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Studies on *Typhonium* (Araceae — Areae) of Thailand V: Two new species from Eastern Thailand

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ABSTRACT: As part of our ongoing revision of the genus *Typhonium* in Thailand, *Typhonium isaniorum* K.Z.Hein, P.Saensouk & Saensouk and *Typhonium brevispadix* K.Z.Hein, P.Saensouk & Saensouk, two species new to science from Roi Et Province, and Ubon Ratchathani Province, Eastern Thailand, respectively, are described and illustrated. With the addition of these species, the total number of *Typhonium* species recorded in Thailand increases to 43, although the actual diversity is likely underestimated. A complete taxonomic account of the two new species is provided, including detailed morphological descriptions, distribution, habitat, phenology, conservation status, and discussion of their taxonomic affinities.

KEY WORDS: Aroideae, Cretaceous sandstone, Indochina, tropical dry deciduous forest, *Typhonium brevispadix*, *Typhonium isaniorum*

INTRODUCTION

Following the transfer of some species to *Sauromatum* Schott (Cusimano *et al.*, 2010), the Australian species to *Lazarum* A.Hay (Hay *et al.*, 2022), and *Typhonium albispathum* Bogner to *Hayarum* K.Z.Hein, Prehsler, Saensouk & S.L.Low (Hein *et al.*, 2025), the genus *Typhonium* Schott (Schott, 1829) *sensu stricto* remains the largest in the tribe Areae, with 80 accepted species (POWO, 2025), and exhibits its greatest diversity in tropical and subtropical regions of Asia, especially within Indochina (Low *et al.*, 2021; Hay and Hein, 2022). In Thailand, *Typhonium* is notably species-rich, representing the second-largest genus of geophytic aroids in the country after *Amorphophallus* Blume ex Decne., with 41 currently recognized species and a high level of endemism. (Boyce *et al.*, 2012; Saensouk *et al.*, 2024a, 2024b, 2025; POWO, 2025). Recent fieldwork and taxonomic investigations have expanded knowledge of the genus, leading to the discovery of three new taxa from Northeastern Thailand (Saensouk *et al.*, 2024a,b, 2025). Nevertheless, many regions remain insufficiently explored, and the true diversity of *Typhonium* in Thailand is likely underestimated (Boyce *et al.*, 2012).

During our recent botanical expedition to Nong Phok District in Roi Et Province, Eastern Thailand, in June 2025, we encountered an unknown *Typhonium* species. Detailed morphological examination and comparison with protologues, relevant literature, and type specimens of all *Typhonium* species from Thailand and neighboring countries revealed that it does not match any known species, and we therefore describe it here as new to science. In addition, we encountered another unidentified *Typhonium* flowering under cultivation at the greenhouse of Mahasarakham University, originally collected from Khong Chiam District, Ubon Ratchathani Province, Eastern Thailand. This material also does not match any known species and is likewise described here as new to science. A complete taxonomic account for these two species is provided below, including detailed morphological descriptions, distribution, habitat, phenology, conservation status, and discussion of their taxonomic affinities.

MATERIALS AND METHODS

Measurements and morphological descriptions were based on fresh and spirit-preserved material. Morphological descriptions follow the style of Saensouk *et al.* (2025), with Araceae morphological terminology adopted from Mayo *et al.* (1997) with general plant terminology standardized according to Beentje (2016). Spathe morphology follows Hetterscheid and Boyce (2000), where the spathe base refers to the lower portion formed by convolute margins, and the spathe limb refers to the upper expanded portion, both separated by a constriction. Herbarium acronyms conform to Index Herbariorum (Thiers, 2025). Relevant literature and type specimens of *Typhonium* were examined. Material deposited in BK and BKF was physically studied by the third author (KZH), while additional specimens from other herbaria (A, AAU, B, BM, C, CAL, DACB, E, G,

K, KKU, KUN, L, M, MO, P, PE, QBG, SING, VMSU, and WAG) were examined using high-resolution images accessed through the Global Plants JSTOR platform (https://plants.jstor.org/) and the Global Biodiversity Information Facility (GBIF) (https://www.gbif.org/). Conservation status was assessed following the IUCN (2024) guidelines. Geological information was derived from 1:250,000-scale geological maps of Roi Et and Ubon Ratchathani Provinces published by the Department of Mineral Resources (2009, 2010).

TAXONOMIC TREATMENT

Typhonium isaniorum K.Z.Hein, P.Saensouk & Saensouk, ***sp. nov.*** **Figs. 1 & 2A**

Type: THAILAND. Eastern: Roi Et Province, Nong Phok District, ca. 240 m, 7 June 2025, *S. Saensouk & K. Z. Hein 008* (holotype BKF, spirit collection!; isotype VMSU, spirit collection!).

Diagnosis: *Typhonium isaniorum* most closely resembles *Typhonium aungmyintwinii* K.Z.Hein & Naive (Hein and Naive, 2021) (Fig. 2B) from Myanmar but differs in having subulate or elongate-fusiform, free staminodes (vs. sickle-shaped, laterally compressed staminodes slightly fused at the base in *T. aungmyintwinii*), a purplish red sterile interstice equal in length to the staminate zone (vs. white sterile interstice longer than the staminate zone in *T. aungmyintwinii*), and a grayish brown appendix (vs. orange appendix in *T. aungmyintwinii*).

Description: Small, deciduous herbs, to 30 cm tall. ***Stem*** hypogeal, subglobose or depressed globose tuber, ca. 1.5 cm in diameter, externally pale brown, internally white. ***Roots*** filiform, 0.8–1.5 mm in diameter, white. ***Leaves*** 2–3 together; *petioles* 21.0–23.5 cm long, 0.3–0.4 cm in diameter, erect, glabrous, cylindrical, almost entirely terete, except for the dorsally shallowly canaliculate distal end, basal subterranean portion white, upper aerial portion plain green, with a dense dark purple to brownish purple flush and short longitudinal striae near the base; *petiolar sheath* 4.8–5.5 cm long, ca. 1/4 of petiole length; *leaf blade* hastate to deeply trilobed, nearly trisect, chartaceous, adaxially medium green, abaxially pale green, glabrous on both sides; *anterior lobe* elliptic-ovate to ovate, 13.7–14.2 × 5.2–6.3 cm, apex attenuate, margins entire; *midrib* adaxially impressed, abaxially raised, rounded, 2–3 mm wide at the base, ca. 1.5 mm wide at center, then narrowing towards anterior lobe apex; *primary lateral veins* of anterior lobe 6–8 per side, adaxially impressed, abaxially raised, diverging from the midrib at 26–45°, anastomosing at 0.2–0.4 cm from margin into a submarginal (intramarginal) collective vein; *posterior lobes* narrowly ovate, 7.5–9.8 × 2.6–4.6 cm, apices obtuse or acute, margins entire; *basal ribs* naked in the sinus for 0.7–1.2 cm, adaxially impressed, abaxially raised, rounded; *interprimary veins* somewhat less conspicuous than primaries; *higher order venation* reticulate. ***Inflorescence*** 1–2 together, appearing simultaneously with the leaves; *peduncle* 3.3–3.5 cm long, 3–4 mm in diameter, almost entirely subterranean, cylindrical, terete, glabrous, white; *spathe* 13.5–15.0 cm long, strongly differentiated into a spathe base and a spathe limb by a constriction; *spathe base* ellipsoid, 2.0–2.1 cm long, 1.3–1.5 cm in diameter, glabrous, externally uniformly pale green, darker green near the constriction, internally pale greenish white, margins free, convolute; *spathe limb* lanceolate, 11.5–13.0 cm long, 2.0–2.5 cm wide at widest point, glabrous, externally and internally reddish brown on the lower half, becoming brownish green towards the upper half with a flush of pale reddish brown, base of the spathe limb erect, upper half reflexed and slightly coiled at anthesis, margins entire, apex narrowly acute. ***Spadix*** sessile, 11.5–15.0 cm long, slightly shorter to equal in length to the spathe; *pistillate zone* shortly truncate-conical, 4–5 mm long, ca. 6 mm in diameter at the base, with 6–8 rows of congested pistils; *ovary* ca. 1.3 mm high, 0.5 mm in diameter, obovoid, greenish white, unilocular with one basal ovule held obliquely on a funicle, on a basal placenta; *stigma* sessile, discoid, ca. 0.7 mm in diameter, wider than the ovary diameter, dark red to nearly black, papillate; *sterile interstice* between pistillate and staminate zones ca. 1.2 mm long, 2 mm in diameter, upper part naked, terete, glabrous, glossy purplish red, lower ca. 0.4 cm covered with 5–7 spirals of staminodes; *staminodes* subulate or elongate-fusiform, 4–5 mm long, ca. 0.5 mm in diameter, free, congested, oriented nearly perpendicular to the spadix axis or slightly upward, apices recurved and pointing downward, acute, glabrous, bright yellow; *staminate zone* 1.2–1.3 cm long, 0.5 cm in diameter, cylindrical; *stamens* congested, always single, not grouped into multi-staminate flowers, 0.5–0.6 mm in diameter, pale yellow; *appendix* subsessile, 8.6–12.2 cm long, 3.0–3.6 mm in diameter at base, slender, elongate-tapering towards apex, erect, glabrous, grayish brown, apex acute, base attenuate. ***Infructescence*** on an erect peduncle, which remains the same length as during flowering, with a persistent spathe base; berries 0.6–0.7 cm long, ca. 0.4 cm at widest point, clavate with an ellipsoid to ovoid head, white with a greenish tint at maturity, apex acute, with black remains of the stigma; *seed* ca. 0.5 cm long, ca. 0.3 cm at widest point, obovoid, white, apex minutely apiculate.

Distribution and habitat: *Typhonium isaniorum* is currently known only from its type locality in Nong Phok District, Roi Et Province, Eastern Thailand. It grows on gravelly soil over Cretaceous sandstone near a waterfall and stream, beneath a semi-open canopy of tropical dry deciduous forest, at an elevation of approximately 240 m a.s.l.

Phenology: Flowering and fruiting were observed in the wild in June, at the beginning of the rainy season.

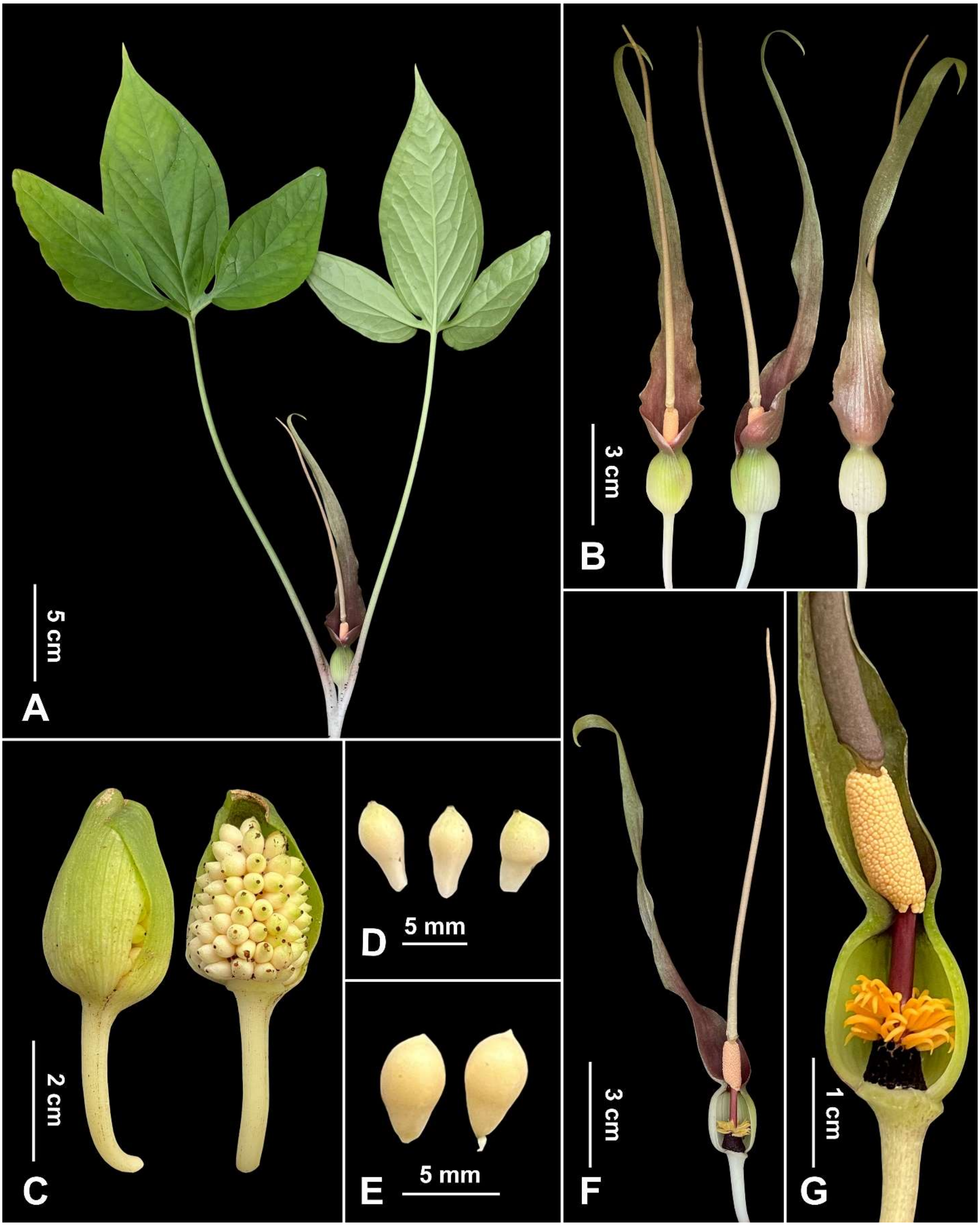

Fig. 1. ***Typhonium isaniorum*** K.Z.Hein, P.Saensouk & Saensouk. **A.** Excavated flowering plant. **B.** Inflorescence at pistillate anthesis (left showing front view, middle showing side view, right showing back view). **C.** Mature infructescence (left showing berries, nearside spathe base artificially removed). **D.** Berries. **E.** Seeds. **F.** Spadix at pistillate anthesis (nearside spathe artificially removed). **G.** Detail of spadix showing pistillate zone, sterile interstice, staminate zone and base of appendix (nearside spathe artificially removed). Photos by K.Z. Hein.

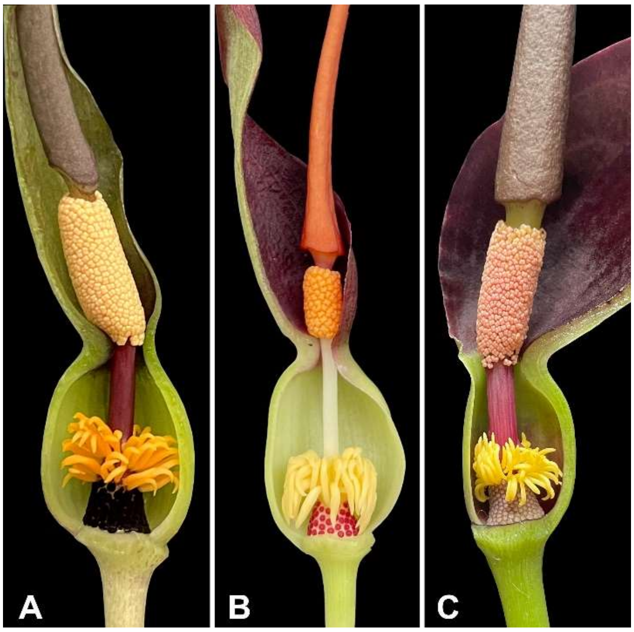

Fig. 2. Detail of spadices each showing pistillate zone, sterile interstice, staminate zone and base of appendix (nearside spathe artificially removed). **A.** ***Typhonium isaniorum***. **B.** ***T. aungmyintwinii***. **C.** ***T. varians.*** Photos by K.Z. Hein.

***Eponymy*:** The specific epithet honors the Isan people, who are indigenous to Northeastern Thailand, also known as the Isan Region.

***Provisional conservation status*:** *Typhonium isaniorum* is currently known only from the type locality. Further field surveys and collections are needed to determine its full distribution. Due to insufficient data on its geographic range, population size, and potential threats, it is provisionally assessed as Data Deficient (DD) following the IUCN Red List criteria (IUCN, 2024).

***Additional specimens examined (paratype)*:** THAILAND. Eastern: Roi Et Province, Nong Phok District, ca. 240 m, 8 June 2025, *S. Saensouk & K. Z. Hein 009* (VMSU, spirit collection!).

***Notes*:** Among the *Typhonium* species in Thailand, *T. isaniorum* is similar to *T. albidinervium* C.Z.Tang & H.Li (Li *et al.*, 1977) and *T. sinhabaedyae* Hett. & A.Galloway (Hetterscheid and Galloway, 2006) in its spathe and spadix structure. However, it can be distinguished from both species by its subulate or elongate-fusiform staminodes that reach the inner wall of the spathe base (vs. fusiform-clavate staminodes that never reach the inner wall of the spathe base in *T. albidinervium* and *T. sinhabaedyae*), and its subsessile, grayish-brown appendix (vs. a sessile, pale brown appendix in *T. albidinervium* and a stipitate, pale orangish-yellow appendix in *T. sinhabaedyae*).

The presence of a purplish red sterile interstice in *T. isaniorum* is shared with *T. varians* Hett. & Sookch. (Hetterscheid *et al.*, 2001) (Fig. 2B), but can be readily distinguished by its lanceolate spathe limb (vs. triangular-ovate spathe limb in *T. varians*) and dark red to nearly black stigmata (vs. dirty whitish to grayish stigmata in *T. varians*).

Typhonium brevispadix K.Z.Hein, P.Saensouk & Saensouk, ***sp. nov.*** **Fig. 3**

***Type*:** Cultivated in the greenhouse of Mahasarakham University, 26 April 2025, *S. Saensouk & K. Z. Hein 005* (original collection: THAILAND. Eastern: Ubon Ratchathani Province, Khong Chiam District, ca. 200 m a.s.l.) (holotype BKF, spirit collection!).

***Diagnosis*:** *Typhonium brevispadix* most closely resembles *Typhonium gagnepainii* J.Murata & Sookch. (Hetterscheid *et al.*, 2001) in inflorescence morphology, but differs in having a shorter petiole 6–7 cm long and glabrous (vs 12–30 cm long and covered with minute glandular hairs in *T. gagnepainii*), a suborbiculate to widely elliptic or widely elliptic-ovate, glabrous leaf blade (vs hastate with veins on the abaxial surface covered with glandular hairs in *T. gagnepainii*), a shorter spathe 2.5–2.6 cm long (vs ca. 4 cm long in *T. gagnepainii*), a shorter spadix 2.0–2.1 cm long (vs. *ca.* 3.5 cm long in *T. gagnepainii*), and a sessile appendix (vs. shortly stipitate in *T. gagnepainii*).

Description*:** Small, deciduous herbs, to 10 cm tall. ***Stem hypogeal, truncated-conical tuber, ca. 2 cm in diameter, externally pale brown, internally white, producing subglobose daughter tubers. ***Roots*** filiform, 0.5–0.8 mm in diameter, white. ***Leaves*** 1–4 together; *petioles* 6.0–7.0 cm long, 2.0–2.5 mm in diameter, erect, glabrous, cylindrical, almost entirely terete, except for the dorsally shallowly canaliculate distal end, basal subterranean portion white, upper aerial portion greenish white or pale green; *petiolar sheath* 0.7–1.0 cm long, ca. 1/7 of petiole length; *leaf blade* suborbicular to widely elliptic or widely elliptic-ovate, 4.7–7.7 × 3.2–5.8 cm, chartaceous, adaxially medium green, abaxially pale green, glabrous on both sides, margins entire, base rounded or subcordate, slightly oblique, apex rounded; *midrib* adaxially impressed, abaxially raised, rounded, ca. 2 mm wide at the base, ca. 1 mm wide at center, then narrowing towards blade apex; *primary lateral veins* 5–7 per side, adaxially impressed, abaxially raised, diverging from the midrib at 20–37°, anastomosing at 1.5–1.8 mm from margin into a submarginal (intramarginal) collective vein; *interprimary veins* somewhat less conspicuous than primaries; higher order venation reticulate. ***Inflorescence*** 1–2 together, appearing simultaneously with the leaves, each subtended by a cataphyll; *cataphyll* up to 2.3 cm long, linear-lanceolate, membranous, translucent white, ephemeral; *peduncle* 5.2–6.5 cm long, 2.5–3.2 mm in diameter, basal half subterranean, cylindrical, terete, glabrous, white; *spathe* 2.5–2.6 cm long, strongly differentiated into a spathe base and a spathe limb by a constriction; *spathe base* ellipsoid, ca. 1 cm long, ca. 0.7 cm in diameter, glabrous, externally pinkish or yellowish pale green with faint brown mottling, internally glossy, pinkish or yellowish pale green, margins free, convolute; *spathe limb* broadly triangular-ovate, 1.5–1.6 cm long, ca. 0.6 cm wide at widest point, glabrous, externally brownish

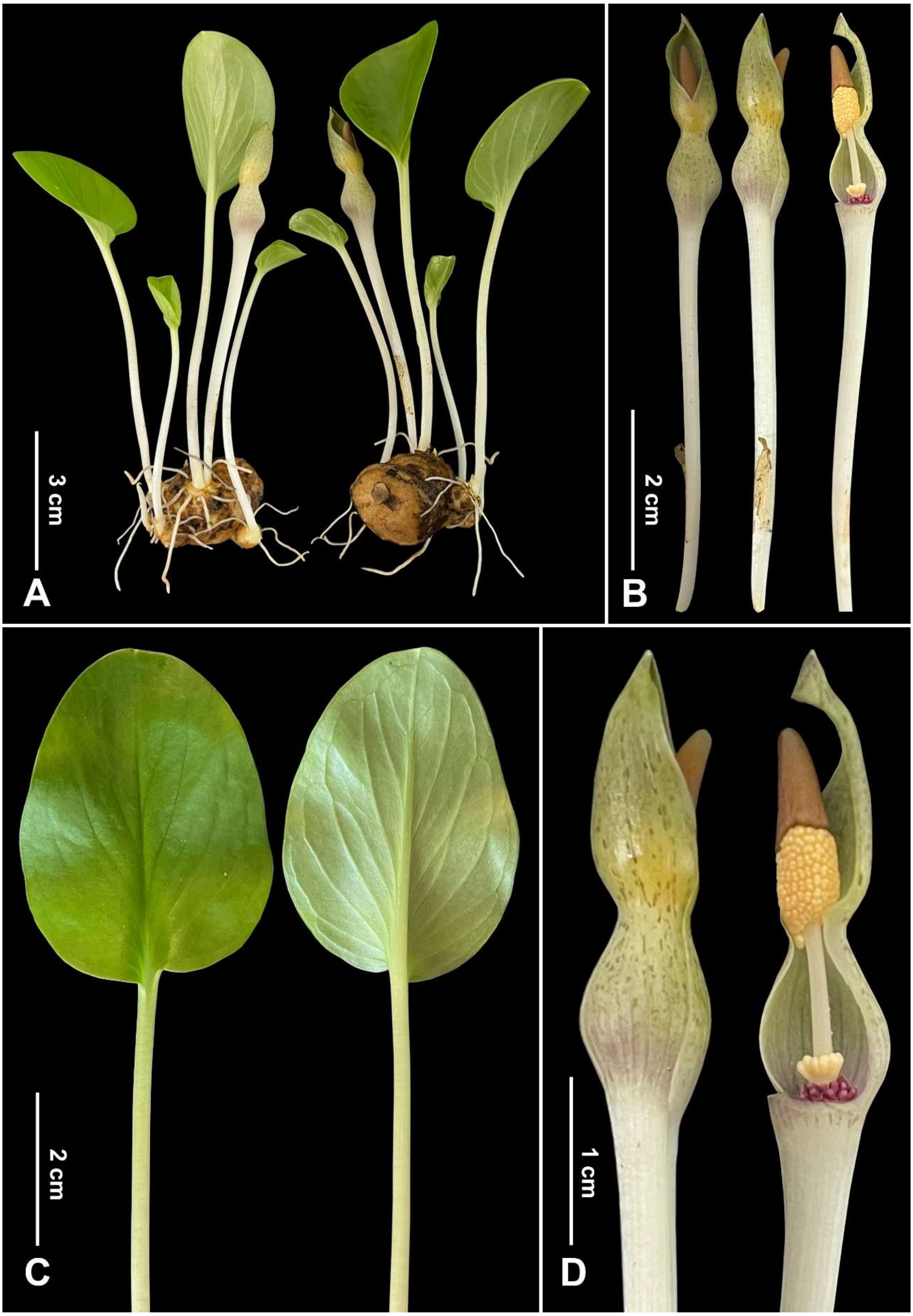

Fig. 3. ***Typhonium brevispadix*** K.Z.Hein, P.Saensouk & Saensouk. **A.** Excavated flowering individuals. **B.** Inflorescence at pistillate anthesis (left to right: front view, side view, side view with nearside spathe artificially removed to expose the spadix). **C.** Leaf blade (left: adaxial surface; right: abaxial surface). **D.** Inflorescence at pistillate anthesis (left: side view; right: nearside spathe removed to expose the pistillate zone, sterile interstice, staminate zone, and appendix). Photos by K.Z. Hein.

or yellowish pale green with faint brown mottling, internally glossy, yellowish pale green, margins free, entire, basal third convolute, apex acute. *Spadix* sessile, 2.0–2.1 cm long, slightly shorter than spathe; *pistillate zone* shortly conical, 1–2 mm long, ca. 2.7 mm in diameter at the base, with 2–3 rows of congested pistils; *ovary* ca. 1 mm high, ca. 0.6 mm in diameter, obovoid, dark purplish red, unilocular with one basal ovule held obliquely on a funicle, on a basal placenta; *stigma* sessile, discoid, 3.5–4.0 mm in diameter, narrower than the ovary diameter, white, papillate; *sterile interstice* between pistillate and staminate zones 8.5–7.5 mm long, ca. 1 mm in diameter, upper part naked, terete, glabrous, glossy white, lower part covered with single whorls of staminodes; *staminodes* oblongoid-clavate, 0.9–1.2 mm long, ca. 0.5 mm in diameter, pointing upward, almost parallel to the spadix axis, congested, almost entirely free except basally connate to adjacent staminodes, terete, glabrous, pale yellow, apex rounded; *staminate zone* ca. 5.5 mm long, ca. 3.3 mm in diameter, cylindrical, with 8–10 whorls of congested stamens; *stamens* congested, always single, not grouped into multi-staminate flowers, 0.4–0.7 mm in diameter, yellow; *appendix* sessile, 0.5–0.6 cm long, ca. 3 mm in diameter at base, elongate conical, tapering towards apex, erect, glabrous, brown, apex obtuse, base truncate. ***Infructescence*** not seen.

***Distribution and habitat*:** *Typhonium brevispadix* is currently known in nature only from the locality in Khong Chiam District, Ubon Ratchathani Province, Eastern Thailand, from which the cultivated type plant was originally sourced, where it grows in gravelly soil over Cretaceous sandstone beneath a semi-open canopy of tropical dry deciduous forest at an elevation of approximately 200 m a.s.l.

***Phenology*:** Flowering was observed in cultivation in April.

***Etymology*:** The specific epithet *brevispadix* is derived from Latin *brevis* meaning 'short', in reference to the short and small size of the spadix of this species.

***Provisional conservation status*:** *Typhonium brevispadix* is currently known only from the locality where the type plant was originally collected. Additional field surveys and collections are required to assess its broader distribution. In the absence of adequate information on its geographic range, population status, and potential threats, it is provisionally assessed as Data Deficient (DD) under the IUCN Red List criteria (IUCN, 2024).

***Additional specimens examined (paratype)*:** Cultivated at Nakhon Sawan, Nakhon Sawan Province, 24 April 2025, *Thoranis Sangchun s.n.* (original collection: THAILAND. Eastern: Ubon Ratchathani Province, Khong Chiam District) (VMSU, spirit collection!).

***Notes*:** In terms of spathe and spadix structure, *Typhonium brevispadix* is also similar to *Typhonium pusillum* Sookch., V.D.Nguyen & Hett. (Hetterscheid *et al.*, 2001), but differs in having a glabrous petiole (vs. petiole covered with short glandular hairs in *T. pusillum*), a suborbicular to widely elliptic or widely elliptic-ovate leaf blade (vs. hastate-sagittate in *T. pusillum*), oblongoid-clavate staminodes (vs. spathulate staminodes in *T. pusillum*), and a sessile appendix (vs. stipitate in *T. pusillum*).

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