

Extensive Studies and New Records to the Grass Flora of Mizoram, North East India

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ABSTRACT

The present floristic inventory revealed 8 (eight) new distributional records of grasses (family Poaceae) in Mizoram state from north eastern India. The state forms a significant part of both the Himalayan and the Indo-Burma biodiversity hotspots. The present investigation is based on fresh survey and collection to generate a documentation of grasses in Mizoram. A list of species, names arranged in alphabetical order, with updated nomenclature, relevant citation, description, voucher nos., vivid illustrations, phenology, distribution, materials examined, notes and colour photographs are provided to alleviate identification.

Keywords: Flora, Grass, India, Mizoram.

Grasses, the members of family Gramineae Juss., *nom. cons.* (Poaceae Barnhart, *nom. cons. et nom. alt.*) are extremely distinctive from other flowering plants owing to their exceptional vegetative and floral morphology, habitat diversity and their immense economic significance. They have virtually colonized every terrestrial habitat covering one-fifth of the Earth's land surface (Shantz, 1954). The family is monophyletic [Grass Phylogeny Working Group (GPWG) 2001; Soreng *et al.*, 2015] and presently includes of 771 genera c. 12,074 species belonging to 51 tribes and 12 sub-families worldwide (Soreng *et al.*, 2015).

Grasslands occupy about 3.9% of the total land area of India (Nair and Thomas 2001). Sampson *et al.* (2001) categorized India into two grass zones viz., (i) Temperate Himalayan zone with Indo-Gangetic plains and (ii) Tropical Peninsular zone, amid which Tropical Indian peninsular region shows highest grass diversity with 55% endemism among the total endemic grasses in India (Sampson *et al.*, 2001). Poaceae is the largest angiosperm family in India, representing c. 263 genera, 1,300 species under 25 tribes (Benjamin *et al.*, 2012) among which c. 430 taxa are endemic to the country (Jain, 1986).

Published works on grasses of north east India includes accounts of Bor (1940), Shukla (1996), Hajra and Verma (1996), Noltie (2000), Bhattacharjee (2002), Sharma *et al.*, (2002), Chowdhury *et al.*, (2009), Barbhuiya *et al.*, (2013), Baruah (2013) etc. Mizoram, the state under floristic

investigations, lies between 21°57'– 24°30' N latitude and 92°15'– 93°29' E longitude, spreading over an area about 21,081 sq. km and sharing International boundaries with Myanmar and Bangladesh, forming a significant part of both the Himalayan and the Indo-Burma biodiversity hotspots. Floristic exertion of grasses in Mizoram have received slightest attention and are barely known from the sporadic reports by Gamble (*l.c.*), Hooker (1897), Bor (*l.c.*), Gupta (1972), Bhattacharjee (2002) etc. Presently, the state consists of a total of 33 species of grasses (Shukla, 1996) with few of additions (Lalchuanawma & Lalramnghinglova, 2010; Barbhuiya *et al.*, 2013; Kumar *et al.*, 2013; Barbhuiya, 2014).

MATERIAL AND METHODS

The present work includes conventional methods of morpho-taxonomic research conducted in the diverse localities of the study area during 2010 – 2015. Collection and preservation of specimens were done following Smith (1971), Jain and Rao (1977), Van Balgooy (1987), Rao and Sharma (1990) and Singh and Subramaniam (2008). All the specimens were examined under Olympus SZ2-ILST Microscope' and 'Nikon Stereo Zoom Microscope' and live photographs were taken with 'Canon Power Shot SX50HS (50X optical zoom) camera'. The taxa were identified consulting taxonomic keys available in the standard Floras, monographs and revisions (Bor 1940, 1960; Sreekumar and Nair, 1991; Shukla 1996; Moulik 1997; Veldkamp 1999; Kabeer and Nair 2009),

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studying authentic herbarium specimens housed at ASSAM, CAL (herbaria acronyms according to Thiers, 2015) and matching with digital images of specimens including the type materials available from different herbarium databases. After critical study through dissections and review of literatures, 8 species were found newly growing to the state of Mizoram.

RESULT AND DISCUSSIONS

1. *Brachiaria subquadriflora* (Trin.) Hitchc., Lingnan Sci. J. 7: 214. 1929. (1931); Bor, Fl. Assam 278. 1940 & Grass. Burma Ceylon India Pakistan 286. 1960; Mitra, Fl. Pl. E. India 192. 1958; Ohasi, Fl. E. Himalaya III: 353. 1975; Karthik. *et al.*, Fl. Ind. Enum. Mono. 191. 1989; Shukla, Grass. N.E. India 314. 1996; Moulik, Grass. Bamb. Eastern India 2: 80. 1997.

Basionym: *Panicum subquadriflorum* Trin., Gram. Panic. 145. 1826.

Type: Mariana Islands, *Chamisso s.n.* (Lecto: Trin-0947.01; cited by Veldkamp, Blumea 41: 426 (1996).

Voucher specimen no.: S. Pathak 48543 (CAL).

(Plate 1. Fig. A & B; Plate 2. Fig. A – L)

Annual; caespitose. Culms 20 – 54 cm; geniculate, semi prostrate to decumbent; dark greenish; furrowed at middle; surface at times faintly villous; nodes glabrous, lower nodes rooting from. Leaf blade 13 – 15 × 0.4 – 0.9 cm; narrowly ovate to lanceolate, acuminate, base somewhat semi amplexicaul; surface scabrid; margin serrulate; mid rib distinct with 3 – 5 pairs of lateral nerves on either side; ligule 0.7 – 1 mm, membranous with a rim of shiny, stiff, whitish hairs; sheath 4 – 9 cm, loose, terete, keeled, surface and margin densely villous, hairs tuberculate, margin hyaline, mouth long ciliate, hairs white. Panicle 2 – 7 cm; drooping. Racemes 2.5 – 4.8 cm; 3 – 6 alternate to times sub whorled, borne along a central axis; axis 3 – 8 cm, unilateral, pubescent; rachis angular, pilose. Spikelets 3.7 – 4 × 1 – 1.2 mm; solitary; obovate to elliptic, base tapering; gibbous; smooth. Glumes dissimilar; persistent. Lower glume 0.7 – 1 × 0.6 mm; ovate to cup shaped, sub acute; chartaceous; glabrous; greenish; 5 – 7 nerved, nerves dark green. Upper glume 3.6 – 4 × 1 – 1.2 mm; narrowly ovate to oblanceolate, apex acute; membranous; glabrous; 5 – 7 nerved, nerves greenish brown. Florets 2, upper bisexual, lower empty. Lower lemma 3.5 – 3.6 × 1.2 mm; oblanceolate, acute to faintly apiculate; membranous; glabrous; 5-nerved. Lower palea 2.9 – 3 × 0.7 – 1 mm; oblong, acute; partly hyaline; 1-nerved. Upper lemma 3 – 3.4 × 0.7 – 1 mm; oblanceolate, acute; chartaceous; brownish;

margins involute; surface indurate, rugulose; 1-nerved. Upper palea 2.7 – 3 × 1 – 1.1 mm; elliptic to oblong; sub-coriaceous; surface faintly indurate, rugose. Stamens 3; anther 1 – 1.2 mm, dark brown; filaments yellowish. Pistil 0.7 – 1 mm; ovary obovate to elliptic, glabrous; style 2, hyaline; stigma 2, plumose, purplish. Lodicules 2; 0.3 – 0.4 mm, truncate, partly hyaline.

Habitat: Edges of small cliffs.

Flowering and fruiting: March – November.

Distribution: Tropical parts of the world. INDIA: Assam, Bihar, Kerala, Uttar Pradesh, West Bengal and Mizoram (present study).

Specimen Examined: INDIA: Mizoram, Kolasib District, Kolasib road side, 887 m, 24°13'51.00" N – 92°40'32.99" E, 12.05.2011, S. Pathak 48543 (CAL); Assam, 1885, Jiri, Fulertal, R.B. Majumdar 73500!; West Bengal, Griffith 2430 (CAL)!

Notes: Bor (1960) mentioned the inflorescence axis to be pubescent and not glabrous, in the key. Again, the species is not reported from any of the south Indian floras (Lija and Kumar, 2018). Therefore, the current collection forms the first report to the state.

2. *Chloris virgata* Sw., Fl. Ind. Occid. 1: 203. 1797; Hook.f., Fl. Brit. India 7: 291. 1896; Bor, Fl. Assam 123. 1940 & Grass. Burma Ceylon India Pakistan 468. 1960; Mitra, Fl. Pl. E. India 166. 1958; Karthik. *et al.*, Fl. Ind. Enum. Mono. 197. 1989; Noltie, Fl. Bhutan 3(2): 677 (plate. 7). 2000; Shukla, Grass. N.E. India 240. 1996.

Type: WEST INDIES: Antigua, O.P. Swartz s.n. (Holo: S; Iso: BM).

Voucher no.: S. Pathak 48521 (CAL).

(Plate 1. Fig. C)

Annual; tufted. Culm 34 – 55 cm; tufted; erect; surface smooth to faintly villous; internodes slightly flattened; lower nodes rooting. Leaf blade 5.5 – 14 × 0.3 – 0.6 cm; linear to lanceolate, apex attenuate, conduplicate; scabrellate abaxially; margin finely serrulate; ligule 1 – 1.4 mm, membrane, faintly ciliate; sheaths 4 – 11 cm, strongly keeled, surface glabrous, striate, at times flabellate below, mouth bearded when young, sometimes uppermost sheaths bearded enclosing the spikes. Panicle composed of digitate spikes. Racemes 4 – 12; each 9 cm; slightly slanting, digitate, spreading, unilateral, silky, pale brown or tinged pink to purple; rachis angular, scabrid. Spikelet 3.3 – 4 × 1.1 – 1.2 mm; sub-sessile; cuneate, laterally compressed; broadside to rachis; imbricate, 2-rowed. Glumes similar; persistent. Lower glume 1.6 – 2.4 × 1 mm; lanceolate, acuminate; membranous; 1-nerved; 1-keeled, keel scabrellate. Upper glume 2.1 – 2.2 × 1.2 mm; oblong, apex setaceous attenuate; 1-nerved.

Florets 2; lower fertile. Lower lemma $3.5 - 4 \times 1.3$ mm; oblanceolate, bifid at apex; chartaceous; margin densely ciliate with a spreading tuft of $2.5 - 3.5$ mm, silky hairs; 3 - 5 nerved; keel and flanks ciliate or glabrous; 1-awned; awn $13.6 - 15$ mm, emerging from the sinus, straight. Upper lemma $2.7 - 3 \times 1.2$ mm; oblong, clavate; scabrid, 1-awned; awn $10.2 - 12$ mm, sub apical. Stamens 3; anther $0.4 - 0.6$ mm, yellowish purple. Pistil $1.7 - 2$ mm; ovary oblong to lanceolate, brownish white; style short; stigma plumose, purplish. Lodicules 2; $0.9 - 1.1$ mm, cuneate, fleshy. Caryopsis $0.7 - 1$ mm, oblong, trigonous, pale brownish.

Habitat: Rocky slopes, at times on walls and edges of roof.

Flowering and fruiting: March - end of April.

Distribution: AFGHANISTAN, AUSTRALIA, BHUTAN, MYANMAR, NEPAL, PAKISTAN, SOUTH WEST ASIA. INDIA: Widely distributed all over the plains in Assam, Bihar, Orissa, Tamil Nadu, Karnataka, Maharashtra, West Bengal (Shukla, 1996; Kabeer and Nair, 2009) and Mizoram (present study).

Specimen Examined: INDIA: Mizoram, Kolasib district, along Kolasib - Aizawl 54 highway, 385 m, $24^{\circ}13'52.00''$ N - $92^{\circ}40'32.99''$ E, 03.04.2011, S. Pathak 48521 (CAL); Assam, 1867, Anderson 7643!; Maharashtra, Griffith 6000 (CAL)!.

Notes: Bor (1940) had included *C. virgata* in Flora of Assam, as it was reported by Jenkins, without providing any locality. Again, Shukla (1996) excluded it as no specimen was available to be examined. Consequently, the present collection forms the first record of the species from this vicinity.

3. *Cynodon barberi* Rang. & Tadul. in J. Bomb. Nat. Hist. Soc. 24: 846. 1916 & Handb. S. Ind. Grass. 194 & 195. 1921; Bor, Grass. Burma Ceylon India Pakistan 469. 1960; Karthik. et al., Fl. Ind. Enum. Mono. 203.1989; Moulik, Grass. Bamb. India 2: 565. 1997.

Type: INDIA: Tamil Nadu, Tinnevely District, Godavari, 1901 - 1902, Dr. C. A. Barber s.n.

Voucher no.: S. Pathak 48572 (CAL).

(Plate 1. Fig. D; Plate 3. Fig. A - J)

Perennial; caespitose. Culm $30 - 46$ cm; decumbent; geniculate; greenish, glabrous; nodes glabrous, brownish, lower nodes rooting. Leaf blade $4.6 - 6.5 \times 0.3 - 0.4$ cm; lanceolate, acute; margin cartilaginous, scabrid, involute; mid rib serrate near apex; ligule $0.3 - 0.4$ mm, membranous, mouth long ciliate; sheath $5 - 9$ cm, terete, keeled, mouth faintly bearded. Panicle composed of digitate, erect, spreading racemes. Racemes $4 - 7$; each $3.7 - 6.5$ cm; rachis triquetrous, margin finely serrulate, base and nodes ciliate; peduncle $11 - 19$ cm, faintly

ribbed, apex hispid. Spikelets $2.5 - 3 \times 0.4 - 0.6$ mm; solitary; alternate; sub sessile; ovate to oblong, acute; yellowish green. Glumes unequal. Lower glume $1 - 1.5 \times 0.4 - 0.5$ mm; slightly curved; lanceolate, acuminate; chartaceous; greenish; prominently 1- nerved; 1- keeled, keel scabrid. Upper glume $1.8 - 2.1 \times 0.5$ mm; lanceolate, acuminate; chartaceous; greenish; almost hyaline; prominently 1- nerved; 1- keeled, keel scabrid. Floret single, bisexual. Lemma $1.9 - 2.5 \times 0.5 - 0.7$ mm; ovate to broadly lanceolate, apex retuse; chartaceous; greenish; margin involute; prominently 3- nerved; clavellate hairs present on nerves; 1- keeled. Palea $1.5 - 2.3 \times 0.3 - 0.4$ mm; narrowly elliptic lanceolate, acuminate; chartaceous; greenish; margin infolded; 2- nerved; 2- keeled, keels ciliate. Stamens 3; anthers $0.9 - 1.2$ mm, yellowish purple; filaments 0.3 mm. Pistil $1 - 1.7$ mm; ovary oblong to elliptic, acute, brown; style hyaline; stigma plumose, purple. Lodicules 2; $0.1 - 0.3$ mm, membranous, hyaline.

Habitat: Slope of hair-pin bend.

Flowering and fruiting: February - May.

Distribution: ASIA, MYANMAR, SRI LANKA. INDIA: Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Lakshadweep, Maharashtra, Meghalaya (CAL), Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal (Kabeer and Nair, 2009) and Mizoram (present study).

Specimen Examined: INDIA: Mizoram, Champhai District, Seiling, 763 m, $23^{\circ}43'32.46''$ N - $92^{\circ}51'19.22''$ E, 16.04.2011, S. Pathak 48572 (CAL); Maharashtra, 1899, A. T. Gage 124 (CAL)!; Meghalaya, Khasi Hills, G. Panigrahi 1218 (CAL)!; 1961; Orissa, Rao 2076, acc. no. 524800 (CAL)!.

Notes: It was observed growing in a single patch along one of the hair-pin bends in Seiling. It was not observed growing elsewhere.

4. *Eragrostiella bifaria* (Vahl) Bor, Ind. For. 66: 270, 1940; Karthik. et al., Fl. Ind. Enum. Mono. 215.1989; Bor, Fl. Assam 107. 1940 & Grass. Burma Ceylon India Pakistan 494. 1960; Moulik, Grass. Bamb. Eastern India 2: 594. 1997.

Basionym: *Poa bifaria* Vahl, Symb. Bot. 2: 19. 1791.

Type: INDIA (Oriental): Anon. (C).

Voucher no.: S. Pathak 48482 (CAL).

(Plate 1. Fig. E)

Perennial; caespitose. Culm $54 - 60$ cm; erect, lateral branches lacking. Leaf mostly basal; leaf blade $15 - 21 \times 0.3 - 0.5$ mm; filiform, linear to lanceolate, attenuate; margin entire, ciliate; mid rib prominent, multiple lateral nerves present; abaxial surface hispid; ligule $0.4 - 0.5$ mm; ciliolate membrane, mouth ciliate, hairs $4 - 6$ mm; sheath $4.3 - 6$ cm; glabrous, green. Spikes $17 - 22 \times 1 - 1.3$ cm;

terminal; erect with alternate, sessile compactly arranged, solitary spikelets; peduncle 15 – 19 cm; terete, triquetrous, finely scabrellate. Spikelets 0.7 – 1.5 × 0.4 – 0.6 cm; comprising 12 – 28 fertile florets, with diminished florets at the apex; elliptic to oblong, acute, curved; laterally compressed; compact; breaking up at maturity; greenish white; rachilla persistent. Glumes similar; deciduous. Lower glume 1.7 – 2 × 1.5 mm; broadly ovate, apex acute; glabrous, margin infolded; 3- nerved, nerves faint, green. Upper glume 1.9 – 2.1 × 1.4 – 1.7 mm; ovate to oblong, apex acute; cartilaginous; 3- nerved, central nerve prominent. Lemma 1.7 – 2.2 × 1.2 mm; oblanceolate; leathery; grayish green; margin white translucent, involute; 3- nerved, lateral nerves faint, may be absent. Palea 2 – 2.5 × 1.3 mm; ovate, apex entire; 2- nerved, 2- keeled, keels narrowly winged, ciliate. Caryopsis 0.5 – 0.6 mm; ovate, isodiametric, trigonous.

Habitat: Along hill slopes.

Flowering and fruiting: December – May.

Distribution: AFRICA, AUSTRALIA, CHINA, SRILANKA, TROPICAL ASIA. INDIA: Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu (Kabeer & Nair, 2009) and Mizoram (present study).

Specimen Examined: INDIA: Mizoram, Aizawl District, Khatla, 238 m, 23°44'48.79" N – 92°44'55.98" E, 18.04.2011, S. Pathak 48482 (CAL); Bihar, 1867, Griffith 555 acc. no. 519045 (CAL)!; Gujarat, 1995, Chatterjee 2015 (CAL)!.

Notes: Shukla (1996) reported a single species i.e. *E. leioptera* (Stapf) Bor, from north eastern India. Neither any literature, nor herbarium collections has established the occurrence of any other species of *Eragrostiella* from this vicinity. Thus, the present collection is an addition in this region.

5. *Eragrostis amabilis* (L.) Wight & Arn., Cat. Indian Pl. 1834: no. 1777. 1834; Hook.f., Fl. Brit. India 7: 317. 1896; Bor, Fl. Assam 99. 1940.

Basionym: *Poa amabilis* L., Sp. Pl.: 68. 1753.

Lectotype: SRI LANKA: Herb. Hermann 2: 59, no. 46; (BM); designated by Veldkamp in Cafferty *et al.*, Taxon 49(2): 254. 2000.

Voucher no.: S. Pathak 48557 (CAL).

(Plate 1. Fig. F)

Perennial; caespitose. Culm 55 – 90 cm; geniculate, weak; node glabrous. Leaf blades 9 – 16 × 0.3 – 0.4 cm; linear to lanceolate, apex acuminate; margin entire; surface scaberulous; mid rib prominent, flat, 3 – 4 pairs of lateral nerves; ligule 2 mm, hairy rim, hairs white; sheath 4 – 4.8 cm, striate, mouth bearded, margin glabrous, smooth. Panicle 6 – 9 × 4 – 4.3 cm; open; oblanceolate; axils of branches smooth to glandular ciliate. Spikelets 2 – 2.7 × 0.7 – 1

mm; solitary; 4 – 8 flowered; ovate to elliptic ovate; pedicelled; pedicel 2 – 3.7 mm; rachilla deciduous. Glumes deciduous; similar. Lower glume 0.3 – 0.4 × 0.2 mm; ovate to broadly lanceolate, apex sub acute; membranous; glabrous; margin entire; 1- nerved; 1- keeled, keel serrulate. Upper glume 0.5 – 0.6 × 0.3 mm; broadly lanceolate, apex almost obtuse; membranous; glabrous; 1- nerved; 1- keeled, keel serrulate. Lemma 0.8 – 1 × 0.5 mm; broadly lanceolate, sub acute; almost chartaceous; greenish; 3- nerved; 1- keeled. Palea 0.7 – 1 × 0.3 mm; obovate; 2- nerved; 2- keeled, keels densely ciliate. Stamens 3; anthers 0.3 – 0.4 mm, brownish purple; filaments white. Pistil 0.7 – 1 mm; ovary globose, glabrous; style 2; stigma 2, purplish green, plumose. Lodicules 2; 0.5 mm, hyaline. Caryopsis 0.4 – 0.5 × 0.3 mm; obovate.

Habitat: Edges of forest trails.

Flowering and fruiting: March – late October.

Distribution: ASIA, CHINA, MALAYSIA, SRI LANKA. INDIA: Andaman, Andhra Pradesh, Bihar, Himachal Pradesh, Jammu & Kashmir, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, West Bengal (Kabeer & Nair, 2009) and Mizoram (present study).

Specimen Examined: INDIA: Mizoram, Kolasib District, forest edges along Kolasib road, 887 m, 24°13'51.00" N – 92°40'32.99" E, 16.05.2011, S. Pathak 48557 (CAL); Sikkim, 1963, D. B. Deb 31166 (CAL)!; Tripura, 1957, D.B. Deb 6679 (CAL)!.

6. *Eragrostis ciliaris* (L.) R. Br., Narr. Exped. Zaire 478. 1818; Hook.f., Fl. Brit. India 7: 314. 1896; Bor, Grass. Burma Ceylon India Pakistan 506. 1960; Karthik. *et al.*, Fl. Ind. Enum. Mono. 216. 1989; Moulik, Grass. Bamb. Eastern India 2: 598. 1997.

Basionym: *Poa ciliaris* L., Syst. Nat. (ed. 10) 2: 875. 1759.

Type: JAMAICA: *Browne s.n.*, (LINN-87.66); designated by Hitchcock, Contr. U.S. Natl. Herb. 12: 121. 1908.

Voucher no.: S. Pathak 48523 (CAL).

(Plate 1. Fig. G – H)

Annual; tufted. Culm 90 – 127 cm; geniculately ascending; surface smooth, greenish brown; node glabrous, brownish. Leaf blade 1 – 2.5 × 0.2 cm; linear to narrowly oblanceolate, apex acuminate; flat; loosely involute; glabrous; scabrellate at apex; abaxial surface sparsely tuberculate hairy; mid rib prominent; ligule 0.3 mm; composed of a row of fine, white hairs; sheath 1.5 – 1.9 cm, faintly keeled at apex, compressed, ribbed, margin membranous, surface sometimes tuberculate hairy, mouth faintly ciliate. Panicle 2.4 – 3.1 × 0.8 cm; densely spiciform; linear to oblong; continuous or interrupted; branches ascending; central axis terete; triquetrous; joints with

purplish dotted glands; peduncle 1.4 – 1.6 cm. Spikelets 1.5 – 2 × 0.7 – 1 mm; narrowly ovate to lanceolate, apex acute, base round; laterally compressed; glabrous; purplish green; pedicel 0.2 – 0.3 mm, short, dotted with purplish glands, scabrid, sub triquetrous, disarticulating below each fertile floret. Glumes dissimilar; deciduous. Lower glume 0.7 – 1 × 0.4 mm; lanceolate, apex acuminate; chartaceous; glabrous; 1- nerved; 1- keeled, keels scabrellate. Upper glume 0.8 – 1.2 × 0.5 mm; narrowly ovate to lanceolate, apex acute, base broad; glabrous; greenish brown; 1- nerved; 1- keeled. Florets 5 – 9; bisexual, disarticulating; rachilla 0.2 mm, smooth. Lemma 0.7 – 1 × 0.4 mm; narrowly oblanceolate, boat shaped, apex minutely mucronate; chartaceous; 3- nerved; lateral nerves sub marginal; 1- keeled, keels ciliate, hairs whitish green. Palea 0.5 – 0.7 × 0.5 mm; elliptic lanceolate, apex retuse, curved at base; chartaceous; margin involute; 2- nerved; 2- keeled, keels raised, ciliate, hairs tuberculate, exceeding the width of palea. Stamens 2; anthers 0.1 – 0.2 mm, brownish-purple; filaments white. Caryopsis 0.3 – 0.5 mm; ellipsoid, glabrous, purplish green.

Habitat: Wet, shady edges of canal, along damp forest trail.

Flowering and fruiting: April – January.

Distribution: Distributed in tropical and warm regions; ASIA, MYANMAR, SRI LANKA, PAKISTAN. INDIA: Andhra Pradesh, Arunachal Pradesh (CAL), Bihar, Daman & Diu, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh (CAL; Kabeer and Nair, 2009) and Mizoram (present study).

Specimen Examined: INDIA: Mizoram, Kolasib district, along a narrow canal beside Kolasib – Aizawl highway no. 54, 378 m, 24°13'52.01" N – 92°40'32.98" E, 03.04.2011, S. Pathak 48523 (CAL); Arunachal Pradesh, Lower Dibang Valley, 01.08.2000, M. Bhaumik 2412 (CAL)! Sikkim, 1906, A. Meebold 9144 (CAL)!.

7. *Polypogon monspeliensis* (L.) Desf., Fl. Atlant. 1: 67. 1798; Mitra, Fl. Pl. E. India 171. 1958; Bor, Fl. Assam 154. 1940 & Grass. Burma Ceylon India Pakistan 403. 1960; Deb in Bull. Bot. Surv. Ind. 3: 135. 1961; Karthik. *et al.*, Fl. Ind. Enum. Mono. 251.1989; Noltie, Fl. Bhutan 3(2): 597. 2000; Chowdhery *et al.*, Mat. Fl. Arun. Pra. 3(2): 304. 2009. Basionym: *Alopecurus monspeliensis* L. Sp. Pl. 1: 61. 1753.

Type: LINN- 82.6 (*Isolecto*: BAA- 4131); designated by Hubbard, Fl. Trop. East Afr. Gramineae 1: 100. 1970, but specific sheet is not indicated; specific sheet designated by Scholz in Cafferty *et al.*, Taxon

49(2): 245. 2000.

Voucher no.: S. Pathak 48560 (CAL).

(Plate 1. Fig. I)

Perennial; tufted. Culm 11 – 54 cm; base geniculately ascending; solitary; slender; surface smooth to coriaceous; greenish yellow; node round, glabrous. Leaf blades 8 – 14 × 0.5 – 0.7 cm; filiform, linear to narrowly lanceolate, apex tapering; margins scabrid; surface scaberulous; mid rib prominent, scabrellate, lateral nerves 5 – 7; ligule 5 – 6 mm, ciliate membranous, lacerate, glaucous; sheath 6 – 10 cm, loose, striate, surface glabrous. Panicle 7 – 11 cm; spiciform, oblong to ovate lanceolate; continuous or interrupted; branches scabrous; peduncle 9 – 16 × 1 – 3.5 cm; glabrous, greenish yellow. Spikelets 2.5 – 3.1 × 0.7 – 7 mm; solitary; falling entire; oblong lanceolate, acute; greenish yellow; pedicels 0.2 – 0.5 mm, scabrous; callus square, base obtuse. Glumes similar, persistent. Lower glume 8 – 9 × 0.7 mm; linear to oblanceolate, apex attenuate; surface scarious; greenish yellow; 1- nerved, 1- keeled, keel faintly serrulate, 1- awned; awn 2 – 4.6 mm. Upper glume 11 – 14 × 0.8 mm; oblong, apex dentate, aristate, arista 2.5 – 3.1 mm; surface scarious; 1- keeled, keel scabrid; 1- nerved. Floret 1, bisexual. Lemma 1.8 – 2 × 0.6 mm; linear to lanceolate, apex acute; surface coriaceous; margins convolute; 3- nerved; 3- awned; principal awn 15 – 31 mm, persistent. Palea 1 – 1.3 × 0.5 mm; oblong to elliptic, apex acute, margin hyaline; infolded, 2- nerved. Stamens 3; anthers whitish brown, 1.3 – 1.4 mm. Pistil 0.3 – 0.5 mm; ovary oblong; style 2; stigma 2, plumose, purplish.

Habitat: Along hill slopes.

Flowering and fruiting: May – September.

Distribution: AFRICA, EUROPE, PAKISTAN, SRI LANKA, TEMPERATE ASIA. INDIA: Andhra Pradesh, Bihar, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal (Shukla, 1996) and Mizoram (present study).

Specimen Examined: INDIA: Mizoram, Aizawl District, Reiek hill slope, 1032 m, 23°41'38.17" N – 92°36'36.82" E, 02.05.2011, S. Pathak 48560; Arunachal Pradesh, Lower Dibang Valley, 2000, M. Bhaumik 3143 (CAL)!; Manipur, D.B. Deb 801 (CAL)!.

Notes: Shukla (1996) revealed this species to be not widespread in north eastern India (not mentioning any precise locality) not but it was not rare as the herbarium collections indicated. The present collection established its distribution in this state.

8. *Setaria viridis* (L.) Peauv., Ess. Agrostogr. 51, 171, 178. 1812; Hook.f. Fl. Brit. India 7: 80. 1896; Bor, Fl. Assam 287. 1940 & Grass. Burma Ceylon

India Pakistan 365. 1960; Mitra, Fl. Pl. E. India 201. 1958; Karthik, *et al.*, Fl. Ind. Enum. Mono. 259. 1989; Shukla, Grass. N.E. India 363. 1996; Moulik, Grass. Bamb. Eastern India 159. 1997; Noltie, Fl. Bhutan 3(2): 721 (plate. 43). 2000.

Basionym: *Panicum viride* L., Syst. Nat. (ed. 10) 2: 670. 1759.

Type: EUROPE (*Europa australi*); Sp. Pl., ed. 2, 1: 83. 1762.

Voucher specimen no.: S. Pathak 48537 (CAL).

(Plate 1. Fig. J)

Annual; tufted. Culm 22 – 58 cm; erect to geniculately ascending; slender; cylindrical; surface hispid; greenish white; nodes roundish, glabrous. Leaf blade 5 – 22 × 0.4 – 0.9 cm; linear to lanceolate, apex acuminate, base sub truncate; pseudopetiolate when young; margins scabrous; papillose on both surfaces; mid rib prominent, flat, scabrid; ligule 0.5 – 0.9 mm, hairy, hairs yellowish white, apex fimbriate; sheaths 5 – 11 cm, terete, glabrous to pilose, margins ciliate. Panicle 9 – 14 cm; cylindrical; dense; curved; usually tapering upward; erect or slightly nodding; branchlets bearing several spikelets, each subtended by 9 – 15 bristles; bristles 6 – 11 mm, unequal, dark greenish purple, faintly antrorsely barbed; axis pilose to pubescent. Spikelets 2 – 3 × 1 – 1.3 mm; oblong to elliptic, apex acute, obtuse; dorsally compressed; falling entire; purplish green. Glumes dissimilar; present. Lower glume 0.3 – 0.5 × 0.2 mm; broadly lanceolate to oblate, subacute; glabrous; entire at margin; membranous, 1 – 3 nerved, nerves green, fainting midways. Upper glume 0.7 – 1 × 0.5 mm; oblong to elliptic, apex sub acute; membranous; glabrous; greenish brown; 5-nerved. Florets 2, lower sterile, upper bisexual. Lower lemma 0.9 – 1.1 × 0.5 mm; oblong to elliptic, acute; membranous; margin entire; 5 – 7 nerved. Lower palea 0.4 – 0.5 × 0.2 cm; lanceolate, acute; membranous; partly hyaline. Upper lemma 1.3 – 1.9 × 0.5 mm; oblong to lanceolate; crustaceous, subcoriaceous; pale green; dorsal surface transversely punctate, rugulose, indurate; margin entire, involute. Upper palea 0.5 – 0.6 × 0.3 mm; oblong to lanceolate; membranous; dorsally rugulose. Stamens 3; anthers 0.6 – 0.8 mm, yellowish brown; filament white. Pistil 1.9 – 2.3 mm; ovary oblong; style 2, filiform; stigma 2, bearded, purplish brown.

Habitat: Along trails.

Flowering and fruiting: April – July.

Distribution: ASIA, CHINA, plateau of TIBET, c. 4000 m; cooler parts of the world. INDIA: Assam, Nagaland (CAL); Arunachal Pradesh, Meghalaya, West Bengal (Shukla, 1996) and Mizoram (present study).

Specimen Examined: INDIA: Mizoram, Kolasib District, along Kolasib-Aizawl Highway no. 54 road side, 382 m, 24°13'51.00" N – 92°40'32.99" E, 23.04.2011, S. Pathak 48537 (CAL); Arunachal Pradesh, Dibang Valley, 1200 m, 01.09.2000, M. Bhaumik 3415 (CAL)!; Assam, Kamrup district, 1956, A.S. Rao 38792 (CAL)!; Nagaland, 1886, D. Prain s.n., acc. no. 521398 (CAL)!.

This qualitative survey revealed the presence of 8 species belonging to 7 genera newly reported from Mizoram. The species enumerated here were hitherto unrecorded from the state as evidenced by meticulous literature survey and herbarium consultation, thus reported here as new records for the grass flora of Mizoram. Further acute exploration is required which will add more information about their conservation status.

CONCLUSION

To conclude, the extensive literature inspection amalgamated with meticulous field survey of the members of the family Poaceae (grasses) in Mizoram ought to have made an impact on the current status of species, their geographical distribution, population etc. and must have augmented the assessment of grasses in this state. It calls for the necessity of further survey and research to complete the evaluation to formulate a checklist of grasses in Mizoram.

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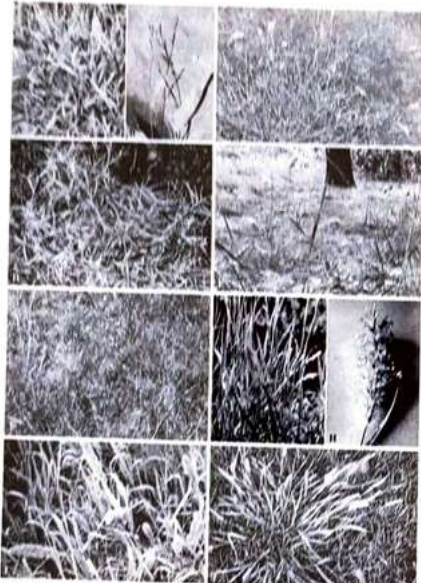


PLATE 1. A & B. *Brachiaria culpanthegana*, C. *Setaria viridis*, D. *Cynodon dactylon*, E. *Fragaria vesicaria*, F. *Fragaria vesicaria*, G. & H. *Fragaria vesicaria*, I. *Paspalum conjugatum*, J. *Setaria viridis*.

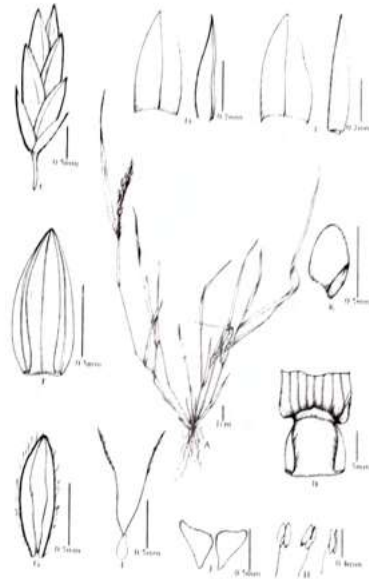


Plate 4. *Fragaria vesicaria*. A. Habit, B. Leaf blade, C. Spikelet, D. Lower glume (upper & lower sides), E. Upper glume, F. Lemma, G. Palea, H. Stamens, I. Pistil, J. Lodicules. (S.P. Pathak 04557, A.I.I.)



Plate 3. *Cynodon dactylon*. A. Habit, B. Leaf blade, C. Spikelet, D. Lower glume (upper & lower sides), E. Upper glume, F. Lemma, G. Palea, H. Stamens, I. Pistil, J. Lodicules. (S.P. Pathak 04557, A.I.I.)

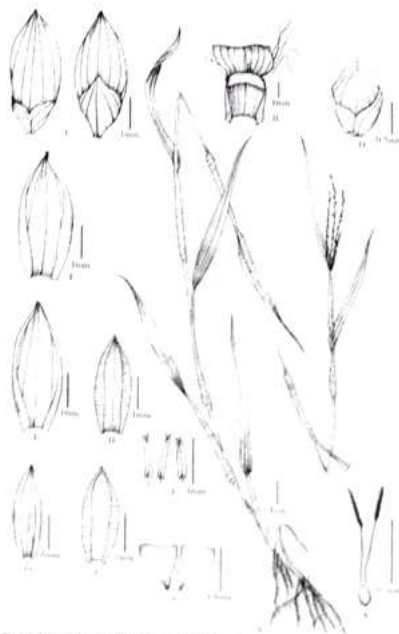


Plate 2. *Brachiaria culpanthegana*. A. Habit, B. Leaf blade, C. Spikelet, D. Lower glume (upper & lower sides), E. Upper glume, F. Lemma, G. Palea, H. Stamens, I. Pistil, J. Lodicules. (S.P. Pathak 04557, A.I.I.)