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NOTE

ADDITIONS TO THE FLORA OF ARUNACHAL PRADESH STATE, INDIA

Umeshkumar Lalchand Tiwari

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ADDITIONS TO THE FLORA OF ARUNACHAL PRADESH STATE, INDIA

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Arunachal Pradesh, by virtue of its geographical position, climatic conditions, and altitudinal variations, is a biodiversity-rich region in northeastern India and the eastern Himalaya, with a large zone of tropical wet evergreen, subtropical, temperate, and alpine forests. The state is recognized as one of the 200 globally important regions (Olson & Dinerstein 1998). The flora of Arunachal Himalaya comprises well over 4,055 species of flowering plants (Hajra et al. 1996).

During the course of a floristic exploration under the project 'Flora of East Kameng District' of the Botanical Survey of India, the author collected some interesting specimens from the district. These specimens were identified with the help of existing flora and confirmed by comparing with authentic specimens housed at various herbaria such as SIKKIM (Gangtok), ASSAM (Shillong), ARUN (Itanagar), and CAL (Howrah). A critical examination of literature (Hooker 1881, 1885, 1890, 1897; Chowdhery 1995; Chowdhery et al. 2009; Giri et al. 2009; Das & Mao 2011; Pal 2013; Bhaumik & Satyanarayana 2014a,b; Tiwari 2015–2016, 2016; Tiwari & Mao 2016; Tiwari & Rawat 2018; Tiwari et al. 2018; Gogoi et al. 2019) revealed that these species had not been reported from the state of Arunachal Pradesh until now. Hence, these species are reported in the

current manuscript as additions to the angiosperm flora of the state. Accordingly, detailed descriptions, herbarium images, and relevant notes based on the collector's information are provided to facilitate their easy identification in the field.



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Synedrella nodiflora (L.)

Gaertn., Fruct. Sem. Pl. 2: 456, t. 171, f. 7. 1791; Hook.f., Fl. Brit. India 3: 308. 1881; H.J. Chowdhery in Hajra et al., Fl. India 12: 413. 1995; Karthik. et al., Flow. Pl. India Dicot. 1: 278. 2009. *Verbesina nodiflora* L., Cent. Pl. 1: 28. 1755 (ASTERACEAE) (Image 1).

Annual herbs, erect up to 1.0–1.5 m tall, appressed-pilose with ascending white hairs; stems terete. Leaves cauline, opposite, petiolate; blade ovate to elliptic, 3–10 cm × 3–4 cm, base rounded or cuneate, margin shallowly serrate to subentire, apex acute, both surfaces ± scabrid, usually 3-veined. Capitula radiate, sessile or subsessile in axillary glomerules or capitula solitary, aggregated in groups of 1–4 at the forks of the stem or leaf axils enclosed in foliaceous bracts; involucre bracts in 2–3 series, outermost foliaceous, phyllaries persistent, lanceolate, herbaceous to papery. Receptacle convex. Ray florets 4–9, 1- or 2-seriate, female, fertile; corolla yellowish, ca. 3–4 mm long; bilobed, tube 2–3 mm long. Disk florets 10–15, bisexual, fertile; corolla yellowish, lobes short, dorsally pubescent. Anthers dark. Ovary slightly compressed, oblong, with two flattened, stout, apical awns; style branched flattened, marginally pilose. Achenes dimorphic, ca. 4mm long, slender, tuberculate, puberulous.

Flowering and fruiting: March–October.

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Image 1. *Synedrella nodiflora* (L.) Gaertn. herbarium specimen M. Bhaumik 29911 (ARUN!).

in size upwards, margins undulate and serrate; lateral veins 6–10 on each side of the midrib. Inflorescences spike, lax, up to 25cm long, ovate, sessile or shortly peduncled. Flowers sub-sessile, solitary from bract axils, 2.5–3.0 cm long. Calyx 7–8 mm long, glandular hairy; lobes equal, spreading flat, orbicular, apex obtuse. Corolla golden yellow, up to 3cm long; tube three times as long as the calyx, sparsely hairy; throat with two oblong red-punctate plaits; lower lip broader than wide, up to 2.5cm long, lateral lobes oblong, middle lobe smaller than other lobes, orbicular, and emarginate; upper lip short and orbicular, emarginate. Filaments hairy below middle. Ovary sericeous. Capsules ovoid, tip exserted



Specimen examined: 29911 (ARUN!), 08.vii.2014, Arunachal Pradesh, Pashighat, New Yingkiang, 28.624°N & 95.031°E, 200m, coll. M. Bhaumik.

Notes: The species grows as a weed in marshy places in the rainy season.

Distribution: India (Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Meghalaya, Tamil Nadu, Kerala, Andaman & Nicobar Islands, and Arunachal Pradesh), Bhutan, Nepal, China, Sri Lanka, Malaya, and tropical America.

Lindenbergia grandiflora

(Buch.-Ham. ex D.Don) Benth., Scroph. Ind.: 22. 1835; Hook.f., Fl. Brit. India 4: 261. 1885. *Stemodia grandiflora* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal.: 89. 1825 (SCROPHULARIACEAE) (Image 2a,b).

A rambling perennial, with flexuous stem and branches sometimes densely pilose. Branches slender, flexuous, 15–80 cm long. Leaves opposite; petiole up to 7cm long; leaf blade ovate, up to 20cm long, decreasing

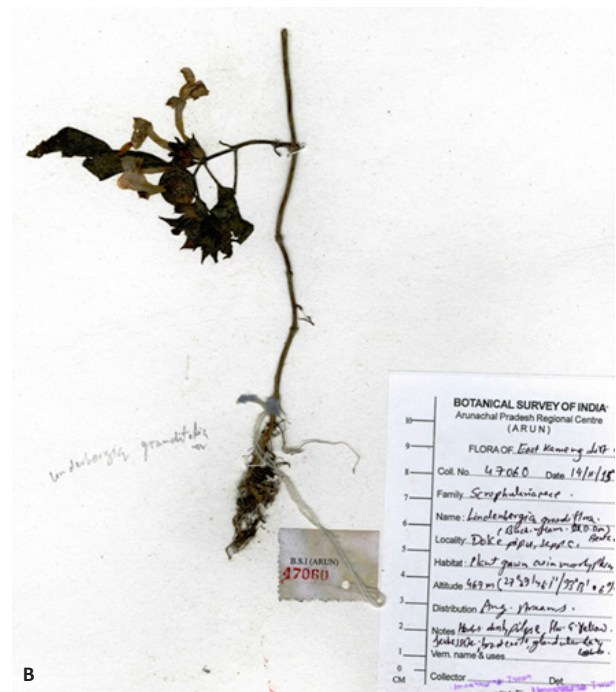


Image 2. *Lindenbergia grandiflora* (Buch.-Ham. ex D. Don) Benth.: A - in the wild | B - herbarium specimen U. Tiwari 47060 (ARUN!).

from persistent calyx. Seeds ca. 0.5mm long.

Flowering and fruiting: July–December.

Specimen examined: 47060 (ARUN!), 14.xi.2015, Arunachal Pradesh, East Kameng District, Doka Pipu, Seppa, 27.462°N & 93.027°E, 467m, coll. U. Tiwari.

Notes: The species grows as a weed in marshy places in the rainy season.

Distribution: India (Himachal Pradesh, Uttarakhand, West Bengal, Sikkim, and Arunachal Pradesh), Bhutan, Nepal, and China.

Balanophora polyandra

Griff., Proc.Trans. Linn. Soc. London 1: 220. 1844; Hook. f., Fl. Brit. India 5:238. 1885 (BALANOPHORACEAE) (Image 3a,b).

Plants dioecious, yellowish-orange to dark red. Rhizomes clustered into a mass; branches covered with granular warts and scattered greyish-white stellate lenticels. Scapes reddish-orange, 12–15 cm x 2–3 cm. Leaves decussate but spirally arranged apically on scape, ovate-oblong, ca. 2cm x 1.5cm. Scales of peduncle imbricate. Flowers pedicellate. Male inflorescences narrowly ellipsoid, ca. 3.7cm long; flowers zygomorphic, each subtended by a single stout and truncate bract, perianth lobes 4–6, reflexed; ca. 1cm in diameter, anther cells transversely divided into small locelli, lateral lobes deltoid to ovate, apex acute; apical and lower lobes oblong, ca. 3.4cm x 2.2.5 mm, apex truncate. Synandria sub-discoid, ca. 4.5mm in diameter; anthers broken up into 20–40 dehiscent by short slits.

Flowering and fruiting: September–December.

Specimen examined: 47244 (ARUN!), 22.xi.2015, Arunachal Pradesh, East Kameng District, Bamang on the way to Seppa, 27.543N & 92.949°E, 1047m, coll. U. Tiwari.

Notes: The species grows on the roots of various trees.

Distribution: India (West Bengal, Sikkim, Meghalaya, and Arunachal Pradesh), Bhutan, Nepal, Myanmar, and China.

Maoutia puya

(Hook.) Wedd., Ann. Sci. Nat., Bot., Sér. 4, 1: 194. 1854; Hook. f. Fl. Brit. India 5:592. 1885. *Boehmeria puya* Hook. in Hooker's J. Bot. Kew Gard. Misc. 1: 26. 1849 (URTICACEAE) (Image 4a,b).

Shrubs up to 2m tall; branches pubescent, monoecious; branchlets zigzag, brown to greyish-brown hirsute. Stipules connate, linear-lanceolate, 6–16 mm, 2-fissured. Leaves 6–18 cm x 4–8 cm, membranous, scabrid above, beneath white except the pubescent

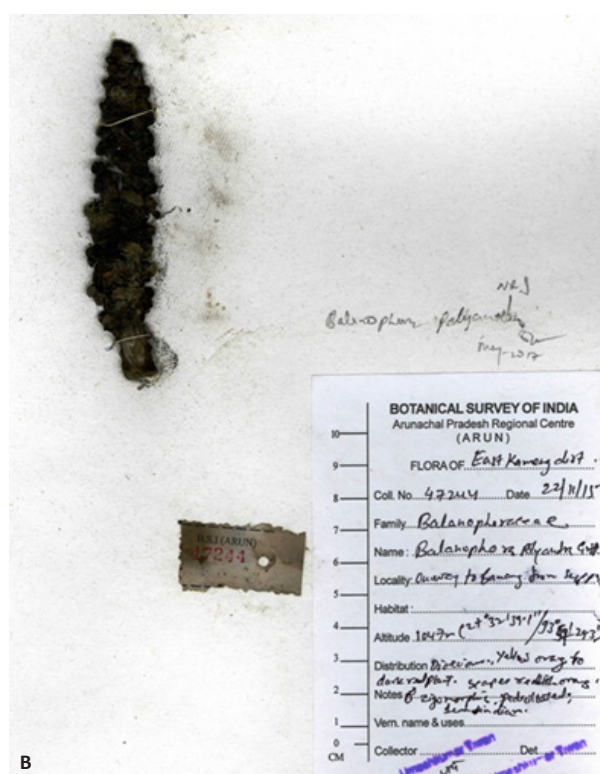


Image 3. *Balanophora polyandra* Griff.: A - in the wild | B - herbarium specimen U. Tiwari 47244 (ARUN!).

nerves, appressed strigose, elliptic caudate-acuminate, coarsely toothed; secondary veins 2–4 on each side, adaxially rugose, thickly snow white tomentose, base broadly cuneate or rounded, apex acuminate. Flowers minute monoecious; cymose globose head in pairs, 3–5 cm long; glomerules lax, 2–3 mm in diameter; bracts triangular or lanceolate, membranous. Male flowers shortly pedicellate, obovoid in the bud, 1mm in diameter; perianth lobes 5, valvate, ovate, connate at the middle, apex acuminate. Stamens 0, inflexed in

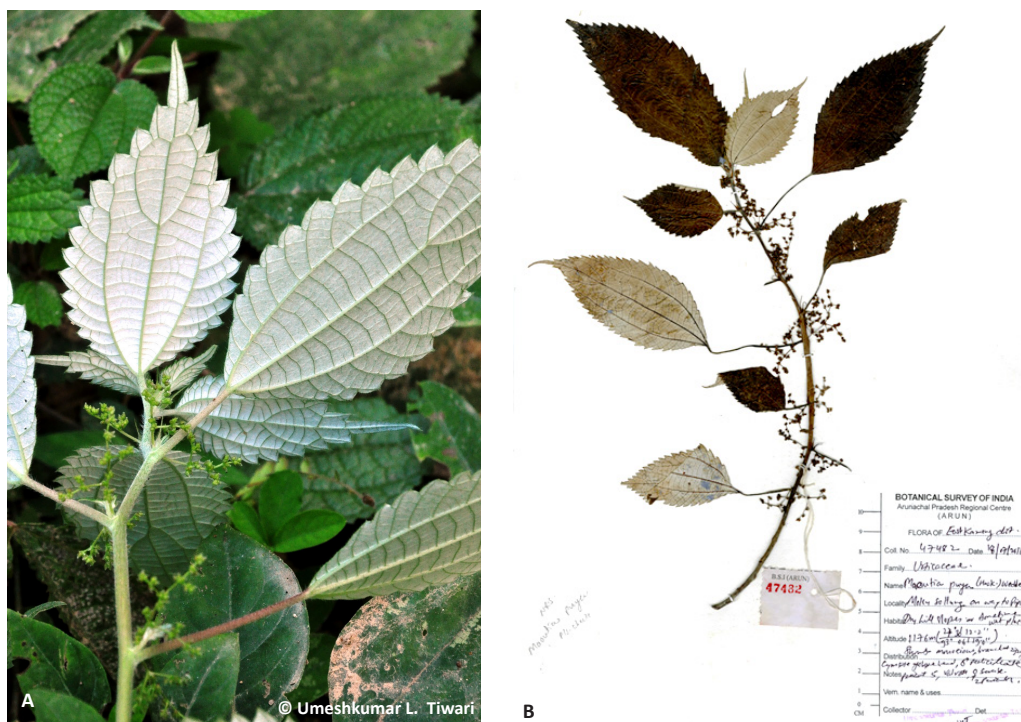


Image 4. *Maoutia puya* (Hook.) Wedd.: A - collected from the wild | B - herbarium specimen U. Tiwari 47482 (ARUN!).

bud, rudimentary ovary trigonous-ovoid, ca. 0.4mm long. Female flowers sessile; perianth lobes 2, minute, unequal, enclosing base of ovary; stigma penicillate, ovule erect. Achenes gibbously ovoid-trigonous, hispid, ca. 1.2mm long, appressed strigillose, albumen scanty, cotyledons oblong.

Flowering and fruiting: June–October.

Specimen examined: 47482 (ARUN!), 18.vii.2016, Arunachal Pradesh, East Kameng District, Moku Sollung on the way to Pipu Village, 27.514°N & 93.073°E, 1476m, coll. U. Tiwari.

Notes: This species occurs in dry hill slopes and sometimes in wet places.

Distribution: India (Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Meghalaya, and Arunachal Pradesh), Bhutan, Nepal, China, and Vietnam.

Isachne pulchella

Roth in Roemer & Schultes, Syst. Veg. 2: 476. 1817. *Sphaerocaryum elegans* (Nees ex Steud.) Nees ex Hook.f., Fl. Brit. India 7: 246. 1896 (POACEAE) (Image 5a,b).

Annual. Culms very slender, 10–25 cm tall, prostrate and rooting at below then erect, rarely branched, nodes bearded. Leaves 2.5–4 cm long, acute or acuminate, ciliate-serrulate, subcoriaceous, ecostate, nerves very close, leaf sheaths much shorter than internodes, ligule

of closed white hairs, outer margin ciliate; leaf blades ovate or ovate-lanceolate, 2–3 cm × 0.8–1.0 cm, scabrid to thinly hispid, base cordate-amplexicaul with pectinate margin, apex shortly acuminate. Panicle 1–2 in solitary and terminal, with very rarely 1–2 lower on the stem; peduncle very short; concealed in the leaf-sheath; rachis rather stout; branches very many, opposite and alternate, capillary, spreading, primary branches inserted singly, stiffly and regularly spreading with branchlets to their base; pedicels mostly shorter than spikelets. Spikelets elliptic; florets clearly dissimilar; lower floret male, upper floret bisexual or female; glumes slightly shorter than lower floret; lower glume elliptic-oblong, 5-veined, upper glume broadly elliptic, 5–7-veined both glabrous, apex obtuse; lower lemma herbaceous, elliptic-oblong, dorsally flattened, smooth, glabrous; upper lemma slightly shorter, crustaceous, pubescent.

Flowering and fruiting: May–October.

Specimen examined: 47502 (ARUN!), 18.vii.2016, Arunachal Pradesh, East Kameng District, near Langyak Sullung, Pipu Block, 27.525°N & 93.119°E, 1176m, coll. U. Tiwari.

Notes: The species grows in open and dry slopes of forests.

Distribution: India (Himachal Pradesh, Uttarakhand, West Bengal, Sikkim, and Arunachal Pradesh), Bhutan, Nepal, and China.



Image 5. *Isachne pulchella* Roth: A - in the wild | B - herbarium specimen U. Tiwari 47502 (ARUN!).

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