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Research Article

Arisaema siahaense sp. nov. (Araceae) from India

Rabishankar Sengupta¹ and Sudhansu Sekhar Dash²  

¹Botanical Survey of India, Central National Herbarium, Howrah, West Bengal, India

²Botanical Survey of India, Headquarters, CGO Complex, Salt Lake, Sector - I, Kolkata, West Bengal, India

Correspondence: Sudhansu Sekhar Dash (ssdash2002@gmail.com)

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A new species of *Arisaema* Mart. (Araceae) belonging to sect. *Fimbriata* is described and illustrated here from the Siaha District, Mizoram, India. This new species is characterized by an evergreen, dioecious herbaceous habit, up to 1.08 m high, having a subglobose tuber, with a solitary trifoliate leaf. The characteristic spadix appendix is 15–21 cm long, pendulous, whip-like, and exserted, bearing dense, filiform, brownish-green 3.5–5.8 cm bristly projections. This new species belongs to the '*Fimbriata*' section under *Arisaema* and the allied species are *Arisaema nonghinense*, *Arisaema tsangpoense*, and *Arisaema lihengianum*.

Keywords: *Arisaema* sect., dioecious cobra lily, *Fimbriata*, Indo-Burma biodiversity hotspot, Mizoram, tropical forest



Introduction

The genus *Arisaema* Mart. (Araceae), commonly known as the cobra lily, is among the most morphologically diverse genera within the family Araceae, comprising 213 accepted species distributed globally (POWO 2025). It is predominantly found in Asia, with extensions to eastern Africa and North America (Govaerts et al. 2002, Li et al. 2010, Ohi-Toma et al. 2016). The genus is taxonomically complex due to its considerable intraspecific variability, dioecy, cryptic speciation, and convergent morphological traits. India harbours a remarkable diversity of *Arisaema*, with more than 55 species reported to date (Sasikala et al. 2020), particularly concentrated in the north-eastern region, a portion of which forms part of the Indo-Burma biodiversity hotspot (Hooker 1893, Chatterjee 1955, Gogoi et al. 2014) and exhibiting floristic affinities with Southeast Asia (Sengupta and Dash 2023, 2024). Mizoram, part of the Indo-Burma biodiversity hotspot, is characterized by a rugged mountainous terrain and rich floristic elements, showing a high level of species endemism due to its geographic isolation, as well as climatic variation that supports evergreen and semi-evergreen forest types rich in endemic relictual taxa (Manpoong and Tripathi 2019).

During floristic expeditions in September 2023 and June 2025 in southern parts of Mizoram, we observed some unique *Arisaema* plants with a dioecious habit, where both the female and male plants exhibited an elongated pendulous spadix appendage.



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The leaves of this species are similar to *A. fimbriatum* but it differs by having a distinct spadix appendage as well as by the inflorescence and spathe colour. This dioecious population of *Arisaema* was up to 1.08 m tall, with subglobose tuber, spathe tube tapering upward into a long filiform tip, spadix appendix filiform, elongated, exserted and cylindrical fruiting spike. These characters ensure its placement in the 'Fimbriata' section under *Arisaema* (Gusman and Gusman 2006, 2013, Ohi-Toma et al. 2016). These specimens were found to be closely allied to *Arisaema tsangpoense* (Yin and Gusman 2006), *Arisaema nonghinense* (Klinratana et al. 2014), and *Arisaema lihengianum* (Murata and Su-Gong 2003) in its morphological attributes. A thorough comparison with relevant taxonomic literature (Hooker 1893, Chatterjee 1955, Hara 1971, Rao and Verma 1976, Gusman and Gusman 2006, Boyce et al. 2012, Bruggeman et al. 2013, Klinratana et al. 2014, Mao and Gogoi 2014, Hoang et al. 2015, Ohi-Toma et al. 2016, Nguyen 2017, Manudev et al. 2019, Sasikala et al. 2020, Matsumoto et al. 2025), morphological investigation and comparison with herbarium material at CAL, ASSAM, and ARUN revealed it to be a hitherto undescribed species. Therefore, we describe and illustrate this as a new species of *Arisaema* with detailed description, illustration, and photos along with its affinities, habitat preferences, phenology, distinct morphometric characters with closely allied species, and conservation status in accordance with IUCN criteria.

Material and methods

During a floristic survey and expeditions in September 2023 and June 2025, the authors ventured to the remote areas of Siaha district in southern Mizoram, India, and found some distinct and interesting populations of *Arisaema* near the peak of Tlangpui at Lungzarhthum village. The two fringe villages of Tlangpui partially share a border with the Lawngtlai district in southern Mizoram. Young fold mountains of up to 2157 m a.s.l. at their highest peak are found in Phawngpui National Park (Sengupta and Dash 2020, 2024). The soil types in Mizoram are acidic and loamy, and include soils with high levels of organic carbon, rendering high endemic species adaptation (Manpoong and Tripathi 2019). The live specimens were collected and photographed from Tlangpui peak near the village of Lungzarhthum and its nearby areas in the Siaha and Lawngtlai district. The images of dissected floral parts were captured in the field. Approximately 15 specimens were measured for each morphological character to determine the morphological measurement range. Live specimens were collected, and dried and voucher specimens were prepared for deposition at the CAL herbarium following the standard protocol (Jain and Rao 1977). Flowers were dissected and studied using a Nikon SMZ1500 stereo-zoom microscope and illustrated for describing this new taxon. The detailed description of the taxon was prepared from the live as well as from the dried voucher specimens. A threat assessment of the species was made according to IUCN

criteria (IUCN 2024). GPS co-ordinates of the all the localities where the plant occurred were recorded using GARMIN eTrex32. The co-ordinates were plotted in a digital elevation model using a licensed version of ArcGIS 10.8.2. Only the latitude and longitude of the specific places were taken into consideration to determine the geographic distributional range of this species.

Taxonomic treatment

***Arisaema siahaense* R. Sengupta and S.S. Dash sp. nov. (Fig. 1–3) [Correction added on 3 February 2026, after first online publication: In the Taxonomic Treatment section, the author citation has been included in this version.]**

Diagnosis

Arisaema siahaense is closely allied to *A. tsangpoense* J. T. Yin and G. Gusman, but can be completely distinguished from it, as the new species bears a subglobose tuber as subterranean stem (versus rhizomatous), leaf blade trifoliate (versus leaf blade pedate with 3–5 segments). The species is strictly dioecious (versus parodioecious in *A. tsangpoense*), spadix appendix is much longer (15–21 cm) in *A. siahaense* (versus 4 cm in *A. tsangpoense*), whip-like, and covered with much longer (3.5–8.5 cm) bristly projections (versus ca 7 cm). The fruiting spike is larger, cylindrical, ca 8 × 3 cm, with green to red berries, each bearing 5–8 seeds (versus smaller, subcylindrical infructescence). Additionally, the neuters in *A. siahaense* are more numerous and distinctly forked (versus not forked), and the inflorescence emerges after leaf expansion (versus simultaneous with leaf unfolding). Ecologically, *A. siahaense* occurs in subtropical montane forests at higher elevations (1563–1617 m a.s.l.) (Fig. 4) on non-limestone substrates (versus *A. tsangpoense* in humid conditions at 900 m a.s.l. in Medog county, China).

Type: India Mizoram, Siaha District, Tlangpui peak area near Lungzarhthum village, 22°30'24.2064"N, 93°01'18.6744"E, 1563 m a.s.l., 21 June 2025, R. Sengupta and S.S. Dash 103418 (CAL, holotype mounted on two cross-labelled sheets: sheet 1 of 2 – female plant, barcode CAL0000295648; sheet 2 of 2 – male plant, CAL0000295649); ibid., 23 June 2025, R. Sengupta and S.S. Dash 103422 (paratype CAL, ♀, barcode CAL0000295652); 22°28'12.7956"N, 93°04'39.0648"E, 1617 m a.s.l., Siaha District, near 10 km milestone to Niawhtlang village, 25 June 2025, R. Sengupta and S.S. Dash 103425 (paratype CAL, ♂, barcode CAL0000295653). –

Etymology

The specific epithet '*siahaense*' meaning 'originating from Siaha' is derived from the type locality Siaha, a district located in southern Mizoram, India, where the species was first discovered in the wild. The region is notable for the strong commitment of its local communities, especially Kompa family,

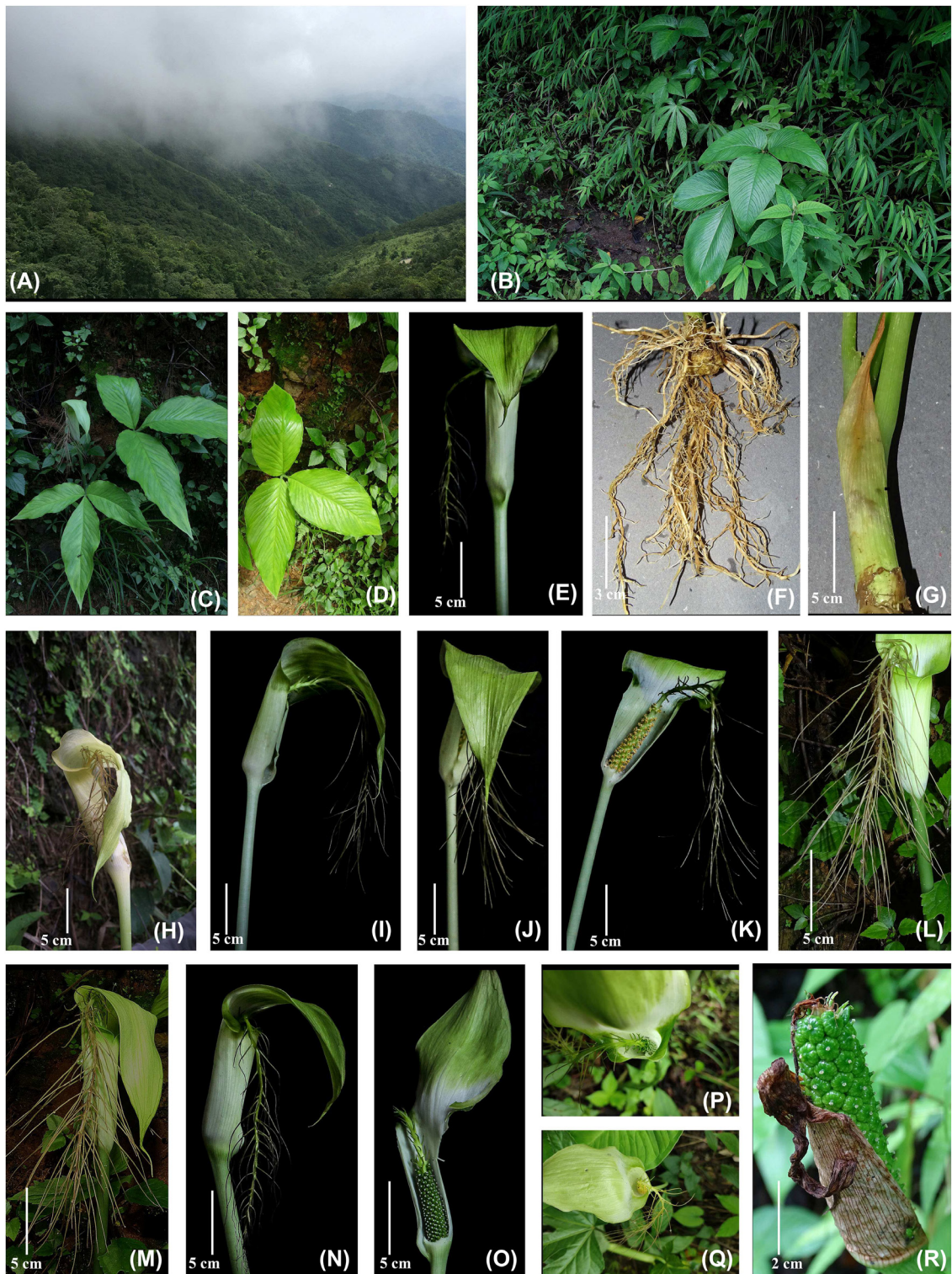


Figure 1. Photoplate of *Arisaema siahaense*. (A) Tlangpui peak area – type locality, (B) habitat in type locality, (C) habit, (D) leaf close-up, (E) front view of female inflorescence, (F) tuber with roots, (G) cataphyll, (H) mature male inflorescence, (I) side view, (J) front view of male inflorescence, (K) male inflorescence showing spadix and pendulous appendix, (L) close-up of pendulous appendix, (M) lateral view, (N) side view of female inflorescence, (O) female inflorescence showing spadix and pendulous appendix; top view of (P) female and (Q) female inflorescence, (R) young infructescence.

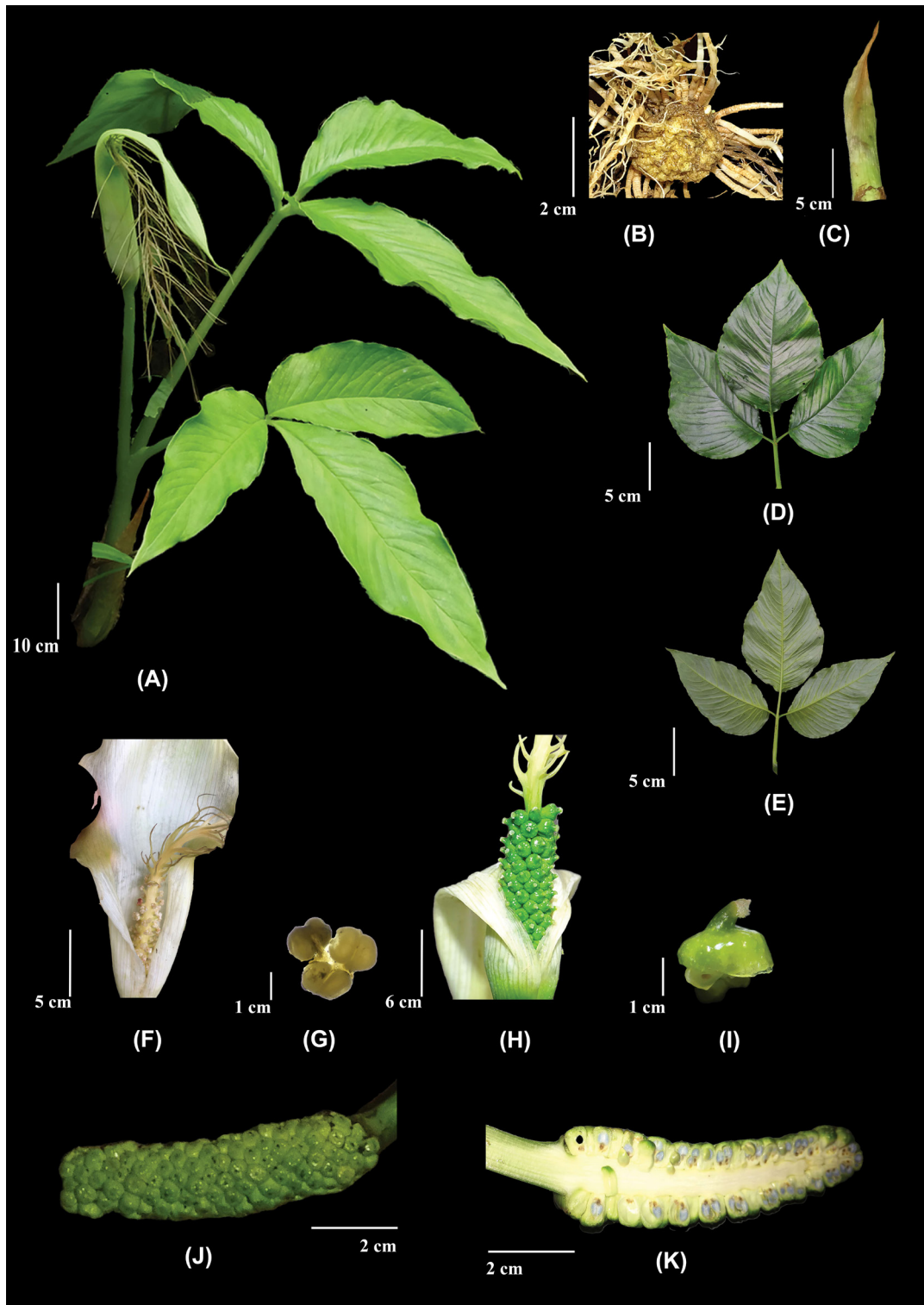


Figure 2. Photoplate of *Arisaema siabaense*. (A) Habit, (B) subglobose tuber, (C) cataphyll, (D) leaf dorsal view, (E) leaf ventral view, (F) Close-up of male spadix, (G) male flower, (H) close-up of female spadix, (I) female flower, (J) infructescence, (K) L. S. infructescence.

towards the conservation of biodiversity, making it a fitting origin for this species. The epithet honours both the ecological richness of the area and the local people's environmental stewardship.

Description

Evergreen perennials, dioecious, herb, up to 1.08 m tall. Subterranean stem a subglobose tuber, $3.2\text{--}4.3 \times 2.0\text{--}3.5$ cm, light yellow ochre outside, proliferous, yellow inside

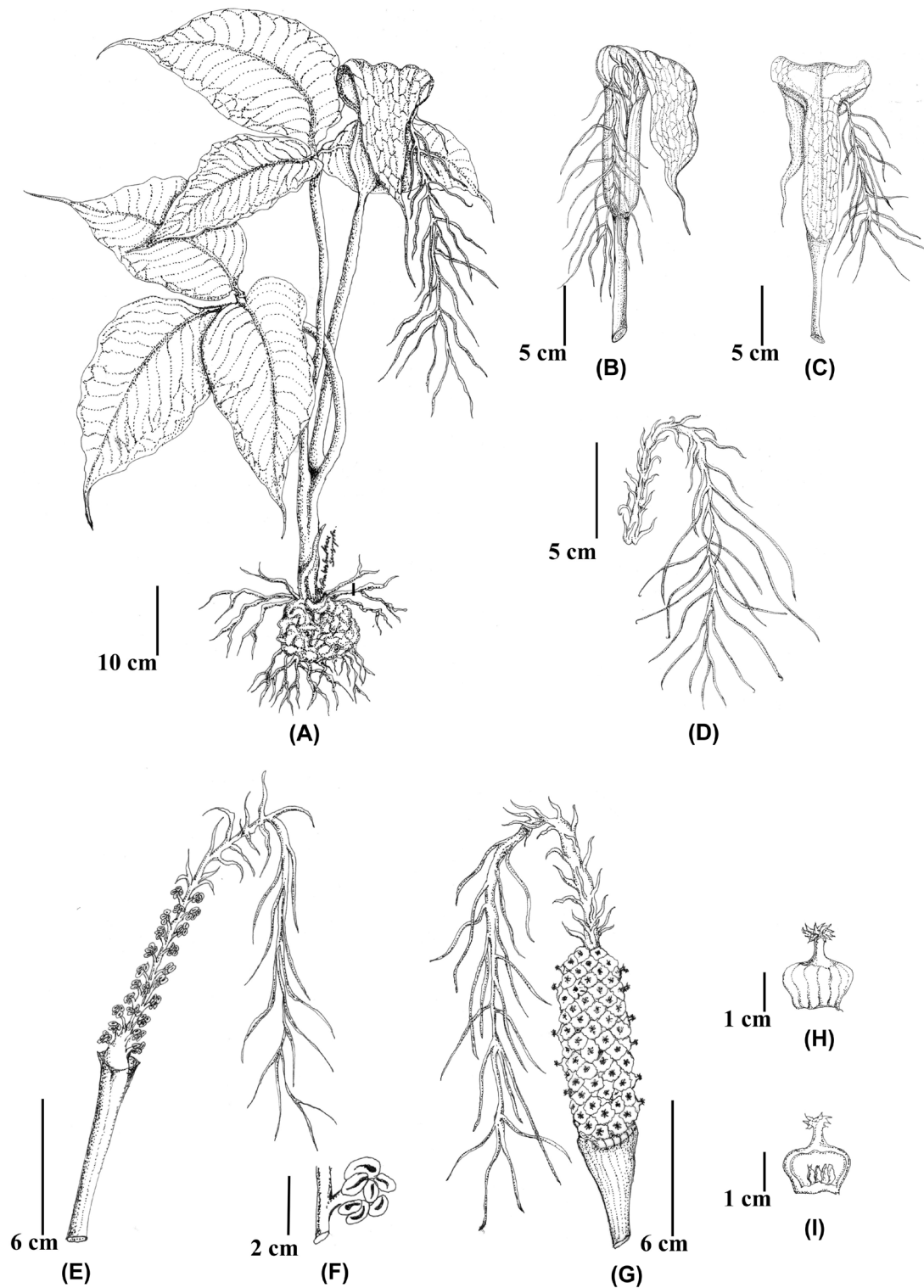


Figure 3. Illustration of *Arisaema siahaense* sp. nov. (A) Habit, (B) inflorescence – lateral view, (C) inflorescence – rear view, (D) spadix appendage, (E) male spadix with appendage, (F) male flowers, (G) female spadix with appendage, (G) female flower, (H) longitudinal section of ovary (drawn by Rabishankar Sengupta).

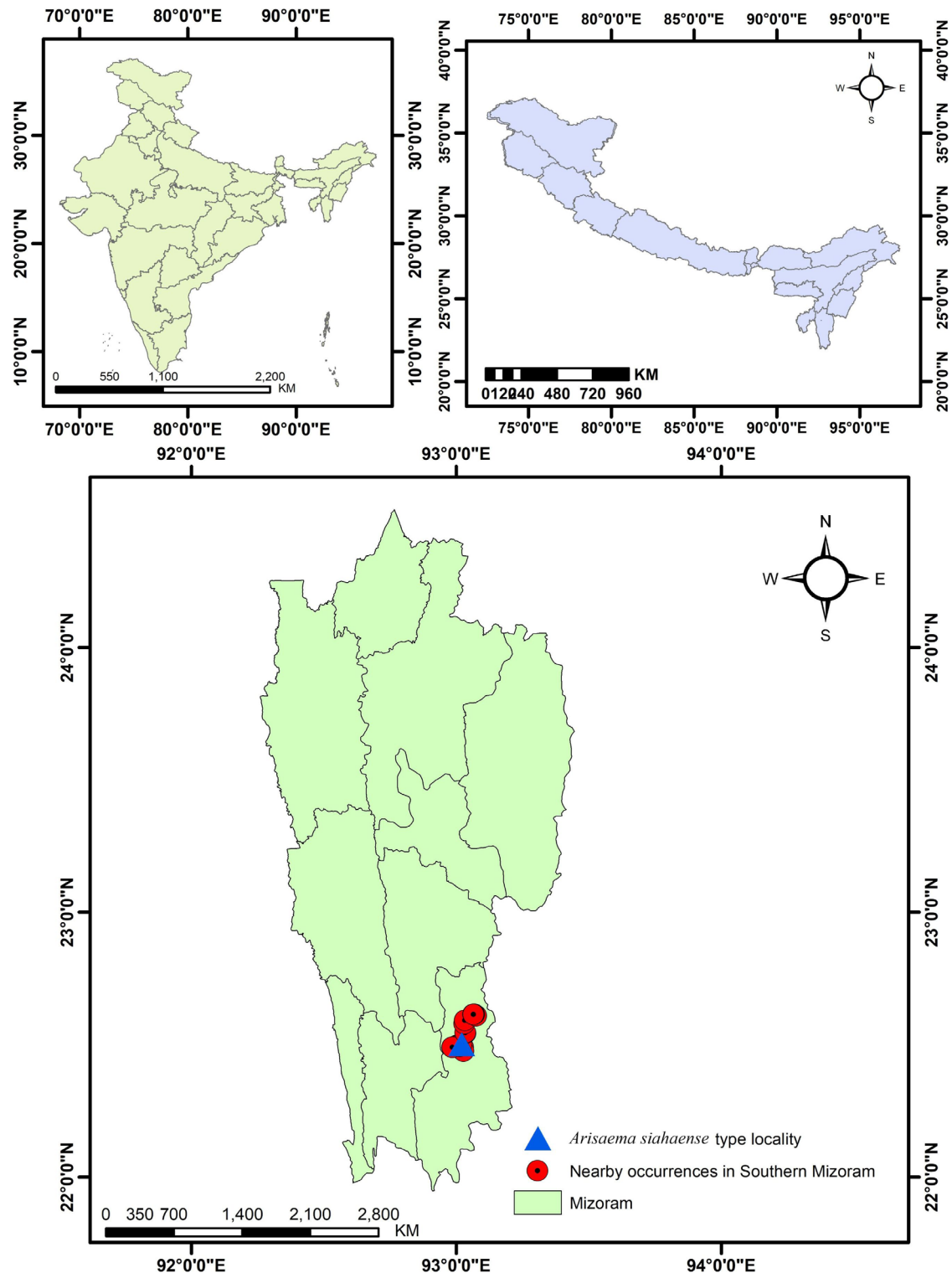


Figure 4. Distribution map of *Arisaema siahaense* sp. nov.

with a dark yellow margin in cross section, surface warty. Roots many, pale-white. Pseudostems absent. Cataphylls 3, enveloping the peduncle, light green to yellowish-brown, $12\text{--}19 \times 1.8\text{--}2.7$ cm. Leaves 2, leaf blade trifoliate; petioles $27\text{--}78 \times 0.8\text{--}2.1$ cm, smooth, greenish yellow to dark

green in maturity; leaflets petiolulate, $2.5\text{--}3.2 \times 0.3\text{--}0.5$ cm, sub-equal, lateral petiolules always shorter than petiolule of central leaflet, central leaflet broadly elliptic-ovate, $32\text{--}53 \times 6.3\text{--}17.0$ cm, lateral leaflets lamina asymmetric, ovate to elliptic-ovate, $28\text{--}45 \times 5.5\text{--}14.0$ cm, base cuneate to obliquely

cuneate, margin entire, apex acuminate to gradually tapering at apex ending in a 1.4–2.0 cm long arista, glabrous, dark green, lower surface with slightly raised veins; Inflorescence more or less held at foliage level or above, emerging after the leaves unfold, peduncle 27–33 cm × 0.6–0.8 cm, greenish yellow; spathe 18–27 cm long, composed of a tubular lower part (spathe tube) and an expanded upper limb; spathe tube cylindric, slightly inflated basally, gradually tapering upward, enclosing the lower portion of the spadix, pale green; outer surface glabrous, inner surface smooth, concolorous; limb horizontal to slightly arched, ovate-lanceolate, 7–10 × 5–6 cm, apex gradually tapering into a long filiform tip, acuminate to caudate, 2.5–3.5 cm long, often recurved or drooping; margins entire, green with prominent darker green longitudinal nerves, thin-membranous to subcoriaceous, often overlapping the tube. Spadix appendix long exserted from the spathe tube at anthesis, 15–21 cm long, slender; exserted portion a pendulous, whitish to greenish, arched over and drooping whip-like tail, covered with 3.5–5.8 cm long, filiform, brownish-green to pale yellowish, fleshy bristle-tipped projections; included portion with scattered green neuters, ca 5 mm long, lime green. Female spadix sessile, 6–8 × 0.8–1.0 cm; fertile region narrow, 3.0–3.5 cm long, followed by more than 25 neuters; appendix stipitate with a slight constriction at the base after neuters, exceeding mouth of the tube,

rugose, green to light green; neuters forked, many, 0.4–0.6 cm long, scattered, upcurved, pale green; pistils many, compactly arranged, 1.6–2.5 cm, globose, green; ovules 8–16, white; stigma papillate, white. Male spadix sessile, similar to female, slender, 5–8 × 0.6–0.8 cm; fertile region narrow, 3.0–4.5 cm; male flowers scattered over, stipitate, consisting of 2–5-androus; anthers sessile, cream-white to yellow, dehisce by an apical pore; neuters many, subulate-echinate, 1.5–3.2 cm, forked, pale green. Fruiting spike cylindrical, ca 8 × 3 cm; borne on an upright peduncle; receptacle green; berries globose, compactly arranged, green, turns yellow to red at maturity, 5–8-seeded.

Phenology

Flowering from May to June, fruiting from June to September (Table 1).

Habitat and distribution

Growing in association with *Melastoma malabathricum* L., *Ageratina adenophora* (Spreng.) R. M. King and H. Rob., *Ageratina riparia* (Regel) R. M. King and H. Rob., *Thunia alba* (Lindl.) Rchb.f., *Euphorbia heterophylla* L., *Hydrangea febrifuga* (Lour.) Y. De Smet and C. Granados, and *Gonostegia hirta* (Blume) Miq. in tropical forests of Tlangpui peak. This new species was growing on moist rocky slopes near the

Table 1. Comparison of morphological characters of *Arisaema siahaense* sp. nov. with allied species.

Characters	<i>A. lihengianum</i> J. Murata and S.K.Wu (after Ohi-Toma et al. 2016)	<i>A. tsangpoense</i> J.T.Yin and Gusman. (after POWO, 2025))	<i>A. siahaense</i> R. Sengupta and S.S. Dash sp. nov. [Correction added on 3 February 2026, after first online publication: the citation for Table 1 has been corrected in this version.]	<i>A. nonghinense</i> Klinrat. and Yannawat (after Ohi-Toma et al. 2016)
Habit	50 cm high	30 cm high	108 m high	80 cm high
Subterranean stem	rhizome subcylindrical, purplish to brownish	rhizome subcylindrical, whitish	subglobose tuber, light-yellow ochre	subglobose tuber, light brownish-yellow
Cataphylls	cataphylls 3, 20 cm long, reddish-purple	cataphylls 3, 2–6 cm long, light brown	cataphylls 3, 12–27 cm long, light green to yellowish-brown	cataphylls 3, 25 cm long, purplish-red
Petiole	30 cm long, purplish-brown mottled with green	25 cm long, dark brown to violet	27–78 cm, greenish-yellow to dark green	25–35 cm, reddish-green to dark purplish-red
Central leaflet	oblong-elliptic, 25 × 15 cm	elliptic, 15 × 5 cm	broadly elliptic-ovate, 32–53 × 6.3–17.0 cm	Broadly elliptic-ovate leaflets, 12–23 × 7–15 cm
Spadix	male or bisexual	male or bisexual	male or female	male or female
Spadix appendage	13–16 cm long, exserted from the mouth of spathe, basal part white, dark red-purple above, from base to the top bearing numerous filiform bristles, 3–5 cm long	4 cm long, exserted from the spathe, exserted portion purple, whip-like tail, covered with 20 fleshy bristles	15–24 cm long, exserted from the spathe tube at anthesis, slender; exserted portion a pendulous, whitish to greenish, arched over and drooping whip-like tail, covered with 3.5–5.8 cm long, filiform, brownish-green to pale yellowish fleshy bristle-tipped projections	5–10 cm long, distinctly exserted from the spathe tube, lower half whitish to brownish-red, upper half divided into many pale yellow to brownish-red fleshy bristles

water streams in tropical forests of the Tlangpui peak area of Lungzarthum village in Siaha district in Mizoram, India (Fig. 1A).

Ecological note: The dioecious habit of *A. siahaense* appears to be stable and persistent, without exhibiting any sexual dimorphism. This contrasts with several other *Arisaema* species known to display sexual dimorphism, including reversible shifts in sexual expression interannually in response to environmental conditions (Matsumoto et al. 2024, Nakazawa et al. 2024). Additionally, the presence of a long, filiform appendix observed in the newly described *A. siahaense*, likely plays a critical ecological role as an adaptive trait by enhancing the attraction and guidance of specific pollinators; this requires further research. Such appendages, common in several fly-pollinated taxa, are hypothesized to function either as visual cues or as structures enhancing the diffusion of floral volatiles that attract ground-dwelling pollinators (Suetsugu 2022). Given the dioecious nature of the species, the efficient attraction and guidance of specific pollinators is ecologically significant for ensuring pollen transfer between male and female individuals, especially in fragmented habitats. This morphological trait may therefore represent an evolutionary convergence toward specialized pollination strategies that promote reproductive isolation and persistence under narrow ecological constraints (Matsumoto et al. 2024).

Conservation status: *Arisaema siahaense* is presently known only from its type locality in the Tlangpui peak area near Lungzarthum village of Siaha District of Mizoram. The recently identified species is under severe threat primarily due to human-induced disturbances like non-timber forest products (NTFP) collection and edible plants by local communities, resulting in removal of surrounding vegetation. Simultaneously, pressures from nearby infrastructure developments, road widening constructions, and grazing by domesticated animals such as mithuns and goats also exhibit significant impact on its habitat loss. Additionally, the proliferation of dominant invasive alien species – such as *Ageratina adenophora* (Spreng.) R. M. King and H. Rob., *Ageratina riparia* (Regel) R. M. King and H. Rob., *Bidens pilosa* L., and *Mikania micrantha* Kunth further intensifies biotic stress, hindering the regeneration of this *Arisaema* species. However, sufficient data for threat assessment of this species in accordance to IUCN criteria and categories is yet to be fully explored and therefore it is considered as ‘Data Deficient’ (DD) according to IUCN norms (2024).

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Conflict of interest – The authors declare no conflict of interest.

Author contributions

Rabishankar Sengupta: Conceptualization (equal); Data curation (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Resources (equal); Validation (equal); Visualization (equal); Writing – original draft (equal). **Sudhansu Sekhar Dash:** Conceptualization (equal); Data curation (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Project administration (lead); Supervision (lead); Validation (equal); Visualization (equal); Writing – original draft (equal); Writing – review and editing (lead).

Data availability statement

This article has no additional data.

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