

BRASSICACEAE (CRUCIFERAE)

十字花科 shi zi hua ke

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Herbs annual, biennial, or perennial, sometimes subshrubs or shrubs, with a pungent, watery juice. Eglandular trichomes unicellular, simple, stalked or sessile, 2- to many forked, stellate, dendritic, or malpighiaceus (medifixed, bifid, appressed), rarely peltate and scalelike; glandular trichomes multicellular, with uniseriate or multiseriate stalk. Stems erect, ascending, or prostrate, sometimes absent. Leaves exstipulate, simple, entire or variously pinnately dissected, rarely trifoliate or pinnately, palmately, or bipinnately compound; basal leaf rosette present or absent; cauline leaves almost always alternate, rarely opposite or whorled, petiolate or sessile, sometimes absent. Inflorescence bracteate or ebracteate racemes, corymbs, or panicles, sometimes flowers solitary on long pedicels originating from axils of rosette leaves. Flowers hypogynous, mostly actinomorphic. Sepals 4, in 2 decussate pairs, free or rarely united, not saccate or lateral (inner) pair saccate. Petals 4, alternate with sepals, arranged in the form of a cross (cruciform; hence the earlier family name Cruciferae), rarely rudimentary or absent. Stamens 6, in 2 whorls, tetradynamous (lateral (outer) pair shorter than median (inner) 2 pairs), rarely equal or in 3 pairs of unequal length, sometimes stamens 2 or 4, very rarely 8–24; filaments slender, winged, or appendaged, median pairs free or rarely united; anthers dithecal, dehiscing by longitudinal slits. Pollen grains 3-colpate, trinucleate. Nectar glands receptacular, highly diversified in number, shape, size, and disposition around base of filaments, always present opposite bases of lateral filaments, median glands present or absent. Pistil 2-carpelled; ovary superior, sessile or borne on a distinct gynophore, mostly 2-locular and with a false septum connecting 2 placentae; placentation parietal, rarely apical; ovules anatropous or campylotropous, bitegmic, 1 to many per locule. Fruit typically a 2-valved capsule, generally termed silique (siliqua) when length 3 × or more than width, or silicle (silicula) when length less than 3 × width, dehiscent or indehiscent, sometimes schizocarpic, nutletlike, lomentaceous, or samaroid, segmented or not, terete, angled, or flattened parallel to septum (latiseptate) or at a right angle to septum (angustiseptate); valves 2 (or 3–6); replum (persistent placenta) rounded, rarely flattened or winged; septum complete, perforated, reduced to a rim, or lacking; style 1, distinct, obsolete, or absent; stigma capitate or conical, entire or 2-lobed, sometimes lobes decurrent and free or connate. Seeds without endosperm, uniseriately or biseriately arranged in each locule, aseriately when 1, winged or wingless, mucilaginous or not when wetted; cotyledons incumbent (embryo notorrhizal: radicle lying along back of 1 cotyledon), accumbent (embryo pleurorrhizal: radicle applied to margins of both cotyledons), or conduplicate (embryo orthoplocal: cotyledons folded longitudinally around radicle), rarely spirally coiled (embryo spirolobal). Germination epigeal.

About 330 genera and 3500 species: all continents except Antarctica, mainly in temperate areas, with highest diversity in Irano-Turanian, Mediterranean, and W North American regions; 102 genera (eight endemic) and 412 species (115 endemic) in China.

Because of lack of a comprehensive classification based on phylogenetic relationships among genera, and in order to facilitate direct comparison between the accounts in FOC and FRPS, the sequence of genera follows Schulz (Nat. Pflanzenfam. 17b: 227–658. 1936). However, it should be emphasized that his system is largely artificial because he placed closely related genera in different tribes and remotely related genera in the same tribe. For example, *Arabis*, *Aubrieta*, *Draba*, and *Macropodium*, which are very closely related on the basis of recent molecular studies, were placed by Schulz in four different tribes, whereas the unrelated *Capsella*, *Lepidium*, and *Thlaspi* were placed in one tribe. The delimitation of genera is often difficult, and mature fruits are needed for reliable identification.

The Brassicaceae include many important crop plants that are grown as vegetables (*Brassica*, *Nasturtium*, *Raphanus*) and sources of vegetable oils (*Brassica*) and condiments (*Armoracia*, *Brassica*, *Eutrema*, *Sinapis*). Oils of *Brassica* probably rank first in terms of tonnage of the world's production of edible oils. The family includes many ornamentals in the genera *Erysimum*, *Iberis* Linnaeus, *Lobularia*, *Malcolmia*, and *Matthiola*. Of these, only *Lobularia maritima* has become naturalized in China. The family also includes more than 120 species of weeds. *Arabidopsis thaliana*, which is naturalized in China, has become the model organism in many fields of experimental biology.

The delimitation of genera in the Brassicaceae is often difficult because of the frequent independent evolution of what appear to be similar character states, the variability of a given character in one genus and its fixture in another, and the inadequate sampling of material by most authors. Fruit characters are essential in the identification of genera. However, a key emphasizing flowering material is given in addition to the one emphasizing fruit. The most reliable determination of genera can be achieved when the material has both fruit and flowers and when both keys are successfully used to reach the same genus.

The types of cotyledonary position, which in reality is the position of the radicle in relation to the cotyledons (e.g., radicle accumbent, incumbent, or conduplicate, though radicle referred to as "cotyledon" throughout) are important in the separation of many genera, and a cross section of the seed provides the easiest and simplest way of determining that position. The exact number of ovules per ovary can easily be determined from the fruit because aborted ovules persist through fruit dehiscence. However, it is more laborious to determine the ovule number from pistils and young fruit.

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Key to fruiting material

- 1a. Fruit silicles (less than $3 \times$ longer than broad).
 - 2a. Fruit much wider than long, 2–16-spined, with prominently 3–20-veined lateral wings larger than the seed-bearing part 15. *Pugionium*
 - 2b. Fruit longer than wide or about as long as wide, not spiny, wingless or with veinless wings smaller than the seed-bearing part.
- 3a. Fruit flattened at a right angle to septum (angustiseptate).
 - 4a. At least some of the trichomes branched.
 - 5a. Cauline leaves sessile, auriculate or sagittate at base; fruit obdeltoid to obdeltoid-obcordate . 19. *Capsella*
 - 5b. Cauline leaves petiolate or cuneate to petiolelike base, not auriculate or sagittate; fruit oblong, elliptic, obovate, or suborbicular.
 - 6a. Fruiting pedicels strongly recurved, often forming a loop; fruit 1- or 2-seeded, often aborted on 1 side; plants rhizomatous perennials 23. *Dipoma*
 - 6b. Fruiting pedicels straight, erect, ascending, or divaricate; fruit more than 5-seeded, not aborted on 1 side; plants annual, biennial, or rarely non-rhizomatous perennials.
 - 7a. Fruiting raceme bracteate throughout or rarely along proximal half; leaves 1- or 2-pinnatisect; fruit more than 20-seeded 20. *Hedinia*
 - 7b. Fruiting racemes ebracteate; leaves entire, dentate, or pinnatifid; fruit less than 20-seeded 21. *Hornungia*
 - 4b. Trichomes absent or exclusively simple.
 - 8a. Seeds (or ovules) 4–24 per fruit.
 - 9a. Fruit borne on solitary pedicels originating from basal rosette 44. *Pegaeophyton*
 - 9b. Fruit borne on racemes, panicles, or corymbs.
 - 10a. Cauline leaves sessile, auriculate, sagittate, or amplexicaul; roots not fleshy, cylindrical; fruit often winged apically 18. *Thlaspi*
 - 10b. Cauline leaves petiolate or sessile but not auriculate, sagittate, or amplexicaul; roots fleshy, fusiform or conical; fruit wingless or cristate apically.
 - 11a. Plants 0.5–2 m tall; infructescence a large panicle; replum slender, not flattened; racemes ebracteate 42. *Armoracia*
 - 11b. Plants rarely to 0.3 m tall; infructescence a small raceme or corymb; replum broad, flattened at least basally; racemes often bracteate throughout.
 - 12a. Cauline leaves sessile; fruit often cristate apically; fruit valves obscurely veined; seeds minutely reticulate 24. *Dilophia*
 - 12b. Cauline leaves petiolate; fruit not cristate apically; fruit valves with a prominent midvein; seeds papillate or foveolate 88. *Taphrospermum*
 - 8b. Seeds (or ovules) 1 or 2 per fruit.
 - 13a. Fruit didymous, breaking into 2, closed, 1-seeded halves.
 - 14a. Fruit halves broadly winged, 8–40 mm; root fleshy, 1–15 cm in diameter 16. *Megacarpaea*
 - 14b. Fruit halves wingless, 1–2 mm; roots not fleshy, slender, much narrower.
 - 15a. Dwarf plants rarely more than 3 cm tall; all or most fruit on solitary pedicels originating from basal rosette; leaves palmately veined; fruit halves smooth; stamens 6 17. *Megadenia*
 - 15b. Plants often more than 10 cm tall; fruit in racemes; leaves pinnately veined; fruit halves prominently reticulate to rugose, very rarely smooth; stamens 2 or 4 11. *Coronopus*
 - 13b. Fruit not didymous, dehiscent and readily releasing seeds, or indehiscent.
 - 16a. Fruit 1-seeded, obscurely differentiated into halves, without a septum, indehiscent, with thickened, central, seed-bearing part; fruiting pedicels reflexed; petals yellow.
 - 17a. Fruit navicular, semiovoid to semiglobose, with strongly involute wing margins bearing 1 or 2 rows of tubercles; fruiting pedicels articulate at base 31. *Tauscheria*
 - 17b. Fruit oblong, elliptic, ovate, or pyriform, flat, wingless or wing margins neither involute nor tuberculate; fruiting pedicels not articulate.
 - 18a. Fruit samaroid, more than 6 mm, wing margin not thickened 13. *Isatis*
 - 18b. Fruit achenelike, rarely to 5 mm, wing margin strongly thickened 14. *Pachypterygium*
 - 16b. Fruit 2-seeded, well differentiated into halves, with a well-developed septum, dehiscent or rarely indehiscent, not thickened at center; fruiting pedicels not reflexed; petals white or pink (yellow in *Lepidium perfoliatum*).

- 19a. Fruit indehiscent; nectar glands confluent; style 0.7–2 mm 12. *Cardaria*
19b. Fruit dehiscent; nectar glands separate teeth; style (ours) absent or to 0.8(–1) mm.
20a. Fruit somewhat 4-angled; leaves leathery; caudex thick, with petiolar remains of
previous
years; stamens 6 27. *Stroganowia*
20b. Fruit flat, not angled; leaves herbaceous rarely leathery; caudex absent or slender, rarely
thick
and with petiolar remains of previous years; stamens 2, 4, or 6 10. *Lepidium*
- 3b. Fruit flattened parallel to septum (latiseptate), terete, or angled.
21a. Fruit on solitary pedicels originating from basal rosette.
22a. Plants glabrous or with simple trichomes only; leaves entire, rarely toothed or pinnately lobed.
23a. Fruit readily detached from pedicel; valve apex persistently united with replum; replum not
flattened; valves marginal veins prominent; petals purple, pink, or blue 64. *Solms-laubachia*
23b. Fruit not detached from pedicel; valve apex readily separated from replum at dehiscence;
replum
strongly flattened; valves marginal veins obscure or absent; petals white 44. *Pegaeophyton*
- 22b. Plants with at least some branched trichomes; leaves subapically toothed.
24a. Fruit ovate or lanceolate, not geocarpic; valves prominently veined; stigma 2-lobed 57. *Desideria*
24b. Fruit oblong, geocarpic; valves obscurely veined; stigma entire 84. *Pycnophilthopsis*
- 21b. Fruit in racemes.
25a. Plants glabrous or with simple trichomes only.
26a. Fruit indehiscent, with a woody or corky wall, sometimes breaking transversely into
segments.
27a. Style slender, 1.5–3.5 mm, readily caducous from a basal articulation; replum strongly
expanded laterally 33. *Litwinowia*
27b. Style obsolete, or fruit attenuate into a conical, persistent, stylelike beak without a basal
articulation; replum not expanded laterally.
28a. Cauline leaves petiolate, not auriculate; plants 0.5–2.5 m tall; fruit rounded at apex,
strongly differentiated into a seedless basal segment and a larger, 1-seeded terminal
segment 7. *Crambe*
28b. Cauline leaves sessile, auriculate to amplexicaul; plants rarely to 0.5 m tall; fruit tapered
to apex, unsegmented.
29a. Fruiting pedicels divaricate, not articulate at base; fruit 2-seeded, not constricted at
middle; cotyledons spirolobal; petals white 35. *Bunias*
29b. Fruiting pedicels reflexed, articulate at base; fruit 1–3-seeded, constricted between
seeds;
cotyledons incumbent; petals purplish or pink 82. *Goldbachia*
- 26b. Fruit dehiscent, with a papery or membranous wall.
30a. At least some leaves dentate, lobed, or compound.
31a. Some or all cauline leaves auriculate or sagittate at base; seeds more than 50 per fruit;
petals
yellow 60. *Rorippa*
31b. Cauline leaves not auriculate or sagittate at base; seeds less than 25 per fruit; petals white,
pink,
blue, or purple.
32a. Leaves trifoliolate, pinnately compound, pinnatisect, or rarely simple; racemes
ebracteate, if bracteate, then basal bracts trifoliolate; fruiting pedicels glabrous or
pubescent all around; petals white 26. *Yinshania*
32b. Leaves palmately 3–5-lobed; racemes bracteate throughout; fruiting pedicels puberulent
adaxially; petals purple, blue, or rarely pink 28. *Lignariella*
- 30b. All leaves entire.
33a. Raceme bracteate throughout; fruit 1- or 2-seeded; valves with 3 rows of crests; filaments
of
median stamens appendaged 22. *Hemilophia*
33b. Racemes ebracteate; fruit more than 2-seeded; valves without rows of crests; filaments of
median stamens unappendaged.
34a. Fruit (0.8–)1–1.7 cm wide; valves with prominent midvein and lateral and marginal
veins,
apex persistently united with replum 64. *Solms-laubachia*

- 34b. Fruit rarely to 0.3 cm wide; valves obscurely veined or only with a prominent midvein, apex readily separated from replum at dehiscence.
- 35a. Fruit slightly 4-angled, on a short gynophore; stems leafy; lowermost leaves cordate to ovate, often palmately veined 89. *Eutrema*
- 35b. Fruit terete, sessile; stems leafless; lowermost leaves linear or oblong, pinnately veined 96. *Braya*
- 25b. Plants with at least some trichomes branched.
- 36a. Fruit indehiscent, often nutletlike, with woody or corky wall.
- 37a. Plants with glandular trichomes, if eglandular then fruit strongly reflexed.
- 38a. Fruiting pedicels divaricate; trichomes simple and forked; seeds wingless, 1 or 2; cotyledons spirolobal; petals bright yellow 35. *Bunias*
- 38b. Fruiting pedicels strongly reflexed; trichomes dendritic; seeds winged, often more than 2; cotyledons accumbent; petals yellowish white 67. *Microstigma*
- 37b. Plants eglandular, fruit erect to divaricate.
- 39a. Cauline leaves sessile, auriculate or sagittate; style less than 1 mm; stigma entire; fruit readily detached from divaricate pedicels; petals yellow 34. *Neslia*
- 39b. Cauline leaves petiolate, not auriculate or sagittate; style 1–7 mm; stigma deeply 2-lobed; fruit not readily detached from erect-ascending pedicels; petals white or pink.
- 40a. Fruit densely covered with silky trichomes 5–8 mm; style (2.5–)4–7 mm; petals pink 29. *Lachnoloma*
- 40b. Fruit scabrous with minute trichomes less than 1 mm; style less than 2 mm; petals white 32. *Euclidium*
- 36b. Fruit dehiscent, with papery wall.
- 41a. Raceme bracteate throughout or at least along proximal half.
- 42a. Fruit 1- or 2-seeded.
- 43a. Fruit valves with 3 rows of crests; fruiting pedicels straight or slightly curved, not forming a loop; leaves entire; filaments of median stamens appendaged 22. *Hemilophia*
- 43b. Fruit valves without crests; fruiting pedicels often forming a loop; at least some leaves dentate or lobed near apex; filaments of median stamens unappendaged 23. *Dipoma*
- 42b. Fruit more than 4-seeded.
- 44a. Fruit latiseptate; trichomes forked or stellate; cotyledons accumbent 41. *Draba*
- 44b. Fruit terete; trichomes dendritic; cotyledons incumbent 100. *Sophiopsis*
- 41b. Raceme ebracteate.
- 45a. Leaves 1- or 2-pinnatisect or 3–5-foliolate.
- 46a. Branched trichomes forked; inflorescence paniculate, ultimate branches flexuous .. 26. *Yinshania*
- 46b. Branched trichomes dendritic; inflorescence non-flexuous racemes, if branched then fruit more than 10-seeded.
- 47a. Annuals or biennials; seeds mucilaginous when wetted; petals yellow 100. *Sophiopsis*
- 47b. Pulvinate perennials; seeds not mucilaginous when wetted; petals white 101. *Smelowskia*
- 45b. Leaves entire or rarely dentate.
- 48a. Cauline leaves auriculate or sagittate at base; fruit obpyriform; valves connate at margin and hiding replum, beaklike apex caudate, extending into style 98. *Camelina*
- 48b. Cauline leaves often neither auriculate nor sagittate at base; fruit variously shaped but not obpyriform; valve margins not connate, apex not extending into a caudate beak.
- 49a. Branched trichomes exclusively malpighiaceous.
- 50a. Fruit 1- or 2- seeded; seeds orbicular; simple trichomes absent 38. *Lobularia*
- 50b. Fruit more than 4-seeded; seeds oblong or ovate; simple trichomes present 41. *Draba*
- 49b. Branched trichomes stellate or forked.
- 51a. Branched trichomes exclusively stellate, sessile, appressed.
- 52a. Seeds broadly winged (wing to 1 mm wide); petals deeply bifid; filaments not toothed or winged 37. *Galitzkya*
- 52b. Seeds wingless or narrowly margined (margin to 0.1 mm wide); petals obtuse or emarginate; filaments often toothed or winged 36. *Alyssum*
- 51b. At least some of the branched trichomes simple or forked, stalked, not appressed.
- 53a. Cauline leaves absent.

- 74a. Fruit dimorphic, lowermost indehiscent, corky, and terete, uppermost dehiscent and flattened;
replum rounded 69. *Diptychocarpus*
- 74b. Fruit of 1 kind, dehiscent, flattened, terete; replum flattened.
- 75a. Cauline leaves absent, rarely few; fruit (2–)2.5–7 mm wide; seeds broadly winged, wing 0.5–3 mm wide 70. *Parrya*
- 75b. Cauline leaves several; fruit 1.5–2 mm wide; seeds narrowly winged, wing 0.1–0.4 mm wide.
- 76a. Basal leaves not rosulate; stigma capitate, lobes slightly decurrent 76. *Clausia*
- 76b. Basal leaves rosulate; stigma linear, lobes strongly decurrent 77. *Pseudoclausia*
- 67b. Glandular trichomes absent.
- 77a. Plants glabrous or with simple trichomes only.
- 78a. Fruit indehiscent, sometimes breaking transversely into corky, 1-seeded units.
- 79a. Cauline leaves auriculate or amplexicaul; style obsolete or rarely to 2 mm; lateral sepals not saccate.
- 80a. Fruit a samara, strongly angustiseptate, 1-seeded; petals yellow 13. *Isatis*
- 80b. Fruit nutletlike, terete or angled, 1–3 seeded, if 2- or 3- seeded then breaking transversely into 1-seeded units; petals purple or pink 82. *Goldbachia*
- 79b. Cauline leaves not auriculate or amplexicaul; style distinct, 5–50 mm; lateral sepals often strongly saccate.
- 81a. Fruit 1-seeded, S-shaped, with a slender, stipelike base; fruiting pedicels articulate at base 30. *Spirorhynchus*
- 81b. Fruit more than 2-seeded, linear, lanceolate, or ovoid, sessile or nearly so; fruiting pedicels not articulate at base.
- 82a. Stigma capitate, entire or slightly lobed; cotyledons conduplicate; plants annual or biennial; petal veins darker in color than rest of petal 6. *Raphanus*
- 82b. Stigma conical, with prominently decurrent and connivent lobes; cotyledons accumbent; plants perennial; petals uniform in color 68. *Chorispora*
- 78b. Fruit dehiscent.
- 83a. Raceme bracteate throughout or rarely only along proximal half.
- 84a. Cauline leaves palmately veined.
- 85a. Fruit flattened, valves coiled during dehiscence 43. *Cardamine*
- 85b. Fruit terete or 4-angled, valves not coiled during dehiscence.
- 86a. Leaves with distinct apiculate callosities terminating ultimate veins 89. *Eutrema*
- 86b. Leaves without apiculate callosities terminating ultimate veins.
- 87a. Taproot fleshy, fusiform; stigma 2-lobed; fruiting pedicels glabrous; cotyledons accumbent; median staminal filaments 1-toothed; petals white 25. *Platycraspedum*
- 87b. Taproot not fleshy, slender; stigma entire; fruiting pedicels papillate adaxially; cotyledons incumbent; petals purple 28. *Lignariella*
- 84b. Cauline leaves pinnately veined.
- 88a. Fruit 90–200-seeded; plants annual 60. *Rorippa*
- 88b. Fruit 4–30-seeded; plants biennial or perennial with caudices, rhizomes, or fleshy taproots.
- 89a. Fruit valves with prominent midvein and marginal veins, apex persistently united with replum; at least some leaves dentate; fruit 14–26-seeded; style obsolete 57. *Desideria*
- 89b. Fruit valves usually obscurely veined, readily separated from replum at dehiscence; leaves entire; fruit 4–12-seeded; style more than 0.5 mm.
- 90a. Replum flattened; roots fleshy; plants without rhizomes or caudices; basal leaves not persistent 88. *Taphrospermum*
- 90b. Replum terete; roots not fleshy; plants with rhizomes or caudices; basal leaves or petioles often persistent.
- 91a. Fruit not torulose; cotyledons incumbent 45. *Phaeonychium*
- 91b. Fruit torulose; cotyledons accumbent 62. *Lepidostemon*
- 83b. Raceme ebracteate.
- 92a. Fruit angustiseptate 18. *Thlaspi*
- 92b. Fruit latiseptate, terete, or angled.
- 93a. Stigma conical or cylindrical, with prominent, decurrent lobes.

- 94a. Fruit latiseptate; seeds broadly winged; cauline leaves absent or rarely few.
 95a. Style distinct, 0.5–6 mm; valve apex readily separated at dehiscence from replum ... 70. *Parrya*
 95b. Style absent; valve apex persistently united with replum 72. *Leiospora*
- 94b. Fruit terete or 4-angled; seeds wingless; cauline leaves several.
 96a. Fruit not torulose, segmented, with stylelike, ensiform, 5-veined, terminal segment 5. *Eruca*
 96b. Fruit torulose, unsegmented, with a distinct style 1–3 mm.
 97a. Leaves pectinate-pinnatifid, terminal lobe about as large as lateral ones; cotyledons
 accumbent 63. *Dontostemon*
 97b. Leaves simple or pinnatisect, terminal lobe considerably larger than lateral ones;
 cotyledons conduplicate 8. *Orychophragmus*
- 93b. Stigma capitate, entire, or if lobed then lobes not decurrent.
 98a. Cotyledons conduplicate; fruit often segmented, usually with a beaklike terminal
 segment; seeds globose, rarely ovoid, ellipsoid, or oblong.
 99a. Fruit flattened; seeds biseriate 4. *Diploxaxis*
 99b. Fruit terete or 4-angled; seeds uniseriate.
 100a. Fruit valves prominently 3–7-veined 3. *Sinapis*
 100b. Fruit valves obscurely veined or only midvein prominent.
 101a. Stigma entire; seeds globose; fruit often segmented, without style or with
 stylelike beak; petals yellow 2. *Brassica*
 101b. Stigma distinctly 2-lobed, lobes subdecurrent; seeds oblong; fruit not segmented,
 with a distinct style; petals purple, lavender, or white 8. *Orychophragmus*
- 98b. Cotyledons accumbent or incumbent; fruit unsegmented, not beaked at apex; seeds
 variously shaped but never globose.
 102a. Fruit valves without a midvein, always coiled during dehiscence; replum strongly
 flattened
 or winged 43. *Cardamine*
 102b. Fruit valves with a prominent midvein or sometimes obscurely veined, never coiled
 during
 or after dehiscence; replum terete or rarely slightly flattened (a few *Dontostemon*).
 103a. All leaves palmately veined, undivided and reniform, cordate, deltoid, or broadly
 ovate.
 104a. Leaf margin with distinct, mucronate callosities terminating ultimate veins; fruit
 valves obscurely veined.
 105a. Annuals; fruit more than 10-seeded; cotyledons accumbent 47. *Neomartinella*
 105b. Rhizomatous perennials; fruit less than 10 seeded; cotyledons incumbent ... 89. *Eutrema*
 104b. Leaf margin without mucronate callosities; fruit valves prominently veined.
 106a. Leaves flabellate, obovate, or spatulate; fruit latiseptate, valve apex persistently
 united
 with replum; cotyledons accumbent 57. *Desideria*
 106b. Leaves reniform, ovate, or deltoid; fruit terete or 4-angled, valve apex readily
 separated from replum at dehiscence; cotyledons incumbent.
 107a. Biennials; fruit torulose, valves 3-veined; seeds longitudinally striate 87. *Alliaria*
 107b. Perennials; fruit not torulose, valves 1-veined; seeds reticulate 89. *Eutrema*
- 103b. Leaves pinnately veined, pinnately divided, if undivided then shapes different from
 above.
 108a. At least lowermost cauline leaves pinnatifid, pinnatisect, or pinnately compound.
 109a. Fruit valves not veined or obscurely veined, if with a distinct midvein then
 seeds biseriate and colliculate.
 110a. Leaves pinnatisect or lyrate; stems solid, not rooting from lowermost nodes;
 seeds foveolate or colliculate; petals yellow 60. *Rorippa*
 110b. Leaves pinnately compound; stems hollow, rooting from lowermost nodes;
 seeds coarsely reticulate; petals white 61. *Nasturtium*
 109b. Fruit valves with prominent midvein and marginal veins.
 111a. Upper cauline leaves auriculate; stems distinctly angular 46. *Barbarea*
 111b. Upper cauline leaves not auriculate; stems usually terete.
 112a. Fruit flattened; stigma entire; cotyledons accumbent; petals white or pink 49. *Sisymbriopsis*
 112b. Fruit terete; stigma 2-lobed; cotyledons incumbent; petals yellow 90. *Sisymbrium*
 108b. Leaves entire or dentate.

- 113a. Cauline leaves absent.
 114a. Fruit lanceolate, latiseptate; basal leaves setose-ciliate 45. *Phaeonychium*
 114b. Fruit ovoid, terete; basal leaves not setose-ciliate 96. *Braya*
 113b. Cauline leaves present.
 115a. Seeds foveolate or colliculate, 60–110 per fruit; petals yellow; cotyledons
 accumbent 60. *Rorippa*
 115b. Seeds reticulate, fewer per fruit, (to 96 in *Thellungiella salsuginea*); petals
 white, lavender, or purple (yellow in *Christolea*); cotyledons incumbent
 (accumbent in
 some *Dontostemon*).
 116a. Annuals.
 117a. Raceme rachis with minute, twisted trichomes; plants not glaucous;
 cauline leaves not auriculate or amplexicaul; filaments of median stamens
 united in pairs 63. *Dontostemon*
 117b. Raceme rachis glabrous; plants glaucous; cauline leaves auriculate or
 amplexicaul (except for *Thellungiella parvula*); filaments of median
 stamens free.
 118a. Fruit 3–10 cm, valves with an obscure midvein; seeds 1.5–2 mm ... 9. *Conringia*
 118b. Fruit 0.2–2 cm, valves with a prominent midvein; seeds 0.4–0.8 mm 97. *Thellungiella*
 116b. Perennials.
 119a. At least middle and lower cauline leaves petiolate, dentate; seeds
 transversely oriented in fruit; petals yellow 56. *Christolea*
 119b. Leaves sessile, entire; seeds longitudinally oriented in fruit; petals white
 or purple.
 120a. Seeds 20–60 per fruit; fruit terete or latiseptate; median staminal
 filaments
 united in pairs 63. *Dontostemon*
 120b. Seeds 2–10 per fruit; fruit slightly 4-angled; median staminal filaments
 free 89. *Eutrema*
 77b. Plants with branched trichomes.
 121a. Cauline leaves 1- or 2-pinnatisect or narrowly trifid.
 122a. Fruit angustiseptate 20. *Hedinia*
 122b. Fruit terete or latiseptate.
 123a. Fruit latiseptate; filaments of median stamens united in pairs.
 124a. Fruit tardily dehiscent, not torulose; leaf segments filiform; stigma conical; seeds
 wingless 73. *Leptaleum*
 124b. Fruit readily dehiscent, torulose; ultimate leaf segment oblong; stigma capitate; seeds
 narrowly winged distally 95. *Synstemon*
 123b. Fruit terete or slightly 4-angled; filaments of median stamens free.
 125a. Inflorescence rachis flexuous; uppermost leaves narrowly trifid 91. *Ianhedgia*
 125b. Inflorescence rachis straight; uppermost leaves pinnatisect, rarely pinnatifid.
 126a. Dendritic trichomes absent; valves obscurely veined or not veined 102. *Sinosophiopsis*
 126b. Dendritic trichomes present; valves often prominently veined.
 127a. Pulvinate perennials; petals white or rarely pale yellow; style 0.5–1.5 mm; seeds not
 mucilaginous when wetted 101. *Smelowskia*
 127b. Annuals or biennials; petals yellow; style obsolete or rarely to 0.5 mm; seeds
 mucilaginous
 when wetted.
 128a. Fruit linear, 20–40-seeded, more than 1 cm, torulose 99. *Descurainia*
 128b. Fruit obovoid to ellipsoid, rarely ellipsoid-linear, 4–16-seeded, rarely to 1 cm, not
 torulose 100. *Sophiopsis*
 121b. Cauline leaves undivided, lyrate, or rarely pinnatifid.
 129a. Fruit subapically 4-horned 65. *Tetracme*
 129b. Fruit not horned.
 130a. Stigma conical, with strongly decurrent, connivent or united lobes.
 131a. Fruit latiseptate; seeds broadly winged; trichomes stellate and/or dendritic; cotyledons
 accumbent.
 132a. Perennials; fruit 6–11 cm × 1.5–2.7 mm; petals linear, circinate involute 66. *Matthiola*
 132b. Annuals; fruit 3–5 cm × 3–6 mm; petals oblong-obovate to narrowly oblanceolate, flat 71. *Cithareloma*

- 131b. Fruit terete or 4-angled (latiseptate in *Malcolmia hispida* and *M. karelinii*); seeds wingless; trichomes simple and forked; cotyledons incumbent.
- 133a. Annuals; lateral sepals not saccate 74. *Malcolmia*
- 133b. Perennials or biennials; lateral sepals saccate 75. *Hesperis*
- 130b. Stigma capitate, entire or slightly lobed, rarely with divergent lobes.
- 134a. At least fruit, pedicels, and distal portions of stem exclusively or predominately with malpighiaceus trichomes and without simple trichomes ones.
- 135a. Fruit indehiscent, breaking transversely into 1-seeded segments; septum absent; lowermost parts of plant with stalked trichomes 79. *Cryptospora*
- 135b. Fruit dehiscent; septum present; all parts of plant with sessile, appressed trichomes.
- 136a. Cotyledons accumbent; petals white becoming purple; anthers of median stamens 1-lobed 78. *Atelanthera*
- 136b. Cotyledons incumbent; petals yellow or orange; anthers of median stamens 2-lobed 83. *Erysimum*
- 134b. Malpighiaceus trichomes absent from distal portions of plant.
- 137a. Fruit (3–)3.5–7(–10) mm wide.
- 138a. Fruit on a recurved gynophore 3–5 mm; stamens long exserted, 7–10 mm ... 1. *Macropodium*
- 138b. Fruit sessile; stamens included or slightly exserted, less than 7 mm.
- 139a. Racemes bracteate throughout 57. *Desideria*
- 139b. Racemes ebracteate.
- 140a. Fruit strongly reflexed, 4-angled, indehiscent; seeds winged 67. *Microstigma*
- 140b. Fruit erect to divaricate, latiseptate, dehiscent; seeds wingless.
- 141a. Fruit margins strongly indurated, bases of valves and replum persistently united; petals white; filaments of median stamens winged 62. *Lepidostemon*
- 141b. Fruit margins not indurated, bases of valves and replum readily separated at dehiscence; petals purplish; median stamens slender 58. *Eurycarpus*
- 137b. Fruit to 2(–2.5) mm wide.
- 142a. Fruit indehiscent, breaking transversely into 1-seeded segments; filaments of median stamens united to middle or nearly to apex 80. *Sterigmostemum*
- 142b. Fruit dehiscent; filaments of median stamens free, rarely united only at base (*Systemon petrovii*).
- 143a. Seeds winged at least distally.
- 144a. Cotyledons incumbent; filaments of median stamens united at base; petal claws pilose 95. *Systemon*
- 144b. Cotyledons accumbent; filaments of median stamens free; petal claws glabrous.
- 145a. Cauline leaves auriculate at base, or absent; valves obscurely veined or only midvein distinct; fruit elliptic-linear in cross section 48. *Arabis*
- 145b. Cauline leaves petiolate; valves with prominent midvein and 2 marginal veins and conspicuous lateral ones; fruit rectangular in cross section 49. *Sisymbriopsis*
- 143b. Seeds wingless.
- 146a. Fruit latiseptate.
- 147a. Fruiting stems leafless.
- 148a. Annuals or biennials.
- 149a. Fruit valve obscurely veined; seeds biseriate 41. *Draba*
- 149b. Fruit valve with a prominent midvein; seeds uniseriate 55. *Drabopsis*
- 148b. Perennials with well-developed caudex.
- 150a. Seeds biseriate; petals yellow 41. *Draba*
- 150b. Seeds uniseriate; petals white or pink.
- 151a. Plants robust, not pulvinate, 8–30 cm tall; cotyledons incumbent; petals 6.5–10 mm 45. *Phaeonychium*
- 151b. Plants slender, pulvinate, to 2 cm tall; cotyledons accumbent; petals 3–4 mm 86. *Baimashania*
- 147b. Fruiting stems leafy.
- 152a. Racemes bracteate throughout or at least along proximal part.
- 153a. Cotyledons accumbent; fruits often twisted; seeds biseriate 41. *Draba*
- 153b. Cotyledons incumbent; fruits not twisted; seeds uniseriate.
- 154a. Fruit linear; seeds uniseriate 45. *Phaeonychium*
- 154b. Fruit lanceolate or elliptic; seeds biseriate 92. *Aphragmus*
- 152b. Racemes ebracteate.

- 155a. Plants exclusively with appressed, stellate trichomes; lateral sepals subsaccate; replum constricted between seeds; seeds 6–12 per fruit 54. *Stevenia*
- 155b. Plants with more than 1 kind of trichomes; lateral sepals often not saccate; replum not constricted between seeds; seeds (16–)20–80 per fruit.
- 156a. Seeds biseriate; fruit narrowly oblong, lanceolate, lanceolate-linear, or rarely linear, often slightly to strongly contorted 41. *Draba*
- 156b. Seeds uniseriate; fruit narrowly linear, not contorted.
- 157a. Cauline leaves sessile, auriculate, sagittate, or amplexicaul at base; at least some trichomes stellate 48. *Arabis*
- 157b. Cauline leaves petiolate, not auriculate at base; trichomes simple and forked 50. *Arabidopsis*
- 146b. Fruit terete or 4-angled.
- 158a. Cauline leaves sessile, auriculate, sagittate, or amplexicaul at base.
- 159a. Fruit nearly 4-angled, appressed to rachis; plants glaucous distally; cotyledons accumbent 59. *Turritis*
- 159b. Fruit terete, variously oriented, if appressed to stem then racemes bracteate and/or fruit pubescent; plants not glaucous distally; cotyledons incumbent.
- 160a. Branched trichomes sessile, all stellate 53. *Pseudoarabidopsis*
- 160b. Branched trichomes forked, submalpighiaceus, subdendritic, and stellate, often more than 1 type present.
- 161a. Fruit with submalpighiaceus trichomes; petals yellow or rarely creamy white; racemes ebracteate 52. *Olimarabidopsis*
- 161b. Fruit glabrous or with stellate or forked trichomes; petals purple, pink, or white; racemes often bracteate at least basally 51. *Crucihimalaya*
- 158b. Cauline leaves petiolate or narrowed to a petiolelike base, never auriculate, or fruiting stems leafless.
- 162a. Fruit pubescent.
- 163a. Plants with exclusively stalked, stellate trichomes; filaments of median stamens strongly flattened or winged at base 93. *Berteroella*
- 163b. Plants with a mixture of simple, forked, stellate, or submalpighiaceus trichomes; filaments of median stamens slender.
- 164a. Fruit linear, sometimes curved or twisted; stems often subdecumbent; plants annual, if perennial then racemes bracteate at least basally 94. *Neotorularia*
- 164b. Fruit oblong, ovoid, or rarely linear; stems erect; plants perennial, with ebracteate racemes 96. *Braya*
- 162b. Fruit glabrous.
- 165a. Fruiting stems leafy.
- 166a. Plants with exclusively simple and forked trichomes; upper cauline leaves entire; seeds 0.3–0.5 mm 50. *Arabidopsis*
- 166b. Plants with some stellate and/or dendritic trichomes; at least some upper cauline leaves dentate, denticulate, or lobed; seeds larger 51. *Crucihimalaya*
- 165b. Fruiting stems leafless.
- 167a. Annuals; fruit linear; fruiting pedicels nearly as wide as fruit 94. *Neotorularia*
- 167b. Perennials; fruit ovoid, oblong, or rarely linear; fruiting pedicels narrower than fruit 96. *Braya*

Key to flowering material

Leads marked with a club (***) indicate that mature fruits are necessary for the identification of genera in the subordinate couplet(s).

- 1a. Flowers on solitary pedicels originating from basal rosette.
- 2a. Stigma conical, with prominent, decurrent, connivent lobes; lateral sepals strongly saccate.
- 3a. Plants with glandular trichomes; leaves pinnatisect or pinnatipartite 68. *Chorispora*
- 3b. Plants eglandular; leaves entire or dentate 72. *Leiospora*
- 2b. Stigma capitate, entire, if 2-lobed (*Desideria*) then lobes neither decurrent nor connivent; lateral sepals not saccate.
- 4a. Stigma distinctly 2-lobed; leaves subapically 3–9-toothed 57. *Desideria*
- 4b. Stigma entire; leaves entire or laterally toothed, if subapically toothed then sepals united or petals yellow.
- 5a. Plants with branched trichomes.

- 31a. Terminal lobe of basal and lowermost cauline leaves about same size as lateral lobes; filaments of median stamens flattened, sometimes 1-toothed 63. *Dontostemon*
- 31b. Terminal lobe of basal and lowermost cauline leaves considerably larger than lateral lobes, sometimes lateral lobes absent; filaments of median stamens slender, not toothed.
- 32a. Petals yellow with dark brown or purple veins; anthers obtuse; uppermost leaves subsessile 5. *Eruca*
- 32b. Petals white, lavender, or purple, without darker veins; anthers apiculate; uppermost cauline leaves petiolate, sometimes also auriculate 8. *Orychophragmus*
- 30b. Perennials with a distinct caudex; flowering stems leafless, rarely 1- or 2-leaved; basal leaves rosulate.
- 33a. Style absent; leaf blade about as long as broad 72. *Leiospora*
- 33b. Style distinct; leaf blade much longer than broad.
- 34a. Ovaries and fruit torulose; petal claws to 8 mm; seeds wingless 68. *Chorispora*
- 34b. Ovaries and fruit not torulose; petals claws longer; seeds winged even at early stages of development 70. *Parrya*
- 29b. Stigma capitate, entire, if lobed then lobes neither connivent nor decurrent (rarely slightly decurrent in *Eruca* and *Orychophragmus*).
- 35a. Lateral pair of sepals slightly to strongly saccate.
- 36a. Sepals united; developing and mature fruit winged and/or spiny 15. *Pugionium*
- 36b. Sepals free; fruit wingless, not spiny.
- 37a. Petals yellow.
- 38a. Cauline leaves sessile, auriculate or amplexicaul; petals without darker colored veins.
- 39a. Cauline leaves entire; petals (7–)9–30 mm 2. *Brassica*
- 39b. Cauline leaves coarsely dentate, pinnatifid, or pinnatisect; petals 3–6(–7) mm 46. *Barbarea*
- 38b. At least some cauline leaves petiolate, not auriculate or amplexicaul; petals with darker colored veins.
- 40a. Stigma 2-lobed, lobes slightly decurrent; pistil sessile 5. *Eruca*
- 40b. Stigma entire; pistil short stipitate on a sterile lower segment 6. *Raphanus*
- 37b. Petals purple, lavender, pink, or white.
- 41a. Pedicels articulate at base; ovaries and young fruit ovoid to oblong.
- 42a. Cauline leaves entire or rarely dentate, auriculate; style obsolete 82. *Goldbachia*
- 42b. Cauline leaves dentate, sinuate, or pinnately lobed, not auriculate; style prominent 30. *Spirorhynchus*
- 41b. Pedicels not articulate at base; ovaries and young fruit linear.
- 43a. Stigma entire; pistil short stipitate on a sterile lower segment 6. *Raphanus*
- 43b. Stigma 2-lobed, lobes slightly decurrent; pistil sessile 8. *Orychophragmus*
- 35b. Lateral pair of sepals not saccate.
- 44a. Petals yellow.
- 45a. Cauline leaves sessile, auriculate, sagittate, or amplexicaul.
- 46a. Leaves strongly dimorphic, basal and lowermost cauline ones 2- or 3- pinnatifid or -pinnatisect, uppermost entire 10. *Lepidium*
- 46b. Leaves usually monomorphic, undivided, if divided than basal and lowermost cauline ones not as above.
- 47a. At least some cauline leaves coarsely dentate to pinnately divided; ovaries and young fruit with numerous ovules 60. *Rorippa*
- 47b. Cauline leaves entire; ovaries and young fruit 1(or 2)-ovuled.***
- 48a. Racemes few, not grouped in panicles; young or mature fruit navicular, with incurved margins 31. *Tauscheria*
- 48b. Racemes often many, grouped in panicles; fruit flat, not navicular.
- 49a. Fruit margin thickened; petals to 2 mm 13. *Pachypterygium*
- 49b. Fruit margin not thickened; petals more than 2 mm, if shorter (*Isatis minima*) then pistils and developing fruit distinctly longer than broad 13. *Isatis*
- 45b. Cauline leaves petiolate, if sessile then not auriculate, sagittate, or amplexicaul.
- 50a. Cespitose perennials (2–)3–12(–17) cm tall; ovaries and young fruit ovoid 96. *Braya*

- 50b. Annuals or biennials, rarely noncespitose perennials, often much taller; ovaries and young fruit linear.
- 51a. Stigma entire.
- 52a. Stems often leafless, rarely few leaved; nectar glands 4, separated 4. *Diploaxis*
- 52b. Stems leafy; nectar glands confluent, subtending bases of all filaments 60. *Rorippa*
- 51b. Stigma 2-lobed.
- 53a. Nectar glands confluent, subtending bases of all filaments; seeds oblong; cotyledons incumbent 90. *Sisymbrium*
- 53b. Nectar glands 4, not confluent; seeds globose; cotyledons conduplicate.***
- 54a. Fruit valves obscurely veined or with a prominent midvein 2. *Brassica*
- 54b. Fruit valves with 3–7, prominent longitudinal veins 3. *Sinapis*
- 44b. Petals purple, lavender, pink, or white.
- 55a. Racemes bracteate throughout or along proximal half.
- 56a. Leaves and bracts palmately veined or trifoliolate.
- 57a. Bracts and/or uppermost leaves trifoliolate 26. *Yinshania*
- 57b. Bracts and uppermost leaves simple.
- 58a. Petals purple or rarely pink; pedicels puberulent adaxially along entire length 28. *Lignariella*
- 58b. Petals white; pedicels glabrous.
- 59a. Filaments of median stamens strongly flattened, 1-toothed; stigma 2-lobed 25. *Platycrasedum*
- 59b. Filaments of median stamens slender, toothless; stigma entire.
- 60a. Leaf margin with mucronate callosities at vein endings; ovules 6–10 per ovary 89. *Eutrema*
- 60b. Leaf margin without mucronate callosities; ovules more than 14 per ovary 43. *Cardamine*
- 56b. Leaves and bracts pinnately veined.
- 61a. Filaments of median stamens winged, toothed, or appendaged.
- 62a. Petals emarginate, 4–5.5 mm wide; ovules 2 per ovary 22. *Hemilophia*
- 62b. Petals obtuse; ca. 2.5 mm wide; ovules ca. 8 per ovary 62. *Lepidostemon*
- 61b. Filaments of median stamens slender, not toothed or appendaged.
- 63a. Plants with a distinct caudex; stigma 2-lobed.
- 64a. Leaves entire; ovules 4–8 per ovary; nectar glands confluent, subtending bases of all filaments 45. *Phaeonychium*
- 64b. Leaves dentate; ovules 14–26 per ovary; nectar glands 2, lateral 57. *Desideria*
- 63b. Plants with a fleshy, obconical to fusiform taproot; stigma entire.
- 65a. Cauline leaves sessile; racemes not elongated in fruit; anthers distinctly apiculate at apex 24. *Dilophia*
- 65b. Cauline leaves petiolate; racemes often elongated in fruit; anthers obtuse at apex 88. *Taphrospermum*
- 55b. Racemes ebracteate.
- 66a. Some or all leaves trifoliolate, pinnately compound, or pinnatisect.
- 67a. Petals purple or pink; ovaries and fruit didymous; ovules 2 per ovary; taproot thick, 1–4 cm in diam. 16. *Megacarpaea*
- 67b. Petals white (purple in some *Cardamine*); ovaries and fruit not didymous; ovules more than 2 per ovary (except some *Yinshania*); taproot almost always not fleshy.
- 68a. Sepals, petals, and stamens spreading; petals 1.5–3.5(–4) mm; ovules often 10 or less per ovary 26. *Yinshania*
- 68b. Sepals, petals, and stamens usually erect to ascending; petals more than 4 mm (except in weedy spp. of *Cardamine*); ovules more than 14 per ovary.***
- 69a. Fruit latiseptate, valves coiled during dehiscence; seeds uniseriate 43. *Cardamine*
- 69b. Fruit terete, valves not coiled during dehiscence; seeds (ours) biseriate 61. *Nasturtium*
- 66b. Leaves simple, entire, dentate, lyrate, or rarely pinnatifid.
- 70a. Ovules 2 per ovary.
- 71a. Filaments of median stamens with a lateral tooth 0.5–1 mm; pistil 2-segmented 7. *Crambe*
- 71b. Filaments of median stamens toothless; pistil unsegmented.
- 72a. Leaves palmately veined 89. *Eutrema*

- 72b. Leaves pinnately veined.
 - 73a. Nectar glands confluent, subtending bases of all filaments.
 - 74a. Racemes many, grouped in corymbose panicles; plants often densely pubescent 12. *Cardaria*
 - 74b. Racemes few, not grouped in panicles; plants glabrous or sparsely pilose 35. *Bunias*
 - 73b. Nectar glands 4 or 6, distinct.***
 - 75a. Fruit 4-angled; caudex thick, with petiolar remains of previous years; racemes grouped in panicles 27. *Stroganowia*
 - 75b. Fruit flat; caudex often thin, with or without petiolar remains of previous years; racemes simple, rarely grouped in corymbose panicles 10. *Lepidium*
- 70b. Ovules 4 or more per ovary.
 - 76a. Leaves palmately veined.
 - 77a. Leaf margin with apiculate callosities at vein endings, if without then ovules 10 or less.
 - 78a. Pistil linear; ovules (20–)30–40 per ovary 47. *Neomartinella*
 - 78b. Pistil oblong; ovules 4–10 per ovary 89. *Eutrema*
 - 77b. Leaf margin without apiculate callosities at vein endings.
 - 79a. Perennials; fruit flattened; seeds reticulate 43. *Cardamine*
 - 79b. Biennials; fruit quadrangular-subterete; seeds longitudinally striate 87. *Alliaria*
 - 76b. Leaves pinnately veined.
 - 80a. Cauline leaves auriculate, sagittate, or amplexicaul at base, if not (*Thellungiella parvula*) then petals to 1.5 mm and racemes flexuous.
 - 81a. Petals purple, 10–17 mm; perennials with stout rhizomes 43. *Cardamine*
 - 81b. Petals white, lavender, pink, or rarely purple, 1.5–7 mm; annuals, biennials, or perennials with a slender caudex.
 - 82a. Plants not glaucous; pistil and young fruit angustiseptate 18. *Thlaspi*
 - 82b. Plants glaucous; pistil and young fruit terete or latiseptate.
 - 83a. Petals 5–7 mm, with purple veins extending to apex; leaves deeply cordate-amplexicaul 9. *Conringia*
 - 83b. Petals 1.5–3 mm, without purple veins; leaves auriculate or not, rarely deeply sagittate-amplexicaul 97. *Thellungiella*
 - 80b. Cauline leaves not auriculate or sagittate, or absent.
 - 84a. Cauline leaves absent or 1 or 2, entire.
 - 85a. Cauline leaves absent, basal ones setose ciliate; stigma 2-lobed; nectar glands confluent, subtending bases of all stamens 45. *Phaeonychium*
 - 85b. Cauline leaves 1 or 2, rarely absent, basal ones pilose or crisped pubescent; stigma entire; nectar glands 2 or 4, lateral.
 - 86a. Petals 10–17 mm; fruit flat, prominently veined, 10–30 mm 64. *Solms-laubachia*
 - 86b. Petals 4–6 mm; fruit terete, not veined, 4–7 mm 96. *Braya*
 - 84b. Cauline leaves several, dentate, crenate, or pinnatifid.
 - 87a. Racemes in large corymbose panicles; fruit angustiseptate; leaves polymorphic on same plant 42. *Armoracia*
 - 87b. Racemes simple; fruit latiseptate; leaves not polymorphic.
 - 88a. Stigma 2-lobed; petals purple, 10–15 mm 57. *Desideria*
 - 88b. Stigma entire; petals white, 2.5–8(–10) mm.***
 - 89a. Anthers obtuse at apex; fruit with a prominent midvein and marginal veins; cotyledons accumbent 49. *Sisymbriopsis*
 - 89b. Anthers apiculate at apex; fruit obscurely veined or only with a distinct midvein; cotyledons incumbent 56. *Christolea*
- 13b. Plants with branched trichomes.
 - 90a. Petal claws crisped pilose; filaments of median stamens united at base 95. *Systemon*
 - 90b. Petal claws glabrous or petals absent; filaments of median stamens free, if united then stigma strongly 2-lobed.
 - 91a. Cauline leaves 1–3-pinnatisect, narrowly trifid, or 3–5-foliolate.
 - 92a. Pulvinate perennials with thick caudices covered with petiolar remains of previous years 101. *Smelowskia*
 - 92b. Annuals, biennials, or non-pulvinate perennials, without petiolar remains of previous years.
 - 93a. Flowers yellow.
 - 94a. Pistil and fruit linear; ovules 20–40 per ovary; raceme ebracteate 99. *Descurainia*

- 94b. Pistil and fruit obovoid to ellipsoid; ovules 16 or less per ovary; raceme bracteate, if not then
 ovules 4–8 per ovary 100. *Sophiopsis*
- 93b. Flowers white, pink, or lavender.
- 95a. Racemes bracteate throughout or at least along proximal half.
- 96a. Pistil oblong to suborbicular; fruit angustiseptate 20. *Hedinia*
- 96b. Pistil linear; fruit terete 102. *Sinosophiopsis*
- 95b. Racemes ebracteate.
- 97a. Stigma conical, 2-lobed; filaments of median stamens united 73. *Leptaleum*
- 97b. Stigma capitate, entire; filaments of median stamens free.
- 98a. Racemes grouped in panicles; ovary and fruit ellipsoid 26. *Yinshania*
- 98b. Racemes simple; ovary and fruit linear.
- 99a. Rachis of raceme flexuous; ovules 6–20 per ovary; trichomes exclusively dendritic; uppermost leaves narrowly trifid 91. *Ianhedgea*
- 99b. Rachis of raceme straight; ovules 20–40 per ovary; trichomes simple and forked; uppermost cauline leaves pinnatisect 102. *Sinosophiopsis*
- 91b. Cauline leaves undivided, lyrate, or pinnatifid.
- 100a. Plants exclusively or at least uppermost parts with malpighiaceae trichomes.
- 101a. Flowers yellow.
- 102a. Pistil and fruit oblong; seeds biseriate; cotyledons accumbent 41. *Draba*
- 102b. Pistil and fruit linear; seeds uniseriate; cotyledons incumbent 83. *Erysimum*
- 101b. Flowers white, lavender, pink, or purple.
- 103a. Raceme bracteate throughout; rhizomatous perennials; filaments of median stamens inflated basally 22. *Hemilophia*
- 103b. Raceme ebracteate; annuals; filaments of median stamens not inflated basally.
- 104a. At least lowermost parts with simple and stalked forked trichomes; fruit indehiscent, breaking at maturity into 1-seeded segments; stigma 2-lobed; seeds 2.5–3.5 mm 79. *Cryptospora*
- 104b. Trichomes exclusively malpighiaceae; fruit dehiscent; stigma entire; seeds 0.7–1.4(–2) mm.
- 105a. Pistil and fruit lenticular, ovate, or suborbicular; anthers of median stamens 2-lobed; ovules 2 per ovary; raceme many flowered 38. *Lobularia*
- 105b. Pistil and fruit linear; anthers of median stamens 1-lobed; ovules 10–25 per ovary; raceme 2–5-flowered 78. *Atelanthera*
- 100b. Plants without malpighiaceae trichomes.
- 106a. Sepals united 57. *Desideria*
- 106b. Sepals free.
- 107a. Cauline leaves auriculate, sagittate, or amplexicaul.
- 108a. Ovary and fruit oblong to ovate; seeds biseriate 41. *Draba*
- 108b. Ovary and fruit of other shapes; seeds uniseriate.
- 109a. Flowers pale to bright yellow.
- 110a. Ovary and fruit globose, sublenticular, or obpyriform; nectar glands 2 or 4, lateral, median glands absent.
- 111a. Fruit globose or sublenticular, 1.7–2.2 mm; ovules 2–4 per ovary; stamens slightly tetradynamous 34. *Neslia*
- 111b. Fruit obpyriform, larger; ovules numerous per ovary; stamens in 3 pairs of unequal length 98. *Camelina*
- 110b. Ovary and fruit linear; nectar glands confluent, subtending bases of all filaments.
- 112a. Plants pubescent with short-stalked or sessile stellate trichomes; fruit pubescent; pedicels divaricate 52. *Olimarabidopsis*
- 112b. Plants glabrous and glaucous distally, pubescent with simple and forked trichomes basally; fruit glabrous; pedicels appressed to rachis 59. *Turritis*
- 109b. Flowers white, pink, or purple.
- 113a. Pistil and fruit obdeltoid to obcordate-obdeltoid 19. *Capsella*
- 113b. Pistil and fruit linear.
- 114a. Plants with exclusively stellate, appressed, sessile trichomes 53. *Pseudoarabidopsis*
- 114b. Plants with more than 1 kind of trichomes.***

- 115a. Fruit latiseptate; cotyledons accumbent 48. *Arabis*
 115b. Fruit terete; cotyledons incumbent 51. *Crucihimalaya*
- 107b. Cauline leaves petiolate, tapered to a petiolelike base, or sessile but not auriculate or sagittate, sometimes absent and flowering stems leafless.
- 116a. Shrubs or subshrubs 48. *Arabis*
 116b. Herbs.
- 117a. Filaments of median stamens united to apex or rarely only to middle.
- 118a. Plants without glandular trichomes; lateral sepals not saccate; fruit indehiscent, breaking at maturity into 1-seeded segments 80. *Sterigmostemum*
- 118b. Plants sparsely to densely covered with glandular trichomes; lateral sepals saccate; fruit tardily dehiscent 81. *Oreoloma*
- 117b. Filaments of median stamens free.
- 119a. Petals deeply bifid.
- 120a. Perennials with a distinct caudex; trichomes exclusively stellate, appressed; lateral sepals saccate 37. *Galitzkya*
- 120b. Annuals or biennials; trichomes a mixture of simple, forked, and stellate; lateral sepals not saccate 39. *Berteroa*
- 119b. Petals undivided, entire or emarginate, or absent.
- 121a. Ovaries and fruit about as long as broad or slightly longer, rarely to 3 × longer.
- 122a. Raceme bracteate throughout or rarely along proximal half.
- 123a. Plants stoloniferous; ovules 2 or 4 per ovary.
- 124a. Leaves entire; filaments of median stamens appendaged; nectar glands confluent, subtending bases of all stamens 22. *Hemilophia*
- 124b. Leaves dentate; filaments of median stamens unappendaged; nectar glands 4, lateral, median glands absent 23. *Dipoma*
- 123b. Plants caespitose perennials or annuals; ovules more than 10 per ovary.
- 125a. Petals yellow; plants coarsely pilose; cotyledons accumbent 41. *Draba*
- 125b. Petals purple or white; plants minutely puberulent; cotyledons incumbent 92. *Aphragmus*
- 122b. Raceme ebracteate.
- 126a. Lateral sepals saccate; stigma 2-lobed; petals linear, strongly differentiated into claw and limb, 0.7–1.5 cm.
- 127a. Petals pink, 7–10 mm; plants without glandular trichomes; fruiting pedicels erect-ascending; fruit densely white silky 29. *Lachnoloma*
- 127b. Petals yellowish to creamy white, 10–15 mm; plants often with glandular trichomes; fruiting pedicels reflexed; fruit not silky 67. *Microstigma*
- 126b. Lateral sepals not saccate; stigma entire, if 2-lobed (*Euclidium*) then petals less than 1.5 mm; petals variously shaped and often smaller, if linear then not differentiated into claw and limb, sometimes absent.
- 128a. Plant with glandular trichomes 35. *Bunias*
- 128b. Plant without glandular trichomes.
- 129a. Filaments winged, appendaged, toothed, or papillate 36. *Alyssum*
- 129b. Filaments slender, unappendaged, toothless, glabrous.
- 130a. Annuals.
- 131a. Stigma 2-lobed; petals less than 1.5 mm; fruit indehiscent 32. *Euclidium*
- 131b. Stigma entire; petals more than 1.5 mm, if less or absent then ovary more than 6-ovuled; fruit dehiscent.
- 132a. Ovules 4 per ovary or fruit 36. *Alyssum*
- 132b. Ovules 8 or more per ovary or fruit.
- 133a. Petals 0.6–1.2 mm; fruit angustiseptate; cotyledons incumbent 21. *Hornungia*
- 133b. Petals larger, rarely absent; fruit latiseptate; cotyledons accumbent 41. *Draba*
- 130b. Perennials.
- 134a. Plants stoloniferous; bases of median filaments broadly dilated ... 40. *Coelonema*
- 134b. Plants caespitose, often with a distinct caudex; bases of median filaments not dilated.***
- 135a. Fruit 5–10 mm wide; style conical or subconical 58. *Eurycarpus*

- 135b. Fruit rarely to 4 mm wide, if wider than stems leafy; style obsolete or cylindrical.
- 136a. Fruit torulose; cotyledons incumbent 96. *Braya*
- 136b. Fruit not torulose; cotyledons accumbent 41. *Draba*
- 121b. Ovaries and fruit at least 5 × longer than broad.
- 137a. Stigma conical, lobes decurrent, connivent; sepals erect.
- 138a. Annuals; anthers 0.3–1.2 mm.
- 139a. Lateral sepals not saccate; fruit 0.5–1.7 mm wide; seeds wingless 74. *Malcolmia*
- 139b. Lateral sepals strongly saccate; fruit 3–6 mm wide; seeds winged 71. *Cithareloma*
- 138b. Perennials or biennials; anthers 2.5–4 mm.
- 140a. Petals linear, circinate involute; seeds winged; cotyledons accumbent 66. *Matthiola*
- 140b. Petals obovate, flat; seeds wingless; cotyledons incumbent 75. *Hesperis*
- 137b. Stigma capitate, entire, if lobed then lobes neither decurrent nor connivent; sepals ascending or slightly spreading.
- 141a. Petals less than 1.5 mm; mature ovaries and young fruits with 4, subapical horns 65. *Tetrame*
- 141b. Petals more than 1.8 mm; ovaries and fruits without horns.
- 142a. Stems leafless.
- 143a. Petals yellow; nectar glands 2 or 4, lateral.***
- 144a. Biennial, perennial, or rarely annual; seeds biseriate; fruit valves obscurely veined 41. *Draba*
- 144b. Annuals; seeds uniseriate; fruit valves with a distinct midvein 55. *Drabopsis*
- 143b. Petals white, lavender, or pink; nectar glands confluent, subtending bases of all filaments.***
- 145a. Fruit valves with prominent midvein and marginal veins; cotyledons incumbent 45. *Phaeonychium*
- 145b. Fruit valves obscurely veined or only midvein distinct; cotyledons accumbent 48. *Arabis*
- 142b. Stems leafy.
- 146a. Pistils and fruit on a distinct gynophore to 5 mm; petals linear to linear-oblong, length 9–12 × width 1. *Macropodium*
- 146b. Pistil and fruit sessile; petals suborbicular, spatulate, oblong, or rarely oblong, length-width ratio much less.
- 147a. Petals yellow 41. *Draba*
- 147b. Petals white, lavender, or purple.
- 148a. All cauline leaves entire.
- 149a. Annuals; cotyledons incumbent.
- 150a. Trichomes simple and forked; style to 0.5 mm; ovules 40–70 per ovary 50. *Arabidopsis*
- 150b. Trichomes mostly stellate, 4–6-rayed; style (1–)1.5–2.5 mm; ovules 6–14 per ovary 93. *Berteroella*
- 149b. Perennials; cotyledons accumbent.
- 151a. Trichomes a mixture of simple, forked, or stellate 41. *Draba*
- 151b. Trichomes exclusively stellate 54. *Stevenia*
- 148b. At least some cauline leaves dentate or lobed.
- 152a. Filaments of median stamens winged basally; valves with thickened margin, base united persistently with replum 62. *Lepidostemon*
- 152b. Filaments of median stamens not winged; fruit valves not thickened at margin, base readily separated from replum at dehiscence.
- 153a. Pistil or fruit glabrous.
- 154a. Trichomes exclusively simple and forked 50. *Arabidopsis*
- 154b. At least some trichomes stellate or dendritic.***
- 155a. Fruit terete; cotyledons incumbent 51. *Crucihimalaya*
- 155b. Fruit latiseptate; cotyledons accumbent.
- 156a. Seeds biseriate, wingless 41. *Draba*
- 156b. Seeds uniseriate, winged or margined at least distally 48. *Arabis*
- 153b. Pistil or fruit pubescent.
- 157a. Nectar glands 2 or 4, lateral, median glands absent; stigma often entire.***

- 158a. Fruits latiseptate, not torulose; cotyledons accumbent; seeds
biseriate 41. *Draba*
158b. Fruits terete, torulose; cotyledons incumbent; seeds uniseriate 94. *Neotorularia*
157b. Nectar glands confluent, subtending bases of all filaments; stigma
often 2-lobed.
159a. Petals 6–9 mm; cotyledons incumbent 45. *Phaeonychium*
159b. Petals 2–4 mm (unknown in *Desideria stewartii*); cotyledons
accumbent.***
160a. Valve apex readily separated from replum during dehiscence;
fruiting pedicels appressed to rachis 49. *Sisymbriopsis*
160b. Valve apex persistently united with replum; fruiting pedicels
not appressed to rachis 57. *Desideria*

1. MACROPODIUM R. Brown in W. T. Aiton, Hortus Kew. 4: 108. 1812.

长柄芥属 chang bing jie shu

Herbs perennial, rhizomatous, puberulent. Trichomes simple and minutely forked. Stems erect, unbranched. Basal leaves long petiolate, rosulate, simple, entire, serrate, or denticulate. Cauline leaves petiolate, uppermost sessile, not auriculate, entire or serrate. Racemes numerous flowered, dense, ebracteate or rarely lowermost few flowers bracteate, elongated in fruit. Fruiting pedicels slender or thickened, divaricate. Sepals oblong-linear, base of lateral pair not saccate, margin narrowly membranous. Petals white; blade linear-oblong or linear-lanceolate, apex obtuse; claw shorter than sepals. Stamens 6, distinctly exserted, subequal in length; filaments dilated at base, filiform; anthers oblong-linear, twisted after dehiscence, obtuse at apex. Nectar glands 2, lateral, semiannular or annular; median glands absent. Ovules 8–22 per ovary. Fruit dehiscent siliques, linear, strongly latiseptate; valves papery, with a prominent midvein and distinct lateral veins, glabrous, torulose; gynophore 0.3–3 cm; replum rounded; septum complete, membranous, translucent, veinless; style obsolete, rarely to 1 mm, subconical; stigma capitate, entire. Seeds uniseriate, winged, ovate or orbicular, strongly flattened; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent.

Two species: China, Japan, Kazakstan, Mongolia, Russia; one species in China.

1. *Macropodium nivale* (Pallas) R. Brown in W. T. Aiton, Hortus Kew. 4: 108. 1812.

长柄芥 chang bing jie

Cardamine nivalis Pallas, Reise Russ. Reich. 2: 113. 1773.

Herbs (20–)30–50(–63) cm tall, sparsely puberulent with trichomes ca. 0.1 mm. Stems glabrous basally, puberulent above. Basal leaves rosulate; petiole (1–)3–10(–15) cm; leaf blade oblong, elliptic, or lanceolate, 3–8 × (1.5–)2–3.5 cm, glabrous or margin puberulent, base obtuse or cuneate, margin entire, denticulate, or serrulate, apex obtuse or subacute. Lowermost cauline leaves petiolate, uppermost sessile; middle cauline leaves sessile or shortly petiolate, lanceolate,

lanceolate-oblong, or elliptic, 3–9 × 0.6–2.5 cm, margin entire, apex acute. Fruiting pedicels stout, 0.5–2 mm, horizontal, puberulent. Sepals oblong-linear, 4–5 × 1–1.5 mm, glabrous. Petals white, linear to linear-oblong, 6–10 × 0.7–1 mm; claw slender, 3–5 mm. Filaments white, 5–8 mm; anthers purplish, oblong-linear, 1.5–2 mm. Ovules 12–18 per ovary. Fruit linear, (1.8–)2.2–4(–4.8) cm × 3–4.5 mm, glabrous, strongly torulose; gynophore 3–6 mm, puberulent, strongly recurved; style 0.2–1 mm. Seeds brown, orbicular or ovate-oblong, 2.5–3.2 × 1.8–3 mm; wing 0.2–0.5 mm. Fl. Jul–Aug, fr. Aug–Sep. $2n = 30$.

Alpine meadows, river banks; 2000–2200 m. Xinjiang [Kazakstan, Mongolia, Russia].

2. BRASSICA Linnaeus, Sp. Pl. 2: 666. 1753.

芸苔属 yun tai shu

Herbs annual, biennial, or perennial, rarely subshrubs or shrubs, often glaucous. Trichomes absent or simple. Stems erect or ascending, simple or branched, leafy or rarely leafless. Basal leaves petiolate, rosulate or not, simple, entire, dentate, lyrate-pinnatifid, or pinnatisect. Cauline leaves petiolate or sessile, base cuneate, attenuate, auriculate, sagittate, or amplexicaul, margin entire, dentate, or lobed. Racemes ebracteate, elongated in fruit. Fruiting pedicels ascending, divaricate, or reflexed. Sepals ovate or oblong, erect, ascending, or rarely spreading, base of lateral pair saccate or not. Petals yellow, rarely white or pink; blade obovate, spatulate, or rarely oblanceolate, apex obtuse or emarginate; claw distinct, subequaling or longer than sepals. Stamens 6, tetradynamous; anthers ovate or oblong, obtuse at apex. Nectar glands 4, median and lateral, rarely 2 and lateral. Ovules 4–50 per ovary. Fruit dehiscent siliques, linear or rarely oblong, terete, 4-angled, or latiseptate, sessile or shortly stipitate, segmented; valvular

segment dehiscent, 4–46-seeded, longer than terminal segment, smooth or torulose, valves with a prominent midvein and obscure lateral veins; terminal segment seedless or 1(–3)-seeded; replum rounded; septum complete, translucent or opaque, veinless or with a distinct midvein; style obsolete or distinct; stigma capitate, entire or 2-lobed. Seeds uniseriate or rarely biseriate, wingless, globose or rarely oblong, plump or rarely slightly flattened; seed coat reticulate, mucilaginous or not when wetted; cotyledons conduplicate.

About 40 species: primarily in the Mediterranean region, especially SW Europe and NW Africa; six species in China.

Brassica includes the most important vegetables and oilseed plants of the Brassicaceae, and China is the center where human selection has created numerous cultivars, more so than elsewhere in the world. Most of these were described by Liberty H. Bailey as species based primarily on minor differences in leaf morphology. In fact, Bailey (Gent. Herb. 1: 53–108. 1922; 2: 211–267. 1930; 4: 319–330. 1940) recognized 25 crop species of *Brassica* (including two presently assigned to *Sinapis* and ten as “new”), of which 23 species names clearly belong to only six species (nos. 1–5 of the present account, plus *B. carinata* A. Braun). Critical study of all of Bailey’s types by one of the present authors (Al-Shehbaz), along with comprehensive cytological, crossing, and molecular studies conducted by numerous researchers over the past several decades, reveal that all of Bailey’s “species and infraspecific taxa” clearly belong to four species: *B. juncea* ($2n = 36$), *B. napus* ($2n = 38$), *B. oleracea* ($2n = 18$), and *B. rapa* ($2n = 20$).

Cultivated forms (or taxa) with the same chromosome number are indistinguishable in fruit, seed, and flower characters, and they interbreed freely and produce fully fertile offspring. Furthermore, such forms often lose their identity outside of cultivation and become basically indistinguishable from the weedy forms of the species to which they belong. Because the Chinese *Brassica* are maintained only in cultivation as distinct crops and have well-established Chinese names, they have been recognized in most of Chinese floras as distinct species. However, they are best treated as varieties, just as the numerous and morphologically far more diversified forms of *B. oleracea* are recognized worldwide (see below). As many as 18 species of *Brassica* have been recognized in China, but the easternmost native range of the genus hardly reaches C Asia. On the basis of the enormous array of cultivated infraspecific taxa of *B. juncea* and *B. rapa* in China, it is evident that these two species have been domesticated there for thousands of years.

1a. Upper cauline leaves sessile, base minutely auriculate, amplexicaul, or deeply cordate.

2a. Plants glabrous throughout; sepals erect; all filaments erect at base; petals (1.5–)1.8–2.5(–3) cm 1. *B. oleracea*

2b. Plants often sparsely pubescent basally; sepals ascending or rarely suberect; filaments of lateral stamens curved

at base; petals (0.6–)0.7–1.6(–1.8) cm.

3a. Flowers overtopping buds; petals bright yellow, rarely creamy or whitish yellow, 0.7–1(–1.3) cm; plants rarely glaucous

2. *B. rapa*

3b. Flowers not overtopping buds; petals pale or creamy yellow, (0.9–)1–1.6(–1.8) cm; plants often glaucous

5. *B. napus*

1b. Upper cauline leaves petiolate or subsessile, base not auriculate, amplexicaul, or cordate.

4a. Petals white or creamy yellow, (1.5–)1.8–2.5(–3) cm; plants glabrous and glaucous throughout 1. *B. oleracea*

4b. Petals bright yellow, (0.5–)0.7–1.1(–1.3) cm; plants sparsely pubescent at least below, sometimes glaucous above.

5a. Fruit strongly 4-angled, subappressed to rachis, (0.5–)1–2.5(–2.7) cm; fruiting pedicels (2–)3–5(–6) mm

3. *B. nigra*

5b. Fruit terete, obscurely 4-angled, or slightly flattened, divaricate or ascending, (1.5–)2–4.5(–5) cm; fruiting pedicels (5–)8–18(–20) mm.

6a. Fruit sessile, terminal segment (4–)5–10(–15) mm; sepals (3.5–)4–6(–7) mm

4. *B. juncea*

6b. Fruit on gynophores to 5 mm, terminal segment (0.5–)1–2.5(–3) mm; sepals 3–4(–4.5) mm 6. *B. elongata*

1. *Brassica oleracea* Linnaeus, Sp. Pl. 2: 667. 1753.

野甘蓝 ye gan lan

Herbs biennial or perennial, rarely annual, (0.3–)0.6–1.5 (–3) m tall, glabrous, glaucous. Stems erect or decumbent, branched at or above middle, sometimes fleshy at base. Basal and lowermost cauline leaves long petiolate, sometimes strongly overlapping and forming a head; petiole to 30 cm; leaf blade ovate, oblong, or lanceolate in outline, to 40 × 15 cm, margin entire, repand, or dentate, sometimes pinnatifid or pinnatisect and with a large terminal lobe and smaller, 1–13, oblong or ovate lateral lobes on each side of midvein. Upper cauline leaves sessile or subsessile in some

cultivated forms, oblanceolate, ovate, or oblong, to 10 × 4 cm, base amplexicaul, auriculate, or rarely cuneate, margin entire, repand, or rarely dentate. Racemes sometimes fleshy and condensed into a head. Fruiting pedicels usually straight, ascending or divaricate, (0.8–)1.4–2.5(–4) cm. Sepals oblong, 0.8–1.5 cm × 1.5–2.7 mm, erect. Petals creamy yellow or rarely white, (1.5–)1.8–2.5(–3) × (0.6–)0.8–1.2 cm, ovate or elliptic, apex rounded; claw 0.7–1.5 cm. Filaments 0.8–1.2 cm; anthers oblong, 2.5–4 mm. Fruit linear, (2.5–)4–8(–10) cm × (2.5–)3–4(–5) mm, terete, sessile or on a gynophore to 3 mm, divaricate or ascending; valvular segment (2–)3–7.5(–9) cm, 10–20-seeded per locule,

valves with a prominent midvein; terminal segment conical, (3–)4–10 mm, seedless or 1(or 2)-seeded; style obsolete. Seeds dark brown or blackish, globose, 1.5–2.5 mm in diam., minutely reticulate. Fl. Mar–Jun, fr. Apr–Jul. $2n = 18^*$.

Cultivated. Throughout China [native to W Europe; cultivated worldwide].

Wild populations of var. *oleracea* are known only from the coastal cliffs of W Europe. Of the 15 varieties and 16 forms recognized by Helm (Kulturpflanze 11: 92–210. 1963), seven varieties are cultivated in China, the most commonly grown of which are vars. *botrytis*, *capitata*, *gongylodes*, and *italica*. The other varieties are less commonly grown.

- 1a. Inflorescence fleshy, forming a compact, globose or obconical head.
 - 2a. Flower buds white, densely and tightly compact; rachis and pedicels white 1b. var. *botrytis*
 - 2b. Flower buds green, somewhat loosely grouped; rachis and pedicels green 1c. var. *italica*
- 1b. Inflorescence not fleshy, never compact, open, not forming heads.
 - 3a. Stem base fleshy, globose 1e. var. *gongylodes*
 - 3b. Stem base not fleshy, cylindrical or narrowly conical.
 - 4a. Basal and lower cauline leaves numerous, densely or somewhat loosely grouped in heads.
 - 5a. Leaves green, strongly overlapping into a compact, closed head 1a. var. *capitata*
 - 5b. Leaves yellow, pink, purple, or red, rarely green, loosely grouped into an open head 1f. var. *acephala*
 - 4b. Basal and lower cauline leaves few to several, widely spaced, not forming heads.
 - 6a. Flowers yellow; axillary buds forming small, globose or obovoid heads 1d. var. *gemmifera*
 - 6b. Flowers white; axillary buds not formed or loose and not forming heads 1g. var. *albiflora*

1a. *Brassica oleracea* var. *capitata* Linnaeus, Sp. Pl. 2: 667. 1753.

甘蓝 gan lan

Brassica capitata (Linnaeus) H. Léveillé.

Stem base highly shortened, not fleshy, conical. Basal and lower cauline leaves green, numerous, strongly overlapping into a compact, globose, oblong, or rarely subconical, closed, apically rounded or flattened head. Axillary leafy buds not forming heads. Inflorescence

neither fleshy nor condensed into a head. Flowers yellow. $2n = 18^*$.

Cultivated as a vegetable. Throughout China [widely cultivated elsewhere].

1b. *Brassica oleracea* var. *botrytis* Linnaeus, Sp. Pl. 2: 667. 1753.

花椰菜 hua ye cai

Stem base elongated, not fleshy, cylindrical. Basal and lower cauline leaves green, few to several, widely spaced, not grouped into a head. Axillary leafy buds not forming heads. Inflorescence white, compact, often globose, with fleshy peduncle, rachis, pedicels, and flowers. Flowers yellow. $2n = 18^*$.

Cultivated as a vegetable. Throughout China [widely cultivated elsewhere].

1c. *Brassica oleracea* var. *italica* Plenck, Icon. Pl. Medic. 6: 29. 1794.

绿花菜 lu hua cai

Stem base elongated, not fleshy, cylindrical. Basal and lower cauline leaves green, few to several, widely spaced, not grouped into a head. Axillary leafy buds not forming heads. Inflorescence green, somewhat loose, usually obconical, with fleshy peduncle, rachis, pedicels, and flowers. Flowers yellow. $2n = 18^*$.

Recently introduced and cultivated as a vegetable. Previously mainly in Guangdong, but now more commonly in other parts of China [widely cultivated elsewhere].

1d. *Brassica oleracea* var. *gemmifera* (de Candolle) Zenker, Fl. Thüringen 15: 2. 1836.

抱子甘蓝 bao zi gan lan

Brassica oleracea var. *bullata* de Candolle subvar. *gemmifera* de Candolle, Syst. Nat. 2: 585. 1821; *B. gemmifera* (de Candolle) H. Léveillé; *B. oleracea* subsp. *gemmifera* (de Candolle) Schwarz.

Stem base strongly elongated, not fleshy, cylindrical. Basal and lower cauline leaves green, few to several, widely spaced, not overlapping into a head. Axillary leafy buds forming small, subglobose or obovoid heads. Inflorescence neither fleshy nor condensed into a head. Flowers yellow. $2n = 18^*$.

Introduced and cultivated as a vegetable. Sichuan, Zhejiang, and a little in Yunnan [widely cultivated elsewhere].

1e. *Brassica oleracea* var. *gongylodes* Linnaeus, Sp. Pl. 2: 667. 1753.

擘蓝 pie lan

Brassica caulorapa (de Candolle) Pasquale; *B. oleracea* var. *caulorapa* de Candolle.

Stem base highly shortened, fleshy, globose. Basal and lower cauline leaves green, numerous, not overlapping into a head. Axillary leafy buds not forming heads.

Inflorescence neither fleshy nor condensed into a head. Flowers yellow. $2n = 18^*$.

Cultivated as a vegetable for the fleshy stem base. Widespread in China [widely cultivated elsewhere].

1f. *Brassica oleracea* var. *acephala* de Candolle, Syst. Nat. 2: 583. 1821.

羽衣甘藍 *yu yi gan lan*

Stem base highly shortened, not fleshy, shortly cylindrical. Basal and lower cauline leaves yellow, pink, purplish, or red, rarely green, numerous, overlapping and forming a loose head. Axillary leafy buds not forming heads. Inflorescence neither fleshy nor condensed into a head. Flowers yellow. $2n = 18^*$.

Cultivated primarily as an ornamental for its colored heads. Precise distribution in China unknown [widely cultivated elsewhere].

1g. *Brassica oleracea* var. *albiflora* Kuntze, Revis. Gen. Pl. 1: 19. 1891.

白花甘藍 *bai hua gan lan*

Brassica albolabra L. H. Bailey.

Stem base strongly elongated, not fleshy, narrowly cylindrical. Basal and lower cauline leaves green, few to several, widely spaced, not grouped into a head. Axillary leafy buds not forming heads. Inflorescence lax, not fleshy. Flowers white or rarely creamy white. $2n = 18^*$.

Cultivated as a vegetable. Guangdong, Guangxi, Yunnan [sporadically cultivated elsewhere].

2. *Brassica rapa* Linnaeus, Sp. Pl. 2: 666. 1753.

蔓菁 *man jing*

Herbs annual or biennial, 30–120(–190) cm tall, glabrous or sparsely pubescent basally, rarely glaucous, sometimes with fleshy taproots. Stems erect, simple or branched above. Basal and lowermost cauline leaves petiolate, not rosulate or obscurely to strongly rosulate and forming a compact, oblong head; petiole (1–)2–10(–17) cm, slender or thickened and fleshy, sometimes strongly winged; leaf blade ovate, oblong, or lanceolate in outline, (5–)10–40(–60) × 3–10(–20) cm, margin entire, repand, dentate, or sinuate, sometimes pinnatifid or pinnatisect and with a large terminal lobe and smaller, 1–6, oblong or ovate lateral lobes on each side of midvein. Upper cauline leaves sessile, ovate, oblong, or lanceolate, 2–8(–12) × 0.8–3 cm, base amplexicaul, deeply cordate, or auriculate, margin entire or repand. Fruiting pedicels, straight, ascending or divaricate, (0.5–) 1–2.5(–3) cm. Sepals oblong, (3–)4–6.5(–8) × 1.5–2 mm, ascending. Petals bright yellow, rarely pale or whitish yellow, 7–10(–13) × (2.5–)3–6(–7) mm, obovate, apex rounded. Filaments 4–6(–7) mm; anthers oblong, 1.5–2 mm. Fruit linear, (2–)3–8 (–11) cm × 2–4(–5) mm, terete, sessile, divaricate or ascending; valvular segment (1.3–)2–5(–7.5) cm, 8–15-seeded per locule, valves with a prominent midvein; terminal segment conical, (0.3–)1–2.5(–3.5) cm, seedless or rarely 1-seeded; style obsolete. Seeds dark or reddish brown, globose, 1–1.8 mm in diam., minutely reticulate. Fl. Mar–Jun, fr. Apr–Jul. $2n = 20^*$.

Cultivated. Throughout China [widely cultivated and naturalized elsewhere].

Both *Brassica campestris* and *B. rapa* were simultaneously described by Linnaeus (Sp. Pl. 2: 666. 1753). Johann Metzger (Systematische

Beschreibung der kultivierten Kohlarten. 68 pp. Heidelberg. 1833), who was the first to unite the two species, adopted *B. rapa* for the combined species, and therefore this name has priority (St. Louis Code, Art. 11.5). Except for being an annual with nonfleshy taproots, *B. campestris* is absolutely indistinguishable from the biennial *B. rapa* with fleshy taproots. In fact, plants of *B. rapa* that escape from cultivation fail to produce fleshy roots. Therefore, *B. campestris* deserves no higher than a varietal rank of *B. rapa*, and it is here reduced to synonymy under var. *oleifera*.

Forms with 3- or 4-valved fruit have been recognized as *Brassica trilocularis* Roxburgh and *B. quadrivalvis* J. D. Hooker & Thomson, respectively. They were treated by Jafri (Fl. W. Pakistan 55: 24. 1973) as subspecies of *B. napus*, but both have $2n = 20$, and therefore they should be recognized as a variety of *B. rapa*. Of the six varieties recognized in *B. rapa*, the following four are grown and naturalized in China.

- 1a. Taproot fleshy, napiform; plants biennial
- 2a. var. *rapa*
- 1b. Taproot not fleshy, cylindrical; plants annual or rarely biennial.
- 2a. Basal leaves rarely up to 10, not rosulate or rarely obscurely rosulate; petioles neither thickened nor broadly winged 2b. var. *oleifera*
- 2b. Basal leaves more than 10, often many more, forming compact rosettes or heads; petioles fleshy and thickened, or strongly flattened and winged
- 3a. Basal leaves forming compact, oblong or subobovoid heads; petioles strongly flattened, with incised or toothed wings 2c. var. *glabra*
- 3b. Basal leaves not forming compact heads; petioles fleshy, semiterete or oblong in cross section, wingless 2d. var. *chinensis*

2a. *Brassica rapa* var. *rapa*

蔓菁(原变种) *man jing* (*yuan bian zhong*)

Barbarea derchiensis S. S. Ying; *Brassica campestris* Linnaeus subsp. *rapa* (Linnaeus) J. D. Hooker; *B. campestris* subsp. *rapifera* (Metzger) Sinskaya; *B. campestris* var. *rapa* (Linnaeus) Hartman; *B. rapa* subsp. *rapifera* Metzger; *Raphanus rapa* (Linnaeus) Crantz.

Plants biennial. Taproot fleshy, napiform. Basal leaves rarely up to 10, not rosulate or obscurely rosulate; petiole slender, neither fleshy nor winged; leaf blade lyrate-pinnatifid or rarely sinuate-dentate. Fl. Mar–May, fr. May–Jul. $2n = 20^*$.

Cultivated for its fleshy roots. Throughout China [widely cultivated elsewhere].

2b. *Brassica rapa* var. *oleifera* de Candolle, Syst. Nat. 2: 591. 1821.

芸苔 *yun tai*

Brassica asperifolia Lamarck; *B. campestris* Linnaeus; *B. campestris* var. *chinoleifera* Viehoveer; *B. campestris* subsp. *nipposinica* (L. H. Bailey) G. Olsson; *B. campestris* (Linnaeus) subsp. *oleifera* (de Candolle) Schübler & Martius; *B. campestris* var. *oleifera* de Candolle; *B. chinensis* Linnaeus var. *angustifolia* V. G. Sun; *B. chinensis* var. *utilis* M. Tsen & S. H. Lee; *B. dubiosa* L. H. Bailey; *B. nipposinica* L. H. Bailey; *B. perviridis* (L. H. Bailey) L. H. Bailey; *B. rapa* subsp. *campestris* (Linnaeus) Clapham; *B. rapa* subsp. *nipposinica* (L. H. Bailey) Hanelt; *B. rapa* subsp. *oleifera* (de Candolle) Metzger; *B. rapa* var. *campestris* (Linnaeus) Petermann; *B. rapa* var. *chinoleifera* (Viehoveer) Kitamura; *B. rapa* var. *perviridis* L. H. Bailey.

Plants annual or rarely biennial. Taproot not fleshy, cylindrical. Basal leaves rarely up to 10, not rosulate or obscurely rosulate; petiole slender, neither fleshy nor winged; leaf blade subentire, sinuately lobed, pinnatifid, or incised with irregularly serrate lobes. Fl. Mar–May, fr. May–Jul. $2n = 20^*$.

Cultivated. Throughout China [widely cultivated elsewhere].

Widely cultivated in Asia as a source of seed oil, but also grown in China as a medicinal plant and vegetable for its purple shoots. Plants of this variety are weedy throughout much of the world and are better known as *Brassica campestris*.

Purplish forms of this subspecies with shallowly lobed or unlobed basal leaves are cultivated in China as a vegetable. They were originally described as *Brassica campestris* var. *purpuraria* L. H. Bailey and later as *B. purpuraria* (L. H. Bailey) L. H. Bailey. If a formal recognition were needed, then the name would be *B. rapa* var. *purpuraria* (L. H. Bailey) Kitamura (Mem. Coll. Sci. Kyoto Imp. Univ., Ser. B, Biol. 19: 78. 1950).

Another leafy form, originally described from Sichuan and later cultivated in Jiangsu and many other provinces, is *Brassica juncea* var. *celerifolia* M. Tsen & S. H. Lee (Hort. Sin. 2: 28. 1942). It was correctly excluded from *B. juncea* because it has $2n = 20$, but was raised to the rank of species, as *B. celerifolia* (M. Tsen & S. H. Lee) Y. C. Lan & T. Y. Cheo (Acta Phytotax. Sin. 29: 74. 1991). It has deeply incised leaf blades.

2c. Brassica rapa var. **glabra** Regel, Gartenflora 9: 9. 1860.
白菜 bai cai

Brassica campestris Linnaeus subsp. *pekinensis* (Loureiro) G. Olsson; *B. campestris* var. *pekinensis* (Loureiro) Viehoveer; *B. chinensis* Linnaeus var. *pandurata* V. G. Sun; *B. chinensis* var. *pekinensis* (Loureiro) V. G. Sun; *B. pekinensis* (Loureiro) Ruprecht; *B. pekinensis* var. *cephalata* M. Tsen & S. H. Lee; *B. pekinensis* var. *cylindrica* M. Tsen & S. H. Lee; *B. pekinensis* var. *laxa* M. Tsen & S. H. Lee; *B. pekinensis* var. *petsai* Loureiro; *B. petsai* (Loureiro) L. H. Bailey; *B. rapa* subsp. *pekinensis* (Loureiro) Hanelt; *B. rapa* subsp. *pekinensis* var. *laxa* (M. Tsen & S. H. Lee) Hanelt; *B. rapa* subsp. *pekinensis* var. *pandurata* (V. G. Sun) Gladis; *Sinapis pekinensis* Loureiro.

Plants annual or biennial. Taproot not fleshy, cylindrical. Basal leaves usually more than 20, strongly rosulate, forming oblong or subobovoid, compact heads; petiole strongly flattened, with incised or dentate wings; leaf blade dentate. Fl. May–Jun, fr. Jun–Jul. $2n = 20^*$.

Long cultivated as the most important domestic vegetable.

Throughout China [widely cultivated elsewhere].

2d. Brassica rapa var. **chinensis** (Linnaeus) Kitamura, Mem. Coll. Sci. Univ. Kyoto, ser. B, 19: 79. 1950.

青菜 qing cai

Brassica chinensis Linnaeus, Moen. Acad. 4: 280.

1759; *B. antiquorum* H. Léveillé; *B. campestris* Linnaeus subsp. *chinensis* (Linnaeus) Makino; *B. campestris* subsp. *chinensis* var. *amplexicaulis* (Tanaka & Ono) Makino; *B. campestris* subsp. *narinosa* (L. H. Bailey) G. Olsson; *B. campestris* var. *chinensis* (Linnaeus) T. Itô; *B. campestris* var. *narinosa* (L. H. Bailey) Kitamura; *B. campestris* var. *parachinensis* (L. H. Bailey) Makino; *B. chinensis* var. *communis* M. Tsen & S. H. Lee; *B. chinensis* var. *parachinensis* (L. H. Bailey) Sinskaya; *B. chinensis* var. *rosularis* M. Tsen & S. H. Lee; *B. napus* Linnaeus var. *chinensis* (Linnaeus) O. E. Schulz; *B. narinosa* L. H. Bailey; *B. oleracea* var. *tsiekentsiensis* H. Léveillé; *B. parachinensis* L. H. Bailey; *B. oleracea* Linnaeus var. *chinensis* (Linnaeus) Prain; *B. rapa* subsp. *chinensis* (Linnaeus) Hanelt; *B. rapa* subsp. *chinensis* var. *parachinensis* (L. H. Bailey) Hanelt; *B. rapa* subsp. *narinosa* (L. H. Bailey) Hanelt; *B. rapa* subsp. *chinensis* var. *rosularis* (M. Tsen & S. H. Lee) Hanelt; *B. rapa* var. *amplexicaulis* Tanaka & Ono; *Raphanus chinensis* (Linnaeus) Crantz (1769), not Miller (1768).

Plants annual or rarely biennial. Taproot not fleshy, cylindrical. Basal leaves usually more than 20, strongly rosulate, not forming compact heads; petiole fleshy or thickened, semiterete or transversely oblong in cross section, wingless; leaf blade entire or repand. Fl. Apr–May, fr. May–Jun. $2n = 20^*$.

Cultivated primarily as an oilseed plant and less so as a vegetable.

Throughout China [widely cultivated elsewhere].

Some forms are grown in S China for seed oil. They are known as *Brassica chinensis* var. *oleifera* Makino & Nemoto, but such distinction is dubious.

3. Brassica nigra (Linnaeus) W. D. J. Koch in Röhlting, Deutschl. Fl., ed. 3, 4: 713. 1833.

黑芥 hei jie

Sinapis nigra Linnaeus, Sp. Pl. 2: 668. 1753;

Sisymbrium nigrum (Linnaeus) Prantl.

Herbs annual, 0.3–2(–3.1) m tall, sparsely hirsute at least basally. Stems erect, branched above. Basal and lowermost cauline leaves with petioles to 10 cm; leaf blade ovate, oblong, or lanceolate in outline, 6–30 × 1–10 cm, lyrate-pinnatifid or pinnatisect; terminal lobe ovate, dentate; lateral lobes 1–3 on each side of midvein, much smaller than terminal lobe, dentate. Upper cauline leaves petiolate, lanceolate or linear-oblong, to 5 × 1.5

cm, base cuneate, margin entire or rarely dentate. Fruiting pedicels straight, slender, erect or ascending, subappressed to rachis, (2–)3–5(–6) mm. Sepals oblong, 4–6(–7) cm × 1–1.5 mm, spreading or ascending. Petals yellow, (5–)7.5–11(–13) × (2.5–)3–4.5(–5.5) mm, ovate, apex rounded; claw 3–6 mm. Filaments 3.5–5 mm; anthers oblong, 1–1.5 mm. Fruit linear or narrowly oblong-elliptic, (0.5–)1–2.5(–2.7) cm × (1.5–)2–3(–4) mm, 4-angled, sessile, subappressed to rachis; valvular segment (0.4–)0.8–2(–2.5) cm, 2–5(–8)-seeded per locule; valves with a prominent midvein, slightly torulose; terminal segment stylelike, sometimes narrowly conical, (1–)2–5(–6) mm, seedless. Seeds dark brown, gray, or blackish, globose, 1.2–2 mm in diam., minutely reticulate. Fl. and fr. Apr–Jul. $2n = 16^*$. Slopes, steppe, field margins; 900–2800 m. Gansu, Jiangsu, Qinghai, Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakstan, Nepal, Pakistan, Russia, Sikkim, Vietnam; N Africa, SW Asia, Europe; cultivated and/or naturalized elsewhere].

The above first record from Xizang is based on *Thomson s.n.*, 14 Aug 1847 (K).

On the basis of recent molecular studies and critical reevaluation of morphology, it appears that *Brassica nigra* should be retained in *Sinapis*, as was originally described by Linnaeus.

Brassica nigra is a cosmopolitan weed. It is cultivated in the West primarily for the use of seeds in seasoning and pickling, but it was used extensively in the manufacturing of table mustard before it was replaced by *B. juncea*.

4. *Brassica juncea* (Linnaeus) Czernajew, Conspect. Fl. Chark. 8. 1859.

芥菜 jie cai

Herbs annual, (20–)30–100(–180) cm tall, pubescent or rarely glabrous, glaucous or not, sometimes with fleshy taproots. Stems erect, branched above. Basal and lowermost cauline leaves long petiolate; petiole (1–)2–8(–15) cm; leaf blade ovate, oblong, or lanceolate in outline, (4–)6–30(–80) × 1.5–15(–28) cm, lyrate-pinnatifid or pinnatisect; terminal lobe ovate, repand, dentate, or incised; lateral lobes 1–3 on each side of midvein, much smaller than terminal lobe, crisped incised, dentate, repand, or entire. Upper cauline leaves petiolate or subsessile, oblanceolate, oblong, lanceolate, or linear, to 10 × 5 cm, base cuneate to attenuate, margin entire or repand, rarely dentate. Fruiting pedicels straight, divaricate, (0.5–)0.8–1.5(–2) cm. Sepals oblong, (3.5–)4–6(–7) × 1–1.7 mm, spreading. Petals yellow, (6.5–)8–11(–13) × 5–7.5 mm, ovate or obovate, apex rounded or emarginate; claw 3–6 mm. Filaments 4–7 mm; anthers oblong, 1.5–2 mm. Fruit linear, (2–)3–5(–6) cm × 3–4 (–5) mm, terete or slightly 4-angled, sessile, divaricate or ascending; valvular segment (1.5–)2–4.5 cm, 6–15(–20)-seeded per locule; valves with a prominent midvein, slightly torulose; terminal segment conical, (4–)5–10(–15) mm, seedless; style often obsolete. Seeds dark to light brown or gray, globose, 1–1.7 mm in diam., minutely reticulate. Fl. Mar–Jun, fr. Apr–Jul. $2n = 36^*$.

Fields, waste places, roadsides. Cultivated throughout China, sometimes naturalized especially in SW China [widely cultivated and naturalized elsewhere].

Variation in the basal leaf morphology of *Brassica juncea* is tremendous, and minor variants have been recognized at specific, subspecific, and varietal ranks. All these “taxa” have $2n = 36$, and they can be readily crossed and produce fully fertile offspring. Seven varieties and three species were recognized in FRPS. Of these, only three major types are recognized here as varieties. *Brassica juncea* var. *megarrhiza* and *B. napiformis* represent one taxon (var. *napiformis*), while *B. juncea* var. *tumida* is quite distinct in leaf morphology. Both varieties are recognized here. The other varieties, which are based solely on the type of leaf margin, are reduced to the synonymy of var. *juncea*. These include var. *gracilis* (margin doubly serrate or incised), var. *multisecta* (margin with linear or filiform lobes), var. *foliosa* (margin sinuate-dentate), var. *crispifolia* (margin sharply dentate or incised), and var. *multiceps* (margin unlobed, slightly incised, or irregularly doubly serrate). *Brassica integrifolia* was described from European plants of *B. juncea* that became naturalized in St. Croix, an island in the Caribbean Sea. It is said to differ from *B. juncea* in having undivided leaves and smaller fruit, but these alleged differences are unrealistic, and *B. integrifolia* does not merit any taxonomic status.

- 1a. Plants biennial; taproots fleshy, napiform, conical, oblong, or obovoid, 7–10 cm in diam. 4b. var. *napiformis*
- 1b. Plants annual; taproots slender, cylindric, rarely to 1.5 cm in diam.
 - 2a. Basal leaves with slender, nonfleshy petiole; midvein not flattened; leaf blade 4–30 cm 4a. var. *juncea*
 - 2b. Basal leaves with fleshy, inflated petioles; midvein strongly flattened; leaf blade 40–80 cm 4c. var. *tumida*

4a. *Brassica juncea* var. *juncea*

芥菜(原变种) jie cai (yuan bian zhong)

Sinapis juncea Linnaeus, Sp. Pl. 2: 668. 1753; *Brassica argyi* H. Léveillé; *B. cernua* (Thunberg) F. B. Forbes & Hemsley; *B. integrifolia* (West) O. E. Schulz; *B. japonica* (Thunberg) Siebold ex Miquel; *B. juncea* subsp. *integrifolia* (West) Thellung; *B. juncea* var. *crispifolia* L. H. Bailey; *B. juncea* var. *foliosa* L. H. Bailey; *B. juncea* var. *gracilis* M. Tsen & S. H. Lee; *B. juncea* var. *integrifolia* (Stokes) Sinskaya; *B. juncea* var. *japonica* (Thunberg) L. H. Bailey; *B. juncea* var. *longidens* L. H. Bailey; *B. juncea* var. *longipes* M. Tsen & S. H. Lee; *B. juncea* var. *multisecta* L. H. Bailey; *B. juncea* var. *multiceps* M. Tsen & S. H. Lee; *B. juncea* var. *rugosa* (Roxburgh) Kitamura; *B. juncea* var. *strumata* M. Tsen & S. H. Lee; *B. juncea* var. *subintegrifolia* Sinskaya; *B. lanceolata* (de Candolle) Lange; *B. napiformis* (Paillieux & Bois) L. H. Bailey var. *multisecta* (L. H. Bailey) A. I. Baranov; *B. rugosa* (Roxburgh) L. H. Bailey; *B. taquetii* H. Léveillé; *B. willdenowii* Boissier; *Raphanus junceus* (Linnaeus)

Crantz; *Sinapis cernua* Thunberg; *S. chinensis* Linnaeus var. *integrifolia* Stokes; *S. cuneifolia* Roxburgh; *S. integrifolia* West; *S. japonica* Thunberg; *S. lanceolata* de Candolle; *S. patens* Roxburgh; *S. ramosa* Roxburgh; *S. rugosa* Roxburgh.

Plants annual. Taproots slender, cylindrical, rarely to 1.5 cm in diam. Basal leaves with a slender, nonfleshy petiole; midvein not flattened; leaf blade 4–30 cm, margin highly variable. Fl. Mar–Jun, fr. May–Jul. $2n = 36^*$.

Fields, waste places, roadsides. Cultivated throughout China, sometimes naturalized [widely cultivated and naturalized elsewhere]. Cultivated for seed oil and medicine and as a vegetable and condiment. It is a naturalized weed on all continents except Antarctica.

4b. *Brassica juncea* var. *napiformis* (Pailleux & Bois) Kitamura, Mem. Coll. Sci. Univ. Kyoto, ser. B, 19: 76. 1950.

芥菜疙瘩 jie cai ge da

Sinapis juncea Linnaeus var. *napiformis* Pailleux & Bois, Potager d'un Curieux 2: 372. 1892; *Brassica juncea* subsp. *napiformis* (Pailleux & Bois) Gladis; *B. juncea* var. *megarrhiza* M. Tsen & S. H. Lee; *B. napiformis* (Pailleux & Bois) L. H. Bailey.

Plants biennial. Taproots fleshy, napiform, conical, oblong, or obovoid, 7–10 cm in diam. Basal leaves with a slender, nonfleshy petiole, midvein not flattened; leaf blade 5–30 cm; margin irregularly dentate or pinnatisect with crisped, incised lobes. Fl. Apr–May, fr. May–Jun. $2n = 36^*$.

Cultivated as a vegetable and for forage. Throughout China [distribution outside China uncertain].

4c. *Brassica juncea* var. *tumida* M. Tsen & S. H. Lee, Hort. Sin. 2: 23. 1942.

榨菜 zha cai

Plants annual. Taproots slender, cylindrical. Basal leaves with a fleshy, inflated petiole; midvein strongly flattened; leaf blade 40–80 cm, margin subentire, repand, or obscurely dentate. Fl. Apr–Jun, fr. Jun–Jul. $2n = 36^*$.

Cultivated as a vegetable. Mainly in Sichuan and Yunnan [distribution outside China uncertain].

5. *Brassica napus* Linnaeus, Sp. Pl. 2: 666. 1753.

欧洲油菜 ou zhou you cai

Herbs annual or biennial, 30–150 cm tall, glabrous or basally sparsely hirsute, often glaucous, with or without fleshy taproots. Stems erect, branched above. Basal and lowermost cauline leaves long petiolate; petiole to 15 cm; leaf blade ovate, oblong, or lanceolate in outline, 5–25(–40) × 2–7(–10) cm, pinnately lobed or lyrate, sometimes undivided; terminal lobes ovate, dentate, repand, or entire; lateral lobes 1–6 on each side of midvein, much smaller than terminal one, entire, repand, or dentate, sometimes absent. Upper cauline leaves sessile, lanceolate, ovate, or oblong, to 8 × 3.5 cm, base amplexicaul, auriculate, margin entire or repand.

Fruiting pedicels straight, divaricate, (1–)1.2–2.3(–3)

cm. Sepals oblong, (5–)6–10 × 1.5–2.5 mm, ascending or rarely suberect. Petals bright or pale yellow, (0.9–)1–1.6(–1.8) cm × (5–)6–9(–10) mm, broadly obovate, apex rounded; claw 5–9 mm. Filaments (5–)7–10 mm; anthers oblong, 1.5–2.5 mm. Fruit linear, (3.5–)5–9.5(–11) cm × (2.5–)3.5–5 mm, terete or slightly 4-angled, sessile, divaricate or ascending; valvular segment (3–)4–8.5(–9.5) cm, 12–20(–30)-seeded per locule; valves with a prominent midvein, slightly torulose or smooth; terminal segment conical, (0.5–)0.9–1.6 cm, seedless or 1-seeded; style often obsolete. Seeds dark brown or blackish, globose, (1.2–)1.5–2.5(–3) mm in diam., minutely reticulate. Fl. Mar–Jun, fr. Apr–Jul. $2n = 38^*$. Cultivated. Throughout China [widely cultivated and naturalized elsewhere].

Native to Europe but not known in the wild, it perhaps evolved in the 16th Century as an allotetraploid derived from *Brassica oleracea* and *B. rapa*.

Brassica napus is one of the most important sources of seed vegetable oil. The seed oil is also used in the manufacture of lubricants, grease, lacquers, varnishes, soap, resins, nylon, plastics, insect repellents, stabilizers, and pharmaceuticals. The green parts and fleshy roots are eaten as vegetables. Two varieties are recognized, and both are cultivated in China.

1a. Taproot not fleshy, slender; plants annual 5a. var. *napus*

1b. Taproot fleshy, napiform; plants biennial

..... 5b. var. *napobrassica*

5a. *Brassica napus* var. *napus*

欧洲油菜(原变种) ou zhou you cai (yuan bian zhong)

Brassica campestris Linnaeus subsp. *napus* (Linnaeus)

J. D. Hooker; *B. campestris* var. *napus* (Linnaeus)

Babington; *B. napus* subsp. *oleifera* (de Candolle)

Metzger; *B. napus* var. *arvensis* (Duchartre) Thellung;

B. napus var. *leptorrhiza* Spach; *B. napus* var. *oleifera*

de Candolle; *B. oleracea* Linnaeus var. *arvensis*

Duchartre; *B. oleracea* var. *hongnoensis* H. Léveillé; *B.*

oleracea var. *pseudocolza* H. Léveillé.

Plants annual. Taproots slender, not fleshy. $2n = 38^*$.

Cultivated. Throughout China [widely cultivated and naturalized elsewhere].

The source of canola oil.

5b. *Brassica napus* var. *napobrassica* (Linnaeus)

Reichenbach in Mössler, Handb. Gewächsk., ed. 2, 3: 1220. 1833.

蔓菁甘蓝 man jing gan lan

Brassica oleracea var. *napobrassica* Linnaeus, Sp. Pl. 2:

667. 1753; *B. campestris* Linnaeus var. *napobrassica*

(Linnaeus) de Candolle; *B. napobrassica* (Linnaeus)

Miller; *B. napus* subsp. *napobrassica* (Linnaeus) Hanelt;

B. napus var. *edulis* Delile; *B. napus* var. *rapifera*

Metzger; *B. rutabaga* de Candolle ex H. Léveillé.

Plants biennial. Roots fleshy, napiform. $2n = 38^*$.

Recently introduced and cultivated as a leaf and root vegetable. Guangdong, Guizhou, Jiangsu, Nei Mongol, Sichuan, Zhejiang [widely cultivated elsewhere].

6. *Brassica elongata* Ehrhart, Beitr. Naturk. 7: 159. 1792.

短喙芥 duan hui jie

Brassica brevirostrata Z. X. An; *B. persica* Boissier & Hohenacker.

Herbs biennial or perennial, (40–)50–100(–130) cm tall, basally hirsute or rarely glabrous. Stems erect, branched basally and above. Basal and lowermost cauline leaves long petiolate; leaf blade oblanceolate, elliptic, oblong-ovate, or oblong-linear, (3–)5–14(–20) × (0.5–)1–3.5(–6) cm, base cuneate or attenuate, margin dentate, repand, or entire. Upper cauline leaves petiolate or subsessile, linear, oblanceolate-linear, lanceolate, or oblong, to 8 cm, base attenuate or cuneate, margin entire or dentate. Fruiting pedicels divaricate, (0.6–)0.8–1.8 cm. Sepals oblong, 3–4(–4.5) × 1–1.5 mm, erect or rarely ascending. Petals yellow, (5–)6–8.5(–10) × 2.5–3.5(–4) mm, obovate, apex rounded; claw 2.5–4

cm. Filaments 3.5–4.5 mm; anthers ovate, 1–1.5 mm. Fruit linear, (1.5–)2–4(–4.8) cm × (1–)1.5–2 mm, terete or slightly flattened, borne on a gynophore (0.8–)1.5–4(–5) mm, divaricate; valvular segment (1.2–)1.6–4(–4.5) cm, (2–)5–11 (–13)-seeded per locule; valves with a prominent midvein, torulose; terminal segment linear, stylelike, (0.5–)1–2.5(–3) mm, seedless. Seeds brown or grayish, globose, 1–1.5 mm in diam., minutely reticulate. Fl. and fr. Jun–Aug. $2n = 22$.

Steppe, disturbed areas; 900–2400 m. Xinjiang [Afghanistan, Kazakstan, Russia (W Siberia), Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; naturalized in Australia and North America].

The protologue of *Brassica brevirostrata* (Fl. Xinjiang. 2(2): 374. 1995) represents the first record of *B. elongata* from China. It is not known whether the species has recently been introduced to China or its native range in China has long been overlooked.

3. *SINAPIS* Linnaeus, Sp. Pl. 2: 668. 1753.

白芥属 bai jie shu

Herbs annual or rarely perennial. Trichomes absent or simple. Stems erect or ascending, often branched apically, leafy. Basal leaves petiolate, not rosulate, simple, lyrate, pinnatifid, pinnatisect, bipinnatisect or/and dentate. Cauline leaves petiolate or sessile, not auriculate, entire, dentate, or shallowly lobed. Racemes ebracteate, elongated considerably in fruit. Fruiting pedicels slender or thickened, erect, ascending, divaricate, or reflexed. Sepals oblong or linear, spreading or reflexed, not saccate. Petals yellow, spreading; blade obovate, apex obtuse or emarginate; claw subequaling sepals. Stamens 6, tetradynamous; anthers oblong, obtuse at apex. Nectar glands 4, distinct; median pair ovoid; lateral pair prismatic, flat, or rarely lobed. Ovules 4–20 per ovary. Fruit dehiscent siliques, linear, lanceolate, or oblong, terete, somewhat 4-angled, or latiseptate, sessile, segmented; valvular segment dehiscent, few to many seeded, longer or shorter than terminal segment, torulose; valves with 3–7, prominent, longitudinal veins, thin or thick and obscurely veined; terminal segment indehiscent, seedless or 1- or 2-seeded, flattened and ensiform, or terete and conical or subulate, sometimes corky; replum rounded; septum complete, membranous; style distinct; stigma capitate, 2-lobed. Seeds uniseriate, wingless, globose, plump or rarely slightly flattened; seed coat reticulate, mucilaginous or not when wetted; cotyledons conduplicate.

Seven species: Mediterranean region, especially N Africa; two species in China.

- 1a. Fruit lanceolate, terminal segment strongly compressed, ensiform; fruiting pedicels divaricate; fruit valves hispid with subsetose trichomes mixed with much shorter, more slender ones 1. *S. alba*
- 1b. Fruit linear, terminal segment terete, conical or subulate; fruiting pedicels ascending or suberect; fruit valves glabrous or rarely sparsely pubescent with 1 kind of trichome 2. *S. arvensis*

1. *Sinapis alba* Linnaeus, Sp. Pl. 2: 668. 1753.

白芥 bai jie

Brassica alba (Linnaeus) Rabenhorst; *B. hirta* Moench.

Herbs (15–)25–100(–220) cm, retrorsely hispid, rarely glabrescent. Stems erect, often branched above. Petiole of basal and lower cauline leaves 1–3(–6) cm; leaf blade oblong, ovate, or lanceolate in outline, lyrate, pinnatifid, pinnatisect, (3.5–)5–14(–16) × 2–6(–8) cm; terminal lobe broadly ovate, (1–)3–6 cm, usually 3-lobed, margin dentate; lateral lobes 1–3 on each side of midvein, oblong, ovate, or lanceolate, 1.5–2.5 cm, margin dentate, repand, or rarely pinnatifid. Upper cauline leaves shortly petiolate; leaf blade ovate or oblong-ovate, 2–4.5 cm, margin coarsely dentate, rarely subentire. Fruiting pedicels divaricate, stout, (3–)6–

12(–17) mm. Sepals yellow or green, narrowly oblong, (3.8–)4–7(–8) × 1–1.8 mm, spreading or reflexed. Petals pale yellow, obovate, (0.7–)0.8–1.2(–1.4) cm × (3–)4–6(–7) mm. Filaments (3–)4–7(–8) mm; anthers oblong, 1.2–1.5 mm. Fruit lanceolate, (1.5–)2–4.2(–5) cm × (2–)3–5.5(–6.5) mm; valvular segment (0.5–)0.7–1.7(–2) cm, 2–5-seeded in each locule, 3–5(–7)-veined, torulose, terete or slightly compressed, hispid with subsetose trichomes mixed with much shorter and more slender ones; terminal segment ensiform, strongly compressed, (1–)1.5–2.5(–3) cm, straight or curved upward, seedless or 1(or 2)-seeded. Seeds gray, pale brown, or reddish brown, globose, (1.7–)2–3(–3.5) mm in diam., finely reticulate. Fl. and fr. May–Sep. $2n = 24^*$.

Roadsides, fields, pastures, disturbed sites. Anhui, Gansu, Hebei, Liaoning, Qinghai, Shandong, Shanxi, Sichuan, Xinjiang [India, Kashmir, Russia, Tajikistan, Turkmenistan, Vietnam; N Africa, SW Asia, Europe; naturalized elsewhere].

The seeds are used for the manufacture of table mustard and also for the extraction of oils, which are used for cooking and making soap and mayonnaise. The species is a cosmopolitan, naturalized weed.

2. *Sinapis arvensis* Linnaeus, Sp. Pl. 2: 668. 1753.

新疆白芥 xin jiang bai jie

Brassica arvensis (Linnaeus) Rabenhorst; *B. kaber* (de Candolle) L. C. Wheeler; *B. sinapistrum* Boissier; *B. xinjiangensis* Y. C. Lan & T. Y. Cheo; *Sinapis kaber* de Candolle.

Herbs (5–)20–100(–210) cm, retrorsely or spreading hirsute or hispid, rarely glabrous. Stems erect, often branched above. Petiole of basal and lower cauline leaves 1–4(–7) cm; leaf blade oblong, ovate, or lanceolate in outline, lyrate, pinnatifid, or undivided and dentate, (3–)4–18(–25) × 1.5–5(–7) cm; terminal lobe broadly ovate, obovate, to elliptic, margin dentate; lateral lobes 1–4 on each side of midvein, oblong, ovate, or lanceolate, smaller than terminal one, margin dentate.

Upper cauline leaves shortly petiolate; leaf blade ovate or lanceolate, often undivided, margin dentate or subentire, apex acute. Fruiting pedicels ascending or suberect, stout, (2–)3–7(–15) mm. Sepals yellow or green, narrowly oblong, (4.5–)5–6(–7) × 1–1.8 mm, spreading or reflexed. Petals bright or pale yellow, obovate, (0.8–)0.9–1.2(–1.7) cm × (3–)4–6(–7.5) mm. Filaments (3–)4–6 mm; anthers oblong, 1.2–1.5 mm. Fruit linear, (1.5–)2–4.5(–5.7) cm × (1.5–)2.5–3.5(–4) mm; valvular segment (0.6–)1.2–3.5(–4.3) cm, (2–)4–8(–12)-seeded in each locule, 3–5(–7)-veined, torulose, terete, glabrous or pubescent with 1 kind of trichome; terminal segment conical or subulate, terete, (0.7–)1–1.6 cm, straight or curved upward, seedless or 1- or 2-seeded. Seeds blackish to dark brown, globose, (1–)1.5–2 mm in diam., finely reticulate. Fl. and fr. May–Sep. $2n = 18^*$.

Roadsides, waste places, fields, pastures; 400–1800 m. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; naturalized elsewhere].

4. **DIPLLOTAXIS** de Candolle, Mém. Mus. Hist. Nat. 7: 243. 1821.

二行芥属 er hang jie shu

Herbs annual or perennial. Trichomes absent or simple. Stems erect or ascending, rarely procumbent. Basal leaves petiolate, rosulate or not, dentate, lyrate, pinnatifid, or pinnatisect, rarely bipinnatifid. Cauline leaves petiolate or sessile and sometimes auriculate. Racemes ebracteate or rarely lowermost flowers bracteate, elongated in fruit. Fruiting pedicels ascending, divaricate, or recurved. Sepals oblong or linear, erect or spreading, base of lateral pair often not saccate. Petals yellow, white, pink, or purple, longer than sepals; blade obovate or suborbicular, apex obtuse or emarginate; claw absent or as long as or shorter than sepals. Stamens 6, tetradynamous; filaments not dilated at base; anthers oblong, obtuse at apex. Nectar glands 4; median glands large; lateral glands smaller. Ovules 16–260 per ovary. Fruit dehiscent siliques, linear, latiseptate or terete, glabrous, sessile or long stipitate, unsegmented or segmented; valvular segment well developed, dehiscent, numerous seeded, much longer than terminal segment, torulose, with a distinct midvein; terminal segment indehiscent, seedless or 1- or 2-seeded; replum rounded; septum complete; style obsolete to 4 mm; stigma capitate, entire or 2-lobed. Seeds biseriate, wingless, oblong, ovoid, or ellipsoid, slightly flattened; seed coat smooth or minutely reticulate, slightly mucilaginous or not mucilaginous when wetted; cotyledons conduplicate.

About 30 species: especially in NW Africa, the Iberian Peninsula, and Macaronesia, extending into C Asia; one species (introduced) in China.

1. *Diplotaxis muralis* (Linnaeus) de Candolle, Syst. Nat. 2: 634. 1821.

二行芥 er hang jie

Sisymbrium murale Linnaeus, Sp. Pl. 2: 658. 1753;
Brassica muralis (Linnaeus) Boissier; *Sinapis muralis* (Linnaeus) R. Brown.

Herbs annual, sometimes perennial, (5–)20–50(–60) cm tall, scapose or subscapose, glabrous throughout or hirsute basally with simple, retrorse trichomes. Basal leaves rosulate, petiolate; leaf blade elliptic, spatulate, or narrowly ovate, 2–9 × 1–3 cm, dentate, sinuate, lyrate, or pinnatifid with 2–6 oblong or ovate lateral lobes smaller than terminal lobe. Cauline leaves absent or few, sessile, not auriculate, much smaller than basal

ones, dentate or entire. Fruiting pedicels slender, divaricate or ascending, straight, glabrous, (0.3–)0.8–1.4(–3) cm. Sepals oblong, 3.5–5.5 mm, glabrous or apically hairy. Petals yellow, obovate, (4.5–)6–8(–10) × 4–5 mm, cuneate to a short clawlike base. Filament 3.5–6 mm; anthers 1.5–2 mm. Ovules 20–36 per ovary. Fruit (1.5–)2.5–4(–4.5) cm × 1.5(–2.5) mm, erect-patent, compressed, slightly torulose; gynophore 0.2–0.5 mm; style stout, beaklike, (1–)1.5–3(–3.5) mm; stigma entire. Seeds ovoid or ellipsoid, 0.9–1.3 × 0.6–0.9 mm. Fl. and fr. late Apr–Aug. $2n = 42$.

Coastal weedy areas. Liaoning [native to Europe; naturalized elsewhere].

5. **ERUCA** Miller, Gard. Dict., Abr. ed. 4, 1: [472]. 1754.

芝麻菜属 zhi ma cai shu

Herbs annual or perennial. Trichomes absent or simple. Stems erect or ascending, leafy or leafless. Basal leaves petiolate, rosulate or not, simple, often lyrate-pinnatifid, rarely bipinnatisect or dentate. Cauline leaves petiolate or sessile, not auriculate, entire, dentate, or lyrate-pinnatifid, sometimes absent. Racemes ebracteate, elongated considerably in fruit. Fruiting pedicels erect or ascending and subappressed to rachis, rarely divaricate. Sepals oblong or linear, deciduous or rarely persistent, erect, base of lateral pair saccate. Petals cream or yellow with dark brown or purple veins, or entire blade purple; blade broadly obovate or oblanceolate, rounded or emarginate; claw subequaling or longer than sepals. Stamens 6, strongly tetradynamous; anthers oblong or linear, obtuse at apex. Nectar glands 4 or 2; lateral pair prismatic; median pair ovoid or oblong, or absent. Ovules 10–50 per ovary. Fruit siliques or silicles, linear, oblong, or ellipsoid, terete or 4-angled, sessile, segmented; valvular segment dehiscent, many seeded; valves smooth, leathery, with a prominent midvein; terminal segment indehiscent, seedless, flattened and ensiform, or 4-angled, shorter or longer than valves; replum rounded; septum complete, membranous; style obsolete; stigma conical, 2-lobed, lobes connivent, decurrent. Seeds biseriate, wingless, globose or ovoid, plump; seed coat minutely reticulate, mucilaginous when wetted; cotyledons conduplicate.

One species: NW Africa, Asia, Europe, naturalized elsewhere.

1. ***Eruca vesicaria*** (Linnaeus) Cavanilles subsp. ***sativa*** (Miller) Thellung in Hegi, Ill. Fl. Mitt.-Eur. 4(1): 201. 1918.

芝麻菜 zhi ma cai

Eruca sativa Miller, Gard. Dict., ed. 8, *Eruca* no. 1. 1768; *Brassica eruca* Linnaeus; *E. cappadocica* Reuter var. *eriocarpa* Boissier; *E. lativalvis* Boissier; *E. sativa* var. *eriocarpa* (Boissier) Post.

Herbs annual, (10–)20–80(–100) cm tall, glabrous or retrorsely hirsute or hispid. Stems erect, usually branched above. Basal leaves not rosulate, often withered by fruiting time; petiole (1–)2–5(–7) cm; leaf blade dentate, lyrate, pinnatifid, pinnatisect, or bipinnatisect, (2–)4–15(–20) × (1–)2–4(–6) cm; terminal lobe suborbicular or broadly ovate, margin dentate or entire; lateral lobes (2 or)3–9 on each side of midvein, oblong or oblong-ovate, margin pinnatifid, pinnatisect, dentate, or entire. Upper cauline leaves subsessile; leaf blade lobed or not. Fruiting pedicels 2–7(–10) mm, slightly thickened, erect or ascending, appressed or subappressed to rachis. Sepals often purplish, oblong, (6–)7–10(–12) × 1.5–2.2 mm, glabrous or hairy, deciduous, weakly cucullate or not. Petals yellow turning white, with dark brown or purplish veins, broadly obovate or spatulate, (1.2–)1.5–2(–2.6) cm × (4–)5–7(–9) mm, apex rounded; claw as long as sepals or slightly longer. Lateral filaments (5–)7–11 mm;

median filaments (8–)10–13(–15) mm; anthers narrowly oblong, 2–3 mm. Fruit linear, oblong, or ellipsoid, (1.1–)1.5–3.5(–4) cm × (2.5–)3–5 mm, glabrous or retrorsely hispid or hirsute; valves (0.7–)1–2.5(–3.2) mm, with a prominent midvein; terminal segment ensiform, (4–)5–10(–11) mm, 5-veined, as long as or slightly shorter than valves. Seeds brown, globose or ovoid, 1.5–2.5 mm in diam. Fl. May–Jul, fr. Jun–Aug. $2n = 22^*$.

Waste areas, fields, roadsides, slopes; near sea level to 3800 m. Gansu, Guangdong, Hebei, Heilongjiang, Jiangsu, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang [Afghanistan, India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; NW Africa, SW Asia, Europe; naturalized elsewhere].

Eruca vesicaria subsp. *vesicaria* is endemic to Spain and NW Africa and is distinguished by having persistent, strongly cucullate sepals. Forms with retrorsely hirsute fruit were recognized in FRPS and some other provincial floras as *Eruca sativa* var. *eriocarpa*, but these always occur with glabrous forms in the same population and throughout the naturalized or native ranges of the species. Therefore, no infraspecific taxa merit recognition.

Widely cultivated in Asia for seed oil which is used as an illuminant, lubricant, and for pickling. The seed oil is one of the richest sources of erucic acid, which is important in industry. The young plants are medicinal and used as a stimulant, antiscorbutic, stomachic, and diuretic. The species is a naturalized weed worldwide, but it is extensively cultivated in Europe and North America as a salad plant.

6. **RAPHANUS** Linnaeus, Sp. Pl. 2: 669. 1753.

萝卜属 luo bo shu

Quidproquo Greuter & Burdet.

Herbs annual or biennial, scabrous or hispid, rarely glabrous. Trichomes simple. Stems erect or prostrate, simple or branched. Basal leaves petiolate, rosulate or not, simple, dentate, lyrate, pinnatifid, or pinnatisect. Cauline leaves similar to basal, petiolate or uppermost subsessile. Racemes several flowered, ebracteate, elongated in fruit. Fruiting pedicels divaricate or reflexed. Sepals oblong or linear, erect, base of lateral pair saccate. Petals yellow, white, pink, or purple, usually with darker veins; blade obovate or suborbicular, apex rounded or emarginate; claw subequaling

or longer than sepals. Stamens 6, strongly tetradynamous; filaments not dilated at base; anthers oblong or oblong-linear, obtuse at apex. Nectar glands 4; median pair oblong; lateral pair prismatic. Ovules 2–22 per ovary. Fruit indehiscent siliques or silicles, often lomentaceous, breaking into 1-seeded units, linear, oblong, ovoid, ellipsoid, or lanceolate, terete or polygonal, sessile, segmented; valvular segment rudimentary, seedless, as thick as or slightly thicker than pedicel, or absent; terminal segment few to many seeded, wingless, corky, smooth or strongly torulose or moniliform, ribbed longitudinally or not ribbed, antrorsely or retrorsely scabrous, or glabrous; replum absent; septum absent; style prominent or obsolete; stigma capitate, entire or slightly 2-lobed. Seeds uniseriate, wingless, oblong, ovoid, or globose, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons conduplicate.

Three species: Mediterranean region; two species (anciently introduced) in China.

- 1a. Petals pink or purple, sometimes white; roots often fleshy; fruit smooth or slightly constricted between seeds 1. *R. sativus*
 1b. Petals yellow or creamy white, rarely pink; roots not fleshy; fruit strongly ribbed and torulose or moniliform 2. *R. raphanistrum*

1. *Raphanus sativus* Linnaeus, Sp. Pl. 2: 669. 1753.

萝卜 *luo bo*

Raphanus acanthiformis J. M. Morel; *R. chinensis* Miller (1768), not (Linnaeus) Crantz (1769); *R. macropodus* H. Léveillé; *R. niger* Miller; *R. raphanistroides* (Makino) Nakai; *R. raphanistrum* Linnaeus var. *sativus* (Linnaeus) Domin; *R. sativus* var. *macropodus* (H. Léveillé) Makino; *R. sativus* f. *raphanistroides* Makino; *R. sativus* var. *raphanistroides* (Makino) Makino; *R. taquetii* H. Léveillé.

Herbs annual or biennial, 10–130 cm tall, glabrous, scabrous, or hispid. Roots fleshy, white, pink, red, or black, linear, fusiform, oblong, or globose, 1–100 × 0.5–45 cm, sometimes slender and not fleshy. Stems simple or branched. Basal leaves with petioles 1–30 cm; leaf blade oblong, obovate, oblanceolate, or spatulate in outline, 2–60 × 1–20 cm, lyrate or pinnatisect, sometimes undivided, margin dentate, apex obtuse or acute; lateral lobes 1–12 on each side of midvein, sometimes absent, oblong or ovate, to 10 × 5 cm. Uppermost cauline leaves subsessile, often undivided, dentate. Fruiting pedicels divaricate or ascending, straight, 0.5–4 cm. Sepals narrowly oblong, 5.5–10 × 1–2 mm, glabrous or sparsely pubescent. Petals purple, pink, or sometimes white, often with darker veins, broadly obovate, 1.2–2.2 cm × 3–8 mm, apex obtuse or emarginate; claw to 1.4 cm. Filaments slender, 5–12 mm; anthers 1.5–2 mm, sagittate at base. Fruit fusiform or lanceolate, sometimes ovoid or cylindrical; seedless valvular segment 1–3.5 mm; seed-bearing distal segment (1–)3–15(–25) × (0.5–)0.7–1.3(–1.5) cm, corky, rounded at base, conical at apex, smooth or rarely slightly constricted between seeds, not ribbed; style 1–4 cm; stigma entire. Seeds globose or ovoid, 2.5–4 mm in diam. Fl. and fr. depending on cultivation time. $2n = 18^*$.

Fields, roadsides, waste areas. Throughout China [native to the Mediterranean region; cultivated worldwide].

Long cultivated in E Asia primarily as a vegetable and medicinal plant. A very variable species with regard to fleshy root color, shape, and size, plant height, degree of division and size of leaves, flower color, and fruit shape and size. Numerous infraspecific taxa have been recognized, and their taxonomy is controversial and highly confused. The interested reader should consult Pistrick (Kulturpflanze 35: 225–321. 1987). Perhaps the most interesting cultivar, which is grown primarily in China and Japan, is var. *longipinnatus* L. H. Bailey, with roots to 50 kg in weight and to 1 m in length and enormous rosettes to 2 m in diam.

2. *Raphanus raphanistrum* Linnaeus, Sp. Pl. 2: 669. 1753.

野萝卜 *ye luo bo*

Herbs annual, (20–)25–60(–75) cm tall, often hispid. Roots not fleshy. Stems erect or prostrate, usually retrorsely hispid. Basal leaves with petioles 1–6 cm; leaf blade oblong, obovate, or oblanceolate in outline, 3–15(–22) × 1–5 cm, lyrate or pinnatifid, sometimes undivided, margin dentate, apex obtuse or acute; lateral lobes 1–4 on each side of midvein, oblong or ovate, to 4 × 2 cm, smaller than terminal lobe. Uppermost cauline leaves subsessile, often undivided, dentate. Fruiting pedicels divaricate or ascending, straight, 0.7–2.5 cm. Sepals narrowly oblong, 7–11 × 1–2 mm, sparsely pubescent. Petals yellow or creamy white, with dark brown or purple veins, broadly obovate, 1.5–2.5 cm × 4–7 mm, apex obtuse or emarginate; claw to 1.5 cm. Filaments slender, 7–12 mm; anthers 2–2.5 mm, sagittate at base. Fruit cylindrical or narrowly lanceolate; valvular segment seedless, 1–1.5 mm; seed-bearing distal segment (1.5–)2–11(–14) cm × (2.5–)3–8(–11) mm, woody or corky, rounded at base, conical at apex, strongly constricted between seeds, strongly ribbed; style 1–5 cm; stigma entire. Seeds oblong or ovoid, 2.5–3.5 × 1.8–2.5 mm. Fl. May–Sep, fr. Jun–Oct. $2n = 18$.

Roadsides, fields, waste areas. Qinghai, Sichuan, Taiwan [native to SW Asia, Europe, and the Mediterranean region; naturalized elsewhere].

7. CRAMBE Linnaeus, Sp. Pl. 2: 671. 1753.

两节芥属 liang jie qi shu

Herbs annual or perennial, rarely subshrubs. Trichomes absent or simple. Stems erect, often simple basally, much branched apically. Basal leaves long petiolate, rosulate or not, simple, dentate, lyrate, or pinnately lobed, often very large. Cauline leaves petiolate, similar to basal leaves. Racemes many flowered, usually lax, ebracteate, often in panicles, elongated considerably in fruit. Fruiting pedicels slender, erect or divaricate. Sepals ovate or oblong, ascending or spreading, not saccate. Petals white or rarely yellow, spreading or ascending, longer than sepals; blade obovate or oblong, apex obtuse; claw much shorter than sepals. Stamens 6, strongly tetradynamous; filaments not dilated at base; lateral pair filiform, wingless, unappendaged; median pairs winged and/or toothed, rarely filiform and toothless; anthers ovate or oblong, obtuse at apex. Nectar glands 4; median pair large, globose or oblong; lateral pair minute, intrastaminal, semiannular. Ovules 2 per ovary. Fruit indehiscent, nutletlike silicles, segmented; basal segment seedless, much shorter than terminal segment; distal segment 1-seeded, globose or ovoid, corky, terete or 4-angled, smooth, rugose, or reticulate; gynophore absent; replum and septum obsolete; style absent, obsolete, or rarely to 1 mm; stigma capitate, entire. Seeds wingless, oblong, pendulous on a basal funicle, plump; seed coat smooth, not mucilaginous when wetted; cotyledons conduplicate.

About 35 species: Africa, Asia, Europe; one species in China.

1. *Crambe kotschyana* Boissier, Diagn. Pl. Orient., ser. 1, 6: 19. 1845.

两节芥 liang jie qi

Crambe cordifolia Steven subsp. *kotschyana* (Boissier) Jafri; *C. cordifolia* var. *kotschyana* (Boissier) O. E. Schulz.

Herbs perennial, 0.5–1.8(–2.5) m tall, with somewhat fleshy roots. Stems simple at base, hirsute. Basal leaves with petioles 10–35 cm; leaf blade cordate-reniform, cordate, or ovate-orbicular, (10–)15–35 × 2–50 cm, densely hirsute abaxially especially along veins, thick, base cordate, margin coarsely toothed, apex acute. Cauline leaves similar to basal, much reduced in size upward. Infructescences large panicles. Fruiting pedicels slender, ascending, (1.5–)2–3.5(–4) cm. Sepals

oblong, 2.5–4 × 1–1.5 mm, sparsely hirsute. Petals white, broadly obovate, 5–9(–11) × 3–4(–6) mm, apex rounded; claw 0.5–1 mm. Median filament pairs flattened, 3–4 mm, with a tooth 0.5–1 mm; lateral pair slender, toothless, 2–2.5 mm; anthers oblong, 0.7–1 mm. Basal fruit segment oblong, seedless, 2–2.5 mm; terminal segment globose, subcorky, 4.5–6.5 mm in diam., smooth, reticulate veined, glabrous; style absent. Seed pale brown, subglobose, 3–4 mm in diam. Fl. Mar–May, fr. May–Jun. $2n = 30$.

Mountain slopes, stony hillsides, grassy foothills; 700–4000 m. Xinjiang, Xizang [Afghanistan, India, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

The leaves and roots are eaten as vegetables.

8. ORYCHOPHRAGMUS Bunge, Enum. Pl. China Bor. 7. 1833.

诸葛菜属 zhu ge cai shu

Herbs annual, biennial, or rhizomatous perennial. Trichomes absent or simple. Stems erect or ascending. Basal leaves petiolate, not rosulate, simple or pinnatisect with 1–6 leafletlike lateral lobes on each side. Cauline leaves petiolate or sessile, not auriculate, auriculate, or amplexicaul at base, entire, dentate, crenate, serrate, or sometimes with 1–4 lateral lobes. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender or stout, divaricate or recurved. Sepals oblong or linear, erect or ascending, base of lateral pair slightly to strongly saccate, margin membranous. Petals purple, lavender, or white; blade obovate or narrowly obovate, apex rounded or emarginate; claw obscurely to strongly differentiated from blade, shorter than to as long as sepals. Stamens 6, tetradynamous; filaments dilated at base; anthers oblong or linear, apiculate at apex. Nectar glands 2, lateral, semiannular or annular. Ovules 20–70 per ovary. Fruit dehiscent siliques, linear, terete or somewhat 4-angled, sessile or shortly stipitate, unsegmented; valves leathery, with an obscure or prominent midvein, glabrous or rarely hairy, torulose; replum rounded; septum complete, membranous, opaque, veinless; style distinct; stigma capitate, 2-lobed, lobes free, decurrent. Seeds uniseriate, wingless, oblong, plump; seed coat alveolate-reticulate, not mucilaginous when wetted; cotyledons conduplicate.

Two species: China, Korea; two species (one endemic) in China.

1a. Cauline leaves auriculate; sepals linear, erect, (6–)8–13(–16) mm, base of lateral pair strongly saccate; petals deep purple, lavender, or rarely white, (12–)16–25(–32) mm, apex rounded, claw well differentiated

and as

- long as sepals; anthers linear, (3–)4–6(–8) mm; style (0.3–)0.7–3(–5.5) cm 1. *O. violaceus*
 1b. Cauline leaves not auriculate; sepals oblong, ascending, 2–3.5 mm, base of lateral pair slightly saccate;
 petals
 white, (6–)7–9 mm, apex shallowly emarginate, claw obscurely differentiated and shorter than sepals;
 anthers
 oblong, 1–1.5 mm; style 0.1–0.3 cm 2. *O. limprichtianus*

1. *Orychophragmus violaceus* (Linnaeus) O. E. Schulz, Bot. Jahrb. Syst. 54(Beibl. 119): 56. 1916.

诸葛菜 zhu ge cai

Brassica violacea Linnaeus, Sp. Pl. 2: 667. 1753;
Arabis chanelii H. Léveillé; *Cardamine potentillifolia*
 H. Léveillé; *Moricandia sonchifolia* (Bunge) J. D.
 Hooker; *M. sonchifolia* var. *homaeophylla* Hance;
Orychophragmus diffusus Z. M. Tan & J. M. Xu; *O.*
hupehensis (Pampanini) Z. M. Tan & X. L. Zhang; *O.*
sonchifolius Bunge; *O. sonchifolius* var. *hupehensis*
 Pampanini; *O. sonchifolius* var. *intermedius* Pampanini;
O. sonchifolius var. *subintegrifolius* Pampanini; *O.*
taibaiensis Z. M. Tan & B. Z. Zhao; *O. violaceus* var.
homaeophyllus (Hance) O. E. Schulz; *O. violaceus* var.
hupehensis (Pampanini) O. E. Schulz; *O. violaceus*
 var. *intermedius* (Pampanini) O. E. Schulz; *O.*
violaceus var. *lasiocarpus* Migo; *O. violaceus* var.
subintegrifolius (Pampanini) O. E. Schulz; *Raphanus*
chanelii H. Léveillé; *R. courtoisii* H. Léveillé; *R.*
violaceus (Linnaeus) Crantz.

Herbs annual or biennial, (6–)15–60(–90) cm tall.
 Stems erect, simple or branched at base, often branched
 above, straight, glabrous or sparsely to densely pilose.
 Basal leaves not rosulate; petiole (1–)2–8(–11) cm;
 blade or terminal leaf lobe cordate, reniform, broadly
 ovate, or suborbicular, (0.4–)1.5–10(–14) × (0.3–)1–4(–
 7) cm, glabrous or pilose, base cordate or rarely obtuse,
 margin coarsely crenate with teeth ending in apiculae,
 apex acute or obtuse; lateral lobes 1–6 on each side,
 sessile or petiolulate, to 3 × 2 cm, sometimes absent.
 Uppermost cauline leaves auriculate or amplexicaul,
 sessile or petiolate, (0.5–)2–9(–15) × (0.2–)1–6(–9) cm,
 margin coarsely and irregularly dentate, rarely entire,
 apex acute or acuminate; auricles to 3 × 4 cm; lateral
 lobes absent or 1–4 on each side, sessile or petiolulate.
 Fruiting pedicels divaricate, glabrous or pilose, nar-
 rower than fruit, (0.6–)0.8–2(–3) cm. Sepals linear,
 erect, connivent, (0.6–)0.8–1.3(–1.6) cm × 1.5–2.5 mm,
 base of lateral pair strongly saccate. Petals deep purple,
 lavender, or white, broadly obovate, (1.2–)1.6–2.5(–3.2)
 cm × (4–)5–9(–11) mm, apex rounded; claw as long as
 sepals. Filaments 0.8–1.8 cm; anthers linear, (3–)4–6(–
 8) mm, distinctly apiculate. Ovules (20–)40–70 per
 ovary. Fruit narrowly linear, stout, terete or somewhat
 4-angled, (3–)4.5–11(–13) cm × 1.5–3 mm; valves
 glabrous or densely hirsute, torulose, usually with a
 prominent midvein; style (0.3–)0.7–3(–5.5) cm; stigma
 slightly to distinctly 2-lobed, lobes decurrent. Seeds

oblong, 2–3(–3.5) × 1–2 mm. Fl. Mar–Jun, fr. May–Jul.
 $2n = 24$.

Roadsides, gardens, forests, fields, thickets, valleys, hillsides, sunny
 slopes; near sea level to 1500 m. Anhui, Gansu, Hebei, Henan, Hubei,
 Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Shaanxi, Shandong,
 Shanxi, Sichuan, Zhejiang [Korea; naturalized in Japan].
 An examination of the holotype of *Arabis chanelii* readily reveals that
 the name is a synonym of *Orychophragmus violaceus*. The former
 was recognized as a distinct species of *Arabis* in FRPS and in Fl.
 Hebei. (1: 538. 1986).

2. *Orychophragmus limprichtianus* (Pax) Al-Shehbaz & G.
 Yang, Novon 10: 351. 2000.

心叶诸葛菜 xin ye zhu ge cai

Cardamine limprichtiana Pax, Jahresber. Schles. Ges.
 Vaterl. Cult. 89, Abt. 2: 27. 1911; *Alliaria grandifolia* Z.
 X. An; *C. hickinii* O. E. Schulz.

Herbs annual or perennial, (12–)25–45(–80) cm tall.
 Stems erect, simple at base, often branched above,
 somewhat flexuous, glabrous or sparsely to densely
 pilose with trichomes to 1.5 mm. Basal leaves not
 rosulate, simple or with 1–3 lateral lobes on each side;
 petiole (3–)5–15(–18) cm, flattened at base; blade or
 terminal leaf lobe cordate to broadly so, (2–)4–8(–10) ×
 (1.5–)2.5–6(–8) cm, glabrous or sparsely to densely
 subappressed pilose abaxially, glabrous or sparsely
 pilose adaxially, sometimes ciliate, base cordate or
 rarely cordate-truncate, margin coarsely crenate with
 teeth ending in apiculae, apex acute or acuminate;
 lateral lobes sessile or petiolulate, 0.1–3 × 0.03–2 cm,
 sometimes absent. Uppermost cauline leaves petiolate,
 much smaller to much larger than basal ones and up to
 18 × 11 cm, base not auriculate, margin coarsely and
 irregularly dentate, rarely crenate, apex caudate or
 acuminate. Fruiting pedicels divaricate or recurved,
 glabrous or pilose, narrower than fruit, (0.5–)1–3(–3.5)
 cm. Sepals oblong, ascending, 2–3.5 × 1–1.5 mm, base
 slightly saccate. Petals white, broadly obovate or
 narrowly obovate, (6–)7–9 × 3–6 mm, apex shallowly
 emarginate; claw obscurely differentiated, shorter than
 sepals. Filaments 2.5–3.5 mm; anthers oblong, 1–1.5
 mm, minutely apiculate. Ovules 20–35 per ovary. Fruit
 narrowly linear, stout, terete, (2–)3–6 cm × 1.5–2 mm;
 valves glabrous or sparsely pilose, strongly torulose,
 inconspicuously veined; style terete, 1–3 mm; stigma 2-
 lobed, slightly decurrent. Seeds oblong, 2–3 × 0.8–1.2
 mm. Fl. Mar–May, fr. Apr–Jun.

• Grassy areas along streams, moist slopes, roadsides, rocky slopes;
 300–1200 m. Anhui, Zhejiang.

Cardamine limprichtiana and *Alliaria grandifolia* were both
 recognized in FRPS and Fl. Zhejiang (3: 51, 55. 1993) as distinct

species in two different tribes (Arabideae and Sisymbriaceae, respectively). However, examination of the type collections of both species and ample additional material reveal that they are conspecific and belong to *Orychophragmus* in the tribe Brassiceae.

Orychophragmus limprichtianus was recorded from Sichuan in Fl. Sichuan. (14: 87. 1999, as *Cardamine limprichtiana*), but the present authors have seen no material from that province.

9. CONRINGIA Heister ex Fabricius, Enum. 160. 1759.

线果芥属 xian guo jie shu

Herbs annual or rarely biennial, mostly glabrous throughout, usually glaucous. Trichomes absent or rarely as minute papillae on pedicels. Stems erect, simple. Basal leaves sessile, cordate-amplexicaul or rarely auriculate at base, entire. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender or thick and as wide as fruit, erect or divaricate. Sepals oblong or linear, erect or ascending, base of lateral pair not saccate or strongly saccate. Petals yellow or white, rarely with purple veins, longer than sepals; blade obovate, oblong, or oblanceolate, apex obtuse; claw somewhat differentiated from blade. Stamens 6, tetradynamous; filaments not dilated at base; anthers narrowly oblong, obtuse at apex. Nectar glands 2, lateral, semiannular, rarely 1 and confluent; median glands absent or rarely present. Ovules 10–50 per ovary. Fruit dehiscent siliques, linear, terete, 4- or 8-angled, or latiseptate; valves veinless or prominently veined, smooth or torulose; replum rounded; septum complete; style to 1.5 mm; stigma capitate, entire or decurrently 2-lobed. Seeds uniseriate, wingless, oblong or elliptic, plump; seed coat reticulate, mucilaginous or not when wetted; cotyledons incumbent or rarely subconduplicate.

Six species: primarily in C and SW Asia, the Caucasus, and Europe; one species in China.

1. Conringia planisiliqua Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 3: 32. no. 564. 1837.

线果芥 xian guo jie

Erysimum planisiliquum (Fischer & C. A. Meyer) Steudel; *Sisymbrium planisiliquum* (Fischer & C. A. Meyer) J. D. Hooker & Thomson.

Herbs (10–)15–50(–75) cm tall, mostly glabrous and glaucous. Stems erect, simple. Basal leaves withered by flowering. Middle cauline leaves broadly ovate or narrowly oblong, (1.2–)2–7(–10) × (0.5–)1–2.5(–3) cm, base deeply cordate-amplexicaul, margin entire, apex shortly mucronate; basal auricles ovate or lanceolate, to 1.5 cm. Fruiting pedicels slender, (4–)7–12(–15) mm, erect-ascending, subappressed to rachis, minutely papillate adaxially or rarely glabrous. Sepals linear, ascending, 3–4.5 × 0.5–1 mm, subequal, not saccate at

base. Petals white or creamy white, with purplish veins extending to apex, oblong, 5–7 × 1.5–2 mm, apex obtuse; claw broad, 3–4 mm. Filaments slender, median pairs 3–4.5 mm, lateral pair 2–2.5 mm; anthers 1–1.2 mm. Ovules 24–44 per ovary. Fruit linear, latiseptate, (3–)3.5–8.5(–10) cm × 1.3–2 mm, erect or ascending, straight or rarely slightly curved, torulose, sessile; valves obscurely veined; style 0.5–1.2(–2) mm; stigma entire. Seeds brown, oblong, 1.5–2 × 0.7–1 mm; cotyledons nearly incumbent. Fl. May–Jun, fr. Jun–Aug. $2n = 14$.

Mountain slopes, sandy deserts, steppe; 300–3600 m. Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

10. LEPIDIUM Linnaeus, Sp. Pl. 2: 643. 1753.

独行菜属 du xing cai shu

Herbs annual, biennial, or perennial, sometimes subshrubs, rarely shrubs or climbers. Trichomes absent or simple. Stems erect or ascending, sometimes creeping, simple or branched basally and/or apically. Basal leaves rosulate or not, simple, entire or pinnately dissected. Cauline leaves petiolate or sessile, base cuneate, attenuate, auriculate, sagittate, or amplexicaul, margin entire, dentate, or dissected. Racemes ebracteate, corymbose, elongated or not in fruit. Fruiting pedicels terete, flattened, or winged, erect or divaricate. Sepals ovate or oblong, rarely orbicular, base of lateral pair not saccate. Petals white, yellow, or pink, erect or spreading, sometimes rudimentary or absent; blade obovate, spatulate, oblong, oblanceolate, orbicular, linear, or filiform, apex obtuse, rounded, or emarginate; claw absent or distinct. Stamens 2 and median, sometimes 6 and tetradynamous or subequal in length, rarely 4 and all median or 2 median and 2 lateral; anthers ovate or oblong. Nectar glands 4 or 6, distinct; median glands always present. Ovules 2 per ovary; placentation apical. Fruit dehiscent silicles, oblong, ovate, obovate, cordate, obcordate, elliptic, or orbicular, strongly angustiseptate; valves veinless or prominently veined, keeled or not, apically winged or wingless; replum rounded; septum complete or perforated, membranous; style absent, obsolete, or distinct, included or exerted from apical notch of fruit; stigma capitate, entire or rarely 2-lobed. Seeds 1 per locule, winged, margined, or wingless, oblong or ovate, plump or flattened; seed coat smooth, minutely reticulate, or papillate, usually copiously mucilaginous when wetted; cotyledons incumbent, rarely accumbent or diplecobal.

About 180 species: all continents except Antarctica; 16 species (two endemic, two introduced) in China.

- 1a. Cauline leaves sessile, amplexicaul, sagittate, or auriculate at base.
- 2a. Flowers yellow; upper leaves amplexicaul-perfoliate, basal leaves 2- or 3-pinnatisect; seeds winged all around 10. *L. perfoliatum*
- 2b. Flowers white; upper leaves auriculate or sagittate, basal leaves entire, dentate, or pinnatifid; seeds wingless.
- 3a. Annuals or biennials, usually densely long pubescent; fruit wings united with lower part of style; leaves herbaceous 1. *L. campestre*
- 3b. Perennials, glabrous, papillate, or crisped hairy; fruit wings free from style; leaves leathery.
- 4a. Basal and lowermost cauline leaves pinnatifid, upper ones subentire; plants glabrous .. 3. *L. cordatum*
- 4b. All leaves entire; plants with curved papillate trichomes 4. *L. cartilagineum*
- 1b. Cauline leaves petiolate or subsessile, cuneate or obtuse at base, if subauriculate then plants with capitate or clavate papillae.
- 5a. Stamens 6; stems glabrous or pubescent with long trichomes (puberulent in *L. alashanicum*).
- 6a. Petals absent; plants puberulent with subclavate papillate trichomes; all leaves linear, entire, margin involute 9. *L. alashanicum*
- 6b. Petals well developed; plants glabrous or pilose with slender trichomes; leaves variously-shaped, at least some pinnatifid, pinnatisect, dentate, or serrate, margin flat.
- 7a. Annuals; fruit (4–)5–6 mm, winged all around, broadly so apically; all or at least lower leaves 1- or 2-pinnatisect or -pinnatifid; cotyledons 3-lobed 2. *L. sativum*
- 7b. Perennials; fruit 1.5–3 mm, wingless or only apically winged; leaves entire, serrate, or dentate; cotyledons entire.
- 8a. Sepals persistent in fruit; fruit cordate at base 7. *L. obtusum*
- 8b. Sepals deciduous shortly after anthesis; fruit cuneate, obtuse, or rounded at base.
- 9a. Basal and lowermost cauline leaves pinnatifid or lyrate, with oblong or linear lateral lobes much smaller than terminal one; style (0.2–)0.3–0.4(–0.5) mm, distinctly exerted from apical notch 8. *L. lacermum*
- 9b. Basal and lowermost leaves dentate, serrate, or subentire; style absent, obsolete, or rarely to 0.1 mm.
- 10a. Uppermost cauline leaves sessile or subsessile, leathery; fruit not carinate; seeds (0.8–)1–1.3 mm 6. *L. latifolium*
- 10b. Uppermost cauline leaves shortly petiolate, papery; fruit carinate; seeds 1.5–2.2 mm 5. *L. ferganense*
- 5b. Stamens 4 or 2; stems puberulent with clavate or capitate papillae, sometimes with minute trichomes.
- 11a. Stamens 4; style longer than and exerted from apical notch of fruit 11. *L. cuneiforme*
- 11b. Stamens 2; style shorter than and included within apical notch of fruit.
- 12a. Fruit orbicular; upper stems and rachis puberulent with curved minute trichomes; cotyledons accumbent 13. *L. virginicum*
- 12b. Fruit elliptic, ovate, or obovate; upper stems and rachis puberulent with straight or clavate papillae; cotyledon incumbent.
- 13a. Middle and upper cauline leaves usually pinnatifid; infructescences capitate; petals 0.5–1 mm 12. *L. capitatum*
- 13b. Middle and upper cauline leaves dentate, serrate, or entire; infructescences elongated racemes; petals absent or rudimentary.
- 14a. Basal leaves 2- or 3-pinnatisect; pedicels puberulent all around with slender trichomes; herbs fetid 14. *L. ruderales*
- 14b. Basal leaves 1-pinnatifid or serrate; pedicel papillate only adaxially; herbs not fetid.
- 15a. Fruit broadly obovate, widest above middle; raceme papillae terete or subclavate 15. *L. densiflorum*
- 15b. Fruit elliptic, widest at middle; raceme papillae clavate or capitate .. 16. *L. apetalum*

1. *Lepidium campestre* (Linnaeus) R. Brown in W. T. Aiton, Hortus Kew. 4: 88. 1812.
绿独行菜 lu du xing cai

Thlaspi campestre Linnaeus, Sp. Pl. 2: 646. 1753.
Herbs annual or biennial, (8–)12–50(–60) cm tall, densely hirsute with spreading trichomes. Stems erect,

simple or branched above. Basal leaves rosulate; petiole (0.5–)1.5–6 cm; leaf blade oblanceolate or oblong, (1–)2–6(–8) × 0.5–1.5 cm, base attenuate, margin entire, pinnatifid, or lyrate, apex obtuse or subacute. Cauline leaves sessile; leaf blade oblong, lanceolate, or narrowly deltoid-lanceolate, (0.7–)1–4(–6.5) cm × (2–) 5–10(–15) mm, base sagittate or auriculate, margin dentate or subentire, apex acute to subobtusate. Fruiting pedicels slender, horizontal, (3–)4–8(–10) mm, pubescent. Sepals oblong, (1–) 1.3–1.8 mm, erect to ascending, pubescent or glabrous. Petals white, spatulate, (1.5–)1.8–2.5(–3) × (0.2–)0.5–0.7 mm, base clawed, apex rounded. Stamens 6; filaments (1.2–)1.5–1.8(–2) mm; anthers oblong, 0.3–0.5 mm. Fruit ovate or broadly oblong, curved adaxially above middle, (4–)5–6(–6.5) × (3–)4–5 mm, winged distally, apex emarginate; valves vesicled; wings 1–2 mm; style united basally with wings, free portion 0.2–0.5 (–0.7) mm, included in apical notch. Seeds dark brown, oblong, 2–2.3(–2.8) × 1–1.3 mm, papillate, wingless; cotyledons incumbent. Fl. May–Jun, fr. Jun–Aug. $2n = 16$.

Fields, roadsides, pastures, waste grounds, disturbed sites, mountain slopes. Heilongjiang, Liaoning, Shandong [Russia; SW Asia, Europe; introduced elsewhere].

2. *Lepidium sativum* Linnaeus, Sp. Pl. 2: 644. 1753.

家独行菜 *jia du xing cai*

Herbs annual, (10–)20–80(–100) cm tall. Stems erect, simple or branched, sparsely crisped pilose above. Basal leaves not rosulate; petiole 1–4 cm; leaf blade variable in shape, 1- or 2-pinnatifid or -pinnatisect, 2–8(–10) × 1–3(–5) cm; ultimate lobes ovate or oblong, margin dentate, apex acute. Cauline leaves petiolate; leaf blade similar to basal ones but less divided, with 1–4 lateral lobes on each side of midvein; uppermost leaves subsessile, linear, margin entire. Fruiting pedicels suberect, appressed to rachis, or ascending, straight, 1.5–4(–6) mm, terete or slightly flattened, glabrous. Sepals oblong, 1–1.8 × 0.5–0.8 mm, glabrous or pubescent abaxially. Petals white or lavender, spatulate or obovate, 2.5–3.5(–4) × 0.7–1.4 mm, base attenuate. Stamens 6; filaments 1.5–2 mm; anthers oblong, 0.4–0.5 mm. Fruit oblong-ovate or elliptic, (4–)5–6(–7) × 3–4.5 (–5.5) mm, base rounded, margin and apex broadly winged, apex emarginate; wings 1–1.5 mm at apex; apical notch 0.2–0.5 mm; style 0.2–0.5(–0.8) mm, free from wings, included in or rarely exerted from apical notch. Seeds reddish brown, oblong, 2–2.6 × 1–1.3 mm, wingless; cotyledons incumbent, 3-lobed. Fl. Jun–Jul, fr. Aug–Sep. $2n = 24, 32^*$.

Cultivated or naturalized; near sea level to 1700 m. Heilongjiang, Jiangsu, Jilin, Shandong, Xinjiang, Xizang [Afghanistan, India, Japan, Kashmir, Kazakstan, Kyrgyzstan, Nepal, Pakistan, Russia, Sikkim,

Tajikistan, Turkmenistan, Uzbekistan, Vietnam; N Africa, SW Asia, Europe; naturalized in North and South America].

3. *Lepidium cordatum* Willdenow ex Steven in de Candolle, Syst. Nat. 2: 554. 1821.

心叶独行菜 *xin ye du xing cai*

Herbs perennial, 15–40 cm tall, glabrous except for pilose sepals and pedicels, glaucous. Stems erect, branched basally and above. Basal leaf blade obovate, pinnatifid, withered by fruiting. Cauline leaves sessile; leaf blade oblong or lanceolate, 0.3–1.8(–3) cm × 2–7(–13) mm, subleathery, base sagittate or auriculate, margin serrulate or entire, apex acute or obtuse. Fruiting pedicels slender, straight, 2–4 mm, pilose in flower, glabrous in fruit. Sepals caducous, broadly ovate or suborbicular, 0.8–1.2 × 0.8–1 mm, sparsely pilose with crisped trichomes, broadly white at margin and apex. Petals white, obovate, 1.5–1.8 × 0.8–1 mm, base clawed, apex rounded. Stamens 6; filaments 0.7–1.5 mm, often conspicuously dilated at base; anthers oblong, 0.2–0.4 mm. Fruit suborbicular or broadly ovate-cordate, 2–2.5(–2.8) × 1.8–2.3 mm, wingless, base sometimes subcordate; apical notch absent or rarely ca. 0.05 mm; style 0.1–0.3 mm; stigma discoid, distinctly broader than style. Seeds reddish brown, oblong, 0.9–1.1 × 0.5–0.6 mm, papillate; cotyledons incumbent. Fl. May–Jun, fr. Jun–Jul.

Saline meadows or lowlands; 1000–3900 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang, Xizang [Kazakstan, Mongolia, Russia, Tajikistan].

The above first record from Xizang is based on *Ladygin 312* (LE).

4. *Lepidium cartilagineum* (J. Mayer) Thellung, Vierteljahrsschr. Naturf. Ges. Zürich 51: 173. 1906.

碱独行菜 *jian du xing cai*

Thlaspi cartilagineum J. Mayer, Abh. Böhm. Ges. Wiss. 235. 1786; *Lepidium cartilagineum* subsp. *crassifolium* (Waldstein & Kitaibel) Thellung; *L. crassifolium* Waldstein & Kitaibel; *L. kabulicum* K. H. Rechinger.

Herbs perennial, (10–)15–35(–40) cm tall, puberulent with papillate or curved trichomes; caudex with fibrous petiolar remains of previous years. Stems erect, branched. Basal leaves rosulate, fleshy, persistent; petiole 1.5–5(–7) cm; leaf blade ovate, oblong, or elliptic, (0.7–)1.7–4(–5) × (0.5–)0.8–1.5(–2.2) cm, usually glabrous, base cuneate or attenuate, margin entire, apex acute or obtuse. Cauline leaves sessile; leaf blade elliptic, oblong, or lanceolate, 0.2–4.7 cm × 1–9 mm, glabrous or with subappressed trichomes, base usually amplexicaul, margin entire, apex acute. Fruiting pedicels divaricate, straight or slightly curved, 3–6 mm, puberulent adaxially. Sepals oblong, 1–1.2 × ca. 0.5 mm, pilose with crisped trichomes, white at margin and apex, apex acute. Petals white, obovate or oblanceolate, 1–1.6 × 0.3–0.8 mm, apex rounded; claw obscurely differentiated. Stamens 6; filaments 0.8–1.1 mm; anthers oblong, 0.2–0.3 mm. Fruit ovate, 2.3–3.3 × 2.1–2.7 mm; valves glabrous, prominently reticulate veined;

wing 0.1–0.2 mm; apical notch 0.05–0.2 mm; style 0.2–0.4 mm, exerted from apical notch. Seeds brown to reddish brown, ovate, 1.3–1.7 × 0.7–1 mm, papillate; cotyledons incumbent. Fl. Aug. $2n = 16$.

Saline lowlands or steppe; 400–1000 m. Nei Mongol, Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, C and S Europe].

5. *Lepidium ferganense* Korshinsky, *Izv. Imp. Akad. Nauk*, ser. 5, 9: 417. 1898.

全缘独行菜 *quan yuan du xing cai*

Herbs perennial, (25–)35–100(–110) cm tall. Stems simple few from base, many branched above, glabrous. Basal and lower cauline leaves long petiolate, papery; leaf blade linear-lanceolate or linear-oblong, (2–)3–12(–14) × (0.3–)1–2.5(–4) cm, base cuneate or attenuate, margin serrate, apex often acute. Upper cauline leaves shortly petiolate; leaf blade linear, (1–)2–8(–10) cm × (1–)2–7(–10) mm, base attenuate or cuneate, margin entire, apex acute. Fruiting pedicels (3–)4–5(–6) mm, slender, divaricate. Sepals deciduous, ovate, 1–1.5 × 0.8–0.9 mm, glabrous, white at margin and apex. Petals white, broadly obovate, (2–)2.5–3 × 1–1.4 mm, apex rounded; claw 0.7–1 mm. Stamens 6; filaments 0.9–1.3 mm; anthers ovate, 0.2–0.3 mm. Fruit ovate-oblong or suborbicular, 2.5–3.5 × 2–2.5 mm, glabrous, wingless, carinate at replum, base rounded; apical notch absent or obsolete; style obsolete or rarely to 0.1 mm; stigma wider than style. Seeds reddish brown, oblong, 1.5–2.2 × 0.7–1.2 mm, often 3-angled, wingless, finely papillate; cotyledons incumbent. Fl. and fr. May–Jul.

Dry mountain slopes; 600–2100 m. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Tajikistan, Uzbekistan].

6. *Lepidium latifolium* Linnaeus, *Sp. Pl.* 2: 644. 1753.

宽叶独行菜 *kuan ye du xing cai*

Lepidium affine Ledebour; *L. latifolium* subsp. *affine* (Ledebour) Kitagawa; *L. latifolium* var. *affine* (Ledebour) C. A. Meyer; *L. latifolium* subsp. *sibiricum* Thellung; *L. sibiricum* Schweigger (1812), not Pallas (1776).

Herbs perennial, (20–)35–120(–150) cm tall. Stems erect, many branched above, slightly woody at base, glabrous or pubescent, often glaucous. Leaves leathery; petiole of basal and lower cauline leaves 1–7(–11) cm; leaf blade elliptic-ovate or oblong, (2–)3.5–15(–25) × (0.5–)1.5–5(–8) cm, glabrous or pubescent with usually curved trichomes, base attenuate, margin usually serrate, apex obtuse to subacute. Upper cauline leaves sessile or sessile; leaf blade elliptic-ovate, oblong, or lanceolate, 1–9 × 0.3–4.5 cm, base cuneate, not auriculate, margin serrate or entire, apex acute. Inflorescence paniculate, ultimate branches subcapitate. Fruiting pedicels slender, 2–5(–6) mm, glabrous or rarely pubescent. Sepals deciduous, oblong

or suborbicular, 1–1.4 × 0.8–0.9 mm, glabrous or pubescent, white at margin and apex. Petals white, obovate, 1.8–2.5 × (0.8–)1–1.3 mm, apex rounded; claw 0.7–1 mm. Stamens 6; filaments 0.9–1.4 mm; anthers ovate, 0.4–0.5 mm. Fruit oblong-elliptic, ovate-elliptic, or suborbicular, (1.6–)1.8–2.4(–2.7) × 1.3–1.8 mm, pubescent or glabrous, not carinate, wingless, base rounded; apical notch absent or obsolete; style obsolete. Seeds light brown, oblong-ovate, (0.8–)1–1.3 × 0.7–0.9 mm, compressed, wingless, finely papillate; cotyledons incumbent. Fl. May–Sep, fr. Jun–Oct. $2n = 24$.

Fields, roadsides, slopes, saline meadows; 100–4300 m. Gansu, Hebei, Heilongjiang, Henan, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, S Europe].

The above first record from Sichuan is based on *Martin s.n.*, 30 May 1890 (LE). Forms with sessile leaves and pubescent fruit are recognized as *Lepidium latifolium* subsp. or var. *latifolium*, whereas those with sessile leaves and glabrous fruit have variously been recognized as *L. affine*, *L. latifolium* var. *affine*, and *L. latifolium* subsp. *sibiricum*. However, such distinction is artificial, as plants with glabrous and pubescent fruit are often found in the same population.

The seeds are used in Gansu and N Shaanxi for medicine.

7. *Lepidium obtusum* Basiner, *Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg* 2: 203. 1844.

钝叶独行菜 *dun ye du xing cai*

Lepidium latifolium Linnaeus subsp. *obtusum* (Basiner) Thellung; *L. loulanicum* Z. X. An & G. L. Zhou.

Herbs perennial, (30–)45–85(–110) cm tall. Stems erect, branched, glabrous. Basal and lowermost cauline leaves petiolate, withered early. Upper cauline leaves sessile or subsessile; leaf blade oblong-ovate, oblong, or lanceolate, 0.3–9(–15) × 0.1–2.5(–4) cm, leathery, glabrous or rarely sparsely pubescent, base cuneate or obtuse, margin entire or rarely serrulate, apex obtuse or acute. Inflorescence paniculate, ultimate branches capitate. Fruiting pedicels 1–3(–4) mm, slender, pubescent. Sepals persistent, ovate or suborbicular, 0.9–1.5 × 0.8–1.5 mm, sparsely crisped pilose abaxially, broadly white at margin and apex. Petals white, obovate, 1.3–1.8(–2.2) × 0.8–0.9(–1) mm, base shortly clawed, apex rounded. Stamens 6; filaments 1–1.4 mm, slightly dilated or not dilated at base; anthers oblong, 0.3–0.4 mm. Fruit broadly ovate, 1.6–2.3 × 1.8–2.2 mm, glabrous or rarely sparsely puberulent, wingless, carinate at replum, base cordate; apical notch absent or obsolete; style obsolete or rarely to 0.1 mm; stigma discoid, much broader than style. Seeds brown, oblong, 0.8–1.1 × 0.5–0.6 mm, wingless; cotyledons incumbent. Fl. and fr. Jul–Aug. $2n = 16$.

Pastures, field margins, waste places, deserts; 400–2800 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang, Xizang [India, Kazakstan, Mongolia, Russia, Tajikistan, Uzbekistan].

The above first records from Nei Mongol and Ningxia are based on *Petrov s.n.*, 6 Jul 1958 (LE), and *Yu Zhaoying 1039* (MO), respectively.

8. *Lepidium lacerum* C. A. Meyer in Ledebour, Fl. Altaic. 3: 191. 1831.

裂叶独行菜 *lie ye du xing cai*

Herbs perennial, (15–)20–50(–60) cm tall, glabrous or sparsely pilose with short trichomes. Stems usually few from base, branched above. Basal and lowermost cauline leaves with petioles 0.5–4(–6) cm, flattened at base, often ciliate; leaf blade oblong or oblanceolate in outline, pinnatifid, lyrate, or incised, (0.5–)1.5–6(–9) × (0.2–)0.7–2(–3) cm, base attenuate; lateral lobes 1–4 on each side of midvein, oblong, linear, or lanceolate, much smaller than terminal lobe, entire. Upper cauline leaves sessile or shortly petiolate, linear to linear-lanceolate, 0.5–2 cm × 0.5–2 mm, entire or sparsely serrate. Fruiting pedicels divaricate-ascending, 3–6 mm, slender, straight, sparsely crisped pilose adaxially. Sepals broadly obovate or suborbicular, 1–1.5 × 0.8–1.2 mm, abaxially sparsely crisped pilose or glabrous, with a broad white margin and apex. Petals white, obovate, 2–2.7(–3) × (1–)1.2–1.7 mm. Stamens 6; filaments 1–1.8 mm; anthers ovate, 0.2–0.3 mm. Fruit ovate, 2.5–3 × 1.8–2.2 mm, glabrous, wingless; apical notch obsolete or to 0.1 mm; style 0.2–0.5 mm, exerted from apical notch. Seeds brown, oblong, 1.2–1.5 × 0.7–0.9 mm; cotyledons incumbent. Fl. and fr. May–Jul.

Slopes, semideserts. Xinjiang [Kazakhstan, Mongolia].

This above first record of *Lepidium lacerum* from China is based on *Yunatov & Yuan 42a* (LE), collected 10–12 km N of Urumqi, as well as on *Xinjiang Team 268* (PE), collected near Urumqi.

9. *Lepidium alashanicum* H. L. Yang, Acta Phytotax. Sin. 19: 241. 1981.

阿拉善独行菜 *a la shan du xing cai*

Herbs perennial, sometimes flowering in first year, 4–15 cm tall, puberulent with subclavate papillate trichomes. Stems erect, branched at base and above. Basal leaves subrosulate; petiole 0.5–2 cm, strongly flattened at base, persistent; leaf blade linear or oblanceolate-linear, 1–3.5 cm × 0.5–1.5 mm, puberulent, margin entire, involute, apex acute to subobtuse. Upper cauline leaves sessile; leaf blade linear, 0.5–2 cm × 0.5–1.5 mm, margin entire, involute. Fruiting pedicels 1.5–4 mm, divaricate, slender, straight or slightly recurved, puberulent adaxially with clavate trichomes. Sepals oblong-ovate, 0.5–0.7 × 0.3–0.4 mm, crisped pilose adaxially, purplish near apex. Petals absent. Stamens 6; filaments 0.5–0.7 mm; anthers broadly ovate, ca. 0.1 mm. Fruit broadly ovate to elliptic-ovate, 2.5–3 × 2–2.5 mm, glabrous; wing apical, 0.2–0.4 mm; apical notch 0.1–0.2 mm; style obsolete or to 0.1 mm, included in apical notch. Seeds yellowish brown, oblong, 1.2–1.5 × 0.6–0.8 mm; cotyledons incumbent. Fl. and fr. Jun–Aug.

• Dry slopes. Gansu, Nei Mongol.

10. *Lepidium perfoliatum* Linnaeus, Sp. Pl. 2: 643. 1753.

抱茎独行菜 *bao jing du xing cai*

Herbs annual or biennial, (7–)15–40(–65) cm tall, glabrous throughout or sparsely pubescent below, often slightly glaucous. Stems erect, simple at base, branched above. Leaves strongly dimorphic. Basal and lowermost cauline leaves with petioles (0.5–)1–2(–4) cm; leaf blade 2- or 3-pinnatifid or -pinnatisect, (1–)3–8(–15) cm; ultimate lobes linear or narrowly oblong. Upper cauline leaves sessile; leaf blade broadly ovate, cordate, or suborbicular, (0.5–)1–3(–4) × (0.5–)1–2.5(–3.5) cm, base deeply cordate-amplexicaul, margin entire, apex acute. Fruiting pedicels divaricate, 3–5(–7) mm, slender, straight, glabrous, terete. Sepals yellowish green, oblong, 0.8–1(–1.3) × 0.5–0.8 mm. Petals yellow, narrowly spatulate, 1–1.5(–1.9) × 0.2–0.5 mm, base attenuate to a claw ca. 0.5 mm. Stamens 6; filaments 0.6–0.9 mm; anthers 0.1–0.2 mm. Fruit rhombic or orbicular, 3–4.5(–4.8) × 3–4 mm narrowly winged distally; wings apical, 0.2–0.4 mm; apical notch to ca. 0.3 mm; style 0.1–0.3 mm, as long as or shorter than apical notch. Seeds dark brown, ovate, 1.6–2(–2.3) × 1.2–1.4 mm, narrowly winged all around; cotyledons incumbent. Fl. Mar–Jun, fr. May–Jul. $2n = 16$.

Waste places, dry sandy slopes; near sea level to 1000 m. Gansu, Jiangsu, Liaoning, Shanxi, Xinjiang [Afghanistan, India, Japan, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced elsewhere].

Sometimes eaten as a vegetable or used medicinally as an anti-scorbutic.

11. *Lepidium cuneiforme* C. Y. Wu, Icon. Cormophyt. Sin. 2: 36. 1972.

楔叶独行菜 *xie ye du xing cai*

Lepidium chinense Franchet, Pl. David. 1: 39. 1883, not Stokes (1812); *L. capitatum* J. D. Hooker var. *chinense* Thellung.

Herbs biennial, (8–)20–45(–60) cm tall, puberulent with clavate to subcapitate papillate trichomes. Stems erect, simple or branched. Basal and lowermost cauline leaves with petioles 5–10 mm; leaf blade spatulate or oblanceolate, 1–5 × 0.4–1.6 cm, base attenuate or cuneate, margin pinnatifid or irregularly crenulate, apex obtuse to subacute. Upper cauline leaves usually sessile; leaf blade obovate or oblanceolate, (0.6–)1–3(–3.8) cm × (2–)5–10(–12) mm, base subauriculate or cuneate, margin serrate along distal half, apex acute or obtuse. Fruiting pedicels slender, divaricate, recurved, 3–6 mm, puberulent adaxially with clavate trichomes. Sepals oblong, 0.7–1 × 0.4–0.6 mm, white at margin and apex, glabrous or with crisped trichomes. Petals white, obovate or suboblong, 0.5–0.7 × 0.2–0.3 mm, claw indistinct, apex rounded to obtuse. Stamens 4; filaments 0.9–1 mm; anthers ca. 0.1–0.3 mm. Fruit

broadly elliptic, rarely ovate or suborbicular, 2.9–3.4 × 2.4–2.8 mm, glabrous; wing apical, 0.1–0.2 mm; apical notch 0.05–0.1 mm; style 0.1–0.3 mm, usually exerted from apical notch. Seeds brown, oblong-ovate, 1.4–1.5 × ca. 0.8 mm, pitted; cotyledons incumbent. Fl. and fr. Mar–Aug.

• Mountain slopes, roadsides, river beaches; 600–2700 m. Gansu, Guizhou, Jiangxi, Qinghai, Shaanxi, Sichuan, Yunnan.

12. *Lepidium capitatum* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 175. 1861.

头花独行菜 *tou hua du xing cai*

Lepidium kunlunshanicum G. L. Zhou & Z. X. An. Herbs annual or biennial, (5–)10–35(–50) cm tall, densely covered with capitate or clavate papillate trichomes. Stems prostrate or rarely suberect, branched basally and above. Basal and lower cauline leaves with petioles 0.5–4 cm; leaf blade oblong, spatulate, or lanceolate, (0.5–)1–4(–7) × 0.2–2 cm, usually glabrous, pinnatifid, base attenuate; lobes oblong, lanceolate, or linear, 2–8(–15) × 0.5–3(–5) mm, 1- or 2-pinnatifid or -partite, serrate, or entire. Upper cauline leaves shortly petiolate or sessile, similar to lowermost leaves, progressively smaller upward. Racemes capitate, elongated slightly or not elongated in fruit. Fruiting pedicels slender, divaricate, slightly recurved or straight, (1–)2–3(–4) mm, puberulent adaxially with clavate or capitate trichomes. Sepals oblong, 0.8–1 × 0.3–0.4(–0.5) mm, glabrous or with crisped trichomes. Petals white, narrowly obovate, (0.5–)0.6–0.9(–1) × 0.2–0.3 mm, base cuneate, apex subtruncate or emarginate. Stamens 4; filaments 0.8–1 mm; anthers ovate, 0.1–0.2 mm. Fruit broadly ovate, 1.8–2.5 × 1.7–1.8 mm, glabrous; wing apical, 0.1–0.3 mm; apical notch 0.05–0.3 mm; style obsolete, rarely to 0.15 mm, included in apical notch. Seeds brown, oblong-ovate, 1–1.1 × 0.6–0.7 mm; cotyledons incumbent. Fl. and fr. Jun–Sep.

Mountain slopes, disturbed areas, plains; 2700–5000 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Sikkim].

13. *Lepidium virginicum* Linnaeus, Sp. Pl. 2: 645. 1753.

北美独行菜 *bei mei du xing cai*

Herbs annual or biennial, (6–)15–55(–70) cm tall, pubescent with curved, usually subappressed trichomes. Stems erect, branched above. Basal leaves with petioles 0.5–3.5 cm; leaf blade obovate, spatulate, or oblanceolate, (1–)2.5–10(–15) × 0.5–3(–5) cm, margin pinnatifid or lyrate; lobes oblong, serrate or dentate, apex acute. Cauline leaves shortly petiolate; leaf blade oblanceolate or linear, 1–6 cm × (2–)5–10 mm, base attenuate to subcuneate, margin serrate or entire, apex acute. Inflorescence lax or rarely dense; puberulent with curved, subappressed trichomes. Fruiting pedicels slender, straight, spreading, 2.5–4(–6) mm, usually glabrous abaxially. Sepals oblong, (0.5–)0.7–1(–1.1) × 0.5–0.7 mm, margin and apex white, pi-

lose outside. Petals white, spatulate, 1–1.5(–2) × 0.2–0.6 mm, base attenuate, apex rounded, rarely rudimentary. Stamens 2; filaments 0.6–0.8 mm; anthers 0.1–0.2 mm. Fruit orbicular, 2.5–3.5(–4) mm in diam., narrowly winged apically, apex emarginate; apical notch 0.2–0.5 mm; style 0.1–0.2 mm, included in apical notch. Seeds reddish brown, ovate-oblong, usually narrowly winged at least distally, 1.3–1.7(–1.9) × 0.7–1 mm; cotyledons accumbent. Fl. Apr–Jun, fr. May–Sep. $2n = 32^*$.

Fields, roadsides, waste places, grassy areas; near sea level to 1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Japan, Pakistan, Russia; native to North America; introduced elsewhere]. The seeds are used medicinally.

14. *Lepidium ruderales* Linnaeus, Sp. Pl. 2: 645. 1753.

柱毛独行菜 *zhu mao du xing cai*

Herbs annual or biennial, (5–)10–35(–55) cm tall, fetid, puberulent with terete papillate trichomes. Stems erect or ascending, branched above. Basal leaves with petioles 1–2(–3) cm; leaf blade (1 or)2- or 3-pinnatisect, (1.5–)3–5(–6) × (0.5–)0.7–2(–2.5) cm, glabrous except for ciliate margin; ultimate lobes oblong, entire or rarely toothed, acute. Upper cauline leaves sessile; leaf blade linear, (0.4–)1–2(–3) cm × (0.3–)0.5–2.5(–3.5) mm, sparsely pubescent, base cuneate, not auriculate, margin usually entire, ciliate, apex obtuse to subacute. Fruiting pedicels slender, divaricate, straight or slightly curved, (1.5–)2–4(–5) mm, puberulent all around. Sepals oblong, 0.5–0.9(–1) × 0.2–0.4 mm, puberulent with papillate trichomes, margin and apex white. Petals absent, sometimes rudimentary and to 0.4 mm. Stamens 2; filaments 0.7–0.8 mm; anthers ovate, 0.1–0.2 mm. Fruit broadly elliptic, (1.5–)1.8–2.5(–3) × 1.5–2(–2.3) mm, narrowly winged apically; apical notch 0.1–0.2 mm; style to 0.1 mm, included in apical notch. Seeds brown, oblong or ovate-oblong, 1–1.5 × 0.6–0.7 mm, wingless, finely papillate; cotyledons incumbent. Fl. and fr. May–Jul. $2n = 16, 32^*$.

Sandy soil, pastures; 300–1100 m. Xinjiang [India, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; introduced in North America].

Lepidium ruderales was recorded in FRPS from Gansu, Henan, Hubei, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, and Shandong. The present authors have seen no material from these provinces, and it is likely that these records are based on misidentified plants of *L. apetalum*. The former is a fetid plant, puberulent with slender trichomes, with basal leaves (1 or)2- or 3-pinnatisect, cauline leaves nonauriculate, and fruiting pedicels terete, puberulent all around with slender trichomes. By contrast, *L. apetalum* is a nonfetid plant, puberulent with capitate or clavate trichomes, with basal leaves pinnatifid, cauline leaves often subauriculate, and fruiting pedicels slightly flattened or obscurely winged, puberulent almost always only adaxially.

15. *Lepidium densiflorum* Schrader, Index Sem. Hort. Gött. 4. 1832.

密花独行菜 *mi hua du xing cai*

Lepidium neglectum Thellung.

Herbs annual or biennial, (10–)25–50(–65) cm tall, puberulent with minute straight papillae, rarely glabrous. Stems erect, branched above. Basal leaves rosulate, withered early; petiole 0.5–1.5(–2) cm; leaf blade often oblanceolate, rarely spatulate or oblong, (1.5–)2.5–8(–11) cm × 5–10(–20) mm, base attenuate, margin coarsely serrate or pinnatifid, apex acute. Cauline leaves shortly petiolate; leaf blade narrowly oblanceolate or linear, irregularly serrulate or dentate, rarely subentire, reduced in size upward. Infructescences dense; rachis papillae straight, slender or subclavate. Fruiting pedicels slender, divaricate, slightly recurved, somewhat flattened, (1.5–)2–3.5(–4) mm, puberulent or papillate adaxially. Sepals oblong, 0.5–0.8(–1) × 0.3–0.5 mm, glabrous or sparsely pilose near apex, margin white. Petals usually absent, rarely filiform and 0.3–0.9 mm. Stamens 2; filaments filiform, 0.6–1 mm; anthers ovate, 0.1–0.2 mm. Fruit obovate to obovate-suborbicular, (2–) 2.5–3(–3.5) × 1.5–2.5(–3) mm, widest above middle, apex obtuse or emarginate; apical wings ca. 0.5 mm; apical notch 0.2–0.4 mm; style 0.1–0.2 mm, included in apical notch. Seeds brown, ovate, wingless or obscurely winged, 1.1–1.3(–1.5) × 0.8–0.9 mm; cotyledons incumbent. Fl. May–Jun, fr. Jun–Jul. $2n = 32$.

Seashores, sandy places, roadsides; near sea level to 3800 m. Hebei, Heilongjiang, Jilin, Liaoning, Shandong, Yunnan [Korea, Mongolia, Russia, Tajikistan; native to North America; introduced elsewhere].

16. *Lepidium apetalum* Willdenow, Sp. Pl. 3: 439. 1800.

独行菜 du xing cai

Lepidium chitungense Jacot.

Herbs annual or biennial, (5–)10–25(–40) cm tall, puberulent with clavate or capitate trichomes. Stems erect, branched basally and above. Petiole of basal leaves (0.5–)1–3 cm; leaf blade oblong, lanceolate, or oblanceolate, 1.5–4(–5) × 0.7–1.2 (–1.5) cm, pinnatifid, sinuate, or dentate. Upper cauline leaves sessile; leaf blade narrowly lanceolate, linear-oblong, or linear, 0.6–3(–4) cm × 1–3(–5) mm, base subauriculate or sometimes cuneate, margin remotely serrate or entire, apex acute to subobtusate. Fruiting pedicels slender, often recurved, 2–4(–5) mm, puberulent only adaxially with clavate or capitate trichomes, slightly flattened or narrowly winged. Sepals caducous, oblong, 0.7–0.8 × 0.3–0.4 mm, glabrous or puberulent, white at margin and apex. Petals absent, or rudimentary, linear, ca. 0.3 mm. Stamens 2; filaments 0.7–0.8 mm; anthers broadly ovate, 0.1–0.2 mm. Fruit broadly elliptic, 2.2–3.1 × 1.7–2.3 mm, widest at middle, apex narrowly winged; apical notch 0.1–0.3 mm; style 0.05–0.15 mm, included in apical notch. Seeds reddish brown, ovate-oblong, 1.1–1.3 × 0.6–0.8 mm, wingless, finely papillate; cotyledons incumbent. Fl. Apr–Aug, fr. May–Sep.

Roadsides, slopes, waste places, ravines, plains, fields; 400–4800 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [India, Japan, Kazakhstan, Korea, Mongolia, Nepal, Pakistan].

The above first record from Mongolia is based on *Chaney 498* (US).

11. CORONOPUS Zinn, Cat. Pl. Hort. Gott. 325. 1757, nom. cons.

臭芥属 xiu qi shu

Senebiera de Candolle.

Herbs annual, biennial, or perennial with woody caudex. Trichomes absent or simple. Stems prostrate or ascending, rarely erect. Basal leaves sometimes rosulate, 1–3-pinnatisect, rarely serrate. Cauline leaves petiolate or sessile, entire, serrate, or pinnatisect. Racemes many flowered, ebracteate. Fruiting pedicels erect or divaricate. Sepals ovate, oblong, or elliptic, ascending or spreading, base of lateral pair not saccate. Petals white or violet, longer or shorter than sepals, sometimes vestigial or absent; blade obovate, oblong, oblanceolate-linear, or subulate, obtuse; claw usually absent. Stamens 6 and tetradynamous, sometimes 2 and median; filaments usually dilated at base; anthers ovate, obtuse. Nectar glands 2, 4, or 6, median ones present. Ovules 2 per ovary. Fruit indehiscent silicle, didymous, schizocarpic, reniform, cordate, or obcordate, angustiseptate, sessile, breaking into 2, 1-seeded, closed halves (mericarps); valves woody, obscurely to prominently veined, glabrous or hairy, keeled or rounded, reticulate, rugose, verrucose, tuberculate, or rarely smooth; replum rounded; septum reduced to a rim or absent; style obsolete or to 1 mm; stigma capitate, entire. Seeds wingless, oblong, reniform, ovoid, or globose, plump or sometimes flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

Ten species: Africa, SW Europe, South America; two species (introduced) in China.

The limits of *Coronopus* are artificial and the genus is polyphyletic; it should perhaps be united with *Lepidium*.

- 1a. Cauline leaves entire, 1–5 mm wide; stems puberulent with minute trichomes to 0.15 mm 1. *C. integrifolius*
1b. Cauline leaves pinnatisect or pinnatifid, broader; stems pilose with trichomes to 1 mm 2. *C. didymus*

1. *Coronopus integrifolius* (de Candolle) Sprengel, Syst. Veg. 2: 853. 1825.

单叶臭芥 dan ye xiu qi

Senebiera integrifolia de Candolle, Mém. Soc. Hist. Nat. Paris 1: 144. 1799; *Coronopus englerianus*

Muschler; *C. linoides* (de Candolle) Sprengel; *C. wrightii* H. Hara; *Senebiera linoides* de Candolle.

Herbs annual or perennial, (7–)10–30(–45) cm tall, puberulent with cylindrical or clavate, often curved trichomes to 0.15 mm. Stems prostrate, ascending, or erect, usually several from at base, branched above.

Basal leaves not rosulate, soon deciduous; petiole 5–10 mm; blade lanceolate or spatulate, 2–4 cm, margin entire, dentate, or pinnatifid, apex acute. Middle cauline leaves narrowly lanceolate, oblanceolate, or linear (0.5–)1–5 (–7.5) cm × 1–5 mm, base attenuate and petiolelike, margin entire or rarely serrate or incised, apex acute or acuminate. Racemes terminal or lateral, leaf-opposed. Fruiting pedicels slender, erect or ascending, straight, 1–3(–4.5) mm, glabrous or pubescent. Sepals greenish white or purplish, elliptic, 0.7–1 mm, ascending or spreading. Petals white, linear, 0.6–1 mm. Stamens 2, median; filaments white, dilated at base, 0.4–0.7 mm; anthers ovoid, ca. 0.1 mm. Fruit 0.9–1.5(–2) × 1.7–2.5(–3.5) mm, didymous, not compressed, emarginate at apex and base; valves subglobose, prominently reticulate or rugose, rarely smooth, rounded on back; style obsolete to 0.1 mm, included in apical notch. Seeds oblong, finely reticulate, 0.8–1.2 × 0.6–0.8 mm.

Roadsides, waste places. Guangdong, Taiwan [native to Africa].

2. **Coronopus didymus** (Linnaeus) Smith, Fl. Brit. 2: 691. 1804.

臭芥 xiu qi

Lepidium didymum Linnaeus, Syst. Nat., ed. 12, 2: 433.

1767; *Senebiera didyma* (Linnaeus) Persoon; S.

pinnatifida de Candolle.

Herbs annual or rarely biennial, fetid, 10–45(–70) cm tall, glabrous or pilose with straight trichomes to 1 mm. Stems procumbent or erect, usually several from base, branched above. Basal leaves not rosulate, pinnatisect or bipinnatisect, 4–10 cm; lateral lobes 2–7(–10) on each side of rachis, variable in size, entire, dentate, or incised, acute. Middle cauline leaves similar to basal ones, 1.5–3.5(–4.5) × 0.5–1.2 cm, progressively smaller and less divided upward, shortly petiolate to sessile; lobes lanceolate to oblong or elliptic, entire to serrate or incised. Racemes terminal or lateral and leaf opposed. Fruiting pedicels slender, ascending to divaricate or slightly reflexed, straight or recurved, 1.5–2.5(–4) mm, glabrous or pubescent. Sepals ovate, 0.5–0.7(–0.9) mm, ascending to spreading, glabrous or pubescent. Petals white, elliptic to linear, 0.4–0.5 mm. Stamens 2 or rarely 4, median; filaments white, dilated at base, 0.3–0.6 mm; anthers ovoid, 0.1–0.2 mm. Fruit 1.3–1.7 × 2–2.5 mm, didymous, compressed, emarginate at apex and base; valves subreniform, semicircular, or suboblong, prominently reticulate or rugose, rounded on back; style absent, sometimes obsolete, included in apical notch. Seeds oblong, curved, finely reticulate, 1–1.2 × 0.7–0.8 mm. Fl. Mar–Jun. 2n = 32.

Roadsides, waste areas, fields; near sea level to 1000 m. Anhui, Fujian, Guangdong, Hubei, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [native to South America; naturalized elsewhere].

12. CARDARIA Desvaux, J. Bot. Agric. 3: 163. 1815.

群心菜属 qun xin cai shu

Hymenophysa C. A. Meyer; *Physolepidion* Schrenk.

Herbs perennial, rhizomatous. Trichomes simple. Stems erect or rarely decumbent, branched above. Basal leaves petiolate, rosulate or not, lyrate, sinuate, dentate, or entire. Cauline leaves sessile, auriculate, sagittate, or amplexicaul at base, margin entire or dentate. Racemes ebracteate, corymbose, grouped in panicles, elongated slightly in fruit. Fruiting pedicels slender, divaricate. Sepals ovate or oblong, deciduous, erect or spreading, base of lateral pair not saccate, margin membranous. Petals white; blade obovate or spatulate, apex obtuse; claw subequaling sepals. Stamens 6, tetradynamous; anthers ovate or oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 2 per ovary; fruit indehiscent sicles, ovoid, obovoid, cordate, obcordate, reniform, or globose, terete or strongly angustiseptate, inflated or not, often sessile; distinctly or obscurely veined, sometimes reticulate, glabrous or pubescent, keeled or not, wingless; replum rounded; septum complete or fenestrate, membranous, translucent, veinless; style distinct, cylindric, exerted from apical notch of fruit; stigma capitate, entire. Seeds wingless, ovoid or ellipsoid, plump; seed coat minutely reticulate, mucilaginous when wetted; cotyledons incumbent.

Two species: native to the Irano-Turanian and Mediterranean regions, widely naturalized elsewhere; two species in China.

The genus *Cardaria* differs from *Lepidium* in having indehiscent instead of dehiscent fruit and confluent instead of separate nectar glands.

However, it is highly questionable if these differences justify the recognition of two independent genera. In fact, recent molecular studies clearly show that the nearest relatives of *Cardaria* are the *L. campestre* group. Critical taxonomic studies of the boundaries of these two genera are needed.

1a. Fruit cordate, ovoid, or subglobose; valves flattened, sometimes slightly inflated, carinate, glabrous or sparsely pubescent when young 1. *C. draba*

1b. Fruit globose; valves semiglobose, inflated, not or only obscurely carinate, often densely puberulent, rarely subglabrous 2. *C. pubescens*

1. **Cardaria draba** (Linnaeus) Desvaux, J. Bot. Agric. 3: 163. 1815.

群心菜 qun xin cai

Herbs perennial, (8–)20–65(–90) cm tall, pubescent with mostly curved simple trichomes, sometimes glabrous or subglabrous at least above. Stems erect or

decumbent basally, many branched above. Basal leaves withered by anthesis, petiolate; leaf blade obovate, spatulate, or ovate, (1.5–)3–10(–15) × 1–4 cm, margin sinuate-dentate, apex obtuse. Cauline leaves sessile; leaf blade ovate, elliptic, oblong, or lanceolate, oblanceolate, or obovate, (1–)3–9(–15) × (0.5–)1–2(–5) cm, pubescent or glabrous, base sagittate-amplexicaul or auriculate, margin dentate or entire, apex acute or acuminate. Fruiting pedicels 5–10(–15) mm, divaricate or ascending, slender. Sepals oblong, 1.5–2.5 mm, glabrous, margin white. Petals white, obovate, (2.5–)3–4(–4.5) × (1–)1.3–2(–2.2) mm, shortly clawed, apex rounded. Filaments 2–3 mm; anthers ovate, 0.4–0.5 mm. Fruit cordate, ovoid, or subglobose, (2.5–)3.5–6(–7) mm, base cordate, rounded, obtuse, or truncate, apex obtuse or acute; valves flattened or somewhat inflated, carinate, reticulate or not, glabrous or sparsely minutely pubescent when young; style (0.7–)1–1.8(–2) mm. Seeds dark brown, ovoid, 1.5–2 × 1–1.2 mm. Fl. May–Jun, fr. Jul–Aug.

Mountain slopes, roadsides, fields, agricultural lands, river banks, pastures, waste areas; near sea level to 4200 m. Gansu, Liaoning, Shandong, Xinjiang, Xizang [Afghanistan, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; naturalized in S Africa, Australia, and North and South America].

- 1a. Fruit base cordate, valves prominently reticulate, glabrous 1a. subsp. *draba*
 1b. Fruit base rounded, obtuse, or truncate, valves not reticulate or obscurely reticulate, glabrous or sparsely puberulent when young 1b. subsp. *chalepensis*

1a. *Cardaria draba* subsp. *draba*

群心菜(原亚种) qun xin cai (yuan ya zhong)

Lepidium draba Linnaeus, Sp. Pl. 2: 645. 1753.

Fruit cordate at base, usually constricted at septum; valves prominently reticulate, glabrous. $2n = 32, 64$.

Mountain slopes, roadsides, fields, agricultural lands, river banks, pastures, waste areas; near sea level to 1600 m. Liaoning, Shandong, Xinjiang [Kazakstan, Pakistan, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe; naturalized in S Africa, Australia, and North and South America].

1b. *Cardaria draba* subsp. *chalepensis* (Linnaeus) O. E. Schulz in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 17b: 417. 1936.

球果群心菜 qiu guo qun xin cai

Lepidium chalepense Linnaeus, Cent. Pl. II, 23. 1756; *C.*

boissieri (N. Busch) Soó; *Cardaria chalepensis*

(Linnaeus) Handel-Mazzetti; *C. draba* subsp.

chalepensis var. *repens* (Schrenk) O. E. Schulz; *C.*

fenestrata (Boissier) Rollins; *C. macrocarpa* (Franchet)

Rollins; *C. propinqua* (Fischer & C. A. Meyer) N.

Busch; *C. repens* (Schrenk) Jarmolenko; *Cochlearia draba* (Linnaeus) Linnaeus; *Hymenophyssa fenestrata* Boissier; *H. macrocarpa* Franchet; *H. persica* Gilli; *L. boissieri* N. Busch; *L. draba* var. *auriculatum* (Boissier) N. Busch; *L. draba* subsp. *chalepense* (Linnaeus) Thellung; *L. draba* subsp. *chalepense* var. *repens* (Schrenk) Thellung; *L. propinqua* Fischer & C. A. Meyer; *L. propinqua* var. *auriculatum* Boissier; *L. repens* (Schrenk) Boissier; *Physolepidion repens* Schrenk.

Fruit rounded, obtuse, or truncate at base, usually not constricted at septum; valves not or obscurely reticulate, glabrous or sparsely pubescent when young. $2n = 48, 80, 128$.

Mountain slopes, roadsides, fields, agricultural lands, river banks, pastures, waste areas; 300–4200 m. Gansu, Shandong, Xinjiang, Xizang [Afghanistan, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia; naturalized in Europe and North and South America].

2. *Cardaria pubescens* (C. A. Meyer) Jarmolenko in Keller et al., Weeds USSR 3: 29. 1934.

毛果群心菜 mao guo qun xin cai

Hymenophyssa pubescens C. A. Meyer in Ledebour, Fl. Altaic. 3: 181. 1831.

Herbs perennial, (10–)15–35(–50) cm tall, usually densely pubescent or puberulent with often curved trichomes. Stems erect, branched above. Petiole of basal and lower cauline leaves 0.5–1.5 cm; leaf blade oblanceolate or obovate, (1–)2–6(–7) × 0.3–2 cm, pubescent, base attenuate, margin sinuately lobed or dentate, apex obtuse or acute. Upper cauline leaves sessile; leaf blade oblong or lanceolate, 1–5(–8) × (0.3–)0.5–1.5(–3) cm, pubescent, base sagittate, margin dentate or subentire. Fruiting pedicels 3–6(–10) mm, slender, puberulent, divaricate. Sepals oblong, 1.5–2 × 0.7–1 mm, pubescent, margin white. Petals white, obovate, (2.5–)3–4 × 1–5 mm, base clawed, apex rounded. Filaments 2–2.5 mm; anthers ovate, 0.4–0.5 mm. Fruit globose to subglobose, (2–)3–4(–5) mm in diam., rounded at apex and base or slightly cordate basally; valves semiglobose, not keeled, inflated, often densely puberulent, rarely subglabrous, not veined or obscurely veined; style 0.7–1.5 mm, glabrous or sparsely puberulent proximally. Seeds brown or dark brown, ovoid, 1.5–2 × 1–1.5 mm. Fl. and fr. May–Jul. $2n = 16$.

Along ditches, fields, pastures; 400–1600 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; naturalized in North and South America].

13. ISATIS Linnaeus, Sp. Pl. 2: 670. 1753.

菘蓝属 song lan shu

Herbs annual, biennial, or perennial, often glaucous. Trichomes absent or simple. Stems erect, simple at base, paniculately branched above. Basal leaves petiolate or rarely sessile, rosulate or not, simple, entire, dentate, or pinnately lobed. Cauline leaves sessile and auriculate, sagittate, or amplexicaul at base, rarely petiolate and attenuate, entire or dentate. Racemes many flowered, ebracteate, forming panicles, elongated considerably in fruit. Fruiting pedicels filiform, often thickened and clavate at apex, reflexed. Sepals ovate or oblong, erect or ascending, base of lateral pair not saccate. Petals yellow, as long as or longer than sepals; blade obovate, spatulate, oblong, or oblanceolate, apex obtuse or subemarginate; claw absent. Stamens 6, slightly tetradynamous; anthers ovate or oblong, apiculate or obtuse at apex. Nectar glands confluent, or 4 and median and lateral pairs distinct. Ovules 1 (or 2) per ovary, subapical. Fruit indehiscent, samaroid siliques or silicles, oblong, ovate, obovate, cordate, elliptic, oblanceolate, spatulate, or orbicular, strongly angustiseptate, sessile, prominently winged all around or distally, 1 (or 2)-seeded, glabrous or hairy, smooth; seed-bearing locule papery or corky, prominently or obscurely 1- or 3-veined, sometimes keeled or shortly winged; valves and replum united; gynophore, style, and septum absent; stigma capitate, entire. Seeds wingless, narrowly oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent or accumbent.

About 50 species: primarily in C and SW Asia; four species in China.

Mature fruit are essential for the reliable determination of species. Leaf, flower, and indumentum characters are unreliable for the determination of Chinese and C Asian species.

- 1a. Fruit winged only above the middle, constricted and often curved at middle, spatulate, often with crisped trichomes; petals 1–2 mm 4. *I. minima*
- 1b. Fruit winged all around, not curved and rarely slightly constricted at middle, variously-shaped but not spatulate, trichomes straight; petals (2.2–)2.5–4 mm.
 - 2a. Fruiting pedicels slender throughout; fruit oblong-pandurate, densely puberulent with subclavate trichomes, apex emarginate or rarely truncate 1. *I. violascens*
 - 2b. Fruiting pedicels clavate at apex; fruit oblong, elliptic, oblong-oblanceolate, or elliptic-obovate, glabrous or pubescent with slender trichomes, apex acute, obtuse, rounded, or rarely subemarginate.
 - 3a. Fruit only with a prominent midvein and inconspicuous lateral veins, widest above middle, black or blackish brown 2. *I. tinctoria*
 - 3b. Fruit with prominent midvein and two lateral veins, widest at middle, light brown 3. *I. costata*

1. *Isatis violascens* Bunge, Arbeiten Naturf. Vereins Riga 1: 166. 1847.

宽翅菘蓝 kuan chi song lan

Herbs annual, 20–60 cm tall, glabrous and glaucous throughout except for fruit, sometimes sparsely pilose. Stems branched above. Basal leaves petiolate or subsessile, withered at flowering; leaf blade oblanceolate, obovate, or ovate, 3.5–7 × 1–2 cm, glabrous, margin entire or obscurely toothed, apex obtuse or rounded. Cauline leaves sessile; leaf blade ovate, lanceolate, oblong-lanceolate, or narrowly oblong, (1–)2.5–6(–8) × (0.2–)0.6–2.5(–4) cm, base cordate-amplexicaul or auriculate, margin entire, apex acute or acuminate. Fruiting pedicels slender, not thickened at apex, (5–)7–10(–15) mm. Sepals purplish, white at apex, oblong, 1.3–1.8 × 0.5–0.8 mm, glabrous or pilose. Petals white, oblong-spatulate, 2.2–2.8(–3) × 0.5–0.8 mm, base cuneate, apex rounded. Filaments 1.2–2 mm; anthers ovate, 0.2–0.3 mm. Fruit oblong-pandurate, (7–)8–10(–12) × (3.5–)4–5 mm, densely puberulent with minute, simple, subclavate trichomes, subequally winged at base and margin, base rounded, apex emarginate or rarely truncate; locule 5–6(–7) mm; wings 1–2 mm wide at base and margin, 2–3 mm wide at apex. Seeds yellowish brown, oblong, 2.5–3(–3.5) × 1–1.4 mm. Fl. and fr. Apr–Jun.

Sandy deserts. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

2. *Isatis tinctoria* Linnaeus, Sp. Pl. 2: 670. 1753.

菘蓝 song lan

Isatis indigotica Fortune; *I. oblongata* de Candolle var. *yezoensis* (Ohwi) Y. L. Chang; *I. tinctoria* var. *indigotica* (Fortune) T. Y. Cheo & K. C. Kuan; *I. tinctoria* var. *yezoensis* (Ohwi) Ohwi; *I. yezoensis* Ohwi. Herbs biennial, (30–)40–100(–150) cm tall. Stems branched above, glabrous and somewhat glaucous, or hirsute, often paniculately branched. Basal leaves rosulate; petiole 0.5–5.5 cm; leaf blade oblong or oblanceolate, (2.5–)5–15(–20) × (0.5–)1.5–3.5(–5) cm, base attenuate, margin entire, repand, or dentate, apex obtuse. Middle cauline leaves sessile; leaf blade oblong or lanceolate, rarely linear-oblong, (1.5–)3–7(–12) × (0.2–)0.8–2.5(–3.5) cm, base sagittate or auriculate and with acute or obtuse auricles, margin entire, apex acute. Fruiting pedicels slender, considerably thickened and subclavate at apex, 5–10 mm. Sepals oblong, 1.5–2.8 × 1–1.5 mm, glabrous. Petals yellow, oblanceolate, 2.5–4 × 0.9–1.5 mm, base attenuate, apex obtuse. Filaments 1–2.5 mm; anthers oblong, 0.5–0.7 mm. Fruit black or dark brown when mature, oblong-oblanceolate, elliptic-obovate, or rarely oblong, (0.9–)1.1–2(–2.7) cm × 3–6(–10) mm, often broader above middle, glabrous or pubescent, winged all around, base cuneate, margin

sometimes slightly constricted, apex subacute, rounded, or rarely subemarginate; locule 3–6(–10) mm, with a distinct midvein and inconspicuous lateral veins; apical wing 3.5–5(–7) mm wide. Seeds light brown, narrowly oblong, 2.3–3.5(–4.5) × 0.8–1 mm. Fl. Apr–Jun, fr. May–Jul. $2n = 14, 28^*$.

Fields, pastures, roadsides, waste places; 600–2800 m. Fujian, Gansu, Guizhou, Hebei, Henan, Hubei, Jiangxi, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Japan, Kazakstan, Korea, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, Europe; naturalized elsewhere].

The above first record of *Isatis tinctoria* from Xizang is based on *Falconer s.n.* (K). *Isatis tinctoria* is a European and probably Asian species very polymorphic in fruit shape, shape and size of auricles of cauline leaves, and the amount of indumentum. It has been cultivated since ancient times as a source of a dark blue dye (woad) obtained by fermenting the leaves and lower portions of the plant. Glabrous forms with oblong fruit and poorly developed or obtuse leaf auricles have been recognized as *I. indigotica*. By contrast, glabrous or hairy forms with cuneiform or oblong-triangular fruit and well-developed, often acute leaf auricles are called *I. tinctoria*. However, every conceivable morphological intermediate between the two forms occurs in China, as well as elsewhere in Asia, Europe, and North America, where they are introduced and naturalized.

The roots and leaves are used for medicinal purposes and a source of dye, and the seed oil is used in industry.

3. *Isatis costata* C. A. Meyer in Ledebour, Fl. Altaic. 3: 204. 1831.

三肋菘藍 san lei song lan

Isatis costata var. *lasiocarpa* (Ledebour) N. Busch; *I. costata* var. *leiocarpa* Ledebour; *I. lasiocarpa* Ledebour.

Herbs annual or biennial, 40–120 cm tall. Stems erect, much branched above, glabrous, slightly glaucous. Leaves glabrous or sparsely pilose. Basal leaves soon withered; petiole (0.5–)1–5 cm; leaf blade obovate-oblong, oblanceolate, or spatulate, (2–)8–9(–14) × (0.5–)1–3 cm, margin entire or dentate. Middle cauline leaves sessile; leaf blade narrowly oblong, lanceolate, or lanceolate-ovate, (1–)3–8(–11) × (0.3–)0.5–2(–3) cm, base auriculate or amplexicaul, margin entire, apex obtuse or subacute. Fruiting pedicels slender, thickened and subclavate at apex, 4–8 mm, glabrous. Sepals oblong, 1.5–1.8 × 0.5–0.8 mm, glabrous. Petals yellow, oblong-oblanceolate, 2.5–3 × 0.5–0.8(–1) mm, apex obtuse. Filaments 1–1.8 mm; anthers ovate, 0.4–0.5 mm. Fruit oblong or elliptic, rarely oblong-obovate, (0.7–)0.9–1.2(–1.5) cm × 3–5(–6) mm, broader at middle,

glabrous or sparsely to densely pubescent, base and apex rounded to subacute, winged all around; locule (3–)4–6(–9) mm, usually conspicuously 3-ribbed or with a prominent midvein and 2 lateral ones, rarely 2-seeded; apical wings (1.5–)2–3.5 mm wide. Seeds yellowish brown, narrowly oblong, 2.5–3.5 × 0.9–1.3 mm. Fl. and fr. Jun–Aug. $2n = 28^*$.

Mountain slopes, steppe, hillsides, roadsides; 700–2500 m. Gansu, Liaoning, Nei Mongol, Xinjiang [Kashmir, Kazakstan, Mongolia, Pakistan, Russia, Tajikistan].

The record in FRPS and provincial Chinese floras of *Isatis oblongata* de Candolle is based on misidentified plants of *I. costata* or *I. tinctoria*. *Isatis oblongata* perhaps deserves only infraspecific rank under *I. costata*. Forms with glabrous or densely pubescent fruit often occur in the same population and, therefore, var. *lasiocarpa* does not merit recognition.

4. *Isatis minima* Bunge, Delect. Seminum Hort. Bot. Dorpat. 1843: 7. 1843.

小果菘藍 xiao guo song lan

Herbs annual, (6–)12–40(–60) cm tall, glabrous or distally pilose on sepals, pedicels, and fruit. Stems erect, branched, glabrous. Basal leaves subsessile or attenuate to a petiolelike base; leaf blade oblong or spatulate, (1.5–)3–6(–12) × (0.3–)0.5–1.5 cm, base attenuate, margin sinuate-dentate or subentire, apex obtuse. Middle cauline leaves sessile; leaf blade oblong or linear-lanceolate, (0.5–)1–4(–6) cm × 2–10(–20) mm, glabrous or sparsely crisped hairy, base auriculate-amplexicaul, margin entire, apex acute. Fruiting pedicels filiform, deflexed, 2–5 mm, conspicuously thickened and subclavate at apex, white crisped hairy. Sepals oblong, 0.8–1.5 × 0.4–0.7 mm, crisped hairy. Petals yellow, oblong-oblanceolate, (1–)1.5–2 × 0.4–0.8 mm, base attenuate, apex obtuse. Filaments 1–1.5 mm; anthers ovate, 0.1–0.2 mm. Fruit spatulate or oblanceolate, usually curved at locule, 0.8–1.4(–1.5) cm, 2–4 mm wide at apex, glabrous or pubescent with crisped trichomes, base and middle not winged, somewhat corky, apex distinctly winged, emarginate; locule 4–6 mm; wings 3–5 mm wide. Seeds light brown, narrowly oblong, 2.5–3 × 0.6–0.8 mm. Fl. and fr. May–Jun. $2n = 42^*, 34$.

Deserts, steppe, roadsides; 300–700 m. Gansu, Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

14. PACHYPTERYGIUM Bunge, Delect. Seminum Hort. Bot. Dorpat. 1843: 8. 1843.

厚壁芥属 hou bi qi shu

Pachypterygis Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 158. 1842, not Brongnart (1828).

Herbs annual, glabrous throughout or pilose, sometimes fruit papillate. Trichomes simple, papillate. Stems erect or ascending, branched. Basal leaves petiolate, not rosulate, simple, entire. Cauline leaves sessile, auriculate, sagittate, or amplexicaul, entire. Racemes several flowered, ebracteate, elongated in fruit, grouped in panicles. Fruiting pedicels filiform, reflexed or rarely divaricate. Sepals ovate or oblong, ascending, base of lateral pair not saccate, margin not membranous. Petals yellow, slightly longer than sepals; blade obovate or oblanceolate, apex obtuse; claw

absent. Stamens 6, slightly tetradynamous; filaments, not dilated at base; anthers subglobose or broadly ovate, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present; lateral glands annular. Ovules 1 per ovary; placentation subapical. Fruit indehiscent, achenelike silicles, oblong, ovate, elliptic, or oblong-linear, angustiseptate, sessile, sometimes constricted above seed-bearing portion; valves papery, corky and thick winged all around, veinless, glabrous or papillate; replum rudimentary; septum absent; style absent; stigma capitate, entire. Seeds wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent.

Three species: C and SW Asia; two species in China.

- 1a. Fruit elliptic, elliptic-oblong, or ovate, not constricted above middle, 2–4 mm, apex obtuse 1. *P. multicaule*
1b. Fruit subpyriform, constricted above middle, 4–5 mm, apex truncate or subemarginate 2. *P. brevipes*

1. *Pachypterygium multicaule* (Karelin & Kirilov) Bunge, Delect. Seminum Hort. Bot. Dorpat. 1843: 8. 1843.

厚壁芥 hou bi qi

Pachypterygium multicaulis Karelin & Kirilov, Bull. Soc.

Imp. Naturalistes Moscou 15: 159. 1842; *Isatis*

multicaulis (Karelin & Kirilov) Jafri; *Pachypterygium densiflora* (Bunge) Parsa; *P.*

lamprocarpa (Bunge) Parsa; *Pachypterygium densiflorum* Bunge; *P. echinatum* Jarmolenko; *P.*

lamprocarpum Bunge; *P. microcarpum* Gilli; *P. praemontanum* Jarmolenko; *P. ramosum* Jarmolenko ex Pavlov.

Herbs 8–25 cm tall, glabrous throughout except sometimes for fruit. Stems erect or ascending, several to many branched below and above, sometimes glaucous. Basal leaves oblanceolate, 0.7–4 cm × 1.5–6 mm, attenuate to petiolelike base 2–15 mm, margin entire, apex obtuse. Cauline leaves oblong, linear, or linear-lanceolate, 0.6–4 cm × 1–5 mm, sometimes glaucous, base sagittate or auriculate, margin entire, apex obtuse to subacute; auricles to 7 × 3 mm. Fruiting pedicels filiform, divaricate or reflexed, 2–6 mm. Sepals yellowish, oblong, (0.6–)0.8–1.2 × 0.3–0.5 mm. Petals yellow, oblanceolate or obovate, (0.9–)1.2–2 × 0.3–0.6(–0.9) mm, apex obtuse; claw absent. Filaments yellowish, 0.5–1(–1.4) mm; anthers subglobose, 0.1–0.2 mm. Fruit elliptic, elliptic-oblong, or ovate, 2–4(–4.5) × 1.5–2.5 mm, base and apex obtuse; valves glabrous or densely papillate with trichomes to 0.3 mm, these longer at the middle than along margin. Seeds narrowly oblong, yellowish, 1.3–1.7 × 0.5–0.9 mm. Fl. and fr. Apr–Jun.

Sandy places; 400–3400 m. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

2. *Pachypterygium brevipes* Bunge, Delect. Seminum Hort. Bot. Dorpat. 1843: 8. 1843.

短梗厚壁芥 duan geng hou bi qi

Isatis brevipes (Bunge) Jafri; *Pachypterygium brevipes* var. *persicum* Boissier; *P. heterotrichum* Bunge; *Pachypterygium persica* (Boissier) Parsa.

Herbs 8–20(–25) cm tall, glabrous and glaucous throughout except sometimes for fruit. Stems erect or ascending, several to many branched below and above. Basal leaves subsessile, soon withered; lowermost cauline leaves sessile, oblong-ovate, (1–)2–3.5 cm × 5–13(–20) mm, subfleshy, base auriculate or subamplexicaul, margin entire or repand, apex obtuse. Uppermost cauline leaves ovate-cordate, 0.5–3 cm × (1–)2–7(–10) mm, subfleshy, base subamplexicaul, margin entire, apex obtuse. Fruiting pedicels filiform, divaricate or reflexed, to 4 mm. Sepals yellowish, oblong, (0.6–)0.7–1 × ca. 0.4 mm. Petals yellow, oblanceolate or obovate, 1–2 × 0.3–0.7 mm, apex obtuse; claw absent. Filaments yellowish, 0.7–1.1 mm; anthers subglobose, 0.1–0.2 mm. Fruit subpyriform, 4–5 × 1.5–2 mm, base obtuse, apex truncate or subemarginate; valves glabrous or pubescent, papillate in the middle. Seeds narrowly oblong, yellowish, ca. 2 × 1 mm. Fl. and fr. Apr–Jun.

Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

The above first record from China is based on *Regel s.n.*, 5 May 1877 (LE), collected from Xinjiang.

15. PUGIONIUM Gaertner, Fruct. Sem. Pl. 2: 291. 1791.

沙芥属 sha jie shu

Herbs annual. Trichomes absent. Stems erect, simple at base, paniculately branched above. Basal leaves petiolate, not rosulate, 1–3-pinnatisect. Cauline leaves attenuate or auriculate at base, subentire, dentate, pinnatifid, or pinnatisect. Racemes numerous flowered, ebracteate, elongated considerably in fruit; rachis flexuous. Fruiting pedicels stout, divaricate. Sepals narrowly oblong, united, rupturing basally at anthesis, unequal, base of lateral pair strongly saccate, margin membranous. Petals white or pink; blade linear or linear-lanceolate, apex subacute; claw subequaling sepals. Stamens 6, tetradynamous; filaments not dilated at base, filiform; anthers oblong, obtuse at apex. Nectar glands 2, lateral, ringlike; median glands absent. Ovules 2 per ovary, subapical. Fruit indehiscent, samaroid silicles, transversely oblong or ovoid, 1-seeded, thin walled, with woody and coarsely reticulate venation,

angustiseptate, sessile, transversely 2-winged, 2–16-spined; wings prominent, longer or shorter than main part of fruit, with 3–20 subparallel veins extending full length; spines often unequal in length, at least some subparallel to pedicel, those on the seed-bearing fruit half longer; replum and valves margin united into a longitudinal vein; septum complete; style absent, obsolete, or conical and to 5 mm; stigma capitate, entire, long papillate. Seeds 1, wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent or obliquely so.

Three species: China, Mongolia, adjacent Russia; two species (one endemic) in China.

1a. Fruit wings ensiform, longitudinally 3-veined, acuminate, ascending or divaricate-ascending; ultimate lobes of

basal and lower cauline leaves lanceolate or oblong, rarely lanceolate-linear 1. *P. cornutum*

1b. Fruit wing lanceolate, obovate, or oblong, longitudinally 5–10(–12)-veined, acute, obtuse, to truncate,

horizontal; ultimate segments of basal and lower cauline leaves filiform or linear 2. *P. dolabratum*

1. *Pugionium cornutum* (Linnaeus) Gaertner, *Fruct. Sem. Pl.* 2: 291. 1791.

沙芥 sha jie

Bunias cornuta Linnaeus, *Sp. Pl.* 2: 669. 1753;

Myagrum cornutum (Lamarck) Linnaeus.

Herbs annual, 50–100(–150) cm tall. Stems erect, many branched above. Basal leaves slightly fleshy; petiole 2–6 cm; leaf blade pinnatisect, 8–25 × 1.5–4.5 cm; lateral lobes 4–7 on each side of midvein, ultimate segments oblong, lanceolate, or rarely lanceolate-linear, 1–5 cm × 1–6 mm, entire or larger ones coarsely dentate or 3-fid, apex acute. Middle cauline leaves pinnatisect, auriculate; uppermost cauline leaves oblanceolate or linear, 3–6 cm × 2–4 mm, base attenuate, not auriculate, margin entire. Fruiting pedicels slightly stout, straight or curved upward, (1–)1.7–3 cm. Sepals 5–7 × 1.2–1.5 mm; sac of lateral pair 0.5–0.8(–1) mm. Petals whitish, linear to linear-lanceolate, 1.2–1.5 cm × 1.5–2.5 mm; claw 5–7 mm. Median filaments 6–8 mm; lateral filaments 4–5 mm; anthers oblong, 1.2–1.5 mm. Fruit transversely oblong or ovoid, excluding wings 0.7–1.2 × 1.5–2 cm; wings ensiform, straight, (2–)3–5(–6.5) cm, 3–5(–6) mm wide at base, longitudinally 3-veined, margin entire, apex acuminate; spines 8–10, to 2 cm × 2 mm, basal 4 pointing downward, subparallel to pedicel, much longer than the others, remaining 4 or 6

horizontal or erect; style absent. Seeds brown, oblong, 8–10 × 3–4 mm. Fl. Jun–Aug, fr. Jul–Sep.

• Desert dunes; 1000–1100 m. Nei Mongol, Ningxia, Shaanxi.

2. *Pugionium dolabratum* Maximowicz, *Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér.* 3, 26: 426. 1880.

斧翅沙芥 fu chi sha jie

Pugionium calcaratum Komarov; *P. cristatum*

Komarov; *P. dolabratum* var. *platypterum* H. L. Yang.

Herbs annual, (50–)60–100 cm tall. Stems erect, many branched above. Basal leaves slightly fleshy; leaf blade 2-pinnatisect, to 25 × 6.5 cm; ultimate lateral lobes filiform or linear, to 5.5 cm × 0.5–1.5 mm, apex subacute. Middle and upper cauline leaves similar to basal. Fruiting pedicels slightly stout, straight, (0.6–)0.8–2(–2.5) cm. Sepals 5–8 × 1.2–1.5 mm; sac of lateral pair 0.6–1.2 mm. Petals pink, linear or linear-lanceolate, 1.2–2 cm × 1.5–2.5 mm; claw 5–8 mm. Median filament pairs 5–8 mm, lateral pair 3–5 mm; anthers oblong, 1.2–1.5 mm. Fruit transversely oblong, excluding wings 0.7–1.2 × 1–2 cm; wings lanceolate, ovate, oblong, or obovate, 0.7–2.5(–3) cm, 4–8(–10) mm wide at base, margin entire, apex obliquely truncate, acute, or obtuse, toothless or toothed, 5–10(–12)-veined; spines absent, sometimes up to 16 and to 2 cm × 3 mm; style obsolete or to 1 mm. Seeds brown, oblong, 5–8 × 1.5–3 mm. Fl. Aug–Sep.

Sandy deserts, dunes; 1000–1400 m. Gansu, Nei Mongol, Ningxia, Shaanxi [Mongolia].

16. MEGACARPAEA de Candolle, *Mém. Mus. Hist. Nat.* 7: 230. 1821.

高河菜属 gao he cai shu

Herbs perennial with a caudex terminated by petiolar remains of previous years. Trichomes simple. Stems erect, simple basally, branched apically. Basal leaves petiolate, rosulate, simple, pinnately lobed or 1–3-pinnatisect, rarely palmately lobed. Cauline leaves petiolate or sessile, often auriculate or amplexicaul at base, sinuate, pinnately lobed, or pinnatisect. Racemes ebracteate, in panicles, elongated in fruit. Fruiting pedicels slender or stout, ascending, divaricate, or reflexed. Sepals oblong, deciduous, base of lateral pair not saccate, margin membranous. Petals yellow, creamy white, pink, or deep purple, rarely absent; blade obovate, oblong, oblanceolate, or oblong-linear, entire or rarely 3(–5)-toothed; claw absent or much shorter than sepals. Stamens 6 or (8–)12–16(–24), slightly tetradynamous or equal in length; filaments dilated at base; anthers oblong or linear, obtuse at apex. Nectar glands confluent around bases of all stamens; median glands present. Ovules 2 per ovary. Fruit indehiscent, schizocarpic, didymous, angustiseptate silicles, sessile or shortly stipitate; valves (mericarps) oblong, obovate, or orbicular, 1-seeded, leathery, smooth, broadly winged, keeled, glabrous; replum rounded; septum complete, thickened, opaque, veinless;

style obsolete, rarely to 0.5 mm; stigma capitate, entire. Seeds wingless, broadly ovate or subreniform, strongly flattened; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent.

Nine species: C Asia, Himalayas; three species in China.

1a. Fruiting pedicels stout, straight, divaricate or ascending; root napiform, fleshy; deserts 2. *M. megalocarpa*

1b. Fruiting pedicels slender, recurved or reflexed; root cylindrical, not fleshy; mountains

2a. Petals pink or deep purple, (5–)7–10(–12) mm, 3(–5)-lobed, rarely entire; stamens 6; fruit halves (0.8–)1–1.2

(–1.5) × (0.6–)0.7–0.8(–1) cm; wings 1–2 mm wide; locule 7–12 × 5–8 mm; seeds 4.5–6 × 3–4 mm 1. *M. delavayi*

2b. Petals yellow, 4–6(–7) mm, entire; stamens (8–)12–16(–24); fruit halves 3–4 × 2.5–3 cm; wings 5–10(–18)

mm wide; locule 15–2(–28) × 12–17 mm; seeds 14–17 × 7–11 mm 3. *M. polyandra*

1. *Megacarpaea delavayi* Franchet, Bull. Soc. Bot. France 33: 406. 1886.

高河菜 gao he cai

Megacarpaea delavayi f. *angustisecta* O. E. Schulz; *M. delavayi* var. *grandiflora* O. E. Schulz; *M. delavayi* f. *microphylla* O. E. Schulz; *M. delavayi* var. *minor* W. W. Smith; *M. delavayi* f. *pallidiflora* O. E. Schulz; *M. delavayi* var. *pinnatifida* Danguy.

Herbs perennial, 15–86 cm tall. Trichomes retrorse, flattened, not crisped. Root cylindrical, to 2 cm in diam. Caudex short, simple or rarely branched. Stems erect, branched above. Petiole of basal and lower cauline leaves (1–)2–5(–8) cm, considerably flattened at base; leaf blade oblong-ob lanceolate in outline, appearing pinnately compound, (0.5–)5–15(–22) cm, sparsely to densely pubescent; lateral lobes 7–13 on each side of rachis, broadly ovate, oblong, or linear, (0.5–)1–2.5(–4.6) × 0.1–1(–2) cm, base decurrent, margin entire, irregularly serrate, or laciniate, apex acute or obtuse. Cauline leaves sessile, strongly auriculate or amplexicaul at base; leaf blade similar to that of basal leaves but with fewer lobes. Fruiting pedicels slender, (0.6–)0.8–1.5(–2) cm, usually strongly recurved, pubescent. Sepals purplish, oblong, 3–4(–4.5) × (1–)1.5–2(–2.5) mm, sparsely pubescent or glabrous. Petals lavender or deep purple, narrowly oblanceolate, oblong, or broadly obovate, entire or shallowly to deeply 3(–5)-lobed, (5–)7–10(–12) × (1–)3–4(–6) mm, base cuneate, apex rounded or subacute. Stamens 6; filaments (2.5–)3–4 mm; anthers narrowly oblong or linear, 1–1.5 mm. Fruit halves broadly obovate, (0.8–)1–1.2(–1.5) cm × (6–)7–8(–10) mm; wings 1–2 mm wide; replum 2.5–4 mm; locule 7–12 × 5–8 mm. Seed dark brown, broadly ovate, 4.5–6 × 3–4 mm. Fl. May–Aug, fr. Jul–Sep.

Swampy meadows, grassy slopes, open thickets; 3300–4800 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan [Myanmar].

All of the synonyms above represent formal recognition of only a small portion of the enormous variation in *Megacarpaea delavayi*. The species is most variable in leaf morphology, flower size, petal shape and apex, and fruit shape and size. However, the variation in all of these characters is continuous in nature and does not show any correlation with geography. Therefore, it is more practical not to

recognize any infraspecific taxa. The species is recorded here for the first time from Xizang and Myanmar; the records are based on *Forrest 4342* (E) and *Forrest 26890* (E, NY, US), respectively.

This species is used for medicine and as a vegetable.

2. *Megacarpaea megalocarpa* (Fischer ex de Candolle) Schischkin ex B. Fedtschenko in Komarov, Fl. URSS 8: 543. 1939.

大果高河菜 da guo gao he cai

Biscutella megalocarpa Fischer ex de Candolle, Ann. Mus. Natl. Hist. Nat. 18: 296. 1811; *Megacarpaea angulata* de Candolle; *M. laciniata* de Candolle; *M. mugodzhatica* Goloskokov & Vassilzenko.

Herbs perennial, 20–30(–40) cm tall. Trichomes sparse to dense, flattened, crisped. Roots napiform, to 4 cm wide. Caudex short, covered with fibrous petiolar remains of previous years. Stems erect, stout, divaricately branched above, glabrescent. Petiole of basal leaves 2–6 cm; leaf blade oblanceolate, (5–)8–16 × (1–)2.5–4 cm, densely pubescent, margin pinnatisect, with 4–7 lateral lobes on each side; lobes irregularly laciniate. Cauline leaves sessile; leaf blade similar to basal but smaller. Inflorescences paniculate, with sessile bracts at branching. Flowers irregularly unisexual. Fruiting pedicels stout, straight, divaricate or ascending, 5–10(–15) mm, pubescent. Sepals and petals present in male flowers, absent in female ones. Sepals narrowly oblong, 5–7 × 2–2.5 mm, margin white, scarious, sparsely pubescent. Petals lavender, linear-oblong, 1–1.5 cm × 3.5–4.5 mm, base attenuate, apex obtuse. Intermediate flowers sometimes present, with whitish petals, and stamens and pistil developed to various degrees. Filaments 3–4 mm; anthers linear, 2–2.5 mm. Fruit halves suborbicular, (1–)1.2–1.8(–2) cm in diam.; wings 3–7 mm wide; locule suborbicular, 6–10 × 5–7 mm; replum 4–7 mm; style 0.5–1 mm. Seeds flattened, suborbicular, 5–7 × 3.5–5 mm. Fl. Apr, fr. May–Jun.

Sandy deserts, alkaline flats. Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Uzbekistan].

3. *Megacarpaea polyandra* Benth, Hooker's J. Bot. Kew Gard. Misc. 7: 356. 1855.

多蕊高河菜 duo rui gao he cai

Herbs perennial, (0.5–)1–2 m tall, tomentose above. Root to 15 cm in diam. Trichomes flattened, crisped. Caudex considerably thickened. Stems erect, branched

above. Basal and lower cauline leaves oblong or oblanceolate in outline, pinnatisect, 15–60 cm, glabrous or sparsely pubescent; lateral lobes 6–12 on each side, oblong or lanceolate, 6–20 × 1–5 cm, base decurrent, margin serrulate, sinuate-dentate, or subentire, apex acuminate. Upper cauline leaves auriculate, similar to lower ones but gradually reduced in size. Fruiting pedicels slender, 1.5–4 cm, strongly recurved, pubescent. Sepals yellowish, oblong, 3.5–5(–6) × 1.5–2.5 mm, sparsely pubescent or glabrous. Petals pale yellow, oblong or obovate, entire, 4–6(–7) × 2–4 (–6) mm, base cuneate, apex rounded to subacute; claw 1–2 mm. Stamens (8–)12–16(–24); filaments 3.5–5 mm;

anthers narrowly oblong, 1–1.3 mm. Fruit halves suborbicular to obovate-orbicular, 3–4 × 2.5–3 cm; wings 5–10(–18) mm wide; replum 7–16 mm; locule 1.5–2(–2.8) × 1.2–1.7 cm. Seeds brown, broadly ovate, 1.4–1.7 × 0.7–1.1 cm. Fl. May–Aug, fr. Aug–Oct.

Slopes, rocky areas, along streams; 3000–4600 m. Xizang [India, Kashmir, Nepal, Pakistan].

Megacarpaea bifida Benth., a little-collected and poorly known species endemic to Kashmir, is probably conspecific with (or at most infraspecific under) *M. polyandra*. It has entire leaf lobes and slightly elongated fruit halves. *Megacarpaea polyandra* is the only species in the Brassicaceae with flowers having more than six stamens. The young leaves are cooked as a vegetable.

17. MEGADENIA Maximowicz, Fl. Tangut. 76. 1889.

双果芥属 *shuang guo qi shu*

Herbs annual, sometimes perennial from slender, deeply buried rhizomes. Trichomes absent. Stems absent or rarely developed. Basal leaves long petiolate, rosulate, simple, entire or repand, palmately 3–5-veined. Cauline leaves absent, rarely present and similar to basal ones. Racemes absent and all flowers on pedicels from basal rosette, if present then few flowered, bracteate throughout. Fruiting pedicels erect-ascending or divaricate, recurved. Sepals ovate, base of lateral pair not saccate, margin not membranous. Petals white, slightly longer than sepals; blade obovate, oblong-obovate, or spatulate, apex obtuse; claw absent. Stamens 6, subequal; filaments not dilated at base; anthers orbicular, obtuse at apex. Nectar glands 4, 1 on each side of lateral stamen; median glands absent. Ovules 2 per ovary. Fruit indehiscent, schizocarpic, didymous, angustiseptate silicles, sessile; valves (mericarps) transversely ovate or sublenticular, 1-seeded, woody, reticulate, keeled all around; replum rounded; septum complete, thickened, opaque, veinless; style slender, to 0.3 mm; stigma capitate, entire. Seeds wingless, broadly ovate, plump or slightly flattened; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent.

One species: China, Russia.

1. *Megadenia pygmaea* Maximowicz, Fl. Tangut. 77. 1889.

双果芥 *shuang guo qi*

Megadenia bardunovii Popov; *M. speluncarum* Vorobiev, Voroschilov & Gorovoi.

Herbs stemless or rarely with flowering stems to 3 cm tall, glabrous throughout. Basal leaves rosulate; petiole (0.7–)2–10(–15) cm, slender, often grooved, expanded at base; leaf blade cordate, orbicular, or broadly ovate, (0.5–)1–2(–2.8) × (0.7–)1.5–3(–4) cm, base cordate, rarely obtuse or subtruncate, margin entire or repand, sometimes 3–7-lobed, apex rounded. Cauline leaves absent, if present as bracts then similar to basal ones but smaller. Fruiting pedicels slender, (0.2–)0.4–2(–3) cm,

often recurved. Sepals 0.8–0.9 × 0.5–0.6 mm. Petals white, 1–1.4 × 0.5–0.6 mm. Filaments white, 0.4–0.6 mm; anthers orbicular, 0.15–0.25 mm. Fruit didymous, notched at both ends; mericarps violet maculate, transversely ovate or sublenticular, 1.4–2 × 1.7–2.5 mm, distinctly reticulate; style 0.2–0.3 mm, included in apical notch of fruit. Seeds yellowish brown, broadly ovate, 1.3–1.5 × 1–1.3 mm. Fl. and fr. Jun–Aug. $2n = 20$.

Steep slopes with semiconsolidated scree, alpine meadows, open scrub; (1000–)3500–4200 m. Gansu, Qinghai, Sichuan, Xizang [Russia (Far East, Siberia)].

18. THLASPI Linnaeus, Sp. Pl. 2: 645. 1753.

菥 属 *xi ming shu*

Herbs annual, biennial, or perennial, often glabrous and glaucous. Trichomes absent or simple. Stems prostrate or erect, simple or branched. Basal leaves petiolate or sessile, rosulate or not, simple, entire or dentate. Cauline leaves sessile, often auriculate, sagittate, or amplexicaul at base, entire or rarely dentate. Racemes ebracteate, elongated or not in fruit. Fruiting pedicels slender, divaricate or ascending, rarely reflexed. Sepals ovate or oblong, erect or ascending, base of lateral pair not saccate, margin membranous. Petals white, rarely purple or yellow; blade obovate, oblong, or spatulate, apex obtuse or emarginate; claw differentiated or not from blade. Stamens 6, tetradynamous; filaments dilated or not at base; anthers ovate or oblong, obtuse at apex. Nectar glands 2 or 4, lateral, often 1 on each side of lateral stamen; median glands absent. Ovules 4–24 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, obovate, obcordate, elliptic, lanceolate, or suborbicular, often apically notched, strongly angustiseptate, sessile; valves keeled, winged or wingless; replum rounded; septum complete, membranous,

translucent, veinless; style obsolete or prominent, exerted or included in apical notch of fruit; stigma capitate, entire or slightly 2-lobed. Seeds uniseriate, wingless, oblong, ovoid, or ellipsoid, plump; seed coat smooth, reticulate, rugose, or striate, mucilaginous or not when wetted; cotyledons accumbent or rarely incumbent.

About 75 species: temperate Eurasia, especially SW Asia and C and S Europe; six species (two endemic) in China.

Thlaspi was divided by Meyer (Feddes Repert. 84: 449–470. 1970) into 12 genera largely based on seed anatomy. Molecular data provide some support for the recognition of some of Meyer's segregates (e.g., *Microthlaspi* F. K. Meyer and *Noccaea* Moench), but such studies are not comprehensive and therefore the traditional broader concept of the genus is tentatively retained in this treatment.

The majority of Chinese and Himalayan material is often difficult to determine to species because of the lack of mature fruit and their remarkable variability in habit, foliage, and flower size.

1a. Annuals; fruit obovate or suborbicular.

2a. Middle and upper cauline leaves auriculate or sagittate at base; fruit 9–20 × 7–20 mm, broadly winged all around; seeds blackish brown, concentrically striate, 1.6–2 mm 1. *T. arvense*

2b. Middle and upper cauline leaves cordate-amplexicaul; fruit 3–7 × 3–5 mm, broadly winged only apically;

seeds yellowish brown, smooth, 1–1.3 mm 2. *T. perfoliatum*

1b. Perennials with slender, branched caudices; fruit oblong or elliptic.

3a. Fruit elliptic, apex neither winged nor emarginate or retuse; ovules or seeds 4–8(–10) 5. *T. andersonii*

3b. Fruit narrowly oblong or oblong-obovate, apex winged and/or emarginate or retuse; ovules or seeds more

than 12, if less then fruit valves prominently veined.

4a. Fruit narrowly oblong, 1.5–2.3(–3) mm wide; petals lavender, purplish, or rarely white; cauline leaves dentate or denticulate, rarely repand or entire 3. *T. yunnanense*

4b. Fruit oblong-obovate, (3.5–)4–5(–6) mm wide; petals white; cauline leaves entire or repand, rarely denticulate.

5a. Ovules or seeds 14–24; fruit wing not veined 4. *T. flagelliferum*

5b. Ovules or seeds 4–8(–10); fruit wing distinctly veined 6. *T. cochleariforme*

1. *Thlaspi arvense* Linnaeus, Sp. Pl. 2: 646. 1753.

菥 xi ming

Herbs annual, (9–)15–55(–80) cm tall, glabrous throughout, often glaucous, fetid when crushed. Stems erect, simple or branched above. Petiole of basal leaves 0.5–3 cm; leaf blade oblanceolate, spatulate, or obovate, 1–5 × 0.4–2.3 cm, base attenuate or cuneate, margin entire, repand, or coarsely toothed, apex rounded. Middle cauline leaves sessile, oblong, (0.5–)1.5–4(–8) × (0.2–)0.5–1.5(–2.5) cm, base sagittate or auriculate, margin dentate, repand, or entire, apex rounded, obtuse, or subacute. Fruiting pedicels (0.5–)0.9–1.3(–1.5) cm, slender, divaricate, straight or slightly curved upward. Sepals ovate or oblong, (1.5–)2–3(–3.3) × 1–1.5 mm, not saccate, margin white. Petals white, spatulate, (2.4–)3–4.5(–5) × (0.8–)1.1–1.6 mm, narrowed to a clawlike base ca. 1 mm, apex obtuse or emarginate. Filaments (1–)1.5–2 mm; anthers ovate, 0.3–0.5 mm. Ovules 6–16 per ovary. Fruit obovate or suborbicular, (0.6–)0.9–2 × (0.5–)0.7–2 cm, base obtuse or rounded, apex deeply emarginate and apical notch ca. 5 mm deep; wings 1–1.5 mm wide at base, 3.5–5 mm wide apically; style absent or 0.1–0.3 mm. Seeds blackish brown, ovoid, (1.2–)1.6–2(–2.3) × 1.1–1.3 mm, concentrically striate. Fl. and fr. Mar–Oct. $2n = 14^*$.

Roadsides, grassy slopes, fields, waste places; 100–5000 m. Throughout China except Guangdong, Hainan, and Taiwan [Afghanistan, Bhutan, India, Japan, Kashmir, Kazakstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Sikkim, Tajikistan, Turkmenistan,

Uzbekistan; Africa, SW Asia; introduced in Australia, North and South America].

This species is a cosmopolitan weed used as a medicinal plant and a source of oil. Cattle feeding on the plant develop tainted milk.

2. *Thlaspi perfoliatum* Linnaeus, Sp. Pl. 2: 646. 1753.

全叶菥 quan ye xi ming

Microthlaspi perfoliatum (Linnaeus) F. K. Meyer. Herbs annual, (3–)5–28(–40) cm tall, glabrous throughout, often glaucous. Stems erect, simple or branched basally or above. Petiole of basal leaves 0.5–1.3 cm; leaf blade ovate or broadly elliptic, 0.3–2(–2.7) cm × 2–10 mm, base cuneate or attenuate, margin entire or rarely obtusely few toothed, apex rounded. Middle cauline leaves sessile, ovate-cordate or suboblong, (1–)2–4(–5.5) × (0.2–)0.5–1.5(–2) cm, base cordate-amplexicaul, margin entire or repand, apex obtuse. Fruiting pedicels (2.5–)4–6(–8) cm, slender, divaricate, straight. Sepals ovate or oblong, (0.8–)1–1.5(–1.8) × 0.5–1 mm, not saccate, margin white. Petals white, spatulate or oblong, 1.5–2.5(–3) × 0.7–1.3 mm, apex rounded. Filaments 1–1.5 mm; anthers ovate, 0.1–0.2 mm. Ovules 4–10 per ovary. Fruit obovate or rarely suborbicular, 3–5.5(–7) × 3–4(–5.5) mm, base obtuse, apex deeply emarginate and apical notch 1–1.5 mm deep; wings 1–2 mm wide apically, much narrower at base; style absent or 0.1–0.3 mm. Seeds yellow-brown, ovoid, 0.9–1.3(–1.5) × 0.7–1 (–1.2) mm, smooth. Fl. and fr. Apr–Jul. $2n = 14, 28, 42$.

Slopes, roadsides, waste grounds, forest margins; 400–2400 m. Xinjiang [Afghanistan, Kazakstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe].

3. *Thlaspi yunnanense* Franchet, Bull. Soc. Bot. France 33: 407. 1886.

云南菥 yun nan xi ming

Thlaspi yunnanense var. *dentatum* Diels.

Herbs perennial, (4–)8–25(–30) cm tall, glabrous throughout. Stems erect or ascending, simple. Basal leaves rosulate; petiole (0.1–)0.5–1.5(–2.5) cm; leaf blade oblong, spatulate, ovate, or suborbicular, 3–10(–15) × 2–5(–10) mm, base obtuse, margin entire, repand, or dentate, apex rounded. Middle cauline leaves sessile, oblong, ovate, or suborbicular, 0.5–1.8(–2.5) cm × (2–)4–7(–10) mm, base auriculate, margin dentate or denticulate, rarely repand or entire, apex rounded, obtuse, or subacute. Fruiting pedicels (2–)4–7(–10) mm, slender, divaricate, straight or slightly recurved. Sepals oblong, 1.5–2 × 0.8–1.2(–1.5) mm, not saccate, margin white. Petals lavender, purplish, or rarely white, spatulate, (3–)3.5–4.5(–5.5) × (1–)1.5–2.2(–3) mm, apex rounded. Filaments 1–2 mm; anthers ovate, 0.4–0.5 mm. Ovules 14–18 per ovary. Fruit oblong to oblong-linear, (0.8–)1–1.4(–1.6) cm × 1.5–2.3(–3) mm, base obtuse, apex retuse and apical notch 0.1–0.4 mm deep, or obtuse and apical notch obsolete; apical wings obsolete or rarely to 0.3 mm wide; style 0.5–1(–1.5) mm. Seeds dark brown, ovoid, 0.9–1.3 × 0.6–0.8 mm, obscurely reticulate. Fl. late May–Aug, fr. Jul–Sep.

• Grassy slopes, pastures, meadows, scree; 3200–5100 m. Sichuan, Xizang, Yunnan.

The type collections of *Thlaspi yunnanense* and *T. yunnanense* var. *dentatum* are indistinguishable in every aspect except for the size of leaf teeth, a feature that is highly variable within any given collection. The apical notch of the fruit can also be variable: in the type collection of *T. yunnanense* it ranges from obsolete to 0.4 mm deep.

Thlaspi yunnanense is recorded here for the first time from Xizang, based on Ludlow, Sherriff & Taylor 4163 (BM).

4. *Thlaspi flagelliferum* O. E. Schulz, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 63: 98. 1926.

四川菥 si chuan xi ming

Herbs perennial, (3–)6–35(–60) cm tall, glabrous throughout. Stems erect or ascending, simple. Basal leaves rosulate; petiole 0.5–2.5(–6) cm; leaf blade oblong, ovate, or orbicular, (0.3–)0.6–2(–3) cm × 3–7(–15) mm, base rounded or truncate, margin entire or repand, apex rounded. Middle cauline leaves sessile, oblong, ovate, or suborbicular, 0.6–1.6(–2.5) cm × 2–8(–12) mm, base auriculate, margin entire or repand, rarely denticulate, apex rounded, obtuse, or subacute. Fruiting pedicels 4–6 mm, slender, divaricate, straight or slightly recurved. Sepals oblong, 2–3 × 1–1.5 mm, not saccate, margin white. Petals white, spatulate or obovate, (4.5–)5–6(–7) × (2–)2.5–3.5(–4) mm, apex rounded. Filaments 3.5–4.5 mm; anthers 0.5–0.7 mm. Ovules 14–24 per ovary. Fruit oblong-obovate, 0.8–1.3 cm × (3.5–)4–5(–5.5) mm, base acute, apex emarginate

and apical notch 0.2–0.5 mm deep; apical wings 0.6–1 mm wide; style (0.6–)1–1.7 mm. Seeds brown, oblong-ovate, 1–1.3 × 0.5–0.6(–0.9) mm, obscurely reticulate. Fl. late Apr–Aug, fr. May–Sep.

• Alpine grassy slopes, alpine meadows, roadsides; 500–4200 m. Sichuan.

The immature fruit of *Thlaspi* cannot be used to determine the degree of development of the apical notch and/or wings. This misled Schulz to describe the fruit of *T. flagelliferum* as wingless and without an apical notch. However, the holotype, *Weigold s.n.* (W), and fragmentary isotype at B clearly show the early development of wings and notch.

5. *Thlaspi andersonii* (J. D. Hooker & Thomson) O. E. Schulz, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 63: 98. 1926.

西藏菥 xi zang xi ming

Iberidella andersonii J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 177. 1861; *I. tibetica* C. Marquand & Airy Shaw.

Herbs perennial, (4–)6–15(–20) cm tall, glabrous throughout. Stems erect or decumbent, simple. Basal leaves rosulate; petiole (2–)5–10(–15) mm; leaf blade oblong, spatulate, or suborbicular, (0.3–)0.5–1.5(–1.8) cm × 2–6(–10) mm, base obtuse, margin entire, apex rounded. Middle cauline leaves sessile, oblong, ovate, or suborbicular, 5–10(–15) × 2–5(–7) mm, base auriculate, margin repand or entire, apex rounded, obtuse, or subacute. Fruiting pedicels (2–)4–7 mm, slender, divaricate, straight. Sepals oblong, 2–2.5 × 1.2–1.5 mm, not saccate, margin white. Petals white with lavender tinge, spatulate, (5–)6–7 × 2.5–3.5 mm, apex rounded. Filaments 2.5–3.5 mm; anthers oblong, 0.6–0.8 mm. Ovules 4–8(–10) per ovary. Fruit elliptic, 5–8 × 3–4 mm, base obtuse, apex obtuse to subacute, without apical notch; apical wings absent; style 0.7–1.5 mm. Seeds dark brown, oblong, 1.6–1.9 × 1–1.2 mm, obscurely reticulate. Fl. (Mar–)May–Jul, fr. Jun–Aug.

Rocky crevices, scree, moist grounds, steep hillsides, grassy river banks; 3200–5200 m. Xizang [Bhutan, Kashmir, Nepal, Pakistan, Sikkim].

The record and illustration in FRPS and Fl. Yunnan. (6: 32. 1995) of *Thlaspi andersonii* from Yunnan are most likely based on young plants of *T. yunnanense* with an obsolete apical notch, a feature not uncommon in the species.

6. *Thlaspi cochleariforme* de Candolle, Syst. Nat. 2: 381. 1821.

山菥 shan xi ming

Noccaea cochleariformis (de Candolle) Á. Löve & D. Löve; *N. exauriculata* (Komarov) Czerepanov; *Thlaspi exauriculatum* Komarov.

Herbs perennial, (5–)8–25(–45) cm tall, glabrous throughout, glaucous. Stems erect or ascending, simple. Basal leaves rosulate; petiole 0.5–1.5(–2.5) cm; leaf blade spatulate, oblong, or ovate, 0.6–2.8(–3.5) cm × 3–11(–15) mm, base obtuse, margin entire, apex rounded. Middle cauline leaves sessile, oblong or ovate, 0.6–

2.8(–3.5) cm × 4–12(–16) mm, base auriculate or amplexicaul, margin repand or entire, rarely denticulate, apex obtuse or acute. Fruiting pedicels (2–)4–8 mm, slender, divaricate, straight. Sepals oblong, 2–3 × 1–1.5 mm, not saccate, margin white. Petals white, spatulate, 5–7 × 2–3 mm, apex rounded. Filaments 2.5–3.5 mm; anthers oblong, 0.6–0.8 mm. Ovules 4–8(–10) per ovary. Fruit narrowly obovate or obovate-obcordate, rarely oblong-obovate, (5–)6–10(–13) × 4–6 mm, base subacute, apex emarginate and apical notch 1–2 mm deep; apical wings 1–2.5 mm wide; style (0.2–)0.7–1.5(–2) mm. Seeds brown, ovate-oblong, 1.2–1.8 × 0.9–

1.1 mm, obscurely reticulate. Fl. May–Jun, fr. Jun–Aug. $2n = 56, 84$.

Grassy slopes, roadsides, meadows; 600–3700 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang, Xizang [Kashmir, Kazakstan, Mongolia, Pakistan, Russia, Tajikistan].

Thlaspi cochleariforme was reduced in FRPS to the synonymy of *T. thlaspioides* (Pallas) Kitagawa, but the latter is a synonym of *T. alpestre* Linnaeus, a species restricted to Europe. The records in FRPS and Fl. Xinjiang. (2(2): 83. 1995) of *Thlaspi ferganense* N. Busch from Xinjiang are based on misidentified plants of *T. cochleariforme*.

19. CAPSELLA Medikus, Pfl.-Gatt. 85, 99. 1792, nom. cons.

芥属 qi shu

Bursa-pastoris Séguier, nom. rej.

Herbs annual or biennial. Trichomes sessile and stellate, sometimes mixed with simple or forked ones. Stems erect or ascending. Basal leaves rosulate, simple, usually pinnately lobed, lyrate, or runcinate, rarely entire or toothed. Cauline leaves sessile, auriculate or amplexicaul, entire, dentate, or sinuate. Racemes many flowered, ebracteate. Fruiting pedicels slender, ascending or divaricate. Sepals ovate or oblong, erect or ascending, glabrous or pubescent, base of lateral pair not saccate. Petals white, pink, red, or rarely yellowish, much longer or shorter than sepals, sometimes lacking; blade obovate or spatulate, apex obtuse; claw distinct from blade. Stamens 6, erect, tetradynamous; filaments not dilated at base; anthers ovate or oblong, obtuse at apex. Median glands absent; lateral glands 1 on each side of lateral stamen. Ovules (12–)20–40 per ovary. Fruit dehiscent silicles, obdeltoid to obdeltoid-obcordate, strongly flattened and angustiseptate, sessile; valves papery, prominently veined, strongly keeled; replum rounded; septum complete; style less than 1 mm, included or exerted from apical notch; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat reticulate, mucilaginous when wetted; cotyledons incumbent.

One species: SW Asia, Europe, naturalized elsewhere as a cosmopolitan weed.

1. Capsella bursa-pastoris (Linnaeus) Medikus, Pfl.-Gatt. 85. 1792.

芥 qi

Thlaspi bursa-pastoris Linnaeus, Sp. Pl. 2: 647. 1753; for more than 250 synonyms, see Index Kewensis. Herbs (2–)10–50(–70) cm tall, sparsely to densely pubescent with sessile, 3–5-rayed stellate trichomes often mixed near base of plant with much longer simple trichomes. Stems erect, simple or branched. Basal leaves rosulate; petiole 0.5–4(–6) cm; leaf blade oblong or oblanceolate, (0.5–)1.5–10(–15) × 0.2–2.5(–5) cm, base cuneate or attenuate, margin pinnatisect, pinnatifid, runcinate, lyrate, dentate, repand, or entire, apex acute or acuminate. Cauline leaves sessile, sagittate, amplexicaul, or rarely auriculate, narrowly oblong, lanceolate, or linear, 1–5.5(–8) cm × 1–15(–20) mm, margin entire or dentate. Fruiting pedicels (0.3–)0.5–

1.5(–2) cm, divaricate, usually straight, slender, glabrous. Sepals green or reddish, oblong, 1.5–2 × 0.7–1 mm, margin membranous. Petals white, rarely pinkish or yellowish, obovate, (1.5–)2–4(–5) × 1–1.5 mm. Filaments white, 1–2 mm; anthers ovate, to 0.5 mm. Fruit (3–)4–9(–10) × (2–)3–7(–9) mm, flat, base cuneate, apex emarginate or truncate; valves with subparallel lateral veins, glabrous; style 0.2–0.7 mm. Seeds brown, oblong, 0.9–1.1 × 0.4–0.6 mm. Fl. and fr. Apr–Jul. $2n = 16, 32^*$.

Roadsides, gardens, fields, waste areas, mountain slopes. Throughout China [native to SW Asia and Europe; naturalized elsewhere as a cosmopolitan weed].

This species is used as a vegetable and in the treatment of eye diseases and dysentery. It is the second most common weed on Earth.

20. HEDINIA Ostenfeld in Hedin, S. Tibet 6(3), Bot.: 76. 1922.

藏芥属 zang qi shu

Hediniopsis Botschantzev & Petrovsky.

Herbs annual, biennial, or short-lived perennial. Trichomes short-stalked, 1–3-forked, mixed with simple ones. Stems procumbent, decumbent, or ascending, rarely erect, few to numerous from base. Basal leaves petiolate, rosulate only early, later deciduous, 1- or 2-pinnatisect. Cauline leaves petiolate or uppermost subsessile, similar to basal ones. Racemes bracteate throughout or only basally, elongated in fruit. Fruiting pedicels suberect or divaricate. Sepals oblong, suberect, base of lateral pair not saccate. Petals white, longer than sepals; blade obovate, apex

rounded; claw subequaling sepals. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers ovate, obtuse at apex. Nectar glands 4, lateral, 1 on each side of lateral stamen; median glands absent. Ovules 18–46 per ovary. Fruit dehiscent silicles or rarely siliques, broadly to narrowly oblong, obovate, or orbicular, strongly angustiseptate, sessile; valves papery, with a prominent midvein, glabrous or pubescent, strongly keeled, slightly torulose, flat or twisted; replum rounded; septum complete or rarely perforated; style distinct, often less than to 1 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat coarsely reticulate, not mucilaginous when wetted; cotyledons incumbent.

Four species: C Asia, Himalayas, Mongolia, Russia; one species in China.

1. *Hedinia tibetica* (Thomson) Ostenfeld in Hedin, S. Tibet 6(3), Bot.: 76. 1922.

藏芥 zang qi

Hutchinsia tibetica Thomson, Icon. Pl. 9: t. 900. 1852; *Capsella thomsonii* J. D. Hooker; *Hedinia elata* C. L. He & Z. X. An; *H. rotundata* Z. X. An; *H. taxkargannica* G. L. Zhou & Z. X. An; *H. taxkargannica* var. *hejigensis* G. L. Zhou & Z. X. An; *Smelowskia tibetica* (Thomson) Lipsky.

Herbs (1–)5–30(–45) cm tall, densely to sparsely pubescent, canescent or green. Stems procumbent or ascending, densely hirsute basally with primarily simple trichomes to 1.3 mm. Basal leaves sparsely to densely pubescent; petiole (0.2–) 0.5–2(–3.5) cm, often ciliate basally; leaf blade ovate or narrowly oblong in outline, 1- or 2-pinnatisect, (0.3–)1–4(–7) × (0.2–)0.7–2(–2.5) cm; ultimate lobes ovate or oblong-linear, 1–12 × 0.5–3 mm. Cauline leaves similar to basal, reduced in

size and divisions toward stem apex. Racemes bracteate throughout or rarely only basally; distal bracts subsessile, sometimes adnate to pedicel. Fruiting pedicel, straight, erect or ascending, 1.5–3.5(–5) mm, pubescent, subappressed to rachis. Sepals oblong, 1.3–2 × 0.7–0.9 mm, sparsely pubescent. Petals obovate, 2–3.2 × (0.6–)0.9–1.4 mm; claw ca. 1.5 mm. Filaments 1.5–2 mm; anthers 0.3–0.4 mm. Ovules 20–46 per ovary. Fruit broadly oblong, rarely oblong-linear or suborbicular, (4.5–)5–10(–14) × 3–5 mm, flat or slightly twisted, obtuse, slightly retuse, or rarely subacute at both ends, appressed to rachis; valves glabrous or pubescent; style 0.3–0.8 mm, glabrous or rarely pubescent. Seeds light to dark brown, oblong, 0.8–1.1 × 0.4–0.6 mm. Fl. Jun–Aug, fr. Jul–Sep.

Sandstone gravel, alpine meadows, steppe, scree, sandy slopes; 3900–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Bhutan, India, Nepal, Sikkim, Tajikistan].

21. HORNUNGIA Reichenbach, Deutschl. Fl. 1: 33. 1837.

薄果芥属 bao guo qi shu

Hutchinsia R. Brown; *Hutchinsiella* O. E. Schulz; *Hymenolobus* Nuttall ex Torrey & A. Gray; *Pritzelago* Kuntze.

Herbs perennial with a branched caudex, or annual. Trichomes absent or minutely branched and subsessile mixed with simple ones. Stems erect, ascending, decumbent, or procumbent. Basal leaves rosulate or not, pinnatisect, sometimes dentate or entire. Cauline leaves petiolate, base cuneate or attenuate, pinnatisect, pinnatifid, dentate, or entire, or absent. Racemes few to many flowered, ebracteate. Fruiting pedicels divaricate. Sepals ovate or oblong, spreading or reflexed, glabrous or puberulent, base of lateral pair not saccate. Petals white, spreading, longer or shorter than sepals; blade obovate, oblong, or oblanceolate, apex obtuse or rounded; claw absent. Stamens 6 and subtetradynamous, rarely 4, erect or slightly spreading; filaments often dilated at base; anthers ovate, obtuse at apex. Median glands present or absent; lateral glands 1 on each side of lateral stamen. Ovules 4–20 per ovary. Fruit dehiscent silicles, oblong, ovate, suborbicular, elliptic, or lanceolate, angustiseptate, sessile; valves with a prominent midvein, glabrous, keeled; replum rounded; septum complete; style obsolete or rarely to 0.5 mm; stigma capitate, entire. Seeds biseriate or aseriate when few, wingless, oblong, plump; seed coat obscurely reticulate, mucilaginous or not when wetted; cotyledons incumbent or rarely accumbent.

Three species: Europe, one species extending into Asia and North America and naturalized elsewhere.

1. *Hornungia procumbens* (Linnaeus) Hayek, Repert. Spec. Nov. Regni Veg. Beih. 30: 480. 1925.

薄果芥 bao guo qi

Lepidium procumbens Linnaeus, Sp. Pl. 2: 643. 1753; *Capsella procumbens* (Linnaeus) Fries; *Hutchinsia procumbens* (Linnaeus) Desvaux; *Hymenolobus procumbens* (Linnaeus) Nuttall ex Torrey & A. Gray.

Herbs annual, (2–)5–22(–30) cm tall, glabrous throughout or puberulent with minutely forked trichomes. Stems erect, ascending, or decumbent, branched at base or rarely simple. Basal leaves rosulate or not; petiole (2–)5–12(–20) mm; leaf blade obovate, oblanceolate, or oblong, (0.2–)1–2.5(–4) cm × (1–)5–11(–16) mm, base cuneate or attenuate, margin entire, dentate, or pinnatifid, apex acute or obtuse. Cauline

leaves similar to basal ones, progressively smaller and subsessile upward. Racemes few to several flowered; rachis straight or slightly flexuous in fruit. Fruiting pedicels slender, divaricate, 3–8(–12) mm. Sepals ovate, 0.6–1.1 × 0.4–0.6 mm. Petals white, spatulate, 0.6–1.2 × 0.3–0.6 mm. Filaments white, 0.5–1 mm; anthers ovate, ca. 0.1 mm. Ovules 10–24 per ovary. Fruit oblong, elliptic, or obovate, (2–)3–4(–4.5) × (1–)1.4–2.2 mm, apex subtruncate to slightly emarginate; valves glabrous, with prominent reticulate veins; style obsolete or to 0.1 mm. Seeds brown, oblong, plump, 0.5–0.6 × 0.3–0.4 mm. Fl. and fr. Apr–Jul. $2n = 12, 24$.

Deserts, disturbed habitats, slopes. Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe, North America; introduced elsewhere].

Extremely variable in plant size, indumentum, number and shape of leaf divisions, fruit shape and size, and seed number per fruit. More than 40 synonyms exist. Other synonyms probably include *Lepidium chinense* Stokes (Bot. Mater. Med. 3: 429. 1812), not Franchet (1883) and *Nasturtium sinense* (Desvaux) de Candolle (Syst. Nat. 2: 699. 1821). The latter is based on *Hutchinsia sinensis* Desvaux (J. Bot. Agric. 3: 168. 1815), a name proposed to replace *Lepidium petraeum* Loureiro (Fl. Cochinch. 2: 479. 1793), not Linnaeus (1753).

22. HEMILOPHIA Franchet, Pl. Delavay. 65. 1889.

半脊芥属 ban ji qi shu

Herbs perennial, rhizomatous. Trichomes simple, malpighiaceus, or sometimes minutely forked. Stems ascending or decumbent, simple or branched. Basal leaves petiolate, rosulate, simple, entire. Cauline leaves petiolate or sessile, attenuate, entire. Racemes several flowered, bracteate throughout. Fruiting pedicels slender, ascending or divaricate, straight or curved. Sepals ovate, oblong, or obovate, ascending, glabrous or pubescent, base of lateral pair subsaccate. Petals yellowish, white, pink, or purple, caducous or persistent, longer than sepals; blade narrowly to broadly obovate or obcordate, apex shallowly to deeply emarginate. Stamens 6, slightly tetradynamous; filaments of lateral stamens filiform, those of median pairs strongly dilated or appendaged basally; anthers ovate, apiculate or not at apex. Nectar glands confluent, subtending bases of all stamens. Ovules 2 per ovary. Fruit dehiscent silicles, oblong, terete, sessile or subsessile; valves papery, navicular, veinless, glabrous, with 3 rows of crests; replum rounded; septum absent; style to 1.5 mm, cylindrical or conical, persistent, glabrous or minutely papillate; stigma capitate, entire. Seeds 1 or 2 per fruit, wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons obliquely accumbent.

• Four species.

- 1a. Cauline leaves sessile; sepals membranous throughout, readily caducous at anthesis; petals persistent till fruit dehiscence; style glabrous, conical; stem trichomes exclusively simple; raceme not elongated in fruit 4. *H. sessilifolia*
- 1b. Cauline leaves petiolate; sepals membranous only at margin, remaining until young fruit develops; petals caducous; style minutely papillate, cylindrical; stem trichomes crisped simple and forked, or malpighiaceus; raceme elongated considerably in fruit.
- 2a. Petals purplish; leaf trichomes setose, appressed; sepals not ciliate; stem with malpighiaceus, noncrisped trichomes 1. *H. franchetii*
- 2b. Petals pink, creamy white or yellowish; leaf glabrous or crisped pilose; sepals ciliate; stems puberulent with crisped trichomes.
- 3a. Petals 2.5–3.5 × 1.5–2 mm, narrowly obovate, pink; base of median filaments slightly dilated, not appendaged, 0.2–0.3 mm wide; leaves glabrous or rarely sparsely pilose; trichomes on inflorescence rachis obsoletely branched 2. *H. pulchella*
- 3b. Petals 5–7 × 3–5 mm, obcordate, creamy white to yellowish; base of median filaments conspicuously broadened, appendaged, 0.6–1.1 mm wide; leaves pilose or rarely glabrescent; trichomes of inflorescence rachis minutely branched 3. *H. rockii*

1. *Hemilophia franchetii* Al-Shehbaz, Adansonia 21: 241. 1999.

法氏半脊芥 fa shi ban ji qi

Hemilophia pulchella Franchet var. *pilosa* O. E. Schulz.

Stems originate from rhizomes and sometimes terminate in a basal rosette, producing 3–15 branches (3–)5–10(–15) cm, pubescent throughout with appressed malpighiaceus trichomes to 0.6 mm. Basal

leaves with petioles (3–)5–12 mm; blade elliptic, ovate, or oblanceolate, to 7 × 5 mm, margin entire, apex obtuse to rounded. Cauline leaves with petioles 1–4 mm; blade elliptic, elliptic-ovate, or rarely ovate-suborbicular, 3–7 × 2–5 mm, gradually reduced in size upward, sparsely to densely covered with appressed setose trichomes to 1 mm, margin entire, apex obtuse. Racemes elongated considerably in fruit. Fruiting

pedicels straight or distinctly curved, divaricate, (3–)5–12(–17) mm, pubescent with simple trichomes. Sepals oblong, pink or purplish, tardily caducous, not saccate, 1.5–2 × 0.7–1 mm, with appressed subsetose or nonsetose simple trichomes to 0.4 mm, margin entire, not ciliate, with a membranous part 0.1–0.2 mm wide. Petals pink or purple, caducous, obovate, 3–4(–5) × 2–2.5 mm, base cuneate to a claw ca. 1 mm, apex emarginate. Filaments pink, lateral pair 1.2–1.5 mm; median pairs 1.3–1.6 mm, inflated basal part 0.5–0.8 mm wide; anthers yellow or pink, 0.3–0.4 mm. Fruit valves papery, 2–3 × 1.5–2 mm, with a crest of tubercles surrounding margin and extending along midvein; gynophore obsolete or to 0.2 mm; style stout, cylindric, minutely papillate throughout, 0.5–0.9 mm. Seeds 2–2.3 × 1–1.1 mm. Fl. Apr–Aug, fr. Jul–Aug.

• Limestone gravel, open sand slopes, pine forests on limestone drift, alpine meadows; 3200–4500. Yunnan.

2. *Hemilophia pulchella* Franchet, Pl. Delavay. 65. 1889.

半脊芥 ban ji qi

Stems from rhizomes, few to many, 4–15 cm, puberulent throughout with minute, crisped, simple and forked trichomes to 0.06 mm. Basal leaves not seen.

Cauline leaves with petioles 1–3 mm; blade oblanceolate or narrowly elliptic, 3–6 × 1.5–3 mm, glabrous or rarely sparsely pilose with nonsetose trichomes, margin entire, apex subacute. Racemes elongated considerably in fruit. Fruiting pedicels straight or slightly curved, divaricate, 3–7 mm, puberulent with crisped minute trichomes. Sepals ovate, greenish, tardily caducous, not saccate, 1–1.5 × 0.7–1 mm, glabrous or sparsely puberulent, margin ciliate with trichomes ca. 0.05 mm, membranous part to 0.2 mm wide. Petals pink, caducous, narrowly obovate, 2.5–3.5 × 1.5–2 mm, cuneate to a clawlike base, apex shallowly emarginate. Filaments pinkish, lateral pair 1–1.3 mm; median pairs 1.2–1.6 mm, not appendaged, base 0.2–0.3 mm wide; anthers yellow, 0.3–0.4 mm. Immature fruit ca. 2.5 × 1.5 mm, with a crest of tubercles surrounding margin and extending along midvein; gynophore absent; style stout, cylindric, minutely papillate throughout, to 1 mm. Seeds not seen. Fl. Jul–Aug.

• Loose limestone gravel; 4000–4700 m. Yunnan.

3. *Hemilophia rockii* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 476. 1926.

小叶半脊芥 xiao ye ban ji qi

Hemilophia pulchella Franchet var. *flavida* Handel-Mazzetti; *H. pulchella* var. *rockii* (O. E. Schulz) W. T. Wang; *H. rockii* var. *flavida* (Handel-Mazzetti) Handel-Mazzetti.

Stems originate from rhizomes and sometimes terminate in a basal rosette, producing few or a cluster of many branches 4–10(–25) cm, puberulent throughout

with crisped, simple and forked trichomes rarely to 0.2 mm. Basal leaves lanceolate to elliptic-lanceolate, 2–5 × 0.5–1.5 mm, densely covered with straight trichomes to 1 mm. Cauline leaves with petioles 1–2 (–3) mm; blade oblanceolate, narrowly elliptic, or rarely ovate, (2–)4–8(–10) × (1–)2–3.5(–5) mm, sparsely covered with crisped simple trichomes to 0.5 mm, rarely glabrous, margin entire, apex subacute to obtuse.

Racemes elongated considerably in fruit. Fruiting pedicels straight to slightly curved, divaricate, (3–)4–8(–10) mm, pubescent with crisped trichomes. Sepals oblong or ovate, greenish, tardily caducous, not saccate, 1.5–2 × 1–1.5 mm, with crisped simple trichomes to 0.4 mm, margin ciliate with trichomes to 0.1 mm, membranous part 0.1–0.2 mm wide. Petals yellowish to creamy white, caducous, obcordate, 5–7 × 3–5 mm, base cuneate to a claw ca. 1 mm, apex deeply emarginate or nearly 2-lobed. Filaments white, lateral pair 1.4–1.5(–1.8) mm; median pairs 1.6–1.8(–2.1) mm, inflated basal appendage 0.6–1.1 mm; anthers yellow, 0.3–0.4 mm. Fruit valves papery, 3–4 × 1.5–2.5 mm, with a crest of tubercles surrounding margin and extending along midvein; gynophore obsolete or to 0.2 mm; style stout, cylindric, minutely papillate throughout, 0.8–1.2 mm. Seeds 2–3 × 1–2 mm. Fl. Jun–Jul, fr. Jul–Aug.

• Loose limestone gravel, scree; 3900–4900 m. SW Sichuan, E Yunnan.

4. *Hemilophia sessilifolia* Al-Shehbaz et al., Novon 9: 8. 1999.

无柄叶半脊芥 wu bing ye ban ji qi

Stems 1 to several from basal rosette or solitary from rhizomes, 3–9 cm tall, simple or few branched, with spreading or appressed simple trichomes to 0.3 mm. Basal leaves oblanceolate, 6–10 × 1.5–2.5 mm, densely covered with straight, simple trichomes 0.8–1.3 mm. Cauline leaves oblong to oblong-oblanceolate, 2.5–5(–8) × 1–2(–2.5) mm, sessile, glabrous or minutely pubescent, margin entire, apex obtuse. Racemes not elongated in fruit. Fruiting pedicels slender, straight, divaricate, 5–6 mm, pilose. Sepals obovate, membranous, early caducous and leaving 4 receptacular teeth, 1.8–2.7 × 1.2–1.5 mm, entire, rounded at apex. Petals creamy white with dark green veins, pale to light brown at base of blade, persistent to fruit maturity, broadly obovate, 6–7 × 4–5.5 mm, 2-lobed, abruptly narrowed to claw, apical notch to 2 mm deep; claws 1.5–2.5 mm. Filaments white, lateral pair 1.8–2.2 mm; median pairs 1.9–2.5 mm, strongly inflated on basal half into an oblong appendage 1.1–1.3 mm; anthers green. Fruit valves thin papery, 3–4 × 1.5–2 mm, with 3 rows of crests; gynophore obsolete or to 0.1 mm; style conical, glabrous, 1–1.5 mm. Seeds 2.5–3 × 1.1–1.3 mm. Fl. & fr. Aug.

• Limestone gravel; 4300–4600 m. Yunnan.

23. DIPOMA Franchet, Bull. Soc. Bot. France 33: 404. 1886.

蛇头荠属 she tou qi shu

Herbs perennial, rhizomatous. Trichomes a mixture of simple and short-stalked, submalpighiaceous. Stems decumbent or ascending. Basal leaves rosulate, simple, entire or distally 3–5-lobed. Cauline leaves sessile and attenuate at base, entire, apically dentate. Racemes several flowered, bracteate. Fruiting pedicels ascending or divaricate at base, strongly recurved and often forming a loop. Sepals oblong, spreading, glabrous or pubescent, base of lateral pair not saccate. Petals white, sometimes with pink veins, much longer than sepals; blade broadly obcordate to orbicular, apex emarginate or rarely subrounded; claw short, well differentiated from blade. Stamens 6, erect, subequal; filaments not dilated at base; anthers ovate to suboblong, obtuse at apex. Median glands absent; lateral glands 1 on each side of lateral stamen. Ovules 4 per ovary. Fruit dehiscent silicles, oblong or ovoid, terete or slightly angustiseptate, sessile; valves membranous, sparsely to densely hirsute with subsetose trichomes, rarely glabrous, rounded, smooth, wingless or with small appendages; replum strongly flattened and to 1 mm wide; septum complete; style conical; stigma capitate, entire. Seeds wingless, oblong, flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

• One species.

1. *Dipoma iberideum* Franchet, Bull. Soc. Bot. France 33: 405. 1886.

蛇头荠 she tou qi

Dipoma iberideum var. *dasycarpum* O. E. Schulz;

Dipoma iberideum f. *pilosius* O. E. Schulz.

Stems slender, (3–)5–15(–22) cm, simple, pubescent with stalked or subsessile forked trichomes to 1 mm. Basal leaves with petioles (1–)2–7 mm; blade obovate to oblanceolate, 3–8 × 2–5 mm, 3–5-lobed or -toothed near apex, rarely entire. Cauline leaves sessile or attenuate to a petiolelike base to 4 mm; blade oblong, obovate, spatulate, or oblanceolate, 0.5–1.5(–3) cm × 2–5(–7) mm, margin entire, sometimes ciliate with subsetose trichomes, apex 3–5-toothed or -lobed; terminal tooth or lobe to 6 × 4 mm. Fruiting pedicels strongly curved, often forming a complete loop, 4–8(–

12) mm, pubescent with simple and forked trichomes. Sepals pink or green, oblong, 1.5–2.5 × 0.7–1 mm, membranous margin 0.1–0.2 mm. Petals white, broadly obcordate or orbicular, (3.5–)5–6(–7) × 2.5–4(–5) mm; claw 0.5–1 mm. Filaments white, 2–3.5 mm; anthers purple, ca. 0.5 mm. Fruit with 1 side aborting; valves thin papery, 3–4 × 1.7–2.5 mm, glabrous or with simple, flattened trichomes to 0.4 mm, rounded or rarely with a dorsal appendage to 1 mm; replum flattened, to 1.5 mm wide; gynophore obsolete or to 0.1 mm; style (1–)2–3.5 mm. Seeds 2.5–3(–3.5) × 1.5–2(–2.5) mm, reddish brown. Fl. Apr–Jul, fr. Jul–Sep.

• Alpine gravel, mountain slopes, limestone drift, open stony meadows, scree, pastures, alpine meadows; 3000–4600 m. Sichuan, Yunnan.

24. DILOPHIA Thomson, Hooker's J. Bot. Kew Gard. Misc. 5: 19. 1853.

双脊荠属 shuang ji qi shu

Herbs perennial. Trichomes absent or simple. Roots fleshy, conical. Stems erect, simple underground, branched aboveground. Basal leaves sessile, fleshy, rosulate, simple, entire or sinuate or dentate. Cauline leaves sessile, attenuate and not auriculate, entire. Corymbs several to many flowered, bracteate or ebracteate, simple or compound, not elongated in fruit. Fruiting pedicels ascending or divaricate. Sepals broadly ovate, persistent, ascending, glabrous or puberulent, base of lateral pair not saccate. Petals white or pink, longer than sepals; blade obovate or spatulate, apex obtuse or emarginate; claw obscurely to distinctly differentiated from blade. Stamens 6, slightly spreading, slightly tetradynamous; filaments not dilated at base; anthers ovate, apiculate at apex. Nectar glands confluent and subtending bases of all filaments. Ovules 4–12 per ovary. Fruit dehiscent silicles, obcordate, angustiseptate, sessile; valves membranous or thin papery, obscurely veined, glabrous or puberulent, rounded, smooth, apically gibbous and cristate; replum strongly flattened, base much broader; septum complete or perforated; style to 0.5 mm, included in apical notch of fruit; stigma capitate, entire. Seeds wingless, broadly oblong or ovoid, slightly flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent or oblique.

Two species: Bhutan, China, India, Kashmir, Kyrgyzstan, Nepal, Sikkim, Tajikistan; two species (one endemic) in China.

1a. Petals broadly obovate, 4.5–6 × 2–3 mm; anther apicula ovate, 0.2–0.5 mm, apex rounded; seeds 2–4 per fruit, 1.8–2.2 × 0.9–1.2 mm

1. *D. ebracteata*

1b. Petals spatulate or spatulate-linear, 1.8–2.5(–3.2) × 0.5–1(–1.5) mm; anther apicula triangular, 0.05–0.1

mm, apex acute; seeds (2–)4–8(–12) per fruit, 0.7–1.1(–1.5) × 0.5–6 mm 2. *D. salsa*

1. *Dilophia ebracteata* Maximowicz, Fl. Tangut. 72. 1889.

无苞双脊芥 wu bao shuang ji qi

Dilophia hopkinsonii O. E. Schulz.

Herbs glabrous throughout, rarely sepals puberulent. Stems erect, somewhat fleshy, simple from taproot, 1.5–10 cm tall. Leaves oblong-spatulate, linear-spatulate, or linear, (3–)5–10 (–15) × (1–)1.5–3 mm, fleshy, base attenuate, margin entire, apex obtuse or rounded. Corymbs few to many flowered, only lowermost few flowers bracteate. Fruiting pedicels 3–10 mm. Sepals erect, broadly ovate, 2.5–3 × 1.5–2 mm, glabrous or subapically puberulent, margin broadly membranous, apex entire or minutely denticulate. Petals white, often with pink tinge outside, broadly obovate, 4.5–6 × 2–3 mm, apex rounded or subemarginate; claw to 3 mm. Filaments white, 2–3 mm; anthers ovate, 0.6–1 mm, the apicula ovate, 0.2–0.5 mm, apex rounded. Ovules 2–4 per ovary. Fruit valves oblong, glabrous, 2–2.5 mm, notch to 2 mm wide, apical cristae 4–12; replum 2–2.5 mm wide at base; style 0.2–0.3 mm. Seeds brown, broadly oblong or ovate, somewhat flattened, 1.8–2.2 × 0.9–1.2 mm. Fl. late Jun–Sep, fr. Aug–Oct.

• Consolidated turf within scree slopes in alpine meadows and on rocky slopes, *Kobresia* mats; 4500–5000 m. Qinghai, Xizang.

The records in FRPS and Fl. Xinjiang. (2(2): 91. 1995) of *Dilophia ebracteata* from Xinjiang are based on misidentified plants of *D. salsa*. The differences previously used to distinguish *D. ebracteata* (leaves entire, flowers ebracteate, ovary cristae longitudinal) from *D. salsa* (leaves dentate or pinnately lobed, flowers bracteate, ovary cristae transverse) do not hold, though the leaves in the latter species are more often sinuate, dentate, or repand, rather than entire.

2. *Dilophia salsa* Thomson, Hooker's J. Bot. Kew Gard. Misc. 5: 20. 1853.

盐泽双脊芥 yan ze shuang ji qi

Dilophia dutreuilii Franchet; *D. kashgarica* Ruprecht; *D. salsa* var. *hirticalyx* Pampanini.

Herbs glabrous throughout, or fruit valves and/or sepals sparsely to densely pubescent with simple, flattened trichomes to 0.5 mm. Stems erect, somewhat fleshy, usually simple from taproot, 1.5–10 cm tall, often forming a flat mat 1–12 cm in diam. Leaves spatulate, linear-spatulate, oblong, or linear, (0.3–)0.6–2(–3) cm × (1–)2–3(–5) mm, fleshy, base attenuate, margin sinuate, dentate, or repand, sometimes entire, apex obtuse. Corymbs few to many flowered, lowermost or most flowers bracteate, sometimes flowers solitary from center of rosette. Fruiting pedicels 3–10 mm. Sepals erect or ascending, broadly ovate, (1–)1.5–2.5 × 1–1.5 mm, glabrous or densely pubescent, margin broadly membranous, apex denticulate or entire. Petals white or pink, drying purplish, spatulate to spatulate-linear, 1.8–2.5(–3.2) × 0.5–1(–1.5) mm, apex obtuse or subemarginate; claw to 2 mm. Filaments white, 1.1–1.6 mm; anthers ovate, (0.2–)0.3–0.5 mm, the apicula triangular, 0.05–0.1 mm, apex acute. Ovules (2–)4–8(–12) per ovary. Fruit valves oblong or ovate, glabrous or densely pubescent, 1–2.5 mm, notch 1–2 mm wide, apical cristae 3–14; replum 1.2–2.5 mm wide at base; style 0.2–0.5 mm. Seeds brown to blackish, broadly oblong, 0.7–1.1(–1.5) × 0.5–0.6 mm. Fl. Jun–Aug, fr. Jul–Sep.

Sandy river bottoms or marshes, damp mud by streamsides, debris covered glacial moraine, scree, grasslands, steep slopes with semiconsolidated scree, turf cushions, sand plains permafrost, salty pastures, dunes, alpine steppe; (2200–)3400–5500. Gansu, Qinghai, Xinjiang, Xizang [Bhutan, India, Kashmir, Kyrgyzstan, Nepal, Sikkim, Tajikistan].

25. PLATYCRASPEDUM O. E. Schulz, Repert. Spec. Nov. Regni Veg. Beih. 12: 386. 1922.

宽框芥属 kuan kuang qi shu

Herbs biennial or perennial. Trichomes simple. Roots fusiform, fleshy. Stems erect, short, and simple at base, with several, long, decumbent or ascending branches. Basal leaves unknown. Cauline leaves petiolate, repand-dentate or palmately lobed, the lobes not mucronate, base cordate. Racemes several flowered, bracteate throughout. Sepals oblong (median pair) or broadly ovate (lateral pair), deciduous, glabrous, unequal, base of lateral pair saccate, margin membranous. Petals white, narrowly obovate or subelliptic. Stamens 6, tetradynamous; filaments white; median pair strongly flattened, laterally 1-toothed; anthers oblong. Nectar glands 2, annular, lateral; median glands absent. Ovules 3–9 per ovary. Fruit dehiscent siliques, linear or oblong, terete or 4-angled; valves obscurely veined or with a prominent, narrowly winged midvein, keeled or not; gynophore short and rarely to 1 mm; replum flattened, winged or wingless; septum absent; style to 1.5 mm; stigma 2-lobed. Seeds uniseriate, wingless, oblong or ovate, flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

• Two species.

- 1a. Fruit 4-angled, narrowly 4-winged, not torulose, 2.5–3 mm wide; petals 4–6 × 2–3 mm; seeds (2.8–)3–3.5 mm 1. *P. tibeticum*
- 1b. Fruit terete, wingless, torulose, ca. 1.5 mm wide; petals 3–4 × 1–1.5 mm; seeds 2–2.5 mm 2. *P. wuchengyii*

1. *Platycraspedum tibeticum* O. E. Schulz, Repert. Spec. Nov. Regni Veg. Beih. 12: 386. 1922.

宽框芥 kuan kuang qi

Herbs (6–)10–20(–60) cm tall, glabrous or sparsely pubescent with trichomes to 0.8 mm. Root fusiform, to 5 mm in diam. Stems several branched from a short base. Cauline leaves petiolate, glabrous or pubescent; petiole (0.1–)0.5–2(–3) cm; leaf blade suborbicular, cordate, or broadly ovate, (4–)7–15 × (1–)5–12(–15) mm, reduced upward, base cordate, margin repand-dentate, repand, or palmately 5-lobed, not mucronate, apex obtuse. Fruiting pedicels slender, ascending or divaricate, straight or recurved, (3–)5–12(–20) mm. Sepals 1.5–2 × 0.8–1.5 mm, glabrous, membranous margin to 0.2 mm wide; median pair oblong, narrower than lateral, not saccate at base; lateral pair broadly ovate, saccate at base. Petals white, narrowly obovate or subelliptic, 4–6 × 2–3 mm, base cuneate, apex rounded. Filaments white, 1.1–2 mm; lateral pair slender; median pair strongly flattened basally, 0.4–0.6 mm wide, with an ovate or oblong lateral tooth 0.2–0.4 × 0.1–0.2 mm; anthers oblong, 0.4–0.6 mm, apex obtuse. Ovules 6–9 per ovary. Fruit narrowly oblong, 4-angled, longitudinally 4-winged, curved, not torulose, (6–)8–15 × 2.5–3 mm, base cuneate; valves glabrous, with a well-developed midvein wing to 0.5 mm wide; replum with a longitudinal wing to 0.5 mm wide; style thick, 0.5–1.5 mm; gynophore to 0.5 mm. Seeds ovate or broadly oblong, flattened, (2.8–)3–3.5 × 1.5–2 mm. Fl. Jun–Aug, fr. Jul–Aug.

• Alpine areas; 4100–4800 m. Sichuan, E Xizang.

2. *Platycraspedum wuchengyii* Al-Shehbaz et al., *Novon* 10: 3. 2000.

吴氏宽框芥 *wu shi kuan kuang qi*

Herbs 5–25 cm tall, glabrous or sparsely pubescent with trichomes to 1 mm. Root fusiform, fleshy, to 2 mm in diam. Stem single from fleshy root then few to several branched, branches slender, ascending or decumbent. Cauline leaves petiolate, glabrous or sparsely pubescent; petiole 0.5–2.5(–4) cm; leaf blade suborbicular, cordate, or subreniform, 4–12 × 5–15 mm, reduced in size upward, base cordate, margin repand or shallowly and obtusely 5-lobed, the lobes not mucronate, apex obtuse. Fruiting pedicels slender, ascending or divaricate, straight, 5–15 mm. Sepals 1–1.5 × 0.6–1 mm, glabrous, membranous margin to 0.1 mm wide. Petals white, narrowly subelliptic to narrowly oblong, 3–4 × 1–1.5 mm, base cuneate, apex rounded. Filaments white, 1.1–1.5 mm; lateral pair slender; median pairs strongly flattened basally and 0.3–0.5 mm wide, with an ovate or oblong lateral tooth to 0.2 × 0.1 mm; anthers oblong, 0.3–0.4 mm, apex obtuse. Ovules 3–6 per ovary. Fruit linear, terete, wingless, torulose, 6–15 × ca. 1.5 mm, base cuneate; valves sparsely and minutely puberulent, obscurely veined, wingless; replum wingless; style thick, 0.5–1.5 mm; gynophore to 1 mm. Seeds oblong, flattened, 2–2.5 × ca. 1.5 mm. Fl. Jun–Aug, fr. Jul–Aug.

• Wet ground by rivers, ravine slopes in *Juniperus* forests, woods; 4000–4500 m. Sichuan, E Xizang.

26. *YINSHANIA* Ma & Y. Z. Zhao, *Acta Phytotax. Sin.* 17(3): 113. 1979.

阴山芥属 *yin shan qi shu*

Cochleariella Y. H. Zhang & R. Vogt; *Cochleariopsis* Y. H. Zhang (1985), not Á. Löve & D. Löve (1976); *Hilliella* (O. E. Schulz) Y. H. Zhang & H. W. Li.

Herbs annual or perennial with tubers or rhizomes. Trichomes absent or simple or 1- or 2-forked. Stems erect, ascending, or decumbent. Basal leaves not rosulate, simple, undivided or pinnately or palmately lobed, trifoliolate, or pinnately compound. Cauline leaves petiolate, not auriculate, similar to basal leaves or simple upward. Racemes few to many flowered, ebracteate or rarely bracteate throughout. Fruiting pedicels erect, ascending, divaricate, or reflexed. Sepals oblong or ovate, spreading, not saccate. Petals white or rarely pinkish, spreading, longer than sepals; blade obovate, oblong, or ovate, apex rounded; claw absent or short. Stamens 6, spreading, subequal; filaments not dilated at base; anthers ovate or oblong, apex obtuse. Median nectaries absent; lateral glands 1 on each side of lateral stamen. Ovules 1–24 per ovary. Fruit dehiscent silicles, oblong, ovoid, ellipsoid, or globose, terete, rarely slightly latiseptate or angustiseptate, sessile; valves veinless or obscurely veined, glabrous, papillate, or with simple trichomes, smooth; replum rounded; septum complete, perforated, or absent; style obsolete or to 3 mm; stigma discoid, entire. Seeds uniseriate or biseriate, wingless, oblong, ovate, reniform, orbicular, ovoid, lenticular, elliptic, ellipsoid, or globose, slightly flattened; seed coat minutely reticulate or papillate, not mucilaginous when wetted; cotyledons incumbent or rarely accumbent.

Thirteen species: China, N Vietnam; 13 species (12 endemic) in China.

All species of *Yinshania* were treated in FRPS as members of *Cochlearia*, a genus that does not occur in China, the Himalaya, or SW Asia. A few species of *Cochlearia* grow in N Russia, with the range of one extending into Japan. The record of *C. officinalis* Linnaeus in FRPS (p. 98) is likely an error. For a detailed account of *Yinshania* and its segregates see Al-Shehbaz et al. (*Harvard Pap. Bot.* 3(1): 79–94. 1998).

1a. Most or all leaves simple, entire, repand, or sinuate, rarely lowermost few trifoliolate 8. *Y. sinuata*
1b. Leaves compound or pinnately lobed.

2a. Flowers bracteate along entire length or only on lower half of inflorescence.

3a. Plants annual; ovary ca. 8-ovuled, cylindric, papillate 13. *Y. hui*

3b. Plants perennial; ovary ca. 4-ovuled, obovate-ellipsoid, glabrous 12. *Y. hunanensis*

2b. Flowers ebracteate.

4a. Trichomes forked.

- 5a. Leaves and stems canescent, densely villous with trichomes 0.3–0.5(–0.6) mm 6. *Y. furcatopilosa*
- 5b. Leaves and stems not canescent, puberulent with trichomes 0.05–0.08(–0.1) mm 3. *Y. zayuensis*

4b. Trichomes simple or absent.

6a. Inflorescence rachis conspicuously flexuous.

- 7a. Leaves canescent, densely villous, margin of lower leaves deeply crenate; seeds 0.7–0.9 mm, (4–)10–20 per fruit 5. *Y. henryi*

- 7b. Leaves not canescent, glabrous or sparsely pubescent, margin of lower leaves not deeply crenate; seeds 1.5–2 mm, 2(–4) per fruit 2. *Y. yixianensis*

6b. Inflorescence rachis straight.

8a. Leaflets of middle and lower leaves less than 1 cm wide.

- 9a. Leaves glabrous, lower ones trifoliolate; fruit papillate 4. *Y. fumarioides*

- 9b. Leaves usually pilose, rarely glabrous, lower ones pinnate, with 2–5 pairs of lateral leaflets; fruit glabrous or rarely pilose 1. *Y. acutangula*

8b. Leaflets of middle and lower leaves more than 1 cm wide.

- 10a. Lower leaves with 5–9 leaflets; fruit conspicuously compressed; plants tuberous perennials 11. *Y. rupicola*

- 10b. Lower leaves with 3(or 5) leaflets; fruit plump, not compressed; plants annuals with slender roots.

- 11a. Leaflet apex acuminate-caudate; fruit appressed to rachis; plants puberulent with trichomes to 0.1 mm 10. *Y. lichuanensis*

- 11b. Leaflet apex obtuse or acute, rarely subacuminate; fruit widely spreading or reflexed; plants glabrous throughout or rarely glabrescent.

- 12a. Fruit ovate or obovate, 2- or 3-seeded; style 0.5–0.8 mm; pedicel (1.5–)2.5–4 mm 9. *Y. paradoxa*

- 12b. Fruit narrowly oblong, 7–10-seeded; style (1–)1.5–2 mm; pedicel 6–10 mm 7. *Y. rivulorum*

1. *Yinshania acutangula* (O. E. Schulz) Y. H. Zhang, Acta Phytotax. Sin. 25: 217. 1987.

锐棱阴山芥 *rui leng yin shan qi*

Annuals, (8–)30–60(–100) cm tall. Stems slender, distinctly angled or subterete, branched, sparsely to densely covered with simple trichomes (0.1–)0.3–0.4(–0.5) mm, rarely glabrescent or glabrous. Basal leaves and lowermost cauline leaves pinnate, with 2–5 pairs of lateral leaflets, often withered at fruiting, pilose with subappressed, simple, straight trichomes; petiole 0.5–2 cm; leaflets membranous, oblong or ovate-lanceolate, 5–20 × 2–9 mm, sparsely pubescent or rarely glabrous, base cuneate, margin deeply serrate or entire, apex obtuse, with a minute callose mucro; upper cauline leaves similar to lower ones but progressively shorter upward. Racemes terminal and lateral, many flowered, elongated in fruit. Fruiting pedicels 4–7 mm, slender, straight, divaricate or slightly recurved, glabrous or pilose. Sepals ovate, 1–1.5 mm. Petals white, obovate, 2–2.5 × ca. 0.7 mm. Filaments ca. 1 mm. Ovules (2–)4–20(–24) per ovary. Fruit oblong-linear, oblong, narrowly ovoid, or globose, 1.5–4 × 1–1.5 mm, not compressed, sessile; valves membranous, papillate or pilose; style 0.5–0.8 mm. Seeds brown, oblong-ovate,

0.6–1(–1.1) × 0.4–0.5(–0.6) mm, reticulate. Fl. Jul–Aug, fr. Aug–Oct.

• Mountain slopes, meadows, rock crevices, valleys, fields, among bushes, roadsides, dry areas; 900–3000 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Sichuan.

- 1a. Fruit oblong to oblong-linear, rarely narrowly ovoid; seeds (10–)14–20(–24) per fruit,

- 0.6–0.8 mm 1a. subsp. *acutangula*

- 1b. Fruit globose, rarely globose-ovoid; seeds 2–4(–6) per fruit, 0.8–1(–1.1) mm.

- 2a. Fruit pilose; stems obscurely angled to subterete 1b. subsp. *microcarpa*

- 2b. Fruit minutely papillate or glabrous; stems distinctly angled 1c. subsp. *wilsonii*

1a. *Yinshania acutangula* subsp. *acutangula*

锐棱阴山芥(原亚种) *rui leng yin shan qi* (*yuan ya zhong*)

Cochlearia acutangula O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 10: 554. 1929; *Rorippa villosa* R. F. Huang; *Yinshania acutangula* var. *albiflora* (Ma & Y. Z. Zhao) Y. H. Zhang; *Y. albiflora* Ma & Y. Z. Zhao; *Y. albiflora* var. *gobica* Z. X. An; *Y. wenxianensis* Y. H. Zhang; *Y. wenxianensis* var. *songpanensis* Y. H. Zhang.

Stems distinctly angled. Fruit oblong to oblong-linear, rarely narrowly ovoid, glabrous or minutely papillate. Seeds (10–)14–20(–24) per fruit, 0.6–0.8 mm. Fl. Jul–Aug, fr. Aug–Oct. $2n = 14^*$.

• Mountain slopes, meadows, rock crevices, valleys, fields, among bushes, roadsides, dry areas; 900–3000 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Sichuan.

1b. *Yinshania acutangula* subsp. ***microcarpa*** (K. C. Kuan) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 83. 1998.

小果阴山芥 *xiao guo yin shan qi*

Cochlearia microcarpa K. C. Kuan, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(8): 40. 1980; *Yinshania microcarpa* (K. C. Kuan) Y. H. Zhang.

Stems obscurely angled to subterete. Fruit globose, pilose. Seeds 2–4(–6) per fruit, 0.8–1(–1.1) mm. Fr. Aug.

• Dry areas by rocks; ca. 1100 m. Gansu, Sichuan.

1c. *Yinshania acutangula* subsp. ***wilsonii*** (O. E. Schulz) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 83. 1998.

威氏阴山芥 *wei shi yin shan qi*

Cochlearia henryi (Oliver) O. E. Schulz var. *wilsonii* O. E. Schulz, Repert. Spec. Nov. Regni Veg. 38: 108. 1935; *Yinshania qianningensis* Y. H. Zhang; *Y. qianningensis* var. *brachybotrys* Y. H. Zhang.

Stems distinctly angled. Fruit globose, rarely globose-ovoid, minutely papillate or glabrous. Seeds 2–4(–6) per fruit, 0.8–1(–1.1) mm. Fl. Jul–Aug, fr. Aug–Oct. $2n = 12^*$.

• Valleys, roadsides; 1400–3000 m. Gansu, Sichuan.

2. *Yinshania yixianensis* (Y. H. Zhang) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 84. 1998.

黟县阴山芥 *yi xian yin shan qi*

Hilliella yixianensis Y. H. Zhang, Acta Phytotax. Sin. 33: 94. 1995.

Annuals or biennials. Stems erect, 40–90 cm tall, striate, glabrous or rarely pilose with simple trichomes. Basal and median cauline leaves compound, with 2 or 3 pairs of lateral leaflets; petiole 0.5–1.5 cm; leaflets thin papery, ovate or elliptic, 1–4 × 0.8–1.7 cm, hispidulous, base obtuse or cuneate, margin obtusely dentate with the teeth mucronate, apex acute; petiolule to 5 mm; uppermost cauline leaves smaller, with fewer teeth and lateral leaflets. Racemes terminal and lateral, elongated considerably in fruit; rachis conspicuously flexuous, slender. Fruiting pedicels slender, 5–6 mm. Sepals elliptic, ca. 1.5 × 0.5 mm, spreading. Petals white, spreading, ovate, ca. 2.5 × 1.5 mm. Fruit subglobose-ovoid, ca. 3.5 × 2.5 mm; valves papillate. Seeds 2(–4) per fruit, ovoid, 1.5–2 mm. Fr. Jul. $2n = 42^*$.

• Roadsides; ca. 200 m. Anhui.

3. *Yinshania zayuensis* Y. H. Zhang, Acta Phytotax. Sin. 25: 214. 1987.

察隅阴山芥 *cha yu yin shan qi*

Yinshania exiensis Y. H. Zhang; *Y. ganluoensis* Y. H. Zhang.

Annuals, (14–)30–60 cm tall. Stems erect, simple or branched, puberulent with forked and bifurcate trichomes 0.05–0.08(–0.1) mm, rarely glabrous above. Leaves pinnatisect; petiole 2–7 mm; leaf blade oblong, 0.6–3 × 0.4–1.5(–2.3) cm, puberulent with minute, simple and forked trichomes, rarely glabrescent; terminal lobe oblong, 3–15 × 1–5 mm, base cuneate, margin serrate or subentire, apex acute; lateral lobes 1–3 pairs, 1.5–13 × 0.5–3 mm. Racemes paniculate; rachis straight or rarely flexuous. Fruiting pedicels divaricate or ascending, slender, straight, 5–10 mm, pubescent or glabrous. Sepals oblong, 1–1.6 × 0.5–0.7 mm, white at margin and apex. Petals white or rarely pinkish, 1.5–2 × 0.7–1 mm. Filaments 1.1–1.2 mm; anthers oblong, ca. 0.2 mm. Ovules 16–20 per ovary. Fruit oblong, ellipsoid, or ovoid, plump, (2–)2.5–4 × 0.9–1.6 mm; valves with distinct midvein and reticulate veins, glabrous; style 0.1–0.5 mm. Seeds dark brown, ovate, 0.6–0.9 × 0.4–0.6 mm, reticulate. Fl. and fr. Jul–Aug.

• Woods; 2600–3000 m. Hubei, Sichuan, Xizang, Yunnan.

4. *Yinshania fumarioides* (Dunn) Y. Z. Zhao, Acta Sci. Nat. Univ. Intramongol. 23: 568. 1992.

紫堇叶阴山芥 *zi jing ye yin shan qi*

Cochlearia fumarioides Dunn, J. Linn. Soc., Bot. 38: 355. 1908; *Cochlearia warburgii* O. E. Schulz; *Cochleariella zhejiangensis* (Y. H. Zhang) Y. H. Zhang & R. Vogt; *Cochleariopsis warburgii* (O. E. Schulz) L. L. Lou; *Cochleariopsis zhejiangensis* Y. H. Zhang; *Hilliella fumarioides* (Dunn) Y. H. Zhang & H. W. Li; *H. warburgii* (O. E. Schulz) Y. H. Zhang & H. W. Li; *H. warburgii* var. *albiflora* S. X. Qian; *Yinshania warburgii* (O. E. Schulz) Y. Z. Zhao; *Y. zhejiangensis* (Y. H. Zhang) Y. Z. Zhao.

Annuals, (5–)10–20(–35) cm tall, glabrous throughout except for papillate fruit valves. Stems slender, branched below or above. Basal and lowermost cauline leaves 3-foliolate; petiole 0.2–3 cm, not winged; terminal leaflet ovate or suborbicular, 0.7–1.5(–2) cm × 4–10 mm, base cuneate or subcordate, margin lobed, without apiculate callosities, apex truncate or emarginate; lateral leaflets obliquely ovate, 2.3–11 × 1.2–8 mm, margin lobed or crenate; uppermost leaves simple, gradually smaller upward. Racemes several to many flowered, ebracteate; rachis slender, only somewhat flexuous. Fruiting pedicels slender, horizontal or slightly reflexed, (3–)6–10 mm, straight or slightly recurved, glabrous. Sepals oblong, 0.9–1.2 × 0.5–0.6 mm, glabrous. Petals white, obovate, 1.8–2.1 × 0.9–1.3 mm, base shortly clawed, apex rounded. Filaments 0.7–

0.9–(1.3) mm; anthers oblong-ovate, 0.2–0.4 mm. Fruit suborbicular, 1.5–2.5 mm in diam., plump; valves densely papillate, appearing minutely papillate or subglabrous when young; style 0.2–0.5 mm. Seeds 2 per fruit, brown, broadly ovate to ovate-oblong, 1.2–1.5 × 0.8–1.1 mm, minutely papillate. Fl. and fr. May–Aug.

• Wet slopes, rocky cliffs, forests, along streams; 400–1000 m. Anhui, Fujian, Zhejiang.

5. *Yinshania henryi* (Oliver) Y. H. Zhang, Acta Phytotax. Sin. 25: 213. 1987.

柔毛阴山芥 rou mao yin shan qi

Nasturtium henryi Oliver, Hooker's Icon. Pl. 18: t. 1719. 1887; *Cochlearia henryi* (Oliver) O. E. Schulz; *N. kouytchense* H. Léveillé.

Annuals, 15–35(–50) cm tall. Stems branched, terete. Leaves 3–5(–9)-foliolate, canescent, usually densely pubescent with straight simple trichomes (0.5–)0.6–1 mm; petiole 1.5–6 cm; terminal leaflet broadly ovate or suborbicular, rarely narrowly ovate, 1.5–2.5 × 0.8–2.8 cm, base slightly cordate or subtruncate, margin 3-lobed, lobes deeply crenate, ending in a small callose mucro, apex rounded; lateral leaflets petiolate or sessile, blade 6–10 mm, base attenuate. Racemes ebracteate, elongated in fruit; rachis slender, slightly to strongly flexuous, at least apically. Fruiting pedicels slender, straight, spreading, 5–10(–15) mm, pubescent or rarely glabrous. Sepals oblong, 1.5–2 × 0.7–1.2 mm, pubescent outside. Petals white, obovate, 2–3.5 × 1–1.5 mm, base shortly clawed, apex rounded. Filaments 1.3–2 mm; anthers ovate, ca. 0.3 mm. Fruit narrowly oblong, oblong-lanceolate, or sublinear, (2.5–)3–5 × 1–1.2 mm, plump; valves navicular, pubescent or sometimes glabrous, thickened at margin; septum complete or perforate; style 0.3–0.7(–1.2) mm. Seeds (2–)5–10 in each locule, brown, reticulate, ovate, 0.7–0.9 × 0.5–0.7 mm. Fl. and fr. Jun–Sep. $2n = 12^*$.

• Mountain slopes, rocky areas, valleys; 800–1200 m. Guizhou, Hubei, Sichuan, Yunnan.

6. *Yinshania furcatopilosa* (K. C. Kuan) Y. H. Zhang, Acta Phytotax. Sin. 25: 214. 1987.

叉毛阴山芥 cha mao yin shan qi

Cochlearia furcatopilosa K. C. Kuan, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(8): 41. 1980.

Annuals, 10–20(–30) cm tall, canescent, densely covered with forked trichomes. Stems erect, branched, terete. Basal and lower cauline leaves 3–5-foliolate, canescent, densely pubescent with bifurcate trichomes 0.25–0.5(–0.6) mm; petiole 1–3(–4.5) cm; terminal leaflet ovate, rarely oblong or subreniform, 0.6–1.2 × 0.4–1.5 cm, base subtruncate or rounded, margin lobed or crenate, not ending in callose apiculae, apex rounded; lateral leaflets suborbicular or ovate, 3–6 × 2–7 mm,

margin crenate or entire. Uppermost leaves simple, pubescent; petiole 1–6 mm; leaf blade oblong, 3–10 × 1.5–4.5 mm, base rounded, margin entire, apex obtuse. Racemes paniculate, ebracteate; rachis distinctly flexuous. Fruiting pedicels divaricate, straight, slender, (3–)5–9(–12) mm, glabrous or pubescent at base. Sepals oblong, 1.2–1.6 × 0.8–0.9 mm, glabrous, white at margin and apex. Petals white, obovate, 3–3.3 × 1.6–2 mm, base shortly clawed, apex rounded. Filaments 1–1.6 mm; anthers oblong-ovate, ca. 0.3 mm. Ovules 8–12 per ovary. Fruit ovate or obovate, rarely oblong, 1.7–2.5(–3) × 0.8–1.1 mm; valves not veined, glabrous; septum perforate; style 0.4–0.5 mm. Seeds brown, oblong, 0.7–0.8 × 0.3–0.4 mm, finely papillate, narrowly margined. Fl. and fr. Jun–Jul. $2n = 12^*$.

• Mountain slopes, rocky areas, roadsides; 800–1600 m. Hubei.

7. *Yinshania rivulorum* (Dunn) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 87. 1998.

河岸阴山芥 he an yin shan qi

Nasturtium rivulorum Dunn, J. Linn. Soc., Bot. 38: 354. 1908; *Cochlearia formosana* Hayata; *C. rivulorum* (Dunn) O. E. Schulz; *Hilliella alatipes* (Handel-Mazzetti) Y. H. Zhang & H. W. Li var. *micrantha* Y. H. Zhang; *H. formosana* (Hayata) Y. H. Zhang & H. W. Li; *H. rivulorum* (Dunn) Y. H. Zhang & H. W. Li; *Yinshania formosana* (Hayata) Y. Z. Zhao.

Annuals, 8–50 cm tall, glabrous throughout. Basal and lowermost cauline leaves trifoliolate, rarely 1 simple; petiole 4–10 cm, gradually shorter upward, not winged; leaflet blade ovate, oblong, or rarely lanceolate, 1–5 × 0.8–3 cm, papery, base cordate, rounded, or cuneate, margin repand or rarely sinuate-toothed, with conspicuous callose mucros terminating veins, apex obtuse or acute; petiolule 2–12 mm, longer on terminal leaflet. Upper leaves similar to lower ones, becoming simple at the inflorescence. Racemes lax, ebracteate; rachis straight. Fruiting pedicels 6–10 mm, slender, straight, reflexed. Sepals 1–2 mm. Petals white, obovate, 1.5–2.5 mm, minutely clawed. Filaments white, 1–2 mm; anthers ca. 0.2 mm. Fruit oblong, 3–6 × ca. 1.5 mm, papillate when immature; septum absent; style 0.5–0.8 mm. Seeds 7–10, oblong, 0.8–1 × ca. 0.5 mm. Fl. and fr. Apr–Dec.

• Shady river banks, mountain slopes; 300–800 m. Fujian, Hunan, Taiwan.

8. *Yinshania sinuata* (K. C. Kuan) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 88. 1998.

弯缺阴山芥 wan que yin shan qi

Annuals, (8–)15–30 cm tall, glabrous throughout. Stems erect or subdecumbent, branched. Petiole 0.5–5 cm; leaf blade simple or rarely lowermost trifoliolate, ovate, 1.5–6 × 1–4 cm, base cordate or subtruncate, margin sinuate or repand, with apiculate callosities at vein tips, apex obtuse. Racemes ebracteate; rachis straight. Fruiting pedicels slender, reflexed, (5–)8–12 mm, straight, glabrous. Sepals oblong-ovate, 1.7–2.5 ×

0.8–1.1 mm, glabrous, narrowly membranous at margin and apex. Petals white, obovate, 2.5–3 × 1.2–1.7 mm, base shortly clawed, apex rounded. Filaments 1.5–2 mm; anthers 0.4–0.6 mm. Fruit oblong, 6–12 × 1.7–2.3 mm, glabrous; style 0.8–1.5 mm. Seeds (5–)7–14(–21), brown, ovate, 0.8–1.3 mm.

• Forests, mountain slopes, rock crevices, shady moist sand; near sea level to 700 m. Anhui, Guangdong, Hunan, Jiangxi.

- 1a. Lowermost leaves simple; seeds 0.8–0.9 mm 8a. subsp. *sinuata*
1b. At least some lowermost leaves trifoliolate; seeds 1.2–1.3 mm 8b. subsp. *qianwuensis*

8a. *Yinshania sinuata* subsp. *sinuata*

弯缺阴山芥(原亚种) wan que yin shan qi (yuan ya zhong)

Cochlearia sinuata K. C. Kuan, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(8): 39. 1980; *Hilliella sinuata* (K. C. Kuan) Y. H. Zhang & H. W. Li.

Lowermost leaves always simple. Fruit 5–10 mm. Seeds 0.8–0.9 mm. Fl. Mar, fr. May. $2n = 42^*$.

• Dense forests, mountain slopes, rock crevices, shady moist sand; near sea level to 200 m. Anhui, Guangdong, Hunan, Jiangxi.

8b. *Yinshania sinuata* subsp. *qianwuensis* (Y. H. Zhang) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 89. 1998.

寻乌阴山芥 xun wu yin shan qi
Hilliella sinuata (K. C. Kuan) Y. H. Zhang & H. W. Li var. *qianwuensis* Y. H. Zhang, Acta Bot. Yunnan. 8: 405. 1986.

At least some of the lowermost leaves trifoliolate. Fruit 6–13 mm. Seeds 1.2–1.3 mm. Fr. May.

• Forests; 200–700 m. Jiangxi.

9. *Yinshania paradoxa* (Hance) Y. Z. Zhao, Acta Sci. Nat. Univ. Intramongol. 23: 567. 1992.

卵叶阴山芥 luan ye yin shan qi

Cardamine paradoxa Hance, J. Bot. 6: 111. 1868; *Cochlearia paradoxa* (Hance) O. E. Schulz; *Hilliella paradoxa* (Hance) Y. H. Zhang & H. W. Li.

Annuals, 30–70 cm tall, glabrous throughout or rarely puberulent with minute simple trichomes to 0.06 mm. Stems erect, angled, simple or branched above. Basal and lowermost cauline leaves 3(or 5)-foliolate; petiole 4–8 cm; leaflet blade ovate, oblong, or lanceolate, 1.5–5(–6) × 1–2(–3) cm, base subtruncate, cuneate, obtuse, or oblique, margin crenate or repand and with mucronate callosities terminating veins, apex obtuse or acute and mucronate; petiolule of terminal leaflets 0.2–2 cm. Racemes terminal and lateral, ebracteate; rachis slender, straight or subflexuous apically. Fruiting pedicels (1.5–)2.5–4 mm, straight, spreading or reflexed. Sepals oblong, 1.5–2 mm. Petals white, obovate, 2–2.5 mm, apex rounded; claw to 1 mm. Filaments white,

1.5–2 mm; anthers oblong, ca. 0.4 mm. Fruit ovoid or ellipsoid, 3–4 × 2–2.5 mm; valves glabrous; septum absent; style 1–2 mm. Seeds 2 or 3, oblong, 1.5–1.8 × ca. 1 mm. Fl. Apr–Nov, fr. May–Dec. $2n = 42^*$.

Mountain slopes, valleys, roadsides; 300–1000 m. Guangdong, Guangxi, Hubei, Sichuan [N Vietnam].

The above first record from Vietnam is based on *Harder, Loc & Tai 4294* (IEBR, MO).

10. *Yinshania lichuanensis* (Y. H. Zhang) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 90. 1998.

利川阴山芥 li chuan yin shan qi

Hilliella lichuanensis Y. H. Zhang, Acta Bot. Yunnan. 9: 158. 1987; *Cochlearia changhuaensis* (Y. H. Zhang) L. L. Lou; *C. lichuanensis* (Y. H. Zhang) L. L. Lou; *C. longistyla* (Y. H. Zhang) L. L. Lou; *H. changhuaensis* Y. H. Zhang; *H. guangdongensis* Y. H. Zhang; *H. longistyla* Y. H. Zhang.

Annuals or perennials, (40–)60–110 cm tall, puberulent with simple trichomes 0.03–0.08(–0.1) mm. Stems erect, sulcate. Basal and lowermost cauline leaves 3–5-foliolate; petiole 2.5–7 cm, usually narrowly winged, grooved and sparsely to densely puberulent adaxially; leaflet blade lanceolate, (3–)6–14 × (0.8–)2–5 cm, terminal ones usually larger, base cuneate, rounded, or oblique, margin serrate or irregularly dentate, mucronate, apex acuminate-caudate, abaxially puberulent, adaxially sparsely puberulent at least on veins; petiolule of lateral leaflets obsolete to 5 mm. Uppermost leaves simple or rarely 3-foliolate, similar in morphology to leaflets of lower leaves. Racemes terminal and lateral, elongated considerably in fruit. Fruiting pedicels straight, slender, 2–5 mm, erect-ascending, subappressed to rachis. Sepals oblong, 2–2.5 mm. Petals white, spatulate, 2.5–3(–3.5) × ca. 1 mm, base clawed. Filaments white, 2–2.5 mm; anthers oblong, 0.5–0.7 mm. Fruit obovoid, oblong, or ellipsoid, 3–5 × 1.5–2 mm; valves thick; gynophore obsolete or to 0.5 mm; septum absent; style 0.5–1.5(–2) mm. Seeds 1–3, brown to blackish brown, oblong, 1.5–2.5 × 1–1.4 mm, reticulate. Fl. May–Jun, fr. Jun–Aug. $2n = 42^*$.

• Limestone areas, wet valleys, shady woods, mountain slopes, roadsides, along streams; 300–1200. Anhui, Fujian, Guangdong, Jiangxi, Zhejiang.

11. *Yinshania rupicola* (D. C. Zhang & J. Z. Shao) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 91. 1998.

石生阴山芥 shi sheng yin shan qi

Perennials, 30–100 cm tall, with a thick tuberous rhizome 2–4 cm wide, glabrous throughout. Stems 1 or few from rhizome, erect, sulcate, branched above. Basal and lowermost cauline leaves compound, 5–9-foliolate; petiole (3–)8–15(–20) cm; leaflets broadly oblong, ovate, or lanceolate, (2–)4–7(–10) × (1–)2–3(–4) cm, base oblique, cuneate, or subtruncate, margin coarsely

serrate with a distinct mucro at tooth apex, apex obtusely acuminate with a distinct mucro; petiolule 1–5(–20) mm. Upper cauline leaves 3- or 5-foliolate, becoming gradually smaller and narrower upward. Racemes terminal and lateral, many flowered; lowermost flowers sometimes bracteate. Fruiting pedicels filiform, recurved to reflexed, 4–10 mm. Sepals oblong, 1.5–2 mm, whitish at margin. Petals white, oblong or obovate, 2–4 × 1–2 mm, apex rounded; claw to 1 mm. Filaments white, 1–1.5 mm; anthers ovate, ca. 0.5 mm. Fruit suborbicular-obovate or narrowly elliptic, conspicuously flattened parallel to replum, 2.5–6 × 2–3(–4) mm; valves obscurely veined; septum sometimes absent; gynophore ca. 0.5 mm; style (0.5–)1–2 mm. Seeds 2 or 3, brown, ovate-oblong, flat, 1.2–1.8 × 0.6–1.5 mm. Fl. May–Sep, fr. Jun–Oct.

• Forests, wet places, valleys, along streams, rock crevices in wet shady places; 700–1200 m. Anhui, Fujian, Guangxi, Hunan, Jiangxi, Sichuan.

- 1a. Fruit narrowly elliptic, 5–6 × 2–2.5 mm 11a. subsp. *rupicola*
- 1b. Fruit suborbicular-obovate, 2.5–4 × 2.5–4 mm 11b. subsp. *shuangpaiensis*

11a. *Yinshania rupicola* subsp. *rupicola*

石生阴山芥(原亚种) shi sheng yin shan qi (yuan ya zhong)

Cochlearia rupicola D. C. Zhang & J. Z. Shao, Acta Phytotax. Sin. 24: 404. 1986; *Hilliella rupicola* (D. C. Zhang & J. Z. Shao) Y. H. Zhang.

Petals white. Fruit narrowly elliptic, 5–6 × 2–2.5 mm. Fl. May, fr. Jun.

• Forests, rock crevices in wet shady places; 1000–1200 m. Anhui.

11b. *Yinshania rupicola* subsp. *shuangpaiensis* (Z. Y. Li) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 92. 1998.

双牌阴山芥 shuang pai yin shan qi

Hilliella shuangpaiensis Z. Y. Li, Acta Bot. Yunnan. 10: 117. 1988; *H. xiangguiensis* Y. H. Zhang.

Petals white or lilac. Fruit suborbicular-obovate, 2.5–3 × ca. 3 mm. Fl. May–Sep, fr. Jun–Oct. $2n = 44^*$.

• Forests, wet places, valleys, along streams; 700–1000 m. Fujian, Guangxi, Hunan, Jiangxi, Sichuan.

The above first record from Jiangxi is based on *Xiong Bing 1566* (MO).

12. *Yinshania hunanensis* (Y. H. Zhang) Al-Shehbaz et al., Harvard Pap. Bot. 3(1): 92. 1998.

湖南阴山芥 hu nan yin shan qi

Hilliella hunanensis Y. H. Zhang, Acta Bot. Yunnan. 9: 160. 1987.

Perennials, glabrous throughout. Rhizomes thick, to 5 mm in diam. Stems slender, branched from base, ascending. Basal and lowermost cauline leaves 5-foliolate; petiole 5–8.5 cm; leaflets thin, broadly ovate or suborbicular, (0.5–)1–2.5(–3.5) × (5–)1–2(–2.5) cm, margin shallowly 5–7-lobed or repand, veins ending in a distinct mucro; terminal leaflet cuneate or subcordate at base, lateral leaflets oblique at base; petiolule (2–)5–10(–30) mm. Middle and upper cauline leaves gradually reduced in size, 3-foliolate. Racemes bracteate along lower half; bracts simple or lowermost 3-foliolate, considerably reduced in size upward. Fruiting pedicels slender, often recurved, 0.8–1.5 cm. Sepals 1.5–1.7 mm. Petals white, 2–2.5 × ca. 1.5 mm. Filaments ca. 1 mm; anthers ca. 0.3 mm. Fruit broadly elliptic or suborbicular, (3–)4–6 × 3–4(–5) mm, flattened; valves glabrous, inconspicuously veined; gynophore ca. 0.5 mm; style (0.5–)1–2(–3) mm. Seeds 2 or 3, oblong, 1.5–2 × 0.7–1.2 mm, minutely papillate. Fl. May–Jun, fr. Jun–Aug.

• Rocky areas, valleys, streamsides, dense forests; 500–1600 m. Guangxi, Hunan, Jiangxi.

13. *Yinshania hui* (O. E. Schulz) Y. Z. Zhao, Acta Sci. Nat. Univ. Intramongol. 23: 567. 1992.

武功山阴山芥 wu gong shan yin shan qi
Cochlearia hui O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 8: 546. 1923; *Hilliella hui* (O. E. Schulz) Y. H. Zhang & H. W. Li.

Annuals, glabrous throughout, 15–20 cm tall. Stems branched, flexuous. Basal leaves trifoliolate; petiole ca. 3 cm; terminal leaflet ovate or subcordate, 1–2 cm, unequally coarsely crenate, apex emarginate and mucronulate; lateral leaflets smaller and with shorter petiolules, obliquely ovate; middle cauline leaves ca. 1 cm, trifoliolate, with ovate terminal leaflet and much smaller lateral leaflets; uppermost leaves simple. Racemes lax, 8–10-flowered, bracteate to apex. Lowermost pedicels to 1.5 cm. Sepals oblong-ovate, ca. 2 mm. Petals white or pink, ca. 3 mm, ovate, cuneate at base, rounded at apex. Stamens 2–2.5 cm; anthers oblong, ca. 0.5 mm. Pistil narrowly cylindrical; ovary 8-ovuled; style ca. 0.7 mm. Immature fruit ellipsoid, ca. 1.5 mm; valves minutely papillate. Fl. Apr.

• About 1500 m. Jiangxi.

27. STROGANOWIA Karelín & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 14: 386. 1841.

革叶芥属 ge ye qi shu

Herbs perennial, with a woody, unbranched caudex covered with petiolar remains of previous years. Trichomes simple or absent. Stems erect or ascending, simple at base, many branched above. Basal leaves petiolate, rosulate,

simple, entire or rarely toothed, leathery, with a single midvein or several, equally thick palmate veins. Cauline leaves petiolate or sessile, few, attenuate, auriculate, sagittate, or amplexicaul at base, entire. Racemes many flowered, ebracteate, corymbose grouped in panicles, elongated in fruit. Fruiting pedicels slender or slightly thickened, ascending or divaricate. Sepals ovate or suborbicular, deciduous, erect or ascending, base of lateral pair not saccate, margin broadly membranous. Petals white, pink, or rarely pale yellow; blade broadly obovate or orbicular, apex rounded or emarginate; claw shorter than sepals. Stamens 6, tetradynamous; filaments not dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands 6, ovoid or toothlike; median glands 2; lateral ones 4, 1 on each side of lateral stamen. Ovules 2 per ovary. Fruit dehiscent silicles, obovoid, ellipsoid, or rarely oblong, quadrangular-angustiseptate, somewhat inflated, sessile or shortly stipitate; valves often leathery, obscurely veined, glabrous, keeled; replum rounded; septum complete, translucent or opaque, veinless; style obsolete or distinct and to 3 mm; stigma capitate, entire. Seeds wingless, oblong or ellipsoid, plump; seed coat nearly smooth, mucilaginous when wetted; cotyledons incumbent.

About 20 species: primarily in C Asia and Iran; one species in China.

The principal differences used to distinguish *Stroganowia* from *Lepidium* are the presence of somewhat 4-angled fruit with thick valves and an unbranched caudex with petiolar remains from previous years. However, these differences can hardly justify the recognition of two genera.

1. *Stroganowia brachyota* Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 14: 387. 1841.

革叶芥 ge ye qi

Lepidium desertorum Schrenk; *Stroganowia desertorum* (Schrenk) Botschantzev.

Herbs (20–)30–50 cm tall, glabrous throughout. Stems erect, many branched above, rounded angular. Leaves leathery. Petiole of basal leaves to 1.5 cm, broadly winged, persisting in subsequent years into fibrous remains; leaf blade obovate-spatulate or spatulate-orbicular, 3–8 × 1.5–5 cm, thick leathery, with several palmate main veins more prominent abaxially, base attenuate, margin entire, apex obtuse to subacute. Middle and upper cauline leaves few, much smaller than basal, sessile, ovate-lanceolate or oblong, base subamplexical and with rounded auricles, margin entire, apex acute. Fruiting pedicels thickish, 6–11 mm, angled, ascending or subdivaricate. Sepals deciduous, broadly ovate or suborbicular, 1.7–2.5 × 1.2–1.7 mm, glabrous,

with broad white margin and apex. Petals white, broadly obovate or suborbicular, 3.5–5.5 × 2–2.5 mm, apex rounded; claw 1–1.5 mm. Filaments white, 2–2.5 mm; anthers oblong, 0.4–0.5 mm. Fruit obovate, 5–7(–8) × 3–4.5(–5) mm, obscurely carinate, with distinct midvein and obscure lateral veins, base and apex obtuse; gynophore 0.2–0.6 mm, stout; style 0.4–0.8(–1) mm. Seeds brown, ovoid, 2.5–3.5 × 1.5–2 mm. Fl. May–Jul, fr. Jun–Aug.

Stony slopes and steppe of desert mountains; 1300–1700 m. N Xinjiang (Toli Xian) [Kazakhstan].

The illustration of this species in Fl. Xinjiang, (2(2): 93. 1995) is inaccurate because it consists of a basal portion, which is correctly based on *Stroganowia brachyota*, and a distal portion based on a plant of *Platycraspedum tibeticum*. The latter species does not occur in Xinjiang, and the illustration is modified from that in FRPS (p. 95), in which both species are correctly illustrated and identified.

28. LIGNARIELLA Baehni, Candollea 15: 57. 1955.

弯梗芥属 wan geng jie shu

Herbs biennial or short-lived perennial. Trichomes simple, clavate papillae. Stems ascending or decumbent or prostrate. Basal leaves not seen. Cauline leaves petiolate, palmately 3(–5)-lobed or 3(–5)-partite to base, sometimes 3(–5)-toothed near apex, rarely repand or entire, glabrous, usually palmately veined. Racemes several flowered, bracteate throughout. Fruiting pedicels divaricate and often recurved or reflexed, rarely straight, papillate adaxially. Sepals oblong, ascending-spreading, glabrous, base subsaccate, rarely nonsaccate. Petals purple or blue, rarely pink, spreading, often much longer than sepals; blade orbicular or obovate, rounded; claw very short. Stamens 6, spreading, equal in length; filaments distinctly dilated at base; anthers narrowly oblong or ovate, apex obtuse. Nectar glands confluent, subtending bases of all filaments. Ovules 2–6(–12) per ovary. Fruit dehiscent siliques or silicles, linear, oblong, ovoid, or ellipsoid, terete or slightly latiseptate, subsessile or long stipitate; valves veinless, glabrous or sparsely papillate, smooth or slightly torulose; replum slightly flattened; septum absent; style to 4 mm; stigma capitate, entire. Seeds uniseriate, rarely 1, wingless, oblong, plump; seed coat minutely colliculate, not mucilaginous when wetted; cotyledons incumbent.

Four species: Bhutan, China, Nepal, Sikkim; three species in China.

1a. Petals orbicular or orbicular-obovate, (5.5–)6–8(–9) mm; anthers 0.6–1.2 mm 3. *L. hobsonii*

1b. Petals narrowly to broadly obovate, 1.5–4(–4.5) mm; anthers 0.25–0.4 mm.

2a. Fruit oblong-ovoid to broadly oblong, 2–4-seeded; fruiting pedicels often recurved; petals purple, (2.7–)3–4(–4.5) × 1.7–2.5 mm 2. *L. serpens*

- 2b. Fruit narrowly oblong or linear, 6–12 seeded; fruiting pedicels usually straight; petals white or rarely pink,
 1.5–2 × 0.5–1 mm 1. *L. ohbana*

1. *Lignariella ohbana* Al-Shehbaz & Arai in Al-Shehbaz et al., Harvard Pap. Bot. 5(1): 120. 2000.

线果弯梗芥 xian guo wan geng jie

Plants slender, biennial or short-lived perennial, glabrous throughout except for pedicels. Stems slender, few or rarely 1 from base, decumbent, 2–12(–15) cm. Lowermost cauline leaves simple, becoming 3-lobed in the middle and distal portions of plant; petiole glabrous, (2–)4–8(–12) mm; blade of lowermost leaves ovate, subacute, 3–5 × 2–3 mm; middle lobe of bracts narrowly oblong or broadly ovate, entire, (2–)3–6(–8) × 1.3–4(–7) mm, obtuse; lateral lobes smaller and narrower, entire or rarely obscurely 1-toothed. Fruiting pedicels 5–8(–13) mm, adaxially puberulent with papillae to 0.1 mm. Sepals oblong, 0.7–1.5 × 0.5–0.7 mm, not saccate at base, scarious at margin. Petals white or rarely pink, narrowly obovate, 1.5–2 × 0.5–1 mm, apex rounded, cuneate and not clawed at base. Filaments white or rarely pink, 0.8–1.2 mm; anthers purple, ovate, 0.2–0.3 mm. Ovules 6–12 per ovary. Fruit linear to narrowly oblong, not geocarpic, straight or slightly curved at middle, 5–10 × 0.7–1 mm; gynophore obsolete; valves torulose; style 0.5–0.8 mm, stout. Seeds uniseriate, oblong, 1–1.4 × 0.5–1 mm. Fl. Jul–Aug, fr. July–Oct.

Among rocks, sandy flats by streamside; 3000–4500 m. Yunnan [Nepal].

2. *Lignariella serpens* (W. W. Smith) Al-Shehbaz et al., Harvard Pap. Bot. 5(1): 119. 2000.

蛇形弯梗芥 she xing wan geng jie

Cochlearia serpens W. W. Smith in W. W. Smith & G. H. Cave, Rec. Bot. Surv. India 4: 175. 1911;

Lignariella hobsonii (H. Pearson) Baehni subsp. *serpens* (W. W. Smith) H. Hara.

Plants slender, short-lived perennial, glabrous throughout except for pedicels and sometimes fruit. Stems slender, few to many from base, decumbent, (1.5–)5–15(–30) cm. Leaves deeply 3(or 5)-lobed throughout, simple leaves absent; petiole glabrous, (2–)5–15(–40) mm; blade of central lobe oblong or ovate, rarely linear, entire or rarely 1-toothed on each side, (1.5–)3–8(–15) × (0.5–)1–3(–7) mm, apex obtuse to subacute; lateral lobes smaller, entire, 1- or 2-lobed or toothed, rarely leaves subternate. Fruiting pedicels (10–)15–30(–40) mm, strongly recurved or sigmoid, often filiform, adaxially puberulent with papillae to 0.1 mm. Sepals oblong, 1.5–5 × 0.7–1 mm, not saccate at base,

scarious margin ca. 0.2 mm wide. Petals purple, broadly obovate, (2–)3–4(–4.5) × (1–)1.5–2.5(–3) mm, apex rounded, cuneate into a claw to 0.1 mm. Filaments purple, 1.5–2.5 mm; anthers purple, ovate, 0.3–0.4 mm. Ovules 3–6 per ovary. Fruit ovoid or oblong, rarely oblong-linear, not geocarpic, often curved at middle, 2.5–8(–12) × 1–2(–2.5) mm; gynophore 0.5–3 mm; valves slightly torulose or not, glabrous or puberulent; style 1–1.5(–2) mm, stout. Seeds uniseriate, oblong, (1–)1.5–2.5 × (0.5–)0.8–1.2(–1.5) mm. Fl. Jun–Aug, fr. Jul–Oct.

Alpine peaty soil, scree, gravelly stream edges, turf among rocks and small shrubs; 2600–4300 m. Xizang [Bhutan, Nepal, Sikkim].

3. *Lignariella hobsonii* (H. Pearson) Baehni, Candollea 15: 57. 1955.

弯梗芥 wan geng jie

Cochlearia hobsonii H. Pearson, Hooker's Icon. Pl. 27: t. 2643. 1900.

Plants short-lived perennial, puberulent on stem and/or pedicels. Stems coarse, few to many from base, decumbent or rarely ascending, (6–)11–20(–30) cm, glabrous or puberulent along 1 line or throughout. Leaves simple or rarely deeply 3(or 5)-lobed apically; petiole somewhat flattened, 4–10(–18) mm; leaf blade broadly obovate or suborbicular and often wider than long, rarely oblong, (3–)6–10(–15) × (1.5–)4–10(–15) mm, glabrous, obscurely to prominently 3- or 5-toothed, teeth sometimes restricted to subtruncate apex, when lobed central lobe broadly to narrowly oblong, slightly broader than lateral lobes. Flowers often protogynous. Fruiting pedicels slender, strongly recurved or sigmoid, (0.7–)1.5–3(–4) cm, adaxially puberulent with papillae to 0.1 mm. Sepals oblong, glabrous, 2.5–3.5(–4) × 1–1.5 mm, margin membranous and to 0.5 mm wide, spreading, slightly saccate at base. Petals blue or deep purple, orbicular to orbicular-obovate, (5.5–)6–8(–9) × 4–6(–7) mm, apex rounded, base abruptly narrowed into a claw 0.5–1.5 mm. Filaments purple distally, whitish basally, 4–5.5 mm; anthers narrowly oblong, 0.6–1.2 mm, often strongly curved after dehiscence. Ovules 4–6(–11) per ovary. Fruit linear or narrowly oblong, rarely ovoid, not geocarpic, straight or curved, (5–)10–20 × 1.5–2 mm; gynophore ca. 0.5 mm; valves torulose; style 3–4 mm, stout. Seeds uniseriate, oblong, 2.2–2.8 × 1.2–1.4 mm. Fl. May–Jul, fr. Jun–Sep.

Streamsides, mossy areas in running water, wet cliffs, scree, damp banks, wet stony slopes; 2800–4100 m. Xizang [Bhutan, Nepal].

29. LACHNOLOMA Bunge, Delect. Seminum Hort. Bot. Dorpat. 1843: 3, 8. 1843.

绵果芥属 mian guo qi shu

Herbs annual, villous throughout. Trichomes stalked, 1–3-forked, mixed with simple ones. Stems erect, simple or branched above. Basal leaves petiolate, subrosulate, simple, entire or sinuate-dentate. Cauline leaves petiolate, similar to basal ones but larger, sometimes pinnatifid. Racemes 3–16-flowered, lax, ebracteate, elongated in fruit. Fruiting pedicels slender, erect-ascending. Sepals oblong or oblong-linear, deciduous, erect, base of lateral pair saccate, margin narrowly membranous. Petals pink; blade linear or narrowly spatulate, apex obtuse; claw strongly differentiated from blade, subequalling sepals. Stamens 6, tetradynamous; filaments not dilated at base, filiform; anthers oblong, apiculate at apex. Nectar glands 2, lateral, semiannular, extrastaminal; median glands absent. Ovules 2 per ovary. Fruit indehiscent, nutletlike silicles, ovoid, terete or slightly 4-angled, sessile; valves thickened, reticulate, densely white silky; replum rounded; septum complete, thickened, opaque; style cylindrical, persistent, to 7 mm; stigma capitate, deeply 2-lobed, lobes spreading. Seeds wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent.

One species: C and SW Asia.

1. *Lachnoloma lehmannii* Bunge, *Delect. Seminum Hort. Bot. Dorpat.* 1843: 8. 1843.

绵果芥 mian guo qi

Herbs annual, (2.5–)10–20(–31) cm tall, villous. Stems erect, simple or branched above. Basal leaves often withered by flowering. Cauline leaves with petioles (0.3–)0.5–3.5(–4.5) cm; leaf blade lanceolate, lanceolate-linear, or oblong, (0.5–)1–6 cm × 2–12 mm, sparsely to densely villous with forked trichomes, base attenuate, margin entire, dentate, or sinuate-dentate, rarely pinnatifid, apex acute. Fruiting pedicels erect-ascending, 1–4 mm, slender, densely villous. Sepals

oblong or oblong-linear, (4–)5–7 × 1–1.5 mm, densely villous. Petals pink, linear, 7–10 × 0.5–1 mm, apex obtuse; claw 4–6 mm. Filaments 4–6 mm, slender; anthers oblong, 0.8–1 mm. Fruit ovoid, 4.5–6.5 × (2–)2.5–4 mm, densely covered with white, undulate, silky trichomes 5–8 mm; style slender, (2.5–)4–7 mm. Seeds brown, ovoid, 2.5–3.5 × 1.2–2 mm. Fl. and fr. May–Jun.

Gypsum ground, sandy or rocky soil; 300–1200 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

30. SPIRORHYNCHUS Karelin & Kirilov, *Bull. Soc. Imp. Naturalistes Moscou* 15: 159. 1842.

螺果芥属 luo hui qi shu

Herbs annual, glabrous or puberulent. Trichomes unicellular, eglandular, simple, papillate. Stems erect, many branched above base. Basal leaves withered early, not rosulate. Cauline leaves sessile, attenuate and not auriculate at base, entire, dentate, sinuate, or rarely pinnatifid. Racemes several flowered, lax, ebracteate, elongated considerably in fruit. Fruiting pedicels slender, divaricate or reflexed, articulate and detached at base. Sepals narrowly oblong, deciduous, suberect, base of lateral pair subsaccate, margin membranous. Petals white or lavender, longer than sepals; blade linear, apex obtuse; claw undifferentiated. Stamens 6, strongly tetradynamous; filaments slightly dilated at base; anthers oblong, obtuse at apex, lateral pair sterile. Nectar glands 2, lateral, semiannular; median glands absent. Ovules 1 per ovary. Fruit indehiscent, 1-seeded, S-shaped siliques, with ellipsoid seed-bearing part and attenuate stipelike base, terete; valves woody, prominently veined, papillate, reticulate, or rugose, wingless; gynophore absent; replum rounded; septum absent; style beaklike, flattened, to 3 cm in fruit, persistent; stigma capitate, entire. Seeds wingless, narrowly oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent.

One species: C and SW Asia.

1. *Spirorhynchus sabulosus* Karelin & Kirilov, *Bull. Soc. Imp. Naturalistes Moscou* 15: 160. 1842.

螺果芥 luo hui qi

Anguillicarpus bulleri Burkill; *Spirorhynchus bulleri* (Burkill) O. E. Schulz.

Annuals, 15–50(–70) cm tall. Stems erect, many branched on lower and middle part, glabrous. Leaves sessile; leaf blade linear, (1–)3–8(–12) cm × (0.5–)1–4(–7) mm, glabrous, base attenuate, margin remotely dentate, sinuate, or pinnately lobed, entire in upper leaves, apex acute. Fruiting pedicels filiform, (0.5–)0.8–1.5(–2) cm, straight or reflexed, articulate at base, sparsely puberulent or papillate with trichomes to 0.3 mm. Sepals oblong-linear, 1.5–2.5 × 0.4–0.6 mm,

glabrous, margin narrowly membranous, apex acute. Petals white or lavender, linear, (3–)4–6(–8) × 0.3–0.5 mm. Filaments white, median pairs 1.5–2 mm, lateral pair ca. 1 mm; anthers oblong, 0.6–0.9 mm. Fruit seed-bearing portion narrowly ellipsoid, 3.5–6 × 2–3(–4) mm; stipelike base attenuate, (3–)4–8(–10) mm, glabrous; style flattened, strongly curved or rarely straight, glabrous, (1.3–)1.7–2.5(–3) cm. Seeds narrowly oblong, 3–5 × (0.8–)1–2 mm. Fl. and fr. Apr–May.

Sandy deserts; 300–1000 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

31. TAUSCHERIA Fischer ex de Candolle, *Syst. Nat.* 2: 563. 1821.

舟果芥属 zhou guo qi shu

Herbs annual, often glaucous. Trichomes simple, straight on pedicels, hooked on fruit, absent elsewhere. Stems erect, simple from base, branched apically. Basal leaves petiolate, not rosulate, simple, entire. Cauline leaves sessile, auriculate, sagittate, or amplexicaul at base, entire. Racemes few to several flowered, ebracteate, elongated in fruit. Fruiting pedicels nearly filiform, strongly recurved, articulate and often detached from base. Sepals oblong, base of lateral pair not saccate, margin not membranous. Petals yellow drying whitish, longer than sepals; blade narrowly spatulate or oblong, apex obtuse; claws absent. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers broadly ovate, apiculate at apex. Median nectar glands present; lateral glands 1 on each side of lateral stamen, annular. Ovules 1 (or 2) per ovary, apical. Fruit indehiscent, samaroid silicles, navicular and semiovoid to semiglobose, rounded abaxially, flat adaxially, strongly angustiseptate, sessile, glabrous or densely pilose with hooked trichomes, beaked; valves papery, veinless, strongly keeled, smooth, strongly 2-winged, wing margin involute and with 1 or 2 rows of tubercles; replum rounded; septum absent; style obsolete; stigma capitate, entire. Seeds 1 per fruit, wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent.

One species: C and SW Asia, W Himalayas.

1. *Tauscheria lasiocarpa* Fischer ex de Candolle, Syst. Nat. 2: 563. 1821.

舟果芥 *zhou guo qi*

Tauscheria desertorum Ledebour; *T. gymnocarpa* Fischer ex de Candolle; *T. lasiocarpa* var. *gymnocarpa* (Fischer ex de Candolle) Boissier; *T. oblonga* Vassilczenko.

Herbs 10–45(–60) cm tall, glabrous and often glaucous except sometimes for fruit and pedicels. Stems simple at base, branched above. Basal leaves shortly petiolate, oblanceolate, withered by anthesis, base cuneate, margin entire, apex obtuse. Middle cauline leaves cordate, ovate, lanceolate, or oblong, 1–6(–9) × 0.2–2.5(–4) cm, somewhat fleshy, sessile, base auriculate, cordate, or amplexicaul, margin entire, apex acute or

obtuse, rarely acuminate in uppermost leaves. Fruiting pedicels 3–5.5(–8) mm, glabrous or adaxially sparsely pilose. Sepals oblong, 0.9–1.5 × 0.5–0.8 mm. Petals yellow drying whitish, oblong or narrowly spatulate, 1.5–2.5 × 0.4–0.6 mm. Filaments 0.8–1.5 mm; anthers 0.1–0.3 mm. Fruit navicular, semiovoid to semiglobose, (3–)4–7(–10) × (2.5–)3–4 mm, glabrous or densely pubescent with hooked trichomes, base obtuse; beak flat, (0.5–)1–3 mm, apex acute or acuminate. Seeds yellow or yellowish brown, oblong, 2–2.5 × (0.8–)1.1–1.5 mm. Fl. Apr–Jun, fr. May–Jul. $2n = 14$.

Desert steppes, rocky soil, roadsides, river banks; 400–3800 m. Nei Mongol, Xinjiang, W Xizang [Afghanistan, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

32. EUCLIDIUM R. Brown in W. T. Aiton, Hortus Kew. 4: 74. 1812, nom. cons.

鸟头芥属 *niao tou qi shu*

Hierochontis Medikus, nom. rej.; *Soria* Adanson, nom. rej.

Herbs annual. Trichomes unicellular, eglandular, simple and stalked forked, in different sizes, some subsetose. Stems erect or ascending, simple or branched. Basal leaves petiolate, not rosulate, simple, entire, dentate, or rarely pinnatifid, often withered by flowering. Cauline leaves similar to basal, entire or dentate, reduced in size upward. Racemes ebracteate, elongated in fruit. Fruiting pedicels stout, thickened, erect, appressed to rachis. Sepals oblong, erect, base of lateral pair not saccate. Petals white, slightly longer than sepals; blade narrowly spatulate, apex emarginate; claw slightly differentiated from blade, shorter than sepals. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers ovate, apiculate at apex. Nectar glands 4, lateral, 1 on each side of lateral stamen; median glands absent. Ovules 2 per ovary, subapical. Fruit indehiscent, nutletlike silicles, ovoid, slightly 4-angled, sessile; valves thickened, woody, veinless, rough pubescent; replum strongly expanded laterally; septum complete, thickened; style to 1.8 mm, stout, subconical, curved, persistent; stigma capitate, 2-lobed, lobes not decurrent. Seeds wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent or obliquely so.

One species: C and SW Asia, E Europe, naturalized elsewhere.

1. *Euclidium syriacum* (Linnaeus) R. Brown in W. T. Aiton, Hortus Kew. 4: 74. 1812.

鸟头芥 *niao tou qi*

Anastatica syriaca Linnaeus, Sp. Pl., ed. 2, 2: 895. 1763; *Bunias syriaca* (Linnaeus) Marschall von Bieberstein.

Herbs annual, (4–)10–40(–45) cm tall, scabrous pubescent throughout; trichomes in various sizes, largest subsetose, to 1 mm. Stems often with ascending rigid branches, mostly branched near base and about

middle. Lower and middle cauline leaves with petioles (0.2–)0.5–2(–2.5) cm; leaf blade oblong, oblong-lanceolate, or elliptic, (1–)1.5–7(–9) × (0.3–)0.7–2(–3) cm, base cuneate, margin entire, dentate, or repand, apex acute or obtuse; uppermost leaves sessile or subsessile, much smaller. Fruiting pedicels 0.5–1(–1.2) mm, stout and nearly as wide as fruit base, appressed to rachis. Sepals 0.6–0.9 × 0.2–0.4 mm, sparsely pubescent. Petals white, narrowly spatulate, 0.9–1.3 × 0.1–0.2 mm, apex emarginate; claw 0.4–0.6 mm.

Filaments 0.5–0.8 mm; anthers 0.1–0.2 mm. Fruit ovoid, 2–2.5 × 1.5–2 mm, erect, appressed to rachis, 2-seeded, scabrous, slightly 4-angled; replum expanded and to 1.5 mm wide basally, narrowed to apex; style subconical, 1–1.8 mm, curved away from rachis, sparsely pubescent.

Seeds brown, oblong, 1.3–1.7 × 0.8–1.2 mm. Fl. and fr. May–Jun. $2n = 14$.

Roadsides, waste places, fields; 300–3500 m. Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; naturalized elsewhere].

33. LITWINOWIA Woronow, Trudy Bot. Sada Akad. Nauk SSSR 43: 452. 1931.

脱喙芥属 tuo hui qi shu

Herbs annual. Trichomes unicellular, eglandular, simple, mixed with much fewer and smaller, glandular, multicellular ones with multiseriate stalk. Stems erect, simple or branched above. Basal leaves petiolate, not rosulate, simple, pinnatifid, dentate, or rarely entire, often withered by flowering. Cauline leaves petiolate or sessile, entire or dentate. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender, ascending, articulate at rachis. Sepals oblong, erect, base of lateral pair not saccate. Petals white or purplish, longer than sepals; blade narrowly spatulate or oblong, apex obtuse; claw subequaling sepals. Stamens 6, slightly tetradynamous; filaments flattened at base; anthers ovate, obtuse at apex. Nectar glands 6; lateral semiannular; median very small, 1 facing each median filament. Ovules 2 per ovary, subapical. Fruit indehiscent, nutletlike silicles, globose, terete, sessile; valves thickened, woody, prominently veined, vesicular papillate; replum strongly expanded laterally; septum complete, thickened, opaque, veinless; style prominent and to 3.5 mm, slender, cylindrical, articulated at base, straight, caducous, glabrous; stigma capitate, entire. Seeds wingless, orbicular, strongly flattened; seed coat reticulate, not mucilaginous when wetted; cotyledons accumbent.

One species: C and SW Asia.

1. *Litwinowia tenuissima* (Pallas) Woronow ex Pavlov, Fl. Centr. Kazakh. 2: 302. 1935.

脱喙芥 tuo hui qi

Vella tenuissima Pallas, Reise Russ. Reich. 3: 740.

1776; *Bunias tatarica* Willdenow; *Euclidium tataricum* (Willdenow) de Candolle; *E. tenuissimum* (Willdenow)

B. Fedtschenko; *Litwinowia tatarica* (Willdenow) Woronow.

Herbs annual, (7–)15–40(–51) cm tall, hirsute with spreading, straight simple trichomes to 1.5 mm. Stems often with ascending slender branches mostly above middle. Basal and lower cauline leaves with petioles (0.2–)0.5–1.5(–2) cm; leaf blade narrowly oblong or linear-oblong, (0.6–)1–5(–7) × (0.3–) 0.5–1.5 cm, sparsely pubescent with simple trichomes and fewer stalked glands 0.05–0.15 mm, base attenuate, sinuate-dentate or pinnatifid; lateral lobes 3 or 4, much larger terminal one, apex acute or obtuse. Middle and upper

cauline leaves sessile or shortly petiolate, linear, linear-lanceolate, or linear-oblong, base attenuate, margin entire or rarely denticulate. Fruiting pedicels 0.1–0.6(–1) mm, slender, readily detached from their articulation with rachis, ascending. Sepals 1.5–2 × 0.4–0.6 mm, glabrous or subapically sparsely pubescent. Petals white or purplish, narrowly spatulate or oblong, 2–3(–3.5) × 0.3–0.6(–0.9) mm, apex obtuse; claw to 1.5 mm.

Filaments 1.5–2.5 mm; anthers 0.2–0.4 mm. Fruit globose, (1.7–)2–2.5(–3) mm in diam., erect, 2-seeded, minutely papillate, terete; replum expanded and to 1.5 mm wide basally, narrowed to apex; style cylindrical, (1.5–)2–2.8(–3.5) mm, straight. Seeds yellow, orbicular, (1–) 1.2–1.4 mm in diam. Fl. and fr. Apr–Jun. $2n = 14$.

Roadsides, pastures, fields; 300–3500 m. Xinjiang [Afghanistan, India, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

34. NESLIA Desvaux, J. Bot. Agric. 3: 162. 1815, nom. cons.

球果芥属 qiu guo qi shu

Vogelia Medikus.

Herbs annual. Trichomes short-stalked, forked or substellate, mixed on stem with simple ones. Stems erect, simple basally, branched above. Basal leaves shortly petiolate, not rosulate, simple, entire or dentate. Cauline leaves sessile, sagittate or auriculate, entire or denticulate. Racemes ebracteate, elongated considerably in fruit. Fruiting pedicels slender, divaricate. Sepals oblong, erect, base of lateral pair not saccate. Petals yellow, longer than sepals; blade spatulate, apex obtuse. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers ovate, obtuse at apex. Nectar glands 2 or 4; median glands absent; lateral glands semiannular or 1 on each side of lateral stamen. Ovules 2–4 per ovary. Fruit indehiscent, nutletlike silicles, compressed globose or sublenticular, 1-seeded, shortly stipitate, readily detached from pedicel at maturity; valves woody, prominently reticulate; replum rounded, obscured by valve margin; septum complete, membranous; style less than 1 mm, cylindrical, readily caducous at fruit maturity; stigma capitate, entire. Seeds wingless, ovoid, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

One species: N Africa, Asia, Europe, introduced in North America.

1. *Neslia paniculata* (Linnaeus) Desvaux, J. Bot. Agric. 3: 162. 1815.

球果芥 qiu guo qi

Myagrum paniculatum Linnaeus, Sp. Pl. 2: 641. 1753;
Vogelia paniculata (Linnaeus) Hornemann.

Herbs annual, (14–)25–75(–90) cm tall, pubescent with small branched trichomes rarely mixed with fewer simple ones near stem base. Stems simple or branched above. Cauline leaves lanceolate, narrowly oblong, or linear-lanceolate, middle ones (1.5–)2.5–7(–9) cm × (2–)3–15(–25) mm, sparsely pubescent with primarily forked trichomes, base sagittate or strongly auriculate, margin entire or rarely denticulate, apex acute or acuminate; the basal lobe oblong or deltoid, acute. Fruiting pedicels (4–)6–10(–14) mm. Sepals 1.5–1.7 × 0.5–0.7(–1) mm. Petals yellow, 2–2.5 × 0.5–0.7(–1)

mm. Filaments 1.5–2 mm; anthers 0.2–0.4 mm. Fruit (1.7–)2–2.2 × (2–)2.2–2.5 mm, umbonate or not at apex; valves prominently to moderately reticulate; style 0.5–0.9 mm. Seeds brown, ovoid, 1.2–1.4 × 1–1.1 mm. Fl. May–Jun. $2n = 14$.

Fields, grassy mountain slopes, plains; 1700–2200 m. Liaoning, Nei Mongol, Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in North America].

This species was recorded in FRPS from Xizang, but the present authors have seen no material from that autonomous region.

Neslia paniculata is represented in China by subsp. *paniculata*, which has a subtruncate fruit apex, whereas subsp. *thracica* (Velenovsky) Bornmüller (from C and SW Asia and S Europe) has a distinctly umbonate fruit apex.

35. **BUNIAS** Linnaeus, Sp. Pl. 2: 669. 1753.

匙芥属 chi qi shu

Herbs annual, biennial, or perennial with a caudex. Trichomes stalked forked and/or simple; glandular multicellular papillae present or absent. Basal leaves petiolate, often not rosulate, simple, entire, pinnatifid, or lyrate. Cauline leaves sessile or subsessile above, cuneate, attenuate, or auriculate, entire or dentate. Racemes ebracteate, elongated in fruit. Fruiting pedicels divaricate. Sepals oblong, ascending or spreading, base of lateral pair not saccate, margin membranous. Petals yellow or white, ascending, longer than sepals; blade obovate, apex obtuse; claw distinct. Stamens 6, tetradynamous; filaments dilated or not at base; anthers ovate or oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 2–4 per ovary. Fruit indehiscent, woody, nutletlike silicles, oblong, ovoid, or subglobose, terete, 4-angled, or with 4 cristate wings, sessile, readily detached from pedicel, 1–4-loculed; replum not distinct; septum subwoody or absent; style obsolete or slender and to 6 mm, filiform or subconical; stigma capitate, entire. Seeds wingless, oblong, suborbicular, or ovoid, plump or flattened; seed coat smooth; cotyledons spirolobal.

Three species: N Africa, E and SW Asia, Europe; two species in China.

- 1a. Plants with stalked forked trichomes; glandular papillae present; cauline leaves not auriculate; petals yellow, 5–8 × (2–)3–5 mm; seeds plump 1. *B. orientalis*
- 1b. Plants glabrous or with simple trichomes; glandular papillae absent; cauline leaves auriculate; petals white, 3–4 × 1.5–2 mm; seeds flattened 2. *B. cochlearioides*

1. *Bunias orientalis* Linnaeus, Sp. Pl. 2: 670. 1753.

疣果匙芥 you guo chi qi

Herbs biennial or perennial, (25–)40–100(–150) cm tall, sparsely to densely pilose with simple and stalked forked trichomes; multicellular glandular tubercles present throughout except for flowers. Stems branched above or rarely basally. Basal leaves with petioles (1–)2–10(–15) cm; leaf blade lanceolate, to 40 × 14 cm, coarsely dentate or pinnatifid; lateral lobes oblong or lanceolate, smaller than deltoid or lanceolate terminal lobe. Uppermost leaves subsessile, lanceolate or sublinear, dentate or entire. Fruiting pedicels 1–2(–2.3) cm, slender, divaricate, straight. Sepals yellowish, oblong, 2.5–3 × 1–1.5 mm, spreading, glabrous. Petals yellow, obovate, (5–)6–7(–8) × (2–)3–5 mm; claw slender, 1–2 mm. Filaments yellowish, 1.5–3.5 mm, strongly tetradynamous, not dilated at base; anthers oblong, 0.8–1 mm. Fruit ovoid, rarely suboblong and slightly constricted at middle,

terete, (5–)6–8 × 3–4(–5) mm, glabrous, woody, gradually tapering to apex, tuberculate, 1- or 2-loculed; valves not distinct; style obsolete or rarely to 0.5 mm; stigma entire. Seeds 2 per fruit, subglobose, plump, 2–2.5 mm in diam. Fl. and fr. May–Jul. $2n = 14$.

Fields. Heilongjiang, Liaoning [Kazakstan, Mongolia, Russia; SW Asia, Europe; introduced elsewhere].

2. *Bunias cochlearioides* Murray, Comment. Goetting. 8: 42. 1777.

匙芥 chi qi

Bunias tcheliensis Debeaux.

Herbs annual or perhaps biennial, 9–40 cm tall, glabrous throughout or rarely sparsely pilose, multicellular glandular tubercles absent. Stems branched near base and above. Basal leaves withered by fruiting; petiole 0.5–2.5 cm, expanded at base; leaf blade pinnatifid, lyrate, or coarsely dentate, 2–10 × 0.5–2.5 cm. Cauline leaves oblong or lanceolate, 0.7–3.5 cm

× 2–15 mm, sessile, auriculate, margin dentate, repand, or subentire, apex obtuse to subacute. Fruiting pedicels 4–8(–10) mm, slender, divaricate or slightly recurved, straight. Sepals pale green, oblong, 1.4–1.7 × 0.7–1 mm, spreading, glabrous. Petals white, obovate, 3–4 × 1.5–2 mm; claw slender, 0.5–1 mm. Filaments white, 1.2–1.6 mm, dilated at base; anthers ovate, 0.3–0.5 mm. Fruit ovoid or subglobose, usually quadrangular, 3–5 × 1.7–3

mm, glabrous, woody, tapering to apex; valves flat, smooth; style obsolete or rarely to 0.3 mm; stigma entire. Seeds 2, oblong or suborbicular, flattened, 1.2–1.5 × 1–1.2 mm. Fl. and fr. May–Jul.

Sandy deserts, grasslands, steppe, meadows. Hebei, Heilongjiang, Liaoning [Kazakstan, Mongolia, Russia].

36. ALYSSUM Linnaeus, Sp. Pl. 2: 650. 1753.

庭荠属 ting qi shu

Gamosepalum Haussknecht; *Meniocus* Desvaux; *Moenchia* Roth (1788), not Ehrhart (1783); *Odontarrhena* C. A. Meyer; *Psilonema* C. A. Meyer; *Ptilotrichum* C. A. Meyer; *Takhtajaniella* V. E. Avetisian; *Triplopetalum* E. J. Nyárády.

Herbs annual, biennial, perennial, or rarely shrubs. Trichomes stellate, stalked or sessile, with 2–6 minute basal branches from which originate up to 30, simple or branched rays, sometimes trichomes lepidote, rarely mixed with simple and forked. Stems erect or decumbent, simple or branched. Basal leaves petiolate or sessile, rosulate or not rosulate, simple, entire. Cauline leaves petiolate or sessile, cuneate or attenuate, not auriculate, entire. Racemes few to many flowered, dense or lax, ebracteate, corymbose or in panicles, elongated or not in fruit. Fruiting pedicels ascending, divaricate, or reflexed. Sepals ovate or oblong, base of lateral pair not saccate. Petals yellow, white, or rarely pink; blade suborbicular, obovate, or spatulate, apex obtuse or emarginate, glabrous or pubescent outside. Stamens 6, tetradynamous; filaments wingless or uni- or bilaterally winged, appendaged or not, toothed or toothless; anthers ovate or oblong, apiculate or not at apex. Nectar glands 4, lateral, 1 on each side of lateral stamen; median glands absent. Ovules 1 or 2(or 4–8) per ovary; placentation apical or parietal. Fruit dehiscent silicles, oblong, ovate, obovate, elliptic, obcordate, or rarely globose, strongly latiseptate or rarely inflated, sessile; valves veinless, pubescent or glabrous, smooth; replum rounded; septum complete, membranous, translucent, veinless; style distinct; stigma capitate, entire. Seeds biseriolate, winged or wingless, orbicular or ovate, flattened; seed coat smooth or minutely reticulate, mucilaginous or not when wetted; cotyledons accumbent or incumbent.

About 170 species: primarily in SW Asia and SE Europe; ten species in China.

In his protologue of *Ptilotrichum*, Meyer (in Ledebour, Fl. Altaic. 3: 64. 1831) distinguished the genus by having white flowers, edentate filaments, and 1-seeded locules. However, these characters are also found in *Alyssum*, in many species of which one of the two ovules fails to mature into a seed, while in others the filaments are edentate. As for the flower color, it is definitely unreliable in *Alyssum sensu lato*, just as is the case in numerous other genera of the family, namely *Cardamine*, *Draba*, *Lepidium*, and *Rorippa*. In fact, the filament base in most plants of *P. canescens*, the generic type of *Ptilotrichum*, produces a small, basal tooth. If one accepts *Ptilotrichum* as a distinct genus, then at least five of the other segregates of *Alyssum* (*Gamosepalum*, *Meniocus*, *Odontarrhena*, *Psilonema*, and *Takhtajaniella*) should also be recognized, an action that the present authors do not support, especially after examining the genus critically on a worldwide basis.

Although *Alyssum fedtschenkoanum* N. Busch was suspected in FRPS to occur in W China, the present authors have seen no Chinese material in the numerous herbaria they consulted both inside and outside of China. The species is narrowly endemic to Kazakstan. It is likely that the plant recorded in FRPS represents a minor variant of the widespread and highly variable *A. tortuosum*.

The ovule number and placentation are important in the identification of the species and can be easily observed in the fruit.

1a. Plants annual.

2a. Fruit flattened; ovules 4–8 per locule; placentation parietal 1. *A. linifolium*

2b. Fruit inflated (biconvex) at least in the middle; ovules 2 per locule; placentation subapical.

3a. All filaments slender, without teeth, wings, or appendages; pedicels and sepals with stellate trichomes mixed with longer, simple and forked ones.

4a. Fruit with stellate trichomes only; fruiting pedicels divaricate or ascending, 2–5(–6) mm, slender, not appressed to rachis 2. *A. alyssoides*

4b. Fruit with stellate trichomes mixed with longer, simple and forked ones; fruiting pedicels erect or ascending, (1–)1.3–1.8(–2) mm, stout, subappressed to rachis 3. *A. dasycarpum*

3b. Filaments of lateral stamens with 2-toothed appendage, median filaments winged and often toothed; pedicels and sepals with stellate and rarely a few forked trichomes.

5a. Fruit glabrous, 2.5–4(–4.5) mm in diam.; style 0.3–0.7 mm; seeds 1.2–1.5 mm; median filaments

toothless 4. *A. desertorum*

- 5b. Fruit densely stellate, (3.5–)4–6.5(–7) mm in diam.; style 0.7–1.6 mm; seeds 1.6–2 mm; median filaments 1- or 2-toothed 5. *A. simplex*
- 1b. Plants perennial with a woody base.
- 6a. Petal blade white; petal claws and filaments pink, papillate at base.
- 7a. Plants often pulvinate, (1–)2–9(–12) cm tall; petals 2–3(–3.5) mm; leaf trichomes rhomboid in outline, with (3 or)4 principal minute branches from stalk apex; seeds 1.4–1.8 × 0.8–1.1 mm 9. *A. canescens*
- 7b. Plants not pulvinate, (5–)8–25(–30) cm tall; petals (3–)3.5–5 mm; leaf trichomes narrowly lanceolate in outline, with only 2 principal minute branches from stalk apex; seeds (1.8–)2–2.5 × 1–1.5 mm 10. *A. tenuifolium*
- 6b. Petals and filaments yellow; claws and filaments glabrous at base.
- 8a. Petals (4.5–)5–7(–8) mm; fruit deeply emarginate at apex 8. *A. lenense*
- 8b. Petals 1.5–3.5(–4) mm; fruit obtuse to subacute at apex.
- 9a. Stems erect or ascending at base, stout; sterile shoots often several; petals 2.5–3.5(–4) mm; fruit 2.5–3.5 mm wide 6. *A. obovatum*
- 9b. Stems tortuous at base, slender; sterile shoots often absent; petals 1.5–3 mm; fruit (1.5–)1.8–2.5 mm wide 7. *A. tortuosum*

1. *Alyssum linifolium* Stephan ex Willdenow, Sp. Pl. 3: 467. 1800.

条叶庭荠 *tiao ye ting qi*

Alyssum cupreum Freyn & Sintenis; *A. linifolium* var. *cupreum* (Freyn & Sintenis) T. R. Dudley; *A. linifolium* var. *tehranicum* Bornmüller; *A. serpyllifolium* Desfontaines; *Meniocus australasicus* Turczaninow; *M. linifolium* (Stephan ex Willdenow) de Candolle.

Herbs annual, (4–)10–30(–40) cm tall, canescent, with appressed, sessile, (7–)10–18-rayed stellate trichomes. Stems erect, ascending, or rarely prostrate, simple or branched near base, always branched above. Cauline leaves shortly petiolate or sessile; leaf blade linear-oblongate or linear, (0.5–)0.7–2 (–3.5) cm × (0.5–)1–2.5(–3.5) mm, base attenuate, apex obtuse or acute. Fruiting pedicels divaricate or ascending, 2–5(–7) mm, slender, straight, covered with stellate trichomes. Sepals oblong, 1.2–2 × 0.4–0.5 mm, caducous, pubescent with stellate trichomes. Petals white or pale yellow, linear-oblongate, 1.2–2.5(–3) × 0.6–1 mm, glabrous, caducous, apex emarginate. Median filaments 1–1.5 mm, 1-toothed; lateral filaments 0.8–1.5, with an appendage 0.3–0.5 mm; anthers ovate, 0.15–0.2 mm. Ovules 4–6(–8) per locule. Fruit obovate, obovate-oblong, or broadly elliptic, (3.5–)4–7 × (2–)2.5–4(–4.5) mm, apex obtuse; valves not veined, flattened throughout, glabrous; style (0.1–)0.3–0.5 mm, slender, glabrous. Seeds 3–6(–8) per locule, oblong or ovate, 1–1.5 × 0.6–0.9 mm, biseriate, compressed, narrowly margined all around, margin to 0.1 mm wide. Fl. and fr. Apr–Jun. $2n = 16$.

Roadsides, cultivated areas, plains, hillsides, steppe, rocky places; 100–2700 m. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; naturalized in Australia].

2. *Alyssum alyssoides* (Linnaeus) Linnaeus, Syst. Nat., ed. 10, 2: 1130. 1759.

欧洲庭荠 *ou zhou ting qi*

Clypeola alyssoides Linnaeus, Sp. Pl. 2: 652. 1753; *Alyssum calycinum* Linnaeus; *A. campestre* (Linnaeus) Linnaeus; *Psilonema alyssoides* (Linnaeus) Heideman; *P. calycinum* (Linnaeus) C. A. Meyer.

Herbs annual, 5–35(–50) cm tall, canescent with appressed, sessile, 6–10-rayed stellate trichomes, these mixed with simple and forked ones on pedicels and sepals. Stems erect, ascending, or decumbent, 1 to several from the base. Cauline leaves subsessile or lowermost shortly petiolate; leaf blade narrowly oblanceolate or linear, sometimes spatulate or obovate, 3–4(–4.5) cm × (0.5–)1–3.5(–5) mm, base attenuate or cuneate, apex obtuse or acute. Fruiting pedicels divaricate or ascending, 2–5(–6) mm, slender, straight, covered with stellate trichomes mixed with fewer, simple and forked ones. Sepals oblong, (1.5–)2–3 × 0.7–1.1 mm, persistent, pubescent as pedicels. Petals white or pale yellow, linear to linear-oblongate, rarely obovate, 2–3(–4) × 0.3–0.7(–1) mm, glabrous or sparsely stellate outside, often persistent, apex emarginate. Filaments 1–1.5 mm, slender, neither appendaged nor toothed; anthers ovate, 0.15–0.2 mm. Ovules 2 per locule. Fruit orbicular, (2–)3–4(–5) mm in diam., apex emarginate or truncate; valves not veined, uniformly inflated at center, strongly flattened at margins, sparsely stellate; style 0.3–0.6(–1) mm, slender, usually glabrous. Seeds 1 or 2 per locule, oblong or ovate, 1.1–2 × 0.7–1.1 mm, compressed, narrowly margined all around, margin ca. 0.1 mm wide. Fl. and fr. May–Jul. $2n = 32$.

Roadsides, waste grounds, disturbed sites; near sea level to 2800 m. Naturalized in Liaoning [Afghanistan, Kazakstan, Kyrgyzstan, Russia,

Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; naturalized in North and South America].

3. *Alyssum dasycarpum* Stephan ex Willdenow, Sp. Pl. 3: 469. 1800.

粗果庭荠 *cu guo ting qi*

Alyssum dasycarpum var. *minus* Bornmüller ex T. R. Dudley; *A. dasycarpum* var. *pterospermum* Bordzilowski; *Psilonema dasycarpum* (Stephan ex Willdenow) C. A. Meyer.

Herbs annual, (3–)5–25(–35) cm tall, canescent, with appressed, sessile, 8–14-rayed stellate trichomes, these mixed with longer, simple and forked ones on pedicels, sepals, and fruit. Stems erect, ascending, or decumbent, often several from the base. Cauline leaves subsessile or lowermost attenuate to petiolelike base to 5 mm; leaf blade spatulate, obovate, or oblong-ob lanceolate, (0.5–)0.8–2.5(–4) cm × (2–)4–10(–15) mm, gradually smaller upward, base attenuate, apex acute. Fruiting pedicels erect or ascending, (1–)1.3–1.8(–2) mm, subappressed to rachis, stout, straight, covered with stellate trichomes mixed with fewer, simple and forked ones. Sepals lanceolate, 2–3 × 0.8–1.3 mm, persistent till fruit maturity, pubescent as pedicels. Petals pale yellow, spatulate, 2.5–3.5(–3.8) × 0.6–1 mm, glabrous, often persistent, base attenuate, apex deeply emarginate. Filaments 2–2.5 mm, slender, neither appendaged nor toothed; anthers ovate, 0.3–0.4 mm. Ovules 2 per locule. Fruit orbicular or orbicular-elliptic, 2.4–3.5(–4) mm in diam., apex rounded or truncate; valves not veined, uniformly inflated except for a narrow flattened margins, with stellate trichomes mixed with longer, simple and forked ones; style (1–)1.5–2 mm, much broader at base, pilose and stellate at least along proximal half. Seeds usually 2 per locule, ovate, 1.1–1.3 × 0.8–1 mm, slightly compressed, usually not margined. Fl. and fr. Mar–Jun. $2n = 16$.

Valleys, steppe, fields; 100–2600 m. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

4. *Alyssum desertorum* Stapf, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 51: 302. 1886.

庭荠 *ting qi*

Alyssum minimum Willdenow, Sp. Pl. 3: 464. 1800, p.p., not Linnaeus (1753); *A. desertorum* var. *himalayense* T. R. Dudley; *A. desertorum* var. *prostratum* T. R. Dudley; *A. turkestanicum* Regel & Schmalhausan var. *desertorum* (Stapf) Botschantzev; *Psilonema minimum* Schur.

Herbs annual, (2–)5–18(–28) cm tall, canescent throughout (except fruit) with appressed, sessile, 8–20-rayed stellate trichomes. Stems erect, ascending, or decumbent, often several from the base. Cauline leaves subsessile or lowermost attenuate to petiolelike base to 5 mm; leaf blade linear to oblanceolate-linear, (0.3–)0.5–2.5(–3) cm × (0.5–)1–3(–4) mm, gradually smaller upward, base attenuate, apex acute. Fruiting pedicels ascending or subdivaricate, (1–)1.5–3.5(–4.5) mm,

stout, straight, covered with stellate trichomes only.

Sepals oblong, 1.4–1.8(–2) × 0.4–0.5 mm, deciduous, stellate. Petals pale yellow, oblanceolate, 2–2.5 × 0.5–0.6 mm, sparsely stellate outside, caducous, base attenuate, apex obtuse or retuse. Filaments 1–1.8(–2) mm; median pairs gradually expanded from apex to narrowly winged base, not toothed; lateral pair with a broadly winged appendage apically notched into 2 teeth; anthers ovate, 0.1–0.2 mm. Ovules 2 per locule. Fruit orbicular, 2.5–4(–4.5) mm in diam., apex shallowly emarginate; valves not veined, uniformly inflated at middle, broadly flattened at margin, glabrous and often glaucous; style 0.3–0.7 mm, slender, glabrous. Seeds often 2 per locule, ovate, 1.2–1.5 × 0.9–1.1 mm, slightly compressed, margined or not. Fl. and fr. Apr–Jun. $2n = 32$.

Deserts, rocky areas; near sea level to 2600 m. Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; Europe; naturalized in North America].

Dudley (Notes Roy. Bot. Gard. Edinburgh 24: 157–165. 1962) divided *Alyssum desertorum* into three varieties distinguished largely on the basis of minor differences in fruit trichomes. In the present authors' opinion, these varieties do not seem to merit recognition. The occurrence in Xizang of this species, which was not recorded in Fl. Xizang. (vol. 2. 1985), is based on the holotype of var. *himalayense*, Hügel 1191 (W).

5. *Alyssum simplex* Rudolphi, J. Bot. (Schrader) 1799(2): 290. 1799.

新疆庭荠 *xin jing ting qi*

Alyssum micranthum C. A. Meyer; *A. minus* Rothmalen; *A. minus* var. *micranthum* (C. A. Meyer) T. R. Dudley; *A. parviflorum* Marschall von Bieberstein.

Herbs annual, (3–)7–25(–35) cm tall, canescent throughout with appressed, coarse, sessile, (3–)5–10-rayed stellate trichomes sometimes with unequal rays. Stems erect, ascending, or decumbent, often several from the base. Cauline leaves subsessile or lowermost attenuate to petiolelike base to 4 mm; leaf blade oblanceolate, obovate-spatulate, or elliptic-lanceolate, (0.5–)0.7–2.2(–3) cm × (1–)2–6(–8) mm, gradually smaller upward, base attenuate, apex acute. Fruiting pedicels divaricate, (2–)3–5(–6) mm, stout, straight, covered with stellate trichomes only. Sepals oblong, 1.7–2.3 × 0.8–1.1 mm, deciduous, with stellate trichomes. Petals pale yellow, oblanceolate, (1.8–)2–2.8(–3.2) × 0.6–0.8 mm, sparsely stellate outside or glabrous, caducous, base attenuate, apex often emarginate. Filaments 1.4–2 mm; median pairs broadly winged, apically 1- or 2-toothed; lateral pair with a broadly winged appendage apically 2-cleft; anthers ovate, 0.3–0.4 mm. Ovules 2 per locule. Fruit orbicular, (3.5–)4–6.5(–7) mm in diam., apex truncate or shallowly emarginate; valves not veined, uniformly inflated at middle, broadly flattened at margin, densely covered with coarse, stellate, equal- or unequal-rayed trichomes; style 0.7–1.6 mm, slender, glabrous or

basally stellate. Seeds often 2 per locule, ovate, 1.6–2 × 1.2–1.5 mm, slightly compressed, margined or not. Fl. and fr. Apr–Jun. $2n = 16$.

Mountain slopes, open places, fields, steppe, meadows; 100–2600 m. Xinjiang [Russia, Turkmenistan; N Africa, SW Asia, Europe; naturalized in North America].

6. *Alyssum obovatum* (C. A. Meyer) Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 10: 57. 1837.

倒卵叶庭荠 *dao luan ye ting qi*

Odontarrhena obovata C. A. Meyer in Ledebour, Fl. Altaic. 3: 61. 1831; *Alyssum americanum* Greene; *A. biovulatum* N. Busch; *A. fallax* E. J. Nyárády.

Herbs perennial, caespitose, 7–15(–20) cm tall, often woody at base, canescent throughout, with sessile, 10–25-rayed stellate trichomes. Stems usually erect or ascending, often several from caudex, sterile shoots often several. Cauline leaves sessile; leaf blade broadly oblanceolate, obovate-spatulate, or obovate, 0.6–1.4(–1.7) cm × (1–)2–6 mm, gradually smaller upward, base attenuate, apex rounded, obtuse, or subacute. Racemes corymbose, simple or in a panicle terminating each stem. Fruiting pedicels divaricate, (2–)3–7(–9) mm, slender, straight, uniformly stellate. Sepals oblong, 1.5–2 × 0.7–1 mm, deciduous, stellate. Petals yellow, broadly spatulate, 2.5–3.5(–4) × 1–1.5 mm, glabrous outside, caducous, base attenuate, apex often obtuse or rounded. Filaments 1.5–2 mm; median pairs unilaterally broadly winged, apically 1-toothed; lateral pair with a lanceolate or narrowly oblong basal appendage apically obtuse or subacute; anthers oblong, 0.3–0.4 mm. Ovules 1(or 2) per locule. Fruit broadly elliptic or obovate, 3–4.5(–5) × 2.5–3.5 mm, apex obtuse to rounded; valves not veined, inflated at middle or on 1 side, flattened at margin, densely covered with stellate trichomes; style 1.5–2 mm, slender, glabrous. Seeds 1(or 2) per locule, ovate, 1.1–1.4 × 0.8–1.1 mm, compressed, not margined. Fl. May–Jul, fr. Jun–Aug. $2n = 16, 30, 32$.

Mountain slopes, cliffs, gravel, rocky places; 500–1500 m. Heilongjiang, Nei Mongol [Kazakhstan, Mongolia, Russia; North America (Alaska, Canada)].

The records in FRPS and Fl. Intramongol. (ed. 2, 2: 646. 1990) of *Alyssum sibiricum* Willdenow, as occurring in Nei Mongol and Heilongjiang, are based on misidentified plants of *A. obovatum*. True *Alyssum sibiricum* is restricted to the Balkan Peninsula, Turkey, Crimea, and the Caucasus. Although the present authors have seen no material of *A. obovatum* from Xinjiang, the species is likely to be gathered from Altay Shan, where it has been extensively collected from the Russian and Mongolian parts of this range. The records herein of *A. obovatum* from Heilongjiang and Nei Mongol are based on *Litvinov 147* (LE) and *Wang Zhan 507* (PE), respectively.

7. *Alyssum tortuosum* Willdenow, Sp. Pl. 3: 466. 1800.

扭庭荠 *niu ting qi*

Alyssum alpestre Linnaeus var. *tortuosum* (Willdenow) Fenzl.

Herbs perennial, caespitose, 6–30(–50) cm tall, often woody at base, canescent throughout, with sessile, 10–18-rayed stellate trichomes. Stems tortuous at base, slender, several from caudex, sterile shoots often absent at flowering. Cauline leaves sessile; leaf blade narrowly obovate or oblanceolate, 0.5–2(–2.5) cm × 1–3(–5) mm, gradually smaller upward, base attenuate, apex acute to subacuminate. Racemes corymbose, in a panicle terminating each stem. Fruiting pedicels divaricate or rarely ascending, (2–)3–6(–8) mm, slender, straight or slightly curved upward, uniformly stellate. Sepals oblong, 1.2–1.8 × 0.5–0.6 mm, deciduous, stellate. Petals yellow, spatulate, 1.5–3 × 0.7–1 mm, glabrous or stellate outside, caducous, base attenuate, apex often obtuse or rounded. Filaments 1–1.5 mm; median pairs unilaterally broadly winged, apically 1- or 2-toothed; lateral pair with a lanceolate basal appendage apically acute; anthers ovate, 0.2–0.3 mm. Ovules 1(or 2) per locule. Fruit elliptic to elliptic-obovate, 2.5–4(–4.5) × (1.5–)1.8–2.5 mm, apex obtuse to subacute; valves not veined, often asymmetrically inflated on 1 side, flattened on other, densely covered with stellate trichomes; style 0.5–1.5 mm, slender, glabrous or sparsely with stellate trichomes basally. Seeds 1(or 2) per locule, ovate, 1.1–1.4 × 0.8–1.1 mm, compressed, not margined. $2n = 16, 32$.

Xinjiang [Kazakhstan, Russia, Turkmenistan; SW Asia, Europe].

The above description is based on non-Chinese material. The Xinjiang plants examined by the present authors are tentatively assigned to this species.

8. *Alyssum lenense* Adams, Mém. Soc. Imp. Naturalistes Moscou 5: 110. 1817.

北方庭荠 *bei fang ting qi*

Alyssum altaicum C. A. Meyer; *A. altaicum* var. *dasy carpum* C. A. Meyer; *A. altaicum* var. *leiocarpum* C. A. Meyer; *A. calycocarpum* Ruprecht var. *edentatum* H. L. Yang; *A. fischerianum* de Candolle; *A. lenense* var. *dasy carpum* (C. A. Meyer) N. Busch; *A. lenense* var. *leiocarpum* (C. A. Meyer) N. Busch.

Herbs perennial, caespitose, (3–)7–25(–30) cm tall, often woody at base, canescent throughout with sessile, 7–16-rayed stellate trichomes. Stems usually erect or ascending, often several from caudex, sterile shoots often several. Cauline leaves sessile; leaf blade linear-lanceolate to linear-oblong, 0.4–2(–3) cm × (0.5–)1–3 mm, gradually smaller upward, base attenuate, apex acute. Racemes corymbose, simple on each stem. Fruiting pedicels divaricate, (3–)4–7(–9) mm, stout, straight, uniformly stellate or sometimes also with simple and forked trichomes. Sepals oblong, 2.5–3 × 1–1.5 mm, deciduous or rarely persistent, stellate. Petals yellow, broadly spatulate, (4.5–)5–7(–8) × (1–)2–3 mm, glabrous outside, caducous, base attenuate, apex rounded or emarginate. Filaments 2.5–4 mm;

median pairs slender or slightly flattened above base, neither winged nor toothed; lateral pair with a minute, unilateral tooth just above base; anthers narrowly oblong, 0.7–1 mm. Ovules 2 per locule. Fruit broadly oblong or oblong-obovate, (3–)4–7 × 3–5 mm, apex emarginate and to 0.5 mm deep; valves not veined, 1 inflated, another concave, margin often not flat, glabrous or sparsely stellate; style 1.5–2.8(–3.5) mm, slender, glabrous. Seeds 2 per locule, ovate or oblong, 1.3–2 × 0.9–1.2 mm, compressed, not margined. Fl. May–Jun, fr. Jul–Aug. $2n = 16$.

Grassy slopes, forests, sandy places. Gansu, Hebei, Heilongjiang, Nei Mongol, Xinjiang [Kazakhstan, Mongolia, Russia].

An examination of the holotypes of *Alyssum lenense* and *A. calycocarpum* var. *edentatum* reveals that they are one taxon. The former is highly variable, and some of its many forms were previously recognized as varieties. *Alyssum calycocarpum* Ruprecht is restricted to the Caucasus and adjacent SW Asia. In fact, the type of var. *edentatum* is very similar to plants of *A. lenense* that have persistent sepals and that were described as *A. altaicum*.

9. *Alyssum canescens* de Candolle, Syst. Nat. 2: 322. 1821.

灰毛庭荠 *hui mao ting qi*

Alyssum canescens var. *abbreviatum* de Candolle;
Ptilotrichum canescens (de Candolle) C. A. Meyer.

Herbs perennial, often pulvinate, (1–)2–9(–12) cm tall, silvery canescent throughout, with short-stalked, stellate trichomes rhomboid in outline and with (3 or)4, branched, principal rays from stalk apex. Stems usually erect or ascending, often several from woody base, sterile shoots often several. Cauline leaves fleshy, sessile; leaf blade oblong or linear, 4–12(–15) × 0.5–2(–3) mm, often grooved adaxially, base attenuate, apex obtuse or subacute. Fruiting pedicels ascending, (3–)4–7 mm, slender, often curved, base subappressed. Sepals oblong, 1.5–2.2 × 1–1.5 mm, deciduous, stellate. Petals white, obovate, 2–3(–3.5) × 1.5–2.5(–3) mm, glabrous outside, caducous, apex rounded; claw often pink, minutely papillate at base. Filaments 1.5–2 mm, dilated and papillate at base, neither winged nor appendaged, lateral pair often minutely dentate above base; anthers ovate, 0.4–0.5 mm. Ovules 1 per locule. Fruit broadly ovate or elliptic-ovate, (2–)4–5 × (1.5–)2–3 mm, apex acute; valves not veined, slightly flattened, densely stellate; style 0.5–2 mm, slender, glabrous. Seeds 1 per locule, ovate, 1.4–1.8 × 0.8–1.1 mm, compressed, not margined. Fl. Jun–Sep, fr. Jul–Oct.

Dry rocky slopes, grassy areas, grasslands, river banks, rock crevices, gravel, alpine steppe; 1000–5000 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang, Xizang [Kashmir, Kazakhstan, Mongolia, Russia (Siberia)].

10. *Alyssum tenuifolium* Stephan ex Willdenow, Sp. Pl. 3: 460. 1800.

细叶庭荠 *xi ye ting qi*

Alyssum canescens de Candolle var. *elongatum* de Candolle; *Ptilotrichum canescens* (de Candolle) C. A. Meyer subsp. *tenuifolium* (Stephan ex Willdenow) Hanelt & Davamzac; *P. elongatum* (de Candolle) C. A. Meyer; *P. tenuifolium* (Stephan ex Willdenow) C. A. Meyer.

Herbs perennial, (5–)8–25(–30) cm tall, silvery canescent throughout, with short-stalked, stellate trichomes lanceolate in outline and with 2, branched, principal rays from stalk apex. Stems usually erect or ascending, often several from woody base, sterile shoots often several. Cauline leaves fleshy, sessile; leaf blade linear, very rarely narrowly oblanceolate, (0.5–)1–2(–2.5) cm × 0.5–2(–4) mm, often grooved adaxially, base attenuate, apex obtuse or subacute. Fruiting pedicels ascending or suberect, 3–12 mm, slender, straight. Sepals oblong, 1.5–2.2 × 1–1.5 mm, deciduous, stellate. Petals white, obovate or sub-orbicular, (3–)3.5–5 × (2–)2.5–3.5 mm, glabrous outside, caducous, apex rounded; claw often pink, minutely papillate at base. Filaments 1–2.5 mm, dilated and papillate at base, neither winged nor appendaged; anthers ovate or oblong, 0.4–0.6 mm. Ovules 1(or 2) per locule. Fruit broadly ovate or lanceolate-ovate, 4–6 × 2–4 mm, apex acute or acuminate; valves not veined, slightly flattened, densely stellate; style 1–2.5 mm, slender, glabrous. Seeds 1 per locule, ovate, (1.8–)2–2.5 × 1–1.5 mm, compressed, not margined. Fl. Jun–Aug, fr. Jul–Oct. $2n = 88, 92$.

Steppe, rocky places, sandy ravines, dry sandy slopes; 900–2400 m. Nei Mongol [Kazakhstan, Mongolia, Russia (Siberia)].

Except for differences in the trichomes, *Alyssum canescens* and *A. tenuifolium* overlap in plant height, petal length, and seed size, and they are sometimes separated with difficulty. A critical field study in parts of their ranges where they overlap, especially in Nei Mongol, Mongolia, and Siberia, is needed in order to reach a better understanding of their limits. Hybridization between the two species (Botschantzev, Bot. Zhurn. (Moscow & Leningrad) 44: 1486. 1959) was suggested, but no experimental work supports that hypothesis. *Alyssum tenuifolium* was not listed in FRPS but was recorded for China (as *Ptilotrichum tenuifolium*) in Fl. Intramongol. (ed. 2, 2: 648. 1990). Several collections from Nei Mongol were examined by the present authors, including *Roerich Expedition 375* (US) and *Petrov s.n.* (LE). Another species, *P. dahuricum* Peschkova (Novosti Sist. Vyssh. Rast. 15: 230. 1979), if indeed distinct from *A. tenuifolium*, was said to occur in China (Fl. Siberiae 7: 107. 1994), but the present authors have seen no Chinese material.

37. GALITZKYA V. V. Botschantzeva, Bot. Zhurn. (Moscow & Leningrad) 64: 1440. 1979.

翅籽芥属 *chi zi qi shu*

Herbs perennial. Caudex often several branched, with persistent petiolar remains of previous years. Trichomes sessile, stellate, 4–8-rayed; rays simple and 1–3-forked. Stems erect, often simple. Basal leaves many, petiolate, rosulate, simple, entire, persistent. Cauline leaves few, sessile, attenuate, not auriculate, entire. Racemes several flowered, ebracteate. Fruiting pedicels divaricate. Sepals ovate or oblong, deciduous, ascending, pubescent, base of lateral pair saccate. Petals yellow or white, longer than sepals; blade obovate, deeply 2-fid. Stamens 6, erect, tetradynamous; filaments only slightly dilated at base; anthers narrowly oblong, obtuse at apex. Nectar glands 4, 1 on each side of lateral stamen; median glands absent. Ovules 6–14 per ovary. Fruit silicles, orbicular, broadly obovate, or broadly elliptic, strongly latiseptate, sessile or rarely on a gynophore to 1 mm; valves subleathery, obscurely or distinctly veined, glabrous or pubescent, flat or slightly inflated; replum slightly flattened, not winged; septum complete, membranous; style to 5 mm, filiform; stigma capitate, entire. Seeds biseriate, broadly winged, orbicular, ovate, or elliptic; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent.

Three species: W China, Kazakstan, Mongolia; two species in China.

The lack in *Galitzkya* of simple and forked trichomes and staminal appendages, and the development of thick, branched caudices and saccate, lateral sepals clearly distinguish it from *Berteroa*. The latter genus has simple and forked trichomes, staminal appendages, and nonsaccate sepals.

1a. Fruit glabrous or very rarely pubescent, somewhat inflated, 3–5(–7) mm; valves rounded at 1 or both ends; petals white 1. *G. spathulata*

1b. Fruit pubescent, flat, larger; valves acute or subacute at both ends; petals yellow 2. *G. potaninii*

1. *Galitzkya spathulata* (Stephan ex Willdenow) V. V. Botschantzeva, Bot. Zhurn. (Moscow & Leningrad) 64: 1442. 1979.

匙叶翅籽芥 *chi ye chi zi qi*

Alyssum spathulatum Stephan ex Willdenow, Sp. Pl. 3: 465. 1800; *Berteroa spathulata* (Stephan ex Willdenow) C. A. Meyer; *Hormathophylla spathulata* (Stephan ex Willdenow) Cullen & T. R. Dudley.

Plants (5–)7–12(–15) cm tall. Basal leaves canescent, densely stellate; petiole (0.3–)0.5–1.8(–2.5) cm, slightly expanded at base; leaf blade broadly spatulate, suborbicular, or obovate, rarely subreniform or oblanceolate, (2–)4–10(–12) × (2–)3–9(–12) mm, base cuneate or rarely subcordate, margin entire, apex rounded or subacute. Cauline leaves linear or narrowly oblong, (3–)4–8(–12) × 0.5–1.5(–2) mm, sessile, apex obtuse or subacute. Fruiting pedicels divaricate, slender, straight, 5–10(–13) mm. Sepals sparsely pubescent, 3–3.5 × 1–1.5 mm. Petals white, obovate, 5–7 mm; lobes ovate or oblong, 1–2 × 0.5–1.5 mm, obtuse. Filaments 2.5–3.5 mm; anthers 0.7–1 mm. Ovules 2–6(–8) per ovary. Fruit orbicular or rarely elliptic, (3–)4–6(–7) × 3–5 mm, somewhat inflated; valves glabrous or very rarely pubescent, rounded at 1 or both ends, reticulate veined; gynophore 0.1–0.7 mm; style glabrous, (1–)2–3(–4) mm. Seeds suborbicular, 3–4 mm in diam., slightly flattened; wing membranous, to 1 mm wide. Fl. Apr–May, fr. Jun–Jul.

Rocky slopes; 500–1000 m. Xinjiang [Kazakstan].

The above first record from China is based on *Bunge 73* (F).

2. *Galitzkya potaninii* (Maximowicz) V. V. Botschantzeva, Bot. Zhurn. (Moscow & Leningrad) 64: 1442. 1979.

大果翅籽芥 *da guo chi zi qi*

Berteroa potaninii Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 26: 422. 1880; *Alyssum magicum* Z. X. An; *B. potaninii* var. *latifolia* Z. X. An.

Plants (9–)15–25(–30) cm tall. Basal leaves canescent, sparsely stellate; petiole (0.3–)0.7–2(–2.5) cm, slightly expanded at base; leaf blade broadly oblanceolate or oblong-lanceolate, (0.6–)1–5(–6) cm × 3–10 mm, base cuneate, margin entire, apex obtuse. Cauline leaves linear-lanceolate, (0.8–)1–3.5 cm × 2–4(–6) mm, sessile, apex obtuse. Fruiting pedicels divaricate, slender, straight, 5–14 mm. Sepals sparsely pubescent, 3–4 × ca. 1.5 mm. Petals yellow, obovate, 5–7 mm; lobes ovate or oblong, 1–2 × 0.5–1.5 mm, obtuse. Filaments 3–4 mm; anthers 0.8–1.1 mm. Ovules to 14 per ovary. Fruit suborbicular or broadly obovate, 0.8–1.3 cm × 6–8 mm, flattened; valves sparsely stellate, acute to subacute at both ends, reticulate veined; gynophore to 1 mm; style sparsely stellate, 3–5 mm. Seeds suborbicular or broadly ovate, to 4 mm in diam., slightly flattened; wing membranous, to 1 mm wide. Fl. Apr–May, fr. Jun–Jul.

Rocky mountain slopes; 800–1700 m. Gansu, Nei Mongol, Xinjiang [Mongolia].

38. LOBULARIA Desvaux, J. Bot. Agric. 3: 162. 1815, nom. cons.

香雪球属 *xiang xue qiu shu*

Aduseton Adanson, nom. rej.; *Koniga* R. Brown.

Herbs annual or perennial, sometimes subshrubs. Trichomes exclusively malpighiaceous, appressed. Stems erect or decumbent, branched basally and above. Leaves all cauline, shortly petiolate or sessile, entire. Racemes several to many flowered, ebracteate, elongated in fruit. Fruiting pedicels slender, ascending or divaricate. Sepals ovate or

oblong, erect or spreading, base of lateral pair not saccate. Petals white or creamy white, rarely purple; blade ovate, spatulate, obovate, or orbicular, apex rounded; claw strongly differentiated from blade, shorter than sepals. Stamens 6, spreading or suberect, slightly tetradynamous or subequal; filaments dilated at base; anthers ovate, obtuse at apex. Nectar glands 8, in pairs, median pairs longer than lateral ones. Ovules 2–14 per ovary. Fruit dehiscent silicles, ovate, obovate, orbicular, or elliptic, latiseptate, sessile or shortly stipitate; valves papery, veinless or with a distinct midvein; replum rounded; septum complete, membranous, translucent; style to 0.6 mm, cylindrical; stigma capitate, entire. Seeds uniseriate or biseriate, winged or wingless, ovate or orbicular, often lenticular, strongly flattened; seed coat reticulate, mucilaginous when wetted; cotyledons accumbent.

Four species: Macaronesia, Mediterranean region, one ornamental species introduced and naturalized worldwide.

1. *Lobularia maritima* (Linnaeus) Desvaux, J. Bot. Agric. 3: 162. 1815.

香雪球 *xiang xue qiu*

Clypeola maritima Linnaeus, Sp. Pl. 2: 652. 1753; *Alyssum halimifolium* Linnaeus; *A. maritimum* (Linnaeus) Lamarck; *A. minimum* Linnaeus; *Koniga maritima* (Linnaeus) R. Brown.

Herbs perennial, sometimes suffruticose, (5–)12–24(–40) cm tall, silvery pubescent. Stems erect, ascending, procumbent, or decumbent, basally branched; pubescent. Leaves linear, lanceolate, or oblanceolate, (1–)1.5–2.5(–4) cm × (0.8–)1.5–3 (–6.5) mm, pubescent, base attenuate, margin entire, apex acute to subobtusate. Racemes many flowered, elongated considerably in fruit. Fruiting pedicels divaricate or ascending, straight, slender, (3–)5–7(–10) mm,

pubescent. Sepals green or purple, oblong, 1.5–1.8(–2.4) × 0.5–1 mm, pubescent. Petals white or deep purple, obovate or suborbicular, 2–3 × 1.5–2.5(–3) mm, abruptly narrowed to claw; claw to 1 mm. Filaments white or purple, 1.2–2 mm; anthers ovate, 0.3–0.5 mm. Fruit ovate, elliptic, or orbicular, (2–)2.3–3(–4.2) × (1.2–)1.5–2(–3) mm; valves convex, pubescent, with a distinct midvein; style 0.4–0.6 mm. Seeds light to reddish brown, 1 per ovary, lenticular, ovate or suborbicular, (1–)1.2–1.4(–2) × (0.7–)0.9–1.1(–1.5), wingless or with a narrow wing to 0.1 mm wide. Fl. and fr. throughout the year depending on locality. $2n = 24$. Stony areas, waste grounds, yards; sea level to 2000 m. Cultivated in most of China, naturalized in Gansu, Hebei, Jiangsu, Shaanxi, Shandong, Shanxi, Taiwan, Xinjiang, Zhejiang [native to W Mediterranean region; naturalized elsewhere].

39. **BERTEROA** de Candolle, Mém. Mus. Hist. Nat. 7: 232. 1821.

团扇芥属 *tuan shan qi shu*

Herbs annual or perennial. Trichomes stellate, mixed with simple ones. Stems erect or ascending, simple or branched. Basal leaves petiolate, not rosulate, simple, entire, dentate, or sinuate. Cauline leaves sessile, not auriculate, often entire. Racemes several flowered, dense, ebracteate. Fruiting pedicels slender, erect or divaricate. Sepals oblong, deciduous, suberect or spreading, pubescent, base of lateral pair not saccate. Petals white or rarely yellow, much longer than sepals; blade obcordate, apex deeply 2-fid; claw short. Stamens 6, tetradynamous; filaments of median pairs flattened basally, unappendaged or laterally 1-toothed; lateral pair with a basal toothlike appendage; anthers oblong, obtuse at apex. Nectar glands 4; median glands absent; lateral glands 1 on each side of lateral stamen. Ovules 4–16 per ovary. Fruit dehiscent silicles, oblong, elliptic, ovate, obovate, or orbicular, latiseptate, sometimes slightly inflated, sessile; valves veinless or with an obscure midvein, stellate hairy or glabrous; replum rounded; septum complete, membranous; style to 4 mm, glabrous or sparsely pubescent; stigma capitate, obscurely 2-lobed. Seeds biseriate, winged, margined, or wingless, suborbicular or lenticular, plump or flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Five species: Asia, Europe (especially Balkan Peninsula), naturalized in North America; one species in China.

1. *Berteroa incana* (Linnaeus) de Candolle, Syst. Nat. 2: 291. 1821.

团扇芥 *tuan shan qi*

Alyssum incanum Linnaeus, Sp. Pl. 2: 650. 1753; *Farsetia incana* (Linnaeus) R. Brown.

Herbs annual or biennial, (20–)30–80(–110) cm tall, densely pubescent with appressed stellate trichomes mixed with some simple ones. Stems erect, simple or few basally, often branched above. Basal leaves petiolate, oblanceolate, (2.5–)3.5–8(–10) cm, withered by flowering time, base cuneate or attenuate, margin entire or repand, apex obtuse. Middle and upper cauline leaves sessile, margin entire, apex acute or obtuse.

Fruiting pedicels slender, erect to erect-ascending, (4–)5–9(–12) mm. Sepals erect-ascending, 2–2.5 mm. Petals white, narrowly obcordate, (4–)5–6.5(–8) mm; lobes oblong, (1–)1.5–3 × 0.5–1.5 mm, apex obtuse. Filaments white; median pairs 2–3.3 mm, flattened base appendaged or unappendaged; lateral pair shorter, with an appendage 0.3–1 mm; anthers oblong, 0.5–1 mm. Fruit oblong or elliptic, slightly inflated, (4–)5–8.5(–10) × (2–)2.5–4 mm; valves stellate, obtuse at both ends; style slender, 1–4 mm, basally sparsely pubescent. Seeds lenticular or ovate-orbicular, 1–2.3 mm in diam., slightly flattened, narrowly margined. Fl. May–Aug, fr. Jun–Sep. $2n = 16$.

Mountain slopes, foothills, fields, river banks, roadsides, disturbed sites, meadows, pastures; 700–1900 m. Gansu, Liaoning, Nei Mongol,

Xinjiang [Kazakstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan; Europe; naturalized in North America].

40. COELONEMA Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 3, 26: 423. 1880.

穴丝芥属 xue si qi shu

Herbs stoloniferous perennial. Trichomes simple, mixed with short-stalked and forked or 3-rayed and stellate ones. Stems erect or decumbent. Basal leaves subsessile or shortly petiolate, rosulate, simple, entire, ciliate, with persistent petiolar bases. Cauline leaves similar to basal ones. Racemes several flowered, ebracteate or basally bracteate. Fruiting pedicels slender, divaricate. Sepals broadly ovate or oblong, ascending, pubescent, unequal, base of lateral pair subsaccate, margin membranous. Petals yellow, longer than sepals; blade obovate, apex subemarginate; claw short, obscurely differentiated from blade. Stamens 6, erect, tetradynamous; filaments filiform, dilated at base; anthers ovate, obtuse at apex. Median glands absent; lateral glands lunar. Ovules 8–10 per ovary. Fruit dehiscent silicles, broadly ovate to ovate-oblong, latiseptate, sessile; valves papery, prominently veined, glabrous or puberulent, smooth; replum rounded; septum complete; style to 0.7 mm; stigma capitate, entire. Seeds blackish, biseriate, wingless, oblong, flattened; seed coat reticulate; cotyledons accumbent.

• One species.

1. *Coelonema draboides* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 3, 26: 424. 1880.

穴丝芥 xue si qi

Draba oreodoxa W. W. Smith var. *glabra* L. L. Lou & T. Y. Cheo; *D. stepposa* L. L. Lou & T. Y. Cheo.

Herbs stoloniferous, with many stems covered with persistent petiolar remains of previous years. Stems 4–8 cm, pilose, with crisped, simple and forked trichomes; flowering stems leafless or few leaved, sterile ones shorter, several leaved. Basal leaves oblong, obovate, or oblanceolate, 4–10(–15) × 2–4(–5) mm, sparsely pilose, then glabrescent, base cuneate or attenuate, margin entire, ciliate with primarily simple trichomes to 1.1 mm, apex obtuse or acute; midvein prominent at base

abaxially. Cauline leaves similar to basal ones. Fruiting pedicels straight or slightly curved, divaricate, 4–10(–14) mm, pilose, with crisped minute trichomes. Sepals broadly ovate or oblong, 1.7–2.5 × 1–2 mm, caducous; lateral pair larger than median pair, subsaccate. Petals yellow, obovate, 4–5 × 2–2.5 mm, apex shallowly emarginate; claw to 1 mm. Filaments yellow; lateral pair 1–1.3 mm; median pairs 1.2–1.6 mm, dilated basally, to 0.5 mm wide; anthers yellow, 0.3–0.4 mm. Fruit broadly ovate to ovate-oblong, 4–6.5 × 2–3.5 mm, puberulent or glabrous; style slender, 0.5–1 mm; stigma wider than style. Seeds blackish, ovate, 1.1–1.3 × 0.9–1. Fl. Jun–Jul, fr. Jul–Aug.

• Grassy slopes, rocky crevices; 3500–4000 m. Gansu, Qinghai.

41. DRABA Linnaeus, Sp. Pl. 2: 642. 1753.

葶苈属 ting li shu

Herbs perennial, rarely annual, biennial (or subshrubs with woody stems). Trichomes simple, forked, stellate, malpighiaceus, or dendritic, stalked or sessile, often more than 1 kind present. Stems erect or ascending, sometimes prostrate, leafy or leafless and plants scapose. Basal leaves petiolate, often rosulate, simple, entire or toothed, rarely lobed. Cauline leaves petiolate or sessile, cuneate or auriculate at base, entire or dentate, sometimes absent. Racemes bracteate or ebracteate, elongated or not in fruit. Fruiting pedicels slender, erect, ascending, or divaricate. Sepals ovate, oblong, or elliptic, base of lateral pair not saccate or subsaccate, margin usually membranous. Petals yellow, white, pink, purple, orange (or rarely red); blade obovate, spatulate, oblong, oblanceolate, orbicular, or linear, apex obtuse, rounded, or rarely emarginate; claw obscurely to strongly differentiated from blade. Stamens 6, tetradynamous; filaments dilated or not at base; anthers ovate or oblong, obtuse at apex. Nectar glands 1, 2, or 4, distinct or confluent and subtending bases of all stamens; median glands present or absent; lateral glands toothlike, semiannular, or annular. Ovules 4 to numerous per ovary. Fruit dehiscent, silicles or rarely siliques, ovate, elliptic, oblong, orbicular, ovoid, globose, lanceolate, or linear, latiseptate or terete, sometimes spirally twisted; valves distinctly or obscurely veined, glabrous or pubescent; replum rounded; septum complete, membranous, translucent; style distinct or obsolete, glabrous; stigma capitate, entire or slightly 2-lobed. Seeds biseriate, wingless (or rarely winged), oblong, ovate, or orbicular, flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

About 350 species: primarily in the N hemisphere, especially arctic, subarctic, alpine, and subalpine regions, with about 70 species in South America; 48 species (16 endemic) in China.

Draba is the largest and most taxonomically difficult genus in the Brassicaceae. More than 950 binomials and nearly a fourth as many infraspecific taxa have been proposed. Numerous taxa are based on trivial characters, especially the presence vs. absence of trichomes on the fruit

valves. Otto Eugene Schulz (Pflanzenr. 89(IV. 105): 1–396. 1927), hereafter Schulz (without a reference), was the last person to monograph *Draba* on worldwide basis. Although he accorded varietal names to forms with glabrous and pubescent fruits, this variation often occurs within the same population (see discussion under *D. oreades*). By contrast, petal color is taxonomically important and should be recorded in the field rather than from dried specimens because white petals sometimes dry yellow or vice versa. Another taxonomically important character is the number of ovules/seeds per ovary/fruit. This is easily obtained by counting the seeds and aborted ovules in the fruit.

The records from China of *Draba fladnizensis* Wulfen (e.g., FRPS, p. 160; Fl. Qinghai. 1: 443. 1997; Fl. Xinjiang. 2(2): 117. 1995) and *D. hirta* Linnaeus (e.g., FRPS, p. 164; Fl. Xinjiang. 2(2): 127. 1995) cannot be confirmed, and it is likely that these records are based on 19th Century accounts that represent misidentifications of plants of several species, including *D. altaica*, *D. lanceolata*, *D. lasiophylla*, *D. mongolica*, and *D. oreades*.

Draba affghanica Boissier was recorded from Gansu by Pohle (Repert. Spec. Nov. Regni Veg. Beih. 32: 128. 1925), but the present authors have seen no Chinese material of that species.

According to FRPS (p. 168), Fl. Qinghai. (1: 449. 1997), and Fl. Xinjiang. (2(2): 125. 1995), *Draba borealis* de Candolle was said to occur in Qinghai, Shaanxi, Sichuan, and Xinjiang. However, the present authors have seen no material from these provinces. The distribution of *D. borealis* in Asia is restricted to Russia (only the coastal Far East, not Siberia) and Japan. It is highly unlikely that the species occurs in China.

Draba fuhaiensis Z. X. An (Fl. Xinjiang. (2(2): 374. 1995) is not included in the present account because the present authors have not seen the type, which was the single collection cited.

1a. Annuals or rarely biennials.

2a. Cauline leaves absent, very rarely 1; fruit base acute 43. *D. melanopus*
 2b. Cauline leaves 2–24(–30); fruit base obtuse.

3a. Seeds and aborted ovules (30–)36–60(–72) per fruit.

4a. Fruit linear, (6–)9–20(–25) mm; petals 3–4 mm 44. *D. stenocarpa*

4b. Fruit oblong or elliptic, (3–)5–8(–10) mm; petals (1.2–)1.7–2.2(–2.5) mm 45. *D. nemorosa*

3b. Seeds and aborted ovules 10–24(–28) per fruit.

5a. Fruit ovate, glabrous, acute at apex; cauline leaves (5–)10–24(–30) 47. *D. eriopoda*

5b. Fruit oblong, oblong-elliptic, or rarely suborbicular, puberulent, obtuse at apex; cauline leaves 3–12.

6a. Petals yellow, (1.2–)1.7–2.2(–2.5) mm; valves with stellate and forked trichomes; racemes (5–)12–40(–60)-flowered 46. *D. huetii*

6b. Petals white, 0.6–1 mm; valves with exclusively simple trichomes; racemes (2–)4–10(–15)-flowered 48. *D. ellipsoidea*

1b. Perennials, with well-developed caudex often covered with leaf or petiolar remains of previous years.

7a. Flowering stems leafless.

8a. Petals white.

9a. Stems distal half and fruiting pedicels glabrous or rarely glabrescent.

10a. Petals 2.5–3(–3.5) × 1–1.5 mm; fruit base obtuse; fruiting pedicels (1–)2–5(–7) mm; Xinjiang 15. *D. turczaninowii*

10b. Petals (3.5–)4–6 × 2–3 mm; fruit base acute; fruiting pedicels 4–13 mm; Jilin 14. *D. ussuriensis*

9b. Stems and fruiting pedicels tomentose throughout.

11a. Petals 4–7 × 1.5–4.5 mm; fruit often twisted, (3–)5–12 mm; style (0.5–)0.7–1.5 mm.

12a. Rachis of infructescence often flexuous; fruit apex acute; petals 1.5–2.5 mm wide; stellate trichomes sessile or subsessile, with some rayed branched 11. *D. winterbottomii*

12b. Rachis of infructescence straight; fruit apex obtuse; petals 2.5–4.5 mm wide; stellate trichomes long-stalked, with unbranched rays 13. *D. sikkimensis*

11b. Petals 1.5–2.5(–3) × 0.6–1.2 mm; fruit not twisted, 2.5–5 mm; style 0.1–0.4 mm.

13a. Sepals sparsely hairy inside; fruit oblong, 1–1.5 mm wide, apex obtuse; petals 1.5–2 mm 12. *D. handelii*

13b. Sepals glabrous inside; fruit narrowly ovate or oblong-ovate, 1.5–2.5 mm wide, apex acute; petals 1.8–2.5(–3) mm 10. *D. glomerata*

8b. Petals yellow.

14a. Leaf margin with exclusively malpighiaceae trichomes; seeds and aborted ovules 24–30 per fruit 40. *D. sibirica*

14b. Leaves without malpighiaceae trichomes; seeds and aborted ovules 6–24 per fruit.

15a. Style (1–)1.5–3.5; sepals 3–4.5 mm 32. *D. jucunda*

15b. Style to 1 mm, if to 1.5 mm then fruits linear to linear-oblong; sepals rarely to 3 mm.

16a. Leaf margin ciliate with setose or subsetose trichomes to 1.4 mm.

17a. Leaves linear or linear-oblong; petals 3–4 × 1–2 mm.

18a. Fruit ovoid to subglobose, inflated, 2.5–4.5 mm; ovules 4–8 per ovary 35. *D. cachemirica*

- 18b. Fruit elliptic-ovate, rarely oblong-lanceolate, flattened, 6–10 mm; ovules 12–16 per ovary 34. *D. setosa*
- 17b. Leaves variously shaped but not linear or linear-oblong; petals 4–7 × 2–3.5 mm.
- 19a. Fruiting pedicels pubescent all around; valves glabrous, base obtuse; racemes 3–7(–12)-flowered; plants surculose 33. *D. senilis*
- 19b. Fruiting pedicels glabrous; valves puberulent, base acute; racemes (6–)10–25(–35)-flowered; plants not surculose 38. *D. olgae*
- 16b. Leaf margin not ciliate or ciliate with nonsetose, shorter trichomes.
- 20a. Fruit inflated at least basally.
- 21a. Fruiting pedicels tomentose all around; ovules 16–24 per ovary; fruit apex obtuse 39. *D. humillima*
- 21b. Fruiting pedicels glabrous at least adaxially; ovules 4–12 per ovary; fruit apex acute to acuminate.
- 22a. Leaves abaxially tomentose with predominantly stellate trichomes; fruit inflated throughout, 2–4 mm, basally semicordate 36. *D. korshinskyi*
- 22b. Leaves abaxially pubescent with predominantly simple trichomes; fruit inflated only basally, (3–)4–9(–12) mm, basally not semicordate 30. *D. oreades*
- 20b. Fruit flattened.
- 23a. Fruit oblong, oblong-linear, or linear-lanceolate; fruiting pedicels (5–)7–18(–22) mm; leaf stellate trichomes 4–6-rayed, at least 1 ray laterally branched.
- 24a. Fruit valves with predominantly stellate trichomes; style 0.4–0.8 mm; seeds and aborted ovules 18–24 per fruit; petals 3.5–5 mm 28. *D. tibetica*
- 24b. Fruit valves with predominantly simple trichomes; style 0.7–1.5 mm; seeds and aborted ovules 10–16 per fruit; petals 4.5–6 mm 29. *D. alajica*
- 23b. Fruit ovate, suborbicular, or elliptic; fruiting pedicels 1–7(–10) mm; leaf stellate trichomes 3- or 4-rayed, all rays unbranched.
- 25a. Leaf trichomes predominantly simple, very rarely absent; fruit apex acute to acuminate; fruiting pedicels glabrous at least adaxially 30. *D. oreades*
- 25b. Leaf trichomes predominantly stellate; fruit apex obtuse; fruiting pedicels tomentose all around 31. *D. involucrata*
- 7b. Flowering stems 1- to many leaved.
- 26a. Petals white.
- 27a. Seeds and aborted ovules 24–60 per fruit.
- 28a. Fruit linear, 1–1.5 mm wide; fruiting pedicels divaricate, not appressed to rachis 1. *D. ladyginii*
- 28b. Fruit oblong-elliptic, oblong, lanceolate, or lanceolate-linear, 1.5–3 mm wide; fruiting pedicels erect to ascending, often subappressed to rachis.
- 29a. Stems and pedicels hirsute with simple trichomes; leaf stellate trichomes with unbranched rays 3. *D. parviflora*
- 29b. Stems and pedicels tomentose with primarily stellate and forked trichomes; leaf stellate trichomes with at least 1 ray laterally branched.
- 30a. Fruit oblong-elliptic to narrowly oblong, 2–3 mm wide; cauline leaves (2 or)3–5(–7) per stem; petals 3.5–7 mm 4. *D. subamplexicaulis*
- 30b. Fruit lanceolate to lanceolate-linear, 1.5–2 mm wide; cauline leaves 6–12(–16) per stem; petals 2.5–3.5 mm 2. *D. lanceolata*
- 27b. Seeds and aborted ovules 6–20(–22) per fruit.
- 31a. Petals broadly obovate, 2.5–4.5 mm wide; sepals 2.5–3 mm; fruit apex obtuse; basal leaves subflaccose with long, slender trichomes 13. *D. sikkimensis*
- 31b. Petals spatulate to narrowly obovate, 1–2(–3) mm wide; sepals 1–2(–2.5) mm; fruit apex acute to acuminate; basal leaves pubescent, pilose, or tomentose with short trichomes.
- 32a. Abaxial surface of basal leaves with predominantly simple trichomes, stellate trichomes with unbranched rays.
- 33a. Fruiting pedicels 1–4 mm; fruit not twisted; cauline leaves (1 or)2–6(–8); Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan 7. *D. altaica*
- 33b. Fruiting pedicels 4–12 mm; fruit slightly twisted; cauline leaves 1–3; Taiwan 9. *D. sekiyana*

- 32b. Abaxial surface of basal leaves with predominantly stellate trichomes 1 to all 4 rays of with laterally branched.
- 34a. Stems distal half and fruiting pedicels glabrous or rarely glabrescent.
- 35a. Petals 2.5–3(–3.5) × 1–1.5 mm; fruit base obtuse; fruiting pedicels (1–)2–5(–7) mm; Xinjiang 15. *D. turczaninowii*
- 35b. Petals (3.5–)4–6 × 2–3 mm; fruit base acute; fruiting pedicels 4–13 mm; Jilin 14. *D. ussuriensis*
- 34b. Stems and fruiting pedicels tomentose throughout.
- 36a. Fruit (5–)6–11 mm, narrowly oblong-ellipsoid to lanceolate-linear; seeds and aborted ovules 12–22 per fruit.
- 37a. Fruiting pedicel erect to ascending, often subappressed to rachis; cauline leaves 1–4(or 5) per stem; fruit twisted 2 or 3 turns, rarely untwisted; base of cauline leaves often ciliate with simple trichomes 5. *D. lasiophylla*
- 37b. Fruiting pedicel divaricate, not appressed to rachis; cauline leaves 6–14(–17) per stem; fruit twisted 1 turn or untwisted; base of cauline leaves not ciliate with simple trichomes 6. *D. mongolica*
- 36b. Fruit 2–4(–5) mm, ovate, elliptic, or rarely oblong-ovate; seeds and aborted ovules 6–12 per fruit.
- 38a. Fruiting pedicels divaricate; racemes bracteate at least basally, slightly elongated in fruit 8. *D. lichiangensis*
- 38b. Fruiting pedicels erect to ascending; racemes ebracteate, distal half not elongated in fruit 10. *D. glomerata*
- 26b. Petals yellow.
- 39a. Racemes bracteate throughout or only basally.
- 40a. Racemes 2–10(–12)-flowered; fruiting pedicels glabrous or pubescent throughout, if glabrous adaxially then style 1.5–3 mm.
- 41a. Petals 2.5–3.5 × 0.8–1.5 mm; style 0.2–0.5 mm; lowermost fruiting pedicels filiform, to 4 cm, strongly recurved 41. *D. gracillima*
- 41b. Petals 6–8 × 3–6 mm; style longer; lowermost pedicels not filiform, to 1.8 cm, rarely recurved.
- 42a. Racemes bracteate basally; ovary and fruit hirsute; basal leaves ciliate 26. *D. bhutanica*
- 42b. Racemes bracteate throughout; ovary and fruit glabrous or puberulent; basal leaves not ciliate.
- 43a. Style ca. 1 mm; ovules ca. 4 per ovary; racemes 8–12-flowered; pedicels divaricate 22. *D. serpens*
- 43b. Style 2–3.5 mm; ovules 18–22 per ovary; racemes 2–6-flowered; pedicels recurved 25. *D. remotiflora*
- 40b. Racemes (12–)15–60(–140)-flowered; fruiting pedicels glabrous adaxially, pubescent abaxially.
- 44a. Fruit pilose; abaxial leaf surface with primarily simple and forked trichomes; lateral pair of sepals not saccate at base 24. *D. matangensis*
- 44b. Fruit glabrous; abaxial leaf surface with stellate trichomes; lateral pair of sepals subsaccate at base.
- 45a. Abaxial surface of basal and lowermost cauline leaves with 5–8-rayed stellate trichomes.
- 46a. Cauline leaves auriculate to amplexicaul, acute, dentate or denticulate; stems often branched; plants not canescent 18. *D. amplexicaulis*
- 46b. Cauline leaves not auriculate or amplexicaul, obtuse, entire; stems simple; plants canescent at least basally 16. *D. yunnanensis*
- 45b. Abaxial surface of basal and lowermost cauline leaves with simple, forked, or 3- or 4-rayed stellate trichomes.
- 47a. Cauline leaves neither auriculate nor amplexicaul; fruit 4–7 mm 23. *D. oreodoxa*
- 47b. Cauline leaves auriculate or amplexicaul; fruit (7–)10–15 mm.
- 48a. Caudex branches surculose; stems few to several from base; seeds and aborted ovules 8–12 per fruit 17. *D. surculosa*
- 48b. Caudex not surculose; stems simple at base; seeds and aborted ovules (12–)16–22(–24) per fruit 19. *D. polyphylla*
- 39b. Racemes ebracteate.

- 49a. Midvein of basal leaves prominent, persistent and often spinelike; leaf margin ciliate with setose or subsetose with simple trichomes to 1.5 mm.
- 50a. Fruit elliptic-ovate, rarely oblong-lanceolate; stems glabrous distally; leaves glabrous adaxially,
midvein narrower than blade on each side 34. *D. setosa*
- 50b. Fruit linear-lanceolate; stems pubescent throughout; leaves hirsute adaxially, midvein wider than
blade on each side 37. *D. linearifolia*
- 49b. Midvein of basal leaves obscure or evident, not persistent and spinelike, leaf margin not ciliate or ciliate with slender, nonsetose trichomes.
- 51a. Petals 1–1.5 mm; seeds and aborted ovules 24–38 per fruit; style absent 42. *D. zangbeiensis*
- 51b. Petals 2.5–8 mm; seeds and aborted ovules 4–20(–24); style 0.1–2 mm.
- 52a. Fruit ovate, suborbicular, or ovate-lanceolate.
- 53a. Cauline leaves 3–6(–9); fruiting pedicels 6–13(–17) mm; seeds and aborted ovules 16–
20 per
fruit; fruit valves pilose, flat 20. *D. elata*
- 53b. Cauline leaves 1(or 2); fruiting pedicels 1–7(–10) mm; seeds and aborted ovules 4–12
per fruit;
fruit valves glabrous or rarely puberulent, inflated basally 30. *D. oreades*
- 52b. Fruit linear, linear-lanceolate, linear-elliptic, to oblong.
- 54a. Racemes (20–)30–90-flowered; fruiting pedicels glabrous adaxially, pubescent
abaxially 21. *D. calcicola*
- 54b. Racemes 2–18(–20)-flowered; fruiting pedicels either glabrous throughout or pubescent
all around.
- 55a. Cauline leaves 2–6; fruiting pedicels filiform, lowermost often recurved; abaxial
surface of
basal leaves with forked or 4-rayed stellate trichomes with unbranched rays.
- 56a. Petals 6–8 × 3–4 mm; fruit 1.5–2.2 cm; style 1.5–2 mm 27. *D. cholaensis*
- 56b. Petals 2.5–3.5 × 0.8–1.5 mm; fruit (0.5–)0.7–1.3(–1.8) cm; style 0.2–0.5 mm 41. *D. gracillima*
- 55b. Cauline leaves 1 or very rarely 2; fruiting pedicels not filiform, suberect to divaricate,
straight; abaxial surface of basal leaves with 4–6-rayed stellate trichomes 1 or more
rays of which forked or with a lateral branch on each side.
- 57a. Fruit valves with predominantly stellate trichomes; style 0.4–0.8 mm; seeds and
aborted
ovules 18–24 per fruit; petals 3.5–5 mm 28. *D. tibetica*
- 57b. Fruit valves with predominantly simple trichomes; style 0.7–1.5 mm; seeds and
aborted
ovules 10–16 per fruit; petals 4.5–6 mm 29. *D. alajica*

1. *Draba ladyginii* Pohle, *Izv. Imp. Bot. Sada Petra Velikago* 14: 472. 1914.

苞序葶苈 *bao xu ting li*

Draba incana Linnaeus var. *flaccida* Maximowicz; *D. incana* var. *microphylla* W. W. Smith; *D. lanceolata* Royle var. *chingii* O. E. Schulz; *D. lanceolata* var. *latifolia* O. E. Schulz.

Herbs perennial, (7–)15–45(–60) cm tall, caespitose. Caudex slender, few branched, ultimate branches terminated in rosettes, covered with petiolar remains of previous years. Stems erect, simple or rarely branched above middle, sparsely to densely pubescent with subsessile stellate trichomes, often glabrescent distally. Basal leaves rosulate, persistent; petiole 5–10(–15) mm, sometimes undifferentiated; leaf blade elliptic, oblong, or lanceolate, (0.3–)1–2.5(–4) cm × (1–)2–7(–10) mm, abaxially pubescent with sessile or short-stalked, 4-rayed stellate trichomes 1 or 2 rays of which often branched, adaxially pubescent with similar stellate trichomes or with a mixture of stellate and simple ones, base attenuate to cuneate, margin entire or denticulate, apex acute. Cauline leaves (4–)6–19(–26),

sessile; leaf blade ovate, oblong, or elliptic, 0.4–2.5(–4) cm × 1.5–7(–15) mm, pubescent as basal leaves or adaxially strigose with simple trichomes, base cuneate to obtuse, margin entire or 1–4(–7)-toothed on each side, apex acute. Racemes (8–)14–35(–45)-flowered, bracteate basally, not elongated in fruit. Fruiting pedicels 2–10(–12) mm, divaricate, straight, glabrous or pubescent all around with subsessile, forked or stellate trichomes sometimes mixed with simple ones. Sepals oblong or ovate, 1–1.5 × 0.5–0.6 mm, erect, abaxially pilose with simple trichomes, base of lateral pair not saccate, margin membranous. Petals white, broadly spatulate, 2–3 × 0.8–1.1 mm, apex emarginate; claw absent. Filaments 0.9–2 mm; anthers ovate, 0.2–0.3 mm. Ovules (28–)32–52(–60) per ovary. Fruit linear, (5–)7–12(–17) × 1–1.5 mm, erect or rarely divaricate, latiseptate, rarely slightly twisted; valves glabrous, base and apex obtuse, with a distinct midvein; style obsolete, rarely to 0.1 mm. Seeds brown, ovate, 0.6–0.8 × 0.4–0.5 mm. Fl. and fr. Jun–Aug.

• Sunny roadsides, sandy damp places, scrub, alpine turf, wood margins; 2100–4700 m. Gansu, Hebei, Hubei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan.

Except for not having fully mature fruits, the type collection of *Draba lanceolata* var. *chingii*, R. C. Ching 497 (holotype, B; isotypes, E, GH, P, PE, US), is indistinguishable from that of *D. ladyginii*, Ladygin 381 (holotype, LE; photos, MO, PE).

2. *Draba lanceolata* Royle, Ill. Bot. Himal. Mts. 1: 72. 1839.

锥果葶苈 *zhui guo ting li*

Draba lanceolata var. *brachycarpa* O. E. Schulz; *D. lanceolata* var. *leiocarpa* O. E. Schulz; *D. lanceolata* var. *sonamargensis* O. E. Schulz; *D. nichanaica* O. E. Schulz; *D. stylaris* J. Gay ex E. A. Thomas var. *leiocarpa* L. L. Lou & T. Y. Cheo.

Herbs perennial, 10–30(–40) cm tall, caespitose. Caudex slender, few branched, ultimate branches terminated in rosettes, covered with petiolar remains of previous years. Stems erect, simple, tomentose with subsessile stellate trichomes. Basal leaves rosulate, persistent; petiole to 1.5 cm, often undifferentiated; leaf blade elliptic, oblong, or lanceolate, (0.4–)1–2(–3) cm × (1–)2–6 mm, tomentose with sessile or short-stalked, 4-rayed stellate trichomes 1 or 2 rays of which often branched, base attenuate to cuneate, margin entire or denticulate, apex acute. Cauline leaves 6–12(–16), sessile; leaf blade ovate, oblong, elliptic, or lanceolate, 0.7–2.6(–3.5) cm × 2–7(–10) mm, pubescent as basal leaves, often adaxially pilose with predominantly simple trichomes, base cuneate to obtuse, margin 2–5 (–9)-toothed on each side, rarely entire, apex acute. Racemes (7–)14–32(–47)-flowered, ebracteate or lowermost flowers bracteate, elongated in fruit. Fruiting pedicels 2–4.5(–7) mm, erect or ascending, often appressed to rachis, straight, tomentose all around with subsessile, stellate trichomes sometimes mixed with simple ones. Sepals oblong or ovate, 1–2 × 0.5–0.8 mm, erect, abaxially pilose, base of lateral pair not saccate, margin membranous. Petals white, spatulate, 2.5–3.5 × 1–2 mm, apex submarginate or rounded; claw absent or to 1 mm. Filaments 1.5–2 mm; anthers ovate, 0.2–0.3 mm. Ovules (26–) 30–48(–56) per ovary. Fruit lanceolate to lanceolate-linear, (6–) 7–11(–12) × 1.5–2 mm, erect and often appressed to rachis, latiseptate, rarely slightly twisted; valves tomentose or very rarely glabrous, obscurely veined, apex acute; style 0.1–0.6 mm. Seeds brown, ovate, 0.8–1.1 × 0.5–0.6 mm. Fl. and fr. Jun–Aug. $2n = 32$.

Mountain slopes, meadows, scrub, gravelly streamsides, roadsides; 1100–4900 m. Gansu, Qinghai, Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Sikkim, Tajikistan, E Turkmenistan, Uzbekistan].

Schulz confused the limits of *Draba ladyginii*, *D. lanceolata*, *D. lasiophylla*, and *D. mongolica*, as evidenced from the varieties he described originally under certain species and in his monograph transferred to others. The first two species are easily separated from the latter two by having usually more than 30 instead of less than 24

ovules/seeds per fruit. Other characters that distinguish the four species are given in the key above.

The records of *Draba incana* Linnaeus and *D. stylaris* J. Gay ex E. A. Thomas from China (e.g., FRPS 168–171; Fl. Qinghai. 1: 449. 1995; Fl. Sichuan. 14: 74. 1999; Fl. Xinjiang. 2(2): 123–126. 1995; Fl. Xizang. 2: 354–355. 1985) are based on misidentified plants of *D. lanceolata*. True *D. incana* (including *D. stylaris*) occurs only in Europe and North America (Canada and N United States). It differs from *D. lanceolata* in being biennial (instead of perennial with a distinct caudex) and in having fruits elliptic to oblong and glabrous (instead of almost always lanceolate to lanceolate-linear and tomentose).

3. *Draba parviflora* (Regel) O. E. Schulz in Engler, Pflanzenr. 89(IV. 105): 273. 1927.

小花葶苈 *xiao hua ting li*

Draba hirta Linnaeus var. *leiocarpa* Regel f. *parviflora* Regel, Nouv. Mém. Soc. Imp. Naturalistes Moscou 11: 51. 1859; *D. subamplexicaulis* C. A. Meyer var. *hirsutifolia* Pohle.

Herbs perennial, (3–)6–20(–25) cm tall, compactly caespitose. Caudex few branched, ultimate branches terminated in rosettes, covered with leaf remains of previous years. Stems erect, simple, hirsute throughout with simple and coarse, forked trichomes. Basal leaves rosulate, persistent; petiole to 7 mm, ciliate; leaf blade oblong or oblanceolate, (0.3–)0.7–2(–2.5) cm × (1–)2–5 mm, abaxially hirsute with sessile or subsessile, 3- or 4-rayed stellate trichomes with unbranched rays, adaxially and ciliate margin with simple, stoutish trichomes to 1 mm, base attenuate to cuneate, margin entire or 1–3-denticulate, apex acute. Cauline leaves 2–4(–8), sessile; leaf blade ovate or oblong, 0.4–1.8 cm × 1–6 mm, pubescent as basal leaves, margin entire or 1–3-toothed on each side, apex subacute. Racemes 4–20-flowered, ebracteate, elongated in fruit. Fruiting pedicels 2–4 mm, erect, often appressed to rachis, straight, hirsute all around with simple trichomes. Sepals oblong-ovate, 1.5–2 × 0.5–0.8 mm, erect, abaxially pilose, base of lateral pair not saccate, margin not membranous. Petals white, spatulate, 2–3.5 × 1–1.5 mm, apex submarginate or rounded; claw absent. Filaments 1–1.5 mm; anthers ovate, 0.2–0.3 mm. Ovules 24–30 per ovary. Fruit oblong-elliptic to oblong, 6–11 × 1.5–2(–2.5) mm, erect, often appressed to rachis, latiseptate, not twisted; valves glabrous, obscurely veined, base and apex subobtuse; style 0.1–0.3 mm. Seeds brown, ovate, 0.9–1.1 × 0.5–0.6 mm. Fl. and fr. Jun–Aug.

Stony meadows of alpine areas, streamsides; 2700–4100 m. Gansu, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan].

The illustration of *Draba stylaris* J. Gay ex E. A. Thomas in Fl. Xinjiang. 2(2): 124. 1995) is based on misidentified plants of *D. parviflora*.

4. *Draba subamplexicaulis* C. A. Meyer in Ledebour, Fl. Altaic. 3: 77. 1831.

半抱茎葶苈 *ban bao jing ting li*

Draba dasycarpa C. A. Meyer; *D. hirta* Linnaeus var. *subamplexicaulis* (C. A. Meyer) Regel.

Herbs perennial, (4–)10–25(–35) cm tall, caespitose. Caudex slender, few branched, ultimate branches terminated in rosettes, covered with leaf remains of previous years. Stems erect, simple, tomentose with sessile, stellate and forked trichomes occasionally mixed with fewer, slender, simple ones. Basal leaves rosulate, persistent; petiole to 6 mm, sometimes ciliate; leaf blade oblong, or oblanceolate, 0.5–3(–3.6) cm × (1–)2–6(–10) mm, tomentose with sessile, 4-rayed stellate trichomes 1 to all rays of which with 1 or 2 lateral branches, base attenuate to cuneate, margin 1–5-toothed on each side, rarely subentire, apex acute. Cauline leaves (2 or)3–5(–7), sessile; leaf blade ovate to oblong, rarely elliptic or lanceolate, 0.7–2.6(–4) cm × 2–6(–10) mm, pubescent as basal leaves, base obtuse or subamplexicaul, margin 1–5-toothed on each side, rarely entire, apex acute. Racemes (3–)7–18(–20)-flowered, ebracteate, elongated in fruit. Fruiting pedicels 2–8(–12) mm, erect-ascending, straight, glabrous or tomentose all around with subsessile, forked and stellate trichomes sometimes mixed with simple ones. Sepals oblong or ovate, 2–2.7 × 1–1.3 mm, erect, abaxially pilose, base of lateral pair not saccate, margin narrowly membranous. Petals white, spatulate, 3.5–5 × 1.5–2.5 mm, apex emarginate; claw 1–2 mm. Filaments 1.5–3 mm; anthers ovate, 0.4–0.5 mm. Ovules 30–40 per ovary. Fruit oblong-elliptic to narrowly oblong, 5–14 × 2–3 mm, erect and often appressed to rachis, latiseptate, not twisted; valves glabrous or puberulent with simple and forked trichomes, not veined, base and apex obtuse to acute; style 0.1–0.5 mm. Seeds brown, ovate, 0.9–1.1 × 0.5–0.6 mm. Fl. and fr. Jun–Jul.

Rocky slopes, gravelly areas; 2300–4600 m. Qinghai, Shaanxi, Sichuan, Xinjiang [Kazakstan, Kyrgyzstan, Mongolia, Russia, Uzbekistan].

5. *Draba lasiophylla* Royle, Ill. Bot. Himal. Mts. 1: 71. 1839.

毛叶葶苈 mao ye ting li

Draba glomerata Royle var. *leiocarpa* Pampanini; *D. ladyginii* Pohle var. *trichocarpa* O. E. Schulz; *D. lasiophylla* var. *leiocarpa* (Pampanini) O. E. Schulz; *D. lasiophylla* var. *royleana* Pohle; *D. torticarpa* L. L. Lou & T. Y. Cheo.

Herbs perennial, 4–20(–28) cm tall, caespitose. Caudex slender, few branched, ultimate branches terminated in rosettes, covered with petiolar remains of previous years. Stems erect, simple, tomentose with subsessile stellate trichomes. Basal leaves rosulate; petiole to 6 mm, often undifferentiated; leaf blade lanceolate or elliptic-oblong, (3–)4–15(–18) × 1–4(–5) mm, tomentose with sessile, 4-rayed stellate trichomes the rays of which with 1 or 2 lateral branches, base attenuate to cuneate, margin entire or 1–3-toothed on each side, often ciliate at least near base, apex acute.

Cauline leaves 1–4(or 5), sessile; leaf blade ovate, oblong, or elliptic, (4–)6–10(–20) × 1.5–4(–7) mm, pubescent as basal leaves, base cuneate to obtuse, margin entire or 1–5-toothed on each side, often subsetose ciliate at base, apex acute. Racemes (5–)7–20(–25)-flowered, ebracteate or lowermost flowers bracteate, at least lowermost portion elongated in fruit. Fruiting pedicels (1–)2–6(–10) mm, erect or ascending, straight, often subappressed to rachis, tomentose all around with subsessile, stellate trichomes rarely mixed with fewer simple ones. Sepals oblong, 1.2–1.8 × 0.5–0.9 mm, erect, abaxially pilose, base of lateral pair not saccate, margin membranous. Petals white, spatulate, 2–3.5 × 0.8–1.1 mm, apex subemarginate or rounded; claw absent. Filaments 1–1.8 mm; anthers ovate, ca. 0.2 mm. Ovules 12–20(–22) per ovary. Fruit narrowly oblong-ellipsoid to lanceolate-linear, (5–)7–10(–11) × 1.5–2 mm, erect to ascending, sometimes appressed to rachis, latiseptate, often twisted 2 or rarely 3 turns, rarely untwisted; valves tomentose or glabrous, obscurely veined, base obtuse, apex acute or acuminate; style 0.1–0.5 mm. Seeds brown, ovate, 0.8–1.1 × 0.4–0.5 mm. Fl. Jun–Aug, fr. Jul–Oct.

Mountain slopes, crevices, *Kobresia* turf; 3000–5200 m. Gansu, Hubei, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang [Bhutan, India, Kashmir, Kazakstan, Kyrgyzstan, Nepal, Sikkim, Tajikistan, Uzbekistan].

The above first records of *Draba lasiophylla* from Hubei, Sichuan, and Xinjiang are based on *Wilson 2069* (A, E, K, NY, P, W), *Harry Smith 11182* (UPS), and *Wu, Ohba, Wu & Fei 2108* (KUN, TI), respectively.

6. *Draba mongolica* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 15: 256. 1842.

蒙古葶苈 meng gu ting li

Draba incana Linnaeus var. *mongolica* (Turczaninow) Regel; *D. mongolica* var. *chinensis* Pohle; *D. mongolica* var. *elongata* Pohle; *D. mongolica* var. *trichocarpa* O. E. Schulz; *D. mongolica* var. *turczaninoviana* Pohle.

Herbs perennial, (3–)5–15(–20) cm tall, caespitose. Caudex slender, few branched, ultimate branches terminated in rosettes, covered with petiolar remains of previous years. Stems erect, simple, tomentose with subsessile stellate trichomes. Basal leaves rosulate; petiole absent or to 1.2 cm; leaf blade lanceolate, 0.8–3 cm × 1–5 mm, tomentose with sessile, 4-rayed stellate trichomes the rays of which with 1 or 2 lateral branches, base attenuate to cuneate, margin entire or dentate, not ciliate, apex acute. Cauline leaves 6–14(–17), sessile; leaf blade ovate, oblong, or elliptic, 0.6–1.5 cm × 2–7 mm, pubescent as basal leaves, base cuneate to obtuse, margin entire or 1–6-toothed on each side, not ciliate at base, apex acute. Racemes 7–20-flowered, ebracteate or lowermost flowers bracteate, elongated slightly in fruit. Fruiting pedicels 1–5(–6) mm, divaricate, straight, tomentose all around with

subsessile, stellate trichomes. Sepals oblong, 1–1.8 × 0.5–0.9 mm, erect, abaxially pilose, base of lateral pair not saccate, margin membranous. Petals white, spatulate, 2–3.5 × 1–1.3 mm, apex subemarginate or rounded; claw absent. Filaments 1–1.8 mm; anthers ovate, 0.1–0.2 mm. Ovules 12–18(–20) per ovary. Fruit narrowly oblong-ellipsoid to lanceolate-linear, (5–)6–8(–9) × (1–)1.5–2.5 mm, erect, latiseptate, flat or twisted to 1 turn; valves tomentose or glabrous, obscurely veined, base obtuse, apex acute or acuminate; style 0.1–0.3 mm. Seeds brown, ovate, 0.9–1.1 × 0.5–0.6 mm. Fl. and fr. Jun–Aug.

Crevices, grassy areas, slopes, river banks; 1700–4000 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang [Mongolia, Russia].

The above first record from Jilin is based on *Anonymus 986* (PE), collected from Antu Xian. *Draba mongolica* was recorded from Xizang in FRPS and by Pohle (Repert. Spec. Nov. Regni Veg. Beih. 32: 78. 1925), but the present authors have not examined material from that autonomous region.

7. *Draba altaica* (C. A. Meyer) Bunge, Delect. Seminum Hort. Bot. Dorpat. 1841: 8. 1841.

阿尔泰葶苈 a er tai ting li

Draba rupestris R. Brown var. *altaica* C. A. Meyer in Ledebour, Fl. Altaic. 3: 71. 1831; *D. altaica* var. *foliosa* O. E. Schulz; *D. altaica* var. *glabrescens* Lipsky; *D. altaica* var. *microcarpa* O. E. Schulz; *D. altaica* prol. *modesta* (W. W. Smith) O. E. Schulz; *D. altaica* var. *modesta* (W. W. Smith) W. T. Wang; *D. altaica* var. *racemosa* O. E. Schulz; *D. modesta* W. W. Smith; *D. rupestris* var. *pusilla* Karelin & Kirilov.

Herbs perennial, (1–)2–8(–10) cm tall, caespitose. Caudex few branched, ultimate branches terminated in rosettes and covered with petiolar remains of previous years. Stems erect, simple from caudex, rarely branched above, sparsely to densely hirsute with simple, straight or crisped trichomes to 0.7 mm, these sometimes mixed with forked and stellate ones, rarely glabrescent. Basal leaves rosulate, persistent; petiole (2–)5–12 mm, becoming stramineous; leaf blade linear-lanceolate or lanceolate, rarely oblanceolate or subspatulate, (0.3–)0.6–2(–3) cm × 1–4(–7) mm, pubescent exclusively or predominantly with simple trichomes, stellate or forked trichomes mainly on midvein, base attenuate to cuneate, margin entire or 1–3(–6)-toothed on each side, often ciliate, apex acute. Cauline leaves (1 or)2–6(–8), sessile; leaf blade ovate, oblong, elliptic, or lanceolate, (3–)4–13(–20) × 1–4.5(–6) mm, pubescent as basal leaves, base cuneate or obtuse, margin entire or 1–5(–7)-toothed on each side, apex acute. Racemes 5–15(–24)-flowered, bracteate basally, rarely ebracteate, not or only slightly elongated and subumbellate in fruit. Fruiting pedicels 1–4 mm, ascending to divaricate, straight, glabrous or sparsely to densely pubescent. Sepals oblong, 1–1.5 × 0.4–0.6 mm, erect, abaxially

sparsely pubescent with simple trichomes, base of lateral pair not saccate, margin not membranous. Petals white, spatulate, (1.2–) 1.5–2.5 × (0.5–)0.7–1 mm, apex emarginate; claw to 0.7 mm. Filaments (0.6–)1–1.5 mm; anthers ovate, 0.1–0.2 mm. Ovules 10–20 per ovary. Fruit ovate to oblong, (3–)4–7(–8) × 1.5–2 mm, latiseptate, not twisted; valves glabrous, not veined, base obtuse, apex acute; style 0.1–0.2 mm. Seeds brown, ovate, 0.7–0.9 × 0.5–0.6 mm. Fl. Jun–Aug, fr. Jul–Sep.

Rocky slopes, gravelly areas, moraine, streamsides, *Kobresia* mats, *Juniperus* forests, grassy slopes; 2000–5600 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Sikkim, Tajikistan].

A widespread and highly variable species divided by Schulz into seven infraspecific taxa that were based primarily on minor, continuous differences in plant height, number and size of cauline leaves, density of indumentum, and fruit size. However, a critical examination of the types of these taxa reveals that none of them merits recognition.

8. *Draba lichiangensis* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 208. 1919.

丽江葶苈 li jiang ting li

Draba daochengensis W. T. Wang; *D. hicksii* Grierson; *D. lichiangensis* var. *microcarpa* O. E. Schulz; *D. lichiangensis* var. *trichocarpa* O. E. Schulz.

Herbs perennial, (1–)2–5(–8) cm tall, often densely caespitose, scapose. Caudex many branched, ultimate branches terminated in rosettes and covered with petiolar remains of previous years. Stems erect, simple, sparsely to densely tomentose with stellate trichomes. Basal leaves rosulate, persistent; petiole to 4 mm, persistent, ciliate with simple trichomes or not ciliate; leaf blade spatulate, oblanceolate, or rarely oblong, (2–)4–8 (–12) cm × (0.5–)1–2.5(–3) mm, abaxially tomentose with stellate trichomes the rays of which with 1 or 2 lateral branches, adaxially subglabrous or with simple or stellate trichomes, base attenuate, margin entire or minutely 1–4-toothed, apex obtuse to acute. Cauline leaves (1 or)2–8(–11), sessile; leaf blade ovate, oblong, or elliptic, similar in indumentum to basal leaves. Racemes (3–)5–10(–13)-flowered, lowermost flower(s) bracteate, very rarely bracteate throughout, slightly elongated in fruit. Fruiting pedicels (1–)2–8(–15) mm, divaricate, straight, sparsely to densely tomentose all around with stellate and forked trichomes. Sepals oblong, 1–1.8 × 0.6–0.8 mm, erect, abaxially sparsely pubescent, base of lateral pair not saccate, margin not membranous. Petals white, narrowly obovate to oblanceolate, 2–3 × 0.7–1.3 mm, apex subemarginate. Filaments 1–1.8 mm; anthers ovate, 0.2–0.3 mm. Ovules 8–12 per ovary. Fruit ovate to elliptic, 2–4(–5) × 1.5–2.5 mm, not inflated, latiseptate, not twisted; valves glabrous or rarely pubescent, obscurely veined, base obtuse to acute, apex acute; style 0.1–0.4 mm. Seeds brown, ovate, 0.9–1.3 × 0.6–0.9 mm. Fl. May–Jul, fr. Jun–Aug.

Mountain slopes, gravelly areas, crevices of limestone cliffs, scree, grassy hillsides, stony moist meadows; 3500–5000 m. Qinghai, Sichuan, Xizang, NW Yunnan [Bhutan, Nepal].

The above first record from Nepal is based on *Einarsson, Skärfby & Wetterhall 2727* (UPS). The above record from Bhutan is based on the holotype and paratype of *D. hicksii*, *Ludlow, Sherriff & Hicks 21111* (BM) and *Ludlow, Sherriff & Hicks 20348* (BM), respectively.

A comparison of the type collections of *Draba lichiangensis*, *Forrest 5698* (holotype, E; isotype, BM), and *D. daochengensis*, *Qinghai-Xizang Team 5091* (holotype, PE; isotypes, KUN, PE), shows that the latter species is indistinguishable from plants of the former that grow in shaded rock crevices.

9. *Draba sekiyana* Ohwi, *Repert. Spec. Nov. Regni Veg.* 36: 51. 1934.

台湾葶苈 *tai wan ting li*

Herbs perennial, 3–6 cm tall, densely caespitose. Caudex several branched, ultimate branches terminated in sterile shoots or rosettes, covered with leaf remains of previous years. Stems erect, simple, moderately pilose or puberulent with crisped, primarily simple trichomes. Basal leaves rosulate, persistent; petiole to 5 mm, ciliate with simple trichomes; leaf blade lanceolate to oblanceolate, 4–10 × 1–2 mm, sparsely to moderately pilose with simple and much fewer, short-stalked forked trichomes, base attenuate, margin entire, apex obtuse to acute. Cauline leaves 1–3, sessile; leaf blade oblong to narrowly ovate, similar in indumentum to basal leaves. Racemes 4–8-flowered, ebracteate or rarely lowermost flower bracteate, elongated in fruit. Fruiting pedicels 4–12 mm, ascending to suberect, straight or slightly curved, slender, pilose or puberulent all around with simple trichomes. Sepals oblong, 1.5–2 × 0.6–0.8 mm, erect, abaxially sparsely pilose with simple trichomes sometimes mixed with much fewer ones, base of lateral pair not saccate, margin not membranous. Petals white, narrowly obovate, 2.5–3 × 0.9–1.1 mm, apex rounded. Filaments 1–1.7 mm; anthers ovate, 0.3–0.4 mm. Ovules 14–20 per ovary. Fruit oblong to elliptic, 5–10 × 1.5–2.5 mm, not inflated, latiseptate, slightly twisted; valves glabrous, obscurely veined, base obtuse, apex acute; style 0.1–0.4 mm. Seeds brown, oblong, ca. 1.1 × 0.6 mm. Fl. and fr. Aug–Sep.

• Mountain summits; 3000–3900 m. Taiwan.

10. *Draba glomerata* Royle, *Ill. Bot. Himal. Mts.* 1: 71. 1839.

球果葶苈 *qiu guo ting li*

Draba glomerata var. *dasycarpa* O. E. Schulz.

Herbs perennial, (1–)2–8(–10) cm tall, densely caespitose, often scapose. Caudex slender, often many branched, ultimate branches terminated in rosettes, covered with leaf remains of previous years. Stems erect, simple, tomentose with subsessile stellate trichomes. Basal leaves rosulate; petiole absent, rarely to 4 mm, rarely ciliate; leaf blade obovate, oblong, or lanceolate, 2–8 × (0.7–)1–2 mm, densely tomentose

with sessile or subsessile, very fine, 4-rayed stellate trichomes the rays of which with 1 or 2 lateral branches on each side, base attenuate to cuneate, margin entire, not ciliate, apex obtuse. Cauline leaves (0 or)1–3(–5), sessile; leaf blade ovate, oblong, or elliptic, 2–5 × 0.5–2 mm, pubescent as basal leaves, base cuneate to obtuse, margin entire or rarely with 1 or 2 minute teeth on each side, not ciliate, apex subobtuse. Racemes 3–10-flowered, ebracteate or rarely lowermost flower bracteate, basally slightly elongated, remainder often subumbellate in fruit; rachis straight. Fruiting pedicels 1–3(–4) mm, ascending, straight, tomentose all around with subsessile, stellate trichomes. Sepals oblong, 1–2 × 0.6–0.8 mm, erect, abaxially sparsely tomentose, base of lateral pair not saccate, margin narrowly membranous. Petals white, spatulate, 1.8–2.5(–3) × 0.8–1.2 mm, apex subemarginate. Filaments 1–1.5 mm; anthers ovate, ca. 0.2 mm. Ovules (6–)8–12 per ovary. Fruit ovate, rarely oblong-ovate, (2.5–)3–4(–5) × 1.5–2.5 mm, not inflated, latiseptate, not twisted; valves glabrous or rarely puberulent, obscurely veined, base obtuse, apex acute; style obsolete or 0.1–0.2(–0.4) mm. Seeds brown, ovate, 0.7–1 × 0.5–0.7 mm. Fl. Jun–Aug, fr. Jul–Oct.

Grassy areas, sandy river banks, gravelly slopes; 2900–5500 m. Gansu, Sichuan, Qinghai, Xinjiang, Xizang [India, Kashmir, Nepal, Pakistan].

Accounts of *Draba dasystra* in FRPS (p. 161–163), Fl. Qinghai. (1: 443–444. 1987), and Fl. Xizang. (2: 352–353. 1985) are based partly on misidentified plants of *D. glomerata* and partly on *D. winterbottomii*.

11. *Draba winterbottomii* (J. D. Hooker & Thomson) Pohle, *Repert. Spec. Nov. Regni Veg. Beih.* 32: 138. 1925.

棉毛葶苈 *mian mao ting li*

Draba tibetica J. D. Hooker & Thomson var. *winterbottomii* J. D. Hooker & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 152. 1861; *D. dasystra* Gilg & O. E. Schulz; *Ptilotrichum wageri* Jafri.

Herbs perennial, (1–)2–7(–12) cm tall, densely or laxly caespitose, scapose. Caudex slender, often many branched, ultimate branches terminated in rosettes, covered with stramineous petiolar remains of previous years. Stems erect, simple, tomentose with subsessile stellate trichomes. Basal leaves rosulate; petiole absent, rarely to 6 mm, rarely ciliate; leaf blade obovate, oblong, spatulate, or lanceolate, 2–10 × 0.5–2 mm, densely tomentose with sessile or subsessile, very fine, 4-rayed stellate trichomes the rays of which with 1 or 2 lateral branches on each side, base attenuate to cuneate, margin entire, not ciliate, apex obtuse. Cauline leaves absent. Racemes 5–12-flowered, ebracteate, lax and elongated in fruit; rachis often flexuous, slender. Fruiting pedicels (3–)5–12(–15) mm, divaricate or rarely ascending, straight, tomentose all around with subsessile, stellate trichomes. Sepals oblong, 2–3 × 1–1.5 mm, erect, abaxially sparsely tomentose, base of

lateral pair not saccate, margin narrowly membranous. Petals white, spatulate, 4–5 × 1.5–2.5 mm, apex subemarginate or rounded. Filaments 2–3 mm; anthers ovate, 0.4–0.5 mm. Ovules (10–)12–20 per ovary. Fruit narrowly elliptic, lanceolate, or oblong, (3–)5–9 × 1.5–2.3(–2.8) mm, not inflated, latiseptate, often twisted; valves glabrous or rarely puberulent, obscurely veined, base obtuse, apex acute; style (0.5–)0.7–1.3(–1.5) mm. Seeds brown, ovate, 0.9–1 × 0.7–0.8 mm. Fl. Jun–Aug, fr. Jul–Sep.

Grassy slopes, gravelly areas, glacial terraces; 4000–5900 m. Qinghai, Xizang [Kashmir, Pakistan].

Ptilotrichum wageri was recognized as a distinct species in FRPS (p. 127), Fl. Xinjiang, (2(2): 105–107. 1995), and Fl. Xizang, (2: 344. 1985). However, an examination of its holotype, *Wager 13* (K), clearly reveals that it is a synonym of *Draba winterbottomii*. No perennial species of *Alyssum* (including *Ptilotrichum*) has leafless scapes and more than four ovules per ovary. In his protologue of *P. wageri* (Notes Roy. Bot. Gard. Edinburgh 22: 208. 1957), Jafri erroneously stated that the ovary is 4-ovuled, though his hand-written comment on the holotype sheet correctly indicated that the ovary is 10-ovuled. The illustrations in Fl. Xinjiang, of two species of *Ptilotrichum* represent two forms of *Alyssum canescens*. The record in FRPS (p. 141) of *Draba incompta* Steven from Xizang is based on misidentified plants of *D. winterbottomii*. True *D. incompta* is endemic to the Caucasus.

12. *Draba handelii* O. E. Schulz in Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 63: 97. 1926.

矮葶苈 ai ting li

Herbs perennial, 1.5–3 cm tall, densely caespitose, scapose. Caudex several and compactly branched, ultimate branches terminated in rosettes and covered with leaf remains of previous years. Stems erect, simple, tomentose with stellate trichomes. Basal leaves rosulate, persistent; petiole to 2 mm, ciliate with simple trichomes; leaf blade oblanceolate, 2–10 × 0.5–2.5 mm, densely tomentose with stellate trichomes the rays of which with 1 or 2 lateral branches, base attenuate, margin entire, apex obtuse or subacute. Cauline leaves absent. Racemes 3–10-flowered, ebracteate or lowermost flower bracteate, slightly elongated in fruit. Fruiting pedicels 1–3 mm, divaricate, straight or slightly recurved, tomentose all around with stellate trichomes. Sepals oblong, 1–1.2 × ca. 0.6 mm, erect, densely tomentose outside, sparsely tomentose inside, base of lateral pair not saccate, margin not membranous. Petals white, narrowly obovate, 1.5–2 × 0.6–0.8 mm, abaxially sparsely tomentose, apex rounded. Filaments 0.8–1.2 mm; anthers ovate, ca. 0.2 mm. Ovules 6–12 per ovary. Fruit oblong, 3–5 × 1–1.5 mm, not inflated, latiseptate, not twisted; valves densely puberulent with simple and forked trichomes, obscurely veined, base and apex obtuse; style 0.1–0.4 mm. Seeds brown, ovate, 0.6–0.8 × 0.4–0.5 mm. Fl. and fr. Jul.

• Granitic rock crevices; 4000–4100 m. NW Yunnan.

Draba handelii is unique among all Chinese species of the genus in having sepals sparsely tomentose adaxially and petals with a few stellate trichomes abaxially. Except for the type collection, *Handel-Mazzetti 9502* (holotype, WU; isotype, W), the present authors have

seen no other material of *D. handelii*. The records and illustrations in FRPS (p. 162, 164) and Fl. Xizang, (2: 352, 354. 1985) of *Draba handelii* from Xizang are based on misidentified plants of *D. glomerata*.

13. *Draba sikkimensis* (J. D. Hooker & Thomson) Pohle, Repert. Spec. Nov. Regni Veg. Beih. 32: 144. 1925.

锡金葶苈 xi jin ting li

Draba tibetica J. D. Hooker & Thomson var.

sikkimensis J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 152. 1861; *D. sikkimensis* f. *thoroldii* O. E. Schulz.

Herbs perennial, (4–)7–20(–26) cm tall, densely caespitose, scapose. Caudex several branched, ultimate branches terminated in rosettes and covered with leaves or petiolar remains of previous years. Stems erect, simple, densely tomentose proximally, sparsely so distally. Basal leaves rosulate, persistent; petiole 2–10 mm, persistent; leaf blade spatulate, oblanceolate, oblong, or rarely obovate, (0.3–)0.5–1.5(–2) cm × (1–)2–4(–6) mm, densely subfloccose with fine, stalked, stellate trichomes with simple or branched slender rays, sometimes fewer, slender, simple trichomes also present, base attenuate to cuneate, margin entire, apex obtuse to subacute. Cauline leaves absent or 1–4, sessile; leaf blade ovate to oblong, 4–15 × 2–4 mm, indumentum as basal leaves, margin entire, apex obtuse. Racemes (2–)5–16 (–20)-flowered, ebracteate, often elongated considerably in fruit; rachis straight. Fruiting pedicels (0.2–)0.7–1.7(–2) cm, erect and subappressed to rachis, or ascending, straight, tomentose all around. Sepals oblong, 2.5–3 × 1–1.5 mm, erect, abaxially sparsely pubescent, base of lateral pair not saccate, margin narrowly membranous. Petals white, broadly obovate, 5–7 × 2.5–4.5 mm, apex rounded; claw ca. 1 mm. Filaments 2.5–3; anthers ovate, 0.5–0.6 mm. Ovules 8–14 per ovary. Fruit oblong to elliptic, 6–12 × 2.5–3 mm, not inflated, latiseptate, twisted to 2 turns, very rarely not twisted; valves tomentose, not veined, base and apex obtuse; style (0.6–)1–1.5 mm. Seeds brown, ovate, 1–1.5 × 0.7–1 mm. Fl. Jun–Jul, fr. Aug–Sep.

Shady grassy slopes, stony slopes; 4800–5500 m. Xizang [Bhutan, Nepal, Sikkim].

The above first record from Nepal is based on *Miyamoto et al. 9592300* (MO, TI).

14. *Draba ussuriensis* Pohle, Izv. Imp. Bot. Sada Petra Velikago 14: 470. 1914.

乌苏里葶苈 wu su li ting li

Herbs perennial, 3–15 cm tall, loosely caespitose, scapose. Caudex several branched, ultimate branches terminated in rosettes and covered with leaf remains of previous years. Stems erect, simple, sparsely pubescent with stellate trichomes, glabrous distally. Basal leaves rosulate, persistent; petiole to 5 mm, ciliate with simple trichomes; leaf blade oblong-obovate, spatulate, or oblanceolate, 0.6–1.6 cm × 2–4 mm, pubescent with subsessile stellate trichomes 1 or 2 rays of which forked or with a lateral branch, base attenuate, margin entire or

1–3-toothed on each side, ciliate with simple trichomes, apex obtuse to acute. Cauline leaves absent or 1 or 2 (or 3), sessile; leaf blade ovate to oblong, 2–9 × 1–3 mm, pubescent as basal leaves, base obtuse, margin entire or 1–3-toothed, apex acute. Racemes 5–17-flowered, ebracteate, elongated in fruit. Fruiting pedicels 4–13 mm, divaricate, straight, slender, glabrous. Sepals ovate-oblong, 1.8–2.5 × 0.9–1.3 mm, erect, abaxially sparsely pubescent, base of lateral pair not saccate, margin not membranous. Petals white, narrowly obovate, (3.5–)4–6 × 2–3 mm, apex subemarginate. Filaments 1.5–2.5 mm; anthers ovate, 0.2–0.3 mm. Ovules 12–16 per ovary. Fruit oblong-ovate to elliptic, 5–8(–10) × 2–2.5 mm, not inflated, latiseptate, not twisted; valves glabrous or pilose, not veined, base and apex acute; style ca. 1 mm. Mature seeds not seen. Fl. and fr. Jul–Aug. $2n = 16, 32$.

Sunny roadsides, hot springs, alpine moss plains; 2100–2600 m. Jilin [Japan, Russia].

Draba ussuriensis is very rare in China and is known to the present authors from a few collections made primarily in Changbai Shan, including Hong *et al.* 32754 (PE). The record in FRPS of *D. ussuriensis* from China is probably based on misidentified plants of *D. mongolica*.

15. *Draba turczaninowii* Pohle & N. Busch, *Izv. Rossijsk. Akad. Nauk* 15: 1633. 1918.

屠氏葶苈 tu shi ting li

Herbs perennial, (1–)2–8(–10) cm tall, caespitose, scapose. Caudex few to several branched, ultimate branches terminated in rosettes and covered with petiolar remains of previous years. Stems erect, simple or rarely branched, sparsely pubescent basally, glabrous in distal half. Basal leaves rosulate, persistent; petiole 1–5 mm, often ciliate with simple trichomes; leaf blade oblong to narrowly lanceolate, (0.3–)0.5–1.5 cm × 1–3 mm, sparsely to densely pubescent with stellate trichomes 1–4 rays of which with a lateral branch on each side, these sometimes mixed with fewer simple or forked trichomes, base cuneate, margin entire or minutely 1- or 2-toothed on each side, apex obtuse to acute. Cauline leaves 1 or 2, rarely absent or 3, sessile; leaf blade ovate to oblong, 3–12 × 1–4 mm, pubescent as basal leaves, base obtuse, margin entire or denticulate, apex obtuse or acute. Racemes 3–14-flowered, ebracteate, elongated in fruit. Fruiting pedicels (1–)2–5(–7) mm, ascending to erect-ascending, straight, stout, glabrous or rarely glabrescent. Sepals ovate-oblong, 1.4–1.8 × 0.6–1 mm, erect, abaxially sparsely pubescent with simple and forked trichomes, base of lateral pair not saccate, margin narrowly membranous. Petals white, narrowly obovate, 2.5–3(–3.5) × 1–1.5 mm, apex subemarginate. Filaments 1–1.5 mm; anthers ovate, 0.2–0.3 mm. Ovules 12–16 per ovary. Fruit lanceolate or ovate-lanceolate, (4–)6–10 × 1.5–2 (–2.5) mm, not inflated, latiseptate, not twisted;

valves glabrous, not veined, base obtuse, apex acute to subacuminate; style 0.1–0.5 mm. Seeds brown, ovate, 0.9–1.4 × 0.6–1 mm. Fl. and fr. May–Aug.

Mountain slopes, alpine zone. Xinjiang [Kazakstan, Kyrgyzstan, Mongolia, Russia (S Siberia)].

Draba turczaninowii was first recorded for China in Fl. Xinjiang. (2(2): 119. 1995). Although the present authors have not examined the material on which that record is based, the occurrence of the species in Xinjiang is here confirmed based on Yunatov & Chen 885, 961 (LE).

16. *Draba yunnanensis* Franchet, *Bull. Soc. Bot. France* 33: 402. 1886.

云南葶苈 yun nan ting li

Draba yunnanensis var. *gracilipes* Franchet; *D. yunnanensis* var. *latifolia* O. E. Schulz; *D. yunnanensis* var. *microcarpa* O. E. Schulz.

Herbs perennial, (5–)10–35(–60) cm tall, caespitose, canescent at least basally. Caudex simple or few to many branched, ultimate branches terminated in rosettes. Stems erect, simple, densely pubescent with a mixture of simple and sessile stellate trichomes, apically tomentose with appressed stellate ones. Basal leaves rosulate, persistent, sessile, oblong, oblong-linear, to narrowly oblanceolate, (0.5–)1–3.5(–5) cm × (1.5–)2–6(–8) mm, abaxially densely pubescent with subsessile, 5–8-rayed stellate trichomes, adaxially with a mixture of primarily simple trichomes and fewer stellate ones, rarely exclusively simple or stellate, base cuneate, margin entire, apex obtuse. Cauline leaves (4–)6–12(–18), sessile; leaf blade narrowly oblong, rarely lanceolate, (0.5–)1–3.8(–5) cm × 1.5–5(–8) mm, pubescent as basal leaves, base obtuse, not auriculate or amplexicaul, margin entire, apex obtuse. Racemes (12–)20–60(–80)-flowered, bracteate basally, elongated considerably in fruit. Fruiting pedicels (0.3–)0.5–1.5(–2) cm, divaricate, straight or slightly curved, glabrous adaxially, pubescent abaxially with stellate trichomes. Sepals oblong or ovate, 2–3(–3.5) × 1–1.5(–2) mm, ascending, abaxially sparsely pilose with primarily simple trichomes, base of lateral pair subsaccate, margin membranous. Petals yellow, obovate, 5–7(–8) × 2–3(–4) mm, apex emarginate; claw 1–2 mm. Filaments 2–3.5 mm; anthers oblong, 0.5–0.9 mm. Ovules (4–)6–10(–12) per ovary. Fruit ovate, sometimes elliptic or suborbicular, 3–7(–10) × 2–3(–4) mm, latiseptate, sometimes slightly twisted; valves glabrous, obscurely to distinctly veined; style 0.4–1.2(–2) mm. Seeds brown, ovate, 1.4–1.9 × 0.9–1.4 mm. Fl. May–Jul, fr. Jun–Sep.

• Rock crevices, limestone scree, open *Pinus-Quercus* forests, grassy scrub, limestone cliffs; 2300–5500 m. Sichuan, Xizang, Yunnan.

17. *Draba surculosa* Franchet, *Bull. Soc. Bot. France* 33: 401. 1886.

山菜葶苈 shan cai ting li

Draba amplexicaulis Franchet var. *bracteata* O. E. Schulz; *D. balangshanica* W. T. Wang; *D. mairei* H. Léveillé; *D. moupinensis* Franchet.

Herbs perennial, (7–)10–45(–82) cm tall, not canescent. Caudex branches many, surculose, terminated in rosettes. Stems erect or decumbent, simple, sparsely or rarely densely pubescent with a mixture of simple and sessile stellate trichomes, apically tomentose with appressed stellate ones. Basal leaves rosulate, persistent, sessile, oblanceolate to obovate or oblong, 1–4 cm × 3–7 mm, abaxially sparsely pubescent with stalked, 3- or 4-rayed stellate trichomes, sometimes glabrescent except for margin and midvein, adaxially with a mixture of primarily simple trichomes and fewer stellate ones, rarely exclusively simple, base cuneate, margin dentate or entire, apex obtuse. Cauline leaves (3–)7–17(–30), sessile; leaf blade oblong, lanceolate, or ovate, 1.5–5(–8) × 0.5–1.5 cm, pubescent as basal leaves, base obtuse, often auriculate or amplexicaul, margin dentate or entire, apex obtuse or acute. Racemes (12–)20–60(–120)-flowered, bracteate basally or to near apex, elongated considerably in fruit. Fruiting pedicels (0.5–)1–2.2(–2.7) cm, divaricate, straight or curved upward, glabrous adaxially, pubescent abaxially with appressed stellate trichomes. Sepals oblong or ovate, 2–3(–3.5) × 1–1.5(–2) mm, ascending, abaxially sparsely pilose with primarily simple trichomes, base of lateral pair subsaccate, margin membranous. Petals yellow, obovate, 5–8 × (2–)2.5–4 mm, apex emarginate; claw 1–2 mm. Filaments 2–3.5 mm; anthers oblong, 0.6–0.9 mm. Ovules 8–12 per ovary. Fruit oblong, elliptic, or elliptic-linear, (0.7–)1–1.5(–2) cm × 3–5 mm, latiseptate, sometimes slightly twisted; valves glabrous, with a distinct midvein extending full length; style 0.5–1.5 mm. Seeds brown, ovate, 1.6–2.5 × 1–1.5 mm. Fl. Jun–Aug, fr. Jul–Sep.

• Grassy slopes, pastures, rock crevices, alpine meadows, thickets, ravines, scree; 2600–4600 m. Sichuan, Xizang, Yunnan.

Draba surculosa is highly variable in the density of indumentum and the relative amounts of simple and stellate trichomes. Some forms are subglabrous except on the leaf margins, while others have an abundance of simple trichomes on both leaf surfaces. Among such forms is the type collection of *D. balangshanica*, Expedition Wolong Panda Research 877 (isotype, PE), which is remarkably similar to that of *D. surculosa* except for the abundance of simple instead of stellate trichomes on the abaxial leaf surface.

18. *Draba amplexicaulis* Franchet, Bull. Soc. Bot. France 33: 403. 1886.

抱茎葶苈 *bao jing ting li*

Draba amplexicaulis var. *dolichocarpa* O. E. Schulz; *D. yunnanensis* Franchet var. *ramosa* O. E. Schulz.

Herbs perennial, (8–)20–60(–80) cm tall, caespitose, not canescent. Caudex simple or few to many branched, ultimate branches terminated in rosettes. Stems erect, often paniculate branched above, densely pubescent with a mixture of simple and sessile stellate trichomes, apically tomentose with appressed stellate ones. Basal leaves rosulate, sessile, narrowly obovate, oblanceolate,

or oblong-linear, 0.8–7 × 0.3–2 cm, abaxially densely pubescent with subsessile, 5–8-rayed stellate trichomes, adaxially with a mixture of primarily simple trichomes and fewer stellate ones, base cuneate, margin entire or denticulate, apex obtuse. Cauline leaves (6–)10–25(–30), sessile; leaf blade ovate, narrowly oblong, or lanceolate, (1–)2–6(–9) × (0.3–)0.5–1.5(–2) cm, pubescent as basal leaves, auriculate or amplexicaul, margin dentate or denticulate, apex often acute.

Racemes 30–80(–100)-flowered, bracteate basally to almost throughout, elongated considerably in fruit.

Fruiting pedicels (0.5–)0.8–2.5(–3) cm, divaricate or slightly reflexed, straight or slightly curved, glabrous adaxially, pubescent abaxially with stellate trichomes. Sepals oblong or ovate, 2–3(–3.5) × 1–1.5(–2) mm, ascending, abaxially sparsely pilose with primarily simple trichomes, base of lateral pair subsaccate, margin membranous. Petals yellow, obovate, 5–7(–8) × 2–3(–4) mm, apex emarginate; claw 1–2 mm. Filaments 2.5–4 mm; anthers oblong, 0.6–1 mm. Ovules 10–14 per ovary. Fruit elliptic, oblong, oblong-linear, or rarely ovate, (0.5–)0.7–1.4(–1.7) cm × (2–)3–4 mm, latiseptate, sometimes twisted; valves glabrous, with a distinct midvein to middle; style 0.5–2 mm. Seeds brown, ovate, 1.5–2.2 × 0.9–1.4 mm, wingless or rarely narrowly winged. Fl. Jun–Aug, fr. Jul–Sep.

• Grassy areas, rocky cliffs, stony slopes, thickets, scree, ledges; 2500–4700 m. Sichuan, Xizang, Yunnan.

Draba amplexicaulis was recorded in FRPS (as var. *dolichocarpa*) from Gansu, but the present authors have seen no material from that province.

19. *Draba polyphylla* O. E. Schulz in Engler, Pflanzenr. 89(IV. 105): 180. 1927.

多叶葶苈 *duo ye ting li*

Herbs perennial, (20–)30–65(–90) cm tall. Caudex simple or branched. Stems erect, simple, sparsely or rarely densely pubescent with a mixture of simple and sessile stellate trichomes, apically tomentose with appressed stellate ones. Basal leaves rosulate, persistent, sessile or rarely on petiole to 4 cm; leaf blade oblanceolate to spatulate, 1.5–5 cm × 5–11 mm, abaxially sparsely pubescent with stalked, 3- or 4-rayed stellate trichomes, sometimes glabrescent except for margin and midvein, adaxially with a mixture of primarily simple trichomes and fewer stellate ones, rarely exclusively simple, base cuneate, margin dentate or entire, apex obtuse. Cauline leaves 5–20(–40), sessile; leaf blade oblong, lanceolate, or ovate, 1.2–3.5(–5) cm × 4–11 mm, pubescent as basal leaves, base often auriculate or amplexicaul, margin dentate or subentire, apex obtuse or acute. Racemes 20–60(–140)-flowered, bracteate basally to throughout, elongated considerably in fruit. Fruiting pedicels (0.3–)0.7–2(–2.5) cm, divaricate, straight, glabrous adaxially, pubescent abaxially with appressed stellate trichomes. Sepals oblong or ovate, 2–3(–3.5) × 1–2 mm, ascending, abaxially sparsely pilose with primarily simple

trichomes, base of lateral pair subsaccate, margin membranous. Petals yellow, obovate, 5–7(–8) × 2–3.5 mm, apex emarginate; claw 1–2 mm. Filaments 2.5–3.5(–4) mm; anthers oblong, 0.6–0.9 mm. Ovules (12–)16–22(–24) per ovary. Fruit oblong, elliptic, or ovate, (0.7–)1–1.5 cm × 3–5(–6) mm, latiseptate, rarely slightly twisted; valves glabrous, with a distinct midvein extending to middle or full length; style 0.5–1.5 mm. Seeds brown, ovate, 1.5–1.9 × 1–1.3 mm. Fl. and fr. Jun–Aug.

Grassy slopes, scree, streamsides, among shrubs, forests, peaty meadows; 2900–5000 m. Xizang, Yunnan [Bhutan, Nepal, Sikkim].

20. *Draba elata* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 150. 1861.

高茎葶苈 *gao jing ting li*

Herbs perennial, 20–45(–60) cm tall. Caudex simple or branched. Stems erect, simple, sparsely pubescent with a mixture of simple and sessile stellate trichomes, apically tomentose with appressed stellate ones. Basal leaves rosulate; petiole 0.6–3 cm; leaf blade narrowly oblanceolate to spatulate, (0.7–)1–3(–4) cm × 2–4 mm, abaxially pubescent with stalked, 3- or 4-rayed stellate trichomes, adaxially with a mixture of primarily simple trichomes and fewer stellate ones, base attenuate, margin dentate or entire, apex subacute. Cauline leaves 3–6(–9), sessile; leaf blade oblong, lanceolate, or ovate, 0.8–3(–4) cm × 3–7(–9) mm, pubescent as basal leaves, base cuneate, rarely obscurely auriculate, margin dentate or subentire, apex obtuse or acute. Racemes 10–25-flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels 6–13(–17) cm, ascending, straight, pubescent all around with appressed stellate trichomes, rarely sparser adaxially. Sepals ovate, 1–2 × 0.8–1.5 mm, ascending, abaxially sparsely pilose with primarily simple trichomes, base of lateral pair not saccate, margin membranous. Petals yellow, obovate, 3–4.5 × 1.5–2 mm, apex emarginate; claw to 1 mm. Filaments 1–2 mm; anthers ovate, 0.4–0.5 mm. Ovules 16–20 per ovary. Fruit ovate to ovate-lanceolate, 7–12 × 3–4 mm, latiseptate, not twisted; valves pilose with simple and forked trichomes, with a distinct midvein extending to middle; style 0.5–1 mm. Seeds brown, ovate, 1.2–1.5 × 0.8–1 mm. Fl. and fr. Jun–Aug.

Mountain slopes, roadsides, wet grassy areas; 3400–4900 m. Xizang [Sikkim].

The records in FRPS (p. 146), Fl. Sichuan. (14: 64. 1999), and Fl. Yunnan. (6: 44. 1995) of *Draba elata* from Sichuan and Yunnan are most likely based on misidentified plants of *D. surculosa* and *D. amplexicaulis*. The present authors have seen no specimens of *D. elata* from these provinces.

21. *Draba calcicola* O. E. Schulz in Engler, Pflanzenr. 89(IV. 105): 373. 1927.

灰岩葶苈 *hui yan ting li*

Draba aprica O. E. Schulz in Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 63: 96. 1926, not Beadle (1913); *D. amplexicaulis* Franchet var.

dasycarpa O. E. Schulz; *D. moupinensis* var. *calcicola* (O. E. Schulz) W. T. Wang; *D. moupinensis* Franchet var. *dasycarpa* O. E. Schulz.

Herbs perennial, 7–45 cm tall, caespitose, canescent at least basally. Caudex branched. Stems erect, much branched above, densely pubescent with a mixture of simple and sessile stellate trichomes, apically tomentose with appressed stellate ones rarely with fewer simple trichomes. Basal leaves rosulate, sessile, oblong-linear to narrowly oblanceolate, 3–6 cm × 2–4 mm, abaxially densely pubescent with subsessile, 5–8-rayed stellate trichomes, adaxially with a mixture of primarily simple trichomes and fewer stellate ones, rarely exclusively simple, base attenuate, margin entire, apex obtuse. Cauline leaves 3–20, sessile; leaf blade ovate, oblong, or lanceolate, 1–5 cm × 3–7 mm, pubescent as basal leaves, base auriculate or amplexicaul, margin entire, apex obtuse. Racemes (20–)30–90-flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels 3–15 mm, divaricate, straight or slightly curved, glabrous adaxially, pubescent abaxially with stellate trichomes. Sepals oblong or ovate, (2–)2.5–3.5 × 1–1.5 mm, ascending, abaxially sparsely pilose with primarily simple trichomes, base of lateral pair subsaccate, margin membranous. Petals yellow, obovate, (4.5–)5–7 × 2.5–4 mm, apex emarginate; claw 1–2 mm. Filaments 1.5–4 mm; anthers ovate, 0.4–0.6 mm. Ovules 6–12 per ovary. Fruit oblong to linear-elliptic, 4–10 × 2–4 mm, latiseptate, not twisted; valves densely pilose with simple, forked, or stellate trichomes, sometimes sparsely pilose only near fruit base; style 0.5–1.5 mm. Seeds brown, ovate, 1.2–1.5 × 0.8–1 mm. Fl. and fr. Jun–Aug.

• Cliffs, rocky slopes; 3300–3400 m. Yunnan.

22. *Draba serpens* O. E. Schulz in Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 63: 96. 1926.

中甸葶苈 *zhong dian ting li*

Herbs perennial, 4–12 cm tall, creeping, with few, slender stolons terminated in rosettes. Stems erect, simple, moderately pubescent with appressed, subsessile, forked and trifid trichomes, simple trichomes absent. Basal leaves rosulate, persistent, sessile, oblanceolate to narrowly obovate, 5–10 × 1–2.5 mm, abaxially densely hirsute with coarse, stalked, forked trichomes, adaxially with a mixture of simple and forked trichomes, base attenuate, margin entire, apex obtuse. Cauline leaves 7–15, sessile, oblong to narrowly obovate, 6–12 × 2–4 mm, glabrous or sparsely pilose, sometimes margin ciliate with simple and forked trichomes, base cuneate, not auriculate, margin entire, apex obtuse. Racemes corymbose, 8–10(–12)-flowered, bracteate throughout. Flowering pedicels 4–8 mm, divaricate, glabrous. Sepals ovate, 1.8–2.5 × 1–1.5 mm, ascending, abaxially sparsely pilose with primarily simple trichomes, margin membranous. Petals yellow, broadly obovate to suborbicular, 6–7.5 × 4–6 mm, apex emarginate; claw to 1 mm. Filaments 2–3.5 mm;

anthers purplish, oblong, 0.5–0.7 mm. Ovules ca. 4 per ovary. Pistil glabrous; style conical, ca. 1 mm, nearly as long as ovary. Fruits and seeds unknown. Fl. Jun.

• Mountain slopes; 4300–4500 m. Yunnan.

Draba serpens, which is known only from the type collection, *Handel-Mazzetti 6961* (holotype, B; isotypes, E, W, WU), resembles *Coelonema draboides* (including *Draba stepposa*; see above) in many respects, but differs in having slender instead of dilated filament bases. Without mature fruits, however, its generic placement remains doubtful.

23. *Draba oreodoxa* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 209. 1919.

山景葶苈 shan jing ting li

Draba dolichotricha W. T. Wang; *Draba ludingensis* W. T. Wang.

Herbs perennial, 5–24 cm tall, caespitose. Caudex few to many branched, with petiolar remains of previous years, ultimate branches terminated in rosettes. Stems erect to decumbent, simple, sparsely to densely pubescent with a mixture of simple, forked, and stellate trichomes, apically tomentose with appressed stellate ones. Basal leaves rosulate, persistent; petiole to 1 cm, base often persistent; leaf blade obovate, spatulate, to narrowly oblanceolate, 0.4–2 cm × (2–)3–7 mm, abaxially pubescent with subsessile, 4(or 5)-rayed, soft, fine stellate trichomes, adaxially with a mixture of primarily simple trichomes with fewer stellate and forked ones, sometimes trichomes restricted to leaf margins and midvein, base cuneate, margin entire or denticulate, apex obtuse or rounded. Cauline leaves 3–7, sessile; leaf blade narrowly oblong, oblanceolate, or ovate, 0.5–2 cm × (1.5–)2.5–5(–7) mm, pubescent as basal leaves, base obtuse, not auriculate, margin entire or denticulate, apex obtuse. Racemes 12–35-flowered, bracteate basally to beyond middle, elongated in fruit. Fruiting pedicels (0.4–)0.6–1.5 cm, divaricate, straight or slightly curved, glabrous adaxially, pubescent abaxially with stellate trichomes. Sepals ovate, 2–3 × 1–1.7 mm, ascending, abaxially sparsely pilose with primarily simple trichomes, base of lateral pair subsaccate, margin membranous. Petals yellow, obovate, (3.5–)4–6(–7) × 2–3(–4) mm, apex emarginate; claw to 1 mm. Filaments 1.5–3 mm; anthers ovate, 0.4–0.6 mm. Ovules (5–)8–12 per ovary. Fruit ovate, 4–7 × 3–5 mm, latiseptate, sometimes slightly twisted; valves glabrous; style ca. 0.5 mm. Seeds brown, ovate, 1.3–1.8 × 1–1.3 mm. Fl. and fr. Jun–Aug.

• Mountain summits, limestone gravel or scree, pastures, grass meadows, rocky crevices, grassy slopes; 3800–4800 m. Sichuan, Yunnan.

24. *Draba matangensis* O. E. Schulz, Acta Horti Gothob. 1: 163. 1924.

马塘葶苈 ma tang ting li

Herbs perennial, 10–35 cm tall, without stellate trichomes. Caudex few branched, ultimate branches terminated in rosettes. Stems erect, simple, densely pubescent with a mixture of simple and short-stalked trichomes crisped and soft on distal parts of plant. Basal leaves rosulate, persistent; petiole 0.5–5 cm; leaf blade oblong, elliptic to oblanceolate, 0.7–4 cm × 5–12 mm, moderately pilose on both surfaces with simple and short-stalked forked trichomes, base cuneate to attenuate, margin entire or denticulate, apex acute. Cauline leaves 4–14, sessile; leaf blade narrowly oblong, elliptic, or lanceolate, 1–3 cm × 4–7 mm, pubescent as basal leaves, base cuneate, not auriculate, margin dentate or denticulate, apex acute. Racemes 15–32-flowered, bracteate basally, elongated considerably in fruit. Fruiting pedicels 0.5–2.5(–3.2) cm, divaricate to ascending, straight or slightly curved, glabrous adaxially, pubescent abaxially with soft, simple and forked trichomes. Sepals oblong, 2–3 × 1–1.7 mm, ascending, abaxially pilose with simple trichomes, base of lateral pair not saccate, margin membranous. Petals yellow, obovate, 5.5–7 × 3–4 mm, apex emarginate; claw ca. 1 mm. Filaments 2–3.5 mm; anthers oblong, 0.6–1 mm. Ovules 4–8 per ovary. Fruit ovate to suborbicular, 3–8 × 3–4 mm, latiseptate, sometimes slightly twisted; valves puberulent with simple trichomes, obscurely to distinctly veined; style 0.4–1 mm. Seeds brown, ovate, 1.3–1.6 × 0.9–1.3 mm. Fl. Jun–Jul, fr. Jul–Sep.

• Rocky mountain slopes; 3600–5100 m. Sichuan, Xizang.

The above first record from Xizang is based on *Ludlow, Sherriff & Elliot 15386* (BM, E, TI). The only other collections examined by the present authors are the type collection, *Harry Smith 4415* (holotype, UPS; isotypes, B, W), and *Li Xin 77774* (IBSC, MO).

25. *Draba remotiflora* O. E. Schulz, Acta Horti Gothob. 1: 165. 1924.

疏花葶苈 shu hua ting li

Herbs perennial, 5–15 cm tall. Caudex several branched, ultimate branches subfiliform, terminated in rosettes. Stems decumbent, simple, basally sparsely pubescent with stalked, forked trichomes, distally with crisped, appressed, sessile or short-stalked, forked or 3-branched trichomes. Basal leaves rosulate, persistent; petiolelike base 2–15 mm; leaf blade broadly obovate, 0.5–1.7 cm × 3–8 mm, abaxially sparsely pilose with a mixture of long-stalked, forked and minutely 3- or 4-rayed stellate trichomes, adaxially with predominantly long-stalked forked trichomes, base cuneate to attenuate, margin 1- or 2-toothed on each side, sometimes subtrilobed and with the terminal lobe largest, apex subacute. Cauline leaves 5–10, similar to basal leaves in shape and indumentum, uppermost bracts entire, oblong. Racemes 2–6-flowered, bracteate throughout, elongated considerably in fruit. Fruiting pedicels 0.5–1.5 cm, strongly recurved or uppermost ascending, sparsely pubescent all around with appressed, subsessile, forked

and 3-branched trichomes. Sepals oblong or ovate, 3–3.5 × ca. 1.5 mm, spreading, abaxially pilose with simple trichomes, not saccate, margin membranous. Petals yellow, broadly obovate, 6–8 × 3–4 mm, spreading, apex emarginate; claw 2–3 mm. Filaments 3.5–5 mm, spreading; anthers oblong, 0.7–1 mm. Ovules 18–22 per ovary. Fruit suborbicular, ovate to oblong, 0.7–1.3 cm × 3–6 mm, pendulous, latiseptate, not twisted; valves puberulent with simple trichomes and fewer, forked trichomes, obscurely veined; style 2–3.5 mm. Seeds brown, ovate, 1.2–1.5 × 0.9–1.1 mm. Fl. and fr. Aug.

• Rocky crevices; ca. 4600 m. Sichuan.

Draba remotiflora is known only from the type collection, *Harry Smith 3474* (holotype, UPS; isotypes, B, BM, E, K, W). It is readily distinguished from all other Chinese species by having lax, few-flowered racemes, spreading floral parts, pendulous, pilose fruits on strongly recurved, lowermost pedicels, and long styles 2–3.5 mm.

26. *Draba bhutanica* H. Hara, J. Jap. Bot. 49: 131. 1974.
不丹葶苈 *bu dan ting li*

Herbs perennial, 3–8 cm tall, densely caespitose, subsca-pose. Caudex many branched, ultimate branches terminated in rosettes and covered with remains of previous years. Stems erect, simple, often densely pubescent with a mixture of simple and sessile forked trichomes. Basal leaves rosulate, persistent, sessile; leaf blade obovate-oblongate to oblong, 3–12 × 1.5–5 mm, thickish, sparsely pubescent with simple and rigid, stalked, forked trichomes, subglabrous adaxially except for margins, base cuneate, margin entire or rarely 1–3-toothed, often ciliate with simple trichomes, apex obtuse to acute. Cauline leaves (bracts) 2–8, sessile, proximal ones elliptic to oblong, 3–11 × 1–4 mm, base subobtusate, margin entire, apex obtuse to subacute. Racemes 2–10-flowered, bracteate basally, soon elongated. Flowering pedicels 0.2–1.8 cm, divaricate or divaricate-ascending, straight, tomentose or pilose abaxially, glabrous adaxially. Sepals oblong to ovate, 2.5–3.5 × 1.5–2 mm, erect, abaxially sparsely pilose, base of lateral pair subsaccate, margin narrowly membranous. Petals yellow, broadly obovate, 6–8 × 3.5–5.5 mm, apex subemarginate or rounded; claw to 1 mm. Filaments 3–4 mm; anthers oblong, 0.7–1 mm. Young fruits oblong, latiseptate; valves subhirsute with simple or forked trichomes, base and apex obtuse; style 1.5–3 mm. Seeds of previous season brown, ovate, ca. 1.3 × 1 mm. Fl. Jun–Jul.

Alpine pastures, open hillsides; 3900–4400 m. Xizang [Bhutan]. The above first record from China is based on *Ludlow & Sherriff 5592* (BM, E).

27. *Draba cholaensis* W. W. Smith, Rec. Bot. Surv. India 4: 352. 1913.

大花葶苈 *da hua ting li*

Draba cholaensis var. *leiocarpa* H. Hara.

Herbs perennial, 5–20 cm tall. Caudex branches slender, few to many, without petiolar remains of previous years. Stems erect to ascending, simple, slender, sparsely

pilose proximally with simple trichomes rarely mixed with fewer forked ones. Basal leaves subrosulate; petiole rarely to 1 cm, ciliate with simple trichomes; leaf blade narrowly obovate or oblanceolate, sometimes oblong-obovate, 0.4–2 cm × 2–8 mm, often sparsely pilose with simple trichomes, abaxially often with stalked forked trichomes rarely also some stellate ones, base cuneate to attenuate, margin entire or minutely 1- or 2-toothed on each side, ciliate with simple trichomes to 1 mm, apex obtuse to acute. Cauline leaves 2–6, sessile; leaf blade oblong to subelliptic, 4–12 × 2–4 mm, with indumentum and leaf margin and apex similar to basal leaves. Racemes 2–5(–12)-flowered, ebracteate, elongated considerably and lax, subflexuous in fruit. Fruiting pedicels 0.6–2 cm, filiform, ascending to divaricate, slightly reflexed, straight or curved, glabrous. Sepals oblong, 2.5–3 × 1.5–1.8 mm, erect, abaxially sparsely pilose with simple trichomes, base of lateral pair subsaccate, margin narrowly membranous. Petals yellow, broadly obovate, 6–8 × 3–4 mm, apex subemarginate; claw to 1 mm. Filaments 3–4.5 mm; anthers oblong, 0.7–0.8 mm. Ovules 18–22 per ovary. Fruit linear, 1.5–2.2 cm × 1.5–2.5 mm, latiseptate, not twisted; valves glabrous or pilose, base and apex subobtusate; style 1.5–2 mm. Seeds brown, oblong, 1–1.3 × 0.6–0.8 mm. Fl. and fr. Jun–Jul.

Rocky grounds; 3700–4300 m. Xizang [Sikkim].

The above first record from China is based on *Gould 2025* (K).

28. *Draba tibetica* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 152. 1861.

西藏葶苈 *xi zang ting li*

Draba sikkimensis (J. D. Hooker & Thomson) Pohle var. *chitralensis* O. E. Schulz; *D. thomsonii* (J. D. Hooker & Thomson) Pohle; *D. thomsonii* var. *lasiocarpa* (Lipsky) Pohle; *D. thomsonii* var. *leiocarpa* (Lipsky) Pohle; *D. tibetica* var. *chitralensis* (O. E. Schulz) Jafri; *D. tibetica* var. *duthiei* O. E. Schulz; *D. tibetica* var. *thomsonii* J. D. Hooker & Thomson; *D. tibetica* var. *turkestanica* (Regel & Schmalhausén) O. E. Schulz; *D. tibetica* var. *turkestanica* subvar. *leiocarpa* O. E. Schulz; *D. tranzschelii* Litvinov; *D. turkestanica* Regel & Schmalhausén; *D. turkestanica* var. *lasiocarpa* Lipsky; *D. turkestanica* var. *leiocarpa* Lipsky.

Herbs perennial, 6–25 cm tall, densely caespitose, scapose. Caudex few to many branched, ultimate branches terminated in rosettes and covered with leaves of previous years. Stems erect, simple, densely tomentose with stellate trichomes, or glabrous throughout. Basal leaves rosulate, persistent; petiole to 1 cm; leaf blade oblanceolate to oblong, sometimes oblong-lanceolate, (0.4–)0.8–2.5(–3) cm × (1–)2–5(–7) mm, densely tomentose with short, 4–6-rayed stellate trichomes 1 or more rays of which forked or with a lateral branch on each side, base attenuate or cuneate, margin entire or rarely 1-toothed on each side, apex obtuse. Cauline leaves absent or 1, very rarely 2, sessile; leaf blade oblong, 0.5–1.5 cm × 1–2 mm, tomentose as

basal leaves, margin entire, apex obtuse. Racemes 5–9(–13)-flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels (0.5–) 0.7–1.8(–2.2) cm, ascending to suberect, straight, tomentose all around. Sepals ovate or oblong, 2–3 × 0.7–1.2 mm, erect, abaxially sparsely pubescent, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, sometimes drying white, obovate, 3.5–5 × 1.5–2.5 mm, apex subemarginate or rounded. Filaments 2–3.5 mm; anthers ovate, 0.3–0.4 mm. Ovules 18–24 per ovary. Fruit oblong, oblong-linear, or narrowly lanceolate, (0.7–)0.9–1.7 cm × 1.5–2.5(–3) mm, not inflated, latiseptate, twisted or not; valves puberulent with predominantly stellate and fewer forked trichomes, not veined, base obtuse, apex subacute; style 0.4–0.8 mm. Seeds brown, oblong, 1–1.5 × 0.6–0.9 mm. Fl. and fr. Jun–Aug.

Mountain slopes, shrubby areas; 2500–4600 m. Xinjiang, Xizang [Afghanistan, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Sikkim, Tajikistan].

29. *Draba alajica* Litvinov, Trudy Bot. Muz. Imp. Akad. Nauk 1: 14. 1902.

帕米尔葶苈 *pa mi er ting li*

Draba alajica var. *lasiocarpa* Pohle; *D. alajica* var. *leiocarpa* Pohle; *D. winterbottomii* (J. D. Hooker & Thomson) Pohle var. *stracheyi* O. E. Schulz.

Herbs perennial, 3–15 cm tall, densely caespitose, scapose. Caudex few to many branched, ultimate branches terminated in rosettes and covered with leaves of previous years. Stems erect, simple, sparsely tomentose proximally, glabrous or glabrescent distally, rarely sparsely with stellate trichomes. Basal leaves rosulate, persistent; petiole to 6 cm; leaf blade oblong or oblong-spatulate, rarely linear-oblong, (0.3–)0.6–1.7(–1.9) cm × 1.5–4 mm, densely tomentose with 4–6-rayed stellate trichomes 1 or more rays of which forked or with a lateral branch on each side, base attenuate or cuneate, margin entire, apex obtuse. Cauline leaves absent or rarely 1, sessile; leaf blade oblong, tomentose as basal leaves, margin entire, apex obtuse. Racemes 5–18 (–20)-flowered, ebracteate, elongated in fruit. Fruiting pedicels (0.5–)0.7–1.5 cm, ascending to subdivaricate, straight, glabrous or rarely sparsely tomentose all around. Sepals ovate or oblong, 2–3 × 1–1.5 mm, erect, abaxially sparsely tomentose with stellate trichomes, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, obovate, 4.5–6 × 2–3 mm, apex subemarginate or rounded. Filaments 2–3 mm; anthers oblong, 0.5–0.6 mm. Ovules 10–16 per ovary. Fruit linear-lanceolate to oblong-linear, (0.5–)0.7–1.3 cm × 1.5–2 mm, not inflated, latiseptate, not twisted or slightly twisted; valves puberulent with predominately simple and fewer forked trichomes, not veined, base obtuse, apex subacute; style 0.7–1.5 mm. Seeds brown, oblong, ca. 1 × 0.6 mm. Fl. and fr. Jun–Aug.

Grassy and stony slopes in alpine areas; 3400–4700 m. SW Xizang [Tajikistan].

The above first record of *Draba alajica* from China is based on the type collection of *D. winterbottomii* var. *stracheyi*, J. E. Winterbottom s.n. (holotype, K; isotypes, BM, GH, P). The species was previously known to be endemic to SE Tajikistan (Pamir Alay and adjacent parts), and it is likely to be found in neighboring SW Xinjiang and Kashmir.

30. *Draba oreades* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 2: 56. 1842.

喜山葶苈 *xi shan ting li*

Draba algida Adams var. *brachycarpa* Bunge; *D. alpicola* Klotzsch; *D. alpina* Linnaeus var. *rigida* Franchet; *D. kizylarti* (Korshinsky) N. Busch; *D. oreades* prol. *alpicola* (Klotzsch) O. E. Schulz; *D. oreades* prol. *chinensis* O. E. Schulz; *D. oreades* var. *ciliolata* O. E. Schulz; *D. oreades* var. *commutata* (Regel) O. E. Schulz; *D. oreades* var. *dasyocarpa* O. E. Schulz; *D. oreades* var. *depauperata* O. E. Schulz; *D. oreades* var. *estylosa* O. E. Schulz; *D. oreades* prol. *exigua* O. E. Schulz; *D. oreades* var. *glabrescens* O. E. Schulz; *D. oreades* var. *occulata* O. E. Schulz; *D. oreades* prol. *pikoi* O. E. Schulz; *D. oreades* var. *pulvinata* O. E. Schulz; *D. oreades* var. *racemosa* O. E. Schulz; *D. oreades* var. *tafelii* O. E. Schulz; *D. pilosa* Adams var. *commutata* Regel; *D. pilosa* var. *oreades* (Schrenk) Regel; *D. qinghaiensis* L. L. Lou; *D. rockii* O. E. Schulz; *D. tianschanica* Pohle; *Pseudobraya kizylarti* Korshinsky.

Herbs perennial, (0.5–)1.5–14(–20) cm tall, caespitose, scapose. Caudex simple to many branched, ultimate branches terminated in rosettes and covered with petiolar remains of previous years. Stems erect, simple, often densely pubescent with a mixture of simple and subsessile forked trichomes, sometimes subhirsute with almost exclusively simple trichomes, rarely glabrous. Basal leaves rosulate, persistent; petiole absent or short, rarely to 2 cm, persistent, often ciliate with simple and/or long-stalked forked trichomes; leaf blade suborbicular, obovate, spatulate, oblanceolate, or lanceolate, (0.3–)0.5–2(–3) cm × (1–)2–6(–8) mm, sparsely or densely pubescent with simple trichomes, these often mixed abaxially with stalked forked and subsessile, 3- or 4-rayed stellate ones with unbranched rays, adaxially with predominantly simple trichomes, rarely glabrous except for margins, base cuneate to attenuate, margin entire or rarely 1- or 2-toothed on each side, apex obtuse to acute. Cauline leaves absent, sometimes 1, very rarely 2, sessile, similar to basal. Racemes (2–)4–15(–25)-flowered, ebracteate, subumbellate and not elongated or rarely subracemose and slightly elongated in fruit. Fruiting pedicels 1–7(–10) mm, divaricate or divaricate-ascending, straight or rarely slightly curved, tomentose or pilose abaxially, glabrous adaxially or rarely throughout. Sepals oblong or ovate, 1.5–2.5(–3) × 0.8–1.5(–1.8) mm, erect, caducous or rarely persistent, abaxially sparsely pilose

or glabrous, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, obovate to narrowly spatulate, 2.5–5 (–6) × (0.9–)1.5–2.5(–3) mm, apex emarginate or rounded; claw absent, rarely 1(–2) mm. Filaments 1.5–2.5(–3) mm; anthers ovate, 0.2–0.4(–0.6) mm. Ovules (4–)6–12 per ovary. Fruit ovate to suborbicular, rarely ovate-lanceolate, (3–)4–9(–12) × 1.5–4.5(–6) mm, latiseptate and basally inflated, not twisted; valves glabrous or rarely puberulent with simple or forked trichomes, not veined, base obtuse, apex acute to subacuminate; style (0.1–)0.3–0.8(–1) mm. Seeds black to dark brown, ovate, (0.7–)1–1.5 × 0.5–0.9(–1) mm. Fl. and fr. Jun–Aug. $2n = 40^*$.

Rock crevices, moraine, scree, alpine meadows and tundra, glacier margins, hillsides, grassy slopes, swampy meadows, muddy gravel, rocky outcrops, cliffs; 2300–5500 m. Gansu, Nei Mongol, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Sikkim, Tajikistan].

Draba oreades is probably the most variable of all Asian species in the genus. A critical examination of the type collections of all except one of the taxa synonymized above (*D. tianschanica*) clearly reveals the following facts: firstly, all of the 14 infraspecific taxa recognized by Schulz are based on quantitative differences of highly variable characters (e.g., density of indumentum, scape length, petal and fruit length, and presence vs. absence of fruit trichomes); secondly, the infraspecific taxa recognized by Schulz occur sporadically throughout most of the range of the species, and none has a distinct geographic distribution; thirdly, Schulz repeatedly recognized two or more varieties from a single collection and often from a single sheet; and fourthly, some of Schulz's varieties (see below) are based on erroneously interpreted characters. Therefore, none of Schulz's varieties merits recognition, a conclusion already reached by several workers who wrote accounts of *Draba* for countries bordering China.

In the protologue of *Draba rockii*, Schulz (Notizbl. Bot. Gart. Berlin-Dahlem 10: 555. 1929) compared his new species with *D. involucrata*, and he was correct in pointing out the differences between the two taxa. However, had the type collection of *D. rockii* been compared with material of *D. oreades*, no differences would have been found. Indeed, *D. rockii* is indistinguishable from any collection that Schulz in his monograph cited under *D. oreades* var. *oreades* or *D. oreades* prol. *chinensis*. The records in FRPS, Fl. Qinghai. (1: 442. 1997), and Fl. Xinjiang. (2(2): 117. 1995) of *D. rockii* from Qinghai and Xinjiang are likely based on misidentified plants of *D. korshinskyi*.

The allegedly slightly longer scapes and slightly larger flowers and fruits that Schulz used to distinguish *Draba oreades* var. *oreades* from prol. *chinensis* are unrealistic. In fact, there is a considerable overlap in every character, and the type collection of prol. *chinensis* can easily be accommodated under var. *oreades*.

Schulz indicated that both *Draba oreades* var. *ciliolata* and var. *dasycarpa* are distinguished from the rest of the species by having pubescent instead of glabrous fruits. However, the holotype specimen of var. *ciliolata* has four plants, of which three have pubescent fruits and one has glabrous ones, whereas the holotype of var. *dasycarpa* has four plants in flower/fruit, of which one has pilose fruits and three have glabrous ones. These facts clearly show the artificiality of Schulz's varieties.

Plants that are completely glabrous, which correspond very well with the holotype of *D. qinghaiensis*, occur sporadically in China and in bordering countries. They are indistinguishable from typical plants of

D. oreades in other characters and, therefore, the two taxa are here considered to be conspecific.

Draba alpina Linnaeus was recorded from China in several treatments (e.g., FRPS, p. 135; Fl. Qinghai. 1: 439. 1995; Fl. Xinjiang. 2(2): 114. 1995; Fl. Xizang. 2: 348. 1985; Fl. Yunnan. 6: 39. 1995), but these records are based on misidentified plants of *D. oreades*. True *D. alpina* is distributed in arctic and subarctic Alaska, N Canada, Europe, Mongolia, and Russia (Far East and Siberia), and the present authors have examined no Chinese material of it. *Draba alpina* is easily distinguished from *D. oreades* by having fruits typically oblong and flattened, instead of ovate and basally inflated.

31. *Draba involucrata* (W. W. Smith) W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 206. 1919.

总苞葶苈 zong bao ting li

Draba alpina Linnaeus var. *involucrata* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 121. 1913; *D. alpina* var. *leiophylla* Franchet; *D. involucrata* var. *lasiocarpa* W. T. Wang.

Herbs perennial, 0.5–3 cm tall, densely caespitose, scapose. Caudex many branched, ultimate branches terminated in rosettes and covered with petiolar remains of previous years. Stems erect, simple, often densely tomentose with a mixture of sessile, forked and 3- or 4-rayed stellate trichomes, very rarely glabrescent distally. Basal leaves rosulate, persistent; petiole 1–5(–8) mm, persistent, rarely ciliate with simple trichomes; leaf blade suborbicular or obovate, 2–5 × 1–4 mm, abaxially sparsely to densely tomentose with sessile, forked and 3- or 4-rayed stellate trichomes with unbranched rays, adaxially glabrous or sparsely tomentose, base cuneate, margin entire, apex rounded or obtuse. Cauline leaves absent. Racemes 3–8-flowered, ebracteate, elongated in fruit. Fruiting pedicels 2–7(–10) mm, divaricate straight, tomentose all around, very rarely glabrescent. Sepals oblong, 1.2–2 × 0.6–1.2 mm, erect, abaxially sparsely pilose or glabrous, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, obovate, 2.5–4(–4.5) × (1–)1.5–2.5(–3) mm, apex emarginate; claw absent, rarely to 1 mm. Filaments 1–1.6 mm; anthers ovate, ca. 0.2 mm. Ovules 8–16 per ovary. Fruit suborbicular to elliptic, 2–4.5(–6) × 2–3 mm, latiseptate, twisted or not; valves glabrous or rarely puberulent, not veined, base and apex obtuse; style 0.1–0.6(–1) mm. Seeds brown, ovate, 1–1.3 × 0.5–0.9 mm. Fl. Jun–Aug, fr. Aug–Sep.

• Rocky cliffs, crevices, montane ravines, scree, scrub, damp mossy rocks, streamsides; 3300–5100 m. Sichuan, E Xizang, Yunnan.

The records of *Draba involucrata* from Qinghai (FRPS, p. 140; Fl. Qinghai. 1: 438. 1997) and from Xinjiang (Fl. Xinjiang. 2(2): 112. 1995) are most likely based on misidentified plants of the closely related *D. oreades*. The present authors have seen no material of *D. involucrata* from this province and autonomous region.

32. *Draba jucunda* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 207. 1919.

愉悦葶苈 yu yue ting li

Herbs perennial, 2–10 cm tall, densely caespitose, scapose. Caudex many branched, ultimate branches terminated in rosettes and covered with remains of previous years. Stems erect, simple, often densely pubescent with a mixture of simple and fewer, subsessile forked trichomes, rarely subglabrous. Basal leaves rosulate, persistent, sessile; leaf blade elliptic to oblong-oblongate, 3–10(–12) × 1.5–4 mm, thickish, sparsely pubescent with simple and rigid, stalked, forked trichomes, rarely with primarily, rigid stellate trichomes abaxially, often subglabrous adaxially except for margins, base cuneate, margin entire, often ciliate with simple trichomes, apex obtuse to acute. Cauline leaves absent. Racemes 2–7(–10)-flowered, ebracteate, elongated in fruit. Fruiting pedicels (2–)5–10(–14) mm, divaricate or divaricate-ascending, straight or rarely slightly curved, tomentose or pilose abaxially, glabrous adaxially. Sepals oblong, 3–4.5 × 1.2–1.8 mm, erect, abaxially glabrous or sparsely pilose with simple trichomes, base of lateral pair subsaccate, margin narrowly membranous. Petals yellow, obovate, 5–7(–8) × 2.5–3.5 mm, apex submarginate or rounded; claw to 2 mm. Filaments (2–)3–4.5 mm; anthers oblong, 0.6–1 mm. Ovules 8–16 per ovary. Fruit oblong to elliptic or suborbicular, 6–12 × 3–6 mm, latiseptate, slightly twisted or not; valves subhirsute with simple or forked trichomes, sometimes glabrous, not veined, base obtuse, apex subacute; style (1–)1.5–3.5 mm. Seeds brown, ovate, 1.2–1.5 × 0.7–1 mm. Fl. Jun–Aug, fr. Aug–Sep.

• Gravelly or sandy areas, scree; 3400–4600 m. SE Xizang, NW Yunnan.

The above first record from Xizang is based on *Rock 23083* (BM, E, GH, K, NY, US) and *Forrest 19280* (E, P), both of which were collected from the vicinity of “Tsarung” (28°40'N, 98°15'E). However, the Forrest specimen at E is a mixed collection of *Draba jucunda* and *D. involucrata*.

33. *Draba senilis* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 475. 1926.

衰老葶苈 *shuai lao ting li*

Draba composita O. E. Schulz; *D. piepunensis* O. E. Schulz.

Herbs perennial, 1–5 cm tall, caespitose, surculose, scapose. Caudex with many, slender branches terminated in rosettes and covered with petiolar remains of previous years. Stems erect, simple, often densely subhirsute with primarily simple and smaller, subsessile forked trichomes, sometimes with few stellate trichomes. Basal leaves rosulate, persistent; petiole 1–5(–8) mm, persistent and becoming stramineous, often ciliate with simple, setose or subsetose trichomes to 1.4 mm; leaf blade oblong, elliptic, or narrowly obovate, 3–10(–15) × (1–)2–4(–7) mm, densely pubescent with whitish, long-stalked, stellate and forked trichomes, adaxially villous with predominantly simple trichomes, rarely softly stellate, base cuneate, margin entire, apex obtuse to subacute. Cauline leaves

absent. Racemes 3–7 (–12)-flowered, ebracteate, elongated slightly in fruit. Fruiting pedicels 3–9(–12) mm, divaricate or divaricate-ascending, straight or rarely slightly curved, pubescent all around. Sepals oblong or ovate, 2–2.5 × 1–1.5 mm, erect, abaxially sparsely pilose or glabrous, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, obovate, 4–6 × 2–3(–3.5) mm, rounded; claw to 1 mm. Filaments 2.5–3 mm; anthers oblong, 0.5–0.6 mm. Ovules 6–10 per ovary. Fruit ovate, 4–7 × 3–5 mm, latiseptate, not twisted; valves glabrous, not veined, base obtuse, apex acute; style 0.5–0.8 mm. Seeds dark brown, ovate, 1.5–2 × 1–1.5 mm. Fl. May–Jul, fr. Jul–Sep.

• Rocky crevices, alpine meadows; 4000–4900 m. Qinghai, Sichuan, Xizang, Yunnan.

A detailed study of the type collections of *Draba senilis*, *Rock 3968* (holotype, B; isotypes, E, GH, P, PE, US, W), and *D. piepunensis*, *Handel-Mazzetti 4712* (holotype, B; isotypes, W, WU), leads to the immediate conclusion that they are flowering and fruiting material (respectively) of the same species.

The above first record from Sichuan is based on *Rock 16320* (E, F, GH, NY, P, US, W), collected from Gongga Shan. *Draba senilis* was recorded, as *D. piepunensis*, from Qinghai (Fl. Qinghai. 1: 438. 1997), and that record is here confirmed based on *Wang Weiyi 234a* (HNWP).

34. *Draba setosa* Royle, Ill. Bot. Himal. Mts. 1: 71. 1839.

刚毛葶苈 *gang mao ting li*

Draba pyriformis Pohle; *D. setosa* var. *pyriformis* (Pohle) O. E. Schulz; *D. setosa* var. *pyriformis* subvar. *glabrata* O. E. Schulz.

Herbs perennial, 5–15 cm tall, densely caespitose, scapose. Caudex often many branched, ultimate branches terminated in rosettes and covered with papery leaf remains of previous years. Stems erect, slender, simple, glabrous throughout or distally, often sparsely pubescent proximally with minute, forked or stellate trichomes. Basal leaves densely rosulate, persistent, sessile; leaf blade linear or linear-oblong, (2–)4–15 × (0.5–)0.7–1.8 (–2.5) mm, sparsely to densely pubescent with subsessile, forked or stellate trichomes, often glabrous adaxially, rarely so on both surfaces, always ciliate with setose or subsetose simple trichomes to 1 mm, base subobtuse, margin entire, apex obtuse to acute; midvein prominent abaxially almost to apex, narrower than blade on each side. Cauline leaves absent, if 1 then sessile, oblong. Racemes 3–10(–15)-flowered, ebracteate, elongated in fruit. Fruiting pedicels 2–7 mm, divaricate-ascending, straight or slightly curved, glabrous or rarely sparsely pilose all around. Sepals oblong, 1.5–2 × 0.7–1 mm, erect, glabrous or abaxially pubescent with simple and forked trichomes, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, narrowly obovate, 3–4 × 1–1.5 mm, apex emarginate. Filaments 1.5–2 mm; anthers ovate, 0.2–0.3 mm. Ovules 12–16 per ovary. Fruit elliptic-ovate, rarely oblong-lanceolate, 6–10 × (1.5–)2.5–3.5 mm, latiseptate, sometimes slightly twisted; valves glabrous or rarely puberulent, obscurely

veined, base obtuse, apex acute; style 0.4–0.7 mm. Seeds brown, ovate, 1–1.4 × 0.6–0.7 mm. Fl. Jun–Jul, fr. Jul–Aug.

Mountain slopes, gravelly areas, scree; 3200–4600 m. Xizang [India, Kashmir].

Draba setosa was recorded from Xinjiang (Fl. Xinjiang, 2(2): 114. 1995), but the present authors have seen no material from that autonomous region, and the record is likely based on misidentified plants of *D. korshinskyi*.

35. *Draba cachemirica* Gandoger, Bull. Soc. Bot. France 46: 418. 1899.

克什米尔葶苈 *ke shi mi er ting li*

Draba cachemirica var. *koelzii* O. E. Schulz; *D. cachemirica* var. *stoliczkae* O. E. Schulz; *D. korshinskyi* (O. Fedtschenko) Pohle var. *setosa* Pohle.

Herbs perennial, 1.5–10 cm tall, densely caespitose, scapose. Caudex many branched, ultimate branches terminated in rosettes and covered with papery leaf remains of previous years. Stems erect, slender, simple, glabrous throughout, sometimes sparsely pubescent with minute, forked or stellate trichomes. Basal leaves densely rosulate, persistent, sessile; leaf blade linear or linear-oblong, 2–7 × 0.5–1(–1.5) mm, abaxially sparsely pubescent with subsessile, forked or stellate trichomes, often glabrous on both surfaces, always ciliate with setose simple trichomes to 1 mm, base subobtusate, margin entire, apex obtuse to acute; midvein prominent abaxially almost to apex, narrower than blade on each side. Cauline leaves absent. Racemes 3–12 (–20)-flowered, ebracteate, elongated slightly or considerably in fruit. Fruiting pedicels 1.5–8 mm, ascending, straight or slightly curved, glabrous or rarely sparsely pilose all around. Sepals oblong, 1.5–2.5 × 0.8–1.2 mm, erect, glabrous or abaxially pilose with simple and forked trichomes, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, narrowly obovate, 3–4 × 1–2 mm, apex emarginate. Filaments 1.5–2.5 mm; anthers ovate, 0.3–0.4 mm. Ovules 4–8 per ovary. Fruit ovoid to subglobose, 2.5–4.5 × 2–3.5 mm, inflated, not twisted; valves glabrous or rarely puberulent, obscurely veined, base semicordate, apex acute; style 0.2–0.4 mm. Seeds brown, ovate, 1–1.2 × 0.5–0.6 mm. Fl. Jun–Jul, fr. Jul–Aug.

Gravelly areas; 3700–5300 m. Xizang [Kashmir].

Although *Draba cachemirica* was first recorded from Xizang by Schulz, that record was overlooked in FRPS and Fl. Xizang. (vol. 2. 1985). The occurrence of the species in Xizang is here confirmed based on *Schlagintweit 2464* and *2410* (both mounted on one sheet at GH). Pohle (Repert. Spec. Nov. Regni Veg. Beih. 32: 135. 1925) recognized the latter gathering as the type collection of *D. korshinskyi* var. *setosa*, but *D. korshinskyi* can easily be distinguished from *D. cachemirica* by having leaves abaxially tomentose (vs. glabrous or rarely sparsely pubescent) with the margin non-setose and ciliate.

36. *Draba korshinskyi* (O. Fedtschenko) Pohle, Trudy Imp. S.-Peterburgsk. Bot. Sada 31: 484. 1914.

科氏葶苈 *ke shi ting li*

Draba alpina Linnaeus var. *korshinskyi* O. Fedtschenko, Trudy Imp. S.-Peterburgsk. Bot. Sada 21: 266. 1903.

Herbs perennial, 1–8(–12) cm tall, densely caespitose, scapose. Caudex many branched, ultimate branches terminated in rosettes and covered with papery leaf remains of previous years. Stems erect, slender, simple, glabrous throughout, sometimes sparsely pubescent proximally with minute, forked or stellate trichomes.

Basal leaves densely rosulate, persistent, sessile; leaf blade linear to narrowly oblong, 2–8 × 0.5–1(–1.5) mm, abaxially tomentose with short-stalked or subsessile, stellate trichomes mixed with fewer simple ones, adaxially glabrous or sparsely tomentose distally with branched and simple trichomes, sometimes ciliate with soft simple trichomes rarely to 0.5 mm, base subobtusate, margin entire, apex obtuse to acute; midvein obscure or prominent abaxially rarely to apex, much narrower than blade on each side. Cauline leaves absent. Racemes 3–18(–25)-flowered, ebracteate, elongated in fruit.

Fruiting pedicels 2–6 mm, ascending, straight or slightly curved, glabrous, slender. Sepals oblong, 1.5–2 × 0.8–1.1 mm, erect, glabrous or abaxially tomentose with branched trichomes, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, narrowly obovate, 2.5–4 × 1–1.5 mm, apex subemarginate.

Filaments 1.5–2.5 mm; anthers ovate, 0.2–0.4 mm.

Ovules 8–12 per ovary. Fruit ovoid to subglobose, 2–4 × 2–3 mm, inflated, not twisted; valves glabrous, obscurely veined, base semicordate, apex acute; style 0.2–0.4 mm. Seeds brown, ovate, 1–1.2 × 0.6–0.7 mm. Fl. Jun–Jul, fr. Jul–Aug.

Stony grounds; 3900–5100 m. Xinjiang, Xizang [Afghanistan, Kashmir, Pakistan, Tajikistan].

The first record of *Draba korshinskyi* from Xizang was made by Hedge (Fl. Iran. 57: 181. 1968) and later confirmed by Tolmachev and Junussov (Fl. Tajik. 5: 194. 1978). The above first record from Xinjiang is based on *Qinghai-Xizang Team 870482* (HNWP, KUN) and *Xinjiang Team 1368* (WUK).

37. *Draba linearifolia* L. L. Lou & T. Y. Cheo, Fl. Xizang. 2: 346. 1985.

线叶葶苈 *xian ye ting li*

Herbs perennial, to 10 cm tall, densely caespitose, scapose. Caudex many branched, ultimate branches terminated in columnar rosettes and covered with spiny leaf midveins of previous years. Stems erect, slender, simple, pubescent with subsessile, forked and stellate trichomes. Basal leaves densely rosulate, persistent, sessile; leaf blade linear, 5–10 × 0.5–0.8 mm, abaxially subhirsute with subsessile, forked and 3–5-rayed stellate trichomes, adaxially densely hispid with simple trichomes, ciliate with setose simple trichomes to 1.5 mm, base attenuate, margin entire, apex acute; midvein very prominent abaxially to apex, usually as broad as or broader than blade on each side, 0.2–0.3 mm wide near base. Cauline leaves 1–3, sessile, oblong-linear, with indumentum similar to that basal leaves, margin entire, apex acute. Racemes 8–12-flowered, ebracteate, elon-

gated in fruit. Fruiting pedicels 4–5 mm, divaricate-ascending, straight, pubescent all around with forked and stellate trichomes. Sepals oblong, ca. 1.5×0.9 mm, erect, abaxially pubescent, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, drying white, narrowly obovate, $3-4.5 \times 1-1.5$ mm, apex obtuse. Filaments ca. 1.5 mm; anthers ovate, ca. 0.2 mm. Fruit linear-lanceolate, $7-10 \times 1-1.3$ mm, not twisted; valves glabrous, obscurely veined, base and apex subacute; style 0.5–1 mm. Mature seeds not seen. Fl. and fr. Jun–Jul.

• Shady mountain slopes; 3600–4000 m. Xizang.

Draba linearifolia, which is known only from the type collection, *Qinghai-Xizang Expedition 4074* (holotype, PE), is readily distinguished from all other Chinese species by having basal leaf midveins persistent into spines.

38. *Draba olgae* Regel & Schmalhausen in Regel, *Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ.* 34(2): 8. 1882.

奥氏葶苈 *ao shi ting li*

Draba olgae var. *chitralensis* O. E. Schulz; *D. pakistanica* Jafri.

Herbs perennial, 3–15(–20) cm tall, loosely caespitose, scapose. Caudex few branched, ultimate branches terminated in rosettes and covered with leaf remains of previous years. Stems erect, simple, lowermost part sparsely pubescent with stellate or simple and forked trichomes, glabrous elsewhere or throughout. Basal leaves rosulate, persistent; petiole 1–4 mm, ciliate with simple trichomes; leaf blade oblong-obovate, oblanceolate, oblong, or lanceolate, $(0.4-0.7-1.5(-2.5))$ cm \times $1.5-3(-6)$ mm, abaxially moderately to densely hirsute with simple, 3–5-rayed stellate trichomes 1 or 2 rays of which sometimes with a lateral branch, these sometimes mixed with fewer simple trichomes, adaxially with primarily simple trichomes sometimes mixed with smaller, fewer stellate ones, margin ciliate with setose or subsetose trichomes to 1 mm, base cuneate to rarely attenuate, margin entire or rarely 1- or 2-toothed, apex obtuse to acute. Cauline leaves absent. Racemes (6–)10–25(–35)-flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels 5–12 mm, divaricate to ascending, straight, glabrous. Sepals oblong-ovate, $2-3 \times 1-1.5$ mm, erect, glabrous or abaxially sparsely pubescent with simple and forked trichomes, base of lateral pair not saccate, margin narrowly membranous. Petals pale yellow, turning whitish, broadly obovate, $(4-5-7 \times 2-3.5)$ mm, apex submarginate; claw ca. 1 mm. Filaments 2–2.5; anthers ovate-cordate, 0.3–0.4 mm. Ovules 10–16 per ovary. Fruit elliptic to lanceolate-elliptic, $(3-4.5-8 \times (1.5-2-3))$ mm, not inflated, latisepate, not twisted; valves puberulent with simple trichomes sometimes mixed with much fewer forked ones, not veined, base and apex acute; style 0.5–1 mm. Seeds brown, ovate, $1-1.3 \times 0.7-0.9$ mm. Fl. Jun–Jul, fr. Jul–Aug.

Stony slopes and meadows of alpine areas; 2900–3800 m. Xinjiang [Kyrgyzstan, Pakistan, Tajikistan].

Draba olgae was recorded from China by Tolmachev and Junussov (Fl. Tajik. 5: 196. 1978), based on *A. Regel s.n.*, 12 July 1879 (LE), collected from Gulja (now Yining), Xinjiang. The species was not included in FRPS or Fl. Xinjiang. (vol. 2(2). 1995).

39. *Draba humillima* O. E. Schulz in Engler, *Pflanzenr.* 89(IV. 105): 114. 1927.

小葶苈 *xiao ting li*

Herbs perennial, 1–2 cm tall, densely caespitose, scapose. Caudex many branched, ultimate branches terminated in rosettes and covered with leaf remains of previous years. Stems erect, simple, tomentose with stalked, forked and stellate trichomes. Basal leaves rosulate, persistent; petiole 2–7 mm, ciliate with simple and/or long-stalked forked trichomes; leaf blade oblong-elliptic, $3-8 \times 1.5-3(-5)$ mm, subhirsute with stalked, 3- or 4-rayed stellate trichomes with simple, rigid rays, sometimes adaxially glabrous or sparsely pubescent distally, ciliate with simple and forked trichomes, base cuneate to attenuate, margin entire, apex obtuse. Cauline leaves absent. Racemes 2–6-flowered, ebracteate, only slightly elongated in fruit. Fruiting pedicels 2–5(–8) mm, divaricate-ascending, straight, stout, tomentose all around. Sepals oblong, $2-2.5 \times 0.7-1$ mm, erect, abaxially sparsely pubescent with simple trichomes, base of lateral pair not saccate, margin not membranous. Petals yellow, obovate, $3.5-4.5 \times 1-1.5$ mm, apex submarginate; claw ca. 1 mm. Filaments 1.5–2 mm; anthers ovate-oblong, ca. 0.4 mm. Ovules 16–24 per ovary. Fruit oblong, $5-7 \times 3-4$ mm, inflated, latisepate, not twisted; valves glabrous, not veined, base and apex obtuse; style 0.5–0.6 mm. Seeds dark brown, ovate, $0.9-1 \times 0.6-0.7$ mm. Fl. and fr. Jul–Sep.

Scree, shaded shelter below rocks; 4300–5600 m. Xizang [Sikkim].

Draba humillima was first recorded from Xizang by Schulz in his monograph (p. 114). However, that record was overlooked in FRPS and Fl. Xizang. (vol. 2. 1985). The occurrence of the species in Xizang is here confirmed based on *Strachey & Winterbottom 2* (GH).

40. *Draba sibirica* (Pallas) Thellung, *Neue Denkschr. Schweiz. Naturf. Ges.* 41: 318. 1907.

西伯利亚葶苈 *xi bo li ya ting li*

Lepidium sibiricum Pallas, *Reise Russ. Reich.* 3: 34.

1776, not Schweigger (1812); *Draba gmelinii* Adams; *D. repens* Marschall von Bieberstein.

Herbs perennial, 5–25 cm tall, scapose. Caudex with many, slender, creeping branches, sparsely covered with petiolar remains of previous years. Sterile stems subdecumbent, sparsely to densely hispid with malpighiaceus trichomes; flowering scapes sparsely pilose proximally with simple trichomes, often glabrous along distal half. Basal leaves subrosulate or not rosulate; petiole to 1 cm, persistent; leaf blade oblong-lanceolate or oblanceolate, $0.4-2.2$ cm \times $1-5(-10)$ mm, sparsely or densely hispid or strigose with appressed,

malpighiaceous trichomes, these sometimes with 1 or 2, shorter lateral branches and appearing 3-fid or cross-shaped, sometimes adaxially or both surfaces glabrous except for margin, base attenuate, margin entire, always with malpighiaceous trichomes, apex acute. Cauline leaves of flowering stems absent, those of sterile shoots similar to basal ones. Racemes 7–20-flowered, ebracteate, glabrous, elongated considerably in fruit. Fruiting pedicels 0.5–1.8(–2.3) cm, divaricate, straight or curved, often filiform, glabrous. Sepals oblong or ovate, 2–2.7 × 0.9–1.2 mm, erect, glabrous or abaxially sparsely pilose with simple trichomes, base of lateral pair subsaccate, margin not membranous. Petals yellow, narrowly obovate, 4–6 × 2–3 mm, apex emarginate. Filaments 2–2.5 mm; anthers ovate-subcordate, 0.4–0.5 mm. Ovules 24–30 per ovary. Fruit oblong to elliptic, rarely sublinear, 4–8 × 1.5–2.2 mm, latiseptate, not twisted; valves glabrous, obscurely veined, base and apex subobtuse; style 0.5–1 mm. Seeds brown, ovate, 0.9–1.2 × 0.5–0.6 mm. Fl. May–Jul, fr. Jun–Aug. $2n = 16$.

Mountain slopes, sunny or shady wet places; 2000–2900 m. Gansu, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia].

Draba sibirica is very rare in China and is known to the present authors from a few collections, including *Jiang Qingtang s.n.*, 24 Jun 1957 (PE), collected from Fuhai, Xinjiang. The species was first recorded from “Dscachor,” Gansu by Maximowicz (Fl. Tangut. 65. 1889, as *D. repens*), but apparently no recent collections have been made from that province, nor was the species recorded from there in FRPS. The present record from Gansu is based on *Przewalski s.n.*, 24 Jun 1880 (LE).

The descriptions and illustrations in FRPS (p. 166) and Fl. Xinjiang. (2(2): 112–113. 1995) of *Draba sachalinensis* Trautvetter are based on misidentified plants of *D. sibirica*, which is the only Chinese species with typically malpighiaceous leaf trichomes. True *D. sachalinensis* is highly restricted to E Russia (Sakhalin) and N Japan (Hokkaido, N Honshu); it does not occur in China.

41. *Draba gracillima* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 153. 1861.

纤细葶苈 *xian xi ting li*

Draba granitica Handel-Mazzetti; *D. wardii* W. W. Smith.

Herbs perennial, 5–55 cm tall, slender. Caudex with several slender branches terminated in rosettes. Stems decumbent, simple, very slender, somewhat flexuous, basally sparsely pubescent with short-stalked, 3- or 4-rayed, stellate trichomes, rarely densely pilose with primarily simple trichomes, apically glabrous. Basal leaves rosulate, persistent; petiolelike base to 7 mm; leaf blade broadly obovate, spatulate, to oblanceolate, 0.5–2 cm × 1.5–7(–10) mm, abaxially sparsely pubescent with short-stalked, 4-rayed stellate trichomes rarely mixed with more, simple and forked ones, abaxially pilose with simple trichomes replaced with forked or stellate ones at leaf apex, rarely blade glabrous except for margin, base cuneate to attenuate, margin denticulate or subentire, often ciliate, apex subacute or obtuse. Cauline leaves 2–6, sessile, ovate,

2–7 × 1–3 mm, pubescent as basal leaves, base obtuse, not auriculate, margin entire or denticulate, apex acute. Racemes 3–10(–12)-flowered, ebracteate or lowermost flowers bracteate, lax, elongated considerably in fruit. Fruiting pedicels 0.4–4 cm, filiform, glabrous, lowermost longest and strongly recurved, uppermost straight and ascending. Sepals oblong, 1.5–2 × 0.6–1.5 mm, erect, glabrous or rarely with a few trichomes, not saccate, margin narrowly membranous. Petals pale yellow or yellowish white, narrowly obovate to oblanceolate, 2.5–3.5 × 0.8–1.5 mm, apex obtuse or subemarginate; claw absent. Filaments 1.2–2 mm; anthers ovate, 0.2–0.4 mm. Ovules 10–20 per ovary. Fruit narrowly oblong, linear, or linear-lanceolate, (0.5–)0.7–1.3(–1.8) cm × 1–2 mm, pendulous, latiseptate, not twisted; valves glabrous, not veined; style 0.2–0.5 mm. Seeds brown, ovate, 0.9–1.1 × 0.5–0.7 mm, subcompressed, wingless. Fl. and fr. May–Aug. Mountain slopes, grassy areas, ravines, stony slopes, scree, alpine grasslands; 3200–5000 m. Xizang, Yunnan [Bhutan, NW India, Nepal, Sikkim].

The type collection of *Draba granitica*, *Handel-Mazzetti 9497* (holotype, WU; isotype, W), is indistinguishable from that of *D. gracillima*, *J. D. Hooker s.n.* (holotype, K; isotypes, E, K, NY, P, W), in every aspect except flower color. The former species was said to have white instead of yellowish white or pale yellow flowers, but the present authors believe that this distinction is artificial, and the two taxa are united here.

Draba wardii, which is known only from the type gathering, *Kingdon Ward 849* (holotype, E), collected from Xizang, was not listed in FRPS or Fl. Xizang. (vol. 2. 1985). It is no more than a young plant of *D. gracillima* with simple trichomes more abundant than stellate ones.

42. *Draba zangbeiensis* L. L. Lou, Acta Phytotax. Sin. 25: 320. 1987.

藏北葶苈 *zang bei ting li*

Herbs perennial, 1–5(–8) cm tall, caespitose. Caudex simple or few branched, ultimate branches terminated in rosettes and covered with petiolar remains of previous years. Stems erect or rarely decumbent, simple or branched, tomentose basally with stellate trichomes, glabrous along distal half. Basal leaves rosulate; petiole 1–4(–8) mm, persistent and becoming stramineous, rarely ciliate with simple trichomes; leaf blade oblanceolate to elliptic-lanceolate, 3–10(–15) × 1–3(–6) mm, abaxially densely tomentose with sessile, stellate trichomes 2 or all 4 rays of which with a lateral branch on each side, adaxillary similar or with simple trichomes also, rarely subglabrous, base attenuate, margin entire, apex acute. Cauline leaves 2–6(–8), sessile; leaf blade ovate to oblong, 3–10(–17) × 1–4(–7) mm, uppermost subglabrous or indumentum as basal leaves, base obtuse or subamplexicaul, margin subentire or minutely 1–4-toothed on each side, apex obtuse or acute. Racemes 6–16 (–20)-flowered, ebracteate, elongated slightly in fruit. Fruiting pedicels 1–3.5(–5) mm, divaricate, slightly curved upward or straight, stout, glabrous. Sepals oblong, 0.9–1.1 × 0.4–0.5 mm, erect, abaxially sparsely pubescent with simple trichomes,

base of lateral pair not saccate, margin not membranous. Petals yellow drying whitish, narrowly spatulate, 1–1.5 × 0.5–0.6 mm, apex subemarginate. Filaments 0.8–1 mm; anthers ovate, ca. 0.2 mm. Ovules 24–38 per ovary. Fruit linear to oblong-linear, 4–10 × 1–1.5 mm, not inflated, slightly latiseptate, not twisted; valves glabrous, often with a distinct midvein, base and apex obtuse; style absent. Seeds brown, ovate, 0.5–0.8(–0.9) × 0.3–0.4(–0.5) mm. Fl. and fr. Jul–Aug.

• Dry mountain slopes, rocky outcrops, frost-heave areas, dry grasslands, steppe on moraine sands; 4100–5000 m. Qinghai, Xizang.

The above first record from Qinghai is based on *Ho, Bartholomew, Watson & Gilbert 1602* (BM, CAS, E, HNWP, MO).

43. *Draba melanopus* Komarov, Trudy Imp. S.-Peterburgsk. Obshch. Estestvoisp., Vyp. 3, Otd. Bot. 26: 102. 1896.

天山葶苈 *tian shan ting li*

Herbs biennial or short-lived perennial, (2–)4–18(–20) cm tall, scapose. Stems few to several from base, erect to subdecumbent, simple, sparsely pubescent proximally with simple or forked trichomes, glabrous along distal half. Basal leaves rosulate, sessile; leaf blade oblong-obovate to subspatulate, 0.4–2 cm × 1.5–5 mm, abaxially densely subhirsute with long-stalked, forked or 3- or 4-rayed stellate trichomes with simple rays, sometimes with a few simple trichomes, adaxially with similar indumentum or with predominantly simple trichomes, base cuneate, margin entire, ciliate with simple trichomes to 1.3 mm, apex subobtuse. Cauline leaves absent, very rarely 1 at stem base. Racemes 4–16-flowered, ebracteate, elongated considerably in fruit; rachis sometimes slightly flexuous. Fruiting pedicels 3–9 mm, divaricate-ascending, slightly curved upward or straight, stout, glabrous or rarely sparsely pubescent. Sepals oblong, 0.9–1.5 × 0.6–0.8 mm, erect, abaxially sparsely pubescent with simple or stalked, forked trichomes, base of lateral pair not saccate, margin not membranous. Petals yellow drying whitish, narrowly spatulate, (1.8–)2.2–3 × 0.6–0.9 mm, apex subemarginate. Filaments 1–1.4 mm; anthers ovate, ca. 0.2 mm. Ovules 16–26 per ovary. Fruit linear to narrowly elliptic, (5–)6–11(–12) × 1–2 mm, not inflated, latiseptate, not twisted, straight or slightly curved; valves glabrous or rarely puberulent, often with an obscure midvein, base and apex acute; style 0.1–0.2 mm. Seeds brown, oblong-ovate, 0.9–1.1 × 0.4–0.5 mm. Fl. and fr. Jun–Aug.

Shady or moist rocky areas; 2200–3700 m. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan].

The description and illustration of *Draba melanopus* in Fl. Xinjiang. (2(2): 129, 131. 1995) are most likely based on misidentified plants of *D. zangbeiensis*.

44. *Draba stenocarpa* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 153. 1861.

狭果葶苈 *xia guo ting li*

Draba media Litvinov; *D. media* var. *leiocarpa* Lipsky; *D. stenocarpa* var. *leiocarpa* (Lipsky) L. L. Lou; *D.*

stenocarpa var. *media* (Litvinov) O. E. Schulz; *D.*

stenocarpa var. *media* subvar. *leiocarpa* (Lipsky) O. E. Schulz.

Herbs annual, (5–)12–45(–50) cm tall. Stems solitary or few from base, erect, simple or few branched near base, densely hirsute basally with subsetose simple trichomes to 1.5 mm, these rarely mixed with fewer, smaller, stalked forked trichomes, glabrous along distal half. Basal leaves rosulate, subsessile; leaf blade oblong-obovate to narrowly oblong, (0.5–) 0.8–3.5(–4.2) cm × 2–8(–12) mm, abaxially densely subhirsute with long-stalked, 3- or 4-rayed stellate trichomes with simple rays, sometimes with a few simple trichomes, adaxially with predominantly simple trichomes mixed with fewer, stalked forked ones, base cuneate, margin entire or 1–3-toothed, ciliate with simple trichomes, apex subobtuse. Cauline leaves 2–5(–7), sessile, oblong-ovate to oblong lanceolate, with indumentum similar to basal leaves, margin entire or minutely 1–3-toothed, apex obtuse to subacute. Racemes (4–)10–50(–60)-flowered, ebracteate, elongated considerably in fruit; rachis straight. Fruiting pedicels (0.1–)0.5–1.8(–2.5) cm, divaricate, slightly curved upward or straight, slender, glabrous. Sepals ovate-oblong, 1.5–2 × ca. 1 mm, erect, abaxially hirsute with simple trichomes, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, spatulate, 3–4 × 1–1.5 mm, apex subemarginate. Filaments 1.5–2 mm; anthers ovate, 0.2–0.3 mm. Ovules (32–) 38–48 per ovary. Fruit linear, (0.6–)0.9–2(–2.5) cm × 1.5–2.5 mm, not inflated, latiseptate, not twisted, straight or slightly curved; valves antrorsely puberulent with simple trichomes rarely mixed with forked ones, very rarely glabrous, with obscure midvein, base and apex subobtuse; style 0.1–0.2 mm. Seeds brown, ovate, 0.7–1 × 0.4–0.5 mm. Fl. and fr. Jun–Aug.

River beaches, shady rocky areas, forest margins; 2500–5000 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Afghanistan, India, Kashmir, Kyrgyzstan, Kazakstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan].

Glabrous fruits are extremely rare in *Draba stenocarpa* and have not been found among the Chinese material examined by the present authors. It is likely that records of such plants in FRPS and provincial Chinese floras are based on misidentified plants of other species, notably *D. ladyginii*. However, the latter species is perennial with white flowers and (4–)6–19(–26)-leaved stems.

45. *Draba nemorosa* Linnaeus, Sp. Pl. 2: 643. 1753.

葶苈 *ting li*

Draba nemoralis Ehrhart; *D. nemorosa* var.

brevisilicula Zapalowicz; *D. nemorosa* var. *hebecarpa* Lindblom; *D. nemorosa* var. *leiocarpa* Lindblom.

Herbs annual, (3–)6–45(–60) cm tall. Stems erect to ascending, simple or branched a little above base, densely pubescent with a mixture of simple (to 1.3 mm), forked, and stalked or subsessile stellate trichomes, glabrous from proximal flower to apex. Basal leaves rosulate, often persistent through flowering or fruiting; petiole

obsolete; leaf blade oblong-obovate or oblanceolate, (0.4–)1–3.5(–5) × (0.2–)0.5–1.5(–2) cm, sparsely or densely pubescent with stalked, forked and stellate trichomes with simple rays, base cuneate, margin dentate or denticulate, rarely subentire, apex obtuse. Cauline leaves (2 or)3–12(–15), sessile; leaf blade broadly ovate to oblong, (0.2–)0.5–1.8(–2.7) cm × (1–)3–10(–15) mm, abaxially pubescent as basal leaves; adaxially pubescent with primarily simple trichomes mixed with fewer forked ones, base cuneate to rounded, margin dentate or denticulate, apex obtuse or acute. Racemes (15–)25–60(–90)-flowered, ebracteate, elongated slightly or considerably in fruit. Fruiting pedicels 0.7–2.5(–3) cm, divaricate, straight, glabrous, filiform, longer than fruits. Sepals ovate, (0.7–)0.9–1.6 × 0.5–1 mm, suberect, abaxially sparsely pubescent with simple trichomes, base of lateral pair not saccate, margin not membranous. Petals yellow, spatulate, (1.2–)1.7–2.2(–2.5) × (0.4–)0.6–1 mm, apex emarginate; claw absent. Filaments (0.9–)1–1.7(–2) mm; anthers broadly ovate to subreniform, 0.1–0.2 mm. Ovules (30–)36–60(–72) per ovary. Fruit oblong or elliptic, (3–)5–8(–10) × 1.5–2.5 mm, slightly latiseptate, not twisted; valves glabrous or puberulent with simple, antrorse trichomes 0.05–0.2 mm, base and apex obtuse, often with a distinct midvein and anastomosing lateral veins; style obsolete, rarely to 0.1 mm. Seeds reddish brown, ovate, 0.5–0.7(–0.8) × 0.3–0.4(–0.5) mm. Fl. and fr. Mar–Jun. $2n = 16$.

Grassy areas, roadsides, wet valleys, river banks, forest margins, streamsides, mountain slopes; near sea level to 4800 m. Anhui, Gansu, Guizhou, Hebei, Henan, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Japan, Kashmir, Korea, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe, North America].

46. *Draba huetii* Boissier, *Diagn. Pl. Orient.*, ser. 2, 5: 31. 1856.

中亚葶苈 *zhong ya ting li*

Herbs annual, 5–20(–30) cm tall. Stems erect, simple or branched just above base, densely pubescent throughout with a mixture of simple (to 1.2 mm), forked, and subsessile stellate trichomes. Basal leaves subrosulate, often withered by fruiting; petiole obsolete; leaf blade obovate or spatulate, 4–7 × 2–4 mm, pubescent with simple and stalked, forked and stellate trichomes with simple rays, base cuneate, margin entire or denticulate, apex obtuse. Cauline leaves 3–6, sessile; leaf blade ovate to elliptic, 0.5–1.5 cm × 3–5 mm, abaxially pubescent as basal leaves, adaxially pubescent with primarily simple trichomes mixed with fewer forked ones, base cuneate, margin denticulate or subentire, apex acute. Racemes (5–)12–40(–60)-flowered, ebracteate, elongated in fruit. Fruiting pedicels (1.5–)2.5–5.5(–7) mm, divaricate, straight, pubescent all around, longer than fruits. Sepals oblong, 0.9–1.5(–2) × 0.4–0.6 mm, suberect, abaxially pubescent, base of lateral pair not saccate, margin narrowly membranous. Petals yellow, spatulate, (1.2–)1.5–2(–2.5) × 0.4–0.6

mm, apex emarginate; claw absent. Filaments (0.7–)1–1.5 mm; anthers ovate, 0.1–0.2 mm. Ovules 12–18(–20) per ovary. Fruit oblong, 5–8(–10) × 2–3 mm, slightly latiseptate, not twisted; valves densely puberulent with antrorse, simple trichomes 0.1–0.2 mm, base and apex obtuse, obscurely veined; style obsolete, rarely to 0.1 mm. Seeds brown, ovate, 0.9–1.2 × 0.6–0.9 mm. Fl. and fr. Mar–Jun.

Slopes; 500–2300 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

47. *Draba eriopoda* Turczaninow, *Bull. Soc. Imp. Naturalistes Moscou* 15: 260. 1842.

毛葶苈 *mao ting li*

Draba eriopoda var. *kamensis* Pohle; *D. eriopoda* var. *sinensis* Maximowicz; *D. pingwuensis* Z. M. Tan & S. C. Zhou.

Herbs annual, 4–45(–60) cm tall. Stems erect, simple or rarely branched above middle, sparsely to densely pubescent with a mixture of simple and subsessile stellate and forked trichomes, sometimes glabrous distally. Basal leaves subrosulate, often withered by flowering. Cauline leaves (5–)10–24(–30), sessile; leaf blade ovate, oblong, elliptic, or lanceolate, 0.5–2.7 (–4.2) cm × 1.5–7(–15) mm, abaxially pubescent with primarily 4-forked, short-stalked stellate trichomes, adaxially strigose with simple trichomes mixed with fewer forked and smaller stellate ones, base cuneate to obtuse, margin 1–6(–10)-toothed on each side, apex acute. Racemes 10–45(–65)-flowered, ebracteate, elongated in fruit. Fruiting pedicels (0.2–)5–13(–22) mm, divaricate, straight, pubescent all around, glabrous adaxially, or glabrous. Sepals oblong or ovate, 1–1.8(–2) × 0.6–0.8 mm, erect, abaxially pilose with simple trichomes, base of lateral pair not saccate, margin membranous. Petals yellow, spatulate or narrowly obovate, 2–3(–3.5) × (0.5–)0.8–1 mm, apex emarginate; claw to 1 mm. Filaments 1–2 mm; anthers ovate, 0.1–0.2(–0.3) mm. Ovules 12–24(–28) per ovary. Fruit ovate, (3–)4–9(–10) × 2–3(–4) mm, often erect, latiseptate, not twisted; valves glabrous, obscurely veined, base obtuse, apex acute; style obsolete, rarely to 0.2 mm. Seeds brown, ovate, 0.8–1.3 × 0.5–0.9 mm. Fl. and fr. Jun–Sep. $2n = 16^*$.

Rocky slopes, grasslands, scrub, moist streamsides, limestone cliffs, forests, river valleys; 2000–4900 m. Gansu, Hubei, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Mongolia, Nepal, Russia, Sikkim].

The above first records from Hubei and Yunnan are based on *Wu & Yang 37631* (PE) and *T. T. Yü 9310* (KUN, PE), respectively.

48. *Draba ellipsoidea* J. D. Hooker & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 153. 1861.

椭圆果葶苈 *tuo yuan guo ting li*

Herbs annual, (0.5–)2–12(–17) cm tall. Stems erect to ascending, simple, slender, flexuous, densely pubescent

with short-stalked to sessile stellate trichomes, usually glabrous distally. Basal leaves not rosulate, soon withered. Cauline leaves 3–12, obovate, elliptic-oblong, or lanceolate, (0.2–)0.5–2(–3) cm × (1.5–)3–8(–10) mm, pubescent on both surfaces with short-stalked, 4-rayed, stellate trichomes, sometimes adaxially with primarily simple trichomes mixed with fewer, forked or stellate ones, cuneate to attenuate into a petiolelike base to 5 mm, margin entire or denticulate, apex obtuse or acute. Racemes (2–)4–10(–15)-flowered, ebracteate, lax and elongated in fruit. Fruit-ing pedicels (1–)3–10(–18) mm, ascending, straight, glabrous or pubescent all around with sessile, 3- or 4-rayed stellate trichomes, slender. Sepals oblong, 0.9–1.4 × 0.4–5 mm, erect, abaxially pubescent with simple trichomes sometimes mixed with fewer forked ones, base of lateral pair not saccate, margin not membranous.

Petals white, narrowly spatulate, 0.6–1 × 0.1–0.2 mm, apex obtuse or subretuse; claw absent. Filaments 0.7–1 mm; anthers ovate, to 0.1 mm. Ovules 10–18(–22) per ovary. Fruit oblong, oblong-elliptic, or rarely suborbicular, (2–)4–8 × (1–)2–3(–4) mm, latiseptate, not twisted; valves puberulent with exclusively sessile stellate trichomes, or with a mixture of stellate, forked, and simple trichomes, rarely only sparsely ciliate at margin, base and apex obtuse to rounded; style obsolete. Seeds blackish, ovate, 0.7–0.9 × 0.5–0.7 mm, slightly compressed, wingless. Fl. and fr. Jun–Oct.

Scree slopes, streamsides, woods, pastures, alpine ledges, meadows, scrub; 3100–5200 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan [Kashmir, Nepal, Sikkim].

42. ARMORACIA P. Gaertner et al., Oekon. Fl. Wetterau 2: 426. 1800, nom. cons.
辣根属 *la gen shu*

Raphanis Moench, nom. rej.

Herbs perennial with rootstocks. Trichomes absent. Stems erect, branched above. Basal leaves long petiolate, rosulate, simple, entire or crenate. Cauline leaves petiolate or uppermost sessile, crenate, lacinate, pinnatifid, or pinnatisect. Racemes many flowered, ebracteate, often in corymbose panicles, elongated considerably in fruit. Fruiting pedicels slender, ascending, divaricate, or slightly reflexed. Sepals ovate or oblong, spreading or ascending, glabrous, base of lateral pair not saccate. Petals white, ascending, longer than sepals; blade obovate, spatulate, oblong, or oblanceolate, apex obtuse; claw short. Stamens 6, somewhat spreading, slightly tetradynamous; filaments slightly dilated at base; anthers ovate, oblong, or linear, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 8–20 per ovary. Fruit dehiscent silicles, oblong, ovate, elliptic, or orbicular, angustiseptate, sessile; valves veinless, glabrous, smooth; replum rounded; septum perforated or reduced to a rim; style obsolete or short and to 2 mm; stigma capitate, entire or 2-lobed. Seeds biseriate, wingless, oblong, plump; seed coat punctate, not mucilaginous when wetted; cotyledons accumbent.

Three species: C and S Europe, Russia; one species (introduced) in China.

1. *Armoracia rusticana* P. Gaertner et al., Oekon. Fl. Wetterau 2: 426. 1800.

辣根 *la gen*

Armoracia sativa Bernhadi; *Cochlearia armoracia* Linnaeus; *Nasturtium armoracia* (Linnaeus) Fries; *Rorippa armoracia* (Linnaeus) A. S. Hitchcock; *R. rusticana* (G. Gaertner et al.) Godron.

Herbs with fusiform or cylindric, fleshy or woody roots. Stems 50–120(–200) cm tall. Basal leaves few; petiole to 60 cm, broadly expanded at base; leaf blade broadly oblong, oblong-lanceolate, or ovate, (10–)20–45(–60) × (3–)5–12(–17) cm, coarsely crenate or rarely pinnatifid. Lower and middle cauline leaves shortly petiolate, pinnatifid or pinnatisect, with oblong to linear-oblong lobes, smaller than basal leaves; upper cauline leaves sessile or shortly petiolate, linear to linear-lanceolate,

base cuneate or attenuate, margin serrate, crenate, or rarely entire. Fruiting pedicels ascending, slender, 0.8–2 cm. Sepals ovate, 2–4 mm. Petals obovate or oblanceolate, 5–7(–8) mm; claw to 1.5 mm. Filaments 1–2.5 mm; anthers ovate, 0.5–0.8 mm. Ovules 8–12 per ovary. Mature fruit rarely produced, ovate, oblong, or suborbicular, 4–6 mm, few seeded; style obsolete or to 0.5 mm; stigma capitate, well developed. Seeds not seen. Fl. May–Jul. $2n = 32$.

Cultivated and naturalized. Hebei, Heilongjiang, Jilin, Jiangsu, Liaoning [native to Europe; cultivated and naturalized elsewhere].

This species has been widely cultivated for some 2000 years for its fleshy roots, which are grated to produce the pungent horseradish sauce. The plant is also a weed that is very difficult to eradicate.

43. CARDAMINE Linnaeus, Sp. Pl. 2: 654. 1753.

碎米荠属 *sui mi qi shu*

Dentaria Linnaeus; *Loxostemon* J. D. Hooker & Thomson; *Sphaerotorrhiza* (O. E. Schulz) Khokhrjakov.

Herbs annual, biennial, or rhizomatous or tuberous perennial. Trichomes absent or simple. Stems erect or prostrate, leafy or rarely leafless and plant scapose. Basal leaves petiolate, rosulate or not, simple and entire, toothed, or 1–3-pinnatisect, or palmately lobed, sometimes trifoliolate, pinnately, palmately, or bipinnately compound. Cauline

leaves alternate, (rarely opposite or whorled), simple or compound as basal leaves, petiolate or sessile and base cuneate, attenuate, auriculate, or sagittate, margin entire, dentate, or variously lobed. Racemes ebracteate or rarely bracteate throughout or only basally, corymbose or in panicles, elongated in fruit. Fruiting pedicels slender or thickened, erect, divaricate, or reflexed. Sepals ovate or oblong, base of lateral pair saccate or not, margin often membranous. Petals white, pink, purple, or violet, never yellow, rarely absent; blade obovate, spatulate, oblong, or oblanceolate, apex obtuse or emarginate; claw absent or strongly differentiated from blade, longer or shorter than sepals. Stamens 6 and tetradynamous, rarely 4 and equal in length; anthers ovate, oblong, or linear, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands 2 or rarely 4 or absent; lateral glands annular or semiannular. Ovules 4–50 per ovary. Fruit dehiscent siliques, linear or rarely narrowly oblong or narrowly lanceolate, latiseptate, sessile; valves papery, not veined, glabrous (or very rarely hairy), smooth or torulose, dehiscing elastically acropetally, spirally or circinate coiled; replum strongly flattened; septum complete, membranous, translucent; style distinct or rarely obsolete; stigma capitate, entire. Seeds uniseriate, wingless, rarely margined or winged, oblong or ovate, flattened; seed coat smooth, minutely reticulate, colliculate, or rugose; mucilaginous or not when wetted; cotyledons accumbent or very rarely incumbent.

About 200 species: worldwide; 48 species (24 endemic, one introduced) in China.

- 1a. Racemes bracteate throughout, very lax 38. *C. lihengiana*
- 1b. Racemes ebracteate, corymbose.
 - 2a. Flowering stems leafless; all leaves basal.
 - 3a. Rhizomal leaves trifoliolate, leaflets ovate, 7–18 × 4–5 cm; petals 1.5–1.7 cm 4. *C. cheotaiyienii*
 - 3b. Rhizomal leaves simple, suborbicular or broadly reniform; rarely to 2 × 3 cm; petals less than 1.5 cm.
 - 4a. Petals (8–)9–13 mm; fruiting pedicels 1–4 cm; leaf blade reniform or suborbicular 13. *C. scaposa*
 - 4b. Petals 3–3.5 mm; fruiting pedicels 0.2–0.7 cm; leaf blade ovate, subcordate, or oblong 42. *C. changbaiiana*
 - 2b. Flowering stems leafy; at least some leaves cauline.
 - 5a. Cauline leaves auriculate, sagittate, or amplexicaul at base, sometimes petiole absent and proximal pair of leaflets attached directly to or a little above node.
 - 6a. Blade of cauline leaves sessile, rachis and petiole absent; petals 10–17 mm 8. *C. violacea*
 - 6b. Blade of cauline leaves on a distinct petiole or rachis; petals 3–9(–10) mm.
 - 7a. Petiole ± absent; proximal pair of lateral leaflets auriclelike, attached to rachis at or a little above node, often giving appearance of amplexicaul leaf base.
 - 8a. Cauline leaves pinnatisect; rhizomes, stolons, stem base, and petiole of basal leaves densely crisped pilose; basal leaves orbicular 12. *C. fargesiana*
 - 8b. Cauline leaves trifoliolate or pinnately compound; rhizomes, stolons, stem base, and petioles of basal leaves glabrous or some of them sparsely pilose; basal leaves variously-shaped.
 - 9a. Cauline leaves trifoliolate; lateral leaflets 1 pair 31. *C. engleriana*
 - 9b. Cauline leaves pinnately compound or pinnatisect; lateral leaflets or leaf lobes 2 or more pairs.
 - 10a. Plants with long stolons bearing simple leaves; seeds broadly winged; petals white . 29. *C. lyrata*
 - 10b. Plants without stolons and simple leaves; seeds wingless; flowers purple or lavender, if white then plants pilose at least basally.
 - 11a. Lateral leaflets 2–4(or 5) pairs; plants erect, pilose basally or along leaf margin.
 - 12a. Cauline leaves 2–5(–7); plants (7–)10–25(–35) cm tall; petals white; stigma entire 30. *C. hygrophila*
 - 12b. Cauline leaves (9–)12–28(–37); plants (20–)30–100(–115) cm tall; petals purple or lavender; stigma 2-lobed 28. *C. griffithii*
 - 11b. Lateral leaflets (6–)7–15 pairs; plants often creeping, glabrous.
 - 13a. Lateral leaflets ovate to ovate-oblong, entire or repand, base obtuse; seeds wingless; style 2–4 mm; sepals 2.5–3 mm 27. *C. multijuga*
 - 13b. Lateral leaflets linear or narrowly oblong, proximal margin 1- or 2(or 3)-toothed, base oblique; seeds winged; style 4–6 mm; sepals 3–4 mm 26. *C. gracilis*
 - 7b. Petiole distinct; proximal pair of leaflets not auriclelike, attached well above node.

- 14a. Petiole broadly winged at least along proximal half.
- 15a. Blade of cauline leaves not lobed; petals 3–4 mm; Heilongjiang, Jilin, Liaoning [Korea] 32. *C. komarovii*
- 15b. Blade of cauline leaves 3-lobed or pinnatisect; petals 5–8 mm; Guizhou, Sichuan, Yunnan.
- 16a. Blade of cauline leaves trilobed, terminal lobe ovate to ovate-lanceolate; petals purple; racemes simple 6. *C. bodinieri*
- 16b. Blade of cauline leaves pinnatisect, terminal lobe obovate to obovate-oblong; petals white; racemes in panicles 7. *C. multiflora*
- 14b. Petiole wingless.
- 17a. Leaves simple, rarely a few trifoliolate.
- 18a. Blade of basal leaves not fleshy, ovate, cordate, or rarely suborbicular, longer than wide; petals white, (4–)5–7(–8) mm 33. *C. circaeoides*
- 18b. Blade of basal leaves fleshy, reniform, much wider than long; petals violet, deep magenta, or rarely lavender or white, 7–10 mm 34. *C. calthifolia*
- 17b. All leaves pinnatisect, trifid, trifoliolate, or pinnately compound.
- 19a. Cauline leaves trifid or pinnatisect, with all lobes decurrent; rhizomes fleshy, often with bulbils 17. *C. repens*
- 19b. Cauline leaves compound, with 3–11 pairs of nondecurent leaflets; rhizomes not fleshy, without bulbils.
- 20a. Cauline leaves (9–)13–23-foliolate 41. *C. impatiens*
- 20b. Cauline leaves 3–7-foliolate.
- 21a. Plants 3–10 cm tall; cauline leaves with petiole 0.4–1.1 cm, terminal leaflet narrowly oblanceolate or linear, 0.5–1 mm wide; ovaries and fruit valves glabrous 43. *C. nipponica*
- 21b. Plants (10–)15–45(–60) cm tall; cauline leaves with petiole (1–)2–7(–8.5) cm, terminal leaflet lanceolate, elliptic, oblong, ovate, or suborbicular, (4–)6–20(–30) mm wide; ovaries and fruit valves sparsely pilose 39. *C. yunnanensis*
- 5b. Cauline leaves not auriculate, sagittate, nor amplexicaul, proximal leaflets or leaf lobes attached to a distinct petiole well above the node.
- 22a. Cauline leaves simple, rarely obscurely 2- or 3-lobed.
- 23a. Cauline leaves reniform, 15–40 mm wide; petals 7–10 mm; sepals 2.5–4 mm 34. *C. calthifolia*
- 23b. Cauline leaves broadly ovate, subcordate, or oblong, 1.5–8 mm wide; petals 3–3.5 mm; sepals 1.3–1.7 mm 42. *C. changbaiana*
- 22b. Cauline leaves pinnatisect, deeply trifid, trifoliolate, or pinnately compound.
- 24a. Plants annual or biennial; petals 1.5–5(–6) mm.
- 25a. Lateral lobes of middle cauline leaves filiform, linear, or narrowly oblong, 0.3–3 mm wide; petals (1.5–)1.8–2.5 mm; fruit 0.6–0.9 mm wide 45. *C. parviflora*
- 25b. Lateral lobes of middle cauline leaves variously-shaped, wider; petals 2.5–4.5(–6) mm; fruit (0.8–)1–1.5 mm wide.
- 26a. Fruit and usually fruiting pedicels erect, often appressed to rachis; stamens 4(–6); petioles of basal leaves ciliate 46. *C. hirsuta*
- 26b. At least pedicels divaricate or ascending, together with fruit not appressed to rachis; stamens (4 or 6); petioles of basal leaves often not ciliate.
- 27a. Terminal lobe of middle and upper cauline leaves nearly as large as lateral ones; raceme rachis and/or stem often flexuous 47. *C. flexuosa*
- 27b. Terminal lobe of middle and upper cauline leaves considerably larger than lateral ones; raceme rachis and stem straight 48. *C. scutata*
- 24b. Plants perennial, with distinct rhizomes, tubers, bulbils, or stolons; petals (5–)6–18 mm.
- 28a. Rhizomes with bulbils or tubers; stem narrowed basally into a fragile, slender attachment to rhizome.
- 29a. Rhizomes with stalked tubers; bulbils absent; rhizomal leaves ternate, biternate, or palmately 5-foliolate; petals 8–11(–14) mm 11. *C. trifida*

- 29b. Rhizomes with sessile bulbils; tubers absent; rhizomal leaves simple, trifoliolate, or pinnately compound; petals smaller.
- 30a. Cauline leaves pinnatisect; terminal lobe filiform, linear, or lanceolate, without petiolule.
 - 31a. Terminal lobe of cauline leaves lanceolate to linear-lanceolate, decurrent with distal pair of lateral lobes, 4–9 mm wide; petiole winged 17. *C. repens*
 - 31b. Terminal lobe of cauline leaves filiform to narrowly linear, not decurrent with distal pair of lateral lobes, 0.5–1.5(–2) mm wide; petiole slender, wingless 18. *C. granulifera*
- 30b. Cauline leaves compound; terminal lobe oblong, elliptic, or obovate, petiolulate.
 - 32a. Cauline leaves with 1(or 2) pairs of lateral leaflets; axils of cauline leaves with bulbils; filaments of median stamens 0.7–1.1 mm wide, extended into an apical tooth . 15. *C. pulchella*
 - 32b. Cauline leaves with (2 or)3–6 pairs of lateral leaflets; axils of cauline leaves without bulbils; filaments of median stamens narrower, toothless.
 - 33a. Terminal leaflet oblong or oblong-elliptic, entire; petals white or rarely lavender, 7–9 mm 14. *C. franchetiana*
 - 33b. Terminal leaflet orbicular, obovate, or oblanceolate, often lobed, trifid, or subapically toothed; petals purple with darker veins, 8–12(–14) mm 19. *C. loxostemonoides*
- 28b. Rhizomes without bulbils or tubers; stem stout at attachment to rhizome, if slender then at least some leaflets more than 1 cm wide.
 - 34a. Terminal leaflet or ultimate segments of upper cauline leaves filiform, linear, linear-lanceolate, or narrowly oblanceolate, to 2 mm wide.
 - 35a. At least some leaf segments bifid or trifid into linear segments 44. *C. caroides*
 - 35b. Leaf segments entire or dentate, never deeply cleft.
 - 36a. Cauline leaves with 4–7(–13) lateral lobes or leaflets on each side of rachis; petals purple or lavender; stems and rachis not flexuous.
 - 37a. Rhizomes stoloniferous; median staminal filaments 4–5 mm; ovules 10–16; fruit to 2.5 cm 24. *C. purpurascens*
 - 37b. Rhizomes not stoloniferous; median staminal filaments 5–10 mm; ovules 20–30; fruit often longer 10. *C. pratensis*
 - 36b. Cauline leaves with 1–3 lateral lobes or leaflets on each side of rachis; petals white; stems and rachis flexuous.
 - 38a. Petals 5–6 mm; fruiting pedicels 8–14 mm, divaricate, recurved 20. *C. stenoloba*
 - 38b. Petals 6.5–9 mm; fruiting pedicels (8–)10–25(–30) mm, erect or ascending, straight 21. *C. simplex*
 - 34b. Terminal leaflet of upper cauline leaves variously-shaped but never filiform, linear, linear-lanceolate, or narrowly lanceolate, more than 2 mm wide.
 - 39a. Cauline leaves with 4–13 lateral leaflets or lobes on each side of rachis.
 - 40a. Terminal leaflet of cauline leaves more than 1 cm; seeds (1.5–)2–3(–4) mm 1. *C. macrophylla*
 - 40b. Terminal leaflet of cauline leaves 0.2–0.8(–1) cm; seeds 1.2–2.1 mm.
 - 41a. Rhizomes thickened, not elongated; lateral leaflets of cauline leaves symmetric, base cuneate; median staminal filaments 5–10 mm 10. *C. pratensis*
 - 41b. Rhizomes slender, elongated; lateral leaflets of cauline leaves strongly asymmetric, base oblique; median staminal filament 3.5–5.
 - 42a. Flowers white; at least some lateral leaflets of lower and middle cauline leaves deeply 3–5-toothed or -lobed along abaxial margin 23. *C. rockii*
 - 42b. Flowers purple or lavender, or white; lateral leaflets entire, repand, or 1(or 2)-toothed along abaxial margin 25. *C. microzyga*
 - 39b. Cauline leaves with 1–3 lateral leaflets or lobes on each side of rachis.
 - 43a. Leaf blade or terminal leaf lobe of rhizomal, basal, and lowermost cauline leaves reniform, suborbicular, orbicular, or rarely broadly cordate, palmately veined.

- 44a. Stems strongly flexuous; terminal leaflet of upper cauline leaves linear or narrowly oblong; fruit valves torulose 16. *C. delavayi*
- 44b. Stems not flexuous; terminal leaflet of upper cauline leaves obovate, suborbicular, subreniform, or ovate-suborbicular; fruit valves smooth.
- 45a. Rhizomes not stoloniferous; ovules or seeds 24–30 per fruit; margin of upper leaves or leaflets crenate or repand-crenate 36. *C. anhuiensis*
- 45b. Rhizomes stoloniferous; ovules or seeds 10–14 per fruit; margin of upper leaves or leaflets entire, repand, dentate, or rarely slightly lobed.
- 46a. Stems pilose; petals 6–9 mm; sepals 3–4 mm; terminal leaflet of cauline leaves obovate 35. *C. calcicola*
- 46b. Stems glabrous or puberulent; petals 5–6 mm; sepals 2–2.5 mm; terminal leaflet of cauline leaves suborbicular, reniform, or ovate-suborbicular 37. *C. hydrocotyloides*
- 43b. Leaf blade or terminal leaf lobe of rhizomal, basal, and lowermost cauline leaves oblong, elliptic, obovate, or lanceolate, pinnately veined.
- 47a. Terminal leaf lobe rarely to 1.2 cm, broadly obovate 22. *C. trifoliolata*
- 47b. Terminal leaf lobe considerably larger, variously-shaped by never broadly obovate.
- 48a. Cauline leaves trifoliolate, uppermost sometimes simple.
- 49a. Plants (35–)50–100(–130) cm tall; cauline leaves (5–)7–10(–15); petals purple, lavender, pink, or rarely white 5. *C. fragariifolia*
- 49b. Plants 15–40 cm tall; cauline leaves 1–4; petals white 40. *C. paucifolia*
- 48b. Cauline leaves 5–23-foliolate, rarely uppermost trifoliolate.
- 50a. Rhizomes stoloniferous; petals white; leaflet apex of cauline leaves obtuse 9. *C. prorepens*
- 50b. Rhizomes not stoloniferous; petals purple or lavender, if white then 6–8 mm; leaflet apex acuminate or acute.
- 51a. Flowers white; stems flexuous; terminal leaflet of cauline leaves petiolulate, apex caudate-acuminate, acuminate, or rarely acute 3. *C. leucantha*
- 51b. Flowers deep purple or lavender; stems straight or rarely subflexuous; terminal leaflet of cauline leaves sessile or rarely petiolulate, apex acute or acuminate.
- 52a. Cauline leaves 1–3(–5); plants (8–)15–30(–40) cm tall; rhizomes sparsely scaly; lateral leaflets of cauline leaves not decurrent 2. *C. tangutorum*
- 52b. Cauline leaves 3–12(–18); plants (20–)30–95(–115) cm tall; rhizomes usually not scaly; at least the distal pair of lateral leaflets of cauline leaves decurrent at base, rarely all cuneate 1. *C. macrophylla*

1. *Cardamine macrophylla* Willdenow, Sp. Pl. 3: 484. 1800.
大叶碎米荠 da ye sui mi qi

Cardamine macrophylla var. *crenata* Trautvetter; *C. macrophylla* var. *dentariifolia* J. D. Hooker & T. Anderson; *C. macrophylla* var. *diplodonta* T. Y. Cheo; *C. macrophylla* var. *foliosa* J. D. Hooker & T. Anderson; *C. macrophylla* var. *lobata* J. D. Hooker & T. Anderson; *C. macrophylla* var. *moupinensis* Franchet; *C. macrophylla* subsp. *polyphylla* (D. Don) O. E. Schulz; *C. macrophylla* var. *polyphylla* (D. Don) T. Y. Cheo & R. C. Fang; *C. macrophylla* var. *sikkimensis* J. D. Hooker & T. Anderson; *C. polyphylla* D. Don (1825), not O. E. Schulz (1903); *C. sachalinensis* Miyabe & Miyake; *C. sinomanshurica* (Kitagawa) Kitagawa; *C. urbaniana* O. E. Schulz; *Dentaria gmelinii* Tausch; *D. macrophylla* (Willdenow)

Bunge ex Maximowicz; *D. sinomanshurica* Kitagawa; *D. wallichii* G. Don; *D. willdenowii* Tausch.
Herbs perennial, (20–)30–95(–115) cm tall. Rhizomes creeping, not scaly, slender or stout and with tuberous knots, 2–10(–30) mm in diam., not stoloniferous. Stems stout or slender, erect, simple or rarely branched above, glabrous, hirsute, or pilose. Rhizomal leaves (4–)10–40(–50) cm; petiole (1–)3–20(–25) cm; terminal leaflet lanceolate, elliptic, oblong, ovate, or obovate, (1–)2–15(–25) × (0.5–)1–3.5(–5) cm, sessile or petiolulate, base cuneate, margin serrate, crenate, dentate, or rarely 3–5-lobed, apex acuminate, acute, or subobtuse; lateral leaflets (1 or)2–6 pairs, similar to terminal but smaller. Cauline leaves 3–12(–18); petiole (1–)2–5(–6.5) cm, not auriculate at base; terminal leaflet narrowly ovate, lanceolate, elliptic, or oblong, rarely obovate or

lanceolate-linear, (2–)4–12(–20) × 1–4(–5) cm, glabrous or pubescent, sessile or on a petiolule to 1 cm, base cuneate, margin ciliolate and crenate, serrate, or serrulate, rarely subentire or doubly serrate, apex acute, rarely acuminate; lateral leaflets 2–7(–11) pairs, sessile or petiolulate, base cuneate or obliquely decurrent, similar to but slightly smaller than terminal leaflet. Racemes 10–30-flowered. Fruiting pedicels ascending or rarely divaricate, (0.3–)0.8–2.5(–3.1) cm, straight, stout. Sepals oblong, 3.5–6.5(–8) × 1.5–3 mm. Petals purple or lilac, obovate or spatulate, (0.8–)1–1.7 cm × 3.5–8 mm, apex rounded or rarely subemarginate. Median filament pairs 7–9(–11) mm, lateral pair 6–7 mm; anthers oblong, 1–2(–2.5) mm. Ovules 8–12(–16) per ovary. Fruit linear, (2.2–)2.5–6(–7) cm × 1.5–2.5 (–3) mm; gynophore 0.5–3 mm; valves smooth, sparsely pubescent or glabrous; style (1–)2–6.5(–9) mm. Seeds brown, ovoid or oblong, (1.5–)2–3(–4) × 1–1.7(–2) mm. Fl. (Mar–) Apr–Oct, fr. May–Oct. $2n = 64, 80, 96$.

Damp forests, river banks, tundra, rock crevices, meadows, damp woodlands, thickets, streamsides, valleys, ravines, mountain slopes, among boulders; 500–4200 m. Anhui, Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, Kashmir, Kazakstan, Mongolia, Nepal, Pakistan, Russia, Sikkim].

The above first records from Anhui, Henan, Hunan, and Jiangxi are based on Yao 8927 (A), Boufford *et al.* 26199 (A, MO), Handel-Mazzetti (E, W, WU), and Tan Ceming 9604090 (MO), respectively. *Cardamine macrophylla* is highly variable, especially in leaflet number, shape, size, base, and margin. An examination of several hundred specimens from the entire range of the species reveals that only a small number of the variants has been recognized formally in China, that the variation does not show any correlation among characters and/or geography, that some of the variants (on which varieties are based) occur within the same population, and that a thorough study at the population level is needed before the species is divided into infraspecific taxa. For example, leaflet number, in which var. *polyphylla* is said to have four or more pairs, is quite variable, though a maximum of seven pairs (e.g., Yü 22173, at A) was found in China, whereas serrate, serrulate, and doubly serrate leaflets were observed in one population (Al-Shehbaz *et al.* 9312, B, BM, E, G, K, MO). Serrate and doubly serrate leaflets also occur sporadically in *C. leucantha* and *C. tangutorum*.

Syntypes of *Cardamine urbaniana* represent robust plants with thick rhizomes and very large leaves. Schulz (Bot. Jahrb. Syst. 32: 280–623. 1903) separated the species from *C. macrophylla* primarily on the basis of its having thick rhizomes and sessile terminal leaflets. However, these two characters, as well as the cuneate vs. decurrent base of the lateral leaflets, do not correlate, and one finds various combinations of them in populations from Bhutan, China, Nepal, and Sikkim. *Cardamine urbaniana* is here lectotypified on Henry 5635 (lectotype, GH; isolectotypes, G, K, US). The isolectotype at K has leaflets ca. 20 × 5 cm, which is the largest examined in the Brassicaceae.

Cardamine macrophylla is used medicinally, and the young parts are eaten as a vegetable.

2. *Cardamine tangutorum* O. E. Schulz, Bot. Jahrb. Syst. 32: 360. 1903.

唐古碎米荠 tang gu sui mi qi

Herbs perennial, (8–)15–30(–40) cm tall. Rhizomes creeping, sparsely scaly, not stoloniferous. Stems simple, erect, strongly curved at base, glabrous throughout or sparsely pilose distally. Rhizomal leaves 7–16(–22) cm; petiole 3.5–8(–12) cm; terminal leaflet oblong, oblong-lanceolate, or elliptic, (2–)3–5 (–6) × 0.7–1.2(–2) cm, sessile, base cuneate, margin serrate and ciliolate, apex acute to subobtusate; lateral leaflets 3–5(or 6) pairs, not decurrent at base. Cauline leaves 1–3(–5), (3–)5–10 (–13) cm, subleathery; petiole (0.5–)1–2.5(–4) cm, not auriculate at base; terminal leaflet oblong, 2–4 cm × 3–10(–15) mm, subsessile, glabrous or rarely sparsely pilose, base cuneate, margin ciliolate and serrate, rarely subentire or doubly serrate, apex acute or acuminate; lateral leaflets 2–4 pairs, similar to terminal but slightly smaller, not decurrent at base. Racemes 10–15-flowered. Fruiting pedicels ascending or divaricate, (0.7–)1–1.5 cm, straight, slender. Sepals oblong, 4–5 × (1–)1.5–2 mm, base of lateral pair saccate. Petals purple, spatulate, 0.8–1.4 cm × (2–)3–5 mm, base not clawed, apex rounded. Median filament pairs 6–8 mm, lateral pair 5–6 mm; anthers oblong, 1.2–2 mm. Ovules 10–14 per ovary. Fruit linear, 3.5–4.5 cm × 2–3 mm; gynophore to 2.5 mm; valves smooth, glabrous; style 2–4 mm. Seeds brown, ovate or suborbicular, 2–2.8 × 1.5–1.8 mm. Fl. May–Jul, fr. Jun–Aug. $2n = 42^*$.

• Montane ditches, swampy meadows, river basins, woodlands; 1300–4400 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.

Although Schulz placed *Cardamine tangutorum* in a section different from that of *C. macrophylla*, the two species, if indeed distinct, are very closely related and are often difficult to separate. The separation in the key above is tenuous, and a critical study of the complex might prove that the two are conspecific.

This species is used medicinally and eaten as a vegetable.

3. *Cardamine leucantha* (Tausch) O. E. Schulz, Bot. Jahrb. Syst. 32: 403. 1903.

白花碎米荠 bai hua sui mi qi

Dentaria leucantha Tausch, Flora 19: 404. 1836; *Cardamine cathayensis* Migo; *C. dasyloba* (Turczaninow) Miquel; *C. leucantha* var. *crenata* D. C. Zhang; *C. macrophylla* Willdenow var. *parviflora* Trautvetter; *D. dasyloba* Turczaninow; *D. macrophylla* (Willdenow) Bunge ex Maximowicz var. *dasyloba* (Turczaninow) Makino.

Herbs perennial, 25–75 cm tall, sparsely to densely villous. Rhizomes creeping, slender, not scaly or stoloniferous. Stems simple, flexuous. Cauline leaves 4–7, including petiole (8–)10–20(–25) cm; petiole (1–)2–8(–10) cm, not auriculate at base; terminal leaflet lanceolate, elliptic, to ovate-elliptic, (3–)4–9(–13) × (0.6–)1–3.5(–4) cm, adaxially shortly strigose or puberulent, abaxially pilose or long strigose, with a petiolule 5–13(–20) mm, base cuneate, margin antorsely ciliate and irregularly serrate, doubly serrate,

or subdentate, apex acuminate or rarely acute; lateral leaflets 2 or 3 pairs, rarely uppermost leaf trifoliolate, similar to terminal one, smaller, sessile, base cuneate or sometimes oblique. Racemes 12–24-flowered. Fruiting pedicels divaricate or ascending, (0.5–)1–1.8(–2.3) cm, pilose or puberulent, slender. Sepals oblong, (2–)2.5–3.5 × 0.9–1.5 mm, margin membranous, pilose abaxially. Petals white, spatulate to oblong-ob lanceolate, 6–8 × 2–3.5(–4) mm, cuneate and not clawed at base, apex rounded. Median filament pairs 5–6 mm, lateral pair 4–5 mm; anther oblong, 0.8–1.3 mm. Ovules 6–12 per ovary. Fruit linear, (1–)1.5–3 cm × 1–1.5 mm; gynophore 0.3–0.8(–1) mm; valves smooth, sparsely hairy or glabrous; style slender, (2–)3–5 mm. Seeds brown, oblong, 1.5–2.2 × 0.8–1.2 mm, narrowly winged or wingless. Fl. Apr–Jul, fr. May–Aug. $2n = 16$.

Roadsides, shady areas, forests, wet places along streams, roadsides; 100–2000 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi, Sichuan, Zhejiang [Japan, Korea, Mongolia, Russia].

The above first record from Sichuan is based on *Henry 5572* (GH, K, P, US).

Dried plants are used as a tea substitute, the rhizomes are medicinal, and seedlings are edible.

4. *Cardamine cheotaiyenii* Al-Shehbaz & G. Yang, *Harvard Pap. Bot.* 3(1): 73. 1998.

周氏碎米荠 *zhou shi sui mi qi*

Hilliella alatipes (Handel-Mazzetti) Y. H. Zhang & H. W. Li var. *macrantha* Y. H. Zhang.

Herbs perennial, scapose. Rhizomes ca. 5 mm in diam., with prominent petiolar scars. Rhizomal leaves 2, trifoliolate; petiole 5–30 cm, glabrous; leaflets ovate, 7–18 × 4–5 cm, adaxially glabrous, abaxially sparsely hirsute with thick trichomes 0.5–0.8 mm, base of terminal leaflet cuneate, that of lateral ones oblique, margin repand to repand-crenate, sparsely ciliate with trichomes 0.1–0.2 mm, apex obtuse or acute; lateral veins ending with mucros 0.3–0.5 mm; petiolule of terminal leaflet 0.6–1.5 cm, that of lateral leaflets 2–6 mm; cauline leaves absent. Scapes 15–30 cm, glabrous, leafless. Racemes few flowered, ebracteate, corymbose. Flowering pedicels slender, 2–3.5 cm, glabrous. Sepals ascending, oblong, 5–6 × 2.5–3.5 mm, erect, slightly saccate at base, glabrous. Petals white, oblong, 1.5–1.7 cm × 5–8 mm, erect, apex rounded; claw 1–2 mm. Filaments white, erect, median pairs 6–7 mm, lateral pair 5–5.5 mm; anthers oblong, ca. 2 mm. Ovary narrowly linear, glabrous. Fruit and seeds unknown. Fl. Feb.

• About 1000 m. SE Yunnan (Malipo Xian).

A very distinct species at present known only from the type collection, *C. W. Wang 86836* (holotype, KUN; isotype, IBSC).

5. *Cardamine fragariifolia* O. E. Schulz, *Bot. Jahrb. Syst.* 32: 446. 1903.

莓叶碎米荠 *mei ye sui mi qi*

Cardamine scoriarum W. W. Smith; *C. smithiana* Biswas; *Cochlearia alatipes* Handel-Mazzetti; *Cochlearia scoriarum* (W. W. Smith) Handel-Mazzetti; *Hilliella alatipes* (Handel-Mazzetti) Y. H. Zhang & H. W. Li; *Yinshania alatipes* (Handel-Mazzetti) Y. Z. Zhao.

Herbs perennial, (35–)50–100(–130) cm tall. Rhizomes 3–8 mm in diam. Stems erect, simple or branched above, glabrous or rarely puberulent. Basal leaves withered by flowering. Cauline leaves (5–)7–10(–15), petiolate, trifoliolate, rarely lowermost with 4 or 5 leaflets, often simple below raceme; petiole 1–6(–10) cm, not auriculate at base, wingless or wing rarely to 1 mm wide; petiolules 1–6(–11) mm; leaflets subequal or terminal larger, ovate or lanceolate, rarely elliptic or subrhomboid, (1.5–)3–8(–12) × (1–)2–3(–5) cm, glabrous or with appressed, antrorse, simple trichomes 0.1–0.7 mm, base cuneate or obtuse, that of lateral leaflets often oblique, margin serrate or crenate, rarely lobed or subentire, ciliate with trichomes more than 0.1 mm, teeth mucronate, apex acute, acuminate, or acuminate-caudate. Fruiting pedicels divaricate, 5–9(–13) mm, slender, straight, glabrous or sparsely puberulent. Sepals oblong, 2.5–3.5(–4) × 1.5–2 mm, erect or ascending, not saccate, glabrous. Petals purple, lavender, pink, or rarely white, obovate or obovate-oblong, (6–)7–9(–10) × (2.5–)3–4 mm, rounded at apex; claw 1.5–2(–3) mm. Median filament pairs 4–5 mm, lateral pair 3–4 mm; anthers (0.6–)0.7–1 mm. Pistil glabrous; style slender, ca. 1 mm; stigma entire. Fruit and not seen. Fl. May–Jul.

Volcanic mountain slopes, shaded streamsides, wet forests, rocky places, moist grasslands; 1000–3000 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar].

The above first record from Myanmar is based on *Maw Mu Pa 17432* (K).

Records of *Cardamine trifoliolata* J. D. Hooker & Thomson in FRPS, Fl. Sichuan. (14: 89. 1999), Fl. Xizang. (2: 360. 1985), and Fl. Yunnan. (6: 58. 1995) are all based on misidentified plants of *C. fragariifolia*. The former species, which also occurs in China (see below), is readily distinguished by being a slender plant, 5–20(–30) cm tall, with white flowers, few cauline leaves, and a repand or obtusely lobed terminal leaflet 0.5–1(–1.5) cm. By contrast, *C.*

fragariifolia is a robust plant, (35–)50–100(–130) cm tall, with purple, lavender, or pink (rarely white) flowers, (5–)7–10(–15) cauline leaves, and a serrate to crenate terminal leaflet (1.5–)3–8(–12) cm.

6. *Cardamine bodinieri* (H. Léveillé) Lauener, *Notes Roy. Bot. Gard. Edinburgh* 26: 336. 1965.

博氏碎米荠 *bo shi sui mi qi*

Dentaria bodinieri H. Léveillé, *Repert. Spec. Nov. Regni Veg.* 8: 452. 1910.

Herbs perennial, ca. 60 cm tall, rhizomatous. Stems erect, simple or branched above, glabrous except for leaves. Basal leaves withered by flowering. Cauline leaves 5–8, simple, deeply 3-lobed; petiole 0.5–5 cm, with a broad wing 2–6 mm wide and extending along

entire length, base amplexicaul; auricles broadly oblong or ovate, to 6 × 4 mm; terminal leaf lobe ovate to ovate-lanceolate, 4–8 × 2–4 cm, sparsely hirsute with stout trichomes to 0.4 mm, sessile and base decurrent with lateral lobes, margin serrate-crenate, ciliolate with trichomes less than 0.1 mm, teeth mucronate, apex acute or acuminate; lateral lobes similar to terminal but smaller. Fruiting pedicels divaricate-ascending, 5–10 mm, straight, glabrous. Sepals ovate-oblong, 2–3 × ca. 1.5 mm, glabrous, lateral pair subsaccate. Petals purple, obovate, ca. 7 × 3 mm, not clawed. Median filaments pairs 2.5–3 mm, lateral pair 1.5–2 mm; anthers ca. 0.6 mm. Ovules 8–12 per ovary. Fruit linear, 0.8–1.2 cm × 1–1.2 mm; gynophore ca. 0.5 mm; valves glabrous, smooth; style 0.5–2 mm. Seeds dark brown, oblong, 1.3–1.7 × 0.7–0.9 mm, wingless. Fl. May, fr. Jul.

• About 1100 m. Guizhou.

Although the type of *Cardamine bodinieri* was collected from Guizhou (“Kouy-Yang” (Guiyang), May 1910, *Bodinier s.n.* (holotype, E)), the species was not mentioned in FRPS or in Fl. Guizhou. (vol. 7. 1989). The above record from Guizhou is also based on C. Z. Dang & P. Dang 335 (PE).

Cardamine bodinieri is related to *C. fragariifolia*, from which it differs by having 3-lobed, simple leaves (vs. trifoliolate, compound leaves with distinctly petiolulate leaflets), a broadly winged (vs. slender or narrowly winged) petiole, an amplexicaul (vs. entire) petiolar base, and petals without (vs. with) well-developed claws.

7. *Cardamine multiflora* T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 21. 1980.

多花碎米荠 duo hua sui mi qi

Herbs perennial, 35–75 cm tall. Rhizomes stout. Stems erect, angled, sparsely pilose, lower nodes sometimes producing stolons to 60 cm, branched above middle. Basal leaves withered by anthesis. Middle cauline leaves pinnatisect; petiole (0.5–)1–3 cm, ciliate, gradually winged from apex to a much broader, auriculate or amplexicaul base; auricles oblong or ovate, (1.5–) 2.5–10(–13) × 1–3(–5) mm, ciliate; terminal lobe broadly obovate or obovate-oblong, (0.5–)1–4.5(–6) × (0.6–)1–2.5(–3) cm, pilose, subsessile or with a petiolule 2–12 mm, base cuneate and often decurrent with adjacent lateral lobes, margin crenate, apex obtuse to subacute; lateral lobes 1–4 on each side of rachis, similar to terminal lobe but smaller. Uppermost leaves and stolon leaves trifid, with oblanceolate or narrowly obovate terminal lobe decurrent with narrower and smaller lateral lobes; petiole rarely to 1 cm; auricles rarely to 2 mm or reduced to a tooth. Racemes many flowered, in panicles. Fruiting pedicels divaricate or ascending, 1–2.5 cm, glabrous, straight. Sepals ovate or oblong, 2–3 × 1–1.5 mm, glabrous, lateral pair subsaccate. Petals purple, spatulate, 6–8 × 2.5–3.5 mm, apex rounded. Median filament pairs 3.5–5 mm, lateral pair 2.5–3.5 mm; anthers oblong, 0.9–1.3 mm. Ovules 12–16 per ovary. Fruit linear, 1–2 cm × 1.2–1.5 mm; valves smooth, glabrous; style 1–3 mm. Seeds brown,

oblong, 1.5–1.7 × 0.8–1 mm, wingless. Fl. May–Jul, fr. Jul–Aug.

• Mountain slopes, damp places, forests; 2100–3700 m. Sichuan, Yunnan.

8. *Cardamine violacea* (D. Don) Wallich ex J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 144. 1861.

堇色碎米荠 jin se sui mi qi

Erysimum violaceum D. Don, Prodr. Fl. Nepal. 202. 1825; *Cardamine violacea* subsp. *bhutanica* Grierson.

Herbs perennial, 20–100 cm tall, shortly pilose or subglabrous. Rhizomes stout, to 1 cm in diam. Stems erect, simple, stout, glabrous. Basal leaves not seen. Middle cauline leaves sessile, strongly auriculate, sagittate, or amplexicaul at base; blade lanceolate, linear-lanceolate, or ovate-lanceolate, 3.5–20 × 0.7–3.5 cm, abaxially glabrous, adaxially puberulent or subpilose, margin ciliolate and dentate, denticulate, or entire, apex acuminate or caudate; auricles oblong or ovate, 2–10 × 2–7 mm. Racemes 5–25-flowered. Flowering pedicels spreading or reflexed; fruiting pedicels divaricate or ascending, 0.8–3 cm, glabrous, straight. Sepals oblong 5–7 × 1.5–3 mm, glabrous or sparsely pilose, base of lateral pair saccae. Petals purple, spatulate or obovate, 1–1.7 cm × 4.5–7 mm. Median filament pairs 7–9 mm, lateral pair 6–7 mm; anthers oblong, 1.5–2 mm. Ovules 10–16 per ovary. Fruit linear, 2–6 cm × 1.4–2.5 mm; gynophore 0.5–1 mm; valves smooth, glabrous; style 3–8 mm. Seeds brown, oblong, 2–3 × 1.4–1.8 mm, wingless. Fl. May–Aug, fr. Jul–Sep.

Grassy slopes, streamsides, open forests, pastures, thickets, roadside banks, sandy moist forests, forest ravines; 1800–4000 m. Yunnan [Bhutan, Nepal, Sikkim].

9. *Cardamine prorepens* Fischer ex de Candolle, Syst. Nat. 2: 256. 1821.

浮水碎米荠 fu shui sui mi qi

Cardamine borealis Andrzejowski ex de Candolle; *C. pilosa* Willdenow; *C. pratensis* Linnaeus var. *prorepens* (Fischer ex de Candolle) Maximowicz; *C. pubescens* Steven.

Herbs perennial, 15–50(–60) cm tall, glabrous or pubescent. Rhizomes prostrate, stoloniferous. Stems stout, erect or decumbent, simple, glabrous or pubescent, 2–5(–8)-leaved. Rhizomal leaves 3–11-foliolate, 2–12 cm; petiole (0.5–)1.5–8(–10) cm; terminal leaflet ovate, oblong, or narrowly obovate, 0.5–2(–3) cm × 4–13(–20) mm, with a petiolule 2–10 mm, margin crenate or repand; lateral leaflets 1–5 pairs, often sessile, similar to terminal ones but smaller. Cauline leaves 3–5-foliolate, often glabrous; petiole to 7 cm, not auriculate at base; terminal leaflet elliptic, oblong, or rhomboid, 1–3.5(–5) × 0.5–1.8(–2.5) cm, with a petiolule to 2.5 cm, base cuneate or obtuse, margin remotely crenate, dentate, or repand, apex obtuse; lateral lobes obliquely ovate or oblong, sessile or shortly petiolulate, similar to

terminal one. Racemes 5–15-flowered. Fruiting pedicels 0.5–3 cm. Sepals ovate, 3–4.5 × 1–2 mm. Petals white, narrowly obovate, 0.9–1.5 cm × 5–7 mm, base cuneate, apex rounded or submarginate. Median filament pairs 5–7 mm, lateral pair 3–5.5 mm; anthers oblong, 1–1.8 mm. Ovules 12–16 per ovary. Fruit linear, 1.5–4 cm × 1.5–2 mm; valves flat, glabrous or pilose; style slender, 2–4 mm. Seeds brown, ovate or suboblong, 1.5–2.2 × 1–1.6 mm, wingless. Fl. May–Jul, fr. Jul–Aug.

River or streamsides, meadows; 1000–1700 m. Heilongjiang, Jilin, Nei Mongol [Korea, Mongolia, Russia].

10. *Cardamine pratensis* Linnaeus, Sp. Pl. 2: 656. 1753.

草甸碎米荠 *cao dian sui mi qi*

Herbs perennial, (8–)15–55(–80) cm tall, glabrous or rarely sparsely pilose basally. Rhizomes tuberous, to 5 mm in diam., without stolons. Stems erect, simple, 2–12(–18)-leaved. Rhizomal leaves to 30 cm; petiole (1–)2–7(–10) cm; terminal leaflet orbicular or broadly obovate, 0.3–2 cm in diam., with a petiolule to 1.5 cm, base rounded, rarely subreniform or cuneate, margin repand, apex rounded; lateral leaflets (0 or)2–8(–15) on each side of rachis, about as large as or smaller than terminal leaflet, orbicular, ovate, or obovate, petiolulate or sessile, margin crenate or repand. Cauline leaves including petiole 2–17 cm, pinnatisect, glabrous; petiole base not auriculate; terminal lobe linear, oblong, ovate, or lanceolate, 1–2.5(–3.5) cm × 5–8(–10) mm, petiolulate or sessile; lateral lobes 4–7(–13) on each side of rachis, similar to terminal lobe, base petiolulate or sessile and decurrent, margin entire or rarely dentate. Fruiting pedicels erect-ascending or subdivaricate, (0.5–)1.2–2.5(–3) cm, slender. Sepals oblong or ovate, (2.5–)3–5(–6) × 1–2 mm, erect or spreading, base saccate, margin membranous. Petals purple or lilac, rarely white, obovate, (0.6–)0.8–1.5(–1.8) cm × 3–7.5(–10) mm, clawed, apex rounded or emarginate. Median filament pairs 5–10 mm, lateral pair 3–6 mm; anthers narrowly oblong, (0.8–)1.2–2 mm. Ovules 20–30 per ovary. Fruit linear, (1.6–)2.5–4.5(–5) cm × (1.2–)1.5–2.3 mm; valves glabrous; style (0.5–)1–2.2(–2.7) mm, stout. Seeds light brown, oblong, 1.2–1.8(–2) × 1–1.4 mm. Fl. May–Jul, fr. Jun–Aug. $2n = 16, 24, 28–34, 38–44, 48, 56, 96$.

Moist grasslands, river or streamsides. Heilongjiang, Nei Mongol, Xinjiang, W Xizang [Japan, Kazakstan, Korea, Mongolia, Russia; Europe, North America].

11. *Cardamine trifida* (Lamarck ex Poiret) B. M. G. Jones, Feddes Repert. Spec. Nov. Regni Veg. 69: 57. 1964.

细叶碎米荠 *xi ye sui mi qi*

Dentaria trifida Lamarck ex Poiret, Encycl. Suppl. 2: 465. 1812; *Cardamine schulziana* Baehni; *C. tenuifolia* (Ledebour) Turczaninow (1842), not Hooker (1834); *D. alaunica* Golitsin; *D. tenuifolia* Ledebour; *Sphaerotorrhiza trifida* (Lamarck ex Poiret) Khokhrjakov.

Herbs perennial, (7–)12–30 cm tall. Rhizomes short, with many, slender petioles 0.5–10 cm that terminate into tubers; tubers fleshy, whitish, representing modified leaf blades, globose, ovoid, or subreniform, to 7 mm, sometimes slightly flattened and 3–7-toothed. Stems erect, simple, glabrous. Rhizomal leaves ternate, biternate, or palmately 5-foliolate; petiole 3–15 cm; terminal leaflet lanceolate, broadly ovate, or suborbicular in outline, to 2 × 1.3 cm, with a petiolule to 6 mm, base cuneate, margin crenate or dissected into 3 sublanceolate or ovate lobes, base cuneate or subcordate. Cauline leaves 1–3, sometimes 2 and subopposite, often restricted to distal 1/3 of stem, minutely scabrid at least along margin with trichomes to 0.1 mm, rarely also pilose with trichomes to 0.4 mm; petiole 0.4–2 cm; terminal leaflet linear or narrowly lanceolate, 0.5–5 cm × 1–6 mm, base cuneate or attenuate, margin entire or 3-toothed or -lobed, apex acute and mucronate; lateral leaflets 1 or 2 pairs, similar to terminal one or entire. Racemes 5–20-flowered. Fruiting pedicels ascending, 0.7–1.3 cm. Sepals oblong, 3.5–5 × 1.5–2 mm, glabrous. Petals purple or pink, rarely white, obovate or spatulate, 8–11(–14) × 3.5–5 mm, apex rounded. Median filament pairs 4–6 mm, slender; lateral pair 3.5–4.5 mm; anthers narrowly oblong 1.1–1.5 mm. Ovules 10–16 per ovary. Fruit linear, 2–3.5 cm × 1.2–1.6 mm; valves glabrous; style 1.5–4 mm. Seeds brown, oblong, 1–1.3 × 0.8–1 mm. Fl. May–Jun, fr. Jun–Jul. $2n = 32, 48$.

Moist meadows or slopes, shady places, forests, among shrubs. Heilongjiang, Jilin, Nei Mongol [Japan, Kazakstan, Korea, Mongolia, Russia (Far East, Siberia)].

12. *Cardamine fargesiana* Al-Shehbaz, Novon 10: 324. 2000.

法氏碎米荠 *fa shi sui mi qi*

Herbs perennial, 8–23 cm tall. Rhizomes ovoid or oblong, 2–5 × 1.5–2 mm. Stolons slender, densely pilose with crisped trichomes. Stems simple, erect, densely crisped pilose at base, gradually sparser upward, completely glabrous at raceme. Basal leaves 1–4 per plant, simple or rarely with a pair of leafletlike lobes; petiole 0.5–4.5 cm, densely crisped pilose; leaf blade orbicular, 5–12 mm in diam., palmately 5-veined, abaxially glabrous or sparsely pilose along proximal portion of veins, adaxially pilose with simple, straight trichomes to 0.5 mm, base cordate, margin entire or obscurely 5-angled, mucronate at vein tips. Cauline leaves 3–5, 0.9–2.2 × 0.7–1.5 cm, broadly ovate or oblong in outline, pinnatisect, abaxially glabrous, adaxially pilose; petiole absent and leaf base appearing auriculate; rachis 2–15 mm; terminal lobe of lowermost leaf obovate, 4–14 × 2–6 mm, apically 3-toothed, sometimes with a minute tooth subbasally on each side, base cuneate into a petiolule to 3 mm, margin entire, apex mucronate; lateral lobes 4–6, linear to lanceolate-linear, margin entire, apex acute, proximal 2–4 attached at one point on each side of rachis. Racemes 3–7-flowered. Flowering pedicels ascending, 5–12 mm,

straight, glabrous. Sepals ovate, 2.5–3 × 1.2–1.6 mm, glabrous, margin and apex membranous, lateral pair saccate. Petals white, broadly obovate, 5–6 × 2.5–3 mm, apex rounded. Median filament pairs 3–3.5 mm, slender, lateral pair 2–2.5 mm; anthers oblong, 0.8–1.1 mm, base sagittate. Pistil glabrous; style 1–1.5 mm; stigma entire. Fruit and seeds not seen.

• NE Sichuan (Chengkou Xian).

Known only from the type collection, *R. P. Farges 1341 bis* (P), said to have been collected in “Tchen-kéou-tin” (Chengkou) but no date or exact locality were given.

13. *Cardamine scaposa* Franchet, Pl. David. 1: 33. 1883.

裸茎碎米荠 *luo jing sui mi qi*

Cardamine denudata O. E. Schulz.

Herbs perennial, (4–)8–18 cm tall, scapose, glabrous throughout. Rhizomes slender, with slender stolons. Stems leafless, erect, simple. Rhizomal leaves simple; petiole (1–)2–9 (–12) cm; leaf blade reniform or suborbicular, (0.3–)0.6–1.7 (–2) × (0.5–)1–2.5 (–3) cm, base cordate, margin repand-crenate or entire. Cauline leaves absent. Racemes terminal, 2–7 (–10)-flowered. Fruiting pedicels erect or erect-ascending, 1–4 cm, proximal longest. Sepals ovate or oblong, 3–4 × 1.5–2.2 mm, margin membranous, lateral pair subsaccate. Petals white, broadly obovate, (0.8–)0.9–1.3 cm × 5–7 mm, cuneate into a clawlike base to 2 mm, apex rounded or subemarginate. Median filament pairs 4.5–8 mm, slightly dilated at base; lateral pair 2.5–4.5 mm; anthers narrowly oblong, 1.5–1.8 mm. Ovules 8–14 per ovary. Fruit linear, 2–3.5 cm × 1.2–1.7 mm; valves glabrous, smooth; style 3–7.5 mm. Seeds brown, oblong, 2–3 × 1–1.5 mm, wingless. Fl. Apr–Jun, fr. Jun–Jul.

• Shrubby slopes, moist areas; 1400–2500 m. Hebei, Nei Mongol, Shaanxi, Shanxi, Sichuan.

The above first record from Sichuan is based on *Farges 570* (P). The type collection of *Cardamine denudata*, *G. Giralddi 5480* (holotype, B), is indistinguishable from that of *C. scaposa*, *A. J. P. David 1815* (holotype, P; isotypes, LE, P). The former specimen was collected from Shaanxi, whereas the latter was from Nei Mongol.

This species is used medicinally.

14. *Cardamine franchetiana* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 205. 1912.

宽翅碎米荠 *kuan chi sui mi qi*

Loxostemon delavayi Franchet, Bull. Soc. Bot. France 33: 400. 1886, not *Cardamine delavayi* Franchet (1886); *Loxostemon smithii* O. E. Schulz; *L. smithii* var. *glabrescens* O. E. Schulz.

Herbs perennial, (5–)10–20 (–27) cm tall, hirsute or glabrescent. Rhizomes to 1 cm, with stolons and numerous bulbils; bulbils whitish, fleshy scales ovoid or subglobose, with rudimentary apical appendages. Stems simple, erect; underground proximal part whitish, slender or filiform, glabrous; aboveground part green or purplish, stout, pilose or glabrous. Rhizomal leaves 1 or

2, 4–12 (–18) cm; petiole 4–10 cm; terminal leaflet oblong, 4–10 × 2–6 mm, sessile or with a petiolule to 2 mm; lateral leaflets 2–4 pairs, similar to terminal one. Cauline leaves (1 or)2 or 3 (or 4), 1.5–5 cm; petiole 0.4–4 (–6) cm, base not auriculate; terminal leaflet oblong to oblong-elliptic, 4–11 × 1.5–3 mm, ciliate or glabrous, base cuneate, margin entire, apex mucronate; lateral leaflets (2 or)3–6 pairs, similar to terminal one. Racemes 3–8-flowered. Fruiting pedicels divaricate-ascending to ascending, 4–13 mm, straight. Sepals ovate or suboblong, 2–3 × 1.2–1.7 mm, margin membranous. Petals white or rarely lavender, broadly obovate or suborbicular, 6–9 × (3–)4–6 mm, base abruptly narrowed into a claw 1–2 mm, apex rounded. Median filament pairs 3–4 × 0.4–0.6 mm, flattened, not extended apically into a tooth; lateral pair slender, 2–3 mm; anthers oblong, 0.6–0.9 mm. Ovules 8–16 per ovary. Fruit linear, 1.5–2.5 cm × 1.5–2 mm; valves smooth, glabrous; style 1–3 mm. Seeds brown, broadly oblong or ovate, 1.3–1.6 × 0.9–1.2 mm, wingless. Fl. Jun–Jul, fr. Aug–Sep.

• Mountain slopes, deep valleys, rocky areas, scree, crevices of boulders, meadows, moist pastures; 2300–4800 m. Qinghai, Sichuan, Xizang, Yunnan.

15. *Cardamine pulchella* (J. D. Hooker & Thomson) Al-Shehbaz & G. Yang, Harvard Pap. Bot. 3(1): 77. 1998.

细巧碎米荠 *xi qiao sui mi qi*

Loxostemon pulchellus J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 147. 1861.

Herbs perennial, (5–)8–15 (–20) cm tall, hirsute or glabrescent. Rhizomes to 1 cm, with stolons and numerous bulbils; bulbils whitish, fleshy scales ovoid or subglobose, with rudimentary apical appendages. Stems simple, erect; underground proximal part slender, glabrous; aboveground part green or purplish, slender or stout, pilose or glabrous; bulbils of leaf axils ovoid, to 3 × 2 mm. Rhizomal leaves 1 (or 2), (1.5–)3–7 cm; petiole (1–)2.2–6 cm; terminal leaflet broadly ovate or oblong, 3–10 × 2–4 (–7) mm, with a petiolule to 3 mm; lateral leaflets 1 (or 2) pairs, similar to terminal one. Cauline leaves 1–3, 1.2–5 cm; petiole 0.5–3.5 cm, base not auriculate; terminal leaflet oblong or narrowly elliptic, (4–)6–12 (–15) × (1–)1.5–4 (–6) mm, ciliate or glabrous, base cuneate, margin entire, apex mucronate; lateral leaflets 1 (or 2) pairs, similar to terminal one. Racemes 2–4 (or 5)-flowered. Fruiting pedicels ascending, 5–13 mm, straight. Sepals ovate, 1.5–3 × 1–1.5 mm, margin membranous. Petals deep purple or mauve, broadly obovate, 5–8 × 2–4 mm, apex rounded. Median filament pairs 2–3 × 0.7–1.1 mm, flattened, extended apically into a tooth; lateral pair slender, 1–2 mm; anthers oblong, 0.5–0.6 mm. Ovules 12–16 per ovary. Fruit linear, 1–1.7 cm × 1–1.2 mm; valves smooth, glabrous; style 0.5–1 mm. Seeds brown, broadly oblong, 1.3–1.6 × 0.8–1.1 mm, wingless. Fl. May–Aug, fr. Jul–Sep.

Grassy marshlands, moist rocky places, stony streamsides, scree, mountain slopes; 3400–4600 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Sikkim].

16. *Cardamine delavayi* Franchet, Bull. Soc. Bot. France 33: 397. 1886.

洱源碎米荠 er yuan sui mi qi

Herbs perennial, 15–45 cm tall, sparsely pilose on leaves and at nodes, or glabrous throughout. Rhizomes slender and much elongated, with a few stolons and no bulbils. Stems simple at base, rarely branched above, erect, strongly flexuous; nodes well spaced, lowermost internodes to 9 cm. Rhizomal leaves simple; petiole 3–12 cm; leaf blade reniform, cordate, or suborbicular, 1.2–2.5 × 1.5–3 cm, palmately veined, base cordate, margin entire or obscurely 5-lobed, endings of principal veins and leaf apex mucronate. Cauline leaves 2–5, trifoliolate; petiole of lowermost and middle ones 2–5 cm, not auriculate and sometimes ciliate at base; terminal leaflet broadly oblong or narrowly obovate, 0.7–2 × 0.7–1.5 cm, with a petiolule to 4 mm, margin entire, apex mucronate; lateral leaflets similar to terminal, slightly smaller. Uppermost cauline leaves trifoliolate; petiole 1–3.5 cm, not auriculate at base; terminal leaflet narrowly oblong or linear, sessile, 1–3 cm × (1–)2–4(–5) mm; lateral leaflets smaller. Racemes 7–15-flowered. Fruiting pedicels ascending, (1–)1.2–2(–2.3) cm, straight. Sepals ovate, 2–3 × 1–1.5 mm, margin membranous. Petals white, broadly obovate, 5–7 × 2.5–4 mm, apex rounded. Median filament pairs 2.5–4, not flattened; lateral pair 1.5–3 mm; anthers linear-oblong, 1–1.3 mm. Ovules 10–20 per ovary. Fruit linear, 2–3 cm × 1–1.3 mm; valves torulose, glabrous; style 2–4 mm. Seeds brown, oblong, 1.2–1.5 × 0.6–0.9 mm, wingless.

Open gravel along streams, forests and clearings; 2100–4000 m. Sichuan, Yunnan [Bhutan].

The above first records from Sichuan and Bhutan are based on *Smith 10441* (UPS) and *Cooper 4917* (BM, E), respectively.

17. *Cardamine repens* (Franchet) Diels, Notes Roy. Bot. Gard. Edinburgh 5: 204. 1912.

匍匐碎米荠 pu fu sui mi qi

Dentaria repens Franchet, Bull. Soc. Bot. France 32: 5. 1885; *Cardamine tenuifolia* (Ledebour) Turczaninow var. *repens* (Franchet) Franchet; *Loxostemon repens* (Franchet) Handel-Mazzetti.

Herbs perennial, 10–45 cm tall, glabrous throughout except for apices of leaf lobes. Rhizomes much elongated, with a few bulbils, 3–8 mm wide. Stems simple, erect, straight, stout. Rhizomal leaves simple or trifoliolate; petiole 4–8 cm; leaf blade or terminal leaflet suborbicular or broadly cordate, to 1.5 cm in diam., base cordate, margin entire or obscurely 5-lobed, terminal leaflet with a petiolule to 7 mm. Cauline leaves 2–5, trifid or pinnatisect and with 2(or 3) lateral lobes on each side of midvein, lobes all decurrent, often 1- or 2-toothed, rarely entire; petiole 0.3–4 cm, winged, glabrous or ciliate, not auriculate or rarely with a small, toothlike, puberulent auricle to 0.3 mm; terminal lobe linear-lanceolate, 1.2–5 cm × 4–9 mm, base attenuate,

margin entire, along distal half often minutely puberulent with stout trichomes rarely to 0.2 mm, apex acute; lateral lobes similar to terminal. Racemes 5–20-flowered. Fruiting pedicels ascending, 0.8–2.2 cm, straight, glabrous. Sepals ovate, 2.5–3 × 1.2–1.7 mm, glabrous, margin and apex membranous, lateral pair subsaccate. Petals white or lavender, broadly obovate or spatulate, 6–8 × 2.5–4 mm, apex rounded. Median filament pairs 2.5–4, slightly flattened; lateral pair 1.5–3 mm; anthers oblong, 0.8–1 mm. Ovules 8–14 per ovary. Fruit linear, 2–3 cm × ca. 1.5 mm; valves smooth, glabrous; style 1–5 mm. Seeds brown, oblong, 1.2–1.5 × ca. 0.7 mm, wingless. Fl. May–Jun, fr. Jun–Jul.

• Grassy slopes, moist rocky crevices; 2400–3400 m. Sichuan, Yunnan.

Although *Cardamine repens* was first recorded from Sichuan by Handel-Mazzetti (Symb. Sin. 7: 362. 1931, as *Loxostemon repens*), this record was overlooked in FRPS and Fl. Sichuan. (vol. 14. 1999). The occurrence of the species in Sichuan is here confirmed based on the same collection cited in that first record, *Handel-Mazzetti 2788* (NY, W, WU).

18. *Cardamine granulifera* (Franchet) Diels, Notes Roy. Bot. Gard. Edinburgh 5: 204. 1912.

颗粒碎米荠 ke li sui mi qi

Cardamine tenuifolia (Ledebour) Turczaninow var. *granulifera* Franchet, Bull. Soc. Bot. France 33: 399. 1886; *Loxostemon granulifer* (Franchet) O. E. Schulz.

Herbs perennial, 6–20(–30) cm tall, glabrous or sparsely pilose. Rhizomes much elongated, slender; bulbils few, spaced, rarely clustered. Stems simple, erect, straight, slender, sparsely pilose along proximal half, or glabrous. Rhizomal leaves simple or trifoliolate; petiole 0.7–4 cm; leaf blade or terminal leaflet suborbicular, broadly ovate, or cordate, 3–12 mm in diam., base cordate or rounded, margin entire or obscurely lobed. Cauline leaves 2–4, trifid or pinnatisect and with 2(or 3) lateral lobes on each side of midvein, lobes not decurrent; petiole 1–15(–28) mm, slender, wingless, glabrous, not auriculate at base; terminal lobe filiform to narrowly linear, 0.9–4.5 cm × 0.5–1.5(–2) mm, base attenuate, margin entire, scabrous with trichomes to 0.3 mm, apex acute. Racemes 3–10-flowered. Flowering pedicels ascending, to 1.2 cm, straight, glabrous. Sepals ovate, 2–1.5 × 1–1.5 mm, glabrous, margin and apex membranous, lateral pair subsaccate. Petals white or lavender, broadly obovate or spatulate, 5–7 × 2–3 mm, apex rounded. Median filament pairs 3–4, slightly flattened; lateral pair 1.5–2.5 mm; anthers oblong, 0.6–0.8 mm. Mature fruit and seeds not seen. Fl. May–Jul.

• Moist shady forests, meadows; 2800–3800 m. Yunnan.

19. *Cardamine loxostemonoides* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 1069. 1926.

弯蕊碎米荠 wan rui sui mi qi

Cardamine tibetana Rashid & H. Ohba; *Loxostemon incanus* R. C. Fang ex T. Y. Cheo & Y. C. Lan; *L.*

loxostemonoides (O. E. Schulz) Y. C. Lan & T. Y. Cheo.

Herbs perennial, (5–)12–30(–35) cm tall, glabrous or sparsely to densely pilose. Rhizomes slender, with several bulbils and stolons; bulbils with fleshy, white, scaly leaves apically with rudimentary appendages. Stems somewhat decumbent and slender below, simple. Rhizomal leaves glabrous or pilose, compound; petiole (0.7–)2–15(–20) cm; terminal leaflet with a petiolule 3–10 mm, blade undivided and suborbicular, oblanceolate, or linear, or trifid and suborbicular or broadly obovate in outline and with obovate or oblong lobes the basal pair of which sometimes with a tiny lobule, terminal lobe 0.6–2(–3) cm × 2–5 mm; lateral leaflets 2–5 pairs, sessile or petiolulate, similar in shape and division to terminal lobe but smaller. Cauline leaves 1–4; petiole (0.3–)1–3(–4) cm, not auriculate at base; terminal and lateral leaflets similar in shape, size, and number to those of basal leaves. Racemes 2–14-flowered. Fruiting pedicels (5–)1–2.5 cm, ascending to suberect, glabrous. Sepals broadly ovate, 2.5–5 × 1.5–2.5 mm, glabrous, broadly membranous at margin and apex, base of lateral pair subsaccate. Petals purple with darker veins, broadly obovate, 0.8–1.2(–1.4) cm × 5–8 (–8.5) mm, not clawed, apex rounded. Median filament pairs (3.5–)4.5–6 mm, lateral pair 2.5–4 mm; anthers narrowly oblong, 1.4–2 mm. Ovules 14–20 per ovary. Fruit linear, 2.5–3.5 cm × 1.2–1.5 mm; valves glabrous; style 1–3 mm. Seeds brown, ovate, ca. 1.5 × 1 mm, wingless. Fl. Jun–Jul, fr. Aug–Sep.

Mountains slopes, along ditches, damp grounds by streams, open grass and gravel, scree; 2900–5500 m. Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Sikkim].

20. *Cardamine stenoloba* Hemsley, J. Linn. Soc., Bot. 29: 303. 1892.

狭叶碎米荠 xia ye sui mi qi

Cardamine pratensis Linnaeus subsp. *chinensis* O. E. Schulz; *Loxostemon stenolobus* (Hemsley) Y. C. Lan & T. Y. Cheo.

Herbs perennial, 5–25 cm tall, slender, glabrous except for leaves. Rhizomes slender, stoloniferous. Stems simple, branched above, flexuous. Basal leaves not rosulate, often withered by anthesis; petiole 1–1.5 cm; terminal leaflet orbicular, 2–4 mm in diam., with a petiolule 1–4 mm, sparsely pilose, base rounded, margin entire or obscurely lobed; lateral lobes similar to terminal one. Middle and upper cauline leaves pinnatisect, margin scabrous with trichomes to 0.1 mm; petiole 3–8 mm, not auriculate at base; terminal lobe filiform, 1–2.5 cm × 0.4–0.7 mm, base attenuate and decurrent with adjacent lateral lobes, margin entire, apex acute, not mucronate; lateral lobes 1–3 pairs, sessile, decurrent, similar to terminal lobe but smaller. Racemes 2–8-flowered, rachis strongly flexuous. Pedicels of young fruit divaricate, 8–14 mm, slender, soon recurved, glabrous. Sepals ovate, 1.5–2 × 0.8–1

mm, glabrous, membranous at margin and apex. Petals white, obovate or broadly spatulate, 5–6 × 2.5–3 mm. Median filament pairs 2.5–3 mm, filiform; lateral pair 1.5–2 mm; anthers oblong, 0.5–0.6 mm. Median nectar glands oblong, to 0.5 mm. Ovules 8–12 per ovary. Fruit linear, 1.5–2.2 cm × ca. 1 mm; valves glabrous; style 1–1.5 mm. Seeds pale brown, oblong, ca. 1.8 × 0.8 mm, wingless.

• Shaanxi, Sichuan.

Cardamine stenoloba is known only from three collections, the syntypes A. Henry 8794 (listed as “8724” in the protologue) and Pratt 352 (both at K and mounted on the same sheet), and the type of *C. pratensis* subsp. *chinensis* (H. Biondi 439 at B). The species is here lectotypified on Pratt’s collection. It is most closely related to *C. elegantula* J. D. Hooker & Thomson (from Bhutan, Nepal, and Sikkim), from which it is readily distinguished by having finely pinnatisect middle and upper cauline leaves with 1–3 pairs of filiform, basally decurrent, acute lateral lobes and well-developed median glands to 0.5 mm. By contrast, *C. elegantula* has compound leaves with 5–7 pairs of elliptic or oblong, petiolulate, apically mucronate lateral leaflets and obsolete median glands.

Cardamine stenoloba was treated in *Loxostemon* in both FRPS (pp. 239, 241) and Fl. Sichuan. (14: 111–112. 1999), but the species has filiform stamens and no bulbils, and the illustrations of *L. stenolobus* in these two floras in fact represent young plants of *C. parviflora*.

21. *Cardamine simplex* Handel-Mazzetti, Symb. Sin. 7: 361. 1931.

单茎碎米荠 dan jing sui mi qi

Cardamine truncatolobata W. T. Wang; *Loxostemon axillus* Y. C. Lan & T. Y. Cheo.

Herbs perennial, (8–)13–35 cm tall, glabrous throughout or sparsely pilose. Rhizomes slender, thickened at stem base, with 1 or few stolons. Stems erect, slender, simple or 1- or 2-branched, flexuous. Basal leaves 1–3, 3- or 5(or 7)-foliolate; petiole (1.3–)2–6(–8) cm; terminal leaflet broadly obovate, 3–12 × 5–13 mm, with a petiolule 1–5(–8) mm, base subtruncate or rounded, margin entire or apically subtruncate or obtusely 3-lobed, ultimately mucronate; lateral leaflets 1 or 2(or 3) pairs, subsessile or petiolulate, somewhat similar to terminal leaflet but smaller. Cauline leaves (1 or)2–5(–7), 3- or 5-foliolate; petiole (0.8–)1.2–3 cm, not auriculate at base; terminal leaflet of uppermost leaves filiform, linear, or rarely narrowly oblanceolate, 0.5–2 cm × (0.3–)1–2 mm, attenuate at base, margin entire, apex acute. Racemes lax, (2–)5–14(–16)-flowered, rachis often flexuous. Fruiting pedicels erect or ascending, (0.8–)1–2.5(–3) cm, straight, glabrous, proximal ones often much longer than distal. Sepals ovate or oblong, 2.5–3.5 × 1.3–1.8 mm, glabrous, lateral pair subsaccate. Petals white, obovate, (6.5–)7–9 × 3.5–5 mm, not clawed, apex rounded. Median filament pairs 4–5 mm, slender; lateral pair 3–3.5 mm; anthers oblong, 0.8–1.1 mm. Ovules 8–14 per ovary. Fruit linear, (1–)1.5–2.5(–2.8)

cm × 1–1.2 mm; valves glabrous, smooth; style (1–)1.5–3(–4) mm. Seeds brown, oblong, 1.2–1.6 × 0.8–1.2 mm, wingless. Fl. May–Jul, fr. Jun–Aug.

• Meadows, damp turf, marshy areas, stream- or ditch-sides; 2500–3800 m. Sichuan, Yunnan.

The above first record of *Cardamine simplex* from Sichuan is based on McLaren AC–19 (E, LE, P) and the type collection of *C.*

truncatolobata.

The type collection of *Cardamine simplex*, Handel-Mazzetti 4310 (holotype, WU; isotypes, E, GH, NAS, W), resembles that of *C. truncatolobata*, Lan Kaiyong, Li Liangqian & Fei Yong 341 (holotype, PE; isotypes, KUN, PE), in every morphological aspect except for having narrower leaflets on the uppermost leaves and slightly lax racemes.

22. *Cardamine trifoliolata* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 145. 1861.

三小叶碎米荠 san xiao ye sui mi qi

Cardamine flexuosoides W. T. Wang; *C. flexuosoides* var. *glabricaulis* W. T. Wang, nom. illeg.; *Loxostemon smithii* O. E. Schulz var. *wenchuanensis* Y. C. Lan & T. Y. Cheo.

Herbs perennial, (4–)6–18(–25) cm tall, often sparsely pilose at least basally. Rhizomes slender, thickened at stem base, with 1 or few stolons. Stems erect or decumbent, slender, simple or few branched. Basal leaves 1–3, 3- or 5(or 7)-foliolate, rarely simple; petiole 1–4(–5.5) cm; terminal leaflet broadly obovate or rarely ovate, 2–12 × 3–14 mm, with a petiolule 1–6(–8) mm, base subtruncate, cordate, or rounded, margin entire and obscurely 5-lobed or -crenate, apically subtruncate or obtusely 3-lobed; lateral leaflets 1(–3) pairs, subsessile or petiolulate, resembling terminal leaflet, or not lobed and oblong or ovate, smaller. Cauline leaves 1 or 2(or 3), 3(or 5)-foliolate; petiole 0.5–1.5 cm, not auriculate at base; terminal and lateral leaflets similar to those of basal leaves; petiolule 0.5–3 mm. Racemes lax, 2–8-flowered, rachis straight. Fruiting pedicels ascending or divaricate, 0.5–1.5(–2) cm, straight, glabrous. Sepals ovate or oblong, 2–3 × 1–1.4 mm, glabrous, lateral pair subsaccate. Petals white, obovate or spatulate, 5–8 × 2.5–4 mm, not clawed, apex rounded. Median filament pairs 3–4.5 mm, slender; lateral pair 2–3 mm; anthers oblong, 0.8–1 mm. Ovules 8–12 per ovary. Young fruit glabrous. Mature fruit and seeds not seen. Fl. May–Jul, fr. Jul–Sep.

Moist rocky crevices, meadows, moist forests, mossy banks, rocky areas; 2500–4300 m. Sichuan, Yunnan [Bhutan, India, Nepal, Sikkim].

The above first record of *Cardamine trifoliolata* from Sichuan is based on Pratt 762 (K) and the type collection of *Loxostemon smithii* var. *wenchuanensis*; the above first record from Yunnan is based on Rock 4166 (E, GH, US) and ACE 172 (K). As indicated above, accounts of *C. trifoliolata* in FRPS, Fl. Sichuan. (14: 89. 1999), Fl. Xizang. (2: 360. 1985), and Fl. Yunnan. (6: 58. 1995) are all based on misidentified plants of *C. fragariifolia*.

The name *Cardamine flexuosoides* var. *glabricaulis* was nomenclaturally superfluous when published and is therefore illegitimate because it was based on the same type collection, Wang Fatsuan

21010 (holotype, KUN; isotype, PE), of the already validly published *Loxostemon smithii* var. *wenchuanensis*. This collection is an excellent match to the type of *C. trifoliolata*, Griffith 1757 (holotype, K; isotype, BM), which was collected from Bhutan.

23. *Cardamine rockii* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 473. 1926.

鞭枝碎米荠 bian zhi sui mi qi

Herbs perennial, (9–)15–45(–55) cm tall, pilose or subhirsute. Rhizomes elongated, 1–3 mm in diam. Stems decumbent basally, erect, simple, ridged, pilose, 4–10-leaved. Basal leaves not rosulate, similar to cauline ones; lower and middle cauline leaves (1.5–)3–12(–15) cm; petiole 0.5–4 cm, ciliate, not auriculate at base; terminal leaflet broadly ovate or suborbicular, (3–)5–12(–15) × (2–)4–8(–10) mm, symmetrical, with a petiolule 1–3 mm, base obtuse, truncate, or cuneate, margin 2–4-toothed on each side, teeth submucronate; lateral leaflets alternate or rarely opposite, 6–12 on each side of rachis, broadly to narrowly ovate or ovate-lanceolate, subequaling terminal leaflet, asymmetric, sessile or with a petiolule to 3 mm, pilose or rarely subglabrous, base oblique, proximal margin coarsely and unequally (2 or)3–5(or 6)-toothed, distal margin entire or 1–3-toothed, acute apex and teeth submucronate. Racemes terminal, many flowered. Flowering pedicels divaricate or ascending, 1–2 cm, slender, pilose. Sepals oblong to narrowly ovate, (2.5–)3–4 × (1–)1.2–1.6 mm, margin membranous, base of lateral pair subsaccate. Petals white, obovate, 7–9 × 2.5–4 mm, cuneate into a clawlike base to 2 mm, apex rounded or subemarginate. Median filament pairs 4–5 mm, slightly dilated, not flattened; lateral pair 2.5–3.5 mm; anthers narrowly oblong, 1–1.5 mm. Ovules 10–14 per ovary. Fruit and seeds not seen. Fl. May–Jul.

• Moist grassy areas, boggy places by streams, alpine meadows; 3100–4700 m. SW Sichuan, Yunnan.

24. *Cardamine purpurascens* (O. E. Schulz) Al-Shehbaz et al., Novon 10: 324. 2000.

紫花碎米荠 zi hua sui mi qi

Cardamine microzyga O. E. Schulz var. *purpurascens* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 11: 225. 1931; *Loxostemon purpurascens* (O. E. Schulz) R. C. Fang ex Y. C. Lan & T. Y. Cheo.

Herbs perennial, (8–)10–25(–30) cm tall, pilose. Rhizomes stout, 0.5–1.5 cm, often with several stolons. Stems erect, simple, ridged, pilose, not flexuous. Basal leaves rosulate, 5–10 cm; petiole 1–3.5 cm, ciliate; terminal leaflet subreniform or orbicular, 4–8 × 4–10 mm, petiolule 1–3 mm, base rounded or cordate, margin entire or obscurely and obtusely 3–5-lobed; lateral leaflets 3–7 pairs, obovate or suborbicular, symmetric or not, slightly smaller than terminal lobe, entire or obscurely toothed, apex rounded. Cauline leaves 2–10, 1–5 cm; petiole (2–)4–10 (–15) mm, ciliate, not auriculate at base; terminal leaflet linear, oblong, or lanceolate, 3–9 × 0.5–2 mm, sessile or with a petiolule to 1.5 mm; lateral leaflets 4–7 pairs, narrowly

oblong to oblong-ovate, subequaling terminal leaflet, symmetric or not, pilose, base oblique or cuneate, proximal margin entire or 1-toothed, distal margin entire, apex acute. Racemes terminal, many flowered. Fruiting pedicels divaricate or ascending, (0.7–) 1–2.2(–3) cm, slender, pilose. Sepals oblong or ovate, 3–4 × 1.5–2 mm, pilose, margin membranous, base of lateral pair saccate. Petals magenta-red, purple, or lavender, broadly obovate, 7–11 × 3–6 mm, cuneate into a clawlike base to 2 mm, apex rounded. Median filament pairs 4–5 mm, flattened below anther, to 1 mm wide; lateral pair 2.5–3.5 mm; anthers narrowly oblong, 0.9–1.2 mm. Ovules 10–16 per ovary. Fruit 1.6–2.5 cm × 1.2–1.8 mm; valves glabrous, smooth; style 1–2 mm. Seeds brown, broadly oblong, 1.2–1.5 × 0.9–1 mm, wingless. Fl. May–Jul.

• River banks, wood margins, marshy places, swampy meadows, *Rhododendron* scrub; 3500–4400 m. Sichuan, Yunnan.

25. *Cardamine microzyga* O. E. Schulz, Bot. Jahrb. Syst. 32: 545. 1903.

小叶碎米荠 xiao ye sui mi qi

Cardamine prattii Hemsley & E. H. Wilson.

Herbs perennial, 10–30(–45) cm tall, sparsely pilose. Rhizomes slender, to 15 cm or longer, 1–1.5 mm in diam., without stolons. Stems erect, simple, ridged, pilose. Basal leaves rosulate, 2–11 cm; petiole 0.5–5 cm, ciliate; terminal leaflet obovate, 2–8(–13) × 2–7(–10) mm, petiolule 0.5–4 mm, pilose, base cuneate, margin 1–3-toothed on each side, apex acute, submucronate; lateral leaflets 5–11 pairs, obovate or ovate, pilose, asymmetric, slightly smaller than terminal lobe, sessile or rarely with a petiolule to 5 mm, base oblique to subcuneate, proximal margin 1- or 2-toothed, rarely 1-lobed, distal margin often entire, apex acute. Cauline leaves 1–3, (2–)4–10(–25) cm; petiole 0.5–4(–9) cm, ciliate, not auriculate at base; terminal leaflet and 6–9 pairs of lateral leaflets similar in morphology to those of basal leaves. Racemes terminal, 10–20-flowered. Fruiting pedicels erect to erect-ascending, (0.7–)1–2 cm, slender, pilose. Sepals oblong or ovate, 2.5–4 × 1–1.7 mm, sparsely pilose or glabrous, margin membranous, base of lateral pair saccate. Petals purple or rarely white, broadly obovate, 6.5–10 × 3–6 mm, cuneate into a clawlike base to 2 mm, apex rounded. Median filament pairs 3.5–5 mm, flattened; lateral pair 2.5–3.5 mm; anthers narrowly oblong, 0.8–1.1 mm. Ovules 10–14 per ovary. Fruit linear, 2.5–4 cm × 1.5–2 mm; gynophore 0.5–2 mm; valves smooth, glabrous; style 1–2.5 mm. Seeds brown, oblong, 1.8–2.1 × 1–1.3 mm, wingless. Fl. (Apr–)Jun–Sep, fr. Jul–Oct.

• Moist alpine meadows, streambanks; 2600–4600 m. Sichuan, Xizang.

The records in FRPS and Fl. Yunnan. (6: 69–70. 1995) of *Cardamine microzyga* from Yunnan are probably based on misidentified plants of *C. purpurascens*, a species that occurs in that province and was listed in Fl. Yunnan. as a synonym of *C. microzyga*. The above first record of *C. microzyga* from Xizang is based on *Soulié 1025* (P) and *Soulié 2466* (MO, P).

Cardamine microzyga var. *dupllobata* C. Y. Wu ex T. Y. Cheo (Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 27. 1980), which is endemic to Sichuan, does not belong to *C. microzyga* because it has strongly 2- or 3-lobed, coarsely dentate leaflets with petiolules nearly as long as or longer than the leaflets. Unfortunately, the type collection, *T. T. Yü 6186* (holotype, PE; isotype, KUN), has no flowers or fruit. The present authors believe that this taxon represents a distinct species, but a formal recognition at that rank awaits the study of flowering and fruiting material.

26. *Cardamine gracilis* (O. E. Schulz) T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 27. 1980.

纤细碎米荠 xian xi sui mi qi

Cardamine multijuga Franchet var. *gracilis* O. E. Schulz, Repert. Spec. Nov. Regni Veg. 17: 289. 1921.

Herbs perennial, 10–35(–50) cm tall, glabrous throughout, semiaquatic. Rhizomes slender, to 10 cm or longer, 0.5–3 mm in diam. Stems erect, simple, striate angled, rooting from lower and sometimes middle nodes. Basal rosettes absent. Cauline leaves 10–20 per stem, (1.5–)2.5–7.5(–9) cm × (1.5–)4–14(–17) mm; petiole absent or rarely to 2 mm; terminal leaflet narrowly obovate, oblong, or rarely broadly ovate, (2–)3–8(–9) × (0.5–) 1.5–5(–7) mm, petiolule 0.5–2 mm, base cuneate or rarely obtuse, margin obscurely 1–3-toothed on each side, apex acute, submucronate; lateral leaflets (6 or)7–12(–15) pairs, linear or narrowly oblong, asymmetric, slightly smaller than terminal lobe, sessile or rarely with a petiolule to 0.5 mm, base oblique, proximal margin 1- or 2(or 3)-toothed, distal margin entire or rarely obscurely 1- or 2-toothed, apex acute; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base. Racemes terminal, 10–20-flowered. Fruiting pedicels divaricate, 0.8–2.2 cm, slender. Sepals oblong or ovate, 3–4 × 1.2–2 mm, spreading, margin membranous, base of lateral pair subsaccate. Petals lavender with darker veins, spatulate, 6–8 × 2–3 mm, spreading, apex rounded. Filaments spreading, dilated at base, subequal, median pairs 3.5–5 mm, lateral pair 3–4.5 mm; anthers narrowly oblong, 1.3–1.6 mm. Ovules 10–14 per ovary. Fruit linear, 2–4 cm × ca. 1.5 mm; gynophore ca. 0.5 mm; valves smooth, glabrous; style 4–6 mm. Seeds brown, oblong, 1.7–2 × ca. 1.3 mm, winged all around; wing ca. 0.4 mm wide. Fl. Jun–Aug, fr. Jul–Oct.

• Marshlands, lake shores, margins of ponds, ditches, open pastures; 2400–3300 m. Yunnan.

This species, as *Cardamine multijuga* var. *gracilis*, was said to occur in Bhutan (Fl. Bhutan 1(2): 432. 1984), but the present authors have seen no material from that country. On the basis of having white flowers with smaller (4–6 mm) petals, it is likely that the record from Bhutan belongs to another species.

27. *Cardamine multijuga* Franchet, Bull. Soc. Bot. France 33: 399. 1886.

多裂碎米荠 *duo lie sui mi qi*

Cardamine griffithii J. D. Hooker & Thomson subsp. *multijuga* (Franchet) O. E. Schulz.

Herbs perennial, (20–)40–100(–160) cm tall, glabrous throughout. Rhizomes creeping, without stolons. Stems erect, simple or branched above, rooting from lowermost nodes, striate angled, 11–25-leaved. Leaves sessile, cauline; lower and middle ones 2.2–6(–10) cm; terminal leaflet orbicular or broadly obovate, 3–12 × 3–11 mm, with a petiolule 0.5–6 mm, base subcordate or cuneate, margin repand and not ciliate, apex obtuse or rounded; lateral leaflets (7 or)8–11(–15) pairs, slightly smaller than terminal one, ovate or ovate-oblong, base obtuse, margin repand and not ciliate, apex obtuse or rounded; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base. Uppermost leaves smaller. Fruiting pedicels divaricate, 1–2 cm, slender, straight. Sepals oblong, 2.5–3 × 1.5–2 mm, spreading. Petals purple or lavender, obovate, 7–9 × 3–4 mm, not clawed, apex rounded. Filaments spreading, subequal, 4–5 mm; anthers narrowly oblong, 1.5–1.7 mm. Ovules 10–16 per ovary. Young fruit glabrous; styles 2–4 mm; stigma entire. Immature seeds wingless. Fl. Jun–Jul.

• Streamsides, marshy places; 200–2800 m. Yunnan.

Cardamine multijuga, which was previously reduced to the synonymy of *C. griffithii*, is known only from older collections. However, it is readily distinguished from *C. griffithii* by having cauline leaves with (7 or)8–11(–15) pairs of nonciliate lateral leaflets, spreading sepals, petals, and stamens, subequal stamens, entire stigmas, and styles 3–4 mm. By contrast, *C. griffithii* has cauline leaves with 2–4(or 5) pairs of ciliate lateral leaflets, erect sepals, petals, and stamens, tetradynamous stamens, strongly 2-lobed stigmas, and styles 0.5–1(–2) mm.

28. *Cardamine griffithii* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 146. 1861.

山芥碎米荠 *shan jie sui mi qi*

Cardamine griffithii var. *pentaloba* W. T. Wang.

Herbs perennial, (20–)30–100(–115) cm tall, glabrous throughout except for leaflet margin. Rhizomes creeping, without stolons. Stems erect, simple or branched above, striate angled, (9–)12–28(–37)-leaved. Leaves sessile, cauline; lower and middle ones (1–)2–9(–11) × (0.7–)1–3.5(–4.5) cm; terminal leaflet orbicular, broadly ovate, or obovate, (0.5–)1–3(–3.5) × (0.3–)0.6–1.9(–2.5) cm, with a petiolule 2–10(–15) mm, base subcordate, rounded, or rarely cuneate, margin repand or entire and sparsely ciliate, apex obtuse or rounded; lateral leaflets 2–4(or 5) pairs, slightly to distinctly smaller than terminal one, base obtuse or rarely slightly oblique, margin entire or repand and sparsely ciliate, apex obtuse or rounded; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base. Uppermost leaves smaller. Fruiting pedicels ascending

or divaricate, (0.4–)0.7–1.5 cm, slender, straight.

Sepals ovate or oblong, 2.5–3 × 1.5–2 mm, erect.

Petals purple or lavender, spatulate or obovate, 6–9 × (2.5–)3–5 mm, not clawed, apex rounded or subemarginate. Staminal filaments erect, median pairs 3.5–4.5 mm, lateral pair 2.5–3 mm; anthers oblong, 0.9–1.1 mm. Ovules 10–22 per ovary. Fruit linear, (1.5–)2–4 cm × 0.9–1.2 mm; gynophore 0.5–1 mm; valves smooth, glabrous; style 0.5–1(–2) mm; stigma 2-lobed, distinctly broader than style. Seeds brown, oblong, 1.4–1.7 × 0.8–1.1 mm, wingless. Fl. May–Aug, fr. Jun–Sep.

Mountain slopes, valleys, streamsides, pastures, marshy places, moist forest floor, shady rocky areas; 2400–4500 m. Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Sikkim].

Records in FRPS and Fl. Guizhou. (7: 5. 1989) of *Cardamine griffithii* from Guizhou, Hubei, and Hunan are very likely based on misidentified plants of *C. hygrophila*. Although the present authors have not seen the type of *C. griffithii* var. *pentaloba*, it is very likely that this plant is only a minor variant of the species. Five-lobed terminal leaflets occur sporadically throughout the range of the species. However, if the type of this variety has terete, pilose stems, then it is *C. hygrophila*, and the type collection will represent a new record for Yunnan.

29. *Cardamine lyrata* Bunge, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 2: 29. 1833.

水田碎米荠 *shui tian sui mi qi*

Cardamine argyi H. Léveillé.

Herbs perennial, (20–)30–70(–80) cm tall, glabrous throughout. Rhizomes short, thick, not scaly. Stolons from rhizome or lower to middle stem nodes, to 80 cm. Stems erect, simple, striate angled, 8–15-leaved. Leaves on stolons simple or rarely with a basal pair of auriclelike leaflets; petiole 3–12 mm; leaf blade suborbicular, cordate, or reniform, (0.7–)1–2.2(–3) × 0.7–2(–2.3) cm, margin repand or entire, apex rounded. Cauline leaves sessile, middle ones (1.5–)3–5(–7) cm; terminal leaflet orbicular, ovate, or rarely oblong, 1–3 × (0.8–)1–3 cm, with a petiolule (0.3–)0.5–1.5(–2) cm, base cordate, subtruncate, or obtuse, margin repand or subentire, apex rounded; lateral leaflets 2–5 pairs, much smaller than terminal one, ovate, suborbicular, or oblong-ovate; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base. Fruiting pedicels (0.7–)1–2(–2.5) cm, slender, divaricate, usually straight. Sepals ovate, 3–3.5 × 1–1.5 mm, margin membranous, lateral pair subsaccate. Petals white, obovate, 7–10 × 3–4 mm, not clawed, apex rounded or emarginate. Filaments slightly spreading, median pairs 4–5 mm, lateral pair 2.5–3.5 mm; anther narrowly oblong, 1–1.5 mm. Ovules 14–18 per ovary. Fruit linear, strongly flattened, (1.5–)2–3(–3.5) cm × 1.5–2 mm; valves smooth, glabrous; styles slender, 1.5–3 mm. Seeds brown, oblong, 2–3 × 1–2 mm, winged all around; wing to 1 mm wide. Fl. Apr–Jun, fr. May–Jul.

Moist places, streamsides; near sea level to 1000 m. Anhui, Fujian, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hunan, Jiangsu,

Jiangxi, Jilin, Liaoning, Nei Mongol, Shandong, Sichuan, Zhejiang [Japan, Korea, Russia].

Although the type of *Cardamine argyi* was collected from Jiangsu, *Argy s.n.* (holotype, E), the name was not listed in FRPS or any provincial Chinese flora.

30. *Cardamine hygrophila* T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 26. 1980.

湿生碎米荠 shi sheng sui mi qi

Herbs perennial, (7–)10–25(–35) cm tall. Rhizomes compact, thick, not stoloniferous. Stems erect, terete, pilose at base, glabrous from the middle upward, often more than 1 from base. Basal leaves rosulate, (3–)5–9(–11) cm; petiole (0.7–)1.5–3.5 (–4.5) cm; terminal leaflet orbicular or reniform, (0.5–)1–3 × (0.5–)1.5–3.5 cm, with a petiolule 1–2 cm, base cordate or subtruncate, margin entire, repand, or obscurely coarsely crenate, apex rounded; lateral leaflets 2 or 3(–5) pairs, much smaller than terminal one. Cauline leaves 2–5(–7), glabrous; middle ones 1.5–6(–8) cm; terminal leaflet suborbicular or broadly ovate, rarely oblong or sublanceolate, (0.5–)1.2–3(–3.5) × (0.5–)1–2.5(–3) cm, with a petiolule 5–12(–20) mm, base rounded or subcuneate, margin obscurely to strongly angled, rarely entire, often mucronulate at angles, apex obtuse to subacute; lateral leaflets (1 or)2 or 3 pairs, smaller and somewhat similar to terminal ones; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base. Fruiting pedicels divaricate or ascending, (0.7–)1–2.2(–3) cm, slender, glabrous, straight. Sepals ovate or oblong, 2.5–3 × 2–2.5 mm. Petals white, obovate, 6–9 × 3–4 mm, not clawed, apex rounded. Filaments subequal in length, somewhat spreading, 4.5–6 mm; anthers narrowly oblong, 1–1.3 mm. Ovules 12–22 per ovary. Fruit linear, 1.5–4 cm × 1–1.5 mm; gynophore to 1 mm; valves smooth, glabrous; style slender, 2–4 mm; stigma entire, narrower than style. Seeds brown, oblong, 1.3–1.8 × 0.7–1 mm. Fl. and fr. Apr–Jun.

• Valleys, streambanks; 1400–2200 m. Guangxi, Guizhou, W Hubei (Badong Xian), Hunan, Sichuan.

The above first record from Guizhou is based on *S Guizhou Team 1148* (NAS); the above first record from Hubei is based on *Wilson 240* (E, US, W) and *Wilson 291* (K, W); the above first record from Hunan is based *Anonymous 700* (MO).

The plants are used as a vegetable or as forage.

31. *Cardamine engleriana* O. E. Schulz, Bot. Jahrb. Syst. 32: 407. 1903.

光头山碎米荠 guang tou shan sui mi qi

Cardamine griffithii J. D. Hooker & Thomson var. *grandifolia* T. Y. Cheo & R. C. Fang.

Herbs perennial, 10–24(–30) cm tall, sparsely to densely pilose, often glabrescent above, rarely glabrous throughout. Rhizomes slender, with 1 or few filiform stolons. Stems erect, simple, terete, crisped pilose at base. Basal leaves not rosulate, often withered by anthesis; petiole 0.5–2 cm; terminal leaflet reniform or suborbicular, 0.5–1.5 × 0.7–1.7 cm, base cordate, margin shallowly crenate or repand; lateral leaflets 2, much smaller than terminal ones, sometimes absent and

leaf simple. Middle and upper cauline leaves trifoliolate, sessile, to 10 cm; terminal leaflet reniform, suborbicular, or broadly ovate, 1.5–6(–7) × 1.2–4(–5) cm, with a petiolule 0.3–2.5(–5.2) cm, base cordate, rounded, or cuneate, glabrous, ciliate, or trichomes forming small tufts at teeth, margin crenate, repand, or obscurely to distinctly 2–6-toothed on each side, apex obtuse or acute; lateral leaflets 2, auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base, suborbicular, ovate, obovate, or reniform, 3–16(–25) × 2–13(–17) mm, much smaller than terminal leaflet, margin entire, 1- or 2-toothed, or repand. Racemes 3–10-flowered. Fruiting pedicels 0.5–1.7 cm, divaricate or ascending, slender. Sepals ovate, 2.5–3 × 1–1.5 mm, lateral pair subsaccate. Petals white, obovate, 6–8 × 2–3 mm, apex rounded. Median filament pairs 3–4.5 mm; lateral pair 1.5–3 mm; anther oblong, 0.7–1 mm. Ovules 8–16 per ovary. Fruit linear, slightly flattened, 1.5–2.5 cm × 1–1.2 mm; valves smooth, glabrous; style 1–2 mm. Seeds brown, oblong, 1.5–1.8 × 0.8–1 mm, wingless. Fl. and fr. Apr–Jul.

• Shady slopes, woodlands, moist places in ravines; 800–2900 m. Anhui, Fujian, Gansu, Hubei, Hunan, Shaanxi, Sichuan.

The above first record from Anhui is based on *K. Yao 9028* (MO).

32. *Cardamine komarovii* Nakai, Repert. Spec. Nov. Regni Veg. 13: 271. 1914.

翼柄碎米荠 yi bing sui mi qi

Alliaria auriculata Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 18: 437. 1901, not *Cardamine auriculata* S. Watson (1882); *Arabis cebennensis* de Candolle var. *coreana* H. Léveillé.

Herbs perennial, 12–75 cm tall. Rhizomes short, stout. Stems erect, simple at base, branched above, finely striate, pubescent or glabrescent. Basal leaves rosulate; petiole 2–5 cm, winged at base, glabrous or pilose; leaf blade broadly cordate or suborbicular, 1.5–4 × 1.5–3.5 cm, margin coarsely dentate, the teeth submucronate. Cauline leaves 3–8, simple; petiole winged, (0.5–)1–4 cm, auriculate-amplexicaul at base; auricles oblong or lanceolate, 2–10 × 0.5–4 mm, entire; leaf blade cordate or broadly ovate, (2–)3–7.5(–9) × (1.2–)2.5–6 cm, pilose at least along veins and margins, rarely glabrous, base cordate, margin coarsely and irregularly toothed, sometimes incised on distal leaves, apex acuminate or obtuse. Racemes ebracteate. Fruiting pedicels divaricate or ascending, 1–2.5 cm, slender, pilose or glabrous. Sepals oblong, 2.5–3 × 1.2–1.6 mm, glabrous or pilose, base not saccate. Petals white, broadly obovate, 3–4 × ca. 1.5 mm, apex rounded. Filaments 2–3 mm; anthers oblong, ca. 1.5 mm. Ovules 6–12 per ovary. Fruit linear, 2–4 cm × ca. 1 mm; gynophore stout, 0.2–0.7 mm; valves glabrous or sparsely pilose, not torulose, acuminate; style 2–3 mm, slender. Seeds brown, oblong, 1.5–2 × 1–2 mm. Fr. Jun.

Streamsides, moist areas; 700–1000 m. Heilongjiang, Jilin, Liaoning [Korea].

33. *Cardamine circaeoides* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 144. 1861.

露珠碎米荠 *lu zhu sui mi qi*

Cardamine agyokumontana Hayata; *C. circaeoides* var. *diversifolia* O. E. Schulz; *C. heterandra* J. Z. Sun & K. L. Chang; *C. insignis* O. E. Schulz; *C. macrocephala* Z. M. Tan & S. C. Zhou; *C. reniformis* Hayata; *C. violifolia* O. E. Schulz; *C. violifolia* var. *diversifolia* O. E. Schulz, nom. inval.; *C. violifolia* var. *pilosa* K. L. Chang & H. L. Huang.

Herbs perennial, (5–)9–36(–45) cm tall, sparsely to densely pilose at least on leaves. Rhizomes slender, sometimes with a few stolons. Stems slender, erect or decumbent, simple or rarely branched above middle. Basal leaves not fleshy, simple or rarely 2–4-foliolate; petiole 1–9(–12) cm, glabrous or rarely ciliate; leaf blade or terminal leaflets cordate or ovate, rarely suborbicular, (0.7–)1.5–5.5(–6.7) × (0.7–)1.5–4.3(–5) cm, always longer than wide, pilose or glabrous, base cordate, sometimes obtuse, subtruncate, or subcuneate, margin often repand-crenate, sometimes coarsely crenate, crenulate, or subentire, often distinctly mucronate at vein endings, apex obtuse; lateral leaflets (when present) petiolulate or sessile, much smaller than terminal one. Cauline leaves 1–4, simple or rarely 1 of which 2- or 3-foliolate, petiolate or rarely uppermost subsessile; petiole (0.4–)1–5(–6) cm, with basal auricles 0.4–2 × 0.2–0.4 mm; leaf blade similar to that of basal leaves, cordate, sometimes ovate to ovate-lanceolate, 1–3.5(–6) × 1–3(–3.5) cm. Fruiting pedicels 3–12(–15) mm, ascending, divaricate, or reflexed, sometimes secund, glabrous, slender. Sepals ovate or oblong, 2–3.5 × 0.8–1.5 mm, glabrous, margin often membranous, base not saccate. Petals white, spatulate, (4–)5–7(–8) × (1.5–)2–2.5(–4) mm. Median filament pairs (2.5–)3.5–5 mm, lateral pair (2–)2.5–3.5 mm; anthers oblong, 0.5–1 mm. Ovules 20–42 per ovary. Fruit linear, 1.3–3(–3.3) cm × 0.8–1.2(–1.5) mm; valves torulose, glabrous; style (0.5–)1–2 mm. Seeds brown, ovate or broadly oblong, 0.8–1.1 × 0.6–0.9 mm, wingless. Fl. and fr. Feb–Jul.

Ravines, along streams and ditches, rocky places, mixed woods, moist pastures, roadsides, forests; 400–3300 m. Gansu, Guangdong, Guangxi, Hunan, Sichuan, Taiwan, Yunnan [India, Laos, Myanmar, Sikkim, Thailand, Vietnam].

Although the present authors have not seen the type collection of *Cardamine agyokumontana*, the protologue of the species and the examination of numerous, simple-leaved specimens from Taiwan leave no doubt that this taxon is conspecific with *C. circaeoides*. Records in FRPS of *C. circaeoides* (as *C. violifolia*) from Anhui, Hubei, and Zhejiang (also in Fl. Zhejiang 3: 55. 1993) are based on misidentified plants of *C. anhuiensis*.

Both *Cardamine violifolia* and *C. violifolia* var. *diversifolia* are based on the same type collection, *Henry 3298* (holotype, B; isotypes, BM,

E, GH, P, US), and the latter name is therefore invalid under Art. 26.2 of the St. Louis Code. The only difference between the two taxa is the presence in var. *diversifolia* of trifoliolate instead of simple leaves, though such variation is very common in, and can be observed on the holotype specimen of, *C. circaeoides*. Schulz (Bot. Jahrb. Syst. 32: 280–623. 1903) separated *C. violifolia* from *C. circaeoides* mainly on account of the former having minutely auriculate instead of nonauriculate petiolar bases. However, he overlooked the occurrence of minute petiolar auricles in every specimen he cited under *C. circaeoides*, including the type collection. In fact, all of the Chinese and non-Chinese material of *C. circaeoides* examined by the present authors has petiolar auricles. The type collection of *C. insignis*, A. Henry 13090 (holotype, B; isotypes, E, K, LE, MO), is indistinguishable from those of both *C. circaeoides* and *C. violifolia*, and Schulz's distinction of these species based on the orientation of the pedicels does not hold.

34. *Cardamine calthifolia* H. Léveillé, Bull. Acad. Int. Géogr. Bot. 24: 281. 1914.

驴蹄碎米荠 *lu ti sui mi qi*

Herbs perennial, 1–30 cm tall, sparsely pilose at least on leaves. Rhizomes stout, to 7 cm in diam., with a few stolons. Stems stout, thickest at base, erect, simple. Basal leaves fleshy, simple; petiole (3.5–)6–15(–20) cm, glabrous; leaf blade reniform, (1–)1.5–3 × (1.5–)3–6 cm, always wider than long, glabrous, base broadly cordate, margin repand, mucronate at vein endings, apex rounded. Cauline leaves 2–5, simple, petiolate or rarely uppermost subsessile; petiole (0.3–)1–3.5 cm, base not auriculate or rarely with minute auricles to 0.3 × 0.3 mm; leaf blade reniform, 1–2.5 × 1.5–4 cm, base cordate, margin dentate-repand and mucronate at vein endings. Flowering pedicels 1–2 cm, divaricate, straight, glabrous, stout. Sepals ovate or oblong, 2.5–4 × 1.5–2 mm, glabrous, margin membranous, base of lateral pair saccate. Petals violet, deep magenta, or rarely pale lavender or white, obovate, 7–10 × 3.5–5 mm. Median filament pairs 3.5–5 mm, lateral pair 2–3.5 mm; anthers oblong, 0.9–1.1 mm. Fruit and seeds not seen. Fl. Mar–Apr.

Shady wet places, moist stony pastures; 2400–3000 m. Guangdong, Sichuan, Yunnan [Myanmar].

The above first records from Guangdong, Sichuan, and Myanmar are based on *Guo Subai 80086* (IBSC, MO), *T. C. Lee 4452* (E), and *Kermode 17204* (K), respectively. Although the type of *Cardamine calthifolia* was collected from Yunnan (“Kiao-me-ti,” May, *Maire s.n.* (holotype, E)), it was not mentioned in FRPS or in Fl. Yunnan. (vol. 6. 1995). Additional collections from Yunnan include *Forrest 26240* (E, K, US, W) and *Forrest 29415* (E).

35. *Cardamine calcicola* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 203. 1919.

岩生碎米荠 *yan sheng sui mi qi*

Herbs perennial, 10–35 cm tall, sparsely to densely pilose on stem and petioles with crisped trichomes to 1.2 mm. Rhizomes thick, short, often with several stolons. Stems erect, simple, pilose or distal parts subglabrous, not flexuous. Basal leaves rosulate, simple or rarely trifoliolate; petiole 1–10 cm, often densely pilose; leaf blade or terminal leaflet reniform, 0.7–3 × 1–4 cm, sparsely pilose or subglabrous, base cordate, margin subentire, repand, or 7–9-crenate, apex acute or

obtuse. Cauline leaves 2–6, 3–7-foliolate; petiole 0.2–2.5 cm, not auriculate at base; terminal leaflet obovate, 0.7–2.5 × 0.6–2.5 cm, with a petiolule 1–8 mm, sparsely pilose or subglabrous, base cuneate and often decurrent with adjacent lateral leaflets, margin entire or obscurely to strongly dentate, apex acute or rounded; lateral leaflets much smaller than terminal one, sessile or rarely shortly petiolulate. Fruiting pedicels divaricate or ascending, 0.7–1.6 cm, straight. Sepals oblong, 3–4 × 1–2 mm, margin and apex membranous, base not saccate. Petals white, obovate, 6–9 × 3–5 mm, apex rounded. Median filament pairs 2.5–3.5 mm, lateral pair 2–2.5 mm; anthers narrowly oblong, 1–1.3 mm. Ovules 12–14 per ovary. Fruit linear, 2–3 cm × 1–1.5 mm; valves glabrous, smooth; style 0.5–2 mm. Seeds brown, oblong-ovate, 1.3–1.9 × 0.8–1.3 mm, wingless. Fl. and fr. May–Jul.

• Crevices of limestone cliffs, moist rocky pastures, valleys; 2600–3700 m. Yunnan.

Cardamine calcicola is a rare and highly restricted species known to the present authors from only a few collections, including *Handel-Mazzetti 6564* (E, GH, US, W, WU) and *Forrest 26329* (BM, E, K). It was recorded from Sichuan in FRPS and Fl. Sichuan. (14: 92. 1999), but the present authors have seen no material from that province, and the records may well be misidentifications.

36. *Cardamine anhuiensis* D. C. Zhang & J. Z. Shao, Bull. Bot. Res., Harbin 6(2): 127. 1986.

安徽碎米荠 an hui sui mi qi

Cardamine jinshaensis Q. H. Chen & T. L. Xu.

Herbs perennial, 11–35 cm tall, sparsely pilose or glabrous. Rhizomes stout, often without stolons. Stems erect, simple or sometimes 1- or 2-branched above, not flexuous. Basal leaves trifoliolate or simple; petiole 2–17 cm; terminal leaflet or leaf blade suborbicular or rarely ovate-orbicular or reniform-orbicular, 0.6–3.5 × 1–5 cm, base cordate or rarely subtruncate, margin crenate or rarely repand-crenate; petiolule of terminal leaflet 0.7–1.4 cm, that of lateral leaflets much shorter; lateral leaflets similar to terminal but much smaller. Cauline leaves 3(or 5)-foliolate; petiole 1.3–3.5 cm, base not auriculate; terminal leaflet ovate-orbicular or subreniform, 1.5–3 × 1–3.2 cm, with a petiolule to 6 mm, margin crenate or crenate-repand; lateral leaflets similar to terminal one, shortly petiolulate or subsessile. Fruiting pedicels divaricate to divaricate-ascending, 0.6–1.5 cm, slender. Sepals oblong, 2–2.8 × 0.8–1.2 mm, base not saccate. Petals white, spatulate, 4–6 × 1.5–2.5 mm, apex rounded. Median filament pairs 2.5–4 mm, lateral pair 1.5–2.5 mm; anthers oblong, 0.5–0.7 mm. Ovules 24–30 per ovary. Fruit linear, 2–4 cm × 1–1.5 mm; valves smooth, glabrous; style 1–3 mm. Seeds brown, oblong, 1.2–2 × 0.8–1.3 mm, wingless. Fl. and fr. Mar–May.

• Shady slopes, along ditches; near sea level to 1000 m. Anhui, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang.

The above first records from Hunan, Jiangxi, and Zhejiang are based on *T. L. Chen 777* (NAS), *Tan Ceming & Xie Guowen 94273* (MO), and *P. L. Chiu 1273* (MO), respectively.

Cardamine jinshaensis is hardly distinct from *C. anhuiensis* except for having leaflets repand-crenate and orbicular-ovate (vs. distinctly crenate and subreniform).

It is quite likely that *Cardamine anhuiensis* is conspecific with the earlier published *C. glechomifolia* H. Léveillé (Repert. Spec. Nov. Regni Veg. 11: 495. 1913), which was described from Korea. The holotype of the latter is so fragmentary that additional collections from Korea and adjacent parts of China are needed to confirm whether or not the two are indeed the same taxon.

37. *Cardamine hydrocotyloides* W. T. Wang, Acta Bot. Yunnan. 9: 8. 1987.

德钦碎米荠 de qin sui mi qi

Herbs perennial, 10–26 cm tall. Rhizomes short, thickened and somewhat fleshy at stem base, with several stolons bearing simple leaves. Stems erect, subglabrous or puberulent with often curved trichomes, simple from rhizomal branches, not flexuous. Rhizomal and lowermost cauline leaves simple; petiole 1.5–6 cm, puberulent or glabrous, not auriculate at base; leaf blade reniform or suborbicular, 0.5–2.5 × 0.8–3.5 cm, papery, glabrous or sparsely pilose adaxially, base cordate, margin repand-crenate or subentire; stolon leaves simple, similar to rhizomal leaves but smaller and with shorter petioles. Uppermost cauline leaves usually 3-foliolate, rarely simple; petiole 0.3–2 cm; terminal leaflet suborbicular, reniform, or ovate-suborbicular, 0.6–2 × 0.8–3 cm, with a petiolule 0.5–7 mm, base cordate, rounded, or subtruncate, margin entire or repand, rarely slightly lobed; lateral leaflets similar to terminal one, petiolulate. Fruiting pedicels 0.9–2 cm, divaricate or ascending, slender, glabrous or puberulent. Sepals ovate, 2–2.5 × 1–1.5 mm, glabrous, not saccate. Petals white, obovate, 5–6 × 3–4 mm, apex rounded. Median filament pairs 3–3.5 mm, slender, toothless; lateral pair 2–2.5 mm; anthers oblong, 0.8–1 mm. Ovules 10–14 per ovary. Fruit linear, 1–2.8 cm × 1–1.3 mm; valves glabrous, smooth; style 1–3 mm. Seeds brown, oblong, ca. 1.3 × 0.8 mm, wingless. Fl. and fr. Jul–Aug.

• Forests, along ditches and trails; 3200–3400 m. Sichuan, Yunnan.

The above first record from Sichuan is based on *Al-Shehbaz et al. 9348* (MO), collected ca. 36 km S of Xiancheng. The filaments in all the material examined by the present authors, including the type collection and paratypes, are slender, and the dentate filaments mentioned in the protologue could not be observed.

38. *Cardamine lihengiana* Al-Shehbaz, Novon 10: 326. 2000.

李恒碎米荠 li heng sui mi qi

Herbs perennial, 30–50 cm tall, glabrous throughout. Rhizomes slender, without stolons. Stems erect, angled, with internodes usually more than 2 cm. Rhizomal and lower cauline leaves simple; petiole 1–4 cm, not auriculate at base; leaf blade reniform or suborbicular, 0.7–2.5 × 1–3 cm, palmately veined, base cordate,

margin repand-crenate, obscurely to distinctly 5- or 7-angled, apex obtuse, obscurely mucronulate. Middle and upper cauline leaves with axillary flowers, simple or rarely 1 or 2 with a lateral, leafletlike lobe, suborbicular or ovate, angled, not crenate, progressively smaller upward. Racemes bracteate throughout, very lax. Fruiting pedicels ascending, 1.5–3 cm, slender, straight. Sepals ovate, 1.5–1.8 × 0.9–1 mm, apex membranous, base not saccate. Petals white, obovate, 3.5–4.5 × 1.5–2 mm, not clawed, apex rounded. Median filament pairs ca. 2.5 mm, lateral pair ca. 2 mm; anthers oblong, ca. 0.6 mm. Ovules 20–24 per ovary. Fruit linear, 2–3.6 cm × ca. 1 mm, sessile; valves glabrous, smooth; style 1–2 mm. Seeds brown, oblong, 1.2–1.4 × 0.7–0.9 mm, wingless. Fl. and fr. Jun.

• About 1900 m. Yunnan.

Cardamine lihengiana is the most distinctive of all Eurasian species in the genus on account of its having very lax racemes that are bracteate throughout.

39. *Cardamine yunnanensis* Franchet, Bull. Soc. Bot. France 33: 398. 1886.

云南碎米荠 *yun nan sui mi qi*

Cardamine bijiangensis W. T. Wang; *C. hirsuta* var. *oxycarpa* J. D. Hooker & T. Anderson; *C. heterophylla* T. Y. Cheo & R. C. Fang (1980), not Host (1797), nor Lapeyrouse (1813), nor Bory (1820), nor Hooker (1835), nor (Nuttall) Wood (1870), nor (J. G. A. Forster) O. E. Schulz (1903); *C. inayatii* O. E. Schulz; *C. levicaulis* W. T. Wang; *C. longipedicellata* Z. M. Tan & G. H. Chen (1996), not Rollins (1940); *C. longistyla* W. T. Wang; *C. muliensis* W. T. Wang; *C. sikkimensis* H. Hara; *C. sinica* Rashid & H. Ohba; *C. weixiensis* W. T. Wang.

Herbs short-lived perennial with slender rhizomes, rarely annual, (10–)15–45(–60) cm tall, often pilose or puberulent, sometimes glabrescent distally. Stems simple or branched from base, angled. Basal leaves petiolate, often withered by flowering, 3–5-foliolate, rarely simple; petiole 1–6(–8) cm; leaf blade or terminal leaflet suborbicular, ovate, or lanceolate, 0.5–3 × 0.5–2.5 cm, dentate, crenate, or rarely subsinuate; lateral leaflets absent or 1 or 2 pairs. Middle cauline leaves 3–7-foliolate; petiole (1–)2–7(–8.5) cm, basally auriculate; auricles toothlike, linear, or lanceolate, (0.4–)1–3(–4) × 0.2–1(–1.5) mm; terminal leaflet lanceolate, elliptic, oblong, ovate, or suborbicular, (1–)1.3–4.5(–6) × (0.4–)0.6–2(–3) cm, sparsely pilose adaxially, often glabrous abaxially, with a petiolule (2–)4–14(–20) mm, base obtuse or cuneate, margin ciliate to ciliolate and dentate, crenate, sinuate, or rarely repand, apex acute or acuminate; lateral leaflets 1–3 pairs, shortly petiolulate to subsessile, similar to terminal one and often oblique at base. Uppermost leaves often trifoliolate, rarely simple. Fruiting pedicels ascending or divaricate, 0.5–1.8(–2.3) cm, straight, slender. Sepals oblong or nearly ovate, 2–3 × 1–1.5 mm, base not saccate. Petals white, obovate, (2.5–)3.5–5(–6) × 2–3 mm, not clawed.

Median filament pairs 2.5–4 mm, lateral pair 2–3 mm; anthers oblong, 0.5–0.8 mm. Ovules 8–18 per ovary. Fruit linear, 1.5–2.8(–3) cm × 1–1.3 mm; valves smooth, sparsely pilose; style (0.5–)1–2.5(–3.5) mm. Seeds brown, narrowly oblong, 1.3–1.8 × 0.7–1 mm, wingless. Fl. Mar–Jul, fr. Apr–Sep.

Moist shady places, mountain slopes, valleys, grasslands, meadows, thickets, forest openings, damp stream beds; 900–4200 m. Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Sikkim].

A critical comparison of the type collection of *Cardamine yunnanensis*, Delavay 1843 (holotype, P; isotypes, E, F, P, US), with those of all the names synonymized above (except the later homonym *C. longipedicellata*) reveals the remarkable similarities among them in all aspects of flowers, fruit, and indumentum. They all have angled stems, auriculate petiolar bases, compound leaves, petiolulate terminal and often lateral leaflets, often oblique bases of lateral leaflets, and sparsely pilose young ovaries and/or fruit. The principal differences among them, which are all trivial, are in the number, shape, and margin of leaflets and length of style. In fact, the type collection of *C. yunnanensis* includes plants with styles 0.5–3 mm. Unfortunately, none of the protologues of the taxa synonymized above can provide a comparison with *C. yunnanensis*, and this perhaps explains why the basic similarities between those taxa and *C. yunnanensis* were overlooked. The present authors believe that none of the taxa synonymized above merits recognition at specific or infraspecific rank. They have also examined the “types” of the invalid names *C. dubia* H. Li (Fl. Dulongjiang Region, 75. 1993, not Zapalowicz, 1912) and *C. gongshanensis* H. Li (loc. cit.; both *nomina nuda*), and these taxa clearly belong to *C. yunnanensis*. Although they have not examined the type collection of *C. longipedicellata*, the detailed description in the protologue corresponds perfectly well with typical plants of *C. yunnanensis*.

40. *Cardamine paucifolia* Handel-Mazzetti, Symb. Sin. 7: 359. 1931.

少叶碎米荠 *shao ye sui mi qi*

Cardamine yunnanensis Franchet var. *obtusata* C. Y. Wu ex T. Y. Cheo & R. C. Fang.

Herbs perennial, 15–40 cm tall, sparsely pilose or glabrescent. Rhizomes slender. Stems simple, slightly angled. Basal leaves often withered by flowering, trifoliolate; petiole 1.5–4.5 cm; leaflets similar to those of cauline leaves, smaller. Cauline leaves 1–4, trifoliolate; petiole 1.5–6 cm, not auriculate at base; terminal leaflet lanceolate, ovate, or broadly elliptic, 3–6.5 × 1–3.5 cm, sparsely pilose or glabrous, with a petiolule 5–12 mm, base obtuse or cuneate, margin ciliate and dentate or crenate, apex acute or acuminate; lateral leaflets 2, shortly petiolulate or sessile and base decurrent to rachis, nearly as large as terminal one, base oblique. Uppermost leaf often with a sessile terminal leaflet decurrent basally with lateral leaflets. Fruiting pedicels ascending or divaricate, 7–11 mm, straight, slender. Sepals oblong, 3.5–4.5 × 1.2–1.5 mm, base not saccate. Petals white, narrowly obovate, 6–8.5 × 1.5–3.5 mm, not clawed. Median filament pairs 3.5–4 mm, lateral pair ca. 3 mm; anthers oblong, 1.1–1.6 mm. Ovules 10–16 per ovary. Fruit linear, 3–5 cm × 1–1.5 mm; valves smooth, glabrous; style 1.5–2.5 mm. Seeds

brown, narrowly oblong, 1.5–2 × 0.6–0.8 mm, apically winged. Fl. and fr. Mar–Jul.

• Ravines, streamsides; 1500–2600 m. Yunnan.

Cardamine paucifolia was not mentioned in FRPS, whereas in Fl. Yunnan. (6: 59. 1995) it was reduced to the synonymy of *C. trifoliolata*. However, *C. paucifolia* is most closely related to *C. yunnanensis*, from which it is readily distinguished by having trifoliolate leaves, no petiolar auricles, larger flowers, glabrous fruit, and apically winged seeds.

The type collection of *Cardamine yunnanensis* var. *obtusata*, *C. W. Wang 64172* (holotype, KUN; isotypes A, NAS), has no petiolar auricles and glabrous fruit, and therefore clearly belongs to *C. paucifolia*. By contrast, the three paratypes of this variety, *T. T. Yü 16025* (A, KUN), *T. T. Yü 11281* (KUN, NAS), and *Handel-Mazzetti 8876* (E, WU), have distinctly auriculate petioles and pilose fruit, and they are assigned to *C. yunnanensis*. Also belonging to *C. paucifolia* is the invalidly named *C. dulongensis* H. Li (Fl. Dulongjiang Region, 75. 1993, *nomen nudum*).

41. *Cardamine impatiens* Linnaeus, Sp. Pl. 2: 655. 1753.

弹裂碎米荠 *tan lie sui mi qi*

Cardamine basisagittata W. T. Wang; *C. dasycarpa* Marschall von Bieberstein; *C. glaphyropoda* O. E. Schulz; *C. glaphyropoda* var. *crenata* T. Y. Cheo & R. C. Fang; *C. impatiens* var. *angustifolia* O. E. Schulz; *C. impatiens* var. *dasycarpa* (Marschall von Bieberstein) T. Y. Cheo & R. C. Fang; *C. impatiens* subsp. *elongata* O. E. Schulz; *C. impatiens* var. *eriocarpa* de Candolle; *C. impatiens* var. *fumaria* H. Léveillé; *C. impatiens* var. *microphylla* O. E. Schulz; *C. impatiens* var. *obtusifolia* Knaf; *C. impatiens* var. *pilosa* O. E. Schulz; *C. nakaiana* H. Léveillé; *C. senanensis* Franchet & Savatier. Herbs biennial or rarely annual, (12–)20–65(–90) cm tall, glabrous or rarely sparsely pubescent near base. Stems erect, simple at base, usually branched above, angled, sometimes flexuous. Basal leaves rosulate, often withered by flowering; petiole 1–4 cm, not auriculate; leaf blade pinnatisect and appearing compound. Cauline leaves to 15 per stem; petiole auriculate, 2–6 cm; auricles lanceolate or linear, 1–8(–10) × (0.1–)0.3–1.8(–2.2) mm, often ciliate; leaf blade (1–)3–18(–22) × (0.6–)1–5.5(–7) cm, pinnatisect; terminal lobe orbicular, obovate, ovate, or lanceolate, 1–4(–5) × 0.5–1.7 cm, with a petiolule to 5 mm, entire or obscurely to strongly 3–5(–9)-toothed or -lobed; lateral lobes (4–)6–11 on each side of midvein, oblong, lanceolate, or ovate, sessile or long petiolulate, smaller than terminal lobe, margin dentate, sublaciniate, or rarely entire; uppermost leaves with narrower segments. Fruiting pedicels divaricate or ascending, 3.5–12(–15) mm, slender. Sepals oblong, 1.2–2(–2.5) × 0.7–1(–1.2) mm. Petals white, oblanceolate, 1.5–4(–5) × 0.6–1.2 mm, rarely absent. Stamens 6; filaments 2–3(–4) mm; anthers ovate, 0.3–0.5 mm. Ovules 10–30 per ovary. Fruit linear, (1–)1.6–3(–3.5) cm × 0.9–1.5 mm; valves glabrous or rarely pilose, torulose; style 0.6–1.6(–2) mm. Seeds brown, oblong, 1.1–1.5 × 0.8–1 mm,

compressed, sometimes apically narrowly winged. Fl. and fr. Feb–Jul. $2n = 16, 32$.

Shady or moist slopes, streamsides, fields, roadsides; near sea level to 4000 m. Anhui, Fujian, Gansu, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Japan, Kashmir, Kazakstan, Korea, Kyrgyzstan, Nepal, Pakistan, Russia, Sikkim, Tajikistan, Uzbekistan; SW Asia, Europe; naturalized in S Africa and North America].

The division of *Cardamine impatiens* into infraspecific taxa based on the size, shape, margin, and indumentum of leaf lobes is definitely artificial. Leaf characters do not correlate in any pattern with geographical distribution. In fact, some of the morphological extremes described as taxa native to Asia appear sporadically in the native European or naturalized American populations. The so-called var. *dasycarpa*, which was described from the Caucasus, represents a form that can be found within populations of typical *C. impatiens*. Furthermore, a critical evaluation of the type collections of *C. basisagittata* and *C. glaphyropoda* shows beyond doubt that they are merely minor variants of *C. impatiens*. Wang (Acta. Bot. Yunnan. 9: 16. 1987) designated *Smith 2969* (UPS) as the lectotype of *C. glaphyropoda*, but the specimen at B would have been a more appropriate choice because it was annotated in Schulz's handwriting. This species is used medicinally and as a source of seed oil.

42. *Cardamine changbaiana* Al-Shehbaz, Novon 10: 323. 2000.

天池碎米荠 *tian chi sui mi qi*

Cardamine resedifolia Linnaeus var. *morii* Nakai.

Herbs perennial, 2–8 cm tall, scapose, glabrous throughout. Rhizomes slender, 0.4–0.7 mm in diam. Stems erect, leafless or rarely 1-leaved. Basal leaves rosulate, fleshy; petiole 0.3–3.5 cm; leaf blade simple or rarely 3-lobed, broadly ovate, subcordate, or oblong, 2–10 × 1.5–8 mm, base cordate or obtuse, margin entire or repand, apex rounded or obtuse. Cauline leaves absent, rarely 1 and petiolate, similar but narrower than basal leaves, petiole base not auriculate. Racemes terminal, 2–5(–7)-flowered, ebracteate. Fruiting pedicels erect to erect-ascending, 2–7 mm, straight. Sepals oblong, 1.3–1.7 × 0.6–0.8 mm. Petals white, obovate, 3–3.5 × 1.5–1.8 mm, base tapering into a claw 0.4–1 mm, apex rounded or subemarginate. Filaments 1.4–2 mm; anthers oblong, 0.5–0.8 mm. Ovules 8–12 per ovary. Fruit linear, 1–2 cm × 1.3–2 mm; gynophore 0.3–1 mm; valves smooth, glabrous; style 0.5–2 mm. Seeds brown, oblong to ovate-oblong, 1.2–1.5 × 0.8–1.1 mm, wingless and not margined. Fl. and fr. Jul–Aug.

Rocky slopes; 2400–2500 m. S Jilin (Changbai Shan) [Korea].

43. *Cardamine nipponica* Franchet & Savatier, Enum. Pl. Jap. 1: 281. 1875.

日本碎米荠 *ri ben sui mi qi*

Herbs perennial, 3–10 cm tall, glabrous throughout. Rhizomes slender, many branched, with petiolar remains of previous years. Stems erect, 2- or 3-leaved. Basal leaves rosulate, (3 or)5- or 7-foliolate; petiole 0.7–2.5 cm; terminal leaflet suborbicular, broadly ovate, or elliptic, 1.5–6 × 1–4 mm, base cuneate or obtuse, margin entire, apex acute and submucronate; lateral leaflets (1 or)2–4 pairs, subsessile, obovate, base

cuneate, margin entire, slightly smaller than terminal one. Cauline leaves 3- or 5-foliolate; petiole 4–11 mm, base auriculate or amplexicaul; auricles lanceolate or toothlike, 0.2–2 × 0.1–0.4 mm, apex acute or subcaudate; terminal leaflet narrowly oblanceolate or linear, 2–10 × 0.5–1 mm; lateral leaflets 2 pairs, smaller than but similar to terminal lobe. Racemes 3–6-flowered, ebracteate; rachis flexuous in fruit. Fruiting pedicels divaricate or ascending, 3–8 mm, straight. Sepals oblong, 1.7–2.2 × ca. 0.8 mm. Petals white, spatulate, 5–6 × ca. 1.5 mm, apex rounded. Median filament pairs ca. 2.5 mm, lateral pair ca. 1.5 mm; anthers ovate, 0.4–0.5 mm. Ovules 10–16 per ovary. Fruit linear, 1.5–3 cm × 0.8–1.2 mm; valves smooth, glabrous; style 0.8–2 mm. Seeds brown, oblong, 1–1.5 × 0.6–0.9 mm, apically winged. Fl. and fr. Jul–Aug.

Alpine slopes. Taiwan [Japan].

44. *Cardamine caroides* C. Y. Wu ex W. T. Wang, Acta Bot. Yunnan. 9: 17. 1987.

细裂碎米荠 xi lie sui mi qi

Herbs perennial, 7–15 cm tall, glabrous or sparsely to densely pilose with trichomes to 0.7 mm. Rhizomes thick, to 10 × 5 mm, with numerous stolons. Stems erect, simple, thick at base, pilose or glabrous at base. Rhizomal and lowermost cauline leaves pilose; petiole 1–3 cm; leaf blade pinnatisect into linear to linear-oblanceolate lobes; terminal lobe obovate in outline, to 8 × 4 mm, cuneate basally into a petiolule 1–4 mm, deeply trifid or apically three toothed; lateral lobes 1–4 on each side of rachis, 2–8 × 0.5–2 mm, undivided or unequally 2- or 3-fid, margin entire, apex acute. Cauline leaves 2–4, including petiole 1.5–4.5 cm, similar to lowermost cauline leaves but with fewer and narrower lobes, petiole base not auriculate. Racemes ebracteate, 6–14-flowered. Pedicels of young fruit ascending or suberect, 0.7–1.5 cm, slender, glabrous, subappressed to rachis. Sepals ovate or suboblong, 2–2.5 × 0.8–1.5 mm, sparsely pilose, subapically membranous, lateral pair subsaccate. Petals lavender, obovate, 5–6 × 2–2.5 mm, apex obtuse. Median filament pairs 2.5–3.5 mm, flattened and to 0.5 mm wide; lateral pair 1.5–2 mm; anthers oblong, 0.6–0.8 mm. Ovules 12–16 per ovary. Young fruit ca. 2 cm × 0.8 mm; valves glabrous; style 1–1.5 mm. Mature seeds not seen. Fl. Jul.

• About 3800 m. Sichuan.

Cardamine caroides, which at present is known only from the holotype, T. T. Yü 6889 (PE), is a delicate plant resembling *C. parviflora*, but is distinct on account of its stoloniferous rhizomes and larger flowers.

45. *Cardamine parviflora* Linnaeus, Syst. Nat., ed. 10, 2: 1131. 1759.

小花碎米荠 xiao hua sui mi qi

Cardamine brachycarpa Franchet (1879), not Opiz (1826); *C. fallax* (O. E. Schulz) Nakai; *C. flexuosa* subsp. *fallax* O. E. Schulz; *C. flexuosa* subsp. *fallax* f.

microphylla O. E. Schulz; *C. flexuosa* var. *fallax* (O. E. Schulz) T. Y. Cheo & R. C. Fang; *C. koshiensis* Koidzumi; *C. manshurica* (Komarov) Nakai; *C. parviflora* f. *hispida* Franchet; *C. parviflora* var. *manshurica* Komarov; *C. scutata* Thunberg subsp. *fallax* (O. E. Schulz) H. Hara.

Herbs annual, (7–)10–30(–40) cm tall, slender, glabrous or sparsely to densely pilose throughout. Stems erect, 1 to several from base, often branched above, somewhat flexuous. Basal leaves rosulate or not, often withered by anthesis; petiole 0.5–1.5 cm; leaf blade 1.5–5 cm, pinnatisect; lateral lobes 3–5 on each side of midvein, oblong, obovate, or suborbicular, sessile or petiolulate, subequaling or smaller than terminal lobe, entire or 3(–5)-toothed or -lobed. Cauline leaves including petiole (1.5–)2–6(–7) × 0.8–2.2 cm, pinnatisect or pectinate; petiole not auriculate at base; lateral lobes (2–)4–7(or 8) on each side of midvein, filiform, linear, or narrowly oblong, 3–10(–16) × 0.3–3 mm, sessile, entire or rarely 1–3-toothed; terminal lobe similar to lateral ones or slightly larger. Fruiting pedicels divaricate or ascending, 4–10 mm, slender. Sepals oblong, 1–1.5(–2) × 0.3–0.5 mm, membranous at margin and apex. Petals white, oblanceolate, (1.5–)1.8–2.5(–3) × 0.4–0.8(–1) mm. Stamens 6; filaments 1.4–2.5 mm; anthers ovate, 0.2–0.4 mm. Ovules 20–50 per ovary. Fruit linear, (0.5–)1–2(–2.5) cm × 0.6–0.9 mm; valves glabrous, torulose; style 0.3–0.7(–1) mm. Seeds pale brown, oblong-ovate, 0.6–0.9 × 0.4–0.6 mm, narrowly margined or not. Fl. May–Jun, fr. Jun–Jul. $2n = 16$.

River banks, along ditches, meadows, roadsides; near sea level to 2500 m. Anhui, Guangxi, Hebei, Heilongjiang, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Taiwan, Xinjiang, Zhejiang [Japan, Kazakstan, Korea, Mongolia, Russia; N Africa, SW Asia, Europe, North America].

The above first records from Guangxi and Yunnan are based on *Tsang* 21800 (A, GH, P) and *Maire* s.n. (B, E, LE, W), respectively.

Cardamine parviflora has often been confused with and treated as distinct from *C. flexuosa* subsp. *fallax*. However, syntypes of the latter name, as well as the types of *C. brachycarpa*, *C. flexuosa* f. *microphylla*, and *C. parviflora* f. *hispida*, are morphologically the same as *C. parviflora*, and are therefore here reduced to synonymy.

46. *Cardamine hirsuta* Linnaeus, Sp. Pl. 2: 655. 1753.
碎米荠 sui mi qi

Cardamine hirsuta var. *formosana* Hayata.

Herbs annual, (3–)10–35(–45) cm tall, sparsely hirsute at least along petioles of basal leaves, often glabrous above. Stems erect, ascending, or decumbent, 1 to several from base, simple or branched above, not flexuous. Basal leaves rosulate; petiole ciliate, 0.5–5 cm; leaf blade (1.5–)2.5–10(–13) cm, lyrate-pinnatisect; terminal lobe reniform or orbicular, 0.4–2 × 0.6–3 cm, margin entire, repand, dentate, or 3–5-lobed; lateral lobes (1–)3–7(–11) on each side of midvein, petiolulate, oblong, ovate, obovate, or orbicular, smaller than terminal lobe, entire, repand, crenate, or 3-

lobed. Cauline leaves 1–4(–6), rarely absent, shortly petiolate, including petiole (0.5–)1.2–5.5(–7) cm; petiole base not auriculate; lateral lobes (2–)4–7(–10) on each side of midvein, ovate, oblong, oblanceolate, or linear, sessile or shortly petiolulate, entire, repand, or dentate. Fruiting pedicels erect or ascending, (2–)3–10(–14) mm, slender. Sepals oblong, 1.5–2.5 × 0.3–0.7 mm. Petals white, spatulate, 2.5–4.5 (–5) × 0.5–1.1 mm, sometimes absent. Stamens 4 and lateral pair often absent, rarely 5 or 6; filaments 1.8–3 mm; anthers ovate, 0.3–0.5 mm. Ovules 14–40 per ovary. Fruit linear, (0.9–)1.5–2.5(–2.8) cm × (0.8–)1–1.4 mm; valves glabrous, torulose; style 0.1–0.6(–1) mm. Seeds light brown, oblong or subquadrate, 0.9–1.3(–1.5) × 0.6–0.9(–1.1) mm, narrowly margined. Fl. Feb–May, fr. Apr–Jul. $2n = 16$.

Mountain slopes, roadsides, fields, clearings, wastelands, damp places, grassy areas; near sea level to 3000 m. Throughout China [India, Indonesia, Japan, Laos, Malaysia, New Guinea, Pakistan, Philippines, Sikkim, Sri Lanka, Thailand, Turkmenistan, Vietnam; SW Asia, Europe; naturalized in S Africa, Australia, North and South America].

A highly variable species, especially with respect to plant size, density of indumentum, number, shape, size, and margins of lateral leaf lobes, and flower morphology (e.g., presence vs. absence of petals and stamen number). The species has been divided into more than 15 subspecies, varieties, and forms. However, all of these taxa are based on characters that can be highly variable even within the same population. Only one synonym pertinent to China is cited above. For additional synonymy, the reader should consult Schulz (Bot. Jahrb. Syst. 32: 464–473. 1903).

Most of the specimens identified as *Cardamine hirsuta* in the Chinese herbaria consulted by the present authors belong to *C. flexuosa*. The two species can be separated easily by the above key. Furthermore, about 80% of the plants of *C. hirsuta* have flowers with four stamens and 18% have five, whereas about 97% of those of *C. flexuosa* have six stamens.

47. *Cardamine flexuosa* Withering, Arr. Brit. Pl., ed. 3, 3: 578. 1796.

弯曲碎米荠 wan qu sui mi qi

Barbarea arisanensis (Hayata) S. S. Ying; *Cardamine arisanensis* Hayata; *C. debilis* D. Don (1825), not Banks ex de Candolle (1821); *C. flexuosa* subsp. *debilis* O. E. Schulz; *C. flexuosa* subsp. *debilis* var. *occulata* (Hornemann) O. E. Schulz; *C. flexuosa* var. *debilis* (O. E. Schulz) T. Y. Cheo & R. C. Fang; *C. flexuosa* var. *ovatifolia* T. Y. Cheo & R. C. Fang; *C. hirsuta* Linnaeus var. *flaccida* Franchet; *C. hirsuta* subsp. *flexuosa* (Withering) J. D. Hooker; *C. hirsuta* var. *omeiensis* T. Y. Cheo & R. C. Fang; *C. hirsuta* var. *sylvatica* (Link) Syme; *C. occlusata* Hornemann; *C. scutata* Thunberg subsp. *flexuosa* (Withering) H. Hara; *C. sylvatica* Link; *C. zollingeri* Turczaninow; *Nasturtium obliquum* Zollinger.

Herbs annual or biennial, (6–)10–50 cm tall, sparsely to densely hirsute basally or throughout, or glabrous. Stems erect, ascending, or decumbent, 1 to several from base, simple or branched, flexuous or straight. Basal

leaves not rosulate, often withered by anthesis, petiolate; leaf blade (2–)4–10(–14) cm, lyrate; terminal lobe reniform, broadly ovate, or suborbicular, repand or 3–5-lobed; lateral lobes, (1 or)2–6(or 7) on each side of midvein, petiolulate or subsessile, oblong, ovate, or elliptic, smaller than terminal lobe, entire, repand, crenate, or 3(–5)-lobed. Cauline leaves 3–15, including petiole (2–)3.5–5.5(–7) cm; petiole base not auriculate; terminal lobe 3–5-lobed; lateral lobes 2–7 on each side of midvein, suborbicular, ovate, oblong, oblanceolate, or linear, similar to or slightly smaller than terminal lobe, sessile or shortly petiolulate, entire, repand, dentate, or 3(–5)-lobed. Fruiting pedicels divaricate or ascending, (5–)6–14(–17) mm, slender. Sepals oblong, 1.5–2.5 × 0.7–1 mm. Petals white, spatulate, 2.5–4(–5) × 1–1.7 mm. Stamens 6, rarely 4 and lateral pair absent; filaments 2–3 mm; anthers ovate, 0.3–0.5 mm. Ovules 18–40 per ovary. Fruit linear, (0.8–)1.2–2.8 cm × 1–1.5 mm; valves glabrous, torulose; style 0.3–1(–1.5) mm. Seeds brown, oblong or subquadrate, 0.9–1.5 × 0.6–1 mm, narrowly margined or not. Fl. Feb–May, fr. Apr–Jul. $2n = 32$.

Fields, roadsides, grasslands, disturbed sites, streamsides, clearings, running water, wet forests, dry sites, greenhouses; near sea level to 3600 m. Throughout China [Bangladesh, Bhutan, India, Indonesia, Japan, Kashmir, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sikkim, Thailand, Vietnam; native to Europe; naturalized in Australia and North and South America].

The above first records from Myanmar and Thailand are based on Keenan *et al.* 3918 (E) and Maxwell 90–149 (MO), respectively.

Cardamine flexuosa is one of the most variable species of Brassicaceae, especially in stem direction, plant height, density of indumentum, flower size, degree of zigzagging of the raceme rachis, orientation of fruiting pedicels and, most dramatically, number, shape, size, base (sessile vs. petiolulate), and margin of lateral leaf lobes. Although Schulz (Bot. Jahrb. Syst. 32: 464–473. 1903) recognized 20 infraspecific taxa in *C. flexuosa*, an examination of the types of most of these reveals that he confused the limits of least four different species, including *C. parviflora*, *C. scutata*, and the North American *C. pennsylvanica* Muhlenberg ex Willdenow. Only a small fraction of the vast number of variants of *C. flexuosa* have been accorded infraspecific ranks, but all of those occur sporadically throughout the range of the species, and the present authors prefer to avoid the recognition of infraspecific taxa that are based on unreliable characters, especially the morphology of lateral leaf lobes. Although *Cardamine occlusata* was based on Chinese material, it was not mentioned in FRPS, and it represents only a minor variant of *C. flexuosa*.

Cardamine flexuosa is used medicinally.

48. *Cardamine scutata* Thunberg, Trans. Linn. Soc. London 2: 339. 1794.

圆齿碎米荠 yuan chi sui mi qi

Cardamine angulata Hooker var. *kamtschatica* Regel; *C. autumnalis* Koidzumi; *C. baishanensis* P. Y. Fu; *C. dentipetala* Matsumura; *C. drakeana* H. Boissieu; *C. flexuosa* Withering var. *kamtschatica* (Regel) Matsumura; *C. flexuosa* subsp. *regeliana* (Miquel) O. E. Schulz; *C. flexuosa* var. *regeliana* (Miquel)

Komarov; *C. flexuosa* var. *manshurica* Komarov; *C. hirsuta* Linnaeus var. *latifolia* Maximowicz; *C. hirsuta* var. *regeliana* (Miquel) Maximowicz; *C. hirsuta* var. *rotundiloba* Hayata; *C. regeliana* Miquel; *C. regeliana* var. *manshurica* (Komarov) Kitagawa; *C. scutata* var. *longiloba* P. Y. Fu; *C. scutata* var. *regeliana* (Miquel) H. Hara; *C. scutata* var. *rotundiloba* (Hayata) T. S. Liu & S. S. Ying; *C. sylvatica* Link var. *regeliana* (Miquel) Franchet & Savatier; *C. taquetii* H. Léveillé; *C. zhejiangensis* T. Y. Cheo & R. C. Fang; *C. zhejiangensis* var. *huangshanensis* D. C. Zhang.

Herbs annual or biennial, rarely short-lived perennial, (5–) 15–50(–70) cm tall, glabrous or sparsely pilose. Stems erect, simple at base, simple or branched above, not flexuous. Basal leaves not rosulate, often withered by anthesis; petiole to 3.5 cm; leaf blade pinnatisect, with 1–4 lateral lobes on each side of midvein; terminal lobe subreniform, suborbicular, rhomboid-ovate, or broadly obovate, much larger than lateral ones, (1–) 1.5–2.5 × 0.7–2 cm, repand, crenate, or 3–5-lobed; lateral lobes petiolulate or sessile, oblong, ovate, or suborbicular. Cauline leaves similar to basal ones; petiole to 3 cm, base not auriculate; lateral lobes 1–5 on each side of midvein, much smaller than terminal lobe; terminal lobe (0.7–)2–5(–6.5) × (0.5–)1.5–4(–5) cm, repand, crenate, or coarsely 3–5(–7)-lobed. Racemes

with a straight rachis. Fruiting pedicels divaricate or ascending, (0.3–) 0.6–1.4(–1.8) cm, slender. Sepals oblong, 1.5–2.5(–3) × (0.7–) 0.9–1.4 mm. Petals white, spatulate, 2.5–4.5(–6) × (1–)1.5–2.5 mm. Stamens 6; filaments 2–3.5 mm; anthers ovate, 0.3–0.6 mm. Ovules 20–40 per ovary. Fruit linear, (0.9–)1.5–2.8(–3.5) cm × (0.8–)1–1.4 mm; valves glabrous or rarely sparsely puberulent or pilose, torulose; style (0.3–)0.6–1.5 mm. Seeds brown, oblong or subquadrate, 0.9–1.5 × 0.6–0.9 mm, narrowly margined or not. Fl. Apr–Jul, fr. May–Aug. $2n = 32$.

Valleys, shady slopes, damp sites, along ditches, rock crevices, mountain slopes, roadsides, streamsides; near sea level to 2100 m. Anhui, Guangdong, Guizhou, Jiangsu, Jilin, Sichuan, Taiwan, Zhejiang [Japan, Korea, Russia (Far East)].

The above first record from Sichuan is based on *Fang 14128* (A). Except for the smaller size of plant, the type collection of *Cardamine zhejiangensis* agrees very well with typical plants of *C. scutata*. The number of lateral leaf lobes varies a great deal among the annual species of *Cardamine*, and therefore it cannot be used as a reliable distinguishing character.

Cardamine dentipetala, described from Japan, differs from *C. scutata* only in having puberulent or pilose (vs. glabrous) fruit. However, some populations of *C. dentipetala* have plants with glabrescent or pilose fruit, and the distinction between the two species is clearly artificial.

44. PEGAEOPHYTON Hayek & Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss.

Kl. 59: 245. 1922.

单花芥属 dan hua qi shu

Herbs perennial, with simple or branched caudex. Trichomes absent or simple. Stems reduced to tiny portions added annually to apex of caudex or its branches. Basal leaves fleshy or not, rosulate, simple, entire or toothed. Cauline leaves absent. Flowers solitary, borne on pedicels from axils of rosette leaves. Fruiting pedicels ascending, straight, reflexed in geocarpic taxa. Sepals broadly ovate or oblong, ascending or spreading, glabrous or pubescent, base not saccate. Petals white, pink, purple, blue, or rarely bright yellow, longer than sepals; blade broadly obovate or suborbicular, rarely spatulate, apex rounded or subemarginate; claw often absent. Stamens 6, erect or spreading, subequal; filaments dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands confluent, subtending bases of all stamens. Ovules 2–15 per ovary. Fruit dehiscent silicles, rarely siliques, oblong, ovate, orbicular, ovoid, or globose, terete, latiseptate, or angustiseptate, geocarpic or not, sessile or stipitate; valves membranous or papery, not veined or obscurely veined, smooth, glabrous or pubescent; replum flattened; septum absent; style obsolete or to 3 mm, subconical; stigma discoid, entire. Seeds uniseriate, wingless, oblong, ovate, or suborbicular, plump or flattened; seed coat obscurely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Six species: Bhutan, China, India, Kashmir, Myanmar, Nepal, Pakistan, Sikkim; four species (one endemic) in China.

- 1a. Fruit angustiseptate, geocarpic; valves ± carinate; fruiting pedicel strongly recurved; replum narrow, wingless; gynophore absent 4. *P. angustiseptatum*
- 1b. Fruit subterete or latiseptate; valves flat; fruiting pedicels usually straight; replum wide, winged; gynophore present.
- 2a. Fruiting pedicels pubescent along 1 side, persisting for more than one season; fruit narrowly oblong; sepals apically ciliate 1. *P. minutum*
- 2b. Fruiting pedicels glabrous or distally pubescent on all sides, not persistent; fruit oblong, ovate, orbicular, ovoid, or subglobose; sepals not ciliate.
- 3a. Fruit ovoid or subglobose; valves membranous, puberulent apically; sepals 1.1–1.3 mm; petals 1.6–2(–2.5) mm; seeds plump, 1–1.1(–1.3) × 0.5–0.6(–0.8) mm 3. *P. nepalense*

- 3b. Fruit oblong, orbicular, or ovate, flattened; valves papery, glabrous; sepals (2–)2.5–6(–10) mm; petals (3.5–)5–12(–15) mm; seeds flattened, 1.5–3.5(–4) × 1–2.5(–3) mm 2. *P. scapiflorum*

1. *Pegaeophyton minutum* H. Hara, J. Jap. Bot. 47: 270. 1972.

小单花芥 xiao dan hua qi

Pegaeophyton garhwalense H. J. Chowdhery & Sur. Singh.

Herbs with slender, branched caudex 0.75–2 mm in diam. Petiole (3–)5–10(–15) mm; leaf blade obovate, spatulate, ovate, oblong, or oblanceolate, 1–4(–5) × (0.5–)1–1.5(–2) mm, somewhat fleshy, adaxially sparsely puberulent with trichomes 0.02–0.08 mm, rarely glabrous, abaxially glabrous, base cuneate or subattenuate, margin entire, apex obtuse to subrounded. Fruiting pedicels slender, puberulent along 1 side of entire length with trichomes 0.02–0.08 mm, (1–)1.5–2.5(–4) cm, persistent. Sepals broadly ovate, 1.2–2 × 0.8–1.2 mm, free, glabrous, distally ciliate with flattened trichomes to 0.05 mm. Petals white, lilac, or violet, broadly obovate or suborbicular, (1.5–)2–3(–4.5) × 1.5–2.5(–3) mm, tapering to clawlike base 0.7–1.5 mm. Filaments dilated at base, (0.9–)1–1.5 mm; anthers broadly ovate or suborbicular, 0.3–0.4 mm. Fruit latiseptate, not geocarpic, narrowly oblong, 3–5 × 1–1.2 mm; valves nearly flat, extending along part of fruit length; gynophore 0.25–0.5 mm; style 0.3–0.4 mm. Seeds 3–5, broadly ovate, brown, plump, 1–1.2 × 0.6–0.7 mm. Fl. May–Jul.

Mossy wet ledges, hillsides, mossy granite or boulders, steep grassy slope; 3700–4200 m. Xizang [Bhutan, India (Uttar Pradesh), Nepal, Sikkim].

2. *Pegaeophyton scapiflorum* (J. D. Hooker & Thomson) C.

Marquand & Airy Shaw, J. Linn. Soc., Bot. 48: 229. 1929.

单花芥 dan hua qi

Herbs with slender or stout, apically branched or unbranched caudex (0.1–)0.3–1.5(–3) cm in diam. Petiole 1–8(–13) cm; leaf blade ovate, oblong, elliptic, obovate, spatulate, oblanceolate, or narrowly linear, (1–)1.5–8(–10) × 0.2–1.2(–2.5) cm, somewhat fleshy or not, glabrous or adaxially sparsely pubescent with trichomes 0.2–0.5 mm, abaxially glabrous, base cuneate or subattenuate, margin entire or dentate, sometimes minutely ciliate, apex obtuse or acute. Fruiting pedicels slender or stout, glabrous or rarely sparsely pubescent apically all around with trichomes 0.2–0.5 mm, (1.2–)2.5–15(–20) cm, not persistent. Sepals ovate or oblong, (2–)2.5–6(–10) × 1.5–3.5(–4.5) mm, glabrous or sparsely pubescent, not ciliate. Petals white, pink, or blue, sometimes white with greenish or bluish center, broadly obovate, spatulate, or suborbicular, (3.5–)5–12(–15) × (1.5–)2–9(–10) mm, tapering to clawlike base (0.5–)1–3(–3.5) mm. Filaments dilated at base, (2.5–)3–5(–7) mm; anthers oblong to narrowly so, (0.5–)1–1.5(–2) mm, sagittate at base. Fruit latiseptate, not

geocarpic, oblong, ovate, or orbicular, (4–)5–13(–20) × (2–)4–8(–10) mm; valves nearly flat, extending along part of fruit length, papery, glabrous; gynophore (0.5–)2–5 mm; style 1–2(–3) mm. Seeds (1–)3–10(–12), broadly ovate, brown, flattened, 1.5–3.5(–4) × 1–2.5(–3) mm.

Alpine tundra, alpine meadows, alpine brooks, muddy gravelly slopes, dry slopes, gravel near glaciers, grassy slopes, lake shores, moist pastures, stony slopes with unconsolidated screes, wet screes and seepage areas in screes, moss by streamlets, among rocks, rock crevices, gravel in stream beds, boggy ground by lakes, sandy stream edges, by melting snow or running water, swampy ground, glacier stream beds, peaty soil; 3500–5400(–5600) m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India (Assam), Kashmir, Myanmar, Nepal, Sikkim].

- 1a. Petals (6–)8–12(–15) × (5–)6–9(–10) mm, length (1–)1.2–1.5 × width; caudex stout, simple or rarely branched at apex; seeds (2–)2.5–3.5(–4) × (1.5–)2–2.5(–3) mm 2b. subsp. *robustum*
1b. Petals (3.5–)5–7 × (1.5–)2–3(–3.5) mm, length (1.8–)2–2.5(–3) × width; caudex slender, few to many branched, rarely simple and stout; seeds 1.5–2(–2.5) × 1–1.6(–1.8) mm 2a. subsp. *scapiflorum*

2a. *Pegaeophyton scapiflorum* subsp. *scapiflorum*

单花芥(原亚种) dan hua qi (yuan ya zhong)

Cochlearia scapiflora J. D. Hooker & Thomson, J. Proc.

Linn. Soc., Bot. 5: 154. 1861; *Pegaeophyton*

scapiflorum var. *pilosicalyx* R. L. Guo & T. Y. Cheo.

Caudex slender, 1–8(–12) mm in diam., few to many branched, sometimes simple and somewhat stout. Petals (3.5–)5–7 × (1.5–)2–3(–3.5) mm, length (1.8–)2–2.5(–3) × width. Seeds 1.5–2(–2.5) × 1–1.6(–1.8) mm. Fl.

May–Sep, fr. Jul–Oct.

Alpine tundra, alpine meadows, muddy gravelly slopes, gravel near glaciers, grassy slopes, lake shores, moist pastures, stony slopes with unconsolidated screes, seepage areas in screes, moss by streamlets, rock crevices, boggy ground by lakes, sandy stream edges, by melting snow or running water; 4000–5400(–5600) m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India (Assam), Kashmir, Myanmar, Nepal, Sikkim].

2b. *Pegaeophyton scapiflorum* subsp. *robustum* (O. E.

Schulz) Al-Shehbaz et al. in Al-Shehbaz, Edinburgh J. Bot. 57: 164. 2000.

粗壮单花芥 cu zhuang dan hua qi

Pegaeophyton sinense (Hemsley) Hayek & Handel-

Mazzetti var. *robustum* O. E. Schulz, Notizbl. Bot. Gart.

Berlin-Dahlem 9: 477. 1926; *Braya sinensis* Hemsley;

P. scapiflorum var. *robustum* (O. E. Schulz) R. L. Guo

& T. Y. Cheo; *P. sinense* (Hemsley) Hayek & Handel-

Mazzetti.

Caudex mostly stout, (5–)8–20(–30) mm in diam., simple or rarely branched at apex. Petals (6–)8–12(–15) × (5–)6–9 (–10) mm, length (1–)1.2–1.5 × width. Seeds (2–)2.5–3.5(–4) × (1.5–)2–2.5(–3) mm. Fl. Apr–Oct, fr. Jul–Nov.

Among rocks, gravel in stream beds, dry slopes, alpine brooks, wet gravel, swampy ground, glacier stream beds, peaty soil, wet screes; 3500–4800 m. Sichuan, Xizang, Yunnan [Bhutan].

3. *Pegaeophyton nepalense* Al-Shehbaz et al., *Novon* 8: 327. 1998.

尼泊尔单花芥 ni po er dan hua qi

Herbs with slender caudex ca. 1 mm in diam. Leaves 5–12 per caudex; petiole (2–)6–10(–14) mm, slender at base, glabrous or with few trichomes; blade suborbicular or broadly obovate, 2–4(–5) × 1.5–3.5(–4.5) mm, somewhat fleshy, adaxially moderately pubescent with trichomes 0.3–0.5 mm, abaxially glabrous, base obtuse, margin entire, apex rounded or subrounded. Flowers 3–8 per plant. Pedicels slender, distally pubescent all around with trichomes 0.3–0.5 mm, 2–5 mm at anthesis, not elongated in fruit. Sepals oblong, 1.1–1.3(–1.5) × 0.5–0.7 mm, free, spreading or ascending, not saccate, pubescent on distal half with trichomes to 0.3 mm, membranous margin 0.05–0.1 mm wide, obtuse. Petals white, broadly obovate or suborbicular, slightly emarginate, 1.6–2(–2.5) mm; blade 0.8–1.5 × 0.8–1.5 mm; claw 0.8–1.2 mm. Filaments erect, white, slightly dilated at base, 1.2–1.5 mm, persistent to fruit maturity; anthers suborbicular, 0.2–0.3 mm, slightly sagittate at base. Fruit latiseptate, not geocarpic, broadly ovoid or subglobose, 2–3 × 1.8–2 mm; valves membranous, rounded, extending along part of fruit length, glabrous or minutely puberulent distally; gynophore 0.1–0.2 mm; replum strongly

45. PHAEONYCHIUM O. E. Schulz, *Notizbl. Bot. Gart. Berlin-Dahlem* 9: 1092. 1927.

藏芥属 zang jie shu

Parryopsis Botschantzev; *Wakilia* Gilli; *Vvedenskyella* Botschantzev.

Herbs perennial, with well-developed caudex. Trichomes dendritic, forked, submalpighiaceae, or almost exclusively simple. Stems erect or ascending, simple or branched. Basal leaves petiolate, rosulate, simple, entire, coarsely dentate, or lyrate, with persistent petioles. Cauline leaves absent, if present sessile or shortly petiolate, entire. Racemes few to many flowered, ebracteate or rarely lowermost flowers bracteate, elongated in fruit. Fruiting pedicels slender, suberect or divaricate. Sepals ovate or oblong, persistent or caducous, base of lateral pair not saccate. Petals pink or violet, rarely white with purplish claws, obovate, apex obtuse or emarginate; claw subequaling sepals. Stamens 6, tetradynamous; filaments dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present; lateral glands often annular. Ovules 10–18 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, ovoid, lanceolate, or ellipsoid, terete or latiseptate, sessile or shortly stipitate; valves with a distinct midvein, smooth or torulose; replum rounded; septum complete, membranous, translucent; style obsolete to 2.5 mm, persistent; stigma capitate, entire or rarely 2-lobed. Seeds uniseriate, wingless, oblong, plump; seed coat reticulate, not mucilaginous when wetted; cotyledons incumbent.

Seven species: Afghanistan, Bhutan, China, Kashmir, Nepal, Tajikistan; six species (three endemic) in China.

1a. Flowering stems leafy; lowermost flowers bracteate.

2a. Leaves lyrate or coarsely dentate; trichomes on stems, pedicels, and fruit submalpighiaceae 3. *P. fengii*

2b. Leaves entire or rarely subapically 1–3-toothed; trichomes on stems, pedicels and fruit simple or dendritic.

flattened, 0.4–0.5 mm wide, glabrous; septum absent; style 0.5–0.7 mm; stigma entire. Seeds 2–4, oblong, brown, plump, 1–1.1(–1.3) × 0.5–0.6(–0.8) mm. Fl. Jun–Sep, fr. Aug–Sep.

Stable moraine, among moss, under rocks by stream, damp or gravelly scree, alpine grassland, wet sand; 3900–5100 m. Xizang [Bhutan, Nepal, Sikkim].

4. *Pegaeophyton angustiseptatum* Al-Shehbaz et al. in Al-Shehbaz, *Edinburgh J. Bot.* 57: 167. 2000.

窄隔单花芥 zhai ge dan hua qi

Herbs with thick, unbranched caudex 3–6 mm in diam. Petiole 1.5–4.5 cm, glabrous; leaf blade spatulate or oblanceolate, 1–2.5 cm × 2–10 mm, not fleshy, sparsely pilose adaxially with simple trichomes, glabrous abaxially, base cuneate or subattenuate, margin entire or obscurely 1- or 2-toothed on each side, sparsely ciliate with trichomes to 1 mm, apex obtuse or subrounded. Fruiting pedicels slender, sparsely to densely pubescent with spreading trichomes along distal half, strongly recurved to the ground, to 7 cm. Sepals broadly ovate, 2.5–3 × 1.5–1.8 mm, sparsely pubescent with trichomes 0.1–0.3 mm, not ciliate. Petals white, broadly obovate, 4–5 × 2.5–3 mm, tapering to clawlike base ca. 2 mm. Filaments 2–2.5 mm; anthers ovate, 0.5–0.6 mm. Fruit angustiseptate, geocarpic, dehiscent, suborbicular or broadly oblong, 4–7 × 4–5 mm, rounded at base and apex; valves carinate, extending along full fruit length, minutely papillate at apex; gynophore absent; style 1.5–2 mm. Seeds brown, up to 10, broadly ovate or suborbicular, compressed, 1.6–1.9 × ca. 1.2 mm. Fl. and fr. Jul.

• Open moist pastures. Yunnan.

- 3a. Petals white; trichomes branched; petiole of basal leaves 1–5 mm, slender, not persistent; young fruit linear; anthers 0.5–0.6 mm 2. *P. albiflorum*
- 3b. Petals lavender or purple; trichomes simple; petiole of basal leaves (7–)10–30(–40) mm, broadly expanded at base, persistent; fruit ovoid or oblong; anthers 1–1.2 mm 5. *P. villosum*
- 1b. Flowering stems leafless; flowers ebracteate.
- 4a. Sepals, distal leaf margin, and petiole with subsetose simple trichomes; fruit lanceolate, 2.5–4 mm wide; sepals soon caducous 6. *P. kashgaricum*
- 4b. Plants tomentose throughout with dendritic, forked, and simple nonsetose trichomes; fruit linear, to 2 mm wide; sepals persistent.
- 5a. Leaves green, with simple and forked, crisped, flattened trichomes, oldest leaves (7–)10–25 mm wide; fruit straight, replum not constricted between seeds 4. *P. jafrii*
- 5b. Leaves canescent, exclusively with dendritic, slender trichomes, oldest leaves 1–4 mm wide; fruit subcontorted, replum constricted between seeds 1. *P. parryoides*

1. *Phaeonychium parryoides* (Kurz ex J. D. Hooker & T. Anderson) O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 1092. 1927.

藏芥 zang jie

Cheiranthus parryoides Kurz ex J. D. Hooker & T. Anderson in J. D. Hooker, Fl. Brit. India 1: 132. 1872. Plants 9–25 cm tall; caudex often stout, woody, few branched, covered with petiolar bases of previous years. Trichomes short-stalked, dendritic. Stems erect, simple from caudex, tomentose. Basal leaves rosulate; petiole (0.5–)0.8–2(–4) cm, basally ciliate, becoming thickened and often subcorky, to 4 mm wide at base; leaf blade narrowly oblanceolate or linear, (0.5–)1–2.5(–4) cm × 1–4 mm, canescent, finely tomentose, base attenuate, margin entire, apex obtuse. Cauline leaves absent. Racemes (15–)20–35-flowered, ebracteate. Fruiting pedicels divaricate-ascending, straight, 0.8–2.5 cm, tomentose. Sepals oblong, 3–3.5 × 1–1.5 mm, tomentose, persistent, margin membranous. Petals lavender or purplish, obovate, 7–9 × 3–4 mm, apex obtuse; claw 3–4 mm. Filaments purple, median pairs 2.5–4 mm, lateral pair ca. 2 mm; anthers oblong, 0.7–0.9 mm. Immature fruit linear, ca. 2 cm × 2 mm, flattened, sessile, subcontorted, constricted between seeds; valves finely tomentose; style 1–1.5 mm; stigma capitate, entire. Mature seeds not seen. Fl. Jun–Aug.

Dry hillsides; 3300–4200 m. Xizang [Kashmir].

The illustration of *Phaeonychium parryoides* in FRPS is based on a plant of *P. jafrii*, but the trichomes were erroneously drawn.

2. *Phaeonychium albiflorum* (T. Anderson) Jafri, Fl. West Pakistan 55: 162. 1973.

白花藏芥 bai hua zang jie

Cheiranthus albiflorus T. Anderson in J. D. Hooker, Fl. Brit. India 1: 133. 1872; *Christolea albiflora* (T. Anderson) Jafri; *Ermania albiflora* (T. Anderson) O. E. Schulz.

Plants 2–8 cm tall; caudex slender, few branched, usually without leaf remains of previous years. Trichomes short-stalked, dendritic or few forked, appressed. Stems erect, often simple from caudex, pubescent. Basal leaves rosulate; petiole 1–5 mm, not ciliate, slender; leaf blade oblanceolate or narrowly spatulate, 2–10(–17) × 1–4 mm, uniformly tomentose on both surfaces, base attenuate or cuneate, margin entire or distally 1–3-toothed, apex obtuse to subacute. Cauline leaves similar to basal, smaller upward, narrowly oblanceolate or sublinear, middle and upper ones always entire. Racemes 8–15-flowered, basally bracteate. Pedicel slender, suberect or ascending, straight, 2–5 mm in flower, tomentose. Sepals 2–2.7 × 1–1.5 mm, sparsely pubescent, margin broadly membranous. Petals white, fading lavender on claw, broadly spatulate, 6–8 × 3–4 mm, apex rounded; claw 3–4 mm. Filaments white, median pairs 2.7–3.5 mm, lateral pair 1.5–2 mm; anthers oblong, 0.5–0.6 mm. Immature fruit linear, densely tomentose; style ca. 0.5 mm; stigma capitate, entire. Seeds unknown. Xizang [Kashmir].

3. *Phaeonychium fengii* Al-Shehbaz, Novon 10: 335. 2000. 冯氏藏芥 feng shi zang jie

Herbs perennial, 3–9 cm tall, caespitose; caudex stout, woody, few branched, to 8 mm in diam., covered with petiolar remains of previous years. Trichomes submalpighiaceous on stems, pedicels, and fruit, these mixed with simple ones especially on leaves and sepals. Stems erect, simple from caudex. Basal leaves rosulate; petiole 0.5–1.5 cm, ciliate with simple trichomes to 1 mm, becoming papery at base; leaf blade oblong or oblanceolate, 3–15 × 1.5–6 mm, sparsely pilose, base attenuate, margin coarsely dentate and with 3–7 teeth on each side, or lyrate, rarely earliest ones subtire, apex subacute. Upper cauline leaves similar to basal, subsessile. Racemes corymbose, ebracteate or lowermost 1 or 2 flowers bracteate. Young fruiting pedicel divaricate-ascending, straight, 5–10 mm. Sepals oblong, 2.5–3.5 × 1–1.5 mm, sparsely pilose, caducous, margin membranous. Petals rose-pink, obovate, 6–7 ×

3.5–4 mm, apex rounded; claw 1.5–2 mm. Filaments slender; median pairs 2.5–3.5 mm; lateral pair 2–2.5 mm; anthers oblong, 0.7–0.8 mm. Ovules 12–16 per ovary. Young fruit terete, pilose; style ca. 1 mm; stigma 2-lobed. Mature seeds unknown.

• Open moist streambanks. Yunnan.

4. *Phaeonychium jafrii* Al-Shehbaz, *Nordic J. Bot.* 20: 160. 2000.

杰氏藏芥 *jie shi zang jie*

Plants 8–30 cm tall; caudex stout, woody, few to many branched, to 3 cm in diam., covered with petiolar bases of previous years. Trichomes simple mixed with stalked or sessile ones, crisped, flattened. Stems erect, simple and to 25 from caudex, tomentose. Basal leaves rosulate; petiole 1–5(–7) cm, ciliate with simple trichomes to 2 mm, becoming thickened and corky, to 6 mm wide at base; leaf blade broadly ovate or oblong, occasionally lanceolate or oblanceolate, 1–5.5(–7) × (0.7–)1–2.5 cm, green, subtomentose, base cuneate or attenuate, margin entire, apex obtuse or acute. Cauline leaves absent. Racemes (8–)12–35-flowered, ebracteate. Fruiting pedicels suberect or ascending, straight, (0.3–)0.6–1.5(–2.5) cm, tomentose. Sepals oblong, 3–4 × 1.5–2 mm, tomentose, persistent, margin membranous. Petals lavender or white flushed basally with purplish, obovate, 6.5–10 × 4–5 mm, apex obtuse; claw 3–4 mm. Filaments purple; median pairs 3–4 mm; lateral pair 2–2.5 mm; anthers oblong, 0.9–1.1 mm. Ovules 5–8 per ovary. Fruit linear, (0.9–)1.5–2.5(–3.5) cm × 1.5–2 mm, slightly flattened, sessile, straight; valves finely tomentose, with a distinct midvein and marginal veins; style 0.3–0.7 mm; stigma capitate, entire. Seeds brown or blackish, oblong, 2–2.5 × 0.9–1.1 mm, slightly flattened, distally margined; funicles often filiform and to 3 mm. Fl. Jul–Sep.

Scrub, cliff ledges, steep rocky hillsides; 4000–4900 m. Xizang [Bhutan, Nepal].

5. *Phaeonychium villosum* (Maximowicz) Al-Shehbaz, *Nordic J. Bot.* 20: 161. 2000.

柔毛藏芥 *rou mao zang jie*

Parrya villosa Maximowicz, *Fl. Tangut.* 55: 1889; *Braya kokonorica* O. E. Schulz; *Christolea villosa* (Maximowicz) Jafri; *C. villosa* var. *platyfilamenta* K. C. Kuan & Z. X. An; *Ermania villosa* (Maximowicz) O. E. Schulz; *Parrya villosa* var. *albiflora* O. E. Schulz; *Parryopsis villosa* (Maximowicz) Botschantzev. Plants (4–)6–14(–18) cm tall; caudex slender, few branched, covered with petiolar remains of previous years. Trichomes simple, often crisped, to 1.5 mm. Stems erect, simple from caudex, villous. Basal leaves rosulate; petiole (0.7–)1–3(–4) cm, ciliate, persistent, becoming papery, strongly expanded and to 7 mm wide

at base; leaf blade narrowly oblanceolate or oblong-linear, (0.8–)1.5–2.8(–3.5) cm × (1.5–)2.5–6(–8) mm, villous, base attenuate, margin entire, apex obtuse. Cauline leaves shortly petiolate; leaf blade often oblong or elliptic-lanceolate, about as large as that of basal leaves. Racemes 10–25-flowered, basally bracteate; flowers fragrant. Fruiting pedicels divaricate, straight or slightly curved, (0.5–)0.7–1.5(–2) cm, villous. Sepals oblong or ovate, 3–5 × 1.5–2 mm, sparsely villous, persistent, margin membranous. Petals lavender or purple, broadly spatulate, 8–10 × 4–6 mm, apex emarginate; claw 2.5–3.5 mm. Filaments lavender; median pairs 3–4 mm; lateral pair 1.5–2 mm; anthers oblong, 1–1.2 mm. Ovules 4–8 per ovary. Fruit oblong or ovoid, (5–)7–12 × 2.5–4 mm, terete, sessile or on gynophores to 1 mm; valves obscurely veined, shortly pubescent; style 1–1.5 mm; stigma capitate, entire or slightly 2-lobed. Seeds ovoid, 2–2.5 × 1–1.5 mm. Fl. Jun–Jul, fr. Aug–Sep.

• Slopes, alpine turf; 3500–4500 m. Gansu, Qinghai, Sichuan, Xizang.

In both FRPS (33: 292, 440. 1987) and Fl. Qinghai. (1: 469, 502. 1997), the flowering material of *Phaeonychium villosum* was recognized as *Christolea villosa* and the fruiting material as *Braya kokonorica*; the two species were placed in different tribes.

6. *Phaeonychium kashgaricum* (Botschantzev) Al-Shehbaz, *Nordic J. Bot.* 20: 162. 2000.

喀什藏芥 *ka shi zang jie*

Vvedenskyella kashgarica Botschantzev, *Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR* 17: 174. 1955; *Christolea kashgarica* (Botschantzev) Z. X. An. Plants 3–15 cm tall; caudex slender, few branched, covered with petiolar remains of previous years. Trichomes simple, rigid, subsetose, to 0.4 mm. Stems erect, simple from caudex, glabrous. Basal leaves rosulate; petiole 0.5–3 cm, ciliate, persistent base becoming papery, expanded and to 2 mm wide at base; leaf blade narrowly oblanceolate or spatulate, 1–3.5 cm × 3–10 mm, glabrous, base attenuate, margin entire, ciliate distally, apex obtuse or subacute. Cauline leaves absent. Racemes 7–18-flowered, ebracteate. Fruiting pedicels ascending, straight or slightly curved, 5–13 mm, glabrous. Sepals oblong or ovate, 3–4 × 1–1.8 mm, subapically hispid, caducous, margin membranous. Petals purple, spatulate, 6–9 × 2.5–4 mm, apex rounded; claw 2–3 mm. Filaments lavender; median pairs 3–3.5 mm; lateral pair 1.5–2.5 mm; anthers oblong, 0.8–1 mm. Ovules 6–10 per ovary. Fruit lanceolate, 2–2.5 cm × 2.5–4 mm, latiseptate, sessile or on gynophore to 1 mm; valves with a distinct midvein, glabrous; style 1–2 mm; stigma capitate, slightly 2-lobed. Mature seeds not seen. Fl. May–Jun, fr. Jun–Jul.

• Slopes; 1800–2400 m. Xinjiang.

46. BARBAREA R. Brown in W. T. Aiton, *Hortus Kew.* 4: 109. 1812, nom. cons.

山芥属 *shan jie shu*

Herbs biennial or perennial, with rhizomes or woody caudex, rarely annuals. Trichomes simple or absent. Stems erect, sometimes prostrate, angular. Basal leaves rosulate or not, lyrate-pinnatifid or pinnatisect, rarely undivided. Cauline leaves petiolate or sessile, auriculate or amplexicaul, entire, dentate, pinnatifid, or pinnatisect. Racemes many flowered, often ebracteate; rachis striate. Fruiting pedicels slender or thickened, erect or divaricate. Sepals oblong or linear, erect or spreading, base of lateral pair saccate. Petals yellow, rarely creamy white; blade spatulate or oblanceolate, apex obtuse or rounded; claw obscurely differentiated. Stamens 6, tetradynamous; filaments not dilated at base; anthers oblong, obtuse at apex. Nectar glands 4, median pair toothlike; lateral pair annular. Ovules 10–40 per ovary. Fruit dehiscent siliques, linear or rarely elliptic-linear, terete, 4-angled, or latiseptate, sessile or shortly stipitate; valves with a prominent midvein and distinct marginal veins, mostly glabrous, smooth or torulose; replum rounded; septum complete; style obsolete or to 5 mm; stigma capitate, entire or slightly 2-lobed. Seeds uniseriate or subbiseriate, wingless, margined, or winged, oblong, ovoid, or orbicular, plump or slightly flattened; seed coat reticulate, rarely tuberculate, not mucilaginous when wetted; cotyledons accumbent.

About 22 species: mainly in SW Asia, Australia, Europe, and North America; five species (two endemic, one introduced) in China.

1a. Terminal lobe of basal and lowermost cauline leaves nearly as large as adjacent lateral lobes; uppermost cauline

leaves with (4–)6–10(–12) lateral lobes; plants perennial 1. *B. taiwaniana*

1b. Terminal lobe of basal and lowermost cauline leaves much larger than adjacent lateral lobes; uppermost cauline

leaves unlobed or with 1–4 lateral lobes; herbs annual or biennial, rarely perennial.

2a. Fruit strongly compressed, 2–2.5 wide; valve apex retuse; seeds 1.6–2 × 1.4–1.7 mm, winged all

around 2. *B. hongii*

2b. Fruit terete, quadrangular, or slightly compressed, 1–1.8(–2) mm wide; valve apex obtuse or subacute; seeds smaller, wingless.

3a. Uppermost cauline leaves pinnatisect into linear or linear-oblong lateral lobes; fruit 1.5–1.8(–2) mm

wide 4. *B. intermedia*

3b. Uppermost cauline leaves undivided, dentate, or lyrate-pinnatifid into oblong or ovate lateral lobes;

fruit 1–1.5 mm wide.

4a. Style in fruit stout, 0.5–1(–1.2) mm; uppermost cauline leaves usually lyrate-pinnatifid 3. *B. orthoceras*

4b. Style in fruit slender, 1.5–3 mm; uppermost cauline leaves undivided 5. *B. vulgaris*

1. *Barbarea taiwaniana* Ohwi, Repert. Spec. Nov. Regni Veg. 36: 50. 1934.

台湾山芥 *tai wan shan jie*

Herbs perennial, (6–)10–20(–35) cm tall. Caudex apically branched or simple in younger plants, often with petiolar remains or previous years. Stems erect or rarely decumbent when many branched from base, angled, glabrous throughout. Basal and lowermost cauline leaves petiolate; petiole (2–)3–7(–10) cm, ciliate at least basally, grooved adaxially; leaf blade (2–)3–5(–9) cm, pinnatisect, with (3–)5–8(–10) lobes on each side of midvein, somewhat fleshy; lateral lobes oblong or ovate, (2–)5–10(–15) × (1–)3–6(–10) mm, entire or obtusely lobed; terminal lobe about as large as lateral ones. Cauline leaves pinnatisect, with (4–)6–10(–12) lateral lobes, petiolate, reduced in size and sessile upward, conspicuously auriculate; auricles ovate or oblong, to 12 × 5 mm, ciliate, base rounded, entire or rarely tooth-ed; lateral lobes linear, narrowly oblanceolate, oblong, or rarely ovate, to 15 × 5 mm, glabrous, entire or usually lobed or obtusely toothed on proximal margin; terminal lobe mostly 3-lobed.

Racemes ebracteate, slightly elongated in fruit. Sepals yellowish, usually tinged purple at middle, oblong, 3–4 × 1–1.5 mm, erect, margin scarious, lateral pair slightly saccate. Petals yellow, oblanceolate, rounded, 5–7 × 2–

2.5 mm, attenuate to base. Filaments yellow, 3–4 mm; anthers oblong, ca. 1 mm. Fruiting pedicels erect-ascending, 3–6(–10) mm, angled to subterete, glabrous. Fruit linear, (1–)1.5–2.5 cm × (1.5–)2–2.5 mm, compressed, somewhat torulose, somewhat appressed to rachis; gynophore 0.2–0.5 mm; valves apex obtuse or retuse; style stout or slender, 0.5–2 mm. Seeds yellowish brown, broadly ovate or suborbicular, 1.5–2 × ca. 1 mm, uniseriate or subbiseriate, somewhat compressed, often winged all around, wing to 0.2 mm wide. Fl. Jun–Jul, fr. Aug–Sep.

• Above timberline in rock crevices, under *Abies*, sunny rocky areas; 3200–4000 m. Taiwan.

The illustration and description of *Barbarea taiwaniana* in FRPS represent plants of *B. orthoceras*.

2. *Barbarea hongii* Al-Shehbaz & G. Yang, Acta Phytotax. Sin. 38: 71. 2000.

洪氏山芥 *hong shi shan jie*

Herbs annual or biennial, 35–60 cm tall. Stems erect, angled, glabrous throughout. Basal leaves not seen; lowermost cauline leaves petiolate; petiole 2.5–6 cm, glabrous; leaf blade 4–7 cm, lyrate-pinnatifid, with 1–3 lobes on each side of midvein, not fleshy; lateral lobes oblong or ovate, 2–10 × 1–5 mm, entire; terminal lobe oblong or ovate, considerably larger than lateral ones, 2–3 × ca. 1.5 cm. Cauline leaves usually with 1 lateral

lobe on each side, with the uppermost unlobed, obtusely toothed, sessile, conspicuously auriculate; auricles narrowly oblong, to 10 × 3 mm, only sparsely ciliate, entire; lateral lobes oblong, to 10 × 3 mm, glabrous, entire; terminal lobe much larger than lateral ones, ca. 3 × 1 cm, repand or obtusely dentate. Fruiting racemes ebracteate, elongated considerably. Flowers not seen. Fruiting pedicels erect, appressed to stem, 4–7 mm, terete or subquadrangular, glabrous, slender, much narrower than fruit. Fruit linear, 1.2–3 cm × 2–2.5 mm, strongly flattened and latiseptate, torulose, erect; gynophore to 0.5 mm; valves apex retuse; style stout, 0.7–1.3 mm, slightly compressed. Seeds brown, broadly ovate or suborbicular, 1.6–2 × 1.4–1.7 mm, uniseriate, strongly compressed, winged all around; wing 0.1–0.3 mm wide. Fr. Jul.

• Basaltic rock; ca. 1700 m. Jilin.

This species is known only from the type collection.

3. *Barbarea orthoceras* Ledebour, Index Sem. Hort. Dorpat. 2. 1824.

山芥 shan jie

Barbarea americana Rydberg; *B. cochlearifolia* H. Boissieu; *B. hondoensis* Nakai; *B. orthoceras* var. *formosana* Kitamura; *B. patens* H. Boissieu; *B. vulgaris* R. Brown var. *orthoceras* (Ledebour) Regel.

Herbs biennial or perennial, (10–)20–60(–100) cm tall. Stems erect, angled, glabrous throughout. Basal and lowermost cauline leaves petiolate; petiole (0.5–)1–5(–7) cm, glabrous or rarely ciliate basally; leaf blade (1–)1.5–4(–6) cm, lyrate-pinnatifid, with (1 or)2–4(–6) lobes on each side of rachis, rarely unlobed, not fleshy; lateral lobes oblong or ovate, 2–10 × 1–5 mm, entire; terminal lobe considerably larger than lateral ones, 1.5–5 × 1–2.5 cm. Cauline leaves usually lyrate-pinnatifid, with 1–4 lateral lobes, rarely coarsely toothed, sessile, conspicuously auriculate; auricles ovate or narrowly oblong, to 8 × 5 mm, ciliate, entire; lateral lobes oblong or ovate, rarely lanceolate, to 2 × 1 cm, glabrous, entire; terminal lobe much larger than lateral ones, to 5 × 3 cm, entire, repand, or rarely dentate. Racemes ebracteate, elongated considerably in fruit. Sepals yellow, oblong, 2.5–3.5 × 1–1.5 mm, erect, margin scarious, lateral pair slightly saccate. Petals yellow or pale yellow, oblanceolate, rounded, (3–)4–5(–6) × 1.5–2 mm, attenuate to base. Filaments yellow, 3–4.5 mm; anthers oblong, ca. 1 mm. Fruiting pedicels erect or ascending, (2–)3–6(–7) mm, terete or subquadrangular, glabrous, stout, slightly narrower than fruit. Fruit linear, (1.5–)2–4(–5) cm × 1.2–1.5 mm, terete-subquadrangular, torulose, erect to erect-ascending; gynophore to 0.3 mm; valves apex obtuse to subacute; style stout, 0.5–1(–1.2) mm. Seeds brown, ovate or oblong, 1.2–1.5 × 0.9–1 mm, uniseriate, somewhat plump, wingless. Fl. Jun–Jul, fr. Aug–Sep. $2n = 16$.

Open grasslands, scree, temperate mixed forests, river and stream-sides, moist grassy slopes; 400–2100 m. Gansu, Heilongjiang, Jilin,

Liaoning, Nei Mongol, Taiwan, Xinjiang [Japan, Korea, Mongolia, Russia; North America].

4. *Barbarea intermedia* Boreau, Fl. Centre France 2: 48. 1840.

羽裂山芥 yu lie shan jie

Herbs biennial, 15–60 cm tall. Stems erect, angled, glabrous. Basal and lowermost cauline leaves petiolate; petiole 0.5–3(–4.5) cm, glabrous or ciliate; leaf blade 1.5–7 cm, lyrate-pinnatifid, with 1–4(–7) lobes on each side of midvein, not fleshy; lateral lobes oblong or ovate, 3–10(–15) × 1–5(–7) mm, entire or repand; terminal lobe ovate, considerably larger than lateral ones, 1–3 × 0.7–1.5 cm. Cauline leaves pinnatifid or pinnatisect, with 1–4 lateral lobes, entire, sessile, conspicuously auriculate; auricles ovate or narrowly oblong, to 10 × 5 mm, ciliate; lateral lobes linear to linear-oblong, to 2.5 × 0.5 cm, glabrous or ciliate, entire; terminal lobe obovate-oblong, larger than lateral lobes and to 4 × 1.5 cm, entire or repand or rarely dentate. Racemes ebracteate, elongated considerably in fruit. Sepals yellow, oblong, 2–3 × 1–1.3 mm, erect, margin scarious, lateral pair slightly saccate. Petals yellow, oblanceolate, rounded, 4–6 × 1–1.5 mm, attenuate to base. Filaments yellow, 3–4 mm; anthers oblong, ca. 1 mm. Fruiting pedicels erect or ascending, rarely divaricate, (2–)3–5 mm, terete or subquadrangular, glabrous, stout, slightly narrower than fruit. Fruit linear, (1–)1.5–3 cm × 1.5–1.8(–2) mm, terete or slightly compressed, torulose, erect to erect-ascending; gynophore to 0.5 mm; valves apex acute to subobtusely; style slender or slightly stout, 1–1.5 mm. Seeds brown, ovate to ovate-oblong, 1.2–1.7 × 1–1.2 mm, uniseriate, somewhat plump or slightly compressed, wingless. Fl. Jun–Jul, fr. Jul–Aug. $2n = 16$.

Woods, along ditches, streamsides; ca. 4100 m. Xinjiang, Xizang [Bhutan, India, Nepal, Pakistan, Sikkim; native to SW Asia and C Europe].

5. *Barbarea vulgaris* R. Brown in W. T. Aiton, Hortus Kew. 4: 109. 1812.

欧洲山芥 ou zhou shan jie

Barbarea arcuata (Opiz ex J. & C. Presl) Reichard; *B. vulgaris* var. *arcuata* (Opiz ex J. & C. Presl) Fries; *Erysimum arcuatum* Opiz ex J. & C. Presl; *E. barbarea* Linnaeus.

Herbs biennial or rarely perennial, glabrous throughout or sparsely hairy. Stems (20–)30–80(–100) cm tall, erect, angled, branched above. Basal and lowermost cauline leaves petiolate; petiole (0.5–)2–8(–12) cm, glabrous or ciliate; leaf blade (1–)2–8(–10) cm, lyrate-pinnatifid, with 1–3(–5) lobes on each side of midvein, rarely early ones undivided, sometimes slightly fleshy; lateral lobes oblong or ovate, 0.3–2(–4) cm × 1–8(–15) mm, entire, repand, crenate, or dentate; terminal lobe ovate or suborbicular, considerably larger than lateral ones, (0.7–)1.5–4.5 (–7) × (0.4–)1–3(–5) cm. Upper cauline leaves ovate or suborbicular, undivided, coarsely dentate, sinuate, or rarely subentire, sessile,

conspicuously auriculate; auricles ovate or narrowly oblong, to 10 × 5 mm, often ciliate. Racemes ebracteate, elongated considerably in fruit. Sepals yellow, oblong, 3–4 × 1–1.5 mm, erect, margin scarious, lateral pair slightly saccate. Petals yellow, spatulate, rounded, 5–6(–7) × 1.5–2 mm, attenuate to base. Filaments yellow, 3–4.5 mm; anthers oblong, 0.7–1.2 mm. Fruiting pedicels divaricate or erect-ascending, 3–7 mm, terete or subquadrangular, glabrous, narrower than fruit. Fruit linear, (0.7–)1.5–3 cm × 1–1.5 mm, terete, somewhat compressed, or 4-angled, torulose, erect to erect-

ascending; gynophore to 0.5 mm; valves apex obtuse or subacute; style slender, 1.5–3 mm. Seeds dark brown, broadly ovate or subglobose, 1.2–1.5 × 1–1.2 mm, uniseriate, plump, wingless. Fl. and fr. Apr–Aug. $2n = 16$.

Along ditches, river banks, damp grasslands, waste places, roadsides, fields, disturbed sites; 700–4100 m. Heilongjiang, Jiangsu, Jilin, Xinjiang [India, Japan, Kashmir, Kazakstan, Korea, Mongolia, Pakistan, Russia, Sri Lanka, Tajikistan; SW Asia, Europe; naturalized elsewhere].

47. NEOMARTINELLA Pilger in Engler & Prantl, Nat. Pflanzenfam., Nachtr. 3: 134. 1906.

堇叶芥属 jin ye jie shu

Martinella H. Léveillé, Bull. Soc. Bot. France 60: 290. 1904, not Cooke & Masee (1889), nor Baillon (1891); *Esquirolia* H. Léveillé.

Herbs annual. Trichomes absent. Stems few to several from basal rosette, simple, leafy or leafless. Basal leaves long petiolate, rosulate, simple, palmately veined, margin crenate-repand or rarely subentire, with distinct apiculate callosities that terminate ultimate veins and occupy marginal notches. Cauline leaves absent or similar to basal. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender, erect or divaricate. Sepals ovate or rarely oblong, spreading, base of lateral pair not saccate. Petals white, spreading; blade obcordate, apex emarginate; claw absent. Stamens 6, spreading, subequal in length; filaments strongly dilated at base; anthers ovate, obtuse at apex. Nectar glands confluent, subtending bases of all stamens; median glands present. Ovules 10–40 per ovary. Fruit dehiscent siliques, linear or oblong, terete or rarely slightly latiseptate, sessile; valves papery, with an obscure midvein, torulose; replum rounded; septum complete, membranous, translucent, veinless; style absent or distinct and to 1 mm, cylindrical or clavate; stigma capitate, entire. Seeds uniseriate, wingless, oblong or orbicular, slightly flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

• Three species.

- 1a. Stems leafy; style clavate 1. *N. yungshunensis*
- 1b. Stems leafless; style absent or cylindrical.
 - 2a. Style absent or rarely to 0.2 mm; sepals 1.5–2 mm; petals 4–5.5 mm; ovules 10–20 per ovary; fruit oblong-linear or oblong, 5–12 mm; at least some flowers on solitary pedicels 2. *N. violifolia*
 - 2b. Style cylindrical, to 1 mm; sepals ca. 3.5 mm; petals ca. 8 mm; ovules 30–40 per ovary; fruit linear, young ones longer; flowers in racemes 3. *N. grandiflora*

1. Neomartinella yungshunensis (W. T. Wang) Al-Shehbaz, Novon 10: 338. 2000.

永顺堇叶芥 yong shun jin ye jie

Cardamine yungshunensis W. T. Wang, Keys Vascular Pl. Wuling Mts. 578. 1995.

Herbs 20–41 cm tall. Stems erect, simple, leafy, few to several from base. Basal leaves rosulate; petiole 3–11 cm; leaf blade ovate or broadly so, 2–6 × 1–5 cm, base subcordate or truncate, margin repand, with apiculate callosities to 0.5 mm, apex rounded or obtuse. Middle cauline leaves similar to basal but smaller, often subentire. Inflorescence lax raceme, ebracteate. Fruiting pedicels ascending, filiform, 1–2 cm. Sepals ovate, 1.5–2 × 1–1.2 mm. Petals white, obcordate, 4–5 × 2–2.5 mm. Filaments white, 1.5–2 mm; anthers ovate, 0.6–0.8 mm. Ovules (20–)30–40 per ovary. Fruit linear, (0.8–)1.5–3.5 × 1–1.5 mm, terete, torulose; valves with an obscure midvein; style 0.6–1 mm. Seeds oblong, slightly flattened, 0.8–1.1 × 0.6–0.7 mm. Fl. Apr, fr. May.

• 500–600 m. Hunan.

2. Neomartinella violifolia (H. Léveillé) Pilger in Engler & Prantl, Nat. Pflanzenfam., Nachtr. 3: 134. 1906.

堇叶芥 jin ye jie

Martinella violifolia H. Léveillé, Bull. Soc. Bot. France 60: 290. 1904; *Esquirolia violifolia* (H. Léveillé) H. Léveillé.

Herbs (4–)7–17(–20) cm tall, scapose. Stems erect, simple, leafless, few to several from base. Basal leaves rosulate; petiole (1.5–)3–10(–14) cm; leaf blade cordate, reniform, or suborbicular, (0.8–)1.5–4(–5) × (0.6–)1–3.5(–4) cm, base cordate, margin crenate-repand or rarely subentire, with apiculate callosities to 1 mm, apex rounded or obtuse. Cauline leaves absent. Fruiting pedicels suberect or spreading, filiform, (1–)1.5–4(–7) cm, a few solitary and originate from center of rosette. Sepals ovate, 1.5–2 × 1–1.2 mm. Petals white, obcordate, 4–5.5 × 2–3 mm. Filaments white, 1.5–2 mm; anthers ovate, 0.4–0.5 mm. Ovules 10–20 per

ovary. Fruit oblong-linear to oblong, 5–12 × 1–1.5 mm, slightly compressed, subtorulose; valves with an obscure midvein; style absent or rarely to 0.2 mm. Seeds suborbicular, slightly flattened, 0.6–0.9 mm in diam. Fl. Feb–Apr, fr. Mar–May.

• Rocky areas; 800–1600 m. Guizhou, Hubei, Hunan, Sichuan, Yunnan.

3. *Neomartinella grandiflora* Al-Shehbaz, *Novon* 10: 339. 2000.

大花堇叶芥 *da hua jin ye jie*

Herbs ca. 15 cm tall, scapose. Stems erect, simple, leafless, few from base. Basal leaves rosulate; petiole

4–12 cm; leaf blade broadly ovate or suborbicular, 2–6 × 1.5–3.5 cm, base subcordate or subtruncate, margin crenate-repand, with apiculate callosities to 0.5 mm, apex rounded. Cauline leaves absent. Fruiting pedicels suberect or ascending, 1–1.5 cm, all on raceme. Sepals oblong, ca. 3.5 × 1.5 mm. Petals white, narrowly obcordate, ca. 8 × 3 mm. Filaments white, ca. 3.5 mm; anthers ovate, ca. 0.6 mm. Ovules 30–40 per ovary. Immature fruit linear, ca. 2 cm × 1 mm, subtorulose; style slender, 1–1.2 mm. Mature seeds not seen. Fl. Apr.

• Damp places by streamsides; about 600 m. Hunan, Sichuan.

48. ARABIS Linnaeus, *Sp. Pl.* 2: 664. 1753.

南芥属 *nan jie shu*

Parryodes Jafri.

Herbs annual, biennial, or perennial, rarely subshrubs or shrubs. Trichomes stellate, dendritic, or stalked forked, sometimes mixed with fewer simple ones, rarely primarily simple. Stems simple or branched apically. Basal leaves petiolate, rosulate, simple, often entire, sometimes dentate, rarely lyrate-pinnatifid. Cauline leaves sessile and auriculate, sagittate, or amplexicaul, very rarely petiolate, entire or dentate. Racemes ebracteate or rarely bracteate throughout or only basally, sometimes in panicles, elongated in fruit. Fruiting pedicels erect, ascending, divaricate, or reflexed. Sepals ovate or oblong, base of lateral pair saccate or not, margin membranous. Petals white, pink, or purple; blade spatulate, oblong, or oblanceolate, rarely obovate, apex obtuse or emarginate; claw shorter than sepals. Stamens 6, tetradynamous; filaments usually not dilated at base; anthers ovate, oblong, or linear, obtuse at apex. Nectar glands confluent, subtending bases of all stamens; median glands sometimes toothlike and free, rarely absent; lateral glands semiannular or annular. Ovules 12–110 per ovary. Fruit dehiscent siliques, linear, latiseptate, sessile or rarely shortly stipitate; valves papery, with an obscure or prominent midvein, smooth or torulose; replum rounded; septum complete, membranous, translucent, veinless; style obsolete or distinct; stigma capitate, entire or slightly 2-lobed. Seeds uniseriate or biseriate, winged or margined, oblong or orbicular, flattened; seed coat smooth or minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

About 70 species: temperate Asia, Europe, North America; 14 species (one endemic) in China.

The limits of *Arabis* are highly artificial, and the genus is defined primarily on the basis of having branched trichomes, flattened, linear fruit, and accumbent cotyledons. However, this combination of characters has evolved independently several times in the Brassicaceae. A critical study of the genus on worldwide basis is much needed.

- 1a. Racemes bracteate throughout 10. *A. axilliflora*
- 1b. Racemes ebracteate, rarely lowermost 1–3 flowers bracteate.
 - 2a. Annuals; fruiting pedicel thickened, at least half as wide as fruit; rachis flexuous 14. *A. auriculata*
 - 2b. Biennials or perennials; fruiting pedicels much narrower than fruit; rachis not flexuous.
 - 3a. Shrubs or subshrubs; style absent or obsolete; fruit densely pubescent 12. *A. fruticulosa*
 - 3b. Herbs; style distinct; fruit glabrous or if pubescent (*A. flagellosa*) then leaves dentate.
 - 4a. Scapose perennials with caudices covered with petioles of previous years; trichomes almost exclusively simple, restricted to leaf margins and sepals abaxially; stems leafless or with 1–3 leafy bracts 11. *A. alaschanica*
 - 4b. Non-scapose biennials or perennials often without petioles of previous years; trichomes a mixture of various kinds, very rarely restricted to leaf margins; stems leafy.
 - 5a. Cauline leaves petiolate or cuneate to petiolelike base; fruit valves with an obscure midvein.
 - 6a. Biennials; petals 3–5 mm; fruit apex acuminate; Xizang [Kashmir, Afghanistan, Pakistan, Tajikistan] 13. *A. tibetica*
 - 6b. Stolonerous perennials; petals 7–10 mm; fruit apex acute; Anhui, Jiangsu, Zhejiang [Japan] 9. *A. flagellosa*
 - 5b. Cauline leaves sessile, auriculate, sagittate, or amplexicaul, rarely rounded at base; fruit valves often with a prominent midvein.
 - 7a. Fruit and often fruiting pedicels erect, appressed to rachis.
 - 8a. Petals (3.5–)4–5 mm; fruit 0.8–1.2 mm wide 8. *A. hirsuta*
 - 8b. Petals 6–10 mm; fruit 1.5–2 mm wide.

- 9a. Petals white, 3–4 mm wide, apex shallowly emarginate; sepals 4–5 mm, lateral pair saccate; middle cauline leaves pilose with primarily branched trichomes; seeds narrowly winged distally 6. *A. stelleri*
- 9b. Petals purple, pink, or rarely white, 2–3 mm wide, apex rounded; sepals 2.5–3.5 mm, lateral pair not saccate; middle cauline leaves hirsute with predominantly simple trichomes; seeds broadly winged all around ... 7. *A. pterosperma*
- 7b. Fruit and fruiting pedicels divaricate or reflexed, fruit sometimes erect on divaricate or ascending pedicels never appressed to rachis.
- 10a. Petals 3–6(–6.5) mm; lateral sepals not saccate; style in fruit 0.2–0.8 mm.
- 11a. Basal rosette absent at anthesis and fruiting; leaves with coarse subsetose trichomes mixed with sessile, much smaller stellate ones; fruit reflexed or divaricate, 1.5–2 mm wide 4. *A. pendula*
- 11b. Basal rosette often present through fruiting; leaves with stalked, forked or 3- or 4-rayed stellate trichomes mixed with simple nonsetose ones; fruit ascending or erect, rarely reflexed or spreading, 1–1.5 mm wide 5. *A. paniculata*
- 10b. Petals 7–15 mm; lateral sepals saccate; style in fruit 1–2.5 mm.
- 12a. Plants hirsute or hispid with primarily simple, subsetose trichomes 1. *A. amplexicaulis*
- 12b. Plants tomentose or pilose with almost exclusively branched trichomes, sometimes glabrescent.
- 13a. Leaves obtuse or auriculate at base; filaments 5–8 mm; petals 9–14 mm, obtuse at apex; 2-forked trichomes distinctly stalked 2. *A. bijuga*
- 13b. Leaves cordate or amplexicaul at base; filaments 4–5 mm; petals 7–10 mm, truncate-emarginate at apex; 2-forked trichomes often submalpighiaceous 3. *A. serrata*

1. *Arabis amplexicaulis* Edgeworth, Trans. Linn. Soc. London 20: 31. 1851.

抱茎南芥 *bao jing nan jie*

Herbs biennial or short-lived perennial, (20–)30–60(–70) cm tall, densely to sparsely hispid or hirsute, with primarily simple subsetose trichomes to 1.7 mm, these mixed with much fewer, smaller, stalked 2–4-forked ones. Stems erect, often single from base. Basal leaves rosulate; petiole 0.5–5 cm; leaf blade lanceolate-obovate, oblong, or oblanceolate, 3–9(–11) × 1–2(–3) cm, base attenuate, margin dentate or entire, ciliate, apex obtuse or rounded. Middle cauline leaves sessile, oblong or ovate, (1–)1.5–5(–8) × 0.6–2.5(–4) cm, base cordate or amplexicaul, margin dentate or entire. Racemes ebracteate. Fruiting pedicels divaricate, 0.6–1.5 cm, slender, straight, glabrous. Sepals oblong, 4–6 × 1.2–1.5 mm, glabrous, lateral pair saccate. Petals white, oblong or narrowly oblanceolate, (0.7–)0.9–1.2 cm × 2–3.5 mm, apex obtuse. Filaments 3.5–6 mm; anthers oblong, 0.8–1 mm. Ovules 50–70 per ovary. Fruit (2.5–)3.5–6.5 (–7) cm × 1–1.5 mm, erect, divaricate, or rarely reflexed; valves with a distinct midvein, torulose, glabrous; style 1–1.5 mm. Seeds brown, oblong, 1.2–1.5 × 0.8–1 mm, uniseriate, narrowly winged apically. Fl. Apr–Jun, fr. May–Jul. *2n* = 16.

Forest margins, shady places; 1800–3200 m. Xizang [Afghanistan, Bhutan, India, Kashmir, Nepal, Pakistan].

The description of *Arabis amplexicaulis* in FRPS and the material so named that was examined by the present authors in various Chinese

herbaria represent misidentifications of *A. paniculata*. However, the occurrence of true *A. amplexicaulis* in China (Xizang) is here confirmed based on *Qinghai-Tibet Team 6886* (PE).

2. *Arabis bijuga* Watt, J. Linn. Soc., Bot. 18: 378. 1881.

大花南芥 *da hua nan jie*

Arabis macrantha C. C. Yuan & T. Y. Cheo; *A. pangiensis* Watt.

Herbs perennial, 15–40 cm tall, often densely tomentose or pilose, with primarily short-stalked, stellate trichomes, these sometimes mixed with much fewer, simple or forked ones, rarely plants glabrescent and trichomes restricted primarily to leaf margins. Stems erect, often branched at base. Basal leaves rosulate; petiole 0.5–5 cm; leaf blade obovate-spatulate, oblong, elliptic, or oblanceolate, 1.5–5 × 0.5–1.5 cm, base attenuate, margin dentate or entire, apex obtuse or rounded. Middle cauline leaves sessile, oblong-linear, narrowly elliptic, or narrowly lanceolate, 1–4(–5.5) cm × 2–8 mm, base obtuse or auriculate, margin dentate or entire. Racemes ebracteate. Fruiting pedicels divaricate or ascending, (0.8–)1.2–2.4(–3) cm, slender, straight, glabrous. Sepals oblong, 3.5–5 × 1.2–1.8 mm, glabrous, lateral pair saccate. Petals white or pinkish, oblong or narrowly oblanceolate, 0.9–1.4 cm × 2–4 mm, apex obtuse. Filaments 5–8 mm; anthers oblong, 1–1.5 mm. Ovules 40–70 per ovary. Fruit 3–6 cm × 1–1.2 mm; valves with a prominent midvein extending full length, slightly torulose, glabrous; style 1–1.5 mm. Seeds brown, oblong, ca. 1.2 × 0.5 mm, uniseriate, narrowly winged apically. Fl. Apr–Jun, fr. May–Jul.

Grassy slopes, rock crevices, dry cliffs, stony pastures; 2400–3000 m. Sichuan, Yunnan [Kashmir, Pakistan].

Arabis bijuga, which was previously thought to be restricted to Kashmir and Pakistan, is recorded here for the first time from China. The records from Sichuan are based on *Soulié 1493* (P) and the type collection of *A. macrantha*, *Fang Wen-pei et al. 12402* (NAS, SZ); the record from Yunnan is based on *Yü 8456* (BM), *Forrest 20147* (E, US), and *Forrest 16192* (E).

The type collection of *Arabis bijuga* is basically indistinguishable from those of *A. macrantha* and *A. pangiensis* except for being glabrescent (vs. moderately to densely tomentose). However, this difference alone does not justify the recognition of more than one species.

3. *Arabis serrata* Franchet & Savatier, Enum. Pl. Jap. 2: 278. 1878.

齿叶南芥 *chi ye nan jie*

Arabis alpina Linnaeus var. *formosana* Masamune ex S. F. Huang; *A. amplexicaulis* Edgeworth var. *japonica* H. Boissieu; *A. amplexicaulis* var. *serrata* (Franchet & Savatier) Makino; *A. boissieuana* Nakai; *A. boissieuana* var. *glauca* (H. Boissieu) Koidzumi; *A. boissieuana* var. *sikokiana* Nakai; *A. fauriei* H. Boissieu (1899), not H. Léveillé (1910); *A. fauriei* var. *grandiflora* Nakai; *A. formosana* (Masamune ex S. F. Huang) T. S. Liu & S. S. Ying; *A. glauca* H. Boissieu; *A. glauca* subsp. *pseudoauriculata* (H. Boissieu) Voroschilov; *A. hallaisanensis* Nakai; *A. iwatensis* Makino; *A. kishidae* Nakai; *A. pseudoauriculata* H. Boissieu; *A. serrata* var. *glabrescens* Ohwi; *A. serrata* var. *glauca* (H. Boissieu) Ohwi; *A. serrata* var. *platycarpa* Ohwi; *A. serrata* var. *japonica* (H. Boissieu) Ohwi; *A. serrata* var. *sikokiana* (Nakai) Ohwi; *A. sikokiana* (Nakai) Honda.

Herbs perennial, (5–)12–35(–45) cm tall, densely to sparsely pilose, with minute, short-stalked or sessile, submalpighiaceous and 3–5-rayed, stellate trichomes, rarely glabrescent or with some simple ones near stem base. Stems erect, single or few from base. Basal leaves rosulate; petiole (0.5–)1–4(–6) cm; leaf blade spatulate, oblanceolate, obovate, or narrowly oblong, (1–)2–7(–14) × (0.5–)1–2(–3) cm, base cuneate or attenuate, margin entire, dentate, or rarely lyrate-sinuate, apex obtuse or rounded. Middle cauline leaves sessile, oblong or ovate, (1–)2–4(–6) × 0.5–2.5(–3.5) cm, base cordate or amplexicaul, margin dentate or entire. Racemes ebracteate. Fruiting pedicels ascending or divaricate, (0.5–)0.8–2(–2.5) cm, slender, straight, often glabrous. Sepals oblong, 3.2–4 × 1.2–1.8 mm, glabrous, lateral pair saccate. Petals white, rarely pinkish, oblong-oblanceolate, 7–10 × (1.5–)2–3(–3.5) mm, apex truncate-emarginate. Filaments 4–5 mm; anthers oblong, 1–1.4 mm. Ovules 28–60 per ovary. Fruit (2–)3.5–7(–8) cm × 1–1.5 mm, erect, divaricate, or rarely reflexed; valves with an obscure or distinct midvein, torulose, glabrous; style 1–2.5 mm. Seeds brown, oblong or rarely suborbicular, (1–)1.5–2(–2.5) × 0.8–1 mm, uniseriate, broadly winged apically; wing 0.3–0.6 mm wide. Fl. Apr–Jun, fr. May–Aug. *2n* = 32.

Rocky crevices, along streams, mountain slopes, deciduous forest; 100–3200 m. Anhui, Taiwan [Japan, Korea].

Arabis serrata is highly variable in basal leaf indumentum, margin, and petiole length. Of the many taxa synonymized above, none seems to merit recognition. In fact, *A. formosana* is indistinguishable from some of the Japanese forms of *A. serrata*.

4. *Arabis pendula* Linnaeus, Sp. Pl. 2: 665. 1753.

垂果南芥 *chui guo nan jie*

Arabis pendula var. *glabrescens* Franchet; *A. pendula* var. *hebecarpa* Y. C. Lan & T. Y. Cheo; *A. pendula* var. *hypoglauca* Franchet; *A. subpendula* Ohwi.

Herbs biennial, (15–)30–110(–170) cm tall, sparsely to densely hispid, with subsetose simple trichomes to 1.7 mm, these mixed with much smaller, sessile, 3–6-rayed stellate ones usually 1 of its rays perpendicular to the surface. Stems erect, simple, often paniculate branched above. Basal and lowermost cauline leaves petiolate, often withered by anthesis. Middle cauline leaves sessile; leaf blade lanceolate, oblong, or elliptic, (1.5–)3–10(–15) × (0.5–)1–2.5(–4) cm, densely to sparsely pubescent, with a mixture of stellate and simple trichomes, often ciliate, base cuneate, auriculate, or amplexicaul, margin dentate, serrate, serrulate, repand, or entire, apex acuminate or acute. Racemes ebracteate. Fruiting pedicels ascending, divaricate, or reflexed, (0.5–)1–2.8(–3.5) cm, slender, straight or curved, stellate or subglabrous. Sepals narrowly oblong, 2.5–3.5(–4) × 1–1.3 mm, glabrous or variously pubescent, not saccate. Petals white or rarely pink, narrowly oblong-oblanceolate (3–)3.5–4.5(–5.5) × 1–1.5 mm. Filaments 3–4 mm; anthers oblong, 0.5–0.8 mm. Ovules 70–110 per ovary. Fruit (3.5–)4.5–9(–10) cm × 1.5–2 mm, spreading or unilaterally deflexed; valves glabrous or very rarely sparsely stellate, with a prominent midvein extending full length; style 0.2–0.8 mm, rarely obsolete. Seeds brown, ovate, suborbicular, or rarely oblong, (1.2–)1.4–1.8 × (0.7–)1–1.3 mm, flattened, uniseriate or biseriate, winged all around or only distally; wing 0.1–0.3 mm wide. Fl. Jun–Aug, fr. Jul–Sep. *2n* = 16.

Rocky slopes, roadsides, woodlands, meadows, limestone cliffs, hillsides, waste places, thickets, forest margins, valleys, river banks, grassy areas, deserts; near sea level to 4300 m. Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Japan, Kazakhstan, Korea, Mongolia, Russia; Europe].

Arabis pendula is highly variable in the density of indumentum, fruit width and orientation, seed arrangement per locule, and development of the seed wing. The type collections of the taxa synonymized above are based on misidentified plants that represent only a few of the numerous variants that occur throughout the range of the species.

5. *Arabis paniculata* Franchet, Pl. Delavay. 57. 1889.

圆锥南芥 *yuan zhui nan jie*

Arabidopsis mollissima (C. A. Meyer) N. Busch var. *yunnanensis* O. E. Schulz; *Arabis alpina* Linnaeus var. *parviflora* Franchet; *A. alpina* var. *rigida* Franchet; *A. alpina* var. *rubrocalyx* Franchet; *A. paniculata* var. *parviflora* (Franchet) W. T. Wang.

Herbs biennial or short-lived perennial, (10–)20–75(–110) cm tall, densely to sparsely hirsute, with stalked, forked or 3- or 4-rayed stellate trichomes mixed at least basally with varying amounts of simple ones. Stems erect, simple or few from base, often branched at middle. Basal leaves rosulate, present at anthesis; petiole often absent, rarely distinct and to 2.5 cm; leaf blade oblanceolate, narrowly obovate, oblong, or lanceolate, (1–)2–6(–8) × (0.5–)1–2(–2.5) cm, base attenuate, margin dentate, serrate, or rarely entire, apex obtuse or acute. Middle cauline leaves sessile, oblong, ovate, or elliptic, rarely suboblanceolate, (0.7–)1.5–4(–6) cm × (2–)4–14(–25) mm, with stellate trichomes sometimes mixed adaxially with simple ones, base cordate or auriculate, rarely amplexicaul, margin dentate or entire, apex obtuse or acute. Racemes ebracteate. Fruiting pedicels divaricate, rarely ascending or slightly reflexed, (0.4–)0.6–1.8(–2.5) cm, slender, straight or rarely slightly curved. Sepals oblong or suboblanceolate, 2.5–3.5(–4) × 1–1.5 mm, glabrous or sparsely pubescent, not saccate. Petals white or rarely pale pink, oblong or narrowly oblanceolate, 4–6(–6.5) × 1–2 mm, apex obtuse. Filaments 3.5–5 mm; anthers oblong, 0.8–1 mm. Ovules 36–80 per ovary. Fruit (1.5–)2.5–5.5(–6.5) cm × 1–1.5 mm, erect or divaricate or rarely reflexed, not appressed to rachis; valves with a distinct midvein, torulose, glabrous; style 0.4–0.8 mm. Seeds brown, oblong or ovate, 1–1.3 × 0.7–0.9 mm, narrowly winged on distal half. Fl. and fr. Apr–Aug. Waste areas, roadsides, grassy slopes, along ditches; 1300–3400 m. Gansu, Guizhou, Hubei, Shaanxi, Sichuan, Xizang, Yunnan [Kashmir, Nepal].

The above first record from Xizang is based on C. Y. Wu *et al.* 75–548 (PE) and Ludlow & Sherriff 1699 (BM). The above first record from Nepal is based on Stainton, Sykes & Williams 1933 (BM, E), Malla 10717 (BM), and Shrestha & Bista 1923 (US). The above first record from Kashmir is based on Winterbottom 59 (K), which was cited by Jafri (Fl. West Pakistan 55: 177. 1973) as *A. pterosperma*. That species, however, is quite different from *A. paniculata* in having predominantly simple trichomes, erect fruit, 1.5–2.5 mm wide, with pedicels appressed to the infructescence rachis.

An examination of all of the type collections (including syntypes) of *Arabidopsis mollissima* var. *yunnanensis*, *Arabis alpina* var. *parviflora*, *A. alpina* var. *rigida*, *A. alpina* var. *rubrocalyx*, and *A. paniculata* clearly shows that they all represent minor variants of one species. *Arabis alpina* var. *parviflora* is here lectotyped on Delavay *s.n.*, 29 Aug 1883 (P) because another of the three syntypes of this variety, Delavay 2758 (P), is a specimen of *A. hirsuta*.

The record of *Arabis chanetii* in FRPS is based on misidentified plants of *A. paniculata*. The holotype of *A. chanetii* is a specimen of *Orychophragmus violaceus*.

Although *Arabis alpina* was recognized in FRPS and some other provincial floras (e.g., Fl. Guizhou. 7: 30, 32. 1989; Fl. Sichuan. 4:

117–119. 1999; Fl. Yunnan. 6: 81–83. 1995) as a distinct species and/or as var. *parviflora*, all such records are based on plants of *A. paniculata*. True *Arabis alpina* is a strictly European species that does not grow anywhere in Asia. It is readily distinguished from *A. paniculata* by having strongly saccate lateral sepals, obovate petals (0.7–)1–2 cm, and broad fruit 1.5–2.5 mm wide. By contrast, *A. paniculata* has nonsaccate sepals, narrowly oblong-oblanceolate petals less than 0.8 mm, and narrower fruit rarely to 1.5 mm wide.

6. *Arabis stelleri* de Candolle, Syst. Nat. 2: 242. 1821.

基隆南芥 ji long nan jie

Arabis alpina Linnaeus var. *japonica* A. Gray; A. *fauriei* H. Léveillé (1910), not H. Boissieu (1899); A. *japonica* (A. Gray) A. Gray (1858), not Regel (1863); A. *kelunginsularis* Hayata; A. *lithophila* Hayata; A. *stelleri* de Candolle subsp. *japonica* (A. Gray) Voroschilov; A. *stelleri* var. *japonica* (A. Gray) F. Schmidt; A. *yokoscensis* Franchet & Savatier.

Herbs perennial, (10–)20–35(–45) cm tall, sparsely to densely pilose, with a mixture of simple and stalked, forked or 3- or 4-rayed stellate trichomes. Stems erect or ascending, simple or branched at base, basally with primarily simple trichomes. Basal leaves rosulate; petiole 1–2 cm, winged; leaf blade spatulate or oblanceolate, obovate, or oblong, (1–)2–5.5(–7) × (0.5–)1–2(–2.8) cm, base attenuate, margin entire or occasionally denticulate, apex rounded or obtuse. Middle cauline leaves sessile, oblong or ovate, (1.2–)2–5(–7) × (0.4–)0.7–1.5(–2) cm, pilose with predominantly stellate and forked trichomes, base auriculate, cordate, or rarely amplexicaul, margin dentate or entire, apex obtuse or rounded. Racemes ebracteate. Fruiting pedicels erect or rarely ascending, often subappressed to rachis, 0.7–1.5(–2) cm, slender, straight. Sepals oblong, 4–5 × 1.5–2 mm, glabrous, lateral pair saccate. Petals white, spatulate, 7–10 × 3–4 mm, apex shallowly emarginate. Filaments 3.5–6 mm; anthers oblong, 1–1.5 mm. Ovules 34–60 per ovary. Fruit (2.5–)3–5(–6) cm × 1.5–2 mm, erect, appressed to rachis; valves with a prominent midvein extending full length, torulose, glabrous; style (0.1–)0.5–1(–1.5) mm. Seeds brown, suborbicular or ovate-oblong, 0.9–1.4 × 0.8–1 mm, uniseriate, narrowly winged distally; wing to 0.1 mm wide. Fl. Apr–Jun, fr. May–Aug. *2n* = 32.

Sandy coasts, roadsides, streamsides, forest margins; near sea level to 600 m. Taiwan [Japan, Korea, Russia].

7. *Arabis pterosperma* Edgeworth, Trans. Linn. Soc. London 20: 33. 1851.

窄翅南芥 zhai chi nan jie

Arabidopsis yadungensis K. C. Kuan & Z. X. An; *Arabis alpina* Linnaeus var. *purpurea* W. W. Smith; A. *latialata* Y. C. Lan & T. Y. Cheo.

Herbs biennial or short-lived perennial, (10–)20–60(–80) cm tall, densely or rarely sparsely hirsute, primarily with simple trichomes, these often mixed at least distally with long-stalked, forked or rarely stellate ones. Stems erect, simple from base, simple or branched above. Basal leaves rosulate; petiole often absent, rarely

distinct and to 4 cm; leaf blade spatulate, oblanceolate, narrowly obovate, or oblong, (1–)2–7(–9) × (0.5–) 1–2(–3) cm, base attenuate, margin dentate, serrate, or rarely entire, often ciliate, apex obtuse or acute. Middle cauline leaves sessile, oblong, elliptic, or ovate-lanceolate, (1–)2–4(–5) cm × (2–)4–10(–15) mm, hirsute, with predominantly simple trichomes, base auriculate, cordate, or rarely amplexicaul, margin dentate or entire, apex obtuse or acute. Racemes ebracteate. Fruiting pedicels erect or rarely ascending, often subappressed to rachis, 4–10(–16) mm, slender, straight. Sepals oblong or sub lanceolate, 2.5–3.5 × 1–1.5 mm, often glabrous, not saccate. Petals purple, pink, or rarely white, oblong or narrowly oblanceolate, 6–9 × 2–3 mm, apex obtuse. Filaments 3.5–5 mm; anthers oblong, 0.6–1 mm. Ovules 40–80 per ovary. Fruit (2.5–)3–5(–6) cm × 1.5–2 mm, erect, appressed to rachis; valves with a prominent midvein extending full length, torulose, glabrous; style 0.5–1 mm. Seeds brown, orbicular to ovate-orbicular, 1–1.6 mm in diam., uniseriate, broadly winged all around; wing (0.1–)0.2–0.4 mm wide. Fl. (Mar–) May–Jul, fr. Jun–Oct.

Roadsides, woodlands, grassy slopes, alpine meadows; 2900–4300 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Pakistan, Nepal, Sikkim].

The above first record from Sichuan is based on *Wilson 3215* (A) and *Guan Kejian & Wang Wencai 239* (MO, PE); the above first record from Yunnan is based on *K. M. Feng 1239 & 2473* (A).

Arabis alpina var. *purpurea* was listed in FRPS as a synonym of *A. paniculata*. However, an examination of the type collection of the former (*Forrest 13977*; holotype, E; isotypes, K, P) clearly shows that it is indistinguishable from plants of *A. pterosperma*. The type collections of *A. latialata* and *Arabidopsis yadungensis* represent fruiting and flowering material, respectively, of *A. pterosperma*.

8. *Arabis hirsuta* (Linnaeus) Scopoli, *Fl. Carniol.*, ed. 2, 2: 30. 1772.

硬毛南芥 *ying mao nan jie*

Turritis hirsuta Linnaeus, *Sp. Pl.* 2: 666. 1753; *Arabis hirsuta* var. *nipponica* (Franchet & Savatier) C. C. Yuan & T. Y. Cheo; *A. hirsuta* var. *purpurea* Y. C. Lan & T. Y. Cheo; *A. sagittata* de Candolle var. *nipponica* Franchet & Savatier.

Herbs perennial or sometimes biennial, (4–)10–80(–110) cm tall, usually densely hispid, with simple and stalked, forked or substellate trichomes. Stems erect, usually simple basally, often branched above. Basal leaves rosulate; petiole (0.5–)1–2 cm; leaf blade spatulate, oblanceolate, or oblong, (1.5–)2.5–8(–10) × (0.5–)1–2.5 cm, pubescent, margin entire, repand, or dentate, apex obtuse or acute. Cauline leaves sessile, lanceolate, oblong, oblanceolate, or ovate, (1–)1.5–5(–7) × (0.5–)1–2 cm, hirsute on both surfaces or adaxially glabrescent, base subcordate or auriculate and with obtuse or subacute auricles, margin dentate or entire, apex acute or obtuse. Racemes ebracteate. Fruiting

pedicels erect to erect-ascending, (2–)3–10(–15) mm, slender, glabrous or sparsely hirsute. Sepals narrowly oblong, 2.5–4 × 0.5–1.2 mm, not saccate. Petals white, rarely pink or purplish, linear-oblanceolate or narrowly spatulate, rarely linear, (3.5–)4–5 × 1–1.5 mm, apex obtuse. Filaments slender, 2.5–4.5 mm; anthers oblong, 0.7–1 mm. Ovules 30–80 per ovary. Fruit linear, (1.5–)2–5.5(–7) cm × 0.8–1.2 mm, erect to erect-ascending, often subappressed to rachis, flattened; valves glabrous, torulose, with a prominent midvein extending full length; style (0.1–)0.3–0.8(–1) mm. Seeds brown, oblong or suborbicular, (0.8–)1–1.5(–1.7) × 0.8–1.3 mm, uniseriate, wingless, narrowly winged all around, or winged distally. Fl. Apr–Aug, fr. May–Sep. $2n = 32$. Meadows, grassy slopes, roadsides, mixed forests; 300–4000 m.

Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Japan, Kazakhstan, Korea, Russia; N Africa, SW Asia, Europe, North America].

A highly variable species, especially in spacing, shape, texture, base, and margin of cauline leaves, flower color, petal size, and density of indumentum. Many of the variants have been recognized at specific and infraspecific ranks. However, since the variation in China does not follow consistent morphological and/or geographical patterns, it is better to recognize only one variable taxon.

The records in FRPS and *Fl. Xinjiang*, (2(2): 142. 1995) of *Arabis borealis* Andrzejowski from Xinjiang, as well as those in FRPS and *Fl. Guizhou*, (7: 30. 1989) of *A. sagittata* de Candolle from Guizhou, are based on misidentified plants of *A. hirsuta*. Typical plants of *A. sagittata* are diploid ($2n = 16$) biennials with strongly sagittate cauline leaves, whereas those of *A. hirsuta* are tetraploid perennials or occasionally biennials with auriculate or subcordate cauline leaves. However, the distinction between the two is often difficult, especially in biennial plants of *A. hirsuta*. The present authors have examined no Chinese material that belongs to either *A. borealis* or *A. sagittata*.

9. *Arabis flagellosa* Miquel, *Ann. Mus. Bot. Lugduno-Batavi* 2: 72. 1865.

匍匐南芥 *pu fu nan jie*

Arabis flagellosa var. *lasiocarpa* Matsumura.

Herbs stoloniferous perennial, (4–)10–30(–45) cm tall, sparsely to densely tomentose or pilose, with short-stalked, 3- or 4-rayed stellate trichomes, sometimes with few forked ones along leaf margin. Vegetative stems decumbent or procumbent, flowering ones erect and much shorter. Basal leaves rosulate; petiole (0.7–)1.5–4(–7) cm, winged; leaf blade spatulate, obovate, or oblanceolate, (0.7–)2–5(–7) × (0.5–)1–3 cm, base attenuate to petiole, margin dentate, apex obtuse or rounded. Cauline leaves shortly petiolate or subsessile; leaf blade obovate or oblong, (0.6–)1–3(–4) × (0.3–)0.6–1.6(–2) cm, margin dentate or subentire, apex obtuse. Racemes ebracteate, rarely lowermost 1 or 2 flowers bracteate. Fruiting pedicels ascending or divaricate, (0.8–)1–1.5 cm, slender, often straight. Sepals oblong, 4–5 × 1.5–2 mm, lateral pair saccate. Petals white, spatulate, 7–10 × 2.5–4 mm, apex rounded. Filaments 5–7 mm; anthers oblong, 1–1.5 mm. Ovules 30–50 per ovary. Fruit (1.5–)2–4(–4.8) cm × 1.2–1.5

mm; valves slightly torulose, glabrous or pilose, with an obscure midvein; style 1–3 mm. Seeds oblong-ovate, 1–1.5 × 0.8–1.1 mm, narrowly winged, uniseriate. Fl. and fr. Mar–May.

Along ditches, rocky crevices, foothills, forest margins, hillsides; near sea level to 1300 m. Anhui, Jiangsu, Jiangxi, Zhejiang [Japan].

The above first record from Jiangxi is based on *Ye* 3852 (MO) and *Shan & Lai* 2389 (MO).

10. *Arabis axilliflora* (Jafri) H. Hara, J. Jap. Bot. 47: 107. 1972.

腋花南芥 *ye hua nan jie*

Parryodes axilliflora Jafri, Notes Roy. Bot. Gard. Edinburgh 22: 207. 1957; *Arabis axilliflora* var. *brevistyla* H. Hara.

Herbs perennial, 3–20 cm tall, with a branched caudex covered with leaf remains of previous years, sparsely to moderately pilose, with simple and stalked forked trichomes. Stems erect, 1 or few from caudex. Basal leaves rosulate; petiole (0.5–)1.5–5 cm; leaf blade spatulate or oblanceolate, (0.5–)1.5–5 × (0.3–)0.7–1.5 cm, pilose throughout or only along margins and midvein, base attenuate, margin entire or denticulate, apex rounded. Cauline leaves 1–3, sessile, sometimes absent; leaf blade oblong, oblanceolate, spatulate, or obovate, 1–4 × 0.5–1.5 cm, base cuneate, margins entire or few toothed. Racemes bracteate throughout; bracts similar to cauline leaves but progressively smaller upward. Fruiting pedicels (0.3–)0.7–2(–2.5) cm, divaricate to divaricate-ascending, straight or slightly recurved. Sepals spreading, light purple, oblong-ovate, 4–7 × 1.5–2.5 mm, lateral pair saccate. Petals purple, spatulate or narrowly obovate, 0.7–1.5 cm × 3–6 mm, apex rounded. Filaments 4–11 mm; anthers oblong, 1–1.3 mm. Ovules 28–40 per ovary. Fruit 2.5–5.5 cm × 1.5–2 mm; valves glabrous, with a prominent midvein extending full length; style slender, 1–3 mm. Seeds dark brown, ovate, 1.2–1.5 × 0.9–1 mm, wingless. Fl. Jun–Jul, fr. Jul–Aug.

Mountain slopes, cliffs, ledges; 3600–5000 m. S Xizang [Bhutan].

The holotype of *Arabis venusta* H. Hara (J. Jap. Bot. 47: 108. 1972, described from Bhutan) probably represents a small-flowered form or variety of *A. axilliflora*. Except for its small flowers (sepals 2.5–3.5 mm, petals 5–6 mm), it is indistinguishable from the latter species. In fact, the holotype of *A. axilliflora* var. *brevistyla* (sepals 4–5 mm, petals 7–12 mm) falls exactly halfway between those of *A. axilliflora* and *A. venusta*. Both species were recognized in Fl. Bhutan (1(2): 435. 1984), and it appears that poor sampling resulted in the recognition of three taxa instead of perhaps only one.

11. *Arabis alaschanica* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 26: 421. 1880.

贺兰山南芥 *he lan shan nan jie*

Arabis holanshanica Y. C. Lan & T. Y. Cheo.

Herbs perennial, (3–)8–20(–30) cm tall, scapose; caudex branched, covered with stramineous, persistent petioles of previous years; trichomes simple, subsetose, to 1.5 mm, rarely mixed with short-stalked, forked ones, often restricted to leaf margins and adaxial surface of

sepals. Stems erect or ascending, leafless or few leaved. Basal leaves rosulate; petiole 0.5–3.5(–5) cm, narrowly winged, ciliate, persistent; leaf blade oblanceolate, spatulate, or obovate, (0.6–)1.5–4.5(–6) cm × (3–)5–10(–14) mm, base attenuate, margin entire or sparsely serrulate distally, ciliate, apex acute. Cauline leaves 1–3 or absent, narrowly oblong or lanceolate, sessile.

Racemes ebracteate or rarely lowermost 1–3 flowers bracteate. Fruiting pedicels 2–10(–20) mm, divaricate, straight, slender. Sepals oblong, 2.5–4 × 1–1.5 mm, abaxially sparsely pubescent, rarely glabrous, not saccate. Petals white, pink, or purplish, spatulate, 6–9 × 2–3 mm, apex obtuse. Filaments 4–7 mm; anthers oblong, 0.7–1 mm. Ovules 12–26 per ovary. Fruit (1.5–)2.5–5(–7) cm × 1.5–2 mm; valves glabrous, slightly torulose, with a prominent midvein extending full length; style slender, 1–3 mm. Seeds brown, oblong, 1.4–2.5 × 0.8–1.4 mm, uniseriate, winged distally. Fl. May–Jun, fr. Jun–Jul.

• Calcareous slopes, forest margins, streamsides; 2300–4200 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan.

The above first record from Shanxi is based on *Smith* 7449 (UPS).

12. *Arabis fruticulosa* C. A. Meyer in Ledebour, Fl. Altaic. 3: 19. 1831.

小灌木南芥 *xiao guan mu nan jie*

Arabis fruticulosa var. *albescens* N. Busch; *Koieia altimurana* K. H. Rechinger.

Subshrubs or shrubs, 10–35(–50) cm tall, densely tomentose throughout with short-stalked, dendritic trichomes rarely up to 0.2 mm in diam. Stems several from base, woody, creeping then erect, covered with leaf remains of previous years. Basal leaves rosulate; petiole 0.5–2.5 cm; leaf blade oblanceolate to oblong-lanceolate, 1–5(–6) cm × 1–7 mm, base attenuate, margin entire, apex obtuse or subacute. Cauline leaves absent or 1–4, sessile; leaf blade narrowly oblong to ovate-oblong, 0.5–1.7 cm × 2–5 mm, base subamplexicaul, margin entire, apex obtuse or subacute. Racemes ebracteate. Fruiting pedicels divaricate-ascending, 3–7(–10) mm, straight to slightly curved, slender, tomentose. Sepals oblong, 3–5 × 1.5–2 mm, tomentose, lateral pair saccate. Petals purple or pink, rarely white, obovate, (0.6–)0.9–1.2 cm × 2–4(–5) mm. Filaments 3–5 mm; anthers narrowly oblong, 1–1.2 mm. Ovules 26–40 per ovary. Fruit (2.5–)3–5 cm × 1–2 mm; valves tomentose, torulose, with inconspicuous or distinct midvein; style obsolete or absent. Seeds brown, oblong, 1.5–2.5 × 0.8–1.2 mm, uniseriate, narrowly winged; wing to 0.1 mm wide. Fl. Apr–May, fr. May–Jul.

Rocky crevices, slopes, hillsides; 500–3400 m. Xinjiang [Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan].

13. *Arabis tibetica* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 143. 1861.

西藏南芥 *xi zang nan jie*

Arabidopsis tibetica (J. D. Hooker & Thomson) Y. C. Lan & Z. X. An; *Arabis clarkei* O. E. Schulz; *A. multicaulis* Pampanini; *A. tenuirostris* O. E. Schulz; *A. thomsonii* J. D. Hooker.

Herbs biennial, (4–)10–35(–50) cm tall, sparsely to densely covered basally with a mixture of simple and stalked, forked, stellate, or subdendritic trichomes, sometimes one type predominant, rarely mostly with simple trichomes, often glabrous or glabrescent on distal parts. Stems erect or ascending, few to several from base. Basal leaves rosulate; petiole 0.5–2(–3.5) cm; leaf blade spatulate, obovate, or oblanceolate, 0.5–2.5(–4) cm × 3–10 mm, base cuneate or attenuate, margin dentate or lyrate-dentate, apex obtuse or rounded. Middle cauline leaves shortly petiolate, linear-oblanceolate or oblong-obovate, 0.5–1.5(–2) cm × (1–)2–4 mm, base attenuate, margin entire or dentate. Racemes ebracteate. Fruiting pedicels divaricate or ascending, (2–)4–9(–12) mm, slender, straight. Sepals oblong, 1.5–3 × 0.8–1.3 mm, not saccate. Petals white or rarely pinkish, narrowly oblanceolate, 3–5 × 1–1.5 mm. Filaments 2–3.5 mm; anthers oblong, 0.4–0.7 mm. Ovules 30–60 per ovary. Fruit (2.5–)3.5–6(–7) cm × 1–1.5 mm, attenuate to apex; valves glabrous, torulose, with an obscure midvein; style slender (0.5–)1–3 mm. Seeds brown, oblong, 0.9–1.2 × 0.5–0.7 mm, flattened, uniseriate, wingless or rarely apically with a narrow wing. Fl. May–Jun, fr. Jun–Jul.

Grassy slopes; 3000–4700 m. Xizang [Afghanistan, Kashmir, Kyrgyzstan, Pakistan, Tajikistan].

Although both FRPS and Fl. Xizang. (2: 370. 1985) recognized “*Arabis attenuata*” as a good species, that name was never validly published, but was merely listed as a questionable synonym in the protologue of *A. tibetica*. The same two floras recognized *A. tibetica* as *Arabidopsis tibetica*, a position that might indeed prove correct with further studies.

14. *Arabis auriculata* Lamarck, Encycl. 1: 219. 1783.

耳叶南芥 er ye nan jie

Arabis cadmea Boissier; *A. recta* Villars; *A. sinaica* Boissier; *A. sogdiana* Komarov; *Sisymbrium sewerzowii* Regel.

Herbs annual, (3–)10–40(–55) cm tall, densely pilose with stalked, forked or 3(or 4)-rayed stellate trichomes, these rarely mixed with fewer simple ones basally. Stems erect, simple at base, sometimes branched above middle. Basal leaves not rosulate; petiole 2–10 mm; leaf blade spatulate, obovate, or oblong-ovate, (0.5–)1–2.5(–3) cm × 3–15 mm, base cuneate, margin dentate or sublyrate, sometimes subentire, apex obtuse or acute. Middle cauline leaves sessile, subappressed to stems, ovate, oblong, or elliptic, (0.5–)1–2(–2.5) cm × 2–10 mm, base auriculate or amplexicaul, margin entire or denticulate. Racemes ebracteate; rachis flexuous in fruit. Fruiting pedicels 1–3(–5) mm, stout, as thick as or about half as thick as fruit, ascending, pubescent or glabrous. Sepals oblong, 1–2 × 0.4–0.5 mm, not saccate. Petals white, narrowly oblanceolate, 2–4 × 0.4–0.7(–1) mm, apex obtuse. Filaments 2–3 mm; anthers ovate, 0.2–0.3 mm. Ovules 16–50 per ovary. Fruit ascending, (1–)2–5 cm × 0.6–1(–1.2) mm, straight or slightly curved, slightly to strongly flattened; valves with distinct midvein, glabrous or puberulent with branched and simple trichomes; torulose or smooth; style 0.1–0.4 mm. Seeds brown, oblong, 0.7–1 × 0.4–0.6 mm, uniseriate, wingless. Fl. and fr. Mar–Jun. *2n* = 16.

Dry mountain slopes, forests, limestone conglomerate; 500–1800 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, E Europe].

Arabis auriculata has been reduced to the synonymy of *A. nova* Villars in some floras of countries W of China. However, the latter is a European species with much longer and more slender pedicels.

49. SISYMBRIOPSIS Botschantzev & Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 21: 143. 1961.

假蒜芥属 jia suan jie shu

Herbs annual, biennial, or perennial. Trichomes simple and stalked, 1- or 2-forked or dendritic. Stems erect or ascending, sometimes decumbent. Basal leaves petiolate, not rosulate, simple, pinnately lobed or coarsely dentate, rarely subentire. Cauline leaves petiolate or sessile not auriculate, entire, dentate, or pinnatifid. Racemes several flowered, bracteate or ebracteate. Fruiting pedicels erect, ascending, divaricate, or rarely recurved. Sepals oblong, erect, glabrous or pubescent, base of lateral pair not saccate. Petals white or pink, longer than sepals; blade obovate, spatulate, or oblanceolate, apex obtuse; claw obscurely distinct. Stamens 6, slightly tetradynamous; filaments dilated or not dilated at base; anthers ovate or oblong, apex obtuse or apiculate. Nectar glands confluent and subtending bases of all stamens. Ovules 15–50 per ovary. Fruit dehiscent siliques, linear, latiseptate, ± rectangular in cross section, sessile; valves with a prominent midvein and 2 marginal veins and less prominent, reticulate lateral veins, pubescent or rarely glabrescent, torulose; replum rounded; septum complete; style obsolete or to 1 mm; stigma capitate, entire or 2-lobed. Seeds uniseriate, wingless or distally margined, oblong, slightly flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons obliquely accumbent.

Five species: China, Kyrgyzstan, Tajikistan; four species (three endemic) in China.

1a. Trichomes simple, flattened; petals 6–10 × 3–5 mm; fruiting pedicels 7–18(–25) mm 4. *S. yechengica*

1b. At least some trichomes branched, not flattened; petals 2–4 × 0.6–1.5 mm; fruiting pedicels 0.5–5(–6) mm.

2a. Plants perennial; inflorescence bracteate; anthers apex obtuse 3. *S. shuanghuica*

2b. Plants annual; inflorescence ebracteate; anthers apex apiculate.

3a. Fruit glabrescent or sparsely pubescent with crisped forked trichomes to 0.4 mm; stigma subentire or

slightly 2-lobed; fruiting pedicels stout; sepals sparsely pubescent with crisped forked trichomes 1. *S. mollipila*

3b. Fruit densely villous with straight forked trichomes to 1 mm; stigma deeply 2-lobed; fruiting pedicels

slender; sepals densely villous with straight simple trichomes 2. *S. pamirica*

1. *Sisymbriopsis mollipila* (Maximowicz) Botschantzev, Novosti Sist. Vyssh. Rast. 3: 122. 1966.

绒毛假蒜芥 *rong mao jia suan jie*

Sisymbrium mollipilum Maximowicz, Fl. Tangut. 1: 62.

1889; *Arabidopsis qiranica* Z. X. An; *Microsisymbrium*

taxkorganicum Z. X. An; *Neotorularia mollipila*

(Maximowicz) Z. X. An; *Stenophragma mollipilum*

(Maximowicz) B. Fedtschenko; *Torularia mollipila*

(Maximowicz) O. E. Schulz.

Herbs annual or rarely biennial, (3–)18–45(–60) cm tall, pubescent basally with a mixture of simple and 1- or 2-forked, short-stalked trichomes, pubescent apically with crisped forked trichomes or rarely glabrescent. Stems erect, simple or sometimes branched at base. Basal leaves withered by fruiting; petiole (0.5–)1–1.7(–3) cm, strongly flattened at base, ciliate with simple trichomes to 1.5 mm; leaf blade narrowly oblong or linear-lanceolate, (1–)2–4(–7) cm × 2–8(–12) mm, base cuneate, margin coarsely dentate or pinnatifid, apex acuminate. Middle cauline leaves sessile or shortly petiolate, linear to linear-lanceolate, 1.5–5(–8) cm × 1–5(–10) mm, progressively reduced in size upward, margin entire or dentate, apex acuminate. Racemes ebracteate, elongated considerably in fruit. Fruiting pedicels erect, appressed to rachis, straight, stout, (0.5–)1–3(–4) mm. Sepals oblong, (1.5–)2–2.5 × 0.8–1 mm, scarious at margin, sparsely pubescent with crisped trichomes. Petals white or pink, oblanceolate, (2–)2.5–4 × (0.6–)0.9–1.2(–1.5) mm, clawlike base to 1.5 mm, apex obtuse. Filaments white or pink, (1.5–)2–3 mm; anthers oblong or subovate, (0.3–)0.4–0.6 mm, apiculate. Fruit (1.5–)3–5(–7) cm × 1–1.2 mm, erect, appressed to rachis; valves sparsely pubescent with finely branched, crisped, forked trichomes to 0.4 mm, rarely glabrescent; style obsolete or to 0.6 mm; stigma subentire or slightly 2-lobed. Seeds yellowish brown, oblong, 0.9–1.4 × 0.6–1 mm, slightly compressed, distal margin sometimes with a minute wing. Fl. Jun–Aug, fr. Jul–Sep.

Exposed banks, gravelly steep slopes, flood lands, alluvial plains, sandy or gravelly beaches, mountain valleys, grassy slopes, *Juniperus* woods; 2800–4500 m. Gansu, Qinghai, Xinjiang, Xizang [Kyrgyzstan, Tajikistan].

2. *Sisymbriopsis pamirica* (Y. C. Lan & Z. X. An) Al-Shehbaz et al., Novon 9: 311. 1999.

帕米尔假蒜芥 *pa mi er jia suan jie*

Arabis pamirica Y. C. Lan & Z. X. An, Fl. Xinjiang.

2(2): 375. 1995.

Herbs annual or ?perennial, ca. 30 cm tall, densely villous throughout with straight, 1-forked, stalked and

simple trichomes. Stems erect, branched at base and above. Basal leaves unknown; lower and middle cauline leaves shortly petiolate, lanceolate to oblong-lanceolate, 1–3 cm × 4–10 mm, base cuneate, margin coarsely dentate or pinnatifid, apex acuminate. Racemes ebracteate, elongated considerably in fruit. Fruiting pedicels erect, appressed to rachis, straight, slender, 2–4 mm, densely covered with simple and branched trichomes. Sepals oblong, 1.5–2 × ca. 0.5 mm, scarious at margin, densely pubescent with straight simple trichomes. Petals pink, oblanceolate, 2–2.5 × ca. 0.7 mm, attenuate to base, apex obtuse. Filaments pink, 1.2–2 mm; anthers suboblong, ca. 0.5 mm, minutely apiculate. Fruit 3–4.7 cm × 1–1.1 mm, erect, appressed to rachis; valves densely villous with straight, stalked, forked trichomes to 1 mm; style obsolete; stigma deeply 2-lobed. Seeds yellowish brown, oblong, 0.8–1 × 0.6–0.7 mm, slightly compressed. Fl. and fr. Jul.

• About 3700 m. Xinjiang.

3. *Sisymbriopsis shuanghuica* (K. C. Kuan & Z. X. An) Al-Shehbaz et al., Novon 9: 311. 1999.

双湖假蒜芥 *shuang hu jia suan jie*

Torularia shuanghuica K. C. Kuan & Z. X. An, Fl. Xi-

zang. 2: 404. 1985; *Neotorularia shuanghuica* (K. C.

Kuan & Z. X. An) Z. X. An.

Herbs perennial with a slender, simple or branched caudex, (5–)18–45(–60) cm tall, canescent, densely tomentose throughout with short-stalked, dendritic trichomes and fewer 2-forked ones. Stems erect or subdecumbent, branched basally and above. Basal leaves not rosulate; petiole 5–10 mm, not flattened at base, ciliate; leaf blade spatulate or oblanceolate, 0.5–2 cm × 1.5–5 mm, base cuneate, margin coarsely dentate, repand, or entire, apex obtuse or subacute. Middle cauline leaves sessile or shortly petiolate, similar to basal ones but progressively smaller upward. Racemes bracteate at least along proximal half, elongated slightly in fruit. Fruiting pedicels erect, appressed to rachis, straight, slender, 3–5(–6) mm, densely tomentose. Sepals oblong 2–2.5 × ca. 1 mm, scarious at margin, densely pubescent. Petals white or pink, spatulate, 2.5–3.5 × 0.9–1.5 mm, clawlike base to 1 mm, apex obtuse. Filaments pink, 2–3 mm; anthers subovate, 0.4–0.5 mm, apex obtuse. Fruit 1.5–3 cm × 1–1.3 mm, erect, appressed to rachis; valves densely pubescent with finely branched, short-stalked, dendritic trichomes to 0.5 mm; style to 0.5 mm; stigma subentire or slightly 2-

lobed. Seeds yellowish brown, oblong, 0.8–1 × 0.5–0.7 mm, slightly compressed. Fl. and fr. Jul.

• Mountain slopes; 4800–4900 m. Xizang.

4. *Sisymbriopsis yechengica* (Z. X. An) Al-Shehbaz et al., *Novon* 9: 312. 1999.

叶城假蒜芥 *ye cheng jia suan jie*

Microsisymbrium yechengicum Z. X. An, *Bull. Bot. Res.*, Harbin 1(1–2): 99. 1981.

Herbs annual or perennial, 15–50 cm tall, glabrescent or sparsely pubescent with flattened, crisped, simple trichomes to 0.7 mm. Stems erect or subdecumbent, simple or many branched at base. Basal leaves withered by fruiting, not rosulate; petiole 0.5–3 cm, not flattened at base; leaf blade narrowly oblong or linear-lanceolate, 2–4 cm × 1–5 mm, base cuneate, margin coarsely dentate or pinnatifid and lobes to 5 × 1 mm, rarely sub-entire, apex acuminate. Middle cauline leaves subsessile to petiolate, similar to basal leaves but progressively reduced in size upward, 3–7 cm × 2–6

mm, margin entire or dentate, apex acuminate.

Racemes ebracteate, elongated considerably in fruit. Fruiting pedicels divaricate or ascending, recurved or straight, slender, 0.7–1.8(–2.5) cm, glabrescent or sparsely with crisped, simple trichomes. Sepals oblong, 3–4 × 1.5–2 mm, scarious at margin, glabrous. Petals white or pink, obovate, 6–10 × 3–5 mm, apex obtuse; claw 1–2 mm. Filaments white, 2.5–3.5 mm; anthers narrowly oblong, 0.9–1.1 mm, apex obtuse. Fruit (1.5–) 2.5–4 cm × 1–1.2 mm, widely spreading; valves glabrescent, rarely sparsely with crisped simple trichomes to 0.5 mm; style 0.4–0.6(–0.9) mm; stigma entire. Seeds yellowish brown, oblong, 1.2–1.7 × 0.8–1 mm, slightly compressed, distal margin with a minute wing. Fl. Jun–Jul, fr. Jul–Aug.

• Grasslands, mountain slopes, steep rocky river banks; 2500–3000 m. Xinjiang.

The single paratype cited in the protologue of *Microsisymbrium yechengicum* is a specimen of *Chorispora sibirica*.

50. ARABIDOPSIS Heynhold in Holl & Heynhold, *Fl. Sachsen* 1: 538. 1842, nom. cons.

鼠耳芥属 *shu er jie shu*

Cardaminopsis (C. A. Meyer) Hayek; *Hylandra* Á. Löve.

Herbs annual, biennial, or perennial with stolons or woody caudex. Trichomes simple, mixed with stalked, 1–3-forked ones. Stems erect or decumbent, often several from base, usually glabrous above. Basal leaves rosulate, entire, toothed, or pinnately lobed. Cauline leaves petiolate or subsessile, entire, dentate, or rarely lyrate. Racemes few to several flowered, ebracteate. Fruiting pedicels ascending or divaricate or slightly reflexed. Sepals oblong, erect or ascending, glabrous or pubescent, base of lateral pair subsaccate or not. Petals white, pink, or purple; blade obovate, spatulate, or oblanceolate, apex obtuse or emarginate; claw distinct or not. Stamens 6, erect, slightly tetradynamous; filaments not dilated basally; anthers oblong, obtuse. Nectar glands confluent, subtending bases of filaments. Ovules 15–80 per ovary. Fruit dehiscent siliques, linear or cylindric, terete or flattened and latiseptate, shortly stipitate or subsessile; valves papery, veinless or midvein distinct, glabrous, smooth or somewhat torulose; replum rounded; septum complete; style obsolete or to 1 mm; stigma capitate, entire. Seeds numerous, uniseriate, wingless or margined, oblong or ellipsoid, plump or flattened; seed coat minutely reticulate, mucilaginous or not when wetted; cotyledons accumbent or rarely incumbent.

Nine species: E and N Asia, Europe, North America; three species in China.

1a. Fruit terete; annuals; petals 2–3.5 mm; seeds usually plump; cotyledons incumbent 1. *A. thaliana*

1b. Fruit strongly flattened; biennials or perennials; petals 4–6.5 mm; seeds usually flattened; cotyledons accumbent.

2a. Plants stoloniferous perennials; fruit valves not veined; basal leaves orbicular or pinnate with orbicular to suborbicular terminal lobes 2. *A. halleri*

2b. Plants non-stoloniferous biennials or perennials; fruit valves with a prominent midvein; basal leaves spatulate or oblanceolate, rarely obovate, without orbicular terminal lobes 3. *A. lyrata*

1. *Arabidopsis thaliana* (Linnaeus) Heynhold in Holl & Heynhold, *Fl. Sachsen* 1: 538. 1842.

鼠耳芥 *shu er jie*

Arabis thaliana Linnaeus, *Sp. Pl.* 2: 665. 1753; *Sisymbrium thalianum* (Linnaeus) J. Gay & Monnard; *Stenophragma thalianum* (Linnaeus) Celakovsky.

Herbs annual, (2–)5–30(–50) cm tall. Stems erect, 1 or few from base, simple or branched above, basally with predominantly simple trichomes, apically glabrous. Basal leaves shortly petiolate; leaf blade obovate, spatulate, ovate, or elliptic, 0.8–3.5(–4.5) cm × (1–)2–10(–15) mm, adaxially with predominantly simple and stalked 1-forked trichomes, margin entire, repand, or dentate, apex obtuse. Cauline leaves subsessile, usually few; blade lanceolate, linear, oblong, or elliptic, (0.4–

0.6–1.8(–2.5) cm × 1–6(–10) mm, entire or rarely few toothed. Fruiting pedicels slender, divaricate, straight, 3–10(–15) mm. Sepals 1–2(–2.5) mm, glabrous or distally sparsely pubescent with simple trichomes, lateral pair not saccate. Petals white, spatulate, 2–3.5 × 0.5–1.5 mm, base attenuate to a short claw. Filaments white, 1.5–2 mm. Ovules 40–70 per ovary. Siliques linear, terete, smooth, (0.8–)1–1.5(–1.8) cm × 0.5–0.8 mm; valves with a distinct midvein; style to 0.5 mm. Seeds ellipsoid, plump, light brown, 0.3–0.5 mm; cotyledons incumbent. Fl. and fr. Jan–Jun(–Oct). $2n = 10^*$.

Plains, mountain slopes, river banks, roadsides; near sea level to 2000 m. Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [India, Japan, Kazakhstan, Korea, Mongolia, Russia, Tajikistan, Uzbekistan; Africa, SW Asia, Europe, North America].

Arabidopsis thaliana is the most widely used flowering plant as a model organism for studies in genetics, development, physiology, biochemistry, and related fields. It is also a naturalized weed throughout much of the world.

2. *Arabidopsis halleri* (Linnaeus) O’Kane & Al-Shehbaz subsp. ***gemmifera*** (Matsumura) O’Kane & Al-Shehbaz, *Novon* 7: 325. 1997.

叶芽鼠耳芥 ye ya shu er jie

Cardamine gemmifera Matsumura, *Bot. Mag. (Tokyo)* 8: 49. 1899; *Arabis coronata* Nakai; *A. gemmifera* (Matsumura) Makino; *A. gemmifera* var. *alpicola* H. Hara; *A. greatrexii* (Miyabe & Kudo) Miyabe & Tatewaki; *A. halleri* Linnaeus var. *senanensis* Franchet & Savatier; *A. maximowiczii* N. Busch; *A. senanensis* (Franchet & Savatier) Makino; *Cardamine greatrexii* Miyabe & Kudo; *Cardaminopsis gemmifera* (Matsumura) Berkutenko.

Herbs perennial, stoloniferous, (10–)20–45(–60) cm tall. Stems decumbent, few from base, simple or branched above, basally with simple and 1-forked trichomes, apically glabrous. Basal leaves with a petiole (5–)1–2.5(–5) cm; leaf blade orbicular, broadly ovate, or spatulate, (1–)2–4.5(–9) × (0.5–)1–1.5(–2.5) cm, adaxially with a mixture of simple and stalked, 1- or 2-forked trichomes, margin lyrate-pinnatifid and with (1 or)2–4(–6) lateral lobes on each side; terminal lobe suborbicular, much larger than lateral ones, sometimes coarsely dentate, rarely entire or repand, apex obtuse. Cauline leaves shortly petiolate, several; blade of middle ones ovate, oblanceolate, oblong, or elliptic, (0.5–)1–2.5(–8) × (0.2–)0.5–1.5(–3) cm, coarsely toothed or rarely lobed, gradually reduced in size upward. Fruiting pedicels slender, divaricate or slightly reflexed, straight, (0.5–)0.8–1.3(–2) cm. Sepals 1.5–2 mm, glabrous or apically with few simple trichomes, lateral pair saccate. Petals white or pale purple, obovate,

4–5(–6.5) × 2–2.5(–3.5) mm; claw 1–2 mm. Filaments white, 2–2.5 mm. Siliques linear, flattened, torulose, (0.9–)1–1.5(–1.8) cm × 0.5–0.8 mm; valves without a distinct midvein; style to 0.7 mm. Seeds oblong, flattened, light brown, 0.5–0.7 mm; cotyledons accumbent. Fl. Jun–Jul, fr. Jul–Aug.

Gravelly or grassy slopes, forests; 1500–2600 m. Heilongjiang, Jilin, Liaoning, Taiwan [Japan, Korea, Russia (Far East, E Siberia)].

The record of *Arabidopsis halleri* subsp. *halleri* in FRPS (as *Arabis halleri*) is based on misidentified plants of subsp. *gemmifera*; true subsp. *halleri* is distributed in E and S Europe.

3. *Arabidopsis lyrata* (Linnaeus) O’Kane & Al-Shehbaz subsp. ***kamchatica*** (Fischer ex de Candolle) O’Kane & Al-Shehbaz, *Novon* 7: 326. 1997.

琴叶鼠耳芥 qin ye shu er jie

Arabis lyrata Linnaeus var. *kamchatica* Fischer ex de Candolle, *Syst. Nat.* 2: 231. 1821; *A. kamchatica* (Fischer ex de Candolle) Ledebour; *A. kawasakiana* Makino; *A. lyrata* subsp. *kamchatica* (Fischer ex de Candolle) Hultén; *A. morrisonensis* Hayata; *Cardaminopsis kamchatica* (Fischer ex de Candolle) O. E. Schulz.

Herbs biennial or perennial with a caudex, (5–)10–30(–45) cm tall. Stems erect or decumbent, 1 to many from base, usually branched above, basally with simple and 1-forked trichomes, apically glabrous. Basal leaves with a petiole 0.5–2(–6) cm; leaf blade oblanceolate or ovate, (0.5–)1–3(–8) × (0.3–)0.5–1.5 cm, adaxially with a mixture of simple and stalked, 1-forked trichomes, rarely glabrous, margin dentate or lyrate, with 1–3 lateral lobes on each side, apex obtuse. Cauline leaves shortly petiolate, several; blade of middle ones oblanceolate, (0.5–)1–3(–4) cm × (1–)2–7 mm, entire, repand, or obscurely toothed, rarely lobed, gradually reduced in size upward. Fruiting pedicels slender, divaricate, straight, (0.5–)0.8–1.2 cm. Sepals 2–3 mm, glabrous or densely pubescent, lateral pair saccate. Petals white, spatulate or obovate, 4–5(–6) × 1.5–2(–2.5) mm; claw to 1 mm. Filaments white, 2–3 mm. Siliques linear, flattened, torulose, (1.5–)2–3.5(–4.5) cm × 0.5–0.8 mm; valves with a distinct midvein extending full length; style to 0.5 mm. Seeds oblong, flattened, light brown, 0.9–1.2 mm; cotyledons accumbent. Fl. Mar–Jul, fr. Jun–Oct. $2n = 16, 32$.

Gravelly slopes, forests, alpine regions, roadsides; 1700–3400 m. Jilin, Taiwan [Japan, Korea, Russia (Far East, E Siberia); NW North America].

Arabidopsis lyrata subsp. *lyrata* is restricted to North America.

51. CRUCIHMALAYA Al-Shehbaz et al., *Novon* 9: 298. 1999.

须弥芥属 xu mi jie shu

Herbs annual or biennial, rarely perennial with a caudex. Trichomes simple and stalked, 1- or 2-forked, sometimes stellate. Stems erect or ascending. Basal leaves rosulate or not, entire or dentate, rarely pinnately lobed. Cauline leaves sessile or subsessile, usually auriculate or sagittate, entire, dentate, or rarely pinnately lobed, rarely absent. Racemes several to many flowered, ebracteate or bracteate. Fruiting pedicels erect, ascending, or divaricate. Sepals oblong, erect, pubescent, base of lateral pair not saccate. Petals white, pink, or purple, longer than sepals; blade spatulate, rounded; claw obscurely distinct from blade. Stamens 6, erect, slightly tetradynamous; filaments not dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands confluent and subtending bases of filament. Ovules (30–)40–120(–150) per ovary. Fruit dehiscent siliques, linear, terete or somewhat 4-angled, rarely latiseptate, sessile or subsessile; valves with a distinct midvein, glabrous or rarely pubescent, smooth or torulose; replum rounded; septum complete; style to 1 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat minutely reticulate, mucilaginous when wetted; cotyledons incumbent.

Nine species: C and SW Asia, Himalayas, Mongolia, Russia; six species in China.

- 1a. Fruit valves densely and coarsely stellate; pedicels pubescent all around; fruit often subappressed to rachis 2. *C. lasiocarpa*
- 1b. Fruit valves glabrous or very rarely puberulent; pedicels glabrous adaxially, rarely (*C. wallichii*) pubescent all around; fruit not appressed to rachis.
- 2a. Cauline leaves distinctly auriculate or amplexicaul at base.
- 3a. Racemes bracteate at least along proximal portion; annuals or biennials; cauline leaves usually auriculate; upper leaves coarsely stellate 4. *C. himalaica*
- 3b. Racemes ebracteate; perennials; cauline leaves sagittate or amplexicaul; upper leaves softly stellate 1. *C. mollissima*
- 2b. Cauline leaves petiolate or sessile, neither auriculate nor amplexicaul, sometimes absent.
- 4a. Lowermost flowers of main raceme ebracteate; basal leaves lyrate or pinnatifid, often canescent, persistent in flower and fruit 6. *C. wallichii*
- 4b. Lowermost flowers of main raceme bracteate; basal leaves entire or dentate, not canescent, withered by flowering or fruiting.
- 5a. Cauline leaves adaxially with simple and forked trichomes, ovate, elliptic, or oblong, rarely oblanceolate; plants 4–15(–20) cm tall; main raceme bracteate nearly throughout 5. *C. axillaris*
- 5b. Cauline leaves adaxially with stellate stalked trichomes, linear-lanceolate; plants (18–)30–85(–120) cm tall; only lowermost flowers of main raceme bracteate 3. *C. stricta*

1. *Crucihimalaya mollissima* (C. A. Meyer) Al-Shehbaz et al., *Novon* 9: 299. 1999.

柔毛须弥芥 rou mao xu mi jie

Sisymbrium mollissimum C. A. Meyer in Ledebour, *Fl. Altaic*. 3: 140. 1831; *Arabidopsis mollissima* (C. A. Meyer) N. Busch; *A. mollissima* var. *dentata* O. E. Schulz; *A. mollissima* var. *glaberrima* (J. D. Hooker & Thomson) O. E. Schulz; *A. mollissima* var. *pamirica* (Korshinsky) O. E. Schulz; *A. mollissima* var. *thomsonii* (J. D. Hooker) O. E. Schulz; *Hesperis mollissima* (C. A. Meyer) Kuntze; *Sisymbrium mollissimum* C. A. Meyer f. *pamiricum* Korshinsky; *S. thomsonii* J. D. Hooker; *Stenophragma mollissimum* (C. A. Meyer) B. Fedtschenko.

Herbs perennial, (5–)10–40(–60) cm tall. Stems erect, simple or few to many branched at base, densely pubescent, with short-stalked, stellate trichomes, often basally hirsute with horizontal simple or forked trichomes to 1.8 mm, rarely glabrous or glabrescent. Basal leaves rosulate, petiolate, often remaining throughout growing season; petiole (0.2–)0.5–1.7(–3) cm, often ciliate, base persistent; leaf blade spatulate, oblanceolate, or oblong, (0.6–)1–2.5(–5) cm × 2–8(–15) mm, finely stellate pubescent, margin coarsely dentate

or rarely subentire, apex obtuse. Middle cauline leaves ovate or narrowly oblong or lanceolate, sessile, 0.7–2.5(–4) cm × 2–7(–10) mm, finely stellate pubescent or rarely glabrescent, base sagittate or amplexicaul, margin entire or rarely repand or dentate, apex acute. Racemes ebracteate. Fruiting pedicels slender, stellate pubescent laterally and abaxially, glabrous adaxially, divaricate, (3–)4–10(–16) mm. Sepals often pink, oblong, 2–2.5 × 0.8–1 mm, densely pubescent, sometimes narrowly membranous. Petals white or pink, spatulate, 3–4.5 × 0.9–1.1(–1.5) mm, attenuate to base; claw to 1 mm. Filaments 2.5–3 mm; anthers oblong, 0.4–0.6 mm. Ovules 70–120 per ovary. Fruit linear, terete, straight or often slightly curved, erect or ascending or rarely divaricate, (1.2–)2.5–3.5(–5) cm × 1–1.5 mm; valves glabrous, with a prominent midvein; style (0.1–)0.4–0.7(–1) mm. Seeds brown, oblong, 0.8–1.1 × 0.3–0.5 mm. Fl. Jun–Aug, fr. Jul–Aug. $2n = 16$. Open slopes, grassy meadows; 2600–4400 m. Gansu, Sichuan, Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia (Siberia), Tajikistan]. The records of *Crucihimalaya mollissima* in FRPS (as *Arabidopsis mollissima*) from Sichuan and Yunnan are based on misidentified plants of *C. himalaica*.

2. *Crucihimalaya lasiocarpa* (J. D. Hooker & Thomson) Al-Shehbaz et al., *Novon* 9: 300. 1999.

毛果须弥芥 *mao guo xu mi jie*

Sisymbrium lasiocarpum J. D. Hooker & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 162. 1861, not (F. Mueller) F. Mueller (1869); *Arabidopsis lasiocarpa* (J. D. Hooker & Thomson) O. E. Schulz; *A. lasiocarpa* var. *micrantha* W. T. Wang; *A. monachorum* (W. W. Smith) O. E. Schulz; *Guillenia duthiei* (O. E. Schulz) Bennet; *Hesperis lasiocarpa* (J. D. Hooker & Thomson) Kuntze; *Microsisymbrium duthiei* O. E. Schulz; *S. bhutanicum* N. P. Balakrishnan, nom. illeg. (included *S. lasiocarpum*); *S. monachorum* W. W. Smith.

Herbs annual or biennial, (10–)25–70(–120) cm tall.

Stems erect, simple or branched at base, densely hirsute with horizontal simple trichomes to 1.3 mm, these mixed throughout with much smaller, short-stalked, stellate trichomes. Basal leaves not rosulate, petiolate, often caducous by fruiting; petiole (0.3–)1–3 cm; leaf blade spatulate, (0.3–)1–5(–7) cm × (2–)6–11(–20) mm, stellate pubescent and often mixed with simple or forked trichomes, margin dentate or rarely lyrate lobed, apex obtuse. Middle cauline leaves obovate, oblong, or elliptic, sessile and broad at base, (0.6–)1–2(–2.5) cm × (3–)6–11 mm, stellate pubescent, dentate, repand, or entire, reduced in size upward. Racemes bracteate throughout or only lower flowers bracteate; bracts similar to uppermost cauline leaves. Fruiting pedicels slender, stellate pubescent all around, suberect or rarely divaricate, (0.5–)1–4(–6) mm. Sepals oblong, 1.5–2(–2.5) × 0.8–1 mm, densely pubescent, sometimes narrowly membranous. Petals white or pink, spatulate or narrowly oblanceolate, 2–3(–4) × 0.6–0.9 mm, attenuate to base; claw to 1 mm. Filaments 1.5–2.5 mm; anthers oblong-ovate, 0.3–0.4 mm. Ovules 70–160 per ovary. Fruit linear, terete, straight, appressed to rachis or rarely divaricate, (0.6–)1.5–3(–4.2) cm × 0.7–1 (–1.3) mm; valves densely stellate pubescent, with an inconspicuous midvein; style 0.3–0.6(–1) mm. Seeds light brown, oblong or subovoid, 0.5–0.6 × 0.3–0.4 mm. Fl. Apr–Aug, fr. May–Sep.

Fields, forest margins, grassy slopes, river banks, limestone scree and slopes, roadsides; 2400–4500 m. Sichuan, Xizang, Yunnan [Bhutan, India (Uttar Pradesh), Nepal].

3. *Crucihimalaya stricta* (Cambessèdes) Al-Shehbaz et al., *Novon* 9: 300. 1999.

直须弥芥 *zhi xu mi jie*

Malcolmia stricta Cambessèdes in Jacquemont, *Voy. Inde* 4(Bot.): 16. 1844; *Arabidopsis himalaica* (Edgeworth) O. E. Schulz var. *kunawurensis* O. E. Schulz; *A. stricta* (Cambessèdes) N. Busch; *A. stricta* var. *bracteata* O. E. Schulz; *Hesperis stricta* (Cambessèdes) Kuntze; *Sisymbrium strictum* (Cambessèdes) J. D. Hooker & Thomson.

Herbs annual or biennial, (10–)22–85(–125) cm tall. Stems erect, simple or sometimes branched at base, densely pubescent with short-stalked, stellate trichomes, often basally hirsute with horizontal simple trichomes to 1.4 mm. Basal leaves not rosulate, petiolate, often caducous by fruiting; petiole to 3 cm; leaf blade spatulate, 4–9 × 1–2 cm, stellate pubescent and sometimes mixed with simple or forked trichomes, margin coarsely dentate or rarely lyrate lobed, apex obtuse. Middle cauline leaves narrowly oblong, lanceolate-linear, or narrowly oblanceolate, sessile, (1–)2–5(–8) cm × (2–)3.5–10(–17) mm, stellate pubescent, base attenuate, margin dentate, repand, or entire. Racemes basally or rarely lowermost 1 or 2 flowers bracteate; bracts similar to uppermost cauline leaves. Fruiting pedicels slender, stellate pubescent laterally and abaxially, glabrous adaxially, divaricate or rarely ascending, (0.5–)1–4(–6) mm. Sepals oblong, 1.7–2.5 × 0.6–0.8 mm, densely pubescent, sometimes narrowly membranous. Petals white, pink, or purple, spatulate, 2.5–3(–4) × 0.7–1 mm, attenuate to base; claw to 1 mm. Filaments 2–2.8 mm; anthers oblong, 0.4–0.6 mm. Ovules 60–120 per ovary. Fruit linear, terete, straight or curved, divaricate or rarely ascending, (1–)2–4(–5.5) cm × 0.6–1 mm; valves glabrous or very rarely puberulent, with a conspicuous midvein; style (0.2–)0.6–1.3(–1.8) mm. Seeds brown, oblong or subovoid, uniseriate, 0.6–0.9 × 0.3–0.4 mm. Fl. Apr–Aug, fr. May–Sep.

Forest margins, grassy areas; 1600–2400(–4200) m. Xizang [India, Kashmir, Nepal, Pakistan].

The record of *Crucihimalaya stricta* in FRPS (as *Arabidopsis stricta*) from Sichuan is based on misidentified plants of *C. himalaica*.

4. *Crucihimalaya himalaica* (Edgeworth) Al-Shehbaz et al., *Novon* 9: 301. 1999.

须弥芥 *xu mi jie*

Arabis himalaica Edgeworth, *Trans. Linn. Soc. London* 20: 31. 1846; *Arabidopsis brevicaulis* (Jafri) Jafri; *A. himalaica* (Edgeworth) O. E. Schulz; *A. himalaica* var. *harrissii* O. E. Schulz; *A. himalaica* var. *integrifolia* O. E. Schulz; *A. himalaica* var. *rupestris* (Edgeworth) O. E. Schulz; *Arabis brevicaulis* Jafri; *A. rupestris* Edgeworth; *Hesperis himalaica* (Edgeworth) Kuntze; *Sisymbrium himalaicum* (Edgeworth) J. D. Hooker & Thomson; *S. rupestre* (Edgeworth) J. D. Hooker & Thomson.

Herbs annual or biennial, very rarely perennial, (3–)10–50(–70) cm tall. Stems erect, simple or few to many branched at base, densely pubescent with coarse, stalked, stellate and forked trichomes, often basally hirsute with horizontal, simple or forked trichomes to 1.8 mm, rarely glabrescent distally. Basal leaves rosulate, petiolate, often withered by fruiting; petiole (0.3–)0.7–1.5(–2) cm, often ciliate; leaf blade spatulate, oblanceolate, ovate, or oblong, (0.4–)1–3(–4) cm × 2–10(–14) mm, densely pubescent with coarse, stalked, stellate and forked trichomes, margin coarsely

dentate or rarely subentire, apex obtuse. Middle cauline leaves oblong, rarely ovate or lanceolate, sessile, 0.5–2.5(–3.2) cm × 2–7(–11) mm, pubescent as basal leaves, rarely glabrescent, base auriculate or rarely sagittate, margin coarsely dentate or rarely entire, apex acute. Racemes bracteate along entire length or only lowermost few flowers bracteate. Fruiting pedicels slender, stellate pubescent laterally and abaxially, glabrous adaxially, divaricate, (1–)2–7(–11) mm. Sepals often pink, oblong, 1.5–2.5(–3) × 0.7–1 mm, densely pubescent, sometimes narrowly membranous. Petals purple, pink, or rarely white, spatulate, 2–3.5(–5) × (0.6–)1–1.5(–2) mm, attenuate to base; claw to 1 mm. Filaments 1.5–3 mm; anthers oblong, 0.3–0.5 mm. Ovules 50–110 per ovary. Fruit linear, terete, straight or rarely slightly curved, erect or divaricate-ascending, (0.8–)1.5–3.5(–4.5) cm × (0.4–)0.5–0.8(–1) mm; valves glabrous or rarely puberulent, with an obscure or rarely prominent midvein; style (0.1–)0.4–0.6 mm. Seeds brown, oblong, 0.5–0.8 × 0.2–0.4 mm. Fl. (Mar)Apr–Sep, fr. Jun–Oct. $2n = 16$.

Rocky hillsides, grassy meadows, sandy slopes, flood plains, scree, pastures; (1500–)2600–4400(–5000) m. Sichuan, Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, Nepal, Pakistan, Sikkim].

5. *Crucihimalaya axillaris* (J. D. Hooker & Thomson) Al-Shehbaz et al., *Novon* 9: 301. 1999.

腋花须弥芥 *ye hua xu mi jie*

Sisymbrium axillare J. D. Hooker & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 162. 1861; *Guillenia axillaris* (J. D. Hooker & Thomson) Bennet; *G. bracteosa* (Jafri) H. B. Naithani & S. N. Biswas; *Microsisymbrium axillare* (J. D. Hooker & Thomson) O. E. Schulz; *M. axillare* var. *brevipedicellatum* Jafri; *M. axillare* var. *dasy carpum* O. E. Schulz; *M. bracteosum* Jafri.

Herbs annual or perennial, (3–)10–20 cm tall. Stems decumbent or ascending, few to many branched at base, densely hispid with coarse, horizontal, simple trichomes to 2 mm, these often mixed with coarse, forked, much smaller, stalked stellate ones, rarely glabrescent distally. Basal leaves rosulate, petiolate, often withered by fruiting; petiole (0.2–)1–2 cm, often ciliate; leaf blade spatulate, (0.6–)1–3.5(–5) × (0.2–)0.5–1.5 cm, pubescent with stalked, forked trichomes mixed with larger, forked or simple ones, margin coarsely dentate, sinuate, or lyrate-pinnatifid, apex obtuse. Middle cauline leaves broadly oblong, elliptic, or obovate, sessile, 1–2.5 × (0.2–)0.7–1.3 cm, pubescent as basal leaves, rarely glabrescent, base cuneate, not auriculate, margin dentate, apex acute. Racemes bracteate along entire length. Fruiting pedicels slender, stellate pubescent laterally and abaxially, glabrous adaxially or rarely all around, divaricate or ascending, (2.5–)4–10(–12) mm. Sepals narrowly oblong, 2–3 × 0.6–1 mm, coarsely pubescent. Petals white or pink, spatulate, 3–4.5 × (0.8–)1–1.2 mm, attenuate to base; claw to 1 mm. Filaments 2–3 mm; anthers oblong, 0.4–0.6 mm. Ovules 60–90

per ovary. Fruit linear, terete, curved upward or sometimes straight, divaricate, (1.4–)2.5–4(–5) cm × 0.6–0.8 mm; valves glabrous or rarely puberulent, with an obscure midvein; style (0.1–)0.4–1 mm. Seeds brown, oblong, 0.8–1 × 0.3–0.4 mm. Fl. Mar–Jun, fr. May–Jul.

Rocky hillsides, shady banks, open woodlands, roadsides, rock crevices, terraces, forests; 2200–3000 m. Xizang [Bhutan, India, Kashmir, Nepal, Sikkim].

6. *Crucihimalaya wallichii* (J. D. Hooker & Thomson) Al-Shehbaz et al., *Novon* 9: 301. 1999.

卵叶须弥芥 *luan ye xu mi jie*

Sisymbrium wallichii J. D. Hooker & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 158. 1861; *Arabidopsis campestris* O. E. Schulz; *A. mollissima* (C. A. Meyer) N. Busch var. *afghanica* O. E. Schulz; *A. russelliana* Jafri; *A. taraxacifolia* (T. Anderson) Jafri; *A. wallichii* (J. D. Hooker & Thomson) N. Busch; *A. wallichii* var. *viridis* O. E. Schulz; *Arabis bucharica* (Lipsky) Nevski; *A. tibetica* J. D. Hooker & Thomson var. *bucharica* Lipsky; *A. taraxacifolia* T. Anderson; *Hesperis wallichii* (J. D. Hooker & Thomson) Kuntze; *Microsisymbrium angustifolium* Jafri.

Herbs annual or biennial, (5–)12–50(–80) cm tall. Stems erect, simple or few to many branched at base, densely to sparsely tomentose with finely branched stellate trichomes, often basally hirsute with horizontal, simple or forked trichomes (0.5–)0.8–1.5(–2) mm, rarely glabrescent distally. Basal leaves rosulate, petiolate, often lyrate or pinnatifid persistent or withered by fruiting; petiole 0.5–1.5(–2.5) cm, often ciliate; leaf blade spatulate, oblanceolate, or obovate in outline, 1–6(–12) × 3–1.7(–3) cm, densely tomentose with finely branched stellate trichomes, margin coarsely dentate or rarely entire, with up to 8 lobes on each side of midvein; lateral lobes oblong or ovate, increasing in size distally, much smaller than obovate or suborbicular terminal lobe, to 1.5 × 0.8 cm, entire or dentate. Middle cauline leaves oblong, oblanceolate, or linear, sessile, 0.7–4(–7) cm × 1–10(–20) mm, pubescent as basal leaves, rarely glabrescent, base usually minutely auriculate, margin entire, coarsely dentate, or lyrate, apex acute. Racemes ebracteate, lax. Fruiting pedicels slender, straight, stellate pubescent all around or glabrous adaxially, divaricate or rarely ascending, (0.2–)0.5–1.6(–2.5) cm. Sepals green or pink, oblong, 1.5–2.5(–3) × 0.7–1 mm, densely pubescent or glabrescent, sometimes narrowly membranous. Petals purple, pink, or white, spatulate, (2–)2.5–3.5(–4.5) × 0.4–0.6 mm, attenuate to base. Filaments 2.5–3(–3.5) mm; anthers oblong, 0.3–0.6 mm. Ovules 70–150 per ovary. Fruit linear, terete or subcompressed, arcuate or straight, divaricate- to recurved or rarely ascending, (2.5–)3.5–7.5(–9.5) cm × 0.6–1 mm; valves glabrous, with an obscure or prominent midvein; style (0.2–)0.5–1(–1.5)

mm. Seeds brown, oblong, 0.6–1 × 0.3–0.5 mm. Fl. Apr–Aug, fr. May–Sep. 2n = 14, 16, 18.

Rocky slopes, hillsides, limestone crevices and ledges; (700–) 1200–4400. Xizang [Afghanistan, Bhutan, India, Kashmir, Kazakstan, Kyrgyzstan, Nepal, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

52. OLIMARABIDOPSIS Al-Shehbaz et al., Novon 9: 302. 1999.

无苞芥属 *wu bao jie shu*

Herbs annual. Trichomes short-stalked or sessile, malpighiaceus and 3- or 4-rayed stellate. Stems erect or ascending. Basal leaves petiolate, not rosulate, simple, entire or rarely pinnatisect. Cauline leaves sessile, auriculate, entire or dentate. Racemes few to several flowered, ebracteate. Fruiting pedicels ascending, divaricate, or reflexed. Sepals oblong, erect, glabrous or pubescent, base of lateral pair not saccate. Petals yellow or yellowish white, slightly longer than sepals; blade oblanceolate, apex obtuse; claw absent. Stamens 6, slightly tetradynamous, rarely 4; filaments not dilated at base; anthers oblong, apex obtuse. Nectar glands confluent and subtending bases of all stamens. Ovules 18–60 per ovary. Fruit dehiscent siliques, linear, terete, sessile; valves with a distinct midvein, pubescent with submalpighiaceus and/or short-stalked, stellate trichomes, smooth; replum rounded; septum complete, perforated, or reduced to a rim; style obsolete or to 1 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat reticulate, slightly mucilaginous or not mucilaginous when wetted; cotyledons incumbent.

Three species: C and SW Asia, E Europe; two species in China.

1a. Septum complete; fruit 1.5–3.2(–4) cm; seeds (15–)20–40(–60) per fruit 1. *O. pumila*

1b. Septum perforate or reduced to a rim; fruit 0.4–1(–1.5) cm; seeds 5–18(–20) per fruit 2. *O. cabulica*

1. *Olimarabidopsis pumila* (Stephan) Al-Shehbaz et al., Novon 9: 303. 1999.

无苞芥 *wu bao jie*

Sisymbrium pumilum Stephan in Willdenow, Sp. Pl. 3: 507. 1800; *Arabidopsis griffithiana* (Boissier) N. Busch; *A. pumila* (Stephan) N. Busch; *A. pumila* var.

griffithiana (Boissier) Jafri; *Drabopsis oronotica* Stapf; *Hesperis pumila* (Stephan) Kuntze; *Microsisymbrium griffithianum* (Boissier) O. E. Schulz; *Sisymbrium foliosum* J. D. Hooker & Thomson; *S. griffithianum* Boissier; *S. hirtulum* Regel & Schmalhausen; *S. kokanicum* Regel & Schmalhausen; *Stenophragma griffithianum* (Boissier) B. Fedtschenko; *S. pumilum* (Stephan) B. Fedtschenko.

Herbs annual, (1–)5–40(–60) cm tall. Stems erect, simple or few branched at base, pubescent with short-stalked or subsessile, stellate trichomes, rarely glabrescent distally. Basal leaves not rosulate, petiolate, often withered by fruiting, pubescent as stems; petiole (0.1–)0.8–2(–3.5) cm; leaf blade oblanceolate, spatulate, or lanceolate, (0.4–)1–8(–12) × (0.1–)0.5–2(–3) cm, margin coarsely dentate, rarely pinnatifid, pinnatisect, or entire, apex acute. Middle cauline leaves oblong, ovate, or lanceolate, sessile, (0.3–)1–5(–7.5) cm × (1–)4–12(–30) mm, base auriculate or rarely sagittate, margin coarsely dentate or rarely entire, apex acute. Fruiting pedicels divaricate, ascending, or strongly reflexed, (1–)2–7(–12) mm, slender or stout, stellate pubescent or rarely glabrescent. Sepals oblong, 1.4–2(–2.5) × 0.3–0.8 mm, pubescent. Petals yellow, turning whitish when dry, spatulate or oblanceolate, (1.6–)2–2.5(–3) × 0.3–0.8 mm, attenuate to base; claw absent. Filaments 1.3–1.8 mm; anthers oblong, 0.2–0.3 mm. Fruit linear, terete, curved or straight 1.5–3.2(–4) cm ×

0.8–1.2 mm, only slightly torulose; valves pubescent with submalpighiaceus and/or subsessile 3-rayed trichomes, usually with a distinct midvein; septum complete; style 0.1–0.4(–0.8) mm. Seeds brown, (15–)22–40(–60) per fruit, oblong, uniseriate, 0.5–0.9 × 0.3–0.5 mm. Fl. Mar–May, fr. Apr–Jun. 2n = 16, 32.

Fields, sandy steppe, stony slopes, scrub; 100–3800 m. Gansu, Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

Records in FRPS from Gansu and Yunnan require verification; no material was seen by the present authors from these provinces.

2. *Olimarabidopsis cabulica* (J. D. Hooker & Thomson) Al-Shehbaz et al., Novon 9: 303. 1999.

喀布尔无苞芥 *ka bu er wu bao jie*

Sisymbrium cabulicum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 161. 1861; *Arabidopsis korshinskyi* Botschantzev; *A. pumila* (Stephan) N. Busch var. *alpina* (Korshinsky) O. E. Schulz;

Sisymbrium pumilum Stephan var. *alpinum* Korshinsky.

Herbs annual, 1–12(–30) cm tall. Stems subdecumbent to erect, few branched or rarely simple at base, pubescent with short-stalked to subsessile, stellate trichomes. Basal leaves not rosulate, subsessile, often withered by fruiting, pubescent as stems; leaf blade oblanceolate, obovate, or lanceolate, 0.2–2(–3.2) cm × 1–9(–15) mm, margin entire, repand, or obscurely dentate, apex acute. Middle cauline leaves oblong or ovate, sessile, 0.2–2(–3.5) cm × 1–8(–15) mm, base auriculate, margin entire or repand, apex acute. Fruiting pedicels slender, stellate pubescent, divaricate, 1–4(–6) mm. Sepals oblong, 1.1–1.5 × 0.3–0.5 mm, pubescent. Petals yellow, turning whitish when dry, spatulate or oblanceolate, 1.6–1.9 × 0.4–0.5 mm, attenuate to base; claw absent. Filaments 1.2–1.6 mm; anthers oblong,

0.1–0.2 mm. Fruit linear, terete, curved or straight, 4–10(–13) × 0.7–0.9 mm, only slightly torulose; valves pubescent with subsessile, 3-rayed trichomes, usually with a distinct midvein; septum perforated or reduced to a rim; style 0.1–0.5 mm. Seeds brown, 5–18(–20) per fruit, oblong, uniseriate, 0.5–0.8 × 0.3–0.4 mm. Fl. Mar–May, fr. Apr–Jun. $2n = 48$.

Valleys, rocky slopes, river banks; 3000–4200 m. Xinjiang [Afghanistan, Kyrgyzstan, Tajikistan].

This species was recorded in FRPS (as *Arabidopsis pumila* var. *alpina*) from Xinjiang. The present authors have seen no material from China, and the above description was based on misidentified plants from Pamir Alai, Tajikistan.

53. PSEUDOARABIDOPSIS Al-Shehbaz et al., Novon 9: 304. 1999.

假鼠耳芥属 *jia shu er jie shu*

Herbs biennial or perennial. Trichomes sessile, stellate, 4- or 5-rayed, with at least some rays branched. Stems erect or ascending, sometimes decumbent. Basal leaves petiolate, rosulate, simple, entire or dentate. Cauline leaves sessile, deeply sagittate-amplexicaul or rarely auriculate, entire or dentate. Racemes several flowered, ebracteate. Fruiting pedicels ascending or divaricate. Sepals oblong, erect, glabrous or pubescent, base of lateral pair subsaccate. Petals white or pink, erect, slightly longer than sepals; blade spatulate, apex obtuse; claw absent. Stamens 6, strongly tetradynamous; filaments not dilated at base; anthers oblong, sagittate at base, obtuse at apex. Nectar glands confluent, subtending bases of all stamens, surrounding those of lateral ones. Ovules 60–100 per ovary. Fruit dehiscent siliques, linear, terete, stipitate; valves papery, with obscure midvein, glabrous, smooth; gynophore distinct; replum rounded; septum complete, without a midvein; style distinct and to 1 mm; stigma capitate, subentire or slightly 2-lobed. Seeds 60–100 per ovary, biseriate, wingless, oblong or ovoid, plump; seed coat minutely reticulate, slightly mucilaginous when wetted; cotyledons incumbent.

One species: Afghanistan, W China, Kazakstan, Russia.

1. *Pseudoarabidopsis toxophylla* (Marschall von Bieberstein) Al-Shehbaz et al., Novon 9: 304. 1999.

假鼠耳芥 *jia shu er jie*

Arabis toxophylla Marschall von Bieberstein, Fl. Taur.-

Caucas. 3: 448. 1819–1820; *Arabidopsis toxophylla*

(Marschall von Bieberstein) N. Busch; *Sisymbrium*

toxophyllum (Marschall

von Bieberstein) C. A. Meyer; *Stenophragma*

toxophyllum (Marschall von Bieberstein) B.

Fedtschenko.

Herbs biennial or perennial, (0.5–)1–4.5(–6.9) cm tall, often with petiolar remains of basal leaves. Stems erect or ascending, simple or few branched at base, pubescent with sessile stellate trichomes, rarely glabrescent distally. Basal leaves rosulate, pubescent as stems; petiole (0.3–)0.8–3.5(–6) cm; leaf blade oblanceolate, spatulate, oblong, or ovate, (0.7–)1–4(–8) × (0.4–)0.8–

2(–3) cm, margin entire, dentate, or rarely runcinate, apex acute. Middle cauline leaves narrowly oblong or linear, sessile, 1–5.5(–8) cm × 1–7(–15) mm, base deeply sagittate-amplexicaul or rarely auriculate, margin entire or rarely obscurely denticulate, apex acute; auricles to 10 × 1 mm. Fruiting pedicels slender, glabrous, divaricate to divaricate-ascending, (2.5–)4–10(–15) mm. Sepals oblong, (2–)2.5–3(–3.5) × 0.6–0.9 mm, glabrous or rarely pubescent. Petals white or pink, spatulate, (6–)6.5–8(–9) × (1.5–)2–3 mm; claw distinct. Filaments 2.5–4(–5) mm; anthers narrowly oblong, 0.8–1 mm. Fruit (0.8–)12–2(–2.8) cm × 0.5–0.8 mm, only slightly torulose; gynophore distinct, (0.1–)0.2–0.6(–10) mm; style 0.1–0.4(–0.9) mm. Seeds brown, 50–100 per ovary, oblong or ovoid, 0.4–0.6 × 0.2–0.3 mm. Fl. May–Jun, fr. Jun–Jul. $2n = 12$.

Steppe. Xinjiang, Xizang [Afghanistan, Kazakstan, Russia].

54. STEVENIA Adams ex Fischer, Mém. Soc. Imp. Naturalistes Moscou 5: 84. 1817.

曙南芥属 *shu nan jie shu*

Herbs annual, biennial, or perennial, tomentose, usually canescent. Trichomes stellate, subsessile, with 4 unequal rays at least 1 of which with 2 subbasal branches. Stems erect, simple at base, often branched above middle. Basal leaves rosulate or not, simple, entire. Cauline leaves sessile, cuneate or attenuate, not auriculate, entire. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender, ascending or divaricate. Sepals oblong, base of lateral pair not saccate or subsaccate, margin membranous. Petals white, pink, purple, or yellowish; blade obovate or suborbicular, apex rounded; claw differentiated from blade, shorter than sepals. Stamens 6, tetradynamous; filaments dilated at base; anthers ovate or oblong, apiculate at apex. Nectar glands 4, lateral, 1 on each side of lateral stamen; median glands absent. Ovules (2–)4–40 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, or elliptic, strongly latiseptate, sessile; valves obscurely veined, tomentose, torulose; replum rounded; septum complete, membranous, translucent, veinless; style distinct, to 3 mm, slender; stigma capitate, entire. Seeds uniseriate, wingless or winged, oblong or suborbicular, flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Four species: China, Mongolia, Russia; one species in China.

1. **Stevenia cheiranthoides** de Candolle, Syst. Nat. 2: 210. 1821.

曙南芥 *shu nan jie*

Draba multiceps Kitagawa.

Herbs perennial, 5–15 cm tall, canescent throughout, sometimes pulvinate, with branched caudex. Stems erect, few branched above middle. Basal leaves densely rosulate, numerous, persistent; petiole obscurely differentiated from blade; leaf blade linear, (0.4–)1–2 cm × 0.5–1.5 mm, attenuate into a petiolelike base, apex acute. Cauline leaves linear, erect, few, similar to basal. Fruiting pedicels, divaricate or ascending, slender, (2.5–)4–8(–10) mm. Sepals narrowly oblong, 1.5–2.5(–

3) × 0.7–1.3 mm, base subsaccate, margin membranous. Petals white, pink, or purple, 4–5(–6) × 2–3(–3.5) mm; claw 1.5–2 mm. Filaments 1.5–2.5 mm; anthers narrowly ovate, 0.5–0.6 mm. Ovules 6–12 per ovary. Fruit linear, (0.5–)0.6–1.5(–2) cm × 1–1.5 mm, strongly torulose; replum constricted between seeds; style slender, (1–)1.5–2.7 mm. Seeds brown, suborbicular, ca. 1 mm in diam., wingless, flattened. Fl. May–Jul. $2n = 32$.

Rocky slopes, crevices, alkaline grasslands. Nei Mongol [Mongolia, Russia].

55. DRABOPSIS K. Koch, Linnaea 15: 253. 1841.

假葶苈属 *jia ting li shu*

Herbs annual, scapose. Trichomes stalked, 3- or 4-rayed stellate, sometimes forked or simple at leaf margin and on sepals. Basal leaves sessile or subsessile, rosulate, simple, entire or rarely few toothed. Cauline leaves absent. Racemes few to several flowered, ebracteate. Fruiting pedicels stout, often as thick as fruit, suberect or divaricate-ascending. Sepals oblong, erect, glabrous or pubescent, base of lateral pair not saccate. Petals yellow or yellowish white, ascending, slightly longer than sepals; blade oblanceolate, apex obtuse or retuse; claw obscurely differentiated from blade. Stamens 6, erect, tetradynamous; filaments not dilated at base; anthers ovate, obtuse at apex. Median glands absent; lateral glands 1 on each side of lateral stamen. Ovules 12–40 per ovary. Fruit dehiscent siliques, linear, latiseptate, sessile; valves with a prominent midvein, glabrous or rarely pubescent with stalked, forked and 3-rayed trichomes, smooth; replum rounded; septum complete; style obsolete or to 0.2 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, flattened; seed coat minutely reticulate, slightly mucilaginous when wetted; cotyledons accumbent.

One species: C and SW Asia, SE Europe.

1. **Drabopsis nuda** (Bélangier) Stapf, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 51: 298. 1886.

假葶苈 *jia ting li*

Arabis nuda Bélangier, Voy. Indes Or., Bot. t. 15a. 1834; *Arabidopsis nuda* (Bélangier) Bornmüller; *Arabidopsis verna* (K. Koch) N. Busch; *Arabis scapigera* Boissier; *Drabopsis brevisiliqua* Naqshi & Javeid; *D. verna* K. Koch; *Sisymbrium nudum* (Bélangier) Boissier; *Stenophragma nudum* (Bélangier) B. Fedtschenko.

Herbs scapose, (1–)3–12(–20) cm tall. Stems erect, 1 to many from base, simple or rarely branched, leafless, glabrous above. Basal leaves sessile or subsessile; leaf blade obovate, oblong, spatulate, or oblanceolate, (0.2–)0.5–2(–3) cm × (0.5–) 2–7(–12) mm, pubescent with stalked, 3- or 4-rayed stellate trichomes, sometimes with forked or simple trichomes along margin, base

cuneate, margin entire or rarely toothed, apex acute or obtuse. Racemes elongated considerably in fruit, rachis straight to slightly flexuous. Fruiting pedicels suberect or divaricate-ascending, 0.5–3(–5.5) mm. Sepals oblong, 1.5–2.5 × 0.5–1 mm, glabrous or pubescent with simple or branched trichomes. Petals yellow or yellowish white, oblanceolate, 2–3 (–4) × 0.5–0.8(–1) mm. Filaments erect, yellowish, 1–2 mm; anthers 0.2–0.4 mm. Fruit linear, (1–)1.7–3.3(–4.5) cm × 0.8–1 mm; valves prominently veined, glabrous or rarely pubescent with forked or 3-rayed stalked trichomes; style to 0.2 mm. Seeds brown, oblong, (0.6–)0.8–1.1 × 0.4–0.6 mm, flattened. Fl. Mar–May, fr. Apr–Jun. $2n = 16$.

Pastures, hillsides, rocky slopes, scree; 1300–3200 m. W Xinjiang [Afghanistan, India, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, SE Europe].

56. CHRISTOLEA Cambessèdes in Jacquemont, Voy. Inde 4(Bot.): 17. 1835.

高原芥属 *gao yuan jie shu*

Koelzia K. H. Rechinger.

Herbs perennial with a woody caudex or herbaceous base. Trichomes simple. Stems branched from caudex and above, sometimes woody at base. Basal leaves absent. Cauline leaves petiolate, dentate, uppermost sometimes entire. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender, ascending, suberect, or reflexed. Sepals oblong, caducous, base of lateral pair not saccate. Petals white, longer than sepals; blade spatulate or oblong-obovate, apex rounded; claw purple, subequaling sepals. Stamens 6, tetradynamous; filaments not dilated at base; anthers oblong, apiculate at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 10–

20 per ovary. Fruit dehiscent siliques, linear, oblong, or lanceolate, latiseptate, sessile; valves papery, with a distinct midvein, glabrous or puberulent, torulose; replum rounded, covered by connate valve margin; septum complete, membranous, translucent, veinless; style obsolete, rarely to 0.5 mm; stigma capitate, entire or slightly 2-lobed. Seeds uniseriate, wingless, sometimes distally appendaged, oblong, slightly flattened, often transversely oriented in locule; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

Two species: Afghanistan, China, Kashmir, Nepal, Pakistan, Tajikistan; two species (one endemic) in China.

- 1a. Plants with a woody caudex; petals 5–6.5 mm; fruiting pedicels ascending; fruit 1.5–3(–3.5) cm, straight, subappressed to rachis, valve apex acute or acuminate 1. *C. crassifolia*
1b. Plants herbaceous; petals 2.5–3.5 mm; fruiting pedicels reflexed; fruit 1–1.5 cm, subfalcate, divaricate-reflexed, valve apex obtuse 2. *C. niyaensis*

1. *Christolea crassifolia* Cambessèdes in Jacquemont, Voy. Inde 4(Bot.): 17. 1844.

高原芥 gao yuan jie

Christolea afghanica (K. H. Rechinger) K. H. Rechinger; *C. crassifolia* var. *pamirica* (Korshinsky) Korshinsky; *C. incisa* O. E. Schulz; *C. pamirica* Korshinsky; *Ermania pamirica* (Korshinsky) Ovczinnikov & Junussov; *Koelzia afghanica* K. H. Rechinger; *Parrya ramosissima* Franchet. Herbs perennial, (8–)15–40(–50) cm tall; caudex woody, compactly branched, to 2.5 cm in diam. Stems branched, sometimes woody at base, hirsute with simple trichomes to 1.2 mm, rarely glabrous. Leaves all cauline, several to many; petiole (2–) 5–12(–15) mm; leaf blade highly variable in shape, pubescence, or margin, usually obovate, spatulate, rhomboid, oblong, or elliptic, (0.8–)1.3–3.5(–5) × 0.4–1.6(–2.5) cm, leathery, densely to sparsely pubescent, rarely glabrous, base cuneate or attenuate, margin dentate or rarely incised along distal half, sometimes entire, apex acute or obtuse. Racemes several to many flowered. Fruiting pedicels 5–9(–12) mm, glabrous or sparsely puberulent, ascending. Sepals oblong, 3–4 × 1.5–2 mm, glabrous or sparsely puberulent. Petals white with purplish claws, 5–6.5 × 2–3 mm; claw 2.5–3.5 mm. Filaments white, median pairs 2.5–3 mm, lateral pair 1.5–2 mm; anthers oblong, 0.9–1.2 mm. Fruit linear, oblong, or lanceolate, 1.5–3(–3.5) cm × (2–) 2.7–4(–4.5) mm, subappressed

to rachis, straight, flattened; valves constricted between seeds, glabrous or puberulent, base obtuse, apex acute or subacuminate; style obsolete or to 0.4 mm. Seeds brown, oblong, 1.8–2.3 × 0.9–1.5 mm, laterally oriented. Fl. Jun–Sep, fr. Jul–Oct. $2n = 14^*$.

Alpine steppe, rocky slopes, bare slopes; 3500–4700 m. Qinghai, Xinjiang, Xizang [Afghanistan, Kashmir, Nepal, Pakistan, Tajikistan].

2. *Christolea niyaensis* Z. X. An, Fl. Xinjiang. 2(2): 376. 1995.

尼雅高原芥 ni ya gao yuan jie

Herbs short-lived perennial, ca. 25 cm tall. Stems branched, herbaceous, sparsely covered with simple, papillate trichomes 0.1–0.2 mm. Leaves all cauline, shortly petiolate or sessile; leaf blade oblong-lanceolate or subelliptic, 1–1.5 cm × 3–6 mm, subleathery, sparsely papillate, base cuneate, margin dentate, apex acute. Racemes several flowered. Fruiting pedicels 4–7 mm, glabrous, curved, reflexed, slender. Sepals oblong, 1.7–2 × ca. 1 mm, sparsely papillate, margin membranous. Petals white, obovate-oblong, 2.5–3.5 × ca. 1 mm; claw obsolete. Filaments white, median pairs ca. 2 mm, lateral pair ca. 1 mm; anthers oblong, 0.6–0.8 mm. Fruit oblong, 1–1.5 cm × 3–3.5 mm, divaricate-reflexed, subfalcate, flattened; valves constricted between seeds, glabrous, base and apex obtuse; style to 0.5 mm. Seeds brown, oblong, ca. 1.5 × 0.8. Fl. and fr. Jun.

• Rocky areas; ca. 2700 m. S Xinjiang (Minfeng Xian).

57. *DESIDERIA* Pampanini, Boll. Soc. Bot. Ital. 1926: 111. 1926.

扇叶芥属 shan ye jie shu

Ermaniopsis H. Hara; *Oreoblastus* Suslova.

Herbs perennial, with a slender, rhizomelike caudex. Trichomes simple or mixed with short-stalked, forked ones. Stems simple, leafy or leafless, sometimes absent. Basal leaves petiolate, rosulate, simple, 3–9(–11)-toothed, rarely subentire, often palmately veined. Cauline leaves absent or similar to basal ones, entire or toothed, sessile or petiolate. Racemes 3–30-flowered, bracteate or ebracteate, sometimes flowers solitary on pedicels originating from basal rosette. Sepals ovate or oblong, free or united, caducous or persistent, erect, base of lateral pair not saccate. Petals purple, purple-green, or rarely white, sometimes yellowish at base of blade; blade obovate or spatulate, apex obtuse or submarginate; claw subequaling or longer than sepals. Stamens 6, tetradynamous; filaments wingless or rarely winged and toothed, dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands 2 and lateral, or confluent and subtending bases of all stamens; median glands present or absent. Ovules 10–70 per ovary. Fruit dehiscent siliques, linear or lanceolate, latiseptate, rectangular in cross section, sessile; valves papery, with a

prominent midvein and distinct marginal veins, not torulose, apex persistently united with replum; replum rounded; septum complete, perforated, or reduced to a rim, translucent, or absent; style obsolete; stigma capitate, 2-lobed or rarely subentire. Seeds uniseriate or biseriate, wingless, oblong or ovate, often flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Twelve species: Himalayas and adjacent C Asia; eight species (two endemic) in China.

- 1a. Sepals connate, persistent till or after fruit dehiscence; septum absent or reduced to a rim 8. *D. mirabilis*
 1b. Sepals free, caducous or rarely persistent till about fruit maturity; septum complete or rarely perforated apically.
 2a. Pedicels solitary from a basal rosette.
 3a. Fruit ovate or broadly lanceolate, 6–9 mm wide, prominently reticulate veined 7. *D. baiogoinensis*
 3b. Fruit linear to linear lanceolate, 2–5 mm wide, obscurely veined.
 4a. Leaf trichomes forked and simple; replum retrorsely ciliate; valves glabrous; sepals 3–4 mm; petals 6–7 mm 6. *D. pumila*
 4b. Leaf trichomes exclusively simple; replum spreading ciliate; valves pubescent; sepals 6–7 mm; petals 11–14 mm 5. *D. prolifera*
 2b. Pedicels on a distinct rachis of (3–)6–30-flowered racemes.
 5a. Racemes ebracteate 4. *D. flabellata*
 5b. Racemes bracteate throughout.
 6a. Stem and pedicel trichomes forked 2. *D. stewartii*
 6b. Stem and pedicel trichomes exclusively simple or absent.
 7a. Fruit lanceolate to linear-lanceolate, (3–)4–6 mm wide; petals (6–)6.5–8 × 3–4 mm; seeds biseriate, (1.5–)1.8–2(–2.3) × 1–1.4 mm 1. *D. himalayensis*
 7b. Fruit linear, (0.8–)1–1.7(–2) mm wide; petals 4–5(–5.5) × 1.5–2.5 mm; seeds uniseriate, 0.8–1.1 × 0.5–0.8 mm 3. *D. linearis*

1. *Desideria himalayensis* (Cambessèdes) Al-Shehbaz, Ann. Missouri Bot. Gard. 87: 555. 2001.

须弥扇叶芥 *xu mi shan ye jie*

Cheiranthus himalayensis Cambessèdes in Jacquemont, Voy. Inde 4(Bot.): 14. 1844; *Christolea himalayensis* (Cambessèdes) Jafri; *Ermania himalayensis* (Cambessèdes) O. E. Schulz; *Oreoblastus himalayensis* (Cambessèdes) Suslova.

Plants 4–20 cm tall, subglabrous or densely pilose throughout. Trichomes simple, to 1.5 mm. Stems simple, pilose or glabrous. Basal leaves not fleshy, pilose or glabrous, persistent; petiole 0.4–1.6(–3) cm, not ciliate; leaf blade broadly obovate or spatulate, 4–14 × 3–9 mm, base cuneate or attenuate, margin (3–)5-toothed, apex acute. Cauline leaves similar to basal, or linear to lanceolate, 5–17 × 1–4 mm, often entire, shortly petiolate or subsessile. Racemes 6–25-flowered, bracteate throughout; bracts similar to cauline leaves but smaller, sometimes adnate to pedicel. Fruiting pedicels ascending, straight or curved, 3–10 mm, pilose or glabrous. Sepals free, oblong, 3–4 × 1.2–1.5 mm, caducous, pilose or with a terminal tuft of trichomes, base not saccate, margin membranous. Petals purple or lilac with yellowish center, broadly spatulate, (6–) 6.5–8 × 3–4 mm, apex submarginate; claw 3–4 mm. Filaments white, slightly dilated at base, median pairs 3–4 mm, lateral pair 2–4 mm; anthers ovate, ca. 0.6 mm. Ovules 14–24 per ovary. Fruit lanceolate to lanceolate-linear, (1.7–)2–3.5(–4) cm × (3–) 4–6 mm, strongly

flattened; valves pilose or glabrous, distinctly veined; septum complete, membranous; style obsolete; stigma 2-lobed. Seeds brown, ovate, (1.5–)1.8–2(–2.3) × 1–1.4 mm, biseriate, minutely reticulate. Fl. Jun–Aug, fr. Jul–Oct.

Alpine tundra, open hills, sandstone scree; 4300–5700 m. Qinghai, Xizang [India, Kashmir, Nepal].

This species was recorded from Xinjiang (Fl. Xinjiang. 2(2): 149. 1995, as *Christolea himalayensis*), but the present authors have seen no material from that autonomous region.

2. *Desideria stewartii* (T. Anderson) Al-Shehbaz, Ann. Missouri Bot. Gard. 87: 556. 2001.

少花扇叶芥 *shao hua shan ye jie*

Cheiranthus stewartii T. Anderson in J. D. Hooker, Fl. Brit. India 1: 132. 1872; *Christolea stewartii* (T. Anderson) Jafri; *Ermania stewartii* (T. Anderson) O. E. Schulz; *Oreoblastus stewartii* (T. Anderson) Suslova.

Plants 8–20 cm tall, densely pilose. Trichomes stalked, forked, rarely some simple near stem base. Stems simple, pilose or glabrous. Basal leaves subsessile, pilose, persistent; petiole 2–10 mm, not ciliate; leaf blade broadly obovate or spatulate, 2–15 × 2–10 mm, base cuneate or attenuate, margin 3–5-toothed or entire, apex acute. Cauline leaves similar to basal or linear to lanceolate, often entire. Racemes 8–15-flowered, bracteate throughout; bracts similar to cauline leaves but smaller, often adnate to pedicel. Fruiting pedicels ascending, straight or slightly curved, 4–12 mm, pilose. Flowers not seen. Ovules 14–24 per ovary. Fruit lanceolate to lanceolate-linear, 1.7–3.5 cm × 3–5 mm,

strongly flattened; valves pilose or glabrous, distinctly veined; septum complete, membranous; style obsolete; stigma 2-lobed. Seeds brown, ovate, 1.4–2.2 × 0.8–1.1 mm, biseriate, minutely reticulate. Fr. Aug.

Scree slopes; 4100–5300. Xizang [India, Kashmir].

3. *Desideria linearis* (N. Busch) Al-Shehbaz, Ann. Missouri Bot. Gard. 87: 556. 2001.

线果扇叶芥 xian guo shan ye jie

Christolea linearis N. Busch in Komarov, Fl. URSS 8: 636. 1939; *C. parkeri* (O. E. Schulz) Jafri; *Ermania kachrooi* Dar & Naqshi; *E. kashmiriana* Dar & Naqshi; *E. linearis* (N. Busch) Botschantzev; *E. parkeri* O. E. Schulz; *Oreoblastus linearis* (N. Busch) Suslova; *O. parkeri* (O. E. Schulz) Suslova.

Plants 4–15 cm tall, densely pilose throughout or subglabrous. Trichomes simple, to 1.5 mm. Stems simple, pilose or glabrous. Basal leaves not fleshy, pilose or glabrous, persistent; petiole 2–7(–12) mm, not ciliate; leaf blade broadly obovate or spatulate, 4–15 × 2–12 mm, base cuneate or attenuate, margin 3–5-toothed or rarely entire, apex acute. Cauline leaves similar to basal or linear to lanceolate, 5–10 × 1–3 mm, often entire, shortly petiolate or sessile. Racemes 8–20-flowered, bracteate throughout; bracts similar to cauline leaves but smaller, often adnate to pedicel. Fruiting pedicels ascending, straight, 2–8(–12) mm, pilose or glabrous. Sepals free, oblong or ovate, 2–3 × 1–1.5 mm, caducous, pilose or with a terminal tuft of trichomes, base not saccate, margin membranous. Petals purple or lavender with paler base, narrowly spatulate, 4–5(–5.5) × 1.5–2.5 mm, apex rounded; claw 2–2.5 mm. Filaments white, slightly dilated at base, median pairs 2.5–3.5 mm, lateral pair 1.8–2.5 mm; anthers ovate, 0.4–0.5 mm. Ovules 16–26 per ovary. Fruit linear, (1.5–)2–3.5(–4.2) cm × (0.8–)1–1.7(–2) mm, flattened; valves pilose or glabrous, distinctly veined; septum complete, membranous; style obsolete; stigma 2-lobed. Seeds brown, ovate, 0.8–1.1 × 0.5–0.8 mm, uniseriate, minutely reticulate. Fl. Jun–Aug, fr. Jul–Sep.

Gravelly or sandy slopes, scree, gravelly moraine below glaciers; 3200–6200 m. Xinjiang [Kashmir, Nepal, Tajikistan].

4. *Desideria flabellata* (Regel) Al-Shehbaz, Ann. Missouri Bot. Gard. 87: 558. 2001.

长毛扇叶芥 chang mao shan ye jie

Parrya flabellata Regel, Bull. Soc. Imp. Naturalistes Moscou 43: 261. 1870; *Christolea flabellata* (Regel) N. Busch; *C. pinnatifida* R. F. Huang; *Ermania flabellata* (Regel) O. E. Schulz; *Oreoblastus flabellatus* (Regel) Suslova.

Plants 4–15 cm tall. Trichomes simple, straight, to 1.5 mm. Stems distinct, simple, densely pilose. Basal leaves subfleshy; petiole 2–7 mm, pilose; leaf blade flabellate or broadly obovate, rarely spatulate, 0.6–2.5 × 0.3–2.5 cm, pilose, base cuneate or attenuate, margin (3–)5–9(–11)-toothed, rarely lowermost leaves entire, apex acute; teeth to 10 × 3 mm. Cauline leaves similar

to basal. Racemes 7–12-flowered, ebracteate. Fruiting pedicels ascending, straight or curved, (0.5–)0.7–1.5 (–2.5) mm, spreading pilose. Sepals free, narrowly oblong, 5–8 × 1.5–2.5 mm, often persistent, pilose, base not saccate, margin membranous. Petals purple, broadly spatulate, 1.1–1.5 cm × 3.5–6 mm, apex submarginate; claw 7–9 mm. Filaments white or mauve, slightly dilated at base, median pairs 4.5–6 mm, lateral pair 3–4 mm; anthers oblong, 0.9–1.3 mm. Ovules 14–24 per ovary. Fruit lanceolate to lanceolate-linear, (1.7–)2.5–3.5 (–4.5) cm × 2.5–5 mm, strongly flattened; valves pilose, distinctly veined; septum complete, membranous; style obsolete; stigma 2-lobed. Seeds brown, ovate, 1.3–2 × 0.9–1.2 mm, uniseriate, minutely reticulate. Fl. Jul–Aug, fr. Jul–Sep.

Alpine gravelly slopes, moraine slopes; 3300–5100 m. Xinjiang [Afghanistan, Kyrgyzstan, Tajikistan].

5. *Desideria prolifera* (Maximowicz) Al-Shehbaz, Ann. Missouri Bot. Gard. 87: 559. 2001.

丛生扇叶芥 cong sheng shan ye jie

Parrya prolifera Maximowicz, Fl. Tangut. 56. 1889; *Christolea prolifera* (Maximowicz) Ovczinnikov; *Ermania prolifera* (Maximowicz) O. E. Schulz; *Oreoblastus proliferus* (Maximowicz) Suslova.

Plants scapose, villous or pilose. Trichomes simple, straight, to 1.5 mm. Stems absent. Basal leaves subfleshy; petiole (0.2–)0.8–2(–3) cm, persistent, sparsely to densely pilose or villous, ciliate, somewhat papery at base; leaf blade broadly ovate, suborbicular, obovate, or spatulate, 2–10(–15) × 2–9(–12) mm, villous or pilose, base obtuse or cuneate, margin (3–)5–9-toothed, rarely subentire, apex subacute. Cauline leaves absent. Flowers solitary from basal rosette. Fruiting pedicels ascending-divaricate, straight, (0.2–)0.5–1.5(–2.5) cm, villous. Sepals free, oblong, 6–7 × 2–2.5 mm, usually persistent, pilose, base not saccate, margin membranous. Petals purplish green, broadly obovate, 1.1–1.4 cm × 4–5 mm, apex submarginate; claw 6–7 mm. Filaments white, dilated at base, toothless, median pairs 4–6 mm, lateral pair 3–4 mm; anthers 1.2–1.6 mm. Fruit linear to linear-lanceolate, (2.5–)4–6.5(–7.2) cm × (3–)4–5 mm, flattened, sessile, straight; valves obscurely veined; replum and valves pilose or villous; septum complete; style obsolete; stigma capitate, 2-lobed. Seeds oblong, 2.5–3.5 × 1.4–1.7 mm. Fl. Jul–Aug, fr. Jul–Sep.

• Scree slopes, siliceous schist; 4700–5900 m. Qinghai, Xizang.

6. *Desideria pumila* (Kurz) Al-Shehbaz, Ann. Missouri Bot. Gard. 87: 560. 2001.

矮扇叶芥 ai shan ye jie

Parrya pumila Kurz, Flora 55: 285. 1872; *Christolea pumila* (Kurz) Jafri; *Ermania bifaria* Botschantzev; *E.*

koelzii O. E. Schulz; *Solms-laubachia pumila* (Kurz) Dvorák; *Vvedenskyella pumila* (Kurz) Botschantzev.

Plants scapose, pilose or tomentose. Trichomes simple, straight, to 0.5 mm, mixed on leaves with short-stalked, forked ones. Stems absent. Basal leaves fleshy; petiole 2–10 mm, persistent, densely pilose with simple trichomes, ciliate, expanded and papery at base; leaf blade broadly ovate, suborbicular, obovate, or spatulate, 2–14 × 1–11 mm, densely tomentose or pilose, base obtuse, margin 3–7-toothed or repand, apex obtuse. Cauline leaves absent. Flowers solitary from basal rosette. Fruiting pedicels ascending-divaricate, straight, 3–10 mm, pilose. Sepals free, oblong, 3–4 × 1.5–2 mm, caducous, pilose, base not saccate, margin membranous. Petals creamy white or purplish green, broadly obovate, 6–8 × 3–4.5 mm, apex subemarginate; claw 3–4 mm. Filaments white, dilated at base, toothless, median pairs 3–4 mm, lateral pair 2–2.5 mm; anthers narrowly oblong, 0.9–1.2 mm. Ovules ca. 14 per ovary. Immature fruit oblong-linear or linear-lanceolate, 1–2 cm × 2–3 mm, flattened, sessile, straight, retrorsely pilose along replum; valves glabrous; septum complete; style obsolete; stigma capitate, 2-lobed. Seeds not seen. Fl. Jun–Jul.

Limestone, mica schist; 4200–5700 m. Xinjiang, Xizang [Kashmir].

7. *Desideria baiogoinensis* (K. C. Kuan & Z. X. An) Al-Shehbaz, Ann. Missouri Bot. Gard. 87: 561. 2001.

藏北扇叶芥 zang bei shan ye jie

Christolea baiogoinensis K. C. Kuan & Z. X. An in C. Y. Wu, Fl. Xizang. 2: 388. 1985.

Plants scapose, villous. Trichomes simple and short-stalked, forked, straight, to 1 mm. Stems absent. Basal leaves subfleshy; petiole 0.4–1.6 cm, persistent, villous, ciliate, somewhat papery at base; leaf blade broadly ovate, suborbicular, or obovate, 4–8 × 3–6 mm, villous, base obtuse or cuneate, margin 3–7-toothed, apex acute. Cauline leaves absent. Flowers solitary from basal rosette. Fruiting pedicels ascending-divaricate, straight, 0.5–2 cm, villous. Sepals free, oblong, 4–6 × 1.5–2.5 mm, usually persistent, pilose, base not saccate, margin membranous. Petals purplish, broadly obovate, 7–1.2

cm × 3.5–4.5 mm, apex subemarginate; claw 4–6 mm. Filaments white, dilated at base, toothless, median pairs 3.5–5 mm, lateral pair 2–2.5 mm; anthers 1–1.2 mm. Ovules 30–40 per ovary. Fruit ovate or lanceolate, 1–2.5 cm × 6–9 mm, flattened, sessile, straight; valves prominently reticulate veined; replum and valves villous; septum complete; style 0.5–1 mm; stigma capitate, 2-lobed. Seeds oblong, 1.5–2 × 0.8–1.1 mm. Fl. Jun–Jul, fr. Jul–Aug.

• Open sand and gravel; 4700–5600 m. Qinghai, Xizang.

8. *Desideria mirabilis* Pampanini, Boll. Soc. Bot. Ital. 1926: 111. 1926.

扇叶芥 shan ye jie

Christolea karakorumsensis Y. H. Wu & Z. X. An; *C. mirabilis* (Pampanini) Jafri; *C. scaposa* Jafri; *C. suslovaeana* Jafri; *Desideria pamirica* Suslova.

Plants 2–10 cm tall. Trichomes simple, to 1.5 mm, rarely mixed with forked ones. Stems simple, densely pilose. Basal leaves subfleshy; petiole 3–15 mm, densely pilose, not expanded or papery at base; leaf blade flabellate or spatulate-orbicular, (2–)5–15 × 3–9(–15) mm, pilose, base cuneate, margin 8–10-toothed, apex acute; teeth to 8 mm. Cauline leaves similar to basal. Racemes 8–20-flowered, ebracteate. Fruiting pedicels ascending, straight or curved, 5–10 mm, spreading pilose. Sepals united, (2.5–)3.5–5.5 × 1.5–2.5(–3) mm, persistent, densely pilose, base not saccate; calyx lobes ovate, unequal, 0.5–2 mm, margin membranous. Petals purple or purplish green with yellowish base, obovate, 5–8 × (1.5–)2.5–3 mm, apex obtuse; claw 2.5–4 mm. Filaments white, slightly dilated at base, median pairs (3–)4–5 mm, lateral pair (2–)2.5–3.5 mm; anthers oblong, 0.5–0.8 mm. Ovules 12–18 per ovary. Fruit linear, 1–2(–3) cm × ca. 2 mm, slightly flattened or subterete; valves pilose, distinctly veined; septum perforate or reduced to a narrow rim, membranous; style obsolete to 0.7 mm; stigma 2-lobed. Seeds oblong, 1.5–1.8 × 0.8–1 mm, papillate. Fl. Jul–Aug, fr. Aug–Sep.

Gravelly slopes; 4000–5000 m. Xinjiang [Kashmir, Tajikistan].

58. EURYCARPUS Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 172. 1955.

宽果芥属 kuan guo jie shu

Herbs perennial, woolly or pilose; caudex slender, few branched. Trichomes simple, mixed with stalked, 1–3-forked ones. Stems erect, simple from rosette. Basal leaves petiolate, rosulate, simple, entire. Cauline leaves absent. Racemes several to many flowered, ebracteate, corymbose, elongated slightly in fruit. Fruiting pedicels slender, divaricate. Sepals oblong, caducous, base of lateral pair not saccate, margin membranous. Petals purple; blade spatulate, apex obtuse; claw subequaling sepals. Stamens 6, tetradynamous; filaments dilated at base; anthers oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 8–20

per ovary. Fruit dehiscent silicles, oblong, elliptic, ovate-oblong, or ovate-lanceolate, strongly latiseptate, subsessile; valves obscurely veined, glabrous, smooth; replum rounded; septum complete or reduced to a rim, membranous, translucent; style to 0.5 mm, conical or subconical; stigma capitate, entire, minute. Seeds biseriate, wingless, oblong, plump or slightly flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent or accumbent.

Two species: China, Kashmir; two species (one endemic) in China.

1a. Leaves woolly; fruit oblong-ovate or ovate-lanceolate; septum reduced to a rim; cotyledons accumbent 1. *E. lanuginosus*

1b. Leaves pilose; fruit elliptic or oblong, rarely ovate-elliptic; septum complete; cotyledons incumbent 2. *E. marinellii*

1. *Eurycarpus lanuginosus* (J. D. Hooker & Thomson) Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 172. 1955.

绒毛宽果芥 rong mao kuan guo jie

Parrya lanuginosa J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 136. 1861; *Christolea lanuginosa* (J. D. Hooker & Thomson) Ovczinnikov; *Draba lanjarica* O. E. Schulz; *Ermania lanuginosa* (J. D. Hooker & Thomson) O. E. Schulz.

Herbs 3–5 cm tall; caudex slender, few branched. Trichomes simple, to 1 mm, mixed with distinctly stalked, 1–3-forked ones. Stems densely villous. Basal leaves rosulate, fleshy; petiole 2–7 mm, persistent, becoming papery; leaf blade suborbicular, spatulate, or oblong-obovate, 5–10 × 2–6 mm, sublanate with forked trichomes, base cuneate, margin entire, apex obtuse or rounded. Cauline leaves absent. Racemes 8–15-flowered, ebracteate. Fruiting pedicels divaricate, straight, 4–7 mm, densely villous. Sepals oblong, 2–2.5 × 1–1.5 mm, pilose. Petals spatulate, ca. 5 × 2.5 mm, apex obtuse; claw ca. 2 mm. Median filament pairs ca. 3 mm, lateral pair ca. 2 mm; anthers oblong, ca. 0.6 mm. Ovules ca. 8 per ovary. Fruit oblong-ovate or ovate-lanceolate, 1.5–2.7 cm × 6–10 mm, strongly flattened; valves glabrous, smooth, with obscure midvein and marginal veins, obtuse at base, acute at apex; septum perforated, reduced to a rim; style 0.2–0.4 mm; stigma minute, entire. Seeds biseriate, narrowly oblong, flattened, 2–2.5 × 1–1.3 mm; cotyledons accumbent.

• Slopes; 5100–5300 m. Xizang.

2. *Eurycarpus marinellii* (Pampanini) Al-Shehbaz & G. Yang, Novon 10: 347. 2000.

马氏宽果芥 ma shi kuan guo jie

Braya marinellii Pampanini, Boll. Soc. Bot. Ital. 1915: 29. 1915; *Christolea longmucoensis* Y. H. Wu & Z. X. An.

Herbs 3–10 cm tall, pilose; caudex slender, few branched. Trichomes simple, to 1 mm, mixed with distinctly stalked 1-forked ones. Stems pilose. Basal leaves rosulate, subfleshy; petiole (1–)3–10(–14) mm, persistent, becoming papery; leaf blade spatulate, oblanceolate, or rarely obovate, (2–)3–12(–15) × (1–)2–8 mm, pilose with simple and forked stalked trichomes, base cuneate, margin entire, apex obtuse or rounded. Cauline leaves absent. Racemes (5–)10–22-flowered, ebracteate. Fruiting pedicels divaricate, straight, 4–8(–10) mm, pilose. Sepals oblong, 2.2–3 × 1–1.5 mm, sparsely pilose. Petals purplish, spatulate, 5–6 × 2–2.5 mm, apex obtuse; claw ca. 2 mm. Median filament pairs 2.5–3.5 mm, lateral pair 1.5–2.5 mm; anthers oblong, 0.5–0.6 mm. Ovules 12–20 per ovary. Fruit elliptic or oblong, rarely ovate-elliptic, (0.7–)1–1.7(–2) cm × 5–7 mm, strongly flattened; valves often purplish, glabrous, smooth, with obscure midvein and marginal veins, subacute at both ends; septum complete; style 0.2–0.5 mm; stigma minute, entire. Seeds biseriate, narrowly oblong, not flattened, 2–2.5 × 0.8–0.9 mm; cotyledons incumbent.

Alpine areas; 5300–5700 m. Xizang [Kashmir].

59. TURRITIS Linnaeus, Sp. Pl. 2: 666. 1753.

旗杆芥属 qi gan jie shu

Herbs biennial, rarely short-lived perennial, glaucous above. Trichomes simple and/or stalked forked or substellate. Stems erect, simple or branched apically. Basal leaves petiolate, rosulate, simple, repand, dentate, or lobed, rarely entire. Cauline leaves sessile, auriculate, sagittate, or amplexicaul at base, entire. Racemes ebracteate, corymbose, elongated considerably in fruit. Fruiting pedicels slender, erect or divaricate. Sepals oblong or linear, erect, base of lateral pair not saccate, margin membranous. Petals yellowish, creamy white, pink, or purplish; blade spatulate, oblanceolate, or rarely linear, apex obtuse; claw undifferentiated from blade. Stamens 6, erect, tetradynamous; filaments not dilated at base; anthers oblong or linear, obtuse at apex. Nectar glands confluent and subtending bases of all stamens, median glands present, lateral ones annular. Ovules 130–200 per ovary. Fruit dehiscent siliques, linear, often subterete-quadrangular, sessile; valves leathery, with a prominent midvein, glabrous, smooth; replum rounded; septum complete, membranous, veinless; style short, stout; stigma capitate, subentire. Seeds biseriate, wingless or rarely narrowly winged, elliptic or orbicular, flattened; seed coat not mucilaginous when wetted; cotyledons accumbent.

Two species: N Africa, Asia, Europe, North America; one species in China.

1. *Turritis glabra* Linnaeus, Sp. Pl. 2: 666. 1753.

旗杆芥 qi gan jie

Arabis glabra (Linnaeus) Bernhardt; *A. perfoliata* Lamarck; *A. pseudoturritis* Boissier & Heldreich; *Turritis glabra* var. *lilacina* O. E. Schulz; *T. pseudoturritis* (Boissier & Heldreich) Velenovsky.

Herbs biennial, rarely perennial, (30–)40–120(–150) cm tall, sparsely to densely pilose basally with simple and short-stalked, forked trichomes, glabrous and glaucous above. Stems erect, simple basally, often branched above. Basal leaves rosulate, petiolate; leaf blade spatulate, oblanceolate, or oblong, (4–) 5–12(–15) × 1–3 cm, pubescent or rarely glabrous, margin pinnatifid, sinuate, dentate, repand, or rarely entire, apex obtuse. Cauline leaves sessile, lanceolate, oblong-elliptic, or ovate, 2–9(–12) × (0.5–)1–2.5(–3.5) cm, base sagittate or auriculate, margin dentate or entire, apex acute.

Fruiting pedicels erect, (0.6–)0.7–1.6(–2) cm, slender, appressed to rachis, glabrous. Sepals oblong or oblong-linear, (2.5–)3–5 × 0.5–1.2 mm, glabrous. Petals pale yellow, creamy white, or rarely pink, linear-oblong, narrowly spatulate, or rarely linear, 5–8.5 × 1.3–1.7 mm. Filaments slender, lateral pair 2.5–4.5 mm, median pairs 3.5–6.5 mm; anthers narrowly oblong, 0.7–1.5 mm. Fruit linear, (3–)4–9(–10) cm × 0.7–1.5 mm, erect, appressed to rachis, subterete-quadrangular; style 0.5–0.8(–1) mm. Seeds brown, oblong or suborbicular, 0.6–1.2 × 0.5–0.9 mm. Fl. Apr–Jul, fr. May–Aug. $2n = 12, 16, 32$.

Mountain slopes, forest margins, valleys, fields, meadows, woods, fields, river banks, roadsides; 100–3500 m. Jiangsu, Liaoning, Shandong, Xinjiang, Zhejiang [Afghanistan, India, Japan, Kashmir, Kazakstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe, North America; naturalized in Australia].

60. RORIPPA Scopoli, Fl. Carniol. 520. 1760.

菜属 han cai shu

Tetrapoma Turczaninow ex Fischer & C. A. Meyer.

Herbs annual, biennial, or perennial, usually of wet or aquatic habitats. Trichomes absent or simple. Stems erect or prostrate, simple or branched, leafy. Basal leaves petiolate, rosulate or not, simple, entire, dentate, sinuate, lyrate, pectinate, or 1–3-pinnatisect. Cauline leaves petiolate or sessile, cuneate, attenuate, auriculate, or sagittate at base, entire, dentate, pinnatifid, or pinnatisect. Racemes ebracteate or rarely bracteate throughout, elongated in fruit. Sepals ovate or oblong, erect or spreading, base of lateral pair not saccate or rarely saccate, margin often membranous. Petals yellow, sometimes white or pink, rarely vestigial or absent; blade obovate, spatulate, oblong, or oblanceolate, apex obtuse or emarginate; claw sometimes distinct, often shorter than sepals. Stamens 6 and tetradynamous, rarely 4 and equal in length; anthers ovate or oblong, obtuse or rarely apiculate at apex. Nectar glands confluent, often subtending bases of all stamens; median glands narrow; lateral glands semiannular and intrastaminal, or annular. Ovules 10–300 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, ovoid, ellipsoid, or globose, terete or slightly latiseptate, sessile or rarely shortly stipitate; valves 2(or 3–6), papery or leathery, veinless or obscurely veined, smooth or torulose; replum rounded; septum complete or rarely perforated, membranous, translucent, veinless; style obsolete or distinct; stigma capitate, entire or slightly 2-lobed. Seeds biseriate or rarely uniseriate, wingless or rarely winged, oblong, ovoid, or ellipsoid, plump; seed coat reticulate, colliculate, rugose, tuberculate, or foveolate, mucilaginous or not when wetted; cotyledons accumbent.

About 75 species: worldwide; nine species in China.

1a. Racemes bracteate throughout or rarely along lowermost third.

2a. Fruiting pedicels slender, 3–6.5(–8) mm; fruit linear, 7–17(–21) × 1.2–1.6 mm; seeds colliculate 4. *R. benghalensis*

2b. Fruiting pedicels stout, (0.3–)0.7–2(–3) mm; fruit oblong, (3–)4.5–8.5(–10) × 1.5–2.5 mm; seeds foveolate 5. *R. cantoniensis*

1b. Racemes ebracteate, rarely lowermost 1 or 2 flowers bracteate.

3a. Fruiting pedicels erect to erect-ascending, subappressed to rachis; fruit valves with a distinct midvein; seeds

1.1–1.5 × 0.7–1.1 mm 6. *R. elata*

3b. Fruiting pedicels ascending, divaricate, or reflexed, not appressed to rachis; fruit valves not veined; seeds

0.4–0.9 × 0.3–0.6 mm.

4a. Fruit globose, oblong, ellipsoid, or oblong-ovoid, length less than 3 × width.

5a. Fruit oblong, ellipsoid, or oblong-ovoid, often slightly curved; seeds colliculate 9. *R. palustris*

5b. Fruit globose or subglobose, not curved; seeds reticulate.

6a. Fruit valves 2, papery; sepals (1–)1.3–1.8(–2) mm; petals 0.7–1.3(–1.5) × 0.3–0.8 mm 7. *R. globosa*

6b. Fruit valves (3 or)4(–6), leathery; sepals 1.6–2.8 mm; petals (1.5–)1.8–3(–3.5) × 0.7–1.8(–2) mm 8. *R. barbareaifolia*

4b. Fruit linear, rarely linear-oblong, length more than 4 × width.

- 7a. Perennials; middle cauline leaves deeply pinnatisect; fruit rarely producing seeds; seeds colliculate 1. *R. sylvestris*
7b. Annuals; middle cauline leaves lyrate-pinnatifid or undivided; fruit producing numerous seeds;
seeds foveolate.
8a. Fruit often curved, (0.7–)1–2.4(–3) cm × 1–1.5(–2) mm; seeds biseriate or nearly so; petals longer than sepals, (2.5–)3–4(–4.5) × 1–1.5 mm, rarely absent 2. *R. indica*
8b. Fruit straight, (1.5–)2.5–4 cm × 0.7–0.9(–1) mm; seeds uniseriate; petals mostly absent, if present
then often shorter than sepals and 1.5–2.5 × 0.2–0.7(–1) 3. *R. dubia*

1. *Rorippa sylvestris* (Linnaeus) Besser, Enum. Pl. 27. 1822.

欧亚 菜 ou ya han cai

Sisymbrium sylvestre Linnaeus, Sp. Pl. 2: 657. 1753;
Nasturtium sylvestre (Linnaeus) R. Brown; *Rorippa liaotungensis* X. D. Cui & Y. L. Chang.

Herbs perennial, (5–)15–80(–100) cm tall, glabrous or sparsely pubescent. Stems prostrate, decumbent, ascending, or suberect, branched mainly basally. Rosette leaves soon withered, similar to cauline leaves. Middle cauline leaves petiolate, deeply pinnatisect; petiole not auriculate, rarely minutely auriculate; leaf blade (2–)3.5–15(–20) × (0.7–)1–4.5(–6) cm; lateral lobes 3–6 on each side of midvein, sublinear, lanceolate, oblong, elliptic, or ovate, margin dentate or serrate, sometimes subentire; uppermost leaves with 1–3 lateral lobes or not lobed, often sessile. Racemes ebracteate. Fruiting pedicels (3–)4–10(–12) mm, slender, divaricate. Sepals green or yellow, oblong, 1.8–3(–3.5) × 0.7–1.5 mm, ascending or spreading. Petals yellow, spatulate or obovate, (2.2–)2.8–5.5(–6) × 1.5–2.5 mm, apex rounded. Filaments (1.5–)1.8–3.5(–4) mm; anthers oblong, 0.7–1 mm. Ovule number highly variable, mostly aborted. Fruit linear, very rarely oblong-linear, (0.4–)0.7–2(–2.5) cm × (0.7–)1–1.3(–1.6) mm, rarely producing seeds; style 0.5–1 (–1.5) mm; stigma subentire or slightly 2-lobed. Seeds reddish brown, ovoid, colliculate, uniseriate or rarely subbiseriate, 0.6–0.9 × 0.4–0.5 mm. Fl. and fr. May–Sep. $2n = 32, 40, 48$.

Along ditches, damp areas, meadows, waste grounds, fields; 100–2000 m. Xinjiang, Liaoning [India, Japan, Kashmir, Russia, Tajikistan, Uzbekistan; SW Asia, Europe; introduced in North and South America].

Although the present authors have not examined the type of *Rorippa liaotungensis*, the detailed description and illustration leave no doubt that it is a synonym of *R. sylvestris*, hundreds of specimens of which were examined from its native and naturalized ranges.

2. *Rorippa indica* (Linnaeus) Hiern, Cat. Afr. Pl. 1: [xxvi]. 1896.

菜 han cai

Sisymbrium indicum Linnaeus, Sp. Pl., ed. 2, 2: 917. 1763; *Cardamine glandulosa* Blanco; *C. lamontii* Hance; *Nasturtium atrovirens* (Hornemann) de Candolle; *N. diffusum* de Candolle; *N. indicum*

(Linnaeus) de Candolle (1821), not Garsault (1764); *N. montanum* Wallich ex J. D. Hooker & Thomson; *N. sinapis* (N. L. Burman) O. E. Schulz; *Radicula montana* (Wallich ex J. D. Hooker & Thomson) Hu ex C. Pei; *Rorippa atrovirens* (Hornemann) Ohwi & H. Hara; *R. montana* (Wallich ex J. D. Hooker & Thomson) Small; *R. sinapis* (N. L. Burman) Ohwi & H. Hara; *S. atrovirens* Hornemann; *S. sinapis* N. L. Burman.

Herbs annual, (6–)20–60(–75) cm tall, glabrous or rarely sparsely pubescent. Stems often branched basally and apically. Basal leaves withered by flowering. Lower and middle cauline leaves auriculate or not; petiole absent or 1–4 cm; leaf blade lyrate-pinnatifid or undivided, obovate, oblong, or lanceolate, (2.5–)3.5–12(–16) × (0.8–)1.5–4(–5) cm, margin entire, irregularly crenate, or serrate, apex obtuse or subacute; terminal lobe oblong, elliptic, or oblong-lanceolate, to 10 × 5 cm; lateral lobes absent or 1–5(or 6) on each side of midvein. Uppermost leaves usually sessile, auriculate or not; leaf blade lanceolate or oblong, margin entire, denticulate, or serrulate, apex acute or acuminate. Racemes ebracteate. Fruiting pedicels slender, ascending, divaricate, or rarely slightly reflexed, straight, (2–)3–10(–15) mm. Sepals often green or pinkish, ascending, oblong-ovate, 2–3 × 0.8–1.5 mm, margin membranous. Petals yellow, obovate or spatulate, (2.5–)3–4(–4.5) × 1–1.5 mm, rarely absent. Filaments 1.5–3 mm; anthers oblong, 0.5–0.8 mm. Ovules (60–)70–110 per ovary. Fruit linear, (0.7–)1–2.4(–3) cm × 1–1.5(–2) mm, often curved upward; valves thin papery, not veined; style (0.5–)1–1.5(–2) mm, slender, narrower than fruit. Seeds reddish brown, ovate or ovate-orbicular, 0.5–0.9 × 0.4–0.6 mm, foveolate, biseriate or nearly so. Fl. and fr. throughout the year. $2n = 24^*, 32^*, 48^*$.

Roadsides, field margins, gardens, river banks; near sea level to 3200 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sikkim, Thailand, Vietnam; naturalized in North and South America].

Although the type of *Cardamine lamontii* was collected from Hong Kong (Sep 1874, *J. Lamont s.n.* (holotype, BM)), that name was not listed in FRPS or any other provincial Chinese flora.

This species is used medicinally.

3. *Rorippa dubia* (Persoon) H. Hara, J. Jap. Bot. 30: 196. 1955.

无瓣菜 wu ban han cai

Sisymbrium dubium Persoon, Syn. Pl. 2: 199. 1807; *Cardamine sublyrata* Miquel; *Nasturtium dubium* (Persoon) Kuntze; *N. heterophyllum* Blume; *N. indicum* (Linnaeus) de Candolle var. *apetalum* de Candolle; *N. indicum* var. *javanum* Blume; *N. sublyratum* (Miquel) Franchet & Savatier; *Rorippa heterophylla* (Blume) R. O. Williams; *R. indica* (Linnaeus) Hiern var. *apetala* (de Candolle) Hochreutiner; *R. sublyrata* (Miquel) H. Hara.

Herbs annual, (4–)15–33(–45) cm tall, glabrous or rarely sparsely pubescent. Stems often branched basally and apically. Basal leaves withered by flowering. Lower and middle cauline leaves auriculate or not; petiole to 4 cm, rarely absent; leaf blade lyrate-pinnatifid or undivided, obovate, oblong, or lanceolate, (2–)3–11(–15) × (0.5–)1–3(–5) cm, margin entire or irregularly crenate or serrate, apex obtuse or subacute; terminal lobe oblong, elliptic, or oblong-lanceolate, to 14 × 4 cm; lateral lobes absent or 1–4 on each side of midvein. Uppermost leaves usually sessile, auriculate or not; leaf blade lanceolate or oblong, margin entire or serrulate, apex acute or acuminate. Racemes ebracteate. Fruiting pedicels slender, divaricate, straight, (2–)3–8(–10) mm. Sepals often pinkish, ascending, oblong-linear, (2–)2.5–3 × 0.5–0.7 mm, margin membranous. Petals mostly absent, rarely present and linear or narrowly oblanceolate, 1.5–2.5 × 0.2–0.7(–1) mm, often shorter than sepals. Filaments 1.5–2.8 mm; anthers oblong, 0.5–0.8 mm. Ovules 70–90 per ovary. Fruit linear, (1.5–)2.5–4 cm × 0.7–0.9(–1) mm, straight; valves thin papery, not veined; style 0.2–1(–1.5) mm, stout and about as wide as fruit, rarely slender and narrower. Seeds reddish brown, subquadrate or ovate-orbicular, 0.5–0.8 × 0.4–0.6 mm, foveolate, uniseriate. Fl. and fr. throughout the year. $2n = 32^*$, 48^* .

Valleys, waste areas, slopes, roadsides, wet grounds, grassy places, field margins; near sea level to 3700 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, Sikkim, Thailand, Vietnam; naturalized in North and South America].

4. *Rorippa benghalensis* (de Candolle) H. Hara, J. Jap. Bot. 49: 132. 1974.

孟加拉菜 meng jia la han cai

Nasturtium benghalense de Candolle, Syst. Nat. 2: 198. 1821, not Hance (1873); *N. diffusum* de Candolle; *N. indicum* (Linnaeus) de Candolle var. *benghalense* (de Candolle) J. D. Hooker & T. Anderson; *Rorippa dubia* (Persoon) H. Hara var. *benghalensis* (de Candolle) Mukerjee; *R. indica* (Linnaeus) Hiern subsp.

benghalensis (de Candolle) Bennet; *R. indica* var. *benghalensis* (de Candolle) Debeaux.

Herbs annual, 15–65(–85) cm tall, glabrous or sparsely to densely hirsute, with spreading or retrorse trichomes. Stems simple at base, few to many branched above. Basal leaves soon withered. Lowermost cauline leaves auriculate; petioles to 3 cm; leaf blade oblong or oblong-obovate in outline, lyrate-pinnatifid, (1.5–)2.5–12(–15) × (0.5–)1–4(–6) cm; terminal lobe broadly ovate or oblong, 1–5 × 0.7–3 cm; lateral lobes 1–4, oblong or ovate, to 2 × 1 cm, margin serrate or dentate. Upper leaves sessile, progressively reduced in size upward into bracts. Racemes bracteate throughout or rarely only along proximal third; bracts lanceolate-linear or oblong-linear, subentire or denticulate, minutely auriculate or cuneate at base. Fruiting pedicels ascending or divaricate, slender, straight, 3–6.5(–8) mm. Sepals elliptic or oblong, 1.5–2 × 0.5–0.8 mm. Petals pale yellow, spatulate or oblanceolate, 2–2.5 × 0.5–0.9 mm, apex rounded. Filaments 2–2.5 mm; anthers oblong, 0.4–0.5 mm. Ovules 100–170 per ovary. Fruit linear, straight or curved, 0.7–1.7(–2.1) cm × 1.2–1.6 mm; style 0.3–0.8 mm. Seeds reddish brown, subglobose or broadly ovoid, biseriate, 0.5–0.6 × 0.4–0.5 mm, minutely colliculate. Fl. and fr. Mar–Jul. $2n = 24, 48$.

Streamsides, wet grounds, marsh edges; near sea level to 1500 m. S Yunnan (Jinping Xian, Menglian Dai-Lahu-Va Zu Zizhixian) [Bangladesh, Bhutan, Cambodia, India, Laos, Malaysia, Myanmar, Nepal, Sikkim, Thailand, Vietnam].

Although *Rorippa benghalensis* was first recorded from China by Hooker and Thomson (J. Proc. Linn. Soc., Bot. 5: 139. 1861, as *Nasturtium benghalense*), that record was overlooked by subsequent botanists. The occurrence of the species in China is here confirmed based on Wang 74232 (A), China-Russia Team 156 (KUN), and Yunnan Team 9474 (KUN).

5. *Rorippa cantoniensis* (Loureiro) Ohwi, Acta Phytotax. Geobot. 6: 55. 1937.

广州菜 guang zhou han cai

Ricotia cantoniensis Loureiro, Fl. Cochinch. 2: 482. 1793; *Cardamine cryptantha* (A. Richard) Kuntze var. *pinnatodentata* Kuntze; *C. microsperma* (de Candolle) Kuntze; *Nasturtium microspermum* de Candolle; *N. microspermum* var. *vegetius* Bunge; *N. microspermum* var. *macilentum* Bunge; *N. sikokianum* Franchet & Savatier; *N. sikokianum* var. *axillare* Hayata; *Rorippa microsperma* (de Candolle) Handel-Mazzetti.

Herbs annual, (5–)10–35(–45) cm tall, glabrous throughout, sometimes sparsely with semiglobose papillae 0.05–0.1 mm. Stems erect or decumbent, branched basally and above, rarely simple. Basal leaves petiolate, rosulate, soon withered, lyrate, pinnatisect, or bipinnatisect, up to 10 × 3 cm, with up to 12 lateral lobes on each side of midvein. Cauline leaves and bracts sessile or rarely petiolate throughout, auriculate

or sagittate at base, lyrate, pinnatisect, or bipinnatisect, rarely sinuate or toothed, (0.8–)1.5–5(–7) × (0.3–)0.8–2.3(–3) cm; lateral lobes 2–6(or 7) on each side of midvein, to 10 × 5 mm, incised, dentate, or entire. Racemes bracteate throughout; bracts rarely adnate to pedicel. Fruiting pedicels stout, ascending, (0.3–)0.7–2(–3) mm. Sepals oblong or subelliptic, 1.5–2(–2.5) × 0.5–0.8 mm. Petals pale yellow, obovate or narrowly spatulate, 2–3(–3.5) × 0.5–1 mm. Filaments 1.5–2 mm; anthers oblong, 0.3–0.4 mm. Ovules 100–230 per ovary. Fruit broadly or narrowly oblong, (3–)4.5–8.5(–10) × 1.5–2.5 mm; valves thin papery, veinless; style 0.1–0.5 mm. Seeds reddish brown, ovate or ovate-reniform, foveolate, biseriate, (0.3–)0.4–0.6 × (0.2–)0.3–0.4 mm. Fl. and fr. Feb–Nov.

Fields, roadsides, valleys, river banks, along irrigation ditches, waste places, damp areas; near sea level to 1800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea, Russia (Far East), Vietnam].

6. *Rorippa elata* (J. D. Hooker & Thomson) Handel-Mazzetti, *Symb. Sin.* 7: 357. 1931.

高菜 gao han cai

Barbarea elata J. D. Hooker & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 140. 1861; *Nasturtium barbareaifolium* Franchet (1888), not Baker (1877), nor (de Candolle) B. Fedtschenko (1912); *N. elatum* (J. D. Hooker & Thomson) Kuntze ex O. E. Schulz.

Herbs annual or short-lived perennial, (20–)30–90(–100) cm tall, sparsely to rarely densely hirsute, glabrous or glabrescent above. Stems erect, simple at base, often branched above. Basal leaves not rosulate, soon withered, petiolate. Lowermost and middle cauline leaves often petiolate; petiole auriculate-amplexicaul at base, (0.5–)1.5–6(–8) cm; leaf blade lyrate or lyrate-pinnatifid, sometimes sinuate or undivided, oblong to oblanceolate, (1.5–)2.5–10(–14) × (0.5–)1–4(–5) cm, margin crenate; lateral lobes 1–5(–8) on each side of midvein, oblong or ovate, to 2.5 × 1.2 cm; terminal lobe oblong or elliptic, to 10 × 4 cm, much larger than lateral ones. Uppermost cauline leaves sessile, often undivided, crenate or rarely sinuate. Racemes ebracteate, to 20–40 cm in fruit. Fruiting pedicels (5–)6–10(–13) mm, erect to erect-ascending, subappressed to rachis. Sepals oblong, 2–3 × 1–1.5 mm. Petals yellow, obovate, 3–4 × 1.5–2 mm, apex obtuse. Filaments 2–3 mm; anthers narrowly oblong, 0.8–1 mm. Ovules 36–60 per ovary. Fruit linear or oblong-linear, (0.8–)1.2–2(–2.3) cm × 2.5–4 mm; valves with a distinct midvein and obscure other veins, subleathery, obtuse at both ends or retuse apically; style 0.5–1.5(–2) mm. Seeds brown or yellowish brown, ovate, slightly compressed, biseriate, 1.1–1.5 × 0.7–1.1 mm, colliculate. Fl. May–Aug, fr. Jun–Oct. $2n = 32^*$.

Sunny grasslands, mountain slopes, forest margins, woodlands, streamsides, meadows, shady ditchsides, roadsides; 2300–4500 m. Qinghai, Shaanxi, Sichuan, Xizang, NW Yunnan [Bhutan, Sikkim].

Three-valved fruits are occasionally produced on misidentified plants with 2-valved fruit, as seen in *T. T. Yü 14587* (A, BM).

7. *Rorippa globosa* (Turczaninow ex Fischer & C. A. Meyer) Hayek, *Beih. Bot. Centralbl.* 27: 195. 1911.

风花菜 feng hua cai

Nasturtium globosum Turczaninow ex Fischer & C. A. Meyer, *Index Sem. Hort. Petrop.* 1: 35. 1835; *Camelina yunnanensis* W. W. Smith; *Cochlearia globosa* (Turczaninow) Ledebour; *N. cantoniense* Hance. Herbs annual or short-lived perennial, (20–)30–90(–120) cm tall, densely villous or hirsute at least near base, rarely glabrous above. Stems erect, simple at base, branched above. Basal leaves rosulate, soon withered; petiole 1–4 cm; leaf blade lyrate-pinnatifid or subruncinate. Lower and middle cauline leaves sessile, lanceolate, oblanceolate, or oblong, 2.5–10(–15) × 0.3–2.5(–4) cm, hirsute, lyrate-pinnatifid and with 1–3 lateral lobes on each side of midvein, sometimes leaves not lobed, base auriculate or amplexicaul, margin irregularly dentate, incised, or serrate, apex acute; terminal lobe not distinct or well developed and to 8 × 4 cm; uppermost leaves undivided, serrate, dentate, or serrulate. Racemes ebracteate. Fruiting pedicels divaricate, (2–)4–8(–10) mm, straight or slightly recurved, slender, glabrous or hirsute. Sepals oblong, spreading, (1–)1.3–1.8(–2) × 0.5–0.9 mm. Petals yellow, obovate, 0.7–1.3(–1.5) × 0.3–0.8 mm, apex obtuse. Filaments spreading, 1.2–1.8(–2) mm; anthers oblong, 0.4–0.5 mm. Ovules 60–100 per ovary. Fruit globose or subglobose, 2–3(–3.5) × (1.5–)2–3 mm; valves 2, papery, glabrous, not veined; gynophore 0.1–0.4 mm, sometimes absent; style stout, 0.1–0.8(–1) mm. Seeds dark reddish brown, broadly ovate, 0.5–0.8 × 0.4–0.5 mm, reticulate. Fl. and fr. Apr–Nov.

River banks, moist areas, grasslands, railroad embankments; near sea level to 2500 m. Anhui, Fujian, Guangdong, Guangxi, Hebei, Heilongjiang, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Japan, Korea, Mongolia, Russia, Vietnam].

8. *Rorippa barbareaifolia* (de Candolle) Kitagawa, *J. Jap. Bot.* 13: 137. 1937.

山芥叶菜 shan jie ye han cai

Camelina barbareaifolia de Candolle, *Syst. Nat.* 2: 517. 1821; *Nasturtium barbareaifolium* (de Candolle) B. Fedtschenko (1912), not Baker (1877), nor Franchet (1888); *Rorippa hispida* (Desvaux) Britton var. *barbareaifolia* (de Candolle) Hultén; *Tetrapoma barbareaifolium* (de Candolle) Turczaninow ex Fischer & C. A. Meyer; *T. kruhsianum* Fischer & C. A. Meyer; *T. pyriforme* Seemann.

Herbs annual or biennial, (20–)30–95(–110) cm tall, densely villous or hirsute at least near base, sparsely so or subglabrous above. Stems erect, simple at base, branched above. Basal leaves rosulate, soon withered; petiole 1–7 cm; leaf blade lyrate-pinnatifid or subruncinate. Lower and middle cauline leaves sessile,

lanceolate, oblanceolate, or oblong, 2.5–10(–15) × 0.4–2.5(–4.5) cm, villous or hirsute, lyrate-pinnatifid, with 2–7 lateral lobes on each side of midvein, base auriculate or amplexicaul, margin laciniate, irregularly serrate, repand, or entire, apex acute; uppermost leaves undivided, entire or obscurely denticulate. Racemes ebracteate. Fruiting pedicels ascending, (2–)4–12(–14) mm, straight, slender, glabrous or hirsute. Sepals oblong, spreading, 1.6–2.8 × 0.6–1.2 mm. Petals yellow, obovate or spatulate, (1.5–)1.8–3(–3.5) × 0.7–1.8(–2) mm, apex obtuse. Filaments 1.5–2.5 mm; anthers narrowly oblong, 0.5–0.6 mm. Ovules 60–85 per ovary. Fruit globose or subglobose, (2.5–)3.5–6(–6.5) × (2.3–)2.8–4(–4.3) mm; valves (3 or)4(–6), leathery, glabrous, not veined; gynophore 0.3–0.8(–1) mm; style stout, 0.5–1(–1.4) mm. Seeds dark reddish brown, oblong-ovate, 0.5–0.7 × 0.3–0.4 mm, reticulate. Fl. & fr. Mar–Aug. $2n = 16$.

Forest borders, roadsides, moist areas, river banks; 100–2100 m. Heilongjiang, Jilin, Nei Mongol [Mongolia, Russia; North America (Alaska, N Canada)].

9. *Rorippa palustris* (Linnaeus) Besser, Enum. Pl. 27. 1822.

沼生 菜 zhao sheng han cai

Sisymbrium amphibium Linnaeus var. *palustre*

Linnaeus, Sp. Pl. 2: 657. 1753; *Cardamine palustre*

(Linnaeus) Kuntze; *Nasturtium densiflorum*

Turczaninow; *N. palustre* (Linnaeus) de Candolle; *N.*

palustre f. *longipes* Franchet; *N. palustre* f. *sto-*

loniferum Franchet.

Herbs annual or rarely short-lived perennial, (5–)10–100(–140) cm tall, glabrous, rarely hirsute. Stems erect, simple or often branched above, ribbed. Basal leaves rosulate, withered early; leaf blade lyrate-pinnatisect, (4–)6–20(–30) × 1–5(–8) cm. Cauline leaves petiolate or sessile, auriculate or amplexicaul, lyrate-pinnatisect, (1.5–)2.5–8(–12) × (0.5–)0.8–2.5 (–3) cm;

61. *NASTURTIUM* R. Brown in W. T. Aiton, Hortus Kew. 4: 109. 1812, nom. cons.

豆瓣菜属 dou ban cai shu

Cardaminum Moench, nom. rej.

Herbs perennial, aquatic, rhizomatous. Trichomes absent or simple. Stems prostrate or decumbent, erect in emergent plants, rooting at proximal nodes. Leaves all cauline, pinnately compound, often simple in deeply submersed plants; petiole sometimes auriculate at base; lateral leaflets 1–6(–12) pairs, petiolulate or sessile, entire, repand, or rarely dentate. Racemes many flowered, ebracteate. Fruiting pedicels usually divaricate. Sepals ovate or oblong, erect or ascending, glabrous, base of lateral pair subsaccate or not saccate. Petals white or rarely pink, longer than sepals; blade obovate or narrowly spatulate, apex obtuse; claw absent. Stamens 6, erect, tetradynamous; filaments base not dilated; anthers oblong, obtuse at apex. Median glands absent; lateral glands 2, annular or semiannular. Ovules 25–50 per ovary. Fruit dehiscent siliques, linear or rarely narrowly oblong, terete, sessile; valves obscurely veined, glabrous, smooth or slightly torulose; replum rounded; septum complete; style obsolete or to 2 mm; stigma capitate, entire. Seeds uniseriate or biseriate, wingless, oblong or ovoid, plump; seed coat minutely to coarsely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Five species: one in NW Africa (Morocco), two in Asia and Europe, and two in North America (N Mexico and United States); one species (introduced) in China.

1. *Nasturtium officinale* R. Brown in W. T. Aiton, Hortus Kew. 4: 110. 1812.

豆瓣菜 dou ban cai

lateral lobes oblong or ovate, smaller than terminal lobe, (1 or)2–6(or 7) on each side of midvein, sometimes absent, margin subentire or irregularly dentate, sinuate, serrate, or crenate. Racemes ebracteate. Fruiting pedicels divaricate or slightly to strongly reflexed, (2.5–)3–8(–12) mm, slender, straight or curved. Sepals oblong, 1.5–2.4(–2.6) × 0.5–0.8 mm. Petals yellow or pale yellow, spatulate, (1.5–)1.8–2.6(–3) × 0.5–1.3(–1.5) mm. Filaments 1–2.5 mm; anthers ovate, 0.3–0.5 mm. Ovules 20–90 per ovary. Fruit oblong, ellipsoid, or oblong-ovoid, often slightly curved, (2.5–)4–10(–14) × (1.5–)1.7–3(–3.5) mm; valves not veined; style 0.2–1(–1.2) mm. Seeds brown to yellowish brown, ovoid or subglobose, colliculate, biseriate, 0.5–0.9 × 0.4–0.6 mm. Fl. and fr. Mar–Oct. $2n = 32$.

Marshlands, pastures, meadows, roadsides, shores of lakes and ponds, streamsides, thickets, grasslands; near sea level to 4000 m. Anhui, Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Japan, Kazakstan, Korea, Mongolia, Ne-pal, Pakistan, Russia, Sikkim, Tajikistan, Turkmenistan, Uzbekistan; Europe, North America; introduced in Australia, South America, and elsewhere].

All records of *Rorippa islandica* (Oeder ex Murray) Borbás from China are based on misidentified plants of *R. palustris*. Plants of the former are prostrate diploids ($2n = 16$) restricted to Europe and W Russia; they have nonauriculate cauline leaves, sepals and petals 1–1.5 mm, and fruit often 2–3(–5) × longer than the pedicels. By contrast, plants of *R. palustris* are widespread, erect tetraploids ($2n = 32$) with auriculate cauline leaves, sepals and petals 1.5–2.6 mm, and fruit shorter than to 2 × longer than the pedicels.

Rorippa palustris is highly variable and has been divided into as many as four subspecies and seven varieties, all of which are indigenous to North America; only subsp. *palustris* is also indigenous in Eurasia.

Sisymbrium nasturtium-aquaticum Linnaeus, Sp. Pl. 2: 657. 1753; *Rorippa nasturtium-aquaticum* (Linnaeus) Hayek.

Herbs perennial, rhizomatous, aquatic, 10–70(–200) cm tall, glabrous throughout or sparsely pubescent with simple trichomes. Stems decumbent or prostrate, erect in emergent plants, branched above, rooting at proximal nodes. Leaves all cauline, pinnately compound, 3–9(–13)-foliolate; petiole auriculate at base; terminal leaflet suborbicular or oblong, 1–4 cm, base obtuse, cuneate, or subcordate, margin entire or repand, apex obtuse; lateral leaflets smaller, usually sessile. Fruiting pedicels slender, divaricate or recurved, 5–12(–20) mm. Sepals oblong, 2–3.5 mm, lateral pair slightly saccate. Petals white or pink, spatulate or obovate, 2.8–4.5(–6) × 1.5–2.5 mm, apex rounded; claw ca. 1 mm.

Filaments white, 2–3.5 mm; anthers oblong, ca. 0.6 mm. Fruit cylindrical, 1–1.5(–2) cm × (1.8–)2–2.5(–3) mm; valves with an obscure midvein; style 0.5–1(–1.5) mm. Seeds biseriate, ovoid, 1–1.3 × 0.7–1 mm, reddish brown, coarsely reticulate, with 25–50(–60) areolae on each side. Fl. Apr–Sep, fr. May–Sep. $2n = 32^*$.

Streams, ditches, lakes, swamps, marshes; near sea level to 3700 m. Anhui, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [native to SW Asia and Europe; widely naturalized elsewhere].

Cultivated as a vegetable and used medicinally.

62. LEPIDOSTEMON J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 131. 1861, nom. cons.

鳞蕊芥属 lin rui jie shu

Chrysobraya H. Hara.

Herbs annual or caespitose perennial. Trichomes dendritic, forked, submalpighiaceus, or simple, often more than 1 kind present. Stems erect, simple from rosettes, leafy or leafless. Basal leaves petiolate, rosulate, simple, entire or dentate. Cauline leaves similar to basal, sometimes pinnatifid, rarely absent. Racemes few to many flowered, ebracteate or rarely bracteate throughout, elongated or not elongated in fruit, sometimes flowers solitary on long pedicels originating from axils of rosette leaves. Fruiting pedicels slender, divaricate or recurved. Sepals oblong, persistent or rarely caducous, base of lateral pair not saccate, margin membranous. Petals yellow, white, lavender, or purple; blade broadly obovate or rarely spatulate, apex rounded or emarginate; claw subequaling sepals. Stamens 6, tetradynamous; filaments winged or rarely wingless, toothed or rarely toothless; anthers reniform or rarely oblong, obtuse at apex. Nectar glands 4, lateral; median glands absent. Ovules 8–28 per ovary. Fruit dehiscent siliques, linear-oblong to linear, terete or latiseptate, sessile; valves papery, obscurely veined, rarely marginal veins prominent, pubescent, torulose or rarely smooth; replum rounded; septum complete or rarely perforated, membranous; style distinct, to 2 mm; stigma capitate, entire or rarely slightly 2-lobed. Seeds uniseriate, wingless, oblong or ovate, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent or rarely incumbent.

Five species: Bhutan, China, Nepal, Sikkim; three species (two endemic) in China.

- 1a. Perennials; racemes bracteate throughout; trichomes almost exclusively simple; anthers oblong, 0.7–0.9 mm 2. *L. everestianus*
- 1b. Annuals; racemes ebracteate, rarely lowermost few flowers bracteate; trichomes dendritic, submalpighiaceus, or simple; anthers reniform, 0.3–0.5(–0.6) mm.
 - 2a. Fruit strongly flattened, not torulose, 2.5–3 mm wide; valve margin thickened, with prominent marginal veins; median filaments toothless; flowers white; seeds ovate 3. *L. rosularis*
 - 2b. Fruit terete, torulose, ca. 1 mm wide; valve margin not thickened, with obscure marginal veins; median filaments toothed; flowers yellow; seeds oblong 1. *L. pedunculosus*

1. Lepidostemon pedunculosus J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 156. 1861.

鳞蕊芥 lin rui jie

Herbs annual, 2–10 cm tall. Trichomes short-stalked and subdendritic or forked, subsessile and submalpighiaceus-stellate on leaves, stems, pedicels and fruit, rarely simple along leaf margin. Basal leaves rosulate, smaller than and somewhat similar to cauline ones, dry by flowering time. Cauline leaves few to many, often densely grouped below inflorescence; petiole 3–10 (–25) mm, ciliate with simple subsetose trichomes; leaf blade spatulate or oblanceolate, 3–12 × 2–7 mm, base attenuate, margin dentate or pinnatifid

and with 1–4, oblong or linear lateral lobes 1–5 × 0.5–1 mm on each side, apex obtuse. Racemes 8- to many flowered, ebracteate or sometimes lowermost pedicels with adnate bracts, not elongated in fruit. Fruiting pedicels divaricate, straight, 1–3.5 cm. Sepals oblong, 2–3.5 × 1–1.5 mm, spreading, sparsely pubescent, persistent. Petals yellow, broadly obovate or spatulate, 3–5.5 × 1.5–4 mm, persistent, apex emarginate or rounded; claw 1–2 mm. Filaments 2–3 mm, persistent; median pairs with oblong or obovate wing 0.5–0.9 mm wide, unexpanded portion of filament to 0.6 mm; lateral pair entire or winged; anthers reniform, 0.3–0.5 mm. Nectar glands ovate, to 0.2 mm. Ovules 12–28 per

ovary. Fruit narrowly linear, 1.5–2.5 cm × ca. 1 mm, terete; valves torulose, densely covered with submalpighiaceous trichomes; septum complete; style 0.5–2 mm; stigma ca. as wide as style, entire. Seeds oblong, 1–1.4 × 0.5–0.6 mm; cotyledons accumbent. Fl. Jun–Jul, fr. Jul–Aug.

Rocky slopes; 4200–4900 m. Xizang [Sikkim].

The above new record from Xizang is based on *Gould 2381* (K), *Gould 2132* (K), and *King s.n.* (BM, K).

2. *Lepidostemon everestianus* Al-Shehbaz, *Novon* 10: 331. 2000.

珠峰鳞蕊芥 *zhu feng lin rui jie*

Herbs perennial, 3–4 cm tall, pilose, with a slender, rhizomelike caudex. Trichomes almost exclusively simple, to 1 mm, rarely a few forked ones present. Basal leaves rosulate, persistent; petiole 0.5–4 mm; leaf blade ovate or oblong, 2–6 × 1–3 mm, densely pilose, base obtuse, margin entire, apex obtuse. Cauline leaves and bracts similar to basal leaves but smaller. Racemes 6–12-flowered, bracteate throughout, slightly elongated in fruit; bracts adnate to pedicels. Fruiting pedicels ascending-divaricate, straight, 2–3 mm. Sepals oblong, ca. 3 × 1 mm, spreading, sparsely pubescent, persistent. Petals whitish, obovate, ca. 5 × 2.5 mm, apex rounded; claw 2–3 mm. Filaments persistent; median pairs ca. 3.5 mm, winged and ca. 0.5 mm wide basally, minutely toothed below middle; lateral pair ca. 3 mm, slender, wingless; anthers oblong, 0.7–0.9 mm. Ovules ca. 8 per ovary. Fruit linear-oblong, ca. 7 × 1.5 mm, terete; valves torulose, densely pubescent, obscurely veined; septum complete; style ca. 0.7 mm; stigma minute, entire. Seeds ovate, ca. 1.4 mm; cotyledons accumbent. Fl. and fr. Jul.

• Scree; ca. 6400 m. Xizang.

Lepidostemon everestianus, which is known only from the type gathering, *Shipton s.n.* (holotype, BM), grows at altitudes higher than those reached by any other species of the Brassicaceae.

3. *Lepidostemon rosularis* (K. C. Kuan & Z. X. An) Al-Shehbaz, *Novon* 10: 332. 2000.

莲座鳞蕊芥 *lian zuo lin rui jie*

Christolea rosularis K. C. Kuan & Z. X. An in C. Y. Wu, *Fl. Xizang*, 2: 386. 1985.

Herbs annual, 1–4 cm tall. Trichomes short-stalked and subdendritic or forked, simple ones to 1 mm on petioles and fruit. Basal leaves rosulate, smaller than cauline ones, entire, dry by flowering time. Cauline leaves several to many, often densely grouped below inflorescence; petiole 5–14 mm, ciliate with simple trichomes; leaf blade spatulate, oblanceolate, or ovate, 3–10 × 2–6 mm, sparsely pubescent, base cuneate, margin with 1–4 teeth on each side, apex obtuse. Racemes 10- to many flowered, ebracteate or rarely lowermost pedicels with adnate bracts, not elongated in fruit. Fruiting pedicels divaricate, straight, 0.5–2 cm. Sepals oblong, 2–3.5 × 1–1.5 mm, spreading, pubescent, persistent. Petals white, broadly obovate, 3–5 × 2–3 mm, persistent, apex rounded; claw 1–2 mm. Filaments 2–2.5 mm, persistent; median pairs narrowly lanceolate, winged, 0.4–0.5 mm wide; lateral pair slender, wingless; anthers reniform, 0.4–0.5 mm. Ovules 12–16 per ovary. Fruit oblong-linear, 1–2 cm × 2.5–3 mm, flattened; valves with obscure midvein and prominent marginal veins, somewhat indurated at margin and connate at base, dehiscent basipetally, not torulose, pilose with forked and/or simple trichomes; septum complete; style 0.5–1.5 mm; stigma subentire or 2-lobed. Seeds ovate, 1.2–1.6 × 0.8–1 mm; cotyledons accumbent. Fl. Jun–Jul, fr. Jul–Aug.

• Stony grounds, slopes, dry gullies, scree; 4200–5100 m. Xizang.

63. DONTOSTEMON Andrzejowski ex C. A. Meyer in Ledebour, *Fl. Altaic*, 3: 118. 1831, nom. cons.

花旗杆属 *hua qi gan shu*

Alaïda Dvorák; *Andreoskia* de Candolle; *Dimorphostemon* Kitagawa; *Hesperidopsis* (de Candolle) Kuntze.

Herbs annual, biennial, or perennial. Trichomes unicellular, eglandular, simple, straight or crisped, sometimes mixed with multicellular, multiseriate glandular ones. Stems erect or ascending, simple or branched. Basal leaves petiolate, rosulate or not, simple, entire, dentate, pinnatifid, or pectinate-pinnatifid. Cauline leaves petiolate or sessile, similar to basal. Racemes ebracteate, elongated in fruit. Fruiting pedicels ascending or divaricate. Sepals ovate, not saccate. Petals white, pink, or purple; blade broadly obovate, obcordate, spatulate, or oblanceolate, apex obtuse or emarginate; claw subequaling sepals or longer. Stamens 6, tetradynamous; median filament pairs united, sometimes free and toothed below anther or expanded to base, dilated at base; anthers ovate or oblong, often apiculate at apex. Nectar glands 4, lateral, 1 on each side of lateral stamen; median glands absent. Ovules 7–60 per ovary. Fruit dehiscent siliques, linear, terete or latiseptate; valves with a prominent midvein and often distinct marginal veins, glabrous or glandular, torulose; gynophore obsolete, rarely to 1 mm; replum flattened; septum complete; style obsolete or to 3 mm; stigma capitate, slightly lobed, rarely prominently lobed and subdecurrent. Seeds uniseriate, winged, margined, or wingless, oblong or ovate, plump or slightly flattened; seed coat reticulate, not mucilaginous when wetted; cotyledons accumbent or incumbent.

Eleven species: China, India, Japan, Kashmir, Kazakstan, Korea, Mongolia, Nepal, Russia, Sikkim, Tajikistan; 11 species (one endemic) in China.

Dontostemon is separated from *Dimorphostemon* only by having united (vs. free) median staminal filaments. However, the union of filaments evolved independently within several other genera in the Brassicaceae, and the separation of these two genera is artificial.

- 1a. Leaves pectinate-pinnatifid, with up to 11 lobes on each side of midvein; stigma prominently 2-lobed, lobes subdecurrent 11. *D. tibeticus*
- 1b. Leaves entire, dentate, or serrate, if pinnatifid then with multicellular glands; stigmas slightly 2-lobed, lobes not decurrent.
 - 2a. Plants sparsely to densely glandular.
 - 3a. Petals (10–)12–18 × (4–)6–8 mm; fruit flattened; anthers apex obtuse, 1.5–2 mm 1. *D. hispidus*
 - 3b. Petals 2–8 × 0.5–3(–5) mm; fruit terete; anthers apiculate, 0.2–0.8 mm.
 - 4a. All leaves entire; median filaments united; stems with minute twisted trichomes 3. *D. integrifolius*
 - 4b. At least basal leaves dentate, serrate, or pinnatifid; median filaments free; stems glabrous or with straight trichomes.
 - 5a. Petals obovate, (5–)6–8 mm; median filaments abruptly expanded and toothed below anther; seeds apically margined; anthers 0.6–0.8 mm 9. *D. pinnatifidus*
 - 5b. Petals spatulate, 2–4(–4.5) mm; median filaments gradually expanded to base, toothless; seeds not margined; anthers 0.2–0.4 mm 10. *D. glandulosus*
 - 2b. Plants not glandular.
 - 6a. At least some cauline leaves petiolate, dentate 2. *D. dentatus*
 - 6b. Cauline leaves sessile, entire.
 - 7a. Plants annual or biennial, never woody basally; stems with minute twisted trichomes.
 - 8a. Petals broadly obovate, 5–7(–8) × 2–3 mm, apex subemarginate; anthers oblong, 0.7–0.8 mm; ovules 15–25 per locule 3. *D. integrifolius*
 - 8b. Petals narrowly oblanceolate, 3–5 × 0.6–1 mm, apex obtuse; anthers ovate, 0.4–0.5 mm; ovules 30–50 per locule 4. *D. micranthus*
 - 7b. Plants perennial with woody base; stems glabrous or with straight trichomes.
 - 9a. Stems glabrous; leaves somewhat fleshy, subleathery; fruit strongly arcuate or twisted.
 - 10a. Fruit terete, strongly arcuate, 1.5–2.5 cm × 1–1.7 mm; style 1.5–2.5 mm; plants 5–10 cm tall; sepals 3–4 mm; median filaments 3.5–4 mm 7. *D. crassifolius*
 - 10b. Fruit compressed, strongly twisted, 3–5 cm × 2–2.5 mm; style rarely to 0.5 mm; plants 15–50 cm tall; sepals 5–6 mm; median filaments 6–8 mm 8. *D. elegans*
 - 9b. Stems sparsely to densely pilose; leaves not fleshy, herbaceous; fruit straight or rarely slightly curved.
 - 11a. Plants pilose with subappressed trichomes rarely to 1 mm; fruit 1–2.5 cm × 0.9–1.1 mm; seeds to 1.4 mm, not margined; cotyledons incumbent 5. *D. perennis*
 - 11b. Plants hirsute with spreading trichomes to 3 mm; fruit (2.5–)3–5 cm × 1.4–2 mm; seeds to 2.5 mm, margined or winged; cotyledons accumbent 6. *D. senilis*

1. *Dontostemon hispidus* Maximowicz, Mélanges Biol. Bull. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 9: 11. 1873.

毛花旗杆 mao hua qi gan

Clausia ussuriensis N. Busch.

Herbs annual, (10–)15–50(–65) cm tall, sparsely to densely hispid with subsetose trichomes to 3.5 mm, these mixed with much shorter ones, glandular on all parts except petals and stamens, gland stalks to 0.4 mm. Stems erect, often simple. Middle cauline leaves with

petioles 2–5 mm; leaf blade elliptic or elliptic-lanceolate, 15–3.5 cm × 5–10 mm, base cuneate, margin serrate-dentate, apex acute. Fruiting pedicels divaricate, straight, slender, 7–15 mm, glandular. Sepals narrowly oblong, (3.5–)5–6 × 1.5–2 mm, glandular and often also setose. Petals lavender or purplish, broadly obovate, (10–)12–18 × (4–)6–8 mm, apex subemarginate; claw 5–7 mm. Filaments of median stamens 5–7 mm, united; filaments of lateral stamens 3–5 mm; anthers narrowly oblong, 1.5–2 mm, apex obtuse. Ovules 30–60 per ovary. Fruit (2–)3–6(–8) cm × 1.5–2 mm, glandular, straight, divaricate or

ascending, subtorulose, flattened, midvein prominent; style (1–)2–3 mm; stigma slightly lobed. Seeds brown, oblong-ovate, 2–2.5 × 1.2–1.4 mm, with a narrow wing to 0.5 mm wide; cotyledons accumbent. Fl. and fr. Jun–Sep. $2n = 14$.

Flood plains, sandy river banks; 200–400 m. ?Heilongjiang [Russia (Far East)].

Although the present authors have seen no material from China, this species was described from Manchuria and was recorded from China in *Pl. Vasc. Orient. Extr. Sov.* 3: 111. 1988. It is likely that the species occurs in SE Heilongjiang and/or NE Jilin.

2. *Dontostemon dentatus* (Bunge) Ledebour, *Fl. Ross.* 1: 175. 1841.

花旗杆 hua qi gan

Andreoskia dentata Bunge, *Enum. Pl. China Bor.* 6. 1833; *Dontostemon dentatus* var. *glandulosus* Maximowicz ex Franchet & Savatier; *D. intermedius* Voroschilov; *D. oblongifolius* Ledebour.

Herbs annual, (9–)15–50(–60) cm tall, eglandular. Stems erect, often simple, branched above, pubescent distally with minute, twisted, simple trichomes, rarely glabrescent. Middle cauline leaves subsessile or petiole 2–10 mm; leaf blade lanceolate to lanceolate-linear, (1.5–)2–5.5(–7) cm × (2–)3–10(–13) mm, base attenuate or cuneate, margin minutely to coarsely dentate, rarely subentire, ciliate with simple, subsetose trichomes to 0.9 mm, apex acute. Fruiting pedicels ascending or divaricate, straight or curved upward, thick, (2–)3–7(–9) mm, glabrous or with twisted trichomes. Sepals oblong, 3–5 × 1–1.5 mm, often with straight simple trichomes. Petals lilac or purplish, obovate, (5–)6–9(–11) × 2.5–4.5 mm, apex subemarginate; claw 2.5–4 mm. Filaments of median stamens 3.5–5.5 mm, united; filaments of lateral stamens 2–4 mm; anthers oblong, 1–1.8 mm, apiculate. Ovules 20–60 per ovary. Fruit (1–)2–5(–6) cm × 0.9–1.1 mm, glabrous, straight, erect or slightly ascending, subtorulose, terete or slightly flattened, midvein prominent; style 0.4–1.5 mm; stigma slightly lobed. Seeds brown, oblong-ovate, 0.8–1.3 × 0.6–0.8 mm, narrowly margined distally; cotyledons accumbent. Fl. and fr. Jun–Sep.

Rocky slopes, sandy areas, roadsides; 200–1900 m. Anhui, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Xinjiang, Yunnan [Japan, Korea, Russia].

3. *Dontostemon integrifolius* (Linnaeus) C. A. Meyer in Ledebour, *Fl. Altaic.* 3: 120. 1831.

线叶花旗杆 xian ye hua qi gan

Sisymbrium integrifolium Linnaeus, *Sp. Pl.* 2: 660. 1753; *Andreoskia eglandulosa* (de Candolle) de Candolle; *A. integrifolia* (Linnaeus) de Candolle; *Cheiranthus muricatus* Weinmann; *Dontostemon eglandulosus* (de Candolle) Ledebour; *D. integrifolius*

var. *eglandulosus* (de Candolle) Turczaninow; *D. integrifolius* var. *glandulosus* Turczaninow; *Hesperis glandulosa* Persoon; *Sisymbrium eglandulosum* de Candolle; *Systemon linearifolius* Z. X. An.

Herbs annual, (2.5–)5–20(–25) cm tall, eglandular or glandular nearly throughout, pubescent, with minute, twisted, simple trichomes mixed with straight ones to 1.5 mm. Stems erect or ascending, simple several branched. Middle cauline leaves sessile, linear, (0.7–)1.5–3 cm × 0.5–1.5 mm, base attenuate, margin entire, ciliate and often pubescent with simple subappressed trichomes, apex subacute. Fruiting pedicels divaricate or rarely ascending, straight, slender, 3–8(–11) mm, pilose. Sepals oblong, 2.5–3.5 × 1–1.5 mm. Petals lilac, broadly obovate, 5–7(–8) × 2–3 mm, apex subemarginate; claw 2.5–4 mm. Filaments of median stamens 2.5–4 mm, united; filaments of lateral stamens 2–3 mm; anthers oblong, 0.7–0.8 mm, apiculate. Ovules 30–50 per ovary. Fruit (0.6–)1.5–2.8(–3.3) cm × 0.9–1.1 mm, glandular or glabrous, straight or slightly curved, divaricate or rarely ascending, torulose, terete, midvein prominent; style 0.5–1 mm; stigma slightly lobed. Seeds brown, oblong, 0.7–0.9 × 0.4–0.5 mm, not margined; cotyledons incumbent or obliquely so. Fl. and fr. Jul–Oct. $2n = 14$.

Open grasslands, meadows, pastures, sandy slopes, dunes; 200–1700 m. Heilongjiang, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi [Mongolia, Russia].

Glandular and eglandular forms of *Dontostemon integrifolius*, which are frequently found within the same population (see for example, *Bunge 1831* (P) and *Liu 5430* (NAS)), have variously been treated as independent species or varieties. However, the present authors believe that these variants do not merit formal recognition.

4. *Dontostemon micranthus* C. A. Meyer in Ledebour, *Fl. Altaic.* 3: 120. 1831.

小花花旗杆 xiao hua hua qi gan

Herbs annual, (7–)15–55(–75) cm tall, eglandular, pubescent, with minute, twisted, simple trichomes mixed with straight rigid ones to 0.5 mm. Stems erect, often simple, branched above. Middle cauline leaves sessile, linear or rarely lanceolate-linear, 1–4(–5) cm × 1–2(–3) mm, base attenuate, margin entire, ciliate and often pubescent with simple rigid trichomes, apex acute. Fruiting pedicels divaricate or rarely ascending, straight, slender, (4–)5–10(–12) mm, pubescent. Sepals narrowly oblong, 2.5–3.5 × 0.5–0.8 mm. Petals lilac or purplish, narrowly oblanceolate, 3–5 × 0.6–1 mm, attenuate to a clawlike base to 1.5 mm, apex obtuse. Filaments of median stamens 2.5–3.5 mm, united; filaments of lateral stamens 2–2.5 mm; anthers ovate, 0.4–0.5 mm, apiculate. Ovules 30–50 per ovary. Fruit (1.8–)2.5–4 cm × 0.6–0.8 mm, glabrous, straight, erect or slightly ascending, torulose, terete, midvein prominent; style 0.4–0.8(–1) mm; stigma slightly lobed. Seeds brown, ovate, 0.5–0.8 × 0.4–0.5 mm, not margined; cotyledons obliquely incumbent. Fl. Jun–Jul, fr. Jul–Aug.

Grassy slopes, river banks; 900–3300. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shanxi, Xinjiang [Mongolia, Russia (Far East, Siberia)].

5. *Dontostemon perennis* C. A. Meyer in Ledebour, Fl. Altaic. 3: 121. 1831.

多年生花旗杆 duo nian sheng hua qi gan

Herbs perennial, 5–15 cm tall, eglandular, with a woody base, pilose, with simple, subappressed trichomes rarely to 1 mm. Stems erect or subdecumbent, branched basally and above, rarely simple, sparsely to densely pilose. Middle cauline leaves sessile, linear, 0.4–3.5 cm × 0.5–1.5(–2.5) mm, base attenuate, margin entire, ciliate with subappressed trichomes, apex obtuse or subacute. Fruiting pedicels divaricate, straight, slender, 4–8 mm, glabrous or sparsely pilose. Sepals oblong, 2.5–3.5 × 1–1.5 mm, often sparsely pilose. Petals lilac or white, obovate, 6–8.5 × 2.5–4 mm, apex rounded; claw 2.5–3.5 mm. Filaments of median stamens 3–3.5 mm, united; filaments of lateral stamens 2–2.5 mm; anthers oblong, 0.6–0.9 mm, apiculate. Ovules 20–30 per ovary. Fruit 1–2.5 cm × 0.9–1.1 mm, glabrous or sparsely puberulent, straight, divaricate, somewhat torulose, slightly flattened, midvein prominent; style to 1 mm; stigma slightly lobed. Seeds to 1.4 × 0.9 mm, not margined or winged; cotyledons incumbent. Fl. and fr. Jun–Sep.

Sandy areas, deserts. Nei Mongol [Mongolia, Russia].

The records of *Dontostemon perennis* in FRPS from Hebei, Heilongjiang, Liaoning, and Ningxia are based on eglandular plants of *D. integrifolius*. The present authors have seen no material of *D. perennis* from China, but, because of its common occurrence in neighboring Mongolia and Russia (Altai, Siberia), it is likely to be found in N Nei Mongol and NW Xinjiang. The illustrations in FRPS (33: 319. 1987) and Fl. Intramongol. (ed. 2, 2: 670. 1990) of *D. perennis* clearly represent plants of *D. integrifolius* because *D. perennis* has a strongly woody base and straight stem trichomes.

6. *Dontostemon senilis* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 26: 421. 1880.

白花花旗杆 bai hua hua qi gan

Herbs perennial, 4–25(–35) cm tall, eglandular, with a woody base, hirsute with simple, spreading trichomes to 3 mm. Stems erect or ascending, branched basally and above, rarely simple, sparsely to densely hirsute. Middle cauline leaves sessile, linear, (0.4–)1.5–3.5 cm × 0.5–3(–5) mm, sparsely to densely hirsute, base attenuate, margin entire, ciliate with spreading trichomes, apex obtuse or subacute. Fruiting pedicels divaricate, straight, stout, (2–)3–5 mm, glabrous or sparsely hirsute. Sepals oblong, 3–3.5 × 1–1.5 mm, often hirsute. Petals lilac, obovate, 6–8.5 × 1.5–2.5 mm, apex rounded; claw 3–3.5 mm. Filaments of median stamens 4–5 mm, united; filaments of lateral stamens 2–2.5 mm; anthers oblong, 1–1.3 mm, apiculate. Ovules 20–40 per ovary. Fruit (2.5–)3–5 cm × 0.9–1.1 mm, glabrous, straight, ascending or divaricate, torulose, flattened, midvein prominent; style 1–3 mm; stigma slightly lobed. Seeds oblong, 1.5–2.5 × 1–1.2 mm,

margined or narrowly winged; cotyledons accumbent. Fl. Jun–Jul, fr. Jul–Sep. $2n = 28$.

Gravelly areas; 300–1500 m. Gansu, Nei Mongol, Ningxia, Xinjiang [Mongolia].

7. *Dontostemon crassifolius* (Bunge) Maximowicz, Prim. Fl. Amur. 46. 1858.

厚叶花旗杆 hou ye hua qi gan

Andreoskia crassifolia Bunge ex Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 15: 271. 1842.

Herbs perennial, 5–10 cm tall, eglandular, with a woody base. Stems ascending, branched basally, glabrous. Middle cauline leaves sessile, linear or lanceolate-linear, rarely oblanceolate, (1–)1.8–3.5(–4.5) cm × 1–3(–5) mm, somewhat fleshy, subleathery, glabrous or rarely sparsely covered with simple trichomes, base attenuate or cuneate, margin entire, apex acute. Fruiting pedicels divaricate, straight or slightly recurved, thick, 3–6 mm, glabrous. Sepals oblong, 3–4 × 1–1.5 mm, glabrous or subapically sparsely pubescent with simple trichomes. Petals lilac, obovate, (6–)7–10 × 2–3 mm, apex obtuse; claw 3–4 mm. Filaments of median stamens 3.5–4 mm, united; filaments of lateral stamens 2–3 mm; anthers oblong, 0.9–1.3 mm, apiculate. Ovules 20–30 per ovary. Fruit (1.5–)2–2.5 cm × 1–1.7 mm, glabrous, strongly arcuate with suberect apex, torulose, terete, midvein obscure; style 1.5–2.5 mm; stigma slightly lobed. Seeds brown, oblong, ca. 1.5 × 1 mm. Fl. Jun–Aug, fr. Jul–Sep. $2n = 14$.

Sandy or gravelly areas, grasslands. Nei Mongol [Mongolia, Russia].

8. *Dontostemon elegans* Maximowicz, Enum. Pl. Mongol. 57. 1889.

扭果花旗杆 niu guo hua qi gan

Dontostemon elegans var. *semiamplexicaulis* (H. L. Yang) H. L. Yang & M. S. Yan; *D. semiamplexicaulis* H. L. Yang.

Herbs perennial, 15–50 cm tall, eglandular, with whitish woody base. Stems ascending, branched basally, glabrous. Middle cauline leaves sessile, linear to oblanceolate-linear, 2–5 cm × 3–5 mm, somewhat fleshy, subleathery, glabrous or sparsely pilose with simple trichomes to 1 mm, base attenuate, margin entire, apex obtuse to subacute. Fruiting pedicels divaricate, straight or slightly recurved, thick, 3–6 mm, glabrous. Sepals oblong or oblong-linear, 5–6 × 1–1.5 mm, sparsely pubescent with simple trichomes. Petals lilac, obovate, 9–12 × 2.5–4 mm, apex obtuse; claw 5–7 mm. Filaments of median stamens 6–8 mm, united; filaments of lateral stamens 4–6 mm; anthers oblong, 1.2–1.8 mm, apiculate. Ovules 32–60 per ovary. Fruit 3–5 cm × 2–2.5 mm, glabrous, strongly twisted, torulose, flattened, midvein prominent; style to 0.5 mm; stigma lobed. Seeds

brown, oblong, ca. 1.5–1.9 × 0.9–1.1 mm, margined; cotyledons accumbent. Fl. May–Jul, fr. Jun–Aug.

Deserts, dry sandy river beds; 1000–1500 m. Gansu, Nei Mongol, Xinjiang [Mongolia, Russia].

9. *Dontostemon pinnatifidus* (Willdenow) Al-Shehbaz & H. Ohba, *Novon* 10: 96. 2000.

羽裂花旗杆 *yu lie hua qi gan*

Herbs annual or biennial, (5–)10–40(–60) cm tall, glandular. Stems erect, often simple, branched above. Basal and lowermost cauline leaves sparsely to densely pubescent, with simple trichomes to 2 mm, glandular; petiole 2–10(–15) mm; leaf blade lanceolate, elliptic, or oblong, (0.7–)1.5–4.5(–6) cm × (1.5–)3–10(–15) mm, base attenuate or cuneate, margin dentate, serrate, or pinnatifid, ciliate, apex acute; middle and upper leaves linear and entire, or elliptic or lanceolate and dentate. Fruiting pedicels ascending or divaricate, (0.3–)0.5–1.5(–2.3) cm, glandular. Sepals oblong, 2–3(–4) × (0.8–)1–1.5 mm, glabrous or sparsely pubescent apically. Petals white, broadly obovate, (5–)6–8 × (2.5–)3–4(–5) mm, apex emarginate; claw 1–3 mm. Filaments of median stamens 2–3 mm, free, abruptly expanded and toothed below anther; filaments of lateral stamens 1.5–2.5 mm, slender; anthers oblong-ovate, 0.6–0.8 mm, apiculate. Ovules 16–60 per ovary. Fruit (1.1–)1.5–4(–5) cm × (0.8–)1–1.3 mm, straight, torulose, terete; valves glandular, with prominent midvein and marginal veins; style 0.5–1.5 mm; stigma slightly lobed. Seeds brown, oblong-ovate or narrowly oblong, 1.1–2.3 × 0.7–1 mm, narrowly margined distally; cotyledons obliquely accumbent or incumbent. Fl. and fr. Jun–Aug.

Grassy plains, hillsides, rocky slopes, roadsides, sand dunes, flood plains, grasslands; 1100–4600 m. Gansu, Hebei, Heilongjiang, Nei Mongol, Qinghai, Shandong, Sichuan, Xinjiang, Xizang, Yunnan [India, Mongolia, Nepal, Russia].

- 1a. Middle cauline leaves elliptic or lanceolate, serrate, dentate, or rarely pinnatifid, (3–)5–10(–15) mm wide; seeds oblong or ovate, 1.1–1.8 mm; cotyledons obliquely accumbent or obliquely incumbent; plants pilose, moderately to densely glandular 9a. subsp. *pinnatifidus*
- 1b. Middle cauline leaves linear to filiform, entire, 0.5–1(–1.5) mm wide; seeds narrowly oblong, 2–2.3 mm; cotyledons incumbent; plants glabrous, very sparsely glandular 9b. subsp. *linearifolius*

9a. *Dontostemon pinnatifidus* subsp. *pinnatifidus*

羽裂花旗杆(原亚种) *yu lie hua qi gan* (*yuan ya zhong*)

Cheiranthus pinnatifidus Willdenow, *Sp. Pl.* 3: 523. 1800; *Alaïda pectinata* (de Candolle) Dvorák; *Andreoskia pectinata* (de Candolle) de Candolle; *Andrzeiowskia pectinata* (de Candolle) Turczaninow; *Dimorphostemon asper* Kitagawa; *D. pectinatus* (de Candolle) Golubkova; *D. pectinatus* var. *humilior* (N.

Busch) Golubkova; *D. pinnatus* (Persoon) Kitagawa; *D. shanxiensis* R. L. Guo & T. Y. Cheo; *Dontostemon asper* Schischkin; *D. pectinatus* (de Candolle) Ledebour; *D. pectinatus* var. *humilior* N. Busch; *Erysimum glandulosum* Monnet; *E. hookeri* Monnet; *Hesperidopsis pinnatifidus* (Willdenow) Kuntze; *Hesperis pilosa* Poiret; *H. pinnata* Persoon; *H. punctata* Poiret; *Sisymbrium asperum* Pallas (1777), not Linnaeus (1753); *S. pectinatum* de Candolle; *Torulularia pectinata* (de Candolle) Ovczinnikov & Junussov.

Plants sparsely to densely pilose, moderately to densely glandular. Middle cauline leaves elliptic or lanceolate, serrate, dentate, or rarely pinnatifid, (3–)5–10(–15) mm wide. Seeds oblong or ovate, 1.1–1.8 mm; cotyledons obliquely accumbent or obliquely incumbent.

Grassy plains, hillsides, rocky slopes, roadsides; 1100–4600 m. Gansu, Hebei, Heilongjiang, Nei Mongol, Qinghai, Shandong, Sichuan, Xinjiang, Xizang, Yunnan [India, Mongolia, Nepal, Russia].

9b. *Dontostemon pinnatifidus* subsp. *linearifolius* (Maximowicz) Al-Shehbaz & H. Ohba, *Novon* 10: 97. 2000.

线叶羽裂花旗杆 *xian ye yu lie hua qi gan*

Sisymbrium glandulosum (Karelin & Kirilov) Maximowicz var. *linearifolium* Maximowicz, *Fl. Tangut.* 61. 1889.

Plants glabrous, very sparsely glandular. Middle cauline leaves linear to filiform, entire, 0.5–1(–1.5) mm wide. Seeds narrowly oblong, 2–2.3 mm; cotyledons incumbent. Fl. and fr. Jul–Aug.

• Sand dunes, flood plains, grasslands; 3100–4500 m. Gansu, Qinghai, Xinjiang.

10. *Dontostemon glandulosus* (Karelin & Kirilov) O. E. Schulz, *Notizbl. Bot. Gart. Berlin-Dahlem* 10: 554. 1930.

腺花旗杆 *xian hua qi gan*

Arabis glandulosa Karelin & Kirilov, *Bull. Soc. Imp. Naturalistes Moscou* 15: 146. 1842; *Alaïda glandulosa* (Karelin & Kirilov) Dvorák; *Dimorphostemon glandulosus* (Karelin & Kirilov) Golubkova; *D. sergievskianus* (Polozhij) S. V. Ovchinnikova; *Neotorulularia sergievskiana* (Polozhij) Czerepanov; *Sisymbrium glandulosum* (Karelin & Kirilov) Maximowicz; *Stenophragma glandulosum* (Karelin & Kirilov) B. Fedtschenko; *Torulularia glandulosa* (Karelin & Kirilov) Vassilczenko; *T. sergievskiana* Polozhij. Herbs annual or biennial, (1.5–)5–20(–30) cm tall, glandular. Stems erect or ascending, simple or many branched basally. Basal and lowermost cauline leaves pubescent, with simple trichomes to 1.5 mm, glandular; petiole 2–10(–25) mm; leaf blade lanceolate or oblong, (0.3–)0.5–2.5(–4) cm × 2–10(–15) mm, base attenuate or cuneate, margin dentate or pinnatifid, ciliate, apex acute. Fruiting pedicels ascending or divaricate, 2–8(–12) mm, glandular. Sepals oblong, 1–2(–3) × 0.5–1 mm, sparsely pubescent apically or glabrous. Petals lavender or white, spatulate, 2–4(–4.5) × (0.5–)1–1.5(–2) mm, apex obtuse or subemarginate; claw to 1.5 mm. Filaments of median stamens 1.5–2.5 mm, free, gradually expanded to broad base, toothless; filament

of lateral stamens 1–2 mm, slender; anthers broadly ovate, 0.2–0.4 mm, apiculate. Ovules 14–70 per ovary. Fruit (0.7–)1.3–3(–4) × 0.8–1.3 mm, straight, torulose, terete; valves glandular, with prominent midvein and marginal veins; style 0.5–1 mm; stigma slightly lobed. Seeds brown, ovate or oblong, 0.8–1.7 × 0.5–0.8 mm, not margined distally; cotyledons obliquely accumbent or obliquely incumbent. Fl. and fr. Jun–Aug.

Alpine meadows and steppe, sandy river banks, rock crevices, gravelly plains, dry scrub, roadsides, scree slopes; 1900–5300 m. Gansu, Nei Mongol, Ningxia, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Kashmir, Kazakstan, Nepal, Russia, Sikkim, Tajikistan].

11. *Dontostemon tibeticus* (Maximowicz) Al-Shehbaz, *Novon* 10: 334. 2000.

西藏花旗杆 xi zang hua qi gan

Nasturtium tibeticum Maximowicz, *Fl. Tangut.* 54. 1889.

Herbs biennial, (1.5–)4–14(–20) cm tall, pilose with simple trichomes to 1.5 mm, with somewhat fleshy root. Stems often few from base, simple above. Basal and lowermost cauline leaves eglandular; petiole (0.3–)1–2 cm; leaf blade lanceolate, oblong, or oblanceolate in outline, somewhat fleshy, (0.7–) 1.2–2.7(–3.5) cm × (3–

)5–1(–14) mm, base attenuate or cuneate, margin pectinate-pinnatifid, apex acute; lateral lobes (4–)7–11, to 5 × 2.5 mm, sometimes imbricate, abaxially toothed or entire, adaxially entire, acute; uppermost cauline leaves sessile. Fruiting pedicels divaricate, (2–)3–7(–9) mm, eglandular, stout. Sepals ovate, 3–4 × 1.5–2 mm, glabrous or sparsely pubescent apically, lateral pair slightly saccate. Petals white, with pink or purplish claws, obcordate, 5–8 × 2.5–3.5(–4) mm, apex emarginate; claw 3–4 mm. Filaments of median stamens 3–4 mm, free, flattened and sometimes minutely toothed on 1 side; filaments of lateral stamens 2–2.5 mm, slender; anthers oblong, 0.7–1 mm, apex obtuse. Ovules 12–20 per ovary. Fruit (0.8–)1–1.5(–1.7) cm × (0.8–)1–1.3 mm, straight, torulose, terete; valves with a prominent midvein and multicellular, glandlike warts; style 1–3 mm; stigma prominently 2-lobed, lobes subdecurrent. Seeds brown, oblong-ovate, 1.4–1.6 × 0.9–1 mm, wingless; cotyledons accumbent. Fl. Jun–Jul, fr. Jul–Aug.

• Loose scree, disturbed alpine meadows, moist gravelly slopes, permafrost gravel and sandstone, steep rocky slopes; 3200–5200 m. Gansu, Qinghai, Xizang.

64. SOLMS-LAUBACHIA Muschler, *Notes Roy. Bot. Gard. Edinburgh* 5: 205. 1912.

丛菴属 cong fu shu

Herbs perennial, sometimes pulvinate, with well-developed, thick caudex covered with petioles of previous years. Trichomes absent or simple. Stems absent or rarely present and few leaved. Basal leaves petiolate, rosulate, simple, entire. Cauline leaves absent, if present then sessile, entire. Flowers solitary on long pedicels originating from center of rosette, rarely in few- to several-flowered, ebracteate racemes elongated slightly in fruit. Fruiting pedicels slender, erect or divaricate. Sepals oblong, free or rarely united, usually persistent, erect, equal, base of lateral pair not saccate, margin not membranous. Petals purple, blue, pink, or white, suborbicular, obovate, spatulate, or oblanceolate, apex obtuse or emarginate; claw subequaling or longer than sepals. Stamens 6; filaments not dilated at base; anthers oblong-linear, obtuse at apex. Nectar glands 2, lateral, often annular; median glands absent. Ovules 5–10 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, ovate, or lanceolate, latiseptate, sessile, readily detached from pedicel; valves papery, reticulate veined, with a prominent midvein and marginal veins, glabrous or pubescent, smooth, margin angled, apex persistently united with replum; replum rounded, concealed by connate valve margin; septum complete or rarely perforated, membranous, translucent; style absent, obsolete, rarely to 1 mm; stigma capitate, entire or slightly 2-lobed, lobes not decurrent. Seeds uniseriate or biseriate, wingless, broadly ovate or suborbicular, flattened; seed coat reticulate, rugose, or papillate, not mucilaginous when wetted; cotyledons accumbent.

Nine species: Bhutan, China, Sikkim; nine species (eight endemic) in China.

1a. Flowers in racemes; stems often 1- or 2-leaved; seeds papillate 1. *S. platycarpa*

1b. Flowers solitary from a basal rosette; scapes leafless; seeds rugose or reticulate.

2a. Leaves gray, densely lanate; seeds rugose.

3a. Leaf blade lanceolate- to oblanceolate-linear, rarely oblanceolate, retrorsely lanate, 1.5–5(–7) mm wide;

fruit valves obscurely veined 2. *S. retropilosa*

3b. Leaf blade broadly spatulate, oblong, or obovate, spreading or antrorsely lanate, (5–)7–17 mm wide;

fruit valves prominently veined 3. *S. lanata*

2b. Leaves green, glabrous or pilose; seeds reticulate.

4a. Leaf blade 0.3–1(–1.5) mm wide, often grooved adaxially, fleshy, filiform to narrowly linear.

5a. Petioles remaining thickened; longest leaf blades (1.5–)2–4.5(–5.5) cm; fruiting pedicels (1–)1.5–3.5(–4.5) cm; petals (1.5–)1.7–2.2 cm; seeds 2–4 × 2–3 mm 7. *S. xerophyta*

- 5b. Petioles often becoming papery; longest leaf blades rarely to 1 cm; fruiting pedicels 0.2–0.7(–1) cm; petals 1–1.2 cm; seeds 1–2 mm in diam. 8. *S. minor*
- 4b. Leaf blade (1.5–)2–16(–23) mm wide, not grooved adaxially, not fleshy, variable in shape, never filiform, rarely narrowly linear.
- 6a. Leaf blade (7–)10–16(–23) mm wide; petiole strongly thickened, subcorky, often purplish 4. *S. eurycarpa*
- 6b. Leaf blade (1.5–)2–5(–7) mm wide; petiole thin or rarely slightly thickened, papery, often not purplish.
- 7a. Sepals united, 2.5–3.5 mm; petals white, oblanceolate, 5–6 × 1.5–2 mm 9. *S. gamosepala*
- 7b. Sepals free, 5–10 mm; petals purple, pink, or deep to turquoise blue, obovate or broadly so, 12–25 × 4–12 mm.
- 8a. Leaves pilose with straight trichomes; petioles membranous, ciliate; fruit (3–)4.5–6.5(–8) cm; seeds 3.5–5 mm 6. *S. linearifolia*
- 8b. Leaves glabrous or sparsely pubescent with crisped trichomes; petioles usually slightly thickened, not ciliate; fruit 2.5–3.5(–4.5) cm; seeds 2.5–3.5 mm 5. *S. pulcherrima*

1. *Solms-laubachia platycarpa* (J. D. Hooker & Thomson) Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 171. 1955.

总状丛蕨 zong zhuang cong fu

Parrya platycarpa J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 136. 1861, not Rydberg (1912); *P. finchiana* Dunn; *Solms-laubachia orbiculata* Y. C. Lan & T. Y. Cheo.

Herbs (2–)4–10(–15) cm tall, glabrous or densely pubescent with straight or crisped, retrorse trichomes to 1.1 mm; caudex covered with petioles of previous years. Petioles of basal leaves (0.5–)1.5–3(–6) cm, ciliate, thickened and subcorky, persistent, often ciliate at least basally; leaf blade lanceolate, elliptic, oblanceolate, or spatulate, rarely broadly obovate, suborbicular, or linear-oblanceolate, (0.5–)1–3.5(–5) cm × 2–7(–10) mm, glabrous or densely pilose, sometimes only sparsely so at leaf apex and petiole base, base cuneate or attenuate, apex acute or rounded. Cauline leaves 1 or 2, much narrower than basal ones, sessile. Racemes 4–10-flowered. Fruiting pedicels divaricate-ascending, 3–10(–15) mm. Sepals oblong to oblong-linear, 4.5–6.5(–8) × 1.5–2 mm, glabrous or pilose. Petals pale blue or purplish, obovate, (1–)1.2–1.5(–1.7) cm × 4–5 mm; claw 6–9 mm. Filaments of median staminal pairs 3–4 mm, those of lateral pair 2–2.5 mm; anthers 1–1.5 mm. Ovules 10–20 per ovary. Fruit elliptic, oblong, or broadly ovate, (1–)1.5–3 × (0.8–)1–1.7 cm; valves glabrous or shortly pilose, prominently reticulate veined; septum complete; style 0.5–3 mm; stigma entire or slightly lobed. Seeds biseriate, broadly ovate or suborbicular, papillate, 2.5–3.5 × 1.7–2.2 mm. Fl. Jun–Jul, fr. Jul–Sep.

Rocky ravines, cliff ledges, beneath boulders, stony hillsides; 4200–5800 m. Xizang [Bhutan, Sikkim].

2. *Solms-laubachia retrovillosa* Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 171. 1955.

倒毛丛蕨 dao mao cong fu

Solms-laubachia Y. C. Lan & T. Y. Cheo.

Herbs 3–10 cm tall, densely lanate with trichomes to 1.5 mm; caudex covered with petioles of previous years. Petioles of basal leaves (0.3–)1–3(–4) cm, retrorsely lanate, papery, persistent, often ciliate at least basally; leaf blade linear-lanceolate, linear-oblanceolate, or rarely oblanceolate, (0.6–)1.2–4.5(–6) cm × 1.5–5(–7) mm, retrorsely lanate, base attenuate, apex acute or obtuse. Cauline leaves absent. Flowers solitary. Fruiting pedicels erect or ascending, (1.5–)2.5–5(–7) cm. Sepals oblong to oblong-linear, 5–8 × 1.5–2.5 mm, lanate. Petals purplish, broadly obovate, (1–)1.2–1.8 cm × (5–)6–7(–9) mm; claw 5–9 mm. Filaments of median staminal pairs 3.5–5 mm, those of lateral pair 2–3 mm; anthers 1.2–1.5 mm. Ovules 10–20 per ovary. Fruit lanceolate, oblong, or broadly ovate, (1–)2–5.2(–6) × (0.6–)0.9–1.5(–2) cm; valves glabrous or lanate, obscurely reticulate veined; septum complete; style obsolete; stigma entire or slightly lobed. Seeds biseriate, broadly ovate or suborbicular, rugose, 3–4.5(–5) × (2–)2.5–3 mm. Fl. May–Jul, fr. Jul–Aug.

• Scree, open scrub; 4200–5100 m. Sichuan, Xizang, Yunnan.

3. *Solms-laubachia lanata* Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 171. 1955.

绵毛丛蕨 mian mao cong fu

Herbs 2–8 cm tall, densely lanate, with trichomes to 1.5 mm; caudex with some petiolar remains of previous years. Petioles of basal leaves 0.5–2 cm, antrorsely lanate, papery, persistent, often ciliate at least basally; leaf blade broadly spatulate, oblong, or obovate, 1.2–4 × (0.5–)0.7–1.7 cm, antrorsely lanate, base cuneate or attenuate, apex rounded or obtuse. Cauline leaves absent. Flowers not seen. Fruiting pedicels solitary, erect or ascending, 1.5–3.5 cm. Ovules 10–20 per ovary. Fruit lanceolate to lanceolate-oblong, 1.8–3.2 × 0.7–1.5 cm; valves sparsely to densely lanate, prominently reticulate veined; septum complete; style 0.5–2 mm; stigma entire or slightly lobed. Seeds biseriate, broadly ovate or suborbicular, rugose, 2–3.5 × 1.5–3 mm. Fr. Aug–Oct.

• Grasslands, meadows; 4000–5000 m. Xizang.

4. *Solms-laubachia eurycarpa* (Maximowicz) Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 169. 1955.

宽果丛蕨 *kuan guo cong fu*

Parrya eurycarpa Maximowicz, Fl. Tangut. 1: 56. 1889; *Solms-laubachia dolichocarpa* Y. C. Lan & T. Y. Cheo; *S. eurycarpa* var. *brevistipes* Y. C. Lan & T. Y. Cheo; *S. eurycarpa* var. *lasiophylla* R. F. Huang; *S. latifolia* (O. E. Schulz) Y. C. Lan & T. Y. Cheo; *S. pulcherrima* Muschler var. *latifolia* O. E. Schulz.

Herbs 3–12 cm tall, sparsely pilose, with trichomes 0.2–0.5 mm; caudex covered with petioles of previous years. Petioles of basal leaves often purplish, (0.7–)1–5(–8) cm, thickened and subcorky, persistent, shortly ciliate; leaf blade oblanceolate, broadly spatulate, oblong, or lanceolate, (1–)1.5–5(–6.5) × (0.7–)1–1.6(–2.3) cm, somewhat fleshy and drying subleathery, glabrous or sparsely pubescent, base attenuate or cuneate, apex obtuse or rounded. Cauline leaves absent. Flowers solitary. Fruiting pedicels erect or ascending, (0.5–)1–3(–5) cm. Flowers not seen. Ovules 20–32 per ovary. Fruit lanceolate to linear-lanceolate, (3.5–)5–8.5(–11) × (0.7–)0.9–1.4(–1.8) cm; valves glabrous or sparsely pilose, with a prominent midvein and obscure lateral ones; septum complete; style obsolete or to 2 mm; stigma entire or slightly lobed. Seeds biseriate, broadly ovate, reticulate, 3–4.5 × 2–3 mm. Fr. Jul–Sep.

• Scree slopes, gravelly areas, cliffs, rocky slopes, alpine meadows, glacier margins; 3800–4900 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan.

5. *Solms-laubachia pulcherrima* Muschler, Notes Roy. Bot. Gard. Edinburgh 5: 206. 1912.

丛蕨 *cong fu*

Parrya ciliaris Bureau & Franchet; *Pegaeophyton sinense* (Hemsley) Hayek & Handel-Mazzetti var. *stenophyllum* O. E. Schulz; *Solms-laubachia pulcherrima* f. *angustifolia* O. E. Schulz; *S. pulcherrima* f. *atrachophylla* Handel-Mazzetti; *S. ciliaris* (Bureau & Franchet) Botschantzev.

Herbs 3–9 cm tall, glabrous to sparsely pubescent, with crisped trichomes rarely to 1 mm; caudex covered with petioles of previous years. Petioles of basal leaves 0.7–2 cm, thickened, persistent, not ciliate; leaf blade lanceolate, oblanceolate, or linear, (0.5–)1.5–5.5(–7.5) cm × (1.5–)3–5(–7) mm, glabrous or sparsely pubescent with crisped trichomes, ciliate, base attenuate, apex acute or obtuse. Cauline leaves absent. Flowers solitary. Fruiting pedicels erect or ascending, 1.5–4.5(–5.5) cm. Sepals oblong or oblong-linear, 5–8(–10) × 1.5–2 mm, pubescent. Petals pink, or light to turquoise blue, obovate to broadly so, (1.5–)1.7–2(–2.5) cm × (5–)6.5–8(–10) mm; claw (0.7–)1–1.5 mm. Filaments of median

staminal pairs 4–5.5 mm, those of lateral pair 2.5–3.5 mm; anthers 1.4–1.6 mm. Ovules 16–20 per ovary. Fruit lanceolate, 2.5–3.5(–4.5) cm × 7–11 mm; valves glabrous or sparsely pilose along margin, reticulate veined; septum complete; style obsolete; stigma entire or slightly lobed. Seeds biseriate, broadly ovate, reticulate, 2.5–3.5 × 2–2.5 mm. Fl. May–Jul, fr. Jun–Aug.

• Scree, boulders, stony outcrops, limestone gravel or rock, crevices of limestone cliffs, stony moist meadows; 3300–5200 m. Sichuan, Xizang, Yunnan.

6. *Solms-laubachia linearifolia* (W. W. Smith) O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 477. 1926.

线叶丛蕨 *xian ye cong fu*

Parrya linearifolia W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 219. 1919, not Pavlov (1949); *Solms-laubachia linearifolia* var. *leiocarpa* O. E. Schulz.

Herbs 3–10 cm tall, sparsely to densely pilose, with straight trichomes to 1.5 mm; caudex covered with petioles of previous years. Petioles of basal leaves (0.4–)0.8–2(–3) cm, papery, persistent, ciliate; leaf blade linear, oblanceolate-linear, or rarely lanceolate, (1–)1.8–4.5(–6) cm × (1.5–)2–3.5(–5) mm, sparsely to densely pilose, ciliate, base attenuate, apex acute or obtuse. Cauline leaves absent. Flowers solitary. Fruiting pedicels erect or ascending, 1.5–3.5(–5) cm. Sepals oblong to oblong-linear, 5–8(–10) × 1.5–2 mm, pubescent. Petals purple, pink, or deep or turquoise blue, obovate to broadly so, (1.2–)1.5–2.2(–2.5) cm × (4–)6–8(–12) mm; claw 0.8–1.3 mm. Filaments of median staminal pairs (3–)3.5–5(–6) mm, those of lateral pair 2–3.5 mm; anthers 1.2–1.5 mm. Ovules 14–20 per ovary. Fruit lanceolate to linear-lanceolate, (3–)4.5–6.5(–8) cm × 6–11 mm; valves glabrous or pilose at least along margin, obscurely reticulate veined; septum complete; style obsolete; stigma entire or slightly lobed. Seeds uniseriate, broadly ovate or suborbicular, minutely reticulate, 3.5–5 × 2.5–3.5 mm. Fl. May–Jul, fr. Jul–Sep.

• Scree, stony slopes, moraine, among rocks, sandy slopes, cliff crevices, wet limestone meadows; 3400–4700 m. Sichuan, Xizang, Yunnan.

7. *Solms-laubachia xerophyta* (W. W. Smith) Comber, Notes Roy. Bot. Gard. Edinburgh 18: 249. 1934.

旱生丛蕨 *han sheng cong fu*

Parrya xerophyta W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 12: 217. 1920.

Herbs 3–10 cm tall, subglabrous or pilose, with trichomes (1–)2–3 mm; caudex covered with petioles of previous years. Petioles of basal leaves 0.7–2(–2.5) cm, thickened, persistent, ciliate pilose; leaf blade filiform to narrowly linear, (1.5–)2–5.5(–7.5) cm × 0.3–1(–1.5) mm, long ciliate or glabrous, often grooved adaxially, base attenuate, apex subacute. Cauline leaves absent. Flowers solitary. Fruiting pedicels erect or ascending,

(1–)1.5–3.5(–4.5) cm. Sepals oblong to oblong-linear, 6–8 × 1.5–2.5 mm, united or free. Petals pink or blue, obovate, (1.5–) 1.7–2.2 cm × 5–8 mm; claw 7–12 mm. Filaments of median staminal pairs 3.5–5 mm, those of lateral pair 2–3 mm; anthers 1.5–1.8 mm. Ovules 12–20 per ovary. Fruit lanceolate to linear-lanceolate, (1.5–)2–5.5(–7) cm × 5–8 mm; valves glabrous or pilose, obscurely veined; septum complete; style obsolete; stigma entire or slightly lobed. Seeds biseriate, broadly ovate or suborbicular, minutely reticulate, 2–4 × 2–3 mm. Fl. Jun–Aug, fr. Jul–Oct.

• Among rocks, cliff ledges, stony meadows, scree; 3700–5200 m. Sichuan, Yunnan.

8. *Solms-laubachia minor* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 59: 246. 1922.

细叶丛蕨 *zi ye cong fu*

Herbs 1–2.5 cm tall, densely subhirsute, with trichomes 1–2.5 mm; caudex covered with curling leaves of previous years. Petioles of basal leaves 2–5 mm, not thickened, persistent, ciliate; leaf blade filiform to narrowly linear, 2.5–10(–1.5) × 0.3–1 mm, long ciliate, often grooved adaxially, base attenuate, apex subacute. Cauline leaves absent. Flowers solitary. Fruiting pedicels erect or ascending, 2–7(–10) mm. Sepals oblong to oblong-linear, 4.5–5.5 × 1–1.5 mm, free. Petals pinkish mauve, pale lilac, or purple, obovate, 1–1.2 cm × 3.5–5 mm; claw 6–7 mm. Filaments of median staminal pairs 3–4 mm, those of lateral pair 2–2.5 mm; anthers 1.2–1.5 mm. Ovules 12–16 per ovary. Fruit lanceolate, 1.5–2 cm × 4–5 mm; valves densely subhirsute, obscurely

veined; septum complete or perforated; style 0.5–1 mm; stigma 2-lobed. Seeds biseriate, suborbicular, minutely reticulate, 1–1.5 mm in diam. Fl. May–Jun, fr. Jul–Aug.

• Rocky crevices, cliff ledges, alpine meadows, scree, sandy areas; 2500–4600. Sichuan, Yunnan.

9. *Solms-laubachia gamosepala* Al-Shehbaz & G. Yang, Harvard Pap. Bot. 5: 380. 2001.

合萼丛蕨 *he e cong fu*

Herbs perennial, forming woody cushions ca. 2 cm tall, very sparsely pilose with crisped trichomes to 0.5 mm; caudex covered with persistent leaves of previous years. Petioles of basal leaves 0.5–1.5 cm, becoming strongly thickened, persistent, ciliate; leaf blade spatulate or oblanceolate, 0.5–1.5 cm × 3–5 mm, subapically pilose, base cuneate, apex subacute. Cauline leaves absent. Flowers solitary. Fruiting pedicels erect ca. 7 mm.

Sepals oblong, 2.5–3.5 × ca. 1 mm, united, membranous at apex, subapically sparsely pilose. Petals white, drying pink, oblanceolate, 5–6 × 1.5–2 mm; claw ca. 3 mm. Filaments of median staminal pairs ca. 4 mm, those of lateral pair ca. 3 mm; anthers 0.7–0.9 mm. Fruit lanceolate, 2.5–3 cm × 4–5 mm; valves glabrous, obscurely veined; septum complete; style ca. 1 mm; stigma entire. Seeds uniseriate, oblong, minutely reticulate, ca. 3 × 1.5 mm. Fl. and fr. Jun.

• Limestone scree; ca. 4700 m. Yunnan.

Solms-laubachia gamosepala is at present known only from the type collection, ACE 855 (K).

65. TETRACME Bunge, Delect. Seminum Hort. Bot. Dorpat. 1836: 7. 1836.

四齿芥属 *si chi jie shu*

Tetracmidion Korshinsky.

Herbs annual, canescent. Trichomes stalked, stellate or dendritic, rarely mixed with fewer, simple or forked, subsetose ones. Stems often several branched basally. Basal leaves petiolate, not rosulate, simple, entire, sinuate-dentate, or pinnatifid. Cauline leaves similar to basal. Racemes ebracteate, corymbose, elongated in fruit. Fruiting pedicels slender or thickened and nearly as wide as fruit base, erect or ascending. Sepals ovate, ascending, base of lateral pair not saccate, margin membranous. Petals white, subequaling or much longer than sepals; blade obovate, spatulate, or oblanceolate, apex obtuse; claw distinct or undifferentiated from blade. Stamens 6, slightly tetradynamous; filaments dilated at base; anthers ovate, apiculate at apex. Nectar glands 4, lateral, 1 on each side of lateral filament; median glands absent. Ovules 2–14 per ovary. Fruit dehiscent siliques or indehiscent silicles, linear, oblong, or ovoid, strongly latiseptate, terete, or 4-angled, sessile; valves obscurely veined, tomentose, smooth or torulose, subapically 4-horned; replum flattened; septum complete, membranous; style absent, obsolete, or distinct; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent.

Eight species: primarily in C Asia; two species in China.

1a. Lower leaves entire or repand; fruit torulose, with stellate and subsetose simple trichomes; subapical horns 0.5–1.8(–2.2) mm, erect or divaricate-ascending, straight; valves not extended beyond horns into stylelike apex 1. *T. quadricornis*

1b. Lower leaves pinnatifid, pinnatifid, or sinuate-dentate; fruit not torulose, with only stellate trichomes; subapical horns (2.5–)4–7(–8) mm, divaricate-reflexed, strongly recurved; valves extended beyond

horns

into stylelike apex 1–2 mm 2. *T. recurvata*

1. **Tetracme quadricornis** (Stephan) Bunge, Delect. Seminum Hort. Bot. Dorpat. 1836: 7. 1836.

四齿芥 si chi jie

Erysimum quadricorne Stephan in Willdenow, Sp. Pl. 3: 514. 1800; *Notoceras quadricornis* (Stephan) de Candolle; *Tetracme elongata* Kitamura; *T. quadricornis* var. *longicornis* Regel.

Herbs (3–)5–20(–25) cm tall, tomentose throughout. Stems ascending, branched at or near base. Basal and lowermost cauline leaves with petioles 2–6(–10) mm; leaf blade oblong-linear or narrowly oblanceolate, (1–)2–5 cm × (1–)2–6(–8) mm, base attenuate, margin entire or rarely repand-dentate, apex obtuse. Upper cauline leaves similar to basal, smaller, subsessile, entire. Fruiting pedicels 1–1.5 mm, subclavate, stout, about as wide as fruit base, appressed to rachis. Sepals ovate, 0.7–0.9(–1) mm, distally white and petaloid. Petals white, narrowly oblanceolate, 0.5–0.8(–0.9) × 0.2–0.3 mm, not clawed. Filaments white, 0.4–0.6 mm; anthers ovate, 0.2–0.3 mm. Ovules 8–14 per ovary. Fruit linear, 5–8 × 0.7–1 mm, compressed, torulose, base appressed to rachis, distal half arcuate or recurved; valves tomentose, with stellate trichomes mixed with fewer, much larger, subsetose simple ones to 1.5 mm, apex not extended beyond horns; subapical horns 0.5–1.8(–2.2) mm, erect or divaricate-ascending, straight; style absent. Seeds yellow or light brown, oblong, 0.7–0.9 × 0.4–0.6 mm. Fl. and fr. May–Jun.

Deserts, sand dunes, field margins, roadsides, disturbed areas; 300–3800 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan, Uzbekistan].

The record of *Tetracme contorta* Boissier in FRPS is based on misidentified plants of *T. quadricornis*. True *T. contorta* is endemic to W Pakistan and adjacent Afghanistan and has petals 2–3 mm, very lax inflorescences, and fruit without subsetose, simple trichomes.

2. **Tetracme recurvata** Bunge, Arbeiten Naturf. Vereins Riga 1: 158. 1848.

弯角四齿芥 wan jiao si zhi jie

Herbs (4–)10–30(–40) cm tall, tomentose throughout. Stems ascending, several branched at or near base. Basal and lowermost cauline leaves with petioles 0.3–2 cm; leaf blade oblong-linear or linear-lanceolate, (1–)2–5(–6) cm × 3–8 mm, base attenuate, margin pinnatifid, pinnatifid, or sinuate-dentate, apex obtuse. Upper cauline leaves similar to basal, smaller, subsessile, sometimes entire. Fruiting pedicels 1–2 mm, subclavate, stout, about as wide as fruit base, appressed to rachis. Sepals ovate, 0.6–1 mm, distally white and petaloid. Petals white, spatulate, 0.8–1(–1.2) × 0.4–0.5 mm, attenuate to clawlike base. Filaments white, 0.5–0.7 mm; anthers ovate, 0.2–0.3 mm. Ovules 4–8 per ovary. Fruit linear, (4–)6–8(–10) × 0.8–1 mm, compressed, not torulose, base appressed to rachis, distal half arcuate or recurved; valves tomentose, exclusively with stellate trichomes, apex extend beyond horns into flattened, triangular, stylelike part 1–2 mm; subapical horns (2.5–)4–7(–8) mm, divaricate-reflexed, strongly recurved; style distinct, to 1 mm. Seeds yellow or light brown, oblong, 1.2–1.6 × 0.5–0.7 mm. Fl. and fr. Apr–Jun.

Sandy deserts, plains; 200–600 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

66. MATTHIOLA R. Brown in W. T. Aiton, Hortus Kew. 4: 119. 1812, nom. cons.

紫罗兰属 zi luo lan shu

Herbs annual or perennial. Trichomes eglandular, stalked or sessile, stellate or dendritic, rarely forked or simple, sometimes mixed with glandular, multicellular, multiseriate ones. Basal leaves petiolate, rosulate or not, simple, entire, dentate, or pinnatisect. Cauline leaves petiolate or sessile and not auriculate, entire, dentate, or pinnatisect. Racemes ebracteate, elongated in fruit. Fruiting pedicels erect or divaricate. Sepals oblong or linear, connivent, erect, base of lateral pair strongly saccate. Petals yellowish green, white, pink, purple, or brown, much longer than sepals, clawed; blade broadly obovate, spatulate, oblong, or linear, flat or involute, crisped or not, apex obtuse or emarginate. Stamens 6, strongly tetradynamous; filaments not dilated at base; anthers oblong or linear, obtuse at apex. Nectar glands lateral, 4, when 1 on each side of lateral stamen, or 2, when semiannular and intrastaminal; median glands absent. Ovules (5–)15–60 per ovary. Fruit dehiscent siliques, linear, terete or latiseptate, sessile; valves with a prominent midvein, often torulose; replum rounded; septum complete, often opaque, veinless; style obsolete or up to 3 mm; stigma conical, 2-lobed, lobes prominent, connivent, free or connate, decurrent, unappendaged or with 2 or 3 hornlike appendages. Seeds uniseriate, narrowly winged or wingless, oblong, ovate, or orbicular, flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

About 50 species: E and N Africa, Asia, Europe; one species in China.

Matthiola incana (Linnaeus) R. Brown is widely cultivated as an ornamental in China, but it is not known to have become naturalized.

1. **Matthiola chorassanica** Bunge ex Boissier, Fl. Orient. 1: 151. 1867. 伊朗紫罗兰 yi lang zi luo lan

Matthiola flavida Boissier var. *integrifolia* (Komarov) O. E. Schulz; *M. integrifolia* Komarov; *M. tenera* K. H. Rechinger.

Herbs perennial, (10–)15–45(–53) cm tall, eglandular, tomentose throughout, with finely branched dendritic trichomes; caudex simple or branched. Stems erect, branched from caudex, sometimes also above. Basal leaves subrosulate; petiole (0.5–) 1–3(–5) cm; leaf blade ovate, narrowly oblong, or elliptic, (1–) 2–4.5(–6) × (0.3–)0.5–1.8(–2.4) cm, base cuneate, margin entire, repand, or coarsely dentate, rarely sinuate or pinnatifid, apex acute or obtuse. Cauline leaves few to many, similar to basal, uppermost much narrower and subsessile. Fruiting pedicels (1–)2–6(–10) mm, stout or slender, divaricate or ascending. Sepals linear, 8–12 × 1–1.5, tomentose. Petals greenish, brown, or purplish; limb linear, circinate involute, crisped, 0.9–1.4 cm × 1.2–1.5 mm, apex obtuse; claw flattened, 0.8–1.2 cm. Median filament pairs 6–8 mm, lateral pair 3–4 mm; anthers linear, ca. 2.5 mm. Fruit narrowly linear, (6–)7–11 cm × (1.5–)1.8–2.7 mm, flattened, torulose; valves tomentose, with a prominent midvein; style obsolete or

to 1 mm; stigma conical, lobes broad. Seeds 2–2.5 × 1.7–2 mm; wing ca. 0.5 mm. Fl. Jun–Jul, fr. Jul–Aug. $2n = 12$.

Rocky slopes; 900–3900 m. Xinjiang, Xizang [Afghanistan, Pakistan, Tajikistan, Uzbekistan; SW Asia].

The above first record from China is based on *Schlagintweit 1375* (P), *Schlagintweit 1485* (GH), *Winterbottom 712* (K), *Falconer 138* (GH, P), and *Thomson s.n.* (E, K, P), all of which are from Xizang, as well as *Team P-041* (PE) from Xinjiang. The alleged differences between *M. chorassanica* and the synonyms listed above are based entirely on whether the cauline leaves are borne along the entire stem or are nearly basal, and whether they are entire, repand, or dentate. All of these characters show continuous variation, and there are no other differences that separate the taxa. Jafri (Fl. West Pakistan 55: 202. 1973) wrongly cited one of the above specimens, *Winterbottom 712*, as *M. flavida* Boissier, but that species has flat petals instead of the circinate involute ones that are characteristic of *M. chorassanica*.

The record from Xinjiang (Fl. Xinjiang. (2)(2): 164. 1995) of *Matthiola odoratissima* (Pallas ex Marschall von Bieberstein) R. Brown, which is endemic to the Caucasus and neighboring areas, is based on misidentified plants of *M. chorassanica*.

67. MICROSTIGMA Trautvetter, Pl. Imag. Descr. Fl. Russ. 36. 1845.

小柱芥属 xiao zhu jie shu

Herbs annual or perennial, tomentose. Trichomes stalked, dendritic, mixed with stalked glands, rarely glands absent. Stems simple or branched. Basal leaves petiolate, rosulate or not, simple, entire or dentate. Cauline leaves similar to basal. Racemes ebracteate, elongated in fruit. Fruiting pedicels thickened, strongly reflexed. Sepals oblong-linear or linear, connivent, base of lateral pair saccate, margin membranous. Petals yellow, creamy white, or purple-lilac; blade linear, narrowly oblong, or spatulate, apex obtuse or rounded; claw subequaling sepals. Stamens 6, strongly tetradynamous; filaments not dilated at base; anthers oblong-linear or linear, obtuse at apex. Nectar glands 2, lateral, annular; median glands absent. Ovules 4–16 per ovary. Fruit tardily dehiscent or indehiscent siliques or silicles, narrowly ovoid, ellipsoid, or oblong-linear, 4-angled or latiseptate, sessile, reflexed; valves thickened, woody or leathery, veinless, densely tomentose, glandular or eglandular, smooth or torulose; replum slightly flattened; septum complete, thickened, opaque, veinless; style stout, to 5 mm, pubescent; stigma capitate, 2-lobed. Seeds uniseriate, broadly winged, ovate or orbicular, strongly flattened; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent.

Two species: China, Mongolia, Russia; one species in China.

1. *Microstigma brachycarpum* Botschantzev, Bot. Zhurn. (Moscow & Leningrad) 44: 1485. 1959.

短果小柱芥 duan guo xiao zhu jie

Microstigma junatovii Grubov.

Herbs annual, 7–25 cm tall, densely tomentose, glandular or rarely eglandular. Stems erect, simple or branched. Lower and middle cauline leaves with petioles 0.5–2.2 cm; leaf blade lanceolate, oblanceolate, or obovate, 0.9–2.5(–4) cm × 1.5–8(–20) mm, densely tomentose, base attenuate or cuneate, margin entire or few toothed, apex acute. Fruiting pedicels strongly reflexed, thickened, 2–3 mm. Sepals oblong-linear, 5.5–7(–9) × 0.7–1 mm, white margined. Petals creamy white or yellowish, linear, 1–1.5 cm × 0.8–1.5 mm.

68. CHORISPORIA R. Brown ex de Candolle, Mém. Mus. Hist. Nat. 7: 237. 1821, nom. cons.

离子芥属 li zi jie shu

Chorispermum W. T. Aiton, nom. rej.

Median filament pairs 3.5–4 mm, lateral pair 2–2.5 mm; anthers linear-oblong, 1.3–1.6 mm. Ovules 4 per ovary. Fruit narrowly ovoid or ellipsoid, 0.9–1.6 cm × 3–4.5 mm, 4-angled, indehiscent; valves woody, not veined, densely covered with dendritic trichomes with stalks to 1.5 mm, sparsely glandular or eglandular, depressed at middle, strongly thickened at margin; septum leathery; style 3–4 mm. Seeds ovate, 2–2.8 × 1.4–1.6 mm; wing to 0.5 mm wide at distal end, narrower along margin. Fl. May–Jul, fr. Jun–Jul.

Dry mountain slopes; ca. 1900 m. Gansu [Mongolia].

Microstigma junatovii is an eglandular form of *M. brachycarpum* with slightly broader cauline leaves.

Herbs annual or perennial. Trichomes stalked, glandular, mixed with eglandular simple ones. Stems leafy or not. Basal leaves petiolate, rosulate or not, sinuate-dentate, pinnatifid, or pinnatisect, rarely entire. Cauline leaves absent or shortly petiolate, not auriculate, similar to basal ones. Racemes ebracteate, elongated in fruit, rarely flowers solitary on long pedicels from axils of rosette leaves. Sepals ovate, oblong, or linear, erect, base of lateral pair strongly saccate. Petals yellow or purple or lavender, much longer than sepals; blade broadly obovate, obcordate or rarely oblanceolate, apex emarginate or rarely obtuse; claws strongly differentiated from blade. Stamens 6, strongly tetradynamous; filaments not dilated at base; anthers narrowly oblong or linear, obtuse at apex. Nectar glands 2 or 4, lateral, intrastaminal or 1 on each side of lateral stamen; median glands absent. Ovules (5–)10–25(–30) per ovary. Fruit breaking into 1-seeded units, lomentaceous, linear, terete, sessile, slightly to strongly torulose or submoniliform; units indehiscent, with a thick corky or woody wall; replum flattened, persisting after segments fall off; septum becoming corky and splitting at middle; style 1.5–21 mm, beaklike; stigma conical, 2-lobed, lobes decurrent, strongly connivent. Seeds uniseriate, wingless, oblong; not mucilaginous when wetted; cotyledons accumbent.

Eleven species: primarily C and SW Asia; eight species (one endemic) in China.

1a. Plants annual; flowering stems leafy.

2a. Flowers purple; fruit slightly torulose 3. *C. tenella*

2b. Flowers yellow; fruit strongly torulose.

3a. Petals narrowly oblanceolate, 3–4 × 0.7–1 mm, rounded at apex; anthers 0.5–0.9 mm; style 2–4 mm

in fruit; fruiting pedicels suberect or ascending, subappressed 2. *C. tashkorganica*

3b. Petals broadly obovate, 6–20 × 3–7 mm, apex emarginate; anthers 1.5–2 mm; style 5–25 mm in fruit;

fruiting pedicels divaricate or recurved 1. *C. sibirica*

1b. Plants perennial with a caudex; flowering stems leafless or rarely 1-leaved, or flowers solitary.

4a. All flowers borne on solitary pedicels arising from basal rosette 4. *C. bungeana*

4b. Flowers always in racemes.

5a. Flowers purple.

6a. Sepals 3–4 mm; petals 6–10 mm; pedicel 0.3–1(–1.5) cm; fruiting style 1.5–3 mm 6. *C. sabulosa*

6b. Sepals 6–7 mm; petals 15–18 mm; pedicel (1.7–)2–3.5(–5.5) cm; fruiting style 5–7 mm .. 5. *C. greigii*

5b. Flowers yellow.

7a. Leaves pinnatisect; petals 12–15 × 5–7 mm; sepals oblong, 5.5–7 mm 7. *C. songarica*

7b. Leaves subentire, sinuate-dentate, or pinnatifid; petals 5–8(–10) × 2–4 mm; sepals ovate, 2–3(–3.5) mm 8. *C. macropoda*

1. *Chorispora sibirica* (Linnaeus) de Candolle, Syst. Nat. 2: 437. 1821.

西伯利亚离子芥 *xi bo li ya li zi jie*

Raphanus sibiricus Linnaeus, Sp. Pl. 2: 669. 1753;

Chorispora gracilis A. Ernst.

Herbs annual, (3–)7–22(–35) cm tall, with multicellular glandular trichomes, these sometimes mixed with simple ones to 2 mm. Stems ascending, branched basally and above. Basal leaves not rosulate; petiole (0.5–)1–2(–3) cm, often ciliate; leaf blade oblanceolate or oblong, (1.5–)2–4(–6) cm × 4–10(–15) mm, glandular, base cuneate or attenuate, margin sinuate-dentate or pinnatisect, with oblong or lanceolate lobes, apex acute. Cauline leaves similar to basal ones, progressively reduced in size upward, uppermost often sessile. Flowers in racemes. Fruiting pedicels slender, (6–)7–10(–14) mm, divaricate, slightly recurved, glandular. Sepals narrowly oblong, 3–4(–5) × 1–2 mm. Petals bright yellow, broadly obovate, 7–9(–12) × 3–4(–5) mm, emarginate at apex; claw 4–5 mm. Filaments 3–5 mm; anthers narrowly oblong, ca. 1.5

mm. Fruit linear-cylindric, 1.4–2(–2.5) cm × 1.5–2 mm, slightly curved upward, strongly torulose and with 6–12 constrictions on each side, glandular or rarely glabrescent; style (3–)5–9 mm. Seeds brown, oblong, 1–1.2 × 0.6–0.9 mm. Fl. Apr–Aug, fr. Jun–Sep.

Roadsides, fields, river beaches, grassy slopes; 700–3800 m. Xinjiang, Xizang [India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia].

2. *Chorispora tashkorganica* Al-Shehbaz et al., Novon 10: 106. 2000.

塔什离子芥 *ta shi li zi jie*

Herbs annual, 12–20 cm tall, densely glandular throughout, apices of sepals and lobes of young leaves sparsely pubescent with simple trichomes to 1 mm, glabrous elsewhere. Stems several from base, decumbent, unbranched. Basal leaves rosulate; petiole 0.5–2.5 cm, not ciliate, expanded at base; leaf blade linear to linear-lanceolate in outline, 1–5 cm × 1–10 mm, densely glandular, base attenuate, margin pinnatisect or sinuate-dentate, apex acute; lateral lobes deltate, acute, smaller than terminal lobe. Cauline leaves few, similar to basal ones but with fewer lobes.

Racemes elongated considerably in fruit. Fruiting pedicels 1.5–3 mm, glandular, ascending to suberect, subappressed. Sepals yellowish, ovate, 2–3 × ca. 1 mm, glandular, margin membranous. Petals yellow, oblanceolate, 3–4 × 0.7–1 mm, rounded at apex; claw 2–2.5 mm. Filaments 2–3 mm; anthers oblong, 0.5–0.9 mm. Fruit linear-cylindric, 1.2–1.5 cm × 1.5–2 mm, corky, strongly torulose, with 5–8 constrictions on each side, glandular; style 2–4 mm. Seeds brown, oblong, ca. 1.4 × 1 mm. Fl. and fr. Jun–Jul.

• Rocky slopes; 4000–4200 m. SW Xinjiang (Taxkorgan Tajik Zizhixian).

3. *Chorispora tenella* (Pallas) de Candolle, Syst. Nat. 2: 435. 1821.

离子芥 li zi jie

Raphanus tenellus Pallas, Reise Russ. Reich. 3: 741. 1776; *R. monnetii* H. Léveillé.

Herbs annual, (5–)10–40(–56) cm tall, with multicellular glandular trichomes, these sometimes mixed with simple ones. Stems erect, branched above. Basal leaves not rosulate, often withered by flowering; petiole (0.5–)1–2(–4) cm; leaf blade oblanceolate or oblong, (1.5–)2.5–8(–13) × (0.4–)0.8–2(–3) cm, glandular, base cuneate or attenuate, margin sinuate-dentate to dentate, apex acute. Cauline leaves similar to basal ones, progressively reduced in size upward, uppermost often entire and sessile. Flowers in racemes. Fruiting pedicels stout, (2–)3–5 mm, divaricate, glandular. Sepals purplish, linear, (3–)4–5(–6) × 0.5–0.7 mm. Petals purple, oblanceolate, 8–10(–12) × 1–2 mm, obtuse at apex; claw 6–7 mm. Filaments 4–6(–7) mm; anthers narrowly oblong, ca. 1.5 mm. Fruit linear-cylindric, (1.4–)1.8–2.5(–3) cm × 1.5–2 mm, slightly curved upward, corky, subturulose, with 8–12 constrictions on each side, glandular or rarely glabrescent; style 1–1.7(–2.1) cm. Seeds brown, oblong, 1–1.4 × 0.8–1 mm. Fl. Apr–Jun, fr. May–Aug. $2n = 14$.

Pastures, roadsides, fields, waste areas; 100–2200 m. Anhui, Gansu, Hebei, Henan, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Korea, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe].

4. *Chorispora bungeana* Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 96. 1941.

高山离子芥 gao shan li zi jie

Chorispora excapa Bunge ex Ledebour; *C. tianschanica* Z. X. An.

Herbs perennial, scapose, with well-developed branched caudex; multicellular glandular trichomes sometimes mixed with simple ones to 2 mm. Basal leaves rosulate, persistent; petiole (1–)1.5–3(–4) cm, ciliate, expanded at base; leaf blade oblanceolate or oblong, (0.8–)1.2–4(–5) cm × 3–10(–15) mm, sparsely

to densely glandular, pilose or glabrous, base cuneate or attenuate, margin pinnatifid or pinnatisect, with up to 12, oblong or ovate lobes, or sinuate-dentate, dentate, repand, or entire, apex obtuse. Cauline leaves absent. Flowers solitary, arising from rosette. Fruiting pedicels (1–)1.5–3(–4) cm, densely glandular or subglabrous, sometimes also pilose. Sepals purplish, linear-oblong, (6–)7–9(–10) × 1–1.5 mm. Petals purple, broadly obovate or obcordate, (1.5–)1.7–2(–2.3) cm × 6–8 mm, emarginate or subrounded at apex; claw 0.9–1.2 cm. Filaments 6–10 mm; anthers narrowly oblong, 1.5–2.5 mm. Fruit linear-cylindric, 2–3 cm × 1.5–2 mm, corky, strongly torulose, with 8–12 constrictions on each side, glabrescent; style 4–7 mm. Seeds brown, oblong, 1.2–1.5 × 0.7–1 mm. Fl. Jun–Aug, fr. Jul–Sep.

Grasslands, open slopes; (2200–)3000–4200 m. Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan].

Chorispora tianschanica was said to differ from *C. bungeana* in being completely glandular and with serrate leaf margins and rounded petal apices. However, these alleged differences do not hold, and *C. bungeana* is highly variable throughout most of its range, especially in leaf morphology and the density of glandular papillae.

5. *Chorispora greigii* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 296. 1878.

具萼离子芥 ju ting li zi jie

Herbs perennial, 7–25 cm tall, with slender, often unbranched caudex, eglandular, glabrous throughout or rarely sparsely shortly pilose on sepals. Basal leaves rosulate; petiole 0.5–3 cm, glabrous, not expanded at base; leaf blade broadly oblanceolate, linear-lanceolate, or oblong, 2–7 cm × 3–15 mm, glabrous, base cuneate or attenuate, margin pinnatifid, with up to 8 oblong or ovate lobes, or sinuate-dentate, apex obtuse. Cauline leaves few, similar to basal ones but much smaller. Flowers in racemes. Fruiting pedicels (1.7–)2–3.5(–5.5) cm, glabrous. Sepals purplish, oblong, 5–6(–7) × ca. 2 mm. Petals purple, broadly obovate or obcordate, 1.2–1.8 cm × 5–6 mm, emarginate at apex; claw 6–8 mm. Filaments 5–7.5 mm; anthers narrowly oblong, 2.5–3 mm. Fruit linear-cylindric, 2.5–4 cm × 2–3 mm, corky, strongly torulose, with 7–12 constrictions on each side, glabrous; style 5–9 mm. Seeds brown, oblong, 1.3–1.6 × 1–1.2 mm. Fl. and fr. Jun–Jul.

Mountains, grassy areas; 1800–2200 m. Xinjiang [Kyrgyzstan].

6. *Chorispora sabulosa* Cambessèdes in Jacquemont, Voy. Inde 4(Bot.): 15. 1844.

砂生离子芥 sha sheng li zi jie

Chorispora elegans Cambessèdes; *C. elegans* var. *integrifolia* O. E. Schulz; *C. elegans* var. *sabulosa* (Cambessèdes) O. E. Schulz; *C. elegans* var. *stenophylla* O. E. Schulz; *C. sabulosa* var. *eglandulosa* Narayanswamy ex Naithani & Uniyal.

Herbs perennial, 3–15 cm tall, with slender, branched caudex, glandular, glabrous or sparsely shortly pilose. Basal leaves rosulate; petiole 1–4 cm, usually ciliate, expanded at base; leaf blade oblanceolate or oblong, (1–)2–5(–8) cm × 3–7(–10) mm, glabrous or glandular,

base cuneate, margin pinnatifid, sinuate-dentate or entire, apex acute or obtuse. Cauline leaves absent. Flowers in racemes. Fruiting pedicels 3–10(–15) mm, glabrous. Sepals purplish, ovate, 3–4 × 1.5–2 mm. Petals purple, broadly obovate, 6–10 × 3–5 mm, obtuse at apex; claw 3.5–5 mm. Filaments 3–5 mm; anthers oblong, 1–1.5 mm. Fruit linear-cylindric, 1–1.5(–1.7) cm × ca. 2 mm, corky, strongly torulose, with 2–6 constrictions on each side, glabrous or glandular; style 1.5–3 mm. Seeds brown, oblong, ca. 1.3 × 1 mm. Fl. and fr. Jun–Jul.

Mountain slopes; 2900–4800 m. Xizang [India, Kashmir, Kazakstan, Pakistan, Tajikistan, Uzbekistan].

Chorispora sabulosa and *C. elegans* were simultaneously published by Cambessèdes. Hooker and Thomson (J. Proc. Linn. Soc., Bot. 5: 181. 1861), who were the first to record the species from Xizang, listed the latter name as a synonym of *C. sabulosa*, which name therefore has priority under Art. 11.5 of the St. Louis Code. The species was not listed in FRPS or in Fl Xizang. (vol. 2. 1985), but the record from Xizang is here confirmed by the study of material cited by Hooker and Thomson (loc. cit.) and also by *Jäschke s.n.* (WU).

7. *Chorispora songarica* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 2: 57. 1842.

准噶尔离子芥 *zhun ga er li zi jie*

Chorispora sibirica (Linnaeus) de Candolle var. *songarica* (Schrenk) O. Fedtschenko; *C. pamirica* Pachomova.

Herbs perennial, (0.4–)0.7–1.8(–4) cm tall, with stout, branched or simple caudex, sparsely to moderately glandular, sparsely covered with simple trichomes to 1 mm. Basal leaves rosulate; petiole 1–2.5(–6.5) cm, glabrous or sparsely ciliate, expanded at base; leaf blade oblong or oblanceolate, 1–2.5 cm × 2–8 mm, glandular or glabrous, base cuneate or attenuate, margin pinnatisect, with oblong or ovate lobes, apex acute. Cauline leaves few. Flowers in racemes. Fruiting pedicels (0.6–)1–1.8 (–2.5) cm, glabrous or glandular. Sepals yellowish, oblong, 5.5–7 × 1.5–2 mm. Petals yellow, broadly obovate, 1.2–1.5 cm × 5–7 mm,

emarginate at apex; claw 6.5–9 mm. Filaments 6–7.5 mm; anthers oblong, ca. 2 mm. Fruit linear-cylindric, 1.5–2 cm × ca. 2 mm, corky, strongly torulose, with 5–8 constrictions on each side, glandular; style 3–5 mm. Seeds brown, oblong, ca. 1.2 × 0.7 mm. Fl. and fr. Jun–Jul.

Mountain slopes; 4300–4700 m. Xinjiang [Kazakstan, Tajikistan, Uzbekistan].

Chorispora songarica was first recorded from China in Fl. Xinjiang. (2(2): 168. 1995). The occurrence in China is here confirmed based on *Xinjiang Expedition 2268* (WUK) and *Xinjiang Expedition 9740* (KUN), as well as on *Robrowski s.n.*, 25 Mar 1889 (LE).

8. *Chorispora macropoda* Trautvetter, Bull. Soc. Imp. Naturalistes Moscou 33(1): 109. 1860.

小花离子芥 *xiao hua li zi jie*

Chorispora pectinata Hadac.

Herbs perennial, 4–15(–28) cm tall, with stout, branched or simple caudex, glandular throughout, sparsely covered with simple trichomes to 1 mm. Basal leaves rosulate; petiole 0.5–2.5(–4) cm, ciliate, expanded at base; leaf blade broadly oblanceolate or linear-lanceolate, 0.5–3(–4) cm × 2–7(–15) mm, glandular, base cuneate or attenuate, margin subentire, dentate, sinuate-dentate, or pinnatifid and with up to 8, oblong or ovate lobes, apex acute or obtuse. Cauline leaves absent. Flowers in racemes. Fruiting pedicels (6–)7–10(–15) mm, glandular. Sepals yellowish, ovate, 2–3(–3.5) × 1.5–2 mm. Petals yellow, 5–8(–10) × 2–4 mm; blade broadly obovate, emarginate at apex; claw 3–5 mm. Filaments 2–3 mm; anthers oblong, ca. 1.5 mm. Fruit linear-cylindric, 1–1.5(–2) cm × 2–2.3 mm, corky, strongly torulose, with 5–8 constrictions on each side, glandular; style 2–4 mm. Seeds brown, oblong, 1.1–1.3 × 0.6–0.8 mm. Fl. and fr. Jun–Jul.

Gravelly areas, slopes; (2200–)3000–4000(–4500) m. Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan].

69. DIPTYCHOCARPUS Trautvetter, Bull. Soc. Imp. Naturalistes Moscou 33(1): 108. 1860.

异果芥属 *yi guo jie shu*

Alloceratium J. D. Hooker & Thomson; *Orthorrhiza* Stapf.

Herbs annual. Trichomes eglandular, simple, mixed with glandular ones. Stems erect, simple basally, often branched above. Basal leaves petiolate, not rosulate, sinuate-dentate, dentate, or rarely pinnatisect. Cauline leaves similar to basal ones, uppermost entire, sessile. Racemes few flowered, ebracteate, elongated in fruit. Fruiting pedicels thickened, ascending or subdivaricate. Sepals oblong-linear, connivent, erect, base of lateral pair saccate. Petals purple or whitish, longer than sepals; blade linear-oblanceolate, apex obtuse; claw obscurely differentiated from blade. Stamens 6, erect, tetradynamous; filaments not dilated at base; anthers ovate, obtuse at apex. Nectar glands 4, lateral, 1 on each side of lateral stamen; median glands absent. Ovules 10–40 per ovary. Fruit dimorphic siliques, linear, sessile, torulose, glabrous; lowermost fruit indehiscent, terete, corky, breaking into 1-seeded units; upper fruit dehiscent, latisepate, with obscurely veined leathery valves; replum rounded; septum corky in lower fruit, opaque, complete, and veinless in upper ones; style to 8 mm, stout, cylindric or subconical; stigma capitate, 2-lobed, lobes connivent. Seeds uniseriate, broadly winged, oblong or orbicular, strongly flattened; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent.

One species: C and SW Asia, SE Europe.

1. *Diptychocarpus strictus* (Fischer ex Marschall von Bieberstein) Trautvetter, Bull. Soc. Imp. Naturalistes Moscou 33(1): 108. 1860.

异果芥 yi guo jie

Raphanus strictus Fischer ex Marschall von Bieberstein, Fl. Taur.-Caucas. 3: 452. 1819–1820; *Alloцерatium strictum* (Fischer ex Marschall von Bieberstein) J. D. Hooker & Thomson; *Chorispora stenopetala* Regel & Schmalhausen; *C. stricta* (Fischer ex Marschall von Bieberstein) de Candolle; *Matthiola fischeri* Ledebour; *Orthorrhiza persica* Stapf.

Herbs annual, (8–)15–40(–50) cm tall, with multicellular glandular trichomes to 0.1 mm, these sometimes mixed with simple ones to 3 mm. Stems erect, branched above. Basal leaves often withered by flowering; petiole 3–15 mm; leaf blade lanceolate to linear-lanceolate, 2.5–5 cm × 3–10 mm, densely glandular, sparsely pilose or glabrous, base cuneate or

attenuate, margin sinuate-dentate, dentate, or rarely pinnatifid, apex acute. Cauline leaves similar to basal ones, progressively narrower upward, becoming linear or filiform, sessile, entire. Fruiting pedicels (2–)3–5(–8) mm. Sepals 4–5 × ca. 1 mm. Petals purple or whitish, oblanceolate, 7–10 × 0.5–1.2 mm; claw 3.5–5 mm. Filaments 3–6 mm; anthers ovate, ca. 0.5 mm. Fruit linear, dimorphic, 2–3.5 mm wide; lowermost fruit terete, 2.5–4.5(–6) cm, corky, indehiscent; upper fruit flattened, (4–)5–8 cm, leathery, dehiscent; style (2.5–)3–8 mm, longer on upper fruit. Seeds brown, oblong or suborbicular, 2.5–4 × 2–2.5 mm; wing 0.3–1 mm. Fl. Apr–Jun, fr. May–Aug. 2n = 14.

Steppe, hillsides, wastelands; 500–1000 m. Gansu, Nei Mongol, Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, SE Europe].

70. PARRYA R. Brown, Chlor. Melvill. 10. 1823.

条果芥属 tiao guo jie shu

Achoriphragma Soják; *Neuroloma* Andrzejowski ex de Candolle.

Herbs perennial, with well-developed caudex, rarely subshrubs or shrubs. Trichomes simple or absent, multicellular glands present or absent. Stems leafy or leafless. Basal leaves petiolate, rosulate, simple, entire, dentate, or pinnately dissected. Cauline leaves similar to basal, often absent. Racemes ebracteate, elongated in fruit. Fruiting pedicels erect, ascending, or divaricate. Sepals linear or oblong, caducous, erect, unequal, base of lateral pair saccate, margin membranous. Petals purple, pink, or white; blade obovate, apex rounded or emarginate; claw subequaling or longer than sepals. Stamens 6, tetradynamous; filaments dilated or not at base; anthers oblong or linear, obtuse at apex. Nectar glands 2, lateral, annular to semiannular; median glands absent. Ovules 10–50 per ovary. Fruit dehiscent siliques, linear, oblong, or lanceolate, strongly latiseptate or rarely subterete or 4-angled, sessile or subsessile, persistently attached to pedicel, unsegmented; valves leathery, with a prominent midvein and obscure to distinct lateral and marginal veins, smooth or torulose; replum almost always flattened; septum complete, membranous or thickened, translucent or opaque; style distinct, 0.5–7 mm; stigma conical or cylindrical, 2-lobed, lobes prominent, connate, decurrent. Seeds uniseriate, often broadly winged, suborbicular or oblong, strongly flattened; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent.

About 25 species: C Asia, Himalayas, two species in North America; four species in China.

- 1a. Fruit with terete replum concealed by thickened valve margin; plants eglandular, hirsute with subsetose straight trichomes; flowering stems mostly with 1 or few leaves 4. *P. beketovii*
- 1b. Fruit with visible, strongly flattened replum, valve margin not thickened; plants glandular or eglandular, glabrous or pubescent with soft, often crisped trichomes; flowering stems leafless.
 - 2a. At least some leaves pinnatifid or pinnatisect; fruit 2–2.5(–3) mm wide; style (1.5–)2.5–6 mm; seeds broadly oblong 3. *P. pinnatifida*
 - 2b. Leaves entire, dentate to dentate-sinuate, rarely subpinnatifid or repand; fruit (3.5–)4–7 mm wide; style 0.5–1.5(–3) mm; seeds orbicular or suborbicular.
 - 3a. Leaves entire; petals 2.5–3 × 0.8–1.5 cm, apex deeply emarginate; lowermost fruiting pedicels 1–2.5 cm 1. *P. lancifolia*
 - 3b. Leaves dentate to dentate-sinuate, rarely subpinnatifid or repand; petals (1.4–)1.6–2(–2.2) × 0.6–1 cm, apex rounded or shallowly emarginate; lowermost fruiting pedicels (1.5–)2.2–7(–11) cm 2. *P. nudicaulis*

1. *Parrya lancifolia* Popov, Bull. Soc. Imp. Naturalistes Moscou 47: 86. 1938.

柳叶条果芥 liu ye tiao guo jie

Achoriphragma lancifolium (Popov) Soják; *Neuroloma lancifolium* (Popov) Botschantzev.

Plants 5–30 cm tall, cespitose, glandular or eglandular, pubescent with crisped, simple retrorse trichomes to 1.5 mm, or glabrous; caudex branched, covered with petiolar remains of previous years. Basal leaves rosulate; petiole broadened at base, often ciliate, 1–6 cm; leaf blade lanceolate to linear-lanceolate, 2–9 × 0.5–2 cm, pubescent or glabrous, base cuneate or attenuate, margin entire, apex acute to subacuminate. Cauline leaves absent. Racemes 2–10-flowered. Fruiting pedicels ascending to divaricate, glandular or eglandular, lowermost 1–2.5 cm. Sepals purple, linear to linear-oblong, 9–12 × 2–3 mm, glabrous, pubescent, or glandular, white margined. Petals purple, broadly obovate, 2.5–3 × 0.8–1.5 cm, apex deeply emarginate; claw 1–1.7 cm. Filaments purple, median pairs 6–10 mm, lateral pair 4–7 mm; anthers linear, 3–5 mm. Ovules 30–40 per ovary. Fruit linear to linear-lanceolate, 4–9(–11) cm × 4–6 mm; valve margin flat; replum flattened; style 0.5–1(–2.5) mm; stigma 0.5–1.5 mm. Seeds orbicular or suborbicular, 4–6 mm in diam., flattened, broadly winged; wing undulate, to 1.5 mm wide. Fl. Jun–Jul, fr. Jul–Aug.

Grassy slopes; 2300–3000 m. Xinjiang [Kazakstan, Kyrgyzstan].

The records of *Parrya pulvinata* Popov in FRPS and Fl. Xinjiang. (2(2): 176. 1995) were based on misidentified plants of *P. lancifolia*. True *P. pulvinata* is distributed in Kazakstan. The above record of *P. lancifolia* from Xinjiang is based on Wu 418 (KUN), Liston et al. 837–2 (MO), and Ludlow 689 (BM). The last specimen includes eight plants, of which three are densely glandular and five eglandular.

2. *Parrya nudicaulis* (Linnaeus) Regel, Bull. Soc. Imp. Naturalistes Moscou 34: 176. 1861.

裸茎条果芥 *luo jing tiao guo jie*

Cardamine nudicaulis Linnaeus, Sp. Pl. 2: 654. 1753; *Achoriphragma ajanense* (N. Busch) Soják; *A. nudicaule* (Linnaeus) Soják; *Arabis nudicaulis* (Linnaeus) de Candolle; *Cheiranthus scapiger* Adams; *Hesperis arabisiflora* de Candolle; *H. scapigera* (Adams) de Candolle; *Matthiola nudicaulis* (Linnaeus) Trautvetter; *Neuroloma ajanense* (N. Busch) Botschantzev; *N. arabisiflorum* (de Candolle) de Candolle; *N. griffithii* Botschantzev; *N. nudicaule* (Linnaeus) Andrzejowski ex de Candolle; *N. scapigerum* (Adams) de Candolle; *N. speciosum* Steudel; *Parrya ajanensis* N. Busch; *P. arabisiflora* (de Candolle) Nicholson; *P. integerrima* G. Don; *P. linnaeana* Ledebour; *P. macrocarpa* R. Brown; *P. scapigera* (Adams) G. Don.

Plants (4–)10–35(–45) cm tall, cespitose, glandular throughout or eglandular, glabrous; caudex branched, covered with petiolar remains of previous years. Basal leaves rosulate; petiole often becoming thickened, (0.5–)2–10(–15) cm, glabrous or rarely sparsely ciliate; leaf blade lanceolate, linear, spatulate, or oblong, (1.2–)3–11(–14) cm × 4–10(–15) mm, base cuneate or attenuate, margin dentate to dentate-sinuate, rarely subpinnatifid or repand, apex acute. Cauline leaves absent. Racemes

2–20-flowered. Fruiting pedicels erect-ascending or divaricate, lowermost (1.5–)2.2–7(–11) cm. Sepals linear to linear-oblong, 6–11 × 1.5–3 mm, glabrous or glandular, white margined. Petals pink with a yellowish center, rarely white or purple, broadly obovate, (1.4–)1.6–2(–2.2) cm × 6–10 mm, apex rounded to shallowly emarginate; claw 0.8–1.2 cm. Filaments white, median pairs 6–8 mm, lateral pair 3–5 mm; anthers linear, 2.5–3 mm. Ovules 16–40 per ovary. Fruit linear to linear-lanceolate, (3–)4–7(–9) cm × (3.5–)4–7 mm; valve margin flat; replum flattened; style 0.5–1.5(–3) mm; stigma 0.5–1.5 mm. Seeds suborbicular, 3–8 mm in diam., flattened, broadly winged; wing (0.5–)1–3 mm wide. Fl. May–Aug, fr. Jul–Sep.

Dry stony hillsides, rocky crevices, among boulders, scree; 2200–5500 m. Qinghai, Xizang [Afghanistan, Bhutan, India, Kashmir, Russia, Sikkim; North America].

The records of *Parrya fruticulosa* Regel & Schmalhaus in FRPS and Fl. Xinjiang. (2(2): 175. 1995) were based on misidentified plants of the highly variable *P. nudicaulis*. The present authors have seen no Chinese material of *P. fruticulosa*, which is endemic to Tajikistan (Pamir Alai) and adjacent Uzbekistan. It is a shrub or subshrub with leafy, strongly woody stems and narrowly linear, entire leaves.

3. *Parrya pinnatifida* Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 147. 1842.

羽裂条果芥 *yu lie tiao guo jie*

Achoriphragma pinnatifidum (Karelin & Kirilov) Soják; *A. stenocarpum* (Karelin & Kirilov) Soják; *Neuroloma minjanense* (K. H. Rechinger) Botschantzev; *N. pinnatifidum* (Karelin & Kirilov) Botschantzev; *N. stenocarpum* (Karelin & Kirilov) Botschantzev; *Parrya chitralensis* Jafri; *P. chitralensis* K. H. Rechinger (1959), not Jafri (1956); *P. minjanensis* K. H. Rechinger; *P. pinnatifida* var. *kizylarti* Korshinsky; *P. stenocarpa* Karelin & Kirilov.

Plants (3–)8–20(–25) cm tall, cespitose, glandular or eglandular, sparsely to densely pubescent with simple trichomes to 1.5 mm; caudex branched, covered with petiolar remains of previous years. Basal leaves rosulate; petiole broadened at base, ciliate or not, (0.5–)1–4(–6) cm; leaf blade lanceolate or linear in outline, all or at least some pinnatifid or pinnatisect and with 3–9 lobes on each side, 1.5–7 × (0.3–)0.6–2 cm, pubescent or glabrous, base cuneate or attenuate, apex acute; lateral lobes oblong, linear, or rarely ovate, 2–10 × 0.5–3 mm, entire. Cauline leaves absent. Racemes 2–10-flowered. Fruiting pedicels ascending or divaricate, glandular or eglandular, (0.4–)1–2.5 cm. Sepals purple, linear or linear-oblong, 6–10 × 1.5–3 mm, glabrous, pubescent, or glandular, white margined. Petals purple or lavender, rarely white, broadly obovate, (1.3–)1.5–2(–2.2) cm × 4–8 mm, apex emarginate; claw 0.8–1.2 cm. Filaments purple or white, median pairs 6–8 mm, lateral pair 3–5 mm; anthers linear, 3–4 mm. Ovules 16–40 per ovary.

Fruit linear to linear-lanceolate, (2–)3–8(–10) cm × 2–2.5(–3) mm; valve margin flat; replum flattened; style (1.5–)2.5–6 mm; stigma 1–2 mm. Seeds broadly oblong, 3–5 × 2–3.5 mm, flattened, broadly winged; wing 0.5–1 mm wide. Fl. May–Jul, fr. Jul–Aug.

Marble scree, stony slopes, gravel; 1600–4400 m. Xinjiang [Afghanistan, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan]. The records of *Parrya pinnatifida* in FRPS and Fl. Xizang. (2: 384. 1985) were based on misidentified plants of *P. nudicaulis*. The records of *P. subsiliquosa* Popov in FRPS and Fl. Xinjiang. (2(2): 176. 1995) were based on misidentified plants of *P. beketovii* and *P. pinnatifida*. The present authors have seen no Chinese material of *P. subsiliquosa*, which is endemic to Kyrgyzstan and neighboring Kazakstan. It is likely to be conspecific with *P. longicarpa* Krassnov, a species with fruit terete to subquadrangular, narrowly linear, and 1.5–2 mm wide and seeds oblong and narrowly winged. The occurrence of *P. pinnatifida* in China is here confirmed based on *Cheo Taiyien* 650883 (HNWP, NAS).

Parrya pinnatifida var. *hirsuta* N. Busch and var. *glabra* N. Busch were accepted in FRPS, but both varieties are invalidly named (they are *nomina nuda*); they are anyway only minor variants and do not merit recognition.

4. *Parrya beketovii* Krassnov, Bot. Zap. 2, 1: 12. 1888.

天山条果芥 *tian shan tiao guo jie*

Achoriphragma beketovii (Krassnov) Soják; *Neuroloma beketovii* (Krassnov) Botschantzev; *Parrya michaelis* Vassiljeva.

Plants (7–)15–30(–40) cm tall, eglandular, sparsely to densely hirsute with spreading, straight, subsetose

simple trichomes 1–2 mm; caudex usually without petiolar remains of previous years. Basal leaves rosulate; petiole ciliate, 1.5–5 cm; leaf blade spatulate, subovate, or lanceolate, 2–6(–9) × (0.4–)1–2.5(–4) cm, hirsute, base cuneate, margin coarsely dentate or pinnate-sinuate, sometimes entire, apex acute. Cauline leaves few, similar to basal ones, rarely absent. Racemes (3–)7–25-flowered. Fruiting pedicels ascending or divaricate, hirsute, (0.7–)1–2.5(–4) cm. Sepals purple, linear to linear-oblong, 6–9 × 1.5–2.5 mm, sparsely hirsute or glabrous, white margined. Petals purple, broadly obovate, (1.1–)1.5–2(–2.5) cm × 4–7 mm, apex rounded; claw 0.7–1.3 cm. Filaments white, median pairs (4–)6–8 mm, lateral pair (2.5–)4–5 mm; anthers linear, 2.5–3.5 mm. Ovules 20–40 per ovary. Fruit linear, (2–)3–6(–7) cm × 2.5–4 mm; valve margin prominently thickened; replum terete, concealed by valve margin; style 0.5–1(–1.5) mm; stigma 0.5–1 mm. Seeds suborbicular-oblong, 2.5–3.5 × 2–2.5 mm, flattened, with a broad wing 0.5–1 mm wide. Fl. May–Jul, fr. Jul–Aug.

Rocky and clayey slopes; 1600–2200 m. Xinjiang [Kazakstan, Kyrgyzstan].

Apparently all specimens of *Parrya beketovii* in the major Chinese herbaria were erroneously identified as other species. The occurrence of this species in China is here confirmed based on several collections, including *Cheo Taiyien* 650721 (IBSC, KUN, NAS, PE), *Cheo Taiyien* 651268 (KUN, PE), and *Moysenko* 35 (LE).

71. CITHARELOMA Bunge, Delect. Seminum Hort. Bot. Dorpat. 1843: 6. 1843.

对枝菜属 *dui zhi cai shu*

Herbs annual. Trichomes eglandular, subsessile, stellate, with basally forked rays, sometimes mixed with long-stalked dendritic ones, rarely with a few simple ones on the stem. Stems erect, often with two opposite basal branches from axils of cotyledons, other branches alternate. Basal leaves soon withered. Cauline leaves petiolate, dentate or entire. Racemes few flowered, ebracteate, elongated in fruit. Fruiting pedicels divaricate. Sepals narrowly oblong, connivent, erect, base of lateral pair strongly saccate. Petals purple, pink, or white, longer than sepals; blade narrowly oblanceolate or oblong-obovate, apex obtuse; claw distinct. Stamens 6, strongly tetradynamous; filaments not dilated at base; anthers linear, obtuse at apex. Nectar glands 2, lateral, semiannular, intrastaminal; median glands absent. Ovules 4–24 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, or ovate, strongly latiseptate; valves papery, with a distinct midvein, pubescent, strongly torulose; gynophore absent or rarely to 1 mm; replum rounded, undulate; septum complete, thickened, opaque, veinless; style slender, 1–5 mm; stigma conical, 2-lobed, lobes prominent, connivent, decurrent. Seeds uniseriate, broadly winged, orbicular or nearly so, strongly flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Two species: C and SW Asia; one species in China.

1. *Cithareloma vernum* Bunge, Linnaea 18: 150. 1844.

对枝菜 *dui zhi cai*

Herbs 6–20 cm tall. Stems pubescent with stellate subsessile trichomes sometimes mixed basally with much coarser, long-stalked subdendritic ones to 3 mm. Petiole of middle leaves 0.5–1.5 cm; leaf blade ovate to oblong-ovate, 2–5(–8) × 1–2(–3) cm, uniformly pubescent with subsessile stellate trichomes, base cuneate, margin sinuate-dentate, dentate, or repand, apex obtuse. Fruiting pedicels 1.5–2.5(–3) mm, stout. Sepals 4–5 × 0.5–0.8 mm. Petals white or purple, 7–10

× ca. 1 mm; claw 4–5 mm. Filaments 2–4 mm; anthers 0.9–1.2 mm. Ovules (14–)18–24 per ovary. Fruit linear, (3–)3.5–4.5(–5) cm × 3–5(–6) mm; valves with subsessile stellate trichomes mixed with coarser, subdendritic ones on stalks (0.5–)0.7–1.7(–2) mm, strongly torulose; gynophore obsolete; style 2–5 mm. Seeds orbicular to ovate-orbicular, 3.5–5 mm in diam., wing 0.5–0.7 (–1) mm. Fl. Mar–May, fr. May–Jul.

Sandy areas, deserts. Gansu, Xinjiang [Kazakstan, Turkmenistan, Uzbekistan].

This is the first record of *Cithareloma* from China, based on *Team F*–357 (PE), from Gansu, and *Anonymous 79–249* (PE) and *Team M*–55 (PE), from Xinjiang. The species was misidentified as *Matthiola*

stoddartii Bunge in FRPS and Fl. Xinjiang. (2(2): 164. 1995). The latter species is distributed from Afghanistan N into C Kazakstan.

72. LEIOSPORA (C. A. Meyer) Dvorák, Spisy Prir. Fak. Univ. J. E. Purkinje Brne 497: 356. 1968.

光籽芥属 *guang zi jie shu*

Parrya R. Brown subgen. *Leiospora* C. A. Meyer in Ledebour, Fl. Altaic. 3: 28. 1831.

Herbs perennial, scapose, rhizomatous or with a caudex covered with petiolar remains of previous years. Trichomes simple or short-stalked, forked, sometimes absent. Stems often absent. Basal leaves petiolate, rosulate, simple, entire or toothed. Cauline leaves absent. Racemes ebracteate, not elongated in fruit, or flowers solitary on pedicels originating from center of basal rosette. Fruiting pedicels erect-ascending. Sepals oblong-linear, erect, unequal, base of lateral pair saccate, margin membranous. Petals pink or purple; blade obovate, apex rounded; claw strongly differentiated from blade, longer than sepals. Stamens 6, tetradynamous; filaments not dilated at base; anthers linear, obtuse at apex. Nectar glands 2, lateral; median glands absent. Ovules 18–50 per ovary. Fruit dehiscent siliques, linear to linear-lanceolate, strongly latiseptate, sessile, readily detached from pedicel; valves leathery, glabrous, torulose, margin angled, with prominent midvein and marginal veins, lateral veins obscure, apex persistently united with replum; replum rounded; septum complete, membranous, translucent; style absent; stigma conical, 2-lobed, lobes prominent, free, decurrent. Seeds uniseriate or biseriate, broadly winged, proximally margined, or wingless, oblong or orbicular, flattened; seed coat smooth, not mucilaginous when wetted; cotyledons accumbent.

Six species: China, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; four species in China.

Leiospora is remotely related to *Parrya*, from which it is easily distinguished by having fruit readily detached from the pedicel, replum terete, valves with marginal veins prominent, margin angled, and apex adnate to the replum, and stigmas sessile with free lobes. *Parrya* has fruit persistent on the pedicel, replum strongly flattened, valves without marginal veins, margin flat, and apex readily detached from the replum, and stigmas borne on distinct styles and with connivent lobes.

- 1a. Flowers in shortly pedunculate racemes 1. *L. bellidifolia*
- 1b. Flowers solitary from center of rosette.
 - 2a. Seeds oblong, wingless; plants glabrous or rarely pubescent; petiole not ciliate 4. *L. exscapa*
 - 2b. Seeds suborbicular, broadly winged; plants pubescent; petiole usually ciliate.
 - 3a. Plants sparsely pubescent; leaf and calyx trichomes exclusively simple 3. *L. ericalyx*
 - 3b. Plants often densely pubescent, rarely glabrescent; leaf and calyx trichomes short-stalked, forked, mixed with simple ones 2. *L. pamirica*

1. *Leiospora bellidifolia* (Danguy) Botschantzev & Pachomova, Bot. Zhurn. (Moscow & Leningrad) 57: 668. 1972.

雏菊叶光籽芥 *chu ju ye guang zi jie*

Parrya bellidifolia Danguy, J. Bot. (Morot) 21: 51. 1908.

Plants 5–10 cm tall, rhizomatous, with few-branched caudices covered with petiolar remains of previous years. Petiole 0.5–2 cm, broadened at base, often ciliate; leaf blade orbicular, spatulate, or obovate, 0.5–2 × 0.5–1.5 cm, subglabrous or pubescent with short simple trichomes, base rounded or cuneate, margin entire or few toothed, apex obtuse to rounded. Racemes (3–)7–22-flowered. Fruiting pedicels erect-ascending, glabrous, 1–3 cm. Sepals oblong, 7–10 × 1.5–2 mm, glabrous or sparsely pubescent, white or purple margined. Petals obovate, 1.7–2.3 cm × 4–7 mm, apex rounded; claw 1–1.3 cm. Filaments white, median pairs 4–7 mm, lateral pair 2–4 mm; anthers linear, 2.5–3 mm. Ovules 30–50 per ovary. Fruit linear to linear-lanceolate, 2.5–5.5 cm × 4–7 mm, margin straight. Seeds orbicular to orbicular-ovate, 2–3 mm in diam.,

uni- or biseriate, flattened; wing to 0.5 mm wide, strongly undulate, brown proximally, white distally. Fl. and Fr. Jun–Aug.

Slopes; 3200–3300 m. SW Xinjiang [Tajikistan].

This species was previously recorded from China in Fl. Tajikistan (5: 120. 1978). That record is here confirmed based on *Duvnogorskaya s.n.* (LE), collected from Kashi (Kashgar), SW Xinjiang.

2. *Leiospora pamirica* (Botschantzev & Vvedensky) Botschantzev & Pachomova, Bot. Zhurn. (Moscow & Leningrad) 57: 669. 1972.

帕米尔光籽芥 *pa mi er guang zi jie*

Parrya pamirica Botschantzev & Vvedensky, Novosti Sist. Vyssh. Rast. 1965: 279. 1965.

Plants 5–10(–15) cm tall, densely caespitose; caudex branched, densely covered with petiolar remains of previous years. Petiole broadened at base, ciliate, (0.5–)1–3(–4.2) cm; leaf blade spatulate or oblanceolate, rarely obovate, elliptic, or oblong, (0.7–)1–4(–5) cm × (3–)4–10(–15) mm, sparsely to densely pubescent with simple and short-stalked, forked trichomes, base cuneate or attenuate, margin entire or rarely few toothed, apex subacute to rounded. Flowers 2–7 per rosette, on solitary pedicels from center of rosette.

Fruiting pedicels erect-ascending, glabrous, (1–)2–6(–7) cm. Sepals oblong, 6–10 × 1.5–2 mm, glabrous or sparsely pubescent, white margined. Petals obovate, (1.3–)1.5–2.2(–2.6) cm × (4–)6–8(–9) mm, apex rounded; claw (6–)8–11 mm. Filaments white, median pairs (4.5–)6–8 mm, lateral pair (2.5–)4–6 mm; anthers linear, 2.5–3 mm. Ovules 24–40 per ovary. Fruit linear to linear-lanceolate, (2.5–)3.5–7(–9) cm × 3–6(–7) mm, margin straight or undulate. Seeds orbicular, (2.5–)3–4 mm in diam., uni- or biseriate, flattened, broadly winged; wing undulate, 0.5–1 mm wide. Fl. and Fr. Jul–Sep.

Dry stony plains, rocky cliffs; 3900–5500 m. Xinjiang, Xizang [Kashmir, Tajikistan].

The protologue of *Parrya pamirica* indicated that the species occurs in China, but no specimens were cited. In fact, Chinese plants have been repeatedly misidentified as *L. exscapa* (see below), both in Chinese herbaria and in the account in FRPS (as *Parrya exscapa*). *Leiospora pamirica* is highly variable in the density of its indumentum; in very sparsely pubescent plants, branched trichomes can still be found along the leaf margin.

3. *Leiospora eriocalyx* (Regel & Schmalhaus.) Dvorák, Spisy Prir. Fak. Univ. J. E. Purkinje Brne 497: 357. 1968.

毛萼光籽芥 mao e guang zi jie

Parrya eriocalyx Regel & Schmalhaus., Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 234. 1877.

Plants 2–10 cm tall, densely cespitose; caudex many branched, densely covered with petiolar remains of previous years. Petiole broadened at base, ciliate; leaf blade spatulate or obovate, rarely oblanceolate, 1–4 cm × 3–10 mm, pubescent with short simple trichomes, base cuneate, margin entire or with few blunt teeth, apex subacute. Flowers 2–5 per rosette, on solitary pedicels from center of rosette. Fruiting pedicels erect-ascending, glabrous or sparsely pubescent, 1–5 cm. Sepals oblong, 5–8 × 1.5–2 mm, glabrous or sparsely pubescent, white or sometimes purple margined. Petals obovate, 1.1–1.8 cm × 3–7 mm, apex rounded; claw 0.9–1.1 cm. Filaments white, median pairs 5.5–7 mm, lateral pair 3.5–4.5 mm; anthers linear, 2.5–3 mm. Fruit linear to linear-lanceolate, 3–5 cm × 3–6 mm, margin

straight or undulate. Seeds orbicular, 3–4 mm in diam., uni- or biseriate, flattened, broadly winged. Fl. and Fr. Jul–Sep.

Gravelly slopes; 3700–4400 m. Xinjiang [Kazakstan, Kyrgyzstan, Tajikistan].

4. *Leiospora exscapa* (C. A. Meyer) Dvorák, Spisy Prir. Fak. Univ. J. E. Purkinje Brne 497: 357. 1968.

无茎光籽芥 wu jing guang zi jie

Parrya exscapa C. A. Meyer in Ledebour, Fl. Altaic. 3: 28. 1831; *Neuroloma exscapum* (C. A. Meyer) Steudel.

Plants 5–10 cm tall, cespitose; caudex thick, few branched, densely covered with petiolar remains of previous years. Petiole broadened at base, glabrous, 0.5–1.5 cm; leaf blade orbicular, obovate, or spatulate, rarely oblanceolate, 1–3 × 0.6–1.5 cm, glabrous or rarely sparsely pubescent at margin with exclusively simple trichomes, base rounded or cuneate, margin obtusely dentate or repand, apex rounded or subacute. Flowers 1–4 per rosette, on solitary pedicels from center of rosette. Fruiting pedicels erect-ascending, glabrous, 1–2.5 cm. Sepals oblong, 7–9 × 1.5–2 mm, glabrous, white or sometimes purple margined. Petals obovate, 1.4–2 cm × 6–10 mm, apex rounded; claw 7–9 mm. Filaments white, median pairs 6–8 mm, lateral pair 3.5–4.5 mm; anthers linear, 2.5–3 mm. Ovules 18–30 per ovary. Fruit linear to linear-lanceolate, 4–9 cm × 5–7 mm, margin straight or undulate. Seeds oblong, 2.7–3.5 × 1.5–2 mm, biseriate, flattened, wingless or narrowly margined proximally. Fl. and Fr. Jul–Sep. Mountain slopes. N Xinjiang (Altay Shan) [Kazakstan, Mongolia, Russia].

Almost all of the specimens identified in Chinese herbaria as *Leiospora exscapa*, as well as the account in FRPS (as *Parrya exscapa*), are based on misidentified plants of *L. pamirica*. True *L. exscapa* is very rare in China and appears to be restricted to Altay Shan in N Xinjiang. It is readily distinguished from *L. pamirica* by being totally glabrous, or exclusively with simple trichomes, and by having oblong and wingless (vs. orbicular and broadly winged) seeds. Records of *L. exscapa* in the floras of India and Pakistan are also based on misidentified plants of *L. pamirica*.

73. **LEPTALEUM** de Candolle, Mém. Mus. Hist. Nat. 7: 239. 1821.

丝叶芥属 si ye jie shu

Herbs annual, puberulent. Trichomes short-stalked or sessile, 1–3-forked or submalpighiaceus, sometimes also simple. Stems decumbent or erect, branched basally and apically, rarely simple from base. Basal leaves petiolate, not rosulate, simple, entire or pinnatisect into filiform segments. Cauline leaves similar to basal ones. Racemes 2–4-flowered, ebracteate, axillary, not elongated in fruit, sometimes flowers solitary and axillary. Fruiting pedicels slender or thickened, erect or ascending. Sepals linear-oblong or linear, erect, base of lateral pair not saccate. Petals white or pink; blade linear to linear-oblanceolate, apex obtuse; claw subequaling or shorter than sepals. Stamens 6, in 2 unequal pairs; filaments of median pairs connate to apex, rarely only basally, not dilated at base; anthers oblong, obtuse at apex, those of connate stamens sometimes 1-lobed. Nectar glands 4, 1 on each side of lateral filament; median glands absent. Ovules numerous per ovary. Fruit indehiscent or very tardily dehiscent siliques, linear, latiseptate, rarely subterete, often distinctly grooved at replum, sessile; valves thick leathery, with a prominent midvein and reticulate lateral veins, puberulent or glabrous, smooth; replum rounded; septum complete, thickened;

style absent or obsolete; stigma conical, 2-lobed. Seeds biseriate, wingless, ovoid or suboblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent.

One species: C and SW Asia.

1. *Leptaleum filifolium* (Willdenow) de Candolle, Mém. Mus. Hist. Nat. 7: 239. 1821.
 丝叶芥 *si ye jie*

Sisymbrium filifolium Willdenow, Sp. Pl. 3: 495. 1800;
Leptaleum hamatum Hemsley & Lace; *L. longisiliquosum* Freyn & Sintenis; *L. pygmaeum* de Candolle.

Herbs annual, (0.5–)2–15(–20) cm tall, puberulent or rarely subglabrous. Stems branched basally and above, rarely simple from base, decumbent or erect. Basal leaves not rosulate, finely pinnatisect, rarely simple, withered early, 0.9–5(–8) cm; lateral lobes 1–3 on each side, filiform, to 3.5 cm × 0.2–1 mm, glabrous or sparsely puberulent, flat or margin incurved and lobes appear grooved. Cauline leaves similar to basal.

Fruiting pedicels 1–4(–10) mm, slender or stout, straight, puberulent. Sepals oblong-linear to linear, (2.5–)3–4(–5) × 0.5–0.7 mm, erect, apically puberulent. Petals white, later pink, linear or oblanceolate-linear, (4.5–)6–9(–11) × 0.4–0.8(–1) mm; claw 2–3.5 mm. Filaments white, filiform, 2.5–5 mm; anthers oblong, 0.5–0.6 mm. Fruit linear, (1.2–)1.5–4(–5.5) cm × 1.5–2.5(–3) mm, often wider at base, gradually tapered to apex, straight or slightly curved distally; valves puberulent or subglabrous, prominently veined. Seeds yellow or light brown, ovoid or suboblong, 0.6–0.9(–1.2) × 0.4–0.5 mm. Fl. Mar–May, fr. Apr–Jun. *2n* = 14.

Deserts, steppe, stony or gravelly plains or hillsides, sandy, silty, or calcareous soil; 100–1000(–4000) m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

74. MALCOLMIA R. Brown in W. T. Aiton, Hortus Kew. 4: 121. 1812, nom. cons.

涩芥属 *se jie shu*

Fedtschenkoa Regel & Schmalhausen ex Regel; *Strigosella* Boissier; *Wilckia* Scopoli, nom. rej.

Herbs annual, biennial, or perennial with a woody caudex. Trichomes a mixture of simple, forked, or stellate, sometimes malpighiaceus. Stems erect or ascending. Basal leaves not rosulate, simple, entire or variously dentate or pinnatifid. Cauline leaves petiolate or sessile, not auriculate, entire, dentate, or rarely lobed. Racemes few to many flowered, ebracteate or rarely bracteate. Fruiting pedicels slender or thickened, ascending or divaricate. Sepals ovate or narrowly oblong, erect, glabrous or pubescent, base of lateral pair saccate or not. Petals white, pink, or purple, longer than sepals; blade obovate, spatulate, oblong, or oblanceolate, apex obtuse or rounded; claw well developed. Stamens 6, erect, tetradynamous; filaments dilated or not at base, free or median 4 connate in 2 pairs; anthers ovate, oblong, or linear, apex apiculate or not. Median glands absent; lateral glands 1 on each side of lateral stamen, or lunar. Ovules 20–90 per ovary. Fruit dehiscent siliques, linear, terete, 4-angled, or latiseptate, sessile; valves glabrous or pubescent, smooth or torulose; replum rounded; septum complete; style obsolete or to 1 mm or longer; stigma conical, 2-lobed, lobes connivent, often connate, opposite replum. Seeds uniseriate, wingless, oblong or ovate, plump or slightly flattened; seed coat reticulate, not mucilaginous when wetted; cotyledons incumbent or rarely accumbent.

About 35 species: C and SW Asia, Mediterranean region; four species in China.

- 1a. Plants densely hispid at least basally with exclusively simple subsetose trichomes to 3 mm; fruit strongly flattened straight 2. *M. hispida*
- 1b. Plants pubescent basally with forked or 3- or 4-rayed trichomes; fruit quadrangular or subterete, if flattened then strongly coiled
 - 2a. Fruit quadrangular, not torulose, straight 1. *M. africana*
 - 2b. Fruit flattened or subterete, torulose, curved or strongly coiled, rarely arcuate or straight.
 - 3a. Fruit subterete, straight or curved near apex, rarely forming a loop, 0.5–0.8(–0.9) mm wide; petals 2–3.5(–4) mm 4. *M. karelinii*
 - 3b. Fruit flattened, strongly coiled from up to 5 loops, (0.9–)1–1.2 mm wide; petals (4.5–)6–8 mm 3. *M. scorpioides*

1. *Malcolmia africana* (Linnaeus) R. Brown in W. T. Aiton, Hortus Kew. 4: 121. 1812.

涩芥 *se jie*

Hesperis africana Linnaeus, Sp. Pl. 2: 663. 1753;
Cheiranthus taraxacifolius Balbis (1814), not Stephan (1800); *Fedtschenkoa africana* (Linnaeus) Dvorák; *F. stenopetala* (Bernhardi ex Fischer & C. A. Meyer)

Dvorák; *F. taraxacifolia* Dvorák; *Hesperis laxa* Lamarck; *Malcolmia africana* var. *divaricata* Fischer; *M. africana* var. *korshinskyi* Vassilczenko; *M. africana* var. *stenopetala* Bernhardi ex Fischer & C. A. Meyer; *M. africana* var. *trichocarpa* (Boissier & Buhse) Boissier; *M. calycina* Sennen; *M. divaricata* (Fischer) Fischer; *M. laxa* (Lamarck) de Candolle; *M.*

stenopetala (Bernhardi ex Fischer & C. A. Meyer) Bernhardi ex Ledebour; *M. taraxacifolia* de Candolle; *M. trichocarpa* Boissier & Buhse; *Strigosella africana* (Linnaeus) Botschantzev; *S. africana* var. *laxa* (Lamarck) Botschantzev; *S. stenopetala* (Bernhardi ex Fischer & C. A. Meyer) Botschantzev; *S. trichocarpa* (Boissier & Buhse) Botschantzev; *Wilckia africana* (Linnaeus) F. Mueller; *W. africana* var. *stenopetala* (Bernhardi ex Fischer & C. A. Meyer) Grossheim; *W. africana* var. *trichocarpa* (Boissier & Buhse) Grossheim; *W. stenopetala* (Bernhardi ex Fischer & C. A. Meyer) N. Busch.

Herbs annual, (4.5–)15–30(–45) cm tall, sparsely to densely pubescent with short-stalked, forked or subdendritic trichomes sometimes mixed with simple subsetose ones, rarely glabrescent. Basal leaves soon withered, not rosulate. Middle and lower cauline leaves petiolate; petiole (0.1–)0.6–2(–3) cm; leaf blade elliptic, oblong, or oblanceolate, (0.5–)1.5–6(–10) × (0.3–)1–2.5(–3.5) cm, base cuneate, margin entire or dentate, rarely sinuate, apex acute; uppermost leaves smaller and subsessile. Racemes few to many flowered, elongated considerably in fruit; rachis straight or slightly flexuous. Fruiting pedicels thickened, as wide as fruit, 0.5–2(–4) mm. Sepals (3.5–)4–5 × 0.5–0.7 mm, caducous or persistent. Petals pink or purple, rarely white, narrowly oblanceolate, (6.5–)8–10(–12) × 1–2 mm. Filaments free, 2.5–5 mm; anthers narrowly oblong, 0.9–1.1 mm. Fruit linear, straight, quadrangular, not torulose, (2.5–)3.5–5.5 (–7) cm × 1–1.3 mm; valves not veined, pubescent with coarse, forked trichomes mixed with much smaller, forked and subdendritic ones or subsetose simple ones, rarely glabrous; style obsolete; stigma conical, to 1 mm. Seeds oblong, 1–1.2 × 0.5–0.6 mm. Fl. Apr–Aug, fr. May–Oct.

Fields, disturbed areas, roadsides, deserts; 700–3300 m. Anhui, Gansu, Hebei, Henan, Jiangsu, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; naturalized elsewhere]. A very highly variable species in pubescence, flower size, and fruit length. Forms with subsetose and branched trichomes on the fruit (var. *trichocarpa*) have been recognized as variety of *Malcolmia africana* or as a distinct species, while those with shorter petals have been recognized as var. *stenopetala*. However, these forms are sporadic throughout most of the range of the species and are often found in the same population with typical plants of *M. africana*.

2. *Malcolmia hispida* Litvinov, Trudy Bot. Muz. Imp. Akad. Nauk 1: 37. 1902.

刚毛涩芥 gang mao se jie

Fedtschenkoa hispida (Litvinov) Dvorák; *Strigosella hispida* (Litvinov) Botschantzev.

Herbs annual, (5–)10–30 cm tall, densely hispid basally with exclusively simple trichomes to 3 mm, these mixed on other parts with much smaller, short-stalked, forked trichomes. Basal leaves not rosulate. Middle and lower cauline leaves petiolate; petiole 0.5–2 cm; leaf blade oblong, oblong-lanceolate, or linear-lanceolate,

2–5 cm × 3–8 mm, base attenuate or cuneate, margin entire or sparsely denticulate, apex obtuse; midvein whitish and thickened; uppermost leaves smaller and subsessile. Racemes several to many flowered, elongated considerably in fruit; rachis straight. Fruiting pedicels thickened, as wide as fruit, 0.5–1.5 mm. Sepals 3.5–4 × 0.5–0.7 mm, persistent. Petals pink, linear, 8–10 × 0.8–1 mm. Filaments free or median pairs connate near base, 2.5–4 mm; anthers narrowly oblong, 0.7–1 mm. Fruit linear, straight, latiseptate, strongly torulose, 4–6 cm × 1–1.7 mm; valves not veined, densely pubescent with setose simple trichomes mixed with much smaller, forked and subdendritic ones; style obsolete; stigma conical, to 1 mm. Seeds oblong, 1.2–1.5 × 0.6–0.8 mm. Fl. Apr–Jun, fr. May–Jul. Foothills; 1900–2000. Xizang [Kazakstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan].

This species was recorded in FRPS from Gansu, Qinghai, and Xinjiang, but the present authors have seen no material from those provinces and autonomous region. It is likely that the records were based on misidentified plants of *Malcolmia africana* that have some simple trichomes on the fruit. The above record from Xizang is based on *Chaffanjon 207* (P).

3. *Malcolmia scorpioides* (Bunge) Boissier, Fl. Orient. 1: 225. 1867.

卷果涩芥 juan guo se jie

Dontostemon scorpioides Bunge, Arbeiten Naturf. Vereins Riga 1: 150. 1847; *Fedtschenkoa multisiliqua* (Vassilczenko) Dvorák; *F. scorpioides* (Bunge) Dvorák; *Malcolmia contortuplicata* (Stephan) Boissier var. *curvata* Freyn & Sintenis; *M. humilis* Z. X. An; *M. multisiliqua* Vassilczenko; *M. scorpioides* var. *curvata* (Freyn & Sintenis) Vassilczenko; *Strigosella scorpioides* (Bunge) Botschantzev.

Herbs annual, (3–)10–30(–45) cm tall, sparsely pubescent with small, short-stalked, forked or 3-rayed trichomes sometimes mixed with fewer simple ones, rarely glabrescent. Basal leaves soon withered, not rosulate. Middle and lower cauline leaves with petioles 4–14(–22) mm; leaf blade elliptic, oblong, or lanceolate, 1–3(–4) cm × 2–10(–16) mm, base cuneate, margin entire or rarely dentate, apex acute; uppermost leaves smaller and subsessile. Racemes few flowered, elongated considerably in fruit; rachis straight. Fruiting pedicels thickened as wide as fruit, 0.5–2 mm. Sepals 2.5–4 × 0.6–1 mm, caducous. Petals pink or rarely white, oblanceolate, (5–)6–8 × ca. 1 mm. Filaments 3.5–4.5 mm; anthers narrowly oblong, ca. 0.8 mm. Fruit linear, strongly coiled to 5 turns, compressed, torulose, (3–)4–6 (–7) cm × (0.9–)1–1.2 mm; valves not veined, glabrous or rarely sparsely pubescent with forked and simple trichomes; style obsolete; stigma conical, to 1 mm. Seeds oblong, 0.9–1.2 × 0.4–0.5 mm. Fl. and fr. Apr–Jun.

Sandy deserts, steppe, rocky areas; 400–1400 m. Gansu, Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

4. *Malcolmia karelinii* Lipsky, Trudy Imp. S.-Peterburgsk. Bot. Sada 23: 31. 1904.

短梗涩芥 duan geng se jie

Sisymbrium brevipes Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 154. 1842, p.p., quoad var.; *Dontostemon brevipes* Bunge; *Malcolmia karelinii* var. *lasiocarpa* Lipsky; *Strigosella brevipes* (Bunge) Botschantzev.

Herbs annual, (3–)10–30(–45) cm tall, sparsely pubescent with small, short-stalked, forked or 3-rayed trichomes sometimes mixed with few simple ones, rarely glabrescent. Basal leaves soon withered, not rosulate. Middle and lower cauline leaves petiolate; petiole 3–12(–20) mm; leaf blade elliptic, oblong, or lanceolate, 1–3(–4) cm × 2–10(–16) mm, base cuneate, margin coarsely dentate, apex acute; uppermost leaves smaller and subsessile. Racemes few flowered, elongated considerably in fruit; rachis straight. Fruiting pedicels thickened narrower than or as wide as fruit, 0.5–1 mm. Sepals 1–2(–2.5) × 0.5–0.7 mm, caducous.

Petals pink or rarely white, narrowly oblanceolate, 2–3.5(–4) × 0.3–0.7 mm. Filaments free, 1.5–2.5 mm; anthers narrowly oblong, 0.3–0.6 mm. Fruit linear, curved at least near apex, or straight, rarely coiled, subterete, torulose, (1.3–) 1.8–3.2(–5) cm × 0.5–0.8(–0.9) mm; valves not veined, glabrous or rarely sparsely pubescent with forked trichomes; style obsolete; stigma conical, to 1 mm. Seeds oblong, 0.9–1.2 × 0.4–0.5 mm. Fl. and fr. Apr–Jun.

Steppes; deserts, hillsides; 800–2000 m. Nei Mongol, Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

The protologue of *Sisymbrium brevipes* included two elements, of which *Karelin & Kirilov 106* (LE) is the type of the species name, and it definitely belongs to the taxon currently known as *Neotorularia brevipes* (see below). The other element, *Karelin & Kirilov 1240* (LE), which is a *Malcolmia* with twisted fruit and connivent stigma, was cited by Karelin and Kirilov under an unnamed variety, which is the basis of the name *M. karelinii*.

75. HESPERIS Linnaeus, Sp. Pl. 2: 663. 1753.

香花芥属 xiang hua jie shu

Herbs biennial, or perennial. Trichomes unicellular, simple and/or forked, these often mixed with glandular ones with a unicellular gland on a few-celled, uniseriate stalk. Stems erect, often simple. Basal leaves petiolate, usually rosulate, entire, dentate, or pinnately divided. Cauline leaves petiolate or sessile, similar to basal, sometimes auriculate or amplexicaul at base. Racemes bracteate or ebracteate, elongated in fruit. Fruiting pedicels slender or thickened, divaricate or reflexed. Sepals oblong or linear, erect, base of lateral pair strongly saccate. Petals white, lavender, purple, yellow, orange, brownish, or green, much longer than sepals; blade obovate or oblong, apex rounded or obtuse; claw strongly differentiated. Stamens 6, strongly tetradynamous; anthers oblong or linear, obtuse at apex. Nectar glands 2, lateral, ringlike or lunar; median glands absent. Ovules 4–40 per ovary. Fruit tardily dehiscent siliques, linear, terete, 4-angled, or slightly latiseptate, sessile; valves with a prominent midvein, torulose; replum rounded; septum complete, membranous; style obsolete or short; stigma conical, 2-lobed, lobes prominent, connivent or free, decurrent. Seeds uniseriate, wingless, oblong, plump; seed coat reticulate, not mucilaginous when wetted; cotyledons incumbent.

About 25 species: primarily C and SW Asia and SE Europe; two species (one introduced) in China.

1a. Plants eglandular or sparsely glandular; upper leaves shortly petiolate; eglandular trichomes simple and forked

..... 1. *H. matronalis*
1b. Plants densely glandular; upper leaves sessile; eglandular trichomes exclusively simple 2. *H. sibirica*

1. *Hesperis matronalis* Linnaeus, Sp. Pl. 2: 663. 1753.

欧亚香花芥 ou ya xiang hua jie

Herbs biennial or rarely perennial, 40–80(–110) cm tall, pubescent with simple and forked trichomes. Stems erect, simple basally, often branched above, eglandular and often glabrous distally. Basal leaves withered by flowering. Middle and upper cauline leaves narrowly oblong, lanceolate, or broadly ovate, (2–)4–15(–20) × (0.4–)0.8–4(–6) cm, shortly petiolate, pubescent with simple and forked trichomes, base cuneate, margin denticulate or entire, apex acute or acuminate. Fruiting pedicels divaricate or ascending, (0.5–)0.7–1.7(–2.5) cm, eglandular. Sepals narrowly oblong, 5–8 × 1.5–2 mm. Petals deep purple, lavender, or white, obovate, (1.1–)1.5–2(–2.2) cm × 3.5–9 mm, apex rounded; claw

6–12 mm. Filaments 2.5–6 mm; anthers linear, 2.5–4 mm. Fruit terete, (4–)6–10(–14) cm × 2–2.5 mm; valves glabrous, constricted between seeds. Seeds oblong, (2.5–)3–4 × 1–1.5 mm. Fl. and fr. May–Sep. $2n = 24$.

Xinjiang [native to Europe and SW Asia; cultivated and naturalized elsewhere].

2. *Hesperis sibirica* Linnaeus, Sp. Pl. 2: 663. 1753.

北香花芥 bei xiang hua jie

Hesperis elata Hornemann; *H. matronalis* Linnaeus var. *elata* (Hornemann) Schmalhausen; *H. matronalis* subsp. *sibirica* (Linnaeus) G. V. Krylov; *H. matronalis* var. *sibirica* (Linnaeus) de Candolle; *H. oreophila* Kitagawa; *H. pseudonivea* Tzvelev; *H. sibirica* var. *alba* Georgi.

Herbs perennial or biennial, (25–)40–100(–140) cm tall, often densely glandular especially above, hirsute with simple trichomes to 3 mm. Stems erect, simple basally, often branched above, glandular and often also subsetose. Basal leaves withered by flowering. Middle and upper cauline leaves narrowly to broadly lanceolate, (3–)5–10(–16) × (0.5–)1–3.5(–5.5) cm, sessile or subsessile, glandular and with simple trichomes, base cuneate, margin denticulate or subentire, apex acute or acuminate. Fruiting pedicels divaricate or ascending, 0.7–2.5(–3.2) cm, glandular. Sepals narrowly oblong, 5.5–7.5(–10) × 1.5–2 mm. Petals deep purple, lavender, or white, narrowly to broadly obovate, 1.5–2(–2.5) cm × 5–10 mm, apex rounded; claw 7–10 mm. Filaments

3–5.5(–6.5) mm; anthers linear, 2.5–4 mm. Fruit terete, (3–)4–10(–13) cm × 1.5–2 mm; valves sparsely to densely glandular, constricted between seeds. Seeds oblong, (1.5–)2–2.7(–3) × 1–1.3 mm. Fl. and fr. May–Sep. $2n = 14$.

Mountains slopes, shrubby areas, plains, near rivers; 900–2900. Hebei, Liaoning, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Uzbekistan].

The alleged differences between *Hesperis sibirica* (petals purple, 15–24 mm) and *H. pseudonivea* (petals white, 18–23 mm) do not support their recognition as independent taxa at any rank because white flowers can be found in many populations of *H. sibirica*, and there are no other characters that separate the two.

76. CLAUSIA Kornuch-Trotzky, Index Sem. Kasan. 1834.

香芥属 xiang jie shu

Herbs annual, biennial, or perennial. Trichomes eglandular and simple, mixed with stalked multicellular, multiseriate glandular ones. Stems erect, simple basally, branched above. Basal leaves petiolate, not rosulate or rarely rosulate, simple, entire or dentate. Cauline leaves shortly petiolate or sessile, not auriculate, entire, dentate, or serrate. Racemes ebracteate, elongated in fruit. Fruiting pedicels thickened, divaricate or ascending. Sepals oblong-linear, erect, glabrous or pubescent, base of lateral pair strongly saccate. Petals purple, lavender, or rarely white, much longer than sepals, not crisped; blade obovate, apex rounded; claw distinct. Stamens 6, strongly tetradynamous; filaments not dilated at base; anthers narrowly oblong, obtuse at apex. Nectar glands, 2, lateral, semilunar, intrastaminal; median glands absent. Ovules 25–45 per ovary. Fruit dehiscent siliques, narrowly linear, latiseptate, sessile; valves with a prominent midvein and distinct lateral veins, glabrous, torulose; replum flattened; septum complete; style short, stout, cylindrical; stigma capitate, 2-lobed, lobes slightly decurrent, free. Seeds uniseriate, narrowly winged, oblong, flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Five species: C and E Asia, SE Europe; two species in China.

1a. Perennial, densely glandular; cauline leaves sessile, entire or rarely dentate; pedicels glandular 1. *C. aprica*

1b. Annual or biennial, almost eglandular; cauline leaves petiolate, coarsely serrate; pedicels glabrous 2. *C. trichosepala*

1. *Clausia aprica* (Stephan) Kornuch-Trotzky, Index Sem. Kasan. 1834.

香芥 xiang jie

Cheiranthus apricus Stephan in Willdenow, Sp. Pl. 3: 518. 1800.

Herbs perennial with branched caudex, (5–)9–40(–45) cm tall, densely glandular. Stems erect, simple below and usually above, hirsute with simple trichomes 1–2 mm, with glands to 0.1 mm. Basal leaves congested; petiole 4–10(–15) mm; leaf blade oblanceolate or oblong, 1–3(–4) cm × 2–4(–6) mm, sparsely to densely hirsute, margin entire or rarely dentate, apex acute or obtuse. Middle cauline leaves sessile, lanceolate or oblong, 1–3(–5) cm × 1–5(–8) mm, margin entire or dentate, apex acute or obtuse. Fruiting pedicels divaricate-ascending, 4–10(–18) mm, densely glandular. Sepals 5–7 × 1.3–1.7 mm, glabrous or sparsely hirsute. Petals purple, lavender, or white, broadly obovate, (1–)1.3–1.7 cm × 5–7 mm; claw 6–10 mm. Filaments 4–9 mm; anthers narrowly oblong, 1.6–2 mm. Fruit erect, (3–)4–7(–8) cm × 1.5–2 mm, sparsely glandular or glabrous; style 0.5–1.5 mm. Seeds 1.2–2 × 0.8–1.2 mm; wing distal, 0.2–0.4 mm wide. Fl. and fr. May–Jul.

Mountain slopes, steppe. Xinjiang [Kazakhstan, Mongolia, Russia; SE Europe].

2. *Clausia trichosepala* (Turczaninow) Dvorák, Phytion (Horn) 11: 200. 1966.

毛萼香芥 mao e xiang jie

Hesperis trichosepala Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 5: 180. 1832; *Cheiranthus apricus* Stephan var. *trichosepalus* (Turczaninow) Franchet; *Clausia aprica* var. *trichosepala* (Turczaninow) Kornuch-Trotzky; *H. limprichtii* O. E. Schulz; *H. limprichtii* var. *violacea* O. E. Schulz.

Herbs annual or biennial, (10–)25–60(–70) cm tall, with a few sparse glands and appearing eglandular, glabrous throughout except for sepals and sometimes stems. Stems erect, simple below, branched above, glabrous throughout or rarely sparsely hirsute with simple trichomes. Basal leaves withered by flowering. Middle cauline leaves with petioles (2–)5–15(–30) cm; leaf blade elliptic, (0.9–)1.7–4.5(–8) × (0.2–)0.5–1.8(–3) cm, margin coarsely serrate, apex acute. Fruiting pedicels divaricate-ascending, 4–10 mm, glabrous. Sepals 4–6 ×

ca. 1.5 mm, densely hirsute distally. Petals purple, obovate, 1–1.7 cm × 4–5 mm; claw 6–8 mm. Filaments 4–8 mm; anthers narrowly oblong, 1.4–1.8 mm. Fruit erect, (3.5–)4.5–7(–8.5) cm × ca. 1.5 mm, glabrous; style 1–2 mm. Seeds 1.2–1.5 × 0.8–1 mm; wing distal, ca. 0.3 mm wide. Fl. and fr. May–Aug.

Mountain slopes; 1100–1700 m. Hebei, Jilin, Nei Mongol, Shandong, Shanxi [Korea, Mongolia].

Clausia trichosepala was treated in FRPS under *Hesperis*. However, the species has multicellular glands on multicellular, multiseriate stalks, a feature that clearly supports its exclusion from *Hesperis*. The glands in *Hesperis* are unicellular on few-celled, uniseriate stalks.

77. PSEUDOCCLAUSIA Popov, Spisok Rosl. Gerb. Fl. USSR 13: 18. 1955.

假香芥属 *jia xiang jie shu*

Herbs biennial or rarely perennial. Trichomes unicellular, eglandular, simple, along with stalked multicellular, multiseriate ones. Stems erect, simple basally, branched above. Basal leaves petiolate, rosulate, pinnatisect or pinnatifid, rarely subentire. Cauline leaves shortly petiolate or sessile, not auriculate, pinnatisect, pinnatifid, dentate, or rarely entire. Racemes ebracteate, elongated considerably in fruit. Fruiting pedicels thickened, divaricate or ascending. Sepals oblong-linear, erect, base of lateral pair strongly saccate. Petals purple, lavender, or rarely brownish, much longer than sepals, crisped; blade linear, narrowly oblanceolate, or rarely obovate, apex rounded; claw distinct. Stamens 6, erect, strongly tetradynamous; filaments not dilated at base; anthers linear to linear-oblong. Nectar glands 2, lateral; median glands absent. Ovules 10–45 per ovary. Fruit dehiscent siliques, narrowly linear, latisepate, sessile; valves with a prominent midvein and distinct lateral veins, torulose; replum flattened; septum complete; style conical; stigma linear, 2-lobed, lobes strongly decurrent, connate. Seeds uniseriate, narrowly winged, oblong, flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Ten species: C and SW Asia; one species in China.

1. Pseudoclausia turkestanica (Lipsky) A. N. Vassilevjeva, Fl. Kazakhst. 4: 244. 1961.

突厥假香芥 *tu jue jia xiang jie*

Clausia turkestanica Lipsky, Trudy Imp. S.-Peterburgsk. Bot. Sada 23: 41. 1904; *C. turkestanica* var. *glandulosissima* Lipsky; *C. turkestanica* var. *subintegrifolia* Lipsky.

Herbs (27–)40–70(–120) cm tall. Stems unbranched below, hirsute with simple trichomes 1.5–2.5 mm, these mixed with glandular ones 0.2–0.3 mm. Basal leaves congested; petiole 0.5–1.5 cm; leaf blade oblanceolate or oblong, 1.5–5(–8) × 0.7–1.5 cm, sparsely to densely hirsute, pinnatifid, sinuate, or rarely subentire. Cauline

leaves sessile, oblong-lanceolate or ovate-oblong, 2.5–5 cm × 3–5(–8) mm, entire or dentate. Fruiting pedicels divaricate, 5–10(–18) mm, glandular. Sepals (5–) 6–8(–9) × ca. 1.5 mm. Petals purplish, linear or linear-oblong, 10–16 × 1.5–3 mm; claw 7–10 mm, broader distally. Filaments 4–6 mm; anthers linear-oblong, 2.5–3 mm. Fruit (3–) 6–9(–12) cm × 1.5–2 mm, sparsely glandular or glabrous; style subconical, 1.5–4 mm; stigma linear, 1.5–2 mm. Seeds 1.2–2 × 1–1.4 mm; wing 0.1–0.4 mm wide. Fl. Jun–Jul.

Mountain slopes; 800–3000 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

78. ATELANTHERA J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 129. 1861.

异药芥属 *yi yao jie shu*

Herbs annual. Trichomes malpighiaceus. Stems erect or ascending, simple basally, branched above. Basal leaves not formed; cotyledons persistent, simple, entire. Cauline leaves sessile, cuneate or attenuate, not auriculate, linear, entire. Racemes few flowered, ebracteate or rarely lowermost flowers bracteate; rachis slightly flexuous. Fruiting pedicels slender, ascending or divaricate. Sepals oblong, caducous, erect, sparsely pubescent with malpighiaceus trichomes, base of lateral pair not saccate. Petals white becoming purplish, longer than sepals; blade narrowly spatulate, apex retuse; claws well developed. Stamens 6, erect, strongly tetradynamous; filaments filiform, not dilated at base; anthers narrowly oblong, apiculate at apex, median pairs 1-lobed, lateral pair 2-lobed, sagittate. Median glands absent; lateral glands 1 on each side of lateral stamen. Ovules 10–25 per ovary. Fruit dehiscent siliques, linear, terete or slightly flattened and latisepate; valves papery, with an obscure midvein, pubescent with malpighiaceus trichomes, smooth; gynophore absent; replum rounded; septum complete, membranous; style to 1 mm; stigma capitate, subentire. Seeds uniseriate, wingless, oblong, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent, long persistent.

One species: Afghanistan, China, Kashmir, Pakistan, Tajikistan.

Atelanthera is the only genus in the Brassicaceae in which the median stamens have 1-lobed anthers.

1. Atelanthera perpusilla J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 138. 1861.

异药芥 *yi yao jie*

Atelanthera contorta Gilli; *A. pentandra* Jafri.

Herbs annual, slender, (1–)3–10 cm tall. Stems erect, usually simple at base, branched above, sparsely to

densely pubescent, usually glabrescent above. Basal 2 leaves represent persistent cotyledons. Cauline leaves linear or narrowly oblong, sessile, (0.5–)1–2(–3) cm × (0.5–)1–3 mm, pubescent with malpighiaceus trichomes, base cuneate, margin entire, apex obtuse. Racemes 2–5-flowered, lax. Fruiting pedicels 1–4(–6) mm, slender, narrower than fruit. Sepals 2–3 × 0.7–1 mm, densely pubescent with malpighiaceus trichomes, membranous margin to 0.1 mm wide, apex obtuse, membranous. Petals white becoming purplish, narrowly

spatulate, 3–4.5 × 0.7–1 mm; claw to 2 mm. Filaments white, 2–3 mm; anthers narrowly oblong, 0.4–0.5 mm. Fruit linear, terete or slightly compressed, 1.3–2.5 cm × 0.6–1 mm; valves densely pubescent with malpighiaceus trichomes; style 0.5–1 mm. Seeds brownish, ovoid, somewhat plump, 0.7–1 × ca. 0.5 mm.

Gravelly or sandy beds, among stones, sandy slopes; 2400–3100 m. Xizang [Afghanistan, Kashmir, Pakistan, Tajikistan].

79. CRYPTOSPORA Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 161. 1842.

隐子芥属 yin zi jie shu

Herbs annual. Trichomes often a mixture of simple, forked, stellate, or malpighiaceus. Stems erect or ascending. Basal leaves subsessile, not rosulate, simple, entire. Cauline leaves sessile, cuneate and not auriculate at base, entire or denticulate. Racemes several flowered, ebracteate. Fruiting pedicels nearly as wide as fruit, ascending and subappressed to rachis or rarely divaricate. Sepals oblong, erect, pubescent, base of lateral pair not saccate. Petals white, longer than sepals; blade spatulate, apex obtuse or emarginate; claw obscurely differentiated from blade. Stamens 6, erect, tetradynamous; filaments dilated at base; anthers ovate or oblong, apiculate. Median glands absent; lateral ones annular. Ovules 3–7 per ovary. Fruit indehiscent siliques, cylindric, sessile, usually breaking into 1-seeded units; valves somewhat woody, veinless or obscurely veined, often with dense malpighiaceus trichomes sometimes mixed with larger, simple or stalked, 2-forked ones on tuberculate base, torulose; replum rounded; septum absent; style obsolete; stigma capitate, 2-lobed. Seeds uniseriate, wingless, narrowly oblong, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

Three species: C and SW Asia; one species in China.

1. *Cryptospora falcata* Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 161. 1842.

隐子芥 yin zi jie

Cryptospora omissa Botschantzev.

Herbs annual, (6–)10–40(–60) cm tall. Stems erect, simple or few branched at base, hispid with simple and/or forked or stellate trichomes. Basal leaves not rosulate, sessile, soon withered. Middle cauline leaves narrowly oblong to oblong-lanceolate, sessile, (1–)1.5–3.5(–5) cm × 2–7(–12) mm, abaxially primarily with 3-forked stalked stellate trichomes, adaxially with simple and stalked forked trichomes, base cuneate or subobtusate, not auriculate, margin entire or sparsely denticulate, apex acute. Fruiting pedicels stout, stellate pubescent, erect or ascending, appressed or subappressed to rachis,

(3–)4–7.5 mm. Sepals oblong, 1.5–2.5 × 0.8–1 mm, pubescent. Petals white, spatulate, 4–8 × 1.5–2.5 mm, attenuate at base, emarginate at apex; claw to 1 mm. Filaments 1.5–3 mm; anthers ovate or oblong, 0.5–0.9 mm. Fruit linear, terete, strongly falcate, 1.5–3.5 cm × 1.5–2.5 mm, strongly torulose; valves densely pubescent with malpighiaceus, small trichomes mixed with sparser and much coarser, tuberculate-based, short-stalked, forked trichomes; style obsolete. Seeds light brown, 3–7 per fruit, narrowly oblong, uniseriate, 2.5–3.5 × 0.9–1.1 mm. Fl. Apr–Jul, fr. May–Jul.

Deserts, steppe; 500–1000 m. W Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

80. STERIGMOSTEMUM Marschall von Bieberstein, Fl. Taur.-Caucas. 3: 444. 1819–1820.

棒果芥属 bang guo jie shu

Sterigma de Candolle.

Herbs annual, biennial, or perennial, or subshrubs. Trichomes dendritic, sometimes mixed with fewer simple and stalked forked ones; glandular trichomes multicellular, multiseriate. Stems erect, simple or branched. Basal leaves petiolate, rosulate, simple, pinnatifid, pinnatisect, or runcinate, rarely sinuate or subentire. Cauline leaves petiolate, similar to basal, often less divided upward. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender, rarely thickened, divaricate or erect-ascending. Sepals oblong, ascending, equal, base of lateral pair not saccate. Petals yellow or orange, rarely white or purplish; blade broadly obovate, apex rounded; claw not differentiated from blade. Stamens 6, strongly tetradynamous; filaments of median pairs connate or rarely free, dilated at base; anthers oblong, obtuse at apex. Nectar glands 2, lateral, annular; median glands absent. Ovules 10–40 per ovary. Fruit indehiscent or tardily dehiscent, often lomentaceous siliques, breaking transversely into 1(or 2)-seeded units, linear or oblong, terete, sessile; valves thickened, obscurely veined, glabrous or with glandular and/or dendritic trichomes, torulose or rarely moniliform; replum rounded; septum complete, thickened, opaque, veinless; style prominent or short or obsolete; stigma capitate, strongly 2-lobed, lobes spreading, free, not decurrent. Seeds uniseriate, wingless, oblong, slightly flattened; seed coat not mucilaginous when wetted; cotyledons incumbent.

Seven species: C and SW Asia; one species in China.

1. *Sterigmostemum caspicum* (Lamarck) Ruprecht, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 15: 95. 1869.

棒果芥 bang guo jie

Cheiranthus caspicus Lamarck in Pallas, Voy. [Reise Russ. Reich., French Transl. 2] 8: 348. 1794; *C. tomentosus* Willdenow; *Sterigmostemum tomentosum* (Willdenow) Marschall von Bieberstein.

Plants perennial, (6–)10–25(–30) cm tall, tomentose, with woody caudex. Trichomes dendritic; glandular trichomes absent. Stems several from base. Basal leaves green or canescent; petiole 0.5–2 cm; leaf blade linear, lanceolate, or obovate, (3–) 4–8(–13) cm × 5–10 mm, base attenuate, margin entire, obtusely sinuate-dentate, pinnatifid, or pinnatisect and with entire, dentate, or lobed lateral segments, apex subacute. Uppermost cauline leaves sessile, smaller, often undivided. Fruiting pedicels thickened, divaricate, (2–)5–12(–17) mm. Sepals oblong, (2.5–)3–4(–5) × 0.5–1 mm, lateral pair broader. Petals yellow, (5–)6–8(–9) × 2.5–3.5 mm, base attenuate into a claw. Median filament 5–6 mm,

united to middle or slightly above; lateral filaments 3.5–4 mm; anthers 2–2.5 mm. Ovules 20–40 per ovary. Fruit linear, (2–)3.5–5.5(–6.5) cm × 1.5–2.2 mm, divaricate to divaricate-ascending, straight or curved; valves thickened, tomentose; style 1–3 mm, thickened; stigma lobes erect to subconnivent. Seeds brown, oblong, 2–2.5 × 0.6–0.8 mm. Fl. Apr–Jun, fr. May–Jul.

Steppe, deserts, arid areas; 500–1200 m. Xinjiang [Kazakstan, Russia].

The record in FRPS of *Sterigmostemum incanum* Marschall von Bieberstein is based on misidentified plants of *Oreoloma violaceum*. The former species is restricted to SW Asia and adjacent Caucasus. The records of *S. tomentosum* in FRPS and Fl. Xinjiang. (2(2): 184. 1995) from Xinjiang are likely based on misidentified plants of *O. eglandulosum* or perhaps refer to *S. caspicum*. The last species is common in Kazakstan but is very rare in China. The only Chinese collection of *S. caspicum* examined by the present authors is *Anonymous 1840* (K, LE), collected from “Songaria Chin. ad lacum Saisang-Nor.” It represents the easternmost known range of the species.

81. OREOLOMA Botschantzev, Bot. Zhurn. (Moscow & Leningrad) 65: 425. 1980.

爪花芥属 zhao hua jie shu

Herbs perennial, with a distinct caudex. Trichomes dendritic, mixed with stalked glandular ones. Stems erect, simple or branched basally and/or apically. Basal leaves petiolate, rosulate, simple, pinnatifid, pinnatisect, sinuate-dentate, repand, or entire. Cauline leaves few to many. Racemes ebracteate, elongated in fruit. Fruiting pedicels thickened, nearly as wide as fruit, divaricate. Sepals oblong-linear, erect, unequal, base of lateral pair saccate, margin membranous. Petals purple, pink, yellow, or rarely white; blade broadly obovate or spatulate, apex rounded; claw well differentiated from blade, longer than sepals. Stamens 6, strongly tetradynamous; median filaments connate into 2 pair, dilated at base; anthers narrowly oblong, obtuse at apex. Nectar glands 2, lateral, annular or semiannular; median glands absent. Ovules 8–50 per ovary. Fruit tardily dehiscent siliques opening basipetally, not breaking transversely into segments, linear or oblong, terete, sessile; valves corky, not veined, with glandular and/or dendritic trichomes, not torulose or moniliform; replum flattened; septum complete, thickened; style prominent, short, or obsolete; stigma capitate or linear, obscurely to strongly 2-lobed, lobes spreading, free, not decurrent. Seeds uniseriate, wingless, oblong, slightly flattened; seed coat not mucilaginous when wetted; cotyledons incumbent.

Three species: China, Mongolia; three species (two endemic) in China.

Oreoloma, which is almost exclusively Chinese, is most closely related to *Sterigmostemum*, a genus distributed primarily in SW Asia. It consists of perennials with erect, unequal, basally saccate sepals, large petals, (1–)1.3–2.2 cm, strongly differentiated into a blade and claw, and fruit not breaking transversely into segments. *Sterigmostemum* comprises mostly annuals with ascending, equal, nonsaccate sepals, smaller petals, 0.5–1(–1.2) cm, undifferentiated into a blade and claw, and fruit generally breaking transversely into segments.

- 1a. Stigma capitate, subtentire or obscurely with lobes as long as wide; cauline leaves more than 10; median filaments 5–6(–7) mm; ovules 8–14 per ovary 1. *O. matthioides*
- 1b. Stigma linear, with 2 prominent lobes much longer than wide; cauline leaves absent or 1–3(–6); median filaments (8–)9–15 mm; ovules 20–50 per ovary.
 - 2a. Leaves pinnatisect, pinnatifid, or rarely sinuate-dentate; plants densely glandular throughout; fruiting pedicels 2–4(–6) mm; ovules 20–30 per ovary 2. *O. violaceum*
 - 2b. Leaves entire or repand; plants sparsely glandular on sepals subapically and pedicels, very rarely throughout; fruiting pedicels (4–)6–12(–15) mm; ovules 40–50 per ovary 3. *O. eglandulosum*

1. *Oreoloma matthioides* (Franchet) Botschantzev, Bot. Zhurn. (Moscow & Leningrad) 65: 426. 1980.

紫爪花芥 zi zhao hua jie

Dontostemon matthioides Franchet, Pl. David. 1: 35. 1883; *Sterigmostemum matthioides* (Franchet) Botschantzev.

Herbs 15–45 cm tall, densely tomentose and glandular throughout; caudex slender, often branched. Stems simple from caudex, often branched above. Basal leaves with petioles (0.5–) 1–3 cm; leaf blade lanceolate in outline, 2–7 × 0.8–3 cm, margin pinnatifid or pinnatisect, rarely sinuate-dentate, apex subacute;

lateral lobes to 5 on each side of midvein, oblong or ovate, (1–)2–10(–20) cm × (0.5–)1–4(–6) mm. Cauline leaves many, shortly petiolate, pinnatifid or sinuate-dentate. Fruiting pedicels stout, slightly narrower than fruit base, 2–3(–5) mm, divaricate. Sepals narrowly oblong, (6–)7–8 × 1.2–1.7 mm. Petals pink, creamy white, or yellowish, spatulate, 1.4–1.8 cm × 3–4(–5) mm; claw 7–10 mm. Median filaments 5–6(–7) mm, connate along 0.5–0.8 of their length; lateral filaments 3–4(–5) mm; anthers narrowly oblong, 2–2.5 mm. Ovules 8–14 per ovary. Fruit cylindrical or oblong, (1–)1.5–3(–4) cm × 2–4 mm, straight, widest at base, narrower at apex; style obsolete or to 1.5 mm; stigma capitate, subentire or with obscure lobes as long as wide. Seeds oblong, brown, 2–2.7 × 1–1.3 mm. Fl. and fr. Jun–Aug.

• Valleys, rocky places, sandy and gravelly slopes; 1400–2000 m. Nei Mongol, Ningxia, Qinghai.

The record of *Oreoloma matthioides* in FRPS (as *Sterigmostemum matthioides*) from Xinjiang is based on misidentified plants of *O. violaceum*.

2. *Oreoloma violaceum* Botschantzev, Bot. Zhurn. (Moscow & Leningrad) 65: 426. 1980.

爪花芥 zhao hua jie

Oreoloma sulfureum Botschantzev; *Sterigmostemum fuhaiense* H. L. Yang; *S. violaceum* (Botschantzev) H. L. Yang.

Herbs 6–22 cm tall, densely tomentose and glandular throughout; caudex woody, branched, covered with petiolar remains of previous years, 2–10 mm in diam. Stems simple from caudex, simple or branched above. Basal leaves with petioles 1–3 cm; leaf blade linear-lanceolate to lanceolate in outline, 2–7.5 × 0.5–2 cm, margin pinnatifid or pinnatisect, rarely sinuate-dentate, apex subacute; lateral lobes to 7 on each side of midvein, oblong or ovate, 3–10 × 1–4 mm. Cauline leaves few, subsessile, pinnatifid or dentate. Fruiting pedicels stout, slightly narrower than fruit base, 2–4(–6) mm, divaricate. Sepals narrowly oblong, (6–)8–10 × 1.5–2 mm. Petals pink, creamy white, or yellowish, (1–)1.3–1.8 cm × (3–)4–6(–7) mm; claw (7–)9–11 mm. Median filaments (8–)9–11 mm, connate along 0.6–0.8 of their length; lateral filaments 6–7.5(–9) mm; anthers narrowly oblong, 2.5–3.5 mm. Ovules 20–30 per ovary. Fruit cylindrical, (1.5–)2.5–3.5 cm × 2–3 mm, straight or curved, widest at base, attenuate to apex; style 3–5 mm;

stigma lobes linear, 1–3 mm. Seeds oblong, brown, 2–2.5 × 1–1.3 mm. Fl. Apr–Jun, fr. Jun–Jul.

Mountain slopes; 1000–2200 m. Xinjiang [Mongolia].

A highly variable species in leaf margin, flower color and size, and degree of connation of median filaments. An examination of the type collections of the three “species” united here reveals that the alleged differences in the length of united portions of median filaments, which were used by Botschantzev (loc. cit.) and Yang (Fl. Desert. Reipubl. Popularis Sin. 2: 64. 1987) to separate species, are totally un-reliable, as is the shape of nectar glands. Yang (loc. cit.) reduced *Oreoloma sulfureum* to the synonymy of *Sterigmostemum sulphureum* (Banks & Solander) Bormüller, but the latter is an entirely different species restricted to SW Asia.

3. *Oreoloma eglandulosum* Botschantzev, Bot. Zhurn. (Moscow & Leningrad) 65: 427. 1980.

少腺爪花芥 shao xian zhao hua jie

Sterigmostemum eglandulosum (Botschantzev) H. L.

Yang; *S. grandiflorum* K. C. Kuan.

Herbs (6–)10–22(–30) cm tall, densely tomentose, sparsely glandular on sepals and sometimes on pedicels and leaf blades, eglandular elsewhere, rarely densely glandular throughout; caudex woody, branched, covered with petiolar remains of previous years. Stems simple from caudex, simple or branched above. Basal leaves with petioles (1–)2–5(–7) cm; leaf blade broadly oblong or broadly oblanceolate, (1–)2–8(–10) × (0.5–)1.5–3(–4) cm, margin entire or repand, apex rounded or obtuse. Cauline leaves absent or few, shortly petiolate, entire. Fruiting pedicels stout, slightly narrower than fruit base, (4–)6–12(–15) mm, divaricate. Sepals narrowly oblong, (0.8–)1–1.5 cm × 2–3 mm. Petals pink, creamy white, or yellowish, (1.5–)1.7–2.2 cm × 4–6 mm; claw 1–1.5 cm. Median filaments 1.1–1.5 cm, connate along 0.5–0.9 of their length; lateral filaments 0.8–1.2 cm; anthers narrowly oblong, 3–4 mm. Ovules 40–50 per ovary. Fruit cylindrical, (3–)4–7(–8) cm × 2–3 mm, straight or curved, attenuate to apex; style 2.5–6(–8) mm; stigma lobes linear, 2.5–4.5 mm. Seeds oblong, brown, 2–3 × 1–1.3 mm. Fl. Jun–Aug, fr. Jul–Aug.

• Slopes, dry gravelly valleys, sandy roadsides; 3000–4300 m. Gansu, Qinghai, Xinjiang.

Both *Oreoloma eglandulosum* and *Sterigmostemum grandiflorum* were published in 1980, the former in March (thus taking priority) and the latter in August. In his protologue of *O. eglandulosum*, Botschantzev indicated that the plants are eglandular. However, the holotype and other collections annotated by him all have the sepals subapically sparsely glandular. The holotype of *S. grandiflorum* has sparsely glandular leaves, pedicels, and sepals. Evidently the density of glands is not a reliable character for the separation of species.

82. GOLDBACHIA de Candolle, Mém. Mus. Hist. Nat. 7: 242. 1821, nom. cons.

四棱芥属 si leng qi shu

Herbs annual. Trichomes absent or eglandular, simple. Stems erect, branched. Basal leaves petiolate, rosulate or not, entire, dentate, or lyrate pinnatifid. Cauline leaves sessile, auriculate or amplexicaul at base, rarely not auriculate, entire, repand, or dentate. Racemes ebracteate, elongated in fruit. Fruiting pedicels filiform, recurved or reflexed, articulate at base or both ends. Sepals ovate or oblong, suberect, base of lateral pair not saccate or subsaccate. Petals

white, pink, or purplish, longer than sepals; blade spatulate, apex obtuse; claw subequaling sepals. Stamens 6, slightly tetradynamous; median filament pairs flattened at base, lateral pair filiform; anthers ovate, obtuse at apex. Nectar glands 4, minute; median glands free or confluent with laterals; lateral glands semiannular, intrastaminal. Ovules 1–3 per ovary, subapical. Fruit indehiscent nutletlike silicle, often breaking into 1-seeded units, oblong, ovoid, or ellipsoid, 1-loculed or transversely 2- or 3-loculed, terete or 4-angled, sessile, woody, often prominently veined, glabrous or papillate, smooth or torulose, sometimes verrucose-reticulate; replum rounded; septum absent; style absent, obsolete, or distinct, thickened and subconical; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons incumbent.

Six species: C and SW Asia, E Europe; three species in China.

- 1a. Cauline leaves widest at base, amplexicaul; sepals densely pubescent with crisped trichomes; fruit pointed upward, fruit and fruiting pedicels form a distinct angle 30–120 degrees 1. *G. laevigata*
 1b. Cauline leaves widest at middle, auriculate or sagittate, or sessile and not auriculate; sepals glabrous or sparsely pubescent with straight trichomes; fruit pointed downward, fruit and fruiting pedicels form a straight line.
 2a. Cauline leaves often denticulate, sparsely ciliate; mature fruit terete or slightly 4-angled, abruptly constricted to beaklike apex 0.5–1.5 mm; fruiting pedicels (4–)6–10(–12) mm, slightly shorter or slightly longer than fruit 2. *G. pendula*
 2b. Cauline leaves subtire or entire, not ciliate; mature fruit distinctly 4-angled, attenuate to beaklike apex (2–)2.5–3 mm; fruiting pedicels 1.5–3(–4.5) mm, much shorter than fruit 3. *G. ikonnikovii*

1. *Goldbachia laevigata* (Marschall von Bieberstein) de Candolle, Syst. Nat. 2: 577. 1821.

四棱芥 si leng qi

Raphanus laevigatus Marschall von Bieberstein, Fl. Taur.-Caucas. 2: 129. 1808; *Goldbachia hispida* Blatter & Hallberg; *G. laevigata* var. *ascendens* Boissier; *G. laevigata* var. *ascendens* f. *reticulata* Kuntze; *G. reticulata* (Kuntze) Vassilczenko.

Herbs annual, (10–)15–40 cm tall. Stems branched basally and above. Basal leaves not rosulate; petiole 1–3 cm; leaf blade often oblong, 2.5–4.5 × 0.8–3 cm, margin sinuate-dentate to dentate. Middle cauline leaves sessile, amplexicaul, cordate-ovate or ovate-lanceolate, (0.8–)1.3–4.5(–5.5) cm × 2–15(–17) mm, widest at base, margin entire. Fruiting pedicels slender, 0.5–1.5 cm, reflexed, forming with fruit a distinct angle 30–120 degrees, articulate at base. Sepals oblong, 2.5–4 × ca. 1 mm, densely pubescent with crisped trichomes, base of lateral pair slightly saccate. Petals pale purplish or pink, spatulate, 5–8 × ca. 1.5 mm. Filaments 3–4 mm; anthers ovate, 0.4–0.6 mm. Fruit narrowly oblong, 0.8–1.3 cm × 3–4 mm, pointed upward, 4-angled, rugose, constricted at middle when more than 1-seeded, base subrounded, beaklike apex (1–)1.5–2(–2.5) mm. Seeds yellow-brown, oblong, 1.6–2.4 × 0.9–1.3 mm. Fl. Apr–Jun.

Fields, roadsides, hillsides; 400–1300 m. Xinjiang [Afghanistan, ?India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, ?Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

Records and illustrations in FRPS (3: 375. 1987), Fl. Qinghai. (1: 483. 1997), and Fl. Xinjiang. (2(2):189. 1995) of *Goldbachia laevigata* are based on misidentified plants of *G. pendula*. The former species has pedicels that form a distinct angle with the fruit and sepals densely pubescent with crisped trichomes. *Goldbachia pendula* and *G.*

ikonnikovii have pedicels and fruit that form a straight line and their sepals are either glabrous or sparsely pubescent with few straight trichomes (see the above key). The occurrence of *G. laevigata* in China is here confirmed based on *Regel s.n.*, May 1877 (LE), collected from Xinjiang. Records of the species from India and Pakistan are questionable, and they are likely based on misidentified plants of *G. tetragona* Ledebour or *G. torulosa* de Candolle.

2. *Goldbachia pendula* Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 22: 140. 1963.

垂果四棱芥 chui guo si leng qi

Herbs annual, (10–)14–40(–50) cm tall. Stems branched basally and above. Basal leaves not rosulate; petiole 1–2.5 cm; leaf blade obovate or oblanceolate, (1.3–)2–5(–8) × 0.4–2(–3) cm, margin sinuate-dentate or dentate, often ciliate, apex obtuse or acute. Middle cauline leaves sessile, auriculate, oblong, narrowly lanceolate, or oblanceolate, (0.8–)1.3–4.5(–5.5) cm × 2–15(–17) mm, widest at middle, margin denticulate, ciliate with straight trichomes to 0.3 mm. Fruiting pedicels slender, (4–)6–10(–12) mm, reflexed, forming a straight line with fruit, articulate at both ends. Sepals oblong, 1.5–2(–2.5) × 0.5–0.7 mm, glabrous or sparsely pubescent subapically with straight trichomes, base of lateral pair slightly saccate. Petals pale purple, narrowly oblanceolate, 3–4 × 0.8–1.2 mm. Filaments 1–2 mm; anthers ovate, 0.3–0.4 mm. Fruit ovoid or narrowly oblong, 5–9(–11) × 1.5–2.2(–3) mm, pointed downward, terete or slightly 4-angled, constricted at middle when more than 1-seeded, base subrounded, abruptly narrowed into a beaklike apex 0.5–1.5 mm. Seeds yellow, oblong, 1.6–2.4 × 0.9–1.3 mm. Fl. May–Jun, fr. Jun–Aug.

Deserts, high plateaus, rocky hillsides; 400–4200 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang, Xizang [Kazakstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan].

Goldbachia pendula is recorded here for the first time from China. The record from Gansu is based on *Przewalski 282* (LE), that from Nei Mongol on *Przewalski s.n.*, 10–22 May 1879 (LE), that from Qinghai on *Boufford et al. 26892* (A, MO) and *Ladygin 164* (LE), that from Xinjiang on *Anonymous 1–170* (PE 1394154), and that from Xizang on *Ladygin 350* (LE).

3. *Goldbachia ikonnikovii* Vassilczenko, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 1(2): 151. 1936.

短梗四棱芥 duan geng si leng qi

Goldbachia laevigata (Marschall von Bieberstein) de Candolle var. *ikonnikovii* (Vassilczenko) Kuan & Ma.

Herbs annual or biennial, 15–40 cm tall. Stems branched basally and above. Basal leaves not rosulate; petiole 1–2 cm; leaf blade oblanceolate, 2–6 × 0.8–2 cm, margin dentate, not ciliate, apex obtuse or acute. Middle cauline leaves sessile, auriculate, linear-oblong or narrowly lanceolate, 0.8–4.5 cm × 1–7(–10) mm,

widest at middle, margin often entire, not ciliate. Fruiting pedicels stout, (4–)6–10(–12) mm, reflexed, forming a straight line with fruit, articulate at base. Sepals oblong, 1.2–1.6 × ca. 0.5 mm, glabrous or sparsely pubescent subapically with straight trichomes, base of lateral pair slightly saccate. Petals pale purple, narrowly oblanceolate, 2–3 × 0.4–0.6 mm. Filaments 1–1.5 mm; anthers ovate, 0.4–0.5 mm. Fruit narrowly oblong or lanceolate, (6–)7–12 × 1.2–1.8 mm, pointed downward, strongly 4-angled, constricted at middle when more than 1-seeded, cuneate at base, attenuate into a beaklike apex (2–)2.5–3 mm. Seeds yellow, oblong, 1.8–2.6 × 0.7–1 mm. Fl. May–Jun, fr. Jun–Jul.

Nei Mongol [Mongolia].

The above first record from Nei Mongol is based on *Chen s.n.* (PE 1138203) and *Licent 7497* (BM).

83. ERYSIMUM Linnaeus, Sp. Pl. 2: 660. 1753.

糖芥属 tang jie shu

Zhou Taiyan (周太炎 Cheo Tai-yien), Lu Lianli (陆莲立 Lou Lian-li), Yang Guang (杨光); Vladimir I. Dorofeyev³, Ihsan A. Al-Shehbaz

Cheiranthus Linnaeus; *Cheirinia* Link; *Cuspidaria* (de Candolle) Besser; *Syrenia* Andrzejowski ex Besser. Herbs annual, biennial, or perennial, rarely subshrubs or shrubs. Trichomes sessile, medifixed, appressed, malpighiaceus or 3–5(–8)-rayed stellate. Stems simple or branched basally and/or apically. Basal leaves petiolate, rosulate, simple, entire or dentate, rarely pinnatifid or pinnatisect. Cauline leaves petiolate or sessile, cuneate or attenuate at base, rarely auriculate, entire or dentate. Racemes ebracteate or basally bracteate, rarely bracteate throughout, corymbose, elongated or not in fruit. Fruiting pedicels slender or thickened and nearly as wide as fruit, erect, ascending, divaricate, or reflexed. Sepals oblong or linear, erect, pubescent, base of lateral pair saccate or not. Petals yellow or orange, rarely white, pink, purple, or violet; blade suborbicular, obovate, spatulate, or oblong, apex rounded or emarginate; claw differentiated from blade, subequaling or longer than sepals. Stamens 6, erect, tetradynamous; anthers oblong or linear. Nectar glands 1, 2, or 4, distinct or confluent and subtending bases of all stamens; median glands present or absent. Ovules 15–100 per ovary. Fruit dehiscent siliques or rarely silicles, linear or rarely oblong, terete, 4-angled, latiseptate, or angustiseptate, sessile or rarely shortly stipitate; valves with an obscure to prominent midvein, pubescent on outside, rarely also on inside, keeled or not, smooth or torulose; replum rounded; septum complete, membranous, translucent or opaque, veinless; style obsolete or short, rarely half as long as or subequaling fruit, often pubescent; stigma capitate, entire or 2-lobed. Seeds uniseriate or rarely biseriate, winged, margined, or wingless, oblong, plump or flattened; seed coat minutely reticulate, mucilaginous when wetted; cotyledons incumbent or rarely accumbent.

About 150 species: N hemisphere, primarily in Asia and Europe, with 14 species in Central and North America and eight species in N Africa and Macaronesia; 17 species (five endemic) in China.

Erysimum cheiri (Linnaeus) Crantz (as *Cheiranthus cheiri* Linnaeus in FRPS) is a widely cultivated ornamental plant, but it is not known if it has become naturalized in China or elsewhere in Asia.

1a. Sepals united, persistent well after fruit maturity; fruit oblong, slightly angustiseptate, with transversely oriented malpighiaceus trichomes; styles (4–)5–10(–12) mm 17. *E. siliculosum*

1b. Sepals free, caducous shortly after anthesis; fruit linear or rarely linear-oblong, terete, 4-angled, or latiseptate; with longitudinally oriented, malpighiaceus and/or 3–5-fid stellate trichomes; styles 0.5–3(–4) mm.

2a. Annuals or biennials.

3a. Fruiting pedicels nearly as thick as fruit.

4a. Trichomes malpighiaceus mixed with 3-forked ones; fruiting pedicels 2–4 mm; petals 6–8 × 1.5–2 mm; fruit 4-angled, (2–)3–8(–10) cm 16. *E. repandum*

4b. Trichomes exclusively malpighiaceus; fruiting pedicels 0.5–1.5(–2) mm; petals 3–4(–5) × 0.3–0.6 mm; fruit terete, (1.3–)1.7–2.2(–2.5) cm 15. *E. sisymbrioides*

³ Herbarium: Higher Plants, V. L. Komarov Botanical Institute, Russian Academy of Sciences, Prof. Popov Street 2, St. Petersburg 197376, Russia.

- 3b. Fruiting pedicels distinctly narrower than fruit.
 - 5a. Fruit valves densely stellate inside.
 - 6a. Petals spatulate, well differentiated into claw and limb, 1.5–2 mm wide; fruiting pedicels 5–13(–16) mm; seeds 1–1.3 mm 13. *E. cheiranthoides*
 - 6b. Petals linear to linear-oblongate, undifferentiated into a claw and limb, 0.3–0.5(–0.7) mm wide; fruiting pedicels 3–7(–9) mm; seeds (0.6–)0.7–0.9 14. *E. macilentum*
 - 5b. Fruit valves glabrous inside, if sparsely pubescent (rarely in *E. hieracifolium*), then petals more than 6×2 mm.
 - 7a. Trichomes exclusively malpighiaceae, rarely 3-fid ones on style; fruit smooth, with 4 bands of white trichomes separated by glabrous replum and valve midveins 9. *E. canescens*
 - 7b. Trichomes 3- or 4-fid mixed with malpighiaceae ones on leaves and fruit; fruit torulose, without 4 white bands of trichomes.
 - 8a. Fruit (6–)7–11(–13) cm; racemes bracteate at base 10. *E. benthamii*
 - 8b. Fruit (1–)1.5–3.5(–4) cm; racemes ebracteate.
 - 9a. Plants (10–)30–90(–110) cm tall; fruiting pedicels suberect or ascending, subappressed to rachis; leaves entire or obscurely denticulate 11. *E. hieracifolium*
 - 9b. Plants 3–10 cm tall; fruiting pedicels divaricate; leaves sinuate-dentate or dentate 12. *E. schlagintweitianum*
- 2b. Perennials.
 - 10a. Petals pink or purple.
 - 11a. Petals narrowly spatulate, 7–9(–10) \times 1.7–2(–2.5) mm; plants (1.5–)2–6(–8) cm tall 5. *E. funiculosum*
 - 11b. Petals broadly obovate or broadly spatulate, (14–)16–22(–25) \times (3–)4–6(–8) mm; plants (6–)10–28(–36) cm tall 4. *E. roseum*
 - 10b. Petals yellow or orange.
 - 12a. Plants stemless; raceme subumbellate and often without a rachis 2. *E. handel-mazzettii*
 - 12b. Plants with a distinct stem; raceme short or long, with a distinct rachis.
 - 13a. Racemes bracteate throughout; fruit 4–5 mm wide; seeds 3–4.5 mm 1. *E. forrestii*
 - 13b. Racemes ebracteate or only lowermost few flowers bracteate; fruit 1–2 mm wide; seeds 0.8–3 mm.
 - 14a. Leaf blade mostly filiform to narrowly linear, folded 7. *E. flavum*
 - 14b. Leaves lanceolate, oblong, lanceolate-linear, or very rarely linear, not folded.
 - 15a. Fruit smooth, strongly 4-angled, with 4 bands of white trichomes separated by glabrous replum and valve midveins 9. *E. canescens*
 - 15b. Fruit torulose, flattened, subterete, or slightly 4-angled, without 4 bands of white trichomes.
 - 16a. Plants 2–10(–15) cm tall; petals yellow, 0.6–1(–1.2) cm; sepals 4–6 mm; raceme usually deflexed in fruit 8. *E. deflexum*
 - 16b. Plants (12–)20–100 cm tall; petals often orange-yellow, (1.2–)1.5–2(–2.3) cm; sepals (6–)7–10(–11) mm; racemes erect.
 - 17a. Basal and lowermost leaves coarsely dentate; stigma subentire; fruit (5–)8–11 cm; Sichuan, Xizang, and Yunnan 3. *E. wardii*
 - 17b. Basal and lowermost leaves entire or obscurely denticulate; stigma prominently 2-lobed; fruit (1.1–)2.5–5(–8) cm; N and E China, Russia, and Korea 6. *E. amurense*

1. *Erysimum forrestii* (W. W. Smith) Polatschek, *Phyton* (Horn) 34: 200. 1994.
匍匐糖芥 pu fu tang jie
Parrya forrestii W. W. Smith, *Notes Roy. Bot. Gard. Edinburgh* 38: 195. 1914; *Cheiranthus forrestii* (W. W.

Smith) Handel-Mazzetti; *Erysimum schneideri* O. E. Schulz.
Herbs perennial, (4–)10–20(–30) cm tall; caudex several branched, covered with petiolar remains of previous years. Trichomes malpighiaceae, rarely a few

3-fid on leaves adaxially. Stems 1 to several from base, leafy. Basal leaves rosulate; petiole (1–)2–5(–8) cm; leaf blade elliptic, oblong, oblong-ovate, spatulate, or oblanceolate-linear, (0.6–)1.5–6(–10) × 0.5–1.5 (–2) cm, base attenuate, margin coarsely dentate or rarely denticulate, apex acute. Racemes corymbose, slightly elongated in fruit, bracteate throughout. Fruiting pedicels divaricate, 3–7 (–20) mm, stout, narrower than fruit, straight. Sepals oblong-linear, 7–10(–12) mm, caducous, lateral pair strongly saccate. Petals yellow, broadly obovate or suborbicular, (1.4–)1.7–2 (–2.5) cm × (6–)7–9 mm; claw usually longer than sepals. Filaments 0.8–1.3 cm; anthers oblong-linear, 2.5–3.5 mm. Ovules 14–24 per ovary. Fruit linear, flattened, (3.2–)4–8(–9) cm × 4–5 mm, not torulose, slightly curved; valves not keeled, with a distinct midvein, outside with malpighiaceus trichomes, inside glabrous; style 1–2 mm; stigma capitate, entire. Seeds oblong, 3–4.5 × 1.5–2.5 mm, on stout funicles. Fl. May–Jul, fr. Jul–Oct.

• Limestone slopes, gravelly slopes, glacial gravel, pastures; 3600–4900 m. Yunnan.

The type collection of *Erysimum schneideri*, Schneider 3292 (holotype, B; isotypes, G, GH, K), is indistinguishable from that of *Parrya forrestii*, Forrest 6518 (holotype, E). In FRPS and Fl. Yunnan. (6: 102, 106. 1995) the two names were treated under *Erysimum* and *Cheiranthus*, respectively.

2. *Erysimum handel-mazzettii* Polatschek, Phytion (Horn) 34: 200. 1994.

无茎糖芥 wu jing tang jie

Cheiranthus acaulis Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 64. 1925, not Balbiani ex Sprengel (1819); *C. forrestii* (W. W. Smith) Handel-Mazzetti var. *acaulis* K. C. Kuan.

Herbs perennial, (2–)3–7(–10) cm tall; caudex several branched, covered with petiolar remains of previous years. Trichomes malpighiaceus, rarely a few 3-fid on leaves adaxially. Stems absent. Basal leaves rosulate; petiole (0.7–)1.5–4.5(–6) cm; leaf blade oblong or lanceolate, (0.9–)1.5–4(–5.5) cm × (1.5–)2.5–8(–10) mm, base attenuate, margin entire or denticulate, apex acute. Racemes subumbellate and often without a rachis, not elongated in fruit, ebracteate. Fruiting pedicels erect, (0.7–)1.5–4(–5) cm, slender, narrower than fruit, straight. Sepals oblong-linear, 7–10 mm, caducous, lateral pair saccate. Petals yellow, broadly obovate or spatulate, (1.5–)1.7–2.1(–2.3) cm × (4–)5–8 mm; claw longer than sepals. Filaments 6–8 mm; anthers oblong, 1.5–2 mm. Ovules 12–24 per ovary. Fruit linear or rarely linear-oblong, slightly 4-angled, (1.5–)2.5–4.5(–5.5) cm × 2–3.5 mm, not torulose, slightly curved; valves not keeled, with a distinct midvein, outside with malpighiaceus trichomes, inside glabrous; gynophore 0.5–3 mm; style 0.7–2 mm; stigma capitate, slightly 2-lobed. Seeds oblong, 2.5–3.5 × 1–2 mm, on filiform funicles to 7 mm. Fl. May–Jul, fr. Jul–Oct.

• Alpine scree and gravel, mountain slopes; 4100–4800 m. Sichuan.

3. *Erysimum wardii* Polatschek, Phytion (Horn) 34: 201. 1994.

具苞糖芥 ju bao tang jie

Erysimum bracteatum W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 185. 1914, not (A. Gray) Kuntze (1891).

Herbs perennial, 20–90 cm tall. Trichomes almost exclusively malpighiaceus, rarely mixed with few 3- or 4-forked ones on leaves. Stems erect, simple or rarely branched basally. Basal leaves rosulate; petiole 1–4(–8) cm; leaf blade lanceolate to linear-lanceolate, (1.5–)3–10(–15) cm × (2–)3–7(–12) mm, base attenuate or cuneate, margin coarsely dentate, apex acute or acuminate. Upper cauline leaves sessile or subsessile, subentire. Racemes corymbose, densely flowered, bracteate basally, elongated considerably in fruit.

Fruiting pedicels divaricate, ascending, or erect, (3–)5–11(–18) mm, stout, narrower than fruit, straight. Sepals lanceolate-linear, (6–)7–10 × 2–2.5 mm, lateral pair saccate. Petals orange-yellow to yellow, obovate, (1.2–)1.5–2(–2.3) cm × (4–)5–6(–7) mm, apex rounded; claw distinct, subequaling or longer than sepals.

Filaments yellow, 8–11(–13) mm; anthers linear, 2–3(–3.5) mm. Ovules 50–80 per ovary. Fruit linear, slightly 4-angled or flattened, (5–)8–11 cm × 1.5–2 mm, slightly torulose, erect and subappressed to rachis or ascending to divaricate, straight; valves with a prominent midvein, outside with malpighiaceus trichomes, inside glabrous; style slender, 1–3 mm, cylindric, narrower than fruit; stigma capitate, subentire. Seeds

oblong, 1.5–2 × 0.8–1.2 mm. Fl. May–Aug, fr. Jul–Sep.

• Alpine meadows, grassy slopes or scrub, open stony pastures, sandy and rocky mountain slopes, scree; 3000–4600 m. Sichuan, Xizang, Yunnan.

4. *Erysimum roseum* (Maximowicz) Polatschek, Phytion (Horn) 34: 201. 1994.

红紫糖芥 hong zi tang jie

Cheiranthus roseus Maximowicz, Fl. Tangut. 57. 1889; *C. roseus* var. *glabrescens* Danguy; *Erysimum limprichtii* O. E. Schulz.

Herbs perennial, (6–)10–28(–36) cm tall; caudex few branched, covered with petiolar remains of previous years. Trichomes malpighiaceus, rarely a few 3-fid ones on leaves adaxially. Stems single from base, leafy. Basal leaves rosulate; petiole (0.5–)1–4.5(–7) cm; leaf blade oblong, oblong-obovate, oblanceolate-linear, or linear, (0.6–)1.5–7(–10) cm × (1.5–)2.5–8(–10) mm, base attenuate, margin entire or denticulate, apex acute or obtuse. Upper cauline leaves subsessile, entire, similar to basal ones in size. Racemes corymbose, elongated in fruit, only lowermost flowers bracteate.

Fruiting pedicels divaricate, (3–)4–10(–12) mm, stout, narrower than fruit, straight. Sepals oblong-linear, 6–9 × 1.5–2 mm, often persistent to early fruit maturity, lateral pair strongly saccate. Petals pink or purple, broadly obovate or broadly spatulate, (1.4–)1.6–2.2(–2.5) cm × (3–)4–6(–8) mm; claw longer than sepals. Filaments 6–8 mm; anthers oblong, 1.5–2.5 mm.

Ovules 18–26 per ovary. Fruit linear or rarely linear-

oblong, 4-angled, (1–)1.5–3(–4) cm × 2–2.5 mm, not torulose, slightly curved; valves not keeled, with a distinct midvein, outside with malpighiaceus trichomes, inside glabrous; style (0.5–)1–2 mm; stigma capitate, prominently 2-lobed. Seeds oblong, 1.5–2.5 × 0.8–1 mm, on slender funicles to 4 mm. Fl. May–Jul, fr. Jul–Sep.

• Rocky schist cliffs, alpine meadows, limestone scree; 3200–4900 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan.

Although *Erysimum limprichtii* was described from Xizang, it was not listed in FRPS or Fl. Xizang. (vol. 2. 1985). Its type collection is indistinguishable in every aspect from that of *E. roseum*. The above first record of *E. roseum* from Yunnan is based on Aldén et al. 470 (E).

5. *Erysimum funiculosum* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 165. 1861.

紫花糖芥 *zi hua tang jie*

Erysimum absconditum O. E. Schulz; *E. chamaephyton* Maximowicz.

Herbs perennial, (1.5–)2–6(–8) cm tall; caudex several branched, covered with petiolar remains of previous years. Trichomes malpighiaceus, very rarely with a few 3-forked ones on leaves adaxially. Stems 1 to several from base, leafless or few leaved. Basal leaves rosulate; petiole (0.2–)0.5–2 cm; leaf blade oblong-linear or oblanceolate-linear, (0.4–)1–4 cm × 1.5–3.5(–5) mm, base attenuate, margin entire or rarely denticulate, apex acute. Racemes corymbose, not elongated or only slightly elongated in fruit, ebracteate or only lowermost flowers bracteate. Fruiting pedicels divaricate, (3–)4–7(–10) mm, stout, narrower than fruit, straight. Sepals narrowly oblong, 5–6.5 mm, sometimes persistent, lateral pair saccate. Petals pink, narrowly spatulate, 7–9(–10) × 1.7–2(–2.5) mm; claw subequaling sepals. Filaments 4–6 mm; anthers oblong, 1–1.4 mm. Ovules (12–) 16–30 per ovary. Fruit oblong-linear, 4-angled, (1–)1.5–2(–2.3) cm × 2.5–3 mm, not torulose, slightly curved; valves slightly keeled, with a prominent midvein, outside with malpighiaceus trichomes, inside glabrous; style 0.5–1 mm; stigma prominently 2-lobed, lobes subdecurrent. Seeds ovoid-oblong, 1.5–2 × 0.8–1 mm, on filiform funicles to 6 mm. Fl. Jun–Jul, fr. Jul–Aug.

Rocky slopes, grassy areas, alpine meadows, stone beaches; 3400–5500 m. Gansu, Qinghai, Xizang [Sikkim].

Although *Erysimum absconditum* was described in 1931 from a specimen collected in Xizang, the name was not listed in FRPS or Fl. Xizang. (vol. 2. 1985). Both floras recognized *E. chamaephyton*, but the type of this name is indistinguishable in every aspect from that of *E. funiculosum*, which was previously considered to be endemic to Sikkim.

6. *Erysimum amurense* Kitagawa, Bot. Mag. (Tokyo) 51: 155. 1937.

糖芥 *tang jie*

Cheiranthus aurantiacus Bunge, Enum. Pl. China Bor. 5. 1833; *Erysimum amurense* subsp. *bungei* Kitagawa; *E. amurense* var. *bungei* (Kitagawa) Kitagawa; *E.*

aurantiacum (Bunge) Maximowicz (1889), not Leybold (1855); *E. bungei* (Kitagawa) Kitagawa.

Herbs perennial, (12–)25–90(–100) cm tall. Trichomes malpighiaceus throughout, mixed mainly on leaves with much fewer 3-fid ones. Stems erect, simple or branched basally, slightly ribbed. Basal and lowermost cauline leaves with petioles (0.5–)1–3 cm; leaf blade narrowly linear to linear-lanceolate, (2.5–)4–12(–15) cm × (2–)4–15(–17) mm, canescent or green, base attenuate, margin entire or obscurely denticulate, apex acuminate or acute. Upper cauline leaves sessile or subsessile. Racemes corymbose, densely flowered, ebracteate or lowermost few flowers bracteate, elongated considerably in fruit. Fruiting pedicels divaricate, (4–)5–9(–10) mm, slender, narrower than fruit, straight. Sepals oblong-linear, (6–)7–10(–11) × 2–3 mm, lateral pair strongly saccate. Petals orange-yellow, broadly obovate or spatulate, (1.2–)1.5–2 cm × (3–)4.5–7(–8) mm, apex rounded; claw distinct, subequaling sepals. Filaments yellow, (6.5–)8–11 mm; anthers linear, 3–4 mm. Ovules (24–) 30–60 per ovary. Fruit linear, subterete or flattened, (1.1–)2.5–5(–8) cm × 1.2–2 mm, slightly torulose, erect to ascending, straight or curved; valves obscurely veined, outside with malpighiaceus trichomes, inside glabrous; style slender, (1.5–)2–4 mm, cylindrical, much narrower than fruit; stigma capitate, prominently 2-lobed. Seeds oblong, (1.5–)2–3 × 0.8–1.3 mm. Fl. May–Aug, fr. Jun–Oct.

Plains, valleys, dry sandy or stony slopes, roadsides, thickets, disturbed secondary forests, gravelly ledges, hillsides, dry river banks; 100–2800 m. Hebei, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Shanxi [Korea, Russia].

The records in FRPS and Fl. Sichuan. (14: 146. 1999) of *Erysimum amurense* (as *E. bungei*) from Sichuan are based on misidentified plants of *E. benthamii*.

7. *Erysimum flavum* (Georgi) Bobrov, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 15. 1960.

蒙古糖芥 *meng gu tang jie*

Herbs perennial, 10–60(–100) cm tall; caudex with petiolar remains of previous years. Trichomes exclusively malpighiaceus. Stems erect, simple or several from caudex. Basal leaves rosulate; petiole (0.3–)0.8–2(–4) cm, often grooved adaxially; leaf blade filiform to narrowly linear, rarely linear-oblanceolate, (0.7–)1–6(–9) cm × (0.5–)1–4(–8) mm, folded, base attenuate, margin entire or rarely denticulate, apex acute. Upper cauline leaves sessile, linear to filiform, entire or rarely denticulate. Racemes corymbose, densely flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels divaricate or ascending, 4–15 mm, stout, narrower than fruit, straight. Sepals lanceolate-linear, 5–14 × 1.5–2 mm, lateral pair strongly saccate. Petals yellow, obovate, 0.9–2.6 cm × 3–8 mm, apex rounded; claw distinct, subequaling or longer than sepals. Filaments yellow, 0.5–1.5 cm;

anthers linear, 2–4 mm. Ovules 60–130 per ovary. Fruit linear, slightly 4-angled or flattened, (3.5–)5–8 (–12) cm × 1–2 mm, slightly torulose, erect-ascending, straight or slightly curved; valves with a distinct midvein, outside with malpighiaceus trichomes, inside glabrous; style slender, (0.5–) 1–3(–4) mm, cylindrical, narrower than fruit; stigma capitate, 2-lobed. Seeds oblong, 1.5–2.5 × 0.8–1.2 mm. Fl. May–Jun, fr. Jul–Sep.

Forest clearings, mountain slopes, dry meadows, steppes, alpine or subalpine areas, tundra; 900–4600 m. Heilongjiang, Nei Mongol, Xinjiang, Xizang [Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia (Siberia), Tajikistan].

A highly variable species that can be divided into two infraspecific taxa separable only by quantitative characters. These are recognized here at subspecific rank, and it is likely that their limits become blurred in parts of Siberia and adjacent Mongolia and Xinjiang.

- 1a. Plants (10–)20–60(–100) cm tall; sepals (0.8–)0.9–1.2(–1.4) cm; petals (1.6–)1.7–2.4(–2.6) cm × 5–8 mm; anthers (2.5–) 3–4 mm 7a. subsp. *flavum*
- 1b. Plants (3–)10–30(–50) cm tall; sepals 5–7 mm; petals (0.9–)1–1.4(–1.6) cm × 3–5 mm; anthers 1.5–2 mm 7b. subsp. *altaicum*

7a. *Erysimum flavum* subsp. *flavum*

蒙古糖芥(原亚种) meng gu tang jie (yuan ya zhong)

Hesperis flava Georgi, Bemer. Reise Russ. Reich. 1: 225. 1775; *Erysimum altaicum* C. A. Meyer var. *shinganicum* Y. L. Chang; *E. flavum* var. *shinganicum* (Y. L. Chang) K. C. Kuan.

Plants (10–)20–60(–100) cm tall. Sepals (0.8–)0.9–1.2 (–1.4) cm. Petals (1.6–)1.7–2.4(–2.6) cm × 5–8 mm. Anthers (2.5–)3–4 mm.

Forest clearings, dry meadows, mountain slopes; 1500–4500 m. Heilongjiang, Nei Mongol [Mongolia, Russia (Siberia)].

7b. *Erysimum flavum* subsp. *altaicum* (C. A. Meyer) Polozhij, Sist. Zametki Mater. Gerb. Krylova Tomsk. Gosud. Univ. Kuybysheva 86: 3. 1979.

阿尔泰糖芥 a er tai tang jie

Erysimum altaicum C. A. Meyer in Ledebour, Fl. Altaic. 3: 153. 1831; *E. altaicum* var. *humillimum* Ledebour; *E. humillimum* (Ledebour) N. Busch.

Plants (3–)10–30(–50) cm tall. Sepals 5–7 mm. Petals (0.9–)1–1.4(–1.6) cm × 3–5 mm. Fruit linear, 3.5–4.5 cm × 1.5–2 mm; style 2–3 mm, slender; stigma 2-lobed. Fl. Jun, fr. Jul.

Steppes, alpine or subalpine areas, tundra; 900–4600 m. Xinjiang, Xizang [Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Russia (Siberia), Tajikistan].

8. *Erysimum deflexum* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 165. 1861.

外折糖芥 wai zhe tang jie

Herbs perennial, 2–10(–15) cm tall. Trichomes malpighiaceus throughout, rarely 3-fid ones on leaves. Stems decumbent or erect, often more than 1 from caudex. Basal leaves rosulate; petiole 4–10(–20) mm, often persistent; leaf blade linear-lanceolate or oblong, (1–)1.5–4(–6) cm × 1–4(–7) mm, base attenuate, margin entire or denticulate, apex acute. Cauline leaves few or absent, subsessile. Racemes corymbose, densely flowered, ebracteate, elongated and often deflexed in fruit. Fruiting pedicels divaricate, (2–)4–7(–8) mm, stout, narrower than fruit. Sepals linear-oblong, 4–6 × 1–1.5 mm, lateral pair saccate at base. Petals yellow, spatulate or obovate, 6–10(–12) × 2–4 mm, apex rounded; claw subequaling sepals. Filaments yellow, 4–6.5 mm; anthers linear-oblong, 1.5–2 mm. Ovules 40–50 per ovary. Fruit narrowly linear, subterete, (2.5–)3–5 cm × 1–1.5 mm, torulose, divaricate or ascending, straight or curved; valves pubescent outside with malpighiaceus and rarely 3-forked trichomes, glabrous inside; style stout, 1–3 mm, cylindrical, sparsely pubescent; stigma entire or slightly 2-lobed. Seeds oblong, 1.2–1.5(–1.9) × 0.7–1 mm. May–Jul, fr. Jul–Aug.

Gravelly areas, slope; 3700–5200 m. SW Xinjiang (Taxkorgan Tajik Zizhixian), Xizang [India, Sikkim].

The above first record from Xinjiang is based on *Northwest Plateau Institute Team 3266* (PE).

9. *Erysimum canescens* Roth, Catalecta 1: 76. 1797.

灰毛糖芥 hui mao tang jie

Herbs biennial or perennial, 20–90 cm tall. Trichomes almost exclusively malpighiaceus, rarely mixed with few 3-forked ones especially on style. Stems erect, simple or branched basally, angled. Basal leaves rosulate; petiole 1–6 cm; leaf blade linear to linear-lanceolate, (1–)2–6(–8) cm × 2–5(–10) mm, flat, base attenuate, margin entire, apex acute. Upper cauline leaves sessile, entire. Racemes corymbose, densely flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels divaricate or suberect, (3–)4–8(–10) mm, stout, narrower than fruit, straight or curved upward. Sepals oblong-linear, 6–8(–9) × 1–1.5 mm, lateral pair slightly saccate. Petals yellow, spatulate, 1–1.5(–1.7) cm × (1.5–)2.5–3.5 mm, apex rounded; claw distinct, subequaling or longer than sepals. Filaments yellow, 6–9 mm; anthers linear, 2–3 mm. Ovules 70–110 per ovary. Fruit linear, strongly 4-angled, (3.5–)5–8(–10) cm × 1–1.5 mm, not torulose, erect and subappressed to rachis, or ascending to divaricate, straight or slightly curved; valves outside with four bands of trichomes separated by glabrous replum and valve midveins, inside glabrous; style slender, 1–3 mm, cylindrical, narrower than fruit; stigma capitate, entire. Seeds oblong, 1–1.3 × 0.4–0.6 mm. Fl. May–Aug, fr. Jul–Sep.

Mountain slopes; 700–3800 m. Xinjiang [Kazakstan, Mongolia, Russia, Tajikistan, Uzbekistan].

Erysimum canescens was recognized in FRPS as a synonym *E. diffusum* Ehrhart. The latter species is restricted to C and S Europe.

10. *Erysimum benthamii* Monnet, Notul. Syst. (Paris) 2: 242. 1912.

四川糖芥 si chuan tang jie

Erysimum benthamii var. *grandiflorum* Monnet; *Erysimum longisiliquum* J. D. Hooker & Thomson (1861), not Schlechtendal (1830–1832); *E. szechuanense* O. E. Schulz; *E. sikkimense* Polatschek.

Herbs annual or biennial, (15–)30–80(–100) cm tall. Trichomes 3(or 4)-forked, mixed with fewer malpighiaceus ones. Stems erect, simple or branched basally, often angled, primarily with malpighiaceus trichomes. Basal leaves petiolate, rosulate, withered by flowering. Lower cauline leaves with petioles 1–3 (–5) cm; leaf blade narrowly linear to linear-lanceolate, (2–)3–8(–11) cm × (2–)4–10(–14) mm, base attenuate or cuneate, margin coarsely dentate, apex acute or acuminate. Upper cauline leaves sessile or subsessile, denticulate or subentire. Racemes corymbose, densely flowered, bracteate basally, elongated considerably in fruit. Fruiting pedicels divaricate or ascending, (0.5–)0.6–1.5(–2.5) cm, stout, narrower than fruit, straight. Sepals oblong-linear, (5–)6–8 × 1–1.5 mm, lateral pair saccate. Petals orange-yellow to yellow, oblanceolate or spatulate, (0.8–)1–1.5 cm × 2–3(–3.5) mm, apex rounded; claw distinct, subequaling sepals. Filaments yellow, 7–10 mm; anthers linear, 2–3 mm. Ovules 60–90 per ovary. Fruit linear, 4-angled, (6–)7–11(–13) cm × 1.2–1.7 mm, slightly torulose, erect or ascending, straight; valves with a prominent midvein, outside with malpighiaceus and 3- or 4-forked trichomes, inside glabrous; style slender, 1–3 mm, cylindrical, narrower than fruit; stigma capitate, subentire. Seeds oblong, 1.5–2 × 0.8–1 mm. Fl. May–Jul, fr. Jul–Sep.

Dry rocky areas, oak woods, open pastures, grassy slopes, meadows, roadsides, mountain slopes; (1900–)2300–4100 m. Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Sikkim].

An examination of the syntypes of *Erysimum benthamii* (including that of var. *grandiflorum*) and the holotypes of *E. longisiliquum* and *E. szechuanense* clearly shows that they are conspecific. Unfortunately, the earliest name for the species, *E. longisiliquum*, is illegitimate (a later homonym, and the replaced synonym of *E. sikkimense*). In FRPS, both *E. benthamii* and *E. longisiliquum* were recognized, even though they are indistinguishable morphologically. *Erysimum benthamii* is the earliest legitimate name for the species.

11. *Erysimum hieraciifolium* Linnaeus, Cent. Pl. I, 18. 1755.

山柳菊叶糖芥 shan liu ju ye tang jie

Erysimum afghanicum Kitamura; *E. eseptatum* Z. X. An.

Herbs biennial, (10–)30–90(–110) cm tall. Trichomes primarily 3- or 4-fid, malpighiaceus ones primarily on stem and pedicels. Stems erect, often branched above, slightly ribbed. Basal leaves rosulate, withered by fruiting; petiole 1–4 cm; leaf blade elliptic-oblong or oblanceolate, (1–)2–6(–8) cm × (0.3–) 5–10 mm, base cuneate, margin entire or obscurely denticulate, apex acute. Cauline leaves sessile or subsessile; leaf blade linear or elliptic-linear, entire or obscurely denticulate. Racemes corymbose, densely flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels

suberect or ascending, (3–)4–8(–10) mm, slender, narrower than fruit, subappressed to rachis. Sepals oblong, 4–7 × 1–1.5 mm, not saccate. Petals yellow, obovate, (6–)7–9(–10) × 2–3 mm, apex rounded; claw distinct, subequaling sepals. Filaments yellow, 4–6 mm; anthers oblong, 1.5–2 mm. Ovules 40–60 per ovary. Fruit linear, 4-angled, (1–) 1.5–2.5(–4) cm × 1–1.3 mm, somewhat torulose, erect and often appressed to rachis, straight; valves with a distinct midvein, outside with 3- or 4-forked trichomes and fewer malpighiaceus ones, inside glabrous or rarely sparsely pubescent; style slender, 0.5–2 mm, cylindrical; stigma capitate, entire. Seeds oblong, 1–1.5 × 0.4–0.6 mm. Fl. May–Aug, fr. Jun–Sep. $2n = 16$.

Moist areas, grasslands; 2100–3800 m. Heilongjiang, Liaoning, Nei Mongol, Xinjiang, Xizang [Kashmir, Kazakstan, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan; Europe; introduced in North America].

This is a highly variable species, and many of the Himalayan records, including those from Bhutan, Nepal, and Sikkim, belong to *Erysimum benthamii*. The record of *E. odoratum* Ehrhart in FRPS is likely based on misidentified plants of *E. hieraciifolium*. The present authors have seen no material of the strictly European *E. odoratum* from China.

12. *Erysimum schlagintweitianum* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 11: 227. 1931.

矮糖芥 ai tang jie

Herbs annual or biennial, 3–10 cm tall. Trichomes malpighiaceus mixed with 3(or 4)-forked ones. Stems erect, simple at base. Basal and lowermost cauline leaves subsulate; petiole 2–7 mm; leaf blade narrowly oblanceolate, flat, 0.7–3 cm × 2–7 mm, base attenuate, margin sinuate-dentate or dentate, apex acute. Upper leaves subsessile, usually smaller than basal, predominantly with 3-forked trichomes adaxially, entire or dentate. Racemes corymbose, densely flowered, ebracteate, elongated in fruit. Fruiting pedicels divaricate, 2–6 mm, stout, narrower than fruit. Sepals linear-oblong, 4–6 × ca. 1 mm. Petals yellow, spatulate, 7–10 × 1.8–2.5 mm, apex rounded; claw subequaling sepals. Filaments yellow, 4.5–6.5 mm; anthers linear-oblong, 1.5–2 mm. Ovules 30–40 per ovary. Fruit narrowly linear, subterete, 2–3.5 cm × ca. 1 mm, somewhat torulose, divaricate-ascending, straight or curved upward; valves pubescent outside with malpighiaceus and 3(or 4)-forked trichomes, glabrous inside; style stout, 1–2 mm, cylindrical, sparsely pubescent; stigma entire or slightly 2-lobed. Mature seeds not seen. Fl. Jun–Jul, fr. Jul–Aug.

Plains, gravelly gorges; 3400–4700 m. W Xizang [Pakistan].

13. *Erysimum cheiranthoides* Linnaeus, Sp. Pl. 2: 661. 1753.

小花糖芥 xiao hua tang jie

Erysimum brevifolium Z. X. An; *E. cheiranthoides* var. *japonicum* H. Boissieu; *E. japonicum* (H. Boissieu) Makino; *E. parviflorum* Persoon.

Herbs annual, (7–)15–100(–150) cm tall. Trichomes primarily 3- or 4-fid, sometimes mixed with 5-fid ones, malpighiaceus trichomes primarily on stem and pedicels. Stems erect, often branched above, ribbed.

Basal leaves rosulate, withered by fruiting. Middle and upper cauline leaves shortly petiolate or sessile; leaf blade lanceolate, linear, or elliptic-oblong, (1–) 2–7(–11) cm × (2–)5–10(–20) mm, base cuneate, margin subentire or denticulate, rarely sinuate-dentate, apex acute or obtuse. Racemes corymbose, densely flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels divaricate or ascending, 5–13(–16) mm, slender, much narrower than fruit. Sepals oblong, 1.8–3 × 0.5–1 mm, not saccate. Petals yellow, narrowly spatulate, 3–5 × 1.5–2 mm, apex rounded; claw distinct, subequaling sepals. Filaments yellow, 2–3.5 mm; anthers oblong, 0.5–0.7 mm. Ovules (20–)30–55 per ovary. Fruit linear, 4-angled, (1–)1.5–2.5(–4) cm × 1–1.3 mm, somewhat torulose, suberect or divaricate-ascending, straight; valves with a distinct midvein, outside with 3–5-forked trichomes, inside densely pubescent; style slender, 0.5–1.5 mm, cylindrical; stigma slightly 2-lobed. Seeds oblong, 1–1.5 × 0.4–0.6 mm. Fl. May–Aug, fr. Jun–Sep. $2n = 16$.

Dry beds, moist areas; 800–3000 m. Heilongjiang, Jilin, Nei Mongol, Xinjiang [Japan, Kazakstan, Korea, Mongolia, Russia; N Africa, Europe, North America].

Records in FRPS of *Erysimum cheiranthoides* from provinces and autonomous regions other than the ones listed above are likely based on misidentified plants of *E. macilentum*. The two species are quite distinct and are easily distinguished by the characters in the above key.

Although the present authors have not examined the type of *Erysimum brevifolium*, it is almost certain that the species is a synonym of either *E. cheiranthoides* or *E. macilentum* because in the protologue the interior of the fruit valves was described as densely stellate. It is here placed in the synonymy of *E. cheiranthoides* based on the shape of the petals, which were said to be narrowly obovate; in *E. macilentum* the petals are linear to linear-oblancheolate.

14. *Erysimum macilentum* Bunge, Enum. Pl. China Bor. 6. 1833.

波齿糖芥 bo chi tang jie

Erysimum cheiranthoides Linnaeus var. *sinuatum* Franchet; *E. sinuatum* (Franchet) Handel-Mazzetti; *E. yunnanense* Franchet.

Herbs annual, (9–)20–70(–100) cm tall. Trichomes primarily 3- or 4-fid, sometimes mixed with 5-fid ones, malpighiaceae trichomes primarily on stem and pedicels. Stems erect, often branched above, ribbed. Basal leaves rosulate, withered by fruiting. Lowermost and middle cauline leaves shortly petiolate or subsessile; leaf blade linear, lanceolate, or oblong, (1–)2–7(–8) cm × (1.5–)2.5–10(–15) mm, mostly with 3- or 4-fid trichomes, base cuneate, margin sinuate-dentate, dentate, or subentire, apex acute or obtuse; uppermost leaves sessile and often entire. Racemes corymbose, densely flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels divaricate or ascending, 3–7(–9) mm, slender, much narrower than fruit. Sepals narrowly oblong, 2–3.5 × 0.4–0.7 mm, not saccate. Petals bright yellow, linear to linear-oblancheolate, 3.5–5(–5.5) × 0.3–0.5(–0.7) mm, apex

obtuse; claw undifferentiated from limb. Filaments yellow, 2–4 mm; anthers oblong, 0.4–0.7 mm. Ovules (20–)30–60(–70) per ovary. Fruit linear, terete or slightly 4-angled, (1–)2–3.5(–4) cm × 1–1.3 mm, somewhat torulose, suberect or divaricate-ascending, straight; valves with a distinct midvein, outside with 3–5-forked trichomes, inside densely pubescent; style slender, 0.5–1.5 mm, cylindrical; stigma slightly 2-lobed. Seeds oblong, (0.6–)0.7–0.9(–1) × 0.4–0.5 mm. Fl. and fr. Mar–Jul.

• Wastelands, roadsides, mountain slopes, fields; 100–2500 m. Anhui, Gansu, Hebei, Henan, Hubei, Hunan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan.

An examination of the types of *Erysimum macilentum*, *E. sinuatum*, and *E. yunnanense* readily reveals that they are conspecific. Both *E. sinuatum* and *E. yunnanense* were recognized in FRPS as distinct species, whereas *E. macilentum* was reduced to the synonymy of *E. cheiranthoides*.

15. *Erysimum sisymbrioides* C. A. Meyer in Ledebour, Fl. Altaic. 3: 150. 1831.

小糖芥 xiao tang jie

Herbs annual, (2–)8–25(–40) cm tall. Trichomes malpighiaceae throughout. Stems erect, simple or branched above. Basal leaves not rosulate, soon withered; lowermost and middle cauline leaves with petioles 3–10(–15) mm, rarely subsessile; leaf blade oblanceolate, oblong, or oblong-spatulate, (0.8–)1–4(–5) cm × (1–)2–5(–8) mm, base attenuate or cuneate, margin entire, apex obtuse. Upper cauline leaves sessile, usually smaller than basal. Racemes corymbose, densely flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels erect, 0.5–1.5(–2) mm, stout, about as wide as fruit. Sepals linear-oblong, 2.2–3 × ca. 0.5 mm, not saccate. Petals yellow, linear, 3–4(–5) × 0.3–0.6 mm, apex obtuse; claw not differentiated from limb. Filaments yellow, 1.5–2.5(–3) mm; anthers oblong, ca. 0.5 mm. Ovules 16–40 per ovary. Fruit narrowly linear, terete, (1.3–)1.7–2.2(–2.5) cm × 0.7–0.9 mm, somewhat torulose, erect or ascending, straight; valves with obscure midvein, outside with malpighiaceae trichomes, inside glabrous; style stout, 0.5–1(–1.5) mm, cylindrical, sparsely pubescent; stigma entire. Seeds oblong, 0.8–0.9 × 0.4–0.5 mm. Fl. May–Jun, fr. Jun–Jul. $2n = 18$.

Grasslands; 700–4000 m. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

16. *Erysimum repandum* Linnaeus, Demonstr. Pl. 17. 1753.

粗梗糖芥 cu geng tang jie

Erysimum rigidum de Candolle.

Herbs annual, (4–)15–45(–70) cm tall. Trichomes malpighiaceae, mixed with fewer 3-forked ones. Stems erect, simple or branched at base. Basal and lowermost cauline leaves subsessile, often withered by fruiting; petiole (0.3–)0.5–2(–3) cm; leaf blade linear,

narrowly oblanceolate, elliptic, or oblong, flat, (1–)2–8(–11) cm × (2–)5–10(–15) mm, base attenuate, margin sinuate, coarsely dentate, denticulate, or repand, apex acute. Upper leaves sessile, usually smaller than basal, entire or denticulate. Racemes corymbose, densely flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels divaricate, 2–4 mm, stout, about as wide as fruit. Sepals linear-oblong, 4–6 × 0.7–1 mm. Petals yellow, narrowly spatulate, 6–8 × 1.5–2 mm, apex rounded; claw subequalling sepals. Filaments yellow, 4–6 mm; anthers linear, 0.8–1.3 mm. Ovules (40–)50–80(–90) per ovary. Fruit narrowly linear, 4-angled, (2–)3–8(–10) cm × 1.5–2 mm, somewhat torulose, widely spreading or divaricate-ascending, straight or curved upward; valves with a distinct midvein, outside with malpighiaceae and fewer 3-forked trichomes on the outside, inside pubescent; style stout, 1–4 mm, cylindrical or subclavate, sparsely pubescent; stigma slightly 2-lobed. Seeds oblong, 1.1–1.5 × 0.6–0.7 mm. Fl. Apr–Jul, fr. May–Sep. $2n = 14$. Disturbed sites, roadsides, fields, waste places, pastures; 200–1400 m. Liaoning, Xinjiang [Afghanistan, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe].

17. *Erysimum siliculosum* (Marschall von Bieberstein) de Candolle, Syst. Nat. 2: 491. 1821.

棱果糖芥 *leng guo tang jie*

Cheiranthus siliculosus Marschall von Bieberstein, Fl. Taur.-Caucas. 2: 121. 1808; *Syrenia siliculosa* (Marschall von Bieberstein) Andrzejewski.

Herbs biennial or perennial, 30–90(–100) cm tall. Trichomes malpighiaceae throughout, mixed with 3-forked ones on calyx. Stems erect, often branched at

base and above. Basal leaves rosulate, often persisting, petiolate; leaf blade filiform to linear, rarely linear-oblanceolate, 1.5–8 cm × 1–2(–5) mm, longitudinally folded, base narrowly attenuate, margin entire, apex acute. Cauline leaves similar to basal. Racemes corymbose, densely flowered, ebracteate or rarely lowermost few flowers bracteate, elongated considerably in fruit. Fruiting pedicels ascending or divaricate-ascending, (2–)4–6 mm, stout, narrower than fruit. Sepals oblong-linear, (6–)7–9(–10) × 1–2 mm, united, persistent well after fruit maturity, strongly saccate. Petals bright yellow, obovate or broadly spatulate, (1.1–)1.4–1.8(–2) cm × 5–8 mm, apex rounded; claw distinct, subequalling sepals. Filaments yellow, 6–10 mm; anthers linear, 2–3 mm. Ovules 50–100 per ovary. Fruit oblong to oblong-linear, strongly 4-angled, slightly angustiseptate, (5–)7–10(–14) × 2–3 mm, smooth, erect and often appressed to rachis, straight; valves with a prominent midvein and slightly winged keel, outside with transversely oriented malpighiaceae trichomes, inside glabrous; style slender, (4–)5–10(–12) mm, cylindrical; stigma strongly 2-lobed, with lobes often divergent. Seeds oblong, 1.1–1.4 × 0.7–0.9 mm. Fl. May–Jun, fr. Jun–Jul. $2n = 14$.

Sandy areas, dunes; 400–1400 m. Xinjiang [Kazakstan, Russia, Turkmenistan].

The record of *Erysimum vassilczenkovi* Polatschek in FRPS (as *Syrenia macrocarpa* Vassilczenko, not *E. macrocarpum* (Ruprecht) Stevens & Trautvetter (1883)) is very likely based on misidentified plants of *E. siliculosum*. The record of *E. sessiliflorum* R. Brown in Fl. Xinjiang. (2(2): 199. 1995, as *Syrenia sessiliflora* (R. Brown) Ledebour) is based on misidentified plants of *E. siliculosum* with slightly shorter fruiting pedicels.

84. PYCNOPLINTHOPSIS Jafri, Pakistan J. Bot. 4: 73. 1972.

假簇芥属 *jia cu jie shu*

Herbs perennial, caespitose, scapose, with simple or many-branched caudex. Trichomes dendritic or forked, occasionally with few simple ones. Basal leaves petiolate, not fleshy, forming well-defined rosettes; petiole caducous, thin; leaf blade simple, distally coarsely dentate or incised. Cauline leaves absent. Flowers solitary on pedicels originating from center of rosette. Fruiting pedicels slender, strongly reflexed, much shorter than leaves. Sepals united into campanulate calyx, persistent, not saccate; lobes ovate or deltoid. Petals white, longer than sepals; blade broadly obovate, shallowly emarginate at apex; claw obscurely differentiated from blade. Stamens 6, tetradynamous; filaments not dilated at base; anthers blackish, oblong, apiculate at apex. Nectar glands 2, lateral, semiannular, intrastaminal; median glands absent. Ovules 8–20 per ovary. Fruit dehiscent siliques or silicles, linear or oblong, terete, geocarpic; valves papery, not navicular, torulose, obscurely veined; replum rounded; septum complete, membranous, with a central midvein; style to 1.5 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat obscurely reticulate, not mucilaginous when wetted; cotyledons incumbent.

One species: Bhutan, China, India, Nepal, Sikkim.

1. *Pycnolinthopsis bhutanica* Jafri, Pakistan J. Bot. 4: 74. 1972.

假簇芥 *jia cu jie*

Pegaeophyton bhutanicum H. Hara; *Pycnolinthopsis minor* Jafri.

Herbs with slender to stout, apically branched or rarely unbranched caudex to 2 cm in diam. Petiole (0.2–)0.5–3(–5) cm, thin, flattened, not persistent; leaf blade spatulate or oblanceolate, rarely obovate, (0.5–)1–4(–4.5) × 0.4–1.6 cm, thin, glabrous or distal half densely pubescent adaxially with forked or dendritic, often crisped trichomes to 0.6 mm, base subattenuate or cuneate, margin subincised or deeply dentate distally

and with (3–)4–8(–12) teeth on each side, apex acute. Fruiting pedicels slender, (0.5–)1–2.5(–4) cm, strongly recurved, much shorter than leaves. Calyx (2.5–)3.5–5 mm, membranous, persisting with fruit, sometimes splitting as fruit develops; lobes deltoid-ovate, 1.5–3.5 × 1–2.5 mm. Petals white, broadly obovate, (0.6–)0.8–1.3 cm × (4–)5.5–8 mm, apex subemarginate; claw obscure, rarely to 1 mm. Filaments slender, median pairs 2–3.5 mm, lateral pair 1.5–2 mm; anthers ovate, ca. 0.4 mm. Fruit linear or oblong, 5–11 × 2–3 mm;

valves not veined, papery; style 0.5–1 mm. Seeds oblong, light brown, 1–1.4 × 0.6–8 mm. Fl. May–Jul, fr. Aug–Sep.

Stony areas at streamsides, wet rocky crevice, open scree, mossy areas below waterfalls, wet rocky ledges; 3000–4500 m. Xizang [Bhutan, India, Nepal, Sikkim].

The above first record of *Pycnoplithopsis bhutanica* from China is based on *Ludlow & Sherriff 2735* (BM). Another collection, *Ludlow & Sherriff 20312* (BM, TI), was collected in Bhutan near the border with Xizang.

85. PYCNOPLINTHUS O. E. Schulz in Engler, Pflanzenr. 86(IV. 105): 198. 1924.

簇芥属 cu jie shu

Herbs perennial, caespitose, scapose, pulvinate; caudex simple or many branched. Trichomes absent. Stems reduced to tiny portions added annually to caudex apex. Basal leaves petiolate, somewhat fleshy, rosulate; petiole persistent, subcorky; leaf blade simple, entire. Cauline leaves absent. Flowers solitary borne on long pedicels originating from center of rosette. Fruiting pedicels slender, terete, ascending, straight or reflexed. Sepals united into campanulate calyx, persistent, not saccate; lobes ovate or deltoid. Petals white or pink, longer than sepals; blade broadly obovate, rounded at apex; claw nearly as long as calyx. Stamens 6, tetradynamous; filaments not dilated at base; anthers oblong, obtuse at apex. Nectar glands 4, lateral, 1 on each side of lateral stamen, or 2, semiannular, intrastaminal; median glands absent. Ovules 6–12 per ovary. Fruit dehiscent siliques, oblong or linear, latiseptate, sessile; valves papery, navicular, smooth, with a prominent midvein and marginal veins; replum rounded; septum complete, membranous, with a central band and two longitudinal veins; style less than 1 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat obscurely reticulate, not mucilaginous when wetted; cotyledons incumbent.

One species: China, Kashmir.

1. *Pycnoplithus uniflora* (J. D. Hooker & Thomson) O. E. Schulz in Engler, Pflanzenr. 86(IV. 105): 199. 1924.

簇芥 cu jie

Braya uniflora J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 168. 1861; *Hesperis uniflora* (J. D. Hooker & Thomson) Kuntze; *Sisymbrium uniflorum* (J. D. Hooker & Thomson) Fournier.

Herbs with slender to stout, apically branched or rarely unbranched caudex to 1.5 cm in diam., glabrous throughout. Petiole (0.3–)0.6–1.7(–2.5) cm, expanded at base, to 4 mm wide, persistent, stramineous, covering caudex and its branches; leaf blade linear, linear-oblong, or linear-lanceolate, rarely oblanceolate, (0.5–)1–2(–2.5) cm × (0.5–)1–2.5 mm, somewhat

fleshy, base subattenuate, margin entire, apex obtuse or acute. Fruiting pedicels slender, 1.5–3.5(–4) cm, ascending or strongly recurved, longer than leaves. Calyx 3–4 mm; lobes deltoid-ovate, 1–1.5 × 1–1.5 mm, subacute. Petals white or pink, obovate, 6–8 × 1.8–2.2 mm, apex rounded; claw 2.5–4 mm. Filaments slender, median pairs 2.5–3.5 mm, lateral pair 2–2.5 mm; anthers oblong, 0.6–1.1 mm. Fruit linear or narrowly oblong, (4–)7–11(–13) × 1.5–2.5(–3) mm; valves prominently veined, papery; style 0.3–0.6(–1) mm. Seeds oblong, light brown, 1.2–1.7 × 0.6–1 mm. Fl. Jun–Jul, fr. Jul–Aug.

Wet places, sandy river beds, sandy areas among gravel, wet grassy areas; 3600–5200 m. Gansu, Qinghai, Xinjiang, Xizang [Kashmir].

86. BAIMASHANIA Al-Shehbaz, Novon 10: 321. 2000.

白马芥属 bai ma jie shu

Herbs perennial, scapose, pulvinate, with a well-developed and few- to many-branched caudex covered with leaves or leaf remains of previous years. Trichomes simple and stalked, 1-forked, restricted to leaves. Stems absent. Basal leaves petiolate, rosulate, simple, entire, persistent, with stramineous, thick, flattened petioles. Cauline leaves absent. Racemes 2- or 3-flowered and ebracteate, or flowers solitary on short pedicels originating from axils of rosette leaves. Fruiting pedicels slender, erect or ascending, often hidden among basal leaves. Sepals oblong, base of lateral pair not saccate, margin membranous. Petals pink; blade spatulate, apex obtuse; claw slightly differentiated from blade, subequaling sepals. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 6–12 per ovary.

Fruit linear siliques, strongly latiseptate, sessile; valves with an obscure midvein, smooth, longitudinally striate; replum rounded; septum complete, membranous, with a distinct midvein; style slender, to 1 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, slightly flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

• Two species.

1a. Leaves ovate or oblong, densely pubescent all over; flowers solitary; ovules 6–8 per ovary; Yunnan 1. *B. pulvinata*

1b. Leaves narrowly linear, glabrous except for ciliate petiole margin and a tuft on leaf apex; flowers

mostly in 2-

or 3-flowered racemes; ovules 10–12 per locule; Qinghai 2. *B. wangii*

1. *Baimashania pulvinata* Al-Shehbaz, Novon 10: 321. 2000.

白马芥 bai ma jie

Herbs 0.5–2 cm tall; caudex many branched, to 3 mm in diam. Trichomes simple, to 1 mm, mixed with fewer, forked stalked ones, restricted to leaves. Basal leaves rosulate; petiole 2–5 mm, expanded base 0.5–1 mm wide, ciliate, persistent; leaf blade ovate or oblong, 2–4 × 1–2 mm, somewhat fleshy, densely pilose throughout, base subattenuate, margin entire, apex obtuse. Flowers solitary. Fruiting pedicels slender, 3–5 mm, ascending, glabrous. Sepals oblong, 1.5–2.5 × ca. 1 mm. Petals pink, spatulate, 3–4 × 1–1.5 mm; claw 1.5–2 mm. Filaments 2–2.5 mm; anthers 0.3–0.5 mm. Ovules 6–8 per ovary. Fruit linear, 4–8 × ca. 1.3 mm; valves longitudinally striate, without a distinct midvein; style 0.4–1 mm. Seeds 1–1.5 × 0.6–0.9 mm. Fl. Jun–Jul, fr. Jul–Aug.

• Moist gravelly meadows, limestone rock crevices; 4200–4600 m. NW Yunnan (Dèqèn Xian: Baima Shan).

2. *Baimashania wangii* Al-Shehbaz, Novon 10: 322. 2000.

王氏白马芥 wang shi bai ma jie

Herbs 1–1.5 cm tall; caudex few branched, to 6 mm in diam. Trichomes simple, to 1 mm, restricted to petiole margin and leaf apices, these mixed at leaf apex with fewer, forked stalked ones. Basal leaves rosulate; petiole 2–5 mm, expanded base 0.5–1.5 mm wide, ciliate; leaf blade narrowly linear, 4–15 × 0.5–1.5 mm, somewhat fleshy, base attenuate, margin entire, apex obtuse, with a tuft of trichomes. Flowers mostly in 2- or 3-flowered racemes, or solitary. Fruiting pedicels slender, 3–5 mm, ascending, glabrous. Flowers not seen. Ovules 10–12 per ovary. Fruit linear, 0.7–1.3 cm × ca. 1 mm; valves not torulose; style 0.4–0.7 mm. Mature seeds not seen. Fr. Jun.

• Under rocks; ca. 4100 m. Qinghai.

87. ALLIARIA Heister ex Fabricius, Enum. 161. 1759.

葱芥属 cong jie shu

Herbs annual or biennial, rarely short-lived perennial. Trichomes absent or simple. Stems erect, sometimes decumbent. Basal leaves long petiolate, rosulate, simple, crenate, dentate, or sinuate. Cauline leaves petiolate, dentate. Racemes several flowered, ebracteate, bracteate throughout, or only basally bracteate. Fruiting pedicels slender or thickened, narrower than or as thick as fruit, terete. Sepals oblong, erect, glabrous, base of lateral pair not saccate. Petals white, longer than sepals; blade oblanceolate, apex obtuse; claw obscurely differentiated from blade. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands confluent, subtending bases of all stamens. Ovules 4–20 per ovary. Fruit dehiscent siliques, linear or oblong, terete or 4-angled, sessile; valves with a prominent midvein and distinct marginal veins, glabrous or scabrous, torulose; replum rounded; septum complete; style obsolete or distinct and to 6 mm; stigma capitate. Seeds uniseriate, wingless, oblong, plump; seed coat longitudinally striate, not mucilaginous when wetted; cotyledons incumbent.

Two species: one endemic to the Caucasus, the other native to SW Asia and Europe and naturalized elsewhere as a cosmopolitan weed.

1. *Alliaria petiolata* (Marschall von Bieberstein) Cavara & Grande, Bull. Orto Bot. Regia Univ. Napoli 3: 418. 1913.

葱芥 cong jie

Arabis petiolata Marschall von Bieberstein, Fl. Taur.-Caucas. 2: 126. 1808; *Alliaria officinalis* Andrzejowski ex Marschall von Bieberstein; *Erysimum alliaria* Linnaeus; *Sisymbrium alliaria* (Linnaeus) Scopoli.

Herbs biennial, with garlicky smell when crushed. Stems erect, (15–)30–90(–130) cm tall, simple or branched above, glabrous or pilose basally with trichomes to 1.5 mm. Basal leaves rosulate, withered by fruiting; petiole

3–10(–16) cm; leaf blade reniform or cordate, (0.6–)1.5–5(–7) cm wide, shorter in length, base cordate, margin crenate or dentate, glabrous or pilose. Cauline leaves with much shorter petioles, ovate, cordate, or deltoid, to 15 × 15 cm, base cordate or truncate, margin acutely to obtusely toothed, apex acute. Racemes ebracteate or rarely lowermost flowers bracteate. Fruiting pedicels divaricate or ascending, (2–)3–10(–15) mm, nearly as thick as fruit. Sepals oblong, (2–)2.5–3.5(–4.5) × 0.7–1.5 mm. Petals white, oblanceolate, (2.5–)4–8(–9) × (1.5–)2–3(–3.5) mm, attenuate to clawlike base. Filaments 2–3.5(–4.5) mm; anthers oblong, 0.7–1 mm. Fruit linear, (2–)3–7(–8) cm × 1.2–

2.5 mm, subtorulose, quadrangular or subterete, divaricate-ascending; valves glabrous; style (0.2–)1–2(–3) mm. Seeds brown or black, narrowly oblong, 2–4.5 × 0.7–2 mm, longitudinally striate. Fl. Apr–Jun, fr. May–Jul. $2n = 36, 42$.

Waste places, roadsides, fields, woodlands, river banks. Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; native to SW Asia and Europe; naturalized elsewhere].

88. TAPHROSPERMUM C. A. Meyer in Ledebour, Fl. Altaic. 3: 172. 1831.

沟子芥属 *gou zi qi shu*

Glaribraya H. Hara.

Herbs biennial or perennial. Trichomes simple, rarely absent. Roots often fleshy, narrowly fusiform, basally with a whorl of caducous or persistent scalelike leaves. Stems prostrate, ascending, or erect. Basal leaves petiolate, not rosulate, simple, entire. Cauline leaves petiolate, entire, lowermost whorled or alternate. Racemes many flowered, bracteate throughout or rarely only basally. Fruiting pedicels ascending or divaricate, straight or recurved. Sepals oblong, erect, glabrous or subapically pubescent, base of lateral pair not saccate. Petals white, longer than sepals; blade obovate or broadly so, apex rounded or emarginate; claw obscure. Stamens 6, subtetradynamous; filaments of median pairs dilated at base; anthers ovate, apex rounded. Nectar glands confluent, subtending bases of all stamens. Ovules to 12 per ovary. Fruit dehiscent siliques or silicles, cylindric, narrowly conical, or obcordate, ovate, or oblong, angustiseptate, terete, or latiseptate, sessile or subsessile; valves distinctly veined, glabrous or papillate, torulose or smooth; replum widely flattened throughout or only basally; septum complete, rarely absent or perforate and reduced to a rim; style to 3 mm; stigma capitate, entire. Seeds uniseriate or biseriate, wingless, oblong, plump or flattened; seed coat foveolate or papillate, not mucilaginous when wetted; cotyledons incumbent, oblique, or accumbent.

Seven species: Bhutan, China, India, Kazakstan, Kyrgyzstan, Mongolia, Nepal, Russia, Tajikistan; six species (three endemic) in China. *Taphrospermum platypetalum* Schrenk, which is endemic to Soongaria in Kazakstan, might also be present in neighboring Xinjiang. It has racemes bracteate only basally, glabrous sepals, and cylindric fruit.

1a. At least some of the lowermost cauline leaves verticillate, other leaves opposite and/or alternate.

2a. Plants densely hirsute throughout with trichomes 0.5–1 mm 6. *T. tibeticum*

2b. Plants glabrous or puberulent with papillae 0.05–0.2 mm.

3a. Petals broadly obovate, (7–)8–9(–10) × (3.5–)4.5–6 mm; seeds foveolate; sepals caducous, margin ciliolate; septum absent 4. *T. verticillatum*

3b. Petals narrowly obovate, 3–3.5 × 1.5–2 mm; seeds papillate; sepals persistent, margin not ciliolate; septum complete 5. *T. lowndesii*

1b. All leaves alternate.

4a. At least some leaves dentate; fruit oblong or ovate, latiseptate 2. *T. himalaicum*

4b. Leaves entire or rarely repand; fruit narrowly conical or obcordate, angustiseptate at least basally.

5a. Fruit obcordate, not torulose, (4–)5–7 mm wide; septum absent; cotyledons accumbent 3. *T. fontanum*

5b. Fruit narrowly conical, torulose, (1.8–)2–2.5(–3) mm wide; septum complete or rarely reduced to a rim; cotyledons incumbent 1. *T. altaicum*

1. Taphrospermum altaicum C. A. Meyer in Ledebour, Fl. Altaic. 3: 173. 1831.

沟子芥 *gou zi qi*

Cochlearia altaica (C. A. Meyer) J. D. Hooker & T. Anderson; *Taphrospermum altaicum* var. *macrocarpum* Z. X. An.

Herbs (4–)10–23(–30) cm tall, with narrowly fusiform roots, glabrous except for fruit. Stems prostrate, ascending, or erect, few to many from base. Leaves not rosulate, somewhat fleshy; petioles of basal and lowermost cauline leaves 1–4(–9) cm; leaf blade suborbicular, subcordate, ovate, or oblong, (0.5–) 1–2.5 × (0.4–)0.7–2 cm, gradually smaller upward, base

obtuse or subcordate, margin entire or rarely repand, apex obtuse or rounded. Racemes densely flowered, elongated in fruit, bracteate throughout; bracts leafy. Fruiting pedicels glabrous, slender, strongly recurved or nearly forming a loop, (3–)5–8(–12) mm. Sepals oblong, 0.8–1.5(–2) × 0.5–0.8(–1) mm, persistent or caducous, membranous at margin. Petals white, obovate, (1.5–)2–2.5(–3) × (0.5–)0.8–1.5 mm, apex rounded or slightly emarginate, clawlike base to 0.5 mm. Filaments 0.8–1.2 mm, median pairs dilated, to 0.3 mm wide at base; anthers ovate, 0.2–0.3 mm. Ovules 6–10(–12) per ovary. Fruit narrowly conical, strongly torulose, angustiseptate at least basally, (4–)7–10(–12) mm, base cordate or truncate and (1.8–)2–2.5(–3) mm wide, apex acuminate; valves membranous, sparsely puberulent

with papillae to 0.3 mm, rarely subglabrous, distinctly veined; replum widely expanded at base, narrowly flattened elsewhere; septum complete or rarely perforate and reduced to a rim, membranous; style slender, (0.5–)0.7–1.2(–1.5) mm. Seeds brown, oblong, plump, 1.4–1.8 × 0.8–1.2 mm; cotyledons incumbent or oblique. Fl. Jun–Aug, fr. Jul–Sep.

Mountain meadows, forest margins, gravelly ridges, open slopes, roadsides; 2000–4000 m. Gansu, Qinghai, Xinjiang, Xizang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan].

2. *Taphrospermum himalaicum* (J. D. Hooker & Thomson) Al-Shehbaz et al. in Al-Shehbaz, Harvard Pap. Bot. 5(1): 102. 2000.

须弥沟子芥 *xu mi gou zi qi*

Cochlearia himalaica J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5:154. 1861.

Herbs (2–)5–10(–15) cm tall, glabrous throughout except for fruit and calyx. Root narrowly fusiform-linear, fleshy, apex with minute scalelike leaves. Stems solitary from fleshy root then producing a rosette with prostrate or rarely ascending to erect branches. Leaves not rosulate; petioles of basal and lowermost cauline leaves (0.5–)1–2.5(–4) cm, gradually shorter upward; leaf blade broadly ovate or oblong, 4–10(–15) × 2–6(–10) mm, gradually reduced in size upward, base obtuse or subcordate, margin lobed, toothed, repand, or entire, apex obtuse or rounded. Racemes densely flowered, elongated considerably or not elongated in fruit, bracteate throughout; bracts leafy, representing all cauline leaves. Fruiting pedicels glabrous, slender, straight or strongly recurved and fruit appearing geocarpic, 4–9(–13) mm. Sepals oblong, 1.2–2 × 0.8–1 mm, persistent, membranous at margin, sparsely pubescent distally. Petals white, obovate or spatulate, 2.5–4(–6) × 1.5–2.5(–3.5) mm, attenuate to base, apex slightly emarginate. Filaments white, 1.5–2 mm, median pairs dilated at base; anthers ovate, 0.2–0.4 mm. Ovules 4–12 per ovary. Fruit ovoid or oblong, latiseptate, not torulose, (2–)4–8(–10) × (1.5–)2–3.4(–4) mm, obtuse at both ends; valves membranous, sparsely puberulent with papillae to 0.5 mm, rarely subglabrous, obscurely veined; replum widely expanded throughout; septum absent; style slender, 0.5–1(–1.2) mm. Seeds (2–)6–8(–12), brown, oblong, 1–1.5 × 0.8–1 mm; cotyledons obliquely accumbent. Fl. Jun–Aug, fr. Jul–Sep.

Rocky grounds on exposed slopes, scree, deep rich soils, muddy slopes, streamsides, sandy beds, moist granite ledges, alpine pastures and dwarf scrub, *Kobresia* turf, under *Juniperus* trees; 3600–5200 m. Qinghai, Xizang [Bhutan, India, Nepal].

3. *Taphrospermum fontanum* (Maximowicz) Al-Shehbaz & G. Yang in Al-Shehbaz, Harvard Pap. Bot. 5(1): 104. 2000.

泉沟子芥 *quan gou zi qi*

Herbs (2–)5–14(–20) cm tall, sparsely to moderately pubescent, rarely glabrous. Root narrowly fusiform-linear, fleshy, base with minute scalelike leaves usually

less than 2 mm. Stems solitary from fleshy root then producing a few prostrate or rarely ascending or erect branches, sparsely to densely pubescent with retrorse to spreading trichomes to 0.5 mm, rarely glabrous. Leaves not rosulate; petioles of basal and lowermost leaves (0.3–)0.6–2(–3) cm, gradually shorter upward; leaf blade ovate or oblong, (2–)4–10(–13) × (1–)2–4(–7) mm, gradually reduced in size upward, base obtuse or cuneate, margin entire or repand, apex obtuse or rounded. Racemes densely flowered, elongated slightly to considerably in fruit, bracteate throughout; bracts leafy, smaller than cauline leaves. Fruiting pedicels glabrous or pubescent adaxially, slender, straight or curved, (1.5–)3–10(–20) mm. Sepals oblong, 1.5–3 × 0.8–1.5 mm, persistent, membranous at margin, sparsely ciliolate near apex with trichomes ca. 0.05 mm, sparsely pubescent distally with trichomes to 0.5 mm. Petals white or lavender, obovate or spatulate, 2–6 × (0.5–)0.7–3.5(–4) mm, attenuate to base, apex slightly emarginate. Filaments white or lavender, 1.5–3 mm, dilated at base; anthers ovate, 0.3–0.4 mm. Ovules 4–8 per ovary. Fruit broadly to narrowly obcordate, strongly to slightly angustiseptate, not torulose, (2–)3–5 × (4–)5–7 mm, obtuse or cuneate at base; valves membranous, sparsely to densely puberulent with trichomes to 0.5 mm, rarely subglabrous, often distinctly veined, smooth or tuberculate; replum widely and evenly expanded throughout; septum absent; style slender, (1–)2–3 mm. Seeds 3–8, brown, oblong, foveolate, compressed, 1.2–2.2 × 0.8–1.5 mm; cotyledons accumbent.

• Slopes with dwarf bushes, disturbed alpine meadows, degraded alpine pastures, moist turf, *Kobresia* turf and cushions, alpine permafrost swamps, damp shingle by rivers, open gravel, slate and schist screes; (3200–)3600–5300 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang.

- 1a. Petals 4.5–6 × 2.5–3.5(–4) mm; fruit valves glabrous or sparsely puberulent, smooth, not tuberculate; seeds (1.5–)1.8–2.2 × (1.1–)1.2–1.5 mm 3a. subsp. *fontanum*
- 1b. Petals 2–3 × (0.5–)0.7–1.2(–1.4) mm; fruit valves densely or rarely sparsely puberulent, often tuberculate; seeds 1.2–1.6 × 0.8–1.1 mm ... 3b. subsp. *microspermum*

3a. *Taphrospermum fontanum* subsp. *fontanum*

泉沟子芥(原亚种) *quan gou zi qi* (*yuan ya zhong*)

Dilophia fontana Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 3, 26: 423. 1880; *D. macrosperma* O. E. Schulz.

Sepals 2.5–3 mm; petals 4.5–6 mm, 2.5–3.5(–4) mm wide; filaments 2.5–3 mm. Fruit valves glabrous or sparsely puberulent, smooth, not tuberculate. Seeds 3 or 4 per fruit, (1.5–)1.8–2.2 × (1.1–)1.2–1.5 mm. Fl. Jun–Sep, fr. Jul–Oct.

• Moist turf, alpine permafrost swamps, damp shingle by rivers, open gravel, slate and schist scree; (3200–)3600–5300 m. Gansu, Qinghai, Sichuan, Xizang.

3b. *Taphrospermum fontanum* subsp. ***microspermum*** Al-Shehbaz & G. Yang in Al-Shehbaz, Harvard Pap. Bot. 5(1): 105. 2000.

小籽泉沟子芥 xiao zi quan gou zi qi

Dilophia fontana Maximowicz var. *trichocarpa* W. T. Wang.

Sepals 1.5–2 mm; petals 2–3 × (0.5–)0.7–1.2(–1.4) mm; filaments 1.5–2 mm. Fruit valves densely or rarely sparsely puberulent, often tuberculate. Seeds 2–8 per fruit, 1.2–1.6 mm × 0.8–1.1 mm. Fl. Jul–Aug, fr. late Jul–Sep.

• Slopes with dwarf bushes, disturbed alpine meadows, degraded alpine pastures, *Kobresia* turf and cushions; 3900–5000 m. Qinghai, Xinjiang, Xizang.

4. *Taphrospermum verticillatum* (Jeffrey & W. W. Smith) Al-Shehbaz, Harvard Pap. Bot. 5(1): 106. 2000.

轮叶沟子芥 lun ye gou zi qi

Cardamine verticillata Jeffrey & W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 120. 1913; *Braya verticillata* (Jeffrey & W. W. Smith) W. W. Smith; *Staintoniella verticillata* (Jeffrey & W. W. Smith) H. Hara.

Herbs (4–)6–15(–23) cm tall, sparsely to moderately pubescent, rarely glabrous. Root narrowly fusiform-linear, fleshy, base with oblong or ovate scalelike leaves 3–7 × 1–2.5 mm. Stems erect, often solitary from fleshy root, lowermost leafless part (0.5–)4–10(–15) cm. Leaves glabrous, lowermost cauline leaves verticillate, others opposite or alternate; petioles (0.4–)0.6–2 cm, gradually shorter upward; leaf blade oblong, rarely oblanceolate, 0.5–1.5(–2.5) cm × 2–7(–9) mm, gradually reduced in size upward, base obtuse or rarely attenuate, margin entire, apex rounded. Racemes densely flowered, elongated considerably in fruit, bracteate throughout; bracts leafy, smaller than cauline leaves; rachis sparsely pubescent with retrorse trichomes 0.4–0.6 mm. Fruiting pedicels glabrous, slender, straight or curved, (4–)6–12(–18) mm. Sepals oblong, 2.5–3.5 (–4) × 1.5–2 mm, caducous, membranous at margin, sparsely ciliolate near apex with trichomes 0.05–0.1 mm, glabrous or distally sparsely pubescent with trichomes to 0.5 mm. Petals white or rarely lavender, broadly obovate, (7–)8–9(–10) × (3.5–)4.5–6 mm, cuneate or clawlike base to 4 mm, apex emarginate. Filaments white or lavender, (3–)3.5–4.5 mm, dilated at base; anthers ovate, 0.6–0.8 mm. Ovules 4–8 per ovary. Fruit ovate or oblong, strongly latiseptate, not torulose, 7–13 × 4–7 mm, obtuse or cuneate at base; valves membranous, glabrous, often distinctly veined, smooth; replum widely and evenly expanded throughout; septum absent; style slender, (1–)2–3 mm. Seeds 3–8, brown, oblong, foveolate, compressed, 1.8–2.2 × 1.2–1.4 mm; cotyledons accumbent. Fl. Jun–Jul, fr. Jul–Aug.

• Scree, cliff ledges, glaciers, open stony moorland, siliceous scree slopes; 3800–5200 m. Xizang, Yunnan.

This species was recorded in FRPS (as *Staintoniella verticillata*) from Qinghai and Sichuan, but the present authors have seen no material from those provinces.

5. *Taphrospermum lowndesii* (H. Hara) Al-Shehbaz, Harvard Pap. Bot. 5(1): 107. 2000.

郎氏沟子芥 lang shi gou zi qi

Glaribraya lowndesii H. Hara, J. Jap. Bot. 53: 136. 1978.

Herbs 5–12 cm, glabrous throughout or puberulent with papillae 0.05–0.2 mm. Root slender, slightly fleshy, base with a whorl of oblong scalelike leaves ca. 2–5 × 0.5–1 mm. Stems erect, 1–3 from root, lowermost leafless part 2–9 cm. Leaves glabrous, fleshy, lowermost cauline ones verticillate, others alternate; petioles 2–5 mm, gradually shorter upward; leaf blade spatulate, 3–15 × 1–5 mm, gradually reduced in size upward, base attenuate, margin entire, apex retuse or rounded. Racemes densely flowered, elongated considerably in fruit, bracteate throughout; bracts leafy, smaller than cauline leaves; rachis glabrous or papillate. Sepals oblong, 1.5–2.5 × ca. 1 mm, persistent well after fruit dehiscence, distal margin and apex membranous, not ciliolate, glabrous or papillate. Petals white, narrowly obovate, 3–5 × 1.5–2 mm, attenuate to clawlike base to 1.5 mm, apex obtuse. Filaments white, 1.5–2.5 mm; anthers broadly ovate, 0.2–0.3 mm. Ovules 4–6 per ovary. Fruiting pedicels glabrous, slender, straight or curved, 4–8 mm. Fruit oblong or narrowly so, strongly latiseptate, not torulose, 0.7–1.5 cm × 3–5 mm, obtuse or cuneate at base; valves membranous, glabrous, often distinctly veined, smooth; replum widely and evenly expanded throughout; septum complete, membranous; style slender, (1–)2–3 mm. Seeds 3–8, brown, oblong, compressed, 1.9–2.1 × 1.2–1.4 mm, with dense papillae 0.1–0.2 mm; cotyledons accumbent. Fl. Jul, fr. Jul–Aug.

Scree slopes; 5000–5200 m. Xizang [Nepal].

6. *Taphrospermum tibeticum* (O. E. Schulz) Al-Shehbaz, Harvard Pap. Bot. 5(1): 107. 2000.

西藏沟子芥 xi zang gou zi qi

Dipoma tibeticum O. E. Schulz, Repert. Spec. Nov. Regni Veg. 38: 32. 1935.

Herbs, 4–12 cm, densely hirsute with simple trichomes 0.5–1 mm. Root conical, slightly fleshy, base with a whorl of oblong, scalelike leaves to 5 × 2 mm. Stems erect, 1–3 from fleshy root, lowermost leafless part 1–9 cm. Leaves densely hirsute, not fleshy, lowermost cauline verticillate, others opposite or alternate; petioles 3–5 mm, gradually shorter upward, densely hirsute; leaf blade oblong or spatulate, 4–7 × 1–3 mm, gradually reduced in size upward, base attenuate, margin entire or 2-toothed, apex retuse. Racemes densely flowered, elongated slightly in fruit, bracteate throughout; bracts leafy, smaller than cauline leaves,

hirsute; rachis retrorsely or spreading hirsute. Fruiting pedicels hirsute, slender, straight, 3–6 mm. Sepals oblong, 1.7–2.5 × 1–1.5 mm, distal margin and apex membranous, ciliolate with trichomes to 0.1 mm, densely hirsute outside with trichomes ca. 0.5 mm. Petals white, broadly obovate, 4.5–5 × 2.5–3 mm, attenuate to clawlike base to 1.5 mm, apex emarginate. Filaments white, 2–2.5 mm, slightly dilated at base; an-

thers broadly ovate, ca. 0.5 mm. Ovules 4–6 per ovary. Immature fruit ovate, apparently latiseptate; valves membranous, densely puberulent; replum widely and evenly expanded throughout; septum absent; style subconical, 1–1.5 mm. Immature seeds oblong, ca. 1 mm, foveolate. Fl. Jun–Jul.

• Stony slopes, turf, earth slides, shale along streamsides; 4200–500 m. Xizang.

89. EUTREMA R. Brown, Chlor. Melvill. 9. 1823.

山 菜属 shan yu cai shu

Wasabia Matsumura.

Herbs perennial, rhizomatous or with a caudex. Trichomes absent or simple. Stems erect, ascending, or decumbent, simple or branched apically. Basal leaves petiolate, rosulate, simple, entire or palmately lobed, palmately veined. Cauline leaves petiolate or sessile and cuneate or auriculate, pinnately or palmately veined, entire, dentate, or crenate; ultimate veins ending or not with apiculate callosities. Racemes ebracteate or rarely bracteate throughout, elongated considerably or not elongated in fruit. Sepals ovate or oblong, base of lateral pair not saccate. Petals white or rarely pink; blade spatulate or rarely obovate, apex obtuse; claw absent. Stamens 6, slightly tetradynamous; filaments slightly dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 2–10 per ovary. Fruit dehiscent, siliques or silicles, linear, oblong, ovoid, or lanceolate, terete or slightly 4-angled, sessile or shortly stipitate; valves with an obscure or prominent midvein, smooth or torulose; replum rounded; septum complete or perforated, translucent, veinless; style obsolete or distinct and to 3 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat obscurely reticulate, not mucilaginous when wetted; cotyledons incumbent.

Nine species: primarily C and E Asia and Himalayas, one species extending into North America; seven species (one endemic, one introduced) in China.

1a. Middle and upper cauline leaves sessile, pinnately veined.

2a. Main infructescence 0.2–2(–3.5) cm, often subumbellate; plants 2–15(–25) cm tall; petals 2–3.5 mm; sepals often persistent to fruit maturity 1. *E. heterophyllum*

2b. Main infructescence 10–20(–40) cm tall, lax racemes; plants 30–110 cm tall; petals 4–5 mm; sepals caducous.

3a. Plants glabrous throughout; uppermost leaves cuneate at base; fruit 5–8(–10) mm 2. *E. integrifolium*

3b. Plants sparsely to densely pilose at least along midvein and leaf margin; uppermost leaves auriculate or amplexicaul at base; fruit (8–)12–20(–25) mm 3. *E. himalaicum*

1b. All leaves petiolate, palmately veined.

4a. Fruiting pedicels erect or ascending; ultimate leaf veins not ending in apiculate callosities; fruit lanceolate, ovoid, or oblong, not torulose, often subappressed to rachis, slightly 4-angled 4. *E. deltoideum*

4b. Fruiting pedicels divaricate or reflexed; ultimate leaf veins ending in apiculate callosities; fruit usually linear, torulose, not appressed to rachis, terete.

5a. Rhizomes fleshy; petals 6–8(–9) mm; sepals 3–4 mm; gynophore (1–)2–5 mm; filaments 3.5–5 mm 7. *E. wasabi*

5b. Rhizomes not fleshy; petals 3.5–5(–6) mm; sepals 1.5–2 mm; gynophore absent or obsolete; filaments 1.5–2 mm.

6a. Racemes bracteate throughout 6. *E. tenue*

6b. Racemes ebracteate or only lowermost few flowers bracteate 5. *E. yunnanense*

1. *Eutrema heterophyllum* (W. W. Smith) H. Hara, J. Jap. Bot. 48: 97. 1973.

密序山 菜 mi xu shan yu cai

Braya heterophylla W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 201. 1919; *Eutrema compactum* O. E.

Schulz; *E. edwardsii* R. Brown var. *heterophyllum* (W. W. Smith) W. T. Wang; *E. obliquum* K. C. Kuan & Z.

X. An.

Herbs 2–15(–25) cm tall, glabrous throughout or rarely puberulent, with a caudex and fleshy root. Stems erect, simple, often few from caudex. Basal leaves rosulate, somewhat fleshy; petiole (0.5–)1–5.5(–7.5) cm; leaf blade ovate, suborbicular, lanceolate, or rhombic, (0.3–)0.5–2(–2.5) cm × (2–)4–10(–15) mm, base cordate, truncate, or cuneate, sometimes distinctly oblique, margin entire, apex obtuse or subacute. Middle cauline

leaves lanceolate, ovate, or linear-lanceolate, 0.7–2.5(–3) cm × 2–9 mm, pinnately veined, sessile, base cuneate, margin entire, apex subacute. Infructescence compact, subumbellate or short racemes, little or not expanded in fruit, 0.2–2(–3.5) cm. Fruiting pedicels divaricate or slightly reflexed, 1–4(–5) mm. Sepals ovate, 1.5–2 × ca. 1 mm, persistent through fruit maturity. Petals white, spatulate, 2–3.5 × 1–1.7 mm. Filaments white, 1–2 mm, slightly dilated at base; anthers ovate, 0.2–0.3 mm. Ovules 4–10 per ovary. Fruit linear or oblong, (4–)5–10(–12) × 1.5–2 mm, slightly 4-angled, not torulose; valves cuneate at both ends, with a prominent midvein; gynophore to 0.5 mm; septum mostly perforate; style obsolete to 0.6 mm. Seeds oblong, plump, 1.5–2 × ca. 1 mm. Fl. Jun–Jul, fr. Jul–Aug.

Alpine meadows, scree, grassy slopes, near glaciers, *Kobresia* turf, alpine mats, sandstone ridges; 2500–5400 m. Gansu, Hebei, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, Kazakstan, Kyrgyzstan, Nepal, Tajikistan].

The records of *Eutrema edwardsii* R. Brown from China (e.g., in FRPS) and C Asia are based on misidentified plants of *E. heterophyllum*. The former species has lax, racemose infructescences to 18 cm, fruit appressed to the rachis, with erect to erect-ascending fruiting pedicels, and readily caducous sepals. By contrast, *E. heterophyllum* has compact, umbellate or shortly racemose infructescences rarely to 3.5 cm, nonappressed fruit, with divaricate or reflexed fruiting pedicels, and sepals often persisting well after fruit maturity. The record and illustration of *E. edwardsii* from Xinjiang in Fl. Xinjiang. (2(2): 204. 1995) are based on misidentified plants of *Taphrospermum altaicum*.

2. *Eutrema integrifolium* (de Candolle) Bunge, Delect. Seminum Hort. Bot. Dorpat. 1839: 8. 1839.

全缘叶山 菜 quan yuan ye shan yu cai

Cochlearia integrifolia de Candolle, Syst. Nat. 2: 369. 1821; *Eutrema alpestre* Ledebour; *E. alpestre* var. *hissaricum* Lipsky; *E. integrifolium* var. *hissaricum* (Lipsky) O. E. Schulz; *Goldbachia laevigata* de Candolle var. *adscendens* Franchet; *Smelowskia integrifolia* (de Candolle) C. A. Meyer.

Herbs (30–)40–80(–90) cm tall, glabrous throughout; rhizomes short. Stems erect, simple at base, branched above. Basal leaves rosulate, somewhat fleshy; petiole (2.5–)3.5–9(–12) cm; leaf blade ovate, orbicular, or cordate, (1.5–)2–4(–6) × (1.5–) 1.7–3.5(–5.5) cm, base cordate or rounded, margin entire, apex obtuse. Middle cauline leaves lanceolate to oblong-lanceolate, 4–6.5(–8) × 1–2(–3) cm, pinnately veined, sessile, base cuneate, margin entire, apex subacute. Infructescence lax raceme, main branch 10–20 cm. Fruiting pedicels divaricate, (4–)6–13(–18) mm. Sepals ovate, 2–2.5 × 1–1.5 mm, caducous. Petals white, spatulate, 4–5 × 2–3 mm. Filaments white, 1.7–2.5 mm, slightly dilated at base; anthers oblong, 0.6–0.7 mm. Ovules 4 per ovary. Fruit ellipsoid or oblong, 5–8(–10) × 1–2 mm, slightly 4-angled, not torulose; valves cuneate at both ends, with a prominent midvein; gynophore to 0.3 mm; septum complete or rarely perforate; style 0.3–0.6 mm. Seeds

oblong, plump, 2–3 × 1–1.5 mm. Fl. May–Jun, fr. Jul–Aug.

Woods, subalpine areas, open slopes; 1200–2400 m. Xinjiang [Kazakstan, Kyrgyzstan, Tajikistan, Uzbekistan].

The records of *Eutrema pseudocordifolium* Popov in FRPS and Fl. Xinjiang. (2(2): 204. 1995) are based on misidentified plants of *E. integrifolium*.

3. *Eutrema himalaicum* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 164. 1861.

川滇山 菜 chuan dian shan yu cai

Eutrema lancifolium (Franchet) O. E. Schulz; *Goldbachia lancifolia* Franchet; *Hesperis spectabilis* (J. D. Hooker & Thomson ex Fournier) Kuntze; *Sisymbrium hookeri* Fournier; *Sisymbrium spectabile* J. D. Hooker & Thomson ex Fournier.

Herbs 30–80(–110) cm tall, sparsely to densely crisped pilose at least along leaf margin and midvein; rhizomes short. Stems erect, simple at base, branched above. Basal leaves rosulate, somewhat fleshy; petiole (2.5–)4–12(–17) cm; leaf blade ovate, oblong, or lanceolate, (1–)2–6(–8) × (0.7–)1.5–4 (–5) cm, base cordate or rounded or cuneate, margin entire, apex obtuse or subacute. Middle cauline leaves lanceolate, oblong-lanceolate, or ovate, 3–6(–8) × 0.7–2(–3) cm, pinnately veined, sessile, base rounded or auriculate, margin denticulate or sparsely so near base, apex acuminate or acute. Infructescence lax raceme, main branch 10–25(–40) cm. Fruiting pedicels divaricate, (0.5–)0.7–1.8(–2.2) cm. Sepals ovate, 2–2.5 × 1–1.5 mm, caducous. Petals white, spatulate, 4–5 × 2.5–3 mm. Filaments white, 1.5–2 mm, slightly dilated at base; anthers oblong, ca. 0.5 mm. Ovules 4–8 per ovary. Fruit linear or rarely oblong, (0.8–)1.2–2(–2.5) cm × 1.5–3 mm, slightly 4-angled, subtorulose; valves cuneate at both ends, with a prominent midvein; gynophore to 0.5 mm; septum perforated or complete; style 0.5–1 mm. Seeds oblong, plump, 2–3 × 1–1.5 mm. Fl. May–Aug, fr. Jul–Sep. Streamsides, swampy or alpine meadows, among rocks; 3300–4400 m. Sichuan, Xizang, Yunnan [Bhutan, Sikkim].

A critical examination of the types of *Eutrema himalaicum* and *E. lancifolium* shows that they are indistinguishable. The species was recognized in FRPS as *E. lancifolium* and was recorded from Gansu, but the present authors have seen no specimens from that province.

4. *Eutrema deltoideum* (J. D. Hooker & Thomson) O. E. Schulz in Engler, Pflanzenr. 86(IV. 105): 35. 1924.

三角叶山 菜 san jiao ye shan yu cai

Sisymbrium deltoideum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 163. 1861; *Eutrema deltoideum* var. *grandiflorum* O. E. Schulz; *Hesperis deltoidea* (J. D. Hooker & Thomson) Kuntze. Herbs (7–)20–75(–110) cm tall, sparsely pilose or glabrous; rhizomes short. Stems erect, simple at base, branched above. Basal leaves rosulate, somewhat fleshy; petiole (1.5–) 3.5–10(–15) cm; leaf blade ovate, deltoid, or oblong, (1–)2–5 (–8) × (0.5–)1–3(–5) cm, base cordate or rounded, margin dentate or rarely subentire, apex obtuse or subacute. Middle cauline leaves with petioles (0.3–)1–2.5(–3.5) cm; leaf blade broadly ovate,

ovate-deltoid, or rhomboid, (1.5–)3–6(–10) × (0.3–)2–4.5(–6) cm, palmately veined, base truncate or cordate, margin dentate, apex obtuse or acute. Infructescence lax raceme, main branch 6–15 cm. Fruiting pedicels ascending or suberect, 5–1.2(–15) mm. Sepals ovate, 2–3 × 1.5–2.5 mm, caducous. Petals white or pink, spatulate or obovate, (5–)6–8 × 2.5–4 mm. Filaments white, 1.5–2.5 mm, slightly dilated at base; anthers oblong, 0.5–1 mm. Ovules 2–4 per ovary. Fruit lanceolate, oblong, or ovoid, 7–10 × 2–3 mm, often subappressed to rachis, slightly 4-angled, not torulose; valves with a prominent midvein; gynophore to 1 mm; septum perforated or complete; style obsolete or to 1 mm. Seeds oblong, plump, 2.5–3.5 × 1–1.5 mm. Fl. Jul–Aug, fr. Aug–Sep.

Rock crevices, among shrubs, steep slopes, moist meadows, *Betula-Rhododendron* forests, streambeds; 3600–4700 m. Xizang, Yunnan [Bhutan, Sikkim].

The fruit shape and dimensions given for *Eutrema deltoideum* in all Chinese floras are based on misidentified plants of *E. himalaicum*. *Eutrema deltoideum* var. *grandiflorum* has slightly larger flowers than those of the type, but these represent extremes of a continuous variation. The species was recorded from Sichuan in FRPS and in Fl. Sichuan. (14: 155. 1999), but the present authors have seen no material from that province.

5. *Eutrema yunnanense* Franchet, Pl. Delavay. 61. 1889.

南山菜 nan shan yu cai

Eutrema potaninii Komarov; *E. reflexum* T. Y. Cheo; *E. yunnanense* var. *tenerum* O. E. Schulz; *E. yunnanense* var. *yexinicum* Z. X. An; *Wasabia yunnanensis* (Franchet) Nakai.

Herbs (12–)20–60(–110) cm tall, glabrous or sparsely pilose on upper parts; rhizomes not fleshy. Stems erect, simple, often a few from base, rarely branched upward. Basal leaves rosulate; petiole 2–25(–35) cm, dilated at base; leaf blade cordate or reniform, (1–)3–10(–20) × (1.5–)3–10(–20) cm, base cordate, margin dentate, denticulate, repand, or subentire, with distinct apiculate callosities terminating ultimate veins, apex rounded or obtuse. Middle cauline leaves with petioles (0.5–)1–3(–5) cm; leaf blade broadly ovate to ovate-cordate, (1–)2–5(–7) × (0.6–)1–4(–5) cm, palmately veined, base and margin as in basal leaves, apex acute. Infructescence lax raceme, ebracteate or rarely lowermost 1–3 flowers bracteate. Fruiting pedicels reflexed or spreading, slender, 0.6–1.5(–2.5) cm. Sepals ovate, 1.5–2 × 1–1.2 mm, caducous. Petals white, oblong-spatulate, 3.5–5(–6) × 1.5–2.5 mm. Filaments white, 1.5–2 mm; anthers ovate, 0.4–0.5 mm. Ovules 6–10 per ovary. Fruit linear or rarely oblong, (0.5–)0.8–1.5(–2.5) cm × 1.5–2 mm, terete, torulose; valves with an obscure midvein; gynophore absent or obsolete; septum usually complete; style 1–2 mm. Seeds oblong, plump, 2–3 × 1–1.5 mm. Fl. Mar–May, fr. Apr–Jun.

• Hillsides, forest undergrowth, shaded moist pastures, roadsides, among *Rhododendron*; 400–3500 m. Anhui, Gansu, Hebei, Hubei, Hunan, Jiangsu, Jiangxi, Ningxia, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang.

6. *Eutrema tenue* (Miquel) Makino, Bot. Mag. (Tokyo) 26: 177. 1912.

日本山菜 ri ben shan yu cai

Nasturtium tenue Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 71. 1866; *Cardamine bracteata* S. Moore (1878), not Philippi (1893), nor Suksdorf (1918); *Eutrema bracteatum* (S. Moore) Koidzumi; *E. hederifolium* Franchet & Savatier; *E. thibeticum* Franchet; *E. wasabi* (Siebold) Maximowicz var. *tenue* (Miquel) O. E. Schulz; *Neomartinella guizhouensis* S. Z. He & Y. C. Lan; *Wasabia hederifolia* (Franchet & Savatier) Matsumura.

Herbs 12–35(–55) cm tall, glabrous or retrorsely pilose; rhizomes not fleshy. Stems decumbent, simple, often a few from base. Basal leaves rosulate; petiole 3–8(–10) cm; leaf blade cordate or reniform, 1–3(–5) × 1–3(–6) cm, base cordate, margin dentate, repand, or subentire, with distinct apiculate callosities terminating ultimate veins, apex rounded or obtuse. Middle cauline leaves with petioles 0.7–2.5 cm; leaf blade broadly ovate to ovate-cordate, 0.7–2(–3.5) × 0.8–2 cm, palmately veined, base and margin as in basal leaves, apex acute. Infructescence lax raceme, bracteate throughout. Fruiting pedicels reflexed or spreading, slender, (0.5–)1–2(–2.5) cm. Sepals ovate, 1.5–2 × 1–1.2 mm, caducous. Petals white, oblong-spatulate, 4–5 × 1–1.5 mm. Filaments white, 1.5–2 mm; anthers ovate, 0.3–0.5 mm. Ovules 6–10 per ovary. Fruit linear, (0.8–)1–2 cm × 1.5–2 mm, terete, torulose; valves with an obscure midvein; gynophore absent or obsolete; septum complete; style 0.5–2 mm. Seeds oblong, plump, 2–3 × 1–1.5 mm. Fl. Mar–May, fr. Apr–Jun.

Near sea level to 4000 m. Guizhou, Sichuan, Xizang, Yunnan [Japan].

The record in FRPS of *Eutrema tenue* from Taiwan is based on misidentified plants of *E. wasabi*. Except for having stout styles to 0.7 mm (vs. 1–2 mm), the type of *E. thibeticum* is indistinguishable from that of *E. tenue*.

7. *Eutrema wasabi* (Siebold) Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 17: 283. 1873.

块茎山菜 kuai jing shan yu cai

Cochlearia wasabi Siebold, Verh. Batav. Genootsch. Kunst. Wet. 12: 54. 1832; *Alliaria wasabi* (Siebold) Prantl; *Eutrema japonicum* (Miquel) Koidzumi; *E. koreanum* (Nakai) K. Hammer; *E. okinosimense* Takenouchi; *Lunaria japonica* Miquel; *Wasabia japonica* (Miquel) Matsumura; *W. koreana* Nakai; *W. pungens* Matsumura; *W. wasabi* (Siebold) Makino.

Herbs 20–60(–75) cm tall, glabrous or sparsely pilose on upper parts; rhizomes fleshy, to 3 cm in diam. Stems erect or decumbent, simple. Basal leaves rosulate; petiole (6–)10–20(–26) cm, dilated at base; leaf blade cordate or reniform, (2.5–)6–15(–20) × (3–)6–18(–22) cm, base cordate, margin dentate, denticulate, shallowly crenate, repand, or subentire, with distinct apiculate callosities terminating ultimate veins, apex rounded or obtuse. Middle cauline leaves with petioles 1–5(–8) cm;

leaf blade broadly ovate to ovate-cordate, 1.5–4(–6) × 2–4(–6) cm, palmately veined, base and margin as in basal leaves, apex acute. Infructescence lax raceme, bracteate throughout or basally. Fruiting pedicels ascending or divaricate, slender, 1–3.5 (–5) cm. Sepals oblong, 3–4 × 2–2.5 mm, caducous. Petals white, oblong-spatulate, 6–8(–9) × 2–3 mm. Filaments white, 3.5–5 mm; anthers oblong, 0.6–0.8 mm. Ovules 6–8 per ovary. Fruit linear, 1–2 cm × 1.5–2 mm, terete, torulose; valves with an obscure midvein; gynophore (1–)2–5

mm; septum usually complete; style 2–3 mm. Seeds oblong, plump, 2–3 × 1–1.5 mm. Fl. Mar–May, fr. May–Jun.

Cultivated, also naturalized in wet areas along streams in mountains; near sea level to 2500 m. Taiwan [native to Japan, Korea, ?Russia (Far East)].

This species is cultivated for its edible rhizomes, which are the source of the pungent condiment wasabi.

90. SISYMBRIUM Linnaeus, Sp. Pl. 2: 657. 1753.

大蒜芥属 da suan jie shu

Herbs annual, biennial, or perennial, rarely shrubs. Trichomes absent or simple. Stems erect, rarely prostrate or decumbent, often branched apically. Basal leaves petiolate, rosulate or not, simple, entire or variously pinnately dissected. Cauline leaves petiolate or sessile, often similar to basal. Racemes ebracteate or rarely bracteate, often elongated considerably in fruit. Fruiting pedicels slender or thickened and nearly as wide as fruit. Sepals ovate or oblong, erect or spreading, base of lateral pair sometimes subsaccate. Petals yellow, white, pink, or purple, obovate, spatulate, oblong, or suborbicular, apex obtuse or emarginate; claw often subequaling or longer than sepals. Stamens 6, tetradynamous; filaments not dilated at base; anthers oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 6–160 per ovary. Fruit dehiscent siliques, linear or rarely lanceolate or subulate, terete or rarely slightly latiseptate; valves papery to subleathery, with a prominent midvein and 2 conspicuous marginal veins, smooth or torulose; replum rounded; septum complete, membranous or rarely thickened, translucent or opaque, veinless or with a midvein; style cylindrical, conical, or clavate, persistent, rarely obsolete; stigma capitate, 2-lobed, lobes not decurrent. Seeds uniseriate, wingless, oblong or ovate, plump; seed coat reticulate or papillate, not mucilaginous when wetted; cotyledons incumbent or obliquely so.

About 40 species: N Africa, Asia, Europe, a few species in S Africa and the New World; ten species (one endemic, one introduced) in China.

- 1a. Fruit subulate-linear, (0.7–)1–1.4(–1.8) cm, appressed to rachis 10. *S. officinale*
 1b. Fruit narrowly linear, (2–)3–14 cm, not appressed to rachis.
- 2a. Fruiting pedicels about as thick as mature fruit.
- 3a. Uppermost leaves simple or hastate, not divided into linear segments; sepals not cucullate; fruiting pedicels (2–)3–6 mm 6. *S. orientale*
 3b. Uppermost leaves pinnatisect into linear lobes; sepals cucullate; fruiting pedicels (4–)6–10(–13) mm 5. *S. altissimum*
- 2b. Fruiting pedicels narrower than fruit.
- 4a. Perennials; sepals subapically cucullate; lowermost flowers bracteate.
- 5a. Fruit terete, torulose; sepals 3.5–5.5(–7) mm; petals 6–8(–10) × 1–1.5 mm; filaments 3–5(–6) mm; anthers 1–1.5 mm; middle leaves often lobed or hastate basally 9. *S. yunnanense*
 5b. Fruit subquadrangular, not torulose; sepals 7–9 mm; petals 12–16 × 2.5–3.5 mm; filaments 6–10 mm; anthers 2–3 mm; middle leaves not lobed or hastate basally 8. *S. luteum*
- 4b. Annuals, if perennial then uppermost leaves filiform to narrowly linear; sepals not cucullate; flowers ebracteate.
- 6a. Perennials; uppermost leaves filiform to narrowly linear, to 5 mm wide 7. *S. polymorphum*
 6b. Annuals; uppermost leaves variously-shaped, sometimes lobed, never filiform or narrowly linear, wider.
- 7a. Fruit recurved or divaricate, very rarely ascending, (5–)6–10(–12) cm.
- 8a. Sepals 4–6 mm; petals 6–10(–12) mm; basal leaves often fleshy; fruiting pedicels stout 3. *S. brassiciforme*
 8b. Sepals 2.5–3.5 mm; petals 3–5 mm; basal leaves not fleshy; fruiting pedicels slender, nearly filiform 4. *S. heteromallum*
- 7b. Fruit erect or ascending, 2–4(–5) cm.
- 9a. Young fruit overtopping flowers; petals 2.5–3.5(–4) mm; plants glabrous or sparsely pubescent 1. *S. irio*

9b. Young fruit not overtopping flowers; petals 6–8 mm; plants usually densely hispid at least below 2. *S. loeselii*

1. *Sisymbrium irio* Linnaeus, Sp. Pl. 2: 659. 1753.

水蒜芥 shui suan jie

Arabis charbonnelii H. Léveillé.

Herbs annual, (10–)20–60(–75) cm tall. Stems erect, branched below and above, glabrous or sparsely pubescent at least basally. Basal leaves not rosulate; petiole (0.5–)1–4.5(–6) cm; leaf blade oblanceolate or oblong in outline, runcinate-pinnatisect, (1.5–)3–12(–15) × (0.5–)1–6(–9) cm; lateral lobes (1 or)2–6(–8) on each side of midvein, smaller than terminal, oblong or lanceolate, entire, dentate, or lobed. Uppermost cauline leaves smaller than basal, entire or 1–3-lobed. Fruiting pedicels divaricate or ascending, slender, much narrower than fruit, (5–)7–12(–20) mm. Sepals oblong, erect, 2–2.5 × 1–1.5 mm. Petals yellow, oblong-oblanceolate, 2.5–3.5(–4) × 1–1.5 mm; claw subequaling sepals. Filaments yellowish, erect, 2.5–4 mm; anthers oblong, 0.5–0.9 mm. Ovules 40–90 per ovary. Fruit narrowly linear, slender, terete, (2.5–)3–4(–5) cm × 0.9–1.1 mm, straight or slightly curved inward, younger ones overtopping flowers; valves glabrous, slightly torulose; style 0.2–0.5 mm; stigma prominently 2-lobed; septum membranous. Seeds oblong, 0.8–1 × 0.5–0.6 mm, inserted in depressions of septum. Fl. May–Aug, fr. Jun–Sep. $2n = 14$.

Rocky slopes, orchards, roadsides, fields, pastures, waste grounds, prairies, disturbed sites; near sea level to 1700 m. Nei Mongol, Taiwan, Xinjiang [Afghanistan, India, Kashmir, Nepal, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; W Asia, Europe].

The above first record from Nei Mongol is based on *Liu 12* (MO).

2. *Sisymbrium loeselii* Linnaeus, Cent. Pl. I, 18. 1755.

新疆大蒜芥 xin jiang da suan jie

Sisymbrium loeselii var. *brevicarpum* Z. X. An.

Herbs annual, (20–)35–120(–175) cm tall. Stems erect, branched above, usually densely hispid below with retrorse trichomes, usually glabrous above. Basal leaves rosulate; petiole 1–4(–5) cm; leaf blade broadly oblanceolate in outline, runcinate- to lyrate-pinnatifid, (1.5–)2.5–8(–12) × (1–)2–5(–7) cm; lateral lobes 2–4 on each side of midvein, much smaller than terminal, entire or dentate; terminal lobe triangular, often hastate. Uppermost cauline leaves entire or toothed, much smaller than basal. Fruiting pedicels divaricate or ascending, slender, narrower than fruit, 0.5–1.2(–1.5) cm. Sepals oblong, ascending, 3–4 × 1–1.5 mm. Petals yellow, spatulate, 6–8 × 2–3 mm; claw subequaling sepals. Filaments yellowish, erect, 3–4.5 mm; anthers oblong, ca. 1 mm. Ovules 40–60 per ovary. Fruit narrowly linear, stout, terete, 2–3.5(–5) cm × 0.9–1.1 mm, curved or straight; valves often glabrous, slightly torulose; style stout, 0.3–0.7 mm; stigma prominently

2-lobed; septum slightly membranous. Seeds oblong, 0.7–1 × 0.5–0.6 mm, inserted in depressions of septum. Fl. May–Sep, fr. Jun–Oct. $2n = 14$.

Valleys, river banks, fields, roadsides, pastures, waste grounds, prairies, disturbed sites, railroad tracks; 300–2800 m. Gansu, Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; W Asia, E Europe].

3. *Sisymbrium brassiciforme* C. A. Meyer in Ledebour, Fl. Altaic. 3: 129. 1831.

无毛大蒜芥 wu mao da suan jie

Sisymbrium ferganense Korshinsky; *S. iscandericum* Komarov.

Herbs annual, (25–)35–100(–125) cm tall. Stems erect, branched above, glabrous or sparsely to densely soft pubescent at least near base, usually glabrous above. Basal leaves rosulate, often fleshy; petiole (1–)2–5(–8) cm; leaf blade broadly oblanceolate to oblong-oblanceolate in outline, lyrate-pinnatifid to lyrate, (1.5–)3–15(–26) × (0.5–)1–6(–9) cm, dentate or rarely subentire; lateral lobes 1 or 2(or 3) on each side of midvein, much smaller than the oblong, dentate terminal lobe. Uppermost cauline leaves narrowly lanceolate or linear, often entire, rarely lobed. Fruiting pedicels horizontal to divaricate-ascending, stout and narrower than fruit, 5–10(–12) mm. Sepals oblong-linear, spreading, 4–6 × 1–1.5 mm. Petals yellow, spatulate, 6–10(–12) × 1.5–2.5 mm; claw subequaling sepals. Filaments yellowish, erect, 3–6 mm; anthers oblong, 1.5–2 mm. Ovules 90–150 per ovary. Fruit narrowly linear, stout, terete, (5–)7–10(–12) cm × 1–1.5 mm, usually recurved; valves glabrous or pubescent, subtorulose; style stout, 0.7–2(–2.5) mm; stigma 2-lobed; septum slightly thickened. Seeds oblong, 0.9–1.3 × 0.5–0.7 mm, inserted in depressions of septum. Fl. Jun–Aug, fr. Aug–Sep. $2n = 14$.

Roadsides, rocky places, fields; 900–4500 m. Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

4. *Sisymbrium heteromallum* C. A. Meyer in Ledebour, Fl. Altaic. 3: 132. 1831.

垂果大蒜芥 chui guo da suan jie

Sisymbrium dahuricum Turczaninow ex Fournier; *S. heteromallum* var. *dahuricum* (Turczaninow ex Fournier) Glehn ex Maximowicz; *S. heteromallum* var. *sinense* O. E. Schulz.

Herbs annual, (20–)35–100(–150) cm tall. Stems erect, branched above, sparsely to densely pubescent at least near base, usually glabrous above. Basal leaves rosulate, not fleshy; petiole 1–3(–5) cm; leaf blade broadly oblanceolate to oblong-oblanceolate in outline, lyrate- or runcinate-pinnatifid, 3–7(–10) × (0.5–)1.5–4 cm;

lateral lobes 2–5 on each side of midvein, much smaller than terminal one, oblong or lanceolate, dentate; terminal lobe lanceolate, dentate. Uppermost cauline leaves narrowly lanceolate or linear, often not lobed, entire or dentate. Fruiting pedicels reflexed or subdivaricate, slender and nearly filiform, much narrower than fruit, (0.5–)0.7–1.5 cm. Sepals narrowly oblong, ascending, 2.5–3.5(–4) × 0.7–1 mm. Petals pale yellow, narrowly spatulate, 3–5 × (0.5–)0.7–1.2(–1.5) mm; claw shorter than sepals. Filaments yellowish, erect, 2.5–3.5 mm; anthers oblong, 0.5–0.6 mm. Ovules (60–)90–160 per ovary. Fruit narrowly linear, slender, terete, (5–)6–9.5(–11) cm × 0.8–1.2 mm; valves glabrous, torulose; style cylindric, 0.5–2 (–3.5) mm; stigma 2-lobed; septum not thickened. Seeds oblong, 0.8–1.1 × 0.4–0.5 mm. Fl. May–Aug, fr. Jun–Sep.

Rocky slopes, roadsides, forests, grassy areas, river banks, alpine meadows, rocky outcrops; 900–4500 m. Gansu, Hebei, Jiangsu, Jilin, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [India, Kazakstan, Korea, Mongolia, Pakistan, Russia].

5. *Sisymbrium altissimum* Linnaeus, Sp. Pl. 2: 659. 1753.

大蒜芥 da suan jie

Herbs annual, (20–)40–120(–160) cm tall. Stems erect, branched above, sparsely to densely hirsute near base, glabrous or subglabrous above. Basal leaves rosulate; petiole 1–10(–15) cm; leaf blade broadly oblanceolate, oblong or lanceolate in outline, pinnatisect, pinnatifid, or runcinate, (2–)5–20(–35) × (1–)2–8(–10) cm; lateral lobes (3 or)4–6(–8) on each side of midvein, smaller than terminal one, oblong or lanceolate, entire, dentate, or lobed. Uppermost cauline leaves with narrowly linear to filiform lobes. Fruiting pedicels divaricate or rarely ascending, stout, nearly as thick as fruit, (4–)6–10(–13) mm. Sepals oblong, cucullate, ascending or spreading, 4–6 × 1–2 mm. Petals yellow, spatulate, (5–)6–8(–10) × 2.5–4 mm; claw subequaling sepals.

Filaments yellowish, erect, 2–6 mm; anthers oblong, 1.5–2.2 mm. Ovules 90–120 per ovary. Fruit narrowly linear, stout, terete, (4.5–)6–9(–12) cm × 1–2 mm, usually straight; valves glabrous, smooth; style subclavate, 0.5–2 mm; stigma prominently 2-lobed; septum slightly thickened. Seeds oblong, 0.8–1 × 0.5–0.6 mm, inserted in depressions of septum. Fl. Apr–Jul, fr. May–Aug. $2n = 14$.

Roadsides, fields, pastures, waste grounds, disturbed sites, grasslands; sea level to 2500 m. Liaoning, Xinjiang, Xizang [Afghanistan, India, Japan, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; native to Europe and W Asia; naturalized worldwide].

The above first record from Xizang is based on *Chaffanjon 406* (P). This species is a noxious weed and is usually a host to several viruses of crop plants.

6. *Sisymbrium orientale* Linnaeus, Sp. Pl. 2: 666. 1753.

东方大蒜芥 dong fang da suan jie

Sisymbrium fujianense L. K. Ling.

Herbs annual, (10–)20–70(–85) cm tall. Stems erect, branched above, sparsely to densely soft pubescent at least near base, usually glabrous above. Basal leaves rosulate; petiole (1–)2–5(–9) cm; leaf blade broadly oblanceolate to oblong-oblanceolate in outline, runcinate-pinnatifid, 3–8(–10) × (1–)2–4(–6) cm; lateral lobes 2–5 on each side of midvein, much smaller than terminal one, oblong or lanceolate, subentire or dentate; terminal lobe lanceolate or deltoid, often hastate. Uppermost cauline leaves with narrowly lanceolate or linear, often hastate terminal lobe and 1 or 2 lateral lobes. Fruiting pedicels ascending to subdivaricate, stout and nearly as thick as fruit, (2–)3–6 mm. Sepals oblong, ascending, 3.5–5.5 × 1–2 mm. Petals pale yellow, spatulate, (6–)7–9(–10) × 2.5–4 mm; claw subequaling sepals. Filaments yellowish, erect, (4–)5–8 mm; anthers oblong, 1–1.8 mm. Ovules (60–)80–100(–140) per ovary. Fruit narrowly linear, stout, terete, (5–)6–10(–13) cm × 1–1.5 mm, straight; valves glabrous or pubescent, smooth; style subclavate, 1–3(–4) mm; stigma prominently 2-lobed; septum slightly thickened. Seeds oblong, 1–1.5 × 0.7–0.9 mm, inserted in depressions of septum. Fl. Apr–Jul, fr. May–Aug. $2n = 14$.

Waste grounds, roadsides, disturbed sites. Fujian, Shanxi [India, Japan, Kashmir, Pakistan, Russia; SW Asia, Europe; introduced elsewhere].

The above first record of *Sisymbrium orientale* from China is based on *Li Huaxi 80* (MO) and the type of *S. fujianense*.

7. *Sisymbrium polymorphum* (Murray) Roth, Mant. Bot. 2: 946. 1830.

多型大蒜芥 duo xing da suan jie

Brassica polymorpha Murray, Novi Comment. Soc. Regiae Sci. Gott. 7: 35. 1776; *Sisymbrium junceum* Marschall von Bieberstein; *S. junceum* var. *latifolium* Korshinsky; *S. junceum* var. *soongaricum* Regel & Herder; *S. polymorphum* var. *latifolium* (Korshinsky) O. E. Schulz; *S. polymorphum* var. *soongaricum* (Regel & Herder) O. E. Schulz.

Herbs perennial, (10–)25–90(–110) cm tall. Stems erect, branched below and above, glaucous, glabrous or sparsely pilose at least near base, glabrous above. Basal leaves fleshy, not rosulate; petiole 0.5–2 cm; leaf blade oblanceolate, oblong or lanceolate, pinnatisect or pinnatifid, 1–6(–9) cm × 1–8(–15) mm; lateral lobes 2–4 on each side of midvein, smaller than terminal one, oblong or lanceolate, entire or dentate. Uppermost cauline leaves filiform to narrowly linear, entire. Fruiting pedicels divaricate, slender, narrower than fruit, (3–)4–8(–10) mm. Sepals narrowly oblong, spreading, 3.5–5 × 1–1.5 mm, glabrous or pilose. Petals yellow, spatulate, (5–)6–8(–9) × 2–2.5 mm; claw subequaling sepals. Filaments yellowish, erect, 3.5–6 mm; anthers oblong, 1–1.5 mm. Ovules 48–70 per ovary. Fruit narrowly linear, slender, terete, (2–)2.5–4(–4.5) cm × 0.5–1.2 mm; valves glabrous, torulose; style slender,

0.5–1 mm; stigma slightly 2-lobed; septum not thickened. Seeds oblong, 0.6–1 × 0.3–0.5 mm. Fl. May–Jun, fr. Jun–Jul.

Steppe, deserts, saline flats, sandy areas, slopes, roadsides; 300–1900 m. Gansu, Heilongjiang, Nei Mongol, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan].

8. *Sisymbrium luteum* (Maximowicz) O. E. Schulz, Beih. Bot. Centralbl. 37: 126. 1919.

全叶大蒜芥 *quan ye da suan jie*

Hesperis lutea Maximowicz, Mélanges Biol. Bull. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 9: 12. 1873.

Herbs perennial, (40–)60–100(–120) cm tall. Stems erect, branched above, sparsely to densely hirsute at least near base, usually glabrous above. Basal leaves not seen; petiole of middle cauline leaves 1–2(–3) cm; leaf blade broadly ovate to ovate-lanceolate, (5–)7–12(–15) × 2–5(–7) cm, sparsely pilose or subhirsute adaxially, densely so abaxially, base cuneate, truncate, or rarely cordate, margin dentate with apiculate callosities, apex acute or acuminate. Uppermost cauline leaves narrowly lanceolate, margin dentate, apex acuminate. Racemes basally bracteate. Fruiting pedicels ascending to subdivaricate, stout, narrower than fruit, (0.7–)0.8–1.3(–1.6) cm. Sepals linear, ascending, 7–9 × ca. 1 mm, subapically cucullate. Petals yellow, spatulate, 1.2–1.6 cm × 2.5–3.5 mm; claw subequaling sepals. Filaments yellowish, erect, 6–10 mm; anthers linear, 2–3 mm. Ovules 90–130 per ovary. Fruit narrowly linear, stout, subquadrangular, 8–14 cm × 1.5–2 mm; gynophore to 2 mm; valves glabrous, smooth, prominently veined; style stout, (0.5–)1–2(–3.5) mm; stigma slightly 2-lobed; septum slightly thickened or membranous. Seeds oblong, (1.3–)1.5–2(–2.3) × 0.7–0.9(–1.1) mm, inserted in depressions of septum. Fl. Jun–Jul, fr. Jul–Aug. $2n = 28$.

Rocky slopes, coastal cliffs, valleys, forests, among shrubs; near sea level to 1600 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi [Japan, Korea, Russia (Far East)].

9. *Sisymbrium yunnanense* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 229. 1919.

云南大蒜芥 *yun nan da suan jie*

Arabis kandingensis Y. H. Zhang; *Sisymbrium luteum* (Maximowicz) O. E. Schulz var. *yunnanense* (W. W. Smith) O. E. Schulz.

Herbs perennial, (0.6–)0.8–1.5(–2.2) m tall. Stems erect, branched above, sparsely to densely pilose at least near base, usually glabrous above. Basal leaves not seen; petiole of middle cauline leaves 1–3.5 cm; leaf blade ovate-lanceolate, lobed near base, 8–16 × 2–7 cm, pilose abaxially, often glabrous adaxially, base often hastate or truncate, or rarely cuneate, margin dentate with apiculate callosities, apex acuminate. Uppermost cauline leaves linear-lanceolate, margin entire or

sparsely denticulate, apex acuminate. Racemes basally bracteate. Fruiting pedicels ascending or subdivaricate, stout, narrower than fruit, (0.7–)0.9–1.3 cm. Sepals linear, ascending, 3.5–5.5(–7) × 1–1.3 mm, subapically cucullate. Petals yellow, narrowly spatulate, 6–8 (–10) × 1–1.5 mm; claw subequaling sepals. Filaments yellowish, erect, 3–5(–6) mm; anthers oblong, 1–1.5 mm. Ovules 70–100 per ovary. Fruit narrowly linear, terete, (6–)8–13 cm × 0.9–1.5 mm; gynophore to 2 mm; valves glabrous, torulose, somewhat prominently veined; style stout, 0.5–1 mm; stigma slightly 2-lobed; septum slightly thickened or membranous. Seeds oblong, 1.4–2 × 0.6–0.8 mm, inserted in depressions of septum. Fl. Jun–Jul, fr. Jul–Aug. $2n = 28^*$.

• Thickets, ravines, mountain slopes, by streams; 2000–3000 m. Sichuan, Yunnan.

Although the present authors have not examined the type of *Arabis kandingensis*, the excellent description and illustration (Bull. Bot. Res., Harbin 14: 144–146. 1994; *ibid.* 18: 156–157. 1998; Fl. Sichuan. 14: 117. 1999) leave no doubt that it is a synonym of *Sisymbrium yunnanense*. It was described as having yellow flowers, exclusively simple trichomes, and chromosome number based on $x = 7$. No species of *Arabis* has any of these characters. *Arabis kandingensis* perfectly matches the above description of *S. yunnanense* in all characters.

Sisymbrium yunnanense was recognized in FRPS as a variety of *S. luteum*, but the differences between the two taxa (see the above key) are significant enough to support their recognition as distinct species.

10. *Sisymbrium officinale* (Linnaeus) Scopoli, Fl. Carniol., ed. 2, 2: 26. 1772.

钻果大蒜芥 *zuan guo da suan jie*

Erysimum officinale Linnaeus, Sp. Pl. 2: 660. 1753;

Sisymbrium officinale var. *leiocarpum* de Candolle.

Herbs annual, 25–75(–110) cm tall. Stems erect, branched above, sparsely to densely hirsute with retrorse trichomes, rarely subglabrous above. Basal leaves usually rosulate; petiole (1–)2–7(–10) cm; leaf blade broadly oblanceolate or oblong-obovate in outline, lyrate-pinnatifid, pinnatisect, or runcinate, (2–)3–10(–15) × (1–)2–5(–8) cm; lateral lobes (2 or)3 or 4(or 5) on each side of midvein, smaller than terminal one, oblong or lanceolate, entire or dentate or lobed; terminal lobe suborbicular or deltoid, dentate. Uppermost cauline leaves lobed, dentate, or subentire. Fruiting pedicels erect, appressed to rachis, stout, narrower than fruit, 1.5–3(–4) mm. Sepals oblong-ovate, erect, 2–2.5 × ca. 1 mm. Petals yellow, spatulate, 2.5–4 × 1–2 mm. Filaments yellowish, erect, 2–3 mm; anthers ovate, 0.3–0.5 mm. Ovules 10–20 per ovary. Fruit subulate-linear, stout, terete, erect, appressed to rachis, (0.7–)1–1.4(–1.8) cm × 1–1.5 mm, straight; valves glabrous or pubescent, 3-veined, slightly torulose; style (0.8–)1–1.5(–2) mm; stigma slightly 2-lobed; septum submembranous. Seeds oblong, 1–1.3 × 0.5–0.6 mm. Fl. Mar–Jul, fr. Apr–Sep. $2n = 14$.

Roadsides, fields, pastures, waste grounds, deserts; near sea level to 1500 m. Heilongjiang, Jilin, Liaoning, Nei Mongol, Xizang [Japan,

Kashmir, Kazakstan, Pakistan, Russia; Africa, SW Asia, Europe; naturalized elsewhere].

91. IANHEDGEA Al-Shehbaz & O'Kane, *Edinburgh J. Bot.* 56: 322. 1999.葶芥属 *ting jie shu*

Herbs annual. Trichomes branched, finely dendritic. Stems erect, slender. Basal leaves petiolate, not rosulate, finely pinnatisect or 3-sect; lobes 3 or 5, filiform, linear, narrowly oblong, or oblanceolate-linear, sparsely to densely dendritic. Cauline leaves shortly petiolate, similar to basal leaves in division and pubescence, reduced in size upward and becoming trifid. Racemes few to several flowered, ebracteate; rachis strongly or rarely slightly flexuous. Fruiting pedicels slender, sometimes thickened and nearly as wide as fruit, erect or divaricate. Sepals oblong, erect, base of lateral pair not saccate. Petals white or pink, longer than sepals; blade oblanceolate, apex obtuse; claw obscurely distinct from blade. Stamens 6, tetradynamous; filaments filiform; anthers broadly ovate, apex obtuse. Nectar glands confluent, subtending bases of all filaments. Ovules (6–)10–20 per ovary. Fruit dehiscent siliques, linear, terete, torulose, divaricate or appressed to rachis, sessile; valves papery, veinless or with an obscure midvein, glabrous or minutely dendritic; replum rounded; septum complete; style absent or obsolete; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat nearly smooth, not mucilaginous when wetted; cotyledons incumbent.

One species: C and SW Asia.

1. *Ianhedgea minutiflora* (J. D. Hooker & Thomson) Al-Shehbaz & O'Kane, *Edinburgh J. Bot.* 56: 322. 1999.葶芥 *ting jie*

Sisymbrium minutiflorum J. D. Hooker & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 158. 1861; *Guillenia minutiflora* (J. D. Hooker & Thomson) Bennet; *Microsisymbrium minutiflorum* (J. D. Hooker & Thomson) O. E. Schulz; *M. minutiflorum* var. *dasycarpum* O. E. Schulz.

Herbs (2–)4–20(–30) cm tall, sparsely to moderately pubescent with finely branched trichomes to 0.1 mm. Stems slender, branched above or rarely simple; branches filiform. Basal and lowermost cauline leaves pinnatisect, with 1 or 2 lateral lobes; petiole 5–12 mm; lobes linear, filiform, narrowly oblong, or oblanceolate-linear, (1–)3–9(–12) × 0.2–0.8(–1.3) mm, margin entire or very rarely obtusely 1-toothed, apex obtuse. Upper and middle cauline leaves 3-lobed, similar to lowermost leaves. Infrutescence axis strongly or rarely slightly

flexuous. Fruiting pedicels (0.5–)3–8(–12) mm, slender or thickened, narrower or rarely nearly as wide as fruit, erect or divaricate, straight or slightly curved. Sepals oblong, (0.6–)0.8–1(–1.2) × 0.4–0.5 mm. Petals white or pink, (0.9–)1.1–1.5(–1.8) × 0.3–0.5 mm, oblanceolate, apex obtuse. Filaments white, 0.8–1.1 mm; anthers broadly ovate, ca. 0.2 mm. Fruit linear, (0.4–)0.7–1.8 (–2.5) cm × 0.5–0.8 mm; valves glabrous or sparsely pubescent; style absent, obsolete, or rarely to 0.1 mm. Seeds brown, oblong, 0.9–1.1(–1.2) × 0.4–0.5(–0.6) mm. Fl. May–Aug, fr. Jun–Aug. $2n = 28$.

Limestone, marble outcrops, scree slopes; 2600–4200 m. Xizang [Afghanistan, India, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

This species is represented in China by subsp. *minutiflora*; subsp. *brevipedicellata* (Hedge) Al-Shehbaz & O'Kane (*Microsisymbrium minutiflorum* var. *brevipedicellatum* Hedge) is restricted to N Afghanistan and adjacent Tajikistan.

92. APHRAGMUS Andrzejowski ex de Candolle, *Prodr.* 1: 209. 1824.寒原芥属 *han yuan qi shu**Oreas* Chamisso & Schlechtendal; *Orobium* Reichenbach; *Staintoniella* H. Hara.

Herbs perennial, with thick caudex covered with petiolar remains of previous years, sometimes with slender rhizomes. Trichomes eglandular, simple or forked, less than 0.1 mm. Stems erect or ascending, branched basally, often minutely puberulent. Basal leaves petiolate, rosulate, simple, entire. Cauline leaves petiolate or sessile, base cuneate or attenuate, not auriculate. Racemes few to several flowered, bracteate throughout, slightly elongated or not in fruit. Fruiting pedicels slender, erect, ascending, divaricate, sometimes recurved, puberulent adaxially. Sepals oblong, base of lateral pair not saccate. Petals white, pink, or purple; blade broadly obovate or spatulate, apex obtuse or rounded; claw subequalling sepals. Stamens 6, slightly tetradynamous; filaments dilated or not at base; anthers obtuse at apex. Nectar glands confluent and subtending bases of stamens. Fruit dehiscent silicles or siliques, ovate, elliptic, lanceolate, rarely linear, latiseptate; valves with an obscure or distinct midvein, smooth; replum flattened basally; septum complete and membranous, or absent; style obsolete or rarely to 2 mm; stigma capitate, entire. Seeds uniseriate or biseriata, wingless, oblong or ovoid, plump, on filiform funicles often longer than seeds; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

Five species: C Asia, Himalayas, North America; one species in China.

1. *Aphragmus oxycarpus* (J. D. Hooker & Thomson) Jafri, *Notes Roy. Bot. Gard. Edinburgh* 22: 96. 1956.尖果寒原芥 *jian guo han yuan qi*

Braya oxycarpa J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 169. 1861; *Aphragmus oxycarpus* var. *glaber* (Vassilczenko) Z. X. An; *A. oxycarpus* var. *microcarpus* Z. X. An; *A. oxycarpus* var. *stenocarpus* (O. E. Schulz) G. C. Das; *A. przewalskii* (Maximowicz) A. L. Ebel; *A. stewartii* O. E. Schulz; *A. tibeticus* O. E. Schulz; *Braya foliosa* Pampanini; *B. oxycarpa* f. *glabra* Vassilczenko; *B. oxycarpa* var. *stenocarpa* O. E. Schulz; *B. rubicunda* Franchet; *Eutrema przewalskii* Maximowicz; *Lignariella duthiei* Naqshi.

Herbs perennial, (1–)2–11(–18) cm tall; caudex covered with petiolar bases of previous years. Stems erect or ascending, branched from base, minutely puberulent with simple or short-stalked trichomes less than 0.1 mm, rarely glabrous. Basal leaves rosulate, subfleshy; petioles persistent, 0.2–2(–5) cm, base broadly expanded and to 3 mm wide; leaf blade spatulate, oblanceolate, linear, oblong, or elliptic, rarely ovate, (0.2–)0.5–2(–3) cm × 0.5–3(–5) mm, glabrous, base cuneate or attenuate, margin entire, apex obtuse or

acute. Cauline leaves and bracts similar to basal leaves but narrower and sessile or shortly petiolate, reduced in size upward. Racemes somewhat elongated in fruit. Fruiting pedicels erect or ascending, (1.5–)2–10(–20) mm, puberulent adaxially, glabrous abaxially. Sepals often purplish, 1.5–2.5 × 1.2–1.5 mm, glabrous. Petals deep purple or white, broadly obovate or spatulate, 3.5–5(–6) × 1.5–3(–4) mm, apex rounded; claw 1–2.5 mm. Filaments 1.5–2.5 mm; anthers 0.3–0.6 mm. Ovules 10–16 per ovary. Fruit lanceolate or elliptic, 5–10 × 1.5–2 mm, compressed; valves obscurely veined, glabrous or rarely sparsely puberulent; gynophore to 0.7 mm; septum complete, hyaline; style 0.5–1(–2) mm. Seeds light brown, oblong, biseriate, 0.9–1.3 × 0.6–1 mm. Fl. May–Aug, fr. Jul–Sep.

Moraine, gravel below glaciers, limestone rubble and cliffs, open stony slopes, alpine pastures, scree, dolomite cliffs, streamsides, peat grounds and turf; 3300–5600 m. Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, Nepal, Pakistan, Sikhim, Tajikistan].

93. **BERTEROELLA** O. E. Schulz in Loesener, Beih. Bot. Centralbl. 37(2): 127. 1919.

锥果芥属 zhui guo jie shu

Herbs annual, canescent or pale green. Trichomes short-stalked or subsessile, stellate, 4–6-rayed. Stems erect, often simple basally, branched apically. Basal leaves absent by flowering. Cauline leaves sessile, cuneate or attenuate, not auriculate, entire. Racemes several flowered, dense, ebracteate. Fruiting pedicels slender, subappressed. Sepals narrowly oblong, ascending, pubescent, base of lateral pair subsaccate. Petals white or light pink, ascending, longer than sepals; blade oblong-obovate or oblanceolate, apex obtuse; claw obsolete. Stamens 6, erect, slightly tetradynamous; median filament pairs strongly flattened and nearly winged basally; anthers oblong, sagittate at base, obtuse at apex. Nectar glands 4, 1 on each side of lateral stamen; median glands absent. Ovules 6–14 per ovary. Fruit dehiscent siliques, linear, terete, sessile; valves papery, with a distinct midvein, stellate, torulose; replum rounded; septum complete, membranous, without 2 longitudinal veins; style to 2.5 mm, filiform; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat smooth, minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

One species: China, Japan, Korea.

1. *Berteroella maximowiczii* (Palibin) O. E. Schulz in Loesener, Beih. Bot. Centralbl. 37(2): 128. 1919.

锥果芥 zhui guo jie

Sisymbrium maximowiczii Palibin, Trudy Imp. S.-Peterburgsk. Bot. Sada 17(1): 28. 1899.

Plants (10–)20–50(–75) cm tall, pubescent throughout with stalked stellate trichomes. Stems erect, simple at base, branched above. Basal leaves not seen. Cauline leaves oblong-obovate or oblanceolate or rarely spatulate, (7–)12–40(–50) cm × (2–)4–10(–16) mm, stellate, gradually reduced in size upward, cuneate to petiolelike base to 3 mm, margin entire, apex rounded

or obtuse. Fruiting pedicels slender, subappressed to rachis, (3–)4–7(–8.5) mm. Sepals narrowly oblong, stellate, 1.5–2(–2.5) × 0.5–0.8 mm. Petals white or pale pink, oblanceolate or oblong-obovate, (2.5–)3–4 × 1–1.5 mm, apex rounded. Filaments 2–3 mm, median pairs strongly broadened basally and to 1 mm wide; anthers 0.5–0.8 mm. Fruit linear, torulose, 0.8–1.4(–1.8) × 0.7–1 mm, densely stellate; style slender, (1–) 1.5–2(–2.5) mm. Seeds dark brown, oblong, ca. 1 × 0.5 mm. Fl. Jun–Oct, fr. Jul–Oct.

Rocky places, forests, mountain slopes; 300–900 m. Hebei, Henan, Jiangsu, Liaoning, Shandong, Zhejiang [Japan, Korea].

94. **NEOTORULARIA** Hedge & J. Léonard, Bull. Jard. Bot. Belg. 56: 393. 1986.

念珠芥属 nian zhu jie shu

Torularia (Cosson) O. E. Schulz in Engler, Pflanzenr. 86(IV. 105): 213. 1924, not *Bonnemaison* (1828); based on *Sisymbrium* Linnaeus sect. *Torularia* Cosson, Comp. Fl. Atlant. 2: 136. 1887.

Herbs annual, biennial, or perennial with a woody caudex. Trichomes stalked or sessile, 1- or 2-forked sometimes also simple. Stems erect or prostrate, usually several from base. Basal leaves petiolate or sessile, rosulate or not, entire, dentate, or pinnatisect. Cauline leaves often similar to basal ones, rarely absent. Racemes few to several flowered, ebracteate or rarely bracteate. Fruiting pedicels erect, ascending, or divaricate. Sepals ovate or oblong, erect or spreading, rarely reflexed, glabrous or pubescent, base of lateral pair not saccate. Petals white or pink, sometimes yellowish, longer or rarely shorter than sepals; blade obovate, spatulate, or oblanceolate, apex obtuse or retuse; claw distinct or not. Stamens 6, tetradynamous; filaments rarely dilated at base; anthers ovate or narrowly oblong, apex apiculate or obtuse. Median glands absent; lateral ones semilunar or 1 on each side of lateral stamen. Ovules (8–)16–36(–44) per ovary. Fruit dehiscent siliques, linear or rarely linear-oblong, terete or 4-angled, sessile; valves with branched trichomes sometimes mixed with simple ones, rarely glabrescent, torulose; replum rounded; septum complete; style obsolete or to 1 mm; stigma capitate, entire or 2-lobed. Seeds uniseriate, wingless, oblong or ovate, plump; seed coat reticulate, not mucilaginous when wetted; cotyledons incumbent.

About 14 species: C and SW Asia, one species extending into North America and another into N Africa and Europe; six species (one endemic) in China.

1a. Perennials, at least lowermost portion of raceme bracteate.

2a. Fruit (9–)12–25(–32) × 0.5–0.9(–1) mm, uniform in width; petals 3–5(–8) mm; seeds uniseriate;

racemes

bracteate along lowermost portion, rarely throughout 1. *N. humilis*

2b. Fruit 3–10(–15) × 1–1.3 mm, widest near or at base; petals 1–2.5(–3) mm; seeds often subbiseriate

at basal portion of fruit; racemes bracteate throughout or rarely only along proximal half .. 2. *N. brachycarpa*

1b. Annuals or biennials, if perennial then style more than 1 mm; racemes ebracteate.

3a. Racemes rachis flexuous; fruit straight; Nei Mongol 6. *N. qingshuiheense*

3b. Racemes rachis straight; fruit twisted or curved apically; elsewhere.

4a. Stem leafless; petals less than 2 mm; basal leaves including petiole less than 1 cm 5. *N. brevipes*

4b. Stem leafy; petals more than 2 mm; basal leaves including petiole more than 1 cm.

5a. Fruiting pedicels narrower than fruit, (3–)4–6(–8) mm; petals 5–7 mm 3. *N. korolkowii*

5b. Fruiting pedicels as thick as fruit, 0.3–1(–2) mm; petals (2–)2.5–3.5(–4) mm 4. *N. torulosa*

1. *Neotorularia humilis* (C. A. Meyer) Hedge & J. Léonard, Bull. Jard. Bot. Belg. 56: 394. 1986.

蜆果芥 ying guo jie

Sisymbrium humile C. A. Meyer in Ledebour, Icon. Pl.

Fl. Ross. 2: 16. 1830; *Arabidopsis trichocarpa* R. F.

Huang; *A. tuernica* K. C. Kuan & Z. X. An; *Arabis*

axillaris Komarov; *A. piasezkii* Maximowicz; *Braya*

humilis (C. A. Meyer) B. L. Robinson; *Dichasianthus*

humilis (C. A. Meyer) Soják; *Erysimum alyssoides*

Franchet; *E. stigmatosum* Franchet; *Hesperis*

hygrophila Kuntze; *H. piasezkii* (Maximowicz) Kuntze;

Malcolmia perennans Maximowicz; *Neotorularia*

humilis f. *angustifolia* (Z. X. An) Z. X. An; *N. humilis* f.

glabrata (Z. X. An) Z. X. An; *N. humilis* f. *grandiflora*

(O. E. Schulz) Z. X. An; *N. humilis* f. *hygrophila*

(Fournier) Z. X. An; *N. maximowiczii* (Botschantzev)

Botschantzev; *N. piasezkii* (Maximowicz) Botschantzev;

Sisymbrium humile var. *hygrophilum* Fournier; *S.*

humile var. *piasezkii* (Maximowicz) Maximowicz; *S.*

nanum Bunge; *S. piasezkii* Maximowicz; *Torularia*

humilis (C. A. Meyer) O. E. Schulz; *T. humilis* var.

maximowiczii (Botschantzev) H. L. Yang; *T. humilis*

var. *piasezkii* (Maximowicz) Jafri; *T. humilis* var.

ventosa O. E. Schulz; *T. humilis* f. *angustifolia* Z. X.

An; *T. humilis* f. *glabrata* Z. X. An; *T. humilis* f.

grandiflora O. E. Schulz; *T. humilis* f. *hygrophila*

(Fournier) O. E. Schulz; *T. maximowiczii* Botschantzev;

T. piasezkii (Maximowicz) Botschantzev.

Herbs perennial, (4–)8–25(–35) cm tall, sparsely to

densely covered with short-stalked or sessile,

submalpighiaceous or rarely 2-forked trichomes often mixed along petioles and stem base with simple trichomes, rarely glabrescent. Stems usually few to many from base, rarely simple, ascending or erect, rarely subdecumbent. Basal leaves rosulate; petiole 2–16(–35) mm; leaf blade obovate, spatulate, oblanceolate, oblong, or sublinear, (0.3–)0.5–2(–3.5) cm × 1–8(–10) mm, sparsely to densely pubescent or rarely glabrous, base attenuate or cuneate, margin entire, repand, dentate, or pinnatifid, apex acute or obtuse. Cauline leaves similar to basal leaves but progressively smaller upward, uppermost sessile to subsessile. Racemes bracteate along lowermost part, very rarely throughout. Fruiting pedicels erect and subappressed to rachis, ascending, or divaricate, slender, much narrower than fruit, (2.5–)3–8(–12) mm. Sepals oblong, 2–3 × 0.8–1.2 mm, slightly saccate or not saccate at base. Petals white, pink, or purple, broadly obovate or spatulate, 3–5(–8) × (1–)1.5–2.5(–4) mm, apex rounded. Filaments 2–3(–4) mm; anthers oblong, 0.4–0.7 mm, apex apiculate. Ovules 20–44 per ovary. Fruit linear, uniform in width, (0.9–)1.2–2.5(–3.2) cm × 0.5–0.9(–1) mm, mostly straight, terete, torulose, pubescent with submalpighiaceous trichomes rarely mixed with fewer straight ones, rarely glabrescent; style 0.3–0.8(–1) mm; stigma entire or strongly 2-lobed. Seeds oblong, uniseriate, 0.6–0.9 × 0.4–0.5 mm. Fl. May–Aug, fr. Jun–Aug. *2n* = 28, 40, 42, 50, 56, 64, 70.

Sandy areas, river terraces, open stony slopes, scree, dolomite cliffs and slopes, degraded loess slopes, limestone ledges; 1000–5300.

Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, Kazakstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan; North America].

A highly variable species in pubescence, leaf shape and margin, flower color and size, length of the bracteate portion of the raceme, fruit orientation and length, cotyledonary position, and chromosome number. Numerous taxa have been described from China, Russia, and North America, but the variation is continuous and does not support the recognition of infraspecific taxa. Fully bracteate racemes, though very rare, appear sporadically in populations that otherwise have racemes only basally bracteate. The above synonymy pertains only to China, and it represents about half of the total synonymy of the species.

2. *Neotorularia brachycarpa* (Vassilczenko) Hedge & J. Léonard, Bull. Jard. Bot. Belg. 56: 393. 1986.

短果念珠芥 *duan guo nian zhu jie*

Torularia brachycarpa Vassilczenko, Fl. URSS 8: 635.

1939; *Dichasianthus brachycarpus* (Vassilczenko)

Soják; *Neotorularia bracteata* (S. L. Yang) Z. X. An; *N.*

conferta R. F. Huang; *N. parvia* (Z. X. An) Z. X. An;

N. tibetica (Z. X. An) Z. X. An; *Torularia bracteata* S.

L. Yang; *T. conferta* R. F. Huang; *T. parvia* Z. X. An;

T. tibetica Z. X. An.

Herbs perennial, (1–)3–10(–2) cm tall, sparsely to densely covered with short-stalked or subsessile, submalpighiaceous or rarely 2-forked trichomes. Stems several to numerous from base, procumbent or decumbent. Basal leaves rosulate; petiole 1–6(–12) mm; leaf blade oblanceolate or oblong, (2–)3–15 × 1–3 mm, sparsely to densely pubescent, base attenuate or cuneate, margin dentate or pinnatifid, apex acute or obtuse.

Cauline leaves similar to basal ones but progressively smaller upward, uppermost sessile to subsessile.

Racemes bracteate throughout, rarely only along proximal half; bracts attached to rachis or pedicel.

Fruiting pedicels subappressed to rachis, slender, much narrower than fruit, 0.5–2.5(–5) mm. Sepals oblong, 0.7–1.5 × 0.5–0.8 mm, not saccate at base. Petals white, spatulate, 1–2.5 (–3) × 0.5–0.9(–1.1) mm, apex rounded.

Filaments 1–1.5 mm; anthers ovate, 0.3–0.5 mm, apex apiculate. Ovules 20–40 per ovary. Fruit oblong, linear-lanceolate, or linear, widest at or near base, 3–10(–15) × 1–1.3 mm, often basally appressed or subappressed to rachis and distally curved away from it, terete, torulose, pubescent with submalpighiaceous trichomes; style 0.1–0.5 mm; stigma entire. Seeds oblong, subseriate at least on proximal half of fruit, 0.5–0.8 × 0.3–0.4 mm. Fl. Jun–Aug, fr. Jul–Sep.

Gravelly slopes, sandy areas. Gansu, Qinghai, Xinjiang, Xizang [Tajikistan].

The alleged differences between *Neotorularia bracteata*, *N. conferta*, *N. parvia*, and *N. tibetica* in fruit length and bract position on the pedicel or rachis are artificial, and the four taxa easily fall within the general range of variation of *N. brachycarpa*.

3. *Neotorularia korolkowii* (Regel & Schmalhausén) Hedge & J. Léonard, Bull. Jard. Bot. Belg. 56: 394. 1986.

甘新念珠芥 *gan xin nian zhu jie*

Sisymbrium korolkowii Regel & Schmalhausén, Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 240. 1877;

Dichasianthus korolkowii (Regel & Schmalhausén)

Soják; *Malcolmia mongolica* Maximowicz;

Neotorularia korolkowii var. *longicarpa* (Z. X. An) Z.

X. An; *N. rosulifolia* (K. C. Kuan & Z. X. An) Z. X. An;

N. sulphurea (Korshinsky) Ikonnikov; *Sisymbrium*

mongolicum (Maximowicz) Maximowicz; *S.*

sulphureum Korshinsky; *Torularia korolkowii* (Regel & Schmalhausén) O. E. Schulz; *T. korolkowii* var.

longicarpa Z. X. An; *T. korolkowii* var. *longistyla*

Vassilczenko; *T. rosulifolia* K. C. Kuan & Z. X. An; *T.*

sulphurea (Korshinsky) O. E. Schulz.

Herbs annual or biennial, rarely perennial, (1.5–)8–45(–60) cm tall, sparsely to densely covered with short- to long-stalked, 1- or rarely 2-forked trichomes sometimes mixed basally with simple ones. Stems usually few to several from base, rarely simple, ascending or erect.

Basal leaves rosulate; petiole 3–15(–30) mm; leaf blade oblong to lanceolate or spatulate-oblanceolate, (0.8–)1–5(–7.5) cm × (1–)2–10(–15) mm, sparsely to densely pubescent primarily with forked stalked trichomes, base attenuate or cuneate, margin entire, repand, or dentate, apex acute or obtuse. Cauline leaves similar to basal leaves but progressively smaller upward, sessile to subsessile. Racemes ebracteate. Fruiting pedicels erect or ascending, slender or stout, narrower than fruit, (3–)4–6(–8) mm. Sepals oblong, 2–2.5 × 1–1.3 mm, not saccate. Petals white, sometimes with yellowish center, broadly obovate, 5–7 × 2–3.5 mm, apex retuse. Filaments 2–2.5 mm; anthers oblong, 0.6–0.8 mm, apex apiculate. Ovules 15–25 per ovary. Fruit cylindrical, (0.7–)1.2–2.2(–3.3) cm × 0.9–1 mm, mostly arcuate, sometimes straight or coiled into a loop, terete, strongly torulose, pubescent with subsessile or short-stalked, forked, slender trichomes; style 1–1.5 mm; stigma slightly 2-lobed. Seeds oblong, 0.9–1.1 × 0.5–0.6 mm.

Fl. and fr. May–Aug.

Mountain slopes, river banks, sandy beaches, grasslands, fields, roadsides; 500–3000 m. Gansu, Qinghai, Xinjiang, Xizang [Afghanistan, Kazakstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan].

Neotorularia rosulifolia is indistinguishable from *N. korolkowii* in every aspect of leaf morphology, trichomes, flower size, pedicel length, and fruit shape and size. The only feature in which the former taxon is said to differ from *N. korolkowii* is in its having only basal leaves. However, this character varies within a given population and throughout the range of the species.

Some forms of *Neotorularia dentata* (Freyn & Sintenis) Hedge & J. Léonard (from Afghanistan, Iran, Pakistan, Tajikistan, and Turkmenistan) approach *N. korolkowii* in petal, pedicel, and fruit size, but the most reliable distinguishing feature is the trichomes on the leaves and fruit. In *N. korolkowii* they are exclusively Y-shaped, whereas in *N. dentata* they are several forked to subdendritic.

4. *Neotorularia torulosa* (Desfontaines) Hedge & J. Léonard, Bull. Jard. Bot. Belg. 56: 395. 1986.

念珠芥 *nian zhu jie*

Sisymbrium torulosum Desfontaines, Fl. Atlant. 2: 84.

1798; *Dichasianthus torulosus* (Desfontaines) Soják;

Malcolmia torulosa (Desfontaines) Boissier; *Neotorularia torulosa* var. *scorpiuroides* (Boissier) Hedge & J. Léonard; *Sisymbrium rigidum* Marschall von Bieberstein; *S. scorpiuroides* Boissier; *Torularia torulosa* (Desfontaines) O. E. Schulz; *T. torulosa* var. *scorpiuroides* (Boissier) O. E. Schulz.
Herbs annual, (1.5–)7–25(–35) cm tall, sparsely to densely covered with rigid, straight, simple trichomes to 1 mm, these mixed with much smaller, short-stalked or subsessile, forked trichomes, rarely glabrescent above. Stems usually few to several from the base, rarely simple, ascending to erect. Basal leaves rosulate; petiole 0.3–2(–4) cm; leaf blade oblong, lanceolate, or linear-oblong, (1.5–)2.5–6.5(–12) cm × (1–)3–13(–20) mm, sparsely to densely pubescent, rarely subglabrous, base attenuate, margin dentate or sinuate, rarely pinnatisect or subentire, apex acute or obtuse. Cauline leaves similar to basal leaves but progressively smaller upward, sessile to subsessile. Racemes ebracteate. Fruiting pedicels divaricate or ascending, stout, as thick as fruit, 0.3–1(–2) mm. Sepals oblong, (1–)1.5–2 × 0.4–0.8 mm, not saccate. Petals white, oblanceolate, (2.2–)2.5–3.5(–4) × (0.3–)0.5–1 mm, apex obtuse. Filaments (1–)1.5–2.5 mm; anthers ovate, 0.3–0.5 mm, apex apiculate. Ovules 14–40 per ovary. Fruit cylindrical, (0.8–)1.5–2.8(–3.7) cm × 0.8–1 mm, straight, arcuate, or spirally inrolled up to 3 turns, terete, strongly torulose, glabrous or pubescent with forked and/or simple subsetose trichomes; style 0.3–1 mm; stigma entire or slightly 2-lobed. Seeds oblong, (0.6–)0.8–1.2 × 0.4–0.6 mm. Fl. and fr. Feb–Jun. $2n = 14$.

Deserts, steppe, hillsides, rocky areas; near sea level to 1500 m. Xinjiang [Afghanistan, Kazakstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan [N Africa, SW Asia, SE Europe].

This is a highly variable species, especially in leaf morphology and pubescence. Forms with glabrous fruit are recognized by some botanists as var. *scorpiuroides*, but these do not merit recognition because both glabrous and pubescent plants can be found in the same population. The species is often confused with some species of *Malcolmia*, but the latter genus has a conical stigma with decurrent lobes, whereas *Neotorularia* has a flat, entire to slightly lobed stigma with nondecurrent lobes.

5. *Neotorularia brevipes* (Karelin & Kirilov) Hedge & J. Léonard, Bull. Jard. Bot. Belg. 56: 393. 1986.

短梗念珠芥 duan geng nian zhu jie

Sisymbrium brevipes Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 154. 1942; *Dichasianthus brevipes* (Karelin & Kirilov) Soják; *Fedtschenkoa brevipes* (Karelin & Kirilov) Dvorák; *Hesperis brevipes* (Karelin & Kirilov) Kuntze; *Malcolmia brevipes* (Karelin & Kirilov) Boissier; *Torularia brevipes* (Karelin & Kirilov) O. E. Schulz; *T. brevipes* var. *leiocarpa* O. E. Schulz.

Herbs annual, (2–)4–11(–15) cm tall, sparsely covered with minute, short-stalked trichomes, often glabrescent above. Stems 1 or few from the base, erect. Basal leaves rosulate, sessile or petiole 0.5–1(–2) mm; leaf blade obovate or oblanceolate, (1–)3–10 × 0.5–1.5(–3) mm, sparsely pubescent, rarely subglabrous, base cuneate, margin entire, apex obtuse or rounded. Cauline leaves absent. Racemes ebracteate. Fruiting pedicels ascending, stout and slightly narrower than fruit, 0.1–2(–5) mm. Sepals oblong, 0.9–1.2 × 0.4–0.5 mm, not saccate. Petals white or lavender, oblanceolate, 1.1–1.7 × 0.3–0.4 mm, apex obtuse. Filaments 0.8–1.5 mm; anthers ovate, 0.1–0.2 mm, apex apiculate. Ovules 14–32 per ovary. Fruit cylindrical, (0.6–)1–1.8(–2.2) cm × 0.5–0.8 mm, straight, terete, torulose, glabrous or pubescent with minute forked trichomes; style 0.2–0.7 mm; stigma slightly 2-lobed. Seeds oblong, 0.6–0.8(–1) × 0.2–0.4(–0.5) mm. Fl. and fr. Apr–Jun.

Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Turkmenistan].

The above first records of *Neotorularia brevipes* from China and Afghanistan are based on *Przewalski s.n.*, 2–14 May 1879 (LE) and *Podlech 31387* (M), respectively. The latter is a mixed collection of *N. brevipes* and *N. torulosa*.

6. *Neotorularia qingshuiheense* (Ma & Zong Y. Zhu) Al-Shehbaz et al. in Al-Shehbaz & O’Kane, Edinburgh J. Bot. 56: 326. 1999.

青水河念珠芥 qing shui he nian zhu jie

Microsisymbrium qingshuiheense Ma & Zong Y. Zhu, Acta Sci. Natur. Univ. Intramongol. 20: 538. 1989.

Herbs annual, 8–13 cm tall, densely covered with short-stalked, forked or 3-rayed trichomes, these mixed with simple ones at least on petioles. Stems usually few from base, ascending or erect. Basal leaves rosulate; petiole 1–1.5 cm; leaf oblanceolate, 1–1.5 cm × 2–2.5 mm, base cuneate, margin coarsely dentate or pinnatifid, apex acute; terminal lobe 2.5–3 mm. Cauline leaves few, similar to basal leaves but smaller and with a shorter petiole. Racemes ebracteate; rachis distinctly flexuous in fruit. Fruiting pedicels ascending or divaricate, slender, narrower than fruit, 3–4 mm. Sepals oblong, 2–2.5 × 1–1.3 mm, not saccate. Petals white or pink, broadly obovate, ca. 5 × 2.5 mm, apex retuse. Ovules 20–22 per ovary. Fruit cylindrical, 0.8–2 cm × ca. 1 mm, straight, terete, strongly torulose, pubescent with short-stalked, forked or 3-rayed trichomes; style ca. 1 mm; stigma slightly 2-lobed. Seeds oblong, ca. 1 × 0.5–0.6 mm. Fl. and fr. Jul.

• Rocky areas. Nei Mongol.

The present authors have seen no material of this species, and the above description was taken from the protologue.

95. SYNSTEMON Botschantzev, Bot. Zhurn. (Moscow & Leningrad) 44: 1487. 1959.

连蕊芥属 *lian rui jie shu*

Synstemonanthus Botschantzev.

Herbs annual or biennial. Trichomes flattened, strongly crisped, simple or minutely stalked and forked. Stems erect or ascending, often branched basally. Basal leaves petiolate, rosulate or not, simple, pinnatifid, or pinnatisect, often withered by flowering. Cauline leaves petiolate or sessile, not auriculate, entire or pinnatisect. Racemes ebracteate, elongated in fruit. Fruiting pedicels ascending or divaricate. Sepals oblong, ascending, base of lateral pair not saccate. Petals lavender, much longer than sepals; blade obovate, apex rounded; claw subequaling sepals, sparsely to densely pubescent. Stamens 6, tetradynamous; filaments glabrous or sparsely to densely pubescent on proximal half, slightly dilated at base, median pairs united only basally; anthers oblong, apiculate at apex. Nectar glands confluent and subtending bases of all stamens; median glands present. Ovules 20–36 per ovary. Fruit dehiscent siliques, linear, latiseptate, sessile or shortly stipitate; valves papery, with a distinct midvein, sparsely pubescent basally when young, torulose; replum rounded; septum complete, membranous, translucent, veinless; style to 1 mm; stigma capitate, entire. Seeds uniseriate, winged distally, oblong, somewhat plump; seed coat minutely reticulate, mucilaginous when wetted; cotyledons incumbent.

• Two species.

- 1a. Annuals; cauline leaves linear, sessile, entire, 0.5–1.7 mm wide; fruit straight; filaments sparsely to densely pilose basally 1. *S. petrovii*
 1b. Biennials; cauline leaves narrowly lanceolate, petiolate, pinnatifid or pinnatisect, 3–10 mm wide; fruit arcuate; filaments glabrous 2. *S. lulanianus*

1. *Synstemon petrovii* Botschantzev, Bot. Zhurn. (Moscow & Leningrad) 44: 1487. 1959.

连蕊芥 *lian rui jie*

Synstemon deserticola Y. Z. Zhao; *S. petrovii* var. *pilosus* Botschantzev; *S. petrovii* var. *xinglongicus* Z. X. An; *Synstemonanthus petrovii* (Botschantzev) Botschantzev; *S. petrovii* var. *pilosus* (Botschantzev) Botschantzev.

Herbs annual, 15–30 cm tall. Stems often branched basally and above, sparsely pilose or glabrescent. Basal leaves shortly petiolate, not rosulate, often withered by flowering, pinnatifid, 1–2 cm × 3–5 mm, apex acute. Cauline leaves linear, sessile, 0.5–4 cm × 0.5–1.7 mm, somewhat fleshy, margin entire, apex acute, sparsely pilose. Fruiting pedicels divaricate or ascending, slender, glabrous, 4–10 mm. Sepals oblong, 2–2.5 × 0.9–1.2 mm, glabrous or densely pilose. Petals lilac, obovate, 4–5.5 × 1.7–2.8 mm, apex rounded; claw 1–2.5 mm, sparsely to densely pilose. Filaments of median stamens 2–3.5 mm, united at base, sparsely to densely pilose on basal half; lateral stamens 1–2 mm, pilose basally; anthers oblong, 0.6–0.8 mm. Ovules 20–24 per ovary. Fruit linear, compressed, (0.5–)1.3–3 cm × 0.8–1.5 mm, straight; valves sparsely pubescent basally when young, soon glabrescent, with a distinct midvein; gynophore ca. 0.5 mm; style 0.5–1 mm. Seeds oblong, 1.2–1.7 × 0.7–0.9 mm. Fl. and fr. Jun.

• Slopes, deserts, rocky and sandy flats; 1500–2400 m. Gansu, Nei Mongol.

2. *Synstemon lulanianus* Al-Shehbaz et al., Novon 10: 102. 2000.

陆氏连蕊芥 *lu shi lian rui jie*

Herbs biennial, 7–15 cm tall. Stems branched basally, unbranched above, sparsely pilose or glabrescent. Basal leaves petiolate, rosulate, often withered by flowering; petiole 0.5–1.5 cm; leaf blade lanceolate, pinnatisect or pinnatifid, 1–2.5 cm × 4–10 mm, apex acute. Cauline leaves with petioles 1–4 mm; leaf blade narrowly lanceolate, 0.5–4 cm × 0.5–1.7 mm, glabrescent or pilose, pinnatisect, apex acute; lateral lobes oblong, 1–5 × 0.5–1 mm. Fruiting pedicels divaricate, slender, glabrous, 6–10 mm. Sepals oblong, 2.5–3 × 1.2–1.5 mm, sparsely pilose or glabrescent. Petals lilac, obovate, 4.5–6 × 2–3 mm, apex rounded; claw 2–2.5 mm, pilose. Filaments of median stamens 2.5–3 mm, united at base, glabrous; lateral stamens 1.5–2.5 mm, glabrous; anthers oblong, 1–1.1 mm. Ovules 28–32 per ovary. Fruit linear, compressed, 2–2.5 cm × ca. 1.2 mm, arcuate; valves sparsely pubescent basally when young, soon glabrescent, with a distinct midvein; gynophore obsolete; style ca. 0.5 mm. Seeds oblong, ca. 1.3 × 0.7 mm. Fl. and fr. Apr.

• Gansu.

This species is known only from the type collection, *Dushendenko 156* (LE).

96. BRAYA Sternberg & Hoppe, Denkschr. Königl.-Baier. Bot. Ges. Regensburg 1: 65. 1815.

肉叶芥属 *rou ye qi shu*

Platypetalum R. Brown.

Herbs perennial with simple or many-branched caudices, sometimes forming cushions. Trichomes simple or forked. Basal leaves petiolate, rosulate, simple, entire or dentate, rarely pinnately lobed, petiolar base persistent. Cauline leaves absent, rarely few, sessile or nearly so, not auriculate, entire or rarely dentate. Racemes ebracteate or only

lowermost flowers bracteate, elongated or not in fruit. Fruiting pedicels erect or divaricate. Sepals ovate or oblong, caducous or persistent, erect, base of lateral pair not saccate, margin membranous. Petals white, pink, or purple, rarely yellow, longer than sepals; blade obovate or oblanceolate, apex obtuse or rounded; claw shorter than sepals. Stamens 6, tetradynamous; filaments dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands 4, 1 on each side of lateral stamen; median glands absent. Ovules 4–26 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, ovoid, or lanceolate, terete or slightly latiseptate, sessile; valves with a distinct midvein, glabrous or pubescent, smooth or torulose; replum rounded; septum complete, membranous, translucent; style obsolete or to 1 mm; stigma capitate, entire or slightly 2-lobed. Seeds uniseriate or rarely biseriate, wingless, oblong or ovoid, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

Six polymorphic species: alpine, subarctic, or temperate regions of Asia, Europe, and North America; three species in China.

Braya siliquosa Bunge (from Kazakstan, Mongolia, and Russia) was recorded from Qinghai and Yunnan in FRPS, Fl. Qinghai. (1: 501. 1997), and Fl. Yunnan. (6: 117. 1995), but these records are based on misidentified plants of *Neotorularia humilis*.

- 1a. Petals yellow; inflorescence basally bracteate 1. *B. scharnhorstii*
 1b. Petals white, lavender, or purple; inflorescence ebracteate.
 2a. Caudex extensively branched, densely covered with persistent petioles; trichomes exclusively simple; fruit hardly longer than sepals 2. *B. forrestii*
 2b. Caudex few branched or simple, often with few or no petiolar remains; at least some trichomes forked; fruit often longer than sepals 3. *B. rosea*

1. *Braya scharnhorstii* Regel & Schmalhausen, Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 241. 1877.

黄花肉叶芥 huang hua rou ye qi

Beketovia tianschanica Krassnov; *Braya oxycarpa* J. D. Hooker & Thomson var. *scharnhorstii* (Regel & Schmalhausen) O. E. Schulz; *B. pamirica* (Korshinsky) O. Fedtschenko; *B. pamirica* var. *glabra* O. Fedtschenko; *B. sternbergii* Krassnov; *B. thomsonii* J. D. Hooker var. *pamirica* (Korshinsky) O. E. Schulz; *Erysimum pamiricum* Korshinsky; *Neotorularia pamirica* Z. X. An; *Solms-laubachia carnosifolia* Z. X. An.

Herbs densely caespitose, (2–)3–12(–17) cm tall, scapose, densely to sparsely pilose with short-stalked, forked trichomes often mixed with fewer simple ones; caudex densely covered with petiolar remains of previous years' growth, few to many branched. Basal leaves rosulate; petiole (2–)3–8(–11) mm, persistent and becoming papery, greatly expanded and to 3 mm wide at base, ciliate with simple trichomes; leaf blade linear to linear-oblanceolate, rarely oblanceolate, (0.2–)0.4–2.5(–4) cm × 0.5–1.5(–2) mm, densely pilose or glabrous, base attenuate, margin entire, apex obtuse. Cauline leaves sessile, similar to basal ones. Racemes bracteate along lower part, elongated in fruit. Fruiting pedicels ascending, 2–6(–10) mm. Sepals greenish, ovate or oblong, 2–2.5 × 1–1.5 mm, sparsely to densely pubescent, broadly white margined. Petals yellow, broadly obovate, 3.5–5 × 1.5–3 mm, apex rounded; claw often pinkish, 1.5–2 mm. Filaments pinkish, 1.5–2.5 mm; anthers ovate, 0.5–0.6 mm. Ovules 6–14 per ovary. Fruit ovoid, oblong, or linear, (3–)4–8(–12) × 1–1.5 mm, puberulent, torulose; style 0.5–1 mm. Seeds ca. 1–1.4 × 0.5–0.6 mm. Fl. Jul–Aug, fr. Aug–Sep.

Stony slopes, sandy areas, mountains; 3500–5000 m. SW Xinjiang (Taxkorgan Tajik Zizhixian, Yecheng Xian) [Kyrgyzstan, Tajikistan].

The above first record of *Braya scharnhorstii* from China is based on the type collections of *Neotorularia pamirica* and *Solms-laubachia carnosifolia*, as well as on *Qinghai-Tibet Team 1151* (HNWP, KUN), from Yecheng Xian, and *Qinghai-Tibet Team 870474* (KUN), *Xinjiang Team 764* (MO, PE), *Xinjiang Team 1351* and *2240* (WUK), and *Zhu Guiling 56* (XJA), all from Taxkorgan Tajik Zizhixian.

This is the only species of the genus with yellow flowers, pinkish petal claws, and bracteate racemes. *Braya pamirica* differs from *B. scharnhorstii* only in having longer fruit, and the difference appears to be continuous and unreliable. The species is highly variable in the density of indumentum, and forms with glabrescent or variously pubescent leaf blades exist.

2. *Braya forrestii* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 119. 1913.

弗氏肉叶芥 fu shi rou ye qi

Braya forrestii var. *puberula* W. T. Wang.

Herbs densely caespitose, (0.7–)1.5–5.5(–6.5) cm tall, scapose, densely to sparsely pilose with exclusively simple trichomes to 1 mm, rarely glabrous throughout except for petiole margin and leaf apex; caudex densely covered with petiolar remains of previous years, up to 40-branched, unbranched basal portion to 3 cm in diam. Basal leaves rosulate; petiole (2–)4–10(–15) mm, persistent and becoming papery, greatly expanded and to 4 mm wide at base, ciliate; leaf blade linear to linear-oblanceolate, rarely broadly oblanceolate, (0.3–)1–2.8(–3.5) cm × 0.5–2(–4) mm, densely to sparsely pilose, rarely glabrous except for a few trichomes at leaf apex, base attenuate, margin entire, apex obtuse or acute. Scapes spreading or retrosely pilose, leafless. Racemes ebracteate, not elongated and to 8 mm in fruit. Fruiting

pedicels ascending, 2–5 mm. Sepals subapically purple, ovate or oblong, 2.5–3 × 1.5–2 mm, glabrous or pubescent, broadly white margined. Petals purple, pink, or white, broadly obovate, 4–6 × 2–3 mm, apex rounded; claw 1.5–2.5 mm. Filaments 2–3 mm; anthers oblong, 0.6–0.8 mm. Ovules 4–8 per ovary. Fruit ovoid, 4–7 × 1.5–3 mm, glabrous or puberulent; style 0.5–1 mm. Seeds ca. 1.7 × 0.9 mm. Fl. May–Jul, fr. Jul–Aug.

Alpine turf and scree, rocky pastures; 3700–5000 m. Sichuan, Xizang, Yunnan [Bhutan].

3. *Braya rosea* (Turczaninow) Bunge, Delect. Seminum Hort. Bot. Dorpat. 1839: 7. 1839.

红花草叶芥 hong hua rou ye qi

Platypetalum roseum Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 11: 87. 1838; *Braya aenea* Bunge; *B. aenea* subsp. *pseudoaenia* Petrovsky; *B. angustifolia* (N. Busch) Vassilczenko; *B. brachycarpa* Vassilczenko; *B. brevicaulis* Em. Schmid; *B. limosella* Bunge; *B. limoselloides* Bunge ex Ledebour; *B. rosea* var. *aenea* (Bunge) Malyshev; *B. rosea* var. *brachycarpa* (Vassilczenko) Malyshev; *B. rosea* var. *glabra* Regel & Schmalhaus; *B. rosea* var. *leiocarpa* O. E. Schulz; *B. rosea* var. *multicaulis* B. Fedtschenko; *B. rosea* var. *simplicior* B. Fedtschenko; *B. sinuata* Maximowicz; *Braya thomsonii* J. D. Hooker; *B. tibetica* J. D. Hooker & Thomson; *B. tibetica* f. *breviscapa* Pampanini; *B. tibetica* f. *linearifolia* Z. X. An; *B. tibetica* f. *sinuata* (Maximowicz) O. E. Schulz; *B. tinkleri* Em. Schmid; *Hesperis limosella* (Bunge) Kuntze; *H. limoselloides* (Bunge ex Ledebour) Kuntze; *H. rosea* (Turczaninow) Kuntze; *Sisymbrium alpinum* (Sternberg & Hoppe) Fournier var. *aeneum* (Bunge) Trautvetter; *S. alpinum* var. *roseum* (Turczaninow) Trautvetter; *S. limosella* (Bunge) Fournier.

Herbs (1–)3–10(–16) cm tall, scapose, densely to sparsely pilose with short-stalked, forked trichomes

97. THELLUNGIELLA O. E. Schulz in Engler, Pflanzenr. 86(IV. 105): 251. 1924.

盐芥属 yan jie shu

Herbs annual, often glaucous above. Trichomes absent. Stems erect or ascending, sometimes prostrate. Basal leaves petiolate, somewhat fleshy, rosulate or not, often withered by flowering, simple, entire or rarely toothed or pinnatifid. Cauline leaves shortly petiolate or sessile, attenuate and not auriculate, auriculate, sagittate, or amplexicaul at base, entire or rarely obscurely dentate. Racemes few to several flowered, ebracteate. Fruiting pedicels ascending or divaricate. Sepals ovate or oblong, erect, base of lateral pair not saccate. Petals white, longer or shorter than sepals, rarely absent; blade obovate or oblanceolate, apex obtuse; claw obscurely differentiated from blade. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers ovate or oblong, apex obtuse or apiculate. Median glands absent; lateral glands 1 on each side of lateral stamen. Ovules 15–90 per ovary. Fruit dehiscent siliques, linear, terete or slightly latiseptate, sessile or rarely shortly stipitate; valves with a distinct midvein, glabrous, torulose; replum rounded; septum complete; style obsolete or rarely to 0.6 mm; stigma capitate, entire. Seeds uniseriate or biseriate, wingless, oblong or broadly ovate, plump or slightly flattened; seed coat minutely reticulate, mucilaginous or not when wetted; cotyledons incumbent.

Three species: saline habitats from SW to E Asia, one species disjunct in North America; three species in China.

1a. Cauline leaves linear to linear-oblanceolate or linear-oblong, shortly petiolate, not auriculate at base; infructescence rachis flexuous; petals absent or rarely as long as sepals; secondary veins of fruit valve

conspicuous 3. *T. parvula*

sometimes mixed with simple ones, rarely glabrous throughout except for petiole margin; caudex slender, sometimes with petiolar remains of previous years, simple or few branched. Basal leaves rosulate; petiole (0.2–)0.4–1.6(–3) cm, slender or slightly expanded at base, ciliate; leaf blade linear, oblong, oblanceolate, obovate, (0.4–)1–3(–4) cm × 0.5–3.5(–6) mm, densely to sparsely pilose or glabrous, base attenuate, margin entire, dentate, or sinuate, apex obtuse or acute. Scapes densely pilose or glabrous, leafless or rarely 1-leaved. Racemes ebracteate, capitate or rarely considerably elongated in fruit. Fruiting pedicels divaricate or ascending, 1.5–5(–7) mm. Sepals subapically purple or greenish, oblong, 1.5–2.5(–3) × 1–1.2 mm, glabrous or densely pubescent, broadly white margined. Petals purple, pink, or white, spatulate or obovate, (2.5–)3–4(–4.5) × (0.7–)1–1.5 mm, apex obtuse. Filaments 1.3–1.8 mm; anthers ovate, ca. 0.3 mm. Ovules 8–12 per ovary. Fruit ovoid or oblong, (2–)3–6.5(–8) × 1–2 mm, glabrous or densely pubescent; style 0.2–0.7(–1) mm. Seeds ca. 0.7–1 × 0.4–0.5 mm. Fl. Jun–Jul, fr. Jul–Sep.

Mountain slopes, river banks, scree, weathered marble rocks and debris, steppe, alpine cushions; 2500–5300 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Bhutan, India, Kashmir, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan].

Critical examination of numerous collections of *Braya aenea*, *B. rosea*, *B. thomsonii*, and *B. tibetica*, including types and authentic material, reveal that there is not a single character that can be used reliably to distinguish these “species.” These and the other synonyms above represent “taxa” that are based on a small portion of the numerous morphological extremes of *B. rosea*. The species shows continuous variation in amount of indumentum, leaf shape and margin, relative length of scape to basal rosette, duration of sepals, petal color and shape, and fruit shape and length. In the absence of detailed field work and experimental studies, the present authors prefer not to recognize any of the taxa described in this complex.

1b. Cauline leaves cordate, ovate, or oblong, sessile, auriculate or amplexicaul at base; infructescence rachis straight;

petals well-developed and much longer than sepals; secondary veins of fruit valve obscure.

2a. Seeds uniseriate, (0.5–)0.6–0.8 mm; ovules 15–26 per ovary; fruit 0.4–0.5 mm wide 1. *T. halophila*

2b. Seeds biseriate, 0.4–0.5 mm; ovules 55–90 per ovary; fruit (0.7–)0.8–1 mm wide 2. *T. salsuginea*

1. *Thellungiella halophila* (C. A. Meyer) O. E. Schulz in Engler, Pflanzn. 86(IV. 105): 253. 1924.

小盐芥 xiao yan jie

Sisymbrium halophilum C. A. Meyer in Ledebour, Fl. Altaic. 3: 143. 1831; *Hesperis halophila* (C. A. Meyer) Kuntze; *Stenophragma halophilum* (C. A. Meyer) B. Fedtschenko.

Herbs (2–)6–22(–30) cm tall. Stems erect or ascending, simple or few branched at base. Basal leaves rosulate; petiole 1–6 mm; blade obovate, spatulate, or oblong, 3–10(–20) × 1–3 (–5) mm, margin dentate, pinnatifid, or entire, apex obtuse. Middle cauline leaves oblong or ovate, sessile, 3–12(–20) × 1–3(–5) mm, base auriculate or rarely deeply sagittate-amplexicaul, margin dentate or entire, apex acute or obtuse. Infructescence rachis straight. Fruiting pedicels slender, divaricate to divaricate-ascending, 2–7(–10) mm. Sepals oblong, 1–1.5 × 0.5–0.6 mm. Petals white, obovate, 2–3 × 1–1.2 mm. Filaments 1–1.5 mm; anthers oblong, 0.2–0.4 mm, apiculate. Ovules 15–26 per ovary. Fruit (0.5–)0.7–1.5(–2) cm × 0.4–0.5 mm, slightly torulose, sessile; valves obscurely veined; style 0.1–0.5 mm. Seeds brown, oblong, uniseriate, (0.5–)0.6–0.8 × 0.3–0.4 mm. Fl. and fr. May–Aug.

Saline areas. Xinjiang [Kazakhstan, Russia (Siberia)].

Records in FRPS of *Thellungiella halophila* from Hebei, Henan, Jiangxi, Nei Mongol, and Shandong were based on misidentified plants of *T. salsuginea*. The differences in stem branching, margin of basal leaves, and fruit length given in FRPS and other floras are unreliable, and only the characters in the key above consistently separate the two species.

2. *Thellungiella salsuginea* (Pallas) O. E. Schulz in Engler, Pflanzn. 86(IV. 105): 252. 1924.

盐芥 yan jie

Sisymbrium salsugineum Pallas, Reise Russ. Reich. 2: 466. 1773; *Arabidopsis salsuginea* (Pallas) N. Busch; *Hesperis salsuginea* (Pallas) Kuntze; *Stenophragma salsugineum* (Pallas) Prantl.

Herbs (6–)10–30(–40) cm tall. Stems erect or ascending, simple or several branched at base. Basal leaves rosulate or not; petiole 5–10 mm; blade obovate, spatulate, or oblong, 0.5–1.5(–2.5) cm × 2–5 mm, margin entire or rarely dentate or pinnatifid, apex obtuse. Middle cauline leaves cordate, ovate, or oblong,

sessile, 0.4–1.7(–2.5) cm × 1–7(–10) mm, base deeply sagittate-amplexicaul, rarely auriculate, margin entire or repand, apex acute or obtuse. Infructescence axis straight. Fruiting pedicels slender, divaricate to divaricate-ascending, 3–10 mm. Sepals oblong, 1–1.5 × 0.5–0.6 mm. Petals white, obovate, 2–3 × 1–1.7 mm. Filaments 1–1.5 mm; anthers oblong, 0.2–0.4 mm, apiculate. Ovules 55–96 per ovary. Fruit 0.7–1.6(–2) cm × (0.7–)0.8–1 mm, distinctly torulose, sessile; valves obscurely veined; style 0.1–0.3 mm. Seeds brown, oblong, biseriate, 0.4–0.5 × 0.2–0.3 mm. Fl. and fr. Apr–Jul.

Saline flats, river banks, steppe. Hebei, Henan, Jiangsu, Jilin, Nei Mongol, Shandong, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan; North America].

3. *Thellungiella parvula* (Schrenk) Al-Shehbaz & O’Kane, Novon 5: 309. 1995.

条叶盐芥 tiao ye yan jie

Diplotaxis parvula Schrenk in Fischer & C. A. Meyer, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 2: 199. 1844; *Arabidopsis parvula* (Schrenk) O. E. Schulz; *Sisymbrium parvulum* (Schrenk) Lipsky; *Stenophragma parvulum* (Schrenk) B. Fedtschenko.

Herbs (4–)7–25(–30) cm tall. Stems erect or ascending, simple or few branched at base. Basal leaves not rosulate, withered by flowering time. Middle cauline leaves shortly petiolate, linear to linear-oblongate or linear-oblong, (0.4–)1.5–3(–4) cm × 0.5–2 mm, base attenuate and not auriculate, margin entire or rarely 1- or 2-toothed on each side, apex rounded or obtuse. Infructescence axis flexuous. Fruiting pedicels slender, glabrous, divaricate to divaricate-ascending, 1–7 mm. Sepals oblong, 1–1.5 × 0.5–0.6 mm, glabrous. Petals absent, rarely present and white, oblanceolate and to 1.5 mm. Filaments 1.5–2 mm; anthers ovate, 0.1–0.2 mm, apex obtuse. Ovules 25–50 per ovary. Fruit (0.5–)0.7–1.5(–2) cm × 1.1–1.4 mm, torulose, sub-sessile or on a gynophore to 0.3 mm; valves prominently veined; style 0.2–0.6 mm. Seeds brown, ovate, 0.5–0.8 × 0.4–0.6 mm. Fl. and fr. May–Jun. *2n* = 14.

Saline steppe. Xinjiang [Kazakhstan, Russia, Turkmenistan, Uzbekistan; SW Asia].

98. CAMELINA Crantz, Stirp. Austr. Fasc. 1: 17. 1762.

亚麻芥属 ya ma qi shu

Herbs annual or biennial. Trichomes simple, mixed with short-stalked, forked smaller ones. Stems simple basally, branched above, base often hirsute with simple trichomes. Basal leaves petiolate or subsessile, not rosulate, simple, entire or toothed, rarely lobed, withered by flowering. Cauline leaves sessile, auriculate or sagittate at base, entire or

dentate. Racemes ebracteate, elongated considerably in fruit. Fruiting pedicels slender, divaricate. Sepals oblong or ovate, erect, base of lateral pair not saccate. Petals yellow or rarely white, spatulate, longer than sepals, apex obtuse. Stamens 6, in 3 pairs of unequal length; filaments not dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands 4, 1 on each side of lateral stamen; median glands absent. Ovules 8–25 per ovary. Fruit dehiscent silicles or rarely siliques, obpyriform, obovoid, or rarely linear, shortly stipitate; valves leathery, often with a prominent midvein, smooth, margins of 2 valves flattened and connate, apex abruptly caudate and extending 1–2 mm into style; replum rounded, concealed by connate margins of valves; septum complete; style 1.5–4 mm; stigma capitate, entire. Seeds biseriolate or rarely uniseriate, wingless or narrowly margined, oblong, plump or slightly flattened; seed coat minutely reticulate, copiously mucilaginous when wetted; cotyledons incumbent or rarely accumbent.

Six or seven species: SW Asia and S Europe; two species in China.

1a. Stems and leaves glabrous, glabrescent, or mainly with minute branched trichomes; fruit 7–9(–10) mm; seeds

(1.5–)1.7–3 mm 2. *C. sativa*

1b. Stems (at least basally) and leaves with predominantly simple trichomes to 2.5 mm, these mixed with much

smaller branched ones; fruit (2.5–)3.5–5(–6) mm; seeds 0.8–1.4(–1.5) mm 2. *C. microcarpa*

1. *Camelina sativa* (Linnaeus) Crantz, Stirp. Austr. Fasc. 1: 17. 1762.

亚麻荠 ya ma qi

Myagrum sativum Linnaeus, Sp. Pl. 2: 641. 1753;

Camelina caucasica (Sinskaya) Vassilczenko; *C.*

glabrata (de Candolle) Fritsch ex N. Zinger; *C. pilosa*

(de Candolle) N. Zinger; *C. sativa* var. *caucasica*

Sinskaya; *C. sativa* var. *glabrata* de Candolle; *C. sativa* var. *pilosa* de Candolle.

Herbs annual, (12–)30–80(–100) cm tall, glabrous or sparsely pubescent with small branched trichomes rarely mixed with fewer simple ones. Stems simple or branched above, often glabrescent. Cauline leaves lanceolate, narrowly oblong, or linear-lanceolate, middle ones (1–)2–7(–9) cm × 2–10(–15) mm, glabrescent or sparsely pubescent with primarily forked trichomes, base sagittate or strongly auriculate, margin entire or rarely remotely denticulate, apex acute. Fruiting pedicels (0.8–) 1.2–2(–2.7) cm. Sepals 2–3 × 0.5–1 mm. Petals yellow, (3–)4–5.5 × 0.5–1 mm. Filaments 1.5–3 mm; anthers ca. 0.5 mm. Fruit obpyriform or broadly obovoid, 7–9(–10) × 4–5 mm, often subtruncate at apex; valves with a distinct midvein and less prominent lateral veins; style 1–2.5 mm. Seeds dark brown, oblong (1.5–)1.7–2.5(–3) × 0.7–1 mm. Fl. May–Jun. $2n = 40^*$.

Farms, grassy areas, fields; 1000–1900 m. Nei Mongol, Xinjiang [India, Kazakstan, Korea, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan; SW Asia, N Africa, Europe; introduced in North America].

2. *Camelina microcarpa* de Candolle, Syst. Nat. 2: 517. 1821.

99. DESCURAINIA Webb & Berthelot, Hist. Nat. Iles Canaries 3(2, 1): 72. 1836, nom. cons.

播娘蒿属 bo niang hao shu

Hugueninia Reichenbach, nom. rej.; *Sophia* Adanson, nom. rej.

Herbs annual or perennial, rarely shrubs. Trichomes short-stalked, dendritic, very rarely simple, sometimes mixed with glandular, clavate papillae. Stems erect or prostrate, simple or branched basally and/or apically. Basal leaves petiolate, withered by flowering, 2- or 3-pinnatisect, rarely 1-pinnate. Cauline leaves similar to basal. Racemes

小果亚麻荠 xiao guo ya ma qi

Camelina longistyla Bordzil; *C. microphylla* Z. X. An; *C. sativa* (Linnaeus) Crantz subsp. *microcarpa* (de Candolle) Hegi & E. Schmid; *C. sylvestris* Wallroth.

Herbs annual, (8–)20–60(–80) cm tall, densely to moderately hirsute with simple trichomes to 2.5 mm, these mixed with branched fewer ones. Stems simple or branched above, densely hirsute basally, glabrescent above. Cauline leaves lanceolate, narrowly oblong, or linear-lanceolate, middle ones (0.8–)1.5–5.5(–7) cm × 1–10(–20) mm, pubescent primarily with simple trichomes, often subciliate, base sagittate or minutely auriculate, margin entire or rarely remotely denticulate, apex acute. Fruiting pedicels 4–14(–17) mm. Sepals 2–2.5 × 0.5–1 mm. Petals pale yellow, 3–4 × 0.5–1 mm. Filaments 1.5–3 mm; anthers ca. 0.5 mm. Fruit obpyriform to narrowly so, (2.5–)3.5–5(–6) × 2–4(–5) mm, acute at apex; valves with a distinct midvein and less prominent lateral veins; style 1–3.5 mm. Seeds reddish brown or brown, oblong, 0.8–1.4(–1.5) × 0.5–0.6 mm. Fl. Apr–Jun, fr. May–Aug. $2n = 40$.

Farms, fields, roadsides, forest margins, mountain slopes; 700–1600 m. Gansu, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Shandong, Xinjiang [Kazakstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; introduced in North America].

Camelina microphylla is based on grazed and deformed plants of *C. microcarpa*. Plants with similarly deformed morphology have been observed in collections from Europe and North America.

ebracteate or rarely basally bracteate, elongated or not in fruit. Fruiting pedicels slender, divaricate or erect. Sepals oblong or linear, erect or ascending, base of lateral pair not saccate. Petals yellow or rarely creamy white, as long as or longer than sepals; blade obovate or oblanceolate, rarely oblong, apex obtuse; claw obsolete or distinct. Stamens 6, tetradynamous; filaments not dilated at base; anthers oblong, obtuse at apex. Nectar glands confluent, subtending bases of all stamens; median glands present. Ovules 5–100 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, clavate, or rarely elliptic, terete, sessile; valves with a prominent midvein, smooth or torulose; replum rounded; septum complete or perforated, membranous, veinless or with 1–3 longitudinal veins; style absent or rarely distinct and to 1 mm; stigma capitate, entire. Seeds uniseriate or biseriate, wingless, oblong or ellipsoid, plump; seed coat minutely reticulate, usually mucilaginous when wetted; cotyledons incumbent.

About 40 species: mainly in North and South America (30 species) and Macaronesia (seven species), one species a cosmopolitan weed.

The record of *Descurainia sopheroides* (Fischer) O. E. Schulz in FRPS and Fl. Xizang. (2: 410. 1985) is based on misidentified plants of *D. sophia*. The former species is restricted to Alaska, Canada, and Russia (Far East and Siberia). It is readily distinguished from *D. sophia* by having clavate glands on the distal parts of the plant and generally shorter fruiting pedicels 2–7(–10) mm. By contrast, *D. sophia* is completely eglandular and has fruiting pedicels (5–)8–15(–20) mm.

1. *Descurainia sophia* (Linnaeus) Webb ex Prantl in Engler & Prantl, Nat. Pflanzenfam. 3(2): 192. 1891.

播娘蒿 bo niang hao

Sisymbrium sophia Linnaeus, Sp. Pl. 2: 659. 1753.

Herbs annual, (10–)20–70(–100) cm tall, eglandular, sparsely to densely pubescent with dendritic trichomes, sometimes glabrous distally. Stems erect, simple basally, often branched above. Basal and lowermost cauline leaves 2- or 3-pinnatisect, ovate or oblong in outline, to 15 × 8 cm; petiole 0.1–2(–3) cm; leaf blade ultimate division linear or oblong, entire, acute to 10 × 2 mm. Upper cauline leaves sessile or shortly petiolate, smaller and often with narrower ultimate lobes, often glabrous. Fruiting pedicels (0.5–)0.8–1.5(–2) cm, slender, much narrower than fruit, straight, divaricate or ascending. Sepals yellowish, oblong-linear, 2–2.5 × 0.5 mm. Petals yellow, narrowly oblanceolate, 2–2.5 ×

ca. 0.5 mm; claw 1.5–2 mm. Filaments 2–3 mm; anthers ca. 0.5 mm. Ovules 20–40 per ovary. Fruit narrowly linear, (1.2–)1.5–2.7(–3) cm × 0.5–0.8(–1) mm; valves glabrous, torulose, with a prominent midvein; septum with a broad central longitudinal band appearing as 2 or 3 veins; style obsolete or to 0.2 mm. Seeds reddish brown, oblong, 0.7–1 × 0.3–0.6 mm. Fl. and Fr. Apr–Jun. $2n = 28^*$.

Roadsides, waste places, disturbed sites, fields, pastures, deserts; near sea level to 4200 m. Throughout China except Guangdong, Guangxi, Hainan, Taiwan [Afghanistan, Bhutan, Japan, Kashmir, Kazakstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Sikkim, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced elsewhere].

The seeds are sometimes used as a substitute for mustard. Preparations from the plant are taken internally to eradicate worms, and externally to treat indolent ulcers.

100. SOPHIOPSIS O. E. Schulz in Engler, Pflanzenr. 86(IV. 105): 346. 1924.

羽裂叶芥属 yu lie ye qi shu

Herbs annual or biennial. Trichomes finely dendritic, rarely also simple and stalked forked at stem base. Stems erect or ascending, sometimes prostrate, terete. Basal leaves petiolate, not rosulate, simple, 2-pinnatisect. Cauline leaves petiolate or uppermost sessile, 1- or 2-pinnatisect, rarely pinnatifid. Racemes ebracteate, bracteate throughout, or only basally bracteate. Fruiting pedicels erect, ascending, or divaricate. Sepals oblong or ovate-oblong, ascending, base of lateral pair not saccate. Petals yellow, shorter or much longer than sepals; blade obovate or spatulate, apex rounded; claw slightly to strongly differentiated from blade, shorter than to as long as sepals. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens; median glands present; lateral glands semiannular. Ovules 4–16 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, obovoid, or ellipsoid, terete or slightly 4-angled, sessile or shortly stipitate; valves with an obscure to prominent midvein, glabrous, smooth or subtorulose; replum rounded; septum complete or basally perforated, membranous; style obsolete or short and less than 1 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat minutely reticulate, mucilaginous when wetted; cotyledons incumbent.

Four species: C Asia; two species in China.

1a. Fruiting pedicels erect or ascending, often subappressed to rachis, densely pubescent; racemes bracteate at least basally; stems prostrate or rarely ascending; uppermost leaves 1-pinnatisect or pinnatifid; fruit terete; ovules

10–16 per ovary 1. *S. annua*

1b. Fruiting pedicels divaricate, not appressed to rachis, glabrous or glabrescent; racemes ebracteate; stems erect

or rarely ascending; uppermost leaves 2-pinnatisect; fruit slightly 4-angled; ovules 4–8 per ovary 2. *S. sisymbrioides*

1. *Sophiopsis annua* (Ruprecht) O. E. Schulz in Engler, Pflanz. 86(IV. 105): 347. 1924.

中亚羽裂叶芥 zhong ya yu lie ye qi

Smelowskia annua Ruprecht, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 14: 4. 1869; *Hutchinsia annua* (Ruprecht) Krassnov; *Sophiopsis annua* var. *fontinalis* O. E. Schulz.

Plants biennial, (4–)10–30(–40) cm tall, uniformly pubescent throughout with minute dendritic trichomes. Stems few to many from base, prostrate or rarely ascending. Basal leaves 2-pinnatisect, with 2–4 lateral lobes; petiole 1–3(–4) cm; leaf blade oblong or ovate in outline, 1–3(–5) cm × 5–10(–15) mm; ultimate segments oblong or obovate, 1–7 × 0.5–2 mm, margin entire, apex obtuse or rounded. Upper cauline leaves 1-pinnatisect or pinnatifid, subsessile, smaller than basal leaves. Racemes bracteate throughout or basally. Fruiting pedicels 3–7 mm, slender, erect or ascending, often subappressed to rachis, densely pubescent. Sepals 1.5–2 × 0.7–0.8 mm, sparsely pubescent. Petals yellow or pale yellow, obovate, 2.5–3.5 × 1–1.5 mm, apex rounded, base attenuate to a clawlike base 0.5–1 mm. Filaments 1–1.5 mm; anthers ovate, 0.4–0.5 mm. Ovules 10–16 per ovary. Fruit ellipsoid to linear-ellipsoid, 5–10 × 1–1.8 mm, terete; valves with an obscure midvein, apex acute; style slender, 0.1–0.2 mm; septum complete or basally perforated. Seeds brown, oblong, 1.3–2 × 0.6–1 mm. Fl. Jun–Aug, fr. Jul–Sep.

Gravelly slopes, alpine meadows; 2500–5100 m. Xinjiang, Xizang [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan].

The above first record from Xizang is based on *Anonymous 13568* (PE). Although *Sophiopsis annua* was recorded from Xinjiang in FRPS, the species was not included in Fl. Xinjiang. (vol. 2(2). 1995).

There are several collections of the species from Xinjiang, including *Qinghai-Xizang Team 870473* (HNWP, PE).

2. *Sophiopsis sisymbrioides* (Regel & Herder) O. E. Schulz in Engler, Pflanz. 86(IV. 105): 346. 1924.

羽裂叶芥 yu lie ye qi

Hutchinsia sisymbrioides Regel & Herder, Bull. Soc. Imp. Naturalistes Moscou 39(2): 99. 1866; *Smelowskia alba* B. Fedtschenko (1904), not (Pallas) Regel (1861); *S. sisymbrioides* (Regel & Herder) Lipsky ex Paulsen.

Plants biennial, (7–)12–45(–55) cm tall, uniformly pubescent throughout with minute dendritic trichomes. Stems simple or branched at base, erect or ascending. Basal leaves 2-pinnatisect, with 3 or 4 lateral lobes; petiole 1–3.5(–5) cm; leaf blade oblong or ovate in outline, 2–6(–8) × 0.7–2.5(–3) cm; ultimate segments oblong or obovate, 1–5(–10) × 0.5–2(–5) mm, margin entire, apex obtuse or rounded. Middle and upper cauline leaves 2-pinnatisect, petiolate, smaller than basal leaves, with 1 or 2 lateral lobes. Racemes ebracteate. Fruiting pedicels (4–)6–11(–13) mm, slender, divaricate, glabrous or glabrescent. Sepals 1.5–2(–2.5) × 0.7–0.8 mm, sparsely pubescent. Petals pale yellow, obovate, 2.5–4 × 1–1.5(–1.8) mm, attenuate to a clawlike base 0.5–1 mm, apex rounded. Filaments 1.2–2 mm; anthers ovate, ca. 0.3 mm. Ovules 4–8 per ovary. Fruit obovoid or ellipsoid or narrowly obovoid-ellipsoid, (2.5–)3.5–7 × 1–1.5 mm, slightly 2-angled; valves with a prominent midvein, apex obtuse; style slender, 0.2–0.5 mm; septum complete or basally perforated. Seeds brown, oblong, 1.2–1.5 × 0.6–0.8 mm. Fl. May–Aug, fr. Jun–Sep.

Slopes, crevices, forests; 1100–3600 m. Xinjiang [Kazakhstan, Tajikistan, Uzbekistan].

101. SMELOWSKIA C. A. Meyer in Ledebour, Icon. Pl. 2: 17. 1830.

芹叶芥属 qin ye qi shu

Chrysanthemopsis K. H. Rechinger.

Herbs perennial, often pulvinate, with well-developed caudex covered with petioles of previous years. Trichomes dendritic, sometimes mixed with simple and forked stalked ones. Stems erect or ascending, several from caudex, simple or branched apically. Basal leaves petiolate, rosulate, simple, 1- or rarely 2-pinnatisect, sometimes entire, densely pubescent. Cauline leaves shortly petiolate or sessile, not auriculate, entire or pinnatisect. Racemes ebracteate or basally bracteate, elongated in fruit. Fruiting pedicels suberect, ascending, or divaricate. Sepals ovate or oblong, ascending or spreading, base of lateral pair not saccate. Petals white, creamy white, or purplish, longer than sepals; blade suborbicular, obovate, or spatulate, apex rounded; claw subequaling or longer than sepals. Stamens 6, tetradynamous; filaments dilated at base; anthers ovate or oblong, obtuse at apex. Nectar glands confluent and subtending bases of all stamens. Ovules 6–30 per ovary. Fruit dehiscent siliques or silicles, linear, oblong, ovoid, obovoid, ellipsoid, or lanceolate, terete or slightly 4-angled, sometimes angustiseptate; valves with a prominent midvein, smooth; replum rounded; septum complete or perforated; style absent or short and to 1.5 mm; stigma capitate, entire. Seeds uniseriate, wingless, oblong, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

Seven species: three in C and E Asia, three in North America, and one in both areas; two species in China.

Smelowskia bifurcata (Ledebour) Botschantzev was recorded from Xinjiang in FRPS, but the present authors have seen no material to confirm that record.

1a. Fruit linear to linear-ellipsoid; seeds (or ovules) (12–)14–22 per fruit; fruiting pedicels divaricate; inflorescence often branched 1. *S. alba*

1b. Fruit ovoid, pyriform, ellipsoid, oblong, or rarely linear-ellipsoid; seeds (or ovules) 4–10(–12) per fruit; fruiting pedicels suberect, ascending, or rarely divaricate; inflorescence often simple 2. *S. calycina*

1. *Smelowskia alba* (Pallas) Regel, Bull. Soc. Imp. Naturalistes Moscou 34: 208. 1861.

灰白芹叶芥 hui bai qin ye qi

Sisymbrium album Pallas, Reise Russ. Reich. 3: 739. 1776; *Hutchinsia alba* (Pallas) Bunge; *Nasturtium album* (Pallas) Sprengel; *Smelowskia cinerea* C. A. Meyer.

Herbs (5–)15–40(–60) cm tall, canescent basally. Stems branched above, densely pubescent basally with simple trichomes to 2 mm and much smaller dendritic ones, often glabrescent above. Basal leaves with petioles (0.5–)1.5–4 cm, ciliate with simple trichomes; leaf blade 1- or 2-pinnatesect, oblong or ovate in outline, 1.5–6 × 0.7–3 cm; ultimate segments linear-oblong, oblong, or rarely ovate, 1.5–15 × 0.5–3 mm, apex obtuse or subacute. Middle and upper cauline leaves sessile or subsessile, smaller and less divided than basal ones. Inflorescence often branched. Fruiting pedicels divaricate, slender, (5–) 7–11(–15) mm, sparsely pubescent with crisped simple trichomes. Sepals ovate, 2–3 × 1–1.5 mm, caducous. Petals white, suborbicular, 3.5–5(–6.5) × 2–3(–5) mm, rounded at apex, abruptly narrowed to claw 1–1.5(–2) mm. Filaments 1.5–3 mm; anthers oblong, 0.7–0.8 mm. Ovules (12–)14–22 per ovary. Fruit linear to linear-ellipsoid, (5–)8–11(–15) × 1–2 mm, narrowly cuneate at both ends; valves with a prominent midvein; gynophore obsolete or to 0.5 mm; septum perforate, with a short midvein distally; style 0.5–1(–1.3) mm. Seeds reddish brown, oblong, 1–1.5 × 0.5–0.7 mm. Fl. Jun–Jul, fr. Jul–Aug.

Rocky crevices. Heilongjiang [Mongolia, Russia (Far East, Siberia)]. The above first record from Heilongjiang is based on *Sato 5672* (PE). Records of *Smelowskia alba* from Xinjiang in FRPS and Fl. Xinjiang. (2(2): 228. 1995) are likely based on misidentified plants of *S. calycina*. The present authors were unable to find collections of the former species from Xinjiang.

2. *Smelowskia calycina* (Stephan) C. A. Meyer in Ledebour, Fl. Altaic. 3: 170. 1831.

芹叶芥 qin ye qi

Lepidium calycinum Stephan in Willdenow, Sp. Pl. 3: 433. 1800; *Chrysanthemopsis koelzii* K. H. Rechinger; *Hutchinsia calycina* (Stephan) Desvaux; *H. calycina*

(Stephan) Desvaux var. *pectinata* (Bunge) Regel & Herder; *H. pectinata* Bunge; *Smelowskia calycina* var. *pectinata* (Bunge) B. Fedtschenko; *S. koelzii* (K. H. Rechinger) K. H. Rechinger; *S. pectinata* (Bunge) Velichkin; *S. tianschanica* Velichkin.

Herbs (3.5–)7–30(–40) cm tall, canescent basally or throughout. Stems often simple above, densely pubescent with simple trichomes to 2 mm and/or much smaller dendritic ones, sometimes glabrescent. Basal leaves with petioles (0.5–)1–5 (–7) cm, ciliate with simple trichomes or not ciliate; leaf blade 1- or 2-pinnatisect, oblong, lanceolate, or ovate in outline, 1.5–8 × 0.4–1.5 cm; ultimate segments linear, oblong, or ovate, to 15 × 3 mm, apex obtuse or subacute. Middle and upper cauline leaves sessile or subsessile, smaller and less divided than basal ones, sometimes pectinate. Inflorescence often simple. Fruiting pedicels suberect or ascending, rarely divaricate, slender, 5–10(–14) mm, pubescent with dendritic and/or simple straight trichomes. Sepals ovate, 2.5–4 × 1.5–2 mm, caducous or persistent. Petals white or pale yellow, suborbicular or obovate, (3.5–)5–7 × 2–4 mm, rounded at apex, narrowed to claw 1–2.5 mm. Filaments 1.5–3.5 mm; anthers oblong, 0.5–0.8 mm. Ovules 4–10(–12) per ovary. Fruit ellipsoid or oblong, rarely ovoid or linear-ellipsoid, (3–)5–9(–10) × 1.5–2.5 mm, cuneate at least at apex; valves with a prominent midvein; gynophore obsolete or to 0.5 mm; septum perforated or complete, with a midvein distally; style 0.5–1(–1.5) mm. Seeds brown, oblong or subovate, 1.1–1.8 × 0.8–1.1 mm. Fl. Jun–Aug, fr. Jul–Sep.

Rocky slopes, gravelly hills, rocky crevices, alpine meadows; 2500–4900 m. Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia (Far East, Siberia), Tajikistan; North America].

Smelowskia calycina is highly variable and has been divided in both Asian and North American accounts into several, poorly defined species or varieties. In the absence of authoritative studies on the species throughout its range, it is better not to recognize any infraspecific taxa. The Chinese plants are a good match for the type collection of the species. Synonyms pertaining only to C Asia are listed above.

102. SINOSOPHIOPSIS Al-Shehbaz, Novon 10: 340. 2000.

华羽芥属 hua yu jie shu

Herbs annual. Trichomes a mixture of simple and short-stalked, forked. Stems erect, simple or branched at base and above middle, angled, longitudinally striate. Basal leaves withered by anthesis. Cauline leaves petiolate, not auriculate at base, pinnatisect. Racemes many flowered, ebracteate or proximal half bracteate, elongated considerably in fruit. Fruiting pedicels slender, ascending, divaricate, or reflexed. Sepals oblong, caducous, ascending, base of lateral pair not saccate, margin and apex membranous. Petals white, longer than sepals; blade spatulate, apex obtuse; claw distinct, shorter than sepals. Stamens 6, tetradynamous; filaments wingless, not dilated at base; anthers ovate, obtuse at apex. Nectar glands confluent, subtending bases of all stamens; median glands present. Ovules (20–)26–40 per ovary. Fruit dehiscent siliques, linear, terete, not inflated; valves papery, with an

obscure midvein, glabrous or sparsely puberulent, strongly torulose; replum rounded; septum complete, membranous, translucent, veinless; style distinct, less than 1 mm, slender, cylindric, glabrous; stigma capitate, entire, unappendaged. Seeds uniseriate, wingless or apically winged, oblong, plump; seed coat coarsely reticulate, mucilaginous when wetted; cotyledons incumbent.

• Two species.

1a. Racemes bracteate at least along proximal half; fruiting pedicels 1–3(–4) mm; seeds wingless; petals

2–2.5 × 0.7–1 mm 1. *S. bartholomewii*

1b. Racemes ebracteate; fruiting pedicels (5–)7–15 mm; seeds apically winged; petals 4–5 × 1.5–2 mm 2. *S. heishuiensis*

1. *Sinosophiopsis bartholomewii* Al-Shehbaz, Novon 10: 341. 2000.

华羽芥 *hua yu jie*

Herbs annual, 13–55 cm tall, sparsely pilose with a mixture of simple and short-stalked, 1-forked trichomes to 1 mm. Stems erect, simple or branched along lower half, longitudinally striate, pilose or glabrescent distally. Basal leaves withered by anthesis. Middle cauline leaves pinnatisect, 1.5–5.5 × 0.5–2.5 cm; petiole 4–13 mm, not auriculate at base; terminal lobe lanceolate or oblong, 0.7–2 cm × 3–7 mm, base decurrent with distal pair of lateral lobes, margin dentate, apex acute or sub-acuminate; lateral lobes 3–5 on each side of midvein, similar to terminal lobe but smaller. Uppermost cauline leaves with axillary flowers, undivided, much smaller than middle leaves, margin entire or denticulate.

Racemes bracteate at least along proximal half. Fruiting pedicels ascending or divaricate, 1–3(–4) mm, straight, slender, glabrous or sparsely pilose. Sepals oblong, 1–1.3 × 0.4–0.6 mm, glabrous or sparsely pilose, not saccate. Petals white, spatulate, 2–2.5 × 0.7–1 mm, base attenuate, apex obtuse; claw shorter than sepals.

Median filament pairs 1.5–1.8 mm, lateral pair 1.1–1.3 mm; anthers ovate, ca. 0.2 mm. Ovules (20–)26–36 per ovary. Fruit linear, 1.5–2.5 cm × 0.8–1 mm; valves glabrous or sparsely puberulent; style 0.1–0.3 mm. Seeds brown, oblong, 0.8–1.1 × 0.5–0.6 mm, plump, strongly reticulate, wingless. Fl. and fr. Aug–Sep.

• Slopes with *Picea likiangensis* forest, among shrubs and under trees, disturbed alpine meadows, slopes and riparian areas along river bottoms; 3400–4100 m. Qinghai, Xizang.

2. *Sinosophiopsis heishuiensis* (W. T. Wang) Al-Shehbaz, Novon 10: 341. 2000.

黑水华羽芥 *hei shui hua yu jie*

Cardamine heishuiensis W. T. Wang, Acta Bot. Yunnan. 9: 15. 1987.

Herbs annual, 15–45 cm tall, sparsely pilose with a mixture of simple and short-stalked, 1-forked trichomes to 1 mm. Stems erect, several branched along lower half, longitudinally striate, pilose. Basal leaves withered by flowering. Middle cauline leaves pinnatisect, 1.2–4.5 × 1–2.5 cm; petiole 3–15 mm, not auriculate at base; terminal lobe lanceolate, elliptic, or oblong, 0.3–2 cm × 2–12 mm, base decurrent with distal pair of lateral lobes or shortly petiolulate, margin dentate or subentire, apex acute or obtuse; lateral lobes 2–4 on each side of midvein, similar to terminal lobe but smaller.

Uppermost cauline leaves much smaller and less divided than middle leaves. Racemes ebracteate. Fruiting pedicels divaricate or reflexed, (0.5–)0.7–1.5 cm, straight, slender, glabrous or sparsely pilose. Sepals oblong, 1.5–2.3 × 0.8–1 mm, glabrous or sparsely pilose, not saccate. Petals white, spatulate, 4–5 × 1.5–2 mm, base attenuate, apex obtuse; claw shorter than sepals. Median filament pairs 2–3 mm, dilated; lateral pair 1–1.5 mm; anthers ovate, 0.4–0.5 mm. Ovules 24–40 per ovary. Fruit linear, 1.5–3 cm × 0.7–1 mm; valves glabrous; style 0.4–1 mm. Seeds brown, oblong, 1.2–1.4 × 0.6–0.8 mm, plump, strongly reticulate, apically winged. Fl. and fr. Jun–Aug.

• Rock crevices; 2100–2500 m. Sichuan.

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