

74. EUPHORBIA Linnaeus, Sp. Pl. 1: 450. 1753.

大戟属 da ji shu

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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 ± 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. *Lacanthis*) 28. *E. milii*
- 3b. Shrubs or small trees with ± 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 ± 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 ± 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 exerted 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 × 2–3.5 cm; glandular vein conspicuous 64. *E. yanjinensis*
 35b. Leaf blade long linear, 9–12 cm × 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. peplus*
 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. inderiensis*
 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 × 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 × 0.4–3 cm.
 44a. Leaf blade 2–3 cm wide; involucre leaves and rays 6–10; plants 60–90 cm tall 74. *E. latifolia*
 44b. Leaf blade less than 10–15 mm wide; involucre 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. jolkinii*
- 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, exserted from involucre; ovary glabrous; styles free, easily fallen; stigma slightly 2-lobed. Capsule exserted, 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 [Cambodia, 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 exserted; anthers yellow. Female flower: pedicel 2–4 mm, exserted from involucre; ovary smooth,

glabrous; styles free, persistent; stigma 2-lobed. Capsule exserted, 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.

鹅銮鼻大戟 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, exerted 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 exerted 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 exerted from involucre. Female flower exerted 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, exerted 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 exerted. Female flower exerted 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 exerted 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 exerted. Female flower exerted 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^o: 52. 1817.

匍根大戟 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 campanulate, 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 (Gaoxiang, 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 (Jiaying) [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, usually 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 × 1.4 mm, smooth, glabrous except for white hairs along angles. Seeds ovoid-tetragonal, ca. 0.9 × 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 × 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 × 1.3–1.5 mm, smooth, shortly pubescent. Seeds ovoid-tetragonal, ca. 0.7 × 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) × 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 × 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 × 2 mm, smooth, sparsely pilose. Seeds ovoid-tetragonal, ca. 1 × 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 × 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 × 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 × 0.3 mm, margin entire to undulate. Male flowers 5–15, exerted from involucre; anthers red. Female flower ± exerted from involucre; ovary pilose; styles free; stigma 2-lobed. Capsule ovoid-globose, 1.4–1.8 × 1.5–1.8 mm, smooth, sparsely pilose; fruiting pedicel 0.8–1.3 mm. Seeds ovoid-tetragonal, ca. 1 × 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 ± 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 × 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 × 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 × 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 × 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 × 5.5 mm, pilose; fruiting pedicel 3–7 mm. Seeds globose-terete, 3.5–4 × 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].

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 ± 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 × 4–10 cm, abaxially pubescent, adaxially shortly pubescent or glabrous,

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 × 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 × 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 × 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.

base attenuate, apex acuminate or acute. Cyathia in a very congested, 1-sided synflorescence, subtended by 5–7 petiolate leaflike bracts, these narrowly elliptic, 3–7 × 1–2 cm, usually entire, sometimes repand-lobed, scarlet, peduncle 3–4 mm; involucre urceolate, light green, 7–9 × 6–8 mm, lobes 5, lacerate, triangular, glabrous; glands usually 1, rarely 2, yellow, compressed, 2-lipped, 4–5 × 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 × 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, sessile, 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 simi-

lar 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 (Le-dong).

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 campanulate, ca. 3×2 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. 4×4 –5 mm, glabrous. Seed

ovoid-globose, ca. 2×1.5 –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 lü 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 lü 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 – 15×0.7 – 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. 2×1.5

mm, shortly pubescent inside; glands 5, peltate-ovate or sub-rounded. Male flowers many, exerted from involucre. Female flower: ovary glabrous, exerted from involucre; styles connate below middle; stigma 2-lobed. Capsule 3-lobed, ca. 8×8 mm, smooth, sparsely pilose or glabrous. Seeds ovoid-globose, ca. 4×4 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 – 5×0.8 – 1.8 cm, base attenuate, margin entire, apex rounded. Cyathia in subapical, dichasial cymes, peduncle 4–7 cm; cyathophylls 2, reniform-rounded, 8 – 10×12 – 14 mm, usually

bright red (pink, white, or yellow in some cultivars), apex rounded; involucre

campanulate, 3–4 × 3.5–4 mm, lobes 5, lanceolate; glands 5, reniform-rounded, ca. 1 × 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 × 4 mm, smooth and glabrous. Seeds ovoid-terete, ca. 2.5 × 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 ± 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 × 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 × 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.

glabrous; styles free; stigma slightly 2-lobed. Capsule 3-lobed, compressed, 3.4–4 × 4–5 mm. Seeds subglobose, ca. 2 × 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.

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.

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).

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 × 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 × 5 mm, lobes 5, rounded, denticulate; glands 5, entire. Male flowers many; bracts linear. Female flower: ovary pedicellate, exerted from involucre, smooth and

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 × 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 × 2.5 mm; glands 5, transversely elliptic, dark yellow. Capsule 3-lobed, 1–1.2 × 1–1.5 cm, smooth and glabrous. Seeds 3–3.5 × 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 cylindric thyrses. Cyathia subtended by cyathophylls longer than cyathia, mostly green, occasionally colored; glands usually 4, sometimes 5, simple or with 2 horns. Capsules often exerted, 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 cm, 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, conspicuous, 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, cylindric, 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, exerted from involucre. Female flower: ovary pedicel up to 4 mm and exerted 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 exerted 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, exerted from involucre. Female flower: ovary pedicel ca. 3 mm and exerted 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 margin, 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, exserted from involucre. Female flower: ovary pedicel ca. 3 mm and exserted 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, exserted from involucre. Female flower: ovary pedicel 3–5 mm, exserted 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 exserted from involucre. Female flower: ovary exserted 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, exserted from involucre. Female flower: ovary pedicel 3–5 mm, exserted 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* (Pro-

khanov) 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 alatavica* 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 exserted from involucre or same. Female flower: ovary shortly exserted 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 exserted 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, exserted from involucre. Female flower: ovary exserted 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, exserted from involucre. Female flower: ovary exserted 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 sessile; 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 involucre 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 sessile; 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, sessile. 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 involucre 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 involucre 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-tuberculate, 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, sessile. 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 involucrel 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 involucrel 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 involucrel 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 involucrel 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-oblong-lanceolate, 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 involucre 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 exserted 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 involucre 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 exserted from involucre. Female flower: ovary pedicel 2–3.5 mm, exserted 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 (Taipei, 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 ab-

sent; 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 exserted from involucre. Female flower: ovary pedicel 5–6 mm, exserted 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, exserted from involucre. Female flower: ovary pedicel 3–5 mm, exserted 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.

英德爾大戟 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.

蒿狀大戟 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, sub-crescent, 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. esquirolii H. Léveillé & Vaniot; *E. glaucopoda* Diels; *E. henryi* Hemsley; *E. hippocrepica* Hemsley; *E. kangdingensis* W. T. Wang; *E. kangdingensis* var. *puberula* W. T. Wang; *E. laticola* 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-triangular, 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, exserted from involucre. Female flower: ovary pedicel 3–6 mm, exserted 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. lunulata*

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. lunulatus* (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 involucral 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 exserted 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, involucral 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.

