

### 3. Tribe CASSIEAE

决明族 jue ming zu

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Leaves paripinnate or imparipinnate, rarely bipinnate. Flowers bisexual, polygamous, or plants dioecious, actinomorphic or zygomorphic. Receptacle cup-shaped. Sepals 4 or 5, rarely 3 or 6, imbricate. Petals usually 5, sometimes 3, rarely absent. Stamens various in number, sometimes with staminodes; anthers basifixed, rarely dorsifixed, opening by apical pores or by lateral short slits. Ovary or ovary stipe inserted at base of receptacle, free; ovules 2 to numerous, rarely solitary.

About 21 genera and 730–740 species: mainly distributed in the tropics and subtropics; four genera and 21 species (15 introduced) in China.

- 1a. Leaves imparipinnate; leaflets alternate ..... 9. *Zenia*  
1b. Leaves abruptly pinnate; leaflets opposite.  
2a. Petioles and rachis of leaves without glands; stamens 10, filaments of 3 abaxial antisealous stamens sigmoidally curved, usually longer than anthers; legume indehiscent ..... 10. *Cassia*  
2b. Petioles and rachis of leaves with or without glands; stamens 10 or 5 fertile, filaments straight; legume dehiscent or indehiscent.  
3a. Bracteoles absent; petals subequal; legume either indehiscent or inertly dehiscent through 1 or both sutures, if latter, not coiling, or valves breaking up into 1-seeded joints ..... 11. *Senna*  
3b. Bracteoles present; petals unequal; legume elastically dehiscent, valves coiling ..... 12. *Chamaecrista*

### 9. ZENIA Chun, Sunyatsenia 6: 195. 1946.

任豆属 ren dou shu

Trees, deciduous. Buds with few perules. Leaves imparipinnate, not stipulate; leaflets alternate, entire, not stipellate. Flowers bisexual, ± actinomorphic, reddish, in terminal panicles. Sepals 5, imbricate. Petals 5, imbricate, slightly unequal. Perfect stamens 4, 5th one reduced to a filiform staminode, rarely 5, inserted on margin of disk. Disk small, sinuate-lobate. Ovary compressed, few (7–9) ovuled, shortly stalked; style subulate, short, slightly curved; stigma small. Legume compressed, membranous, indehiscent, reticulate veined, broadly winged along upper (adaxial) suture. Seeds few, compressed, orbicular, with long funicle.

One species: S China, Vietnam.

#### 1. *Zenia insignis* Chun, Sunyatsenia 6: 196. 1946.

任豆 ren dou

Trees, 15–20 m tall. Trunk to 100 cm d.b.h. Branchlets blackish brown, with scattered, yellowish white, small lenticels. Bark rough, exfoliating in strips. Buds elliptic-fusiform, with few scales, yellowish pubescent at first, glabrescent. Leaves 25–40 cm; petiole short, 3–5 cm; rachis and petiole ± yellowish puberulent; petiolules 2–3 mm; leaflets oblong-lanceolate, 6–9 × 2–3 cm, thinly leathery, abaxially grayish white strigose, adaxially glabrous, base rounded, margin entire, apex shortly acuminate or acute. Panicles terminal; peduncles and pedicels yellow or brown strigose. Flowers red, ca. 1.4 cm; bracts cadu-

cous, narrowly ovate, small. Sepals oblong, slightly unequal in size, 10–12 × 5–6 mm, thickly membranous, outside strigose, inside glabrous, apex rounded. Petals slightly larger than sepals, ca. 1.2 cm, uppermost one obovate, ca. 8 mm wide, others elliptic-oblong or obovate-oblong, 5–6 mm wide. Filaments ca. 3 mm, puberulent; anthers ca. 6 × 1 mm. Ovary 7–9-ovuled, margin adpressed pilose; stalk ca. 4 mm. Legume reddish brown, oblong or elliptic-oblong, usually ca. 19 cm, sometimes to 15 × 2.5–3.5 cm; wing 5–6 mm wide. Seeds brownish black, shiny, 4–9 × ca. 7 mm, smooth; funicle filiform, ca. 4 mm. Fl. May, fr. Jun–Aug.  $2n = 28^*$ .

Dense or sparse forests, mountain slopes; 200–1000 m. Guangdong, Guangxi, Yunnan [Vietnam].

### 10. CASSIA Linnaeus, Sp. Pl. 1: 376. 1753, nom. cons.

决明属 jue ming shu

Trees or large shrubs. Leaves spirally arranged, often distichous, abruptly pinnate; rachis and petioles without glands; leaflets opposite, without stipels. Flowers in terminal panicles on main shoots or racemes on short side shoots; pedicels with 2 bracteoles at or shortly above base. Calyx 5-merous; sepals reflexed at anthesis. Corolla zygomorphic; petals 5. Stamens 10; filaments of 3 abaxial antesealous stamens sigmoidally curved, usually longer than their anthers, dehiscent by slits; remaining 7 filaments straight and short, with anthers mostly dehiscent by basal pores. Legume elongate, cylindrical or compressed, indehiscent. Seeds numerous, 1- or 2-seriate; funicle filiform.

About 30 species: tropical regions; two species (one introduced) in China.

Because of insufficient materials for comparison, *Cassia lancangensis* Y. Y. Qian (Acta Bot. Austro Sin. 6: 23. 1990) could not be treated here.

- 1a. Inflorescence 20–40(–60) cm; leaves with 3 or 4 pairs of leaflets; legume 2–2.5 cm in diam. .... 1. *C. fistula*  
1b. Inflorescence shorter than 15 cm; leaves with 5–12 pairs of leaflets; legume less than 1.5 cm in diam. .... 2. *C. javanica*

**1. *Cassia fistula*** Linnaeus, Sp. Pl. 1: 377. 1753.腊肠树 *la chang shu*

Trees, deciduous, to 15 m tall. Leaves 30–40 cm, with 3 or 4 pairs of leaflets; leaflets adaxially shiny, broadly ovate or ovate-oblong, 8–13 × 4–8 cm, leathery, both surfaces puberulent when young, glabrous when mature, base broadly cuneate, apex acute. Racemes axillary, 20–40(–60) cm, lax, pendent, many flowered; flowers 3.5–4 cm in diam. Pedicels 3–5 cm, slender. Sepals narrowly ovate, 1–1.5 cm, reflexed at anthesis. Petals golden yellow, broadly ovate, subequal, 2.5–3.5 cm, shortly clawed. Stamens 10, 3 long with curved filaments 3–4 cm, anthers ca. 5 mm, exceeding petals, 4 short with straight filaments 6–10 mm, reduced stamens with minute anthers. Ovary stalked, strigulose; stigma small. Legume pendulous, blackish brown, terete, sausage-shaped, indehiscent, 30–60 cm, 2–2.5 cm in diam. Seeds numerous, separated by papery septa, glossy brown, elliptic, flattened.  $2n = 28$ .

Cultivated in S and SW China [native to India; cultivated throughout the tropics].

This is a common ornamental tree in the southern region. The bark contains tannin, a source of red dye. The fruit pulp and seeds are used medicinally as a laxative. The wood is hard and durable and is used for props, bridges, and farm tools.

**2. *Cassia javanica*** Linnaeus, Sp. Pl. 1: 379. 1753.爪哇决明 *zhao wa jue ming*

Trees, deciduous, usually more than 10 m tall, sometimes to 30 m. Leaves 15–40 cm; leaflets 5–12 pairs, 2–8 × 1.2–3.3 cm, both surfaces pilose or abaxially pilose, adaxially sparsely puberulent, base slightly asymmetric, apex acute, obtuse, or shortly acuminate. Inflorescences lateral on short side branches or terminal on young leafy shoots. Sepals ovate or broadly lanceolate. Petals deep yellow or pink, 2.5–4.5 × 1–2 cm. Stamens 10, among them 3 abaxial antepetalous with filaments longer than other 7. Ovary pubescent. Legume terete, 30–50 × 0.2–1.5 cm, with annular nodes.

Forests, mountain slopes, also cultivated. Native in Guangxi and Yunnan; cultivated in S China [India, Indonesia, Laos, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam; widely cultivated in the tropics].

This is a very polymorphic species with a wide distribution from N India through the Indochinese Peninsula and the Malesian region to New Guinea. Altogether, seven subspecies are recognized, two of them in China. Outside of China, *Cassia javanica* subsp. *javanica* was described from Java, is widely distributed from Indonesia to the Philippines, and is widely cultivated as an ornamental throughout SE Asia. The other four subspecies are subsp. *bartonii* (F. M. Bailey) K. Larsen (New Guinea); subsp. *microcalyx* (H. S. Irwin & Barneby) K. Larsen (Indonesia: Kalimantan and Sumatra); subsp. *pubiflora* (Merrill) K. Lar-

sen (Philippines); and subsp. *renigera* (Wallich ex Benth) K. Larsen (Myanmar).

- 1a. Inflorescences lateral on short side branches; leaflets 2–5 cm; legume 1–1.5 cm in diam.; petals deep yellow; branchlets thinly canescent ..... 2a. subsp. *nodosa*  
 1b. Inflorescences terminal on leafy shoots; leaflets 5–8 cm; legume ca. 0.2 cm in diam.; petals pink ..... 2b. subsp. *agnes*

**2a. *Cassia javanica* subsp. *nodosa*** (Buchanan-Hamilton ex Roxburgh) K. Larsen & S. S. Larsen, Nat. Hist. Bull. Siam Soc. 25(3–4): 205. 1975.

节荚决明 *jie jia jue ming*

*Cassia nodosa* Buchanan-Hamilton ex Roxburgh, Fl. Ind. 2: 336. 1824.

Trees, deciduous. Branchlets pendulous, slender, thinly canescent. Leaves 15–30 cm; leaflets 5–12 pairs, 2–5 × 1.2–2 cm, subleathery, abaxially pilose, adaxially sparsely puberulent, base slightly asymmetric, apex acute or obtuse. Racemes lateral on short side branches; inflorescence axis slender. Sepals green (in living specimens), ovate. Petals deep yellow, ovate, 2.5–3 × 1–1.5 cm. Stamens 10, among them 3 abaxial antepetalous with longer filaments than other 7. Ovary linear, whitish pubescent. Legume blackish brown, terete, 30–45 × 1–1.5 cm, with conspicuous annular nodes.  $2n = 24, 28$ .

Cultivated in S China [Indonesia (Java), Malaysia (Peninsular), Thailand; cultivated in the neotropics].

**2b. *Cassia javanica* subsp. *agnes*** (de Wit) K. Larsen, Nordic J. Bot. 13: 403. 1993.

神黄豆 *shen huang dou*

*Cassia javanica* var. *agnes* de Wit, Webbia 11: 220. 1956; *C. agnes* (de Wit) Brenan.

Trees, usually more than 10 m tall, sometimes to 30 m. Leaves 25–40 cm; petiole 3–6 cm; leaflets 6–10 pairs, elliptic or oblong-elliptic, 5–8 × 2.5–3.3 cm, both surfaces pilose, base slightly asymmetric, apex shortly acuminate. Panicles 6–9 cm, terminal on young leafy shoots, composed of 6–10 racemes; bracts broadly lanceolate, 5–8 mm. Sepals broadly lanceolate, 8–10 mm. Petals pink, slightly unequal in size, 3–4.5 × 1.4–2 cm. Stamens 10, among them 3 abaxial antepetalous with filaments 3–3.5 cm, inflated in middle, 4 of medium size, filaments ca. 1/2 as long as former, not inflated at middle, other 3 smaller. Ovary long, slender, slightly pubescent. Legume terete, 30–50 × ca. 0.2 cm, with annular nodes. Seeds numerous.  $2n = 28^*$ .

Forests, mountain slopes. Guangxi, Yunnan [Laos, Thailand, Vietnam].

**11. SENNA** Miller, Gard. Dict. Abr., ed. 4. 1754.番泻决明属 *fan xie jue ming shu*

Herbs, shrubs, or small trees. Leaves abruptly pinnate; leaflets opposite; rachis and petiole with or without glands. Flowers in axillary or terminal racemes; bracteoles absent. Sepals 5. Petals 5, subequal, usually yellow. Stamens 10; filaments of all stamens straight, sometimes 10 fertile, subequal, sometimes 3 adaxial stamens staminodes, (6 or)7 fertile; anther thecae not ciliate along

suture. Legume either indehiscent or inertly dehiscent through 1 or both sutures, in last case not coiling, sometimes valves breaking up into 1-seeded joints. Seeds numerous, funicle filiform.

About 260 species: pantropical; 15 species (13 introduced) in China.

- 1a. Petiole and rachis of leaves without glands.  
 2a. Petiole and rachis of leaves with 2 longitudinal ribs, narrowly winged; legume with a membranous wing at middle downward to base of each valve ..... 1. *S. alata*  
 2b. Petiole and rachis of leaves without wings.  
 3a. Leaflets abaxially densely yellowish brown velutinous; legume narrowly cylindrical ..... 4. *S. spectabilis*  
 3b. Leaflets abaxially glabrous and farina-white; legume flattened.  
 4a. Leaflets 6–10 pairs; stipules linear, caducous ..... 2. *S. siamea*  
 4b. Leaflets 8–16 pairs; stipules ovate-cordate, tardily deciduous ..... 3. *S. didymobotrya*
- 1b. Petiole and rachis of leaves with glands.  
 5a. Glands on petiole only.  
 6a. Gland on upper part of petiole, blackish brown, discoid, sessile; leaflets 8–28 pairs ..... 8. *S. nomame*  
 6b. Leaf with a solitary gland above base of petiole; leaflets 3–10 pairs.  
 7a. Young branchlets, petiole, and rachis of leaves densely yellowish brown villous; leaflets villous on both surfaces; legume densely hirsute on surfaces of valves ..... 5. *S. hirsuta*  
 7b. Plants glabrous or subglabrous throughout; legume glabrous.  
 8a. Petiolar gland sessile, globose or ovoid, at basal joint; legume flattened, 10–13 cm ..... 6. *S. occidentalis*  
 8b. Petiolar gland narrow, clavate to subulate, above basal joint; legume terete, 5–10 cm, with light-colored suture ..... 7. *S. sophera*
- 5b. Glands only present on rachis between leaflets.  
 9a. Leaflets 2 pairs, obliquely ovate, very unequally sided, 4–16.5 × 2–7 cm, larger half facing leaf base ..... 9. *S. fruticosa*  
 9b. Leaflets 3 to more pairs, smaller than above.  
 10a. Leaflets 10–26(–50) pairs, a conical or narrowly ovoid gland between lowermost pair of leaflets (often early caducous) ..... 10. *S. multijuga*  
 10b. Leaflets 3–9 pairs.  
 11a. Fertile stamens 10.  
 12a. Leaflets 4–6 pairs; leaves 15–30 cm; stipe of legume 10–20 mm ..... 11. *S. sulfurea*  
 12b. Leaflets 6–9 pairs; leaves 10–15 cm; stipe of legume 5–7 mm ..... 12. *S. surattensis*  
 11b. Fertile stamens 7.  
 13a. Rachis of leaves with a gland between lowest pair of leaflets ..... 15. *S. bicapsularis*  
 13b. Rachis of leaves with a gland between each pair of leaflets.  
 14a. Legume terete, 6–10 × ca. 1 cm; leaflets ovate to ovate-elliptic, apex acute to acuminate ..... 13. *S. septemtrionalis*  
 14b. Legume linear, terete, 10–15 × ca. 0.5 cm; leaflets obovate, apex broadly rounded ..... 14. *S. tora*

**1. *Senna alata*** (Linnaeus) Roxburgh, Fl. Ind., ed. 1832, 2: 349. 1832.

翅荚决明 *chi jia jue ming*

*Cassia alata* Linnaeus, Sp. Pl. 1: 378. 1753.

Shrubs, 1.5–3(–5) m tall. Branches greenish, thick, pubescent. Leaves 30–60 cm; stipules persistent, triangular, 6–10(–15) mm; petiole and rachis with 2 longitudinal ribs and narrow wings; petiolar glands absent; petiolules very short or leaflets sessile; leaflets 6–12(–20) pairs, oblong or obovate-oblong, 6–15 × 3.5–7.5 cm, thinly leathery, glabrous, base obliquely truncate, apex obtusely rounded and cuspidate. Racemes axillary, dense, many flowered, or sometimes several racemes forming a terminal panicle, 10–50 cm; peduncles 7–14 cm; bracts caducous, strobilaceous, oblong to broadly ovate, 2–3 × 1–2 cm, at first enveloping flowers. Flowers ca. 2.5 cm in diam. Sepals orange-yellow, oblong, unequal. Petals bright yellow, tinged with conspicuous purple veins, ovate-orbicular, 16–24 × 10–15 mm, shortly clawed. Stamens 10, fertile stamens 7, opening with apical pores, lower 2 with stout filaments ca. 4

mm and larger anthers, 4 with filaments ca. 2 mm and smaller anthers, reduced stamens 3 or 4. Ovary puberulent, sessile; ovules many. Legume winged, sharply tetragonal, 10–20 × 1.5–2 cm, glabrous, with a broad, membranous wing down middle of each valve; wings 4–8 mm wide, papery, crenulate. Seeds 50–60, compressed, deltoid.  $2n = 24, 28$ .

Sparse forests, dry slopes. Guangdong, ?Hainan, S Yunnan [native to tropical America; widely introduced in the tropics elsewhere].

This plant is used as a laxative.

**2. *Senna siamea*** (Lamarck) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 98. 1982.

铁刀木 *tie dao mu*

*Cassia siamea* Lamarck, Encycl. 1: 648. 1785.

Trees, 10–15 m tall. Bark gray, subsmooth; young branches ribbed, sparsely puberulent. Leaves 20–30 cm; stipules caducous, linear, tiny; rachis and petiole without glands, puberulent; leaflets 6–10(–15) pairs, oblong or ovate-oblong, 3–7 × 1.5–2.5 cm, leathery, abaxially finely pubescent, adaxially

smooth and glabrous, base rounded, apex obtusely rounded, often emarginate, mucronate. Racemes in axils of apical leaves, often several forming a large terminal panicle on a robust peduncle 5–7 cm; bracts linear, 5–6 mm. Sepals suborbicular, unequal in size, outer smaller, inner larger, ca. 9 mm, outside hairy. Petals yellow, broadly obovate, 1.2–1.5 cm, shortly clawed. Stamens 10, among them 7 fertile, anthers opening by apical pores, 2 with filaments ca. 10 mm and anthers 6–7 mm, 4 or 5 with filaments 2–3 mm and anthers 5–6 mm, staminodes ca. 3 mm. Ovary sessile, densely white pubescent. Legume flattened, 15–30 × 1–1.5 cm, suture thick, riblike, pubescent, purplish brown when mature. Seeds 10–30, light brown, ovoid, 2–2.5 × 5–6 mm.  $2n = 28$ .

Cultivated in S China [native to Myanmar and Thailand, and probably also to Cambodia, Laos, and Vietnam; widely cultivated in the tropics].

This tree is planted as an ornamental in parks and gardens and is used as a wayside tree. The hard, durable wood is used for furniture.

**3. *Senna didymobotrya*** (Fresenius) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 467. 1982.

长穗决明 chang sui jue ming

*Cassia didymobotrya* Fresenius, Flora 22: 53. 1839.

Shrubs, 2.5–3 m tall. Young branches and leaves puberulent, glabrescent when old. Leaves to 35(–50) cm; stipules tardily deciduous, ovate-cordate, 6–17 mm, acuminate; petiole and rachis without glands, puberulent; petiolules very short; leaflets 8–16 pairs, abaxially farina-white, ovate-oblong or lanceolate-oblong, 3–5.5 × 1–2 cm, base rounded and oblique, apex obtuse or subacute, mucronate. Racemes in axils of leaves in upper part of branches, 10–35 cm, sometimes several arranged in a terminal leafy panicle; bracts caducous, imbricate, broadly ovate, apex subacute or acuminate. Sepals oblong-obovate. Petals yellow, oblong or obovate, shortly clawed. Stamens 10, among them functionally 2 extra large, curved, ca. 12 mm. Ovary densely yellowish or pallid pilosulose. Legume compressed, ligulate-oblong, 8–10 × 1.6–1.8 cm, leathery, bicarinate by sutures, apex with a long and slender awn, stipe 1–1.2 cm; fruiting pedicel ca. 1 cm. Seeds 9–16, obovoid-oblong, compressed.  $2n = 28$ .

Cultivated in Hainan, ?Yunnan [native to tropical Africa; now naturalized in India and Sri Lanka].

**4. *Senna spectabilis*** (Candolle) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 600. 1982.

美丽决明 mei li jue ming

*Cassia spectabilis* Candolle, Cat. Pl. Horti Monsp. 90. 1813.

Trees, evergreen, small, 5–7(–10) m tall, with long, spreading branches. Young branches, petioles, and rachises of leaves densely yellowish brown velutinous. Leaves 12–30 cm; rachis and petiole without glands; leaflets 8–15(–19) pairs, elliptic or oblong-lanceolate, 3–7 × 1–2 cm (lowermost pair usually much smaller and early caducous), abaxially densely yellowish brown velutinous, adaxially glabrous or puberulent, base subrounded and slightly oblique, apex acute, cuspidate.

Flowers in terminal panicles or axillary racemes; peduncles and pedicels densely yellowish brown velutinous; bracts caducous, ovate, 4–5 mm. Sepals 5, orange-yellow, unequal: 2 outer smaller, ovate, 5–7 mm, pubescent; 3 inner larger, suborbicular, 8–11 mm in diam. Petals yellow, darkly brownish yellow veined, unequal in size, broadly to narrowly obovate, shortly clawed. Stamens 10, 7 of them fertile, anthers opening by apical pores, staminodes 3, smaller. Ovary linear, ca. 3 cm, recurved; style and stigma inconspicuous. Legume pendulous, black, narrowly cylindrical, slightly compressed, 25–35 × 1–1.5 cm, slightly contracted between seeds, annulate-septate, glabrous. Seeds 50–70, suborbicular, ca. 5 mm in diam.

Cultivated in Guangdong, S Yunnan [native to tropical America; cultivated throughout the tropics].

This is a rapidly growing tree, which is usually cultivated ornamentally; the flowers are fragrant.

**5. *Senna hirsuta*** (Linnaeus) H. S. Irwin & Barneby, Phytologia 44: 499. 1979.

毛荚决明 mao jia jue ming

*Cassia hirsuta* Linnaeus, Sp. Pl. 1: 378. 1753.

Herbs or shrubs, 0.6–2.5 m tall. Young branches, petioles, and rachises of leaves densely yellowish brown villous. Leaves 10–20 cm; petiole 3–6 cm, with a sessile, blackish brown, ovoid-oblong gland near insertion; rachis 7–10 cm, without glands; leaflets 3–7 pairs, ovate-oblong or oblong-lanceolate, 3–9 × 1.5–3.5 cm, papery, both surfaces villous, base subrounded, apex acuminate. Racemes axillary or several in axils of apical leaves forming a leafy panicle; peduncles and pedicels villous; bracts early caducous, subulate, hairy. Sepals 5, unequal in size, densely villous, 2 outer small, ovate to obovate, ca. 5 mm, 3 inner puberulent, similar but larger, 7–8 mm. Petals yellow, obovate, 1.4–1.8 cm, glabrous. Stamens 10, 6 or 7 of them fertile, unequal in length, anthers opening by apical pores, staminodes 3 or 4. Ovary hirsute, subsessile; style short, glabrous; stigma small. Legume long, slender, flat, 10–20 × ca. 0.5 cm, densely hirsute on surfaces of valves. Seeds numerous, flat, obovoid, 3–4 mm.  $2n = 14, 28$ .

Cultivated in Guangdong, Yunnan [native to tropical America; introduced in the tropics elsewhere].

**6. *Senna occidentalis*** (Linnaeus) Link, Handb. 2: 140. 1831.

望江南 wang jiang nan

*Cassia occidentalis* Linnaeus, Sp. Pl. 1: 377. 1753.

Subshrubs or shrubs, erect, 0.8–1.5 m tall, glabrous, few branched. Branches herbaceous, ribbed; roots blackish. Leaves ca. 20 cm; stipules caducous, triangular to lanceolate, 1–2 cm, membranous; petiole 3–4 cm, with a large, brown, ovoid gland near base; petiolule 1–2 mm, with a rotten smell when kneaded; leaflets 3–5(or 6) pairs, ovate to ovate-oblong, 4–10 × 2–3.5 cm, membranous, base rounded, apex acuminate. Corymbose racemes few flowered, axillary or terminal, ca. 5 cm; bracts caducous, linear-lanceolate. Flowers ca. 2 cm. Sepals unequal, outer ones suborbicular, ca. 6 mm in diam., inner ones ovate, 8–9 mm. Petals yellow, purplish veined, 2 outer slightly larger, shortly clawed. Fertile stamens 7, anthers opening by apical

pores, reduced stamens 3, without anthers or with tiny anthers. Ovary tomentose; style glabrous. Legume brown, with pale thick margins, strap-shaped, falcate, flattened, 10–13 × ca. 1 cm, with septa between seeds. Seeds 30–40, flat, orbicular, 3–4 mm in diam.  $2n = 24, 26^*, 28^*, 56^*$ .

Among shrubs on riverbanks, wilderness tracts, hills, sparse forests, wastelands near villages. S regions of China [native to tropical America; widely introduced in the tropics and subtropics elsewhere].

**7. *Senna sophera*** (Linnaeus) Roxburgh, Fl. Ind., ed. 1832, 2: 347. 1832.

槐叶决明 huai ye jue ming

*Cassia sophera* Linnaeus, Sp. Pl. 1: 379. 1753; *Senna occidentalis* (Linnaeus) Link var. *sophera* (Linnaeus) X. Y. Zhu.

Shrubs, 1–2(–3) m tall, glabrous. Leaves 7–18(–21) cm; petiole 3–5 cm, with a subulate or narrow clavate gland 5–10 mm above petiole joint; petiolules ca. 2 mm; leaflets 4–10 pairs, lanceolate or elliptic-lanceolate, 1.7–4.2 × 0.7–2 cm, base rounded, apex acute to shortly acuminate. Corymbs axillary, few flowered; peduncles 1–2 cm; bracts ovate, ca. 5 mm; pedicels 1–1.5 cm. Sepals ovate-orbicular, ca. 5 mm. Petals yellow, obovate, shortly clawed. Stamens 10, 6 or 7 fertile, 2 longer; anthers opening by apical pores; staminodes 3 or 4, ca. 2 mm. Ovary finely pubescent. Legume straight, 5–10 × 0.5–1 cm, flattened and slightly thick at first, subcylindric, ± swollen when ripe. Seeds 30–40, ovoid, compressed.  $2n = 28$ .

Mountain slopes, roadsides. C and S China [native to tropical Asia; widely introduced in the tropics and subtropics elsewhere].

The young leaves and legumes are edible. The seeds are used medicinally for fever reduction.

**8. *Senna nomame*** (Makino) T. C. Chen, **comb. nov.**

豆茶决明 dou cha jue ming

Basionym: *Cassia mimosoides* Linnaeus var. *nomame* Makino, J. Jap. Bot. 1(5): 17. 1917; *C. nomame* (Makino) Kitagawa; *Chamaecrista nomame* (Makino) H. Ohashi, nom. superfl.

Herbs, annual, 30–60 cm tall, slightly hairy, branched or not. Leaves 4–8 cm, with a blackish brown, discoid, sessile gland in upper part of petioles; leaflets 8–28 pairs, ligulate-lanceolate, 5–9 mm, slightly asymmetric. Flowers inserted in axils of leaves, with pedicels, solitary or 2 to several in short racemes. Sepals 5, free, outside sparsely pubescent. Petals 5, yellow. Stamens 4, sometimes 5. Ovary densely puberulent. Legume compressed, dehiscent, 3–8 × ca. 0.5 cm, hairy, 6–12-seeded. Seeds compressed, subrhomboid, smooth.

Mountain slopes, open grassy fields. Anhui, Hebei, Heilongjiang, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

**9. *Senna fruticosa*** (Miller) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 121. 1982.

大叶决明 da ye jue ming

*Cassia fruticosa* Miller, Gard. Dict., ed. 8, *Cassia* no. 10. 1768.

Shrubs or small trees, ca. 3 m tall. Branches grayish white, glabrous. Leaves 12–18 cm, with an oblong, convex gland on rachis between lower pair of leaflets; stipules early caducous, linear, 3–4 mm; petiolules 3–4 mm; leaflets 2 pairs, obliquely oblong-ovate, 4–16.5 × 2–7 cm, membranous, both surfaces pubescent when young, abaxially puberulent when old, base obliquely cuneate, very unequally sided, midvein near upper side, apex acute to acuminate. Racemes short, densely flowered, to 6 cm, in axils of apical leaves, several racemes forming a leafy panicle; bracts early caducous, narrowly lanceolate. Sepals yellowish green, often tinged with red, oblong-obovate, outside puberulent. Petals orange-yellow, broadly obovate to orbicular, 2–2.5 cm, both sides pubescent. Fertile stamens 6 or 7, opening by apical pores, upper 3 stamens usually absent. Ovary linear, densely appressed whitish pubescent. Legume pendulous on a short stout stipe, terete, 15–25 × 1–1.5 cm, slightly annulate, with a beak ca. 1 cm on top. Seeds 80–100, dark brown, compressed, ovoid, 5–6 mm, embedded in a foetid, black pulp.  $2n = 28$ .

Cultivated in Guangdong [native to tropical America].

**10. *Senna multijuga*** (Richard) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 492. 1982.

密叶决明 mi ye jue ming

*Cassia multijuga* Richard, Actes Soc. Hist. Nat. Paris 1: 108. 1782.

Shrubs, small trees, or trees, 7–20(–40) m tall. Young parts generally puberulent; branchlets reddish brown when dry. Leaves 12–20 cm; stipules early caducous, linear; rachis and petiole puberulent, with a long, ovoid gland on rachis between lowest pair of leaflets (often early caducous); leaflets 10–26(–50) pairs, linear-oblong or oblong, 1.2–4 × 0.6–0.8 cm, both surfaces puberulent or adaxially glabrous, apex obtusely rounded, mucronate, slightly oblique. Racemes several, arranged in a terminal, leafy panicle 10–20(–40) cm; peduncle and pedicels puberulent. Flowers 2.5–4 cm in diam.; bracts ovate, ca. 2 mm, tomentose. Sepals greenish yellow when mature, slightly unequal, 5–6 mm. Petals yellow, ovate-oblong, 1–2(–3) cm, glabrous. Fertile stamens 7, 3 larger, with filament ca. 10 mm and anthers 6–7 mm, staminodes 3, tiny. Ovary linear, glabrous. Legume dark brown, flat, broadly linear, obtuse. Seeds 30–60, flattened, ca. 6 mm.

Cultivated in Guangdong (Guangzhou) [native to tropical America; widely cultivated in the tropics].

**11. *Senna sulfurea*** (Colladon) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 78. 1982.

粉叶决明 fen ye jue ming

*Cassia sulfurea* Colladon, Hist. Nat. Méd. Casses, 84. 1816; *C. glauca* Lamarck; *C. surattensis* N. L. Burman subsp. *glauca* (Lamarck) K. Larsen & S. S. Larsen; *Senna surattensis* (N. L. Burman) H. S. Irwin & Barneby subsp. *glauca* (Lamarck) X. Y. Zhu.

Shrubs, large, or small trees. Young shoots pilose, later glabrescent. Leaves 15–30 cm, with a clavate gland 1–2 mm on rachis between each of lowest 2 pairs of leaflets; stipules cadu-

cous, linear; petiole 3.5–6.5 cm; petiolules ca. 3 mm; leaflets 4–6 pairs, usually 5 pairs, abaxially farina-white, adaxially greenish, ovate or elliptic, 3.5–10 × 2.5–4 cm, base broadly cuneate or subrounded, apex obtusely rounded or inconspicuously emarginate. Racemes in axils of leaves in upper part of branches; peduncles 3–10 cm; rachis 1–6 cm; bracts ovate, 3–8 mm, apex acute, finally reflexed. Pedicels 1–3 cm. Sepals green to reddish brown, unequal, outer 2 suborbicular, ca. 3 mm in diam., inner 3 obovate, 6–9 mm. Petals bright yellow (drying orange or pinkish brown), ovate or obovate, 1.5–2.5 cm, 5-veined, clawed. Stamens 10, all fertile, with short, thick filaments, lowest 2 with longer filaments; anthers subequal, opening by short, apical slits. Ovary hairy; style glabrous. Legume glossy, flat, straight, strap-shaped, dehiscent, 12–20 × 1.2–1.8 cm, with long, slender beak on top, valves papery. Seeds 20–30, oblong-elliptic, ca. 7 × 4 mm.

Cultivated in Fujian, Guangdong, ?Guizhou, Yunnan [native to India, Laos, Malaysia (Peninsular), Sri Lanka, Thailand, Vietnam; Australia, Pacific islands (Polynesia); now naturalized in the neotropics].

**12. *Senna surattensis*** (N. L. Burman) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 81. 1982.

黄槐决明 huang huai jue ming

*Cassia surattensis* N. L. Burman, Fl. Indica, 97. 1768.

Shrubs or small trees, 5–7 m tall. Bark grayish brown, smooth; young branches, petioles, and rachises of leaves puberulent. Leaves 10–15 cm, with 2 or 3 clavate, long glands 1–2 mm on rachis between lowest 2 or 3 pairs of leaflets and in upper part of petiole; stipules subsistent, linear, 5–10 mm; leaflets 6–9 pairs, abaxially farina-white, ovate to ovate-oblong, 2–5 × 1–1.7 cm, abaxially sparsely pubescent, adaxially glabrous, base rounded, apex rounded, slightly emarginate. Racemes in axils of apical leaves, 3–6 cm, 10–15-flowered; peduncles 2.5–5 cm; bracts ovate-oblong, 5–8 mm, outside puberulent, finally reflexed. Pedicels 1–2 cm. Sepals unequal, 2 outer suborbicular, ca. 3 mm in diam., 3 inner obovate, to 7 mm. Petals bright yellow to deep yellow, subequal, ovate to obovate, 1.5–2 cm, with long claw 1–1.5 mm. Stamens 10, all fertile, with short, thick filaments, lowest 2 filaments longer; anthers oblong, subequal, 5–7 mm, opening by apical slits. Ovary puberulent; style glabrous. Legume flat, strap-shaped, dehiscent, 7–10 × 0.8–1.5 cm, long slender beaked, valves papery. Seeds 10–25, glossy, flattened.  $2n = 48, 56$ .

Cultivated in Fujian, Guangdong, Guangxi, ?Hainan, Taiwan, ?Yunnan, ?Zhejiang [native to India; widely introduced and cultivated elsewhere].

**13. *Senna septemtrionalis*** (Viviani) H. S. Irwin & Barneby, Mem. New York Bot. Gard. 35: 365. 1982.

光叶决明 guang ye jue ming

*Cassia septemtrionalis* Viviani, Elench. Pl. 14. 1802; *C. laevigata* Willdenow.

Shrubs or small trees, 1–4 m tall. Young branches green, smooth, glabrous. Leaves ca. 15 cm; rachis 6–12 cm, with a clavate or conical gland between all except upper pair of leaflets; stipules early caducous, linear; leaflets 3 or 4 pairs, abaxially

ially farina-white, ovate to ovate-lanceolate, 5–11 × 2–3.5 cm, both surfaces glabrous, base cuneate or narrowly cuneate, sometimes oblique, apex acute to acuminate. Racemes axillary or terminal, 4–10-flowered, 5–10 cm including peduncle 2.5–5 cm; bracts caducous, linear-lanceolate, 2–5 mm. Pedicels 1.5–2.5 cm. Sepals yellowish green, ovate-elliptic, unequal, inner 8–10 mm, outer shorter. Petals bright yellow, ovate-orbicular, 1–1.5(–2) cm, shortly clawed. Fertile stamens 7, unequal, anthers opening by apical pores; 3 staminodes with anthers flat, suborbicular, non-functional. Ovary glabrous; style linear. Legume terete, 6–10 × ca. 1 cm, slightly subquadrangular when fully mature, valves subleathery, tardily dehiscent. Seeds 50–70, olive-colored, glossy, obovoid, flat, 5–6 mm.

Cultivated in Guangdong, Guangxi [native to tropical America; widely cultivated in the tropics].

**14. *Senna tora*** (Linnaeus) Roxburgh, Fl. Ind., ed. 1832, 2: 340. 1832.

决明 jue ming

*Cassia tora* Linnaeus, Sp. Pl. 1: 376. 1753.

Herbs, suffrutescent, annual, erect, 1–2 m tall. Leaves 4–8 cm; stipules caducous, linear, 10–15 mm; petiole without glands; rachis with a club-shaped gland between leaflets; petiolules 1.5–2 mm; leaflets 3 pairs, obovate or obovate-oblong, 2–6 × 1.5–2.5 cm, membranous, abaxially pubescent, adaxially sparsely pubescent, base cuneate to rounded and oblique, apex rounded, cuspidate. Racemes axillary, short, 1- or 2( or 3)-flowered; peduncles 6–10 mm; bracts linear, acute. Pedicels 1–1.5 cm. Sepals ovate or ovate-oblong, 5–8 mm, membranous, outside pubescent. Petals yellow, unequal, obovate, lower 2 slightly longer, 12–15 × 5–7 mm, shortly clawed. Fertile stamens 7, nearly equal, filaments 1.5–2 mm, anthers opening by apical pores, ca. 4 mm, 3 larger, 4 smaller, staminodes absent. Ovary sessile, densely white pubescent; style glabrous. Legume terete, subtetragonous, slender, 10–15 × 0.3–0.5 cm, both ends acuminate, valves membranous. Seeds 20–30, glossy, rhomboid, ca. 5 × 3 mm, with an areole.  $2n = 26^*, 28^*, 56^*$ .

Mountain slopes, wastelands, riverbank sand. Widespread to S of the Chang Jiang [native to tropical America; widely cultivated in the tropics and subtropics].

The seeds known as “jue ming zi” (决明子) are used medicinally as a diuretic and purgative.

In addition, X. Y. Zhu et al. (Legumes China, 32. 2007) recorded *Senna obtusifolia* (Linnaeus) H. S. Irwin & Barneby as widely cultivated in China (as *S. tora* var. *obtusifolia* (Linnaeus) X. Y. Zhu).

**15. *Senna bicapsularis*** (Linnaeus) Roxburgh, Fl. Ind., ed. 1832, 2: 342. 1832.

双荚决明 shuang jia jue ming

*Cassia bicapsularis* Linnaeus, Sp. Pl. 1: 376. 1753.

Shrubs, erect, to 3 m tall, much branched. Crown spreading, with pendent or sometimes climbing twigs. Leaves 7–12 cm, with 3 or 4 pairs of leaflets; stipules caducous, narrowly lanceolate, subulate, 1–3 mm; petiole 2.5–4 cm, slender;

rachis with a blackish brown, clavate to ovoid gland between lowest pair of leaflets; leaflets obovate or obovate-oblong, 1.5–4 × 1–2.5 cm, membranous, glabrous, base obliquely cuneate, apex obtusely rounded. Racemes lax, in axils of apical leaves, 5–15 cm, slender; bracts early caducous. Sepals yellowish to reddish brown, ovate, 5–10 mm. Petals yellow, obovate, 1.1–1.5 cm, very shortly clawed. Stamens 10, 7 fertile: 3 lower with unequal filaments 2–10 mm, anthers large, curved, ca. 1 mm; 4

short with filaments ca. 1 mm and anthers 4–5 mm; 3 staminal nodes with minute anthers. Ovary with glabrous stalk and style. Legume brown, terete, straight or slightly curved, 9–17 × 1–1.5 cm, tardily dehiscent, valves membranous. Seeds 50–60, olive-green, ovoid, flattened, 5–7 mm.

Cultivated in Guangdong, Guangxi, Hainan [native to tropical America; widely cultivated in the tropics].

## 12. CHAMAECRISTA Moench, Methodus, 272. 1794.

山扁豆属 shan bian dou shu

Herbs or suffrutescent herbs, rarely small trees. Leaves abruptly pinnate; leaflets opposite; foliar glands usually present, disk- or cup-shaped, rarely flat. Flowers yellow or red. Sepals 5. Petals 5, unequal. Stamens 10 to 5 fertile, filaments straight, anther thecae ciliate along suture, dehiscent terminally by slit or pore. Legume elastically dehiscent, valves coiling. Seeds with either smooth or pitted testa, usually exareolate.

About 270 species: mostly (ca. 240) indigenous to America, with only a few (ca. 30) in tropical Asia; three species (one introduced) in China.

- 1a. Petiolar gland distinctly stipitate ..... 1. *C. pumila*  
 1b. Petiolar gland sessile, discoid, raised or slightly flat.  
 2a. Rachis of leaves not canaliculate; leaflets 20–50 pairs, 3–4 mm; ovary with short, stiff, appressed hairs;  
 legume with scattered, appressed hairs ..... 2. *C. mimosoides*  
 2b. Rachis of leaves canaliculate; leaflets 10–25 pairs, 8–13 mm; ovary woolly with long and short, thin  
 hairs; legume with long and short, non-appressed hairs ..... 3. *C. leschenaultiana*

**1. *Chamaecrista pumila*** (Lamarck) V. Singh, J. Econ. Taxon. Bot. 16: 600. 1992.

柄腺山扁豆 bing xian shan bian dou

*Cassia pumila* Lamarck, Encycl. 1: 651. 1785.

Subshrubs or diffuse herbs, perennial, woody at base, 25–75 cm tall, with many branches. Branches, petioles, and rachises of leaves pilose. Leaves 3–6 cm, with a stipitate gland on top of petiole and on rachis between lowest pair of leaflets; stipules linear-subulate, 6–8 mm, acuminate; leaflets 12–20 pairs, sessile, unequally sided, linear-falcate, 8–12 × ca. 2 mm, midrib near upper margin of blade, apex mucronate. Flowers axillary, solitary or most often 2 or 3 together in a very short raceme; bracts and bracteoles similar to stipules but shorter. Sepals ovate-oblong, 4–6 mm, apex acute. Petals bright yellow, unequal, oblong-obovate, shorter than or ca. as long as sepals, shortly clawed. Stamens 5, subequal; anthers oblong, opening by apical pores enlarging to short slits. Ovary sessile, appressed tomentose; stigma peltate, small. Legume flat, straight, strap-shaped, 3–5 × ca. 0.5 cm, pilose. Seeds 10–20, subrhomboid, ca. 3 mm, flat, smooth.  $2n = 32$ .

Mountain slopes, open fields, among shrubs, grasslands. Guangdong, Hainan, Yunnan [India, Laos, Malaysia, Myanmar, Vietnam; Australia].

**2. *Chamaecrista mimosoides*** (Linnaeus) Greene, Pittonia 4: 27. 1897.

山扁豆 shan bian dou

*Cassia mimosoides* Linnaeus, Sp. Pl. 1: 379. 1753.

Herbs, suffrutescent, annual or perennial, with woody base, 30–60 cm tall, or low shrubs to 1 m tall, with many slender, puberulent branches. Leaves 4–8 cm, with an orbicular, dis-

coid, sessile gland in upper part of petiole, below lowest pair of leaflets; stipules persistent, linear-subulate, 4–7 mm, with conspicuous longitudinal veins; rachis not canaliculate, sparsely pubescent; leaflets sessile, 20–50(–80) pairs, reddish brown when dry, linear-falcate, 3–4 × ca. 1 mm, midvein near upper margin of blade, very unequally sided, base obliquely truncate, apex acute, mucronate. Flowers supra-axillary, mostly solitary, sometimes 2 or 3 together in a very short raceme; bracts and bracteoles similar to stipules but latter smaller. Sepals lanceolate, 4–8 mm, apex acute. Petals bright yellow, unequal, obovate to orbicular, equal to or slightly longer than sepals, shortly clawed. Stamens 10, alternately 5 shorter and 5 longer; anthers opening by apical pores. Ovary with stiff, appressed hairs; stigma flat. Legume flat, falcate, 2.5–5 × ca. 0.5 cm. Seeds 10–20, flat, smooth.  $2n = 16$ .

Slopes, wastelands, among bushes, grasslands. S China [native to tropical America; widely introduced in the tropics and subtropics].

This is a drought-enduring and barren-resistant plant, grown for improving the soil. The roots are used medicinally for treating dysentery.

**3. *Chamaecrista leschenaultiana*** (Candolle) O. Degener, Fl. Hawaiiensis Fam. 169b. 1934.

大叶山扁豆 da ye shan bian dou

*Cassia leschenaultiana* Candolle, Mém. Soc. Phys. Genève 2: 132. 1824 [*“leschenaultiana”*].

Herbs, suffrutescent, annual or perennial, 30–100(–150) cm tall. Stems erect or decumbent; young branches densely yellowish pubescent. Leaves 3–8 cm, with a slightly raised, orbicular-discoid gland just below lowest pair of leaflets in upper part of petiole; stipules persistent, linear-subulate, 7–9 mm; rachis canaliculate, pubescent; leaflets sessile, 10–25 pairs, linear-falcate, 8–13(–15) × 2–3 mm, very unequally sided, with mid-

vein close to upper border of blade. Flowers axillary or in few-flowered, short, axillary or supra-axillary racemes; bracts and bracteoles like stipules but smaller. Sepals ligulate-lanceolate, ca. 1 cm, outside sparsely yellowish pubescent. Petals orange-yellow, slightly longer than or equal to sepals. Stamens 10, sometimes 1–3 reduced. Ovary densely whitish pubescent; stigma flat, ciliate. Legume flat, strap-shaped, 2.5–5 × ca. 0.5 cm,

with long and short, non-appressed hairs to nearly glabrous. Seeds 8–16, flat, smooth.

Mountains, among shrubs, near roads, grassy slopes. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Sichuan, Taiwan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, New Guinea, Thailand, Vietnam].