ARPHA Preprints

PENSOFT

PREPRINT

Author-formatted, not peer-reviewed document posted on 10/07/2023

DOI: https://doi.org/10.3897/arphapreprints.e109276

Some notes on section *Sinarisaema* (*Arisaema*, Aroideae, Araceae) in Vietnam and a new species of *Arisaema* from Vietnam

Van Tien Tran, Nguyễn DƯ, Nguyen Thi Van Anh, Hong Truong Luu, Scott Mc Mahan Forrest, Richard Moore

ARPHA Preprints *Author-formatted, not peer-reviewed document posted on 10/07/2023* DOI: https://doi.org/10.3897/arphapreprints.e109276

Some notes on section *Sinarisaema* (*Arisaema*, Aroideae, Araceae) in Vietnam and a new species of *Arisaema* from Vietnam

Tran Van Tien[1], Nguyen Van D[2 &3*], Nguyen Thi Van Anh[2], Luu Hong Truong[4], Scott Forret Mc Mahan[5] & Richard Moore[6]

[1]*Vietnam National Institute of Administration*

[2]*Institute of Ecology and Biological Resources (IEBR) – Vietnam Academy of Science and Technology (VAST), A11-18 Hoang Quoc Viet Street, Cau Giay, Hanoi, Vietnam;*

[3]*Graduate University of Science and Technology – Vietnam Academy of Science and Technology(VAST), 18 Hoang Quoc Viet Street, Cau Giay, Hanoi, Vietnam;*

[4]*Institute of Southern Ecology – Vietnam Academy of Science and Technology (VAST), 18 Hoang Quoc Viet Street, Cau Giay, Hanoi, Vietnam;*

[5]*Atlanta Botanic Garden, Atlanta, Georgia, USA;*

[5]*Royal Botanic Garden Edinburgh, United Kingdom*

*Corresponding author.

Abstract

A new species, *Arisaema ytyense* is described here for the first time, belonging to section *Sinarisaema*. Including the species described here three species from sect. *Sinarisaema* are present in Vietnam. The morphological features of this species are discussed and compared with those belonging to the same section within Vietnam. The authors introduce a species key to Vietnamese *Arisaema* sect. *Sinarisaema* and the ecology, habitat and conservation status of this new species is discussed.

Keywords

New species, *Arisaema*, *Sinarisaema*, Y Ty, Bat Xat, Lao Cai, Vietnam.

Introduction

The genus *Arisaema* Mart. includes about 200 species mainly distributed across Eastern Asia from both temperate and tropical regions as far south as Indonesia and west into the Himalayas with some species occurring in the Arabian Gulf, East Africa and North America (Mayo et al. 1997; Govaerts et al. 2002; Gusman and Gusman 2006; Boyce et al. 2012; Nguyen 2017). Following Gusman & Gusman (2006), the genus *Arisaema* is divided into 14 sections: *Anomala, Arisaema, Attenuata, Clavata, Decipientia Flagellarisaema, Frenchetiana, Lobata, Nepenthoidea, Pedatisecta, Sinarisaema, Tenuipistillata* and *Tortuosa*. The species described here belongs to sect. *Sinarisaema* characterised by having verticillate, radiate foliage, a flagellate-tailed spathe limb, a rounded spadix appendage, and occasional presence of neuters at the base of the spadix appendage (Nakai 1950; Gusman & Gusman 2006). With the addition of this new species sect. *Sinarisaema* contains 29 species of which three can be found in Vietnam. Currently a total of 26 species of *Arisaema* belonging to seven sections are now recorded in Vietnam; these are sections: *Anomala, Attenuata, Decipientia, Franchetiana, Nepenthoidea, Odorara and Sinarisaema*, (Nguyen 1998, 2000, 2002, 2005a, 2005b, 2007,

2017; Pham-Hoàng 2000; Nguyen & Boyce 2005; Gusman and Gusman 2006; Nguyen & Vu, 2009; Li et al. 2010; Boyce et al. 2012; Bruggemen et al. 2013; Luu et al. 2013, 2014, 2020, 2022; Nguyen et al. 2014; Hoang et al. 2015; Ohi-Tomi et al. 2016; Van et al. 2016a, 2016b, 2017; Van 2017; Le et al. 2020) with a single representative from sect. *Nepenthoidea* only very recently added to those recorded in Vietnam with the discovery of a new species in 2022 from Pu Ta Leng Mountain, in Tam Duong District, Lai Chau Province (Luu et al. 2022). In this paper, we introduce a key to the species of sect. *Sinarisaema* in Vietnam and describe *A. ytyense* as a new species. A table of the morphological characters for the three species of sect. *Sinarisaema* in Vietnam, images of the new species, *A. consanguineum* and the type of *A. parisifolia* are introduced to allow for comparison between the three species.

Taxonomy

Arisaema ytyense V.D. Nguyen & H.T. Luu, sp. nov.

Diagnosis: *Arisaema ytyense* shares some similarities with both *A. consanguineum* and *A. parisifolia*. Both *A. ytyense* and *A. consanguineum* bear a long tail at the apex of the spathe lamina and have neuters at the base of the spadix appendix. Compared with *A. parisifolia* both possess a slender spadix appendix, not clavate as with *A. consanguineum*, with stamens arranged in scattered groups of 2–3. *A. ytyense* differs from both later species by its distinctly elongate funnel shaped spathe tube with the spathe mouth not auriculate, spathe lamina narrow triangular with margins rolled upwards and anthers which are globose in shape with a conspicuous stipe (Table 1).

Type: VIETNAM, Lao Cai province, Bat Xát district, Y Ty Commune, on the tracking to Nhiu Co San peak from Nhiu Co San market, GPS 22º37’26.12” N 103º37’23.12” E, Nguyen Van Du 540 (HN).

Description: Deciduous tuberous perennial, 30–45 cm tall. Tuber pressed globose, 1.5–2 cm diam.; roots numerous, fleshy, from upper surface of tuber. Leaf solitary; petiole cylindrical, slender, 32-–45 cm long, 1.2–1.5 cm diam., free part shorter or longer than sheath portion (pseudostem) 15–20 cm long, 10–12 mm diam., green to dull green or dull light brown; pseudostem, 15–22 cm long, 1.5–1.7 cm diam., smooth, dull pale green, without or with 1–2 black streaks along, sometimes very light brown to meat brown, with very dark brown or black mottles, covered by slight white chalk on surface; leaf blade radiate with 8–10 leaflets; leaflets sessile or subsessile, elongate elliptical or elongate obovate, unequal in length, 12–14 cm long, 1.5–2 cm at widest point, base gradually acute, top lightly obtuse, abruptly acuminate, 1–1.5 cm long with a arista 1–2 mm long, adaxial surface medium green, abaxial surface lighter green; middle vein abaxially prominent, lateral veins 9–11 each side, upward from middle vein by 60–80º angle, far each other 5–9 mm, conspicuous on surface, intermediate and small veins inconspicuous. Inflorescence solitary; peduncle much shorter than free petiole, 3–6 cm long, c. 8 mm diam., medium green, light dull green; spathe 16–18 cm long; spathe tube elongate funnel shape, 6–7.5 cm long, 1 cm diam. at base, 1.4 cm at apex, mouth margin straight or lightly recurved, not auriculate, medium green with murky white streaks; spathe lamina narrow triangular, equal to spathe tube, 6–7.5 cm long, 2–2.5 cm wide at base, margin rolled upwards, acute at apex and tipped by a long tail, 7–9 cm long, medium to light green with murky white streaks. Male spadix 8 cm long; fertile portion conical, 4 cm long, 4 mm wide at base, 2.5 mm wide at apex, flowers arranged in scattered clusters; appendix cylindrical slender, equal fertile portion length, 4 cm long, 1.5–2 mm wide, slightly narrowed at base and near apex, smooth, naked, light green at base, slightly darker at apex; female spadix slightly shorter than male spadix; fertile portion conical, 2.8 cm long, 1.2 cm wide at base, 0.5 cm wide at apex, gynoecium closed arranged, dark green; appendix stipitate light subulate, 5.2 cm long, up to 3–4 mm wide at base, 2 mm wide at apex; stipe cylindrical, 6 mm long, 1.5 mm diam., with neuters

present above fertile part, 1–3 mm long, medium green. Male flowers in groups of 2–3, c. 1.2 mm tall, sharing a stipe 0.5 mm long; anthers petit, globose, dehiscing by an elliptical pore. Gynoecium subglobose, 1.2×1.5 mm, crossing sections hexagonal, stigma pointed, sessile, black, with a white sticky, triangular scale at terminal.

Ecology and habitat: Temperate primary evergreen forest on high mountain slopes, average annual temperature is about 20°C. Associated species include *Rhododendron*, *Tsuga*, *Fokienia*, *Camellia*, etc. *A. ytyense* grows on the forest floor under dappled shade amongst a range of Ferns, *Osbeckia*, *Cyperus*, grasses etc.

Etymology: The specific epithet of the new species name is derived from the name of Y Ty commune where the type specimens were collected.

Phenology: Flowering in December to January, fruiting in April to July.

Distribution: Endemic to Vietnam, Lao Cai province, Bat Xat district, Y Ty commune.

Conservation status: *A. ytyense* is quite commonly found in Y Ty, however, the understory flora is at great threat from the cutting down of the lower forest level for the agricultural cultivation of Chinese cardamom (*Lanxangia tsao-ko*) by local minorities limiting the regeneration of *A. ytyense* and neighboring species. At present, specimens have been found mainly growing at the sides of tourist tracks. The number of wild plants could be reduced if education on the importance of natural resources is not carried out regularly. This species is threatened by visitors and tourist programs of local governments. Based on IUCN assessment criteria, the species could be placed at level **VUL B2 C2.**

Table 1. Comparison of morphological characters between the three species of *Arisaema* sect. *Sinarisaema* in Vietnam. Morphological data for *A. parisifolia* is based on original literature by Gagnepain (1941, 1942) and Murata (2005).

Morphological characters	*A. ytyense*	*A. consanguineum*	*A. parisifolia*
Tuber	Tuber pressed globose, 1.5–2 cm diam.	Subglobose, 4–12 cm diam.	Subglobose
Pseudostem	15–22 × 1.5–1.7 cm	40–110 cm long	5.5–20 cm long
Colour of pseudostem	Dull pale green to light or meat brown, with or without 1–2 vertical black streaks	Plain green or brown mottled	Unknown
Free part of petiole	15–20 cm long × 10–12 mm diam.	Up to 60 cm long	12–18(22) cm long
Number of leaf blade lobes	8–10	9–22	6–8
Leaf blade lobes	elongate elliptical or elongate obovate, size 12–14 × 1.5–2 cm; base acute, sessile or subsessile	Ovate, size 15–25 × 2–5 cm, base cuneate, sessile to subsessile	Oblanceolate, size 10–15 × 2–5 cm, long stipitate, petiolule 1–2 cm long
Peduncle length	Shorter than petiole, 3–6 cm long x 8 mm diam.	Shorter than petiole, up to 10 cm long	½ to as long as petiole (22 cm long)
Spathe tube	Elongate funnel shape, size 6–7.5 × 1–1.4 cm at base and apex	Cylindrical, size 5–10 × 2–4 cm	Obconical, size 4.5 × 1 cm

Mouth of spathe tube	Not auriculate, lightly recurved	Widely recurved, auriculate	Auriculate
Spathe lamina	Narrow triangular, size 6–7.5 × 2–2.5 cm, margins rolled upwards, spathe tip prolonged 7-9 cm	Ovate, size 7–12 × 4–8 cm, spathe tip prolonged 10–35 cm	Elliptic to ovate, size 4 × 2 cm, spathe tip prolonged 2 cm
Spadix length	7.5–8 cm	c. 15 cm	4 cm
Male fertile portion	Conical, size 4 cm × 4 mm wide, flowers scattered	Slightly conical, thick, 2.5-3 cm long	Conical, size 1.4 cm x 2 mm wide, flowers scattered
Female fertile portion	Conical, size 2.8 cm x 1.2 cm wide at base; gynoecium closed, dark green	Slightly conical, size 5 × 2 cm; gynoecium closed	Size 8-9 × 5–7 mm wide
Appendix	Cylindrical to slightly subulate, slender, 4–5 × 1.5–4 mm wide, obtuse to truncate at apex	Cylindrical to slight clavate, thick, 10 cm × 10–15 mm wide, round at apex	Cylindrical slender, size 1.8–2.5 cm × 2 mm
Male flower	Grouped 2–3, dull light yellow or dull pale green, stipitate; anthers petit, globose, dehiscing by an elliptical pore	Grouped 2–4, light brown, subsessile or sessile; anthers, globose.	Grouped 2–3, sessile; anthers globose.
Female flower	Subglobose, size 1.2 ×1.5 mm, stigma with a white triangular terminal scale	Bottle shape, stigma apiculate, cream	Unknown

Species key to *Arisaema* sect. *Sinarisaema* in Vietnam

1. Spathe mouth distinctly auriculate, spathe lamina ovate; anthers sessile or subsessil 2

- Spathe mouth not auriculate, spathe lamina narrow triangular, anthers with conspicuous stipe ..... 1. ***A. ytyense***

2. Leaflets 6–8, with distinguished stipe; spadix appendix slender cylindrical .....***A. parisifolia***

- Leaflets 9–22, sessile to subsessile; spadix appendix rounded clavate form ....***A. consanguineum***

Discussion

Among the seven sections of *Arisaema* present in Vietnam, two species from sect. *Sinarisaema* were recorded by Pham-Hoàng (2000), *A. hypoglaucum* Craib. (=*A. kerrii* Craib.) and *A. petiolulatum* Gagnep. (=*A. parisifolia* J.Murata). Among them, *A. hypoglaucum* Craib (= *A.*

kerrii Craib) was identified by Pham-Hoàng based on dried herbarium specimens, however, his illustration and description of this plant does not conform with the known characters of *A. kerrii* (Pham-Hoàng 2000) and as such its presence in Vietnam is doubtful. Based on the misidentification of this Vietnamese plant Gusman & Gusman (2006) did not accept the occurrence of this species in Vietnam.

The second species, *A. petiolulatum* Gagnep. (=*A. parisifolia* J.Murata), was first described by Gagnepain (1941, 1942), a homonym of *A. petiolulatum* Hook.f. described in 1893 and was later given the name *A. parisifolia* by Murata (2005). After studying the original descriptions (Gagnepain 1941, 1942) and type specimens (Fig. 4), we recognized a number of important features of this species; the length of the peduncle is described as 22 cm long and equal to the free part of petiole and the leaflets bearing a stipe 1.5 cm long, however, as is visible from herbarium specimens the peduncle is often shorter than the free part of the petiole. This species also has a distinctly auriculate spathe mouth. In 2005, when redescribed as *A. parisifolia* J. Murata, Murata recorded this species in Ham Rong of Sapa district, Lao Cai province, Northern Vietnam noting in his new description that the peduncle is '1/2-as long as petiole' (Murata 2005). The first author has carried out extensive fieldwork in Sapa and the surrounding areas but has never found specimens with the peduncle as long as the petiole as originally described for *A. petiolulatum* Gagnep. (= *A. parisifolia* J.Murata) and has not yet discovered any living specimens of this species.

Another species commonly found in Northern Vietnam, not published in Pham-Hoàng (2000) is *A. consanguineum* Schott. This species is the most widespread of Asian *Arisaemas* and is equally morphologically variable (Fig. 3). During work in the region, we found several populations of *Arisaema* belonging to section *Sinarisaema* in Y Ty commune of Bat Xat district, Lao Cai province. After careful examination of the specimens collected, we recognized a new species distinct from *A. consanguineum* and *A. parisifolia* by its straight spathe tube with the spathe mouth not auriculate, stamens with an obvious short stipe and with small globose anthers (Figs. 1, 2). We confirm that this is a new species belonging to sect. *Sinarisaema* and name it as *A. ytyense*, after the locality of the type specimens collected.

Conclusion

The genus *Arisaema* in Vietnam includes seven sections and a total of 26 recorded species. Up to now three species belonging to sect. *Sinarisaema* have been recorded. Among them, living specimens of *Arisaema parisifolia* have not been rediscovered in the locations previously recorded.

Acknowledgements

This research is funded by the Selected Basic Project of Institute of Ecology and Biological Resources – Vietnam Academy of Science and Technology under grant number: CSCL09.02. The first author would like to thank the support from Atlanta Botanic Garden (USA) for the cooperation expeditions between IEBR and ABG in the studied areas mentioned in the paper.

Conflict of interest

No conflict of interest has been declared.

References

Boyce PC, Sookchaloem D, Hetterscheid WA, Gusman G, Jacobsen N, Idei T, & Nguyen VD (2012) Araceae. The Flora of Thailand 11:101–321.

Bruggeman P, Truong BV, Rybkova R, Ponert J (2013) *Arisaema claviforme* sp. nov. and new record of *Arisaema* (Araceae) from Vietnam. Nordic Journal of Botany 31:556–560.

Gagnepain F (1941) Aracées nouvelles Indochinoises. Notulae Systematicae (Paris) 9: 116–140.

Gagnepain F (1942) Aracées. In: Lecomte, H. (Ed.) Flore générale de l'Indo-Chine 6. Paris, 1075–1196.

Govaerts R, Frodin DG, Bogner J, Boos J, Boyce PC, Cosgriff B, Croat T, Gonçalves E, Grayum M, Hay A, Hetterscheid W, Landolt E, Mayo S, Murata J, Nguyen VD, Sakuragui CM, Singh Y, Thompson S, Zhu G (2002) *Arisaema*. World checklist and Bibliography of Araceae (and Acoraceae). Royal Botanic Gardens, Kew, Richmond, 181–218.

Gusman G, Gusman L (2006) The genus *Arisaema*: a monograph for botanists and nature lovers, second revised and enlarged edition. Ruggell, Ganter Verlag.

Hoang TS, Trinh NB, Nguyen QH, Pham VV, & Pham QT (2015) *Arisaema lihengianum* (Araceae): a new record from Vietnam. Science Research Reporter, 5: 97–99.

Le CT, Ha MT, Nguyen MH, Trinh XT, Tran VT, Nguyen VD (2020) *Arisaema menglaense* (Araceae:Arisaemateae) newly recorded for northern Vietnam. Aroideana, 43(3&4): 12–21.

Li H, Zhu G & Murata J (2010) Arisaema. Flora of China, 23: 43–69.

Luu HT, Tran G, Tich NT, Nguyen VD, & Le KHV (2013) *Arisaema honbaense* (Araceae) – a new species from Vietnam. Folia malaysiana, 14(1): 45–50.

Luu HT, Nguyen QD, Vu NL, Vuong DH, Kieu DT, & Vo HS (2014) *Arisaema chauvanminhii* (Araceae), a new species from Vietnam. Annales Botanici Fennici, 51: 394–398.

Luu HT, Nguyen QD, Nguyen HC, Van HT, Nguyen VD (2020) *Arisaema liemiana* (Araceae:Arisaemateae), a new species from southern Central of Vietnam. Phytotaxa, 468(2): 214–220.

Luu HT, Nguyen HC, Nguyen TQT, Nguyen QB (2022) Arisaema vietnamense (Section Nepenthoidea, Araceae): A new species from Vietnam. Academy Journal of Biology, 44(1): 1-9. Doi: 10.15625/2615-9023/16646.

Mayo SJ, Bogner J, Boyce PC (1997) Araceae. In: Kubitzki K. (ed.) The families and genera of vascular plants. New York, Springer-Verlag Berlin Heidelberg GmbH. 4: 26–74.

Murata J (2005) *Arisaema parisifolia* J. Murata (Araceae) from Laos and Vietnam. Journal of Japanese Botany, 80(6): 349-351.

Nakai T (1950) Classes, ordines, familiae, subfamiliae, tribus, genera nova quae attinent ad plantas Koreanas (Supplementum). Journal of Japanese Botany, 25(1): 6.

Nguyen VD & Boyce PC (2005) Two new species of the genus *Arisaema* (Araceae) from Northern Vietnam. Folia malaysiana, 6 (1 & 2): 35–40.

Nguyen VD (1998) Discovery of new species of the genus *Arisaema* (Araceae) with medicinal value. Journal of Materia Medica, 3 (4): 102–103 & 125. (in Vietnamese).

Nguyen VD (2000) Two new species of Arisaema from Vietnam. Aroideana, 23: 36–40.

Nguyen VD (2002) Three new records of the genus *Arisaema* (Araceae) for Flora of Vietnam and their medicinal values. Journal of Materia Medica, 7(3): 69–73. (in Vietnamese).

Nguyen VD (2005a) Two new records of the genus *Arisaema* (Araceae) for the Flora of Vietnam. In: Proceedings of the First National Conference on Ecology and Biological Resources. Hanoi, Vietnam. Pp. 62–64. Agriculture Publishing House, Hanoi. (in Vietnamese).

Nguyen VD (2005b) Araceae. In: Ban NT, Checklist of Plants of Vietnam, vol. 3: 871–898. Agriculture Publishing House, Hanoi, Vietnam.

Nguyen VD (2007) Two new species of the genus *Arisaema* Mart. (Araceae) described for Flora of Vietnam. VNU Journal of Science, Natural Sciences and Technology, 23: 86–90.

Nguyen VD (2017) *Arisaema*. Flora of Vietnam 16. Science and Technology Publishing House, Hanoi, 267–307.

Nguyen VD & Vu TC (2009) New discoveries in the family Araceae in Indochina over the past twenty years. In: Proceedings of the Third National Conference on Ecology and Biological Resources, 22 October 2009. Hanoi, Vietnam. Agriculture Publishing House, Hanoi, Vietnam: 87–92.

Nguyen VD, Tran V T, Le CS, Nguyen TVA (2014) Rediscovery of *Arisaema pierreanum* Engl. after 145 years, and its current status. Aroideana, 37E(2): 88–93.

Ohi-Toma T, Wu S, Murata H, Murata J (2016) An updated genus-wide phylogenetic analysis of *Arisaema* (Araceae) with reference to sections. Botanical Journal of the Linnean Society, 182: 100–114.

Pham-Hoàng H (2000) *Arisoema* - Araceae. An illustrated Flora of Vietnam 3: 365-366. Tre Publishing House. Hochiminh city.

Van H T (2017) Building phylogenetic trees for the Araceae in southern Vietnam based on morphological and molecular markers. Doctoral thesis. Graduate University of Science and Technology, Vietnam Academy of Science and Technology, pp. 150.

Van HT, Nguyen PN, Luu HT (2016a) A new species of *Arisaema* (Araceae) from Vietnam. *Phytotaxa*, 277(1): 90–94.

Van HT, Nguyen-Phi N, Luu HT (2016b) On the taxonomic identity of *Arisaema pierreanum* Engl. (Araceae) in Vietnam. Science & Technology Development Journal - Natural Sciences, 19(4): 52–54.

Van HT, Nguyen-Phi N, Luu HT (2017) Taxonomic identity of *Arisaema condaoense* (Araceae) based on new morphological and molecular data. Vietnam Journal of Biotechnology, 15(4): 661–668.

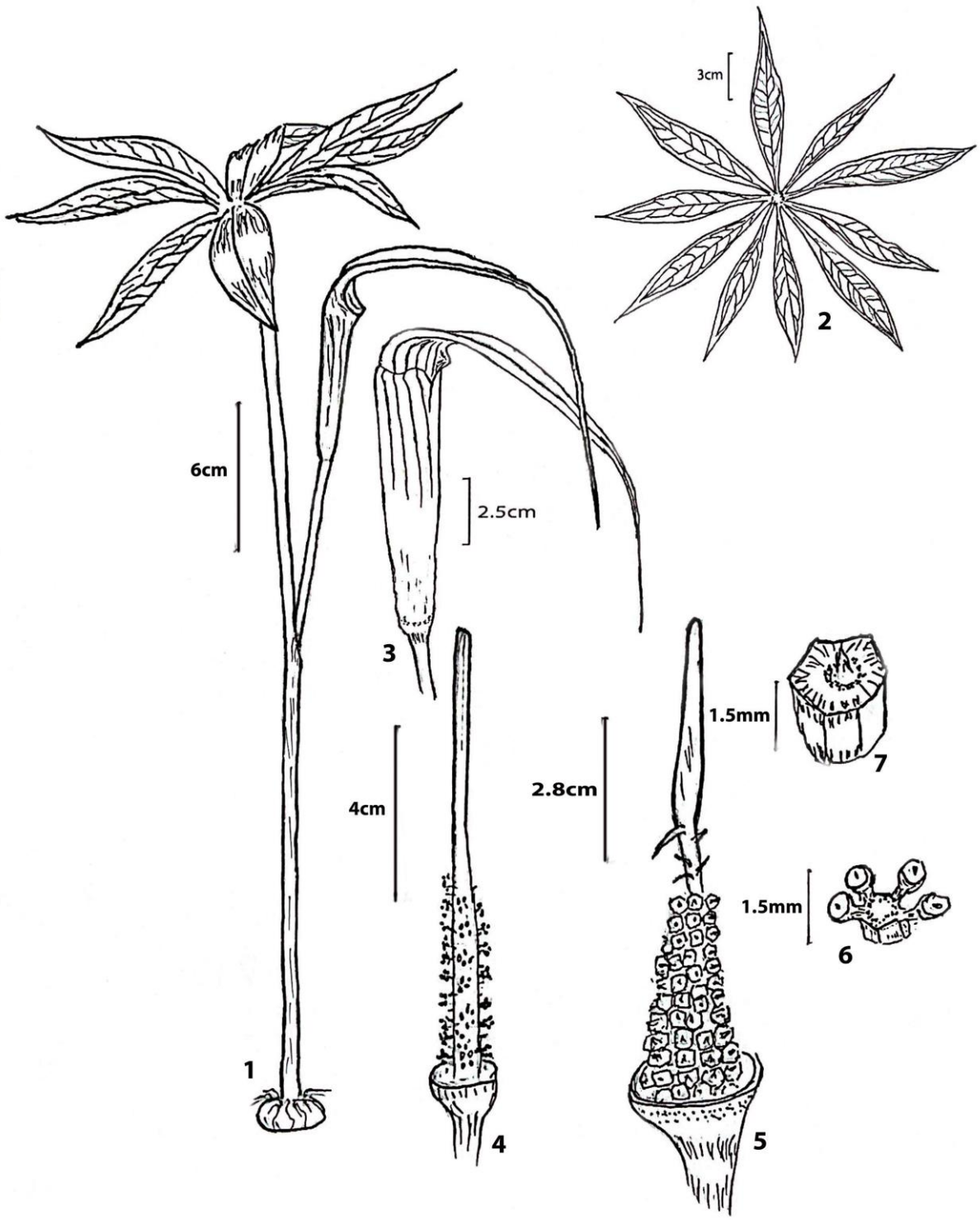

Figure 1. *Arisaema ytyense* V.D. Nguyen & H.T. Luu. 1. Plant habit; 2. Leaf blade; 3. Spathe; 4. Male spadix; 5. Female spadix; 6. Male flower; 7. Gynoecium.

Figure 2. Images of *Arisaema ytyense* V.D. Nguyen & H.T. Luu
A. Habit and habitat; B, C, D. Section of petiole in different colors; E. Leaf blades in close up view; F. Female and male spadix; G. Fertile portion of female spadix; H. A section of a fertile male spadix in close up view.

Figure 3. *Arisaema consanguineum* Schott
A & B. Habit and habitat showing leaf blades and variation in petiole colour within a small population; C. Another form of leaf blade; D-F. Different colour forms of spathe and male spadices; G-J. Different forms of female spadices.

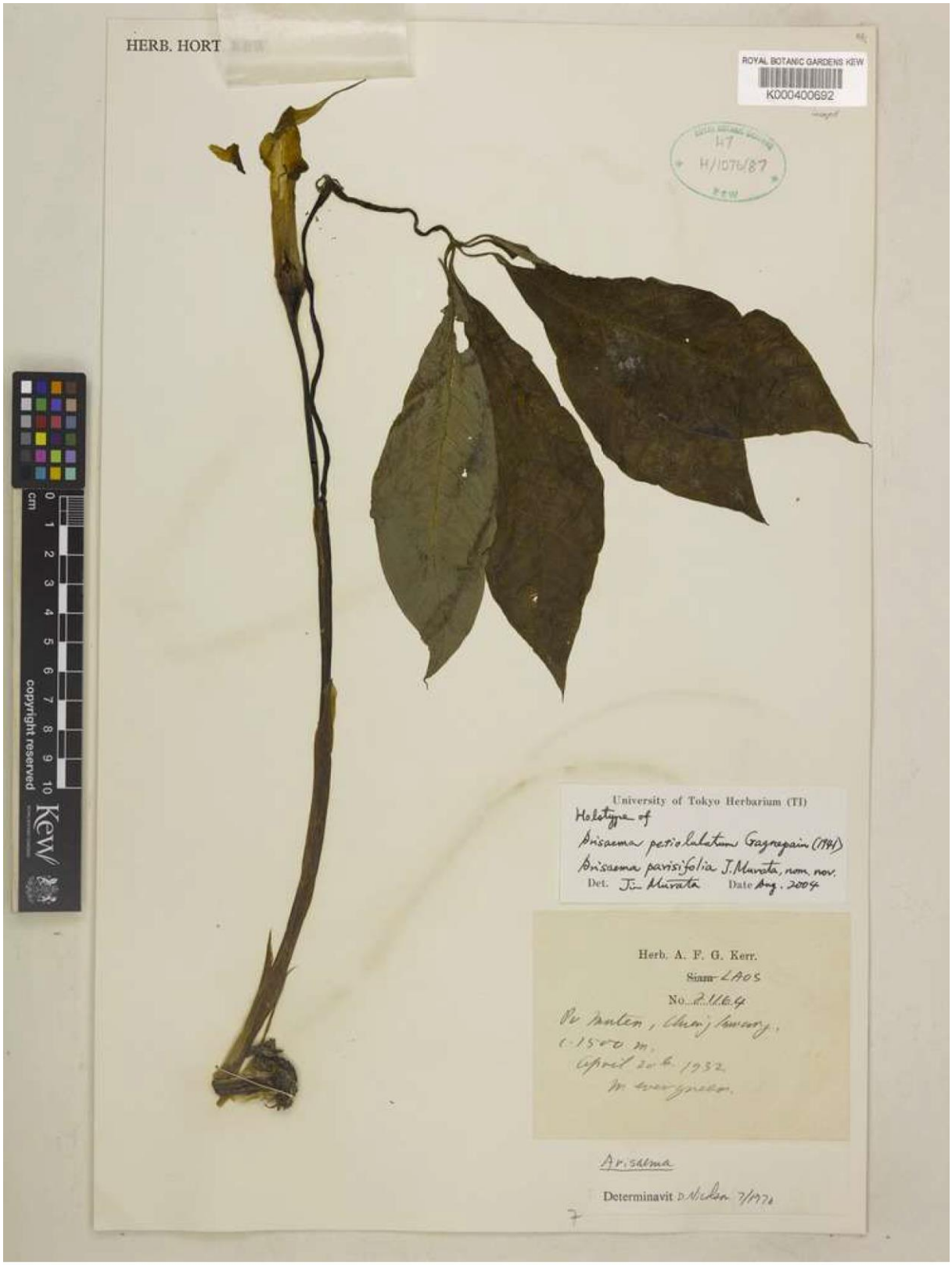

Figure 4. Isotype of *A. parisifolia* J. Murata (A. F. G. Kerr 21164, P-holo; K-iso).