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## NOTE

### FIVE NEW ADDITIONS TO THE GRASS FLORA OF TRIPURA STATE, INDIA

Sampa Ghosh & Debjyoti Bhattacharyya

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As an outcome of morpho-taxonomic research on grasses in Tripura that has been going on since 2014, the authors came across some interesting specimens from different localities of the study area. After analyzing the external morphological characteristics of the specimens by simple dissection and following identification keys available in the literature (Bor 1940 & 1960; Clayton & Renvoize 1986; Shukla 1996; Moulik 1997; Kabeer & Nair 2009), the species were identified as *Acroceras munroanum* (Balansa) Henrard, *Cyrtococcum patens* var. *latifolium* (Honda) Ohwi, *Leptochloa chinensis* (L.) Nees, *Panicum maximum* Jacq. and *Pseudechinolaena polystachya* (Kunth) Stapf. Authentic herbarium specimens housed in Eastern Regional Circle, Shillong (ASSAM) and Central National Herbarium, Howrah (CAL) of Botanical Survey of India were consulted to confirm the identity of the species. Images of type sheets available at various databases were also seen.

Further, it has been revealed from the literature survey (Deb 1981–83; Datta et al. 2008) that these species were hitherto unreported from Tripura and, therefore, these collections constitute five new distribution records of grasses for the state. Updated nomenclature, detailed taxonomic description, habitat, phenology and distribution are provided for all these species. Illustrations and photographs are provided for

FIVE NEW ADDITIONS TO THE GRASS FLORA OF TRIPURA STATE, INDIA

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supplementing their easy identification. Distributions of species in the study area are also given which is shown in Fig. 1.

1. *Acroceras munroanum* (Balansa) Henrard in Blumea 3: 445. 1940; Bor, Grass. Burma, Ceylon, India & Pakistan 275. 1960; Karthikeyan et al., Fl. Ind. Enum. Monocot. 178. 1989. *Panicum munroanum* Balansa in J. Bot. (Morot) iv. 140. 1890. *Panicum latifolium* sensu Hook.f., (Fl. Brit. India 7: 39. 1896), non L., 1753. *Panicum crassipiculatum* Merr. in Philipp. J. Sci. 1 (Suppl. 5): 356. 1906. *Acroceras crassipiculatum* (Merr.) Alston in Trimen, Handb. Fl. Ceylon vi. Suppl., 324. 1931; Bor, Fl. Assam 5: 28. 1940. (Fig. 2; Image 1).

Annuals or perennials. Culms creeping or geniculate, 10–35 cm long, rarely erect, often prostrate and rooting at the nodes, smooth and glabrous; nodes glabrous. Leaves lanceolate, 2–8 x 0.4–0.8 cm, glabrous on both surfaces or rarely ciliate on the rounded base, scabrid at margins; sheaths 1–3 cm long, loose below, closely fitting

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Competing interests: The authors declare no competing interests.

Acknowledgements: The authors are thankful to the Head, Department of Life Science & Bioinformatics, Assam University, Silchar for providing facilities. They are also thankful to the Head(s) of herbaria ASSAM and CAL, Botanical Survey of India for giving permission to consult the herbaria and library. The first author sincerely acknowledges the financial support provided by the University Grants Commission, New Delhi under National Fellowship for Other Backward Classes (NFOBC) scheme [Letter No. F./2016-17/NFO-2015-17-OBC-TRI-41951 (SA-iii/website), February, 2016]. Sincere thanks are also extended to the Forest Department of Tripura for giving permission to conduct field surveys in the state.



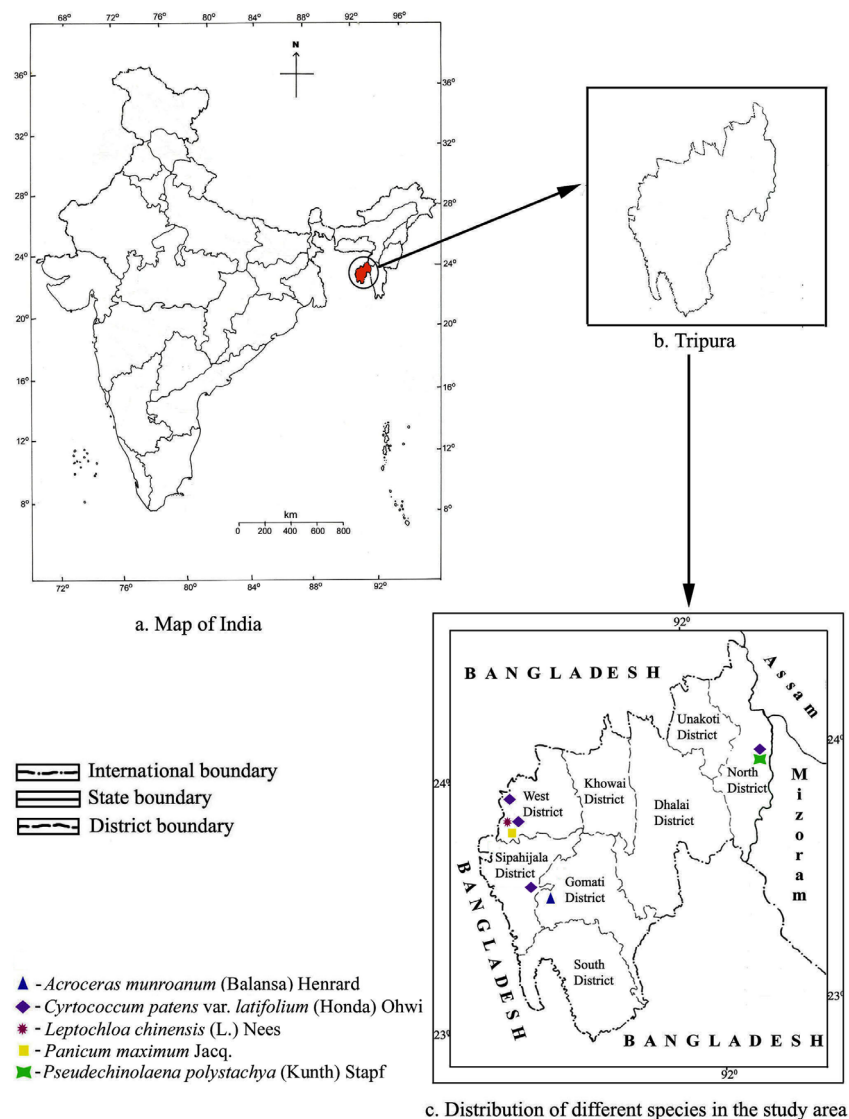


Figure 1. Map showing distribution of different species in the study area (Tripura)

above, striate, glabrous except for the outer margins; outer margin ciliate; ligules fimbriate, membranous. Inflorescence a panicle of 4-6 suberect, interruptedly spiciform racemes, 3–10 cm long; each raceme 2–4 cm long disposed on a short, deeply channelled, central rachis; rachis branches hairy at junction. Pedicels 1–6 mm long, trigonous, scabrid along margins. Spikelets elliptic or ovate-lanceolate, c. 4x1.7 mm, bluntly apiculate; lower glumes ovate-lanceolate, c. 3.5x1.2 mm, chartaceous, 3-nerved with laterally compressed, thickened tip; upper glume elliptic or broadly ovate, c. 4x1.5 mm, acute at tip; tip laterally compressed and thickened, chartaceous, 1–3 nerved. Florets 2. Lower floret empty; lower lemma broadly ovate, c. 3.5x1.7 mm, apiculate, laterally compressed at tip, chartaceous,

5-nerved; lower palea elliptic-lanceolate, c. 2.5x0.7 mm, delicate, 2-keeled, hyaline. Upper floret bisexual; upper lemma elliptic or ovate, c. 3x1.5 mm, subcoriaceous, faintly 3-5-nerved, smooth, shining, glabrous except for a few hairs below tip; tip apiculate, laterally compressed and thickened; upper palea elliptic, c. 2.5x1 mm, subcoriaceous, smooth, shining with notched, reflexed tip; lodicules 2, obovate, c. 0.2x0.15 mm, wavy at apex. Stamens 3, ca. 2mm long. Ovary ovate, c. 0.3x0.15 mm; styles c. 0.75mm long; stigmas c. 0.5mm long, plumose.

Habitat: Shady areas of forest margins, along river banks and grasslands; prefers sandy soils.

Flowering & Fruiting: August–November.

Specimen examined: 12616, Fl.; 20.x.2014, India, Tripura, Gomati District, Hurijala (23.462230°N &



Image 1. *Acroceras munroanum* (Balansa) Henrard

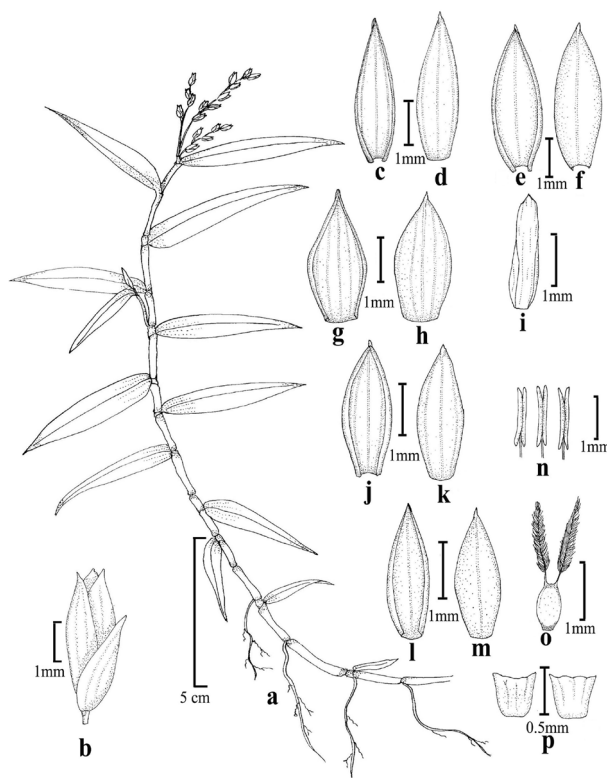


Figure 2. *Acroceras munroanum* (Balansa) Henrard  
 a - habit; b - single spikelet; c - lower glume (adaxial view); d - lower glume (abaxial view); e - upper glume (adaxial view); f - upper glume (abaxial view); g - lower lemma (adaxial view); h - lower lemma (abaxial view); i - lower palea; j - upper lemma (adaxial view); k - upper lemma (abaxial view); l - upper palea (adaxial view); m - upper palea (abaxial view); n - stamens; o - gynoecium; p - lodicules

91.428812°E), coll. S. Ghosh (deposited in Herbarium of Department of Life Science & Bioinformatics, Assam University, Silchar) (Image 6).

Distribution: India (Assam, Karnataka, Kerala, Tripura (present report), West Bengal), Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand.

**2. *Cyrtococcum patens* var. *latifolium*** (Honda) Ohwi in Acta Phytotax. Geobot. 11: 47. 1942. *Panicum patens* f. *latifolium* Honda in Bot. Mag. (Tokyo) 37: 25. 1923. *Panicum accrescens* Trin. in Sp. Gram. 1: pl.88. 1828. *Cyrtococcum accrescens* (Trin.) Stapf in Hooker's Icon. Pl. 31: 4. 3096. 1922; Bor, Fl. Assam 241. 1940 & Grass. Burma, Ceylon, India, Pakistan 291. 1960. (Fig. 3; Image 2).

Perennials, Culms creeping, smooth and glabrous, 15–60 cm tall, often branching at the nodes. Leaf sheaths loosely pilose with tubercle-based hairs; leaf blades lanceolate, 3–15 × 0.3–2 cm, pubescent on both surfaces or sub-glabrous, basal margins with a few long, stiff, tubercle based hairs, apex acuminate; ligule 0.5–2 mm, subrounded. Panicle very lax, 5–35 cm, often diffuse, branches loosely ascending to widely spreading, very slender, glabrous; pedicels filiform, longer than spikelets. Spikelets 1.3–1.8 mm, varying from glabrous to appressed-pubescent or shortly hispid with stiff, conspicuously tubercle-based hairs, purplish at maturity; glumes unequal, the lower ca. 1/2 spikelet length, 0.7mm, 3-veined, the upper glume 2/3 spikelet length, 5-nerved, boat shaped; lower lemma subequalling spikelet, apex obtuse 4-nerved, lower palea hyaline; upper lemma coriaceous, gibbous, 5-nerved, upper palea 3-nerved. Stamens 3, ca. 0.8mm.

Habitat: Sandy or hilly region, prefers swampy areas.

Flowering & Fruiting: September-December.

Specimens examined: 12719, Fl., 01.xi.2015, Tripura, Sipahijala District, Bairagi Bazar (23.553355°N & 91.357209°E), coll. S. Ghosh; 12772 Fl., 30.x.2016, North District, Jampui Hills, Vangmun (24.005098°N, 92.280721°E), coll. S. Ghosh; 12627, Fl., 20.x.2014, West District, Barjala (23.865186°N & 91.275082°E), coll. S. Ghosh; 12701, Fl., 28.vii.2015, North Bardowali (23.821838°N & 91.277275°E), coll. S. Ghosh (deposited in Herbarium of Department of Life Science & Bioinformatics, Assam University, Silchar) (Images 7–10).

Distribution: India (Arunachal Pradesh, Assam, Bihar, Mizoram, Nagaland, Tripura (present report), Uttar Pradesh, West Bengal), tropical region of southeastern Asia and China.



Image 2. *Cyrtococcum patens* var. *latifolium* (Honda) Ohwi

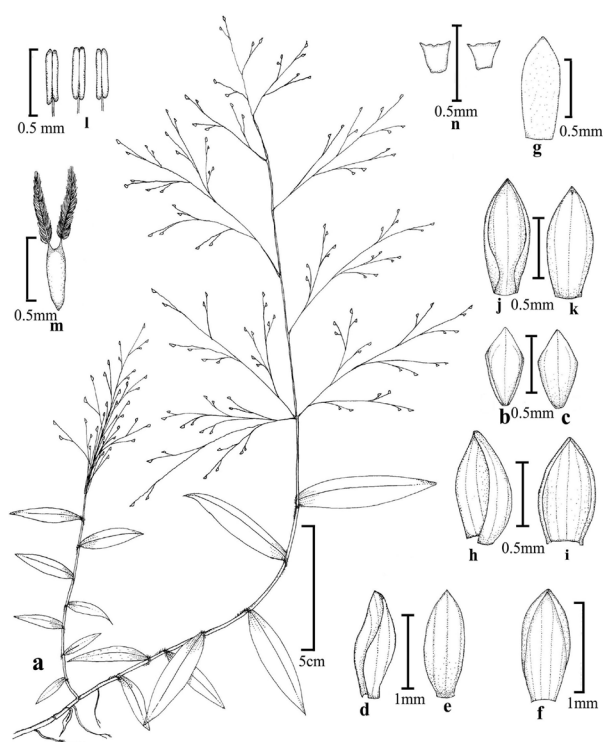


Figure 3. *Cyrtococcum patens* var. *latifolium* (Honda) Ohwi  
 a - habit; b - lower glume (adaxial view); c - lower glume (abaxial view); d - upper glume (side view); e - upper glume (abaxial view); f - lower lemma; g - lower palea; h - upper lemma (side view); i - upper lemma (adaxial view); j - upper palea (adaxial view); k - upper palea (abaxial view); l - stamens; m - gynoecium; n - lodicules

**3. *Leptochloa chinensis*** (L.) Nees in Syll. Pl. Nov. 1: 4. 1824; Hook. f., Fl. Brit. India. 7: 299. 1896; Bor, Fl. Assam 5: 112, 1940 & Grass. Burma, Ceylon, India, Pakistan 516. 1960; Karthikeyan et al., Fl. Ind. Enum. Monocot. 235. 1989; Shukla, Grass. N. E. India 260. 1996. *Poa chinensis* L., Sp. Pl. 1: 69. 1753. (Fig. 4; Image 3).

Annuals or perennials, Culms geniculate, 60–75 cm long, smooth and glabrous; nodes glabrous. Leaves linear-lanceolate, about 25cm long, 0.8cm broad, rough on both surfaces, apex acuminate, margin involute; leaf sheath rough, 5–10 cm long; ligules membranous, hyaline. Inflorescence a long panicle, about 33.5cm long, branches numerous, simple, pyramidal. Spikelets elliptic or ovate, c. 2.2x1 mm, 4-5 flowered, glume persistent, florets deciduous; lower glume oblong-lanceolate, c. 0.7–1 x 0.5–0.7 mm, chartaceous, 1-nerved, prominent, hairs on midrib; upper glume almost like lower glume, 1.2–1.5 x 0.5–0.7mm, chartaceous, prominently 1-nerved. Florets 4-5 in numbers, similar; lemma broadly ovate, c. 1.3x1.4 mm, acute, chartaceous, 5–7-nerved, sparsely hairy below the middle of the lemma; palea lanceolate to ovate, c. 1.1x0.5-0.7 mm, chartaceous, 2-keeled, ciliate; lodicules 2, obovate, c. 0.2x0.15 mm, wavy at apex. Stamens 3, ca. 2 mm long. Ovary ovate, c. 0.3x0.15 mm; stigma plumose.

Habitat: Prefers marshy areas, along road side.

Flowering & Fruiting: August–January.

Specimen Examined: 12724, Fl., 03.xi.2015, India, Tripura, West District, Nagerjala (23.824865°N & 91.269175°E), coll. S. Ghosh (Deposited in Herbarium of Department of Life Science & Bioinformatics, Assam University, Silchar) (Image 11).

Distribution: India (Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Nagaland, Tamil Nadu, Tripura (present report), Uttar Pradesh, West Bengal), Bangladesh, Bhutan, China, Malaysia, Australia, South Africa.

**4. *Panicum maximum*** Jacq. in Icon. Pl. Rar. 1: 2, pl. 13. 1781; Hook. f., Fl. Brit. India 7: 49. 1896; Fischer in Gamble, Fl. Pres. Madras 1783. 1934 (Repr. Ed. 3: 1235. 1957); Bor, Fl. Assam 5: 224, 1940 & Grass. Burma, Ceylon, India, Pakistan 327. 1960; Majumdar in Bull. Bot. Soc. Bengal 27: 53. 1973. *Urochloa maxima* (Jacq.) R.D. Webster, Austral. Paniceae (Poaceae) 241. 1987. (Fig. 5; Image 4).

Densely tufted perennial; culms more than 2m high, culms erect, internodes rigid, smooth and sparsely hairy, nodes slightly pubescent; Leaf blades 45–52 cm long, 2–5 cm wide, stiff, thick, pointed at tips, midrib whitish, pubescent on both surfaces, also scabrid on



Image 3. *Leptochloa chinensis* (L.) Nees



Image 4. *Panicum maximum* Jacq.

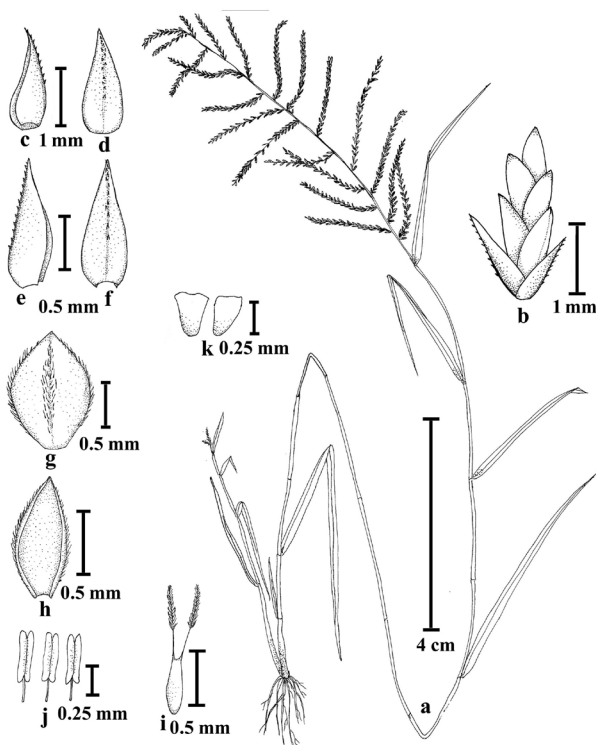


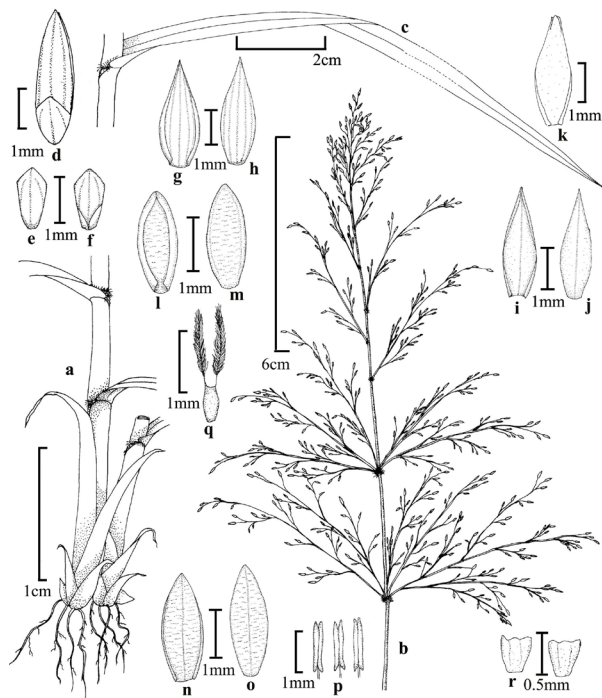
Figure 4. *Leptochloa chinensis* (L.) Nees  
a - habit; b - spikelet; c - lower glume (side view); d - lower glume (abaxial view); e - upper glume (side view); f - upper glume (abaxial view); g - lemma (abaxial view); h - palea (adaxial view); i - gynoecium; j - stamens; k - lodicules

the margins; Ligule a membranous; sheath shiny and slightly pubescent; Inflorescence 35–40 cm long, main rachis slightly wavy and scabrid, whole spikelet shed off including glumes; Spikelet 3.7mm long, oblong ovate; Glumes unequal, Lower glume about half of the length of spikelet, 1.5mm, ovate obtuse, three nerved, purplish; upper glume little shorter than spikelet, 3.5mm, ovate, five nerved; lower floret barren, lower lemma as long as the spikelet, 1–3-nerved, similar to upper glume, greenish in the lower half and purplish in the upper half, its palea slightly hyaline, obtuse, two keeled, and slightly shorter or almost equal to lemma; upper floret bisexual, Upper lemma transversely rugose, faintly 0–2 nerved, upper palea also rugose, enclosed by the incurved margins of lemma, faintly 1–3-nerved ; Anthers 3, 0.8–1.0 mm long; Stigma 0.5mm long, style 0.3mm long.

Habitat: Common along road sides, on hill slopes.

Flowering & Fruiting: September–January.

Specimen examined: 12624, Fl., 28.x.2014, India,



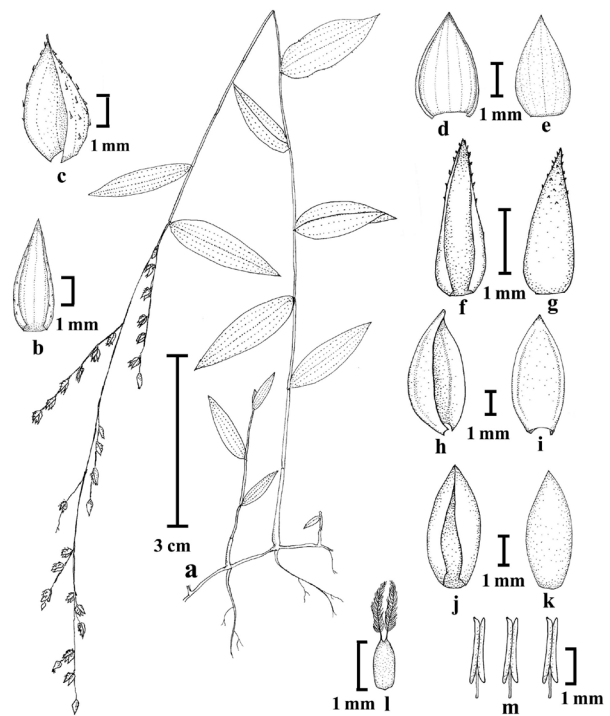
**Figure 5.** *Panicum maximum* Jacq. a - habit; b - panicle; c - leaf; d - single spikelet; e - lower glume (abaxial view); f - lower glume (adaxial view); g - upper glume (adaxial view); h - upper glume (abaxial view); i - lower lemma (adaxial view); j - lower lemma (abaxial view); k - lower palea; l - upper lemma (adaxial view); m - upper lemma (abaxial view); n - upper palea (adaxial view); o - upper palea (abaxial view); p - stamens; q - gynoceium; r - lodicules

Tripura, West District, Sekerkote (23.749192°N & 91.269432°E), coll. S. Ghosh (deposited in Herbarium of Department of Life Science & Bioinformatics, Assam University, Silchar) (Image 12).

Distribution: India (Assam, Bihar, Delhi, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Tripura (present report), Uttar Pradesh, West Bengal), Tropical Africa and almost all tropical countries.

**5. *Pseudechinolaena polystachya* (Kunth) Stapf** in Prain, Fl. Trop. Africa 9: 495. 1919; Bor, Grass. Burma, Ceylon, India, Pakistan 327. 1960; S. Moulik, Grass. Bamb. India 1: 143. t. 24. 1997; Kabeer & V. J. Nair, Fl. Tamil Nadu Grasses: 298. 2009. *Echinolaena polystachya* Kunth, Nov. Gen. Sp. 1: 119. 1816. *Panicum uncinatum* Raddi, Agrostogr. Bras. 41. 1823; Hook. f., Fl. Brit. India 7:58. 1896. (Fig. 6; Image 5).

Annuals or perennials, Stoloniferous. Culms erect, 25–45 cm long, rooting and branching at the nodes, smooth and glabrous; nodes glabrous. Leaves lanceolate, 3–4.3 x 0.5–1.2 cm, sparsely hairy on both surfaces, dorsally glaucous, margins serrulate; leaf sheath 6–9 cm long,



**Figure 6.** *Pseudechinolaena polystachya* (Kunth) Stapf a - habit; b - lower glume (adaxial view); c - upper glume (side view); d - lower lemma (adaxial view); e - lower lemma (abaxial view); f - lower palea (adaxial view); g - lower palea (abaxial view); h - upper lemma (side view); i - upper lemma (abaxial view); j - upper palea (adaxial view); k - upper palea (abaxial view); l - gynoceium; m - stamens

sparsely hairy with ciliate margins; ligules membranous, hairy at apex, truncate. Inflorescence a long panicle of 6–8 sub-erect racemes, upper racemes are shorter than the lower ones, central rachis sometimes sparsely hairy. Spikelets elliptic or ovate, c. 4.5x2 mm, gibbous on one side, pedicelled, ca. 1.5mm long; lower glume oblong-lanceolate, c. 4.5x1 mm, chartaceous, faintly 3–5 nerved, sparsely hairy on the base; upper glume elliptic or broadly ovate, boat shaped, gibbous, 3.5–4 x 1.5–2 mm, chartaceous, 5–7 nerved, sparsely covered with tuberculate hairs with bent tips. Lower floret barren or sometimes male, Upper floret bisexual; lower lemma broadly ovate, c. 3.5x2.5 mm, acute, chartaceous, 5–7-nerved, sparsely tuberculate hairy; lower palea lanceolate, c. 3–3.2 x 0.5–0.7 mm, delicate, hyaline; upper lemma elliptic to ovate, boat shaped, c. 2x1 mm, faintly 3-nerved, smooth, shining, glabrous; upper palea elliptic, c. 2 x 0.5 mm, smooth, shining; lodicules 2, obovate, c. 0.2x0.15 mm, wavy at apex. Stamens 3, ca. 2mm long. Ovary ovate, c. 0.3x0.15 mm; stigma plumose.

Habitat: Shady areas of forest floors.

Flowering & Fruiting: September–December.



Image 5. *Pseudechinolaena polystachya* (Kunth) Stapf

Specimen examined: 12768, Fl., 30.x.2016, India, Tripura, North District, Jampui Hills, Vangmun (23.999344°N & 92.280592°E), coll. S. Ghosh (deposited in Herbarium of Department of Life Science & Bioinformatics, Assam University, Silchar) (Image 13).

Distribution: India (Arunachal Pradesh, Assam, Karnataka, Kerala, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Tripura (present report), West Bengal), tropical Africa, Asia.

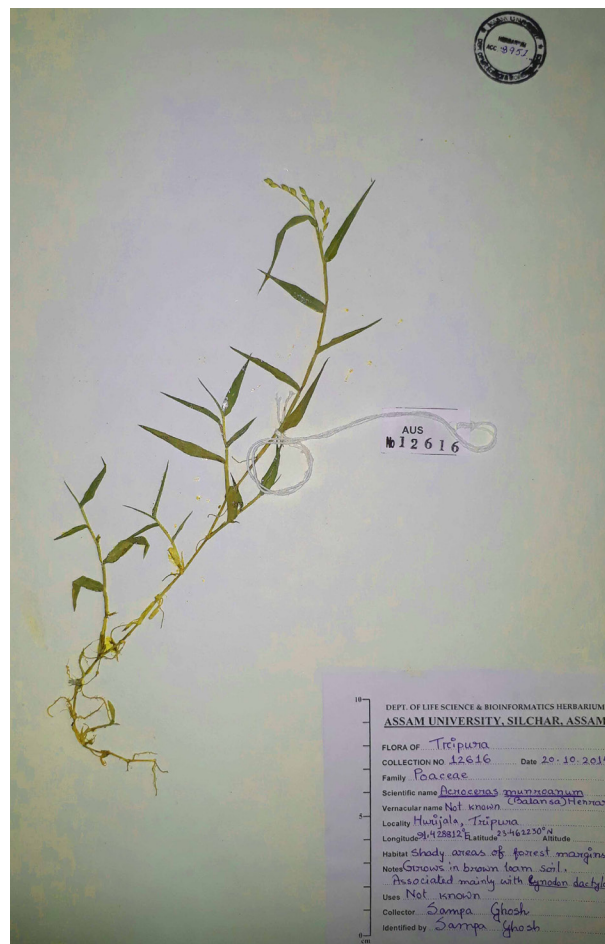
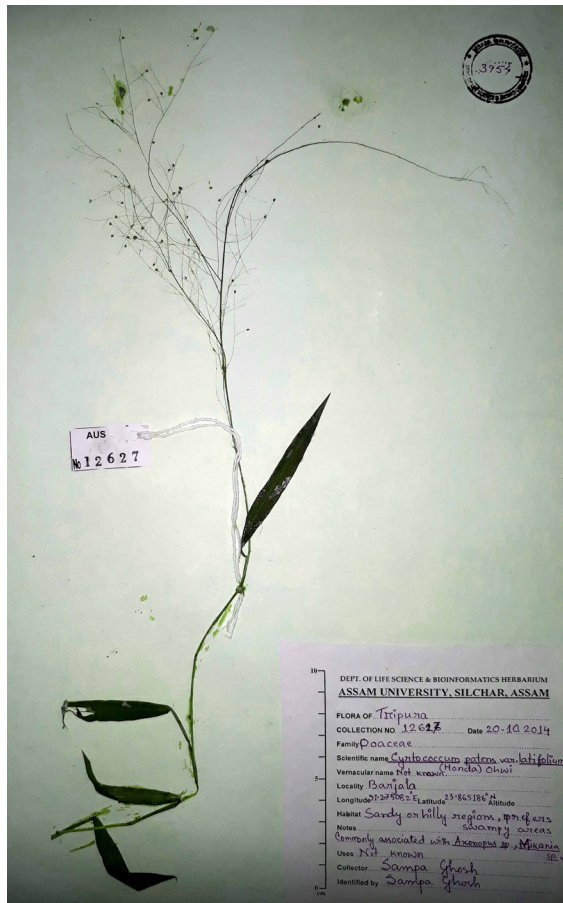
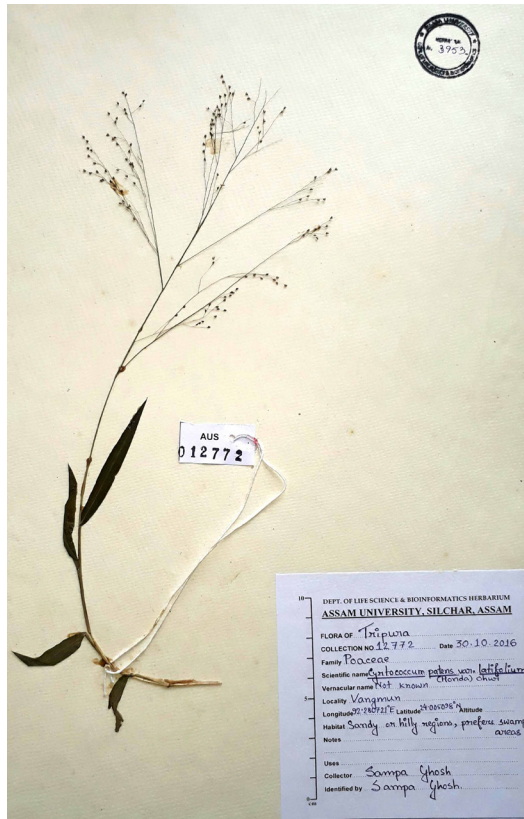


Image 6. Herbarium sheet of *Acroceras munroanum*

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Images 7–10. Herbarium sheets of *Cyrtococcum patens* var. *latifolium*

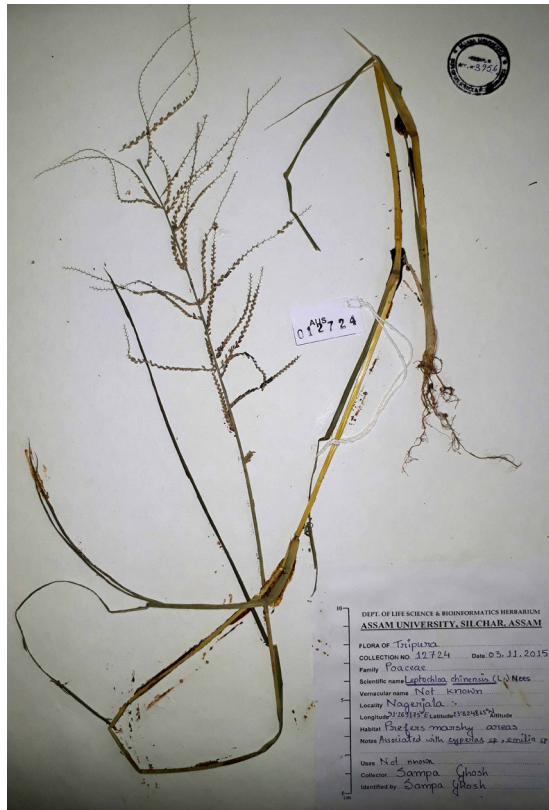


Image 11. Herbarium sheet of *Leptochloa chinensis*



Image 12. Herbarium sheet of *Panicum maximum*

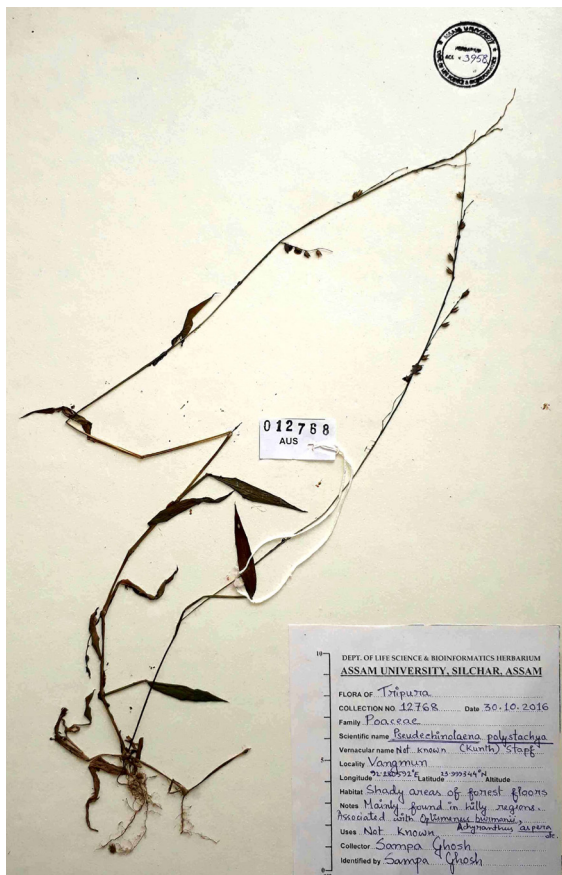


Image 13. Herbarium sheet of *Pseudechinolaena polystachya*







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#### Miscellaneous

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