BRYODIVERSITY OF DISTRICT BUDGAM (JAMMU AND KASHMIR) DIPLOLIPDEA PLEUROCARAPE III

Amarpreet Kour & Anju Rao & Sunita Kapila
Department of Botany, Panjab University, Chandigarh-160014

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ABSTRACT *The present survey of the unexplored area till date has revealed the occurrence of 73 bryophyte species in various habitats. These species fall in 32 genera in 10 orders and 18 families. Among these, there are 26 diplololepidous pleurocarape specices. The present study provides a working base to an Ecologist, Cytologist, Chemist, Physiologist and Pharmacist to evaluate potential of these tiny plants in their relevant field of study.*

Keywords:

Racopilumcuspidigerum (Schwaegr.) Åongstr.,Oefv. K. Vet. Ak, Foerh., 29(4): 10 (1872).
Plate 44
*Hypnumcuspidigerum*Schwaegr, in Gaud in Freyc.,VoyageAut. Monde OraninePhys. Bot.: 229(1828). *Hookeriatomentosa* (Hedw.) Arnott var. subintegrifolia Arnott, Mem .Soc. Hist. Nat. Paris, 5: 250(1897). *Racopilumdemissum* Bosch & Lac., Bryol. Jav., 2: 18(1861).
Monoecious. Plants yellow green to brown, growing in tufts. Stem erect, brown, ±4cm long, ; Leaves dimorphic, phyllodioecious, ±2mm long and ± 0.5 mm broad, lateral leaves long with long arista, margins dentate; costa strong, excurrent; upper laminal cells irregular, smooth, parenchymatous, quadrate-hexagonal, ±12×8µ, basal laminal cells rectangular, ±17×8µ; perichaetial leaves longer, 5.5 mm long. Seta ±4cm long, erect; capsules horizontal, ±5mm long and ±2mm broad, inclined, elongated, cylindrical, furrowed when dry; peristome hypnoid, endostome with 2-3 cilia; operculum conic rostrate; calyptra cucullate, hairy. Spores round, brownish, ±12 µ in diameter.
The aristate leaves help easy distinction. Widespread species
Specimen examined
Budgam:ChararíSharief, Khansahib; Attached to rock; Feb 2014,
PAN 6153.
Distribution: Fiji, Papua New Guinea, Indonesia, Philippines, Australia and Malaysia.
*Chromosome number:*Not known so far.

KEY TO THE SPECIES OF GENUS *DREPANOCLADUS*
1. Dioecious, leaf tips falacate, laminal cells hyaline, alar cells inflated ……..
……..*Drepanocladus exannulatus* Monoecious, leaf tips stairght,laminal cells yellow, alar cells rectangular …… .....*Drepanocladus aduncus*

Drepanocladusaduncus(Hedwig) Warnstorf, Beih. Bot. Centralbl. 13: 400 (1903). **Plate 45**
*Hypnumaduncum*Hedwig, Sp. Musc. Frond.,295. 1801
Monoecious. Plants robust, growing in dense mats. Stem, creeping, ±5cm long, irregularly branched; Leaves dense, decurrent, ±2mm long and ±0.5 mm broad, concave, falcate, margins dentate; costa strong, covers half of the leaf length; upper leaf cells long, linear, ±31×8µ, smooth; basal cells longer, ±23×15µ; alar cell rectangular ±23×15 µ; perichaetial leaves longer, narrow, erect, 3mm long and 0.7mm wide. Seta long, ±2.5cm long, curved; capsule inclined horizontally, ±2.5mm long and ±1.5 mm wide; peristome double, normal, hypnoid; operculum conical, beaked or apiculat. Spores spherical, brownish, 14 µ in diameter.
Plants were found growing in thick mats on sandy bank of stream and they were also present on ground under the decayed leaves. A cosmopolitan species.
Specimen examined
Budgam: Khansahib; Growing on sandy bank of stream and also found on ground under the decayed leaves; Feb 2014, **PAN 6107a.**
Distribution: India, Europe and N. America.
Chromosome number n=12
Drepanocladus exannulatus (B. S. G.) Warnst., Beih. Bot. Centralbl., 13:405(1903). **Plate 46**

*Hypnumexannulatum*B. S. G. in Bryol. Eur., 6: 110(1854).
Amblystegiumexannulatum (B. S. G.) De Not., Atti. Univ. Geneva, 1: 142(1869).
Harpidiumexannulatum (B. S. G.) C. Jens., Medd. Groenland, 3: 324(1887).
Drepanocladuspurpurascens (Schimp.) Loesk.,Moosfl. Harz.:304(1903).
D. orthophyllus (Mild.) Warnst.,Krypt. Fl. Brandenburg, 2:955(1906).
D. serratus (Mild) Warnst.,*ibid*.,: 1055(1906).
Warnstorfiaexannulata (B.S. G.) Loesk.,Hedwigia, 46:310(1907).
D. fluitans (Hedw.) Warnst. ssp. exannulatus(B.S.G.) Ren. Rev. Bryol., 39:137(1909).

Dioecious. Plants green-brown to dark brown, robust, growing in dense mats. Stem creeping, pinnately branched, robust, branch tip circinate,±3cm long. Leaves closely set, erecto-patent to erect, ±2.2 mm long and ±0.6mm wide, tips erect, falcate, margins crenulate; costa excurrent, upper laminal cells linear; ±57×7µ, basal laminal cells ±40×7µ, rounded-quadrate to rectangular, alar cells inflated, ±40×15µ; auriculate.
Sporophyte not observed.

Specimen examined

Budgam: Khansahib; Attached to rocks; Sep 2014, **PAN 6154.**

Distribution: Kashmir , Himachal Pradesh, Baltistan, Caucasus, Alps, Great Britain, Spitsbergen, Lapland, Siberia, Japan, Alaska, Greenland, Labrador, Canada, Northern united states and Colorado. A cosmopolitan species.

Chromosome number: n= 11, 12

Cratoneuron commutatum(*Hedw.*)Roth.,Hedwigia, 38: 6(1899). **Plate 47**
*Hypnumcommutatum*Hedw., Sp. Musc. : 284(1801).
Hypnumglaucum Lam. &Cand., Fl. Franc. ed. 2: 522 (1805).
*H. vitellinum*Brid.,Bryol. Univ., 2: 769(1827).
Stereodoncommutatum (Hedw.) Mitt., J. Linn.Soc. Bot., 8: 43(1864).
Amblystegiumcommutatum (Hedw.) De Not., Cronanc. Briol. Ital., 2: 25(1867).
*A. glaucum*Lindb.,Musci Scand.: 32(1879).
*Harpidiumglaucum*C.Jens Med. Groenland, 3 :322(1887).
*Cratoneuronglaucum*Broth.,LaubmFennosk. :466(1923).
*Hypnumfalactum*Brid.,Musc. Rec., 2(3): 63(1801).
Amblystegiumfalcatum(Brid.) De Not., Atti Univ. Genova, 1: 148(1869).
Cratoneuronfalcatum (Brid.) Roth.,Hedwigia, 38: 6(1899).

Dioecious. Plants calcicolous, greenish brown to orange-brown, pinnately branched, growning in mats. Stem erect, brown, branched, ±3cm long. Leaves dense, erectopatent, lanceolate, tip falcate, decurrent, stem leaves ±2.5mm long and ±1mm wide, branch leaves ±2mm long and ±0.6mm wide, margins smooth, entire; costa strong; laminal cells linear rhomboid ±40×8µ, alar distinct, pellucid, rectangular, ±40×12µ, perichaetial leaves narrow, linear, ±3mm long and ±0.8 mm wide. Seta erect, ±4cm long; capsule horizontal, ±4mm long and ±2mm wide, arcuate; peristome normal, cilia short, in groups of three; operculum short conical. Spores calcicolous, papillose, slightly yellow, ±18 µ in diameter.

Specimen examined

Budgam: Budgam; Attached to rocks along streams and springs; Sep 2014, **PAN 6106a.**

Distribution:W. Asia, S.E Asia, N. Africa, Europe, N. America and Greenland. North hemisphere species.

Chromosome number: n=10

KEY TO THE SPECIES OF GENUS *HAPLOCLADIUM*

1. Leaves narrowly ovate-lanceolate, leaf margin dentate…… …… …… …… …… ……
   ……..*Haplocladium microphyllum*
   Leaves broadly ovate-lanceolate, *leaf margin faintly crenulate broader with acute tips*……
   ……..*Haplocladium schimperi*

Haplocladium microphyllum (Hedw.) Broth., Nat. Pfl. 1(3): 1007(1907). **Plate 48**
*Hypnummicrophyllum*Hedw., Sp. Musc.: 269(1801).
Haplocladium gracile Bruch &Shimp., Lond. J. Bot., 2:668(1843).
Thuidiumgracile B. S. G., Bryol. Eur., 5:161(1852).
*Pseudoleskealatifolia*Lac., Ann. Mus. Bot. Lugd. Bot., 2: 297(1866).
*Hypnumsubgracile*Hamp., Vic Medd. Naturh. For. Kjoebnh. ser. 3, 2:284(1870).

*H. stellatifolium*Hamp.,*ibid.* ser. 3, 6: 175(1875).
*Thuidiumpallens*Lindb. *ex*Schimp., Syn. ed. 2: 611(1876).
*Pseudoleskeaparaguensis*Besch., Mem. Soc. Sc. Nat. Cherbourg, 21: 267(1877).
Hypnumlaterculi C. Muell., Linn., 42: 457(1879).
H. cataractarum C. Muell., *ibid.*: 459(1879).
H. austroserpens C. Muell., *ibid.*: 459(1879).
H. amblyostomum C. Muell., *ibid.*, 43: 483(1882).
*Pseudoleskeacryptocolea*Besch., Bull. Soc. Bot. France, 34: 97(1887).
*Thuidiumcataractarum*Kindb.,Enum. Bryin. Exot.: 104(1891).
*T. caldense*Broth.,Bih. K. Svensk. Vet. Ak. Handl. 2I Afd., 3(3): 67(1895).
*T. longicupis*Broth.,*ibid*., 3(3):66(1895).
T. semilunare C. Muell., Hedw. , 36:141(1897).
T. torskii C. Muell., *ibid.*,: 144(1897).
Pseudoleskealaplatae C. Muell., *ibid.,*:138(1897).
P. uruguensis C. Muell., *ibid*.,: 138(1897).
Haplocladiumpseudogracile C. Muell., *ibid*.,: 139(1897).
*H.occultissimum*C.Muell., Nuov. Giorn. Bot. Ital. n. ser., 5:208(1898).
Thuidiummicrocalycinum Par., Index Bryol.: 1285(1898).
Haplocladiumflavinerve C. Muell., Hedw., 40:82(1901).
H. amblyostomum (C. Muell.) Broth., Nat. Pfl., 1(3): 1007 (1907).
H. austroserpens (C.Muell.) Broth.,*ibid.*: 1007(1907).
H. caldense (Broth.) Broth.,*ibid*.,:1007(1907).
*H. cataractarum*Broth.,*ibid*.,:1007(1907).
H. laplatae(C.Muell.) Broth.,*ibid.* :1007(1907).
H. laterculi (C.Muell.) Broth.,*ibid.:* 1007(1907).
H. latifolium (Lac.) Broth. *ibid.:* 1008(1907).
H. longicuspis (Broth.) Broth.,*ibid.:* 1007(1907).
H. molliculum (Broth.) Broth.,*ibid.:* 1007(1907).
H.semilunare(C.Muell.) Broth.,*ibid.:* 1007(1907).
H. stellatifolium (Hamp.) Broth *ibid.,:* 1007(1907).
H. subgracile (Hamp.) Broth.,*ibid.:* 1007(1907).
*H. torskii (*C. Muell.) Broth.,*ibid.:* 1007(1907).
H. uruguense (C.Muell.) Broth.,*ibid.:* 1007(1907).
H. eberhardtii Par. &Broth., Rev. Bryol., 36:90(1909).
H. paraguense(Besch.) Broth., Nat. Pfl., ed. 2, 11:320(1925).
*H. bavianum*C.Muell. Reim. Hedw., 76: 237(1937) nom. inval. insynon.

Dioecious. Plants robust, yellow-green, darker-brown below, growning in mats, pinnately branched, numerousparaphyllia on main branch. Main stem creeping, green to yellow, ± 5cm long. Leaves erect when dry, spreading when moist, ±0.6mm long and ±0.2mm wide, concave, ovate, ending in long apiculus, margins flat or irregularly recurved, dentate; costa strong, excurrent, filling long apiculus; laminal cells papillose, upper laminal cells linear, ±12×6µ, median laminal cells sub-quadrate, ±15×7µ, basal laminal cells sub-rhombic, ±15×6µ, alar cells quadrate, ±16 µ; costa strong, percurrent;perichaetial leaves pale, erect, longer, ±0.9mm long and ±0.4mm wide. Seta ±1cm long. Capsule oblong, ±2.6mm long and ±0.7 mm wide, erect; peristome perfect, exostome teeth lanceolate; operculum conic, short, rostrate. Spores spherical, fine papillose, ±12 µ in diameter.

Specimen examined

Budgam: Budgam,Khansahib; Growing on wet wood logs; Oct 2012, **PAN 6108a.**

Distribution: India, Nepal, Bhutan, China, Tonkin, Korea, Japan, Taiwan, Siberia, Cuba, Europe, Mexico, Canada and South America.

Chromosome number: n = 11 (10 + m)

Haplocladium schimperi Ther., Ann. Crypt. Exot., 3: 75 (1930). **Plate 49**

*Hypnumjacquemontii*Cambess.,Jacquemont in Jacquemont: Voyage Ind. Bot. 1828-32, 4: 51(1844).
*Haplocladium himalayanum*Bartr., Bull. Torr. Bot. C., 82:27(1955).
Thuidiuminveste (Mitt.) Jaeg.,Ber. S. Gall. Naturw. Ges. 1876-77: 252(1878).
*Hynum investe*Mitt., Kew J. Bot., 8: 355(1856).
Leskea investis (Mitt.) Mitt.,Musc. Ind. Or., : 135 (1859).

Autoecious. Plants delicate, green-brown, robust, growing in mats, numerous paraphyllia on main branch. Main stem creeping, bipinnately branched. Leaves erect when dry, spreading when moist, ±1mm long and ±0.5 mm wide, ovate, concave, acute, margins crenulated; costa single, covers two-third of leaf length; laminal cells rhomboid-hexagonal, ±8×6µ, papilose, basal laminal cells rectangular, ±15×7µ, border cells pellucid, rhomboidal, ±15×6µ; perichaetial leaves ±1.5mm long and ± 0.5mm wide, plicate. Seta erect, ±1.5cm long. Capsule horizontal, ±1.3mm long and ±0.7mm wide, curved, ovate-cylindrical; peristome normal hypnoid. Spores spherical, fine papillose, ±12 µ in diameter.

Previously this species was known only from Assam. The present finding is new for the area and extends its range of distribution.

Specimen examined

Budgam: Budgam,Khansahib;Growing on wet wood logs; Oct 2012, **PAN 6155.**

Distribution: India (North and Western Himalaya and Assam).

Chromosome number: Not known so far.

Lindbergia duthiei (Broth.) Broth., Nat. Pflanzenfam. I(3): 993. (1907). **Plate 50**

Autoecious. Plants dark green to brownish green, medium-sized, growing in mats. Main stem creeping, branching irregularly, ± 4cm long. Leaves spreading when moist, imbricate when dry, acuminate, ovate-lanceolate, ±1.3mm long and ±0.1mm wide, concave, decurrent, margins plane, dentate; costa ending much below apex, covers one-third of leaf length; upper laminal cells ±14×24.2µ, rounded oval to rhomboid-hexagonal, unipapillose, middle laminal cells ±18.5×10µ, basal laminal cells longer, ±54×8.5µ, marginal laminal cells rectangular ±17×4.2 µ; perichaetial bracts large, lanceolate, with a shorter costa, ±1.5mm long and ±0.3mm wide. Seta 2cm long. Capsule erect, ±3mm long and ± 0.7 mm broad, symmetrical, oblong-ovoid; exostome teeth short, blunt; operculum conical; calyptra cucullate, smooth.

Specimen examined

Budgam: ChararíSharief; Growing on wet sandy soil covered as grass; Mar 2014, **PAN 6156.**

Distribution: India (Kashmir), Russia.

Chromosome number: n = 12 (10 + 2 m)

KEY TO THE SPECIES OF GENUS *THUIDIUM*

1. Paraphyllia simple……2 Paraphyllia branched……*3*
2. Nerve back smooth……*Thuidium glaucinum* Nerve back spinose throughout……*Thuidium orientale*
3. *Seta shorter (upto 1.2cm)……Thuidium meyenianum Seta longer (upto 1.5cm)……Thuidium investe*

Thuidium glaucinum (Mitt.) Bosch & Sande Lac.,Bryol.Jav., 2: 117 (1876). **Plate 51**

*Laskeaglaucina*Mitt.,Musc. Ind. Or.: 133(1859).

*Thuidiumcochlearifolium*Reim. &Sak., Bot. Jahrb., 64: 549(1931).

*T. laticuspis*Sak., Bot. Mag. Tok., 60: 87(1947).

Dioecious. Plants yellow-brown, robust, growing densely. Stem bipinnately branched, primary stem creeping, ±15cm long, paraphyillia present all over the stem. Leaves erect, ±1.6mm long and ±0.5 mm wide, lanceolate, filiform, papillose, concave, ovate, shortly acuminate; branch leaves dense, smaller than stem leaves ±0.6mm long and 0.3mm wide, erectopatent, imbricate when dry, concave, ovate lanceolate, apex acute, margins crenulated; costa ending below tip, bifurcate at tip, ending below the leaf; laminal cells quadrate-rhomboid, 10µ, papillose, upper leaf cells elongated, ±12×8µ; perichaetial bracts differentiated, ±2mm long and ±0.9 mm wide, perichaetial leaves longer. Seta very long, about ±1.5cm, erect, arcuate, smooth. Capsule ovate, ±2.9 mm long and ±1mm wide, cylindrical, horizontal; peristome normal; operculum conic rostrate. Spores papilose, yellow, ±12 µ in diameter.

Specimen examined

Budgam: Budgam; Growing on sandy bank of stream on wet soil; Sep 2014, **PAN 6157**.

Distribution: India (Eastern and Western Himalaya), Southeast Asia and East Asia.

Chromosome number: n= 10,11

Thuidium investe (Mitt.) Jaeg.,Ber. S. Gall. Naturw. Ges. 1876-77: 252(1878). **Plate 52**

Autoecious. Plants delicate, green-brown, growning in dense mats. Primary stem creeping, bipinnately branched, ±1.2 cm long. Leaves ±0.2mm long and ±0.05mm wide, erectopatent, ovate, concave, acute at tip,

margins crenulated, flat; costa single, covers two-third of leaf length; laminal cells rhomboid-hexagonal, ±8µ, papillose; perichaetial leaves long, plicate, ±1 mm long and ±0.3mm wide. Seta erect ±2cm long. Capsule horizontal, ±1.2mm long and ±0.5 mm wide, ovate-cylindrical; endostome and exostome of same height, hypnoid; peristome normal. Spores yellow, papilose,±12 µ in diameter.

Specimen examined

Budgam: Budgam; Growing on sandy bank of stream and wet sandy soil; Sep 2014, **PAN 6160.**

Distribution: India (Budgam and Assam) Burma, Thailand, New Guinea and Philippines.

Chromosome number: Not known so far.

Thuidium meyenianum (Hamp.) Doz. &Molk., Bryol. Jav., 2;121(1865). **Plate 53**

*Hypnummeyenianum*Hamp., Icon. Musc. :8(1844).

Hypnumkuripanum Doz. &Molk. Zoll. Syst. Verz.: 29(1855).

*Leskeatrachypoda*Mitt.,Musc. Ind.Or., 133(1859).

*Hypnumfaulense*Reichdt.,Verh. Zool. Bot. Ges. Wien, 18: 196(1868).

Thuidiumfaulense (Reichdt.) Reichdt., Reis. Oeste. Freg. Novara Not., 1(3): 187(1870).

*T. pelekioides*Broth., Bot. Jahrb., 17: 479(1893).

Autoecious. Plants delicate, wiry, yellow-green. Stem bipinnately branched, primary stem creeping, ±11cm long, paraphyillia present all over the stem, paraphyllia numerous, simple and filamentous. Leaves erect-spreading when moist, curled when dry, ±0.7mm long and ± 0.3mm wide, concave, ovate, plicate, apex acuminate, margins crenulated, flat; costa single, decurrent, ends below apex; laminal cells small, hexagonal ±6µ wide, papillose ; pericheatial leaves narrow, ±2mm long. Seta erect, arcuate, ±1.2cm long. Capsule horizontal, ±1.3mm long and ±0.6mm wide, ovate-cylindrical, exostome teeth lanceolate, bordered, endostome keeled, yellow, longer than exostome; peristome normal hypnoid;calyptra cucullate, smooth. Spores papilose, yellow, ±12 µ in diameter.

Specimen examined:

Budgam: Budgam; Growing on sandy bank of stream on decayed wood and wet soil; Sep 2014, **PAN 6159.**

Distribution: India (Budgam,Dehradun, Coorg, Palni, Karwar) Ceylon, Burms Annam, Sumatra, Java, Banka, New Guinea, Philippines, Japan, Australia and Samoa.

Chromosome number: Not known so far.

Thuidium orientale Mitt. *ex* Dixon, J. Bot., 51: 329(1913). **Plate 54**

Dioecious. Plants yellow-brown, robust, growing in tufts. Stem bipinnately branched, primary stem creeping, ±15cm long, paraphyillia present all over the stem, paraphyllia numerous, branched and filamentous. Stem leaves erect-spreading when moist, curled when dry, ovate, branch leaves dense, erectopatent, imbricate when dry, concave, ovate-lanceolate, apex acute, margin crenulate; costa strong, ending below apex; laminal cells small, quadrate-hexagonal, ±10×8µ, basal cells papillose.

Sporophyte not observed.

In India, this species is previously known from Mussoorie. The present find is a new for the area, which extends its range of distribution.

Specimen examined

Budgam: Budgam; Growing on sandy bank of stream, wood logs and wet soil; Sep 2014, PAN 6158.

Distribution: India (Kashmir, Mussoorie) Penang Indo-Malay.

Chromosome number: Not known

KEY TO THE SPECIES OF GENUS *BRACHYTHECIUM*

1. Leaf ovate triangular……..*Brachythecium buchananii* Leaf ovate-lanceolate……2
2. Dioecious…… ……3
   Autoecious……4
3. Plants ±10cm long, Seta erect, ±1cm long……*Brachytheciumkamounense* Plants 4 cm long, Seta erect, ±2cm long……*Brachytheciumrivulare*
4. Leaf non- plicate, basal laminal cells rhomboid……*Brachytheciumplumosum* Leaf, plicate, basal laminal cells hexagonal……*Brachytheciumrutabulum*

Brachythecium buchananii (Hook.)Jaeg.,Ber. S. Gall. Naturw. Gess. 1876-77: 341(1878). **Plate 55**

Hypnumbuchananii Hook. W. D. Trans. Linn. Soc., 9:320(1808).

*Brachytheciumpilicuspis*C.Muell. Par.: Index Bryol. Suppl.97(1900).

Dioecious. Plants robust, glossy, yellow-green to brown, growning in dense mats. Main stem creeping, pinnately branched, ±10cm long. Leaves imbricate when dry, erectopatent when moist, ±1.8mm long and

±0.5mm wide, terete, concave, plicate, triangular-ovate, acute to acuminate, decurrent, margins dentate in upper half of leaf; costa strong, covers one third of leaf; leaf cells linear rhomboid, ±79×9µ, alar cells rectangular ±46×12µ; sporophytes lateral on main branch; perichaetial leaves erect-spreading, ±2mm long and ±0.7mm wide. Seta erect, 2.5 cm long, rough; capsule ±2.6mm long and ±1mm broad, inclined to horizontal, arcuate, ovate-cylindrical; peristome normal hypnoid; operculum conic. Spores yellow, slightly papilose, ±12 µ in diameter.

Specimen examined
Budgam: ChahariSharief,Chadoora; Growing on wet soil; Sep 2014,**PAN 6162.**
Distrbution: India (Jammu and Kashmir, Garhwal) Afghanistan, Tibet, Central Asia, Amur, Japan, Taiwan, Caucasus, Europe, Madeira, South Africa, Greenland, Nortern Canada and Australia.A cosmopolitan species
Chromosome number: n=9+1m, 10, 10+1m, 11, 20+2m

This species exists in five cytological races. Interestingly, these races show no morphological distinction between them. It is evident that polyploidy is not accompanied with quantative changes or else the polyploidy arose long back and morphological characters have reverted to the parental morphotype.
Brachythecium kamounense(Harv.) Jaeg.,Ber. S. Naturw. Ges., 1876-77:342(1878).

Plate 56

Dioecious. Plants robust, glossy, yellow-green, growing in dense mats. Stem erect, pinnately branched, ±10cm long. Leaves imbricate when dry, erectopatent when moist, ±3mm long and 1mm wide, ovate-lanceolate, base decurrent, dense, imbricate, concave, plicate, apex acuminate, margins denticulate on top; costa covers half of leaf; upper laminal cells linear-rhomboid, ±69×8µ; basal leaf cells rectangular, shorter and wider, ±50×12µ, alar cells rectangular, ±46×20µ; perichaetial leaves erect, longer than vegetative leaves, ±3.7mm long and 1mm wide. Seta erect, ±1cm long, smooth; capsules horizontal, ±2mm long and ±1mm wide, arcuate, ovate-oblong; peristome normal; operculum conical. Spores slightly yellow, papilose, ±14 µ in diameter.

Specimen examined
Budgam: Budgam,ChahariSharief,Khansahib, Beerwah; Growing on wet soil. They were also present in dense alpine fores, among tall coniferous trees; Oct 2012, **PAN 6103a.**
Distribution: India (Kashmir, Kumaon, Garhwal, Chamba) Northern Hemisphere, Nepal and Kumaon.
Chromosome number:n=11
Brachythecium plumosum (Hedw.) B.S.G., Bryol. Eur., 6: 8(1853). **Plate 57**
*Hypnumplumosum*Hedw., Sp. Musc. : 257(1801).
*Hypnumflagellare*Hedw., Sp. Musc.: 282(1801).
H. pseudo-plumosum Brid., Musc. Rec., 2 (2): 108(1801).
H.saxatile Brid., *ibid*. : 153(1801).
*H. chrysostomum*Michx., Fl. Am. Bor.: 319(1803).
*H. alpinum*Turn., Musc. Hib.: 192(1804).,
*H. laevisetum*Crom., Mag. Ges. Nat. Fr. Berlin, 5(1): 78(1811).
H. asperulum Brid., Sp. Musc., 2: 169(1812).
*H. polyrhizon*Brid.,*ibid*: 176(1812).

Autoecious. Plants robust, glossy, yellow-green, brown below. Main stem creeping, pinnately branched, ±7cm long. Leaves dense, imbricate when dry, erectopatent when moist, ±1.5 mm long and ±0.5mm wide, concave, ovate-lanceolate, margins entire; costa strong, covers about two-third of leaf length, perichaetical leaves erect, squarrose; upper laminal cells rhomboid, ±46×8µ, basal laminal cells rhomboid, ±44×15µ, alar cells shorter, ±31×15µ. Seta erect, ±1.5cm long. Capsule ±1.3mm long and ±0.7 mm broad, arcuate; operculum conical; calyptra cucullate. Spores slightly yellow, papilose, ±14 µ in diameter.
Specimen examined
Budgam: Budgam,ChahariSharief, Chadoora, Beerwah; Growing on wet soil, water seeping from a hill; Oct 2012, **PAN 6104a.**
Distribution: India (Western Himalaya, Mussoorie and Mukteshwar), Japan, China, Russia, N. America, Europe, Australia . A cosmopolitan species.
Chromosome number: n=15
Brachythecium rivulare B.S. G., Bryol. Eur., 6: 17(1853). **Plate 58**
*Hypnumchryostomum*Michx., Fl. Am. Bor.: 319(1803).

Bracytheciumrutabulum(Hedw.) B.S.G. var. *rivulare*(B.S.G.) Lang., Bot. Tidskr., 3: (1869).
*Hypnumamoenum*Stirt., Ann. Scott. Nat., 9(35): 180(1900).
*Calliergonkawaguchii*Okam., J. Coll. Sc. Imp. Univ. Tok., 36(7): 29(1915).
Brachytheciumlaticuspis Broth. *ex* Dix., Rev. Bryol. n. ser., 4: 159(1932).
Bryhniakawaguchii(Okam.) Sak., Bot. Mag. Tok., 50: 623(1936).

Dioecious. Plants robust, glossy, yellow-green to golden brown. Main stem erect, 4 cm long, branched pinnately. Leaves erect when moist, erectopatent and rolled when dry, ±2.5mm long and ±1mm wide, terete, concave, plicate, ovate-lanceolate, apex acute, decurrent, margins dentate; costa strong covering three-fourth of leaf length; laminal cells linear rhomboid, ±77×8µ, alar cells rectangular, ±70×20µ; perichaetial leaves erect, ±2.8mm long and ±1.5 mm wide. Seta erect, ±2cm long; capsule inclined to horizontal, ±2mm long, ±1mm broad, arcuate; peristome hynoid; operculum conic. Spores yellow, finely papilose, ±12 µ in diameter.

Specimen examined

Budgam: Khansahib,Beerwah; Growing on wet soil; Sep 2014, **PAN 6161.**

Distribution: India (Kashmir, Jammu, Chamba, Garhwal) Afghanistan, Tibet, Central Asia, Amur, Japan, Taiwan, Caucasus, Europe, Madeira, South Africa, Greenland, Northern Canada and Australia. A cosmopolitan species.

Chromosome number: n=6

Brachythecium rutabulum (Hedw.) B.S.G., Bryol. Eur., 6: 15(1853). **Plate 59**
Hypnumrutabulum L. *ex*Hedw., Sp. Musc. :276(1801).
*Hypnumcrenulatum*Sm., Fl. Brit., 3: 1289(1804).
Brachytheciumleucoglaucum C. Muell&Kindb., Mocoun: Cat. Canad. Pl., 6: 198(1892).
*B. mirabundum*C Muell. &Kindb., *ibid.* : 199(1892).
*B. scabrum*Besch., Par. : Index Bryol. : 144(1894).
*Hypnumscabrum*Mitt*., ibid*.: 144(1894).*Brachytheciumnivescens*Broth.,Par. : Index Bryol. Suppl. 46(1900).

Autoecious. Plants robust, glossy, yellowish-green, growing in close tufts. Main stems creeping, pinnately branched, ± 10cm long. Leaves erectopatent when wet, appressed to stem when dry, ±2.4mm long and ±0.6mm wide, erect to concave, plicate, ovate-lanceolate, margin denticulate near to the base; costa covers half-two third of leaf length; upper laminal cells linear-rhomboidal, ±77×8µ; basal laminal cells hexagonal ±27×5.4µ, alar cells larger ±58×11µ,; perichaetial leaves oblong, nerveless, ±3mm long and ±0.5mm wide. Seta erect, ±2cm long. Capsule oblong, arcuate, ±2mm long and ±0.9mm wide; operculum short conic, peristome teeth hypnoid. Spores yellow, finely papilose, ±14 µ in diameter.

Specimen examined

Budgam: Budgam,CharariSharief; Growing on wet soil; Oct 2012, **PAN 6105a.**

Distribution: India (Northern India, Peninsular India), Nepal, Bhutan, Sri Lanka, China, Japan, New Zealand, Papua New Guinea, Australia and America.
A cosmopolitan species.

Chromosome number: n=5,10, 11

KEY TO THE SPECIES OF GENUS *RHYNCHOSTEGIUM*

1. Leaves acute……..*Rhynchostegium celebicum* Leaves ovate-lanceolate……2
2. Leaf margins almost smooth only with few teeth, basal laminal cells 30×11.4µ ……..*……Rhynchostegium planiusculum* Leaf margins dentate above base, basal laminal cells ±75×12µ…… ……*Rhynchostegium herbaceum*

Rhynchostegiumcelebicum (Lac.) Jaeg.,Ber. S. Gall. Naturw. Ges., 1876-77: 374 (1878). **Plate 60**

Hypnumcelebicum Lac. Bryol. Jav., 2:159(1866).

Monoecious. Plants semi robust, yellow-green to brownish, more or less glossy, growing densely. Main stem creeping, ±6cm long, pinnately branched, terete. Leaves erectopatent when moist, appressed to stem when dry, ±2mm long, ±1.2mm wide, acute, decurrent at base, margins denticulate; costa two-third of leaf; laminal cells narrow rhomboid, ±77×12µ, marginal laminal cells rectangular to quadrate, ±60×19µ; perichaetial leaves narrow, erect or with spreading tip, ±2.3mm long, ±1mm wide. Seta erect, ±1.8cm long smooth. Capsule horizontal, ±1.6mm long and ±1mm wide, arcuate; peristome normal; operculum normal.

Specimen examined:

Budgam Budgam; Growing on wet soil; Mar 2014, **PAN 6165.**
Distribution: Papua, New Guinea, India, China, Thailand, Tonkin, Sumatra, Java, Celebes and Philippines.
An Indo-malesian species.
Chromosome number: Not known so far.
Rhynchostegiumherbaceum (Mitt.) Jaeger.,Ber. S. Gall. Naturw.Ges., 1876-77: 368 (1878). **Plate 61**
*Hypnumherbaceum*Mitt.,Musci Ind. Or.: 81(1859).
Monoecious. Plants robust, yellow green, growing in close tufts. Main stem creeping, wiry, 6cm long, branches terete. Leaves erectopatent-spreading when moist, imbricate when dry, ±2.5mm long and ±1.3 mm wide, ovate, apex acute, concave, slightly decurrent, margins dentate to above base; costa covers two-third of leaf length; upper laminal cells thick walled, rhomboid, ±46× 11.4µ, basal laminal cells rectangular, ±70×11.4µ, extreme basal cells shorter, rectangular, ±30×18µ, alar cells rectangular, ±75×12µ . Perichaetial leaves narrow, erect, ±2.8mm long and ±0.8 mm wide. Seta erect, ±1.8cm long, smooth. Capsule ±2.5 mm long and ±1mm wide, horizontal, arcuate; peristome normal; operculum rostrate. Spores not observed.
Specimen examined
Budgam: Budgam; Growing on very wet soil under the decayed leaves; Mar 2014, **PAN 6163**.
Distribution: India (Budgam, Sikkim, Darjeeling, Arunachal Pradesh, Khasia hills, Naga hills, Mussoorie, Dehradun, Guptakashi, Binsar) and Sri Lanka. Indo- Sri Lanka species.
Chromosome number:n=10,11
Rhynchostegium planiusculum (Mitt.)Jaeg.,Ber. S. Gall. Naturw. Ges., 1876-77: 364(1878). **Plate 62**
Hypnumplaniusculum Mitt. Musci Ind. Or.: 81(1859).
Monoecious. Plants semi-robust, yellow-green, growing in close tufts or mats. Main stem creeping, ±5cm long, irregularly pinnate, terete. Leaves erectopatent when moist, erect to imbricate when dry, ±1.8mm long, ±1mm wide, concave, plicate, ovate-lanceolate, decurrent, apex acute, margins almost smooth only with few teeth; costa covers about two- third of leaf length; upper laminal cells rhomboid, ±40×8µ, basal laminal cells rhomboid, ±30×11.4µ; alar cells not distinct; Perichaetial leaves narrower, erect, enervate, ±2mm long, ±0.7 mm wide . Seta ±1.4cm long, erect, smooth. Capsule ±1.8mm long, 1mm wide, horizontal, arcuate, ovoid; peristome normal; operculum conic rostrate. Spores not observed.

Specimen examined
Budgam: Budgam; Growing on wet soil under the decayed leaves;Mar 2014, **PAN 6164.**
Distribution: India (Mussoorie, Chakrata, Budgam)
An endemic Himalayan species.
Chromosome number:n=10
Rhynchostegiella scabriseta (Schwaegr.) Broth., Nat. Pfl.1(3): 1161 (1909).**Plate 63**
Hypnum scabrisetum Schwaegr., Sp. Musc., Suppl. 3(2): 281b(1830).
Monoecious. Plants yellow-green to brown, glossy, slender, growning in mats, pinnately branched. Main stem prostrate, irregularly or pinnately branched, 6 cm long. Leaves erect to erectopatent when moist, shrunken when dry, ±1.6 mm long and ±0.6mm wide, squarrose, oval to lanceolate, base wide, decurrent, apex narrow acuminate, margins dentate; costa covers about two-third of leaf length; apical leaf cells narrow-rhomboid, ±45×8µ, alar cells rectangular, ±35×11µ. Perichaetial leaves erect, oblong-lanceolate, ±2.2 mm long and ±0.6mm wide, tips long. Seta erect, ±2cm long. Capsules horizontal, ±2.5mm long and ±0.5mm broad, ovate- cylindrical; peristome normal; operculum conical, long rostrate.

Specimen examined
Budgam: Budgam; Growing on wet soil; Mar 2014, **PAN 6166.**
Distribution: India, Nepal, Sikkim and Himalaya. Endemic in Himalayan regions.
Chromosome number:n=11, 12
KEY TO THE SPECIES OF GENUS *EURHYNCHIUM*
1. Dioecious. ……..*Eurhynchium swartzii*
   Autoecious……2
2. Leaves ovate-lanceolate, non-plicate, upper laminal cells ±46×9µ……
   ……*Eurhynchium riparioides* Leaves ovate, plicate, upper laminal cells 100×8µ……*Eurhynchium mulleri*

Eurhynchiummulleri(Jaeg.) Bartr., Bishop Mus. Bull., 101: 214 (1933). **Plate 64**
Rhynchostegiummuelleri. Jaeg. , Ber. S. Gall. Naturw. Ges., 1876-77: 378(1878).

*Hypnummuelleri*Lac.,Bryol . Jav., 2: 162(1867).
Oxyrrhynchiummuelleri (Jaeg.) Broth. Nat. Pfl., 1(3): 1155(1909).
Platyhypnummuelleri (Jaeg.) Loesk., Hedwigia, 50: 243(1911).
Platyhypnidiummuelleri (Jaeg.) Fleisch.,Musci Fl. Buitenz., 4: 1537(1923).

Autoecious. Plants robust, glossy, yellow-green, growing in tall tufts. Main stem erect, pinnately branched, 7cm long. Leaves dense, erectopatent to spreading when moist, erect, imbricate and shrunken when dry, ±2.2 mm long and ±1.6mm wide, ovate, plicate, apex pointed, margins denticulate; costa covering three-fourth of leaf length; upper laminal cells linear rhomboid, ±100×8µ, basal laminal cells rectangular, ±40×11µ. Perichaetial leaves erect to erectopatent, ±3 mm long and ±2 mm wide. Seta erect, ±1.8cm long. Capsule ±2.5mm long, ±1mm wide, inclined-horizontal; operculum rostrate.

Specimen examined
Budgam: Budgam,Khansahib; Growing on sandy bank of stream and very wet soil often flooded with water; Oct 2013, **PAN 6168.**
Distribution: Budgam, Garhwal, Palni, Sumatra, Java, Philippines and Hawaii. An Indomalesian species.
Chromosome number : Not known so far.
Eurhynchium riparioides (Hedw.) Richs., Ann. Bryol., 9:135(1937). **Plate 65**
*Hypnumriparioides*Hedw., Sp. Musc.:242(1801).
Hypnumruscifolium Neck. *ex* With., Syst.Arr. Brit. Pl. ed. 4, 3: 831(1801).
H.rusciforme B.S.G., Musc. Rec., 2(2): 173(1801).
Rhynchostegiumrusciforme B.S.G., Bryol. Eur., 5: 207(1852).
*Eurhynchiumrusiforme*Mild.,Bryol. Siles. : 312(1869).
*Stereophyllumnordenskioldii*Besch.,Oefv. K. Vet. Ak. Foerh., 57: 294(1900).
*Oxyrrhynchiumrusciforme*Warnst.,Krypt. Fl. Brandenb., 2: 789(1905)
O. ripariodes (Hedw.) Jenn., Man. Moss. W. Pennsylv.: 348(1913).
Rhynchostegiumripariodies (Hedw.) Card., Tourret: Bull. Soc. Bot. France, 60:231(1931).
*Platyhypnidiumrusciforme*Fleisch., Musci Fl. Buitenz., 4: 1537(1923).
P. riparioides(Hedw.) Dix., Rev. Bryol. Lich., 6:111(1934).

Autoecious. Plants green-brown, glossy. Main stem prostrate, ±8cm long, irregularly branched. Leaves erectopatent both dry and wet, ±2mm long and ±1.5 mm wide, dense, broad, ovate-lanceolate, concave, plicate, decurrent at base, apex acute, margins denticulate; costa decurrent, covers two-third to three-fourth of leaf length; upper laminal cells linear, rhomboid, ±46×9µ, incrassate, alar cells rectangular, ±38×19µ. Sporophyte not observed.

Specimen examined
Budgam: Budgam, CharariSharief,Khansahib; Growing on sandy bank of stream often flooded with water; Oct 2013, **PAN 6167**.
Distribution: Afghanistan, Tibet, Central Asia, Yunnan, Szechuan, Manchuria, Siberia, Japan, Sinai, Caucasus, Canary Is., Morocco, Algeria, Central Africa, Europe, Canada, U.S.A, Mexico and Argentina. A cosmopolitan species.
Chromosome number :n=6-8, 10,12, 20
Eurhynchium swartzii(Turn.) Curnow, Rabenh.:Bryoth. Eur., 12: 593(1862).
Plate 66
*Hypnum swartzii*Turn.,Musc. Hib.: 151(1804).
*Hypnum praelongum*Hedw. var. *atrovirens* Brid., Sp. Musc., 2:104(1812).
*H. praelongum*Hedw. var. *swartzii*(Turn.) Hartm.,Handb. Skand. Fl. ed. 3: 305(1838).
H. praelongum var. rigidium Boul., Fl. Crypt. Est. Muscin:230(1872).
Oxyrrhynchium swartzii(Turn.) Warnst., Krypt. Fl. B randenb., 2:784(1905).
*Hypnumanomalum*Stirt., Ann. Scott. Nat. Hist., 15(58):112(1906).
Eurhynchium hians var. *swartzii*(Turn.)Cortes., An . Inst. Bot. Cavanilles, 11(1):228(1953).

Dioecious. Plants delicate, glossy, yellow-green, growing in close tufts. Main stem creeping, ±8cm long, pinnately branched, branches erect. Leaves erectopatent to spreading , ±1mm long and ±0.5mm wide, sub-complanate, concave, acuminate, decurrent, margins denticulate; costa covering two-third to three-fourth of leaf length, laminal cells rhomboid, ±46×8µ, broader at base, extreme basal cells lax rectangular, ±38×12µ; perichaetial leaves squarrose, erect, ±1.8 mm long and ±0.8 mm wide. Seta ±2cm long, sporophytes lateral

on main branch Capsule ±2.6 mm long and ±0.6mm wide, horizontal, ovate, arcuate; peristome regular; operculum rostrate.

Specimen examined

Budgam: Budgam, CharariSharief; Growing on sandy bank of stream and wet soil often flooded with water; Oct 2013, **PAN 6169.**

Distribution: India**,** Srilanka, China, Japan, Siberia, Kurdistan, Caucasus, Europe, Azores, Algeria, Central and South Africa, Canada and U.S.A.

Chromosome number:n=7, 7+2 acc., 10

KEY TO THE SPECIES OF GENUS *HYPNUM*

1. Lamina slightly falcate, costa covers more than half of leaf length, basal laminal cells ±65×20µ, laminal cells yellowish, alar cells linear, ……*Hypnum aduncoides*
   Lamina strongly falcate, costa very short, basal laminal cells ±27×18µ, laminal cells hyaline, alar cells quadrate to sub-quadrate, ……*Hypnum cupressiforme*

Hypnum aduncoides (Brid.) C. Muell., Syn., 2:295(1851). **Plate 67**

*H. cupressiforme*Hedw. var. aduncoides Brid., Sp. Musc., 2:219(1812) .

H. zickendrahtii(thii) Ren. & Card., Bul. Soc. R. Bot. Belg., 41(1): 116(1905).

Stereodon zickendrahtii (Ren. & Card.)Broth., Nat. Pfl., 1(3): 1071(1908).

Dioecious. Plants creeping, robust, light green, glossy, growing densely. Main stem robust, pinnately branched, ±9cm long. Leaves erectopatent when moist, shrunken when dry, ±2.25 mm long and ±0.77 wide, falcate, concave, oblong-lanceolate, apex hooked; costa covers more than half of leaf, single to double; upper laminal cells linear, ±38×5µ, basal laminal cells ±65×5µ, alar on extreme base of leaf linear, ±65×20µ. Perichaetial leaves erect, differentiated, plicate, ±3 mm long and ±1 mm broad. Seta slender, erect, ±2.4cm long. Capsule horizontal, ovate, cylindrical, ±2.3mm long and ±1.1mm wide; peristome hypnoid, teeth 16, trabeculate, cilia 2-3, rarely appendiculate; operculum conic, mamillate; calyptra cucullate, smooth, naked. Spore smooth, yellow, ±15 µm in diameter.

Specimen examined

Budgam: Budgam; Growing on sandy bank of stream and attached to rock or on logs; Oct 2012, **PAN 6170.**

Distribution: India,Burma, China, Madagascar and South Africa.

Chromosome number: Not known so far.

HypnumcupressiformeHedw., Sp. Musc. : 291(1801). **Plate 68**

*H. decipiens*Hoffm. *ex* Bird., Musc.Rec., 2(2):120(1801).

*H. fastigiatum*Wibel : Roemer's Arch. Bot., 3: 283(1805).

*H. homomallum*Bertol., Brid.: Bryol. Univ., 2: 606(1827).

Stereodoncupressiformis (Hedw.) Brid *ex*Mitt.:Musc. Ind. Or.: 96(1859).

*S. complexus*Mitt., J. Linn. Soc. Bot., 8:41(1846).

Hypnumpseudofastigiatum C. Muell. &Kindb.,Macoun: Cat. Canad. Pl., 6: 235(1892).

Cupressinafilaris C. Muell., Nuov. Giorn. Bot. Ital. n. ser. 3: 122(1896).

Hypnumfilare (C.Muell.) Par., Index Bryol. Suppl. 200(1900).

*H. teichophyllum*Stirt., Ann. Scott. Nat. Hist., 16(63):177 (1907).

*H. deflectens*Stirt.,*ibid*., 19: 243(1910).

Dioecious. Plants robust, light green, glossy, procumbent. Stem erect ±9cm long, pinnately branched, paraphyllia few. Leaves ±3mm long and ±0.6 mm broad, imbricate, strongly falcate, concave, ovate,margins smooth, slightly denticulate at apex; costa short, covers one-third of leaf; laminal cells linear, ±60×4µ, basal laminal cells shorter, ±40×4µ, alar cells quadrate to sub-quadrate ±27×18µ; perichaetial leaves erect, differentiated, plicate, ±3.4 mm long and ±1 mm broad. Seta slender, ±2.5cm long, erect; capsule sub-cylindrical, ±2.5mm long, ±0.7 mm wide, peristome hypnoid, teeth 16, trabeculate, cilia 2-3 or rarely appendiculate; operculum conic, mamillate; calyptra cucullate, smooth, naked. Spores smooth, yellow, ±17 µm in diameter.

Specimen examined

Budgam: Khansahib; Growing on sandy bank of stream, attached to rock and also on fallen dead logs; Oct 2012, **PAN6109a.**

Distribution: It is a cosmopolitan species but it is mainly distributed in Laurasia.

Chromosome number:n = 10

Leucodon sciuroide (Hedw.) Schwaegr., Suppl. 1: (1816). **Plate 69**

*Hypnumsciuroide*Hedw. S.P 1956
*Dicrannumsciuroide*SwartsMusci 32 Engl. Bot 1903,
Fissidenssciuroide (Hedw.) S. Musci 161

Dioecious. Plants brownish-green or brown, small to moderate, epiphytic, dark green, sturdy, sympodially branched, secondary branches not much branched, erect or hanging. Stem erect, ±5cm long, straight or curved. Leaves closely appressed and curved when dry, patent when moist, ±3.6mm long and ±0.9mm wide, plicate, lanceolate, acute to acuminate, margin plane, entire, nerveless; cells obliquely arranged, smooth, thick walled, upper laminal cells upto±58× 3.2µ, basal laminal cells narrow, ovate, upto ±8µ in diameter, marginal cells are rounded. Seta reddish brown, 1cm long. Capsules ovoid,± 3.2mm long and ±1.2mm wide, elliposoid, lid rostarte, exostome regular, papilose. Spores spherical, smooth ±25 µm in diameter.

Specimen examined
Budgam: Khansahib,Beerwah; Growing on tree trunk, fallen dead logs and hanging from shady rock; Feb 2014, **PAN 6171.**
Distribution: India, China, Japan, Kazakhstan, Mongolia, Russia and USA.
Chromosome number:n=10;11
Intrestingly, the cytological races are not known to show any morphological differences.
Herpetineurontoccoae (C. Muell.) Card., Beih. Bot. Centralbl. 19(2): 127 (1905). **Plate 70**
*Anomodontoccoae*Sull. &Lesq.,Musci Bor. Am. :52(1856).
*Anomodondevolutus*Mitt.,Musc. Ind. Or. : 127(1859).
*A. wichurae*Broth.,Hedwigia 39: 247(1899).
*A. fuscinervis*C.Muell.,Salm., J. Bot., 39:363(1901).
Herpetineuronwichurae(Broth.) Card., ibid.(1905).
H. attenuatum Okam., J. Coll. Sc. Imp. Univ. Tokyo, 38(4): 54(1916).

Dioecious. Plant medium sized to roboust, dark-green to yellow-green, non-glossy, primary stem creeping forming thick mats. Stem ±5cm long, irregularly branched, branches arcuate-circinate, secondary branches erect. Leaves dense, ±2.25mm long and ±1.75mm wide, erectopatent, imbricate when dry, apex acute, margins flat, serrate to toothed; costa strong, percurrent; median laminal cells ±9×5µ,rounded-quadrate to hexagonal, ray like in lamina, smooth, flattened at base, basal laminal cells rectangular, upto±23×11µ, hyaline. Seta slender, twisted, ±1.5cm long. Capsules ±2mm long and ±0.7mm broad, erect, cylindrical to oblong; peristome double, exostome narrow, lanceolate, papillose, endostome teeth shorter than exostome; operculum conical; calyptra cucullate. Spores yellow, papillose, ±12.5 µm in diameter.
Plants are green to brown in color. They were present on fallen dead logs.

Specimen examined
Budgam: Beerwah; Growing on wood log and extending to on base of tree trunk, wet soil; Oct 2012,
PAN 6172.
Distribution: India (Darjeeling, Sikkim, Manipur, Khasi hills, W. Himalayas - Kasauli, Nainital, Garhwal, Almora, Mussoorie, S. India - W. Ghats, Kodaikanal, Palni hills Orissa, Bihar). Arizona, Australia, Celebes, Central and S. Africa Ceylon, E. china, E. Nepal, Florida, Formosa, Fr. Guinea, Georgia, Guatemala, Hong Kong, Japan, Java, Korea, Louisiana, Manchuria, Mexico, New Caledonia, North Carolina, New Zealand, Philippines, S. California, Sumatra, Taiwan, Tonkin, Ussuri.
Chromosome number:n=11
the acrocarpic mosses (44 species) outnumber the pleurocarpic taxa (26 species).
This finding is compatible with the fact that factors governing distribution of mosses, in general, are the same for the large group, yet there is significant variation also within the group. This variation is caused by the largely epiphytic habit of the members of the pleurocarpic group which are exposed to more challenging conditions of water availability and drying action of winds. These factors adversely influence the survival of the pleurocarps which have adversely influence the survival of the pleurocarps in the under study area. It would be of further interest to note that majority of the pleurocarps found in the area are on wet shaped rocks or the base of tree trunks in association with some acrocarpic mosses along with some other ground vegetation.

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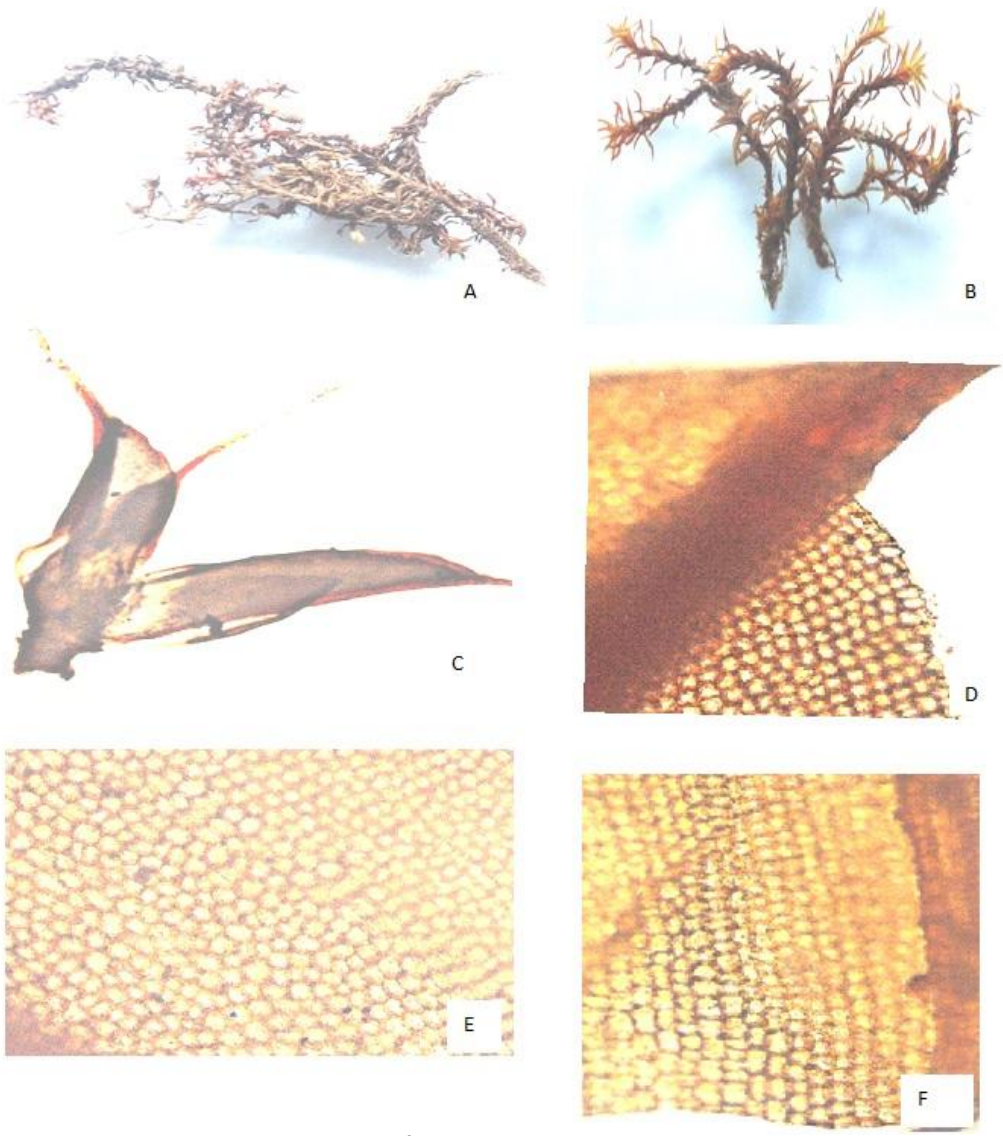
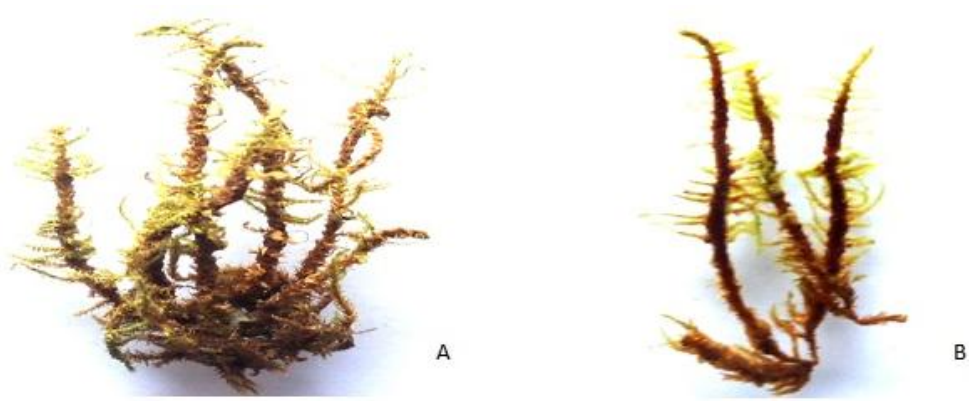


Plate 44:*Racopilumcuspidigerum* (Schwaegr.)Åongstr.Oefv. K. Vet. Ak, Foerh., 29(4): 10 (1872); A. Dry plant (3X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).



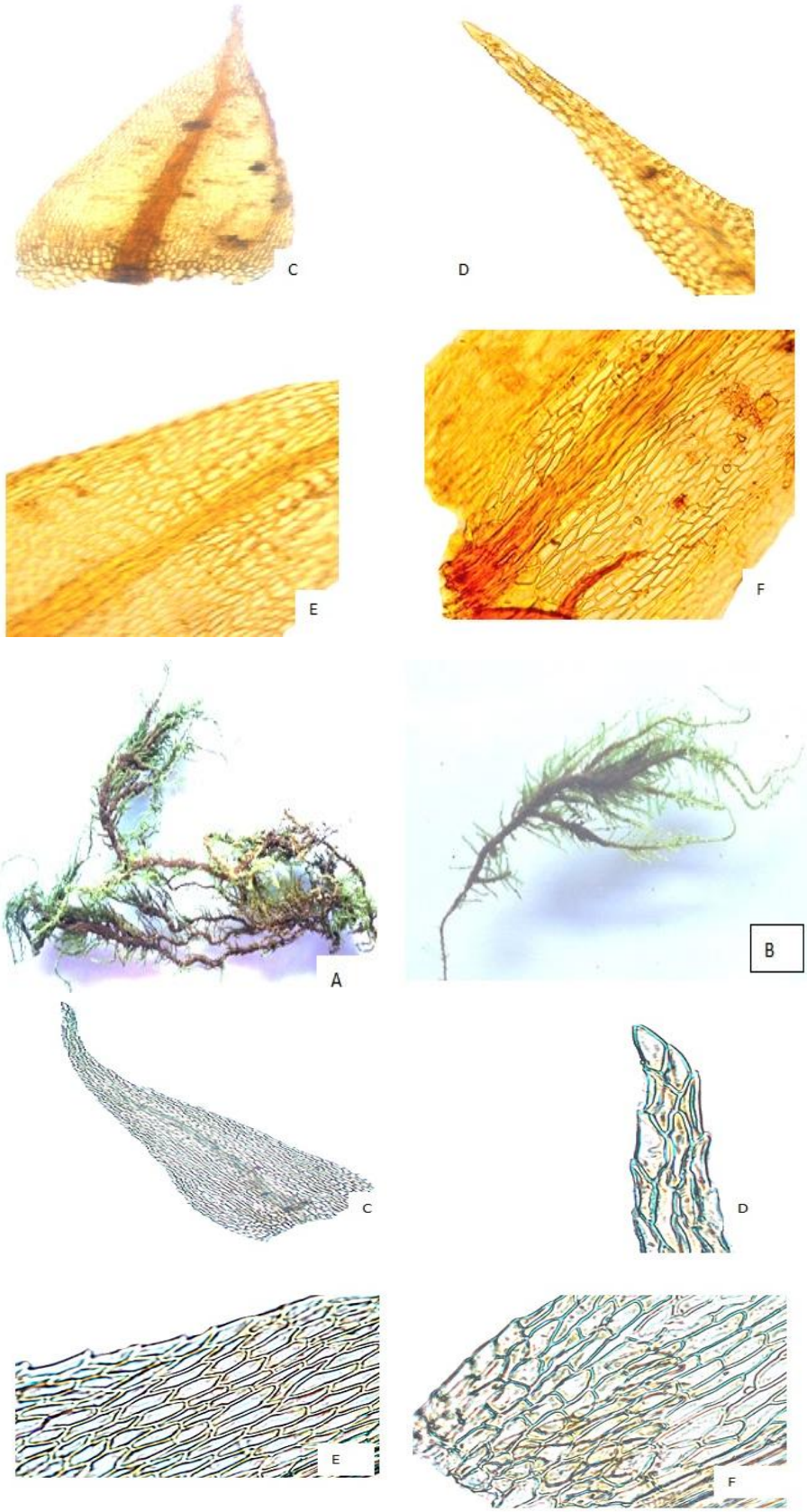


Plate 46:*Drepanocladusexannulatus* (B. S. G.)Warnst., Beih. Bot. Centralbl., 13:405(1903); A. Dry plant (3X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

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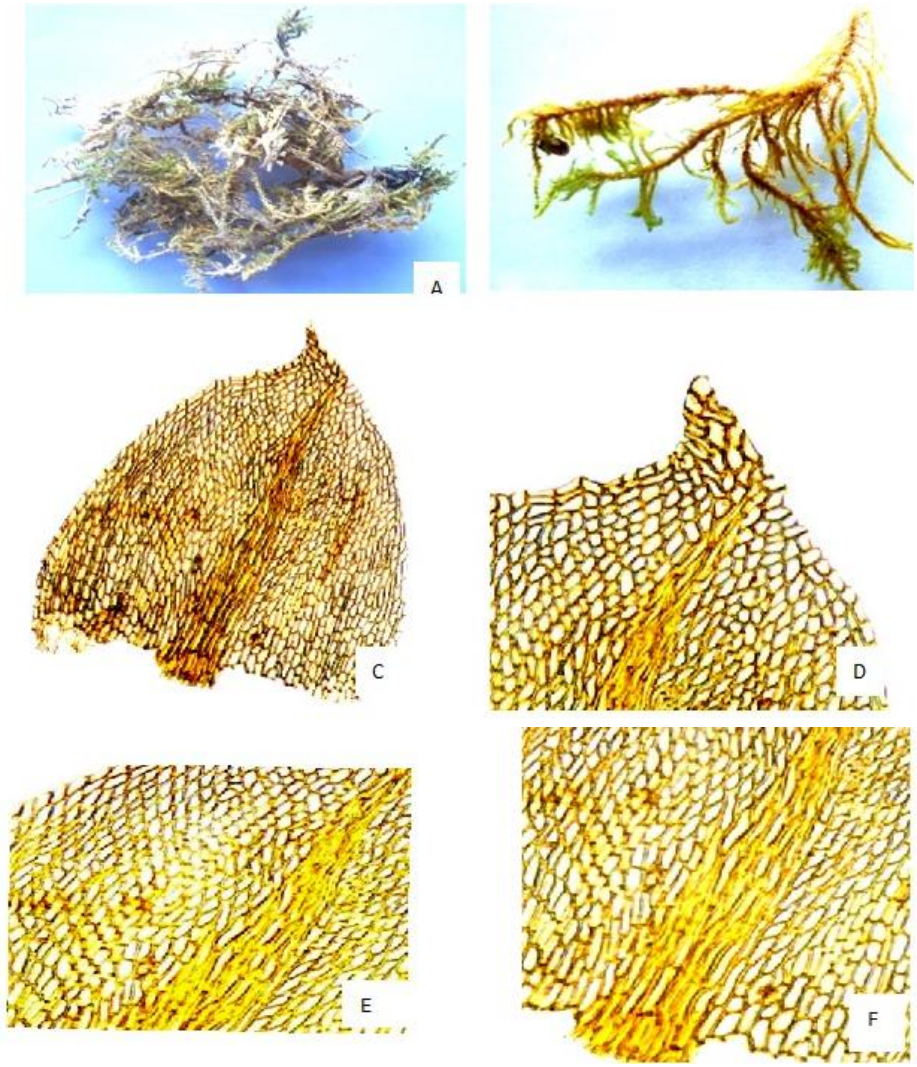
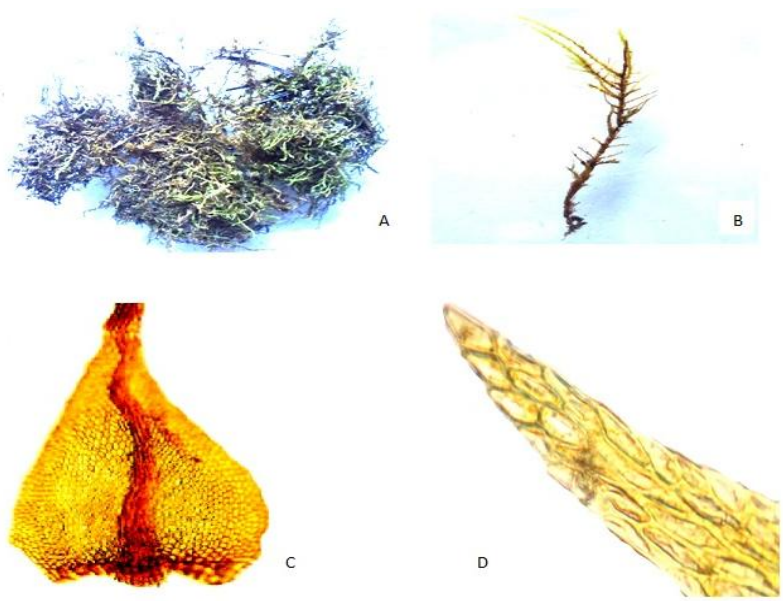
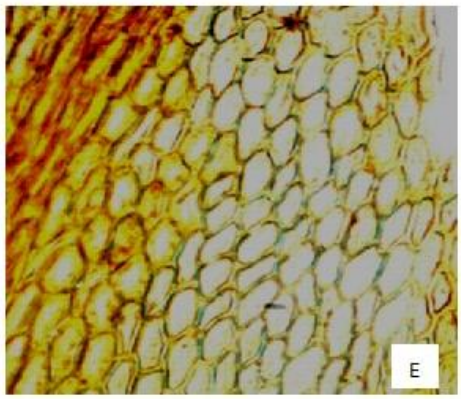


Plate 47:*Cratoneuroncommutatum*(Hedw.)Roth.,Hedwigia, 38: 6(1899); A. Dry plant (2X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).





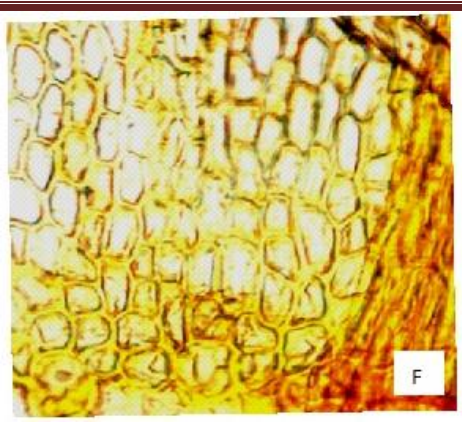
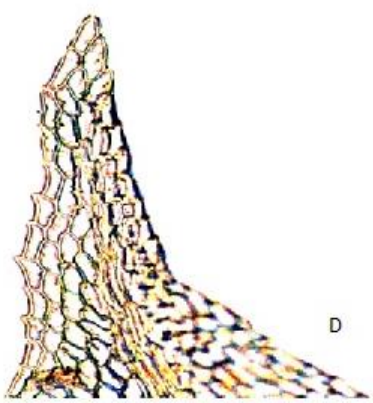
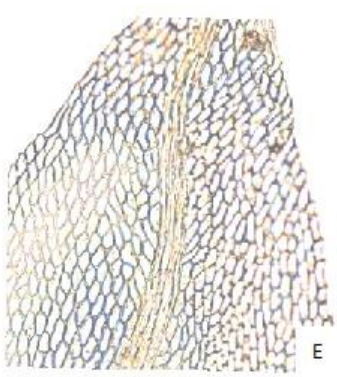


Plate 48:*Haplocladiummicrophyllum* (Hedw.)Broth.Nat. Pfl. 1(3): 1007(1907); A. Dry plant (1X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).





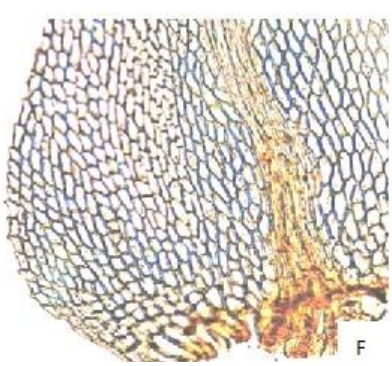


Plate 49:*Haplocladiumschimperi*Ther.,Ann. Crypt. Exot., 3: 75 (1930); A. Dry plant (1X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X),

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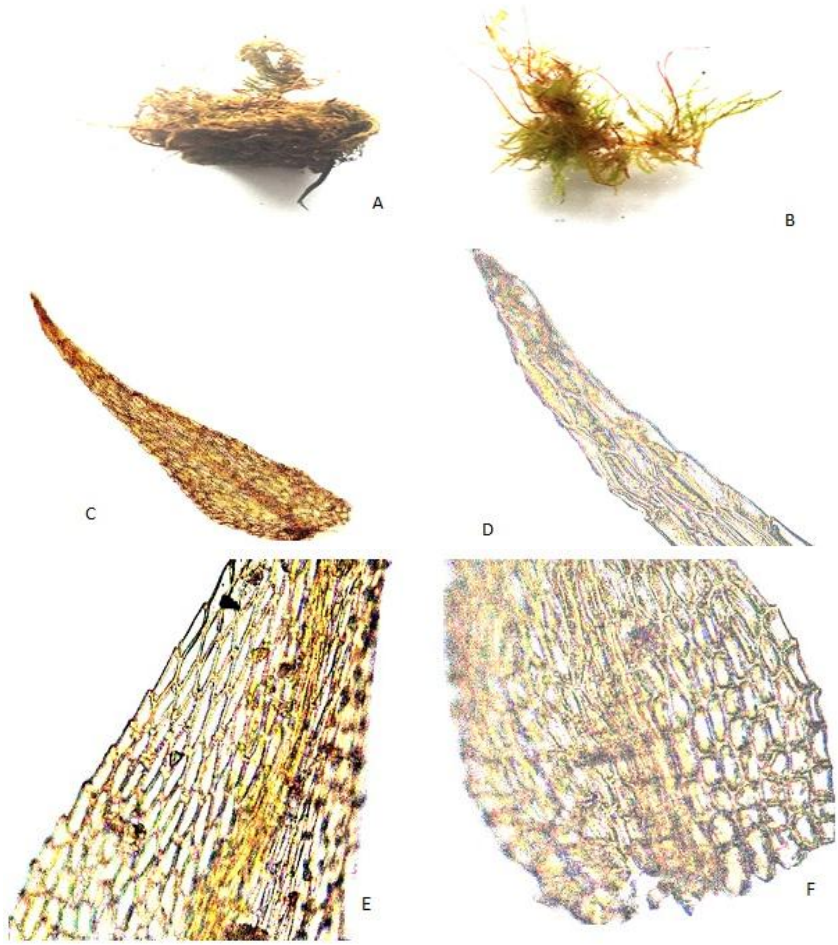


Plate 50:*Lindbergiaduthiei* (Broth.)Broth., Nat. Pflanzenfam. I(3): 993. (1907); A. Dry plant (1X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

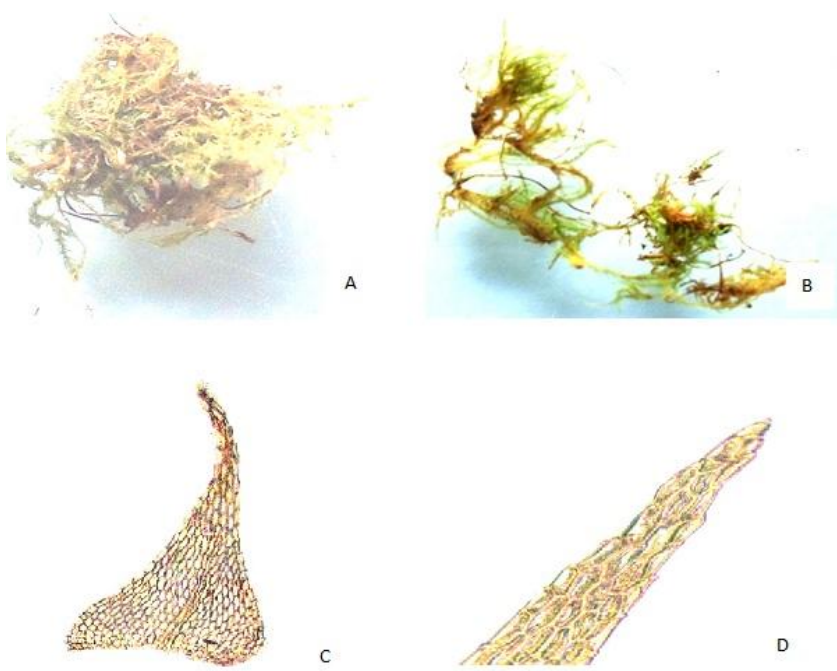


Plate 51:*Thuidiumglaucinum* (Mitt.) Bosch &Sande Lac.,Bryol.Jav., 2: 117 (1876); A. Dry plant (1X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

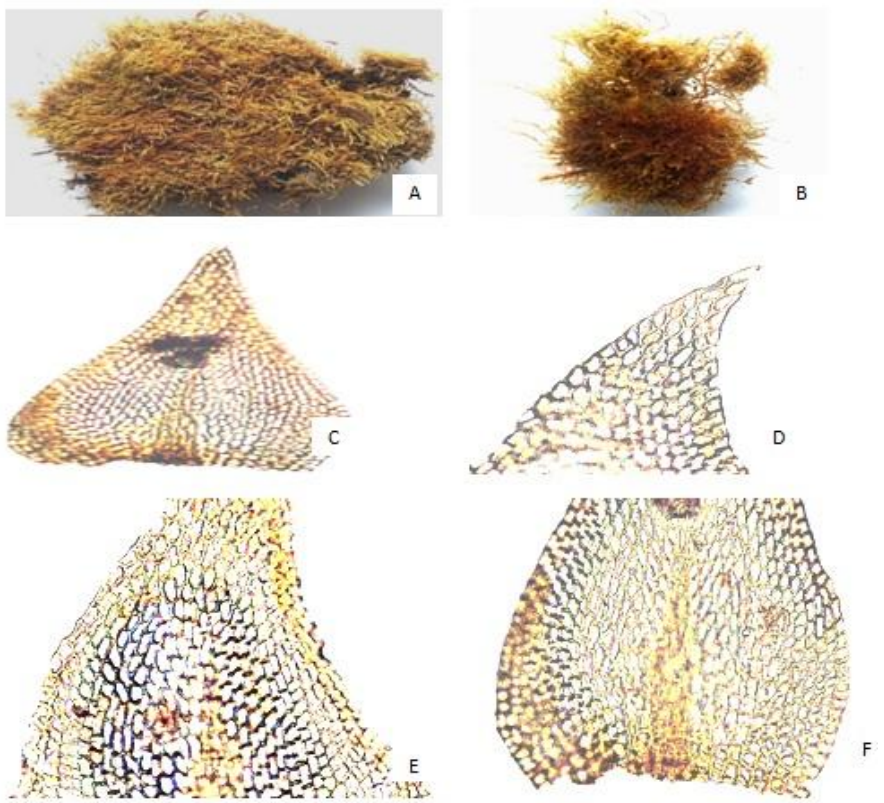
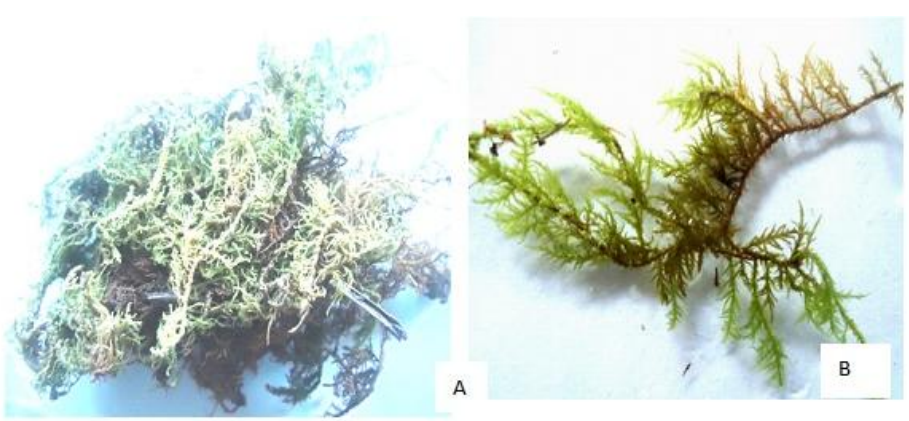


Plate 52:*Thuidiuminveste* (Mitt.)Jaeg.Ber. S. Gall. Naturw.Ges. 1876-77: 252(1878); A. Dry plant (2X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).



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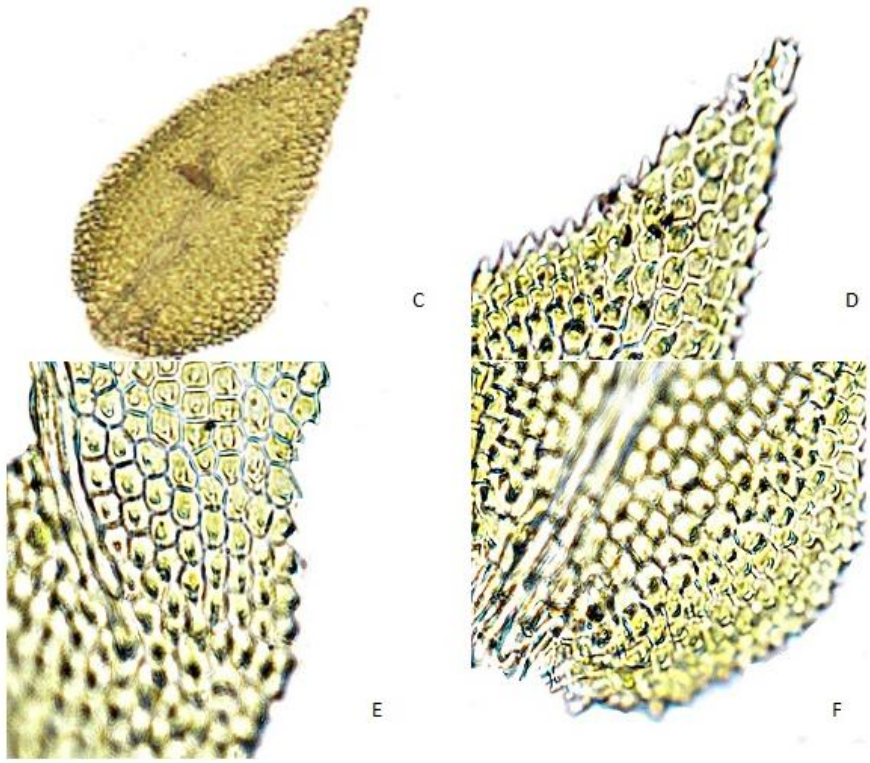
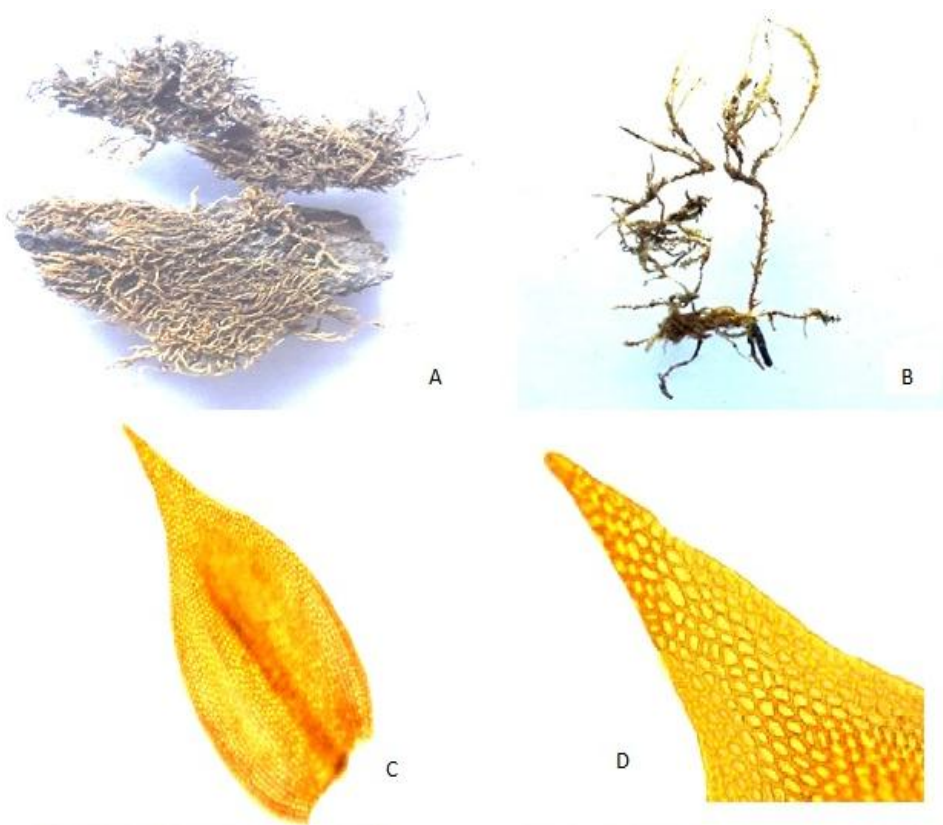


Plate 53: *Thuidiummeyenianum* (Hamp.)Doz. &Molk., Bryol. Jav., 2;121(1865); A. Dry plant (1X), B. Wet plant (2X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).



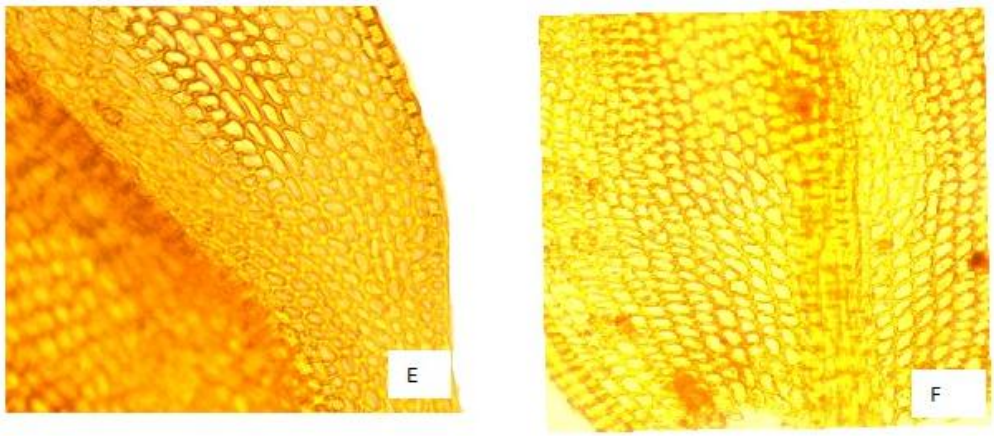


Plate 54:*Thuidiumorientale* Mitt.*ex* Dixon, J. Bot., 51: 329(1913); A. Dry plant (1X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

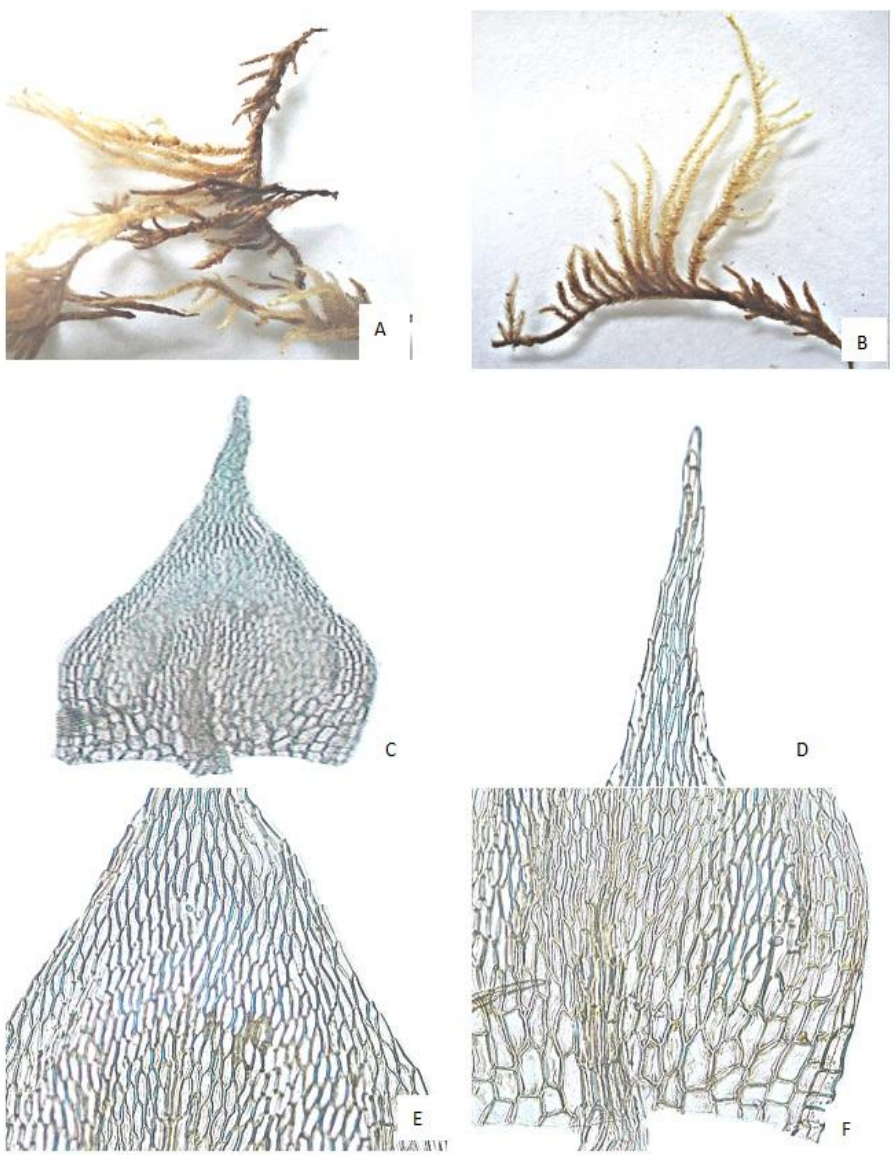


Plate 55:*Brachytheciumbuchananii*(Hook.)Jaeg.inBer. S. Gall. Naturw.Gess., 1876-77: 341(1878);A. Dry plant (3X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

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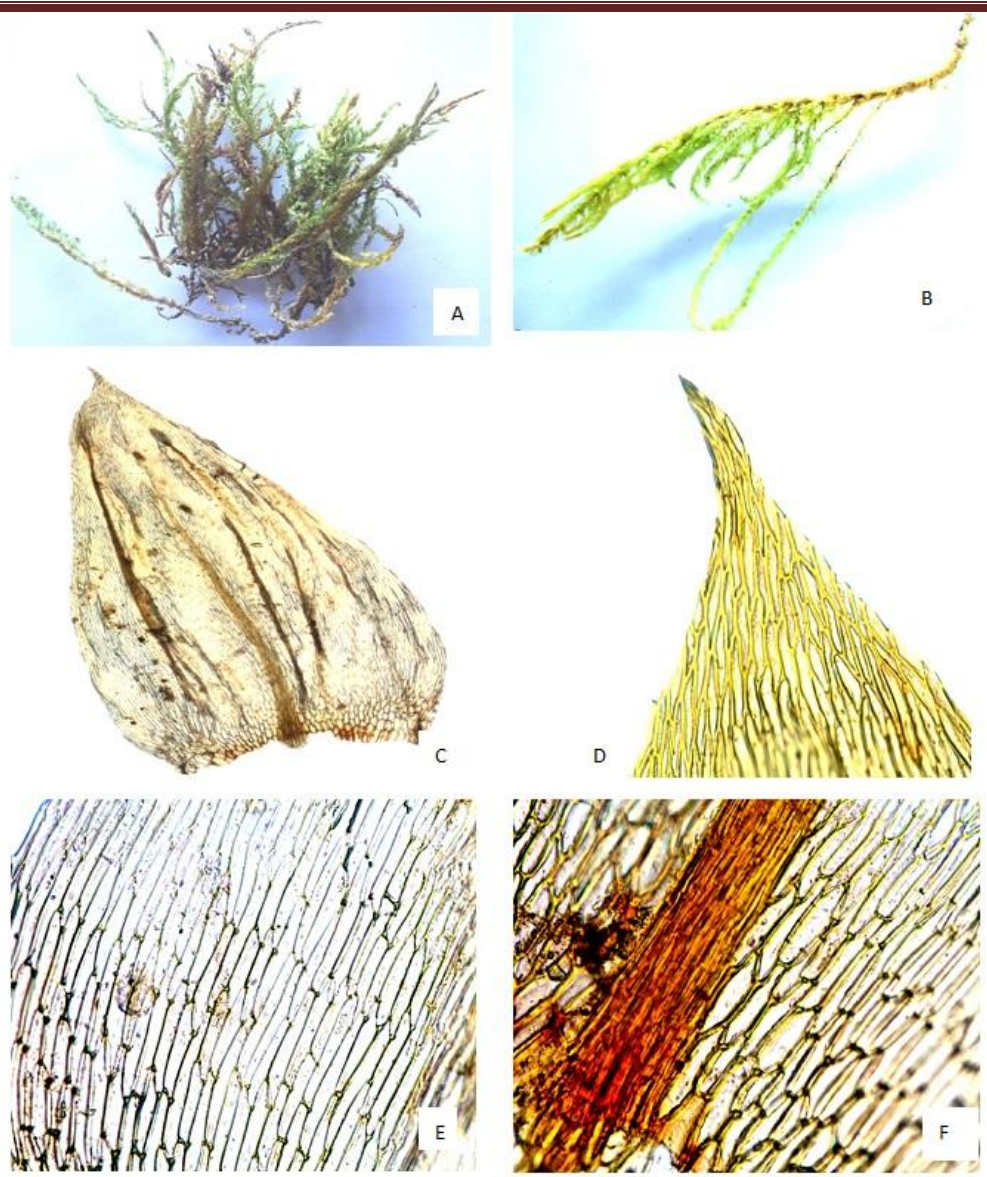


Plate 56:*Brachytheciumkamounense* (Harv.)Jaeg.,Ber. S. Naturw. Ges., 1876-77: 342(1878);A. Dry plant (1X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

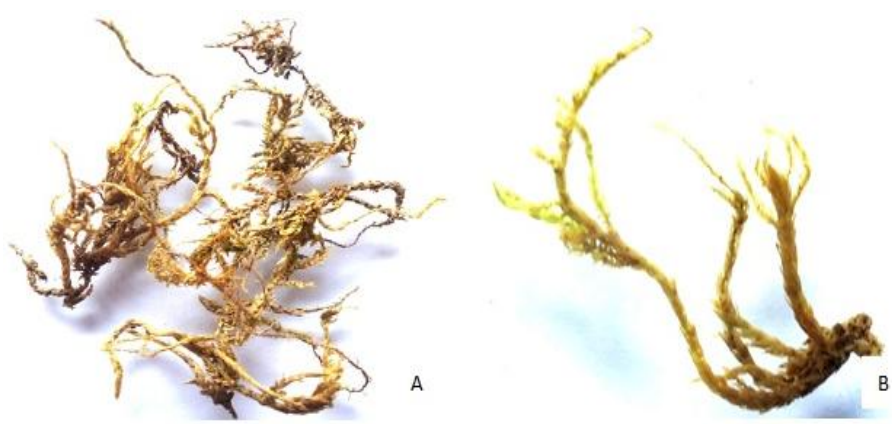
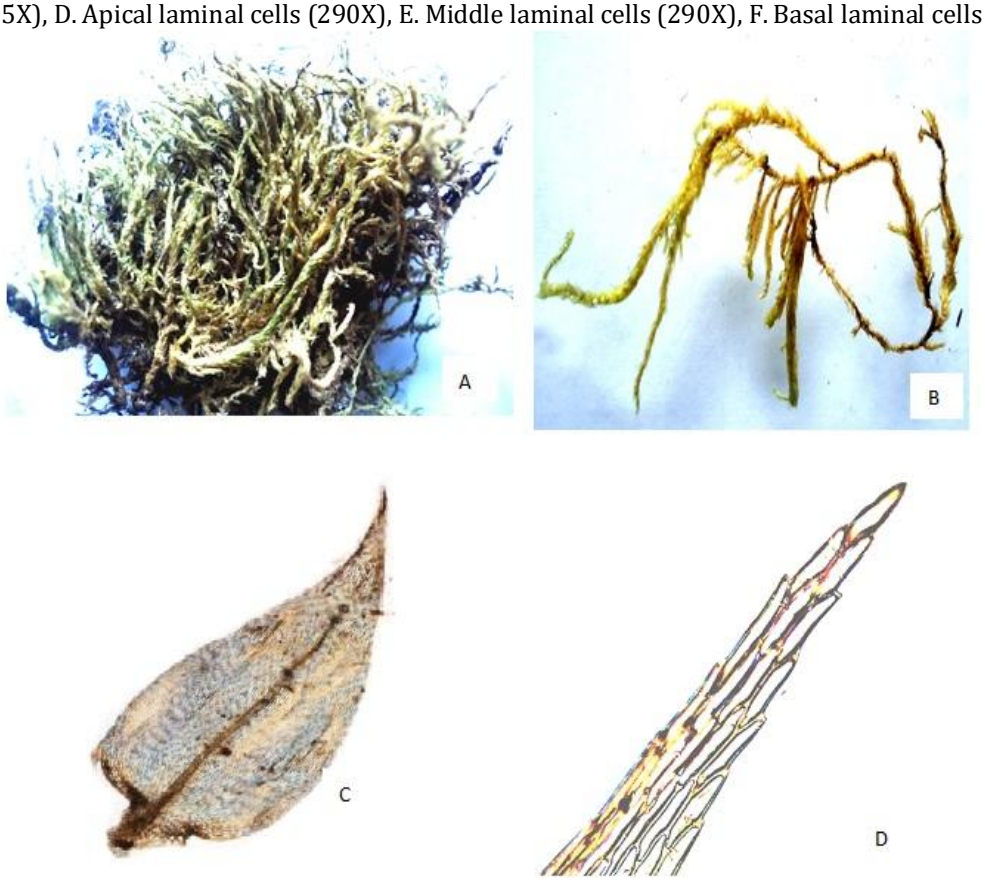


Plate 57:*Brachytheciumplumosum* (Hedw.) B.S.G., Bryol. Eur., 6: 8(1853); A. Dry plant (2X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).



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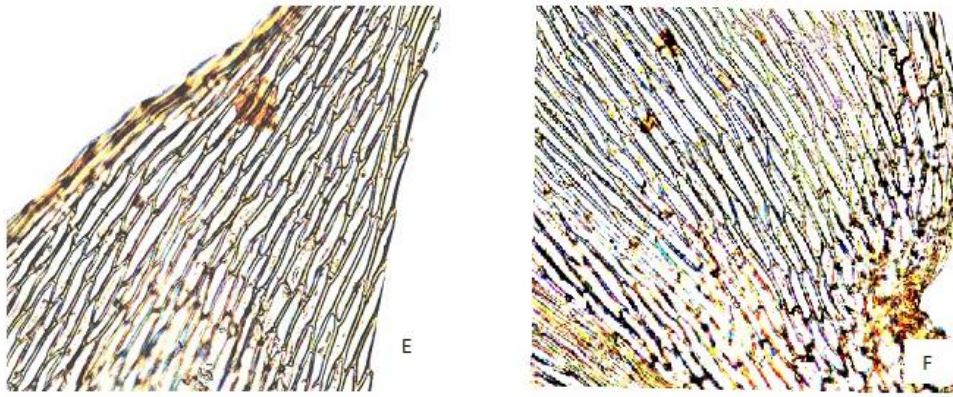
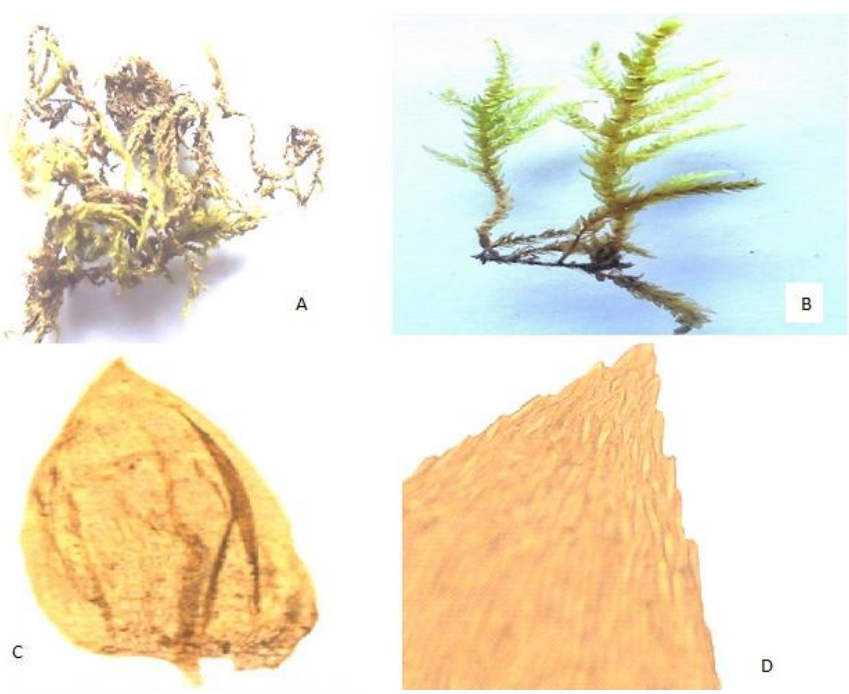


Plate 58:*Brachytheciumrivulare* B.S. G.,Bryol. Eur., 6: 17(1853); A. Dry plant (1X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

Plate 59:*Brachytheciumrutabulum* (Hedw.) B.S.G., Bryol. Eur., 6: 15(1853);A. Dry plant (2X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

Plate 60:*Rhynchostegiumcelebicum* (Lac.)A.Jaeg.,Ber. S. Gall. Naturw.Ges., 1876-77: 374(1878);A. Dry plant (2X), B. Wet plant (5X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).



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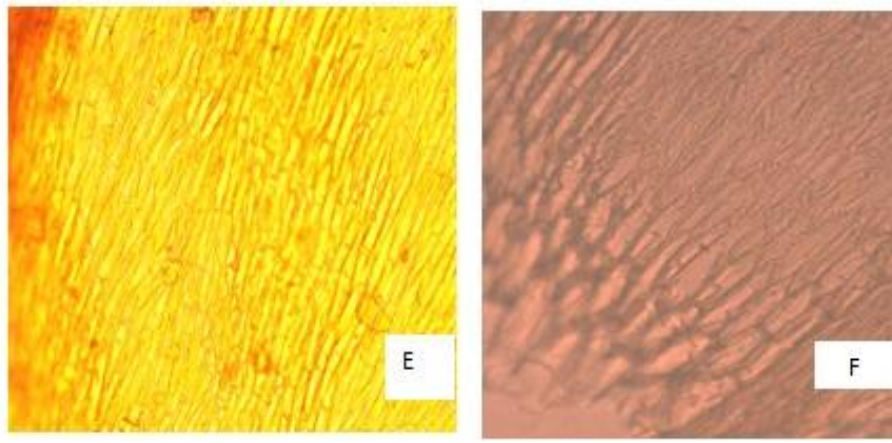

Plate 61:*Rhynchostegiumherbaceum* (Mitt.) A. Jaeger.,Ber. S. Gall. Naturw.Ges., 1876-77: 368 (1878); A. Dry plant (2X), B. Wet plant (4X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

Plate 62:*Rhynchostegiumplaniusculum* (Mitt.) A. Jaeg. Ber. S. Gall. Naturw.Ges., 1876-77: 364(1878); A. Dry plant (2X), B. Wet plant (4X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

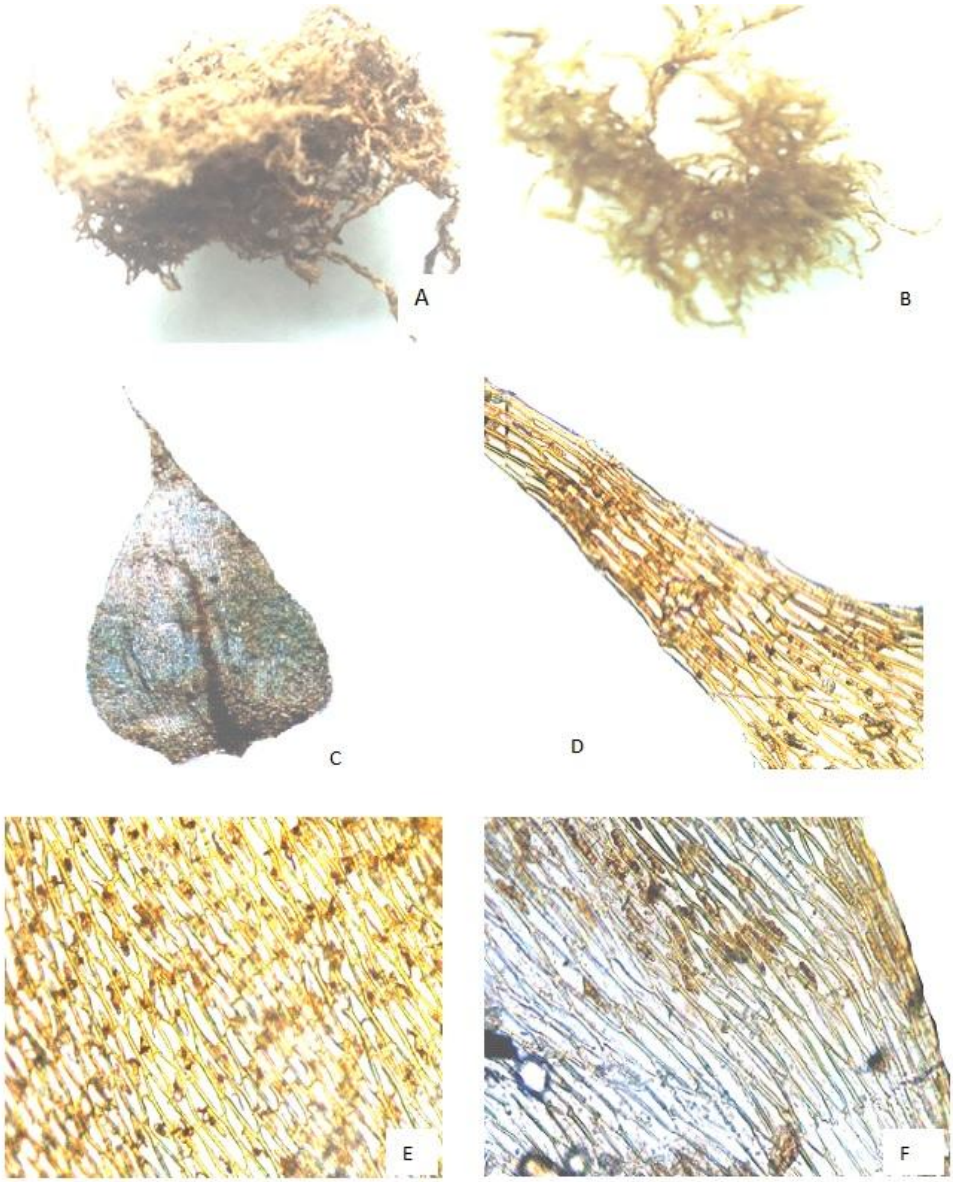

Plate 63:*Rhynchostegiellascabriseta* (Schwaegr.) Broth., Nat. Pfl.1(3): 1161 (1909); A. Dry plant (2X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

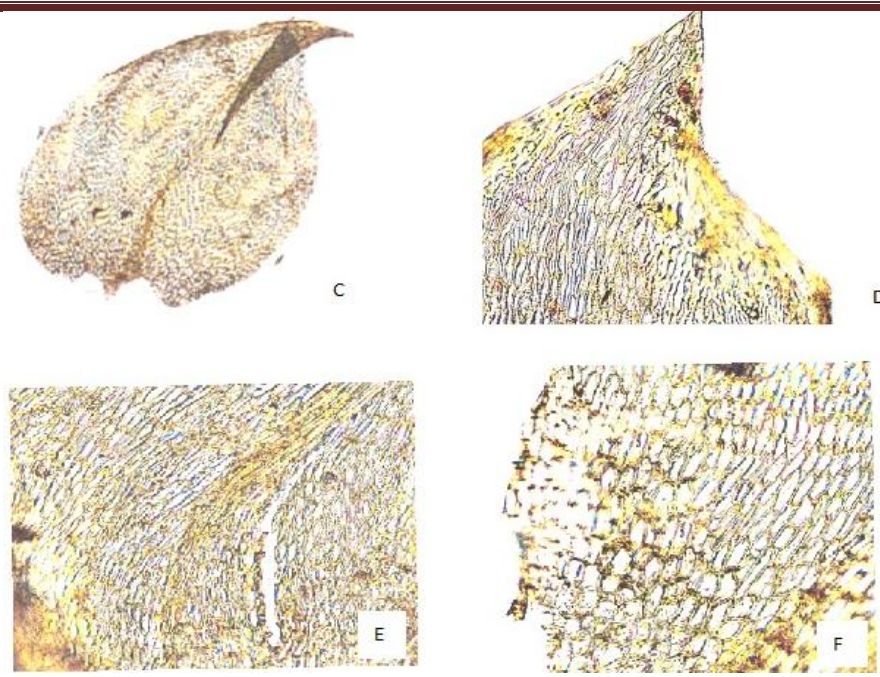

Plate 64:*Eurhynchiummulleri* (Jaeg.)Bartr. Bishop Mus. Bull., 101: 214 (1933);A. Dry plant (1X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

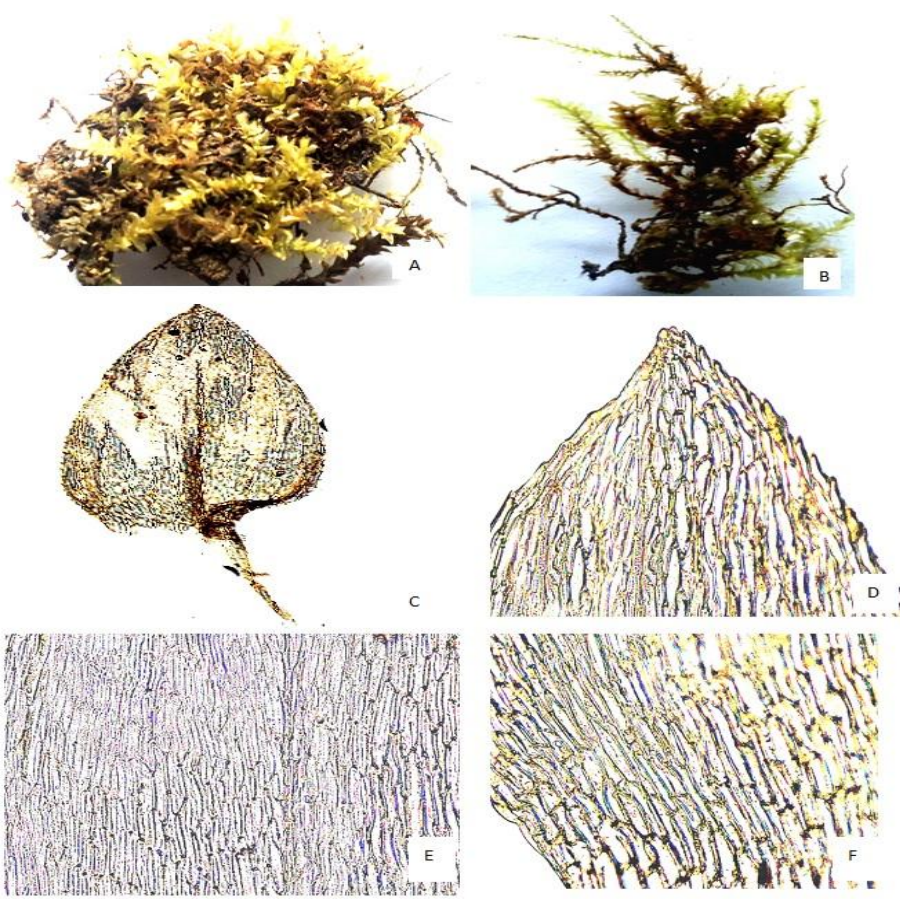

Plate 65:*Eurhynchiumriparioides* (Hedw.)Richs., Ann. Bryol., 9:135(1937);A. Dry plant (3X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

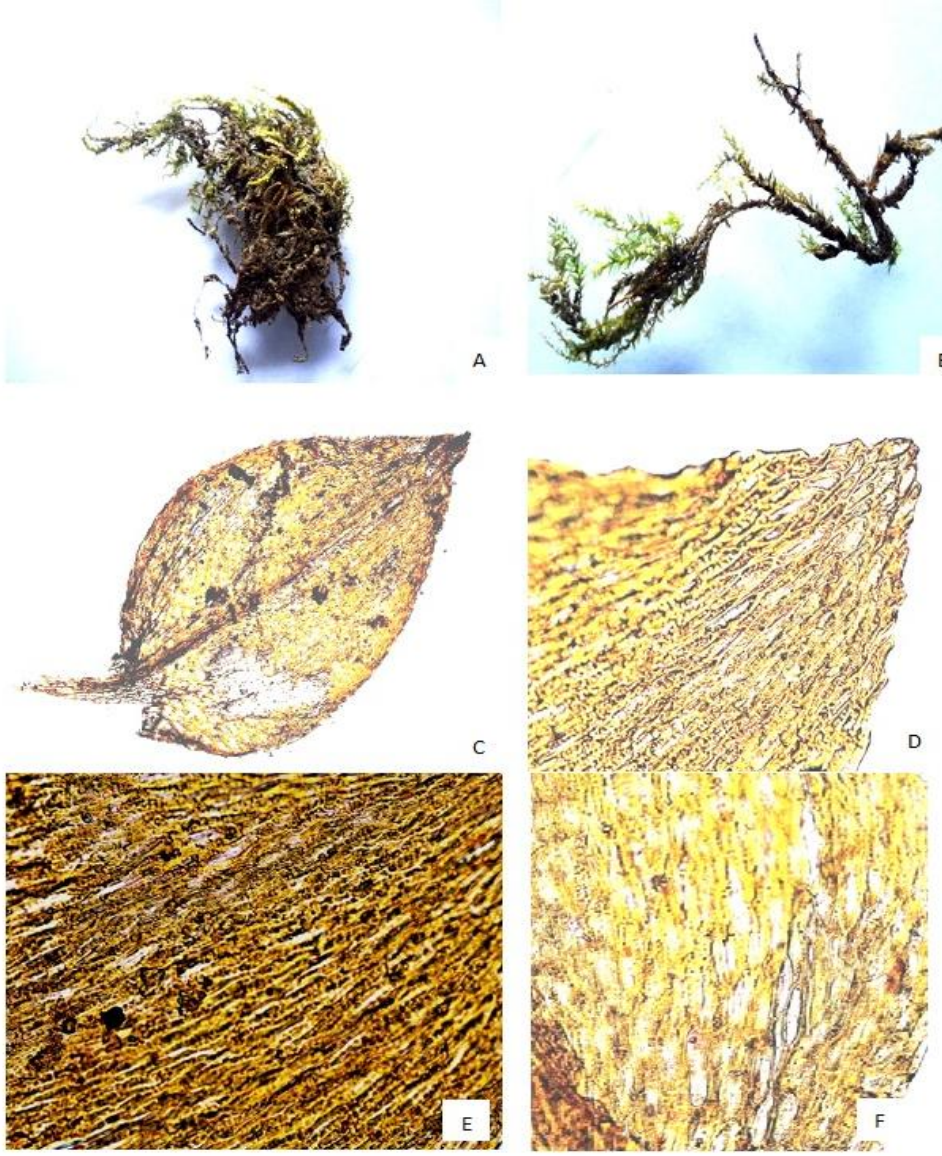

Plate 66:*Eurhynchiumswartzii*(Turn.) Curnow, Rabenh.:Bryoth. Eur., 12: 593(1862); A. Dry plant (2X), B. Wet plant (4X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

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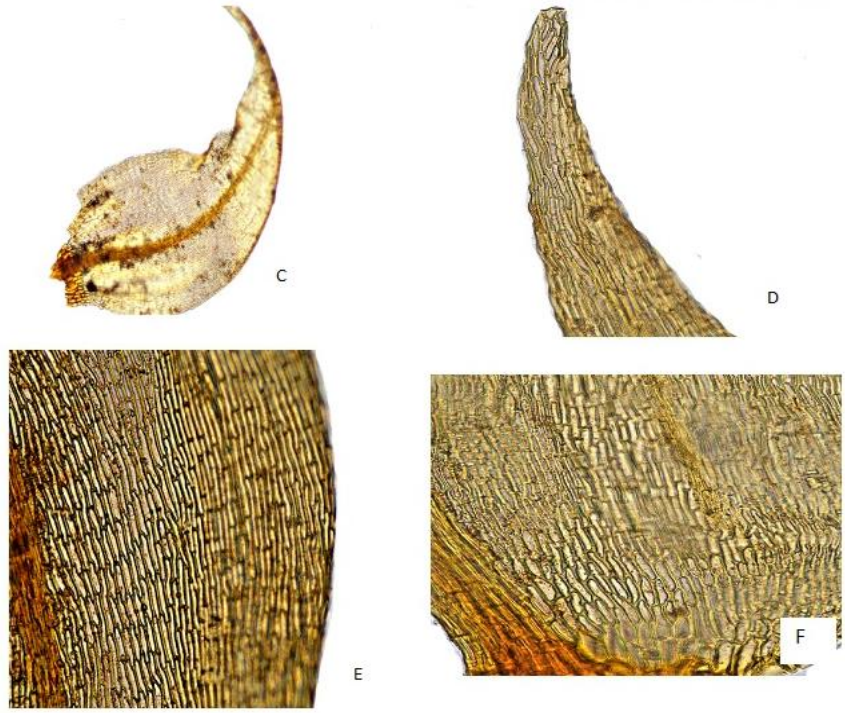


Plate 67:*Hypnumaduncoides* (Brid.) C. Muell., Syn., 2:295(1851). A. Dry plant (2X), B. Wet plant (4X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

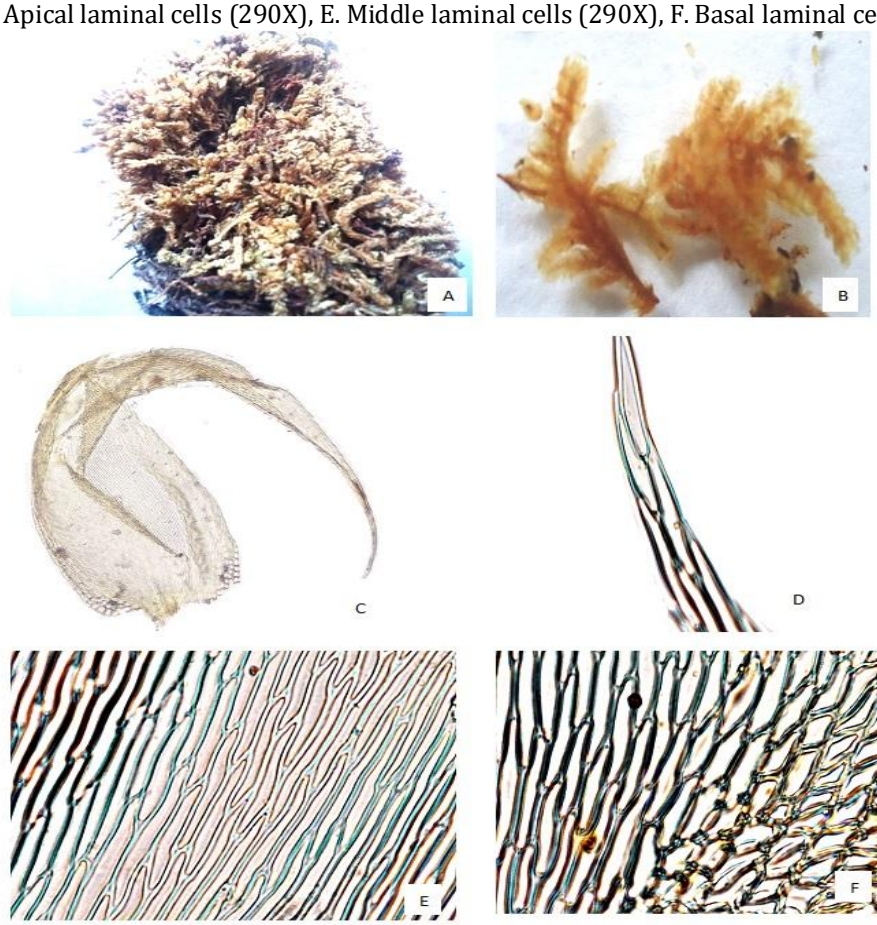


Plate 68:*Hypnumcupressiforme*Hedw., Sp. Musc. : 291(1801); A. Dry plant (2X), B. Wet plant (5X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).

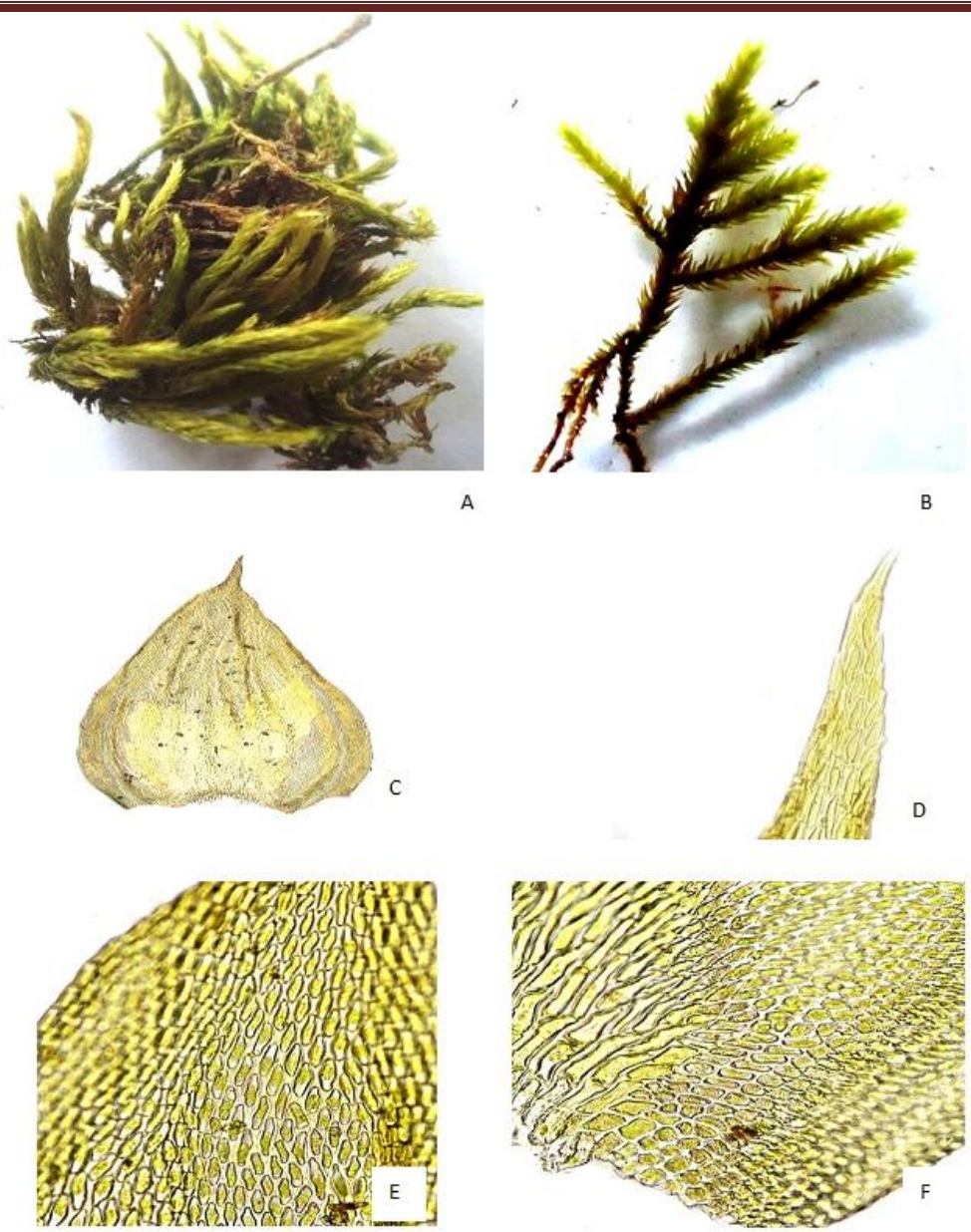
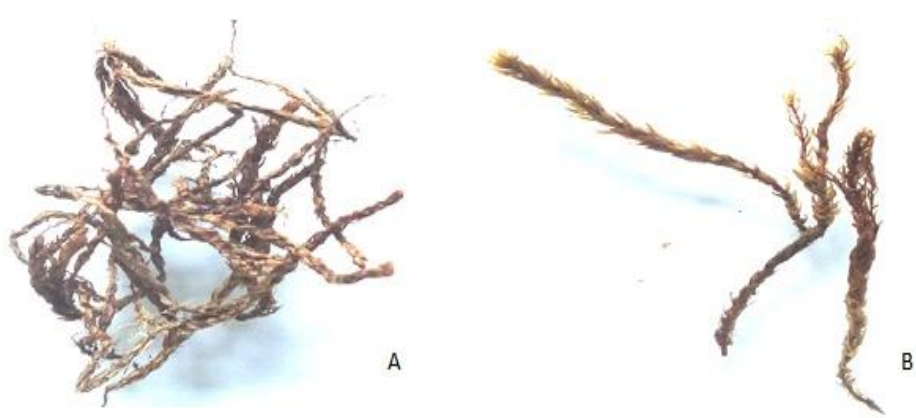


Plate 69:*Leucodonsciuroide* (Hedw.)Schwaegr., Suppl. 1: (1816); A. Dry plant (2X), B. Wet plant (3X), C. Leaf (75X), D. Apical laminal cells (290X), E. Middle laminal cells (290X), F. Basal laminal cells (290X).



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