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Six new additions for the flora of Assam and Arunachal Pradesh (India)

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Abstract

The Eastern Himalaya, particularly Assam and Arunachal Pradesh, represents a globally significant hotspot of plant diversity characterized by high species richness and endemism. Field surveys conducted between 2022 and 2025 resulted in the documentation of six new distributional records, including four from Assam and two from Arunachal Pradesh, belonging to the families Begoniaceae, Rubiaceae, Piperaceae, and Gesneriaceae. Specimens were collected, photographed, and processed using standard herbarium methods and deposited in ARUN and TOSEHIM. Taxonomic identifications were confirmed through critical comparison with relevant literature, herbarium specimens, and online databases. These new records enhance the floristic understanding of the Eastern Himalaya and underscore the region's significance for future biodiversity exploration and conservation efforts.

1 Introduction

The Eastern Himalaya stands out as a globally significant centre of plant diversity, shaped by dramatic elevational and climatic gradients. Assam's lowland floodplains and foothill forests support diverse plants including wetland and orchid-rich assemblages, whereas Arunachal Pradesh accommodates a unique micro habitat specific flora rich in endemics [1–3]. The state of Assam has diverse habitats ranging from grasslands and wetlands to tropical evergreen forests, which support both Indo-Malayan and Himalayan floristic elements, contributing to high species turnover. More than 3,800 species have been recorded from Assam so far, and the number keeps on increasing with an increase in documentation efforts [3, 4]. Arunachal Pradesh, the largest state in the Eastern Himalaya, harbours nearly 5,000 species of flowering plants, representing one of the highest floristic diversities in India. Nearly one-third of Arunachal's flora comprises rare or endemic taxa [5, 6]. The state is also a hotspot of endemism, with over 30% of its flora considered rare or restricted in distribution [6, 7], making it a priority region for taxonomic and conservation studies. In the present study, we report six new distributional records from Northeast India, four for Assam and two for Arunachal Pradesh. The four species from Assam represent three different families: *Begonia shilendrae* Rekha Morris & P.D. McMillan, *Begonia ovatifolia* A. DC. (Begoniaceae), *Mycetia listeri* Deb

(Rubiaceae), and *Peperomia bourneae* C. DC. (Piperaceae). And the two species from Arunachal Pradesh belong to the family Gesneriaceae: *Didymocarpus oblongus* Wall. ex D. Don and *Petrocosmea parryorum* C.E.C. Fisch.

2 Materials and methods

Various field explorations were conducted in a few districts of Assam (Karbi- Anglong, Lakhimpur, Kamrup) and Arunachal Pradesh (West Kameng, Lower Subansiri) from 2022 to 2025 (Fig. 1). During the survey, we have collected a few specimens of, *Begonia ovatifolia* A. DC., *Begonia shilendrae* Rekha Morris & P.D. McMillan, *Mycetia listeri* Deb, *Peperomia bourneae* C. DC., *Didymocarpus oblongus* Wall. ex D. Don and *Petrocosmea parryorum* C.E.C. Fisch. for a detailed study. The specimens were identified by studying various literature [8–17] and consultation of different regional herbaria (ASSAM, ARUN, GUBH, Herbarium of Cotton University, Dibrugarh University and various colleges) revealed that these species were not recorded previously from the study areas. The specimens were photographed, systematically collected, and processed in accordance with the most accepted herbarium practices [18]. The specimens were deposited in the herbarium (ARUN & TOSEHIM). The collected specimens were identified by reviewing pertinent taxonomic literature [8–16] and consulting herbarium specimens stored at various herbaria (ASSAM, ARUN, CAL, K, E, PE, B). For valid taxonomic nomenclature, various online databases, including POWO (Plants of the World Online) [19] and WFO (World Flora Online) [21] were consulted. The distribution map was prepared by using QGIS 3.28.13 'firenze' (2025) software [20].

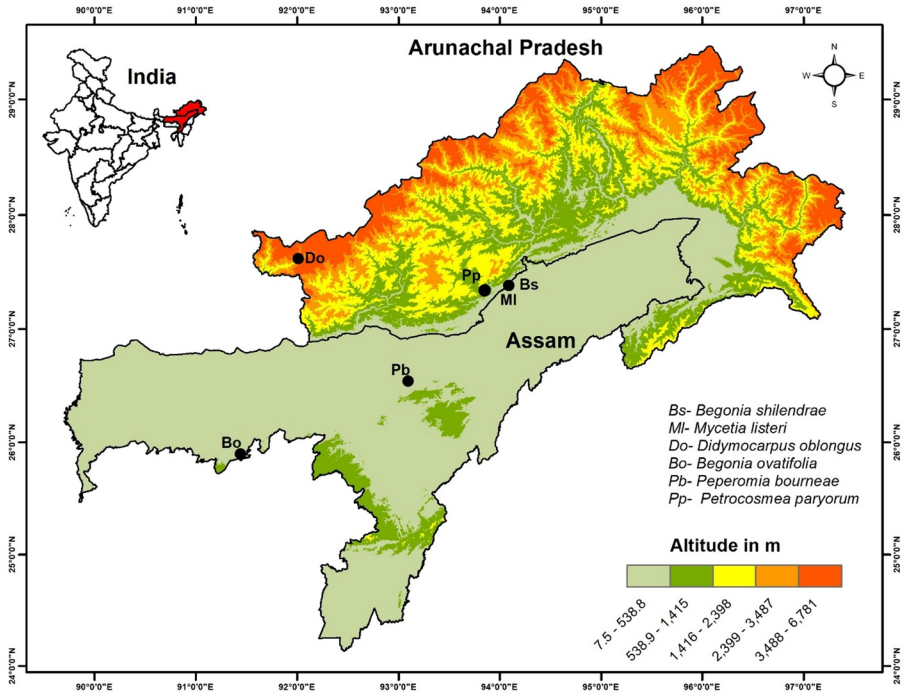

Fig. 1 The location map shows the distribution of six new records for the state of Assam and Arunachal Pradesh (India)

3 Results and discussion

3.1 Taxonomic treatment (Fig. 2 and 3)

Begonia ovatifolia A.DC. Ann. Sci. Nat., Bot. 11: 132. (1859). (Fig. 3. L-N)

Type: India, Khasia: 16 July 1850, Hooker & Thomson 27 (lecto K image!, designated by Camfield and Hughes, 2018).

Erect herb, monoecious, 2.5–15 cm high. Tubers 2–3 × 0.5–1.0 cm. Stipules subulate, 1–2 × 1 mm, glabrous. Leaves cauline, lamina ovate to broadly ovate, 2–10 × 2–8 cm; basifixed, cordate at base, apex shortly acuminate; adaxially pubescent, later glabrescent, abaxially sparsely puberulous prominent on veins; venation palmate-pinnate, with 7–8 veins. Inflorescence axillary or terminal, 1–3 flowered cyme, dioecious; peduncle glabrous, 4–12 cm long; branching 1–2; bracts linear, 1–2 × 0.8–1 mm, glabrous, persistent. Male flower 1–2 cm in diameter; pedicel 1.0–2.5 × 0.1 cm long, glabrous; tepals 4, outer tepal elliptic ovate to broadly ovate to ovate orbicular, 0.5–0.7 × 0.3–0.6 cm, pinkish white, glabrous, inner tepal narrowly elliptic to obovate, 0.4–0.6 × 0.2–0.4 cm, white,

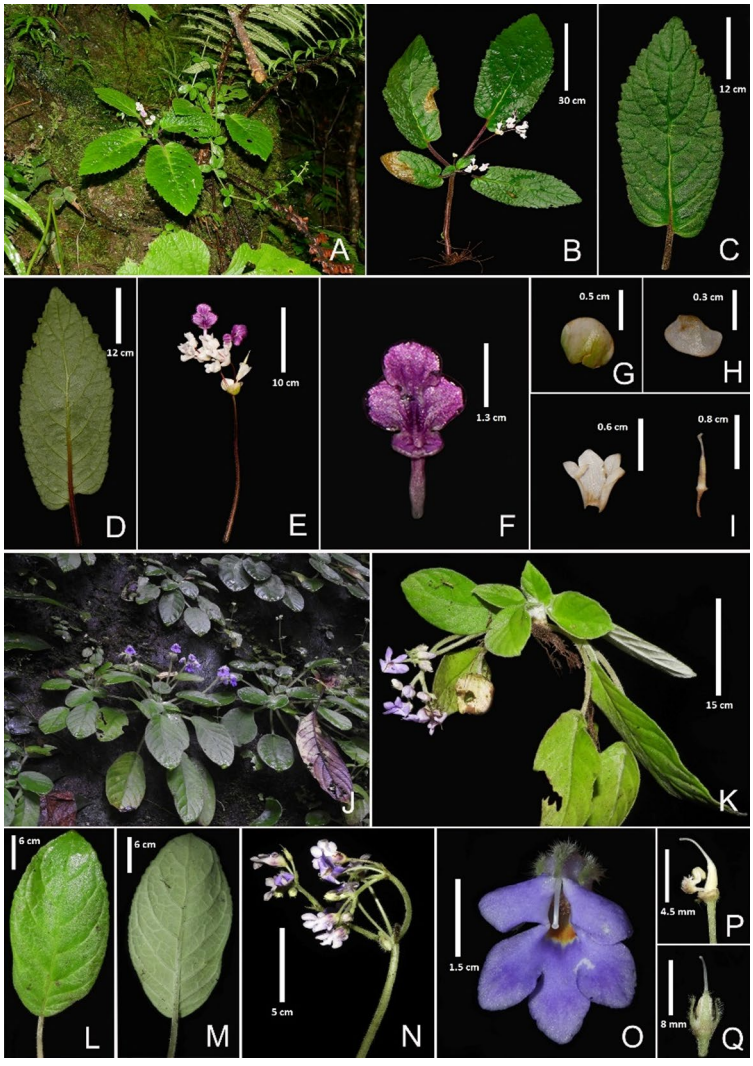

Fig. 2 *Didymocarpus oblongus* Wall. ex D. Don—A (Habit) B (Whole plant with inflorescence) C–D (Leaf showing adaxial and abaxial surface E (inflorescence) F (Front view of corolla) G–H (Primary and secondary bracteole) I (Calyx and pistil), *Petrocosmea parryorum* C.E.C. Fisch.—J (Habit) K (Whole plant) L & M (Leaf showing adaxial and abaxial surface) N (Inflorescence) O (Front view of corolla) P & Q (Androecium and gynoecium side and back view)

Fig. 3 *Peperomia bourneae* C. DC.—A (Habit) B (Plant with inflorescence) C (Infructuscence), *Begonia shilendrae* Rekha Morris & P.D. McMillan—D (Habit) E (Inflorescence) F (Female flower) G (male flower), *Mycetia listeri* Deb—H (Habit) I (Inflorescence showing the grandular bracts) J & K (Single flower and it's section) *Begonia ovatifolia* A. DC.—L (Habit) M (Male flower) N (Female flower)

glabrous; androecium with 20—450 stamens; filaments 1 mm long, anther broadly obovate, ca. 1 × ca. 0.5 mm. Female flower 1–1.5 cm in diameter; pedicel 1–1.4 × 0.1 cm, glabrous; tepals 4, unequal, outer tepal 2, orbicular, 0.5–1 × 0.4–0.5 cm, white to pink, glabrous, inner tepal narrowly elliptic to ovate, 0.4–0.5 × 0.2–0.3 cm, glabrous; ovary 3-locular; placentae bifid; fruit with three unequal triangular wings; styles 3, forked once and twisted once, persistent. Fruit pendulous; capsule ellipsoid, 7–12 × 2–7 mm, glabrous; wings unequal, central wing, 2–2.1 × 1.5–2.5 cm, lateral wings, 1–1.5 × 1.5 cm.

Habitat ecology and associated species The species was found growing on steep walls of a stream sides in semi-evergreen forests and mixed decidous forests, where it grows in association with *Begonia manhaoensis* and Didymocarpus sp. This was observed in three localities of Assam (Chandubi-Kamrup, Suang-Nagaon and Nameri-Sonitpur).

Flowering July–September; *Fruiting* September–October.

Distribution India (Assam, Arunachal Pradesh, Meghalaya, Sikkim, Nagaland), Nepal, Bhutan.

Specimen examined India, Assam, Kamrup Rural, Chandubi, 25°54′03.4"N 91°26′20.5"E, 183 m, 03 September 25, Niku Das 2590 (TOSEHIM!).

Begonia shilendrae Rekha Morris & P.D.McMillan, Begonian79: 63 (3–4). 2012. (Fig. 3D-G)

Type India, Arunachal Pradesh, Itanagar, 3 Apr. 2005, Morris AR1 (holo: CLEMS image!).

Rhizomatous monoecious herb, 20–60 cm high. Rhizome 7–25 × 1–2 cm, glabrous, internodes 5–25 mm long. Leaves palmate, petiole 15–40 cm × 1–2.5 cm, pubescent to sparsely villose; lamina broadly ovate, base shallowly cordate to truncate, 15–35 × 6.5–30 cm, slightly asymmetric, adaxially glabrous, abaxially pubescent prominent on venation palmate, margin with deeply 5–8 lobes. Inflorescence panicle or raceme of cymes, terminal; peduncle glabrous, branching 1–3 times, primary 8–30 cm long, secondary and tertiary c. 1 cm, up to 15 flowers per branch, dioecious. Male flower pedicel 5–15 mm long, glabrous; tepals 2; outer tepals cordate-ovate, 0.4–10 × 0.4–0.5 cm, pinkish, glabrous, margin entire; androecium with 30–40 stamens, stamens, symmetric; filaments 1–3 mm long; fused at base; anther globose, 1 mm long, not hooded, connective not extended. Female flower: pedicel 1–3.5 cm long, glabrous; tepals 2, ovate, 0.4–1 × 0.4–0.9 cm, pinkish, glabrous, entire; ovary 2–3 locular, 0.5–0.9 cm long, placentae bifid; styles 2–3, forked once and twisted once, persistent, 0.1–0.2 cm long, and persistent. Capsule elliptic, 0.9–1.3 × 0.3–0.5 cm, glabrous; wings extending along the pedicel and in front of the capsule, unequal; central wing rounded triangular 1.5–2 × 1–1.4 cm; lateral wings oblong, 0.1–0.2 × 1.1–1.7 cm.

Habitat ecology and associated species The species occurs on steep streamside slopes within dense tropical forests, where it grows in association with *Mycetia listerii, Steudnera colocasioides, Tacca integrifolia, Thysanolema latifolia*, and several other grasses.

Flowering December-January; *Fruiting* January-March.

Distribution India (Arunachal Pradesh, Assam).

Specimen examined India, Assam, Lakhimpur, Kakoi R.F., 26.06.25, N 27°23′08.8" E 094°05′28.0", 130 m asl, 26 June 2025, Niku Das 2581 (TOSEHIM).

*Didymocarpus oblongus D. Don, Prodr. Fl. Nep. 123. 1825; C.B. Clarke in Hook.f., Fl. Brit. India 4: 346. 1884. (*Fig. 2*. A-G)*

Type Nepal, Wall. Cat. Num. List no. 738 (BM image!, n.v.) Herbs.

Perennial herbs, 10–40 cm tall. Stem strigose, 10–13 cm × 0.3–0.5 cm, glandular; glands reddish brown. Leaves 1 or 2 pairs, opposite, clustering at apex; petioles 0.2–1.5 × 0.2–0.3 cm, pilose; lamina elliptic to elliptic lanceolate, 6–14 × 3–6 cm, rugulose, adaxially appressed strigose, abaxially tomentose to villous, strigose along the veins with reddish sessile glands on both surfaces; base cuneate, round to oblique; apex rounded margins bicrenate or biserrate; lateral veins 5–7 pairs. Petioles 0.2–1.5 cm long, puberulous. Midrib with 17—18 nos. of lateral veins. Cyme 3–4-flowered. Peduncle glabrescent or appressed strigose with reddish sessile glands; primary peduncle 5–7 × 0.1–0.15 cm long, secondary peduncle 2–2.7 × 0.1 cm. Bracts orbicular to round, fused together to form a cupulate structure 0.4–0.8 × 0.3–0.5 cm, purplish-pink to greenish pink or white, outer surface glabrescent to appressed strigose with sessile glands, more prominent near the base, inner surface glabrous. Pedicel 0.2–0.7 cm long, glabrous. Calyx conical to campanulate, glabrous on both sides, 0.5–0.6 × 0.4–0.5 cm, 5-lobed, lobbing above the middle of the calyx tube; calyx lobes twisted, overlapping at margins, unequal, broadly trigular to ovate or rounded, c. 1 mm × 2 mm, margin entire, apex rounded. Corolla purple to dark purple, glabrous, bilabiate, 1–2 cm long; tube 0.5–0.8 × 0.1–0.2 cm, broader

at the base, narrow towards lobes, mouth oblique; lobes rounded to orbicular, glabrous upper lip perfoliate to decurrent, 0.3–0.5 × 1–2 mm, lower lip 3-lobed, 0.5–0.9 × 0.2–0.4 cm. Stamens 2, filaments 0.7–1 mm long, glabrous; anthers 0.2–0.3 mm long, glabrous, dorsifixed. Pistils 0.5–9 mm long. Ovary, 3–5 mm long, glabrous, not stipitate; style 1–2 mm long, glabrous. Fruits not observed.

Habitat ecology and associated species The species was found growing roadside, in the walls of hill slopes in dense evergreen forests, where it grows in association with *Henckelia lachenensis, Didymocarpus punduanus* and *Begonia josephii.*

Flowering August–September.

Distribution India (Arunachal Pradesh, Sikkim), Nepal.

Specimen examined India, Arunachal Pradesh, Tawang, N 27°37′12.7" E 092°00′42.5", 1928 m asl, 13 July 2025, Dipankar Borah and Niku Das 2595 (TOSEHIM!).

*Mycetia listeri Deb, Blumea xiv. 241. 1966. (*Fig. 3*. H & I)*

Type India, Arunachal Pradesh, Daphla hills, 1874, J. L. Lister s.n. (CAL image!).

Shrub, 1–2 m tall. Stem branched, nodes slightly swollen, glabrescent. Stipule, not persistent, ovate to lanceolate, apex acute to attenuate, 0.8–1.5 × 0.2–0.4 cm long, with minute hairs, with longitudinal veins like projections. Petioles 0.6–1 × 0.1–0.2 cm long, with minute hairs. Leaves opposite, unequal, lanceolate to elliptic-lanceolate, 8–28 × 0.7–4 cm, apex acuminate, attenuated at base, margin entire to slightly repand lateral veins 11–20 pairs, abaxially hairy, adaxially sparsely hairy. Inflorescence axillary or terminal, dichotomously branched panicle of cymes, 9–17 cm long; bracts caducous, small, 0.2–0.3 × 0.1–0.15 cm, also forming a glandular-like structure. Flower 0.7–1.2 cm across, pedicel 0.3–0.4 mm long; calyx 5 lobed, 0.2–0.3 × 0.1–0.2 cm, with glandular appendages; corolla yellow, tubular, 0.3–0.5 cm, corolla lobes densely pubescent adaxially, 0.1–0.2 × 0.1–0.15 cm, apex acute to attenuate. Stamens at the base of the corolla tube, filaments short to almost sessile, anthers linear to oblong. Hypanthium 0.3–0.4 × 0.2–0.3 cm, glabrous. Pistil, 0.4–0.7 cm, stigma 2-lobed; ovary hemispherical, 2 locular. Berries ovoid.

Habitat ecology and associated species The species occurs on steep streamside slopes within dense tropical forests, where it grows in association with *Begonia shilendrae, Steudnera colocasioides, Tacca integrifolia, Thysanolema latifolia*, and several other grasses.

Flowering May–June; *Fruiting* July–September.

Distribution India (Arunachal Pradesh, Assam), Bangladesh.

Specimen examined India, Assam, Lakhimpur, Kakoi R.F., N 27°23′08.8" E 094°05′28.0", 130 m asl, 26 June 2025, Niku Das 2588 (TOSEHIM).

*Peperomia bourneae*C.DC., Candollea 1: 345. 1923. (Fig. 3A &C)

Type India, Tamil Naidu, Shenthadikanal, Pulneys, Bourne 1178 (holo: G-DC image!).

Epiphytic trailing perennial herbs, 10–20 cm long, rooting from the nodes, internodes 0.8–2 cm long, basal internodes longest, terete, winged. Leaves alternate, one leaf per node; petioles 0.3–0.8 cm long, pubescent; lamina orbicular, suborbicular to slightly rounded, elliptic to ovate or obovate, 1–2.5 × 1–1.5 cm, glabrous on both surfaces, base cuneate or rounded, apex acute to rounded, margin entire. Inflorescence branched, yellowish green, 2.5–4.5 × 0.2 cm, sometimes solitary on lower branches, peduncles 0.2–0.5 cm long, glabrous with red stipes; rachis green about 1–2 mm in diameter, rachial

pits green; floral bracts dark punctuate. Fruits sessile, globose to oblate, 1 mm in diameter, greenish to light brown at maturity.

Habitat ecology and associated species The species was found growing on the walls of a large boulder in hillside semi-evergreen forests, where it grows in association with *Tupistra nagarum* and *Begonia hatacoa.*

Flowering April–May; *Fruiting* June–August.

Specimen examined India. Assam, Nagaon, Phulaguri Pahar, E 26.547344, E 93.087249, 248 m asl, 10 May 2025, Niku Das & Dipankar Borah 2570 (TOSEHIM!).

Distribution India (South India, Assam).

*Petrocosmea parryorum*C.E. Fischer, Bull. Misc. Inform. Kew 1926: 438. 1926; Trisepalum kingii C. B. Clarke in A et C DC. Monog. Phan. 5: 139. 1883.(Fig. 3J-Q).

Type Assam, Lushai hills, 1700 m, Muallung (Chin border), 3rd November 1925, Mr. and Mrs. N.E. Parry *s.n* (K image!, Barcode K000196635).

Perennial herb with a short rhizomatous stem and crowded fibrous roots. Leaves in basal rosette 7–23 per plant; petiole 2–13 cm long, hyaline villous to hirsute; lamina oblong to narrowly oblate or broadly elliptic, 2–13 × 1–7 cm; base rounded, cordate, oblique or peltate with entire to repand or sinuate to serrated, margin ciliate, apex acute to rounded; lateral veins 3–5 pairs adaxially papillose, abaxially densely hairy. Cymes 1–6, 1–25-flowered, pilose, branched twice or thrice; primary peduncle 5–14 cm long, secondary peduncle 3–7 cm long, tertiary peduncle 1–2 cm long; bracts linear to lanceolate, pilose or villous, c. 1 cm × 0.2 cm. Calyx 5-lobed from the base, lobes c. 6 × 2 mm, equal, lanceolate, apex acute, hirsute or villous outside, glabrous inside. Corolla purple to violet, broadly campanulate; tube short, 1.3–1.5 cm in diam.; limb bilabiate, 4.5–6 × 4–5 mm, subequal, pilose outside, glabrous inside, anterior lip 3-lobed, lobes broadly rounded, posterior lip 2-lipped, narrowly blunt orbicular. Filaments 1–3 mm long, broad, apex geniculate, red villous, base glabrous; anthers 3–4 mm long, basifixed, ovate to cordate, coherent at apex, 2 locules, thecae parallel, connective not projected, dehiscence longitudinal. Staminodes 3, ligulate, minute. Ovary 2–3 mm long, oblong, white pubescent, mature ovary up to 7 mm long; style 5–7 mm long, obscurely pilose near base, glabrous above, exerted, stigma capitate. Capsules linear-lanceolate, 1.3–2 × 4–6 mm. Seeds fusiform, acute at both ends, smooth, brown, c. 0.5 mm long.

Habitat ecology and associated species The species was found growing roadside, in the walls of hill slopes in dense evergreen forests, where it grows in association with *Begonia medogensis, Begonia sikkimensis, Elatostemma* sp., *Hydrocotyle* sp., *Impatiens* sp., etc.

Flowering August–September; *Fruiting* September–October.

Distribution India (Arunachal Pradesh, Meghalaya, Mizoram, Sikkim), China, Vietnam.

Specimen examined India, Arunachal Pradesh, Lower Subaniri, Potin, 27.340598 N, 93.853963 E, 870 m amsl, 30 August 2022, Momang Taram 9747 (ARUN!).

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Author contributions

D.B and S.S. wrote the main manuscript text, collection of the plants has by done by N.D, D.B and M.T, plants were correctly identified by N.D, D.B and M.T, study area map designed by SS. All authors reviewed the manuscript completely.

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Data availability
All data generated or analysed during this study are included in this published article (and its supplementary information files).

Declarations

Conflict interest
The authors declare no competing interests.

Ethical approval
The ethical guidelines for plants and plant materials are followed for sample collection and identification. All the collection activities were conducted in accordance with the established guidelines and regulations for environmental and ecological research of Department of Environment, Forest & Climate Change, Govt. of India. Dr. Dipankar Borah identified all species taxonomically. The specimens are deposited in the in the ARUN and TOSEHIM Herbaria. The collection number of each species has been mentioned along with the description.

Consent to participate
Not applicable.

Consent to publication
Not applicable.

Plant guidelines
The collection of plant material, complied with relevant institutional, national, and international guidelines and legislation. In Arunachal Pradesh it has been conducted with the permission of the villagers, who are the landowners and custodians of the forest patch where specimens were collected. And in Assam, it has been conducted with the permission of the Department of Environment, Forest & Climate Change, Govt. of Assam, India.

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