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Arisaema globiceps (Araceae), a new species from Taiwan

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ABSTRACT: A new species, *Arisaema globiceps* (Araceae), is described from southern Taiwan. Morphologically, it is closely related to *A. consanguineum* and *A. formosanum* but can be readily distinguished by its spadix appendix, which is apically abruptly dilated into a globular knob. Additional information about its morphology, distribution and ecology is provided.

KEY WORDS: *Arisaema consanguineum*, *Arisaema formosanum*, Aroideae, Arisaematae, taxonomy.

INTRODUCTION

Arisaema Mart. comprises approximately 200 species distributed across Asia, Africa and North America, with its greatest diversity in the subtropical and temperate regions of Asia (Tran *et al*., 2022). In Taiwan, Wang (1996) recognized nine species and one additional variety in his comprehensive regional revision, including *A. grapsospadix* Hayata, *A. matsudae* Hayata, *A. ilanense* J.C. Wang, *A. thunbergii* subsp. *autumnale* J.C. Wang, J. Murata & H. Ohashi, *A. heterophyllum* Blume, *A. consanguineum* Schott, *A. formosanum* (Hayata) Hayata, *A. taiwanense* J. Murata, *A. taiwanense* var. *brevipedunculatum* J. Murata, and *A. ringens* (Thunb.) Schott. Subsequently, Huang and Wu (1997) described a new species, *A. nanjenense* T.C. Huang & M.J. Wu from southern Taiwan, which was included in the Flora of Taiwan, 2nd ed. (Wang, 2000). However, later studies treated *A. nanjenense* as a synonym of *A. grapsospadix* (Li *et al.*, 2010; Ohi-Toma *et al.*, 2016). Additionally, Gusman and Gusman (2006) classified the Taiwanese populations of *A. consanguineum* as an endemic subspecies namely *A. consanguineum* subsp. *kelung-insulare* (Hayata) Gusman, and they treated *A. matsudae* as a synonym of *A. penicillatum* N.E. Br. In the Flora of China, Li *et al.* (2010) further synonymized *A. consanguineum* (including subsp. *kelung-insulare*) and *A. formosanum* under *A. erubescens* (Wall.) Schott, though this taxonomic treatment was not supported by molecular evidence (Ohi-Toma *et al.*, 2016; Tran *et al.*, 2022).

During a field expedition to Mt. Talili in April 2019, we discovered a flowering *Arisaema* population resembling *A. consanguineum* but distinguished by its remarkable globose-tipped spadix appendix (Fig. 1), a feature not previously documented in any known species in Taiwan. In subsequent years, similar populations were observed at several additional localities in southern Taiwan (Fig. 2). Following a comprehensive study of specimens and relevant literature, we determined that these plants represent a species new to science, which is herein described and illustrated as *A. globiceps*.

Key to the *Arisaema* taxa in Taiwan:

1a. Leaf blade radiate …… 2 [sect. ***Sinarisaema***]
1b. Leaf blade 3-foliolate or pedate ……..…… 6
2a. Spadix appendix stipitate, apex distinctly rugose, 5–15 mm thick …… 3 [***A. taiwanense***]
2b. Spadix appendix sessile, apex smooth or slightly tuberculous, 1–8 mm thick ……..…. 4
3a. Peduncle 5–15 cm long; spathe tube 3.8–5 cm long; limb 5–7 cm long …… ***A. taiwanense*** var. ***taiwanense***
3b. Peduncle 1–5 cm long; spathe tube 2–4 cm long; limb 3–5 cm long …… ***A. taiwanense*** var. ***brevipedunculatum***
4a. Spadix appendix linear, 1–2 mm thick …… ***A. formosanum***
4b. Spadix appendix cylindric, 2–8 mm thick ……. 5
5a. Spadix appendix rounded at apex, not abruptly dilated; spathe limb ca. 2× wider than tube, inside with white stripes throughout …… ***A. consanguineum*** subsp. ***kelung-insulare***
5b. Spadix appendix abruptly dilated into a globular knob at apex; spathe limb ca. 1.5× wider than tube, inside with white stripes only at base …… ***A. globiceps***
6a. Leaf blade 3–5-foliolate ……..…… 7
6b. Leaf blade pedate, with 7–19 leaflets ……9
7a. Spadix appendix conical-cylindrical, stipitate, without neuter flowers …… ***A. ringens*** [sect. ***Pistillata***]
7b. Spadix appendix filiform, sessile, with baccate or neuter flowers at apex ……..…8
8a. Plant evergreen; underground stems rhizomatous; leaf blade 3–5-foliolate …… ***A. grapsospadix*** [sect. ***Anomala***]
8b. Plant deciduous; underground stems tuberous; leaf blade 3-foliolate …… ***A. penicillatum*** [sect. ***Fimbriata***]
9a. Spadix appendix clavate, included within spathe or slightly exerted …… ***A. ilanense*** [sect. ***Clavata***]
9b. Spadix appendix filiform, long exerted from spathe .. 10 [sect. ***Tortuosa***]
10a. Central leaflet much smaller than adjacent lateral leaflets; spathe green …..…… ***A. heterophyllum***
10b. Central leaflet as large as or larger than adjacent lateral leaflets; spathe white or pale yellow with dark stripes …… ……..…… ***A. thunbergii*** subsp. ***autumnale***

TAXONOMIC TREATMENT

Arisaema globiceps T.C. Hsu, W.J. Huang & S.W. Chung, ***sp. nov.*** **Fig. 1.**

Type: TAIWAN. Taitung County: Jinfong Township, Mt. Talili, 1400 m, 7 April 2019, *T.C. Hsu 11448* (holotype: TAIF-537147!, here designated; isotype: TAIF-537148!; TAIF-537149!; TNM!).

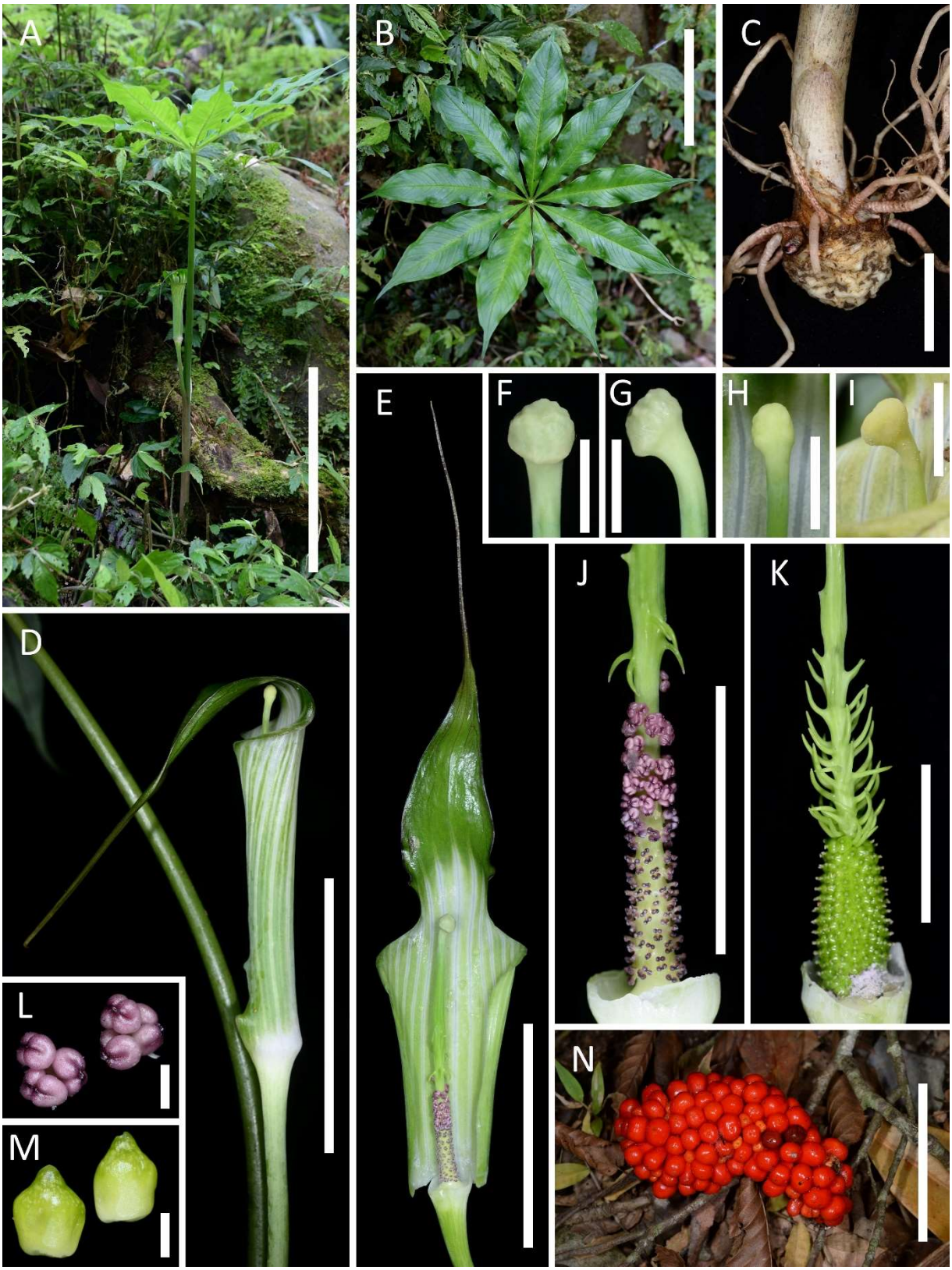

Fig. 1. Morphology of ***Arisaema globiceps***, from *Hsu 11448* (A–H, J, L; type), *Chang ZXC001608* (I), *Hsu 14070* (K, M) and *Hsu 13232* (N). **A.** Habitat and habit. **B.** Leaf. **C.** Tuber and plant base. **D.** Inflorescence. **E.** Male inflorescence, with spathe expanded. **F–I.** Globose tips of spadix appendix from different plants. **J.** Male spadix. **K.** Female spadix. **L.** Synandra. **M.** Ovaries. **N.** Infructescence. Scale bars: A = 20 cm; B, D, E, N = 5 cm; C, J, K = 2 cm; F–I = 5 mm; L, M = 1 mm.

Table 1. Morphological comparison between ***Arisaema globiceps*** and allied taxa in East Asia. Data gathered from monographic studies (Wang, 1996; Gusman and Gusman, 2006) and fresh materials observed in Taiwan.

	A. globiceps	*A. concinnum*	*A. consanguineum* ssp. *consanguineum*	*A. consanguineum* ssp. *kelung-insulare*	*A. erubescens*	*A. formosanum*
Stolon	absent	present	absent	absent	present	absent
Spathe limb						
Size	3.5–6 × 1.4–3 cm	5–7 × 2–4 cm	7–12 × 4–8 cm	4–8 × 2–4 cm	3–5 × 2–4 cm	3–7 × 2–3.5 cm
Coloration	green, inside with white stripes at base	green or dark purple, inside with white stripes throughout	green or brownish green, obscurely striped	green or dark purple, inside with white stripes throughout	pink, inside with white stripes throughout	green or dark purple, inside with white stripes throughout
Thread-like tail	present	present	present	present	absent	present
Spadix appendix						
Shape	cylindric, abruptly dilated into a globular knob at apex	cylindric-clavate, gradually dilated and fluted at apex	cylindric, not dilated at apex	cylindric, not dilated at apex	cylindric, not dilated at apex	linear, not dilated at apex
Diameter	2–4 mm	2–4 mm	10–15 mm	3–8 mm	ca. 10 mm	1–2 mm
Infructescence	nodding	erect	nodding	nodding	erect	nodding

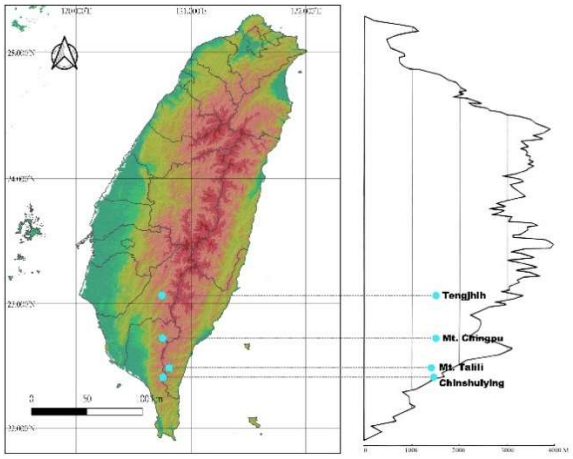

Fig. 2. Distribution map of ***Arisaema globiceps*** in Taiwan.

Diagnosis: *Arisaema globiceps* resembles *A. consanguineum* and *A. formosanum* in terms of gross morphology but can be readily distinguished by its globose dilation at the tip of its spadix appendix. In contrast, *A. consanguineum* features a clavate spadix appendix, while that of *A. formosanum* is filiform.

Morphology: **Tuber** depressed-globose, 2–4 cm in diameter. **Cataphylls** 3, greenish or brownish, sometimes with purple-brown marks, up to 30 cm long, acute. **Leaf** solitary; **petiole** 20–80 cm × 1–1.5 cm, proximal 10–40 cm sheathing into pseudostem, free part shorter than or about as long as pseudostem, greenish, sometimes mottled with white and purple-brown marks; **leaf blade** radiate; **leaflets** 6–13, sessile, narrowly elliptic to elliptic, 8–25 × 1–4 cm, apex acuminate, without filiform tails, base attenuate or narrow-cuneate, green adaxially, glaucous abaxially; veins raised abaxially, impressed adaxially; lateral veins numerous, obliquely ascending. **Peduncle** distinctly shorter than petiole, free part 6–10 cm long. **Spathe** green, with pale green and white stripes along veins throughout the tube and extending to the base of the limb; **tube** cylindric, auriculate and recurved at throat, 4.5–8 cm long, 0.8–2 cm in diameter; **limb** triangular-ovate, 3.5–6 × 1.4–3 cm (excluding tail), green, yellowish green or purplish green, usually with dark green or purple veins, arching, apex acuminate with long filiform tail; tail purple or purplish green, 3–10 cm long, pendulous. **Spadix** unisexual, 5–8.5 cm long including appendix; **female zone** conic-cylindric, 1.5–2.5 cm long, 0.8–1.3 cm in diameter; **ovary** green, obovoid; **stigma** sessile, spherical, pilose; **male zone** cylindric, 2–3 cm long, 0.4–0.6 cm in diameter; **synandria** dark violet; **anthers** subsessile, 2 or 3, dehiscent by apical pores. **Appendix** cylindric, erect (sometimes slightly curved forward at apex), green, 2.7–6 cm long, 0.2–0.4 cm in diameter, with some acute neuter flowers at base, gradually narrower upward and then abruptly dilated into a globular knob; knob grayish green, 3–4 mm in diameter, surface slightly tuberculous or nearly smooth. **Infructescence** nodding. **Berries** red.

Distribution and ecology: The new species is endemic to Taiwan, specifically in Kaohsiung, Pingtung and Taitung (Fig. 2). It has been sparsely found around the southern regions of the Central Mountain Range at elevations of 1400–1600 m, growing on shaded floors of damp broadleaved forests. Flowers were observed from early April to early May; ripen fruits were observed from December to January.

Etymology: The specific epithet is derived from *globus*, meaning "ball" or "sphere", and *–ceps*, meaning "headed", referring to its diagnostic globose dilation at the tip of the spadix appendix. We also propose a Mandarin vernacular name "頂珠天南星".

Additional specimens examined: TAIWAN. Kaohsiung City: Taoyuan District, Tengjhih National Forest Recreation Area, 1500–1600 m, 5 May 2019, *Lu 32036* (TAIF); same loc., 1400–1500 m, 6 May 2019, *Chang ZXC001608* (TAIF); Tengchih, 1500–1600 m, 29 April 2020, *Chung 14245*; *14246* (TAIF). Pingtung County: Wutai Township, Mt. Chingpu, ca. 1500 m, 10 January 2021, *Hsu 13232* (TAIF); Chunrih Township, Chinshuiying, ca. 1450 m, 24 April 2022, *Hsu 14070* (TAIF). Taitung County: Jinfong Township, Mt. Talili, ca. 1400 m, 7 April 2019, *Hsu 11449* (TAIF).

Taxonomic remarks: The new species belongs to sect. *Sinarisaema* based on its radiate leaflets and sessile spadix appendix (Gusman and Gusman, 2006; Li *et al.*, 2010). It is closely related to *A. consanguineum* and *A. formosanum* in morphology, as their vegetative parts are nearly undistinguishable. However, the spadix appendix of *A. globiceps* is not only characterized by its distinctive knobby tip (Fig. 1, D–I), but is also stouter than that of *A. formosanum* (2–4 mm vs. 1–1.5 mm in diameter). Additionally, *A. globiceps* slightly differs from *A. consanguineum* subsp. *kelung-insulare* in having relatively narrower spathe limbs (1.4–3 cm wide, ≤1.5× the width of the tube) with white stripes reaching only the base (Fig. 1, E). In contrast, *A. consanguineum* subsp. *kelung-insulare* has broader spathe limbs (2–4 cm wide, ca. 2× the width of the tube), usually with white strips extending throughout.

A Sino-Himalayan species, *A. concinnum* Schott, also bears an apically dilated spadix appendix, which may appear somewhat similar to that of *A. globiceps*. However, *A. concinnum* is distinct in having stoloniferous habits and upright infructescences (Gusman and Gusman, 2006; Li *et al.*, 2010). A detailed comparison between *A. globiceps* and similar taxa is further provided in Table 1.

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