaf blade oblong-lanceolate, 8–18 × 2–5 cm, papery, both surfaces glabrous, base attenuate to obtuse, base of midrib usually with stalked gland, margins entire or serrulate, apex acuminate. Inflorescence terminal, ca. 3 cm; bracts small. Male flowers many per bract; bud globose, ca. 2 mm in diam.; pedicel short; sepals ovate; petals narrow and small; stamens 16; filaments woolly. Female flowers usually solitary at base of inflorescence; sepals oblong, 4–5 mm; ovary subglobose, densely pubescent; styles 3, connate to below middle, upper part bifid. Fruits not seen. Fl. Jun–Aug.

• Dense forests; 500–600 m. Guangdong, Guangxi.

**19. *Croton merrillianus*** Croizat, J. Arnold Arbor. 21: 498. 1940.

厚叶巴豆 hou ye ba dou

Shrubs 1.5–3 m tall; indumentum dense, stellate-tomentose; branches glabrescent. Leaves clustered at stem apex; stipules linear, 5–8 mm; petiole 1–6 cm; leaf blade narrowly elliptic or oblong-elliptic, 11–20(–32) × 3–6(–11) cm, thickly papery, adaxially glabrous, base rounded to slightly cordate, base of midrib with stalked glands, margin entire, revolute when dry, apex acute to acuminate; lateral veins 8–12, arcuately ascending, anastomosing before margins. Inflorescence terminal, base with

several female flowers. Male flowers: sepals ovate, ca. 2 mm, stellate-hairy outside, glabrous inside; petals oblong, glabrous outside, woolly inside; stamens ca. 16; filaments white pubescent. Female flowers: sepals elliptic, 6–7 × 2–3 mm, stellate-hairy outside, glabrous inside, accrescent to 1 cm; petals filamentous, ca. 1.2 mm; ovary subglobose, densely pubescent; styles 3, bipartite. Capsules subglobose, ca. 1 cm in diam., densely stellate-hairy. Seeds ellipsoidal, ca. 7 mm. Fl. Jan–Oct, fr. Apr–Dec.

- Dense forests; 200–700 m. W Guangxi, SW Hainan.

**20. *Croton laniflorus*** Geiseler, *Croton*. Monogr. 44. 1807.

疏齿巴豆 *shu chi ba dou*

*Croton lanatus* Loureiro, Fl. Cochinch. 2: 581. 1790, not Lamarck (1786); *C. lasianthus* Persoon, nom. illeg. superfl.; *C. limiticola* Croizat.

Shrubs ca. 1 m tall; indumentum of scurfy stellate hairs; branches glabrous, but with small convexity after hairs deciduous. Stipules subulate, 2–8 mm; petiole 0.5–4 cm, apex with 2 sessile and cupular glands; leaf blade oblong or elliptic, 10–20 × 3–10 cm, thinly leathery, adaxially glabrous, lower part attenuate to cuneate into obtuse or slightly cordate base, margins sparsely serrulate, usually with glands, apex acuminate or acute; lateral veins 9–11. Inflorescence terminal or axillary, to 7 cm. Male flowers: sepals ovate, ca. 3 × 2.5 mm, with appressed stellate hairs; petals obovate, ca. 2 mm, woolly; stamens 13–15, filaments woolly. Female flowers: sepals lanceolate, ca. 4 × 2 mm, with appressed stellate hairs; petals filamentous or absent; ovary with densely scurfy, appressed stellate hairs; styles entire or bifid. Capsules subglobose, ca. 9 mm in diam., with scurfy stellate hairs. Fl. Sep–Nov, fr. Oct–Dec.

- Dense forests; ca. 600 m. Hainan [N Vietnam].

**21. *Croton dinghuensis*** H. S. Kiu, *J. Trop. Subtrop. Bot.* 6: 101. 1998.

鼎湖巴豆 *ding hu ba dou*

Treelets 5–8 m tall; young branches sparsely white stellate-hairy. Stipules subulate, 3–5 mm, stellate-hairy; petiole 2–5 mm, glabrous; leaf blade elliptic, 9–15 × 3–6 cm, papery, both surfaces glabrous, dark brown when dry, base broadly cuneate, margins subentire or shallowly undulate, base of midvein/midrib with sessile disciform glands, apex acuminate or long acuminate; venation pinnate, lateral veins 5 or 6. Inflorescence terminal, 5 cm or more, glabrous; bracts lanceolate, ca. 1 mm, bracts with 1 female flower or 1 female and 1 male. Male flowers: pedicels ca. 2 mm; sepals oblong, ca. 1.5 mm, glabrous; petals oblong, ca. 1.3 mm, apex woolly, margins pubescent; stamens 10; filaments glabrous. Female flowers: pedicels 2–3

mm; sepals 5, lanceolate, ca. 2.5 mm, glabrous; petals absent; disk annular; ovary densely white stellate-hairy; styles 3, ca. 3 mm, bipartite, lobes linear. Capsules subglobose, ca. 1 cm in diam., brownish when dry, sparsely stellate-pubescent; sepals persistent, 3–6 mm. Seeds subellipsoid, ca. 6 mm, yellow-brown, with white spot-stripes. Fl. May–Jun, fr. Jul–Oct.

- Open or dense forests in limestone regions; below 100–250 m. Guangdong (Guangzhou, Panyu, Zhaoqing).

**22. *Croton laevigatus*** Vahl, *Symb. Bot.* 2: 97. 1791.

光叶巴豆 *guang ye ba dou*

Shrubs or trees, up to 15 m tall; indumentum with dense, appressed stellate hairs; branches glabrescent, older branches silvery gray. Leaves clustered at stem apex; stipules subulate, 2–3 mm, caducous; petiole 1–5 cm; leaf blade elliptic or oblong-elliptic to oblanceolate, 7–25 × 3–9 cm, papery, abaxially with sparse stellate hairs, glaucous-gray when dried, adaxially glabrescent, base attenuate, base of midrib with abaxial sessile semiorbicular glands, margins subentire, usually with glands, bilateral apex acuminate. Inflorescences terminally clustered, 10–30 cm, persistently hairy. Male flowers: sepals ca. 2 mm, densely and appressed stellate-hairy; petals oblong, ca. 2 mm, margins woolly; stamens 12–15. Female flowers: sepals as in male; petals small; ovary with densely appressed stellate hairs. Capsules obovoid or trigonous, ca. 10 × 8 mm, densely hairy. Fl. Oct–Dec, fr. Dec–Mar.

- Dense or open forests; below 100–600 m. Hainan.

**23. *Croton laui*** Merrill & F. P. Metcalf, *Lingnan Sci. J.* 16: 389. 1937.

海南巴豆 *hai nan ba dou*

Shrubs 1–5 m tall; young branches densely stellate-pubescent, glabrescent. Leaves clustered at stem apex; petiole 5–20 mm, stellate-pubescent to glabrous; leaf blade obovate or oblong-obovate to oblanceolate, rarely elliptic, 4–14 × 1.5–5 cm, papery, stellate-tomentose when young, glabrescent, yellow-brown when dry, base obtuse to slightly cordate, margin subentire or irregularly serrulate, apex obtuse to acute, base of midrib (or lateral veins) with abaxial sessile cupular glands. Inflorescence terminal, 2–13 cm, densely stellate-tomentose. Male flowers: sepals elliptic, ca. 2 mm; petals oblong, nearly as long as sepals, woolly; stamens 10; filaments woolly. Female flowers: sepals ca. 3 mm; ovary subglobose, densely stellate-tomentose; styles bifid to base. Capsules subglobose, ca. 9 mm in diam., sparsely stellate-pubescent. Seeds ellipsoidal, slightly flattened. Fl. Jan–May, fr. Apr–Aug.

- Open forests; 100–300 m. Hainan.

**46. HEVEA** Aublet, *Hist. Pl. Guiane* 2: 871. 1775.

橡胶树属 *xiang jiao shu shu*

Li Bingtao (李秉滔 Li Ping-tao); Gordon D. McPherson

*Caoutchoua* Gmelin; *Siphonia* Richard.

Trees, monoecious, with much milky latex. Leaves alternate, spirally arranged, or subopposite at apex of branches; stipules small, caducous; petiole long, glandular at apex; leaf blade palmately compound, usually 3-foliolate; leaflets entire, petiolulate. Inflorescence

in axils of leaves or fallen leaves, many-flowered panicles of cymes, central flower of each cyme female, others male. Male flower: bud subglobose or ovate-globose; sepals 5-dentate or 5-lobed, lobes valvate; disk small, 5-lobed or dissected, rarely indehiscent; stamens 5–10; filaments connate into column longer than anthers; anthers sessile, in 1 or 2 series. Female flowers: sepals as in male; female disk dissected or obsolete; ovary 3-celled; ovules 1 per cell; styles usually absent; stigmas stout. Capsules large, usually 3-valved; epicarp subfleshy; endocarp woody. Seeds oblong-elliptic, maculate-striate; caruncle absent; cotyledon broad and flattened.

About ten species: Amazonian South America, one species widely cultivated throughout the tropics; one species (introduced) in China.

**1. *Hevea brasiliensis*** (Willdenow ex A. Jussieu) Müller Argoviensis, *Linnaea* 34: 204. 1865.

橡胶树 xiang jiao shu

*Siphonia brasiliensis* Willdenow ex A. Jussieu, *Euphorb. Gen. t.* 12. 1824.

Large trees, up to 30 m tall, with much milky juice. Petiole 5–15 cm, apex usually with 2(–4) glands; leaflets 3, elliptic, 10–25 × 4–10 cm, both surfaces glabrous, base cuneate, margin entire, apex acute to acuminate; lateral veins 10–16, reticulate veins prominent. Panicles axillary, to 16 cm, gray-white pubescent. Male flowers: sepals ovate-lanceolate, ca. 2 mm; stamens

10, in 2 series; anthers 2-locular, longitudinally dehiscent. Female flowers: sepals as in male, but larger; ovary (2 or)3(–6)-locular; stigmas 3, sessile. Capsules ellipsoidal, 5–6 cm in diam., with 3 longitudinal grooves, apex rostrate, base retuse; epicarp thinner, with reticulate stripes; endocarp thicker, woody. Seeds ellipsoidal, gray-brownish, maculate-striate. Fl. May–Jun, fr. Aug–Sep.

Cultivated. S Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [native to Brazil; widely introduced throughout the tropics].

This species is cultivated in great numbers for the production of rubber.

## 47. ALEURITES J. R. Forster & G. Forster, *Char. Gen. Pl.* 111. 1776.

石栗属 shi li shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Camirium* Gaertner.

Evergreen trees, monoecious; indumentum of stellate hairs. Leaves alternate; stipules minute, soon lost; petiole long, 2-glandular at apex; leaf blade simple, entire or 3–5-lobed, palmately 3–5-veined. Inflorescence terminal, branched, conical, lower bracts subtending clusters of male flowers, each major axis terminated by solitary female flower; buds subglobose. Male flowers: calyx splitting irregularly into 2 or 3(or 4) valvate lobes; petals 5, white or cream; disk glands 5, thick; stamens 15–32 in 3 or 4 series, outer ones free, inner ones united into column; anthers 2-locular, basi- to dorsibasifixed, introrse; pistillode absent. Female flowers similar to male but slightly larger, pedicellate; ovary 2(or 3)-locular; ovules 1 per locule; styles bifid. Fruit a drupe, subglobose; exocarp thinly fleshy; endocarp woody, 1- or 2-seeded. Seeds compressed globose, not carunculate.

Two species: one endemic to Hawaii, the other widely distributed in tropical and subtropical regions of Asia and Oceania; one species in China.

**1. *Aleurites moluccana*** (Linnaeus) Willdenow, *Sp. Pl.* 4: 590. 1805.

石栗 shi li

*Jatropha moluccana* Linnaeus, *Sp. Pl.* 2: 1006. 1753; *Aleurites ambinux* Persoon; *A. commutata* Geiseler; *A. cordifolia* (Gaertner) Steudel; *A. javanica* Gandoger; *A. lanceolata* Blanco; *A. lobata* Blanco; *A. triloba* J. R. Forster & G. Forster; *Camirium cordifolium* Gaertner; *C. moluccanum* (Linnaeus) Kuntze; *C. oleosum* Reinwardt ex Müller Argoviensis; *Juglans comirium* Loureiro.

Evergreen trees up to 20 m tall; bark dark gray, shallowly dehiscent to nearly smooth; young branches densely gray-brown stellate-puberulent, subglabrous at maturity. Stipules minute, subulate; petiole 6–12(–22) cm, densely stellate-puberulent; leaf blade papery, ovate to elliptic-lanceolate (sometimes rounded-reniform, entire or up to 5-lobed), (7–)14–20(–24) × (4–)7–17(–20) cm, both surfaces stellate-puberulent when young, adaxially glabrescent, abaxially sparsely stellate-puberulent or glabrescent, base broadly cuneate or obtuse, rarely shallowly cordate, with 2 sessile discoid adaxial glands, margin entire or shallowly repand-dentate, apex acute to acuminate; basal veins 3–5(–7). Panicles terminal, (10–)15–20 × 10–14 cm.

Male flowers: pedicels 7–10 mm; buds ovoid, ca. 2 mm; calyx lobes ovate, 3–3.5 × 2–3 mm, apex acute, abaxially stellate-tomentose, adaxially glabrous; petals narrowly oblong-spatulate, 6–8 × ca. 2 mm, obtuse, glabrous, yellowish white; disk glands shallowly 3-lobed; stamens 15–20; inner filaments connate into hairy column, ca. 4 mm; free filaments ca. 1 mm, puberulent. Female flowers: pedicels 3–4.5 mm; buds ca. 4 mm, conical; calyx and petals as in male but petals ca. 1.5 mm wide; disk ca. 2 mm across, flat; ovary densely stellate-puberulent, 2(or 3)-locular; styles 2, short, bipartite. Drupes subglobose or slightly obliquely globose, 4–5 × 4–6 cm, shallowly 2-lobed with 4 low longitudinal ribs, 1- or 2-seeded. Seeds broadly ovoid, ca. 2.5 × 2.75 × 2.25 cm, lateral margin flattened; episperm hard, tuberculate-angular. Fl. Apr–Oct, fr. Oct–Dec.

Mixed evergreen forests, cultivated on hillsides, at roadsides, and in country villages; 100–1000 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Cambodia, India, Indonesia, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands (New Zealand, Polynesia)]; widely cultivated in the tropics].

*Aleurites moluccana*, known as the candlenut tree, is cultivated for the oil obtained from its seeds. It is also widely grown as a roadside tree. The seeds contain hydrocyanic acid and a trace of a toxalbumin.

**48. REUTEALIS** Airy Shaw, Kew Bull. 20: 394. 1967.

三籽桐属 san zi tong shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Deciduous trees. Leaves alternate, simple; petiole long; leaf blade ovate to cordate, membranous, glabrous; basal veins 5–7 and prominently 2-glandular. Plants monoecious or dioecious. Inflorescence terminal, thyrsoïd, many flowered, densely gray stellate-tomentose; bracts conspicuously cucullate, deciduous; pedicels very short. Male flowers: calyx spatulate-cupular, 2- or 3-lobed; petals 5, uniformly colored, obovate-spatulate, exterior and interior at base sericeous-pubescent; stamens 7–13, in 2 series; anthers large, elliptic, extrorse, connectives broader. Female flowers: calyx and petals as in male; ovary ovoid, 3- or 4-locular, sericeous; styles 3 or 4, bifid. Fruit a drupe, large, subglobose, 3- or 4-locular, 3- or 4-angled, 3- or 4-seeded.

Two species: China, Philippines; one species (introduced) in China.

**1. Reutealis trisperma** (Blanco) Airy Shaw, Kew Bull. 20: 395. 1967.

三籽桐 san zi tong

*Aleurites trisperma* Blanco, Fl. Filip. 755. 1837; *Camirium trispermum* (Blanco) Kuntze.

Trees to 15 m tall; trunk to 35 cm d.b.h. Petiole 14–15 cm; leaf blade ovate or ovate-cordate, 12–14 × 12–13 cm, abaxial surface with hair-tufts in many vein-axils, base usually deeply cordate with rounded lobes, sometimes rounded or obtuse on old trees, apex gland-tipped. Plants dioecious, sometimes monoecious. Male inflorescences flat-topped, with many cymelets. Male

flowers: calyx cylindrical, ca. 13 mm, 2- or 3-lobed, glabrous; petals 5, yellowish white, obovate, obovate-spatulate, or obovate-lanceolate, 8–16 × 3–5 mm; stamens 10–13, in 2 series; outer filaments free, inner ones connate at base. Female inflorescences flat-topped, racemose, or thyrsoïd. Female flowers: ovary 3-celled, ovoid-globose-trigonal, densely appressed hairy; styles bifid. Capsule depressed globose to obtusely trigonal; pericarp 4–5 × 5–6.5 cm, longitudinally 3-angular, rugose, densely velutinous-pubescent. Fl. Apr, fr. Oct.

Cultivated for oil and medicine. Guangdong, Guangxi [native to the Philippines; cultivated in Indonesia].

**49. VERNICIA** Loureiro, Fl. Cochinch. 2: 586. 1790.

油桐属 you tong shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Dryandra* Thunberg.

Trees, monoecious or dioecious; indumentum of simple or T-shaped hairs, often sparse. Leaves alternate, simple; stipules caducous; petiole long, with 2 adaxial glands at apex; leaf blade entire, palmately veined. Inflorescence terminal, much branched, thyrsoïd, cymules of bisexual inflorescences each with several male flowers and a terminal female flower; bracts inconspicuous. Male flowers: buds ovoid or subglobose; calyx ± spatulate, ± regularly 2- or 3-lobed; petals 5, white or reddish white to purple, base clawed; disk segments 5, subulate; stamens 8–12, in 2 series; outer filaments free, inner ones longer and connate at base. Female flowers: sepals and petals as in male; disk obscure or absent; ovary densely pubescent, 3(–8)-locular; ovules 1 per locule; styles 3–5, bifid. Fruit a drupe, large, subglobose, beaked at apex, indehiscent or slightly dehiscent at base, 3-seeded; exocarp crustaceous. Seed without caruncle; seed coat woody.

Three species: Myanmar to Indonesia, China, Japan; two species in China.

- 1a. Trees deciduous; inflorescences produced before new leaves, usually bisexual; glands at junction of petiole and leaf blade sessile and cushion-shaped; fruits smooth ..... 1. *V. fordii*  
 1b. Trees evergreen; inflorescences produced with new leaves, usually unisexual; glands at junction of petiole and leaf blade stalked and cupular; fruits wrinkled, longitudinally grooved, and ridged ..... 2. *V. montana*

**1. Vernicia fordii** (Hemsley) Airy Shaw, Kew Bull. 20: 394. 1966.

油桐 you tong

*Aleurites fordii* Hemsley, Hooker's Icon. Pl. 29: t. 2801, 2802. 1906.

Trees deciduous, up to 10 m tall, monoecious; bark gray, nearly smooth; branches verticillate, stout, glabrous, prominently lenticellate. Petiole as long as leaf blade, glabrescent, with 2 compressed and sessile glands; leaf blade ovate, 5–18 × 3–15 cm, puberulent when young, dark green and glabrous adaxially,

gray-green and pubescent abaxially at maturity, base truncate to shallowly cordate, margin entire, rarely shallowly 1–3-fid, apex acute; palmate veins 5(–7). Inflorescences flat-topped panicles of cymes, appearing generally before new leaves, usually bisexual; calyx ca. 10 mm, 2(or 3)-fid, densely brown puberulent outside; petals obovate, 2–3 × 1–1.5 cm, yellow at base, pink to purplish, pink-veined, base clawed, apex rounded; stamens 8–12; outer filaments free, inner filaments connate to below middle; ovary 3–5(–8)-locular, pubescent; styles 3–5(–8), bifid. Drupe subglobose, 4–6(–8) cm in diam.; exocarp smooth, not grooved, 3- or 4(–8)-seeded. Seed coat woody. Fl. Mar–Apr, fr. Aug–Nov.



Open forests; 200–1500(–2000) m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang [Vietnam; cultivated in the Old and New Worlds].

This species is usually cultivated on slopes below 800 m.

**2. Vernicia montana** Loureiro, Fl. Cochinch. 2: 586. 1790.

木油桐 mu you tong

*Aleurites cordata* Gagnepain; *A. montana* (Loureiro) Wilson; *A. vernicia* (Corrêa) Hasskarl; *Dryandra vernicia* Corrêa; *Elaeococca vernicia* (Corrêa) A. Jussieu.

Trees evergreen, up to 20 m tall, usually dioecious; bark brown; branches glabrous, with sparsely elevated lenticels. Petiole 7–17 cm, glabrous, apex with 2 stalked and cupular glands; leaf blade broadly ovate, 8–20 × 6–18 cm, pubescent on both surfaces when young, only abaxially pubescent along base of

nerves at maturity, base cordate to truncate, margin entire or 2–5-fid, apex acute to acuminate, sinus usually with cupular glands. Inflorescences produced with new leaves, usually unisexual. Male flowers: calyx ca. 10 mm, 2- or 3-fid, glabrous; petals obovate, 2–3 cm, base clawed, white or purple-red at base and with purple-red nerve-stripes; stamens 8–10; filaments hairy, outer filaments free, inner filaments connate at and below middle. Female flowers: calyx and petals as in male; ovary densely brown pubescent, 3-locular; styles 3, bipartite. Drupes ovoid, 3–5 cm in diam., longitudinally 3-angular, between angles with sparsely reticulate wrinkles, 3-seeded. Seeds compressed globose; seed coat thicker, verrucose. Fl. Apr–Jun, fr. Jul–Oct.

Open forests; below 1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Taiwan, Yunnan, Zhejiang [Myanmar, Thailand, Vietnam; cultivated in Japan].

The seeds are a source of drying oils, used in paints and varnishes.

**50. DEUTZIANTHUS** Gagnepain, Bull. Soc. Bot. France 71: 139. 1924.

东京桐属 dong jing tong shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Loerzingia* Airy Shaw.

Trees, dioecious; indumentum of stellate hairs. Leaves alternate; petiole long, with 2 apical glands; leaf blade simple; basal veins 3, lateral veins prominent. Inflorescences terminal, branched thyrses, female inflorescences narrow and shorter than male. Male flowers: calyx campanulate, shallowly 5-fid; petals 5, alternating with sepals, valvate; disk 5-parted; stamens 7, in 2 series; outer 5 filaments free, inner 2 usually connate to below middle; rudimentary ovary absent. Female flowers: sepals triangular; petals as in male; disk cupular, 5-fid; ovary hairy, 3-locular; ovules 1 per locule; styles 3, partly connate. Fruit a drupe, subglobose, indehiscent; epicarp crustaceous; endocarp woody. Seeds ellipsoid; seed coat hard-crustaceous; endosperm spongy.

Two species: China, Indonesia (Sumatra), Vietnam; one species in China.

**1. Deutzianthus tonkinensis** Gagnepain, Bull. Soc. Bot. France 71: 139. 1924.

东京桐 dong jing tong

Trees up to 12 m tall; trunk to 30 cm d.b.h.; young branches densely stellate-hairy, glabrescent, with prominent leaf scars. Petiole 5–20 cm, glabrous, 2-glandular at apex; leaf blade elliptic-ovate to elliptic-rhomboid, 10–15 × 6–11 cm, abaxially glaucous-gray, glabrous except for tufted pubescent vein axils, adaxially glabrous, base cuneate or broadly cuneate to rounded, margin entire, apex acute to acuminate; lateral veins 5–7 pairs, arcuately ascending, anastomosing near margins. Inflorescence terminal, densely gray pubescent; male inflorescences ca. 15 ×

20 cm; female inflorescences ca. 10 × 12 cm, bracts persistent and nearly filamentous. Male flowers: calyx campanulate, lobes triangular, ca. 1 mm; petals oblong, ligulate, hairy on both surfaces; disk 5-parted; stamens 7; filaments hairy; anthers exerted. Female flowers: calyx and sepals as in male, calyx 2–5 mm; disk cupular, 5-fid; ovary sericeous; styles dichotomous, diverging at apex. Fruits slightly compressed globose, ca. 4 cm in diam., gray pubescent; exocarp thickly crustaceous; endocarp woody. Seeds ellipsoid, ca. 2.5 × 1.8 cm; seed coat smooth, glossy. Fl. Apr–Jun, fr. Jul–Sep.

Densely forested slopes; below 900 m. SW Guangxi, S Yunnan [N Vietnam].

**51. CODIAEUM** Rumphius ex A. Jussieu, Euphorb. Gen. 33. 1824, nom. cons.

变叶木属 bian ye mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Shrubs or treelets, monoecious, rarely dioecious; indumentum when present simple; latex present, clear and nontoxic. Leaves alternate, petiolate; stipules minute, caducous, sometimes obsolete; leaf blade entire, rarely lobed; venation pinnate. Inflorescence axillary, long, unbranched, usually unisexual. Male flowers several per bract; calyx (3–)5(–6)-lobed, lobes imbricate; petals small, 5 or 6, rarely absent; disk divided into 5–15 free glands; stamens 15–100; rudimentary ovary absent. Female flowers 1 per bract; calyx 5-lobed; petals absent; disk subtire or divided; ovary 3-locular; ovules 1 per locule; styles 3, unlobed, rarely bifid. Fruit a capsule. Seeds carunculate; cotyledons broad and flat.

About 15 species: from Indonesia and Philippines to New Guinea, tropical Australia, and Pacific islands; one species (introduced) in China.

**1. *Codiaeum variegatum*** (Linnaeus) Rumphius ex A. Jussieu, Euphorb. Gen. 80, 111. 1824.

变叶木 *bian ye mu*

*Croton variegatus* Linnaeus, Sp. Pl. 2: 1199. 1753 [*“variegatum”*]; *Codiaeum variegatum* (Linnaeus) Blume; *C. variegatum* var. *pictum* (Loddiges) Müller Argoviensis; *Croton pictus* Loddiges.

Shrubs up to 3 m tall; branches glabrous, with prominent leaf scars. Petiole 0.2–2.5 cm; leaf blade very variable in shape and color, linear, linear-lanceolate, oblong, elliptic, lanceolate, ovate, spatulate, or fiddle-shaped to obovate, sometimes divided to midvein into upper and lower parts, 5–30 × (0.3–)0.5–8 cm, thinly leathery, green, purple-red, and/or yellow, sometimes

with colored spots or stripes of spots, base cuneate to obtuse, apex acute or acuminate to rounded. Inflorescences 8–30 cm. Male flowers white; pedicels delicate; petals 5, smaller than sepals; disk glands 5; stamens 20–30. Female flowers yellowish; pedicels slightly thickened; sepals ovate-triangular; disk annular; styles recurved, entire. Capsule subglobose, slightly flattened, glabrous, ca. 9 mm in diam. Seeds ca. 6 mm. Fl. Sep–Oct, fr. Nov–Dec.

Cultivated. Fujian, Guangdong, Guangxi, Hainan, Yunnan [native to Indonesia and Malaysia (peninsular) to Oceania; widely introduced].

*Codiaeum variegatum* is widely cultivated as a house plant for its very brightly colored foliage. The leaves are used as a medicine to disperse extravasated blood and as an anti-inflammatory.

## 52. *JATROPHA* Linnaeus, Sp. Pl. 2: 1006. 1753, nom. cons.

麻风树属 *ma feng shu shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Trees, shrubs, subshrubs, or herbs. Stems with laticifers, latex clear, white, or reddish; indumentum simple, sometimes glandular. Stipules persistent or deciduous, entire or setiform, or a series of stalked glands. Leaves alternate, unlobed or palmately lobed or parted, usually with glands at apex of petiole; venation palmate [or pinnate]. Flowers monoecious or dioecious in paniculate dichasia. Male flowers: sepals 5, imbricate, slightly connate at base; petals 5, imbricate, free, sometimes coherent or connate at base; disk glands 5, free or connate into ring; stamens 8–12, sometimes more, in 2–6 series; filaments at least partly connate, sometimes inner filaments connate into a column; pistillode filamentous or absent. Female flowers: sepals 5 (or 6), free, imbricate, usually persistent in fruits; disk annular, lobed, or dissected, sometimes with staminodes; ovary 2- or 3 (or 4 or 5)-locular; ovules 1 per locule; styles unlobed or bifid, sometimes dilated. Fruits capsular. Seeds carunculate; episperm crustaceous; endosperm fleshy; cotyledon broad and flat.

About 175 species: most in the tropics and subtropics of America, ca. 70 species in Africa, widely introduced elsewhere; three species (introduced) in China.

- 1a. Stipules scalelike, deciduous; inflorescences axillary, shorter than leaves; petals connate to middle, greenish yellow; leaves unlobed or shortly 3–5-lobed ..... 1. *J. curcas*  
 1b. Stipules divided into spines or setae, persistent; inflorescences terminal, longer than leaves; petals free or almost so, red; leaves shortly lobed or very deeply divided.  
 2a. Leaves peltate, entire or shortly 2–6-lobed; stipule lobes spinelike ..... 2. *J. podagrifera*  
 2b. Leaves not peltate, palmately deeply 9–11-lobed, lobes linear-lanceolate; stipule lobes divaricate, setiform ..... 3. *J. multifida*

**1. *Jatropha curcas*** Linnaeus, Sp. Pl. 2: 1006. 1753.

麻风树 *ma feng shu*

*Manihot curcas* (Linnaeus) Crantz.

Shrubs or treelets, 2–5 m tall, with watery latex; bark smooth; branches glaucous-gray, glabrous, sparsely lenticellate, pith larger. Stipules small; petioles 6–18 cm; leaf blade rotund to ovate, 7–18 × 6–16 cm, papery, nitid green and glabrous adaxially, gray-green and along nerves puberulent to glabrous abaxially, base cordate, apex acute; palmate veins 5–7. Inflorescences axillary, 6–10 cm; bracts lanceolate, 4–8 mm. Male flowers: sepals 5, ca. 4 mm, connate at base; petals oblong, green-yellow, ca. 6 mm, connate to middle, hairy inside; disk glands 5, nearly terete; stamens 10; outer 5 filaments free, inner filaments connate in lower part. Female flowers: pedicels elongate; sepals free, ca. 6 mm; petals and disk glands as in male; ovary 3-locular, glabrous; styles bifid at apex. Capsules ellipsoidal or globose, 2.5–3 cm, yellow. Seeds ellipsoidal, 1.5–2 cm, black. Fl. Sep–Oct, fr. Oct–Dec.

Cultivated for medicine. Fujian, Guangdong, Guangxi, Hainan,

Sichuan, Taiwan, Yunnan [native to tropical America; widely introduced].

*Jatropha curcas* seeds are the source of curcas oil, a very powerful purgative, also used for making candles and soap, for lighting, and as a lubricant. There is interest in the oil as a biofuel crop for areas too dry for normal crops. The bark is used as medicine for leprosy (leprosy), itchy skin, eczema, chronic ulcers, etc.

**2. *Jatropha podagrifera*** Hooker in Curtis, Bot. Mag. 74: t. 4376. 1848.

佛肚树 *fo du shu*

Erect shrubs to 2 m tall, with woody stem swollen at base or lower part; branches stout and short, fleshy, sparsely lenticellate. Stipules spiniform, persistent leaf scar large and prominent; petiole 8–10 cm, glabrous; leaf blade peltate, rotund to elliptic, 8–18(–25) × 6–16 cm, nitid green adaxially, gray-green abaxially, glabrous on both surfaces, base truncate or obtuse, margin entire or shallowly 2–6-lobed, apex obtuse; palmate veins 6–8. Inflorescences terminal, long pedunculate, branching short, red; calyx ca. 2 mm; sepals rotund, ca. 1 mm; petals obovate-oblong, ca. 6 mm, red; stamens 6–8, connate at base; anthers nearly as

long as filaments; ovary glabrous; styles 3, connate at base, bifid at apex. Capsules ellipsoidal, 1.3–1.8 × ca. 1.5 cm, with 3 longitudinal grooves. Seeds ca. 1.1 cm, smooth. Fl. and fr. almost throughout year.

Cultivated for medicine and ornamental purposes. Fujian, Guangdong, Guangxi, Hainan, Yunnan [native to Central America; widely introduced].

All parts are used as medicine for reduction of swelling, for pain relief, and to detoxify snakebites.

**3. *Jatropha multifida*** Linnaeus, Sp. Pl. 2: 1006. 1753.

珊瑚花 shan hu hua

Shrubs or treelets, 2–3(–6) m tall; stems glabrous. Stipules divided into forked setiform, to 2 cm; petiole 10–25 cm; leaf

blade orbicular in outline, 10–30 cm wide, green adaxially, gray-green abaxially, glabrous on both surfaces, margin palmately 9–11-lobed, lobes entire; venation pinnate. Inflorescences terminal; peduncle 13–20 cm; pedicels short; flowers dense. Male flowers: calyx 2–3 mm, lobes 5, rotund, glabrous; sepals 5, spatulate, red, ca. 4 mm; stamens 8; filaments connate at base; anthers elongate. Female flowers: calyx as in male; sepals 6–7 mm, red; ovary glabrous; styles 3, connate in lower 1/2. Capsules ellipsoidal to obovate, ca. 3 cm, glabrous. Fl. Jul–Dec, fr. Sep–Feb.

Cultivated for ornamental and medicinal purposes. Guangdong, Guangxi, Hainan, Yunnan [native to tropical and subtropical America].

The bark and leaves are used as medicine for neurodermatitis, itchy skin, and skin eczema.

**53. *BLACHIA*** Baillon, Étude Euphorb. 385. 1858, nom. cons.

留萼木属 liu e mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Shrubs, monoecious. Leaves simple, alternate, shortly petiolate; leaf blade entire, rarely divided; venation pinnate. Inflorescences terminal or axillary, male flowers in dense or lax racemelike thyrses, female flowers in umbel-like or racemelike inflorescences, sometimes 1 to several inserted at base of male inflorescences; bracts absent; pedicels delicate. Male flowers: sepals 4 or 5, imbricate; petals 4 or 5, shorter than sepals; disk glands scalelike; stamens 10–30, inserted on elevated receptacle; filaments free. Female flowers: pedicels stouter in upper part; sepals 5, accrescent or slightly so; petals absent; disk annular or divided; ovary 3- or 4-locular; ovules 1 per locule; styles 3, free, bifid. Capsule slightly depressed globose, with 3 longitudinal grooves. Seeds not strophiolate; endosperm fleshy; cotyledon broad and flat.

About ten species: tropical regions of Asia; four species in China.

- 1a. Leaf apex rounded, rarely retuse, lateral veins 3–5, divaricate near margins; capsule ca. 8 mm in diam. .... 3. *B. siamensis*  
 1b. Leaf apex acute to long acuminate, lateral veins 4–12; capsule 12–15 mm in diam.  
 2a. Leaf blade abaxially greenish when dry, margin entire or undulate, sometimes with 1 shallow lobe on one side, lateral veins sparsely pubescent ..... 4. *B. jatrophiifolia*  
 2b. Leaf blade red-brown when dry, margin entire, lateral veins glabrous.  
 3a. Male peduncle 2–8 cm; stamens ca. 15; ovary and capsule glabrous ..... 1. *B. pentzii*  
 3b. Male peduncle 1–3.5 cm; stamens ca. 24; ovary and capsule pubescent ..... 2. *B. andamanica*

**1. *Blachia pentzii*** (Müller Argoviensis) Benth, J. Linn. Soc., Bot. 17: 266. 1878.

留萼木 liu e mu

*Codiaeum pentzii* Müller Argoviensis in A. Candolle, Prodr. 15(2): 1118. 1866.

Shrubs 1–4 m tall; branches usually gray-white, with dense elevated lenticels, glabrous. Buds perulate. Petiole 0.5–2(–3) cm; leaf blade very variable in shape, ovate-lanceolate, obovate, or oblong to long lanceolate, 4–18 × 1–6 cm, papery or submembranous, both surfaces glabrous, base attenuate, broadly cuneate, or obtuse, margin entire, apex acute to long acuminate; lateral veins 6–12. Plants monoecious. Male inflorescence racemose, peduncle 2–8 cm, rachis much shorter; female inflorescence umbel-like, sometimes from base of male peduncle, peduncle 1–2 cm. Male flowers often in pairs; pedicel 8–20 mm; sepals rotund, ca. 2 mm; petals broadly obovate, apex truncate or retuse, 1–2 mm, yellow; disk glands broad and flat; stamens ca. 15. Female flowers: pedicels 5–10 mm; sepals ovate to ovate-lanceolate, 2–3 mm, accrescent, clavate; disk glands 4 or 5;

ovary globose, glabrous; styles 3, bipartite, lobes linear. Capsule subglobose, slightly depressed, ca. 1.5 cm in diam., glabrous. Seeds ovoid to broadly ellipsoidal, ca. 5.5 × 4.5 mm, black with dense paler blotches. Fl. and fr. almost throughout year.

Thickets, open riverside woodlands or valleys; 200–400 m. S Guangdong, Hainan [Vietnam].

**2. *Blachia andamanica*** (Kurz) J. D. Hooker, Fl. Brit. India 5: 403. 1887.

大果留萼木 da guo liu e mu

*Codiaeum andamanicum* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42: 246. 1873; *Blachia longzhouensis* X. X. Chen; *B. philippinensis* Merrill.

Shrubs to 2 m tall; branches gray, with prominent lenticels. Petiole 5–10 mm, white pubescent to glabrous; leaf blade oblong to elliptic-lanceolate, 2–17 × 1–5.5 cm, papery, both surfaces glabrous, base rounded to broadly cuneate, margin entire, apex acute to acuminate; lateral veins 4–7. Male inflorescence racemose, 5–10-flowered, peduncle 1–3.5 cm, white-sericeous pu-

bescent; female inflorescence umbelliform, 2–4-flowered, inserted at base of male inflorescences or apex of branchlets. Male flowers: pedicels 2–5 mm; sepals 5, green, ovate or subovate, ca. 3 mm, glabrous; petals 5, broadly obovate, ca. 1.2 × 1.6 mm, membranous; disk 5-lobed; stamens 12–24, glabrous. Female flowers: pedicels clavate, 4–5(–8) mm, pubescent; sepals 5, lanceolate or long ovate, 2.5–3 mm, pubescent outside, glabrous inside; disk annular, 5- or 6-lobed; ovary with densely white-sericeous pubescence; styles 3, connate at base, bipartite in upper part, lobes linear. Capsule depressed globose, with 3 longitudinal grooves, ca. 1.2 cm in diam., pubescent. Seeds ellipsoidal, ca. 7 mm; episperm crustaceous, with stripes of spots. Fl. Sep–Oct, fr. Oct–Dec.

Thickets on limestone; 500–600 m. SW Guangdong (Yangjiang), SW Guangxi (Longzhou), W Hainan (Changjiang) [Bangladesh, India, Indonesia, Malaysia, Myanmar, Philippines].

**3. *Blachia siamensis*** Gagnepain, Bull. Soc. Bot. France 71: 620. 1924.

海南留萼木 hai nan liu e mu

*Blachia chunii* P. T. Li; *B. jatrohifolia* Pax & K. Hoffmann var. *siamensis* Craib.

Shrubs 1–2 m tall; young branches pubescent, glabrescent, sometimes with corky angles. Petiole 2–6 mm; leaf blade obovate-elliptic, 2–5.5 × 1.5–3.5 cm, papery, gray-brown when dry, both surfaces glabrous, base broadly cuneate, rarely rounded, margin entire, prominently revolute, apex rounded, rarely retuse; lateral veins 3–5, divaricate near margin. Male inflorescence terminal, ca. 5 cm, 4–6-flowered; female inflorescence terminal or subterminal, 1–5-flowered. Male flowers white; pedicels slender, 10–15 mm; sepals 5, subovate, sparsely pubescent at apex; petals 5, obtriangular, ca. 0.7 mm; disk glands 5; stamens

ca. 20; filaments free; anthers rounded. Female flowers: pedicels ca. 5 mm, sparsely pubescent; sepals 5, ovate-triangular, ca. 1.5 mm, pilose inside; disk glands 5; ovary sparsely villous to glabrous; styles 3, connate at base, bifid at apex, lobes linear. Capsule subglobose, ca. 8 mm in diam., glabrous. Seeds elliptic, ca. 5 × 2.5 mm, dark brown, with stripes of gray-brown spots. Fl. Jun–Jul, fr. Aug–Sep.

Open coastal woodlands; 100–200 m. Guangdong (cultivated), S Hainan (Sanya) [Thailand].

**4. *Blachia jatrohifolia*** Pax & K. Hoffmann in Engler, Pflanzenr. 47(IV. 147. III): 39. 1911.

崖州留萼木 ya zhou liu e mu

*Blachia yaihsienensis* F. W. Xing & Z. X. Li.

Shrubs, up to 4 m tall; young branches sparsely pubescent, glabrescent. Petiole 5–12 mm, sparsely pubescent; leaf blade ovate-oblong or elliptic, 5–10 × 3.5–10 cm, papery to nearly membranous, abaxially greenish when dry, base cuneate or broadly so, margin entire or undulate, sometimes with 1 shallow lobe on one side, apex acuminate; lateral veins 5–7, sparsely pubescent. Male inflorescence a flat-topped cyme, usually 5–7-flowered; female inflorescence with flowers sometimes sparsely inserted at axis. Male flowers: pedicel slender, 5–8 mm; sepals 5, ovate, ca. 2 mm, sparsely ciliate to glabrous. Female flowers: pedicel 9–10 mm, clavate, pubescent to glabrous; sepals 5(or 6), lanceolate, 2–3 mm, acute, sparsely ciliate; disk annular; ovary densely white pubescent; styles 3, 2.5–3 mm, connate at base, bifid at apex. Capsule subglobose, ca. 10 mm in diam., shallowly 3-ribbed, sparsely pubescent. Seeds ovate, with stripes of brown spots. Fl. Apr–Oct, fr. Jun–Dec.

Slopes with shrubs. Hainan (Baoting, Sanya) [Laos, Vietnam].

## 54. STROPHIOBLACHIA Boerlage, Handl. Fl. Ned. Ind. 3(1): 235. 1900.

宿萼木属 su e mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Shrubs, monoecious; indumentum mostly of simple hairs. Leaves alternate; stipules persistent; petiole present; leaf blade simple, entire; venation pinnate. Inflorescence terminal, cymose. Male flowers: sepals 4 or 5, imbricate; petals 5, white, as long as sepals, serrulate; disk glands 5, opposite sepals; stamens ca. 30; filaments free; anthers 2-celled, longitudinally dehiscent; pistillode absent. Female flowers: sepals 5, accrescent, margins and sometimes back with gland-tipped hairs; petals absent; disk urceolate, entire; ovary 3-locular; ovules 1 per locule; styles 3, connate at base, bipartite. Capsules glabrous, with persistent sepals. Seeds carunculate; cotyledon broad and flat.

Two species: SE Asia; two species in China.

*Strophoblachia* is very easily recognized by the conspicuously glandular-fimbriate female sepals.

- 1a. Leaf blade glabrous on both surfaces, base broadly cuneate to rounded ..... 1. *S. fimbriicalyx*  
 1b. Leaf blade pubescent on veins when young, base cordate, rarely truncate ..... 2. *S. glandulosa*

**1. *Strophoblachia fimbriicalyx*** Boerlage, Handl. Fl. Ned. Ind. 3(1): 236. 284. 1900.

宿萼木 su e mu

Shrubs 2–4 m tall; young branches gray-white and sparsely pubescent, glabrous and lenticellate at maturity. Petiole 1–5 cm, pilose to glabrous; leaf blade ovate-lanceolate, ovate, or obovate-lanceolate, 7–14 × 2.5–5 cm, membranous, glabrous on both sur-

faces, base broadly cuneate to rounded, margin entire, apex acuminate or caudate-acuminate, rarely acute; lateral veins 6–8. Inflorescence terminal. Male flowers: sepals ovate, ca. 3 mm; petals obovate, nearly as long as sepals; disk glands broad and flat; stamens 15–30, longer than petals. Female flowers: sepals ovate, slightly unequal, 8–10 mm, accrescent 1–2 cm, margins with dense or sparse 2–5 mm glandular hairs; petals absent; disk annular; ovary 3-locular; styles 3, bipartite. Capsules ovoid-

globose, slightly depressed, 8–10 mm in diam., with 3 longitudinal grooves, glabrous, red-brown. Seeds ca. 6 mm. Fl. (Mar–)May–Oct, fr. (Jun–)Jul–Dec.

Dense forests or thickets; 200–400 m. SW Guangxi, Hainan, S Yunnan [Indonesia, Philippines, Vietnam].

- 1a. Fruiting sepals 1.5–2 cm, margins with dense 4–5 mm long glandular hairs ..... 1a. var. *fimbricalyx*  
 1b. Fruiting sepals 1–1.5 cm, margins with sparse 2–2.5 mm long glandular hairs ..... 1b. var. *efimbriata*

**1a. *Strophoblachia fimbricalyx* var. *fimbricalyx***

宿萼木(原变种) *su e mu* (yuan bian zhong)

*Strophoblachia glandulosa* Pax var. *tonkinensis* Gagnepain.

Fruiting sepals ovate, 1.5–2 cm, margins with dense 4–5 mm long glandular hairs. Fl. May–Jun, fr. Jul–Oct.

Dense forests or thickets; 200–400 m. SW Guangxi, Hainan, S Yunnan [Indonesia, Philippines, Vietnam].

**1b. *Strophoblachia fimbricalyx* var. *efimbriata* Airy Shaw, Kew Bull. 25: 544. 1971.**

广西宿萼木 *guang xi su e mu*

Fruiting sepals ovate, 1–1.5 cm, margins with sparse 2–2.5 mm long glandular hairs. Fl. Mar–Oct, fr. Jun–Dec.

• Dense forests or thickets; ca. 400 m. SW Guangxi.

**2. *Strophoblachia glandulosa* Pax var. *cordifolia* Airy Shaw, Kew Bull. 25: 545. 1971.**

心叶宿萼木 *xin ye su e mu*

*Strophoblachia fimbricalyx* Boerlage var. *cordifolia* (Airy Shaw) H. S. Kiu.

Small shrubs 0.5–5 m tall; young branches densely puberulent, older ones gray-brown, lenticellate and glabrous. Petiole 2–6 cm, densely puberulent to glabrous; leaf blade ovate, broadly elliptic, obovate, or panduriform, 8–11 × 4–6 cm, papery, only nerves densely puberulent when young, glabrous on both surfaces at maturity, base cordate, rarely shallowly cordate or truncate, apex acute, rarely caudate-acuminate; veins from base 3–5, lateral veins 4 or 5. Flowers several in ca. 2 cm long and densely pubescent cymes. Male flowers: sepals ovate, 2–3 mm, membranous; stamens numerous. Female flowers: sepals 5, ovate, membranous, accrescent, to 1.3 cm, margins and back with stout glandular hairs; ovary glabrous. Capsules subglobose, ca. 1 cm in diam., with 3 longitudinal grooves, brown, glabrous. Seeds ellipsoid, ca. 6 mm in diam., brown, with yellowish spot-stripes. Fl. May–Jul, fr. Aug–Oct.

Thickets; below 500 m. S Yunnan [Thailand].

*Strophoblachia glandulosa* var. *glandulosa*, characterized by having leaves that are not panduriform and not cordate at the base, occurs in Cambodia and Vietnam.

**55. OSTODES Blume, Bijdr. 619. 1826.**

叶轮木属 *ye lun mu shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Shrubs or trees, monoecious or dioecious; indumentum, when present, of simple hairs. Leaves alternate; petiole usually long, apex with 2 glands; leaf blade simple, margin glandular-serrate; venation palmate, basal veins 3. Inflorescences axillary or subterminal, racemelike thyrses, branched or unbranched. Male flowers: sepals 5, unequal, imbricate; petals 5, longer than calyx; disk 5-lobed or disk glands free; stamens 20–40, free; filaments pubescent; pistillode absent. Female flower: calyx as in male, but larger; disk annular; ovary densely hairy, 3-locular; ovules 1 per locule; styles 3, deeply 2-lobed. Fruit a capsule, 3-locular. Seeds ellipsoid; testa crustaceous; endosperm fleshy; cotyledon broad and flat.

Three species: tropical Asia, from the E Himalayas to N Borneo; two species in China.

- 1a. Inflorescences glabrous or sparsely appressed-puberulent; branches and leaves glabrous; plants dioecious ..... 1. *O. paniculata*  
 1b. Inflorescences densely tomentose; young branches and leaves densely appressed-pubescent; plants monoecious

..... 2. *O. katharinae*

**1. *Ostodes paniculata* Blume, Bijdr. 620. 1826.**

叶轮木 *ye lun mu*

*Ostodes kerrii* Craib; *O. thyrantha* Pax.

Trees, up to 15 m tall, dioecious; bark gray-brown; branches and leaves glabrous. Leaves usually apically clustered; stipules caducous; petiole 4–12 cm; leaf blade ovate-lanceolate to oblong-lanceolate, 10–24 × 5–10 cm, thinly leathery, abaxially glaucous-gray or gray-brown when dry, base rounded or broadly cuneate, apex acuminate or caudate-acuminate; lateral veins 7 or 8. Male thyrses 7–25 cm, female shorter. Male flowers: sepals 5 (3 wider, 2 narrower), 3–3.5 mm; petals 5, ovate-elliptic, ca. 5 mm, white; disk glands free; stamens 20–35. Female flowers ca. 12 mm; sepals and petals as in male; disk annular; ovary hirsute; styles 3, bifid to below middle,

apex densely longitudinally grooved. Capsule tomentulose and densely elevated-verrucose; mesocarp hard, woody. Seeds ellipsoidal, ca. 1.1 cm, brown, with stripes of yellowish spots, smooth, glossy. Fl. Mar–May, fr. Aug–Sep.

Montane evergreen forests; 400–1400 m. Hainan, Yunnan [Bhutan, Cambodia, India, Indonesia, Malaysia (peninsular), Myanmar, Nepal, Vietnam].

**2. *Ostodes katharinae* Pax in Engler, Pflanzenr. 47(IV. 147. III): 19. 1911.**

云南叶轮木 *yun nan ye lun mu*

*Ostodes kuangii* Y. T. Chang.

Trees up to 15 m tall, to 30 cm d.b.h., monoecious; young branches with yellow-brown, appressed pubescence, glabres-

cent. Petiole 3–7 cm, densely tomentose to glabrescent; leaf blade ovate, ovate-lanceolate, oblong-lanceolate to elliptic-lanceolate, 10–22 × 5–10 cm, thinly leathery, both surfaces densely tomentose when young, glabrescent, or abaxial surface and midrib becoming pubescent, base rounded to broadly cuneate, apex acuminate to caudate-acuminate; lateral veins 7–9 pairs. Inflorescences racemelike, axils densely tomentose; male inflorescences 10–30 cm, female inflorescences shorter. Male flowers: sepals 5, unequal, tomentose outside; petals obovate,

bearded at base; disk with irregular lobes; stamens to 40. Female flowers: ovary densely yellow-brown tomentose. Capsules slightly depressed globose, ca. 2.5 × 3 cm, densely brown tomentulose, obscurely sparsely elevated-verrucose. Seeds ellipsoidal or ovoid, ca. 1.5 × 1.3 cm, maroon-brown, with stripes of obscurely yellow spots, glossy. Fl. Apr–Jun, fr. Jul–Aug.

Dense forests; 900–2000 m. SE Xizang, S Yunnan [N Thailand].

## 56. DIMORPHOCALYX Thwaites, Enum. Pl. Zeyl. 278. 1861.

异萼木属 *yi e mu shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Trees or shrubs, dioecious, rarely monoecious; indumentum of simple hairs, sparse. Leaves alternate, petiolate; leaf blade simple, margin entire; venation pinnate. Inflorescences terminal or axillary, racemelike thyrses or cymes, usually few flowered. Male flowers: calyx cupular, rim 5-toothed or shortly 5-lobed; petals 5, free; disk glands 5, alternating with petals; stamens 10–15, outside 5 free, inner ones connate into column; pistillode absent. Female flowers: calyx 5-partite, imbricate, accrescent, persistent; petals 5, disk annular; ovary 3-locular; ovules 1 per locule; styles 3, connate at base, each bifid. Fruit a capsule, 3-locular; endocarp crustaceous; ovules 1 per locule. Seeds ellipsoidal; endosperm fleshy; cotyledon broad and flat.

About 15 species: mainly in tropical Asia (India and Sri Lanka to S China and Borneo) but extending to Australia; one species in China.

**1. *Dimorphocalyx poilanei*** Gagnepain, Bull. Soc. Bot. France 71: 622. 1924.

异萼木 *yi e mu*

Shrubs or treelets 3–8 m tall; stems and older branches usually thick, bark softly woody, 2–5 mm thick, divided into many longitudinal narrow angles; branchlets gray-white, glabrous. Stipules small, ca. 1 mm; petiole 5–10 mm; leaf blade oblong to broadly ovate, 4–8 × 2–5 cm, leathery, glabrous on both surfaces, base broadly cuneate to rotund, margin entire, apex acute to obtuse; lateral veins 5–8. Inflorescences terminal

or axillary, to 1 cm. Male flowers: calyx cupular, with 5 short teeth; petals 5, longer than calyx; disk glands 5; stamens 10, in 2 series inserted on elevated receptacle, inner 5 longer. Female flowers: sepals oblong, accrescent; petals elliptic, ca. 3 mm, slightly shorter than sepals; disk annular, margins obtusely toothed; ovary subglobose, glabrous; styles 3, bifid at and above middle. Capsules subglobose, ca. 1 cm in diam., glabrous; endocarp woody. Seeds ellipsoidal, ca. 8 mm, brown, with speck-stripes, smooth. Fl. May–Dec, fr. Aug–Feb.

Coastal thickets, open woodlands; 100–200 m. S Hainan [Vietnam].

## 57. TRIGONOSTEMON Blume, Bijdr. 600. 1826 [*“Trigostemon”*], nom. cons.

三宝木属 *san bao mu shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Enchidium* Jack; *Poilaniella* Gagnepain; *Prosartema* Gagnepain.

Trees or shrubs, monoecious. Leaves simple, alternate, rarely opposite to nearly whorled; stipules small, persistent or deciduous; leaf blade unlobed, pinnately veined, sometimes stipulate at base, paired glands at apex of petiole. Flowers androgynous or anisogynous; inflorescences terminal or axillary, racemose or thyrsoid. Male flowers: sepals 5, free, imbricate; petals 5, exceeding calyx; disk cupular or annular, or shortly divided, or dissected, sometimes divided into 5 glands; stamens 3–5; filaments connate or only free at upper part; anther connective enlarged, often elongated, thecae adnate to thickened connectives; pistillode absent. Female flowers: pedicels usually prominently stronger than axil of inflorescence; sepals and petals as in male; disk annular or cupular, usually unlobed; ovary 3-locular; ovules 1 per locule; styles 3, free, connate at near base, bifid or unlobed at apex. Capsules 3-valved. Seeds not carunculate; testa dry; endosperm present; endosperm fleshy; cotyledon broad and flat.

About 50(–80) species: tropical Asia, extending from India and Sri Lanka to New Guinea; eight species (one endemic) in China.

See P. T. Li et al. (Harvard Pap. Bot. 11: 117–120. 2006) for a review of *Trigonostemon* in China.

- 1a. Leaves usually in dense pseudowhorls at tips of branches; petiole less than 1 cm; inflorescences unbranched, racemelike.  
 2a. Leaf blade abaxially glabrous; sepals uniform in size; petals yellow; ovary and fruits glabrous ..... 1. *T. xyphophylloides*  
 2b. Leaf blade abaxially villous or hirsute; sepals unequal in size; petals purple-red; ovary and fruits densely hirsute.  
 3a. Bracts leaflike, 10–25 mm; inflorescence less than 6 cm ..... 2. *T. flavidus*

- 3b. Bracts linear or linear-lanceolate, 3–6 mm; inflorescence 15–25 cm ..... 3. *T. howii*
- 1b. Leaves evenly spaced; petiole 1–11 cm; inflorescences branched.
- 4a. Leaf blade glabrous, apex shortly acuminate to acuminate.
- 5a. Leaf blade broadly elliptic, margins entire or obscurely serrulate; basal veins 3; petals white or yellowish white; stamens 3 ..... 4. *T. albiflorus*
- 5b. Leaf blade obovate, margins sparsely serrate; venation pinnate; petals yellow; stamens 5 ..... 5. *T. thyrsoides*
- 4b. Leaf blade pilose or pubescent, apex obtuse to caudate.
- 6a. Pedicels filamentous; petals elliptic ..... 6. *T. bonianus*
- 6b. Pedicels more robust; petals obovate.
- 7a. Sepals unequal in size; leaf blade adaxially densely tuberculate ..... 7. *T. chinensis*
- 7b. Sepals uniform in size; leaf blade adaxially not tuberculate ..... 8. *T. fragilis*

**1. *Trigonostemon xyphophylloides*** (Croizat) L. K. Dai & T. L. Wu, Acta Phytotax. Sin. 8: 277. 1963.

剑叶三宝木 jian ye san bao mu

*Cleidion xyphophylloides* Croizat, J. Arnold Arbor. 21: 503. 1940.

Shrubs ca. 3 m tall; branchlets dark brown, scabrous. Leaves densely clustered in apparent whorls; stipules small; petiole 3–6 mm, with paired glands at apex; leaf blade oblanceolate to subspatulate, 25–50 × 7–11 cm, both surfaces glabrous, base cuneate, obtuse, margins sparsely glandular-serrulate, apex acute to acuminate; lateral veins 14–22, arcuate anastomosing before margins. Racemes axillary, less than 3 cm, bisexual; bracts 2–3 mm, abaxially hirsute. Male flowers: pedicel 4–8 mm; sepals elliptic, ca. 1.2 mm, hirsute; petals oblanceolate, ca. 4 mm, yellow, glabrous; disk glands 5; stamens 3; filaments connate. Female flowers: pedicel ca. 6 mm; sepals narrowly ovate, ca. 3 mm, abaxially hirsute; petals as in male; disk glands 5; ovary glabrous; styles short; stigmas capitate and retuse. Capsules slightly depressed globose, 1–1.5 × ca. 1.5 cm, shallowly 3-grooved. Seeds depressed globose, ca. 8 mm in diam., brown, with stripes of yellow spots. Fl. Jun–Sep, fr. Aug–Nov.

• Dense forests; 400–500 m. Hainan.

**2. *Trigonostemon flavidus*** Gagnepain, Bull. Soc. Bot. France 69: 749. 1923.

异叶三宝木 yi ye san bao mu

*Trigonostemon heterophyllus* Merrill.

Shrubs 1–2 m tall; branchlets densely yellow-brown hirsute; older branches scabrous, glabrescent. Leaves densely clustered in apparent whorls; petiole 3–6 mm, densely yellow-brown hirsute; leaf blade oblanceolate to oblong-oblanceolate, 12–35 × 4–10 cm, membranous to papery, densely hairy, basally attenuate into auriculate or subcordate base, margin entire or obscurely serrulate beyond middle, ciliate, apex shortly acuminate, acumen caudate. Male flowers: inflorescences axillary, racemelike, ca. 2.5 cm, few flowered; bracts 4 or 5, linear-lanceolate, slightly falcate, 1–2 cm; sepals 5, hirsute, 3 larger, 2.5–3 mm, 2 smaller, ca. 1.5 mm; petals obovate-elliptic, ca. 4.5 mm, purple-red; disk glands 5, ca. 0.8 mm; stamens 3; filaments connate. Female flowers axillary, solitary; pedicels short, or sometimes inserted in upper part of to 6 cm inflorescences; sepals lanceolate, ca. 5 mm, hirsute, apex long ciliate, acuminate; petals elliptic or obovate, 4.5–5 × ca. 4 mm; disk glands 5, oblong; ovary densely hairy; styles bifid. Fruiting peduncles 1–8 cm; persistent sepals and bracts lanceolate, ca. 2 cm. Capsules

subglobose, ca. 6 mm in diam., chestnut brown, with stripes of yellow spots. Fl. May–Oct, fr. Aug–Dec.

Dense forests; ca. 300 m. Hainan [Laos, Myanmar, Thailand].

**3. *Trigonostemon howii*** Merrill & Chun, Sunyatsenia 2: 262. 1935.

长序三宝木 chang xu san bao mu

*Prosartema gaudichaudii* Gagnepain (1925), not *Trigonostemon gaudichaudii* (Baillon) Müller Argoviensis (1865); *T. gagnepainianus* Airy Shaw.

Shrubs 2–4 m tall; branchlets densely yellow-hirsute, sparsely so at maturity. Leaves densely clustered in apparent whorls; stipules linear, hirsute, caducous; petiole 5–15 mm, hirsute; leaf blade oblanceolate to oblong-oblanceolate, 9–28 × 3.5–8 cm, papery to thinly leathery, abaxially purple-red and sparsely yellow hirsute, adaxially glaucous-green when dry and hirsute along midvein, base attenuate, obtuse to slightly cordate, margin entire or sparsely serrulate, ciliate, apex acute to shortly acuminate, sometimes acumen slightly inflected; lateral veins 10–12. Racemes or narrow panicles axillary, 15–25 cm, many flowered; peduncles densely hirsute; bracts linear, hirsute. Male flowers: sepals membranous, elliptic, ca. 1.5 mm, hirsute outside; petals obovate, ca. 3 mm, purple-red; stamens 3; connectives thickened, conspicuously produced. Female flowers: sepals unequal, ca. 2 mm; petals obovate, purple-red; disk crenellated; ovary densely hirsute; styles bifid at apex. Capsules subglobose, ca. 1 cm in diam., densely yellow hirsute. Seeds depressed globose, smooth. Fl. Jun–Jul, fr. Aug–Sep.

Dense montane forests; 400–500 m. Hainan [Vietnam].

**4. *Trigonostemon albiflorus*** Airy Shaw, Kew Bull. 25: 547. 1971.

白花三宝木 bai hua san bao mu

*Trigonostemon leucanthus* Airy Shaw; *T. leucanthus* var. *siamensis* H. S. Kiu.

Shrubs ca. 1 m tall; branchlets sparsely appressed pubescent to glabrescent. Leaves uniformly spaced; stipules small; petiole 2–5.5 cm, sparsely pilose to glabrous, apex with 2 subulate glands; leaf blade broadly elliptic, 9–16 × 3.5–6 cm, thinly leathery or papery, both surfaces glabrous, adaxially verruculose, base cuneate, margin entire or obscurely undulate-crenellate, apex acute to acuminate, rarely obtuse; basal veins 3, lateral veins ca. 6, delicate. Inflorescences axillary or terminal, panicles, to 21 cm, bisexual, bracts subulate, ca. 2.5 mm, villous. Male flowers: pedicel delicate, 3–7 mm, glabrous; sepals obo-

vate, 1–2 mm, apex rounded, glabrous; petals broadly spatulate, ca.  $3.5 \times 2$  mm, white, membranous, clawed, apex rounded; disk cupular, ca. 0.5 mm high; stamens 3; filaments connate for ca. 2 mm, free part to 0.5 mm. Female flowers: pedicels clavate, 1–1.5 cm, glabrous; sepals 5, ovate, ca. 3 mm, exterior sparsely villous; petals as in male, ca. 7 mm; disk cupular, ca. 0.5 mm high, margins undulate or entire; ovary glabrous; styles free, ca. 1 mm; stigmas bifid, divaricate. Fruiting pedicels clavate, to 2.8 cm; capsules ca. 1 cm in diam., glabrous. Seeds elliptic, ca. 6 mm in diam., brown with stripes of gray-white spots. Fl. Apr–May, fr. Jun–Aug.

Montane thickets; 500–600 m. S Guangxi [N Thailand].

**5. *Trigonostemon thyrsoides*** Stapf, Bull. Misc. Inform. Kew 1909: 264. 1909.

长梗三宝木 chang geng san bao mu

Shrubs or treelets, 1–6 m tall; branches puberulent to glabrous. Leaves uniformly spaced; petiole 4–12 cm, glabrous, with 2 conical glands at apex; leaf blade obovate-elliptic or oblong-elliptic to lanceolate, [10.5–]16–32  $\times$  3.5–12 cm, papery, both surfaces glabrous, brownish when dry, base broadly cuneate to rounded, margins obscurely sparsely glandular-serrate, apex acute to shortly acuminate; lateral veins 8–13. Inflorescences terminal, pyramidal thyrses, to 20 cm, brown pubescent. Male flowers: sepals 5, ovate, ca. 1.5 mm, exterior pilose; petals 5, oblong, yellow, glabrous, 3–4  $\times$  1.8–2 mm; disk glands 5; stamens 5; filaments connate; connectives conspicuously produced, erect, emarginate. Female flowers: sepals and petals as in male, but larger; disk cupular, 5-lobed; ovary glabrous; styles 3, short, shallowly bifid. Fruiting pedicels ca. 3 cm; capsules ca. 1.5 cm in diam., deeply longitudinally 3-grooved, sparsely and very shortly aculeolate. Seeds ellipsoidal, with stripes of gray spots. Fl. Apr–Jul, fr. Jun–Sep.

Dense forests; 600–1000 m. Guangxi, Guizhou, S Yunnan [Laos, Myanmar, N Thailand, Vietnam].

**6. *Trigonostemon bonianus*** Gagnepain, Bull. Soc. Bot. France 69: 747. 1923.

勐仑三宝木 meng lun san bao mu

*Trigonostemon filipes* Y. T. Chang & X. L. Mo; *T. kwangsiensis* Handel-Mazzetti; *T. kwangsiensis* var. *viridulus* H. S. Kiu; *T. lii* Y. T. Chang; *T. petelotii* Merrill.

Shrubs or treelets, 2–4 m tall; young branches puberulent, glabrous at maturity; leaf blade narrowly elliptic to oblong-lanceolate, 10–17  $\times$  2.5–5 cm, papery, glabrous on both surfaces, base cuneate, margin entire or sparsely serrulate, apex acuminate to caudate-acuminate, acumen obtuse; veins from base 3, lateral veins 3–5. Racemes terminal, spreading, to 15 cm, puberulent; bracts linear, 3–10 cm. Male flowers ca. 6 mm in diam.; sepals 5, lanceolate; petals yellow. Female flowers: sepals lanceolate, 5–6 mm; petals elliptic, ca. 1.2 cm, yellow; ovary glabrous; styles 3, short; stigmas capitate. Fruits not seen. Fl. May.

Open forests; 500–700 m. S Yunnan [Vietnam].

**7. *Trigonostemon chinensis*** Merrill, Philipp. J. Sci. 21: 498. 1922.

三宝木 san bao mu

*Trigonostemon chinensis* f. *fungii* (Merrill) Y. T. Chang; *T. fungii* Merrill; *T. harmandii* Gagnepain; *T. huangmosu* Y. T. Chang; *T. leucanthus* Airy Shaw var. *hainanensis* H. S. Kiu; *T. wui* H. S. Kiu.

Shrubs 2–4 m tall; young branches with densely yellow-brown pubescence, glabrescent at maturity. Petiole 1–2 cm, hispidulous to glabrescent, with 2 conical glands; leaf blade obovate-elliptic to oblong, 8–18  $\times$  3–5.5 cm, thinly papery, hirsute or villous on both surfaces when young, glabrous or glabrescent at maturity, usually densely tuberculate adaxially, base cuneate to rounded, margins entire or obscurely serrulate at upper part, apex acute, usually attenuate into cauda; lateral veins 6–8. Racemes terminal, 9–18 cm, branching, spreading, pilose or hispidulous to glabrescent. Male flowers: pedicel delicate, 2–5 mm; sepals 5, oblong, ca. 1.2 mm, pilose; petals obovate, 5–6.5 mm, yellow; disk annular; stamens 3; filaments connate at and below middle, free at upper part. Female flowers: pedicel clavate, 1–1.5 cm; sepals 5, lanceolate, unequal, 5–6 mm, exterior pilose; petals obovate, ca. 12 mm, yellow; ovary glabrous; styles 3, short; stigmas subcapitate. Capsules subglobose, ca. 1.2 cm in diam., glabrous, with 3 longitudinal grooves. Fl. Jan–Sep, fr. May–Nov.

Dense forests, riverside thickets; 400–600 m. Guangdong, S Guangxi, Hainan [Vietnam].

**8. *Trigonostemon fragilis*** (Gagnepain) Airy Shaw, Kew Bull. 32: 415. 1978.

黄花三宝木 huang hua san bao mu

*Poilaniella fragilis* Gagnepain, Bull. Soc. Bot. France 72: 467. 1925; *Trigonostemon lutescens* Y. T. Chang & J. Y. Liang.

Shrubs ca. 1 m tall; young branches, petiole, and inflorescences uniformly densely spreading tawny pubescent, glabrescent. Leaves uniformly spaced; petiole 1–3 cm; leaf blade elliptic to oblong, 15–23  $\times$  6–8.5 cm, papery, pubescent to glabrous on both surfaces, base broadly cuneate to rotund, margin entire or sparsely serrulate, apex acuminate, sometimes long acuminate; lateral veins 8–10. Panicles terminal, to 25 cm; bracts lanceolate, 3–5 mm. Male flowers: sepals 5, ovate, ca. 2 mm, exterior sparsely hairy; petals yellow, orange when dry, obovate, 3–5 mm, hooked; stamens 3. Female flowers: sepals lanceolate, 5–7, exterior pubescent; petals yellow, orange when dry, obovate-elliptic, ca. 8  $\times$  4–5 mm, hooked; disk annular; ovary glabrous; styles 3; stigmas capitate. Capsules subglobose, ca. 1 cm, glabrous. Fl. Apr–May, fr. Jun–Aug.

Thickets on limestone; 500–600 m. S Guangxi, Hainan [Vietnam].

## 58. *ERISMANTHUS* Wallich ex Müller Argoviensis in A. Candolle, Prodr. 15(2): 1138. 1866.

轴花木属 zhou hua mu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert



Trees or shrubs, monoecious; indumentum of simple hairs. Leaves alternate, distichous; stipules present; petiole almost absent; leaf blade simple, base oblique, margin entire or obscurely dentate, pinnately veined. Plants monoecious. Male inflorescences axillary, racemose or spicate, bisexual, bracts dense; female inflorescences solitary, axillary or inserted in base of male inflorescences. Male flowers sessile or pedicellate; pedicels delicate, elongate; sepals 4 or 5, imbricate or nearly valvate; petals 4 or 5, shorter than sepals; disk absent; stamens 12–15; filaments short, free; anthers bilocular, mucous, introrse, longitudinally dehiscent; pistillode elongate, clavate, or linear. Female flowers: sepals 5–6, unequal, imbricate, slightly accrescent; petals absent or present; ovary 3-locular; ovules 1 per locule; styles free or connate, entire or bifid, lobes linear, densely papillose. Fruit a capsule, 3-locular. Seeds not carunculate, subglobose; testa dry, smooth, with spot-stripes.

Two species: Cambodia, S China, Indonesia, Laos, Malaysia, Thailand, Vietnam; one species in China.

**1. *Erismanthus sinensis*** Oliver, Hooker's Icon. Pl. 15: t. 1578. 1887.

轴花木 *zhou hua mu*

*Erismanthus indochinensis* Gagnepain.

Trees or shrubs, 3–11 m tall; young stems purple-red, pilose, glabrescent. Stipules oblong, [3–]6–8 mm, appressed pubescent; petiole [1.5–]3–5 mm, usually red; leaf blade oblong, elliptic, or oblong-lanceolate, [2.3–]5–18 × [0.8–]2–7 cm, leathery, base shallowly obliquely cordate, margin sparsely serrulate, apex bluntly acuminate; lateral veins 8–10[–12]. Inflorescences ca. 1 cm; peduncle ca. 2.5 mm; bracts ovate, 1.5–2 mm, pubescent. Male flowers many and dense; pedicels delicate, 20 mm or

more, pilose; sepals 5, elliptic, ca. 1 mm, pubescent; petals 5, oblanceolate, small, pinkish to light purple; stamens 12–15; anthers ovoid; pistillode clavate, ca. 3 mm, pilose. Female flowers green, ca. 1 cm in diam., solitary at base, sometimes solitary, axillary; pedicel 14–26 mm; sepals 5, oblong, unequal, 2–3 mm, accrescent to 3.5–5 mm, exterior puberulent, margins sparsely glandular; ovary globose, densely yellowish appressed-hispidulous; styles 3, ca. 1 cm, connate at near base, bifid at upper part. Fruiting pedicels 1.5–2 cm; capsules subglobose, 6.5–13 × 4.5–7 mm, sparsely hispidulous. Seeds subglobose, ca. 5 mm in diam., with brown spot-stripes. Fl. and fr. almost throughout year.

Evergreen forests; 100–400 m. SW Hainan [Cambodia, Laos, Thailand, Vietnam].

**59. MANIHOT** Miller, Gard. Dict. Abr., ed. 4. 1754.

木薯属 *mu shu shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Janipha* Kunth; *Mandioca* Link; *Manihotoides* D. J. Rogers & Appan.

Trees, shrubs, or herbs, monoecious (rarely dioecious), sometimes with fleshy root-tubers; stems and branches with prominently large leaf scars; latex white; indumentum absent. Leaves alternate; stipules small, usually caducous; petioles long, apex glandular or stipellate; leaf blade usually palmately lobed or dissected, sometimes uppermost subtire. Inflorescences terminal or pseudoaxillary, mostly racemose-paniculate, usually bisexual, with long peduncles; flowers apetalous. Male flowers: calyx synsepalous; sepals 5, imbricate, petaloid; disk intrastaminal, usually 10-lobed; stamens 8–15, in 2 series; filaments free, delicate; anthers 2-locular, longitudinally dehiscent, connectives hairy at apex; pistillode small or absent. Female flowers: sepals 5, free or connate, sometimes deciduous; disk annular, sometimes with staminodes; ovary 3(or 5)-locular; ovules 1 per locule; styles short, free, mostly multifid or lacerate (rarely bifid); stigmas broad. Fruit a capsule, 3-valved; columella often persistent. Seeds carunculate; testa dry, crustaceous; endosperm fleshy; cotyledon broad and flat.

About 60 species: tropics of the Americas, mostly from Brazil, also widely cultivated in tropical regions; two species (introduced) in China.

- 1a. Leaf blade peltate with petiole inserted at least 5 mm from margin, lobes obovate to elliptic; male calyx glabrous inside; fruits without wings ..... 1. *M. glaziovii*  
 1b. Leaf blade peltate with petiole inserted less than 5 mm from margin, lobes oblanceolate to narrowly elliptic; male calyx hairy inside; fruits with 6 longitudinal wings ..... 2. *M. esculenta*

**1. *Manihot glaziovii*** Müller Argoviensis in Martius, Fl. Bras. 11(2): 446. 1874.

木薯胶 *mu shu jiao*

*Manihot carthaginensis* (Jacquin) Müller Argoviensis subsp. *glaziovii* (Müller Argoviensis) Allem.

Trees or shrubs, up to 14 m tall; bark strongly peeling glossy brown, latex abundant; branches herbaceous, glabrous. Stipules lanceolate, 4–6 mm, gray-green, lacinate; petiole 4–25 cm, with many longitudinal grooves, peltate, inserted at least 5 mm from margin; leaf blade palmately 3–7-lobed, 10–30 ×

15–25 cm, papery or membranous, lobes obovate, elliptic, rhomboid, or spatulate, 7–10 × 3.5–7 cm, margins entire, apex acute to shortly acuminate. Panicles 7–9 cm; bracts lanceolate, ca. 2.5 mm. Male flowers: calyx 9–11 mm, 5-lobed, lobes oblong, ca. 5 × 2–3 mm, apex obtuse, glabrous inside; disk shallowly cupular, 10-lobed, glabrous; anthers oblong, ca. 2.5 mm. Female flowers: calyx 10–11 mm, 5-lobed; ovary ellipsoidal, glabrous. Capsules subglobose or globose, ca. 2 cm in diam., warty, wingless, rugose. Seeds depressed-ovoid, ca. 1.5 cm, with shallow brown spot-stripes. Fl. Sep–Oct, fr. Nov–Dec.

Cultivated. S Guangdong, Guangxi, Hainan [native to Brazil; widely cultivated in tropical Africa, Asia, and elsewhere].

*Manihot glaziovii*, the Ceará rubber tree, is grown as a source of rubber. It has become naturalized in some parts of the world and is considered to be a potentially invasive weed.

**2. *Manihot esculenta*** Crantz, *Inst. Rei Herb.* 1: 167. 1766.

木薯 mu shu

*Jatropha manihot* Linnaeus, *Sp. Pl.* 2: 1007. 1753; *Janipha aipi* (Pohl) J. Presl; *J. manihot* (Linnaeus) Kunth; *Jatropha stipulata* Vellozo; *Mandioca aipi* (Pohl) Link; *M. dulcis* Parodi; *M. utilissima* (Pohl) Link; *Manihot aipi* Pohl; *M. edulis* A. Richard; *M. utilissima* Pohl.

Erect shrubs 1.5–5 m tall; root tubers terete. Stipules triangular-lanceolate, 5–7 mm, entire or with 1 or 2 bristly segments; petiole 6–35 cm, slightly peltate, inserted less than 5 mm from margin; leaf blade palmately 3–9-lobed, 5–20 cm, lobes oblanceolate to narrowly elliptic, 8–18 × 1.5–4 cm, apex acu-

minate, entire; lateral veins 5–15. Racemes terminal or axillary, 5–8 cm; bracts oblong-lanceolate; pedicels 4–6 mm. Male flowers: calyx ca. 7 mm, purple-red, divided to or over middle, lobes long ovate, 3–4 × ca. 2.5 mm, hairy inside; stamens 6–7 mm; anthers white pubescent at apex. Female flowers: calyx ca. 10 mm, lobes oblong-lanceolate, ca. 8 × 3 mm; ovary ovoid, longitudinally 6-angled; stigmas recurved, plaited. Capsule ellipsoidal, 1.5–1.8 × 1–1.5 cm, longitudinally 6-winged, scabrous. Seeds slightly triangular, ca. 1 cm; testa crustaceous, smooth, with spot-stripes. Fl. Sep–Nov.

Widely cultivated. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [native to Brazil; cultivated throughout the tropics].

The root tubers yield tapioca and are a staple crop in many areas of the tropics. They contain hydrocyanic acid and may cause death if eaten raw; they become edible after thorough soaking in water and cooking.

## 60. **SUREGADA** Roxburgh ex Rottler, *Ges. Naturf. Freunde Berlin Neue Schriften* 4: 206. 1803.

白树属 bai shu shu

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Erythrocarpus* Blume; *Gelonium* Roxburgh ex Willdenow; *Owataria* Matsumura.

Trees or shrubs, dioecious (very rarely monoecious); latex not evident; indumentum absent or short and simple. Leaves alternate; stipules small, connate, caducous, leaving annular scars at nodes; petiole short; leaf blade simple, entire or rarely sparsely serrulate, venation pinnate, usually pellucid-punctate. Inflorescence a leaf-opposed glomerule or cyme. Male flowers: sepals 5 or 6, free, imbricate, sometimes glandular abaxially; petals absent; disk extrastaminal or intrastaminal, annular or dissected; stamens 6–60, free; anthers longitudinally dehiscent; pistillode absent. Female flowers: sepals 4–8, imbricate, sometimes glandular abaxially; petals absent; disk annular; staminodes sometimes present; ovary (2 or)3(or 4)-locular; ovules 1 per locule; stigmas bifid (rarely multifid), spreading. Fruit a capsule or sometimes indehiscent and drupelike. Seeds not carunculate, covered by pale sarcotesta; endosperm present; cotyledon broad and flat.

About 35 species: tropical Africa, Asia, and Oceania; two species in China.

The pellucid-punctate leaf blades and small leaf-opposed inflorescences make *Suregada* very easy to recognize.

- 1a. Leaf blade 2–3.5 cm wide, apex rounded, petiole 0.5–2 mm; fruits 6–8 mm ..... 1. *S. aequorea*  
 1b. Leaf blade 3–8 cm wide, apex acute to shortly acuminate, petiole 3–12 mm; fruits 11–15 mm ..... 2. *S. multiflora*

**1. *Suregada aequorea*** (Hance) Seemann, *J. Bot.* 4: 403. 1866 [“*aequorea*”].

台湾白树 tai wan bai shu

*Gelonium aequoreum* Hance, *J. Bot.* 4: 173. 1866; *Owataria formosana* Matsumura.

Shrubs ca. 3 m tall; branchlets greenish, subangular, glabrous. Petiole 0.5–2 mm; leaf blade elliptic to obovate-oblong, 3.5–9 × 2–3.5 cm, papery, glabrous, base cuneate to broadly so, margin entire, slightly revolute, apex rounded, rarely obtuse; lateral veins 5–7. Inflorescences sessile glomerules, slightly hairy; flowers white, ca. 5–6 mm in diam. Male flowers: sepals 5, orbicular; stamens 20–30, free; disk annular. Female flowers: sepals 5 or 6, narrower than in male; disk cupular or annular; ovary 3-locular; styles 3; stigmas bifid, revolute. Capsules globose, 6–8 mm, slightly fleshy, glabrous, often 1-seeded. Seed surface often foveolate. Fl. May–Jul, fr. Jul–Sep.

Coastal thickets; below 100 m. S Taiwan [Philippines].

The name *Suregada glomerulata* (Blume) Baillon has long been used incorrectly for the following species. Closely related to *S. aequorea*, true *S. glomerulata* is found from Thailand to Australia but not in China.

**2. *Suregada multiflora*** (Jussieu) Baillon, *Étude Euphorb.* 396. 1858.

白树 bai shu

*Gelonium multiflorum* Jussieu, *Euphorb. Gen.* 111, t. 10, f. 31A. 1824; *G. aequoreum* Hance var. *hainanense* Hemsley.

Shrubs or trees, 2–13 m tall; branches gray-yellow to gray-brown, glabrous. Petiole 3–12 mm, glabrous; leaf blade obovate-elliptic to obovate-lanceolate or oblong-elliptic, 5–16 × 3–8 cm, thinly leathery, glabrous, base cuneate or broadly cuneate, margin entire, apex acute or shortly acuminate; lateral veins 5–9. Inflorescences pedunculate cymules; pedicels and sepals puberulent; flowers 5–8 mm in diam. Male flowers: sepals orbicular, margin shallowly serrate; stamens 30–60; disk glands small, inserted at base of filaments. Female flowers: disk annular; ovary globose, glabrous; styles 3, horizontal, 2-lobed, lobes shallowly bifid to irregularly multifid. Sepals persistent in fruit; capsule globose, 11–15 mm, slightly fleshy, subglabrous, 3-seeded. Fl. May–Sep, fr. Jun–Nov.

Lowland and montane thickets; below 100–600 m. S Guangdong, S Guangxi, Hainan, S Yunnan [Bangladesh, Cambodia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**61. BALIOSPERMUM** Blume, Bijdr. 603. 1826.斑籽木属 *ban zi mu shu*Li Bingtao (李秉滔 *Li Ping-tao*); Michael G. Gilbert

Shrubs or subshrubs, dioecious or monoecious; indumentum of simple hairs. Leaves alternate; petiole usually long, apex or base of leaf blade 2-glandular; leaf blade simple, penninerved. Flowers in axillary panicles; male inflorescences many flowered, female ones few flowered, rarely female flowers inserted at base of male inflorescences (*B. solanifolium*); inflorescences branching. Male flowers: sepals (4 or)5 or 6, membranous, round, imbricate; petals absent; disk annular, lobed or 5-glandular; stamens 10–20, or more; filaments free; anthers 2-locular, longitudinally dehiscent; pistillode absent. Female flowers: sepals 5 or 6, sometimes accrescent; petals absent; disk annular; ovary 3- or 4-locular; ovules 1 per locule; styles 3, bifid; stigmas bifid. Capsules 3-valved.

About eight species: China, India, Indonesia, Malaysia, Myanmar, Thailand, Vietnam; five species (two endemic) in China.

Recent studies of *Baliospermum* (e.g., Phattarahirankanok & Chayamarit in Chayamarit & Welzen, Fl. Thailand 8, 1: 120. 2005) indicate that there are rather fewer species than had been supposed. Three of the Chinese species are rather poorly known.

- 1a. Plants monoecious; inflorescences usually leafy, female flowers axillary or inserted at base of male inflorescences; male disk glands connate into an urceolate structure ..... 1. *B. solanifolium*  
 1b. Plants dioecious; female inflorescences prominently pedunculate, male a narrow panicle; male disk glands free.  
 2a. Young branches ferruginous-tawny tomentose, glabrescent.  
   3a. Leaves ovate, oblong, elliptic, or elliptic-lanceolate, 3–11 cm wide; stamens 16–20 ..... 2. *B. bilobatum*  
   3b. Leaves narrowly lanceolate or narrowly elliptic, 2.5–3.5 cm wide; stamens 10–15 ..... 3. *B. angustifolium*  
 2b. Young branches glabrous or puberulent, glabrescent.  
   4a. Leaves ovate-cordate to broadly ovate, 15–25 × 10–16 cm, base cordate, rarely broadly cuneate to rotund; young stem glabrous ..... 4. *B. yui*  
   4b. Leaves elliptic, narrowly elliptic, or oblong to lanceolate, 9–16 × 3–8 cm, base cuneate to broadly cuneate; young stem puberulent ..... 5. *B. calycinum*

**1. *Baliospermum solanifolium*** (Burman) Suresh, Regnum Veg. 119 [Interpret. Van Rheede's Hort. Malab.]: 106. 1988.

斑籽木 *ban zi mu*

*Croton solanifolius* Burman, Fl. Malab. 6. 1769; *Baliospermum angulare* Decaisne ex Baillon; *B. axillare* Blume; *B. indicum* Decaisne; *B. montanum* (Willdenow) Müller Argoviensis; *B. moritzianum* Baillon; *B. pendulinum* Pax; *B. polyandrum* (Roxburgh) Wight; *B. razianum* Keshava Murthy & Yoganarasimhan; *C. polyandrus* Roxburgh; *C. roxburghii* Wallich; *Jatropha montana* Willdenow; *Ricinus montanus* (Willdenow) Wallich.

Shrubs 1–3 m tall, monoecious (rarely dioecious); young branches green, appressed pubescent, glabrous at maturity. Petiole 1–8[–13] cm, pubescent to glabrous, apex usually 2-glandular; leaf blade elliptic, oblong, or oblanceolate to broadly ovate, sometimes shallowly 3–5-lobed, 5–20 × 1–9 cm, papery, both surfaces appressed pubescent to glabrous, base rounded to broadly cuneate, rarely subcordate, margin subentire or sparsely serrulate to undulate-crenulate, apex obtuse or acute, rarely acuminate; lateral veins 4 or 5. Panicles axillary, male ones 2–7(–16) cm, narrow, pubescent. Male flowers: pedicel 2–12 mm; sepals 5, ovate; disk urceolate; stamens ca. [10–]17. Female flowers 1–3, axillary or inserted at base of male inflorescences; pedicel 2–10 mm; sepals 5, ovate or triangular, 1–2 × 0.8–1 mm, pubescent outside; disk annular; ovary densely pubescent; styles 3, 1.5–3 mm, apex bifid. Fruiting calyx accrescent to (3–)5 × 2(–3) cm; capsule pendulous, subglobose, 8–10[–13] mm in diam., puberulent. Seeds elliptic-ovoid, ca. 3.5 × 3 mm, gray-brown, with stripes of yellowish spots. Fl. Mar–May, fr. Jun–Sep.

Mixed woodlands; below 700 m. SW Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

**2. *Baliospermum bilobatum*** T. L. Chin, Acta Phytotax. Sin. 18: 252. 1980.

西藏斑籽木 *xi zang ban zi mu*

Dioecious shrubs to treelets, 1–6 m tall; young branches densely tawny-tomentose, glabrous at maturity. Petiole 1–10 cm, villous, apex usually 2-glandular; leaf blade ovate or oblong elliptic to elliptic-lanceolate, 8–18 × 3–11 cm, thickly papery to thinly leathery, both surfaces densely brown-yellow pubescent when young, sparsely puberulent with age, hairs denser abaxially along veins, base cuneate, broadly cuneate, or rotund, rarely cordate, margin irregularly rough glandular serrate, apex acuminate, sometimes caudate-acuminate, or slightly falcate-inflected; lateral veins 7 or 8. Male flowers: inflorescences densely pubescent, paniculate, 7–21 × 1–2 cm; bracts small, triangular, ca. 1 mm; sepals 5 or 6, round, 1–2 mm, margins ciliate; stamens 16–20. Female flowers: inflorescences racemelike or paniculate, 3–5 cm; bracts 2–5 mm; sepals 5–7, imbricate, pubescent, 5 equal or 7 unequal, 1–2 mm, margins serrulate; ovary densely pubescent; styles 3; stigmas bifid. Persistent sepals accrescent; capsules subglobose, longitudinally 3-grooved, densely pubescent. Seeds ovoid, 3–4 mm in diam., with stripes of gray-brown spots. Fl. Aug–Sep, fr. Sep–Nov.

• Broad-leaved forests; 800–1300 m. SE Xizang (Médog).

**3. *Baliospermum angustifolium*** Y. T. Chang, Acta Phytotax. Sin. 27: 148. 1989.

狭叶斑籽木 *xia ye ban zi mu*

Shrubs 3–4 m tall; young branches ferruginous-brown tomentose, glabrescent. Leaves clustered at apex of branches; petiole 2–4.5 cm, puberulent to glabrescent, apex 2-glandular; leaf blade narrowly lanceolate or narrowly elliptic, 12–18 × 2.5–3.5 cm, papery, both surfaces appressed pubescent when dry, glabrescent, base attenuate, minutely obtuse, margins irregularly rough glandular-serrate, apex acuminate or caudate-acuminate, acumen slightly falcate-inflected; lateral veins 6 or 7, ascending to tips of serrations. Male flowers: inflorescences subapical, narrowly thyrsoid, 10–12 cm; pedicels delicate, 1–3 mm; sepals 5, rotund, ca. 1 mm; stamens 10–15. Female flowers and fruits not seen. Fl. Aug.

- Scrub; ca. 1100 m. SE Xizang (Médog).

**4. *Baliospermum yui*** Y. T. Chang, Acta Bot. Yunnan. 11: 413. 1989.

心叶斑籽木 xin ye ban zi mu

Shrubs 1–2 m tall, dioecious; branches glabrous, densely longitudinally verruculose. Stipules narrowly oblong, ca. 4 mm, glabrous; petiole 3–12 cm, glabrous, apex 2-glandular; leaf blade ovate-cordate to broadly ovate, 15–25 × 10–16 cm, papery, both surfaces sparsely puberulent when young, denser along veins, glabrescent, base cordate, rarely broadly cuneate to rounded, margins sparsely glandular-serrulate, apex acuminate to caudate-acuminate; basal veins 3–5, lateral veins 9–12. Male inflorescences not seen. Female flowers: inflorescences axillary, paniculate, to 12 cm; peduncle 6–10 cm, branches short, dense; bracts and bracteoles narrowly lanceolate, 5–15 × 1–2 mm, glabrous; pedicels sparsely puberulent; sepals 5, lanceolate or ovate-lanceolate, 4–6 × 1–2 mm, glabrous, not accrescent; ovary glabrous; styles 3, bifid. Capsule slightly depressed globose, ca. 8 × 11 mm, glabrous, longitudinally 3-grooved, verruculose. Seed ellipsoidal, ca. 5 mm, with stripes of brown spots. Fl. May–Jul, fr. Jul–Oct.

Dense forests; ca. 800 m. SW Yunnan [Myanmar].

**5. *Baliospermum calycinum*** Müller Argoviensis, Flora 47: 470. 1864.

云南斑籽木 yun nan ban zi mu

*Baliospermum calycinum* var. *corymbiferum* (J. D. Hooker) Chakrabarty & N. P. Balakrishnan; *B. calycinum* var. *densiflorum* (D. G. Long) Chakrabarty & N. P. Balakrishnan; *B. calycinum* var. *effusum* (Pax & K. Hoffmann) Chakrabarty & N. P. Balakrishnan; *B. calycinum* var. *micranthum* (Müller Argoviensis) Chakrabarty & N. P. Balakrishnan; *B. calycinum* var. *siamense* (Craib) Chakrabarty & N. P. Balakrishnan; *B. corymbiferum* J. D. Hooker; *B. densiflorum* D. G. Long; *B. effusum* Pax & K. Hoffmann; *B. meeboldii* Pax & K. Hoffmann; *B. micranthum* Müller Argoviensis; *B. siamense* Craib; *B. suffruticosum* Pax & K. Hoffmann.

Shrubs 0.5–2.5(–3) m tall, dioecious; young branches puberulent, glabrescent. Petiole 2–10 cm, subglabrous, 2-glandular at apex; leaf blade narrowly elliptic or lanceolate to oblong, 9–16[–20] × 3–8 cm, membranous or papery, both surfaces puberulent to glabrescent, sometimes veins persistently hairy, densely granulose when dry, base cuneate or broadly cuneate, margin sparsely serrulate to slightly crenate, rarely subentire, apex acute to caudate-acuminate; basal veins 1 or 3, midrib prominent on both surfaces, lateral veins 6–14. Inflorescences axillary, glabrous to pubescent; peduncles elongated. Male flowers: inflorescences narrowly paniculate, to 18 cm, many flowered; pedicels 1–4 mm; sepals 5, orbicular to ovate, 1–2.5 × 0.8–2 mm, white, glabrous; disk glands free; stamens 10–16[–21]; filaments (0.2–)1–2 mm; anthers oblong, (0.3–)0.6 × ca. 0.2 mm. Female flowers larger; inflorescences 2–3 cm, paniculate, sometimes only several flowered; pedicels 1–2 mm, stouter; sepals elliptic or oblong (or slightly ovate), 3–5(–8) × 1–2(–4) mm, chartaceous, pubescent or almost glabrous, not or slightly accrescent; disk annular; ovary glabrous or puberulent; styles 3, bifid at apex. Capsules erect, ± depressed globose, ca. 6 × 8–10 mm, glabrous, with 3 longitudinal grooves. Seeds ellipsoid, ca. 4 × 3 mm, brown to dark brown, with stripes of brown spots. Fl. Jun–Oct, fr. Sep–Dec.

Dense forests; 500–2500 m. S Yunnan [Bangladesh, Bhutan, India, Myanmar, Nepal, Thailand].

## 62. ENDOSPERMUM Bentham, Fl. Hongk. 304. 1861, nom. cons., not *Endespermum* Blume (1823).

黄桐属 huang tong shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

Trees or shrubs, dioecious; indumentum of stellate hairs; branches terete, with prominent pith. Leaves alternate [or opposite]; stipules present; petiole long, junction with leaf blade usually with 2 glands; leaf blade simple, entire; venation pinnate. Inflorescences axillary, paniculate. Male flowers almost sessile, clustered in bract-axils; calyx cupular, 3–5-lobed; petals absent; disk margin shallowly lobed; stamens 5–12 in 2 or 3 series, inserted on raised receptacle; filaments short, free; anthers bilocular; pistillode absent. Female flowers in racemelike inflorescences, sometimes branched; calyx cupular, shallowly 3–5-lobed; petals absent; disk annular; ovary 2–6-locular; ovules 1 per locule; styles very short, confluent into a cap or disk. Fruit a drupe; exocarp slightly fleshy, 2- or 3-locular. Seeds not carunculate.

About ten species: from China to Malaysia, New Guinea, and tropical Australia (Queensland); one species in China.

**1. *Endospermum chinense*** Bentham, Fl. Hongk. 304. 1861.

黄桐 huang tong

Trees 6–35 m tall; bark gray-brown; young branches, in-

florescences, and fruits densely gray-yellow stellate-puberulent; branchlets stout, gray-brown, glabrescent, leaf scars prominent, gray-white. Stipules triangular-ovate, 3–4 mm, hairy; petiole 4–9 cm; leaf blade elliptic, ovate, broadly ovate, or rotund, 8–20

× 4–14 cm, thinly leathery, both surfaces subglabrous or abaxially only sparsely stellate-hairy, base broadly cuneate to truncate or shallowly cordate, basal glands 2, globose, margins entire, apex acute to obtuse; lateral veins 5–7. Inflorescences axillary, male 10–20 cm, female 6–10 cm; bracts ovate, 1–2 mm. Male flowers: calyx cupular, with 4 or 5 shallow crenulations; stamens 5–12, in 2 or 3 series, inserted in elevated receptacle; filaments ca. 1 mm. Female flowers: calyx cupular, ca. 2 mm,

undulately 3–5-lobed, hairy, persistent; disk annular, 2–4-seriate-lobed; ovary subglobose, tomentulose, 2- or 3-locular; styles very short, stigmatiform, confluent into a disk. Fruits subglobose, ca. 1 cm in diam. Seeds ellipsoid, ca. 7 mm. Fl. May–Aug, fr. Aug–Nov.

Evergreen forests; below 800 m. S Fujian, Guangdong, Guangxi, Hainan, S Yunnan [India, Myanmar, Thailand, Vietnam].

**63. CHAETOCARPUS** Thwaites, Hooker's J. Bot. Kew Gard. Misc. 6: 300. 1854, nom. cons., not Schreber (1789).

刺果树属 *ci guo shu shu*

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Regnaldia* Baillon.

Trees or shrubs, dioecious; indumentum of simple hairs. Leaves alternate; stipules small, deciduous; petiole without glands; leaf blade entire; venation pinnate. Inflorescences axillary, small, bracteate glomerules; pedicels short, jointed in middle. Male flowers: sepals 4 or 5, imbricate; petals absent; disk glands small, alternating with sepals; stamens 5–15; filaments basally connate, apically free, hirsute at base; anthers 2-locular, dehiscing longitudinally; rudimentary ovary prominent, 3-fid, hirsute. Female flowers: sepals 4–8, imbricate; petals absent; disk urceolate, margins undulate or divided; ovary 3-locular; ovules 1 per locule; styles 3, free, bipartite; stigmas densely papillose or fimbriate. Fruit a capsule, densely spinescent-bristly or tuberculate; endocarp bony. Seeds smooth, blackish, arillate, carunculate; endosperm copious; endosperm fleshy; cotyledon broader and longer than radicle.

About 12 species: disjunct distribution in W Africa, tropical Asia, Madagascar, South America, and West Indies; one species in China.

**1. Chaetocarpus castanicarpus** (Roxburgh) Thwaites, Enum. Pl. Zeyl. 275. 1861 [“*castanocarpus*”].

刺果树 *ci guo shu*

*Adelia castanicarpa* Roxburgh, Fl. Ind., ed. 1832, 3: 848. 1832; *Chaetocarpus pungens* Thwaites, nom. illeg. superfl.; *Regnaldia chuytioides* Baillon; *R. myrtioides* Baillon.

Trees 5–12 m tall; young branches sparsely puberulent, glabrous at maturity. Stipules obliquely lanceolate, small, caducous; petiole 5–8 mm; leaf blade leathery, ovate-lanceolate or elliptic, 7–15 × 3–5 cm, both surfaces glabrous, reddish brown when dry, glossy, base broadly cuneate or obtuse, margin entire, apex acuminate; lateral veins 6–9, ascending, arcuate, anastomosing before margins. Flowers in axillary glomerules; bracts

ovate, ca. 1 mm. Male flowers: pedicels ca. 4.5 mm; sepals 4, oblong, 2–3 mm, exterior puberulent, margins ciliate; stamens 8; filaments ca. 2.5 mm, connate for half length; anthers ca. 1 mm; pistillode 3-fid, yellow pubescent. Female flowers: pedicels ca. 4.5 mm, puberulent; sepals 4, ovate, ca. 3 mm, exterior puberulent, margins ciliate; disk urceolate, margin undulate; ovary subglobose, ca. 2.5 mm, densely pubescent; styles 3, ca. 3 mm, bipartite; stigmas densely fimbriate. Capsule subglobose, 1–1.2 cm in diam., densely tawny bristly, 3-valved. Seeds subovoid, ca. 5 mm, black, smooth; arils fleshy, bifid, ca. 2 mm. Fl. Oct–Dec, fr. following Jan–Mar.

Slopes with evergreen forests, secondary forests; 600–800 m. S Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

**64. HOMALANTHUS** A. Jussieu, Euphorb. Gen. 50. 1824 [“*Omаланthus*”], nom. cons.

澳杨属 *ao yang shu*

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

Trees or shrubs, monoecious (sometimes one sex missing); latex white; indumentum absent [or consisting of multicellular, uniseriate, brownish hairs]. Apical buds enclosed by conspicuous large stipules. Leaves alternate; stipules caducous; petioles long, 2-glandular at apex or eglandular; leaf blade sometimes peltate, margin entire [to serrate], pinnately veined. Inflorescence terminal, elongate racemelike thyrses, unbranched. Flowers unisexual, apetalous, without disk. Male flowers 1–3 (to many) per bract, pedicellate; calyx 1- or 2-lobed, free, bilaterally compressed; stamens 4–50; filaments nearly as long as anthers, free; anthers basifixed, extrorse, 2-thecate, longitudinally dehiscent; pistillode absent; receptacle flat to elevated. Female flowers usually 1 per bract, pedicellate; calyx 1–3-lobed, free, eglandular or glandular; ovary smooth, papillate to puberulent, with 2 (or 3) locules; ovules 1 per locule; style short to distinct; stigmas 2 (or 3), glandular below, apex often bifid. Capsule subglobose, regularly or irregularly dehiscent. Seeds 2 (or 3) per fruit, reddish to brownish, flattened, partly to completely covered by a whitish arillode; testa crustaceous; cotyledon broad and flattened.

About 20–25 species: S Thailand through Malaysia to Australia, New Zealand, and the Pacific islands, and SE China to the Philippines, also widely cultivated; one species in China.

**1. Homalanthus fastuosus** (Linden) Fernández-Villar in Blanco, Fl. Filip., ed. 3, 4(13A): 196. 1880.

圆叶澳杨 yuan ye ao yang

*Mappa fastuosa* Linden, Belg. Hort. 15: 100. 1865; *Carumbium fastuosum* (Linden) Müller Argoviensis; *Homalanthus alpinus* Elmer; *H. bicolor* Merrill; *H. milvus* Airy Shaw.

Trees or treelets, 8–18 m tall, often much branched apically, glabrous. Leaves often fascicled at apex of branch; stipules 1.5–8.5 cm; petioles 5–9 cm, reddish, with a pair of abaxial-lateral glands; leaf blade rhomboid-ovate or triangular-ovate, 4–23 × 3.5–24 cm, papery to leathery, adaxially green, abaxially glaucescent, with 0–17 laminar glands below, base obtuse or attenuate to shallowly retuse, peltate or not, apex shortly acuminate; midvein elevated abaxially, lateral veins 7–15 pairs, reticulate veins prominent. Inflorescences 12–20 cm, bisexual, fe-

male in lower part, male in upper part. Male flowers usually 3 per bract; bracts each with one pair of basal glands; glands orbicular, ca. 1.2 mm in diam.; pedicels 1.5–4 mm; calyx 2-lobed, free, lobes reniform, apex rounded; stamens 9; filaments shorter. Female flowers: pedicels 4–5 mm (elongating to 13 mm in fruits); glands orbicular; calyx 2-lobed, lobes ovate, ca. 1 mm in diam.; ovary elliptic, with 2 locules; styles 2, free; stigmas ca. 2 mm, recurved, undivided to rarely divided, with small apical glands. Capsules obovoid to subglobose, 4–6 × 6–8 mm, papillate, keeled. Seeds 3–5 × 3–4 mm, upper half or more covered by arillode.

Lowland forests. ?Hainan, Taiwan (Lan Yu) [Philippines].

The name *Homalanthus alpinus* was formerly used for plants with nonpeltate leaves that in all other characters are identical with *H. fastuosus*. The identity of plants so named from Hainan is uncertain; it is possible that they do not belong to this genus.

## 65. EXCOECARIA Linnaeus, Syst. Nat., ed. 10, 2: 1288. 1759.

海漆属 hai qi shu

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Commia* Loureiro.

Trees or shrubs, with milky juice, glabrous. Leaves alternate or opposite, petiolate; stipules small, caducous; leaf blade entire or serrulate, penninerved. Flowers unisexual (plants monoecious or dioecious), apetalous, without disk, in axillary or terminal racemelike thyrses. Male flowers (sub)sessile; sepals 3, small, imbricate, free; stamens 3; filaments free; anthers longitudinally dehiscent, without pistillode. Female flowers sessile to pedicellate; calyx 3-lobed or 3-partite; ovary 3-celled, smooth; ovules 1 per locule; stigmas extended or recurved, free to slightly connate at base, undivided, eglandular. Capsules dehiscent into 2-valved cocci; columella persistent, winged. Seeds globose, estrophiolate; epispERM crustaceous; endosperm fleshy; cotyledon broad and flattened.

About 35 species: Africa, Asia, Australia, Pacific islands; five species (two endemic) in China.

1a. Leaves opposite above, alternate on lower parts.

2a. Leaf blade purple or dark red abaxially..... 1. *E. cochinchinensis*

2b. Leaf blade green or greenish abaxially when old.

3a. Leaf blade ca. 3 × as long as wide, apex acuminate, not falcate, petiole 3–13 mm ..... 1. *E. cochinchinensis*

3b. Leaf blade more than 5 × as long as wide, apex acuminate-falcate, petiole 3–5 mm ..... 2. *E. venenata*

1b. Leaves alternate on all parts.

4a. Leaf blade serrulate; male bracts 2- or 3-flowered ..... 5. *E. acerifolia*

4b. Leaf blade entire or nearly so; male bracts 1-flowered.

5a. Petioles 2-glandular at apex; plants dioecious ..... 3. *E. agallocha*

5b. Petioles not glandular at apex; plants monoecious ..... 4. *E. kawakamii*

**1. Excoecaria cochinchinensis** Loureiro, Fl. Cochinch. 2: 612. 1790.

红背桂 hong bei gui

Evergreen shrubs to 1 m tall; branches glabrous, many lenticellate, often much branched. Leaves opposite, rarely alternate or nearly 3-wooled; stipules ovate, ca. 1 mm; petiole 3–13 mm, eglandular at apex; leaf blade narrowly elliptic or oblong, 6–14 × 2–4 cm, papery, glabrous, green adaxially, purple or dark red abaxially, or green or greenish abaxially when old, base attenuate, margin serrulate, apex long acuminate; midvein convex on both surfaces, lateral veins 8–12. Flowers dioecious in axillary or terminal racemes; male inflorescences 1–2 cm, female ones 3–5-flowered, slightly shorter than male. Male flowers: pedicels ca. 1.5 mm; bracts broadly ovate, ca. 1.7 × 1.7 mm, serrulate inside base, 2-glandular, each bract 1-flowered; bractlets 2,

linear, ca. 1.5 mm, lacerate-serrulate on upper part, 2-glandular at base; sepals 3, lanceolate, ca. 1.2 mm, serrulate at apex; stamens exerted from calyx; anthers rounded, slightly shorter than filaments. Female flowers: pedicels strong, 1.5–2 mm, bract and bractlets as in male; sepal 3, slightly connate at base, ovate, ca. 1.8 × 1.2 mm; ovary globose, glabrous; styles 3, free or ± connate at base, ca. 2.2 mm. Capsules globose, ca. 8 mm in diam., truncate at base, concave at apex. Seeds nearly globose, ca. 2.5 mm in diam. Fl. almost throughout year.  $2n = 22$ .

Evergreen or deciduous forests, secondary forests, thickets, also cultivated; below 1500 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Laos, Malaysia, Myanmar, Thailand, Vietnam; originally from Vietnam, widely cultivated].

1a. Leaf blade purple or dark red

abaxially ..... 1a. var. *cochinchinensis*

- 1b. Leaf blade green or greenish  
abaxially when old ..... 1b. var. *viridis*

**1a. *Excoecaria cochinchinensis* var. *cochinchinensis***

红背桂(原变种) hong bei gui (yuan bian zhong)

*Antidesma bicolor* Hasskarl; *Excoecaria bicolor* (Hasskarl) Zollinger & Hasskarl; *E. bicolor* var. *purpurascens* Pax & K. Hoffmann; *Sapium cochinchinense* (Loureiro) Kuntze.

Leaf blade purple or dark red abaxially.

Thickets, also cultivated. SW Guangxi (Longzhou); cultivated in Fujian, Guangdong (Guangzhou), Hainan, Taiwan, Yunnan [native to Vietnam; widely cultivated].

This variety is cultivated for ornamental purposes because of the bi-colored leaves. All parts are used as medicine for measles, parotitis, tonsillitis, and lumbar muscle strain.

**1b. *Excoecaria cochinchinensis* var. *viridis*** (Pax & K. Hoffmann) Merrill, Philipp. J. Sci. 15: 244. 1919.

绿背桂花 lü bei gui hua

*Excoecaria bicolor* var. *viridis* Pax & K. Hoffmann in Engler, Pflanzenr. 52(IV. 147. V): 159. 1912; *E. bicolor* var. *orientalis* (Pax & K. Hoffmann) Gagnepain; *E. cochinchinensis* var. *formosana* (Hayata) Hurusawa; *E. crenulata* Wight var. *formosana* Hayata; *E. formosana* (Hayata) Pax & K. Hoffmann; *E. orientalis* Pax & K. Hoffmann.

Leaf blade green or greenish abaxially when old.

Evergreen or deciduous forests, secondary forests; below 1500 m. Guangdong, Guangxi, Hainan, Taiwan [Laos, Malaysia, Myanmar, Thailand, Vietnam].

**2. *Excoecaria venenata*** S. K. Lee & F. N. Wei, Guihaia 2: 129. 1982.

鸡尾木 ji wei mu

Shrubs, up to 3 m tall, monoecious; branchlets green or purple, glabrous, longitudinally angular. Stipules ovate, 1–1.5 mm; petioles 3–5 mm, eglandular at apex; leaves opposite or occasionally alternate; leaf blade narrowly lanceolate or narrowly elliptic, 9–15 × 1.5–3 cm, subleathery, reddish or only veins adaxially purple when young, green on both surfaces, glabrous, base cuneate, margin sparsely serrulate, apex acuminate, with falcate mucro; midvein elevated on both surfaces, lateral veins 10–13 pairs, at 60°–80°. Flowers in axillary 8–20 mm racemes, female in lower part, male in upper part. Male flowers: bracts broadly ovate, ca. 1.2 × 1.2 mm, base bilateral, each with 1 rotund gland, each bract 1-flowered; bracteoles 2, linear, base 2-glandular; sepals 3, linear-lanceolate, margins sparsely serrulate; stamens 3, rarely 2, longer than sepals; anthers subglobose, slightly shorter than filaments. Female flowers not seen. Capsules globose, ca. 7 mm in diam., triangular; styles persistent. Seeds subglobose, ca. 4 mm in diam., with maculate stripes. Fl. Aug–Oct.

- Limestone forests, bushlands. SW Guangxi.

The leaves are used in Guangxi as a medicine for ringworm.

**3. *Excoecaria agallocha*** Linnaeus, Syst. Nat., ed. 10, 2: 1288. 1759.

海漆 hai qi

*Commia cochinchinensis* Loureiro.

Trees deciduous, up to 15 m tall; branches lenticellate, glabrous. Leaves alternate throughout; stipules ovate, 1.5–2 mm; petiole 1.5–3 cm; leaf blade elliptic or broadly elliptic, rarely ovate-oblong, 4.5–10 × 3–5 cm, subleathery, base obtuse or broadly cuneate, margin entire or indistinctly serrulate, with 2 distinct glands at base near junction with petiole, apex obtusely acuminate; midvein stout, concave adaxially, convex abaxially, lateral veins 10–13, arcuately ascending steeply and running close to edge some distance before terminating. Flowers dioecious, in axillary, solitary or double racemelike thyrses; male inflorescences 3–4.5 cm, dense and catkinlike, female ones shorter. Male flowers 1 per bract; bracts broadly ovate, fleshy, ca. 2 × 2 mm, base inside 2-glandular, branchlets lanceolate; sepals linear-acuminate, ca. 1.2 mm; stamens usually exceeding sepals. Female flowers: bracts and bracteoles as in male; pedicels slightly longer than male ones (elongating to 5 mm in fruit); sepals broadly ovate or triangular, slightly connate at base, ca. 1.4 × 1 mm; ovary ovoid; stigmas, ca. 3 mm, free, revolute at apex. Capsules globose, trisulcate, 7–8 × ca. 10 mm; cocci ovoid, rostrate at apex. Seeds globose, ca. 4 mm in diam. Fl. and fr. Jan–Sep.  $2n = 140$ .

Mangrove and tidal forests, brackish areas and rice fields; sea level to 100 m. Guangdong, Guangxi, Hainan, Taiwan [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands].

This species is cultivated for ornamental purposes.

**4. *Excoecaria kawakamii*** Hayata, Icon. Pl. Formos. 3: 173. 1913.

兰屿土沉香 lan yu tu chen xiang

Shrubs; branches robust, glabrous. Leaves subleathery, alternate, usually fascicled at apex of branchlets; stipules caducous; petioles robust, flattened, 1–1.5 cm, eglandular at apex; leaf blade oblanceolate or obovate-oblong, 9–18 × 2.5–3.5 cm, glabrous, base cuneate or attenuate, margin entire, apex obtuse; midvein flat adaxially, elevated abaxially, lateral veins many, almost at a right angle to midvein. Flowers unisexual, monoecious and androgynous or dioecious in alternate fascicled racemes; inflorescences 7–10 cm, male in upper part, female in lower part. Male flowers: bracts broadly ovate, ca. 2 × 2 mm, base with 2 glands, margin praemorse, each bract with 1 flower; pedicels ca. 0.5 mm, glabrous; sepals 3, broadly ovate or ovate-triangular, ca. 1.4 × 1 mm, margins sparsely serrulate; stamens 3; anthers reniform, mucronate at apex. Female flowers: each bract with 1 flower; pedicels ca. 1 mm; sepals 3, cordate, ca. 1.5 × 1.5 mm, margins sparsely serrulate; ovary ovate, ca. 1.5 mm; style 3-lobed, recurved. Capsules not seen. Fl. Feb.

- Sparse or dense forests. Taiwan (Huoshao Dao, Lan Yu).

**5. *Excoecaria acerifolia*** Didrichsen, Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn 1857: 129. 1857.

云南土沉香 yun nan tu chen xiang

Shrubs 1–3 m tall, glabrous; branchlets longitudinally

angulate, sparsely lenticellate. Leaves alternate; stipules small, gland-shaped, ca. 0.5 mm; petioles 2–5 mm, eglandular; leaf blade ovate, ovate-lanceolate, or lanceolate, rarely elliptic, 5–13 × 0.8–6 cm, papery, base attenuate, sometimes obtuse, margins densely acutely glandular-serrate, apex acuminate or long acuminate to caudate-acuminate; midvein elevated on both surfaces, lateral veins 6–10. Flowers unisexual, monoecious and androgynous in terminal and axillary 2.5–6 cm racemes, female in lower part, male in upper part. Male flowers: pedicels short; bracts broadly ovate or triangular, ca. 1.3 × 1.5 mm, apex acute, base bilateral, each with 1 rotund gland, each bract with 2 or 3 flowers; sepals 3, lanceolate, ca. 1.2 × 0.6–0.8 mm; stamens 3; anthers globose, longer than filaments. Female flowers: pedicels short; bracts ovate, ca. 2.5 × 1.5 mm, aristate at apex, acumen to 1.5 mm, base bilateral, each with 1 rounded gland; bractlets 2, oblong, ca. 1.5 cm, apex irregularly 3-serrulate; sepals 3, slightly connate at base, ovate, ca. 1.5 × 1.2 mm, apex acute, margins serrulate; ovary globose, ca. 1.5 mm in diam. Capsules subglobose, triangular, ca. 1 cm in diam. Seeds ovoid, gray-black when dry, smooth, ca. 4 mm in diam.

Montane forests and thickets, along rivers and streams in bushlands; 1200–3000 m. Gansu, Guangzhou, Hubei, Hunan, Sichuan, Yunnan [India, Nepal].

- 1a. Leaf blade ovate or ovate-lanceolate, rarely elliptic, 6–13 × 2–6 cm, apex acuminate ..... 5a. var. *acerifolia*  
 1b. Leaf blade lanceolate, 5–9 × 0.8–2 cm,

apex long acuminate to caudate-acuminate ..... 5b. var. *cuspidata*

#### 5a. *Excoecaria acerifolia* var. *acerifolia*

云南土沉香(原变种) yun nan tu chen xiang (yuan bian zhong)

*Excoecaria acerifolia* var. *himalayensis* (Klotzsch) Müller Argoviensis; *E. himalayensis* (Klotzsch) Müller Argoviensis; *Stillingia himalayensis* Klotzsch.

Leaf blade ovate or ovate-lanceolate, rarely elliptic, 6–13 × 2–6 cm, apex acuminate. Fl. Jun–Aug.  $2n = 24$ .

Montane forests and thickets; 1200–3000 m. Guangzhou, Hubei, Hunan, Sichuan, Yunnan [India, Nepal].

The seed oil content is up to 26%. The oil is used as soap.

#### 5b. *Excoecaria acerifolia* var. *cuspidata* (Müller Argoviensis) Müller Argoviensis in A. Candolle, Prodr. 15(2): 1222. 1866.

狭叶海漆 xia ye hai qi

*Excoecaria himalayensis* var. *cuspidata* Müller Argoviensis, Linnaea 32: 122. 1863; *E. acerifolia* var. *lanceolata* Pax & K. Hoffmann; *E. cuspidata* (Müller Argoviensis) Chakrabarty & M. Gangopadhyay.

Leaf blade lanceolate, 5–9 × 0.8–2 cm, apex long acuminate to caudate-acuminate. Fr. Jun–Sep.

Along rivers and streams in bushlands; ca. 1700 m. Gansu, Sichuan, Yunnan [India].

## 66. MICROSTACHYS A. Jussieu, Euphorb. Gen. 48. Feb 1824.

地杨桃属 di yang tao shu

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Elachocroton* F. Mueller.

Herbs to subshrubs, monoecious; indumentum of multicellular, hyaline hairs, simple [or dendritic]. Leaves alternate, petiolate; stipules often present, small; leaf blade margin serrulate, rarely entire, pinnately veined. Flowers in terminal, axillary, leaf-opposed, or extra-axillary narrow racemes, female flowers often distant from male part; bracts each with 2 basal glands. Male flowers small, 1–3 per bract-axil, subsessile; sepals 3, free or very indistinctly connate at base; petals and disk absent; stamens 3; filaments free; anthers longitudinally dehiscent; pistillode absent. Female flowers: pedicel short to absent; sepals 3, free, usually larger than in male; petals and disk absent; ovary 3-locular; ovules 1 per cell; styles 3, spreading or revolute, free or connate at base. Capsules subglobose, echinate [or smooth], of 3 2-valved cocci. Seeds globose or oblong, carunculate; endosperm fleshy; cotyledon broad and flat.

About 17 species: mainly neotropical, but with outliers in Africa, Asia, and Australasia; one species in China.

1. *Microstachys chamaelea* (Linnaeus) Müller Argoviensis, Linnaea 32: 95. 1863.

地杨桃 di yang tao

*Tragia chamaelea* Linnaeus, Sp. Pl. 2: 981. 1753; *Elachocroton asperococcus* F. Mueller; *Sebastiania chamaelea* (Linnaeus) Müller Argoviensis; *S. chamaelea* var. *asperococca* (F. Mueller) Pax & K. Hoffmann.

Perennial herbs to many-stemmed subshrubs, 20–60 cm tall; main root long, to 5 mm thick; lateral roots slender; stem ± woody at base, branching dichotomous, slightly angular, glabrous or pubescent when young. Stipules persistent, ovate, ca. 1

mm, ciliate, apex acuminate; petiole ca. 2 mm, usually pubescent; leaf blade linear or linear-lanceolate, 20–55 × 2–10 mm, thickly papery, abaxially pubescent, base slightly attenuate, usually with paired concave glands, margins densely serrulate, apex obtuse; midrib prominent on both surfaces, lateral veins 15–30 pairs, obscure. Inflorescence 5–12 mm, lower part with 1 or 2 female flowers, upper part with many spirally arranged male flowers. Male flowers: bracts ovate, ca. 0.5 mm, apex acuminate, mostly covered by a pair of large spatulate glands; each bract 1- or 2-flowered; sepals ovate, ca. 0.5 mm, margins ciliate-serrulate; stamens with filaments much shorter than anthers. Female flowers: bracts lanceolate, ca. 1 mm; sepals slightly larger than



in male, broadly ovate, margins fimbriate, sometimes with 2 glands at base inside; ovary triangular-globose, glabrous, with 6 rows of spines; stigmas free. Capsules triangular-globose, 3.5–4.5 mm, lobes softly spiny, spines reddish. Seeds subterete, smooth, 2.5–2.75 mm. Fl. and fr. Mar–Nov.  $n = 14$ .

Beaches, dry fields, roadsides, along rivers, disturbed areas; near sea level to 300 m. Guangdong, Guangxi, Hainan [Brunei, Cambodia, India, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Pacific islands (Solomon Islands)].

## 67. FALCONERIA Royle, Ill. Bot. Himal. Mts. 354. 1839.

异序乌柏属 *yi xu wu jiu shu*

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Sapium* sect. *Falconeria* (Royle) J. D. Hooker.

Trees or shrubs, monoecious, with whorled distal branching, glabrous; latex white. Leaves alternate, apically crowded; stipules small, divided, caducous; petiole much shorter than blade, with 2 apical glands; leaf blade margin serrate, below with marginal glands; venation pinnate. Male and female flowers in separate inflorescences, in terminal elongate racemelike thyrses; bracts with 2 large glands at base abaxially. Male flowers small, yellow, 9–15-fascicled in axil of bracts, with very short pedicel; calyx membranous, cupular-shaped, shallowly 2-lobed or 2-dentate; petals and disk absent; stamens 2; filaments free; anthers 2-celled, longitudinally dehiscent; pistillode absent. Female flowers larger than male; each bract-axil with only 1 female flower; pedicel very short; calyx cup-shaped, 3-dentate; petals and disk absent; ovary 2- or 3-celled; ovules 1 per cell, smooth; styles 2 or 3, free or connate at base; stigma revolute, entire, eglandular. Fruit a capsule, subsessile, globose, 2- or 3-celled, irregularly dehiscent. Seeds subglobose, pale, covered with thin aril, without caruncle; columella persistent; exocarp slightly fleshy when young, later dry, very thin; endosperm fleshy; cotyledon broad and flattened.

One species: S and SE Asia.

### 1. *Falconeria insignis* Royle, Ill. Bot. Himal. Mts. 354. 1839.

异序乌柏 *yi xu wu jiu*

*Carumbium insigne* (Royle) Kurz; *Excoecaria insignis* (Royle) Müller Argoviensis; *Falconeria wallichiana* Royle; *Gymnobotryis lucida* Wallich ex Baillon; *Sapium insigne* (Royle) Trimen.

Trees, 7–18(–40) m tall, deciduous, often fruiting when leafless; bark very thick and rough. Branchlets robust, many branched, slightly succulent, with leaf scars. Stipules subulate, ca. 4 mm; petioles 2.5–6 cm, apex 2-glandular; leaf blade elliptic, (4.5–)8–20(–33) × (2–)4–11 cm, papery, base attenuate to acute, margins undulate-serrate, apex acuminate; lateral veins 10–23 pairs, sometimes with 3 obscure basal veins. Thyrses

terminal, unisexual, 10–25; bracts ca. 0.75 mm, apex rounded, basal glands large, mostly decurrent along axis. Male flowers: pedicels 0.25–0.5 mm; calyx to 1 mm; stamen filaments 0.75–1 mm; anthers globose, 0.4–0.6 mm. Female flowers: pedicels ca. 1 mm; calyx 2- or 3-lobed, 1.5–2 mm; ovary ovate, with 2 or 3 locules; style ca. 0.5 mm; stigmas 0.5–1 mm, recurved. Inflorescences up to 50 cm; fruits biglobose 7–8 mm in diam.; exocarp slightly fleshy. Seeds globose, outside with white, waxy arils. Fl. Mar–Apr, fr. May–Dec.  $n = 22$ .

Deciduous forests, rocky places; 200–800 m. Hainan, Sichuan, Yunnan [Bangladesh, Bhutan, Cambodia, India, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

The latex is poisonous. The plant is used for stupefying fish in India.

## 68. BALAKATA Esser, Blumea 44: 154. 1999.

浆果乌柏属 *jiang guo wu jiu shu*

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Sapium* sect. *Pleurostachya* Pax & K. Hoffmann.

Trees or shrubs, monoecious, sometimes with one sex missing, glabrous throughout; latex white. Leaves alternate; stipules small, undivided, caducous; petiole with 2 apical glands; leaf blade entire, pinnately veined, eglandular above, below with a pair of distinct basal glands and with additional smaller submarginal glands. Flowers in terminal or axillary compound paniculate thyrses; bracts bearing 2 large glands at base on lower surfaces. Male flowers in apical part of inflorescences, small, yellow, 5–9-fascicled in axil of bracts, with distinct pedicel; pistillode absent; calyx membranous, cupular-shaped, shallowly 2-lobed; petals and disk absent; stamens 2; filaments free; anthers 2-celled, longitudinally dehiscent. Female flowers at base of inflorescences, larger than male ones, each bract-axil with only 1 female flower; pedicel short but distinct; calyx, rarely 2-sepaled, slightly fused at base; petals and disk absent; ovary 2-celled; ovules 1 per cell, smooth; styles short; stigmas 2, revolute, entire, eglandular. Fruits pedicellate, fleshy and indehiscent, globose, 2-celled with 1 or 2 seeds. Seeds subglobose, with a thin sarcotesta and a stony seed coat, without caruncle; endosperm fleshy; cotyledon broad and flattened.

Two species: S and SE Asia; one species in China.

**1. *Balakata baccata*** (Roxburgh) Esser, *Blumea* 44: 155. 1999.浆果乌柏 *jiang guo wu jiu*

*Sapium baccatum* Roxburgh, *Fl. Ind.*, ed. 1832, 3: 694. 1832; *Carumbium baccatum* (Roxburgh) Kurz; *Excoecaria affinis* Griffith; *E. baccata* (Roxburgh) Müller Argoviensis; *Stillingia paniculata* Miquel.

Trees, up to 30 m tall, evergreen, glabrous; trunk up to 60 cm d.b.h.; branchlets usually in whorls, glaucescent. Stipules ca. 1.5 mm, caducous; petioles 3.5–9.5 cm; leaf blade ovate or long ovate, rarely elliptic, 8–22 × 4–11 cm, adaxially hardly shining, abaxially pale papillate, with 3–12 glands per side from margin, basal ones distinctly enlarged, base acute to obtuse, rarely attenuate or cordate, not auriculate, margins entire, apex acuminate;

midvein elevated abaxially, lateral veins 10–16 pairs. Inflorescences in terminal whorls and in leaf axils, 4–12 cm, male at upper part, female at base, or sometimes all male. Male flowers: pedicels 2–3 mm; bracts broadly ovate, 1–1.2 × ca. 1.8 mm, base bilateral with 1.5–2 mm oblong and reticular-striate glands; each bract with ca. 6 flowers; bracteoles linear, ca. 1 mm; calyx 2-lobed, lobes 0.5–1 mm, serrulate; stamens with filaments 0.4–0.6 mm, nearly as long as anthers, longer than calyx; anthers globose. Female flowers: pedicels 1.5–2 mm (elongating to 4 mm in fruit); calyx ca. 1 mm, lobes ovate; ovary ovate, smooth, 2-celled; style nearly free. Fruits baccate, 1- or 2-seeded. Seeds subglobose, ca. 5 mm in diam. Fl. Apr–May. *n* = 22.

Primary and secondary forests, streamsides; 600–700 m. Yunnan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**69. TRIADICA** Loureiro, *Fl. Cochinch.* 2: 598, 610. 1790.乌柏属 *wu jiu shu*

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Sapium* sect. *Triadica* (Loureiro) Müller Argoviensis.

Trees or shrubs, monoecious or sometimes dioecious; indumentum absent; latex white. Leaves alternate or nearly opposite; petioles with 1 or 2 apical glands; leaf blade margin entire or serrate; venation pinnate, lowermost pair of veins originating at very leaf base, forming basal margin. Inflorescences terminal or axillary, spikelike or racemelike thyrses, sometimes branched; bracts with 2 large abaxial glands at base. Male flowers small, yellow, fascicled in axils of bracts; calyx membranous, cup-shaped, shallowly 2- or 3-lobed or -dentate; petals absent; disk absent; stamens 2–3; filaments free; anthers 2-celled, longitudinally dehiscent; pistillode absent. Female flowers larger than male, 1 per bract; calyx cup-shaped, 3-partite, or cylindrical and 3-dentate, rarely 2- or 3-sepaled; petals absent; disk absent; ovary 2- or 3-celled; ovules 1 per cell; styles usually 3, free or connate at base; stigma revolute, entire. Capsules globose, pyriform or 3-valved, rarely baccate, usually 3-celled, loculicidal, sometimes irregularly dehiscent. Seeds subglobose, usually covered by waxy aril; exocarp hard; endosperm fleshy; cotyledon broad and flattened.

Three species: E and S Asia; three species in China.

- 1a. Petiole with a single gland above; leaf blade subrotund, base cordate to rounded, apex rounded or rarely acute or incised ..... 3. *T. rotundifolia*  
 1b. Petiole with a pair of glands above; leaf blade ovate to elliptic, base cuneate to obtuse (very rarely rounded), apex acute to acuminate.  
 2a. Leaf blade nearly as long as wide, apex acuminate; fruits 11–13 mm ..... 1. *T. sebifera*  
 2b. Leaf blade distinctly longer than wide, apex acute to subacuminate; fruits 7–9 mm ..... 2. *T. cochinchinensis*

**1. *Triadica sebifera*** (Linnaeus) Small, *Florida Trees*, 59. 1913.乌柏 *wu jiu*

*Croton sebifer* Linnaeus, *Sp. Pl.* 2: 1004. 1753 [“*sebiferum*”]; *Excoecaria sebifera* (Linnaeus) Müller Argoviensis; *Sapium chihsinianum* S. K. Lee; *S. discolor* (Champion ex Benth) Müller Argoviensis var. *wenhsienense* S. B. Ho; *S. pleiocarpum* Y. C. Tseng; *S. sebiferum* (Linnaeus) Roxburgh; *S. sebiferum* var. *cordatum* S. Y. Wang; *S. sebiferum* var. *dabshense* B. C. Ding & T. B. Chao; *S. sebiferum* var. *multiracemosum* B. C. Ding & T. B. Chao; *S. sebiferum* var. *pendulum* B. C. Ding & T. B. Chao; *Triadica sinensis* Loureiro.

Trees to 15 m tall, monoecious, glabrous; bark dark green, with longitudinal stripes, pale brownish when older; branchlets spreading, lenticellate. Leaves alternate; stipules 1–1.5 mm; petiole 2.5–6 cm, 2-glandular at apex; leaf blade rhomboid, rhomboid-ovate, broadly ovate, or rarely rhomboid-obovate, 3–13 × 3–9 cm, papery, base broadly rounded, truncate, or some-

times shallowly cordate, margin entire, apex acutely acuminate; midrib slightly elevated on both surfaces, lateral veins 6–12. Flowers yellowish green in terminal 3–35 cm racemes, female in lower part, male in upper part or male throughout. Male flowers 10–15 per bract; bracts broadly ovate, 1.5–2 × 1.5–2 mm, basal glands nearly reniform; pedicels slender, 1–4 mm; bracteoles 3, unequal, margins lacerate; calyx cup-shaped, shallowly 3-lobed, lobes obtuse, irregularly serrulate; stamens 2 or 3, exceeding calyx; filaments free, nearly as long as globose anthers. Female flowers 1 per bract, sometimes with several additional male flowers; bracts 3-partite, lobes acuminate, glands as in male; pedicels stout, 2–5 mm; bracteoles as in male flowers; calyx 3-partite, lobes ovate or ovate-lanceolate; ovary ovoid-globose, smooth, 3-celled; styles 3, connate at base; stigma revolute. Inflorescences up to 28 cm; capsules subglobose to pyriform-globose, black when mature, 11–13 mm in diam., 3-seeded; cocci deciduous; columella persistent. Seeds oblate, ca. 8 × 6–7 mm, black, covered with white, waxy aril. Fl. Apr–Aug, fr. Aug–Dec. *2n* = 44.

Wilds of the Huang He valley, forests on limestone, widely cultivated; below 100 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Jiangxi, Jiangsu, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Vietnam; cultivated in Africa, America, Europe, India].

The pressed seeds of *Triadica sebifera* are a source of fat, used for candles and soap. The bark and the seed oil contain a poisonous alkaloid. Its roots are used as a medicine to detoxify snakebites. The leaves are used in making a dark dye.

**2. *Triadica cochinchinensis*** Loureiro, Fl. Cochinch. 2: 610. 1790.

山乌柏 shan wu jiu

*Excoecaria discolor* (Champion ex Benth) Müller Argoviensis; *E. loureiroana* Müller Argoviensis; *Sapium cochinchinense* (Loureiro) Pax & K. Hoffmann (1912), not (Loureiro) Kuntze (1898); *S. discolor* (Champion ex Benth) Müller Argoviensis; *S. laui* Croizat; *Shirakia cochinchinensis* (Loureiro) Hurusawa; *Stillingia discolor* Champion ex Benth.

Trees to 12(–20) m tall, glabrous; branchlets gray-brown, lenticellate. Leaves alternate; stipules small, subovate, ca. 1 mm; petioles 2–7.5 cm, 2-glandular at apex; leaf blade elliptic or oblong-ovate, 4–10 × 2.5–5 cm, papery, reddish when young, base cuneate, apex obtuse or shortly acuminate, with several rounded glands on or near margin abaxially; midvein elevated on both surfaces, lateral veins 8–12 pairs, alternate or nearly opposite. Flowers monoecious in terminal racemes; inflorescences 4–9 cm, female in lower part, male in upper part or throughout. Male flowers: pedicels 1–3 mm; bracts ovate, ca. 1.5 × 1 mm, glands oblong or reniform, ca. 2 × 1 mm at bilateral base, each bract 5–7-flowered; bractlets 1–1.2 mm; calyx cup-shaped, irregularly serrulate; stamens 2 or 3; filaments short; anthers globose. Female flowers: pedicels stout, terete, ca. 5 mm; bracts almost as in male, each bract only 1-flowered; calyx 3-partite to base, lobes triangular, 1.8–2 × ca. 1.2 mm, margins sparsely serrulate; ovary ovoid, 3-celled; styles 3, revolute. Capsules black, globose, 7–9 mm in diam.; columella persistent. Seeds subglobose, 4–5 × 3–4 mm in diam., with thinly waxy aril. Fl. Apr–Jun, fr. Jul–Oct.

Moist broad-leaved evergreen forests, subtropical forests, montane forests or brushwood; 100–1100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

*Sapium cochinchinense* (Loureiro) Kuntze is based on *Excoecaria cochinchinensis* Loureiro, whereas *S. cochinchinense* (Loureiro) Pax & K. Hoffmann is an illegitimate later homonym based on *Triadica cochinchinensis*.

The timber of *Triadica cochinchinensis* is used for matchsticks and tea boxes. The roots and leaves are used as medicine for traumatic injury and to detoxify snakebites. The seed oil is used to make soap.

**3. *Triadica rotundifolia*** (Hemsley) Esser, Harvard Pap. Bot. 7: 19. 2002.

圆叶乌柏 yuan ye wu jiu

*Sapium rotundifolium* Hemsley, J. Linn. Soc., Bot. 26: 445. 1891; *Baccaurea esquirolii* H. Léveillé; *S. rotundifolium* var. *obcordatum* S. K. Lee.

Trees up to 12 m tall, glabrous; branchlets robust. Leaves alternate; stipules small, glandular, caducous; petioles 3–7 cm, with 1 gland at apex; leaf blade subrotund, 5–11 × 6–12 cm, base rounded to shallowly cordate, margin entire, apex rounded, rarely acute or incised; lateral veins 10–15 pairs. Flowers unisexual, monoecious, densely fascicled in terminal racemes, female in lower part, male in upper part, sometimes male throughout. Male flowers: pedicels cylindrical, 1–3 mm; bracts ovate, ca. 2 × 2 mm, margins fimbriate, base bilateral, each with 1 gland; bracteoles narrowly ovate, less than 1 mm; calyx cupular, shallowly 3-lobed; stamens (1 or)2(or 3); filaments shorter; anthers subglobose. Female flowers: pedicels robust, ca. 2 mm; calyx 3-lobed, lobes broadly ovate, ca. 1 mm, margins serrulate; ovary ovate, 3-lobed; styles 3, connate at base; stigma revolute. Capsules subglobose, 8–10 mm in diam. Seeds oblate, ca. 5 mm in diam., with waxy arils. Fl. Apr–Jun, fr. Jul–Oct.

Limestone montane forests; 100–500 m. Guangdong, Guangxi, Guizhou, Hunan, Yunnan [N Vietnam].

## 70. SHIRAKIOPSIS Esser, Blumea 44: 184. 1999.

齿叶乌柏属 chi ye wu jiu shu

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

Trees, monoecious; flowering and fruiting twigs with leaves; indumentum of pale to yellowish [or reddish], multicellular, uniseriate hairs. Leaves regularly alternate; stipules ovate to triangular, undivided, without glands; petiole much shorter than blade, without glands; leaf blade oblong to elliptic to ovate, abaxial surface paler than adaxial one but not whitish and not papillate, with 0–10 strictly marginal glands on each side, basal glands slightly larger but very similar, adaxial surface eglandular, base obtuse to slightly attenuate, margin serrate with teeth 3–5 mm apart, apex acute to acuminate. Inflorescences terminal, yellowish, racemelike thyrses, unbranched, without sterile basal region, bisexual, pilose. Male flowers (3–)5–7 in cymules, pedicellate; bracts triangular, pilose to ciliate, at base with a pair of elongate-spheroidal to elliptic glands touching axis of thyrses and sometimes decurrent; calyx with 3 sepals, fused at base; petals and disk absent; stamens 3; filament and anther of similar length. Female flowers 1–3 at base of inflorescence, sometimes absent; pedicel distinct; sepals [2 or]3, irregularly triangular, fused at base, glandless; petals and disk absent; ovary [2 or]3-locular, smooth, usually glabrous; style present; stigmas [2 or]3, undivided, glandless. Fruits distinctly (at least 8 mm) pedicellate; mericarps 3-seeded [2-seeded in African species], smooth, dry and woody [partly fleshy in *S. virgata*], regularly dehiscent along septa (sometimes tardily so) [mericarps with very thick pericarp in Malesian taxa (fruit length/pericarp thickness more than 10:1) but much thinner pericarp in African taxa]; septa with a separate basal triangle and 1 vascular strand; central columella alate. Seeds elliptic, dry; caruncle very inconspicuous to absent.

Six species: three in tropical Africa and three in tropical Asia, from India to Cambodia and to the Caroline and the Solomon Islands; one species (introduced) in China.

**1. *Shirakiopsis indica*** (Willdenow) Esser, *Blumea* 44: 185, Map 5. 1999.

齿叶乌柏 *chi ye wu jiu*

*Sapium indicum* Willdenow, *Sp. Pl.* 4: 572. 1805; *Excoecaria indica* (Willdenow) Müller Argoviensis; *S. bingyricum* Roxburgh ex Baillon; *Shirakia indica* (Willdenow) Hurusawa; *Stillingia diversifolia* Miquel.

Trees up to 30 m tall, to 40 cm d.b.h., bole twisting, with spines at base. Stipules 1–2 mm; petiole 1–1.5 cm, sparsely pilose to glabrous, eglandular at apex; leaf blade oblong to elliptic or slightly ovate, 7–14 × 3–4 cm, leathery, abaxially with 2–4 glands per side, base obtuse, margins conspicuously serrate, apex subacuminate to acuminate; lateral veins 18–24 pairs, at 60°–66° to midrib. Inflorescence solitary, racemelike, to 10 cm, axis pilose. Male flowers: bracts broad, ciliate, bases with 2 glands; pedicels 1–2 mm; calyx 0.6–0.8 mm, ciliate; stamen filaments 0.5–0.6 mm at anthesis, nearly absent in bud; anthers

0.4–0.5 mm. Female flowers: pedicel ca. 5 mm; calyx 1.25–1.75 mm, pilose; ovary ovate, ca. 2.5 mm; styles ca. 1.5 mm; stigmas 4–6 mm. Fruiting pedicel 8–22 mm; capsules subglobose, 18–30 × 20–32 mm, rounded at both ends or slightly attenuate at base, obscurely 3-lobed, walls of cocci very thick and hard. Seeds often less than 3 per fruit, ellipsoid, 11–13 × 7–8.5 mm, keeled on back, medium to pale brown, not spotted, without caruncle. Fl. Jun–Jul.

Along rivers and seashores, gallery, tidal, and mangrove forests, primary and old secondary forests of swampy and seasonally inundated areas; below 100 m. Guangdong [native to Bangladesh, Brunei, India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Singapore, Sri Lanka, Thailand, Vietnam; Pacific islands (Bismarck Archipelago, Caroline Islands, Solomon Islands)].

*Shirakiopsis indica* is cultivated for timber and used medicinally. A drying oil is obtained from the seeds, which are edible, though the outer layers of the fruit and other parts of the plant are poisonous and have been used as fish poisons. It is of particular interest because of its ability to grow in waterlogged soils.

## 71. GYMNANTHES Swartz, *Prodr.* 95. 1788.

裸花树属 *luo hua shu shu*

Zhu Hua (朱华); Hans-Joachim Esser

*Duvigneaudia* J. Léonard.

Shrubs to trees, monoecious but male flowers sometimes lacking; indumentum mostly absent [or sometimes of simple multicellular hairs], latex present, white. Leaves alternate; stipules small; petiole without glands; leaf blade margins entire [to rarely serrate], with marginal glands abaxially, pinnately veined. Inflorescences terminal or axillary, elongate racemelike thyrses, unbranched [rarely branched]; bracts 2-glandular [or eglandular]. Male flowers 1–3 per bract-axil, small; pedicel short but distinct; sepals 3, small, fused only at base; petals absent; disk absent; stamens 3–12; filaments free; anthers longitudinally dehiscent; pistillode absent. Female flowers: pedicel distinct and often elongating considerably in fruit; sepals 3, free to slightly united at base; petals absent; disk absent; ovary 3-locular, smooth or muricate with 3 pairs of spines; ovules 1 per cell; styles 3, undivided. Capsules subglobose, smooth or muricate, of 3 2-valved cocci. Seeds ellipsoid, dry, usually ecarunculate; endosperm fleshy.

About 25 species: mainly neotropical, but with two species each in Africa and Asia; one species in China.

**1. *Gymnanthes remota*** (Steenis) Esser, *Blumea* 44: 172. 1999.

裸花树 *luo hua shu*

*Sebastiania remota* Steenis, *Bull. Jard. Bot. Buitenzorg*, sér. 3, 17: 410. 1948; *Excoecaria yunnanensis* Y. H. Li & J. C. Xu.

Trees 12–20 m tall, glabrous. Stipules [0.5–1 mm] caducous; petioles 5–7 mm; leaf blade elliptic, 5–9 × 1.5–3 cm, thickly papery to thinly leathery, base cuneate, margin entire, with few indistinct abaxial marginal glands, apex acuminate; midrib abaxially prominent, adaxially slightly impressed, lateral

veins 14–18 pairs, arching and distinctly looped. Inflorescences terminal or axillary, male inflorescences dense, racemelike, ca. 2 cm, bracts broadly ovate, ca. 0.7 mm, acuminate, with a pair of glands 0.3–0.4 mm, each bract 1-flowered. Male flowers: pedicel to 1 mm; sepals 0.5–0.7 mm, hardly fused; stamens 3; filaments slightly longer than anthers. Female flowers not seen. Fruits 1 or 2 per node; pedicel 3–5 cm, thickening apically; capsule ca. 1 cm, 3-celled, sometimes with only 1 or 2 seeds, slightly reticulate but otherwise smooth outside. Seeds ca. 8 mm.

Local but also common in wet tropical montane forests, in a community described as *Parachmeria yunnanensis*–*Gymnanthes remota* forest; 1600–2000 m. S Yunnan (Jinghong) [Indonesia (N Sumatra)].

## 72. NEOSHIRAKIA Esser, *Blumea* 43: 129. 1998.

白木乌柏属 *bai mu wu jiu shu*

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

*Excoecaria* sect. *Parasapium* Müller Argoviensis, *Linnaea* 32: 123. 1863; *Shirakia* Hurusawa (1954), not S. Kawasaki (1934).

Trees or shrubs, monoecious or sometimes one sex missing; indumentum absent; latex white. Leaves alternate; stipules long and

conspicuous, caducous; petioles without glands; leaf blade margin entire, with an abaxial row of marginal glands below; venation pinnate. Inflorescences terminal or axillary, long racemelike thyrses, unbranched, apetalous, without disk; bracts with 2 large abaxial glands at base. Male flowers yellow, 3 per bract, pedicellate; calyx membranous, cup-shaped, 3-lobed; stamens 3; filaments free; anthers 2-celled, longitudinally dehiscent; pistillode absent. Female flowers larger than male, 1 per bract, pedicellate; calyx cup-shaped, 3-partite; ovary 3-celled, smooth; ovules one per cell; styles usually 3, free; stigma revolute, entire, eglandular. Fruit a capsule, pedicellate, globose, 3-valved, 3-celled, septicidally dehiscent. Seeds subglobose, dry; caruncle absent; central columella persistent; testa hard, without waxy aril; endosperm fleshy; cotyledon broad and flattened.

Two or three species: China, Japan, Korea; two species (one endemic) in China.

- 1a. Leaf blade elliptic to slightly obovate, with a pair of basal glands; fruiting pedicel more than 10 mm ..... 1. *N. japonica*  
 1b. Leaf blade ovate-elliptic, without basal glands; fruiting pedicel less than 10 mm ..... 2. *N. atrobadiomaculata*

**1. *Neoshirakia japonica*** (Siebold & Zuccarini) Esser, *Blumea* 43: 129. 1998.

白木乌柏 bai mu wu jiu

*Stillingia japonica* Siebold & Zuccarini, *Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss.* 4(2): 145. 1845; *Excoecaria japonica* (Siebold & Zuccarini) Müller Argoviensis; *Sapium japonicum* (Siebold & Zuccarini) Pax & K. Hoffmann; *Shirakia japonica* (Siebold & Zuccarini) Hurusawa; *Triadica japonica* (Siebold & Zuccarini) Baillon.

Treelets to 8 m tall, glabrous; branches slender, smooth, gray-brown. Stipules membranous, linear-lanceolate, ca. 1 cm; petiole 1.5–3 cm, bilateral flattened into attenuate winged shape, without glands; leaf blade ovate, ovate-rectangular, or elliptic, 7–16 × 4–8 cm, papery, base obtuse, truncate, or sometimes shallowly cordate, usually oblique, margin entire, sparsely glandular abaxially in upper half near margin, with 2 glands at base of midrib; midrib elevated abaxially, lateral veins 8–10 pairs. Inflorescences terminal, 4.5–11 cm, female flowers at base, male ones at upper part, or sometimes male throughout. Male flowers: pedicels 1–2 mm; bracts ovate to ovate-lanceolate, 2–2.5 × 1–1.2 mm, margins irregularly serrulate, basal glands ovoid, bracts 3- or 4-flowered; calyx cup-shaped, 3-lobed, lobes irregularly serrulate; stamens (2 or) 3, usually exceeding calyx; anthers globose, slightly shorter than filaments. Female flowers: bracts 3-partite almost to base, lobes lanceolate, 2–3 mm, usually central ones larger, lateral lobes each 1-glandular; pedicels stout, 6–10 mm; calyx lobes 3, triangular, nearly as long as wide; ovary ovoid, smooth, 3-celled; styles connate at base; stigma 3, revolute. Capsules triangular-globose, 10–15 mm in diam.; columella deciduous. Seeds obovate, 6–9 mm in diam., with tawny maculate stripes. Fl. May–Jun, fr. Jul–Sep.

Moist forests; 100–400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Hubei, Jiangsu, Jiangxi, Shandong, Sichuan, Zhejiang [Japan, Korea].

Initial observations suggest that the Chinese material of *Neo-*

*shirakia japonica* can be divided into two forms, one of relatively limited distribution matching the type from Japan and the other more widespread differing in leaf shape and enlarged basal glands and probably representing a third species.

**2. *Neoshirakia atrobadiomaculata*** (F. P. Metcalf) Esser & P. T. Li, **comb. nov.**

斑子乌柏 ban zi wu jiu

Basionym: *Sapium atrobadiomaculatum* F. P. Metcalf, *Lingnan Sci. J.* 10: 490. 1931. Type: China. Fujian: Shouning, R. C. Ching 2224 (lectotype designated here, A; duplicates, UC, US).

Shrubs 1–3 m tall, glabrous; branchlets slender, longitudinally angular. Leaves alternate; stipules membranous, linear-lanceolate, deciduous; petiole 5–12 mm, bilateral flattened into winged shape, 2-glandular at apex; leaf blade narrowly elliptic or lanceolate, 3–9 × 1.5–3 cm, papery, base broadly cuneate or obtuse, margin entire, apex shortly acuminate, rounded glands near margin and basal lateral veins abaxially; midvein slightly elevated on both surfaces, lateral veins ca. 7 pairs, campylo-dromous, ascending steeply and running close to edge some distance before termination. Inflorescences terminal, racemes 2–4 cm, female flowers 1 or 2 at base, sometimes absent, male flowers many along upper part. Male flowers: bracts 2- or 3-flowered, ovate to lanceolate, 0.5–2 mm, sparsely serrulate, basal glands reniform, glands at base bilateral, each bract pedicel filamentous, 1–2 mm; calyx cup-shaped, 3-lobed, lobes broadly ovate, serrulate; stamens 2 or 3; filaments very short; anthers globose. Female flowers: pedicels stouter, 3–5 mm; bracteoles 3, central ones lanceolate, ca. 2 mm, lateral ones smaller, attenuately ovate, ca. 1 mm, with 2 basal abaxial glands; sepals 3, ovate, ca. 1.5 × 1 mm; ovary subglobose, ca. 3 mm in diam., smooth; styles short; stigma 3-lobed, revolute. Capsules triangular-globose, ca. 5 mm in diam., with dark brown stripes of spots. Fl. Mar–May, fr. Jun–Sep.

• Dry woods, sparse forests on slopes, brushwood, roadsides; 100–400 m. Fujian, Guangdong, Hunan, Jiangxi.

### 73. *HURA* Linnaeus, *Sp. Pl.* 2: 1008. 1753.

响盒子属 xiang he zi shu

Li Bingtao (李秉滔 Li Ping-tao); Hans-Joachim Esser

Trees, branching usually in whorls; trunk and branches spiny; indumentum of simple, multicellular hairs; white latex present. Leaves alternate; stipules large, caducous; petioles 2-glandular at apex; leaf blade subentire or undulate-serrulate, pinnately veined. Plants monoecious. Inflorescences terminal or axillary, unbranched, elongate. Male flowers in terminal, long pedunculate catkin;

bracts not glandular, united into membranous sheath around bud, afterward irregularly lobed; calyx membranous, shallowly cup-shaped, truncate or slightly serrulate; petals absent; disk absent; stamens (8–)10–20, several-seriate; filaments and connectives united into a stout column, theca free, extrorse, longitudinally dehiscent; pistillode absent. Female flowers solitary, axillary; pedicel long; calyx leathery, broadly cup-shaped, truncate at apex; petals absent; disk absent; ovary 5–20-celled; ovules 1 per locule; styles fused into prominent, fleshy column; stigmas united into large umbrella-shaped lobed disk. Fruit a large, oblate schizocarp, depressed at apex, breaking up into laterally compressed woody mericarps. Seeds laterally compressed, smooth; caruncle absent; endosperm fleshy; cotyledon rounded and flattened.

Two or three species: tropical America, also widely cultivated; one species (introduced) in China.

**1. *Hura crepitans* Linnaeus, Sp. Pl. 2: 1008. 1753.**

响盒子 xiāng hé zǐ

Trees up to 40 m tall in wild; stem and main branches densely spiny; indumentum yellowish brown; branches densely lenticellate, glabrous. Stipules lanceolate or ovate-lanceolate, 10–15 × 2–3 mm, pubescent, caducous; petiole 4–20 cm, apex with 2 glands; leaf blade broadly ovate, 5–29 × 5–17 cm, papery, abaxially pilose along midrib, adaxially glabrous, base cordate, margins ± shallowly dentate-serrate, apex caudate-acuminate, mucronulate; midrib elevated on both surfaces, lateral veins 10–13(–16) on each side. Male flowers: inflorescence ovoid-conical, (1.6–)4–5 × (0.8–)1.5–2 cm, mostly dark red; peduncles (1.2–)7–10 cm, often with solitary female flower at base; pedicel ca. 2 mm; calyx tube 2–3 mm; stamen connectives and filaments

connate into column, 4–12 mm, longest at base of catkin; anthers in (1 or)2 or 3 whorls. Female flowers: pedicel 10–17 mm, after anthesis up to 6 cm; calyx tube truncate, 4–6(–8) mm, enclosing ovary; style column 2–5 cm; stigmatic disk dark purple, 1.5–2.5 cm in diam., with 11–14 obtuse lobes, spreading radially. Fruiting pedicel pendent, to 6 cm; fruit oblate, 3–5 × 8–9 cm in diam., becoming reddish brown, concave at apex and base, longitudinally grooved. Seed ca. 2 cm in diam. Fl. May, fr. Aug.

Cultivated. Hainan, Hong Kong [native to tropical America, widely grown elsewhere].

This species is cultivated for medicine and as an ornamental. The latex is extremely toxic. The distinctive fruit was once used for holding fine dry sand used for blotting ink before the introduction of blotting paper, hence the common name “sand box tree.” The distinctive dolphin-shaped mericarps are sometimes used in necklaces.

**74. *EUPHORBIA* Linnaeus, Sp. Pl. 1: 450. 1753.**

大戟属 dà jǐ shù

Ma Jinshuang (马金双); Michael G. Gilbert

Herbs (annual, biennial, or perennial), shrubs, or trees, very rarely subscandent, sometimes rhizomatous, monoecious or, rarely in Flora area, dioecious; indumentum of simple hairs, often absent, all parts with abundant white, very rarely yellow, latex; roots fibrous or tuberous. Stems sometimes succulent, terete or variously winged or tuberculate. Leaves alternate or opposite, rarely verticillate; stipules present or not, sometimes modified into glands or prickles; petiole often ill-defined to absent; leaf blade usually entire, sometimes serrulate or dentate. Inflorescence a flowerlike cyathium, single or often several in terminal or axillary, dichasial or monochasial cymes often in a “pseudumbel” with a terminal ± sessile cyathium subtended by a whorl of pedunculate cymes, each subtended by an involucre leaf; cyathium consisting of a bowl-shaped to tubular involucre subtended by a pair of bracts, “cyathophylls,” enclosing several clusters of male flowers and 1 central female flower, occasionally cyathia unisexual, involucre margin with 4 or 5 lobes, cyathial glands (1–)4 or 5(–7), mostly alternating with involucre lobes, sometimes with petaloid appendages or a pair of horns. Male flower reduced to a single stamen, with an articulation at junction of pedicel and filament, subtended by slender bracteoles. Female flower pedicellate, reduced to a single ovary, rarely subtended by a very reduced perianth; ovary 3-loculed; ovules 1 per locule; styles 3, free, sometimes partly connate; stigma 2-lobed or not, ± capitate. Fruit a capsule, breaking into 3 2-valved cocci, dehiscence usually explosive, very rarely almost indehiscent. Seeds 1 per locule, globose to ovoid or ± cylindrical; caruncle present or not; endosperm abundant; cotyledons large.

Up to 2000 species: worldwide, particularly in drier areas of the tropics, especially diverse in Africa; one major group centered in temperate regions; 77 species (11 endemic, nine introduced) in China.

Many species are grown as ornamentals, particularly the more succulent species by specialist collectors. Members of *Euphorbia* subg. *Esula* are grown as garden plants, while *E. pulcherrima* and *E. milii* are extremely important in the horticultural trade. Some species have been investigated as sources of rubber but without great success; others are of possible interest for the seed oils. Many, perhaps most, species have been used to some extent medicinally.

*Euphorbia consanguinea* Schrenk has been recorded as being used in Chinese traditional medicine in Xinjiang, and *E. schugnanica* B. Fedtschenko and *E. seguieriana* Necker have been reported from Xinjiang from local taxonomic work, but no material has been seen and these records must remain doubtful. Further taxa have been recorded for China by Govaerts et al. (World Checkl. Euphorbiaceae: <http://www.kew.org/wcsp/home.do>), but these could not be confirmed. These include Himalayan species *E. jacquemontii* Boissier and *E. pseudosikkimensis* (Hurusawa & Yu. Tanaka) Radcliffe-Smith, which might occur in Xizang; the C Asian species *E. andrachnoides* Schrenk, *E. microcarpa* (Prokhanov) Krylov, and *E. potaninii* Prokhanov, from W Siberia, Mongolia, and Kazakhstan, which could extend into the adjacent area of N and NW China; and widespread Eurasian taxa *E. falcata* Linnaeus and *E. palustris* Linnaeus, which might also extend into NW China.

- 1a. Trees or shrubs; stems succulent, leaves often inserted on  $\pm$  raised ribs or tubercles and each subtended by 1 or 2 pairs of spines, less often stems terete, longitudinally finely striate; leaves readily caducous; inflorescences small axillary cymes, usually subterminal, if terminal then in sessile cluster and plant dioecious.
- 2a. Trees; stems and branches green, terete, without angles or tubercles, longitudinally finely striate; cyathia in terminal clusters, unisexual (plants dioecious) (4. *E.* subg. *Tirucalli*) ..... 27. *E. tirucalli*
- 2b. Shrubs or shrublike plants; stems and branches green or brown-green, succulent with spines on wings or angles; cyathia axillary, usually subterminal, usually bisexual.
- 3a. Irregularly branched shrubs; inflorescence long pedunculate; involucre leaves conspicuous, usually red, sometimes yellow; spines not differentiated from grayish brown stem (5. *E.* subg. *Lacanthia*) ..... 28. *E. milii*
- 3b. Shrubs or small trees with  $\pm$  erect or ascending branches; inflorescence subsessile to shortly pedunculate; involucre leaves very inconspicuous, same color as inflorescence; spines inserted on gray to brown "spine shields" sharply differentiated from green stem (6. *E.* subg. *Euphorbia*).
- 4a. Stems  $\pm$  terete, leaves inserted on spirally arranged tubercles, spine shield widely separated ..... 29. *E. neriifolia*
- 4b. Stems winged or ribbed, leaves arranged along ribs, spine shields often  $\pm$  contiguous.
- 5a. Stem 3(or 4)-winged, wings thin and irregularly dentate, 1–2 cm wide ..... 30. *E. antiquorum*
- 5b. Stem 5–7-angular, angles impressed and flat, irregularly repand-dentate ..... 31. *E. royleana*
- 1b. Herbs or shrubs; stems herbaceous, sometimes hollow and inflated, always terete, leaves never subtended by spines or prickles; inflorescence terminal, often pseudumbellate, rarely reduced to solitary cyathium, or inflorescences lateral.
- 6a. Cyathial glands with petal-like appendage.
- 7a. Leaf blade symmetric at base, upper leaves opposite or verticillate, lowermost leaves sometimes alternate, stipules absent; inflorescence a terminal pseudumbel (2. *E.* subg. *Agaloma*).
- 8a. Herbs, annual; lower leaves alternate, sessile, green, with white margin; cyathial gland appendages white, entire ..... 20. *E. marginata*
- 8b. Shrubs or small trees, whole plant reddish; leaves always verticillate, conspicuously petiolate, uniformly reddish; cyathial gland appendages yellow-white, 4- or 5-toothed ..... 21. *E. cotinifolia*
- 7b. Leaf blade oblique at base, always opposite, distichous, stipules present; inflorescence a lateral cyme or solitary cyathium, sometimes associated leaves reduced and inflorescence apparently terminal (1. *E.* subg. *Chamaesyce*).
- 9a. Subshrubs, woody at base; leaf blade leathery or thinly leathery.
- 10a. Leaf blade margin serrulate at least at apex; cyathia axillary, solitary; cyathial gland appendages conspicuous, wider than glands ..... 3. *E. garanbiensis*
- 10b. Leaf blade margin entire; cyathia terminal and subterminal, in cymes; cyathial gland conspicuous or not.
- 11a. Leaves  $\pm$  patent from stem and not obviously overlapping; leaf blade elliptic to ovate-oblong, apex obtuse or rounded; appendages narrowly elliptic, inconspicuous ..... 1. *E. atoto*
- 11b. Leaves  $\pm$  adpressed to stem, conspicuously overlapping; leaf blade ovate, apex acute; appendages obovate to reniform, conspicuous ..... 2. *E. sparrmannii*
- 9b. Herbs; leaf blade membranous or chartaceous.
- 12a. Stem ascending to suberect; cyathia in pedunculate cymes.
- 13a. Capsule pubescent.
- 14a. Stem with a mixture of long, yellow to brown, multicellular hairs and minute white hairs; gland appendages narrowly obtriangular ..... 7. *E. hirta*
- 14b. Stem uniformly white puberulent; gland appendages transversely elliptic ..... 8. *E. indica*
- 13b. Capsule glabrous.
- 15a. Leaf blade distinctly serrulate, petiole 1.5–2.5 mm ..... 6. *E. bifida*
- 15b. Leaf blade entire or inconspicuously repand, petiole usually  $\pm$  absent.
- 16a. Stipules 0.7–0.9 mm; capsule 2–2.5 mm ..... 4. *E. hyssopifolia*
- 16b. Stipules 1.3–1.5 mm; capsule 1–1.5 mm ..... 5. *E. hypericifolia*
- 12b. Stem prostrate; cyathia solitary.
- 17a. Capsule glabrous.
- 18a. Leaf blade 3–5  $\times$  2–4 mm.
- 19a. Internodes of uppermost shoots shorter than leaves; leaf base obviously oblique; cyathial gland appendage entire ..... 9. *E. heyneana*
- 19b. Internodes of uppermost shoots often longer than leaves; leaf base  $\pm$  symmetrical; cyathial gland appendage dentate ..... 12. *E. makinoi*
- 18b. Leaf blade ovate to lanceolate, 5–10  $\times$  4–6 mm.
- 20a. Leaf blade margin completely entire; cyathial gland appendage conspicuous, reniform, entire ..... 11. *E. serpens*

- 20b. Leaf blade margin serrulate at least at apex; cyathial gland appendage inconspicuous, elliptic, narrower than glands and/or  $\pm$  repand to dentate.
- 21a. Annual herbs; stipules usually lacerate into linear segments ..... 14. *E. humifusa*
- 21b. Perennial herbs; stipules entire, triangular ..... 10. *E. taihsiensis*
- 17b. Capsule pubescent.
- 22a. Gland appendage expanded, ca. 2–4  $\times$  as wide as gland; stem and internodes conspicuous ..... 13. *E. granulata*
- 22b. Gland appendage not expanded, not wider than gland proper; stem and internodes inconspicuous.
- 23a. Stem densely pubescent along upper side; ovary and capsule puberulent mainly along angles ..... 15. *E. prostrata*
- 23b. Stem sericeous to sparsely pilose or hispid; ovary and capsule uniformly pubescent or sparsely pilose.
- 24a. Stem uniformly densely softly hispid; leaf blade adaxially softly pilose ..... 19. *E. hispida*
- 24b. Stem glabrous to sparsely pilose or densely tomentulose; leaf blade adaxially pubescent or glabrous.
- 25a. Capsule ca. 1 mm, partly enclosed by cyathium at maturity; leaf blade uniformly green to reddish, obovate-oblong to oblong-lanceolate, 3–8  $\times$  2–5 mm ..... 16. *E. thymifolia*
- 25b. Capsule ca. 2 mm, completely exserted from cyathium at maturity; leaf blade with 1 or more purple blotches or spots.
- 26a. Stem densely tomentulose; leaf blade usually with an elongate purple spot centrally adaxially ..... 17. *E. maculata*
- 26b. Stem glabrous to sparsely pilose; leaf blade with several small purple spots adaxially ..... 18. *E. hsinchuensis*
- 6b. Cyathial glands without petaloid appendage, sometimes with a pair of horns.
- 27a. Stipules present; involucre with 1(–3) glands (3. *E.* subg. *Poinsettia*).
- 28a. Upper leaves uniformly green.
- 29a. Glands usually 3; leaves with petiole, 2–4 cm ..... 25. *E. hainanensis*
- 29b. Glands usually 1, rarely 2 or 3; leaves sessile or subsessile ..... 26. *E. dentata*
- 28b. Upper leaves partly or wholly red, yellow, or white.
- 30a. Upper leaves uniformly bright scarlet (or yellow or white in some cultivars) ..... 22. *E. pulcherrima*
- 30b. Upper leaves green with a pale or red blotch at base.
- 31a. Involucral leaves usually red at base; glands 2-lipped, opening narrowly oblong ..... 23. *E. cyathophora*
- 31b. Involucral leaves pale at base, sometimes green; glands funnel-like, opening rounded ..... 24. *E. heterophylla*
- 27b. Stipules absent; involucre with 4 or 5 glands (7. *E.* subg. *Esula*).
- 32a. Leaves opposite, decussate; capsule walls spongy, dehiscence sometimes very delayed ..... 32. *E. lathyris*
- 32b. Leaves usually alternate, rarely opposite, never decussate; capsule walls thin, not spongy, always readily dehiscent.
- 33a. Glands horned or truncated, fimbriate or emarginate.
- 34a. Glands funnelform.
- 35a. Leaf blade obovate, 6–8  $\times$  2–3.5 cm; glandular vein conspicuous ..... 64. *E. yanjinensis*
- 35b. Leaf blade long linear, 9–12 cm  $\times$  4–8 mm; glandular vein inconspicuous ..... 65. *E. tongchuanensis*
- 34b. Glands flat, never funnelform.
- 36a. Annual herbs; leaves opposite.
- 37a. Leaf blade ovate or obovate, more than 7–8 mm wide; plant 10–30 cm tall.
- 38a. Plant 10–30 cm tall; leaf blade obovate, apex dentate; seeds with small pores ..... 66. *E. pepplus*
- 38b. Plant 10–15 cm tall; leaf blade long ovate to ovate-elliptic; seeds with striae ..... 67. *E. turczaninowii*
- 37b. Leaf blade linear, less than 6 mm wide; plant 10–40 cm tall.
- 39a. Plant 35–40 cm tall; seeds gray-white, striate ..... 68. *E. sororia*
- 39b. Plant less than 20 cm tall; seeds not striate.
- 40a. Plant 10–17(–30) cm tall; leaf blade 3–5 mm wide; seeds ovoid-rounded, whitish ..... 69. *E. franchetii*
- 40b. Plant 10–20 cm tall; leaf blade 1–2 mm wide; seeds angular-terete, gray ..... 70. *E. indieriensis*
- 36b. Perennial herbs; leaves alternate.
- 41a. Gland margin serrulate ..... 71. *E. lioui*
- 41b. Gland margin not serrulate.
- 42a. Leaf blade linear, lanceolate, or oblanceolate, 1–4  $\times$  0.2–0.5 cm.
- 43a. Involucral leaves 2, similar to normal leaves; involucre campanulate ..... 72. *E. dracunculoides*
- 43b. Involucral leaves 4–6, oblong; involucre broadly campanulate ..... 73. *E. prolifera*
- 42b. Leaf blade ovate, obovate, or oblong-ovate, 2–7  $\times$  0.4–3 cm.
- 44a. Leaf blade 2–3 cm wide; involucral leaves and rays 6–10; plants 60–90 cm tall ..... 74. *E. latifolia*
- 44b. Leaf blade less than 10–15 mm wide; involucral leaves and rays 3–6; plants 20–70 cm tall.
- 45a. Rhizome thin and long, with adventitious shoots ..... 75. *E. sieboldiana*



- 45b. Root without rhizome, without adventitious shoots.
- 46a. Root with tuber at end ..... 76. *E. kansui*
- 46b. Root without tuber at end ..... 77. *E. esula*
- 33b. Glands suborbicular or ovate, without any appendage.
- 47a. Glands 4, insertion peltate; capsule reticulate; leaf blade margin prominently serrate ..... 33. *E. helioscopia*
- 47b. Glands 4 or 5, insertion marginal; capsule smooth or verrucose; leaf blade margin entire or serrulate.
- 48a. Capsule verrucose; glands 4.
- 49a. Leaf blade margin serrulate.
- 50a. Stem multibranched apically, each divided again; plants pilose, especially toward apex ..... 55. *E. pilosa*
- 50b. Stem multibranched basally, branches undivided; plants glabrous or very sparsely pilose.
- 51a. Plants pale red or purplish; cyathia brown ..... 52. *E. pachyrrhiza*
- 51b. Plants green; cyathia yellow-green.
- 52a. Leaf blade oblong, 2–3 cm × 3–6 mm; glandular lobes triangular-rounded ..... 53. *E. buchtormensis*
- 52b. Leaf blade long ovate-elliptic, 2–3 cm × 8–10 mm; glandular lobes spine-form ..... 54. *E. alata*
- 49b. Leaf blade entire.
- 53a. Root fibrous, less than 5 mm in diam.
- 54a. Herbs annual; capsule trigonous, furrowed, conspicuous ..... 56. *E. heishuiensis*
- 54b. Herbs perennial; capsule without furrows.
- 55a. Leaf blade long elliptic to oblong, 1–2.5 cm × 3–6 mm; ovary and capsule densely verrucose ..... 57. *E. altaica*
- 55b. Leaf blade elliptic, 1–2 × 0.8–1.2 cm; ovary and capsule sparsely minutely tuberculate ..... 58. *E. alpina*
- 53b. Root woody, more than 6 mm in diam.
- 56a. Ovary and capsule sparsely or obscurely verrucose at least when young.
- 57a. Stem 3 or 4 branches at base, each branch undivided; plants 20–50 cm tall; leaf blade 1–3 cm ..... 59. *E. micractina*
- 57b. Stem branches both from base and top, and each branch divided again; plants 50–80 cm tall; leaf blade 3–5 cm ..... 60. *E. lucorum*
- 56b. Ovary and capsule densely verrucose/tuberculate.
- 58a. Tubercles on capsule laterally compressed; root 2–5 cm in diam. .... 61. *E. macrorrhiza*
- 58b. Tubercles on capsule rounded; root less than 2 cm in diam.
- 59a. Seeds brown, adaxially lightly striate; style free ..... 62. *E. pekinensis*
- 59b. Seeds yellow-brown, adaxially without striae; styles connate at base ..... 63. *E. jolkini*
- 48b. Capsule smooth; glands 4 or 5.
- 60a. Glands 5; rootstock not rhizomatous.
- 61a. Leaf blade oblong, or suboblong, apex truncate, repand.
- 62a. Annual herbs; leaf blade 1–2 × 0.3–1 cm; seeds compressed-ovoid, (3–)4–5 × ca. 3 mm, greenish brown, spotted ..... 34. *E. turkestanica*
- 62b. Perennial herbs; leaf blade 1.8–3 × 1–1.5 cm, mostly much smaller; seeds ovoid-globose, 2.5–3 × 1.8–2.3 mm, pale fawn with brown marbling ..... 35. *E. altotibetica*
- 61b. Leaf blade oblong or lanceolate, apex serrulate.
- 63a. Plants less than 30 cm tall, leaves usually apically clustered; leaf blade oblong ..... 36. *E. tibetica*
- 63b. Plants 50–90 cm tall, leaves usually distributed along stem; leaf blade lanceolate ..... 37. *E. soongarica*
- 60b. Glands 4; rootstock rhizomatous.
- 64a. Herbs 5–7(–15) cm tall; leaf blade succulent, without midrib ..... 38. *E. humilis*
- 64b. Herbs more than 20 cm tall; leaf blade papery, with midrib clearly defined.
- 65a. Involucral leaves intensely colored, yellow to red, or purplish.
- 66a. Stems usually in clusters; involucral leaves yellow, caruncle yellow ..... 39. *E. sikkimensis*
- 66b. Stems usually solitary; involucral leaves red, reddish yellow, or purple.
- 67a. Involucral glands orbicular; styles free; cyathophylls bright red or reddish yellow; plants often extensively rhizomatous, less often from shallow tuber ..... 40. *E. griffithii*
- 67b. Involucral glands oblong; style connate or less lobed; cyathophylls often suffused with very dark purple; plants from deeply buried tuber ..... 41. *E. stracheyi*
- 65b. Involucral leaves usually green, without conspicuous pigment.
- 68a. Root linear, less than 5 mm thick.
- 69a. Stems few, branching mainly toward apex; involucral leaves and rays 3–5; plants 50–90 cm tall ..... 51. *E. hylonoma*
- 69b. Stems many, branching at or very near ground level; involucral leaves 2, rays 2 or absent; plants less than 25 cm tall.

- 70a. Cyathia solitary, terminal ..... 49. *E. monocyathium*  
 70b. Cyathia several, in 2-rayed dichasial cymes ..... 50. *E. kozlovii*  
 68b. Root cylindrical, more than 1 cm in diam.  
 71a. Involucre pedunculate, short; ovary exerted from cyathium, up to 4–5 mm ..... 42. *E. donii*  
 71b. Involucre without peduncle; ovary never beyond cup.  
 72a. Leaf blade cordate at base, or auriculate expanded, margin ciliate ..... 43. *E. blepharophylla*  
 72b. Leaf blade attenuate or rounded at base, margin not ciliate.  
 73a. Plant suffused purplish or light reddish.  
 74a. Root usually ± swollen, radishlike ..... 44. *E. rapulum*  
 74b. Rootstock terete, 30–50 cm ..... 45. *E. thomsoniana*  
 73b. Plant green; rootstock rhizomatous.  
 75a. Capsule 9–11 mm in diam.; seeds angulate-terete, 5–6 × 4–5 mm ..... 46. *E. wallichii*  
 75b. Capsule less than 7 mm in diam.; seeds less than 4 mm.  
 76a. Glands glabrous inside; ovary and capsule glabrous ..... 47. *E. kansuensis*  
 76b. Glands white pilose inside; ovary densely white pilose; capsule white  
 pilose ..... 48. *E. fischeriana*

**1. Euphorbia** subg. **Chamaesyce** (Gray) Caesalpinus ex Reichenbach, Deut. Bot. Herb.-Buch 193. 1841.

地锦草亚属 di jin cao ya shu

*Chamaesyce* Gray, Nat. Arr. Brit. Pl. 2: 260. 1821.

Herbs [or shrubs]. Main stem abortive, lateral stems usually many. Leaves opposite; stipules membranous; leaf blade base oblique. Cyathia lateral at nodes, sometimes gathered into terminal inflorescence by reduction of subtending leaves, in cymes or solitary; cyathophylls inconspicuous; glands with pink or white petal-like appendages. Seeds not carunculate.

About 250 species: most numerous in New World tropics but with local species scattered throughout the tropics; 19 species (three endemic) in China.

This subgenus is often treated as a distinct genus.

**1. Euphorbia atoto** G. Forster, Fl. Ins. Austr. 36. 1786.

海滨大戟 hai bin da ji

*Chamaesyce atoto* (G. Forster) Croizat; *Euphorbia articulata* Dennstedt (1818), not Burman (1760); *E. atoto* var. *minor* Boissier; *E. halophila* Miquel; *E. pallens* Dillwyn; *E. lingiana* Shih ex Chun.

Herbs, perennial, 20–40(–60) cm tall. Rootstock woody, 8–10 mm thick. Stems woody at base, many branched, each branched again, ascending or suberect, to 8–10 mm thick at base; internodes large and conspicuous. Leaves opposite, mostly not overlapping; stipules mostly interpetiolar, membranous, triangular, 1–2 mm, lacerate, caducous when dry; petiole 1–3 mm; leaf blade long elliptic or ovate-oblong, 1–3(–4) × 0.4–1.3(–1.5) cm, thinly leathery, base obliquely subrounded or rounded-cordate, margin entire, apex a small tip, obtuse in upper; lateral veins pinnate. Cyathia in terminal and subterminal cymes, peduncle 2–5 mm; involucre cuplike, ca. 2 × 1.5 mm, marginal lobes (4 or)5, triangular-ovate, apex acute, lacerate; glands 4, yellow, transversely elliptic, appendages very inconspicuous, almost absent. Male flowers 10–25; anthers yellow. Female flower: pedicel 2–4 mm, exerted from involucre; ovary glabrous; styles free, easily fallen; stigma slightly 2-lobed. Capsule exerted, nutant, 3-angular, ca. 3.5 × 3.5 mm, smooth; fruiting pedicel to 6 mm. Seeds globose, ca. 1.5 × 1.5 mm, light yellow, adaxially inconspicuously light brown striate; caruncle absent. Fl. and fr. Jun–Nov.

Sandy places near coasts. S Guangdong, Hainan, Taiwan [Cam-

bodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands].

*Euphorbia lingiana* is only an extreme example, with a long root, of this species.

**2. Euphorbia sparrmannii** Boissier, Cent. Euphorb. 5. 1860.

心叶大戟 xin ye da ji

Herbs, perennial, 10–15 cm tall. Rootstock woody, 3–5(–8) mm thick. Stems woody at base, many branched, ascending, to 3 mm thick, glabrous. Leaves opposite, overlapping on uppermost shoots; stipules interpetiolar, membranous, triangular, 1–2 mm, brown, irregularly lobed or lacerate, persistent; petiole 1–1.8 mm; leaf blade ovate, 1–1.8 × 0.6–1.3 cm, thinly leathery, base obliquely cordate, margin entire, apex acute. Cyathia clustered terminally, peduncle 1–3 mm; involucre stipelike, 1.2–1.8 × ca. 0.8 mm, smooth and glabrous, marginal lobes 5, triangular; glands 4, yellow, rounded to transversely elliptic, appendages white, wider than glands, 0.5–0.9 × 0.3–0.7 mm, margin entire. Male flowers 15–20, usually not exerted; anthers yellow. Female flower: pedicel 2–4 mm, exerted from involucre; ovary smooth, glabrous; styles free, persistent; stigma 2-lobed. Capsule exerted, nutant, subglobose, ca. 2.5 × 2.5 mm, smooth, glabrous; fruiting pedicel to 4 mm. Seeds ovoid-tetragonal, ca. 1.3 × ca. 1 mm, dark gray or light brown, smooth or shallowly transversely furrowed; caruncle absent. Fl. and fr. Aug–Nov.

Coral reefs along coastal areas. Taiwan (Lan Yu) [Indonesia, Japan (Ryukyu Islands), Malaysia, Philippines; Pacific islands].

This species is most easily identified by its distinctively overlapping leaves.

**3. *Euphorbia garanbiensis*** Hayata, Icon. Pl. Formos. 9: 103. 1920.

鹅銻鼻大戟 e luan bi da ji

Herbs, perennial, 20–40 cm tall. Rootstock woody. Stems many from base, often prostrate, 1–2 mm thick, with large internodes. Leaves opposite, subsessile; stipules shortly triangular, lacerate; leaf blade rounded-ovate to obovate, 8–12 × 6–8 mm, coriaceous, margin serrate, apex rounded; involucre leaves sessile, ovate, ca. 3 × 2.5 mm, remotely crenate. Cyathia axillary or terminal, solitary or in pedunculate cymes; involucre turbinate, 0.7–1.1 × ca. 1 mm, glabrous, marginal lobes 4; glands 4, yellow-green, transversely elliptic, appendages white, reniform, 0.2–0.5 × 0.4–0.8 mm, margin entire or dentate. Male flowers 20–30; anthers yellow. Female flower exserted from involucre; ovary smooth, glabrous; styles free; stigma 2-lobed. Capsule 3-angular-ovoid, 1.6–2.2 × 1.7–2.3 mm, smooth, glabrous; fruiting pedicel to 3.7 mm. Seeds ovate-globose, 1–1.1 × 0.6–0.8 mm, gray, brown, or red, shallowly transversely furrowed, adaxially grooved; caruncle absent. Fl. and fr. summer.

• Coastal sands and grasslands; near sea level. S Taiwan (Eluanbi Peninsula).

**4. *Euphorbia hyssopifolia*** Linnaeus, Syst. Nat., ed. 10, 2: 1048. 1759.

紫斑大戟 zi ban da ji

Herbs, annual, 15–20 cm tall. Root fibrous, 0.8–1 mm. Stems many from base, ascending or suberect, rarely prostrate, ca. 1 mm thick, usually glabrous, rarely with a few hairs when young. Leaves opposite; stipules interpetiolar, truncate, 0.7–0.9 mm, shallowly lacerate; petiole 1.5–2 mm; leaf blade oblong-elliptic, 0.7–3 cm × 0.3–1.2 mm, thickly papery, base slightly oblique, asymmetric, subrounded, margin sparsely crenate, apex obtuse, adaxially with a few purple spots. Cyathia axillary and terminal, single or in small cymes, peduncle to 4 mm; involucre narrowly campanulate, ca. 0.8 × 0.4–0.5 mm, glabrous, marginal lobes 5, triangular; glands 4, yellow-green, rounded to transversely elliptic, appendages white or pale pink, wider than glands, to 0.7 × 0.5 mm, margin entire to slightly undulate. Male flowers 5–15, exserted; anthers red. Female flower pedicellate, exserted from involucre; ovary smooth, glabrous; styles free; stigma slightly 2-lobed. Capsule 3-angular-ovoid, 2–2.5 × ca. 2.5 mm, smooth, glabrous; fruiting pedicel ca. 2 mm. Seeds ovoid-tetragonal, ca. 1.1 × 0.8 mm, blackish, each side with 3 or 4 transverse furrows; caruncle absent. Fl. and fr. Jan–Apr.

Disturbed areas along railways and roads. Hainan, Taiwan (Gao-xiong, Tainan, Taizhong) [New World; naturalized in the Old World].

**5. *Euphorbia hypericifolia*** Linnaeus, Sp. Pl. 2: 454. 1753.

通奶草 tong nai cao

Herbs, annual, 15–30 cm tall. Root fibrous, 2–3.5 mm thick. Stems branched mainly from upper parts, erect, 1–3 mm thick, glabrous or sparsely pilose. Leaves opposite; stipules triangular, 1.3–1.5 mm, free or connate; petiole 1–2 mm; leaf blade narrowly oblong or obovate, 1–2.5 cm × 4–8 mm, adaxially dark green, light green abaxially, sometimes purple-red, sparsely pilose on both surfaces, or glabrescent abaxially, base rounded,

margin entire or finely serrulate toward apex, apex obtuse or rounded; involucre leaves 2, similar to normal leaves. Cyathia many in axillary or terminal cymes, peduncle 3–5 mm; involucre turbinate, ca. 1 × 1 mm, marginal lobes 5, ovate-triangular; glands 4, appendages white or light pink. Male flowers numerous, slightly exserted from involucre. Female flower: pedicel longer than involucre; ovary 3-angular, glabrous; styles free; stigma slightly 2-lobed. Capsule 3-angular, 1–1.5 × ca. 2 mm, smooth, glabrous. Seeds ovoid-angulate, ca. 1.2 × 0.8 mm, each side with several striae; caruncle absent. Fl. and fr. Aug–Dec. *2n* = 32\*.

Fields, roads, scrub. Beijing, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [New World; naturalized in many parts of the Old World].

This species is used medicinally. It has been much confused with *Euphorbia indica* but that species differs by the puberulent stems and capsules (see Raju & Rao, Indian J. Bot. 2: 202. 1979).

**6. *Euphorbia bifida*** Hooker & Arnott, Bot. Beechey Voy. 213. 1837.

细齿大戟 xi chi da ji

*Chamaesyce bifida* (Hooker & Arnott) T. Kurosawa; *C. harmandii* (Gagnepain) Soják; *C. vachellii* (Hooker & Arnott) H. Hara; *Euphorbia coudercii* Gagnepain; *E. coudercii* f. *glaberrima* Gagnepain; *E. harmandii* Gagnepain; *E. reinwardtiana* Steudel; *E. serrulata* Reinwardt ex Blume (1825), not Thuillier (1799); *E. vachellii* Hooker & Arnott.

Herbs, annual, 20–40(–50) cm tall. Root fibrous, 3–5 mm. Stems woody at base, many branched, ascending, each branched again, 3–5 mm thick, internodes terete, conspicuous. Leaves opposite; stipules membranous, spinelike-triangular, 0.4–0.6 mm, free or connate at base, caducous; petiole less than 3 mm; leaf blade long elliptic to widely linear, 1–2.5 cm × 2–5 mm, base subtruncate or slightly oblique, margin finely serrulate, apical short tip on fine serrulations, apex obtuse or acuminate; main vein prominent abaxially, impressed adaxially, lateral veins pinnate, clear. Cyathia clustered, occasionally single; involucre cuplike, ca. 1 × 1 mm, marginal lobes 5, triangular, apex lacerate; glands 4, appendages pink-red, wider than glands. Male flowers numerous, slightly exserted from involucre. Female flower exserted from involucre; ovary smooth, glabrous; styles free; stigma 2-lobed. Capsule 3-angular, ca. 2 × 2 mm, smooth, nearly glabrous. Seeds 3-angular, ca. 1.5 × 1 mm, brown, sides transversely furrowed; caruncle absent. Fl. and fr. Apr–Oct.

Roadsides, forest margins, scrub, fields. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Jiangsu, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands].

**7. *Euphorbia hirta*** Linnaeus, Sp. Pl. 2: 454. 1753.

飞扬草 fei yang cao

*Chamaesyce hirta* (Linnaeus) Millspaugh.

Herbs, annual, 30–60(–70) cm tall, usually few branched. Root fibrous, 3–5 mm. Stem branched from middle or above, ascending to erect, rarely prostrate, ca. 3 mm thick, with mixture

of long yellow-brown multicellular hairs and much shorter white hairs. Leaves opposite; stipules membranous, triangular, 0.8–1.7 mm, caducous; petiole 1–3.5 mm; leaf blade lanceolate-oblong, long elliptic, or ovate-lanceolate, 10–50 × 3–16 mm, adaxially green to red, sometimes with purple blotch along midrib, abaxially gray-green, both surfaces pilose, denser abaxially, base slightly oblique, margin entire or few serrulate below middle, finely serrulate above middle, apex acuminate or obtuse. Cyathia in dense, often headlike, pedunculate cymes at upper nodes, peduncle to 25 mm, all parts very hairy; involucre campanulate, ca. 1 × 1 mm, pilose, marginal lobes 5, triangular-ovate; glands 4, red, rounded to transversely elliptic, center slightly sunken, appendages white to reddish, narrowly elliptic to obdeltoid, to 0.3 × 0.2 mm, margin entire to slightly undulate. Male flowers 4 or 5; anthers red. Female flower: pedicel short, exserted from involucre; ovary 3-angular, sparsely pilose; styles free; stigma slightly 2-lobed. Capsule 3-angular, 1–1.5 × 1–1.5 mm, smooth, shortly pilose; fruiting peduncle to 1.5 mm. Seeds subglobose-tetragonal, 0.7–0.9 × 0.4–0.5 mm, reddish, sides transversely furrowed; caruncle absent. Fl. and fr. Jun–Dec.  $2n = 18^*$ .

Roadsides, fields, scrub, open forests. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [tropical and subtropical regions in both hemispheres].

This species is used medicinally.

**8. *Euphorbia indica*** Lamarck, Encycl. 2: 423. 1788.

南亚大戟 nan ya da ji

*Chamaesyce indica* (Lamarck) Croizat; *Euphorbia indica* var. *angustifolia* Boissier.

Herbs, annual, to 50(–100) cm tall. Root fibrous. Stems many from base, spreading or erect, often purplish tinged, sparsely white pubescent. Leaves opposite; stipules triangular, to 1.5 mm, lacinate; petiole to 3 mm; leaf blade ovate, to 3(–7) × 1.5(–2.5) cm, adaxially almost glabrous, abaxially glaucous, base obliquely rounded, margin obscurely toothed, apex rounded. Cyathia in axillary or terminal pedunculate capitate cymes, peduncle to 30 mm; involucre cuplike, ca. 1 × 1 mm, pubescent, marginal lobes triangular, apex acute; glands 4, green, rounded, appendages white, to 1 mm in diam., often smaller. Male flowers slightly exserted. Female flower exserted from involucre; ovary pubescent; styles free; stigma deeply 2-lobed. Capsule 3-angular-ovoid, ca. 1.5 × 2 mm, smooth, pubescent; fruiting pedicel ca. 1.5 mm. Seeds ovoid-tetragonal, ca. 1 × 0.75 mm, reddish brown, sides obscurely transversely furrowed; caruncle absent.

Disturbed areas, either seasonally inundated or irrigated and often with impeded drainage. Guangdong, Guizhou [tropical weed in Africa and Asia].

Until recently, this species was consistently named as *Euphorbia hypericifolia*, but that New World species is completely glabrous and with smaller capsules and dimpled seeds (see Raju & Rao, Indian J. Bot. 2: 202. 1979).

**9. *Euphorbia heyneana*** Sprengel, Syst. Veg. 3: 791. 1826.

小叶地锦 xiao ye di jin

*Euphorbia microphylla* B. Heyne ex Roth, Nov. Pl. Sp. 229.

1821, not Lamarck (1788); *Chamaesyce heyneana* (Sprengel) Soják.

Herbs, annual, 8–17 cm tall. Root fibrous, 1–2 mm. Stems many from base, prostrate, 1–2 mm thick, light red or red. Leaves opposite; stipules membranous, subulate, caducous; petiole ca. 1 mm, leaf blade scalelike, 3–5 × 2–3 mm, base extremely oblique, margin subentire, apex rounded. Cyathia single or paired, axillary, peduncle absent; involucre campanulate, ca. 0.7 × 0.6 mm, glabrous, marginal lobes 5, triangular, apex acute; glands 4, narrowly elliptic, appendages white, very narrow. Male flowers 3–5, not exserted from involucre or reaching margin. Female flower pedicellate, nearly reaching margin of involucre; ovary glabrous; styles connate at base; stigma 2-lobed. Capsule 3-angular-globose, ca. 1.5 × 1.5 mm, smooth, glabrous. Seeds ovoid-angulate, light yellow, smooth; caruncle absent. Fl. and fr. Jun–Dec.

Roadsides, sunny slopes. S Fujian [Bangladesh, India, Malaysia, Myanmar, Pakistan, Thailand, Vietnam; Indian Ocean islands (Mauritius, Seychelles)].

**10. *Euphorbia taihsiensis*** (Chaw & Koutnik) Oudejans, World Cat. Sp. Names Publ. Tribe Euphorbieae (Euphorbiaceae) Geogr. Distrib. 5. 1990.

台西地锦 tai xi di jin

*Chamaesyce taihsiensis* Chaw & Koutnik, Bot. Bull. Acad. Sin., n.s., 31: 163. 1990.

Herbs, perennial. Stems prostrate; internodes conspicuous, glabrous. Leaves opposite; stipules triangular, 0.3–0.5 mm, ciliate at tip, connate at base; petiole 0.2–1 mm, glabrous; leaf blade elliptic to obovate, 2.5–6 × 1.5–3.5 mm, glabrous on both surfaces, base rounded, margin entire or serrulate, apex truncate or emarginate. Cyathia single, axillary; involucre campanulate, 0.8–1 × 0.6–1.1 mm, glabrous; glands 4, green to red, elliptic to oblong, 0.2–0.3 × ca. 0.1 mm, appendages elliptic, entire or sparsely repand. Male flowers 3–10, usually exserted. Female flower exserted from involucre; ovary glabrous; styles free; stigma 2-lobed. Capsule 1.3–1.7 × 1.2–1.7 mm, smooth, glabrous; fruiting pedicel to 2.4 mm. Seeds ovoid-tetragonal, 0.8–1.2 × 0.6–0.9 mm, gray or light brown, smooth or slightly transversely furrowed; caruncle absent. Fl. and fr. May–Aug.

• Coastal, on coral islands. W Taiwan (Penghu Liedao, Taixi).

**11. *Euphorbia serpens*** Kunth in Humboldt et al., Nov. Gen. Sp. 2, ed. 4<sup>o</sup>: 52. 1817.

葡根大戟 pu gen da ji

*Chamaesyce serpens* (Kunth) Small; *Euphorbia orbiculata* Miquel (1859), not Kunth (1817); *E. orbiculata* var. *jawaharii* Rajagopal & Panigrahi.

Herbs, annual, 15–20 cm tall. Root fibrous, 1–2 mm, branched or not. Stems many from base, prostrate, 1–2 mm thick, internodes with adventitious roots, often green, sometimes purple striate, glabrous. Leaves opposite; stipules membranous, triangular, caducous; petiole ca. 1 mm; leaf blade oblong, 2–5 × 1.5–3 mm, gray-green pilose, base truncate or cordate, margin entire. Cyathia single, axillary; involucre turbinate to campanu-

late, 0.5–0.7 × 0.4–0.5 mm, glabrous, marginal lobes 4; glands 4, reniform-rounded, appendages white, longer and wider than glands. Male flowers 3–5, usually not exerted. Female flower: pedicel ca. 0.5 mm; exerted from involucre; ovary smooth, glabrous; styles free; stigma deeply 2-lobed. Capsule subglobose, 1.5–1.8 × 1.6–1.9 mm, smooth, glabrous; fruiting pedicel ca. 2 mm. Seeds oblong-ovoid, 0.9–1.1 × 0.6–0.9 mm, gray to brown, often smooth, sometimes furrowed; caruncle absent. Fl. and fr. Mar–Aug.

Sandy places along roads and coastal areas. Taiwan (Gaoxiong, Taibei, Tainan, Xinzhu, Zhanghua) [pantropical weed, originally from the New World].

*Euphorbia serpens* has naturalized recently in Taiwan.

**12. *Euphorbia makinoi*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 262. 1911.

小叶大戟 xiao ye da ji

Herbs, annual, 8–10 cm tall. Root fibrous, single, 2–3 mm thick. Stems many from base, prostrate, internodes with some branched, slightly pinkish red, blunt-tipped, adventitious roots. Leaves opposite; stipules erose, apex subtruncate; petiole conspicuous, 1–3 mm; leaf blade elliptic-ovate, 3–5 × 2–3.5 mm, base rounded or nearly so, margin entire or subentire, apex rounded. Cyathia single, axillary; involucre narrowly campanulate, 0.4–0.6 × 0.4–0.6 mm, marginal lobes 5, triangular-lanceolate, lacerate, pilose; glands 4, nearly elliptic, appendage narrow and white. Male flowers 3 or 4, near margin of cup. Female flower: pedicel exerted from involucre; ovary smooth, glabrous; styles free, caducous; stigma 2-lobed. Capsule not exerted, 3-angular-globose, 1–1.3 × 1.3–1.5 mm, smooth, glabrous; fruiting pedicel ca. 1 mm. Seeds ovoid-tetragonal, ca. 0.8 × 0.5 mm, yellow or light brown, smooth; caruncle absent. Fl. and fr. May–Oct.

Fields, yards, roads, sandy seashores of lower plains. Fujian (Fuzhou), Hong Kong, Jiangsu (Nanjing), Taiwan, Zhejiang (Jiaxing) [Japan (Ryukyu Islands), Philippines].

**13. *Euphorbia granulata*** Forsskål, Fl. Aegypt.-Arab. 94. 1775.

土库曼大戟 tu ku man da ji

*Euphorbia turcomanica* Boissier.

Herbs, ephemeral, 6–13 cm tall; indumentum with very short stiff erect hairs. Root fibrous, 0.5–3 mm thick. Stems usually unbranched, occasionally branched at end, usually woody at base, many from base, ascending or prostrate, 2–3 mm thick, internodes conspicuous, glabrous or pilose. Leaves opposite; stipules persistent; petiole extremely short; leaf blade subelliptic, 3–6 × 2–4 mm, glabrous on both surfaces or subglabrous, base extremely obliquely auriculate, margin entire or serrulate, apex rounded. Cyathia single, axillary, peduncle almost absent; involucre turbinate, ca. 1.5 × 1.5–2 mm, white pilose, marginal lobes 5, very small, subtruncate; glands 4, appendages white and unequal, narrow adaxially, but wider than glands abaxially, ca. 2–4 × as wide as gland, irregular, concave or repand. Male flowers many, usually not exerted. Female flower: pedicel long, exerted from involucre; ovary pilose or not; styles very short; stigma ± 2-lobed. Capsule 3-angular, ca. 1.5 × 1–1.5 mm,

smooth, sometimes pilose. Seeds tetragonal, ca. 1.5 × 1 mm, gray, adaxially grooved; caruncle absent. Fl. and fr. Jun–Sep.

Sandy or stony fields; ca. 500 m. Xinjiang (Kuytun to Jinghe) [Afghanistan, N India, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; Africa, SW and W Asia (Iran, Iraq)].

This is the only species in the subgenus in NW China and can be identified easily by its white appendages and distinctive indumentum.

**14. *Euphorbia humifusa*** Willdenow, Enum. Pl., Suppl. 27. 1814.

地锦 di jin

*Chamaesyce humifusa* (Willdenow) Prokhanov; *Euphorbia granulata* Forsskål var. *dentata* N. E. Brown; *E. inaequalis* N. E. Brown; *E. parvifolia* E. Meyer ex Boissier; *E. pseudochamaesyce* Fischer; *E. sanguinea* Klotzsch & Garcke; *E. tashiroi* Hayata.

Herbs, annual, 20(–30) cm tall. Root fibrous, 2–3 mm, usually single. Stems many from base, prostrate or ascending, 1–3 mm thick, often red or pinkish red, glabrous or pilose. Leaves opposite; stipules membranous, deeply divided into often threadlike lobes, to 1.5 mm, caducous; petiole 1–2 mm; leaf blade oblong or elliptic, 5–10 × 3–6 mm, adaxially green, abaxially light green, sometimes light red, both surfaces glabrous or pilose, base obliquely truncate, margin finely serrulate above middle, apex obtuse. Cyathia single, axillary, peduncle 1–3 mm; involucre turbinate, ca. 1 × 1 mm, marginal lobes 4, triangular; glands 4, oblong, appendages white or pink-red. Male flowers many, as high as cup. Female flower: ovary 3-angular-ovoid, smooth and glabrous; styles free, persistent; stigma 2-lobed. Capsule 3-angular-ovoid-globose, ca. 2 × 2.2 mm, smooth. Seeds 3-angular-ovoid-globose, ca. 1.3 × 0.9 mm, gray, each side smooth; caruncle absent. Fl. and fr. May–Oct.  $2n = 22^*$ .

Fields, roadsides, sandy hills, seashores, slopes, very common, usually in open situations; near sea level to 3000(–3800) m. Throughout China except Hainan [widely distributed in temperate regions of Africa, Asia, and Europe].

There is no clear way of separating *Euphorbia humifusa* from *E. inaequalis*, which is widely distributed in Africa and expands the distribution and synonymy considerably.

This species is used medicinally.

**15. *Euphorbia prostrata*** Aiton, Hort. Kew. 2: 139. 1789.

匍匐大戟 pu fu da ji

*Chamaesyce prostrata* (Aiton) Small.

Herbs, annual, 15–19 cm tall. Root fibrous. Stems many from base, prostrate, usually light red or red, occasionally green or yellow-green, glabrous or sparsely pubescent. Leaves opposite; stipules long triangular, easily fallen; petiole very short or sessile; leaf blade elliptic to obovate, 3–7(–8) × 2–4(–5) mm, adaxially green, sometimes with light red or red abaxially, margin entire or irregularly finely serrulate, apex rounded. Cyathia single, axillary or few clustered, peduncle 2–3 mm; involucre turbinate, ca. 1 × 1 mm, usually glabrous, sometimes with some pubescence, marginal lobes 5, triangular or rounded; glands 4, appendages white, extremely narrow. Male flowers many, usu-

ally shorter than cup. Female flower pedicellate, exerted from involucre; ovary sparsely pubescent on angles; styles nearly connate at base; stigma 2-lobed. Capsule 3-angular, ca.  $1.5 \times 1.4$  mm, smooth, glabrous except for white hairs along angles. Seeds ovoid-tetragonal, ca.  $0.9 \times 0.5$  mm, yellow, each side with 6 or 7 transverse furrows; caruncle absent. Fl. and fr. Apr–Oct.

Roadsides, fields, villages, scrub. Fujian, Guangdong, Hainan, Hubei, Jiangsu, Taiwan, Yunnan [tropical and subtropical Americas; naturalized in many parts of the Old World].

**16. *Euphorbia thymifolia*** Linnaeus, Sp. Pl. 1: 454. 1753.

千根草 qian gen cao

*Chamaesyce thymifolia* (Linnaeus) Millspaugh.

Herbs, annual, 10–20 cm tall. Root fibrous. Stems slender and thin, many from base, usually prostrate, 1–2(–3) mm thick, with many adventitious roots, sparsely pilose. Leaves opposite; stipules lanceolate or linear, 1–1.5 mm, easily fallen; petiole ca. 1 mm; leaf blade rounded or cordate, margin usually finely serrulate, occasionally entire, both surfaces pubescent. Cyathia single or numerous clustered and axillary, peduncle 1–2 mm, sparsely pilose; involucre campanulate to turbinate, ca.  $1 \times 1$  mm, outside shortly pilose, marginal lobes 5, ovate; glands 4, appendage white. Male flowers few, slightly exerted from involucre. Female flower: pedicel short; ovary shortly pubescent; styles free; stigma 2-lobed. Capsule 3-angular-ovoid, ca.  $1.5 \times 1.3$ – $1.5$  mm, smooth, shortly pubescent. Seeds ovoid-tetragonal, ca.  $0.7 \times 0.5$  mm, dark red, each side with 4 or 5 transverse furrows; caruncle absent. Fl. and fr. Jun–Nov.

Roadsides, grasslands, scrub, fields, very common. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang [widely spread in warm countries of both hemispheres].

This species is used medicinally.

**17. *Euphorbia maculata*** Linnaeus, Sp. Pl. 1: 455. 1753.

斑地锦 ban di jin

*Chamaesyce maculata* (Linnaeus) Small; *Euphorbia supina* Rafinesque.

Herbs, annual, 10–17 cm tall. Root fibrous, ca. 2 mm thick. Stems many from base, prostrate, ca. 1 mm thick, sparsely white pilose. Leaves opposite; stipules forming prickles, ciliate; petiole ca. 1 mm; leaf blade long elliptic to reniform-oblong, 6–12(–30)  $\times$  2–4(–13) mm, adaxially green, often with an oblong purple spot in middle, abaxially light green or gray-green, purple spot easily seen when fresh, invisible when dry, both surfaces glabrous, base obliquely slightly attenuate-rounded, margin entire below middle, finely serrulate above, apex obtuse. Cyathia from nodes, peduncle 1–2 mm; involucre narrowly cuplike, 0.7–1  $\times$  ca. 0.5 mm, white pubescent outside, marginal lobes 5, triangular-rounded; glands 4, yellow-green, transversely elliptic, appendages white. Male flowers 4 or 5, slightly exerted. Female flower exerted from involucre; ovary pilose; styles short, con-

nate at base; stigma 2-lobed. Capsule 3-angular-ovoid, ca.  $2 \times 2$  mm, smooth, sparsely pilose. Seeds ovoid-tetragonal, ca.  $1 \times 0.7$  mm, gray or gray-brown, each side with 5 transverse furrows; caruncle absent. Fl. and fr. Apr–Sep.

Grasslands, roadsides, naturalized. Hebei, Henan, Hubei, Jiangsu, Jiangxi, Taiwan, Zhejiang [Asia, Europe, North America].

**18. *Euphorbia hsinchuensis*** (S. C. Lin & S. M. Chaw) C. Y. Wu & J. S. Ma, Acta Bot. Yunnan. 15: 115. 1993.

新竹地锦 xin zhu di jin

*Chamaesyce hsinchuensis* S. C. Lin & S. M. Chaw, Bot. Bull. Acad. Sin. 32: 238. 1991.

Herbs, perennial, 15–20 cm tall. Rootstock woody. Stems many from base, prostrate or ascending, light red, glabrous or sparsely pilose on upper side. Leaves opposite; stipules triangular, free on upper side, connate on lower, 0.6–1.3 mm, pilose; petiole 0.5–0.8 mm, light red, pubescent; leaf blade ovate, obovate, or long ovate, 2–7  $\times$  1–3.5 mm, adaxially often with scattered purple spots, sparsely pilose abaxially, base obliquely rounded, margin serrulate, apex obtuse or rounded. Cyathia single, peduncle 0.3–0.8 mm; involucre ca.  $1 \times 0.6$  mm, pilose, marginal lobes 5, rounded, apex lacerate; glands 4, red, rounded or elliptic, slightly sunken in center, appendages white to red, longer and wider than glands, to  $0.5 \times 0.3$  mm, margin entire to undulate. Male flowers 5–15, exerted from involucre; anthers red. Female flower  $\pm$  exerted from involucre; ovary pilose; styles free; stigma 2-lobed. Capsule ovoid-globose, 1.4–1.8  $\times$  1.5–1.8 mm, smooth, sparsely pilose; fruiting pedicel 0.8–1.3 mm. Seeds ovoid-tetragonal, ca.  $1 \times 0.7$  mm, light red, sides transversely furrowed; caruncle absent. Fl. and fr. Jul–Sep.

• Seashores, riverbanks. Taiwan (Xinzhu).

*Euphorbia hsinchuensis* seems to be rather similar to *E. hispida*.

**19. *Euphorbia hispida*** Boissier, Cent. Euphorb. 8. 1860.

硬毛地锦 ying mao di jin

Herbs, annual, to 15 cm. Stems decumbent or prostrate, softly hispid. Leaves opposite; stipules divided into 2 or 3 linear lobes; petiole almost absent; leaf blade elliptic, both surfaces softly pilose, base obliquely rounded, margin sharply serrulate, apex obtuse. Cyathia single or on short leafy shoots; involucre turbinate, glabrous; glands 4, purplish, transversely ovate, appendages white or pink, obtusely 2- or 3-lobed, as wide as gland. Style arms shortly 2-lobed. Capsule lobes sharply keeled, sparsely pilose.

Yunnan [Afghanistan, Bangladesh, E India, Pakistan; SW Asia (Iran, Kuwait)].

*Euphorbia hispida* is included in this Flora on the basis of a single collection, *Ducloux 4686*, in Paris (P). The distinctive indumentum superficially resembles that of *E. hirta* but the hairs are uniformly long, not a mixture of long and very short.

One of us (Ma) does not agree with the treatment of this species here.

**2. *Euphorbia* subg. *Agaloma*** (Rafinesque) House, New York State Mus. Bull. 254: 471. 1924.

美洲大戟亚属 mei zhou da ji ya shu

*Agaloma* Rafinesque, Fl. Tellur. 4: 116. 1838.

Herbs, shrubs or trees. Leaves alternate, opposite, or whorled; stipules present but small. Cyathia often in terminal pseudumbel; cyathophylls conspicuous or not; glands with petaloid appendages.

About 110 species: North and South America; two species (introduced) in China.

This subgenus comprises a large group of New World species that have usually conspicuous petaloid gland appendages but are otherwise very variable, some  $\pm$  intermediate with *Euphorbia* subg. *Chamaesyce* and others approaching *Poinsettia*. Some species are grown as ornamentals and have escaped.

**20. *Euphorbia marginata*** Pursh, Fl. Amer. Sept. 2: 607. 1814.

银边翠 yin bian cui

Herbs, annual, up to 60–90 cm tall. Root fibrous, 3–5 mm thick, with many rootlets. Stem single, many from base, 3–5 mm thick, smooth, usually glabrous, sometimes less pilose. Leaves alternate, sessile or subsessile; leaf blade elliptic, 5–7  $\times$  ca. 3 cm, green, base truncate-rounded, margin entire, apex obtuse, with small tip. Primary involucre leaves 2 or 3, green with white margin, elliptic, 3–4  $\times$  1–2 cm, base attenuate, margin entire, apex rounded, primary rays 2 or 3, 1–4 cm, pubescent or subglabrous; secondary involucre leaves elliptic, 1–2 cm  $\times$  5–7(–9) mm, attenuate at base, subsessile, apex obtuse. Cyathia single from axils of involucre leaves or numerous clustered, peduncle 3–5 mm, densely pilose; involucre campanulate, 5–6  $\times$  ca. 4 mm, pubescent outside, 5 lobes, lobes triangular to rounded, apex acute to emarginate, pubescent inside; glands 4, rounded, appendages white, longer and wider than gland. Male flowers many, exerted from involucre; bracts linear. Female flower: pedicel 3–5 mm, exerted from cup; ovary densely pilose; styles free, persistent; stigma slightly 2-lobed. Capsule subglobose, ca. 5.5  $\times$  5.5 mm, pilose; fruiting pedicel 3–7 mm. Seeds globose-terete, 3.5–4  $\times$  2.8–3 mm, light yellow to gray-brown, with tubercle or inconspicuous enation; caruncle absent. Fl. and fr. Jun–Sep.

Escaped and naturalized. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Ningxia, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang; also cultivated in N China [native to North America; naturalized in the Old World].

*Euphorbia marginata* is sometimes grown for the cut flower trade.

**21. *Euphorbia cotinifolia*** Linnaeus subsp. ***cotinoides*** (Miquel) Christenhusz, Harvard Pap. Bot. 7: 3. 2002.

紫锦木 zi jin mu

*Euphorbia cotinoides* Miquel, Linnaea 21: 473. 1848.

Trees, evergreen, 13–15(–19) m; trunk to 12(–17) cm thick. Branches spreading, dark red. Leaves 3-whorled; petiole 2–9 cm, less reddish; leaf blade ovate-rounded, 2–6  $\times$  2–4 cm, both surfaces red, base subtruncate, margin entire, apex obtuse; main vein prominent at both surfaces, lateral veins numerous pairs, reticulate before reaching margin. Cyathia numerous, peduncle ca. 2 cm; involucre broadly campanulate, ca. 4  $\times$  2.5–3 mm, lobes 4–6, triangular, pilose on margin; glands 4–6, dark green, rounded, appendages white, lobed. Male flowers numerous, bracts linear. Female flower exerted from involucre; ovary 3-angular, with vertical furrows, conspicuous. Capsule 3-angular-ovoid, ca. 5  $\times$  6 mm, smooth, glabrous. Seeds subglobose, ca. 3 mm in diam., brown, adaxially dark striate; caruncle absent. Fl. and fr. Apr–Nov.

Cultivated and escaped. Fujian, Hainan, Taiwan; also widely cultivated in greenhouses of C and N China [native to Central and South America].

*Euphorbia cotinifolia* subsp. *cotinifolia* differs most obviously by the orbiculate, apically rounded leaf blades. It is not cultivated, unlike subsp. *cotinoides*, which is cultivated throughout the tropics.

**3. *Euphorbia* subg. *Poinsettia*** (Graham) House, New York State Mus. Bull. 254: 473. 1924.

一品红亚属 yi pin hong ya shu

*Poinsettia* Graham, Edinburgh New Philos. J. 20: 412. 1836.

Shrubs or herbs. Stems mostly herbaceous, sometimes becoming woody. Leaves alternate; stipules very small, usually caducous. Cyathia in congested terminal cymes; cyathophylls often unequal, sometimes leaflike, often colored; cyathial glands 1, rarely 2 or 3, narrow, often cupular or 2-lipped, without appendages. Seeds with or without caruncles.

About 20 species: predominantly a New World group but with one almost ubiquitous ornamental plus a few very widely distributed, weedy annuals that are  $\pm$  pantropical; five species (one endemic, three introduced) in China.

**22. *Euphorbia pulcherrima*** Willdenow ex Klotzsch, Allg. Gartenzeitung 2: 27. 1834.

一品红 yi pin hong

*Poinsettia pulcherrima* (Willdenow ex Klotzsch) Graham.

Shrubs to small trees, 1–3(–4) m, many branched. Stems glabrous. Leaves alternate; stipules minute, membranous, caducous; petiole 2–5 cm, glabrous; leaf blade ovate-elliptic, oblong, or lanceolate, often shallowly lobed, 6–25  $\times$  4–10 cm, abaxially pubescent, adaxially shortly pubescent or glabrous, base attenu-

ate, apex acuminate or acute. Cyathia in a very congested, 1-sided synflorescence, subtended by 5–7 petiolate leaflike bracts, these narrowly elliptic, 3–7  $\times$  1–2 cm, usually entire, sometimes repand-lobed, scarlet, peduncle 3–4 mm; involucre urceolate, light green, 7–9  $\times$  6–8 mm, lobes 5, lacerate, triangular, glabrous; glands usually 1, rarely 2, yellow, compressed, 2-lipped, 4–5  $\times$  ca. 3 mm. Male flowers many, usually exerted from involucre; bracts linear, pilose. Female flower: ovary glabrous, pedicellate, exerted from involucre, smooth; styles connate below middle; stigma deeply 2-lobed. Capsule, 3-lobed-globose, 1.5–2  $\times$  ca. 1.5 cm, smooth and glabrous. Seeds ovoid,

ca. 10 × 8–9 mm, gray or light gray, subsmooth, without caruncle. Fl. and fr. Oct–Apr.

Widely cultivated and occasionally escaped and naturalized. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang; also cultivated in C and N China [native to Central America].

*Euphorbia pulcherrima* is cultivated worldwide on a massive scale as a potted plant.

**23. *Euphorbia cyathophora*** Murray, *Commentat. Soc. Regiae Sci. Gott.* 7: 81. 1786.

猩猩草 xing xing cao

*Euphorbia heterophylla* Linnaeus f. *cyathophora* (Murray) Voss; *E. heterophylla* var. *cyathophora* (Murray) Grisebach.

Herbs, annual, shrubby, erect to 1 m tall. Stems glabrous, hollow. Leaves alternate; stipules brownish glands; petiole to 1.5 cm, pilose; leaf blade lanceolate in outline, violin-shaped, to 10 × 5 cm, abaxially sparsely pilose, glabrescent, adaxially glabrous, base cuneate, margin shallowly and irregularly toothed, apex obtuse. Inflorescence a terminal cyme forking ca. 4 times, cyathia densely clustered; basal bracts similar to leaves but with a bright orange-red blotch at base, upper bracts progressively smaller, more lanceolate, subsessile, entirely red. Cyathia ca. 3.5 × 3 mm; involucre barrel-shaped, glabrous, lobes ca. 1.5 × 1.5 mm, rounded, margin deeply and bluntly toothed; glands 1(or 2), funnel-shaped, opening transversely elliptic, ca. 2 mm wide. Male flowers: bracteoles ligulate, feathery; stamens ca. 4 mm. Female flower: ovary pedicellate, glabrous; styles ca. 2 mm, bifid almost to base. Fruiting pedicel reflexed to 5.5 mm; capsule deeply 3-lobed, ca. 4 × 5 mm. Seeds ovoid-conical, ca. 2.8 × 2.2 mm, apex acute; seed coat sharply warty, blackish brown. Fl. and fr. May–Nov. *2n* = ?56.

Cultivated, sometimes naturalized. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [native to America; naturalized in the Old World].

There has been much confusion in the literature between this and the following species, *Euphorbia heterophylla*.

**24. *Euphorbia heterophylla*** Linnaeus, *Sp. Pl.* 1: 453. 1753.

白苞猩猩草 bai bao xing xing cao

*Euphorbia epilobiifolia* W. T. Wang; *E. geniculata* Ortega; *E. taiwaniana* S. S. Ying; *Poinsettia geniculata* (Ortega) Klotzsch & Garcke var. *heterophylla* (Linnaeus) Klotzsch & Garcke.

Herbs, annual, erect to 1 m tall, often tinged red. Stem glabrous to sparsely pilose at apex, hollow. Leaves alternate; stipules purplish glands, fairly conspicuous; petiole to 2(–4) cm; leaf blade ovate, to 12 × 6 cm, abaxially pilose especially on midrib and veins, glabrescent, adaxially glabrous to sparsely pilose near margin, base cuneate, margin with minute distant gland-tipped teeth, apex obtuse. Cymes terminal and axillary, each forking ca. 5 times, cyathia densely clustered; basal bracts similar to leaves but paler green, progressively smaller. Cyathia ca. 3.5 × 2.5 mm; involucre barrel-shaped, glabrous; gland ca. 1

mm, funnel-shaped, opening circular, ca. 1.2 mm across, often red-rimmed; lobes ca. 1.3 mm, subcircular, deeply toothed with minutely ciliate margins. Male flowers: bracteoles few, ligulate, feathery; stamens ca. 4 mm. Female flower: ovary pedicellate, glabrous or occasionally minutely puberulent, perianth forming an obvious rim; styles ca. 1 mm, occasionally minutely puberulent, bifid to halfway. Fruiting pedicel reflexed to 6 mm; capsule exserted, ca. 4.5 × 5.5 mm, deeply 3-lobed. Seeds conical, ca. 2.6 × 2.4 mm, apex acute, bluntly warty, blackish brown.

Weed of cultivation and other disturbed areas. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [native to America, now pantropical].

**25. *Euphorbia hainanensis*** Croizat, *J. Arnold Arbor.* 21: 505. 1940.

海南大戟 hai nan da ji

Shrubs, rounded, up to 1 m tall. Stems many branched, glabrous; pith hollow. Stipules very small, membranous, caducous; petiole 2–4 cm; leaf blade elliptic, 1.5–7 × 1.2–4 cm, thinly papery, both surfaces smooth, glabrous, base usually attenuate, rarely rounded, margin entire, apex rounded or emarginate. Inflorescence a terminal or axillary solitary cyathium. Cyathium stipe ca. 3 mm; involucre campanulate, ca. 3.5 × 3.5 mm, lobes 4 or 5, pilose; glands 3 or 4, light yellow, flat, transversely elliptic, entire, ca. 2 × 1.5 mm. Female flower: ovary ca. 2.5 mm in diam., smooth; styles connate below middle; style arms not lobed. Capsule 3-angular-ovoid, ca. 6 mm in diam., smooth, glabrous. Immature seeds globose, ca. 3 mm in diam., without ornamentation, without caruncle. Fl. Dec.

● Among rocks at base of limestone cliffs; ca. 900 m. Hainan (Ledong).

Though it has cyathia with 3, flat cyathial glands, rather than the solitary cupular or 2-lipped glands typical of *Euphorbia* subg. *Poinsettia*, initial molecular data indicates that *E. hainanensis* is most closely related to that group, as was suggested in the protologue. All other members are native to the New World, and Croizat suggested that the Hainan plant might be introduced in China; however, a second collection (*M. G. Gilbert et al. [National Geographic Society 2000 Hainan Expedition] 501*, BM, IBSC, MO) shows that this is extremely unlikely. It grows in a very distinctive habitat with a number of other Hainan endemics.

**26. *Euphorbia dentata*** Michaux, *Fl. Bor.-Amer.* 2: 211. 1803.

齿裂大戟 chi lie da ji

*Euphorbia purpureomaculata* T. J. Feng & J. X. Huang.

Herbs, annual, 20–50 cm tall, Root fibrous, 7–10 cm × 2–3 mm thick. Stems single, many branched above base, 2–5 mm thick, minutely pubescent and sparsely setose. Lower leaves opposite; stipules minute, caducous; petiole 0.3–2 cm, minutely puberulent; leaf blade linear to ovate, 2–7 × 0.5–2 cm, adaxial surface often with purplish spot, both surfaces coarsely pilose on veins or glabrous, base attenuate, margin entire, repand-toothed, or shallowly lobed, very variable, with narrow marginal vein, apex acute or obtuse. Inflorescence terminal, cyathia in whorl of 2 or 3 congested 1-sided cymes; lower involucre leaves 2 or 3, similar to normal leaves; primary rays 2–4 cm; upper involucre leaves few, reduced. Cyathium stipe 1–4 mm; involucre cam-



panulate, ca.  $3 \times 2$  mm, lobes 5, triangular, lacerate; gland 1, lateral on margin of cup, light yellow-brown, cup-shaped, ca. 1.2 mm in diam. Male flowers many, exerted from involucre; anthers yellow. Female flower: ovary globose, glabrous; styles free; style arms 2-lobed. Fruiting pedicel short, as long as cup; capsule compressed globose, ca.  $4 \times 4$ –5 mm, glabrous. Seed

ovoid-globose, ca.  $2 \times 1.5$ –2 mm, gray to almost black, papillate-tuberculate, adaxially black grooved; caruncle small, peltate, yellow, sessile. Fl. and fr. Jul–Oct.  $2n = 28^*$ .

Naturalized recently in grasslands in the Beijing Botanical Garden [native to North America].

**4. Euphorbia subg. Tirucalli** (Boissier) S. Carter, Kew Bull. 40: 823. 1985.

绿玉树亚属 lǜ yu shu ya shu

*Euphorbia* sect. *Tirucalli* Boissier in A. Candolle, Prodr. 15(2): 94. 1862.

Mostly trees; branches succulent, often striate. Leaves alternate, usually short-lived; stipules glandular. Cyathia clustered at stem apex, small, unisexual; cyathophylls very inconspicuous.

About ten species as here defined: most species in S Africa and Madagascar, with an outlying species on Socotra and one species (*E. tirucalli*) now widespread throughout the tropics; one species (introduced) in China.

**27. Euphorbia tirucalli** Linnaeus, Sp. Pl. 1: 452. 1753.

绿玉树 lǜ yu shu

Trees or shrubs, 2–6 m tall, dioecious, eventually forming trunk, 10–25 cm d.b.h.; bark rugose, gray or light. Stems green, succulent, very finely longitudinally striate. Leaves alternate, present only on new growth; stipules very small, caducous; petiole  $\pm$  absent; leaf blade oblong-linear,  $7$ – $15 \times 0.7$ – $1.5$  mm, base attenuate, margin entire, apex obtuse. Cyathia clustered at apex of branches, pedunculate, unisexual; involucre leaves minute, membranous, caducous; involucre turbinate, ca.  $2 \times 1.5$

mm, shortly pubescent inside; glands 5, peltate-ovate or subrounded. Male flowers many, exerted from involucre. Female flower: ovary glabrous, exerted from involucre; styles connate below middle; stigma 2-lobed. Capsule 3-lobed, ca.  $8 \times 8$  mm, smooth, sparsely pilose or glabrous. Seeds ovoid-globose, ca.  $4 \times 4$  mm, smooth; caruncle small. Fl. and fr. Jul–Oct.

Cultivated and escaped. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang; also widely cultivated in greenhouses of C and N China [native to Africa (Angola); widely cultivated in tropical Asia].

**5. Euphorbia subg. Lacanthis** (Rafinesque) M. G. Gilbert, Kew Bull. 42: 238. 1987.

非洲大戟亚属 fei zhou da ji ya shu

*Lacanthis* Rafinesque, Fl. Tellur. 2: 94. 1837.

Dwarf herbs to shrubs, sometimes geophytic. Stems succulent, mostly spiny, mostly terete or obscurely angled, rarely distinctly angled. Leaves alternate, persistent or caducous; stipules often spinelike, sometimes with additional spines, rarely without spines. Cyathia in axillary, usually subterminal, cymes, often with long peduncles; cyathophylls usually conspicuous, brightly colored; cyathial glands without appendages.

About 75 species: endemic to Madagascar; one species (introduced) in China.

Molecular data have shown that species from NE Africa, formally related to *Euphorbia* subg. *Lacanthis*, belong to a distinct lineage.

**28. Euphorbia milii** Des Moulins, Bull. Hist. Nat. Soc. Linn. Bordeaux 1: 27. 1826.

铁海棠 tie hai tang

*Euphorbia splendens* Bojer ex Hooker.

Shrubs, scrambling, many branched, 60–90 cm. Stems obscurely 3–5-angled, densely spiny. Leaves alternate, clustered at stem apex; stipules forming spines 1–1.3(–2) cm; petiole absent or nearly so; leaf blade obovate to oblong-oblancoelate,  $1.5$ – $5 \times 0.8$ – $1.8$  cm, base attenuate, margin entire, apex rounded. Cyathia in subapical, dichasial cymes, peduncle 4–7 cm; cyathophylls 2, reniform-rounded,  $8$ – $10 \times 12$ – $14$  mm, usually bright red (pink, white, or yellow in some cultivars), apex rounded; involucre

campanulate,  $3$ – $4 \times 3.5$ – $4$  mm, lobes 5, lanceolate; glands 5, reniform-rounded, ca.  $1 \times 2$  mm, yellow-red. Male flowers many; bracteoles linear, apex pilose. Female flower: ovary smooth and glabrous, usually included with involucre; styles connate below middle; stigma 2-lobed. Capsule 3-lobed-ovoid, ca.  $3.5 \times 4$  mm, smooth and glabrous. Seeds ovoid-terete, ca.  $2.5 \times 2$  mm, gray-brown, reticulate; caruncle absent. Fl. and fr. all year.

Cultivated and escaped. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [native to Madagascar; widely cultivated elsewhere].

*Euphorbia milii* is widely cultivated as an ornamental and frequently grown as a low hedge. It is used medicinally.

**6. Euphorbia subg. Euphorbia**

大戟亚属 da ji ya shu

Trees, shrubs, or herbs. Stems always succulent, usually with prominent ribs or tubercles. Leaves opposite or alternate, each

inserted on a callosed "spine shield" bearing 1 or 2 spines below a pair of pricklelike stipules; leaf blade often very small and scalelike, rarely persistent. Cyathia in small subterminal cymes; cyathophylls reduced, somewhat scalelike; cyathial glands without appendages, usually  $\pm$  contiguous. Seeds usually without caruncle.

About 250 species: most numerous and diverse in the drylands of Africa but with a few species extending into the drier regions of Asia as far east as SE China; three species (two introduced) in China.

Some species are used as live fences. There are unconfirmed reports that *Euphorbia sessiliflora* Roxburgh extends into China. Though it has terete stems and lacks the characteristic spine shields, it has very similar axillary inflorescences and is possibly most closely related to this group.

**29. *Euphorbia neriifolia* Linnaeus, Sp. Pl. 1: 451. 1753.**

金刚纂 jin gang zuan

Trees or shrubs, 3–5(–8) m tall, glabrous except for cyathia. Stems 6–15 cm thick, green, with 5 spiral ranks of tubercles, ascending, branching from upper parts. Leaves alternate, apically clustered, persistent, succulent; spine shields small, stipules pricklelike, 2–3 mm; petiole short, 2–4 mm; leaf blade obovate or obovate-oblong to spoon-shaped, 4.5–12  $\times$  1.3–3.8 cm, fleshy, base attenuate, margin entire, apex obtuse, apiculate; veins inconspicuous. Cyathia in subterminal cymes, peduncle ca. 3 mm; cyathophylls membranous, caducous; involucre campanulate, ca. 4  $\times$  5–6 mm, lobes 5, rounded; glands 5, succulent, thick and entire. Male flowers many, bracts linear. Female flowers rarely developed. Capsule and seeds not seen. Fl. Jun–Sep.

Cultivated. Guangdong, Guangxi, Hainan, Yunnan [native to India; widely cultivated in tropical Asia].

*Euphorbia neriifolia* is also cultivated in the greenhouses of C and N China. The stems and leaves are used medicinally.

**30. *Euphorbia antiquorum* Linnaeus, Sp. Pl. 1: 450. 1753.**

火殃勒 huo yang le

Trees or shrubs, 3–5(–8) m tall, glabrous except for cyathia. Stems 5–7 cm thick, green, 3(or 4)-ribbed, branching from upper parts; ribs prominent, winglike, up to 1–2 cm wide, 3–5 mm thick, prominently triangular toothed. Leaves alternate, apically clustered, caducous; spine shields small, stipules pricklelike, spines paired, 2–5 mm; petiole very short; leaf blade obovate or obovate-oblong, 2–5  $\times$  1–2 cm, base attenuate, margin entire, apex rounded. Cyathia subterminal, single, peduncle 2–3 mm; cyathophylls as long as involucre, membranous; involucre broadly campanulate, ca. 3  $\times$  5 mm, lobes 5, rounded, denticulate; glands 5, entire. Male flowers many; bracts linear. Female flower: ovary pedicellate, exserted from involucre, smooth and

glabrous; styles free; stigma slightly 2-lobed. Capsule 3-lobed, compressed, 3.4–4  $\times$  4–5 mm. Seeds subglobose, ca. 2  $\times$  2 mm, brown-yellow, smooth; caruncle absent. Fl. and fr. all year.

Escaped or naturalized, more widely cultivated. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang [Bangladesh, India, Indonesia, Malaysia, Myanmar, Pakistan, Sri Lanka, Thailand, Vietnam; wild origin obscure].

*Euphorbia antiquorum* is the type species for the genus *Euphorbia*. It is used medicinally.

**31. *Euphorbia royleana* Boissier in A. Candolle, Prodr. 15(2): 83. 1862.**

霸王鞭 ba wang bian

*Euphorbia pentagona* Royle, Ill. Bot. Himal. Mts. 329. 1836, not Haworth (1828).

Small trees or shrubs, 5–7 m tall, glabrous except for cyathia. Stems 4–7 cm thick, green, 5–7-angled, many branching from upper parts; ribs with rounded teeth/tubercles. Leaves alternate, apically clustered; stipules pricklelike, spines paired, 3–5 mm; petiole absent; leaf blade oblanceolate to spoon-shaped, 5–15  $\times$  1–4 cm, slightly succulent, base attenuate, margin entire, apex obtuse or subtruncate; veins inconspicuous. Cyathia in subterminal cymes, yellow, peduncle ca. 5 mm; cyathophylls as long as involucre, membranous; involucre ca. 2.5  $\times$  2.5 mm; glands 5, transversely elliptic, dark yellow. Capsule 3-lobed, 1–1.2  $\times$  1–1.5 cm, smooth and glabrous. Seeds 3–3.5  $\times$  2.5–3 mm, brown, adaxially striate; caruncle absent. Fl. and fr. May–Jul.

Subtropical rainshadow valleys, forming its own communities on rocky slopes. W Guangxi, S Sichuan, Taiwan, Yunnan [Bhutan, N and NE India, Myanmar, Nepal, Pakistan].

*Euphorbia royleana* is grown as a live fence in S Yunnan and is cultivated as a potted plant in C and N China. It is used medicinally.

**7. *Euphorbia* subg. *Esula* Persoon, Syn. Pl. 2: 14. 1806.**

乳浆大戟亚属 ru jiang da ji ya shu

*Esula* (Persoon) Haworth (1812), not Morandi (1761); *Tithymalus* Gaertner (1790), nom. cons., not Miller (1754).

Herbs and shrubs, annual to perennial. Stems often little branched, often hollow, often dying after flowering. Leaves usually alternate; stipules absent; leaf blade symmetrical, usually persistent. Inflorescence usually a terminal pseudumbel, sometimes compound, sometimes also with axillary cymes from uppermost axils forming cylindrical thyrse. Cyathia subtended by cyathophylls longer than cyathia, mostly green, occasionally colored; glands usually 4, sometimes 5, simple or with 2 horns. Capsules often exserted, sometimes papillate. Seeds with or without caruncle.

About 500 species: most numerous in temperate Asia and Europe, extending into montane regions of the tropics; 46 species (seven endemic) in China.

Most members are very easily recognized by the monocarpic stems, lack of stipules, and pseudumbellate inflorescences.

**32. *Euphorbia lathyris* Linnaeus, Sp. Pl. 1: 457. 1753.**续随子 *xu sui zi*

Herbs, annual, erect, up to 1(–1.5) m tall. Rootstock a simple taproot, slightly swollen in seedlings, up to more than 20 cm × 3–7 mm thick; lateral roots thin and branched. Stem single, gray-green, smooth and glabrous. Leaves opposite, decussate; stipules absent; petiole absent; leaf blade linear-lanceolate, 6–15(–20) × 0.4–2.5 cm, glabrous, base ± clasping stem, margin entire, apex acuminate or acute; midrib prominent adaxially, lateral veins inconspicuous. Inflorescence a terminal pseudumbel, often compound, eventually broad and lax; primary involucre leaves (2–)4 or 5(or 6), slightly yellowish green, narrowly elliptic to ovate-elliptic, somewhat unequal, margin entire, base rounded, primary rays (3 or)4 or 5; cymes regularly many forked; cyathophylls 2, ovate-triangular, 3–8 × 2–4 mm, base truncate to clasping, margin entire, apex acuminate or acute. Cyathium subsessile; involucre subcampanulate, 2.5–4 × 2.5–3.5(–5) mm, lobes triangular-oblong, less repanded or lobed; glands 4, dark brown, transversely oblong-reniform with a club-shaped horn at each tip. Male flowers many, exerted from involucre. Female flower exerted from cup; ovary smooth, glabrous; styles free, slender and long, caducous; style arms 2-lobed. Capsule trigonous-globose, ca. 10 × 13–17 mm, smooth, glabrous. Seeds ovoid-globose to barrel-shaped, 5–8 × 4–6 mm, brown or gray-brown, with black-brown spots on surface, sharply rugulose; caruncle ca. 1.5 mm wide, yellowish, sessile, easily lost. Fl. Apr–Jul.  $2n = 20^*$ .

Weed of cultivation. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [N Africa, America, Asia, Europe].

*Euphorbia lathyris* is a very isolated species that is adventive in many parts of the world. It is probably native only in the Mediterranean region.

The seeds are used medicinally. The seed oil (ca. 50%) can also be widely used in industry, and there has been some work on the development of *Euphorbia lathyris* as a commercial crop, particularly by the selection of forms with indehiscent fruits.

**33. *Euphorbia helioscopia* Linnaeus, Sp. Pl. 1: 459. 1753.**泽漆 *ze qi*

Herbs, usually annual, erect or ascending, 10–30(–50) cm tall. Root fibrous, 7–10 cm × 3–5 mm, branched. Stems single or with ascending branches from near base, 3–5(–7) mm thick, sometimes slightly fistulose, smooth and glabrous. Leaves alternate; stipules absent; petiole absent or nearly so; leaf blade obovate to spoon-shaped, 1–3.5 × 0.5–1.5 cm, base cuneate, margin dentate, apex rounded. Inflorescence a compound pseudumbel, usually rather compact; primary involucre leaves 5, yellowish green, obovate-oblong, 3–4 × 0.8–1.4 cm, margin dentate, base attenuate, primary rays 5, to 2–4 cm, progressively shorter; cyathophylls 2, obovate, base rounded, margin dentate, apex rounded. Cyathium subsessile; involucre campanulate, ca. 2.5 × 2 mm, smooth and glabrous, lobes rounded, pilose at margin and inside; glands 4, pale brown, disklike, shortly stalked, shallowly concave. Male flowers many, exerted from involucre. Female flower: ovary slightly reaching margin of cup. Capsule trigonous-terete, 2.5–3 × 3–4.5 mm, with 3 vertical furrows, con-

spicuous, smooth, glabrous. Seeds ovoid, ca. 2 × 1.5 mm, dark brown, reticulately wrinkled; caruncle compressed, sessile. Fl. and fr. Apr–Oct.  $2n = 42^*$ .

Fields, roadsides, scrub, margins of mixed forests. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan, Zhejiang [widely spread in N Africa, Asia, and Europe; introduced to North America].

This species is used medicinally.

*Euphorbia helioscopia* is a widespread and variable species and several subspecies have been proposed. Chinese material all belongs to subsp. *helioscopia*.

**34. *Euphorbia turkestanica* Regel, Descr. Pl. Nov. Fedtsch. 78. 1882.**中亚大戟 *zhong ya da ji*

Herbs, annual, 6–20 cm tall, glaucous. Rootstock a slender taproot, 4–7 cm × 2–4 mm thick. Stems usually single, 2–3(–4) mm thick, usually unbranched below inflorescence, smooth and glabrous. Lowermost leaves opposite or subopposite, upper leaves alternate, largest below inflorescence; stipules absent; basal scale-leaves absent; petiole absent; leaf blade oblong-ovate, fleshy, 1–2 × 0.3–1 cm, base subtruncate to shallowly cordate, margin irregularly finely serrulate or subrepand, apex obtuse or truncate; midrib raised abaxially in dried material, lateral veins ca. 2 pairs, slender, basal. Inflorescence a terminal pseudumbel; primary involucre leaves (2 or)3, similar to normal leaves but larger; 1.5–2.5 × 1–2 cm, margin denticulate, base amplexicaul, primary rays 2 or 3, longer than involucre leaves; cymes to at least 3 × forked; cyathophylls 2, similar to primary involucre leaves but narrower, 1.5–3 × 0.6–1.8 cm. Cyathium involucre broadly campanulate, to 2 mm wide, glabrous, lobes subrounded, emarginate, glabrous; glands 5, brown or pale brown, transversely reniform. Male flowers many, exerted from involucre. Female flower: ovary pedicellate, exerted from cup; styles free or connate below middle, persistent; style arms unlobed or slightly 2-lobed. Fruiting pedicel ca. 5 mm; capsule ovoid-globose, 5–6 mm, smooth, faintly reticulate. Seeds compressed-ovoid, (3–)4–5 × ca. 3 mm, greenish brown, spotted, adaxially clear striate; caruncle peltate-cordate, orange-yellow, extremely shortly stipitate. Fl. and fr. May–Jul.

Xinjiang (Ili He valley) [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan].

**35. *Euphorbia altotibetica* Paulsen, S. Tibet Bot. 6(3): 56. 1922.**青藏大戟 *qing zang da ji**Euphorbia przewalskii* Prokhanov.

Herbs, perennial, 15–30 cm tall. Rootstock a short, deeply buried rhizome, 8–20 cm × 3–6 mm thick. Stems single or in small groups, to 5 mm thick, vegetative portion often short and inconspicuous, often drying a rather bright green, smooth and glabrous. Leaves alternate, increasing in size up stem; stipules absent; basal scale-leaves soon lost; petiole ill-defined, to 2 mm, relatively broad; leaf blade ovate to oblong, to 1.8–3 × 1–1.5 cm, mostly much smaller, base subtruncate to shallowly

cordate, margin repand-denticulate, often undulate, apex rounded; midrib and lateral veins inconspicuous. Inflorescence a terminal pseudumbel, sometimes compound; primary involucre leaves 3–5, ovate-triangular, amplexicaul, 1–3 × 1.2–3 cm, margin denticulate, base amplexicaul, primary rays 3–5, 1–5 cm; cymes at first forked but then often reverting to small-leaved vegetative shoots; cyathophylls 2, similar to primary involucre leaves, but smaller. Cyathium stipe to 4 mm; involucre broadly campanulate, 2.5–3.5 × 4–6 mm, glabrous, lobes oblong, apex 2-lobed or slightly repand, inconspicuous, glabrous or sparsely ciliate; glands 5, dark brown, transversely reniform or oblong-elliptic, entire. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3–5 mm, exerted from cup, strongly reflexed at anthesis; ovary smooth, glabrous; styles very short, free, strongly recurved, persistent; style arms unlobed or emarginate. Fruiting pedicel 3–10 mm; capsule ovoid-globose, 4–5 × 4–5 mm, very faintly rugulose, glabrous. Seeds ovoid-globose, 2.5–3 × 1.8–2.3 mm, pale fawn with brown marbling, smooth, matte, with dark adaxial line; caruncle subglobose, peltate, yellowish, very shortly stipitate. Fl. and fr. May–Aug.

• Grasslands along slopes of lakesides; 2800–3900 m. Gansu (Gaotai, Jiuquan), Ningxia (Yanchi), Qinghai, Xizang.

**36. *Euphorbia tibetica*** Boissier in A. Candolle, Prodr. 15(2): 114. 1862.

西藏大戟 xi zang da ji

Herbs, perennial, usually erect or ascending, 10–15(–30) cm tall. Rootstock vertical, cylindrical, up to more than 10 cm, to 10 mm thick but often less, many branched at apex. Stems densely clustered, mostly sterile, 1–2(–5) mm thick, glabrous. Leaves alternate; stipules absent; basal scale-leaves few; petiole absent or nearly so; leaf blade obovate to oblong-lanceolate, 6–15 × 3–6 mm, base attenuate, margin entire, repand, or dentate, apex rounded; lateral veins inconspicuous. Inflorescence an ill-defined terminal pseudumbel or dichasial cyme; involucre leaves 2 or 3, ovate-triangular, sometimes oblique, margin denticulate, base attenuate, primary rays 2 or 3, 0.2–2.5 cm; cymes ca. 3 × forked; cyathophylls 2, similar to primary involucre leaves. Cyathium stipitate; involucre turbinate, 3.5–4.5 × 3–5 mm, lobes entire, bent inside; glands 5, dark brown, rounded to transversely oblong, entire. Male flowers many, slightly exerted from involucre. Female flower: ovary pedicellate and extended out of cup, smooth, glabrous; styles very short, free, persistent; style arms slightly 2-lobed. Capsule shortly terete, ca. 5 × 5 mm, smooth, glabrous. Seeds ovoid-globose, 3–4 × 1.7–3 mm, brown to black-brown, smooth without modification; caruncle trigonous, yellow. Fl. and fr. Jun–Sep.

Deserts, semidesert areas, dry and semidry fields; 2500–5000 m. Xinjiang, Xizang [NW India, Kazakhstan, Kyrgyzstan, N Pakistan, Tajikistan].

**37. *Euphorbia soongarica*** Boissier, Cent. Euphorb. 32. 1860.

准格尔大戟 zhun ge er da ji

*Euphorbia lamprocarpa* (Prokhanov) Prokhanov; *E. soongarica* subsp. *lamprocarpa* (Prokhanov) Prokhanov; *Tithymalus lamprocarpus* Prokhanov.

Herbs, perennial, erect, 50–90 cm tall, Rootstock obliquely

descending, 30–50 cm × 5–10 mm, thickest below stem. Stems several clustered, 8–10 mm thick, many branched above middle, striate when dried, glabrous, with many sterile lateral branches. Leaves alternate, larger toward apex; stipules absent; basal scale-leaves soon lost; petiole almost absent; leaf blade oblanceolate or narrowly lanceolate, (2–)3–11 × 0.5–1.8(–2.2) cm, base attenuate, margin usually finely serrulate above middle, apex acuminate or acute; midrib prominent on both surfaces, lateral veins many, inconspicuous. Inflorescence a terminal pseudumbel plus 3–7 small subterminal pseudumbels, ± flat-topped; primary involucre leaves 3–5, ovate to oblong, 0.5–1(–3) × 0.4–1 cm, margin subentire, base cuneate, primary rays 3–5, to 1.6 cm; cyathophylls 2, yellowish, similar to primary involucre leaves but smaller, 0.4–1 × 0.2–0.8 cm. Cyathium stipitate; involucre campanulate, ca. 2.5 × 2–2.5(–3.5) mm, exterior glabrous, interior tomentose; lobes rounded to ovate-oblong, ciliate at margin and inside; glands 5, pale brown, rounded [transversely elliptic], entire. Male flowers many, exerted from involucre. Female flower: ovary pedicel up to 5 mm, exerted from cup; ovary smooth, glabrous; styles connate ca. 1/2 length, persistent; style arms capitate. Capsule subglobose, 4–5 × 4–5 mm, smooth, sometimes sparsely spotted. Seeds ovoid-globose, 2.5–3 × ca. 2 mm, yellow-brown, smooth with adaxial ridge; caruncle present, sessile. Fl. and fr. Jun–Sep.

Steppes, low mountain slopes, fields, along dry valleys; common; 500–2000 m. W Gansu, N Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia (W Siberia), Tajikistan, Turkmenistan, Uzbekistan; E Europe].

The root is used medicinally.

**38. *Euphorbia humilis*** C. A. Meyer ex Ledebour, Icon. Pl. 2: 25. 1830.

矮大戟 ai da ji

*Euphorbia korovinii* Pavlov.

Shrublets, very densely branched, 5–7(–15) cm tall. Rootstock a woody taproot, single, 10–20 cm × 5–10 mm thick, many branched at apex. Stems densely clustered, many branched from base, 1–1.5 mm thick, upper parts mostly unbranched, glabrous or minutely puberulent. Leaves alternate; stipules absent; basal scale-leaves overlapping, sometimes persistent; petiole absent; leaf blade obovate to elliptic, somewhat thickened, 6–8 × 3–5 mm, both surfaces glabrous, base cuneate, margin entire, apex acute; midrib inconspicuous, lateral veins invisible. Inflorescence a terminal pseudumbel; primary involucre leaves and rays (2–)4, similar to normal leaves; rays 0.6–1.5 cm, secondary branching rare; cyathophylls 2, similar to normal leaves but smaller and broader. Cyathium sessile; involucre cuplike, 2–2.5 × 2–2.5 mm, lobes obtusely triangular; glands 4, pale yellow-brown, ± fan-shaped, spreading. Male flowers many, only slightly exerted from involucre. Female flower: ovary pedicel up to 4–6 mm and exerted from cup; ovary smooth, glabrous; styles almost free, persistent, easily lost; style arms shortly 2-lobed, not enlarged. Fruiting pedicel reflexed after dehiscence; capsule ovoid-globose, 3.5–4 × ca. 3 mm, smooth, glabrous. Seeds compressed tetragonal, 2–2.5 × ca. 1.5 mm, with clear spots; caruncle peltate, sessile. Fl. and fr. May–Jul.

Rock slopes, scrub, steppes. N Xinjiang [Kazakhstan, Kyrgyzstan, Russia (W Siberia), Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Iran)].

*Euphorbia humilis* is easily identified within the Flora area by its small stature, as well as by its succulent leaf blades.

**39. *Euphorbia sikkimensis*** Boissier in A. Candolle, Prodr. 15(2): 113. 1862.

黄苞大戟 huang bao da ji

*Euphorbia chrysocoma* H. Léveillé & Vaniot; *E. chrysocoma* var. *glaucophylla* H. Léveillé & Vaniot.

Herbs, 20–80 cm tall. Root terete, 20–40 cm × 3–5 mm. Stems single or clustered, 3–4 mm thick, mostly unbranched, glabrous. Leaves alternate, all but lowermost uniform in size; stipules absent; petiole very short to almost absent; leaf blade narrowly ovate to oblong-elliptic, 6–10 × 1–2 cm, glabrous, base attenuate, margin entire, apex obtuse; midrib prominent on both surfaces, lateral veins slender, branching well before margin. Inflorescence a terminal pseudumbel; primary involucre leaves and rays 5, involucre leaves and cyathophylls yellow, leaves long elliptic to ovate-elliptic, somewhat unequal, 4–7 × 0.8–1.2 cm, base subrounded or triangular-rounded, apex obtuse, primary rays 0.8–1.4 cm; secondary involucre leaves usually 3, ovate, 1–2 × 0.6–1 cm; cyathophylls 2, ovate, 1–1.3 × 1–1.2 cm, base and apex rounded. Cyathium stipe 2–3 mm; involucre campanulate, ca. 3.5 × 3.5 mm, lobes rounded, white pilose inside; glands 4, brown, rounded. Male flowers many, slightly exerted from involucre. Female flower: ovary pedicellate and extended out of cup, smooth, glabrous; styles free, caducous; style arms 2-lobed. Capsule globose, ca. 5 × 5 mm, smooth, glabrous. Seeds ovoid-globose, ca. 3 × 2 mm, gray or dark gray, adaxially white striate; caruncle peltate, yellow or light yellow, sessile. Fl. Apr–Jul.

Meadow steppes to alpine meadows, sparse forests, scrub; 600–4500 m. Guangxi, Guizhou, Hubei, Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Myanmar, Nepal].

The root is used medicinally.

**40. *Euphorbia griffithii*** J. D. Hooker, Fl. Brit. India 5: 259. 1887.

圆苞大戟 yuan bao da ji

*Euphorbia bulleyana* Diels; *E. cyanophylla* H. Léveillé; *E. erythrocoma* H. Léveillé; *E. porphyrastra* Handel-Mazzetti; *E. rubriflora* H. Léveillé; *E. seriocarpa* Handel-Mazzetti.

Herbs, perennial, erect, 20–70 cm tall. Rootstock usually extensively rhizomatous, rarely a shallowly buried subglobose tuber, rhizome 3–5 mm thick, tuber to 5 cm. Stems mostly single, less often clustered, 3–7 mm thick, sometimes branched, usually mostly glabrous. Leaves alternate; stipules absent; basal scale-leaves few; petiole indistinct, short and broadly winged; leaf blade ovate-oblong to elliptic, very variable, 2–7 × 0.6–1.2 cm, leathery or almost so, base attenuate-cuneate, margin entire, apex acute or obtuse; midrib prominent on both surfaces, lateral veins not reaching margin. Primary involucre leaves 3–7(–12), light red or orange, less often yellow, long elliptic to elliptic, base attenuate, apex rounded or acuminate, primary rays 3–7, 2–4 cm; cyathophylls 2, usually red or red-purple, much varied, rounded or subtruncate at base, usually rounded or subrounded at apex. Cyathium involucre cuplike, ca. 3 × 3.5 mm, lobes

rounded, white pilose at margin and inside; glands 4, brown, rounded. Male flowers many, exerted from involucre. Female flower: ovary pedicellate and extended out of cup, smooth, glabrous; styles free; style arms peltate, slightly 2-lobed. Fruiting pedicel 4–5 mm; capsule globose, ca. 4 × 4 mm, smooth, glabrous. Seeds ovoid-globose, 2.5–3 × ca. 2 mm, dark gray or gray-brown, adaxial surface light striate; caruncle peltate, extremely shortly stipitate. Fl. and fr. Jun–Sep.

Sparse forests, scrub, meadows; 2500–4900 m. Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, Myanmar, Nepal].

This species varies much in the color of involucre leaves from yellowish red to red. There is also significant variation in the nature of the rootstock, which can be either extensively rhizomatous or form a thick tuber. Most material including that from China belongs to *Euphorbia griffithii* var. *griffithii*; *E. griffithii* var. *bhutanica* (Fischer) Long is restricted to Bhutan.

The root is used medicinally.

**41. *Euphorbia stracheyi*** Boissier in A. Candolle, Prodr. 15(2): 113. 1862.

高山大戟 gao shan da ji

*Euphorbia bupleuroides* Diels; *E. himalayensis* (Klotzsch) Boissier; *E. mairei* H. Léveillé; *E. mairei* var. *luteociliata* W. T. Wang; *E. megistopoda* Diels; *E. riae* Pax & K. Hoffmann; *E. shetoensis* Pax & K. Hoffmann; *Tithymalus himalayensis* Klotzsch.

Herbs, prostrate, ascending or erect, 5–30(–80) cm tall, often suffused deep purple. Rootstock a deeply buried subglobose tuber producing 1 to several slender annual shoots, 10–20 cm × tuber 2–4 cm thick; tuber sometimes with bright yellow latex in center; shoots 3–5 mm thick. Stems single or clustered, underground portion often very slender, usually many branched above ground, red or pale red when young, pale yellow or yellow-green when old, glabrous or puberulent; sterile shoots often present and overtopping inflorescence. Leaves alternate, mostly uniform in size; stipules absent; basal scale-leaves ovate-oblong; petiole absent; leaf blade obovate (to long elliptic), rarely linear, 0.8–2.7 × 0.4–0.9 cm, glabrous or ciliate on margins, base rounded or cuneate, margin entire, apex rounded or subacute; midrib raised abaxially, lateral veins few, inconspicuous. Inflorescence a terminal pseudumbel [often overtopped by lateral branches]; primary involucre leaves 5–8(–16), often flushed dark purplish abaxially, sometimes brownish yellow, similar to normal leaves, base often attenuate into broad petiole, apex rounded, primary rays 5–8, 1–5 cm; secondary involucre leaves similar to primary involucre leaves; cyathophylls often 3, obovate, ca. 8 × 5–6 mm, base cuneate, apex rounded. Cyathium sessile; involucre cuplike, ca. 3.5 × 3–4 mm, outside usually brown pilose, lobes linear, apex irregularly finely serrulate, inside pilose or glabrous; glands 4, pale brown, reniform-rounded, outside pubescent. Male flowers many, usually not exerted from involucre. Female flower: ovary not exerted at anthesis, smooth, sparsely pubescent when young; styles free almost to base; style arms almost entire. Capsule ovoid-globose, 5–6 × 5–6 mm, smooth, glabrous. Seeds ovoid-terete, 2.5–4 × 1.8–2.5 mm, gray-brown or light gray, smooth, adaxially ridged; caruncle peltate, white, sessile. Fl. and fr. May–Aug.

Alpine meadows, scrub, mixed sparse forests; 1000–4900 m. S Gansu, S Qinghai, Sichuan, Xizang, Yunnan [Bhutan, India, Nepal].

*Euphorbia stracheyi* varies from a very small plant, 5–20 cm, in alpine meadows to a larger plant, 30–80 cm, in the plateau of SW China. However, there is no discontinuity to justify separation into distinct species.

The rhizome is used medicinally.

**42. *Euphorbia donii*** Oudejans, *Phytologia* 67(1): 45. 1989.

长叶大戟 chang ye da ji

*Euphorbia longifolia* D. Don, *Prodr. Fl. Nepal.* 162. 1825, not Lamarck (1788); *Tithymalus longifolius* Hurusawa & Yu. Tanaka.

Herbs, perennial, 20–60 cm tall. Rootstock woody, with many old stem bases, 20–30 cm × to 10 mm thick; roots fleshy, to 5 mm thick when dried. Stem single or several clustered, 2–5 mm thick, branched apically, glabrous. Leaves alternate, larger toward apex; stipules absent; lowermost leaves scalelike; petiole ± absent; leaf blade long elliptic to oblanceolate, 4–7 × 0.7–1.1 cm, slightly paler abaxially, glabrous, base cuneate or slightly rounded, margin entire, apex obtuse to subacute, mucronulate; midrib prominent abaxially, sunken adaxially, lateral veins 12 or more pairs, branching before margin. Inflorescence a terminal pseudumbel, sometimes with additional cymes from upper axils; primary involucre leaves usually 5, ovate-elliptic, 2.5–6 cm × 6–10 mm, base cuneate to ± rounded, apex obtuse to acute, primary rays 5, 3–4 cm; secondary involucre leaves usually 3, ovate-rounded, 1–2 × 0.5–0.8 cm; cyathophylls 2, ovate-rounded, 6–9 × 6–8 mm, base cuneate, apex rounded. Cyathium stipe 1–3 mm; involucre campanulate, ca. 3 × 2.5 mm, exterior glabrous, interior white pilose, lobes square, entire; glands 4, pale brown, rounded to transversely elliptic, entire. Bracteoles linear, densely pilose. Male flowers many, exserted from involucre. Female flower: ovary pedicel up to 4 mm and exserted from cup; ovary smooth, glabrous; styles connate to near middle; style arms shallowly 2-lobed, inconspicuous. Capsule ovoid-globose, 4–5 × 4–5 mm, smooth, glabrous. Seeds ovoid-globose, ca. 3 × 2 mm, dark brown, adaxially striate; caruncle peltate, yellow, sessile. Fl. and fr. Jun–Aug.

2000–2500 m. S Xizang (Nyalam) [Bhutan, N India, Nepal].

**43. *Euphorbia blepharophylla*** C. A. Meyer ex Ledebour, *Icon. Pl.* 4: 24. 1833–1834.

睫毛大戟 jie mao da ji

Herbs, erect, 10–30(–45) cm tall. Rootstock a fusiform tuber, 10–17 × 3–5 cm thick, apex few branched. Stems single, or few branched, 8–19 mm thick, smooth and glabrous, sterile branches absent. Leaves alternate; stipules absent; petiole absent; lower leaves: blade long rounded, 1–2 cm × 3–7 mm, membranous or thinly papery, entire, glabrous; upper leaves: blade ovate-oblong or broadly ovate, thinly papery to leathery, 3–5 × 2–4 cm, ciliate, base attenuate into amplexicaul sheath, nearly enclosing stem, margin entire, apex obtuse-acute. Inflorescence a terminal compound pseudumbel; primary involucre leaves 3–5, similar to normal leaves, primary rays 3–5, 0.5–3 cm; secondary pseudumbels 3-rayed; cyathophylls 2, similar to normal leaves, but smaller, 0.8–1.4 cm × 4–8 mm. Cyathium

subsessile, or stipe 1–3 mm; involucre broadly campanulate, ca. 3.5 × 3–4 mm, both surfaces pilose, lobes rounded to broadly ovate; glands 4, pale brown, rounded to transversely reniform, entire. Male flowers many, not exserted from involucre. Female flower: ovary reaching margin of cup, smooth, glabrous; styles free; style arms oblique or slightly 2-lobed. Capsule 3-lobed, 5–6 × 5–6 mm, smooth, glabrous. Seeds oblong, ca. 4 × 2.5–3.2 mm, brown, smooth; caruncle peltate, bluntly conical, shortly stipitate. Fl. and fr. Apr–Jun.

Stone or sandy fields; below 800 m. N Xinjiang [Kazakhstan, Russia (W Siberia)].

**44. *Euphorbia rapulum*** Karelin & Kirilov, *Bull. Soc. Imp. Naturalistes Moscou* 15: 448. 1842.

小萝卜大戟 xiao luo bo da ji

Herbs, 10–30 cm tall, gray-brown suffused purplish. Rootstock a globose or radish-shaped tuber, 3–5 × 2–4 cm or even larger, sometimes branching. Stems single, 3–7 mm thick, many branched apically. Leaves alternate; stipules absent; basal scale-leaves amplexicaul, slightly light purple, especially abaxially, 1–2 cm × 3–6 mm; petiole short to almost absent; upper leaf blades obovate to elliptic, 3–4.5 × 0.6–2 cm, glabrous or ciliate on margins, base tapering and sometimes cordate, margin entire, apex obtuse; lateral veins few, from lower part of main vein. Inflorescence an indistinct terminal pseudumbel plus many subterminal cymes; primary involucre leaves 2–4, similar to and slightly smaller than normal leaves; cyathophylls 2, rarely 3, ovate-oblong, 0.8–1.3 cm × 3–6(–10) mm. Cyathium sessile; involucre broadly campanulate, ca. 2.5 × (2–)3–4.5 mm, exterior glabrous, interior hairy; lobes oblong, ± obtuse, margins densely ciliate; glands 4, pale brown, rounded or reniform. Male flowers many, exserted from involucre. Female flower: ovary pedicel ca. 3 mm and exserted from cup; ovary smooth, glabrous; styles free, persistent; style arms 2-lobed. Capsule ovoid-globose, 4.5–5.5 × 4–5 mm, longitudinally furrowed, smooth, glabrous. Seeds ovoid-terete, ca. 3 × 2 mm, yellow-brown to light gray, smooth, adaxially striate; caruncle sessile. Fl. and fr. Apr–Jun.

Fields, plains, lower steppe slopes; 800–2000 m. N Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan].

**45. *Euphorbia thomsoniana*** Boissier in A. Candolle, *Prodr.* 15(2): 113. 1862.

天山大戟 tian shan da ji

*Euphorbia tianshanica* (Prokhanov) Popov; *Tithymalus tianshanicus* Prokhanov.

Herbs, 20–30 cm tall. Root terete, few branches, 30–50 cm × 6–10 mm. Stems many branched basally, slightly purplish, glabrous. Leaves alternate; stipules absent; basal scale-leaves purple or light red, ca. 5 × 3 mm, overlapping; leaf blade elliptic, 2–3 × 1–1.6 cm, glabrous, base subrounded, apex rounded; lateral veins inconspicuous. Primary involucre leaves 5–8, broadly ovate, ca. 2.5 × 1–2 cm, base subrounded, apex slightly narrow, primary rays 5–8, 1–4 cm; cyathophylls 2, triangular-ovate, ca. 1.5 × 1.4 cm, base subtruncate, apex acuminate. Cyathium sessile; involucre campanulate, 4–5 × 4–5 mm, lobes triangular, slightly bent inside, densely white pubescent inside and on mar-

gin, sparsely white pilose outside; glands 4, dark brown, reniform, shortly stalked, suberect, sparsely shortly pilose. Male flowers many, little exerted from involucre. Female flower: ovary usually not exerted from cup, sparsely shortly pilose; styles connate below middle, persistent; style arms 2-lobed. Capsule subglobose, 6–7 × ca. 7 mm, sparsely shortly pilose. Seeds ovoid-globose, ca. 6.5 × 5 mm, light gray with brown reticulum, smooth; caruncle present. Fl. and fr. Jun–Sep.

Subalpine meadows, scrub, stone hills; 2000–4500 m. Xinjiang (Tian Shan) [Afghanistan, NW India, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan].

**46. *Euphorbia wallichii*** J. D. Hooker, Fl. Brit. India 5: 258. 1887.

大果大戟 da guo da ji

*Euphorbia duclouxii* H. Léveillé & Vaniot; *E. luteoviridis* D. G. Long; *E. yunnanensis* Radcliffe-Smith.

Herbs, up to 100 cm tall. Root terete, up to 50 × 5 cm. Stems single or several clustered, few branched basally, ca. 1.2 cm, upper parts many branched, smooth and glabrous. Leaves alternate, larger toward apex; stipules absent; petiole absent or nearly so; leaf blade elliptic, long elliptic, or ovate-lanceolate, 5–10 × 1.2–2.9 cm, base attenuate, rounded, or subtruncate, margin entire, apex acuminate to subacute; midrib prominent on both surfaces, lateral veins ca. 7 pairs, dividing before margin. Inflorescence a compact terminal pseudumbel; primary involucre leaves (3–)5(–7), yellow or yellow-green, usually ovate, occasionally ovate-elliptic or oblong, 4–6 × 2–3.5 cm, base rounded or subtruncate, apex obtuse to acute, primary rays (3–)5(–7), up to 5 cm, shorter than involucre; secondary involucre leaves usually 3, ovate to broadly ovate, 2.5–3.5 × 1–2 cm; cyathophylls 2, similar to secondary involucre leaves, base subtruncate, apex acuminate. Cyathium sessile or shortly stipitate; involucre broadly campanulate, ca. 5 × 6–7 mm, exterior shortly brown pilose, lobes rounded, apex irregularly lacerate, densely white pilose inside; glands 4, pale brown to yellow-brown, reniform-rounded. Male flowers many, exerted from involucre, conspicuous. Female flower: ovary pedicel up to 3–5 mm; styles free, falling easily; style arms 2-lobed. Capsule 3-lobed, 9–11 × 9–11 mm, glabrous. Seeds angulate-terete, 5–6 × 4–5 mm, light brown to gray-brown, adaxially striate; caruncle peltate, extremely shortly stipitate. Fl. and fr. May–Aug (or Sep).

Alpine meadows, slopes, forest margins; 1800–4700 m. S Qinghai, Sichuan, Xizang, Yunnan [Afghanistan, Bhutan, India (Sikkim), Kashmir, Nepal].

**47. *Euphorbia kansuensis*** Prokhanov, Izv. Akad. Nauk SSSR, Ser. 6, 20: 1371, 1383. 1926.

甘肃大戟 gan su da ji

*Euphorbia yinshanica* S. Q. Zhou.

Herbs, erect, to 20 cm tall, gray-green. Rootstock tuberous or rhizomatous, 10–30 × 3–7(–20) mm, branched or not. Stems often solitary, 5–7 mm thick, upper parts with many slender axillary branches, thinly pilose. Leaves mostly alternate, occasionally opposite on lateral branches; stipules absent; basal

scale-leaves few, relatively long and narrow; petiole absent; leaf blade very variable, linear, linear-lanceolate, or oblanceolate, usually oblong, 6–9 × 1–2 cm, gray-green, sparsely pilose, base cuneate, margin entire, apex rounded or acuminate; midrib prominent abaxially, lateral veins inconspicuous. Inflorescence an inconspicuous terminal pseudumbel surrounded by many axillary cymes; primary involucre leaves 3–5(–8), similar to normal leaves, primary rays usually 5, 1–3 cm; cymes rather congested; cyathophylls 2, ovate-triangular, 2–2.5 × 2.2–2.7 cm, base truncate or emarginate, apex acute. Cyathium sessile; involucre campanulate, 2.5–3 × 2.5–3 mm, lobes triangular-ovate, entire; glands 4, dark brown to brownish yellow, rounded. Male flowers many, exerted from involucre. Female flower: ovary pedicel ca. 3 mm and exerted from cup; ovary smooth, glabrous; styles connate below middle, persistent; style arms shortly 2-lobed. Capsule trigonous-globose, 5–5.8 × 5–6 mm, obscurely rugose, glabrous. Seeds trigonal-ovoid, ca. 4 × 4 mm, light brown to gray-brown, smooth, adaxially striate; caruncle white, stipitate. Fl. and fr. Apr–Jun.

• Steppes, slopes, valleys, scrub, fields, forest margins. Gansu, Hebei (Gaocheng, Neiqiu), Henan, Hubei (Suixian), N Jiangsu, Nei Mongol (Yin Shan), Ningxia, Qinghai, Shaanxi, Shanxi, NW Sichuan.

This species is similar in general to *Euphorbia fischeriana* but differs by the glabrous, not pilose, ovary.

The root is used medicinally.

**48. *Euphorbia fischeriana*** Steudel, Nomencl. Bot., ed. 2, 611. 1840.

狼毒 lang du

*Euphorbia fischeriana* var. *komaroviana* (Prokhanov) Y. C. Chu; *E. komaroviana* Prokhanov; *E. pallasii* Turczaninow; *E. verticillata* Fischer.

Herbs, 15–45 cm tall. Root terete, usually branched, 20–30 × 4–6 cm. Stem single, 5–7 mm thick. Leaves alternate; stipules absent; basal scale-leaves ovate-oblong, 1–2 cm × 4–6 mm; petiole absent; leaf blades gradually larger upward, to oblong, 4–6.5 × 1–2 cm, base subtruncate, apex rounded or acute; lateral veins inconspicuous. Primary involucre leaves usually 5, similar to normal leaves, primary rays 5, 4–6 cm; secondary involucre leaves usually 3, ovate, ca. 4 × 2 cm; cyathophylls 2, triangular-ovate, ca. 2 × 2 cm, base subtruncate, apex acute. Cyathium sessile; involucre campanulate, ca. 4 × 4–5 mm, white pubescent, lobes rounded, white pubescent; glands 4, pale brown, rounded. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3–5 mm, exerted from cup; ovary densely white pubescent; styles connate below middle, persistent; style arms unlobed, slightly emarginate at middle. Fruiting peduncle to 5 mm; capsule ovoid-globose, ca. 6 × 6–7 mm, white pilose. Seeds compressed globose, ca. 4 × 4 mm, gray-brown, adaxially striate, striae unclear; caruncle present, sessile. Fl. and fr. May–Jul.

Grasslands, dry lower mountain slopes, *Pinus* forests; 100–600 m. Heilongjiang, Jilin, Liaoning, E Nei Mongol, Shandong (Laoshan, Yantai) [Japan, Korea, E Mongolia, Russia (E Siberia, Far East)].

The root is used in traditional Chinese medicine.

**49. *Euphorbia monocyathium*** Prokhanov, *Izv. Glavn. Bot. Sada S.S.S.R.* 29: 552. 1930.

单伞大戟 dan san da ji

Herbs, perennial, ascending or prostrate, 6–15 cm tall. Rootstock vertical, cylindrical, to 8 mm thick, apex with dense cluster of old and new stems. Stems unbranched, ca. 2 mm thick, light red or reddish, glabrous. Leaves alternate, mostly uniform in size; stipules absent; basal scale-leaves ovate, overlapping; petiole absent; leaf blade elliptic or ovate-elliptic, 1–2.5 × 0.4–0.9(–1.2) cm, glabrous, base subrounded, margin entire, apex acuminate. Inflorescence reduced to a solitary terminal cyathium; primary involucre leaves 3–5, similar to normal leaves, 0.7–2 × 0.4–1.5 cm, primary rays not developed [cyathophylls 2, similar to normal leaves, but smaller, 7–11 × 2–7 mm]. Cyathium stipe to 2 mm; involucre broadly campanulate, ca. 3 × 3–4 mm, glabrous outside, lobes ovate, relatively large, pubescent at margin and inside; glands 4, pale brown, rounded-reniform. Male flowers many, not exerted from involucre. Female flower: ovary exerted from cup, smooth, glabrous; styles connate below middle; style arms 2-lobed. Capsule ovoid (immature), 6–7 mm, smooth, glabrous. Seeds not seen. Fl. and fr. Jul–Sep.

Slopes, riverbanks. Xinjiang (Kashi) [Kazakhstan, Kyrgyzstan, Tajikistan].

**50. *Euphorbia kozlovii*** Prokhanov, *Izv. Akad. Nauk SSSR, Ser. 6*, 20: 1370, 1383. 1926.

沙生大戟 sha sheng da ji

*Euphorbia kozlovii* var. *angustifolia* S. Q. Zhou.

Herbs, erect, 15–20 cm tall. Rootstock 7–12 cm × 3–5 mm, few branched. Stems 1 to several, 3–5 mm thick, smooth and glabrous. Leaves alternate; stipules absent; petiole ± absent; leaf blade elliptic to ovate-elliptic, 2–4 cm × 3–5 mm, base cuneate or rounded and ± contracted into short false petiole, margin entire or irregularly denticulate, apex obtuse; midrib prominent abaxially, lateral veins mostly basal, 3–5 pairs plus several finer outer veins. Inflorescence a compound pseudumbel, usually without lateral cymes; primary involucre leaves (2–)4 or 5, leaflike but broader, ovate-long-triangular, 3–5 × 0.8–1.6 cm, base auriculate, apex acuminate, primary rays (2–)4 or 5, 1–3(–5) cm; cyathophylls 2, similar to primary involucre leaves, 0.9–1 × 0.7–1.1 cm, base cuneate, margin entire, apex subacute. Cyathium stipe 3–5 mm; involucre broadly campanulate, ca. 3 × 4–6 mm, glabrous outside, lobes triangular-ovate, pilose inside; glands 4, transversely elliptic, ± peltate, entire. Bracteoles linear. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3–5 mm, exerted from cup; ovary smooth, glabrous; styles free, persistent; style arms deeply 2-lobed. Fruiting peduncle ca. 5 mm; capsule globose or ovoid-globose, 4–5 × 3.5–4 mm, smooth, glabrous. Seeds ovoid, ca. 4 × 2.5–3 mm, densely verrucose; caruncle large, peltate, yellowish white, stipe extremely thin. Fl. and fr. May–Aug.

Sandy deserts. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi [Mongolia].

**51. *Euphorbia hylonoma*** Handel-Mazzetti, *Symb. Sin.* 7(2): 230. 1931.

湖北大戟 hu bei da ji

*Euphorbia fischeriana* Steudel var. *komaroviana* (Prokhanov) G. L. Chu; *E. komaroviana* Prokhanov; *E. pallasii* var. *komaroviana* (Prokhanov) Y. C. Zhu.

Herbs, erect, 50–90 cm tall. Root thick, up to more than 10 cm × 3–5 mm. Stem 3–7 mm thick, many branched apically. Leaves alternate; stipules absent; petiole 3–6 mm; leaf blade oblong to elliptic, very variable, 4–10 × 1–2 cm, sometimes light purple abaxially, green adaxially, base attenuate, apex rounded; lateral veins 6–10 pairs. Primary involucre leaves 3–5, similar to normal leaves, primary rays 3–5, 2–4 cm; cyathophylls 2 or 3, usually ovate, 2–2.5 × 1–1.5 cm, sessile. Cyathium sessile; involucre campanulate, ca. 2.5 × 2.5–3.5 mm, lobes triangular-ovate, entire, pilose; glands 4, dark brown, reniform. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3–5 mm, exerted from cup; ovary smooth; styles free; style arms 2-lobed. Capsule globose, 3.5–4 × ca. 4 mm, smooth. Seeds ovoid-globose, ca. 2.5 × 2 mm, gray or light brown, smooth, adaxially striate; caruncle present, very shortly stipitate. Fl. Apr–Jul.  $2n = 20^*$ .

Roadsides, valleys, mountain slopes, grasslands, steppes, scrub, sparse forests; 200–3000 m. Anhui, S Gansu (Wenxian), Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [Mongolia, Russia (Far East)].

The root is used medicinally.

**52. *Euphorbia pachyrrhiza*** Karelin & Kirilov in *Bull. Soc. Imp. Naturalistes Moscou* 14: 745. 1841.

长根大戟 chang gen da ji

Herbs, perennial, 20–60 cm tall. Root thick and long, 30–50 × ca. 1 cm in diam., apex many branched, with remains of old stems. Stem ca. 3 mm thick, reddish purple, often with sterile branches from lower axils. Leaves alternate; stipules absent; petiole absent or nearly so; leaf blade elliptic or oblong-obovate, 1–2.2 × 0.4–0.7(–1.1) cm, glabrous, base subcuneate, usually finely serrate, very variable, apex rounded; lateral veins inconspicuous. Inflorescence a terminal pseudumbel, usually also with axillary cymes from subterminal axils; primary involucre leaves 3 or 4( or 5), similar to normal leaves, primary rays 3 or 4, 1–3 cm; cymes simple or once-forked; cyathophylls 2, obovate-elliptic, base attenuate, margin finely serrulate, apex rounded. Cyathium usually reddish purple, stipe 3–7 mm; involucre broadly cuplike, ca. 4.5 × 3–4 mm, exterior glabrous, interior densely tomentose opposite glands, lobes rounded, white tomentose inside; glands 4, brown, reniform-rounded. Male flowers many, exerted from involucre. Female flower: ovary exerted from cup, densely tuberculate; styles free, easily fallen; style arms slightly 2-lobed. Fruiting peduncle 3–5 mm; capsule cylindrical-globose, [3.5–]5 × [3–]5 mm, hardly furrowed, exerted from involucre, densely tuberculate, reddish brown. Seeds compressed ellipsoid, ca. 3 × 2 mm, dark or light brown; caruncle white, sessile. Fl. and fr. Jun–Aug.

Dry stony slopes, steppes; 1200–2700 m. Xinjiang (Ili He valley, Tacheng) [Kazakhstan, Kyrgyzstan, Tajikistan].



**53. *Euphorbia buchtormensis*** C. A. Meyer ex Ledebour, Icon. Pl. 2: 26. 1830.

布赫塔尔大戟 bu he ta er da ji

*Euphorbia subamplexicaulis* Karelin & Kirilov; *Tithymalus subamplexicaulis* (Karelin & Kirilov) Klotzsch & Garcke.

Herbs, perennial, ca. 20 cm tall. Rootstock a thick taproot, 10–17 cm × ca. 6 mm, apex many branched. Stems ca. 3 mm thick, upper parts undivided, white hispid at base, otherwise glabrous. Leaves alternate; stipules absent; basal scale-leaves ciliate; petiole absent; leaf blade oblong [or oblong-elliptic or spatulate-obovate], (1.5–)2–3 cm × 3–6(–10) mm, sometimes hairy on margins, base attenuate [or cordate, sometimes amplexicaul], margin finely serrulate (or entire), apex acuminate [or obtuse]; lateral veins inconspicuous. Inflorescence a terminal compound pseudumbel, sometimes with additional cymes from upper axils; primary involucre leaves 3[or (4 or)5], triangular-ovate, ca. 8 × 5 mm, base attenuate, apex obtuse, primary rays usually 3[or (4 or)5], ca. 2 cm; cyathophylls 2 or 3, similar to primary involucre leaves, but smaller, ca. 6 × 4 mm. Cyathium sessile; involucre cuplike, ca. 2 × 2[or 3–4] mm, exterior glabrous, interior woolly, lobes triangular-rounded; glands 4, brown, reniform-rounded, entire. Male flowers many, exerted from involucre. Female flower: ovary pedicel ca. 2 mm, exerted from cup; ovary sparsely aculeate, glabrous; styles free; style arms 2-lobed. Capsule trigonous-globose [or oblate-globose], ca. 2 × 2.5 mm, obscurely furrowed, sparsely softly spiny, glabrous. Seeds ellipsoid, ca. 1.5 × 1 mm, brown, adaxially white striate; caruncle grooved-subulate, yellowish, sessile. Fl. and fr. Jun–Aug.

Mountain steppes; 1000–1300 m. Xinjiang (Altay Shan, Ili He valley) [Kazakhstan, Kyrgyzstan, Russia (W Siberia), Tajikistan].

**54. *Euphorbia alata*** Boissier, Cent. Euphorb. 33. 1860.

阿拉套大戟 a la tao da ji

Herbs, perennial, (8–)20–50 cm tall, Rootstock woody, to more than 10 cm × 4–8 mm thick. Stems many from base, ca. 3 mm thick, upper parts undivided, often reddish, often white pilose. Leaves alternate, broader toward apex; stipules absent; petiole absent; leaf blade ovate-elliptic, (1–)2–3(–3.5) × 0.8–1 cm, ± villous, base rounded, margin finely serrulate, sometimes inconspicuous, apex acuminate; lateral veins inconspicuous. Inflorescence a terminal pseudumbel, sometimes with additional cymes from upper axils; primary involucre leaves (3 or)4(–8), often flushed reddish purple, triangular-ovate, ca. 1.3 × 0.8–1 cm, base attenuate, apex rounded, primary rays usually 4, ca. 2(–3.5) cm; cyathophylls 3, obovate, 4–6 × 4–6 mm. Cyathium sessile; involucre cuplike, ca. 2 × 2 mm, lobes ovate-orbicular, glabrous; glands 4, brown-yellow, transversely elliptic-orbicular. Male flowers many, slightly exerted from involucre. Female flower: ovary [pedicel short] exerted from involucre; ovary tuberculate, glabrous; styles free; style arms slightly 2-lobed. Capsule globose, 2.5–3.5 × 3.5–4.5 mm, sparsely tuberculate, glabrous. Seeds ovoid-globose, 1.5–2 mm, shiny dark brown; caruncle present, shortly stipitate. Fl. Jun–Aug.

Steppes, sparse forests in mountains. Xinjiang (Ili He valley) [Kazakhstan, Kyrgyzstan, Tajikistan].

**55. *Euphorbia pilosa*** Linnaeus, Sp. Pl. 1: 460. 1753.

毛大戟 mao da ji

Herbs, perennial, erect, 50–90 cm tall. Rootstock a deep taproot to 10 mm thick. Stems single or in small clusters, to 9 mm thick, upper parts few branched, often conspicuously white pilose. Leaves alternate, well spaced; stipules absent; basal scale-leaves ovate, overlapping; petiole almost absent; leaf blade elliptic, 4–6 × 1.5–2.5 cm, glabrous or abaxially pilose especially near midrib, base broadly cuneate, margin finely ?serrulate, apex rounded; lateral veins 5–7 pairs. Primary involucre leaves 4–8, similar to normal leaves but smaller, 2–3 × 0.8–1.8 cm, primary rays 4–8, 3–4 cm; cyathophylls 2, subrounded, 10–15 × 10–15 mm, base rounded, apex rounded. Cyathium sessile; involucre subcampanulate, ca. 2.5 × 3 mm, lobes rounded to triangular, sparsely pilose; glands 4, dark brown to pale brown, rounded to oblong, entire. Male flowers many, slightly exerted from involucre or same. Female flower: ovary shortly exerted from cup, densely long tuberculate; styles free, persistent; style arms slightly 2-lobed. Capsule compressed globose, 2.5–3.5 × 3.5–4.5 mm, tuberculate. Seeds abaxially inconspicuously angled, 2–2.5 × ca. 1 mm, gray-brown, adaxially white striate; caruncle thin, peltate, shortly stipitate. Fl. and fr. Jun–Aug.

Alpine meadows, steppes, margins of open forests. N Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia), Tajikistan].

**56. *Euphorbia heishuiensis*** W. T. Wang, Acta Bot. Yunnan. 10: 42. 1988.

黑水大戟 hei shui da ji

Herbs, annual, 15–40(–90) cm tall. Rootstock a slender taproot, 3–6 cm × 1–4 mm thick, unbranched, with few small fibrous rootlets. Stems single, 2–4 cm, branched at top. Leaves alternate; stipules absent; petiole almost absent; leaf blade linear or linear-elliptic, 2–6 × 0.3–0.5 cm, base attenuate, margin entire, apex rounded. Cyathium stipe ca. 2 mm; involucre campanulate, ca. 2.5 × 2 mm, shortly pubescent outside, lobes ovate, ciliate; glands 4, transversely oblong. Male flowers small, not exerted from involucre. Female flower: ovary densely tuberculate; styles free, persistent; style arms unlobed. Capsule trigonous-ovoid, ca. 3 × 3 mm, with vertical furrows, densely tuberculate. Seeds ovoid, ca. 2.2 × 1.5 mm, yellow, smooth and shiny; caruncle subulate, deep yellow, sessile, easily lost. Fl. and fr. May–Jul.

• Roadsides; ca. 2000 m. Gansu (Maiji Shan), Sichuan (Heishui).

**57. *Euphorbia altaica*** C. A. Meyer ex Ledebour, Icon. Pl. 2: 26. 1830.

阿尔泰大戟 a er tai da ji

Herbs, perennial, 12–40 cm tall. Rootstock a horizontal rhizome, 7–10 cm × to 7 mm thick, branched at apex, often with remains of old stems. Stems 3–5 mm thick, upper parts undivided, glabrous, sterile shoots present. Leaves alternate, few (5–11); stipules absent; basal scale-leaves few, reddish; petiole absent; leaf blade narrowly elliptic to oblong, 1–2.5(–4.5) × 0.3–0.6(–1.8) cm, glabrous, base rounded or attenuate, margin entire [or finely serrate], apex obtuse; lateral veins inconspicuous; leaves on sterile shoots 3–3.5 × 0.7–0.9 cm. Inflorescence

a terminal pseudumbel, rarely with lateral pseudumbels; primary involucre leaves 4–6, similar or identical to normal leaves, primary rays 4–6, 1–2(–3.5) cm; cyathophylls [2 or]3, ovate-rounded, ca. 5 × 4–5 mm, base subtruncate, apex obtuse. Cyathium sessile; involucre cuplike, 2–2.5 × 4–5 mm, lobes orbicular, dentate, glabrous; glands 4, pale yellow-brown, transversely elliptic, entire. Male flowers many, exerted from involucre. Female flower: ovary exerted from cup, densely tuberculate; styles free, persistent; style arms almost unlobed. Capsule trigonous-globose, 3–4 × 4–5 mm, with dense, short, scalelike tubercles. Seeds ovoid-globose, 2–2.5 × ca. 1.5 mm, yellow-brown (immature), smooth; caruncle present, peltate, sessile. Fl. and fr. Jun–Jul.

Mountain slopes, meadows, margins of open forests; above 2500 m. Xinjiang (Altay Shan) [Kazakhstan, Mongolia, Russia (Siberia)].

**58. *Euphorbia alpina*** C. A. Meyer ex Ledebour, *Icon. Pl.* 2: 26. 1830.

北高山大戟 bei gao shan da ji

Herbs, perennial, erect or slightly spreading, (10–)15–20(–35) cm tall. Rootstock vertical or oblique, ca. 10 cm × 4–5(–15) mm thick, apex many branched. Stems ca. 3 mm thick, upper parts sometimes branched, usually pubescent. Leaves alternate; stipules absent; petiole absent; leaf blade elliptic, 1–2(–3.5) × 0.8–1.2 cm, both surfaces glabrous, base rounded or subtruncate below, usually cordate at middle of stem, margin entire [or finely serrulate], apex rounded; lateral veins inconspicuous. Inflorescence a terminal compound pseudumbel, with lateral pseudumbels from upper axils; primary involucre leaves 2–4, similar to normal leaves, to 2 × 1.5 cm, primary rays 2–4, ca. 1.5 cm; cyathophylls 2, ovate-obtriangular, 6–8 × 4–6 mm, base attenuate, margin usually finely crenate, rarely entire, apex obtuse. Cyathium sessile; involucre cuplike, ca. 3 × 3 mm, lobes orbicular, apex obtuse, ciliate; glands 4, yellow-brown, transversely reniform to oblong, entire. Male flowers many, exerted from involucre. Female flower: ovary exerted from cup, sparsely aculeate; styles connate for 1/3–1/2, caducous; style arms 2-lobed. Capsule trigonous-globose, 4–5 × ca. 4 mm, sparsely softly spiny, processes to 1 mm, glabrous. Seeds compressed ellipsoid, 2–3 × ca. 1.5 mm, brown; caruncle obtusely conical, peltate, yellow-brown, very shortly stipitate. Fl. and fr. May–Jun.

Grasslands in mountains. Xinjiang (Altay Shan) [Kazakhstan, Mongolia, Russia (Siberia)].

**59. *Euphorbia micractina*** Boissier in A. Candolle, *Prodr.* 15(2): 127. 1862.

甘青大戟 gan qing da ji

*Euphorbia lancasteriana* Radcliffe-Smith; *E. lucorum* Ruprecht var. *parvifolia* H. L. Yang; *E. tangutica* Prokhanov; *E. villifera* W. T. Wang (1988), not Scheele (1849); *E. wangii* Oudejans.

Herbs, perennial, 20–50 cm tall. Rootstock tuberous or rhizomatous, 10–12 cm, tubers 6–12 mm thick, rhizomes 2–3 mm thick, remains of old stems inconspicuous. Stems in groups up to 4, 1–6 mm thick, more slender below ground, upper parts

usually unbranched, often with very slender lateral branches, drying yellowish or purplish, glabrous. Leaves alternate; stipules absent; basal scale-leaves oblong; petiole absent or nearly so; leaf blade narrowly elliptic to ovate-elliptic, 1–3 × 0.5–0.7 cm, both surfaces glabrous, base cuneate or subcuneate, very variable, sometimes almost amplexicaul on lowermost leaves, margin entire, apex obtuse; midrib prominent abaxially, grooved adaxially, lateral veins inconspicuous or invisible. Inflorescence a terminal pseudumbel, usually also with slender, long-pedunculate dichasial cymes from subterminal axils; primary involucre leaves 5–8, similar to normal leaves, margin entire, base ± rounded, apex rounded or cuspidate, primary rays 5–8, 0.5–4 cm; cyathophylls 2 or 3, ovate-rounded, ca. 6 × 4–5 mm, base cuneate, apex rounded. Cyathium subsessile; involucre cup-shaped, ca. 2 × 1.5 mm, glabrous, lobes triangular or linear-triangular, glabrous or sparsely pilose; glands 4, pale yellow-brown, rounded to transversely elliptic, entire. Pilose bracteoles sometimes present. Male flowers many, exerted from involucre. Female flower: ovary exerted from cup, densely tuberculate, glabrous; styles connate for less than 1/4 length, persistent, style arms shortly 2-lobed; style arms slightly enlarged. Capsule globose, ca. 3.5 × 3.5 mm, exerted from involucre, sparsely softly spiny or tuberculate along angles, very variable. Seeds broadly ovoid, ca. 2 × 1.5 mm, gray-brown, smooth, adaxially white striate; caruncle present, peltate, very shortly stipitate. Fl. and fr. Jun–Jul.

Mountain slopes, meadows, sparse forest margins, shaded rock clefts on vertical moist walls of narrow gorges, on sandstone or limestone; 900–2700 m. Gansu, NW Henan, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, E Xinjiang, Xizang [Kashmir, Korea, Pakistan, Russia (Far East)].

*Euphorbia micractina* varies very much in W China. However, its 5–8 involucre leaves and rays, and small gray-brown seeds, with a very shortly stipitate caruncle, easily separate it from otherwise similar species. *Euphorbia lancasteriana* was based on plants with pendent stems growing in a narrow, shaded gorge. Similar pendent stems have been seen scattered in other areas and are best regarded as just an ecotype.

**60. *Euphorbia lucorum*** Ruprecht in Maximowicz, *Prim. Fl. Amur.* 239. 1859.

林大戟 lin da ji

Herbs, perennial, erect, 50–80 cm tall. Rootstock woody, dark brown, 10–15 cm × 6–11 mm thick, with fleshy roots to 8 mm thick, remains of old stems prominent. Stems single or in small clusters, 4–6 mm thick, a little branched toward apex, glabrous or sparsely pilose [or densely white hirsute]; sterile branches absent. Leaves alternate; stipules absent; basal scale-leaves many, overlapping; petiole almost absent; leaf blade elliptic or oblong, sometimes shorter than internodes, (1.5–)3–5(–6) × (0.6–)1–1.5(–2.2) cm, base cuneate, margin entire [or obscurely serrate], apex obtuse; midrib prominent abaxially, lateral veins inconspicuous. Inflorescence a terminal compound pseudumbel, with 2–8 slender, often abortive, pseudumbels from subterminal axils; primary involucre leaves 4–8, ovate, 1.5–2.2(–4.3) × (0.8–)1–1.3(–2.7) cm, margin minutely serrulate, base rounded or broadly cuneate to subtruncate, apex subacute, primary rays [0.3–0.9 cm or] 5.5–6 cm; secondary in-

volucral leaves 3, rhombic-ovate or subrounded, 1–1.2 × 1–1.2 cm; cyathophylls 2, rhombic-ovate, ca. 10 × 9 mm, base ± rounded, apex rounded. Cyathium subsessile; involucre campanulate, ca. 2.5 × 2–3 mm, exterior glabrous, interior sparsely hairy, lobes obtuse-rounded, repand or shallowly emarginate, glabrous; glands 4, dark brown, narrowly transversely elliptic, entire. Bracteoles absent. Male flowers many, slightly exerted from involucre. Female flower: ovary shortly exerted from cup, densely tuberculate; styles connate for less than 1/4 length; style arms shortly 2-lobed, slightly enlarged. Capsule trigonous-globose, ca. 3 × 3–4 mm, longitudinally furrowed, sparsely tuberculate or cristate along angles. Seeds broadly ellipsoid, 1.5–2 × ca. 1.5 mm, yellow-brown [becoming black], shiny; caruncle peltate, yellowish, subsessile. Fl. May–Jun.

Open forests, forest margins, scrub, grasslands. Heilongjiang, Jilin, Liaoning, E Nei Mongol [Korea, Russia (Far East)].

**61. *Euphorbia macrorrhiza*** C. A. Meyer ex Ledebour, Icon. Pl. 2: 26. 1830.

粗根大戟 *cu gen da ji*

Herbs, perennial, 40–60 cm tall. Rootstock cylindrical, vertical or obliquely descending, 20–30 × 2–3(–5) cm thick, apically branched. Stems clustered, 4–7 mm thick, upper parts sometimes with many lateral branches [or upper parts undivided], tomentose toward apex; sterile branches absent. Leaves alternate, larger toward stem apex; stipules absent; petiole absent; leaf blade oblong, 2–5 × 0.5–1 cm, base attenuate, margin minutely serrulate (use hand lens!), apex subrounded; lateral veins inconspicuous. Inflorescence overall cylindrical, an ill-defined terminal pseudumbel, often plus many small 3-rayed pseudumbels from upper axils; primary involucral leaves 4(or 5), ovate, ca. 1.5 × 0.8–1.2 cm, primary rays 4 or 5, usually 3–5 cm; cyathophylls 2 or 3, rather variable, similar to involucral leaves to much narrower, ca. 9 × 5–8 mm, base cuneate to subtruncate, margin entire or very minutely serrulate, apex acute. Cyathium stipe 3–5 mm, slender; involucre campanulate, ca. 4 × 3–4 mm, lobes rounded; glands 4, pale brown, rounded. Male flowers many, slightly exerted from involucre. Female flower: ovary pedicel up to 5 mm, exerted from cup; ovary densely compressed spinescent-tuberoses, glabrous; styles connate for ca. 1/4 length, caducous; style arms simple, swollen, bifid. Capsule globose, ca. 5 × 5 mm, longitudinal furrows almost absent, tuberculate or softly spiny, glabrous. Seeds compressed globose, ca. 2.5 × 2 mm, yellow-brown or brown, adaxially white striate; caruncle present, subsessile. Fl. and fr. May–Jul.

Scrub, meadows on stony mountain slopes; 1100–1300 m. Xinjiang (Altay Shan) [Kazakhstan, Russia (W Siberia)].

**62. *Euphorbia pekinensis*** Ruprecht in Maximowicz, Prim. Fl. Amur. 239. 1859.

大戟 *da ji*

*Euphorbia barbellata* Hurusawa; *E. cavaleriei* H. Léveillé & Vaniot; *E. hurusawae* Oudejans; *E. hurusawae* var. *imaii* (Hurusawa) Oudejans; *E. imaii* Hurusawa; *E. jesonii* Oudejans; *E. kitagawae* (Hurusawa) Kitagawa; *E. labbei* H. Léveillé; *E. lanceolata* T. N. Liou; *E. lasiocaula* Boissier; *E. lasiocaula* var. *pseudolucorum* Hurusawa; *E. sinensis* Jesson; *E. sampsonii*

Hance; *E. tchen-ngoii* (Soják) Radcliffe-Smith; *E. virgata* Waldstein & Kitaibel var. *kitagawae* Hurusawa; *Tithymalus tchen-ngoii* Soják.

Herbs, perennial, 40–80(–90) cm tall. Rootstock vertical, cylindrical, 20–30 cm × 6–14 mm thick, sometimes branched. Stems single or clustered, 3–6(–7) mm thick, upper parts 4- or 5-branched, pilose or glabrous. Leaves alternate; stipules absent; petiole absent or nearly so; leaf blade very variable, usually elliptic, occasionally lanceolate, narrowly oblong or oblanceolate, rarely linear, 3–7(–9.5) × 0.7–1.7(–2.4) cm, both surfaces glabrous or abaxially pilose or pubescent, base subrounded or subtruncate for lower leaves, attenuate for upper leaves, margin entire or serrulate, apex acuminate or acute; midrib raised abaxially, often grooved adaxially, lateral veins inconspicuous, much varied. Inflorescence usually a terminal compound pseudumbel, sometimes much branched, sometimes with slender long pedunculate cymes or pseudumbels from axils below; primary involucral leaves 4–7(–16), leaflike but shorter, narrowly elliptic, base rounded, apex acute, primary rays 4–7, 2–5 cm; cyathophylls 2, base ± truncate, apex subrounded with micro-tip. Cyathium sessile; involucre cuplike, ca. 3.5 × 3.5–4 mm, lobes rounded, irregularly ciliate; glands 4, pale brown, rounded or reniform-rounded, entire. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3–5(–6) mm, exerted from cup; ovary densely tuberculate; styles free, persistent but easily fallen; style arms 2-lobed. Capsule globose, ca. 4.5 × 4–4.5 mm, sparsely tuberculate. Seeds long globose, ca. 2.5 × 1.5–2 mm, dark brown or slightly shiny, adaxially slightly colored striate; caruncle subpeltate, sessile. Fl. May–Aug.

Slopes, scrub, roadsides, fields, grasslands, steppes, sparse forests; common. Throughout China except Taiwan, Xinjiang, Xizang, Yunnan [Japan, Korea].

*Euphorbia pekinensis* is the most variable species in China, especially on indumentum, and requires much more extensive study.

The root is used medicinally.

**63. *Euphorbia jolkini*** Boissier, Cent. Euphorb. 32. 1860.

大狼毒 *da lang du*

*Euphorbia calonesiaca* Croizat; *E. formosana* Hayata; *E. japonica* Siebold ex Boissier; *E. nematocypha* Handel-Mazzetti; *E. nematocypha* var. *induta* Handel-Mazzetti; *E. regina* H. Léveillé; *E. shouanensis* H. Keng.

Herbs, perennial, 40–80[–95] cm tall. Rootstock cylindrical, up to 25 cm × 6–15 mm. Stems single, sometimes branched basally, 5–9 mm thick, upper parts several branched, glabrous or very sparsely pubescent. Leaves alternate; stipules absent; petiole absent or nearly so; leaf blade ovate-oblong, ovate-elliptic, or elliptic, 1–4 × 0.3–0.7 cm, abaxially pale green, light gray when dried, especially when young, adaxially green, base attenuate, cuneate, or subtruncate, margin entire, apex obtuse or rounded; midrib prominent abaxially, lateral veins inconspicuous. Inflorescence a terminal, often compound, pseudumbel, sometimes with subterminal cymes or small pseudumbels; primary involucral leaves (3–)5–8[–10], yellow, ovate-elliptic to broadly ovate, 1–2.5 cm × 0.6–0.9 mm, margin entire, base subtruncate, apex rounded, primary rays (3–)5–7(–10), 1–3 cm; secondary

involucral leaves 2 or 3; cyathophylls 2 or 3, yellow, ovate or subrounded, 6–10 × 4–8 mm, base subtruncate, apex rounded. Cyathium sessile; involucre cuplike, ca. 3 × 3.5 mm, lobes ovate-triangular, densely white pilose inside; glands 4, pale brown, reniform-rounded, entire. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3–6 mm, exerted from cup; ovary densely tuberculate; styles connate below middle, persistent but easily lost; style arms slightly 2-lobed. Fruiting peduncle 4–6 mm; capsule globose, ca. 5.5 × 5.5 mm, densely long tuberculate, base compressed, apex acute. Seeds ellipsoid, ca. 3 × 2 mm, light brown, shiny; caruncle trigonous-peltate, sessile. Fl. and fr. Mar–Jul.

Meadows, mountain slopes, open forests; 200–3000 m. Sichuan, Taiwan, Yunnan [Japan, Korea].

The root is used medicinally.

**64. *Euphorbia yanjinensis*** W. T. Wang, Acta Bot. Yunnan. 10: 45. 1988.

盐津大戟 yan jin da ji

Herbs, erect, 24–30 cm tall. Stem 3–5 mm thick, upper parts many branched. Leaves alternate; stipules absent; petiole absent or nearly so; leaf blade obovate, 6–8 × 2–3.5 cm, base attenuate, margin entire, apex rounded, slightly emarginate; midrib prominent abaxially, lateral veins 4–6 pairs, not reaching margin. Primary involucral leaves 3 or 4, ovate-rounded, 4–6 × 2–2.8 cm, base slightly emarginate, lowermost rounded or subtruncate, apex rounded, primary rays 3 or 4, ca. 4 cm; cyathophylls 2, rounded, 1.6–2.5 × 1.5–2.5 cm, base subtruncate, apex rounded. Cyathium sessile; involucre cuplike, ca. 3 × 3–3.5 mm, lobes ovate-rounded or rounded, ciliate; glands 4, rounded, funnel-shaped, concave at middle, apex 2-horned, veins visible abaxially and conspicuous. Bracteoles absent. Male flowers many, not exerted from involucre. Female flower: ovary slightly exerted from cup, smooth, glabrous; styles free, persistent; style arms 2-lobed. Capsule subglobose, ca. 6 mm, densely micropunctate, glabrous. Seeds ellipsoid, 3–4 × ca. 2.5 mm, yellow; caruncle absent. Fl. and fr. Apr.

• Yunnan (Yanjin).

**65. *Euphorbia tongchuanensis*** C. Y. Wu & J. S. Ma, Collect. Bot. (Barcelona) 21: 116. 1992.

铜川大戟 tong chuan da ji

Herbs, erect, up to 35 cm tall. Root fibrous, brown, 5–10 cm × 3–4 mm. Stem single, ca. 4 mm thick, unbranched. Leaves alternate; stipules absent; petiole absent; leaf blade linear-oblancoolate, 9–12 cm × 4–8 mm, abaxially light gray when dry; adaxially green, base attenuate, margin entire, apex acuminate; midrib prominent on both surfaces, lateral veins inconspicuous. Primary involucral leaves 3 or 4, long elliptic, 1–2 × 0.3–0.5 cm, base subtruncate, apex acuminate, primary rays 3 or 4, 1–2 cm; cyathophylls 2, ovate or triangular-ovate, 4–6 × 4–5 mm, base subtruncate or subemarginate, apex acuminate. Cyathium sessile; involucre cuplike, ca. 3 × 2.5 mm, pilose outside, light yellow, lobes triangular-rounded, white pilose at margin and inside; glands 4, subinfundibular, concave at middle, adaxially lower, abaxially higher, apex 2-horned. Bracteoles linear. Male flowers

many. Female flower: ovary exerted from cup, densely micropunctate, glabrous; styles connate below middle; style arms 2-lobed. Fruit and seeds not seen. Fl. Oct.

• Sunny slopes; ca. 2400 m. Shaanxi (Tongchuan).

**66. *Euphorbia peplus*** Linnaeus, Sp. Pl. 1: 456. 1753.

南欧大戟 nan ou da ji

*Esula peplus* (Linnaeus) Haworth; *Tithymalus peplus* (Linnaeus) Gaertner.

Herbs, ephemeral, erect or ascending, 10–30 cm tall. Taproot 1–2 mm thick. Stems single or branched near base, ca. 2 mm thick, ascending. Leaves alternate, mostly uniform in size; stipules absent; scale-leaves absent; petiole 1–3 mm or almost absent; leaf blade obovate to spoon-shaped, (0.5–)1.5–4 × (0.4–)0.7–1.8 cm, pale green, usually glabrous; base cuneate below, truncate or cordate above, margin entire [or finely serrulate above middle], apex rounded; midrib inconspicuous. Inflorescence a terminal pseudumbel, rays irregularly branched, lateral branches few; primary involucral leaves 3 or 4, similar to normal leaves; primary rays 3 or 4, short; cyathophylls 2, similar to normal leaves. Cyathium subsessile; involucre cuplike, ca. 1 × 1 mm, lobes rounded, ciliate; glands 4, yellow-green, crescent-shaped, apex 2-horned, horns ± threadlike. Male flowers many, usually not exerted from involucre. Female flower: ovary pedicel 2–3.5 mm, exerted from cup; ovary trigonous, smooth, glabrous; styles free; style arms 2-lobed. Capsule oblong-ovoid, 3-lobed, 2–2.5 mm, smooth with 2 narrow wings along each keel, glabrous. Seeds ovoid-angulate, 1.2–1.3 × 0.7–0.8 mm, gray or gray-white, each surface with 2 or 3 micropores; caruncle present, peltate, yellow-white, sessile. Fl. and fr. Feb–Oct.

Weed of disturbed areas, roadsides, gardens, grasslands. Fujian (Fuzhou, Xiamen), Guangxi (Nanning), Hong Kong, Taiwan (Taibei, Taizhong), Yunnan (Kunming) [N Africa, America, S Europe, Pacific islands].

**67. *Euphorbia turczaninowii*** Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 448. 1842.

土大戟 tu da ji

Herbs, ephemeral, 10–15 cm tall. Root fibrous, single, ca. 10 cm × 3 mm. Stems many branched basally, slender, ascending, glabrous. Leaves opposite; stipules absent; petiole absent; leaf blade long ovate to ovate-elliptic, 2–3 × 0.8–1.2 cm, base attenuate, apex acuminate; lateral veins 3–5, pinnate. Inflorescence a terminal much-branched dichasial cyme; cyathophylls 2, oblong-lanceolate, 1–3 × 0.5–1.5 cm, base obliquely cuneate, margin cartilaginous, often denticulate, apex usually abruptly acuminate. Cyathium sessile; involucre cuplike, 1.5–2 × 1.5–2 mm, yellow-white, lobes linear, pilose; glands 4, crescent-shaped, apex 2-horned. Male flowers many, usually not exerted from involucre. Female flower: ovary pedicel 5–6 mm, exerted from cup; ovary smooth; styles free; style arms 2-lobed. Capsule globose-ovoid, 2–3 × 2–3 mm, 3-furrowed, smooth, glabrous. Seeds oblong, 6-sided, 2–2.5 × ca. 1.2 mm, ash-gray, irregularly rugose, adaxially brown striate; caruncle absent. Fl. and fr. May–Jul.

Semimobile sandy hills and fields, scrub, river plains. N Xinjiang

[Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Iran)].

**68. *Euphorbia sororia*** Schrenk, Bull. Acad. Imp. Sci. Saint-Petersbourg 3: 308. 1845.

对叶大戟 *dui ye da ji*

Herbs, annual, erect to spreading, 5–40 cm tall. Rootstock absent, taproot slender. Stem 2–3 mm thick, branched from all but lowest nodes, smooth and glabrous. Leaves opposite; stipules absent; petiole absent; leaf blade linear to oblong-elliptic, (1.2–)2.5–4 × 0.4–0.6 cm, base cuneate, margin entire, apex acute. Inflorescence mostly a dichotomous cyme, sometimes initially 3- or 4-branched; primary involucre leaves 2, similar to normal leaves, primary rays 2, to 5 cm, often much shorter; cyathophylls 2, similar to normal leaves, but smaller. Cyathium shortly stipitate; involucre narrowly campanulate, 1–2 × 1–1.5 mm, lobes subtriangular; glands 4, pale yellow, crescent-shaped, apex long 2-horned, bent outside. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3–5 mm, exerted from cup; ovary smooth, glabrous; styles free; style arms 2-lobed. Capsule trigonous-ovoid-globose, ca. 3 × 3 mm, smooth or very finely reticulate, glabrous. Seeds angular-terete, ca. 2.5 × 2 mm, black or gray-brown, irregularly punctate-papillate; caruncle slightly peltate, white, stipe very short, appearing sessile. Fl. and fr. Jun–Jul.

Xinjiang (Hetian) [Kazakhstan, Kyrgyzstan, Tajikistan; SW Asia].

The status of *Euphorbia sororia* in China is uncertain because only a few incomplete specimens are available.

**69. *Euphorbia franchetii*** B. Fedtschenko in O. Fedtschenko & B. Fedtschenko, Consp. Fl. Turkest. 6: 310. 1916.

北疆大戟 *bei jiang da ji*

*Euphorbia turkestanica* Franchet, Ann. Sci. Nat., Bot., sér. 5, 18: 248. 1884, not Regel (1882); *Tithymalus franchetii* (B. Fedtschenko) Prokhanov.

Herbs, annual, 10–17(–30) cm tall, pale green. Rootstock a slender taproot, 5–10 cm × 2 mm. Stem single, ca. 1 mm thick, unbranched below inflorescence, light gray-green, glabrous. Leaves alternate, larger toward apex; stipules absent; petiole absent; leaf blade broadly linear, 1–1.6 × 0.3–0.5 mm, glabrous, base attenuate, margin entire, apex obtuse to subacute; midrib inconspicuous, lateral veins invisible. Inflorescence a terminal pseudumbel, lateral cymes usually absent; primary involucre leaves 2 or 3, larger than normal leaves, 1.5–2 × 0.4–0.5 cm; cymes laxly many forked; cyathophylls 2, same as normal leaves. Cyathium sessile; involucre narrowly campanulate, ca. 1.5 × 1–1.5 mm, lobes triangular, lacerate; glands 4, crescent-shaped, apex 2-horned. Male flowers many, less than involucre margin, not exerted from involucre. Female flower: ovary pedicel ca. 3.5 mm, exerted from cup; ovary smooth, glabrous; styles free; style arms slightly 2-lobed. Capsule ovoid-globose, 1–1.5 × ca. 1 mm. Seeds 6-sided-cylindric, 1.7–2 mm, light white, rugose or densely tuberculate; caruncle present, flat and inconspicuous, whitish, sessile. Fl. and fr. May–Jul.

Mountain slopes; below 1500 m. N Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**70. *Euphorbia inderiensis*** Lessing ex Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 448. 1842.

英德尔夫大戟 *ying de er da ji*

*Euphorbia pygmaea* Fischer & C. A. Meyer ex Boissier.

Herbs, annual, (5–)10–20(–25) cm tall, glaucous. Root fibrous, thin and undivided, up to 15 cm × 1.5–2 mm. Stems single, thin and slender, half as long as plant, usually purplish toward base, light gray or gray-brown, glabrous. Stem-leaves alternate, deciduous; stipules absent; petiole absent; leaf blade linear-lanceolate, 1–2 × (0.05–)0.1–0.2 cm, base attenuate, margin entire, apex acuminate to often obtuse. Inflorescence a large terminal pseudumbel; primary involucre leaves 2 or 3, similar to normal leaves but larger and persistent; cyathophylls 2, same as normal leaves, to 2.7 cm. Cyathium sessile; involucre narrowly campanulate, ca. 1.5 × (0.7–)1–1.5 mm, lobes ovate, lacerate; glabrous; glands 4, crescent-shaped, 2-horned, horns short. Male flowers many, not exerted from involucre. Female flower: ovary pedicel ca. 3 mm, exerted from cup; ovary smooth, glabrous; styles free; style arms 2-lobed. Capsule ovoid-globose, 2–3(–3.5) × 2–3 mm, 3-furrowed, almost smooth, very faintly reticulate, glabrous. Seeds 6-sided-cylindric, 1.2–1.5 × ca. 1 mm, ash-gray, transversely rugose; caruncle scalelike, peltate, obviously stipitate. Fl. and fr. Apr–Jun.

Fields, steppes. N Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan].

*Euphorbia inderiensis* is rather similar to *E. consanguinea* Schrenk (in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 88. 1841), which was described from close to the Xinjiang border and has been recorded in traditional Chinese medicine in Xinjiang. It differs by the absence of a caruncle on the seed.

**71. *Euphorbia lioui*** C. Y. Wu & J. S. Ma, Acta Bot. Yunnan. 14: 371. 1992.

刘氏大戟 *liu shi da ji*

Herbs, erect, ca. 15 cm tall. Root thinly terete, yellow-brown, 6–16 cm × 2–6 mm. Stems 2–4 mm thick, many branched above middle; sterile stems present, ca. 10 cm. Leaves alternate; stipules absent; petiole absent; leaf blade linear to obovate-lanceolate, 2–6 cm × 3–7 mm, base attenuate or truncate, apex acuminate or acute. Involucre leaves 4 or 5, ovate-lanceolate, 2–3 × 0.6–0.9 cm, base truncate or attenuate, apex acuminate or acute, rays 4 or 5, ovate-rounded or ?subtriangular-ovate, 8–12 × 0.8–1(–1.2) cm, base truncate or emarginate, apex obtuse. Cyathium sessile; involucre cuplike, ca. 3 × 3 mm, lobes rounded, apex emarginate, some pilose inside; glands 4, brown, dentate-lobed. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3–4 mm, exerted from cup; ovary smooth, glabrous; styles connate below middle; style arms deeply 2-lobed. Fruit and seed not seen. Fl. May.

• “Front plain of mountains.” Nei Mongol (Alxa Meng).

**72. *Euphorbia dracunculoides*** Lamarck, Encycl. 2: 428. 1788.

蒿状大戟 *hao zhuang da ji*

*Euphorbia lanceolata* Sprengel; *Tithymalus dracunculoides* (Lamarck) Klotzsch & Garcke.

Herbs, annual or short-lived perennial, 10–40 cm tall. Root terete, single, 30–40 cm × 3–8 mm. Stem sometimes branched basally, 3–7 mm thick, branches ascending. Leaves alternate; stipules absent; petiole absent or nearly so; leaf blade linear-oblong, 1–3 cm × 2.5–4 mm, base truncate or subattenuate below, rounded higher up, margin entire, apex rounded or obtuse; lateral veins few, inconspicuous, at acute angle to midrib. Inflorescence an inconspicuous terminal few-rayed cyathium; primary involucre leaves similar to normal leaves, primary rays ca. 3, robust and ascending, dichotomous; cyathophylls 2, similar to normal leaves. Cyathium sessile; involucre broadly campanulate, 2–3 × 3–5 mm, lobes rounded; glands 4, pale brown, crescent-shaped, apex 2-horned, horns light green. Male flowers many, not exerted from involucre. Female flower: ovary exerted from cup, smooth, glabrous; styles free, persistent; style arms 2-lobed. Fruiting peduncle ca. 3 mm; capsule subglobose, ca. 3.5 × 3.5 mm, smooth or obscurely reticulate, glabrous. Seeds ovoid-terete, ca. 2.5 × 1.5–2 mm, gray or dark gray, adaxially striate; caruncle present, stipitate. Fl. Apr–Jul, fr. May–Aug.

Riverbanks, valleys, roadsides of sandy areas; 400–1900 m. Yunnan (Jinsha Jiang valley) [India, Nepal, Pakistan; N Africa, C and SW Asia, S Europe].

*Euphorbia dracunculoides* is regarded as a problematic weed of certain crops in Pakistan. The Chinese material belongs to the nominal subspecies, subsp. *dracunculoides*. A number of other subspecies have been recognized from North Africa.

**73. *Euphorbia prolifera*** Hamilton ex D. Don, Prodr. Fl. Nepal. 62. 1825.

土瓜狼毒 tu gua lang du

*Euphorbia nepalensis* Boissier; *E. pinus* H. Léveillé.

Herbs, erect or ascending, 20–30 cm tall. Root terete, 10–20 × 0.5–2 cm, few branched. Stem many branched basally, ca. 3 mm thick. Leaves alternate; stipules absent; petiole absent; leaf blade linear-rounded, 2–4 cm × 3–5 mm, base attenuate or subtruncate, apex obtuse; lateral veins basal, inconspicuous. Primary involucre leaves 4–6, ovate-oblong to broadly ovate-oblong, 1.5–2.5 × 0.6–1.2 cm, apex rounded or acute; cyathophylls 2, ovate, 1–1.5 × 0.8–1 cm, base rounded or subtruncate, apex acute or rounded. Cyathium sessile; involucre broadly campanulate, ca. 3.5 × 3–5(–7) mm, lobes lacerate or triangular, some pilose on margin and inside; glands 4(–8), brown, subcrescent, apex 2-horned. Male flowers many, slightly exerted from involucre. Female flower: ovary pedicel up to 5 mm; styles connate below middle; style arms slightly 2-lobed. Fruiting peduncle to 8 mm; capsule ovoid-globose, ca. 4.5 × 5.5 mm. Seeds ovoid-globose, 2.5–3 × 2–2.5 mm, yellow-brown, smooth but with spot modification; caruncle present, small, pale yellow, easily lost. Fl. and fr. Apr–Aug.

Valleys, sloping grasslands, *Pinus* forests; 500–2300 m. Guizhou (Puding), Sichuan, Yunnan [N India, Myanmar, Nepal, Pakistan, Thailand].

**74. *Euphorbia latifolia*** C. A. Meyer ex Ledebour, Icon. Pl. 2: 25. 1830.

宽叶大戟 kuan ye da ji

Herbs, perennial, erect, (30–)60–90(–100) cm tall, pale

green. Root terete, brown, 15–30 cm × 5–7 mm thick. Stems single or few branched basally, 5–7 mm thick, upper parts many branched, smooth and glabrous; sterile stems present. Leaves alternate; stipules absent; basal scale-leaves many; petiole almost absent; leaf blade broadly elliptic, (2–)4–6.5 × (1–)2–3 cm, base subrounded or cuneate, margin entire [or crenulose at apex], apex rounded; midrib prominent abaxially, lateral veins 11–15 pairs; leaves on sterile branches petiolate, linear-spatulate, 2–4.5 × 0.7–1.5 cm. Inflorescence a terminal pseudumbel, usually also with slender, long pedunculate dichasial cymes from subterminal axils; primary involucre leaves 6–10(–17), similar to normal leaves but smaller, primary rays 6–10(–16), 3–5 cm; cymes twice-forked; cyathophylls 2, ovate-rounded, triangular-ovate, or rounded, 1–1.5 × 1–2 cm, base subtruncate, apex rounded or subrounded. Cyathium stipe short; involucre campanulate, 2–2.5 × 1.5–2 mm, glabrous, lobes ovate-triangular, pilose inside; glands 4, pale brown or brown, crescent-shaped, apex 2-horned, horns obtuse. Bracteoles linear, lacerate. Male flowers many. Female flower: ovary exerted from cup, smooth, glabrous; styles free, persistent; style arms 2-lobed. Capsule ovoid-globose, 4–4.5 × ca. 4 mm, with 3 vertical furrows. Seeds ovoid, 2.5–3 × 1.5–2 mm, yellow-brown; caruncle present, sessile. Fl. and fr. May–Sep.

Valleys, meadows, forests, scrub margins; 1000–1500 m. Xinjiang (Ili He valley, Tacheng) [Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia), Tajikistan].

*Euphorbia latifolia* is similar to *E. esula* but differs in having broader, elliptic leaves, pedunculate cyathia, glands with obtuse horns, and seeds with differently colored caruncles.

**75. *Euphorbia sieboldiana*** C. Morren & Decaisne, Bull. Acad. Roy. Sci. Bruxelles 3: 174. 1836.

钩腺大戟 gou xian da ji

*Euphorbia bodinieri* H. Léveillé; *E. erythraea* Hemsley; *E. esquirollii* H. Léveillé & Vaniot; *E. glaucopoda* Diels; *E. henryi* Hemsley; *E. hippocrepeica* Hemsley; *E. kangdingensis* W. T. Wang; *E. kangdingensis* var. *puberula* W. T. Wang; *E. luticola* Handel-Mazzetti; *E. savaryi* Kiss; *E. szechuanica* Pax & K. Hoffmann.

Herbs, (22–)40–70 cm tall. Rootstock extensively rhizomatous, 10–20 cm, rhizomes 4–15 mm thick, segmented/moniliform. Stems single or clustered, (2–)4–7 mm thick, often with branchlets from upper nodes, smooth and glabrous. Leaves alternate, progressively larger toward apex; stipules absent; basal scale-leaves soon lost; petiole absent or nearly so; leaf blade elliptic, obovate-lanceolate, or oblong-elliptic, very variable, 2–5(–10) × 0.5–1.5(–3) cm, glabrous, base attenuate or cuneate, (crenulate or) entire, apex obtuse, acute, or acuminate; lateral veins pinnate. Inflorescence a terminal pseudumbel; primary involucre leaves 3–5(or 6), elliptic or ovate-elliptic, 1.5–2.5(–4.2) cm × 0.4–0.8(–2.8) mm, base subtruncate, apex obtuse, primary rays 3–5(or 6), 2–4(–7) cm; cymes mostly dichasial, sometimes becoming monochasial; cyathophylls 2, very variable, reniform-rounded, ovate-triangular, or rounded, 0.8–1.4(–1.8) × 0.8–1.6(–3.2) cm, base very broadly cuneate, shallowly cordate, or subrounded, apex rounded. Cyathium shortly stalked; involucre cuplike, 3–4 × 3–5 mm, lobes triangular or ovate-tri-

angular, shortly pilose inside; glands 4, mainly yellow-brown, sometimes pale yellow or yellow-green, crescent-shaped, tips extended into 2 slender horns, horns obtuse to needlelike, very variable. Male flowers many, exerted from involucre. Female flower: ovary exerted from cup, smooth, glabrous; styles connate for less than 1/4 length, persistent but easily lost; style arms 2-lobed. Capsule 3-lobed, (3-)3.5-4 × 4-5 mm, smooth, glabrous. Seeds subterete-globose, ca. 2.5 × 1.5 mm, gray-brown, smooth; caruncle present, small, sessile. Fl. and fr. Apr-Sep.

Fields, scrub, forest margins, sparse forests, grasslands. Throughout China except Fujian, Hainan, Nei Mongol, Qinghai, Taiwan, Xinjiang, Xizang [Japan, Korea, Russia (Far East)].

*Euphorbia sieboldiana* varies very much, especially in the 2 gland horns, which are either obtuse or acute. However, plants have in common the large rhizome, involucre leaves, and capsule, as well as the seeds.

The rhizome is used medicinally.

**76. *Euphorbia kansui*** T. N. Liou ex S. B. Ho, Fl. Tsinling. 1(3): 450. 1981.

甘遂 gan sui

Herbs, 20-30 cm tall. Rootstock irregularly swollen, somewhat moniliform, 20-40 cm × 6-9 mm thick. Stems many branched basally, sometimes only few, 3-5 mm thick. Leaves alternate; stipules absent; petiole absent; leaf blade linear-lanceolate, linear, or linear-elliptic, very variable, 2-7 cm × 4-5 mm, base attenuate, entire, apex obtuse or acuminate; lateral veins inconspicuous. Cyathophylls 3-6, obovate-elliptic, 1-2.5 cm × 4-6 mm, base attenuate, apex obtuse or acute. Cyathium subsessile; involucre cuplike, ca. 3 × 3 mm, lobes rounded, white pilose on margin and inside; glands 4, dark yellow to pale brown, crescent-shaped, 2 horns inconspicuous. Male flowers many, exerted from involucre. Female flower: ovary pedicel 3-6 mm, exerted from cup; ovary smooth, glabrous; styles connate below 2/3, persistent, easily fallen; style arms slightly 2-lobed. Capsule trigonous-globose, 3.5-4.5 × 3.5-4.5 mm. Seeds long globose, ca. 2.5 × 2 mm, gray-brown to light brown; caruncle present, peltate, sessile. Fl. Apr-Jun.

• Fields, roadsides, low mountain slopes. Gansu, Henan, Ningxia, Shaanxi, Shanxi.

The root is used in traditional Chinese medicine.

**77. *Euphorbia esula*** Linnaeus, Sp. Pl. 1: 461. 1753.

乳浆大戟 ru jiang da ji

*Euphorbia croizatii* Hurusawa; *E. cyparissias* Linnaeus; *E. distincta* Stscheglejew; *E. eriophylla* Karelin & Kirilov; *E. esula* var. *latifolia* Ledebour; *E. leoncroizatii* Oudejans; *E. humulata*

Bunge; *E. maackii* Meinshausen; *E. mandshurica* Maximowicz; *E. minxianensis* W. T. Wang; *E. nakaiana* H. Léveillé; *E. octoradiata* H. Léveillé & Vaniot; *E. subcordata* C. A. Meyer ex Ledebour; *E. takouensis* H. Léveillé & Vaniot; *E. tarokoensis* Hayata; *Tithymalus esula* (Linnaeus) Hill; *T. humulatus* (Bunge) Soják; *T. mandshuricus* (Maximowicz) Soják; *T. subcordatus* Klotzsch & Garcke.

Herbs, erect, (15-)30-60 cm tall. Rootstock enlarged or sometimes extensively rhizomatous, brown or dark brown, up to 20 cm × 3-5(-6) mm, branched or not. Stems single or clustered, many branched basally, 3-5 mm thick; sterile stems sometimes present, sometimes overtopping inflorescence. Leaves alternate, often larger toward stem apex; stipules absent; basal scale-leaves few; petiole absent; leaf blade linear to ovate, very variable, (1.5-)2-7 × (0.15-)0.4-0.7(-1.2) cm, base attenuate, cuneate, or truncate, apex acuminate or acute; leaves on sterile branches denser, needlelike, 2-3 × ca. 0.1 cm. Inflorescence a terminal pseudumbel, often with lateral cymes from axils below; cymes mostly dichotomous; primary involucre leaves 3-8, similar to normal leaves to almost orbicular, primary rays 3-8, 2-4(-5) cm; cyathophylls 2, sometimes overlapping at base, usually reniform, occasionally ovate or triangular-ovate, pair often forming complete circle, 0.4-1.2 × 0.4-1 cm, base subtruncate to shallowly cordate, apex shortly acuminate to rounded. Cyathium sessile; involucre campanulate, ca. 3 × 2.5-3 mm, lobes rounded to triangular, tomentose on margin and inside; glands 4, brown, crescent-shaped, usually 2-horned, horns long and acute to short and obtuse or absent, sometimes so tightly incurved that gland looks circular. Bracteoles linear, glabrous. Male flowers many. Female flower: ovary exerted from cup, smooth, glabrous; styles free, persistent; style arms 2-lobed. Capsule trigonous-globose, 5-6 × 5-6 mm, with 3 vertical furrows. Seeds ovoid-globose, 2.5-3 × 2-2.5 mm, yellow-brown; caruncle present, peltate, sessile. Fl. and fr. Apr-Oct. 2n = 40\*.

Roadsides, fields, grasslands, steppes, slopes, sparse forests, sandy areas. Throughout China except Guizhou, Hainan, Xizang, Yunnan [Afghanistan, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Iran), Europe; naturalized in North America].

*Euphorbia esula* is extremely diverse, especially in the form of the leaf blade, involucre leaves, abortive branches, and the horns of the cyathial glands. However, it can be differentiated from *E. kansui* and *E. sieboldiana* by the involucre with 5 lobes and 4 glands (and from *E. prolifera*) and by the involucre without peduncle (from *E. latifolia*). There are many synonyms from outside China that are not given here. It is classified as a noxious weed in N America.

The seed oil is used in industry.

## 75. **PEDILANTHUS** Necker ex Poiteau, Ann. Mus. Natl. Hist. Nat. 19: 388. 1812, nom. cons.

红雀珊瑚属 hong que shan hu shu

Li Bingtao (李秉滔 Li Ping-tao); Michael G. Gilbert

*Tithymaloides* Ortega; *Tithymalus* Miller (1754), not Gaertner (1790).

Erect shrubs or subshrubs, monoecious, most parts fleshy; indumentum of simple hairs; latex present, white. Leaves alternate, distichous; stipules small, glandular or not; leaf blade entire; venation pinnate. Inflorescence a strongly zygomorphic cyathium in dichasial cymes or cincinni, bracteate, stalked; cyathophylls inconspicuous; involucre obliquely shoe- or boat-shaped, base oblique,

stalked, apex 2-lipped, 2-fid, inner segments shorter and narrower than outer ones, with 2–6 glands at base of involucre, or sometimes eglandular. Flowers unisexual. Male flowers many, each reduced to 1 stamen; filament short, similar to pedicels; anthers globose, thecae introrse, longitudinally dehiscent. Female flower solitary at center of involucre, oblique, with long pedicels; ovary 3-celled; ovules 1 per locule; styles slightly connate; stigmas 3, 2-fid. Fruit a capsule, 3-coccal, central column persistent. Seeds without funicle; caruncle absent.

About 15 species: Central America, cultivated throughout the tropics; one species (introduced) in China.

**1. *Pedilanthus tithymaloides*** (Linnaeus) Poiteau, Ann. Mus. Natl. Hist. Nat. 19: 390. 1812.

红雀珊瑚 hong que shan hu

*Euphorbia tithymaloides* Linnaeus, Sp. Pl. 1: 453. 1753.

Erect subshrubs 40–70 cm tall; stems stout, slightly fleshy, strongly flexuous, glabrous or pubescent when young. Leaves distichous; stipules small, with a rounded ca. 1 mm in diam. gland; leaf blade ovate or long ovate, 3.5–8 × 2.5–5 cm, fleshy, both surfaces pubescent, glabrescent, base rounded or obtuse, apex ± acuminate; midrib elevated abaxially, lateral veins 7–9 pairs, ascending steeply and running close to margin for some distance before terminating. Cyathia in cymes clustered on leafless stems, terminal or axillary at upper part, each one with many

male flowers and 1 female flower; involucre shoe-shaped, deep-red or purple-red, equilateral, ca. 1 cm, glabrous, apex nearly labiate-shaped, 2-fid, lobes small, oblong, 3-serrulate at apex, other lobe boat-shaped, ca. 1 cm, 2-partite at apex. Male flower: pedicels slender, 2.5–4 mm, glabrous, similar to filaments; anthers globose, slightly shorter than filaments. Female flower inserted at center of involucre, oblique, exerted from involucre; pedicels 6–8 mm, glabrous; ovary fusiform; styles usually connate; stigma 3, 2-fid. Fl. Dec–Jun.

Cultivated. Guangdong, Guangxi, Hainan, Yunnan [native to Central America, cultivated throughout the tropics].

This species is cultivated as an ornamental, often as a potted plant. All parts are used as medicine for traumatic injury and fractures.