

MOLLUGINACEAE

粟米草科 su mi cao ke

Lu Dequan (鲁德全)¹; Heidrun E. K. Hartmann²

Herbs annual or perennial, subshrubs, or shrubs, rarely dioecious, glabrous or rarely hairy. Stems erect or prostrate. Leaves simple, alternate, rarely opposite, often in a basal rosette or in pseudowhorls on stems, margin entire; stipules absent or membranous. Inflorescences terminal or in seemingly axillary cymes, rarely as a solitary flower. Flowers bisexual, rarely unisexual, actinomorphic, hypogynous, rarely perigynous. Tepals 5, rarely 4, free or connate below into a tube, lobes white or pink to purple, sometimes yellow inside (in *Glinus*). Petals absent or few to many, white, pink, or purple. Stamens 3–5 or many, arranged in several rings, free or connate at base in bundles; anthers dehiscing by longitudinal slits. Ovary superior, syncarpous (in *Gisekia* developmentally syncarpous; fruit a deeply lobed schizocarp); carpels 2–5 or many, placentation axile, rarely seemingly basal. Stigmas as many as locules. Ovules 1 to many per locule. Fruit usually a loculicidal capsule or deeply (3–)5–15-lobed mericarps (in *Gisekia*), rarely breaking into 2 nutlets [in *Limeum* Linnaeus, not in Flora area]. Seeds with embryo curved around a hard, starchy perisperm.

About 14 genera and 120 species: arid, tropical and subtropical regions of both hemispheres; three genera and eight species in China.

Lu Dequan. 1996. Aizoaceae (*Gisekia*–*Mollugo*). In: Tang Changlin, ed., Fl. Reipubl. Popularis Sin. 26: 20–30.

The relationships of the anomalous genus *Gisekia* are uncertain. In the past, *Gisekia* has been included in Aizoaceae, often together with Molluginaceae. Recent treatments offer either a placement in Phytolaccaceae (e.g., Rohwer in Kubitzki, Fam. Gen. Fl. Pl. 2: 511, 514. 1993) or in a family of its own, Gisekiaceae (e.g., Gilbert, Kew Bull. 48: 343–356. 1993); one of us (Hartmann) favors either option. The mericarpic fruit separates the genus from Aizoaceae and Molluginaceae, from which it differs also by the presence of betalain and the absence of anthocyanin as pigments. No currently accepted plant family contains both anthocyanin and betalain producers.

- 1a. Carpels apparently free, fruit deeply (3–)5-lobed mericarps; seeds 1 per locule 1. *Gisekia*
- 1b. Carpels connate, fruit a loculicidal capsule; seeds many per locule.
 - 2a. Seeds with long filiform arils: strophioles; flowers mostly with staminodes 2. *Glinus*
 - 2b. Seeds without filiform strophioles; flowers without staminodes 3. *Mollugo*

1. GISEKIA Linnaeus, Mant. Pl. 2: 554. 1771.

吉粟草属 ji su cao shu

Herbs erect or prostrate, many branched, most parts usually streaked with white raphids. Leaves opposite or pseudovercillate, linear to narrowly lanceolate. Inflorescences terminal, sometimes apparently axillary, sessile or pedunculate, dichasial, dense and umbel-like or lax; bracts and bracteoles minute and scarious, sometimes obsolete. Flowers usually bisexual. Tepals 5, persistent, free, pale green to white, often flushed pink to red, rarely yellowish, herbaceous with membranous margin. Stamens 5–20, free; filaments flattened, lanceolate. Carpels (3–)5(–15), seemingly free but basally connate, each with one ovule. Fruit a cluster of reniform mericarps, usually tuberculate to ± spiny, often also smooth on same individual, or winged (not in Flora area). Seeds with curved embryo.

About seven species: five restricted to Africa, one widely distributed in tropical and subtropical Africa and Asia, one restricted to Asia; two species in China.

- 1a. Stamens 5; pedicel 3–5(–8) mm; white raphides easily seen in leaves; annual 1. *G. pharnaceoides*
- 1b. Stamens 12–15; pedicel 10–15 mm; white raphides not obvious in leaves; perennial 2. *G. pierrei*

1. *Gisekia pharnaceoides* Linnaeus, Mant. Pl. 2: 562. 1771.

吉粟草 ji su cao

Herbs annual, 20–50 cm, prostrate. All parts streaked with linear white raphides. Petiole poorly defined, 2–10 mm; leaf blade elliptic, lanceolate, or spatulate, 1–2.5 cm × 4–10 mm, both surfaces with many white raphides, base attenuate, apex obtuse or subacute. Inflorescences mostly sessile, apparently axillary, densely umbel-like. Flowers 5–20. Pedicel 3–5 mm. Tepals 5, green (to red), ovate, 1.5–2 mm, apex acute. Stamens 5, ca. 1 mm; filaments flattened and dilated at base. Carpels 5; styles short. Mericarp reniform, mostly spiny tuberculate,

sometimes also some smooth, surrounded by persistent tepals. Seeds black, smooth, minutely pitted. Fl. summer–autumn, fr. winter.

Open, sandy habitats, often near the sea; low elevations. Hainan [Afghanistan, India, Pakistan, Thailand, Vietnam; tropical and subtropical Africa; introduced in North America (SE United States)].

Collections from Iran and Pakistan with winged mericarps have been described as var. *alata* M. G. Gilbert.

2. *Gisekia pierrei* Gagnepain in Lecomte, Notul. Syst. (Paris) 3: 367. 1914.

多雄蕊吉粟草 duo xiong rui ji su cao

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MOLLUGINACEAE

Herbs perennial, diffuse. Roots woody. Stems decumbent, weak; branches many, short. Leaf blade obovate-oblong, 1.5–3 cm × 3–5 mm, white raphides not obvious, attenuate to petiole, base amplexicaul. Inflorescences apparently axillary, umbel-like, 3–5-flowered; peduncle 3–5 mm. Pedicel 1–1.5 cm. Tepals 5, oblong, ca. 4 × 1.5 mm, with white raphides. Stamens 12–15; filaments very broad. Carpels 4 or 5; styles linear, ca. as long as

ovary. Fruit dark brown, with white raphides. Mericarp tuberculate. Seeds reniform. Fl. and fr. almost year-round.

Sands of seashores, open places; low elevations. Hainan [Cambodia, Vietnam].

This species is very similar to the highly variable *Gisekia africana* (Loureiro) Kuntze.

2. GLINUS Linnaeus, Sp. Pl. 1: 463. 1753.

星粟草属 xing su cao shu

Herbs annual, diffuse, procumbent, often much branched, with stellate or simple hairs or glabrous. Leaves alternate, or in pseudowhorls, margin entire or with sparse teeth. Inflorescences in seemingly axillary cymes. Flowers pedicellate or sessile. Tepals 5, persistent, free, usually with white scarios margin, often yellowish on inner surface, often unequal. Petals absent or 1–8(–20), linear, often split at tips. Stamens (3–)5(–20), free or fascicled when numerous. Carpels 3(–5), connate; ovary ovate or oblong, 3(–5)-loculed; ovules numerous. Stigmas 3(–5), persistent, erect, spreading, or curved, linear or oblong-elliptic. Capsule ovoid or ellipsoid, 3–5-valved. Seeds numerous, reniform, each with a short funicle with a long filiform appendage, the strophiole, coiled around the seed; testa finely granulate or smooth.

About ten species: tropical, subtropical, and warm-temperate regions; two species in China.

Glinus herniarioides (Gagnepain) Tardieu (Fl. Cambodge, Laos & Vietnam 5: 97. 1967), described from Vietnam, might occur within the Flora area. It is most similar to *G. oppositifolius* but differs by the sessile flowers with tepals only ca. 2 mm. Wu Zhengyi (editor's note) adds that it indeed occurs in Mengla Xian, in the extreme south of Yunnan.

1a. Plant densely stellate tomentose; styles 5; capsule 5-valved; pedicel to 4 mm 1. *G. lotoides*
1b. Plant subglabrous or pilose with simple hairs; styles 3 or 4; capsule 3- or 4-valved; pedicel 5–14(–18) mm 2. *G. oppositifolius*

1. *Glinus lotoides* Linnaeus, Sp. Pl. 1: 463. 1753.

星粟草 xing su cao

Mollugo hirta Thunberg; *M. lotoides* (Linnaeus) Kuntze.

Herbs sturdy, densely stellate tomentose. Stems decumbent, 10–40 cm, much branched. Petiole very short; basal leaves in a rosette, drying soon; upper leaves verticillate or opposite, obovate to oblong-spatulate, 6–24 × 5–15 mm, base attenuate, decurrent, margin entire, apex obtuse, rounded, or acute. Flowers several, in groups, sessile or subsessile. Tepals elliptic or oblong, 4–6(–10) mm. Stamens usually 3–15, free. Ovary ovoid, 5-loculed; styles 5, free, linear, short, curved outward. Capsule ovoid, ca. as long as persistent tepals, 5-valved. Seeds numerous, chestnut-brown, reniform, granulose; strophiole scrotiform, ca. 2/3 as long as seed or longer. Fl. and fr. spring–summer. $2n = 36$.

Open sands, riversides, cultivated fields, waste places; sea level to 500 m. Hainan, Taiwan, Yunnan [Indonesia, Malaysia, Philippines, Sri Lanka; N and tropical Africa, S to SE Asia, S Europe, tropical America, Oceania].

2. *Glinus oppositifolius* (Linnaeus) Aug. Candolle, Bull. Herb. Boissier, sér. 2, 1: 559. 1901.

长梗星粟草 chang geng xing su cao

Mollugo oppositifolia Linnaeus, Sp. Pl. 1: 89. 1753; *M. spergula* Linnaeus.

Herbs 10–40 cm, much branched, pilose or subglabrous. Leaves in pseudowhorls of 3–6 or opposite; leaf blade spatulate-oblongate or elliptic, 1–2.5 cm × 3–6 mm, base attenuate, margin with sparse teeth, apex obtuse or acute. Pedicel 5–14(–18) mm, slender. Flowers usually 2–7 in a cyme. Tepals greenish white, yellowish, or milky-colored, oblong, 3–4 mm, margin membranous, 3-veined. Stamens 3–5. Styles 3(or 4). Capsule ellipsoid, slightly shorter than persistent tepals, 3- or 4-valved. Seeds chestnut-brown, subreniform, granulose; strophiole ca. 1/5 as long as seed, claviform. Fl. and fr. almost year-round. $2n = 36$.

Riversides, open sands of seashores, rice fields; low elevations. Hainan, S Taiwan [tropical Africa and Asia, N Australia].

3. MOLLUGO Linnaeus, Sp. Pl. 1: 89. 1753.

粟米草属 su mi cao shu

Herbs annual or perennial, glabrous. Stems diffuse, decumbent, or erect, branched or not, sometimes absent. Leaves in a basal rosette, pseudoverticillate, opposite, or whorled, ± sessile, margin entire. Inflorescences terminal or seemingly leaf-opposed cymes or umbels. Flowers pedicellate. Tepals 5, rarely 4, free, herbaceous, often with transparent scarios margins. Stamens usually 3(–5), rarely more (6–10). Carpels 3(–5), connate; ovary superior, ovoid or ellipsoid, 3(–5)-loculed, each locule with many ovules on axile placenta. Styles 3(–5), linear. Capsule globose, membranous, 3(–5)-valved, loculicidal, with persistent tepals. Seeds numerous, reniform or D-shaped, smooth, sculptured, or raphe ribbed, without filiform arils or caruncles; embryo annular.

About 35 species: mostly in tropical and subtropical regions, extending into warm-temperate regions of Europe, E Asia, and North America; four species in China.

1a. Plant stemless; inflorescences arising from a rosette of persistent basal leaves 1. *M. nudicaulis*

- 1b. Plant with leafy stem; inflorescences terminal or seemingly axillary, basal leaves usually soon drying up.
 2a. Plant 7–8 cm; leaves linear; seeds D-shaped, reticulate 2. *M. cerviana*
 2b. Plant 10–30 cm; leaves not linear; seeds reniform, smooth or tuberculate.
 3a. Stem leaves lanceolate or linear-lanceolate; inflorescence a terminal cyme appearing leaf-opposed; seeds tuberculate 3. *M. stricta*
 3b. Stem leaves oblanceolate or linear-oblanceolate; inflorescence seemingly an axillary umbellate cluster; seeds smooth 4. *M. verticillata*

1. *Mollugo nudicaulis* Lamarck, Encycl. 4: 234. 1786.

无茎粟米草 wu jing su mi cao

Herbs acauline. Leaves all in a basal rosette, sessile; leaf blade elliptic-spatulate or obovate-spatulate, 1–5 × 0.8–1.5 cm, base attenuate, apex obtuse. Inflorescence a dichasium arising from a rosette of basal leaves, spreading; peduncle and pedicel wiry, stiff. Tepals 5, yellowish white, oblong, 2–3 mm. Stamens 3–5. Ovary subglobose, 3-loculed; stigmas 3, very short. Capsule subovoid or ellipsoid, ca. as long as persistent tepals. Seeds numerous, black, subreniform, granulose, 0.5–0.7 mm. Fl. and fr. almost year-round. $2n = 54$.

Sandy seashores, open places, ruderal of sandy soils; low elevations. Guangdong, Hainan [Afghanistan, India, Pakistan; tropical Africa, W Indies (Cuba), Pacific Islands (New Caledonia)].

2. *Mollugo cerviana* (Linnaeus) Seringe in Candolle, Prodr. 1: 392. 1824.

线叶粟米草 xian ye su mi cao

Pharmaceum cerviana Linnaeus, Sp. Pl. 1: 272. 1753.

Herbs small, to 8 cm. Root thin. Stems numerous, ascending, thin, stiff. Leaves sessile, basal leaves in a rosette; cauline leaves in pseudowhorls of 3–10, gray-green, linear, 5–10 × 0.3–0.5 mm, apex acute. Inflorescences terminal or seemingly axillary, trichotomous umbellate cymes. Pedicel 7–8 mm, thin, stiff. Tepals 5, elliptic to oblong, 2–2.5 mm, midvein green, margin white membranous. Stamens 3–5, shorter than tepals. Styles 3, short. Capsule broadly ellipsoid, ca. as long as tepals or slightly shorter. Seeds numerous, brown, slightly shiny, D-shaped, ca. 0.2 mm, reticulate. Fl. Jun–Jul. $2n = 18$.

Dry sands, roadsides, shady and wet fields; 400–1200 m. Hebei, Xinjiang [India, Kazakhstan, Mongolia, Myanmar, Sri Lanka; Africa, S to SE Asia, Australia, S Europe].

This species is used medicinally. It is a very inconspicuous and easily overlooked ephemeral.

3. *Mollugo stricta* Linnaeus, Sp. Pl., ed. 2, 1: 131. 1762.

粟米草 su mi cao

Herbs diffuse, 10–30 cm. Stems ascending, slender, much branched, angled, glabrous, when old often reddish brown.

Leaves in pseudowhorls of 3–5 or opposite; petiole short or leaves subsessile; leaf blade lanceolate or linear-lanceolate, 1.5–4 cm × 2–7 mm, base attenuate, apex acute or acuminate; midvein prominent. Inflorescences terminal or in seemingly leaf-opposed lax cymes; peduncle slender. Pedicel 1.5–6 mm. Tepals 5, greenish, elliptic or orbicular, 1.5–2 mm, veins reaching 2/3, margin membranous. Stamens 3. Ovary broadly elliptic or rotund, 3-loculed; styles 3, linear, short. Capsule subglobose, ca. as long as persistent tepals, 3-valved. Seeds numerous, chestnut-colored, reniform, tuberculate. Fl. Jun–Aug, fr. Aug–Oct. $2n = 18^*$, 36.

Open waste places, sands of seashores, farmlands; 100–1800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [tropical and subtropical Asia].

In past Chinese literature, this species was erroneously reported as *Mollugo pentaphylla* Linnaeus.

This species is used medicinally.

4. *Mollugo verticillata* Linnaeus, Sp. Pl. 1: 89. 1753.

种棱粟米草 zhong leng su mi cao

Mollugo costata Y. T. Chang & C. F. Wei.

Herbs erect or diffuse, 10–30 cm. Petiole short or leaves subsessile; basal leaves in a rosette, obovate or obovate-spatulate, 1.5–2 cm; stem leaves in pseudowhorls of 3–7, or 2 or 3 in groups on one side of node, oblanceolate or linear-oblanceolate, 1–3 cm × 1.5–4(–8) mm, yellowish green when dry, base narrowly cuneate, apex acute or obtuse. Inflorescences axillary, umbellate clusters, 3–5-flowered. Pedicel 3–5 mm, slender. Tepals 5, rarely 4, imbricate, pale or greenish white, oblong or ovate-oblong, 2.5–3 mm, margin membranous, apex acute. Stamens (2 or)3(–5). Ovary 3-loculed; styles 3. Capsule ellipsoid or subglobose, 3–4 × ca. 2.5 mm, pericarp membranous, 3-valved, apex with persistent styles, persistent tepals surrounding more than half. Seeds numerous, chestnut-colored, shiny, reniform, smooth, raphe with 3–5 arcuate ribs, between ribs with fine and closely transverse grains. Fl. and fr. autumn–winter.

Barren grasslands, dry farmlands; near sea level. Fujian, Guangdong, Guangxi, Hainan, Shandong, Taiwan [Japan; tropical America, S Europe].

MOLLUGINACEAE