

67. PAVETTA Linnaeus, Sp. Pl. 1: 110. 1753.

大沙叶属 da sha ye shu

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Pavate Adanson.

Shrubs, small trees, or infrequently subshrubs, unarmed. Raphides absent. Leaves opposite or rarely whorled, usually with bacterial nodules and/or domatia in abaxial vein axils; stipules generally persistent, shortly united around stem, triangular, often aristate, often sericeous adaxially. Inflorescences terminal on principal stems, terminal on reduced lateral stems and appearing axillary, or rarely truly axillary, cymose to corymbiform, many flowered, sessile to pedunculate, bracteate with bracts often fused in pairs. Flowers pedicellate or sessile, bisexual, monomorphic, fragrant, with secondary pollen presentation. Calyx limb truncate or 4(or 5)-lobed. Corolla white to cream [or rarely red], salverform with tube slender, inside glabrous or pubescent in throat; lobes 4, convolute in bud. Stamens 4(or 5), inserted in corolla throat, exerted or included; filaments short; anthers dorsifixed near base, sometimes becoming twisted with age. Ovary 2-celled, ovules 1(or 2) in each cell on axile placentas attached at top of septum; stigma restricted to terminal portion of thickened style, very shortly 2-lobed with lobes erect, exerted. Fruit black and often shiny or infrequently white, red, or blue, drupaceous, thinly fleshy, globose to ovoid, with calyx limb persistent or deciduous; pyrenes 2, 1-celled, each with 1 seed, plano-convex or concavo-convex, papery; seeds medium-sized, ellipsoid, discoid, or plano-convex; testa membranous; endosperm corneous; embryo dorsal, curved; cotyledons leaflike; radicle hypogeous.

About 400 species: paleotropical, widespread in Africa, tropical Asia, Australia, and Pacific islands, apparently absent from Madagascar; six species (two endemic) in China.

Secondary pollen presentation is found in *Pavetta* (De Block, Opera Bot. Belg. 9: 1–218. 1998; Rout & Deb, Bull. Bot. Surv. India 41: 1–182. 1999). Rout and Deb (loc. cit.) reported synchronous flowering in the Indian species of *Pavetta*. W. C. Ko (in FRPS 71(2): 25. 1999) described the filaments as ranging from short to prolonged, but that latter condition has not been reported by other authors in *Pavetta* or *Ixora*. Ko also described the placentas as sometimes attached to the middle of the septum, but Bremekamp (Repert. Spec. Nov. Regni Veg. 37: 2–11. 1934) said this is incorrect and an old mistake in *Pavetta*.

Bremekamp (loc. cit.; Repert. Spec. Nov. Regni Veg. 47: 12–28. 1939) recognized three subgenera of *Pavetta*; the Chinese species all belong to his *P.* subg. *Pavetta*, and the other two subgenera are restricted to Africa.

Bremekamp, in general, distinguished *Pavetta* species more narrowly than many other authors; for example, he (loc. cit. 1934; loc. cit. 1939) reported 42 species for the Indian subcontinent, while Rout and Deb (loc. cit.) recognized only 25 species with the rest of Bremekamp's names synonymized. W. C. Ko (loc. cit.: 25–30) followed Bremekamp (loc. cit. 1934) closely; in contrast, all the morphological variation found among the Chinese species falls well within Rout and Deb's (loc. cit.: 114–136) circumscription of *P. indica* Linnaeus. Bremekamp (loc. cit. 1939) noted that the E Chinese plants previously identified as *P. indica* were included by him in *P. hongkongensis*.

In particular, Bremekamp (loc. cit. 1934) considered stem characters to be informative taxonomically in *Pavetta*, particularly green vs. corky-barked stems, but Rout and Deb (loc. cit.) concluded that these represent different developmental stages rather than differences between species. Bremekamp (loc. cit. 1934) considered the arrangement of the bacterial nodules in the leaves to be taxonomically informative for distinguishing infrageneric groups and sometimes species, but Rout and Deb (loc. cit., as “bacterial leaf-galls”) found them to have no taxonomic value and concluded that the nodules vary in shape and number among different leaves on a plant as well as between plants of the same and different species. Bremekamp (loc. cit. 1934) distinguished several species based on leaf shape and size, but Rout and Deb (loc. cit.) included notable variation in leaf size and shape, from relatively very narrow to quite broad, within individual species of *Pavetta*; Bridson and Verdcourt (Fl. Trop. E. Africa, Rub. (Pt. 2), 619–686. 1988) circumscribed several species similarly to Rout and Deb. Bremekamp (loc. cit. 1934) considered several species of *Pavetta* to have axillary inflorescences, as did Rout and Deb (loc. cit.), but Bridson and Verdcourt (loc. cit.) considered the inflorescences of the African species at least to be terminal on reduced lateral short shoots, as found in a number of Rubiaceae genera, and to appear axillary but not be truly axillary. Bremekamp (loc. cit. 1934) gave much attention to the arrangement of the inflorescence bracts in *Pavetta*; his descriptions apply to bracts but not bracteoles, so his characterizations may be misinterpreted if not observed carefully. Bremekamp noted (loc. cit. 1934) that occasional flowers with 5 calyx and corolla lobes are found in most *Pavetta* species, but the majority of flowers are always 4-merous and the genus best considered to be 4-merous; a similar situation is found in other Rubiaceae genera.

The treatment here follows that of W. C. Ko (loc. cit.), for reference. The key here has been augmented with characters from the descriptions, and the descriptions have been augmented with characters from the available specimens cited by Bremekamp.

- 1a. Flowering branches not green.
 - 2a. Leaf blade elliptic-oblong to obovate-oblong, 9–18 × 3–3.5 cm, drying membranous, adaxially glabrous, abaxially villosulous, with secondary veins 6–8 pairs 1. *P. arenosa*
 - 2b. Leaf blade elliptic or elliptic-lanceolate, 8–15 × 4–9 cm, drying thickly papery, adaxially scabrous, abaxially tomentose, with secondary veins 10–12 pairs 6. *P. tomentosa*
- 1b. Flowering branches green or almost green, sometimes becoming black when dry.
 - 3a. Leaf blade scabrous on both surfaces on midrib; style ca. 38 mm 4. *P. scabrifolia*
 - 3b. Leaf blade smooth, glabrous, or variously pubescent but not scabrous on both surfaces; style 35 mm or

shorter.

- 4a. Flowering branches and hypanthium portion of flower glabrous; leaf blade elliptic-oblong to elliptic-obovate, adaxially glabrous, abaxially subglabrous or pubescent along midrib and in axils of veins 2. *P. hongkongensis*
- 4b. Flowering branches and hypanthium portion of flower puberulent to pilosulous or glabrescent; leaf blade narrowly obovate, lanceolate, narrowly elliptic, or oblanceolate, adaxially glabrescent, abaxially puberulent to pilosulous at least on veins.
 - 5a. Leaf blade narrowly obovate or lanceolate, 9–13 × 3.5–4.7 cm, with secondary veins 6–8 pairs 3. *P. polyantha*
 - 5b. Leaf blade narrowly elliptic or oblanceolate, 10–13 × ca. 5 cm, with secondary lateral veins 6 or 7 pairs 5. *P. swatowica*

1. *Pavetta arenosa* Loureiro, Fl. Cochinch. 1: 73. 1790, emend. Bremekamp, Repert. Spec. Nov. Regni Veg. 47: 23. 1939.

大沙叶 da sha ye

?*Pavetta sinica* Miquel.

Shrubs, 1–3 m tall; branches compressed, puberulent to glabrous. Petiole 5–20 mm, glabrous to sparsely pilosulous; leaf blade drying membranous, elliptic-oblong to obovate-oblong, 9–18 × 3–3.5 cm, usually with bacterial nodules, adaxially glabrous and somewhat shiny, abaxially sparsely to densely villosulous, base cuneate to acute, apex acuminate; secondary veins 6–8 pairs; stipules broadly ovate-triangular, 2–12 mm, pilosulous to glabrous, acute to obtuse. Inflorescence terminal, 9–11 × ca. 15 cm, pilosulous to glabrescent; peduncle 2.5–4 cm; pedicels 10–12 mm. Flowers pedicellate. Calyx with hypanthium portion ellipsoid, ca. 1 mm, densely pilosulous; limb ca. 1 mm, sparsely pilosulous to glabrescent, lobed for up to 1/2. Corolla white, outside glabrous; tube 10–18 mm, bearded in throat; lobes narrowly oblong, 3–5 mm, obtuse. Style 25–30 mm. Drupe globose, 6–7 mm in diam., glabrous, calyx limb persistent. Fl. Apr–May, fr. Oct–Nov.

Sparse forests at low elevations. Guangdong, Guangxi, Hainan [Vietnam].

Plants with calyx tube glabrous from Guangxi have been called *Pavetta arenosa* f. *glabrituba* Chun & F. C. How ex W. C. Ko (Fl. Hainan. 3: 583. 1974). This may be best synonymized here, pending further study.

In his revision of *Pavetta* Bremekamp (Repert. Spec. Nov. Regni Veg. 37: 104. 1934) described *P. hongkongensis* for the common Chinese plants and considered *P. arenosa* a dubious name that he tentatively referred to *Tarenna*, but later (Bremekamp, Repert. Spec. Nov. Regni Veg. 47: 12–28. 1939) he reported that Merrill had differed with his conclusion, had examined the type of *P. arenosa*, and had sent him information that persuaded him to apply this latter name to Chinese plants. The protologue provided very limited information, which was significantly expanded by Bremekamp, thus the annotation here of this as an emended description. Bremekamp here also stated, without citing any individual specimens or contrasting the species, that both *P. arenosa* and *P. hongkongensis* are found commonly in China. W. C. Ko (in FRPS 71(2): 26. 1999) separated these based on the color of their flowering branches: green or almost green in *P. hongkongensis* vs. not green in *P. arenosa*; however, this is a character that Rout and Deb (Bull. Bot. Surv. India 41: 1–182. 1999) tested empirically and found to be variable within all Indian species of *Pavetta* and, thus, of questionable use there and elsewhere.

W. C. Ko (loc. cit.: 28) cited the name *Pavetta sinica* as a synonym of *P. arenosa*, but the source for this synonymy is unknown to us.

Bremekamp specifically excluded this name from synonymy in his circumscription of *P. arenosa*, though apparently Merrill did synonymize it here (Lingnan Sci. J. 15: 17. 1936). Bremekamp treated *P. sinica* as a species distinct from *P. arenosa* and *P. hongkongensis* and considered it most closely related to *P. tomentosa*. Bremekamp saw its type and described the corolla tube as 17 mm, which does not agree with the descriptions presented by W. C. Ko (loc. cit.: 27–28) for either *P. arenosa* or *P. hongkongensis*. However, the specimens cited for *P. arenosa* by Bremekamp (loc. cit. 1939) have corolla tubes 10–18 mm, so Bremekamp's description of *P. sinica* is easily included in his circumscription of *P. arenosa*.

2. *Pavetta hongkongensis* Bremekamp, Repert. Spec. Nov. Regni Veg. 37: 104. 1934.

香港大沙叶 xiang gang da sha ye

Tarenna kwangsiensis Handel-Mazzetti.

Shrubs or small trees, 1–4 m tall; branches compressed, glabrous, green or almost green, often drying blackened. Petiole 1–2 cm, glabrous; leaf blade drying membranous, elliptic-oblong to elliptic-obovate, 8–15 × 3–6.5 cm, often with bacterial nodules, adaxially glabrous, abaxially glabrous, glabrescent, or pubescent along midrib, base cuneate to acute, apex acuminate to acute; secondary veins 6 or 7 pairs; stipules broadly ovate-triangular, 1–3 mm, glabrous, acute to shortly aristate. Inflorescences terminal on lateral branches, laxly corymbose, 7–9 × 7–15 cm, many flowered, glabrous; peduncle 1–2 cm; pedicels 3–6 mm. Flowers pedicellate. Calyx with hypanthium portion ellipsoid, ca. 1 mm, glabrous; limb 0.5–1.5 mm, glabrous, shallowly lobed. Corolla white, outside glabrous; tube 12–19 mm, inside pilose at throat; lobes narrowly triangular-oblong, 5–7 mm, acute to obtuse. Style ca. 35 mm. Drupes globose, 6–7 mm, pilosulous to glabrous, calyx limb persistent. Fl. Mar–Jul, fr. Jul–Nov.

Thickets; 200–1300 m. Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

Bremekamp noted in his description of this species that it comprises the Chinese plants previously treated as *Pavetta indica* by at least some authors.

3. *Pavetta polyantha* (J. D. Hooker) R. Brown ex Bremekamp, Repert. Spec. Nov. Regni Veg. 37: 103. 1934.

多花大沙叶 duo hua da sha ye

Pavetta indica Linnaeus var. *polyantha* J. D. Hooker, Fl. Brit. India 3: 150. 1880.

Shrubs, 1–3 m tall; young branches compressed to subterete, glabrescent or puberulent. Petiole 10–30 mm, puberulent;

leaf blade drying membranous, narrowly obovate or lanceolate, 9–13 × 3.5–4.7 cm, with several bacterial nodules, adaxially glabrescent, abaxially puberulent at least along veins, base cuneate or acute, apex acuminate; secondary veins 6–8 pairs; stipules ovate-triangular, 5–7 mm, puberulent or glabrescent, shortly aristate. Inflorescences terminal on developed branches, laxly corymbose, ca. 9 × 15 cm, many flowered, strigillose to glabrescent; peduncle 1.5–2 cm; pedicels 3–5 mm. Flowers pedicellate. Calyx with hypanthium portion ellipsoid, 1–1.2 mm, densely strigillose; limb 1–1.5 mm, sparsely strigillose, lobed for up to 1/2. Corolla white, outside glabrous; tube 19–22 mm, bearded in throat; lobes narrowly ligulate, 6–7 mm, obtuse to rounded. Style ca. 30 mm. Drupe globose, ca. 8 mm, glabrous. Fl. Apr–Jun.

Sparse forests, streamsides; 900–1200 m. Guangdong, Guangxi, Guizhou, Yunnan [Bhutan, India, Indonesia, Myanmar, Philippines].

Rout and Deb (Bull. Bot. Surv. India 41: 122–128. 1999) included *Pavetta polyantha* within their circumscription of *P. indica* var. *glabrescens* (Kurz) Deb & Rout. The name *P. polyantha* is based on a Wallich specimen from Assam.

4. *Pavetta scabrifolia* Bremekamp, Repert. Spec. Nov. Regni Veg. 37: 100. 1934.

糙叶大沙叶 cao ye da sha ye

Shrubs, height not noted; branches subcompressed to angled, puberulent to pilosulous, green or almost green. Petiole 1–1.5 cm, pubescent; leaf blade drying membranous, lanceolate, 13–16 × 3.2–4.4 cm, adaxially subglabrous except scabrous along midrib, abaxially scabrous, base cuneate, apex caudate; secondary veins 5 or 6 pairs; stipules broadly triangular, cuspidate. Inflorescence terminal on branches with 1 long internode and several short internodes, laxly corymbose, pubescent. Calyx subglabrous; limb ca. 1 mm, lobed for ca. 1/2. Corolla white; tube ca. 17 mm, glabrous inside; lobes narrowly oblong-triangular, ca. 5.5 mm. Style ca. 38 mm. Drupes subglobose, ca. 5 mm in diam., glabrescent, calyx limb persistent. Fl. May–Jun.

• Sparse forests, ditch sides; 900–1300 m. Yunnan.

5. *Pavetta swatowica* Bremekamp, Repert. Spec. Nov. Regni Veg. 37: 104. 1934.

汕头大沙叶 shan tou da sha ye

Shrubs, height not noted; branches compressed to terete, pilosulous, green or almost green becoming grayish or blackened when dry. Petiole 1–2 cm, pilosulous; leaf blade drying thinly papery or submembranous, narrowly elliptic or oblanceolate, 10–13 × ca. 5 cm, adaxially glabrescent, abaxially pilosulous, base cuneate, apex long acuminate; secondary veins 6 or 7 pairs; stipules ovate-triangular, ca. 5 mm, puberulent, shortly cuspidate. Inflorescence terminal on developed branches, laxly corymbose, many flowered, pubescent; peduncles 2–3 cm; pedicels 4–6 mm. Flowers pedicellate. Calyx with hypanthium subglobose, densely grayish pilosulous or sericeous; limb shallowly lobed. Corolla white, outside glabrous; tube ca. 14 mm, sparsely tomentose inside; lobes narrowly oblong or oblong-lanceolate, ca. 6 mm. Style ca. 35 mm. Drupes unknown.

• Sparse forests, streamsides. Guangdong.

This name was incorrectly spelled by W. C. Ko (in FRPS 71(2): 26–27. 1999) as “*Pavetta swatouica*.” Ko’s description, perhaps following that of Bremekamp, described the stipules as caducous, although the stipules are otherwise considered persistent in *Pavetta* by other authors, including Bremekamp.

6. *Pavetta tomentosa* Roxburgh ex Smith in Rees, Cycl. 26: *Pavetta* no. 2. 1814.

绒毛大沙叶 rong mao da sha ye

Ixora tomentosa (Roxburgh ex Smith) Roxburgh; *I. tomentosa* var. *roxburghii* Kurz; *Pavetta indica* Linnaeus var. *tomentosa* (Roxburgh ex Smith) J. D. Hooker; *P. tomentosa* var. *roxburghii* (Kurz) Bremekamp.

Shrubs or small trees, height not noted; branches tomentose. Petiole 1–3 cm, tomentose; blade drying thickly papery and blackening, elliptic or elliptic-lanceolate, 8–15 × 4–9 cm, scabrous adaxially, tomentose abaxially, base acute, apex acute or acuminate; secondary veins 10–12, with foveolate and/or pubescent domatia; stipules ovate-triangular, 6–8 mm, tomentose, aristate. Inflorescences terminal on branches with 1 or 2 internodes, laxly corymbose, 5–10 × 5–25 cm, densely tomentose, pedunculate; peduncle 0.5–1.5 cm; pedicels 4–8 mm. Flowers pedicellate. Calyx densely tomentose; hypanthium portion ellipsoid, ca. 1 mm; limb ca. 0.5 mm, denticulate to lobed. Corolla white, outside glabrous; tube (6.2–)8–12 mm, sparsely pilose inside; lobes narrowly oblong, 4.6–7 mm, acute. Style 24–33 mm. Drupes globose, ca. 5 mm, tomentulose. Fl. and fr. Jul–Sep.

Tropical rain forests; ca. 1000 m. Yunnan (Menghai) [India, Malaysia, Myanmar, Nepal, Pakistan, Thailand, Vietnam].

Rout and Deb (Bull. Bot. Surv. India 41: 128–136. 1999) treated this species as *Pavetta indica* var. *tomentosa*. Bremekamp (Repert. Spec. Nov. Regni Veg. 37: 113–114. 1934) and Rout and Deb described the corolla tubes as 8–12 mm, but W. C. Ko (in FRPS 71(2): 28. 1999) gave the minimum measurement as 6.2 mm.

Fl. China 19: 287–290. 2011.