A New Species of *Amorphophallus* (Araceae) from Yunnan, China

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ABSTRACT. *Amorphophallus xiei* H. Li & Z. L. Dao (Araceae), described here as new, is endemic to Yunnan Province, China, where it is locally esteemed as a food plant. The new species is illustrated and distinguished from *A. yuloensis* H. Li and *A. muelleri* Blume, to which it is most closely related.

Key words: Amorphophallus, Araceae, China, Yunnan.

Amorphophallus Blume ex Decaisne (Araceae) is a genus of perhaps 175 species ranging throughout tropical and subtropical regions of Africa, Madagascar, Asia, and Australasia. Dehong Prefecture, in southwestern Yunnan Province, China, is the home of an apparently endemic *Amorphophallus* species that is gathered by local people as red konjac (红魔芋) because of its red tuber and petiole and purple berries. Beginning in 1998, the local agricultural department introduced this plant to farmers for the development of konjac plantations. At present, the red konjac is a new food crop in Dehong Prefecture, where it is considered the best edible *Amorphophallus*. Surprisingly, however, it has not yet been described scientifically by botanists, a situation we here remedy.

Amorphophallus xiei H. Li & Z. L. Dao, sp. nov. TYPE: China. Yunnan: Dehong Prefecture, Longchuan County, Zhangfeng Town, E side of Nanwan river, in thickets, 900 m, 15 May 2004, *Xie Shi-Qing 110* (KUN). Figure 1.

Amorphophallo yuloense similis, sed folio bulbilis 4 ad 9 inserto, pedunculo elongato, ca. 18 cm longo, spatha spadice breviore, appendice fusiforme, flore masculo stamine unico ornato, stylo inconspicuo, stigmate majore quam ovarium, 5 vel 6-lobato, stellato, bacca purpurea differt.

Tuber 7–8 cm high, ca. 16 cm diam., depressed-globose, dark brown outside, pink inside. Leaf solitary: petiole 60–80 cm, smooth, pink at base, green to deep green distally, sometimes with some inconspicuous white spots; lamina 60–120 cm diam., developing 4 to 7(to 9) bulbils on the upper surface; leaflets to ca. 23 × 8 cm, ± elliptic, acuminate at the apex, green on the upper surface, paler on the lower surface, the main vein green on the upper surface, white on the lower surface; secondary veins numerous (ca. 40 pairs); collective vein ca. 3 mm from the margin; bulbils brown, the central one ca. 3 cm diam. (others smaller), depressed globose with many conic protuberances. Inflorescence solitary: peduncle ca. 18 cm, 1.3–1.5 cm diam., smooth, dark green, containing white latex; spathe almost erect, ca. 18 × 10 cm, campanulate, yellowish brown externally with dark brown dots, purple at the base within, minutely verruculose, and deep pink distally; spadix sessile, 23–24 cm, longer than spathe, the flowers congested; female zone 4–4.5 cm, 1.5–2.0 cm diam., cylindric, yellow; male zone 6.5–7 cm, 2.6–3.7 cm diam., slightly obconical, yellowish white; appendix ca. 11 cm, ca. 5 cm diam., spindle-shaped, conical distally, smooth, pale pink with small brown dots, dark brown distally. Female flowers with the ovary ca. 3 mm, ca. 2 mm diam., obconical, pink, unilocular, ovule 1, anatropous, the funicle erect, very short; style inconspicuous; stigma ca. 0.5 mm high, ca. 3 mm diam., larger than ovary, depressed, slightly 5- or 6-lobed, yellow; male flower with a single stamen, free, ca. 2 mm, ca. 1.5 mm diam. distally, filament ca. 1 mm, anthers ca. 1 mm, truncate, the pores apical, slightly elongate. Fruits ca. 1.5 cm long, 5 mm diam., cylindrical, green-yellow to purple.

Distribution and habitat. Amorphophallus xiei is known only from Longchuan County (southwestern Yunnan), in the valleys of Nanwan and Husa rivers of the Irrawaddy water system. Here it grows at altitudes of 930–1100 m in tropical thickets and at forest margins, and it is cultivated as a new food crop in farmers' plantations with lemons (*Citrus limon* (L.) Burman f.) and sweet potatoes (*Ipomoea batatas* (L.) Lamarck).

Phenology. Amorphophallus xiei flowers in April and May, and fruits from May through November.

This new species is closely similar to *Amorphophallus yuloensis* H. Li (1988), which is also endemic to Yunnan. Both *A. xiei* and *A. yuloensis* have tubers lacking offset development, green petioles (or with a few white spots upward), leaf blades developing bulbils, male flowers consisting of one stamen, and unilocular ovaries with a single ovule; both are distributed in tropical and subtropical areas of Yunnan. However, *Amorphophallus xiei* is different

NOVON 16: 240–243. PUBLISHED ON 26 JULY 2006.

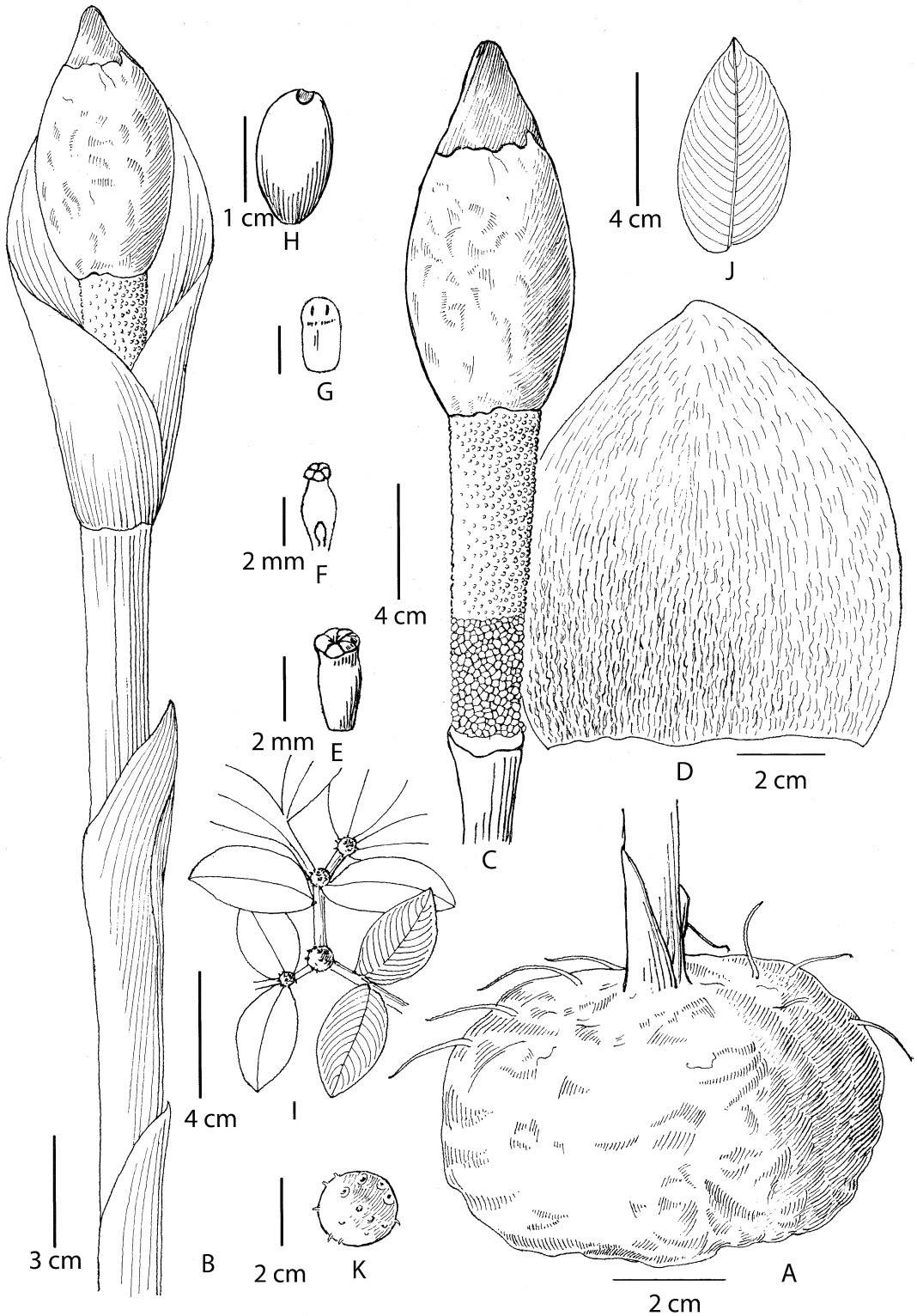

Figure 1. *Amorphophallus xiei* H. Li & Z. L. Dao. —A. Tuber. —B. Inflorescence. —C. Spadix. —D. Spathe (spread). —E. Gynoecium. —F. Gynoecium (longitudinal section). —G. Stamen. —H. Fruit. —I. Part of leaf with bulbils. —J. Leaflet. —K. Bulbil. A–G drawn from type *Xie Shiqing 110* (KUN); H from *Xie Shiqing 117* (KUN); I–K from *Li Heng et al. 458* (KUN).

Table 1. Comparison of *Amorphophallus xiei* and its morphologically related species.

Characters	*A. xiei*	*A. yuloensis*	*A. muelleri*
Tuber color inside	pink	white	yellow
Leaf petiole color	pink at base, green to deep green, without spots, rarely with inconspicuous white spots	uniformly pale green to deep green, without spots or with a few darker spots	green to almost black with numerous large elongate-elliptic, diamond shaped or stripelike, pale green spots, and sometimes with an additional high number of small, pale green spots
Leaf bulbil	4 to 7(to 9)	1	4 and more
Peduncle	ca. 18 cm long	6–7.5 cm	30–60 cm
Spathe form	campanulate, without constricted zone	navicular, without constricted zone	constricted between the tube and limb, tube strongly convolute, limb funnelform
Spathe color	yellowish brown outside, purple at the base within, and pink distally	pale green to pink outside, pale pink at the base within and cream distally	pale green to brownish purple with large white spots outside, dark pink at the base within, and purplish with pale brown oval spots
Spadix	longer than spathe	shorter than spathe	much longer than spathe
Male flower	a single stamen	a single stamen	3 or more stamens
Female flower	ovary unilocular with a single ovule	ovary unilocular with a single ovule	ovary 2- to 3-locular
Stigma	5- or 6-lobed	entire, discoid	
Berry	purple	blue	deep red
Spadix appendix	spindle-shaped	cylindric, conical	long conical
Distribution	southwestern Yunnan, China	southern to central Yunnan, China	tropical Asia: from Andamans through Myanmar, Thailand, to Sumatra, Java

in having 4 to 7(to 9) bulbils on the upper surface of the leaves, the spathe shorter than the spadix, a spindle-shaped spadix appendix, female flowers with the style inconspicuous and the stigma yellow, ca. 0.5 mm high and ca. 3 mm diam., larger than the ovary, depressed, slightly 5- or 6-lobed, and purple fruits (Table 1). Moreover, living plants of *A. xiei* are easily distinguished from *A. yuloensis* by various other characters. The tubers of *A. xiei* are dark brown outside and pink within, but those of *A. yuloensis* are black or dark brown outside and white within; the petioles of *A. xiei* are pink at the base and green to deep green distally (sometimes with some inconspicuous whitish spots), while those of *A. yuloensis* are green, very rarely "with a few darker striations/spots" (Hetterscheid & Ittenbach, 1996: 126).

Both *Amorphophallus xiei* and *A. yuloensis* may be affined to *A. muelleri* Blume by producing bulbils on the leaves and not offset from the tuber, but *A. xiei* and *A. yuloensis* differ by having male flowers consisting of one stamen and female flowers with a unilocular ovary. Moreover, *A. muelleri* has a spadix much longer than the spathe, a peduncle, at 30–60 cm, as long as the petiole, a spathe with "base strongly convolute and slightly or clearly constricted at the top..." (Hetterscheid & Ittenbach, 1996: 102), while the spadix of *A. xiei* and *A. yuloensis* is a little longer than the spathe and shorter than the spathe, respectively, the peduncle is short (ca. 18 cm and 6–7.5 cm), the spathe is campanulate and navicular, slightly convoluted at the base, never constricted between the tube and the limb as in *A. muelleri*. The spathe of *A. xiei* and *A. yuloensis*, which mostly lacks dots or spots on both sides, is also different from that of *A. muelleri*, which is described as having "outside base pale green or pale dirty pinkish with, usually transversely elongate, whitish spots and few small, blackish green dots..." (Hetterscheid & Ittenbach, 1996: 103). See Table 1.

Paratypes. CHINA. **Yunnan:** Dehong Prefecture, Longchuan County, Zhangfeng Town, W side of Nanwan river, *Xie Shi-Qing 111* (MO); Husa Village, *Xie Shi-Qing 112* (KUN); cultivated in an *Amorphophallus* plantation, *Xie Shi-Qing 117* (KUN), *Li Heng et al. 458* (KUN, MO).

Etymology. The species is named in honor of Professor Xie Shi-Qing of the Yunnan Agriculture University (YAU), the director of Institute of Amorphophallus YAU, and the director of Tuberroot Crops Research and Training Center of Southeast Asia, for his friendship with the authors and his fine skills in growing *Amorphophallus*. He also collected many *Amorphophallus* species from China as well as from Myanmar and Laos; furthermore, he helps Yunnan farmers to develop *Amorphophallus* plantations.

Acknowledgments. We thank the reviewers for providing useful remarks and suggestions. Wilbert Hetterscheid (Netherlands) is also thanked for his comments on the manuscript. We are grateful for the assistance and cooperation of Li Rong, Gao Fu, and Jiang Zhu-Tan of the Kunming Institute of Botany (KIB) in the field, Yin Xin-Xiang of the Longchuan County Agriculture Department for discussion about the red konjac, and Ji Yun-Heng (KIB) for his help in preparing this manuscript. The present study was sponsored by the National Science Foundation (U.S.A.) grant DEB-0103795, and the Kunming Institute of Botany, the Chinese Academy of Sciences. We also thank Wu Xi-Lin (KIB) for preparing the illustration.

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