

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.

野甘藍 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. *gemmafera*
 - 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.

甘藍 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. *gemmafera* (de Candolle) Zenker, Fl. Thüringen 15: 2. 1836.

抱子甘藍 bao zi gan lan

Brassica oleracea var. *bullata* de Candolle subvar. *gemmafera* de Candolle, Syst. Nat. 2: 585. 1821; *B.*

gemmafera (de Candolle) H. Léveillé; *B. oleracea* subsp. *gemmafera* (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.

羽衣甘蓝 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.

白花甘蓝 bai hua gan lan

Brassica alboglabra 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 re-

cognition 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. pekinensis* var. *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, cylindric. 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 Röhling, *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 sessile, 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. *multisepta* 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* (Pailieux & Bois) L. H. Bailey var. *multisepta* (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* (Pailieux & 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* Pailieux & Bois, Potager d'un Curieux 2: 372. 1892; *Brassica juncea* subsp. *napiformis* (Pailieux & Bois) Gladis; *B. juncea* var. *megarrhiza* M. Tsen & S. H. Lee; *B. napiformis* (Pailieux & 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 sessile, 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.

