

CONTRIBUTION TO THE BAMBOOS OF EASTERN INDIA

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ABSTRACT

Morphological description is completed for *Bambusa jaintiana* and *B. pseudopallida*. Floral morphology is provided for *Yushania hirsuta* for the first time and notes on few important characters of climbing bamboo *Melocalamus indicus* are given.

Keywords : Bamboo, *Bambusa jaintiana*, *B. pseudopallida*, *Melocalamus indicus*, *Yushania hirsuta* description, first flowering.

INTRODUCTION

Bamboos are one of the most difficult groups of plants to identify. These are monocarpic with very uncertain flowering records and most of the old herbarium specimens are representing only a part of their life cycles as many are having either only vegetative or only flowering materials. Like wise the species described are often based on part information only. Moreover morphological variations, within populations of a species and overlapping characters between different species, add to the woes of taxonomists for their correct identification. Quite often the same species has been redescribed again due to lack of complete description.

J.S.Gamble (1896) described 115 species from the then Indian subcontinent, as per recent estimates there are c. 140 species present in India of which quite a substantial number are less known and based on meagre descriptions and insufficient materials. Four such species of eastern India are discussed here.

DISCUSSION

Bambusa jaintiana R.B.Majumdar was described in 1989 from Meghalaya, India, with very little diagnostic features which distinguish this species from *B. tulda* Roxb. in having glabrous culm-sheaths, smaller auricles and shrubby habit.

Subsequently *B. alamii* Stapleton was described in 1994 from Nepal differentiated from *B. eutuldoides* McClure. Though the holotype of *B. jaintiana* bears culm-sheaths, leaves and inflorescence, the species was minimally diagnosed, the same species was redescribed as *B. alamii* by Stapleton (1994). However, later on Stapleton (2000) mentioned that *B. alamii* has been considered as a synonym of *B. jaintiana* by Alam & Hasan (1994). Most of the workers (Tiwari 1992, Seethalakshmi & Kumar 1998) have given only a brief description of this species. Here the full description and illustration is provided for this commercially important species which is widely distributed in the North eastern states including Assam, Meghalaya, Manipur, West Bengal and extending to Bangladesh, Nepal and Bhutan. This species was found in sporadic flowering from Meghalaya.

Bambusa jaintiana R.B.Majumdar in Karthik. & al., Fl. Ind. Enum. Mono. 275. 1989; D.N.Tiwari, Monogr. Bamboo 39. 1992; Seethalakshmi & Kumar, Bamboos India 53. 1998. Type: Shillong, G. K. Deka 31765 (holo. CAL; iso. ASSAM). *Bambusa alamii* Stapleton, Edinburgh J. Bot. 51(1): 10. 1994.

(Fig. 1).

Vern.: 'U-shken' (Kh.).

Shrubby erect bamboo in loose clump. Rhizome pachymorph. Culms 8-10 m tall, 2-5 cm in diameter, green, becoming orange green with age, young white powdery; nodes even; internodes 45-52 cm long, terete, thin walled (5-6 mm) smooth, glabrous; bud onion shaped; branches starts from above, occurs on all nodes, in triplets with 3 main dominating, subequal and subsequent thinner ones, horizontal. Culm-sheaths deciduous triangular, shorter than internodes, yellowish, thickish, crustaceous; sheath proper 14-23 cm long, 18-25 cm

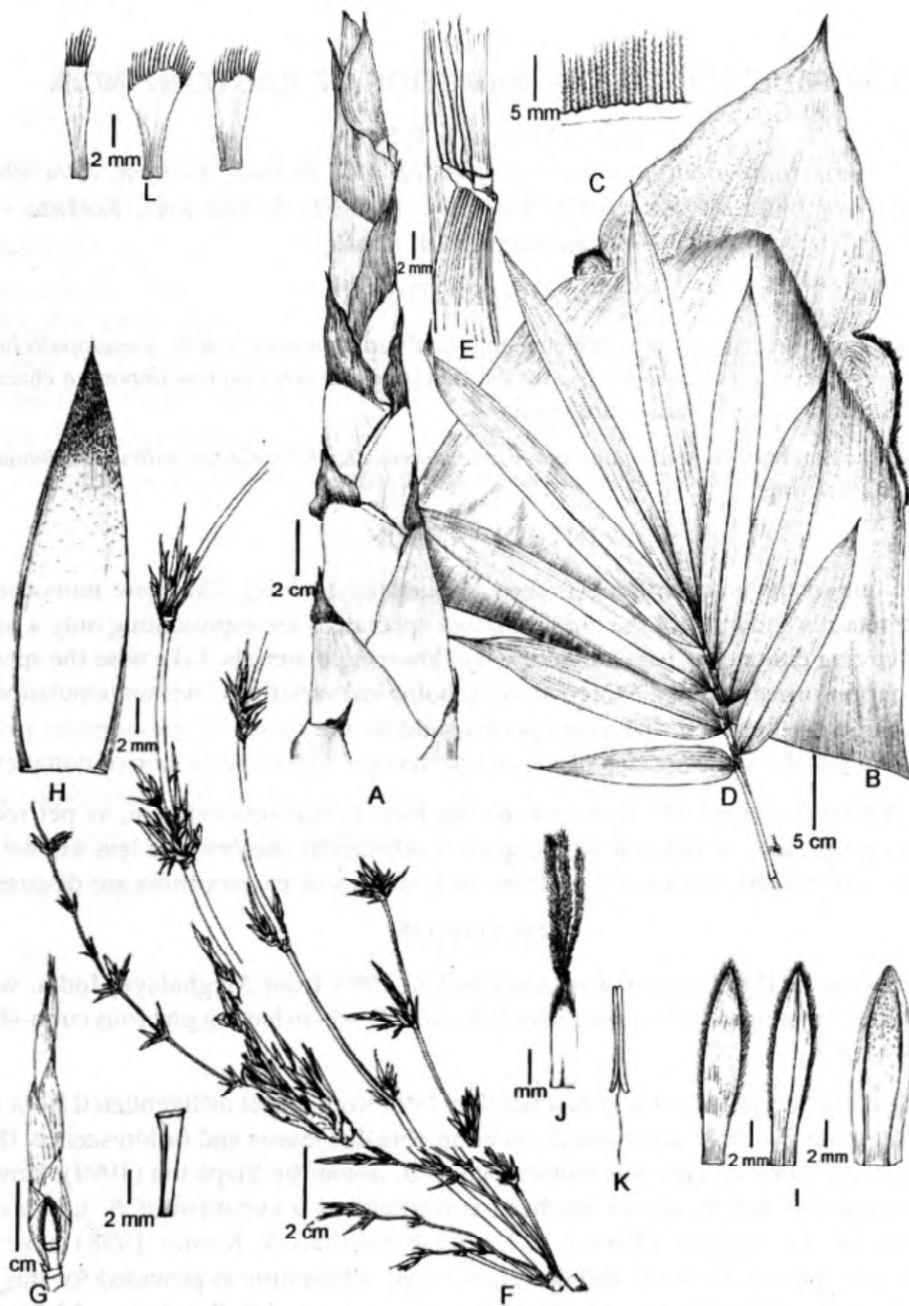


Fig. 1. *Bambusa jointiana* R.B.Majumdar: A. young shoot; B. culm-sheath; C. imperfect blade base (inner surface); D. leafy-twig; E. leaf-sheath; F. inflorescence; G. spikelet; H. lemma; I. palea; J. pistil; K. stamen; L. lodicules.

broad at base, gradually attaining into a 11-12 cm wide triangularly convex top, glabrous on outer surface, smooth and shining on inner surface, smooth at margins; imperfect blade persistent (late deciduous), erect, shorter than sheath proper, 5-20 cm long, 8-13 cm broad, triangular, cuspidate, rounded at base, continuing into unequal auricles and terminating into incurved pointed apex, striate, glabrous except minutely pubescent on inner surface, margins smooth except very short ciliate below; ligule 1-2 mm tall, crenate, ciliate at mouth; auricles not similar, smaller rounded and somewhat erect, another elongated 4-5 times of shorter one, decurrent downwards, having c. 1 cm long straight deciduous bristles. Leaves 8-9 per twig; leaf-blades lanceolate, (9-) 15-30 cm long, (1.3-) 2-3.3 cm broad, lower rounded at base, upper unequally attenuate, gradually and acuminate terminating into incurved, needle like, scabrous, 5-8 mm long apex, glabrous on adaxial surface except scabrid nerves along one margin and minute hairs along midrib in young stage, glaucescent-sparsely hairy on abaxial surface; midrib thick, raised, yellowish, sometimes with sparse hair near base otherwise

glabrous, secondary veins 8-12 pairs, tertiary (6-)7, very faint cross bars may be seen; one margin fine serrated; pseudopetiole 1-2 mm long; leaf-sheath lowest 4-5 cm long, striate, glabrous, keeled, smooth, ending into shining rounded, smooth callus, margins smooth; ligule c. 1 mm tall, unevenly truncate, serrated, ciliate at mouth, glabrous underneath imperfect blade; auricles roundedly elongated, with 8-10, c. 1 cm long, straight, deciduous bristles. Inflorescence branched leafless panicle, branchlets spicate with clusters of spikelets sometimes in axil of bract; rachis rounded, glabrous. Spikelets cylindrical, 1-5 cm long, 4-7 flowered, with 2-3 gemmiparous glumes and terminal 2-3 convolute imperfect flowers; rachilla 6-7 mm long, flattened, clavate, glabrous; empty glume 1, ovate acute, glabrous, faintly multi-nerved; lemma 1.5-2.5 cm long, ovate-acute, fine hairy near apex on inner surface, faintly multinerved, transversely veined on inner surface, margins smooth; palea spatulate, shorter than lemma, 2-keeled, ciliate at keels, 7-nerved in between keels, 3-5 nerved on either side; faintly transverse veined and minutely hairy on inner surface, margins smooth; lodicules 3, variable, 1-1.2 cm long, linear or sometimes one obliquely truncate above, long white fimbriate above, thick, much dark below; stamens 6, 3-5 mm long, exserted, emarginate or apiculate at tip; ovary c. 2 mm, oblong, narrow and long hairy at apex; style short, soon dividing into 3, 4-5 mm long, feathery stigmas.

Flowering: Periodic. Flowering reports from Meghalaya are in 1941 by G.K. Deka from Khasi hills and in 2005 during present work from Garo hills.

New Shoot: June – August.

Uses: Chiefly used for handicrafts, basket, mats and other general purposes.

Distribution: INDIA: Assam, Manipur, Meghalaya, West Bengal.

BANGLADESH, BHUTAN, MYANMAR (Tiwari, 1992; Stapleton, 2000).

Bambusa pseudopallida R.B.Majumdar was described from Meghalaya and was differentiated from *B. pallida* Munro in being shrubby, having longer culm-sheath blade and pointed auricles: one auricle projecting upward and the other downward. Though the holotype is a collection made from Umtapoh on Dawki – Jarain Road, this species has not further been collected and the only representative of this less known plant is its type which contains the culm-sheath, leaves and the flowering materials. Repeated tours were taken to Dawki-Jarain area and Barapani to relocate this species, but it could not be collected again and is known from type material only. U. Shukla in Grasses of N.E. India (1996) has not mentioned the species. So far the description of this species available in the literature is meager and insufficient. Based on the type materials available in CAL and ASSAM a complete description along with line drawing is provided to facilitate its identification and recollection.

Bambusa pseudopallida R.B.Majumdar in Karthik. & al., Fl. Ind. Enum. Mono. 275. 1989; D.N.Tiwari, Monogr. Bamboo 48. 1992; Seethalakshmi & Kumar, Bamboos India 74. 1998. [Type: Umtapoh on Dawki – Jarain Road, N. P. Balakrishnan 42700 (holo. CAL; iso. ASSAM); Paratype: Barapani, U. N. Kanjilal 6108 (CAL, ASSAM). (Fig. 2)

Shrubby to moderate sized clump forming bamboo. Culms 10-15 m tall, 1.5-3 cm in diameter; node even; internodes terete, glabrous, smooth. Culm-sheaths younger rolled, somewhat thin but crustaceous, glabrous, smooth; imperfect blade longer than sheath proper, broad leaf like, minute hairy on inner surface near acute apex; auricles pointed, one projecting upward and the other downward, fringed with erect bristles. Leaves 4-5 per twig; leaf-blades lanceolate, 5-15 cm long, 1-2 cm broad, unequally rounded at base, terminating acuminate into 1 cm long twisted, incurved, scabrous apex; glabrous on adaxial surface except scabrid nerve along one margin, glaucous and white hairy on abaxial surface; midrib thin, yellowish, glabrous, secondary 8-9 pairs, tertiary (5-) 7, very faint pellucid dots like cross bars observed, one margin serrated; pseudopetiole short, c. 1 mm long; leaf-sheath lowest 6-9 cm long, striated, glabrous, ending into rounded, smooth, shining callus, margins smooth; ligule c. 1 mm tall, truncate, slightly oblique; auricles roundedly broad, c. 2 mm, somewhat pointed, having 5-6 straight c. 5 mm long bristles. Inflorescence spicate branches with clusters of few pseudospikelets; rachis rounded, glabrous, smooth. Spikelets yellowish, cylindrical, acute, 2-4 cm long, 6-7 flowered with 1-3 gemmiparous glumes and terminal convolute immature flower, glabrous smooth; empty glumes 2-3, 5-10 mm long, ovate, acute, glabrous, smooth, margins smooth; lemma 2-2.5 cm long, ovate, acute, glabrous, smooth on outer surface as well on inner surface except few minute hairs at apex, faintly multinerved, shortly cross-veined on inner surface, margins smooth; palea shorter than lemma, spatulate,

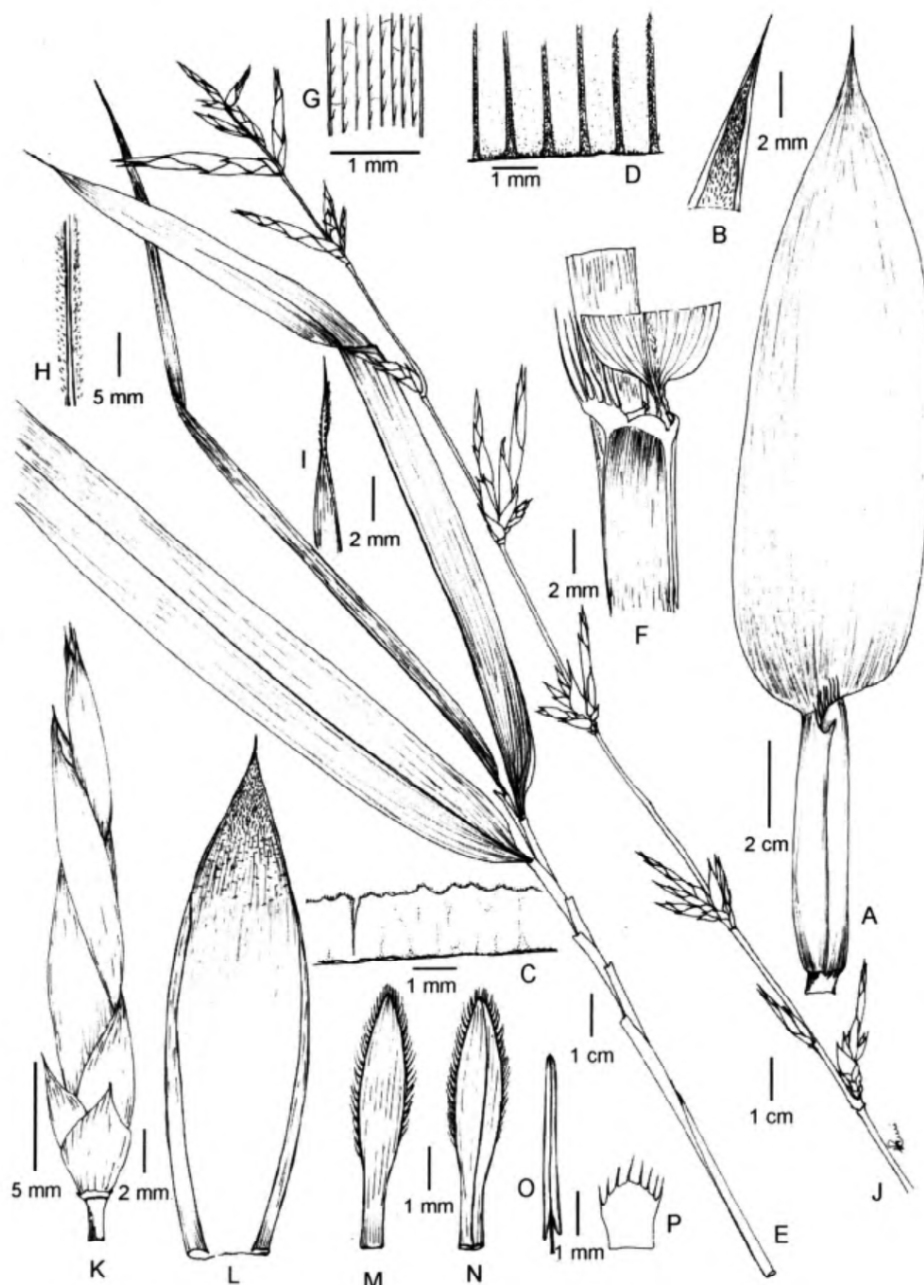


Fig. 2. *Bambusa pseudopallida* R.B.Majumdar: A. young rolled culm-sheath; B. imperfect blade apex; C. culm-sheath ligule; D. imperfect blade base (inner surface); E. leafy twig; F. leaf sheath; G. leaf abaxial surface; H. midrib; I. leaf apex; J. inflorescence; K. pseudo spikelet; L. lemma; M & N. palea; O. stamen; P. lodicules.

2-keeled, 7-nerved in between keels, ciliate at keels, hairy on inner surface; stamens 6, 8-10 mm long, blunt or somewhat acute at apex; lodicules immature c. 1 mm, rest not seen.

Flowering : Sporadic. Flowering recorded in 1965 from Khasi hills, Meghalaya.

New Shoot : June – August.

Distribution : INDIA: Assam, Meghalaya.

Yushania hirsuta (Munro) R.B.Majumdar was described in 1868 under genus *Arundinaria* by Munro. Since then this thin, small bamboo is known in vegetative form only. In 2004 (P.K. 34620) the species was collected in flowering from the Elephant water falls, Upper Shillong area. Interestingly the smaller culms coming up after a thorough clearing were found flowering. The first flowering report with the description and



Plate 1. *Melocalamus indicus* R.B. Majumdar A & B. Habit with young shoots and drooping branches C. Nodal bud D. Culm internode E. Culm sheath F. Leaf sheath G. Leaf apex H. nodal branching

illustration is presented here. On account of its sympodial rhizomes with long necks, branching patterns etc. it was placed under *Yushania* by R.B.Majumdar (1989). Recent discovery of flowering materials also support its placement under the genus *Yushania*.

***Yushania hirsuta* (Munro) R.B.Majumdar** in Karthik. & al., Fl. Ind. Enum. Mono. 282. 1989; Stapleton, Fl. Bhutan 3(2): 503. 2000. *Arundinaria hirsuta* Munro in Trans. Linn. Soc. London 26(1): 30. 1868; Gamble in Ann. Roy. Bot. Gard. Calcutta 7: 22, t. 20. 1896; Brandis, Indian trees 667. 1906; N.L.Bor, Fl. Assam 45. 1940; D.N.Tiwari, Monogr. Bamboo 23. 1992; U.Shukla, Grass. N.E. India 170. 1996. *Sinarundinaria hirsuta* (Munro) C.S.Chao & Renvoize in Kew Bull. 44: 355. 1989; S.Maulik, Grass. & Bamb. India 1: 16. 1997; Seethalakshmi & Kumar, Bamboos India 273. 1998. Type: Khasi Hills, 5600 ft, Nov. 1835, Griffith 6726 (lecto K). Lectotype designated by Stapleton (1997). (Fig. 3)

Vern.: 'U-stoh', 'Dait-si-sai', 'U-stewiong' (Kh.).

Small shrubby, erect bamboo with somewhat distant thin culms in loose clump. Rhizome pachymorph. Culms 1-3 m tall, c. 5 mm in diameter, greyish green; nodes raised with a ring of sheath scar; internodes terete, up to 40 cm long, thick walled, strigose hirsute first, afterwards scabrid; branches from upper nodes, intravaginal, in threes, just above the nodal line. Culm-sheaths deciduous, linear, smaller than internodes, thin, striate, crustaceous, brown; sheath proper 8-10 cm long, c. 2 cm broad, roundedly truncate into c. 5 mm top, hirsute on outer surface, smooth and shining on inner surface, margins ciliate; imperfect blade linear, 2-2.5 cm long, reflexed, margins incurved, apex acute; ligule narrow, entire; auricles rounded, reflexed, projecting outwards, fringed with c. 1 cm long, stiff bristles. Leaves 4-5 per twig; leaf-blades oblong-lanceolate, green, 7.5-15 cm long, 1.2-2 cm broad, basal leaf with equally rounded base, apical unequally rounded-attenuate, gradually terminating into a 5-7 mm long, twisted, pointed apex, glabrous on adaxial surface except minute cilia near base along midrib, abaxial surface hairy with white ascending hairs, margins serrate; midrib pale, shining, secondary veins 5-6 pairs, tertiary 8, transverse veinlets numerous, prominent; pseudopetiole 2-3 mm long; leaf-sheath lowest 5-7 cm long, striate, hairy (fine white hairy) terminating into a narrow ciliate callus, margins densely ciliate; ligule c. 2 mm tall, projecting above the auricle's height, dark, pubescent; auricles rounded, reflexed, fringed with 5-8 mm long hairy bristles. Inflorescence a terminal panicle on leafy branches; rachis angular (triangular type), striate smooth, glabrous on most of the part, often fine white hairy below. Spikelets distant, purplish, on 0.6-2 cm long pedicels, 3-spikelets originating at the first node of rachis, then 2 and finally single spikelets towards apex, lower spikelets 1-1.2 cm long, reaching up to 2.2 cm at apex, 4-7 flowered with terminal imperfect flower; rachilla 4-5 mm, towards terminal floret shorter, c. 2 mm, flattened, white hairy at apex, glabrous below; empty glumes 2, lower c. 4 and upper c. 5 mm long, ovate-acute, upper keeled, scabrously ciliate at keel above, fine ciliate at apical margins, faintly 5-7 nerved; lemma 8-9 mm long, 3-4 mm broad, ovate-acuminate, keeled, mucronate, minute hairy above on outer surface, sparsely minute hairy near apex on inner surface, short ciliate at apical margins, faintly 9-nerved; palea 6-7 mm long, oblong-lanceolate, shorter than lemma, 2-keeled, ciliate at keels, bifid and bimucronate at apex, faintly 2-nerved, minutely hairy above between keels and on either side; lodicules 3, c. 1.5 mm, ovate-acute, long fimbriate along margin, hyaline; stamens 3, c. 2 mm long, saggitate, blunt at apex; ovary c. 5 mm, ovate glabrous, with two soon dividing, short, hairy, c. 1.5 mm long stigmas.

Flowering: Reported by P. Kumari in 2004 from Shillong for the first time.

New Shoot: March – April.

Distribution : INDIA: Arunachal Pradesh, Meghalaya, Naga hills, Sikkim, West Bengal.

BHUTAN. (Gamble, 1896; Tiwari, 1992; Stapleton, 2000).

Uses : For roofing, fencing, making arrows popularly called 'Rishaw' used in 'Arrow Shooting Game' and as pony fodder. It is used to make the local products used by tribals as 'smuk', 'sping', 'shna dab', 'pynpur khnam', etc.

***Melocalamus indicus* R.B.Majumdar** a scandent bamboo described from Cachar, Assam has recently been collected from Manipur (P.K. 38550) which reveals that the culm is thick walled and the culm-sheath ligule is long and concavely oblique. The leaf twigs mounted on the type sheet is having shaggy apex which is not evidenced in the fresh collection. Moreover there is no information about the leaf and leaf-sheaths characters. Thus here a brief description of the species is provided for its correct identification.

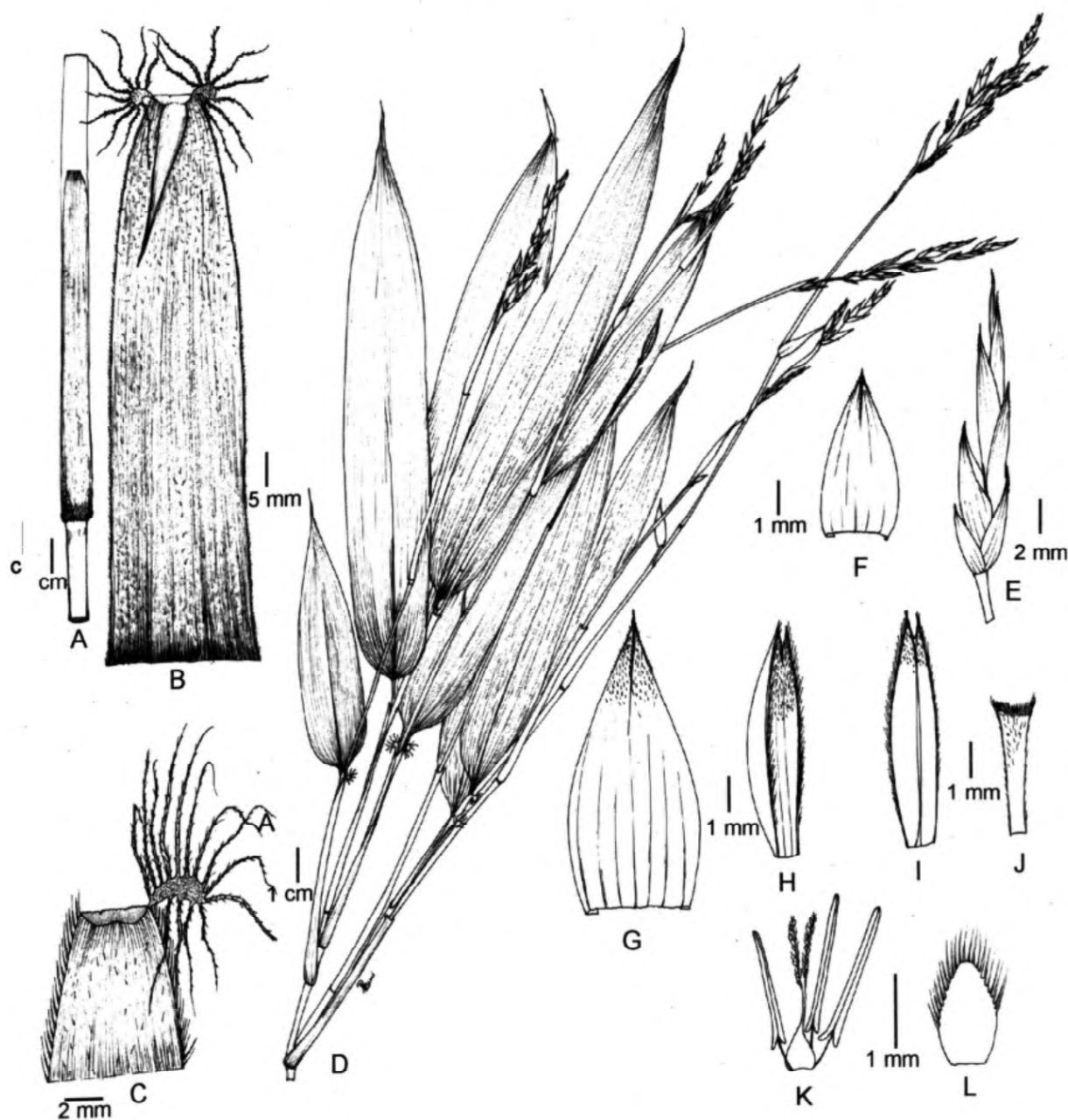


Fig. 3. *Yushania hirsuta* (Munro) R.B. Majumdar: A. culm portion; B. culm-sheath; C. culm-sheath auricle; D. inflorescence; E. spikelet; F. glume; G. lemma; H & I. palea; J. rachilla; K. pistil & stamen; L. lodicules.

Melocalamus indicus R.B. Majumdar, Bull. Bot. Surv. India 25: 236. 1985; *Dinochloa indica* (R.B. Majumdar) Bennet, Van Vigyan 27 (2): 121. 1989. Type: Cachar: Bhuban Hill, Majumdar 73083-vegetative (CAL). (Plate 1)

Vern.: 'Umu, Daral, Sairi' (Mani.).

Arborescent, evergreen climbing bamboo in somewhat loose clumps. Rhizome pachymorph. Culms 1-2 cm in diameter, grayish-green, arching over tall trees and then hanging downwards with tufts of green leaves at the branch tips; nodes swollen, girdled, with a white-pale, velvety band below; internodes terete, thick walled, minute silvery pubescent when young, afterwards glabrous; bud ovate; branches many, often supporting a solitary large bud or a dominating branch as thick as the main-culm. Culm-sheaths deciduous,

shorter than internodes, yellowish-brown; sheath proper 25-30 cm long, convolute, 3-4 cm broad at rounded top with a deep concave sinus, hard, crustaceous, covered with scanty patches of very deciduous silvery hairs on outer surface, smooth and shining on inner surface, margins smooth; imperfect blade deciduous, leafy, reflexed, glabrous on both surfaces; ligule c. 2.5 cm long at one side and c. 1 cm at another, oblique with concavely cut apex, glabrous; auricles obscure. Leaves 8-9 per twig; leaf-blades broadly lanceolate, 12-32 cm long, 2.5-4.5 cm broad, roundedly attenuate at base, attaining acuminate into c. 5 mm long, twisted, scabrous apex, glabrous on both surfaces; secondary veins 8-9 pairs, tertiary 7-9, margins smooth except few scabrid nerves along one side on adaxial surface; pseudopetiole 6-7 mm long; leaf-sheaths thin keeled, with scanty appressed hairs otherwise glabrous, smooth, ending above in a narrow thin callus, smooth at margins except few very deciduous cilia near apex; ligule c. 5 mm long at one side, obliquely tapering to meet the leaf-sheath margin on another side, glabrous, dark; auricles obscure. Inflorescence panicle with globular clusters of spikelets on the nodes of flexuous branches. Spikelets 2-fl., lower floret sterile and the upper hermaphrodite but without rachilla extension.

New Shoot: May – June.

Distribution : INDIA: Assam, Manipur.

Uses : Culms used for basket making and in handicraft industries.

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पूर्वी भारत के बांस के लिए योगदान

पुष्पा कुमारी और पी. सिंह

सार संक्षेप

बैबुसा जैतियाना और बैबुसा सूडोपेलिडा के लिए रूपात्मक वर्णन पूरा हो गया है। युशानिया हिरसुता में पुष्प मोरफोलोजी की पहली बार सूचना दी गई है और मलोकैलमस इंडिकस के कुछ महत्वपूर्ण चरित्र पर नोट्स प्रस्तुत किए गए हैं।