

16. AMORPHOPHALLUS Blume ex Decaisne, *Nouv. Ann. Mus. Hist. Nat.* 3: 366. 1834,
nom. cons.

魔芋属 mo yu shu

Li Heng (李恒 Li Hen); Wilbert L. A. Hettterscheid

Brachyspatha Schott; *Candarum* Reichenbach ex Schott & Endlicher; *Conophallus* Schott; *Hydrosme* Schott; *Kunda* Rafinesque; *Pythion* Martius.

Herbs, terrestrial, small to massive. Stem subterranean, tuberous, rarely a chain of tubers or a true rhizome; rhizome ± creeping. Leaves usually solitary, rarely paired or more; petiole terete, rarely angulate, shallowly grooved, or partly rugulose, rarely entirely verrucate or hairy; leaf blade decompose, divided into 3 main segments; main segments equally long or anterior shorter than posterior ones (blade ± subpedate); rachises naked, narrowly or broadly winged and often carrying supernumerary leaflets on proximal parts; bulbils sometimes developing on leaves, either epiphyllar, intercalary (developing inside rachis), or half-epiphyllar (base developing in rachis, apex exposed beyond rachis). Inflorescence 1, rarely 2 or 3 (synflorescence) or more per season (then developing from different buds on stem), epigeal, rarely partly buried, solitary or simultaneous with or directly preceding leaf development, rarely emerging after leaf development. Spathe base convolute, rarely open or connate, not or clearly separated from limb by a constriction, outside variously colored, variously shaped, often cymbiform or campanulate, rarely funnel-shaped; limb erect, spreading, oblique, or arching. Spadix sessile or shortly stipitate; female zone contiguous with male zone or separated from it by a sterile zone; flowers sometimes surrounded by staminodes; female flowers consisting of 1 pistil; ovary sessile or shortly stipitate, 1–4-loculed, with 1 ovule per locule, basifixed, or rarely axillary ca. halfway up ovary; style present or (nearly) absent, clearly separated from ovary or less so, sometimes with apical projections (“branches”) extending beyond stigma; sterile zone (when present) covered with staminodes, rarely partly or entirely naked; male zone cylindrical, fusiform, conic, or obconic; male flowers consisting of (1–)3–6(–8) stamens; stamens depressed or elongate; filaments present or nearly absent, separated or partly or entirely fused within a flower or rarely fused between adjacent flowers; anthers bithecal; thecae 2-celled (with 2 pollen sacs), rarely 1-celled; pores apical, rarely lateral or subterminal; pollen inaperturate, globose or elliptic, exine rarely absent, psilate, striate, verrucate, echinate, areolate, porate, fossulate, reticulate, or scabrous; appendix rarely absent, contiguous with male zone or separated by a constriction or a short stipe, sometimes with large longitudinal folds or ± irregular deep cracks. Berries crowded or distant, ripening red, rarely blue, globose, ovoid, or narrowly elliptic, smooth or rarely verrucate, 1–4-seeded. Seeds usually with a distinct raphe; endosperm absent.

About 200 species: paleotropical, W to E Africa, S and SE to E Asia, N Australia, Pacific islands; 16 species (seven endemic) in China.

Amorphophallus stipitatus Engler (*Notizbl. Bot. Gart. Berlin-Dahlem* 8: 457. 1923) was described based on cultivated material in the Berlin Botanical Garden, originally from Guangdong. The holotype (*Mell. s.n.*, B) has been destroyed, and Engler’s protologue does not give enough clues as to the identity of the species to which the name refers. It is no doubt a member of the *A. yunnanensis* alliance, but the differences between species recognized in this group are too subtle to leave room for any guessing about the identity of *A. stipitatus*. So as not to confuse matters, this name is here treated as of uncertain application.

The status of *Amorphophallus zengianus* C. Long & H. Li (*Novon* 10: 125. 2000), described from S Yunnan (Jinping), is uncertain. H. Li notes that the morphology of the inflorescence might be misleading because it was damaged while in the bud stage. She considers it to be conspecific with *A. yunnanensis*, based on morphological similarity of the petiole and leaf blade. On the other hand, Hettterscheid considers *A. zengianus* to represent a less-than-optimal specimen of *A. krausei*, based on photographs provided by H. Li of living material of *A. zengianus*. This identity with *A. krausei* could be confirmed if there exists a staminodal zone between the male and female zones of the spadix. However, H. Li notes that the living material no longer exists and the holotype specimen cited in the protologue (*C. L. Long 98003*, KUN) never existed.

“*Amorphophallus tienmushanensis*” (Y. Z. Tao, *Compreh. Invest. Rep. Nat. Resource Tianmu Mount. Nat. Reserve*, 130. 1992) was described from Zhejiang (Tianmu Shan). The present authors consider this name to be not validly published because the requirement of Art. 36.1 of the ICBN (*Vienna Code*) was not fulfilled. The intended validating description given by Tao is a mixture of Latin and English. The code requires “a Latin description or diagnosis.” D. H. Nicolson (pers. comm.) is of the opinion that a percentage of non-Latin is admissible; a similar view was held by R. K. Brummitt and D. E. Boufford (pers. comm.; for further discussions see *Plant Press* 45, Jan. 1994 and *Plant Press* 45, Feb. 1994). We consider as quite disturbing the discussion about the acceptance of a percentage of non-Latin in a diagnosis where “a Latin description or diagnosis” is required, especially given that non-English users of the ICBN will not be able to read between subtle English lines. The ICBN must be unambiguous at an international level, and the phrase “a Latin description or diagnosis” should be clear to all, as it is to us, to mean 100% Latin.

The following species were recorded in FRPS but are, in fact, not distributed in China: *Amorphophallus bangkokensis* Gagnepain (*FRPS* 13(2): 91, 99. 1979), *A. mekongensis* Engler & Gehrman (p. 91), *A. oncophyllus* Prain ex J. D. Hooker (p. 98; *A. muelleri* Blume), and *A. variabilis* Blume (p. 95).

- 1a. Underground part a terete rhizome or chain of tubers.
 - 2a. Underground part a terete creeping rhizome 5. *A. hayi*
 - 2b. Underground part a chain of tubers 2. *A. coetaneus*
- 1b. Underground part a single tuber.

- 3a. Peduncle shorter than or equal to spathe.
- 4a. Spathe limb erect, concave or straight; appendix whitish or pinkish.
- 5a. Spathe limb concave; spadix shorter than spathe; appendix whitish, conic 14. *A. yuloensis*
- 5b. Spathe limb straight, distally slightly widening; spadix longer than spathe; appendix whitish or pinkish, conic or fusiform-conic and laterally compressed 15. *A. xiei*
- 4b. Spathe limb horizontal, campanulate; appendix dark purple.
- 6a. Appendix narrowly conic, sometimes with scattered hairs 6. *A. henryi*
- 6b. Appendix globose or broadly conic 12. *A. paeoniifolius*
- 3b. Peduncle distinctly longer than spathe.
- 7a. Spadix distinctly stipitate.
- 8a. Appendix with a strongly cerebriform (brainlike) surface 3. *A. corrugatus*
- 8b. Appendix glabrous, shallowly or deeply fissured, partly or entirely echinate.
- 9a. Appendix deeply fissured/cracked lengthwise 8. *A. kachinensis*
- 9b. Appendix glabrous, with shallowly concave sides, or partly or entirely echinate.
- 10a. Appendix variously laterally compressed, sides shallowly or more deeply concave, glabrous; stigma hardly broader than style 16. *A. yunnanensis*
- 10b. Appendix terete or dorsiventrally compressed, sides convex, glabrous or entirely or distally echinate; stigma distinctly broader than style 4. *A. dunnii*
- 7b. Spadix sessile.
- 11a. Male and female zones separated by sterile zone with ovate or elliptic, slightly convex staminodes.
- 12a. Male zone distinctly longer than appendix 11. *A. krausei*
- 12b. Male zone equaling appendix 1. *A. albus*
- 11b. Male and female zones contiguous or with different types of staminodes in between.
- 13a. Spathe erect; spadix shorter than or equaling spathe.
- 14a. Male zone at most twice as long as female zone 13. *A. tonkinensis*
- 14b. Male zone (including sterile zone when present) at least 2.5 × as long as female zone 11. *A. krausei*
- 13b. Spathe oblique; spadix longer than spathe.
- 15a. Stigma sessile or nearly so; appendix glabrous or with a few scattered hairs 9. *A. kiusianus*
- 15b. Style distinct; appendix densely covered with long hairs or glabrous.
- 16a. Appendix densely covered with long hairs 7. *A. hirtus*
- 16b. Appendix glabrous 10. *A. konjac*

1. *Amorphophallus albus* P. Y. Liu & J. F. Chen, J. S. W. Agric. Coll. 1984(1): 67. 1984.

白蘑芋 *bai mo yu*

Tuber brown, subglobose, 5–6 cm high, 7–10 cm in diam., seasonally producing long rhizomatous offsets, these to 23 × 1.5 cm. Leaf solitary; petiole pale green with grayish green, irregular, elongate or rounded spots, and whitish dots, 40–70 × 1.5–2 cm, glabrous; leaf blade ca. 80 cm in diam., rachises winged; leaflets elliptic-lanceolate, 2–12 × 1–3 cm, acuminate. Inflorescence solitary, long pedunculate; peduncle 16–30 × 1–2 cm. Spathe cymbiform, narrowly ovate, 12–22 × 6–10 cm, acute; proximal margin of limb recurved, outside base green to pale green, inside creamy white; outside limb pale green, spotted with dark green and near margin with numerous indistinct white punctiform dots, inside creamy white with a faint pale green flush, base within densely verruculose. Spadix producing a heavy gaseous smell during female anthesis, sessile, bright pale green, turning yellowish during male anthesis, slightly curved, shorter than spathe, ca. 13.5 cm; female zone cylindrical, ca. 1 × 1.2–1.3 cm, flowers congested; ovary bright green, depressed, angulate in cross section, ca. 1.5 mm high, 2.5–3 mm in diam., 2-loculed, but 1 locule reduced and sterile; style strongly oriented parallel to spadix axis, bright green, distally pale to yellowish green, 2–2.5 × ca. 1 mm; stigma lateral, slightly arching, whitish disciform, ca. 1.5 mm in diam., ca. 0.8 mm thick, entire, strongly scabrous; sterile zone between

male and female zone swollen, slightly conic, 1–2.5 × 1–1.8 cm; staminodes congested; staminodes consisting of sterile entire flowers, off-white, slightly hemispheric, irregular, largest ca. 12 × 7 mm, with shallow irregular depressions, or with a few irregular grooves; male zone narrowly conic, apex slightly expanded, ca. 4 × 0.8 cm, ca. 1.5 cm in diam. at base, flowers congested; male flowers consisting of 3 or 4 (or 5) stamens; stamens ca. 2 mm; filaments entirely fused, off-white, ca. 1.3 mm; anthers ca. 0.7 × 2 mm, truncate; thecae off-white, opening with apical rounded pores; connective dirty pale yellowish, flat, raised after anthesis; appendix narrowly conic, ca. 6 × 1.6 cm, finely rugulose, apex obtuse. Berries orange-red when mature, ovoid.

- Open forests, arid thickets; 800–1000 m. S Sichuan, NE Yunnan.

This species is used as a crop plant and is cultivated in Yunnan.

2. *Amorphophallus coetaneus* S. Y. Liu & S. J. Wei, Guihaia 6: 183. 1986.

桂平蘑芋 *gui ping mo yu*

Amorphophallus arnautovii Hettterscheid; *A. pingbianensis* H. Li & C. L. Long.

Tuber persistent, dark brown to blackish, depressed globose, to 3 cm high, to 6 cm in diam., chained with others to form a pseudorhizome of 2–6 modules, each 3–5 cm in diam.

Leaves 1–3, lasting up to 3 years; petiole uniformly dark green, terete, 60–120 × 1–2 cm, turgid, glabrous; leaf blade to ca. 100 cm in diam.; rachises only winged distally, common base of 3 main branches sometimes developing into an intercalary bulbil; leaflets dark green, oblanceolate, 15–20 × 4–6 cm, acuminate. Inflorescence long pedunculate; peduncle colored as petiole, 10–50 × 0.6–1.3 cm. Spathe shortly convolute at base, outside green, dirty green flushed with dirty brownish purple or distal half entirely brownish purple; inside uniformly green or background color dirty green, at base and along midrib flushed dirty dark purplish, near apex less so, or base pale green and rest flushed with brownish purple, narrowly triangular to triangular-ovate, 7.5–15 × 3–7 cm, base within glabrous or nearly glabrous with a few scattered, small, punctiform warts, apex acute. Spadix giving off a heavy gaseous stench at female anthesis, sessile, pale yellowish green with a very faint greenish flush, as long as or longer than spathe, 10–19.5 cm; female zone cylindrical, 1–2 × 1–1.6 cm, flowers congested; ovary green or pale whitish green, strongly depressed, depressed globose, or subglobose, 1.5–2 mm high, 1.5–4 mm in diam., angulate or irregularly orbicular in cross section, 1- or 2-loculed; style straight or slightly upcurved, pale green, 1–2 × ca. 0.8 mm; stigma pale yellowish or pale greenish, flattened, disciform or nearly so, 0.7–0.8 mm high, 0.8–2 mm in diam., irregularly orbicular or elliptic in cross section, entire with a shallow, elongate, central depression or shallowly 2-lobed, or more distinctly bilabiate, margin with 2 small notches or a few small lobes, densely verruculose or echinulate; male zone cylindrical, apex slightly widened, terete or slightly compressed, 2.3–4.5 × 0.7–1.5 cm, flowers congested; male flowers consisting of 3 or 5 stamens; stamens ca. 2 × 1–2 mm; filaments ca. 0.7 mm, connate or largely free; anthers off-white, ca. 1.3 mm, truncate; pores apical, elongate and connected to margin of anther by a groove; appendix narrowly fusiform-conic, 5.5–14.5 cm, base 0.7–2.3 cm in diam., sometimes slightly compressed, glabrous or shallowly corrugate, base glabrous or with some flattened staminodes, separated by grooves, base constricted, apex acute. Fruiting zone at least 5 × ca. 4 cm. Berries dark blue, oval or oval-ellipsoid, ca. 1 × 0.8 cm, 1- or 2(or 3)-seeded. Fl. Mar.

Moist forested valleys, along water, thickets; 300–900 m. Guangxi (Guiping, Rongshui), Yunnan [E and N Vietnam].

The inclusion of *Amorphophallus arnautovii* and *A. pingbianensis* in the synonymy of *A. coaetaneus* has been published and discussed by Hetterscheid and van der Ham (Blumea 46: 279–281. 2001).

In the protologue of *Amorphophallus coaetaneus*, the specific epithet was given in error as “*guipingensis*” in the figure caption on p. 186.

3. *Amorphophallus corrugatus* N. E. Brown, Bull. Misc. Inform. Kew 1912: 269. 1912.

田阳藤芋 tian yang mo yu

Amorphophallus tianyangensis P. Y. Liu & S. L. Zhang;
Thomsonia sutepensis S. Y. Hu.

Tuber dark brown, globose, ca. 7 cm high, to 8 cm in diam., weighing up to 850 g, developing seasonal offsets; offsets long, rhizomatous, ca. 9 cm, slender, ca. 0.8 cm in diam., not apically thickened. Leaf solitary; petiole background color

dirty white or pale green with a very faint, pale brownish hue overlain with numerous tiny and fewer large, partly confluent, irregular, dark chocolate-brown or grayish spots, 10–95 cm, slender, to 2 cm in diam. at base, longitudinally, shallowly ridged; leaf blade green adaxially, moderately dissected, 10–150 cm in diam.; rachises only winged in distal 1/3; main segments subdichotomous; terminal segments oblong or lanceolate, base long decurrent in most distal ones, other segments narrowly sessile, 10–28 × 4–9 cm, apex acuminate. Inflorescence long pedunculate; cataphylls to 40 cm; peduncle colored as petiole, 30–70 cm, 0.8–2 cm in diam. at base. Spathe shortly convolute at base, outside pale greenish, grayish purple, or white, sometimes to base with whitish spots, or with gray-green or pale olive-brown spots, either only margin purplish red or also large parts reddish brown, inside pale greenish white with several irregular, purplish red spots and a purplish red margin, base inside often purplish red, or utmost base whitish, ovate or elliptic-ovate, concave, 7–26 × 4–16 cm, apex acute or obtuse, glabrous. Spadix white or with some pale brownish spots and a pinkish hue, much shorter than spathe, stipitate, 4–11 cm; stipe 0.2–1.5 cm, slender; flowers unisexual; female zone cylindrical or slightly obconic, 1.3–3.5 cm, 0.8–2 cm in diam. (including styles), flowers congested; ovary dark purple with pale whitish green base, globose, depressed, or subpyriform, orbicular, diamond-shaped, or irregularly angulate in cross section, 1–2 mm high, 1.5–2(–3) mm in diam., ± gradually tapering to style but after fertilization developing an annular articulation, 1-loculed, occasionally 2-loculed, with 1 basal ovule per locule; style straight or ± strongly curved toward spadix axis, entirely dark purple or apical half bright pale green, slender, cylindrical or slightly conic, apex oblique and sometimes tricuspidate or drawn out in a slender point reaching beyond stigma, 2–4 mm, ca. 0.8 mm in diam. at base; stigma subapical or lateral, superficial or subcapitate, usually transversely bilabiate, rarely longitudinally oval, shallowly but densely verrucate or echinate, occasionally with elongate, fleshy, conic verrucae, pale yellowish or dirty whitish, 0.5–1 mm in diam., 0.2–0.5 mm high; male zone cylindrical to fusiform-obconic, 1.3–4 × 0.7–2.2 cm, flowers densely congested; male flowers consisting of 3–5 stamens; stamens 3–3.5 mm; filaments 1.8–2 mm, proximal half connate, whitish; anthers whitish, pinkish, or flesh-colored, elongate, subquadrangular or strongly biconcave in cross section, 1.3–1.5 × 1–1.3 mm, apex truncate; connective pale violet, massive; pores transversely elongate, lateral; appendix hardly to distinctly stipitate, globose, ovoid, elliptic, or conic, obtuse or truncate, at first turgid but during female anthesis weakening quickly and soon shriveling and drying, turning brown, 1–5 × 1–3 cm, with several irregular grooves (not associated with staminodes), longitudinal ones deepest, between usually with a complex and dense pattern of elongate, convolute staminodes, separated by narrow grooves, whole appearing brainlike, yellowish white or pale grayish green, occasionally with a pale violet hue; stipe of appendix cylindrical or obconic, 0.1–0.6 × 0.3–1 cm. Infructescence cylindrical, ca. 4 × 2 cm. Berries at first green, maturing orange, elliptic, 1- or 2-seeded. Fl. Mar–May, fr. Apr–Jun.

Shaded places in primary evergreen forests, on granite bedrock; 800–1700 m. Guangxi, SE Yunnan [N Myanmar, N Thailand].

4. *Amorphophallus dunnii* Tutcher, J. Bot. 49: 273. 1911.

南蛇棒 nan she bang

Amorphophallus mellii Engler; *A. odoratus* Hetterscheid & H. Li.

Tuber dark brown, subglobose or depressed globose, to 10 cm high, to 12 cm in diam., developing numerous offsets annually, these shortly narrowly fusiform, 1–3 × ca. 1 cm. Leaf solitary; petiole green or grayish green with numerous elongate, confluent, pale green or brownish green spots, 30–60 × 1–1.5 cm, glabrous; leaf blade to ca. 100 cm in diam., rachises winged throughout; leaflets dark green adaxially, elliptic-lanceolate, 3–21 × 1.5–7 cm, acuminate. Inflorescence solitary, long pedunculate, producing a scent of fresh carrots; peduncle colored as petiole, 20–60 cm, 0.7–1.8 cm in diam. at base. Spathe shortly convolute at base, outside bright pale green, basally with rounded white spots, these distally grading to whitish green, inside base or a larger patch reddish purple, remainder and limb as outside but paler, broadly ovate, strongly concave, 8.5–24 × 8.5–23 cm, base within ridged-verruculose, apex acute, over-arching spadix. Spadix stipitate or rarely nearly sessile, slightly shorter than spathe, 8–20 cm; stipe colored as peduncle but much paler, 0.5–1.5 cm; female zone cylindrical, distal part occasionally broadened, 0.5–2.5 × 1–2.2 cm, flowers congested; ovary pale green, depressed, angulate in cross section, 1–1.5 mm high, 2–3 mm in diam., 2- or 3-loculed, with 1 basal ovule per locule; style pale green, 0.5–1 × 0.8–1 mm; stigma yellowish, flattened, ca. 1 mm high, ca. 2 mm in diam., 2- or 3(or 4)-lobed, oval or triangular in cross section, scabrous-verrucate, lobes obtuse; male zone broadly fusiform, 1.8–3 × 1.3–3.5 cm, flowers congested; male flowers consisting of 4 or 5 stamens; stamens ca. 3 mm; filaments ca. 1.5 mm, basal 1/3 connate; anthers butterfly-shaped in cross section, ca. 1.5 × 1.5–1.8 mm; pores elongate, apical but near margin, sometimes connected by an eccentric groove; pollen striate; appendix ivory-white, narrowly to broadly conic, usually slightly dorsiventrally compressed, occasionally substipitate, variable, hollow, 3–14 cm, 1.3–4.5 cm in diam. near base, glabrous or entirely echinate or verruculose, or only distal 1/3 so, base constricted and sometimes grooved, apex subacute or obtuse. Infructescence: fruiting zone cylindrical, ca. 12 × 5 cm. Berries crowded, shortly stalked, glossy dark blue, elongate, to ca. 1.8 × 1.5 cm.

• Guangdong, Guangxi.

H. Li (in FRPS 13(2): 92–95. 1979) treated *Amorphophallus dunnii* and *A. mellii* separately, but the descriptions indicate to Hetterscheid that they represent one variable species. The placement of *A. mellii* as well as *A. odoratus* in the synonymy of *A. dunnii* was explained by Hetterscheid (Blumea 46: 281. 2000).

5. *Amorphophallus hayi* Hetterscheid, Blumea 39: 258. 1994.

红河蘑芋 hong he mo yu

Rhizome horizontal, brown and green, to ca. 25 × 5 cm, branching infrequently, internodes 1–1.3 cm, leaf scars transversely oval; offset tubers long lasting, depressed, broadly attached; roots mainly developed from ventral side. Leaves solitary or paired or simultaneous with inflorescence, latter emerging from petiole sheath; petiole moderately glossy, back-

ground color dirty grayish green but nearly totally hidden by large, oval, confluent, reddish brown spots, 40–60 × 1–1.5 cm, turgid, glabrous; leaf blade 50–70 cm in diam., anterior segment less strongly developed than posterior ones; rachises short, unwinged except for distalmost parts; leaflets paler green abaxially, moderately glossy green adaxially, lanceolate, 8–32 × 2.5–7 cm, margin crispate-undulate, apex acuminate; venation quite strongly impressed. Inflorescence solitary or with leaf, long pedunculate; peduncle reddish brown to yellowish brown, densely covered with dark reddish brown, narrowly oval, often confluent spots, ca. 50 cm, ca. 1.5 cm in diam. at base, ca. 0.8 cm in diam. at apex, glabrous. Spathe erect, basally loosely convolute, apical 1/3 horizontally spreading, outside base very pale purplish brown on a ± cream-colored background, with numerous small and slightly larger, punctiform, rounded, partly confluent, dark purplish brown spots, distally outside dirty cream-colored with less numerous rounded spots but numerous tiny ones, to margin flushed with gray, inside base dark maroon, distally ± cream-colored with few tiny dark purple spots, to margin flushed with dirty dark brownish green, ovate, funnel-shaped, margin involute, base and limb not differentiated, 16–20 × 12–15 cm, base within with very shallow, interconnected ridges, apex narrowly acute. Spadix emitting a strong cheesy smell, shortly stipitate, longer than spathe, 20–28 cm; female zone cylindrical or slightly obconic, 1.8–2.2 × 1–1.3 cm, distal limit irregular, flowers congested; ovary bright pale green with tiny reddish purple dots near stigma, very broadly ovoid, 2–2.3 × ca. 2 mm, rounded in cross section, 1-loculed, ovule on a heavy placenta, running on one side to apex of ovary; style absent; stigma acroscopic on ovary, pale dirty yellowish, ± reniform, ca. 1 × 0.8 mm, very thin, scaberulose; male zone fusiform or fusiform-obconic, 2–3 × 1.2–1.5 cm, proximal and/or distal limit irregular, flowers congested; stipe ca. 2 mm; appendix 16–23 cm, basal part 1–1.7 cm in diam., distal part ca. 4 mm in diam., narrowly fusiform, upper half tail-like and horizontal, flexed or nearly erect, apex obtuse, all ± cream-colored with a faint bright greenish hue, base with flattened staminodes separated by shallow grooves, distally diminishing, remainder glabrous; male flowers consisting of ca. 4 stamens; stamens 1.5–1.8 mm; filaments whitish, ca. 0.3 mm, basally connate; anthers dark pink to purplish, 1.2–1.5 × ca. 1 mm, truncate, pores elongate, apical; pollen irregular, in tetrads, psilate to verrucate.

Secondary forests; below 1100 m. SE Yunnan [N Vietnam].

6. *Amorphophallus henryi* N. E. Brown, J. Linn. Soc., Bot. 36: 181. 1903.

台湾蘑芋 tai wan mo yu

Amorphophallus nimurae Yamamoto.

Tuber dark brown, depressed globose, 2–6 cm high, 3–11 cm in diam., weighing up to 500 g, seasonally producing several globose offset tubers, these 0.5–1 cm in diam. Leaf solitary; petiole dull or moderately glossy, mid- or dark green with several ± oval or irregular, whitish spots, with or without numerous small, white dots in between, 30–60 cm, near base 1–2 cm in diam., glabrous; leaf blade moderately or highly dissected, 30–100 cm in diam.; rachises narrowly winged; leaflets abaxially

pale green, adaxially mid- or dark green, dull or glossy, margin at first reddish pink, later usually turning green or whitish, elliptic-ovate, elliptic, or lanceolate, 4–26 × 1.5–5.5 cm, apex acuminate or long acuminate; major veins strongly impressed. Inflorescence solitary, shortly pedunculate; peduncle colored as petiole, 4–20 × 0.8–1.5 cm, lengthening in fruit. Spathe strongly convolute at base, outside glossy pale green, with or without a purplish flush, with or without a few small, paler spots; inside dark maroon, near constriction dirty whitish or greenish purple, campanulate, constricted between base and limb, broadly triangular-ovate, 9–25 × 8–23 cm, thickly walled, apex acute or obtuse; limb horizontal, irregularly wavy, outside pale green, with a variable, pinkish purplish hue, maroon near margin, inside dark maroon, dull or glossy, near margin greenish or pale purplish, base within densely covered with large, irregular verrucae; venation strongly impressed. Spadix producing a smell of decaying meat or cow dung at female anthesis, sessile, longer than spathe, 20–52 cm, female and male zones contiguous or separated by a short (ca. 0.5 cm) (partly) sterile zone; female zone cylindrical or slightly conic, 1.5–4 cm, 2–3 cm in diam. (including styles), flowers congested or all or partly ± remote; ovary: base or larger part greenish, rest dark purple, depressed, orbicular or suborbicular in cross section, 1.5–3 mm high, 2–3(–4.5) mm in diam., 2-loculed, with 1 basal ovule per locule; funicle long, strongly coiled; style brownish purple or blackish, 2–3 mm, slender, 0.8–1.2(–1.5) mm in diam.; stigma grayish purple, large, orbicular or oval in cross section, 0.8–1.5 mm high, ca. 2 mm in diam., 2- or 3(or 4)-lobed, densely scabrous-papillate; lobes conic, obtuse or subacute; sterile zone with variously transformed male flowers (staminodes), sometimes intermixed with a few sterile remnants of bisexual flowers, often accompanied by all possible transitional stages from adjacent zones; appendix pale or dark brown, narrowly fusiform, 15–42 cm, 1.4–3 cm in diam. near base, 1.8–4 cm in diam. ca. 1/3 from base, oval in cross section, thinly walled and hollow after anthesis, apex ± obtuse or acute, with regular or irregular, shallow, strongly wrinkled and/or with elongate depressions, these in basal half of appendix with or without a short, pale or dark purplish or whitish hair (0.5–2.5 mm); sterile flowers (when present) between male and female zone either pale green or purple, to 5 mm, hairlike, or reduced bisexual flowers, these consisting of a reduced pistil surrounded by several stamens; male zone ± obconic, 1.5–4.5 cm, 0.9–1.9 cm in diam. at base, 1.5–3.5 cm in diam. at apex, flowers congested or proximal ones distant, free or in distal part fused into low-angled spirals; male flowers consisting of (2 or)3–6 stamens; stamens ivory-white, oval in cross section, ca. 2 × 1.8 mm; filaments ca. 1 mm, basally connate; anthers ca. 1 mm, truncate or rostrate (elongation of connective); connective minutely verrucate, after anthesis more strongly rostrate by differential shrinking of lateral sides of anthers; pores apical, elongate prior to anthesis, oval at anthesis, opening by deepening of lower margin, after anthesis ± laterally displaced. Berries blue or violet, elliptic.

- Broad-leaved forests, mixed forests, bamboo plantations, orchards, in heavily to lightly shaded places, on thin soils on limestone bedrock or in karst areas; sea level to 700 m. Taiwan.

7. *Amorphophallus hirtus* N. E. Brown, J. Linn. Soc., Bot. 36: 181. 1903.

密毛薯芋 mi mao mo yu

Tuber whitish, turning grayish brown upon exposure, globose or depressed globose, 2–9 cm high, 3–15 cm in diam., weighing up to ca. 1500 g, seasonally producing numerous thin, rhizomatous offset tubers, these to 3 × ca. 1 cm. Leaf solitary; petiole dark green with numerous tiny, blackish green spots or with larger, ± diamond-shaped, pale grayish green spots, these filled with numerous dark green, elongate dots, 20–100 cm, 1–2.6 cm in diam. at base, turgid, glabrous; leaf blade 30–120 cm in diam., highly dissected; rachises only in distal half of blade winged, wings sinuous; leaflets adaxially dark emerald green with a pinkish violet margin, ± obovate or elliptic-oval, 5.5–11 × 2.5–4.5 cm, ± fleshy, long acuminate; venation impressed adaxially. Inflorescence solitary, long pedunculate; peduncle colored as petiole, 38–125 cm, 1–4 cm in diam. at base. Spathe strongly convolute at base, outside pale green, faintly flushed with purple or dark grayish green with numerous pale whitish green spots, proximal ones confluent, veins dark green, inside blackish maroon, campanulate, constricted between base and limb, broadly triangular, 13–53 × 12–45 cm, covered with numerous shortly ridgelike, laterally compressed, fleshy warts, base obliquely urceolate, thickly walled, apex acute; limb horizontally spreading or obliquely upturned, outside pale green, flushed with purple-brown or dark grayish green with angulate, whitish green spots and margins dirty purple, without spots, inside ± maroon, flushed with green or with numerous small, rounded, sometimes confluent, whitish greenish spots, veins maroon, margin undulate. Spadix emitting a strong smell of old socks or strong compost, ± stipitate, much longer than spathe, 31–88.5 cm, stipe 0.2–1 cm, female and male zones separated by a narrow sterile zone; female zone slightly obconic or cylindrical, 1.6–6.5 cm, 1.1–3.5 cm in diam. at base, 1.2–3.7 cm in diam. at apex, flowers lax; ovary: basal half white, apical half blackish maroon, ± globose, ca. 2.5 mm high, ca. 2.5 mm in diam., orbicular in cross section, ± gradually tapering to style, 2-loculed, with 1 basal ovule per locule; style maroon, thick, ca. 1 × 1.5 mm; stigma ± pyramidal, orbicular in cross section, ca. 1.8 mm high, ca. 2.5 mm in diam., shallowly 2(or 3)-lobed, lobes pale olive-green, rounded, scabrous; sterile flowers between male and female zone consisting of 1–7 staminodes, these consisting of a swollen, often depressed, white base and a purple hair 5–10 mm; male zone urceolate, terete or slightly laterally compressed, distal margin straight or very irregular, 3–9 cm, 0.9–3.7 cm in diam. at base, 2–7 cm in diam. at apex, flowers congested, with scattered, purple hairs between; male flowers consisting of 3–6 stamens; stamens very shallowly hemispheric, ca. 2 mm, some uppermost stamens intermediate with hairs on appendix, carrying a short hair on connective or reduced to a slightly concave, broad base, carrying a hair (staminode); filaments short, ca. 0.5 mm, connate; anthers ca. 1.5 × 3–3.5 mm, polygonal in cross section, apex very shallowly rounded, ivory-white, producing a clear fluid from top during female anthesis; connective brownish; pores apical, elongate, oval after anthesis; appendix very narrowly conic, 25.5–73 cm, 2–7 cm in diam. at base, entirely purple or with numerous dirty greenish, small spots, with numerous laxly disposed hairs, these directed perpendicular to appendix axis, 0.2–1.5 cm, purple, in shallow pockets, base not swollen, apex obtuse, producing a clear fluid during female anthesis.

• Dense grasslands; below 100–100 m. Taiwan.

8. *Amorphophallus kachinensis* Engler & Gehrmann, Pflanzendr. 48(IV. 23C): 91. 1911.

勐海魔芋 meng hai mo yu

Amorphophallus bannaensis H. Li.

Tuber brown, depressed globose, 3–5 (or more) cm high, 5–30 cm in diam., developing offsets; offsets incompletely known but probably rhizomatous. Leaf solitary; petiole dirty white with dark green to reddish brown spots, ca. 20 cm (?or longer), glabrous; leaf blade to 100 cm in diam.; leaflets elliptic, 6–9 × 2–3 cm, acute-acuminate. Inflorescence solitary, long pedunculate; cataphylls 9–20 cm; peduncle ivory-white, grayish, or greenish with brown or purple blotches and greenish patches, 24–80 cm, 0.7–1 cm in diam. at base. Spathe shortly convolute at base, outside green or greenish brown with green spots or purplish red stripes and spots, apex purple, concave, 8–29 × 7–14 cm, base inside with scattered, shallow, punctiform warts. Spadix emitting an unpleasant, rancid smell, much shorter than spathe, 6.5–18 cm; stipe 0.2–1 × 0.4–1 cm; flowers unisexual; female zone slightly obconic or cylindrical, 1.3–5 × 0.6–1.4 cm, flowers congested, proximal ones often more loosely arranged; ovary dark purple, globose or subpyriform, after anthesis (?fertilization) articulate to style, ca. 2 mm high, ca. 1.5 mm in diam., 1-loculed, with 1 basal, anatropous ovule; style strongly curved, dark purple, 1–2 mm, slender; stigma superficial, semi-globose, triradiate or flattened, subapical, often transversely expanded beyond style and subbilabiate, ca. 0.4 mm high, 0.7–1 mm in diam., verrucate, verrucae sometimes elongate and “catcher”-like; male zone obconic, occasionally fusiform, base often constricted, flowers congested, 2–4 × 1.2–3 cm; male flowers consisting of 3–6 stamens; stamens ca. 3 mm; filaments ca. 2 mm, basal half connate, occasionally entirely connate; anthers white, 1–1.5 × ca. 0.8 mm, apex subtruncate; pores apical to sublateral, marginal, elongate; appendix stipitate, occasionally sessile, dirty white, ovoid or conic, occasionally nearly globose, 5.5–7 × 2–4 cm, often with a few deep, longitudinal grooves or with a few shallow folds, glabrous, base constricted, apex truncate, rounded, or rarely acute; stipe 0.3–1.5 × 0.8–2 cm. Fl. Mar–May.

Dense climax forests, on limestone rocks; 1000–1500 m. S and W Yunnan [Laos, N Myanmar (Kachin State), N Thailand].

9. *Amorphophallus kiusianus* (Makino) Makino, Bot. Mag. (Tokyo) 27: 244. 1913.

东亚魔芋 dong ya mo yu

Amorphophallus konjac K. Koch var. *kiusianus* Makino, Bot. Mag. (Tokyo) 25: 16. 1911; *A. hirtus* N. E. Brown var. *kiusianus* (Makino) M. Hotta; *A. sinensis* Belval.

Tuber depressed globose, to ca. 20 cm in diam., to ca. 12 cm high, [no offset development (Japanese specimens) or] with a few sessile, globose offsets (mainland Chinese specimens). Leaf solitary; petiole glossy, dirty olive-green or grayish green, with narrowly oval or irregular whitish or very pale greenish spots and numerous tiny dark green dots, to ca. 65 × 4 cm, glabrous; leaf blade 60–90 cm in diam., rachises winged, distal

from basal main branchings; leaflets adaxially bright green with a narrow pale violet margin, narrowly elliptic to lanceolate, 6–20 × 3–4.5 cm, margin undulate, apex moderately to long acuminate. Inflorescence solitary, long pedunculate; peduncle colored as petiole, 40–100 cm (in fruit to ca. 120 cm), 1.5–4 cm in diam. Spathe outside dark greenish, greenish pinkish, or glossy dark purplish brown, with small, whitish spots, margin with a narrow, reddish violet line, inside pale pinkish with a purplish base, purplish and greenish, or entirely dark brown, with or without a greenish margin, latter sometimes flushed pinkish, sometimes only medially pale green, otherwise with rounded, whitish spots, base outside dark green or dark greenish brown, with small, rounded whitish spots and blackish green veins, triangular, base rounded, 9–25 × 4–13 cm, shallowly or clearly constricted between base and limb; limb at first oblique, then reflexing and bending downward, margin reflexed or undulate; base within dark purple and with numerous ± distant, conic warts, occasionally with small, whitish spots. Spadix sessile or subsessile, shorter than, equal to, or longer than spathe, 9–22 cm; female zone slightly conic, 1–4 × 0.5–2 cm; ovary bright pale green, ± obovoid, angulate in cross section, ca. 2.5 mm high, ca. 2 mm in diam., 2-loculed; style bright pale green or dark brown, nearly absent, ca. 0.2 × 1 mm, bifurcate at apex; stigma pale greenish gray, shallowly or distinctly 2-lobed-sinuuous, slightly oval in cross section, ca. 0.8 mm high, ca. 1.5 mm in diam., minutely papillate; staminodes between male and female zone isolated or in groups of 2–4, or together with functional stamens as part of lowermost male flowers, consisting of a highly reduced stamen and a long, brown hair on connective, those in groups often forming one common disciform base with grooves corresponding with limits of defunct stamens, those on appendix consisting of only a brown hair and each from a shallow depression; male zone cylindrical or slightly obconic, 2.5–4.5 × 0.5–2 cm; male flowers consisting of 4 or 5 stamens; stamens pale yellow, ca. 1.5 mm; filaments ca. 0.5 mm, entirely connate; anthers subtruncate or truncate, mostly subrectangular in cross section, 1–2 × ca. 1 mm; connective brownish; pores apical, elongate; appendix fusiform-conic or narrowly fusiform, 4–16 cm, 1–3 cm in diam. near base, apex acute or obtuse, entirely blackish or with scattered, tiny green spots, or entirely dark greenish, glossy, glabrous or with shallow depressions, base grooved, otherwise naked or with scattered, thin, violet-brown hairs, emerging from depressions, these to ca. 1 cm; pollen striate-areolate, released in strings. Inflorescence with dried spathe base sometimes remaining, cylindrical, 5–22 × 3–4.5 cm. Berries glossy, at first bright green, turning pinkish purple and finally deep blue, rounded or oval, ca. 1 × 0.8–1 cm, 2-seeded. Seeds oval in longitudinal section, flattened on one side, ca. 8 × 6 × 4 mm; testa black, moderately glossy, minutely rugulose. Fl. Apr–Jun, fr. May–Jul.

Shaded, semishaded, or sun-exposed places, plantations, secondary forests, mixed bamboo and broad-leaved forests, orchards; 300–900 m. Anhui, Fujian, Guangdong, Hunan, Jiangxi, Taiwan, Zhejiang [S Japan].

10. *Amorphophallus konjac* K. Koch, Wochenschr. Gärtnerei Pflanzenk. 1: 262. 1858.

花魔芋 hua mo yu

Amorphophallus mairei H. Lévillé; *A. nanus* H. Li & C. L. Long; *A. rivieri* Durieu ex Riviere; *Brachyspatha konjac* (K. Koch) K. Koch; *Hydrosme rivieri* (Durieu ex Riviere) Engler; *Proteinophallus rivieri* (Durieu ex Riviere) J. D. Hooker.

Tuber brown, slightly glossy, depressed globose, to ca. 20 cm high, to ca. 30 cm in diam., seasonally producing numerous long rhizomatous offsets with swollen apical part, these to ca. 50 × 3 cm. Leaf solitary; petiole background color dirty whitish pinkish or dirty cream-colored, often nearly entirely covered by large, elongate, dark green confluent spots and smaller white dots, or with numerous small, blackish green spots, very variable, to ca. 100 × 8 cm, glabrous or with scattered punctiform warts at base; leaf blade highly dissected, to ca. 200 cm in diam., rachises narrowly winged; leaflets dull green adaxially, elliptic, 3–10 × 2–6 cm, acuminate. Inflorescence long pedunculate (rarely short); peduncle colored as petiole, to ca. 110 × 5 cm. Spathe outside base dirty pale brownish with blackish green spots, or dirty pale whitish grayish with a few scattered blackish green dots, near margin flushed with purple; inside base maroon with or without a paler whitish purplish zone above, elliptic-lanceolate to broadly ovate-triangular, 10–60 × 10–55 cm, base and limb ± separated by a shallow constriction, margin ± strongly sinuous, apex acute; base within densely verrucate, verrucae tiny, punctiform; limb erect, outside uniformly dark purplish brown, or with scattered blackish green spots, inside uniformly dark brown, glossy, undulate and/or longitudinally folded, basal margin spreading. Spadix during female anthesis producing a strong smell of rotting meat and producing small, clear, slightly viscous droplets, sessile, 15–110 cm; female zone cylindrical or narrowly conic, 2–11 cm, 1–4 cm in diam. at base and to ca. 6 cm in diam. at apex, flowers congested or distant; ovary whitish or pale pinkish, apex purplish, depressed globose, oval or suborbicular in cross section, 2–2.5 mm high, 2–4 mm in diam., 2- or 3-loculed; style purplish, 1–5 mm, ± slender, 0.7–1 mm in diam., often distinctly branched at apex; stigma dirty yellowish brown, depressed, strongly undulate, often sunk between enlarged style branches, 2- or 3(or 4)-lobed, oval or triangular in cross section, ca. 0.5 mm high, 1.5–2 mm in diam., verruculose-scabrous; transitional zone between female and male zones occasionally with partly staminodal male flowers and/or pistillodial female flowers or flowers showing all intermediate stages; male zone cylindrical, slightly fusiform, or slightly obconic, 2–12 × 1–6 cm, flowers congested; male flowers consisting of 3–5 stamens; stamens 2–2.5 mm; filaments pale orangish yellow or whitish, 0.5–1 mm, basally or entirely connate or slightly diverging at apex; anthers dirty whitish grayish, or ± cream-colored, truncate or subtruncate, 1–1.5 × 0.8–2 mm, rectangular in cross section; connective purplish, turning grayish at anthesis, slightly raised; pores apical, oval or reniform; appendix narrowly fusiform-conic, often laterally compressed and with irregular, shallow longitudinal furrows, 10–85 × 1.5–6 cm, acute, dark purplish brown or paler, densely rugulose, base often with several diamond-shaped, flattened staminodes. Fl. Apr.

• Open situations or forest margins and thickets, secondary forests; 200–3000 m. Yunnan.

The species occurs wild in Yunnan; other occurrences are re-

garded as plants escaped from cultivation. It is an important crop plant, also cultivated in Japan.

11. *Amorphophallus krausei* Engler, Pflanzenr. 48(IV. 23C): 94. 1911.

西盟魔芋 xi meng mo yu

Amorphophallus sutepensis Gagnepain; *A. ximengensis* H. Li.

Tuber dirty pale yellowish, brownish, or orangish, yellow inside, globose, sometimes slightly subcylindric, with a deep central depression, 4–8 cm high (or more), 5–25 cm in diam., weighing up to 750 g (?or more), seasonally developing several offsets; offsets rhizomatous, long and thin, 2–27 × 0.4–1 cm, apically slightly thickened or not. Leaf solitary; cataphylls 3, to 25 cm, proximally pale pink, distally grading into off-white, covered with pale blackish green, elongate spots; petiole background color pale green, at base often pale pink or with a reddish brown or reddish hue, with many smaller and larger, partly or nearly entirely confluent, elliptic to narrowly elliptic, blackish green or paler green or rarely reddish brown spots and several small, white dots, intensity of color and extension of pattern variable, 20–190 cm, 1–5 cm in diam. at base, glabrous; leaf blade 100–200 cm in diam.; rachises broadly winged; leaflets paler green abaxially, green or grayish green adaxially, lanceolate to elliptic-lanceolate, more rarely elliptic, 11–48 × 2–11 cm, base decurrent, apex acuminate. Inflorescence solitary; peduncle colored as petiole but smaller, 25–100 cm, 0.8–2 cm in diam. at base. Spathe erect, convolute at base, outside pale green, toward base slightly darker, inside pale yellowish green, base sometimes ± maroon, cymbiform, ovate to ovate-lanceolate, 11–40 × 6–26 cm, basal convolute part 4–6 cm, base inside with many small, slightly elongate or irregularly ridge-shaped warts, apex acute-acuminate. Spadix developing considerable heat at female anthesis and producing a heavy, gaseous, nauseating stench, yellowish white or pale green, nearly as long as spathe, rarely distinctly shorter or slightly longer, 8–35 cm; flowers unisexual, naked; female zone cylindrical or slightly obconic, 0.6–5 cm, 0.6–2.3 cm in diam. (including styles), flowers congested; ovary pale green, occasionally pale magenta-purple near style base, globose or slightly depressed, 1.5–2 mm high, 2–2.5 mm in diam., 1-loculed (rarely ?2-loculed), with 1 basal ovule; style green or magenta-purple, cylindrical or conic, 1–2 mm; stigma globose or semiglobose, ca. 1 mm in diam., entire or with a shallow central depression or shallowly 2- or 3-lobed; lobes pale yellowish white, yellow, or brownish, rounded, scabrous, margin sinuous; sterile zone between female and male zones rarely absent, cylindrical, 0.6–2 × 0.8–1.8 cm, staminodes congested; appendix fusiform or fusiform-conic, sometimes slightly laterally compressed, 3–17 × 0.9–5 cm, sometimes with a small stipelike part, glabrous, apex rounded or ± acute, base occasionally stipelike, at base sometimes with a few rounded staminodes or staminodal remnants, separated by small grooves; staminodes often with a droplet as on connectives at female anthesis, ivory-white or creamy orange, occasionally flushed with pale purple, ovate or diamond-shaped in cross section, semiglobose, 1–4.5 × 1–3.1 mm in cross section; male zone cylindrical-fusiform or slightly obconic, sometimes slightly laterally compressed, 3.5–13 × 0.8–3 cm, flowers congested;

male flowers consisting of (1–)3 or 4(or 5) stamens, ivory-white; stamens 2–2.2 mm high; filaments short, 0.75–1 mm, thick, connate, in lowermost flowers greatly enlarged and with reduced thecae, grading into staminodes; anthers with a rounded apex or subtruncate, 1–1.3 mm high, 1–1.75 mm in diam.; pores apical, elongate; connectives often with a clear, slightly sticky droplet at female anthesis. Infructescence cylindrical, ca. 10 cm. Berries 1-seeded (rarely ?2-seeded), bright red, ca. 1 cm. Seeds silvery gray with small, black dots, elliptic-ovoid, 6–9 × 3–5 mm. Fl. Jun–Aug, fr. Nov–Dec.

Shaded to open, often fire-prone, places in mixed primary evergreen/deciduous forests and deciduous dipterocarp forests, forest margins, bamboo thickets, on granite bedrock, sometimes near streams, lowlands; below 1500 m. Yunnan [Bangladesh, Laos, N Myanmar, N Thailand].

This species is used as a food resource by ethnic minorities in China (H. Li, J. Wuhan Bot. Res. 6: 212. 1988, under *Amorphophallus ximengensis*).

12. *Amorphophallus paeoniifolius* (Dennstedt) Nicolson, Taxon 26: 338. 1977.

疣柄薯芋 *you bing mo yu*

Dracontium paeoniifolium Dennstedt, Schlüssel Hortus Malab. 13: (21, 38). 1818 [*“paeoniaefolium”*]; *Amorphophallus campanulatus* Decaisne; *A. gigantiflorus* Hayata; *A. microappendiculatus* Engler; *A. paeoniifolius* var. *campanulatus* (Decaisne) Sivadasan; *Arum campanulatum* Roxburgh, nom. illeg. superfl.; *A. rumphii* Gaudichaud, nom. illeg. superfl.; *Candarum rumphii* Schott, nom. illeg. superfl.; *Hydrosme gigantiflora* (Hayata) S. S. Ying.

Tuber dark brown, depressed globose, ca. 20 cm high, to ca. 30 cm in diam., weighing up to ca. 15 kg; root scars prominent, annulate; offsets produced every season, thick and rhizomatous, to ca. 10 × 4 cm. Leaves 1 or 2; petiole background pale to dark green or blackish green, usually with large and small pale blotches and numerous tiny dark dots, large blotches often confluent, especially near base, petiole to ca. 2 m × 20 cm, shallowly corrugate to strongly echinate-verrucate; leaf blade highly dissected, to ca. 3 m in diam.; rachises narrowly or broadly winged almost to base; leaflets abaxially mid-green or pale green, adaxially mid-green, orbicular, oval, ovate, obovate, elliptic, elliptic-oblong, elliptic-lanceolate, or lanceolate, 3–35 × 2–12 cm, apex acuminate. Inflorescence shortly pedunculate; peduncle 3–20 × 1–8 cm, usually paler and more glabrous than petioles. Spathe campanulate, broader than long, 10–45 × 15–60 cm, base and limb often separated by a shallow constriction; limb spreading, background ranging from pale green to dark brown, usually with both large and small, orbicular paler spots, base inside proximal part deep maroon, distal part dirty whitish or very pale pinkish, limb outside as base but with more prominent maroon flushes, especially near margin, limb inside usually glossy dark maroon, strongly undulate, base outside very variable, base within densely verrucate, verrucae variable, mostly conic, fleshy. Spadix giving off a stench of rotting meat, sessile, shorter or longer than spathe, 7–70 cm; female zone cylindrical, 3–25 × 1–12 cm, flowers congested or slightly distant; ovary entirely pale green or largely maroon with a whitish

base, depressed, orbicular in cross section, 1.5–2.5 mm high, 3–5 mm in diam., 2- or 3-loculed; style maroon, 3–15 mm, slender, 1–1.5 mm in diam.; stigma pale or deep yellow, oval or triangular in cross section, large, 3–5 mm high, 4–7 mm in diam., often strongly laterally compressed, then cordate in longitudinal section, verruculose, shallowly or deeply 2- or 3-lobed, lobes rounded or conic, sometimes with a strong groove on outward side; male zone cylindrical or strongly obconic, 2.5–15 cm, 1–10 cm in diam. at base, 1–20 cm in diam. at apex, flowers congested; male flowers consisting of 4–6 stamens; stamens 4–6 mm; filaments ca. 0.5 mm, connate; anthers off-white, cylindrical, 3.5–5.5 × ca. 1.5 mm, subtruncate; pollen psilate; appendix very variable, glossy dark maroon, rarely pinkish or yellow, inflated, globose, depressed globose, ovoid, or triangular-conic (pyramidal), 1.5–30 cm, 1.2–30 cm in diam. (slightly above base), minutely granulate, glabrous or with various folds and/or irregular shallow depressions, base often with flattened, staminodal structures, apex obtuse or ± acute. Infructescence long pedunculate; peduncle stretching strongly after fertilization, 20–100 cm, becoming uniformly tan, with very numerous narrow, transverse cracks; fruiting zone cylindrical, 10–50 × 3–8 cm. Berries closely set or slightly distant, ripening from green through yellow to bright red, elongate, 1.5–2 cm × 8–10 mm. Fl. Apr–May, fr. Oct–Nov.

Secondary conditions, secondary forests or highly disturbed areas, in dappled shade or fully exposed; sea level to 800 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, India, Indonesia, Laos, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands; naturalized in Indian Ocean islands (Seychelles)].

This taxon is extensively cultivated as a tuber crop, serving as an important food for humans and as animal feed.

13. *Amorphophallus tonkinensis* Engler & Gehrman, Pflanzenr. 48(IV. 23C): 87. 1911.

东京薯芋 *dong jing mo yu*

Tuber brown, somewhat glossy, depressed globose, at least 9 cm in diam., root scars slightly raised, no offsets observed. Leaf solitary; petiole uniformly pale green or background pale grayish green with a clear bluish flush near base and on subterranean part, and with whitish spots, these often broader than long, irregularly shaped, and scattered over entire surface with short, longitudinal, blackish dots, these in proximal part often raised, petiole 80–200 × 2.5–7 cm, glabrous, turgid; leaf blade highly dissected, 80–200 cm in diam.; rachises winged only distally from basal main branchings, sometimes some nodes swollen and forming intercalary bulbils; leaflets elliptic-lanceolate to lanceolate, 8.5–24 × 3.5–6 cm, long acuminate. Inflorescence solitary, long pedunculate; peduncle colored as petiole, 22–50 cm (but probably longer), ca. 1 cm in diam. Spathe (all dimensions based on relatively small specimens) shortly convolute at base, erect or arching over spadix apically, outside green with a few transverse, whitish spots, inside whitish green with small, punctiform or slightly elongate verrucae, oval, 8–20 × 5–17 cm, strongly concave; outside limb dark green with an obscure blackish purplish flush and a few scattered, small whitish dots, inside bright green with a few small, whitish spots. Spadix sessile, shorter than or nearly as long as spathe,

7.5–17 cm; female zone cylindric or slightly obconic, 1–1.5 × 1–2 cm, flowers congested; ovary bright pale green, depressed globose, ca. 2 mm high, 2.5–3 mm in diam., 2-loculed; style whitish, straight, short, 0.8–1 × ca. 0.8 mm; stigma dirty pale yellowish brownish, depressed, large, ca. 1.5 mm high, 2–2.5 mm in diam., orbicular or oval in cross section, verruculose, entire, with an acroscopic shallow depression, or shallowly or distinctly 2-lobed, lobes rounded; male zone slightly or strongly obconic, 1.5–4 cm, 1.5–2 cm in diam. at base, 1.6–3 cm in diam. at apex, flowers congested; male flowers consisting of 4 or 5 stamens; stamens 3–3.5 × 1–1.5 mm; filaments ca. 1.5 mm, connate; anthers 1.5–2 mm, truncate; pores apical or subapical, elliptic, small, with a groove running from every pore to margin of anther; connective large, raised; appendix conic, oval-elliptic, or narrowly fusiform, 4.5–12 × 2.2–5 cm, obtuse, white, with many shallow, often longitudinally confluent depressions and with or without scattered, tiny, punctiform pustules, base with sterile stamens, gradually merging to form appendix wall. Fl. May.

Dense tropical forests, moist shaded places; 800–900 m. SE Yunnan [N Vietnam].

14. *Amorphophallus yuloensis* H. Li, J. Wuhan Bot. Res. 6: 211. 1988.

佻乐藜芋 *you le mo yu*

Tuber depressed globose, to ca. 10 cm in diam., without offset development. Petiole uniformly olive-green to pale green, 10–75 × 0.5–2 cm, smooth; leaf blade pale green abaxially, mid green adaxially, 10–100 cm in diam.; rhachises winged distally from basal branchings, central branching point and several more distal nodes becoming intercalary bulbils, producing new plants after detachment; leaflets elliptic to elongate elliptic, 2–25 × 2–10 cm, apex acuminate, veins impressed adaxially. Peduncle dark olive-green with fine, darker, short striations/spots, ca. 10 cm × 8 mm, glabrous. Spathe erect, outside base pale greenish with small, blackish green dots, center very pale pinkish with similar dots, distally dirty creamish with scattered, grayish black dots, inside base pale pink with numerous white verrucae, distal part dirty cream, concave, broadly ovate, ca. 11 × 10 cm, margins incurved, obtuse; spathe on second day open to base. Spadix sessile, shorter than spathe, ca. 8.5 cm; female zone cylindric, distal margin very irregular, 1–2 × ca. 1.3 cm, flowers congested or just touching; ovary depressed, orbicular in cross section, 2–2.5 mm high, ca. 4 mm in diam., pale green with very thin, scattered pinkish, short stripes in apical half, 2-loculed, with 1 basal ovule per locule; style ivory-white, short but distinct, ca. 0.8 × 1.1 mm; stigma pale dirty yellow, disciform, rounded in cross section, ca. 1 mm high, ca. 2.5 mm in diam., densely verrucate, with a shallow central depression; male zone slightly fusiform, 2.5–4 × ca. 11.5 cm, flowers mostly separated but distally congested, occasional flowers transformed into conic-pyramidal staminodes; male flower consisting of (2 or)3(or 4) stamens; stamens ca. 2 mm; filaments ivory-white, ca. 0.8 mm, basally connate; anthers dirty ivory-white, truncate, ca. 1 × 2 mm, rectangular in cross section; pores apical, elliptic; staminodes representing one stamen each; appendix ivory-white, broadly conic, massive, 3.2–4 × ca. 1.8

cm, glabrous, base irregular, apex obtuse. Fr. Jun.

• Dense primary evergreen valley forests on limestone; 200–2400 m. Yunnan.

15. *Amorphophallus xiei* H. Li & Z. L. Dao, Novon 16: 240. 2006.

谢君藜芋 *xie jun mo yu*

Tuber dark brown outside, pink inside, depressed globose, 7–8 cm high, ca. 16 cm in diam., root scars not swollen, without offset development. Leaf solitary; petiole pink at base, green to deep green apically, sometimes with some inconspicuous, paler, rhombic, linear, or irregular spots with a dark center or with scattered very small, dark green dots, 60–80 cm, glabrous; leaf blade 60–120 cm in diam.; leaflets pale abaxially, green adaxially, elliptic, to ca. 23 × 8 cm, apex acuminate; main branching points in leaf blade with an epiphyllar bulbil, these brown, depressed globose to subglobose, to 3 cm in diam. Inflorescence solitary; peduncle colored as petiole, to 18 × 1.3–1.5 cm. Spathe almost erect, outside very pale whitish pinkish with scattered punctiform dark brown dots, with purple base, and margin sometimes reddish, inside dark pink, campanulate, ca. 18 × 10 cm, base minutely verruculose. Spadix sessile, longer than spathe, 23–24 cm; flowers unisexual, naked; female zone cylindric, 4–4.5 × 1.5–2 cm, flowers congested; ovary pink to reddish pink, obconic, ca. 3 mm high, ca. 2 mm in diam., 1-loculed; style almost absent; stigma nearly sessile, yellow, strongly depressed, disciform, ca. 0.5 mm high, ca. 3 mm in diam., wider than ovary, slightly 5- or 6-lobed to irregularly 8-lobed; male zone cylindric or slightly obconic, 6.5–7 × 2.6–3.7 cm; male flower consisting of 4 or 5 stamens; stamens almost entirely free, ca. 2 × 1.5 mm; filaments ca. 1 mm; anthers off-white with a pinkish apex, truncate, ca. 1 mm; pores apical, slightly elongate; appendix off-white or pale pink, fusiform-conic, laterally compressed in larger individuals, ca. 11 × 5 cm, smooth. Fruit red when mature, ovoid, ca. 1.5 cm × 5 mm. Fl. Apr, fr. May–Nov.

• Forest margins, tropical thickets; 900–1100 m. W Yunnan (Longchuan).

This species is cultivated as a food crop in the valleys of the Nanwan and Husa rivers of the Irrawaddy system.

The species status of *Amorphophallus xiei* is doubted by one of us (Hettterscheid). It differs only in color from *A. bulbifer* Blume (N, NE, and S India), an otherwise variable species forming a close relationship with *A. muelleri* Blume (NE India, N Thailand southward to the lesser Sunda islands of Indonesia). Both species also produce the same epiphyllar bulbils unique in *Amorphophallus*. Molecular analysis indicates that *A. xiei* is most closely related to *A. bulbifer*, if not just a somaclonal variant of it (both *A. bulbifer* and *A. muelleri* are apomicts with $2n = 39$) taken up for cultivation and possibly escaped to non-agricultural terrain.

16. *Amorphophallus yunnanensis* Engler, Pflanzenr. 48(IV. 23C): 109. 1911.

滇藜芋 *dian mo yu*

Amorphophallus kerrii N. E. Brown.

Tuber dark brown, white or yellow inside, depressed globose, to 9 cm high, to 13 cm in diam., weighing up to 500 g, root scars with an annular thickening, seasonally developing several offsets; offsets sessile, rounded or elliptic, ca. $2.5 \times$ to 1.2 cm. Leaf solitary; cataphylls 3, dark grayish green, largely covered with pale pinkish, rhombic spots, 6–35 cm; petiole medium to dark olive-green or dark olive-brown with several rhombic or narrowly elliptic, pale whitish greenish spots, 10–80 cm, 0.5–2.5 cm in diam. at base, glabrous; leaf blade highly dissected, to 190 cm in diam.; rachises broadly winged except below basal branching points, basal branching points sometimes developing intercalary bulbils after disturbance; leaflets abaxially paler, adaxially dark green, often with a bluish sheen when young, margin often narrowly violet, elliptic, $10\text{--}40 \times 5\text{--}13$ cm, base broadly decurrent, apex acuminate. Inflorescence solitary, long pedunculate; cataphylls as with leaf; peduncle colored as petiole, 13–60 cm, 1–2 cm in diam. at base. Spathe shortly convolute at base, erect, concave, arching over spadix, outside white or pale greenish white, rarely dark green, sometimes near base with paler, occasionally ringlike spots, or sometimes flushed with pale pinkish, margin sometimes lined pinkish, inside pale greenish white without spots; limb outside dirty creamish, sometimes with faint spots, margin sometimes pale pinkish violet, inside \pm cream-colored or pale greenish white, margin sometimes pale pinkish violet, broadly ovate, $9\text{--}29 \times 4\text{--}20$ cm, inside base glabrous or with a few scattered, punctiform warts, apex obtuse or acute. Spadix creamy white or pale pinkish, much shorter than spathe, 3–18 cm; stipe pale green with whitish spots, 0.5–2.5 cm; flowers unisexual; female zone cylindrical, slightly conic or obconic, $0.8\text{--}3.5 \times 0.5\text{--}2$ cm, flowers congested but in proximal part sometimes loosely arranged; ovary green, pale green, brownish green, or purplish, near style insertion sometimes dirty creamish, globose, subglobose, or depressed, orbicular or angulate in outline, 2–2.5 mm high, 2–4 mm in diam., 2-loculed; style straight or curved, green or dirty pale pinkish, narrowly to broadly conic, base (articulation) thickened, $1\text{--}2.5 \times 0.3\text{--}1$ mm; stigma pale yellowish or dirty brownish, variable, usually distinctly broader than style diam., disciform to subhemispheric, more rarely superficial, punctiform, orbicular or oval in outline, with a shallow central depression to clearly 2-lobed, verrucate; lobes rounded, 0.4–0.6 mm high, 0.6–1.2 mm in diam.; male zone conic or fusiform-cylindric, rarely obconic, sometimes (partly) laterally compressed, $1\text{--}4 \times 0.6\text{--}3.5$ cm, flowers congested; male flowers consisting of 3–5 stamens; stamens 3–3.5 mm; filaments 0.5–2 mm, basally or up to $2/3$ of length connate; anthers creamy white, $1.5\text{--}3 \times 1\text{--}2$ mm; connectives flat or with a ridgelike extension, perpendicular to long axis, either small or very large, maroon or dark brown; pores apical, elongate; appendix ovoid, conic, or triangular-ovoid, rarely subcylindric,

inflated or strongly laterally compressed, $3\text{--}11 \times 1.5\text{--}5$ cm, glabrous or verruculose, rarely entirely echinate, often with a few longitudinal shallow or deep, broad folds, or irregularly folded throughout, base strongly truncate, apex obtuse, rarely acute, usually with a few broadly conic staminodes. Infructescence cylindrical or subglobose, $4\text{--}11 \times 3.5\text{--}5$ cm, dried male zone and appendix often remaining, as well as dried spathe. Berries 1- or 2-seeded, at first green, at maturity turning blue and finally violet, at apex with dried style and stigma remaining. Fl. Apr–May.

Shaded places in primary evergreen or mixed evergreen/deciduous forests, on metamorphic bedrock, in rich soils, or secondary forests, thickets, forest margins; 100–3300 m. Guangxi, Guizhou, Yunnan [Laos, N Thailand, N Vietnam].

Fl. China 23: 23–33. 2010.