

Frullania udarii sp. nov. – A new species from Meghalaya, India

In India, the genus *Frullania* Raddi is represented by about 58 species mainly distributed in eastern Himalaya (38 species), western Himalaya (14 species), South India (17 species), Central India (2 species) and Andaman Islands (1 species)¹. Meghalaya alone hosts 31 species of *Frullania*. During the present exploration and survey in various localities of Meghalaya, a new species of the genus has been encountered, which is named as *Frullania udarii* sp. nov. A taxonomic account with the distribution (Figure 1) of the new taxon has been provided.

Plant specimens were collected during November 1998 and September 2000 from Barapani and BSI campus, Shillong, Meghalaya (altitude ca. 765–1411 m), growing epiphytically in extremely moist places. The specimens have been deposited in the Bryophyte Herbarium, National Botanical Research Institute, Lucknow, India (LWG).

Frullania udarii sp. nov. (Figure 2).

Monoica, viridis: planta major, caulis ad 20–30 mm longus, cumfallis 2.25 mm latus, folia caulina imbricata, dorso caulem ovata 1.15–1.23 mm longa, 0.90–0.95 mm lata: lobulus fere explanatus, lanceolatus, 0.52 mm longus, 0.20 mm latus; cellulae apicales 12.5 × 15–20 μm, trigones parvis, mediae 15–20 × 17.5–25 μm, trigones magnis: amphigastria caulina approximata, subtransverse inserta, 0.43–0.46 mm longa, 0.34–0.40 mm lata, apice 1/3 incisio bifida, sinu subacuto, lobis triangulatis:

folia floralia intima oblonga, 0.67 mm longa, 0.25 mm lata apice subobtusum, margine integerrimo, lobulo brevior, lanceolato, 0.95 mm longa, 0.35 mm lato, acuto: amphigastrium florale 0.13 mm longa, 0.058 mm lato, apice ad 2/3 bifidum; perianthia majora, 1.75 mm longa, 0.95 mm lato, 4 carinata.

Monoecious. Plants brownish, light green to dark green, prostrate or strongly appressed to the substratum, delicate; shoots 20–30 mm long, 2.25 mm wide, branching of *Frullania*-type (a branch arises from the whole of a postical segment, so that the postical lobe of the leaf below which it arises is absent); primary branches 16 mm long, 1.45 mm wide, including leaves; secondary branches small, 1.25 mm long, 1.18 mm wide, including leaves. Stem yellowish-brown, cylindrical, 137.5 × 162.5 μm in diameter, nine cells across; cortical cells subquadrate, thick walled, 7.5–10 × 12.5 μm, one layered; medullary cells quadrate to subquadrate, thick walled, 12.5–15 × 22.5 μm. Leaves remote to loosely imbricate or imbricate, widely spreading, slightly concave with flat or recurved apices, dorsal margin arching to the farther edge of the stem or beyond it, ventral margin of leaf generally adnate to the lobule margin with the base becoming concave, or rarely both basal margins develop appendages with slightly broader base and narrow apex; leaf lobes 1.15–1.23 mm long, 0.90–0.95 mm wide, mar-

gin entire, ovate-oblong with rounded or subobtusum apex. Leaf lobules always explanate, subparallel with stem, half of the lobe length, 0.52 mm long, 0.20 mm wide, oblong, acute, margin entire, attached with the stem and postical margin of the antical lobes (*Frullania*-type) rather than away from stem (*Jubula*-type); marginal cells of leaf slightly thin to thick-walled, 12.5 × 15–20 μm, trigonous; median cells thin-walled, 15–20 × 17.5–25 μm with acute and nodulose trigones; basal cells thin walled, 20–25 × 30–45 μm with acute and nodulose trigones. Stylus absent. Underleaves distant, flat, appressed to the stem, as wide or wider than the stem, 0.43–0.46 mm long, 0.34–0.40 mm wide with subsinuate insertion, ovate, one-third bilobed, sinus subacuto, occasionally obtuse, 145 μm deep; lobes triangular, subacuto, margin entire or rarely undulate, or with one-celled protrusion on each side. Male inflorescence on a very short lateral branch, usually capitate; bracts 3–4 paired, closely imbricate, 0.28–0.30 mm long, 0.20–0.23 mm wide; bracteoles bilobed, 0.14–0.15 mm long, 0.06–0.10 mm wide; sinus subacuto, 0.04–0.05 mm deep, margin with small teeth or cell protrusion near lobe base. Female inflorescence terminal on the main stem or branches without innovations (*Frullania*-type); bracts 2–3 paired, lobes oblong-ovate, 1.58 mm long, 0.63 mm wide, apex subobtusum, dorsal margin arched, ventral

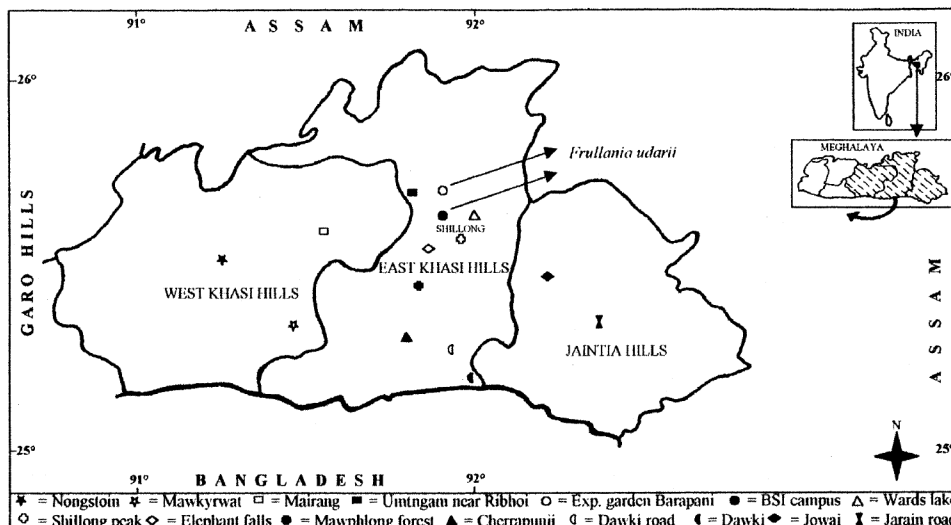


Figure 1. Distribution of *Frullania udarii* sp. nov. in Khasi Hills, Meghalaya.

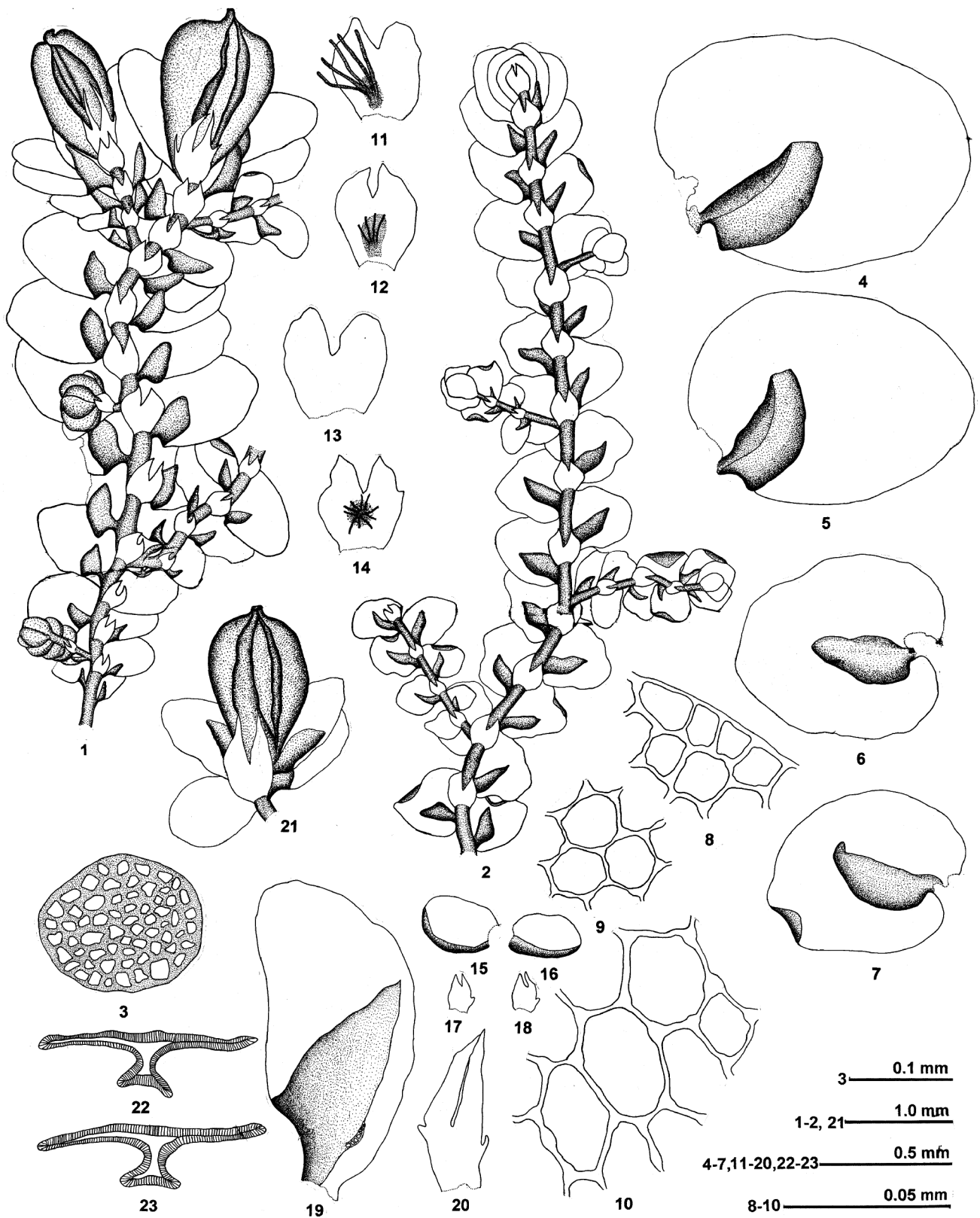


Figure 2. 1–23, *Frullania udarii* sp. nov. 1, Fertile plant in ventral view; 2, Vegetative plant in ventral view; 3, Cross-section of stem; 4–7, Leaves with lobe and lobules; 8, Marginal cells of leaf; 9, Median cells of leaf; 10, Basal cells of leaf; 11–14, Underleaves; 15, 16, Male bracts; 17, 18, Male bracteoles; 19, Female bract; 20, Female bracteole; 21, Perianth; 22, 23, Cross-section of perianth. (1, 3, 4, 5, 8–23 drawn from LWG-208067-A; 2, 6, 7 from LWG-208008-A).

margin incurved towards the attachment of the lobules; bract lobules oblong, 0.95 mm long, 0.35 mm wide, apex acute with one marginal 7–8-celled long tooth at base; bracteoles free or slightly adnate on one side with bract margin at extreme base, oblong, 0.70 mm long, 0.25 mm wide, bilobed, sinus deep, two-third of the lobes, very narrow, acute, lobes acute, margin entire–subundulate with one tooth on each side of the margin at base. Perianth 1.75 mm long, 0.95 mm wide, two-thirds emergent, pyriform–obcuneate, smooth, four-keeled (two lateral, two ventral), apex beaked. Sporophyte not developed.

Distribution and ecology: Eastern Himalaya – Meghalaya: East Khasi Hills (BSI campus, Shillong) and Ri Bhoi district (Barapani).

Plants grow epiphytically on the bark of trees in association with *Chiloscyphus* sp., *Cheilolejeunea serpentina* (Mitt.) Mizut. and *Plagiochila phalangea* Tayl., between 765 and 1411 m altitude.

Range: Endemic to India.

Specimens examined: *Frullania udarii* sp. nov., HOLOTYPE: 208067-A (LWG): BSI campus, Barapani (Ri Bhoi district) Meghalaya, altitude ca. 765 m, growing on tree trunks up to 5 ft height in loose population of 5 cm² area, 12.11.1998, leg., V. Nath & party, det. V. Nath & A. P. Singh. PARATYPE: 208008-A, 208070-A (LWG): BSI campus, Barapani (Ri Bhoi district) Meghalaya, altitude ca. 765 m, growing on basal region of tree trunks in loose population of 3–5 cm² area, 12.11.1998, leg., V. Nath & party; 208724-C, 208726-C, 208727-A (LWG): BSI campus, Shillong (East Khasi Hills) Meghalaya, altitude ca. 1411 m, growing on tree trunks up to 5 ft height in loose population of 3–4 cm² area, 20.09.2000,

leg., V. Nath & party, det. V. Nath & A. P. Singh.

Amongst Indian taxa, *F. udarii* approaches *F. muscicola* Steph., which is a more plastic and variable species occasionally having explanate lobules. The former being monoecious clearly differs from the latter in sexuality. *F. muscicola* is a dioecious taxon with saccate to rarely explanate–cucullate lobules and usually five-keeled (two lateral, two ventral and one dorsal) to occasionally three-keeled (two lateral and one ventral) perianth. *F. udarii* also resembles *F. neurota* Tayl. in sexuality (monoecious), perianth keels (four-keeled), plant length, incurved apices of leaf lobes and subrotund basal appendages. However, *F. neurota* differs from *F. udarii* in (reddish-brown) plants, which have galeate lobules without or with weakly developed beak and rounded apex, laminal portion triangular, free margin entire, slightly sinuose, keels more wider and long.

On the basis of the critical examination of the populations, type/authentic specimens of other species loaned from various herbaria and relevant literature^{2–9}, *F. udarii* has been determined as a new species under the genus.

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Landrace/gender-based differences in phenol and thiocyanate contents and biological activity in *Piper betle* L.

Piper betle L. leaves are used in many countries as masticatory with areca nut, lime and spices such as cardamom, clove and cinnamon, which act as ‘breath fresheners’ and help in the prevention of halitosis¹. It is called ‘paan’ in Hindi and ‘tambula’ in Sanskrit. Frequent references of *P. betle* can be found in ancient Sanskrit texts, including *Charaka*, *Susruta*

Samhita and *Astanga Hradayam*². Since this crop is under obligate vegetative propagation and cultivated widely, it is claimed to have hundreds of landraces, which can be broadly grouped into five to six types such as Bangla, Desavari, Kapoori, Sanchi, Meetha and Khasi³. Its utility as an anti-inflammatory and antimicrobial is emphasized at several places^{2,3}.

P. betle leaves have been reported to possess antioxidant⁴, antibacterial, digestive, stimulant⁵, antifungal and nematocidal⁶ properties. Despite this, there is lack of information regarding its activity against various tropical diseases such as visceral leishmaniasis (VL) or kala-azar and filariasis, which are prevalent in India and are considered to be diseases of the