

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 submarginate; 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, Kazakhstan, 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.

三肋菘蓝 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, Kazakhstan, 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.

小果菘蓝 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].

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