Volume 18: 227–232
Publication date: 28 August 2015
dx.doi.org/10.7751/telopea8886

TELOPEA
Journal of Plant Systematics

The Royal Botanic Gardens & Domain Trust

plantnet.rbgsyd.nsw.gov.au/Telopea • escholarship.usyd.edu.au/journals/index.php/TEL • ISSN 0312-9764 (Print) • ISSN 2200-4025 (Online)

Sauromatum horsfieldii (Araceae – Areae): an addition to the Flora of India

Nripemo Odyuo[1], Dilip Kr. Roy[1, 3], Santanu Dey[2] and A. A. Mao[1]

[1]*Botanical Survey of India, Eastern Regional Centre, Shillong- 793003, Meghalaya, India*
[2]*Department of Botany, Nagaland University, Lumami- 798627, Nagaland, India*
[3]*Author for correspondence:* dilipbsierc@gmail.com

Abstract

Sauromatum horsfieldii (Araceae – Areae) is reported here as a new record for India. A detailed description and photographic illustration are provided, along with an account and revised key of the Indian species of *Sauromatum*.

Introduction

The genus *Sauromatum* (Araceae – Areae) was established by Heinrich Wilhelm Schott (1832) to accommodate *S. guttatum* (Aiton) Schott (basionym *Arum guttatum* Aiton) and *S. pedatum* (Link & Otto) Schott (basionym *Arum pedatum* Link & Otto). He classified the genus in his subtribe *Euaroideae* together with *Arum* L., *Biarum* Schott and *Typhonium* Schott. From the first two genera, *Sauromatum* was separated by having staminodes only grouped below the male flowers and not above (as seen in *Arum* and some *Biarum)* and from *Typhonium* by the connate spathe base, distant staminodes, the ovaries possessing two rather than one ovule, the leaf appearing after the inflorescence and being pedate rather than entire and the peduncle being very short (Hetterscheid and Boyce 2000; Cusimano *et al.* 2010). The morphological complexities of the members of *Sauromatum* fascinated many taxonomists. Subsequently Hetterscheid and Boyce (2000) reduced the generic status and merged it into the genus *Typhonium* based on a few preliminary phylogenetic analyses of a character matrix including all *Typhonium* and *Sauromatum* species. Later on, Cusimano *et al.* (2010) separated *Sauromatum* from *Typhonium* as a distinct genus based on chloroplast and nuclear DNA sequences. So far the genus *Sauromatum* consists of 10 species, of these, nine are accepted according to the Plant List (2015) and one species published recently by Talukdar *et al.* (2014) is not yet cited in the Plant List. They are distributed in South East Asia from China to Indonesia through Nepal, Bhutan, India, Bangladesh, Myanmar, Thailand, Vietnam and Cambodia. In India, the genus is represented by four species viz. *S. brevipes* (Hook.f.) N.E.Brown, *S. diversifolium* (Wall. ex Schott) Cusimano & Hett., *S. meghalayense* D.K.Roy, A.D.Talukdar, B.K.Sinha & M.Dutta Choudhury and *S. venosum* (Dryand. ex Aiton) Kunth (Talukdar *et al.* 2014).

During field exploration in May 2015, in the Tuensang district of Nagaland state, North East India, one aroid plant (flowering and fruiting) was collected in the bank of Chingse stream, c. 10 km south-east of Noklak to Chingmei village. The plant was found growing in the semi-evergreen forest floor. The significant morphological characters of the mature plant viz. pedatisect leaves, convolute spathe tube, clavate lower staminodes, differently shaped upper staminodes from the lower ones, fruiting zone with spathe tube remaining, revealed that the plant is a member of the genus *Sauromatum*. After critical examination of the

specimens and literature (Hooker 1884; Hetterscheid and Boyce 2000; Hetterscheid *et al.* 2001; Cusimano *et al.* 2010; Heng and Hetterscheid 2010; Talukdar *et al.* 2014), the plant is identified as *Sauromatum horsfieldii* Miq., a hitherto unknown species in India. This was further compared and confirmed with the photograph of type specimens of *Typhonium larsenii* S.Y.Hu, a heterotypic synonym of *Sauromatum horsfieldii* deposited at Museum Botanicum Hauniense, University of Copenhagen (C) [available at https://plants.jstor.org/partner/C]. The Indian specimens of this plant are morphologically slightly different in having a pale green petiole without any stripe or spot, leaf blades without spots or splash, spathe tube uniformly pale green without any spot or stripe outside. However, these differences are regarded as not being of taxonomic significance.

In this publication, *Sauromatum horsfieldii* is reported as an addition to the Flora of India. A detailed description, along with in-situ image and photographic illustration has been provided. An account of Indian *Sauromatum* is given, along with a revised key to the species.

Materials and Methods

The collection, pressing and preparation of herbarium specimens were in accordance to the conventional herbarium techniques (Jain and Rao 1977). Inflorescences were preserved in FAA solution. Taxonomic measurements and descriptions of each plant part are based on living material. Microscopic details were observed using Olympus stereo-zoom microscope SZ-2-ILST, Japan and photographed with Nikon COOLPIX P520, China.

Taxonomic treatment

Sauromatum horsfieldii Miquel, *Flora van Nederlandsch Indie* 3: 196 (1856)

Tuber depressed globose, c. 1.5–2 cm high and c. 2–2.5 cm diam., producing several annual offsets. Petiole glabrous, pale green, up to 35 cm long and 1 cm diam., partially subterranean. Leaf blade abaxially pale to grey-green, adaxially mid- to dark green, deeply 9–12-pedatified; lobes elliptic-lanceolate, margin entire to slightly crenate, apex acuminate, central lobe up to 12 cm long, 2.7 cm wide; lateral lobes gradually smaller. Inflorescence appearing simultaneously and in conjugation with the leaf, 3 or 4 per tuber, c. 5–27 cm long. Peduncle largely subterranean, greenish white, 10–18.5 cm long, 2.5–3.4 mm wide. Spathe convolute, 10.5–13.5 cm long; spathe tube triangular-ovate, strongly convolute, 5–7 cm long, 2.5–3.5 cm wide, outside mid-green, inside white, apex tapering to constricted; limb convolute at base, lanceolate, outside pale green turning yellowish in mature, inside white turning yellowish in mature, apex long acuminate. Spadix shorter than spathe, 5–8 cm; female zone cylindric, 3–5 mm long, 2.8–5 mm wide; ovary ovoid to oblong-ovoid, 1-loculate, white; stigma sessile, ring like, surrounding depression; sterile zone narrowly conic, 1.3–3.5 cm long, 2–3 mm wide, carrying staminodes of two types in proximal half, these distally gradually shorter and finally disappearing, distally verruculose; proximal staminodes clavate, bent upward, white, brown when dry, c. 3.2 mm long; sub-basal staminodes linear-aristate, strongly bent and pointing upwards, white, suddenly shorter and disappearing; male zone cylindrical, 0.6–0.8 cm long, 3–4 mm wide; male flowers cream-white, subclavate to spathulate; appendix stipitate, flattened, smooth, erect, 2.2–3.5 cm long, 3–3.3 mm wide, cream-coloured, apex obtuse. Fruiting zone elongated, with spathe base remaining, c. 1.5–2 cm long, 1.8–2 cm wide; berries whitish-green, crowded, cylindric, 5–7 mm long, 3–4 mm wide, apex truncate.

Flowering & Fruiting: April–July.

Specimen examined: INDIA: Nagaland: Tsuengsang district, Noklak, 1500–1600m, 26°12'38.6"N, 094°59'37.0"E, *N. Odyuo 132792*, 30 May 2015 (ASSAM).

Distribution: Cambodia, India, Indonesia, Laos, Myanmar, S China, Thailand, Vietnam.

Conservation status in India: Not evaluated. The species was encountered only in one locality in India. Therefore, further field assessment is required in the entire areas of Tsuengsang district, Nagaland, India to ascertain its population status. Five individuals were collected for ex-situ conservation and introduced in the Garden of Botanical Survey of India, ERC, Shillong, Meghalaya. The plants are growing well.

Plate 1. *Sauromatum horsfieldii* Miq.: **A**. Plant *in situ*; **B**. Inflorescences; **C**. Lower half of Plant.

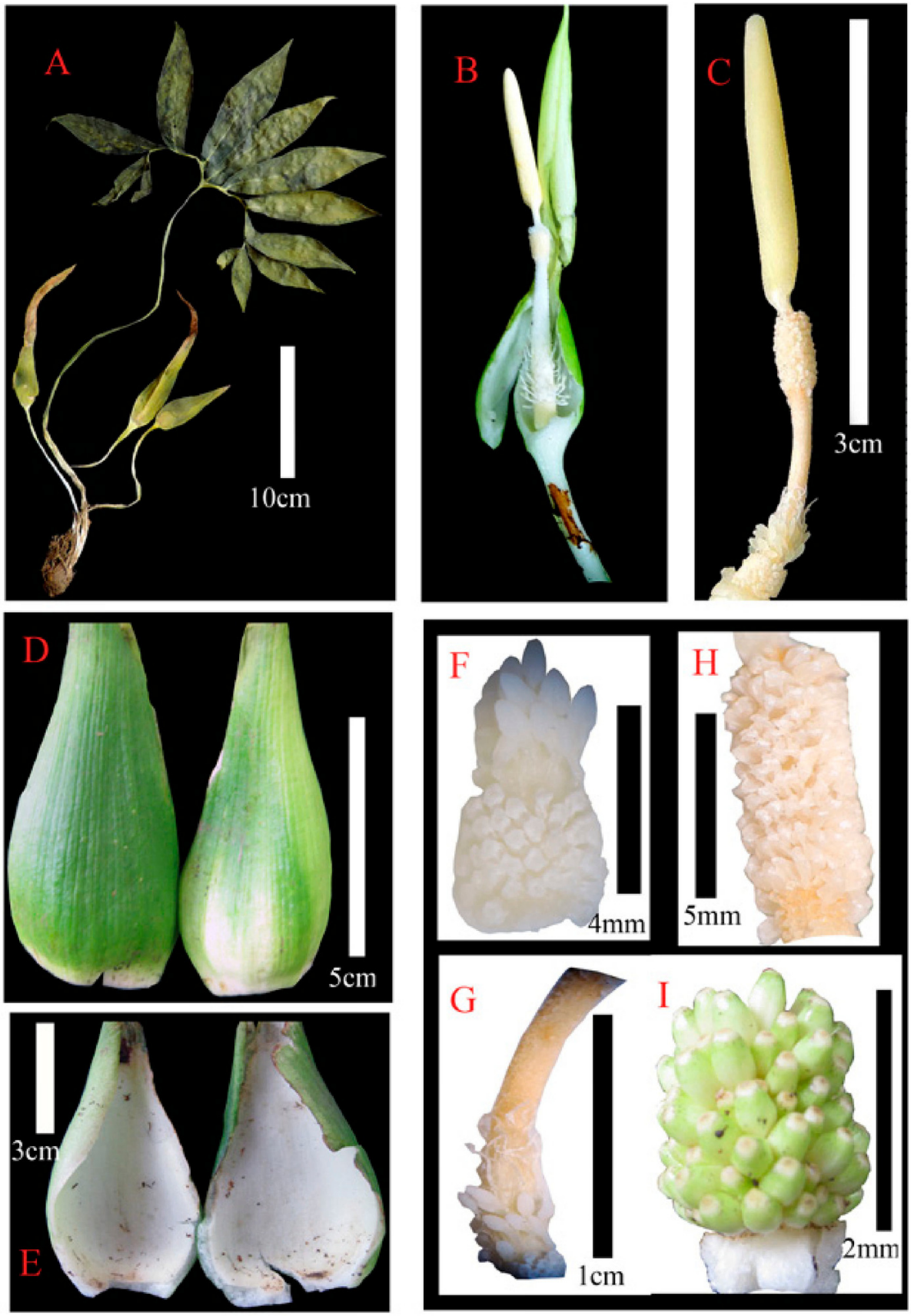

Plate 2. ***Sauromatum horsfieldii*** Miq.: **A**. Habit; **B**. Longitudinally opened spathe; **C**. Spadix; **D**. L.S. of spathe tube (dorsal view); **E**. L.S. of spathe tube (ventral view); **F**. Female zone and lower clavate staminodes; **G**. Sterile zone with two type of staminodes; **H**. Male zone; **I**. Fruiting zone with berries.

Key to the Indian species of *Sauromatum*

In India, the genus comprises five species represented by *S. brevipes*, *S. diversifolium*, *S. meghalayense* and *S. venosum* (Talukdar *et al*. 2014) and the new record, *S. horsfieldii*.

1a. Leaf blade diversified (often in one plant) from simple to pedatisect ..... ***S. diversifolium***

1b. Leaf blade always pedatisect 2

2a. Spathe tube connate; 1 type of staminodes 3

2b. Spathe tube convolute; 2 types of staminodes 4

3a. Inflorescence appearing before leaves; spathe tube dark purple inside ..... ***S. venosum***

3b. Inflorescence appearing alongside first developing leaf; spathe tube greenish to white inside ..... ***S. brevipes***

4a. Peduncle greenish white, to 20 cm long; spathe tube pale green outside, white inside ..... ***S. horsfieldii***

4b. Peduncle purplish brown, to 5 cm long; spathe tube purplish brown to dark brown outside, purple inside but creamy to white on margin and toward the limp inside ..... ***S. meghalayense***

Sauromatum brevipes (Hook.f.) N.E.Br., *Gardeners' Chronicle*, ser. 3, 34(2): 93 (1903)

Typhonium brevipes Hook.f., *Flora of British India* 6: 511(1893)

Syntypes: India: Darjeeling, 7500 ft., *Clarke 26708* (K); Jore Pokri, 7600 ft., *Gammie s.n.* (K).

Distribution: INDIA: Sikkim; BANGLADESH, CHINA, NEPAL.

Other specimens examined: INDIA: Uttarakhand: Udhampur, Pouni village, *A. Swami 1108*, 5 Apr 1987 (BSD); Sikkim: Lachung Valley, *G.A. Gammie 763*, 14 Aug 1862 (CAL).

Sauromatum diversifolium (Wall. ex Schott) Cusimano & Hett., *Taxon* 59(2): 445 (2010)

Typhonium diversifolium Wall. [in Wallich's Numer. List n. 8933 (1949), nom. nud.] ex Schott, *Aroideae* 13: 20 (1855)

Holotype: Nepal, *Wallich's Numer. List. no. 8933a*, anno 1821 (K).

Distribution: INDIA: NW and NE India; BHUTAN, CAMBODIA, CHINA, MYANMAR, NEPAL.

Sauromatum horsfieldii Miquel, *Flora van Nederlandsch Indie* 3: 196 (1856)

Typhonium horsfieldii (Miq.) Steenis, *Bulletin du Jardin Botanique de Buitenzorg*, ser. 3, 17: 403 (1948)

Arisaema submonoicum Gagnep., *Notulae Systematicae* 9: 128 (1941)

Typhonium larsenii S.Y.Hu, *Dansk Botanisk Arkiv Udgivet af Dansk Botanisk Forening* 23: 448 (1968)

Pedatyphonium larsenii (S.Y.Hu) J.Murata & Ohi-Toma, *Systematic Botany* 36: 254 (2011)

Holotype: Indonesia: Java, Oenagaran, *Horsfield s.n.* (K); iso: Ungarang, *T. Horsfield s.n.* (isotype; BM – image).

Distribution: INDIA: Nagaland; CAMBODIA, INDONESIA, LAOS, MYANMAR, S CHINA, THAILAND, VIETNAM

Other specimen examined: THAILAND: Chiang Mai, *T. Sorensen 3931, K. Larsen & B. Hansen*, 7 Jul 1958 (C – image).

Sauromatum meghalayense D.K.Roy, A.D.Talukdar, B.K.Sinha & M.Dutta Choudhury, NeBIO 5(3): 1–3 (2014)

Holotype: India, Meghalaya, South Garo Hills, Hatisia, *D.K. Roy 130216*, 5 Jun 2014 (ASSAM).

Distribution: INDIA: Meghalaya, Endemic.

Sauromatum venosum (Dryand. ex Aiton) Kunth, *Enumeratio Plantarum Omnium*

Hucusque Cognitarum, Secundum Familias Naturales Disposita, Adjectis Characteribus, Differntiis et Synonymis 3: 28 (1841)

Arum venosum Dryand. ex Aiton, *Hortus Kewensis* 3: 315 (1789)

Holotype: Plant of unknown origin introduced into cultivation at Kew by William Malcolm in 1774 (BM).

Distribution: INDIA: Peninsular, NE and NW India; AFGHANISTAN, AFRICA, BHUTAN, CHINA, MYANMAR, NEPAL.

Other specimens examined: INDIA: Kashmir: Bhadrawah – Jai, 2000–2500m, *T.A. Rao 9031*, 29 May 1959 (BSD). Maharastra: Thane, *K.V. Billor 116259*, Feb 1968 (CAL); Poona, *D. Prain s.n.*, 14 May 1896 (CAL496355,); Chota Nagpur, *D. Prain 4*, 13 Sep 1886 (CAL). Meghalaya: Woodland, *D.M. Verma 35665*, 17 Jul 1967 (ASSAM); Mowprem, Near Hindu Mission, *K.M. Dey 32631*, 1 May 1964 (ASSAM). Uttarakhand: Dehra Dun, BSI office compound, *S.K. Malhtra 18061*, 10 Oct 1961 (BSD); Rajpur Canal Road, *S.K. Malhotra 18508*, 3 Nov 1961 (BSD); Arcadio Tea Estate, 600m, *N.P. Singh 31316*, 18 Jul 1964 (BSD); Garhwal, Nandheswari, 1300m, *U.C. Bhattacharjee 35151*, 28 Apr 1967 (BSD); Uttarkashi, *B. Balodi 91550*, May 1996 (BSD); Kumaon, Baram, 1100m, *U.C. Bhattacharjee 21187*, 24 Apr 1962 (BSD). Uttar Pradesh: Saharanpur, Mohan, *V.S. Murty 869 & A.K. Goel*, Aug 1974 (BSD).

Acknowledgments

Authors are grateful to Dr. P. Singh, Director, Botanical Survey of India, Kolkata for facilities and encouragement and Dr. Olof Ryding, Collection Manager, National History Museum of Denmark, University of Copenhagen for sending the image of the type of *Typhonium larsenii*. They also thankfully acknowledge the help rendered by Department of Forests, Ecology, Environment and Wildlife, Kohima, Nagaland during field survey.

References

Cusimano N, Barrett MD, Hetterscheid WLA, Renner S (2010) A phylogeny of the Areae (Araceae) implies that *Typhonium, Sauromatum*, and the Australian species of *Typhonium* are distinct clades. *Taxon* 59(2): 439–447

Heng L, Hetterscheid WLA (2010) *Sauromatum* Schott. Pp. 36–39 in Wu ZY, Raven PH, Hong DY (eds.) *Flora of China* 23 (Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis)

Hetterscheid WLA, Boyce PC (2000) A reclassification of *Sauromatum* Schott and new species of *Typhonium* Schott (Araceae). *Aroideana* 23: 48–55

Hetterscheid WLA, Sookchaloem D, Murata J (2001) *Typhonium* (Araceae) of Thailand: New Species and a Revised Key. *Aroideana* 24: 30–55

Hooker JD (1893) *Aroideae. Flora of British India* 6. L. Reeve and Co., London, pp. 490–556

Jain SK, Rao RR (1976) *A Handbook of Field and Herbarium Methods* (Today & Tomorrow's Printer Publisher, New Delhi)

Schott HW (1832) Araceae. Pp. 16–22 in Schott HW, Endlicher S (eds.) *Meletemata botanica* (Gerold, Vienna)

Talukdar AD, Roy DK, Sinh BK, Choudhury MD (2014) *Sauromatum meghalayense* (Araceae; Tribe: Areae), a new species from Meghalaya, India. *NeBIO* 5(3): 1–3

The Plant List (2015) Version 1.1, www.theplantlist.org [accessed 24 Jul 2015]

Manuscript received 24 June 2015, accepted 20 August 2015