

OBSERVATIONS

Observations

In the present study only Liverworts and Hornworts from Kas plateau were reported. Among these a wide range of physiographic features were displayed on study side. A total of 16 species of hepatics were collected of which 15 are liverworts and 2 hornworts. These 16 species belong to 11 genera, 7 families. A complete list of genera collected presently, has been provided.

List of genera collected.

Family: Ricciaceae

Riccia

Family: Targioniaceae

Targionia

Cyathodium

Family: Marchantiaceae

Plagiochasma

Asterella

Cryptometrium

Family: Fossombroniaceae

Fossombronia

Family: Lophoziaceae

Solenostoma

Family: Lejuneaceae

Harpalejeunea

Family: Anthocerotaceae

Anthoceros

Notothylas

The detailed description of collected specimens is given below.

Class-Hepaticae

Order: Marchantiales

Class-Hepaticae

Gametophyte dorsiventrally differentiated, may be thallose or commonly leafy (foliose) leaves without midrib, thallus attached to the substratum by means of simple, unicellular rhizoids. Internal structure simple, dorsal layer with air chambers and assimilatory filaments. Reproductive organs develop from a single initial cell, Sporophyte without meristematic tissue. Sporophyte with foot, seta and capsule. Sporogenous tissue endothelial in origin, with spores and elaters (except *Riccia*), columella absent.

Order: Marchantiales:

The plant body or the gametophyte usually prostrate. Thalloid, thallus green flat thick and fleshy dorsiventral. Dichotomously branched. Thallus with prominent midrib. Rhizoids are of two types. smooth and tuberculate. Scales often present. Thallus differentiated into dorsal assimilatory portion and ventral colourless, compact storage tissue. Dorsal surface differentiated into air chamber or air pores. Sex organ either scattered along with midrib or grouped in receptacle. Sporangium may be simple or with foot seta and capsule. Elaters often present.

Family: Ricciaceae

Ricciaceae the gametophyte is a flat, dorsiventral, dichotomously branched, ribbon shaped, fleshy. Dorsal photosynthetic region contains air channels. Epidermis lack definite pore. Sex organ occur on median furrow on the upper surface in longitudinal rows, extending the entire thallus apex to backwards Archegonia immersed in the cavity on the dorsal surface. Spores are set free by the decay of surrounding sterile tissue

Genus- *Riccia*. (Michx) L.

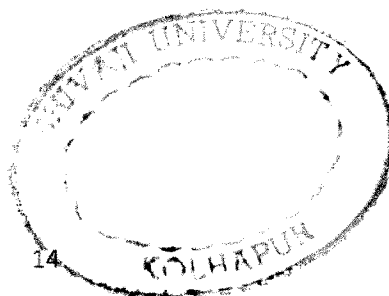
Monoecious or Dioecious. Thallus Dichotomously branched, rosette like appearance, terrestrial or rarely floating on water body. Mid rib present. Ventral surface bear scale and rhizoid. Scales are one cell thick, hyaline violet Rhizoids both Tuberculate or smooth.

Assimilatory region consist green tissue. Photosynthetic layer with air space. Antheridia and Archegonia scattered singly on dorsal surface Involucres absent. Spores large brown to black.

***Riccia billardieri* Mont. et N**

Thalli monoecious, once or twice forked, overlapping, up to 12mm long 3 mm broad. Tubers at apical end Antheridia in row, projecting above the surface. Archegonia on dorsal groove Rhizoids many both type smooth and tuberculate. Ventral scale prominent, purple. Cross section of thallus is broad than high. Capsule sunken in the thallus. Spores brown reticulate 18 μ in diameter.

Habitat- On moist ground associated with mosses



Riccia discolor L. et L.

Thalli dioecious, dichotomously branched, Female plant larger than Male. Female Thalli 10 mm long and 4mm broad .Ventral scale semilunar, purple .Dorsal groove narrow. Rhzoid both simple as well as tuberculate.Antheridia in row, antherdeal papilli consipicious. Archaegonial neck protruding out in median groove on the dorsal surface. Capsule single in row in the middle of the thallus. Spore reticulate 90 µin diameter.

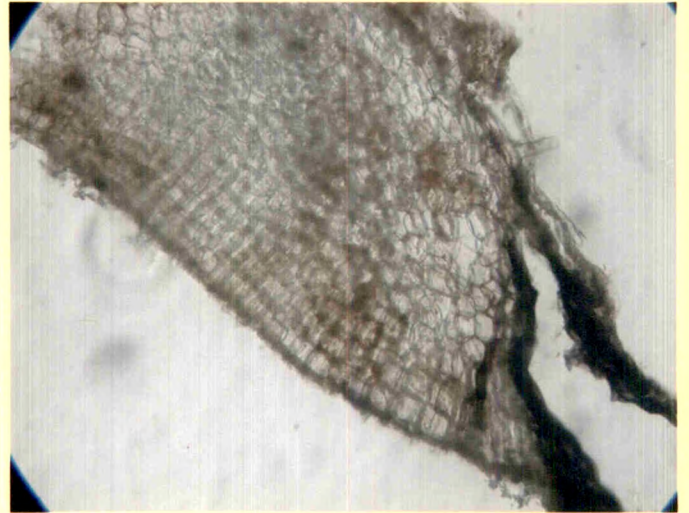
Thalli were found attacked by an ascomycetes fungus which formed sunken perithecia with neck projecting on dorsal surface. These could easily mistaken for capsule.

Habitat: On moist soil.

Riccia billardieri Mont. et N



Natural patch of plant



T.S. of thallus with scale
10X



Thallus with ventral tubers

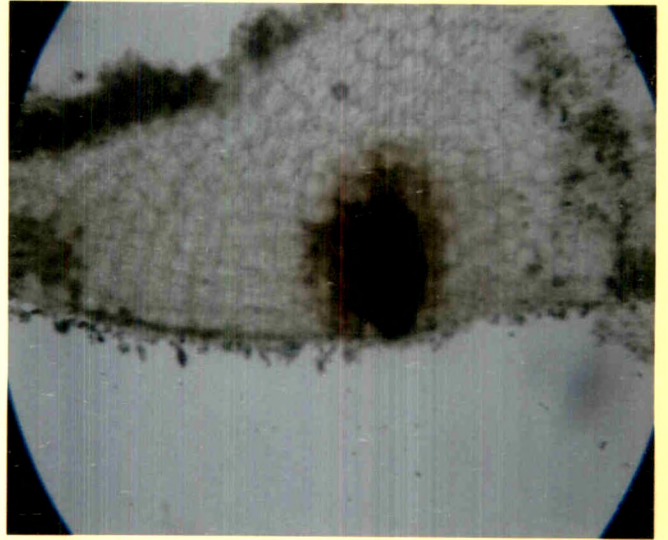


spore 10X

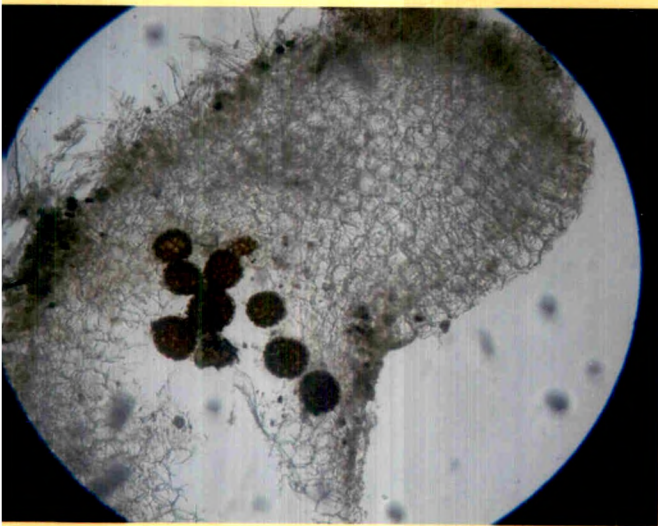
Riccia discolor L.et L.



natural patch of thallus



T S. showing infection 10X



Spore 10X



Ventral semilunar scale

Family-Targioniaaceae

Plant monoecious or dioecious dorsiventrality prostrate, thin. Air chambers in row, with or without filament, scale in two rows, rhizoids smooth and tuberculate. Antheridia on mid dorsal or on ventral innovation, may be on main thallus, in cushion, lateral or terminal, involucre terminal. Archegonia few. Capsule ovate. Spores rounded, reticulate. Elaters long, fusiform, bi or trispiral.

Genus - *Targionia* (Mech.), L. Sp.PL.

Plant thallose, terrisrial prostrate, Monoecious or dioecious, thallus simple, with innovation ventrally present near the apex, with distinct areoles on the dorsal surface. Air pore simple, projecting, air chamber distinct. Ventral scale in two rows, purple. Antheridia on dorsal surface, disc like ends arising from midrib or in mid dorsal cushion on the main shoot; ostioles papilliform. Involucres two, bivalved on the underside behind the apex, Archegonia few in single sporangium. Perianth absent. capsule shortly pedicellate with a foot, breaking through calyptra. Apex of capsule become detached in fragments at maturity. Capsule wall single layered, with or annular band. Spore reticulate. Elaters bi-spiral, long.

***Targionia hypophylla* (Mech.), L.**

Plant dioecious or monoecious. Thallus is 11 mm long and 3 mm broad. Thallus green in color, prostrate. Ventral innovation less frequent, rarely grow dichotomously, margin entire. Thallus apex is distinctly notched. Dorsal surface green, margin entire. Scales are triangular, purplish delicate, appendages with slightly curved subulate apex. Antheridia aggregated on disc of the short ventral shoots. Involucres are terminal and ventral, sessile, purple. Capsule spherical, spore black, 50 μ in diameter; elaters yellowish colored with bispiral bands and 150 μ in long.

Habitat: Patches on moist grounds.

Genus : *Cyathodium* Kunze.

Monoecious or dioecious. Plant, small, tufted on rock or on ground., thin, consisting of a dorsal and ventral layer of cell separated by an air space divided thin vertical portion. Dichotomously divided. Air chambers in one layer, empty with or without simple pores. Pore when present large bounded by concentric rings of cells. Rhizoid smooth some thick walled but not tuberculate. Position the male receptacle variable; terminal, lateral or in the forked between two branches Capsule globose, inserted by small foot. Spore spherical. Elaters Trispiral.

***Cyathodium tuberosum* Kash.**

Thalli dioecious, dichotomously membranous, fan shaped, fluorescent yellow. densely crowded on soil, in shade. Sterile plant small yellowish or green in colour. Lobes marked with dichotomous network of lines. Dorsal surface usually flat. Dorsal pores found only in well developed female plants, scattered circular behind the apex, elongated. Each pores bounded by two or three series of four or five each. Ventral pores simple, large, bounded by ordinary cell of the thallus .Midrib absent. Rhizoids both thin walled or thick walled Margin notched with sporangia. Sporangia black Spore finely ornamented. Elaters trispiral. Spore 40 μ in diameter. Elaters 17-30 μ long. Some time very few even only two to three trumpets shaped.

Habitat: Terrestrial forming patches

Targonia hypophylla (Mech.)L.



Natural patch of thallus



Dorsal view of thallus



Ventral view of thallus



Triangular scale



Spore and elater 10 X

Cythodium tuberosum Kash.



Habitat



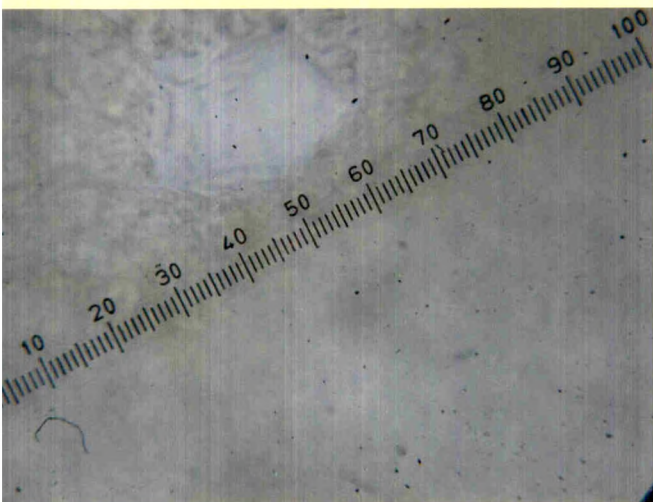
Thallus with sporophyte



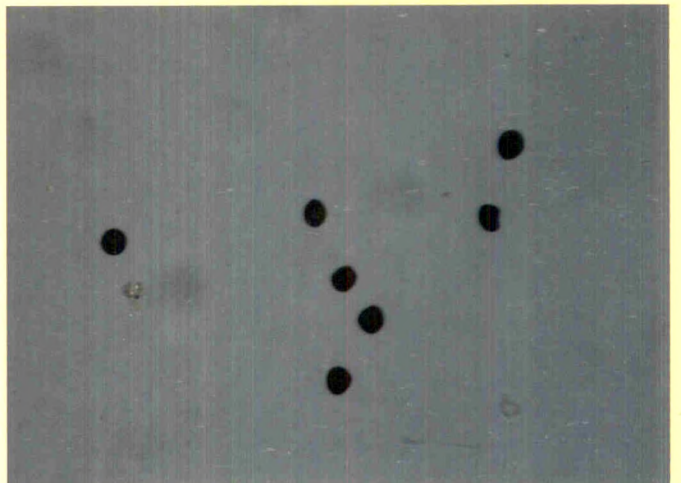
Spore & elater 10X



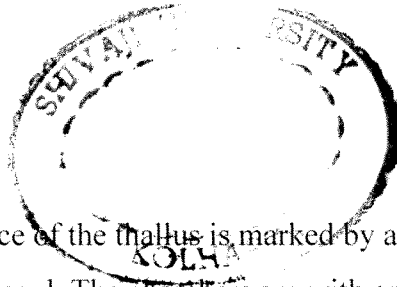
An elater 45X



Pore 45X



Spore 10X



Family: Marchantiaceae

Plant body thalloid, dorsal surface of the thallus is marked by areolae, each with a central pore. Internally thallus is chambered. The chambers are with or without photosynthetic filament. Sex organs occur on dorsal surface and are united in groups to a special region of thallus called the receptacle. Sporangium is usually differentiated into foot, seta and capsule. Capsule dehisces either by separation of lid or by valves, elaters well developed.

Genus : *Cryptometrium* Austin

Plant thallose, broad, thin, closely creeping, attached to the soil by the midrib only. Thallus once or twice divided. Dorsal surface flat, air chamber large, empty. Midrib narrow passing into the thin broad wings. Antheridia in the mid dorsal groove, two or three seriate. Papillae very small. Female receptacle terminal, stalked, stalk long, naked with one or two furrows. Receptacle thin, broad, circular, with an irregular margin convex on the dorsal side flat ventrally. Sporangia not exserted. Foot spherical, seta small. Capsule included. Lid definite, Spore yellow reticulate

***Cryptometrium himalayensis* Kash.**

Monoecious. Thallus up to 5mm long, yellowish, very delicate, once or twice forked, scale absent. Female receptacle on lobe of forked. Stalk with one deep groove. Dorsal surface areolated. Pore small, slightly raised. Scale minute, hyaline and much larger under the tuberculous apex, ovate in two rows. Female receptacle on lobe of fork. Stalk on deep groove up to 1-2 mm long, thin, broad, circular, with irregularly toothed margin, slightly convex on the dorsal side in the center, Sporangia one to two and seta small, capsule wholly included. Spore yellow, reticulate up to 70 μ in diameter elater trispiral 280 μ in long.

Habitat: Dense shade along with *Cyathodium tuberosum*

Genus : *Asterella* Nees.

Monoecious or dioecious. Plant thallose, small or medium green. Terrestrial, prostrate, scale with appendage. Thallus simple rarely divided. Rhizoids two type covered with scale. Dorsal layer low, chamber narrow often very irregular with numerous secondary lamellae. stomata simple Ventral scales in one row on each side of midrib. Male receptacle sessile, naked just behind the stalk of female receptacle (except *A. angusta*). Involucer arising from margin, cup shaped. Female receptacle with stalk, terminal convex, four lobed, Archegonia in each involucre. Capsule globose. Elaters short bi spiral. Spores reticulate.

***Asterella angusta* St.**

Plant dioecious, up to 18 mm long 3 mm broad narrow, linear, ribbon shaped, smooth, margin entire with narrow posterior end, Dorsal surface flat, purple ,apex notched. Male and female thalli distinct, partially overlapping. Rhizoid are present between two tips directing toward margin of thallus. Air chambers one layers above the midrib with few free filament; in more layers in the wings and empty. Midrib strongly convex gradually passing in to the wings. Ventral surface purple. Antheridia on the main shoot forming a long cushion. Female receptacle stalked, two lobes. Spore tetrahedral, dark brown 60 μ in diameter. Elaters bispiral, 160 μ long.

Habitat: Thick patches on wall.

***Asterella reticulata* Kash.**

Monoecious. Thallus 5mm long 3 mm broad, slightly purplish, thin forming dense web like patches, small, once or twice dichotomous, lobes obovate to obovate-oblong. Dorsal surface flat, margin entire, purplish. Ventral surface greenish. Midrib broad, slightly projecting ventrally. Scale are present at the middle of the ventral side of thallus. Transverse section of thallus is multichambered with a thick mass of tissue on ventral

side. The female receptacle is terminal, stalked reddish at the base. Spore brown, 50 μ in diameter. Elater biserial 115 μ long.

Habitat: Thick patches on rocky ground and exposed walls.

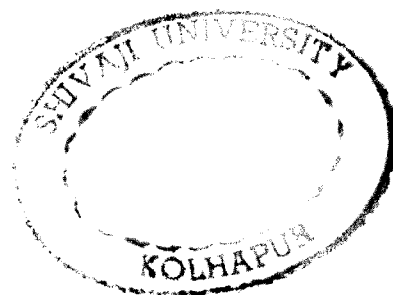
Genus : *Plagiochasma* L. et L.

Monoecious or dioecious. Thalli large prostrate in thick large patches, greenish or bluish in colour. Air chamber narrow, air pore with thick radial walls. Scale in two rows with appendages. Male receptacle horse shoe shaped, sessile, surrounded by scale. Air pore simple. Female receptacle sessile in young condition, staked at maturity, stalk arising from dorsal surface with at base and apex. Receptacle concave on dorsal side with barrel shaped pores, two to six lobed. Involucre large, bivalved, valve margin involute in young condition, one open at maturity. Capsule shortly with large foot, opens by lid. Spore large brownish yellow, tetrahedral. Elaters short bi spiral.

***Plagiochasma appendiculatum* L. et L.**

Plant monoecious. Thalli large up to 20 mm length and 10 mm in breadth forming large and thick patches. Lobes oblong, obovate, dichotomously branched. Dorsal surface slightly concave, smooth. Margin undulate, areoles inconspicuous. Epidermal cells large. Angle thickened. Air pore large bounded by three to four rings of seven eight cell each. Ventral surface purplish. Scale in one row on each side of the midrib, purple, lunate. Midrib not inconspicuous. Male receptacle horse shoe shaped surrounded by a small scale. Female receptacle stalked usually with 5 or 6 lobes. Spore yellow, 70 μ in diameter (excluding wing) Elaters 280 μ long, without spiral.

Habitat: On crevices of wall.



***Plagiochasma intermedium* L. et G**

Thalli are dioecious, 25 mm in long and 5mm in broad forming thick patches. dorsal surface green. Margins are thin, purple, and entire to dentate lobes strap shaped. Dorsal surface green, sub plane. Margin purple, dented. Ventral surface purple, scale purple overlapping lunate. Air pore large, bounded by 3 or 4 rings of 7-9 cells each. Male receptacles are at the joint of the main thallus. Female receptacle sub-sessile on the dorsal surface of the middle. Spores are brownish, reticulate 85 μ in diameter. Elaters with spiral band ,220 μ long.

Habitat: On moist wall association with *Plagiochasma appendiculatum*

***Plagiochasma simlensis* Kash.**

Thalli monoecious or dioecious, 14mm long and 4mm broad, bluish, creeping occurs in dense patches. Lobes long, linear, narrow having rounded apex. Margin entire purple, dorsal surface smooth and plane, scale purple overlapping ovate, not reaching the margin, triangular appendage not sharply constricted off from the body, ovate to lanceolate, usually ending at the apex in a 2-celled filament, epidermal cell thin walled. Dorsal layer shallow. Pore minute bounded by 4 cells. Ventral surface purple. Male receptacle on mid dorsal side, cushion like, circular. Female receptacle sessile. Sporangia two. Spores broadly reticulate 114 μ in diameter. Elaters tri-spiral 410 μ long.

Habitat: On rocky area and moist wall.

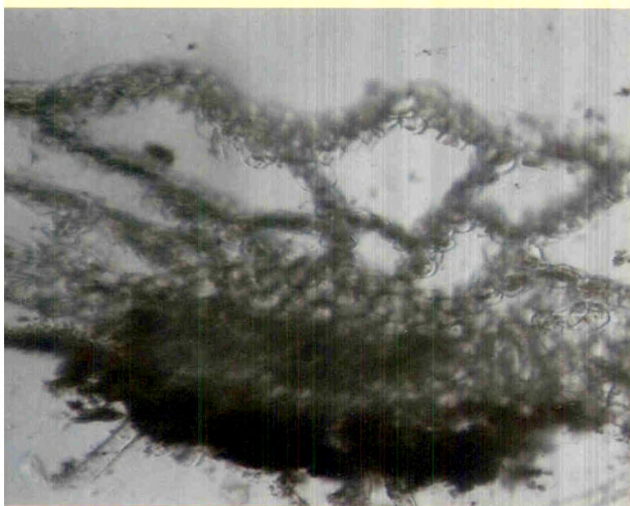
Cryptometrium himalayensis Kash.



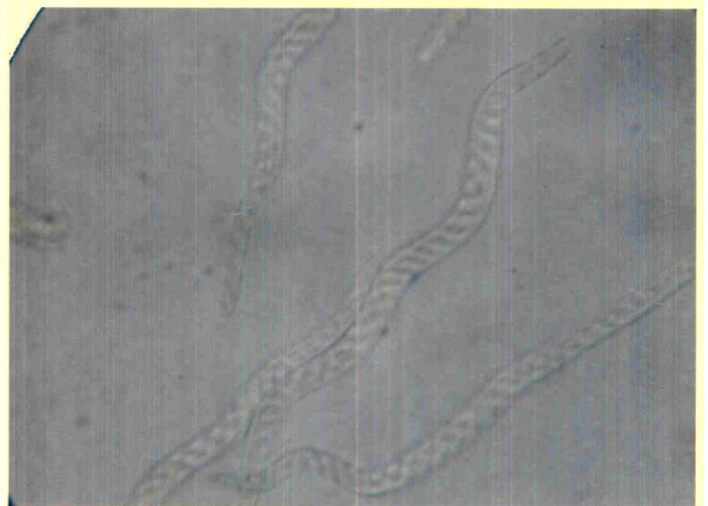
Thallus with tuberous apex



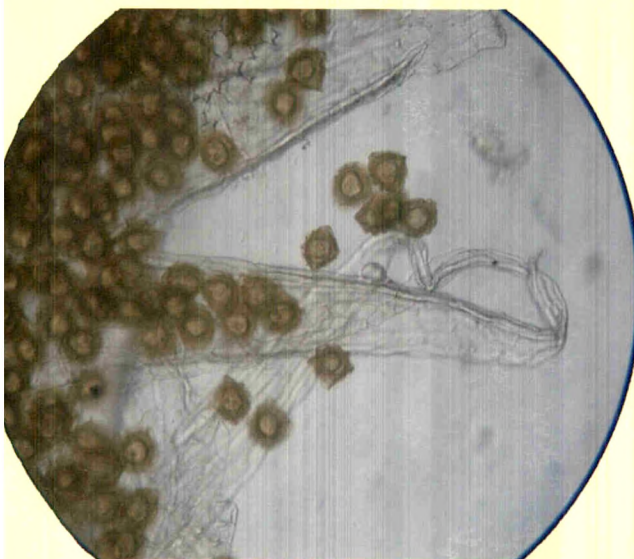
Sporophyte with sporangia



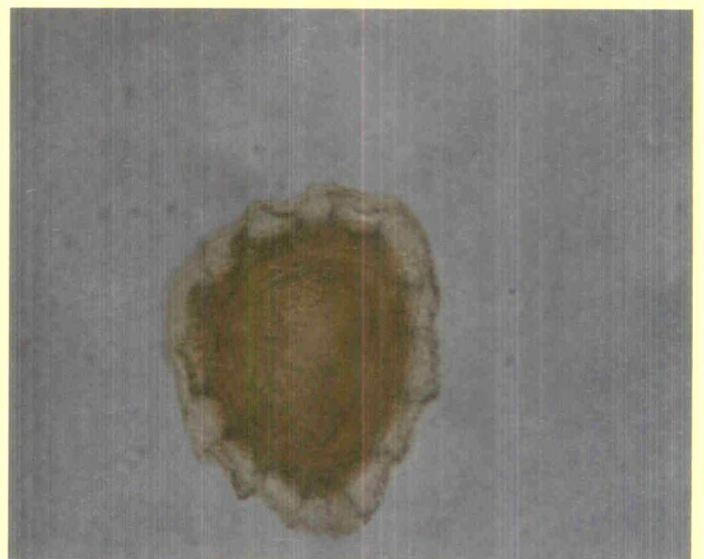
T.S. of thallus 45X



An elater 45X



Spores 10X



Single spore 45X

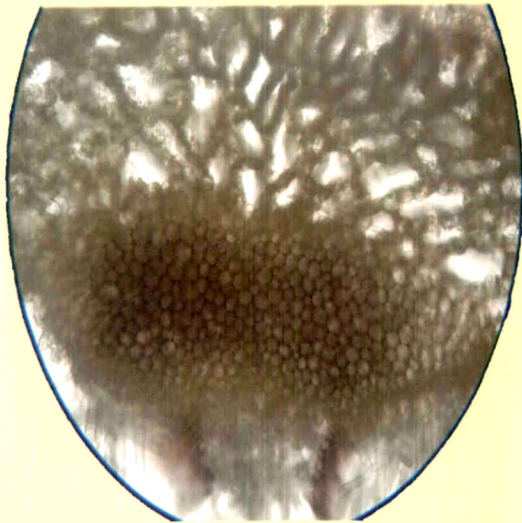
Astellia angusta St.



Male plant



Female plant



S. of thallus 45X



Rhizoides 45X

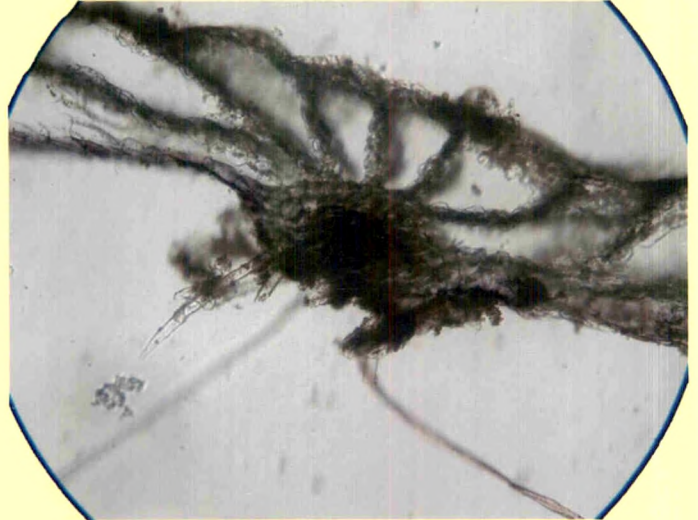


Spore & elater 10X

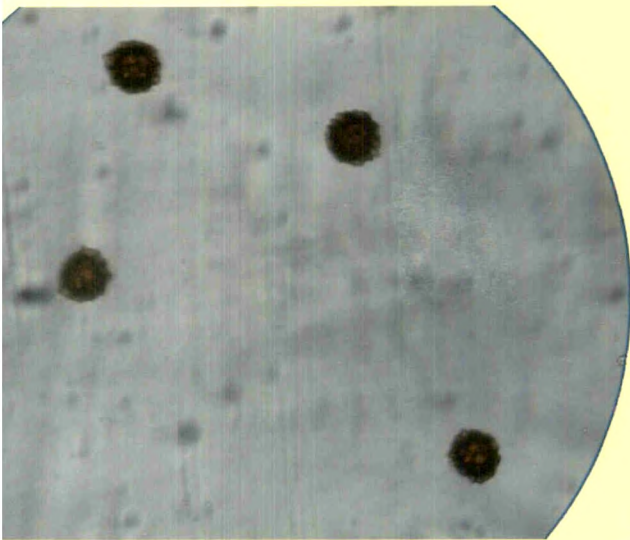
Astellia reticulata Kash.



Thallus with sporophyte



T.S. of thallus 10X



Spore 10 X

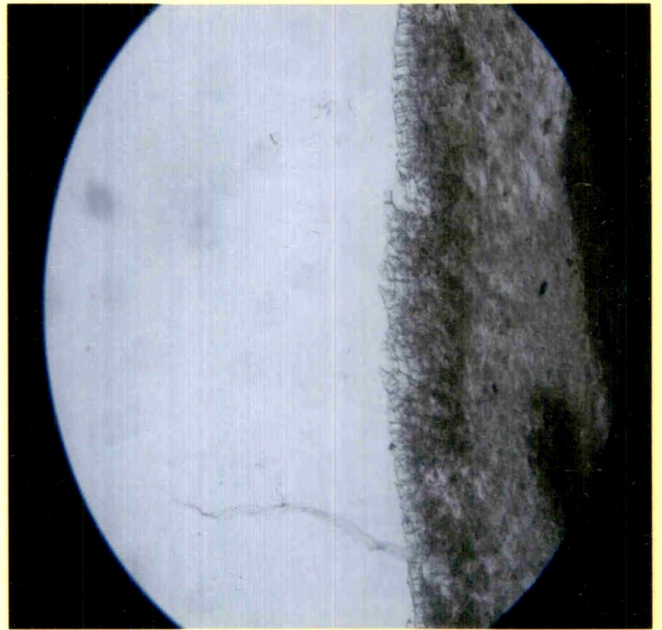


Elater 10X

Plagiochasma appendiculatum L.et L.



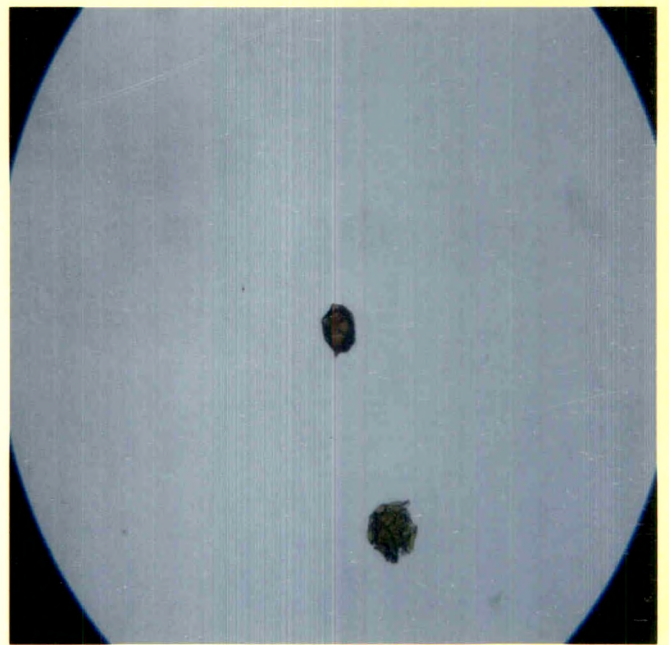
Thallus with male & female receptacle



T.S.of thallus with airpore 45X



An elater 10X



Spore 10X

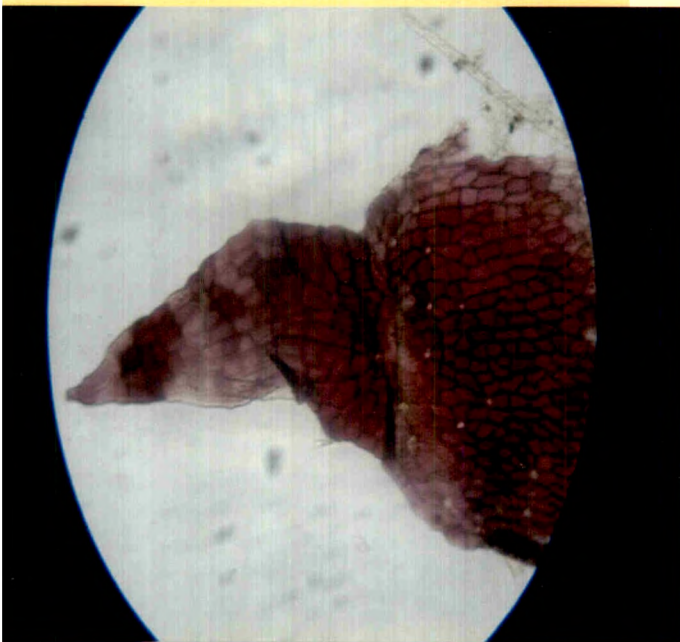
Plagiochama intermedium L. et G



Thallus with male receptacle



T.S of thallus 45X



Scale 10X

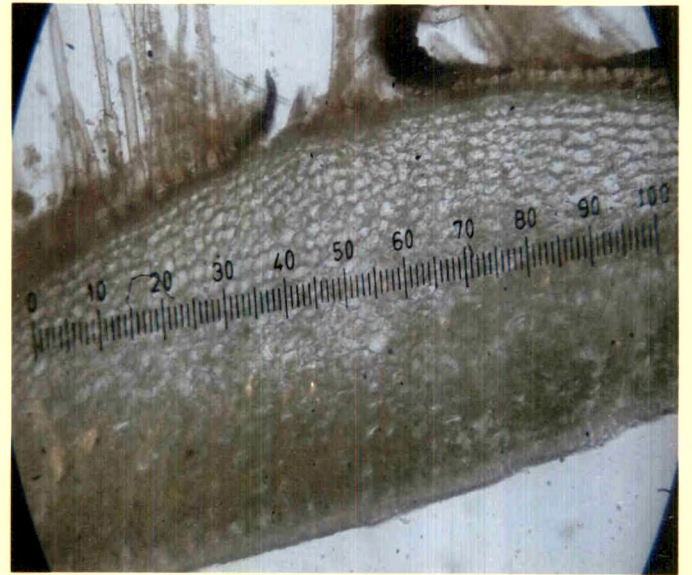


An elater 10X

Plagiochasma simlensis Kash.



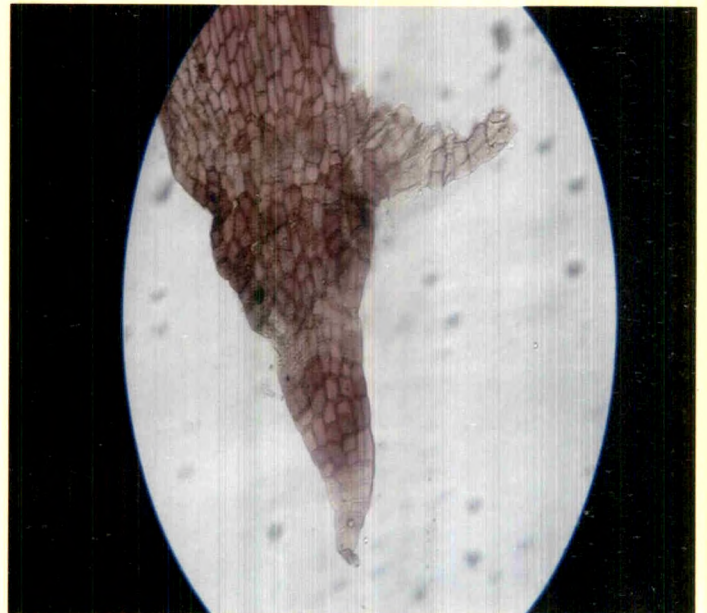
Thallus with sporophyte



T.S. of thallus
10 X



Sporophore & elater 10X



Scale 10X

Class-Hepaticae

Order: Jungermanniales

Sub-order: Metzgerineae

Order: Jungermanniales

Plant body is either thalloid or foliose form, differentiated into stem and leaves. Thalloid members show little or no anatomical differentiation. Leafy forms are distinctly dorsiventral. Scales usually absent. Rhizoids always smooth, leaves without midrib. Antheridia superficial, sometimes immersed in cavities, globular stalked. Archegonia arranged in groups but never on stalked receptacle. Sporophyte with foot, seta and capsule. Wall of the capsules is two or more cells in thickness. Elaters are present. Capsules dehisces generally by four valves.

Sub-order: Metzgerineae

The gametophyte is usually thallose, always dorsiventral and prostrate. Sex organs are scattered on the dorsal surface of the thallus, occasionally borne on highly reduced specialized branches.

Family: Fossombroniaceae

Plant thallose, foliose or intermediate. In foliose forms, leaves in two rows, parallel to the stem or obliquely inserted. Simple sub-sessile. Rhizoids present, male and female sex organs scattered on dorsal side or in groups. Archegonial cluster surrounded by an involucre. Generally capsule with long seta, globose, dehiscent irregularly or by four valves to the base. Capsule wall usually of two layers of cells.

Genus: *Fossombronia* Raddi

Gametophyte delicate, pale-greenish in color. Plant may be solitary or in patches. Stem creeping, simple or dichotomously branched, flattened, with or without tubers, mostly with smooth rhizoids, leaves simple, quadrate to sub-quadrate, broader than long, narrow at the base, succubous, obliquely inserted, irregularly lobed. Antheridia orange-yellow, lies at the base of leaf lobe, shortly stalked, arranged towards apex. Archegonia in group on the dorsal surface of stem, generally solitary, sometimes mixed with antheridia, bracts usually absent, pseudoperianth distinct. Calyptra pyriform, thick at the base. Sporogonium differentiated into foot, seta and capsule. Capsule shortly pedicellate, globose, dark brown to blackish at maturity. Dehisces irregularly, spores usually large, tetrahedral. Elaters small to large, branched or unbranched, bi-trispiral.

***Fossombronia himalayensis* Kash.**

Plants are green, monoecious or dioecious, growing on moist soil or rocks. Small and compact forming a dense patch. Rhizoids violet. Stem prostrate. Leaves simple, oblong, quadrate, overlapping, obliquely inserted on the stem in two lateral rows, irregularly lobed, wavy at the margin, uniseriate, showing thin walled cells. Scattered antheridia situated on the dorsal surface, at the base of lamellae. Capsule spherical with a long seta. It becomes dark brown at maturity, dehisces irregularly. Spore dark brown 42 μ in diameter, elaters reticulate, tri-spiral, 120 μ in length.

Habitat: On moist rock.

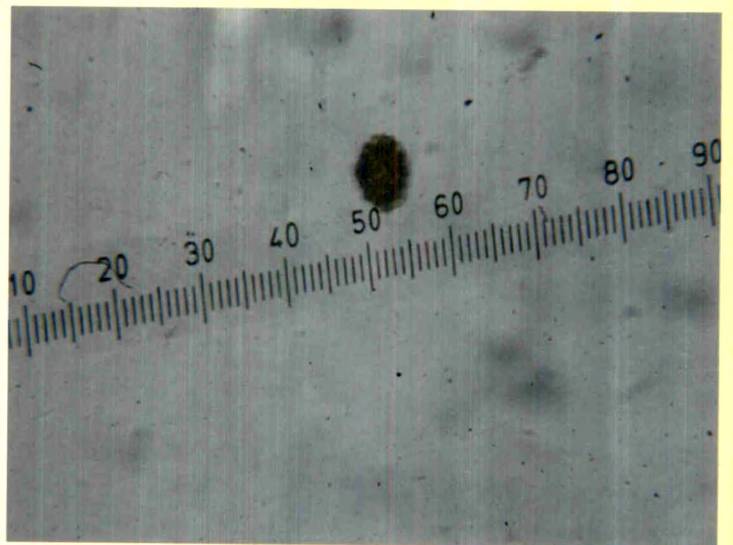
Fossombronia himalayensis Kash.



Thallus in natural habitat



Thallus with sporophyte



Spore 10X



An elater 45X

Sub-order: Jungermanniaceae

Gametophyte in the foliose (leafy) forms, consist of branched or unbranched central axis, bearing leaf like expansions. Leaves are closely and obliquely set into two lateral rows on the stem. Frequently third row of a ventral leaves (amphigastria) are present. Antheridia borne either singly or in small groups in the axis of modified leaves (perigonal bracts). Archegonia always restricted to apices of the stem or its branches. Sporophyte always terminal.

Family: Lopoziaceae

Plants medium or small, terrestrial, stem prostrate to erect, irregularly branched. Branches always lateral lateral, leaves alternate, succubously inserted entire. Amphigastria generally absent or very small. Male bracts with one to five androecia. Perianth compressed from the lateral sides, cylindrical.

Genus: *Solenstoma* Mitt.

Plant dioecious. Plant small or medium, delicate or robust, cespitose, green reddish or brownish purple. Stem prostrate, erect, simple or slightly branched. Rhizoids numerous, hyaline. Leaves alternate, succubose, obliquely or almost transversally inserted. More or less spreading, rounded, ovate or oblong. Amphigastria usually absent. Androecia terminal like a leaves. Involucral bract in one to several pair. Capsule long, oval. Spore small brown. Elaters short, attenuate, biserial.

***Solenostoma fossombronioides*, Sch.**

Plant dioecious, small in loose tufts of green. Stem up to 1-3cm long , brownish purple, Axis prostrate with ascending apices, branched, Leaves simple, alternate, cell from leaf base are elongated thick walled, cell from apical portion hexagonal, thick walled. Rhizoid purplish, long slightly rounded at apex with blunt end at the base shoot. Amphigastria absent.

Habitat: On Moist soil.

Family: Lejeuneaceae

Leaves are alternate, incubous, postical lobe small, inflated. Amphigastria usually present. Antheridial shoot lateral. Archegonia terminal. Perianth free from the involucre bracts. Apical portion constricted into short tubular beak. Capsule on short pedicel.

Genus : *Harpalejeunea* Libert

Plants delicate, stem pinnately branched. Leaves alternate, incubus, entire. Lobule incurved. Amphigastria bifid or entire, rarely absent. Monoecious or dioecious. Antheridia on short branches. Gynoecia with a single archaegonium, usually with sub-involucral innovation. Bracts different from the leaves. Perianth free from bract, sub-cylindrical, pyriform, usually apex produced into a beak, capsule hyaline, pedicellate, globose.

***Harpalejeunea indica* St.**

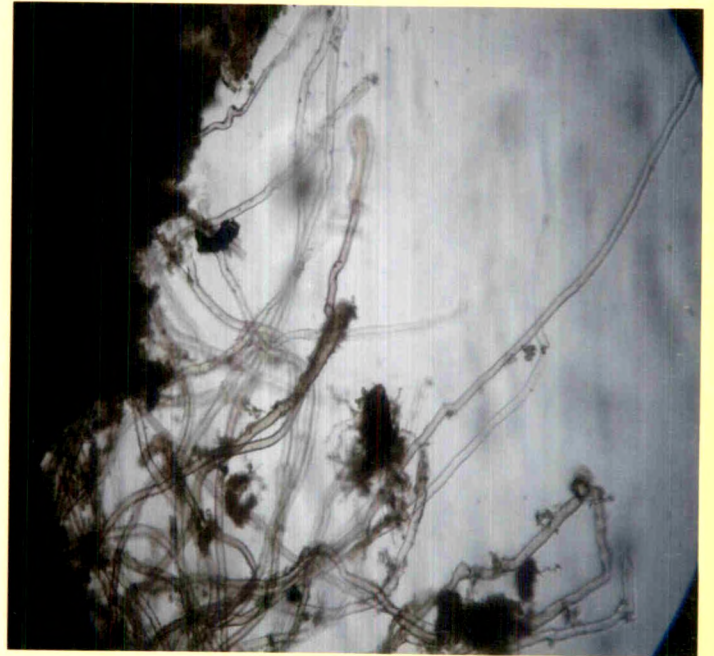
Plant branched, delicate, leaves with entire margin, large. Amphigastria broad and blunt, bifid. Stem prostrate. Rhizoid from base of amphigastria large distant, bifid not very deep basal cell thick. Leaves are sub orbicular, imbricate, base broad flat, margin entire, leaf apex rounded. Cells from leaf base are elongated and thick walled while cell from apical portion poly-hexagonal, thin walled. Antheridia on lateral branches. Archegonia in the axil of leaf. Sporophyte on ventral surface.

Habitat: On tree trunk.

Solenostoma fossombronioides Sch.



Plant 10X



Rhizoid 10X



Leaf cell 10X



Rhizoid with blunted end
10 X

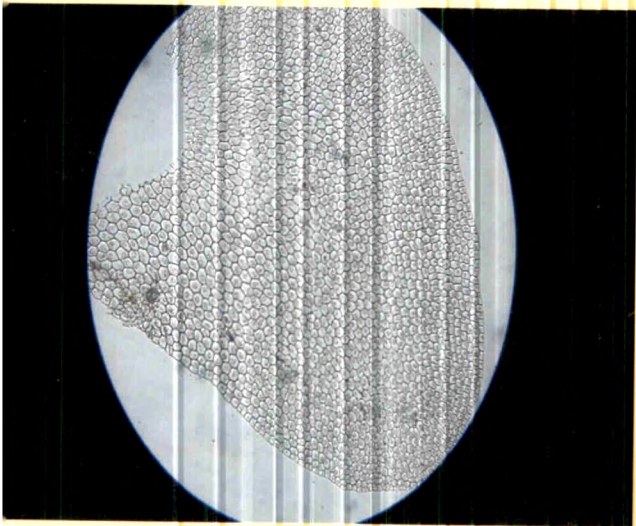
Harpejeunea indica St.



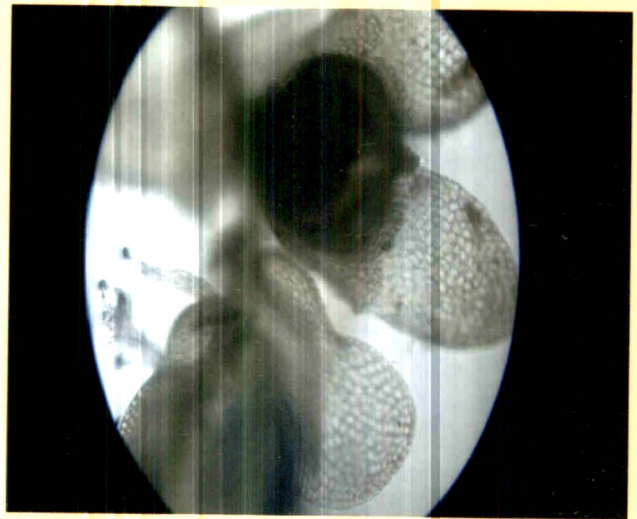
Natural habitat



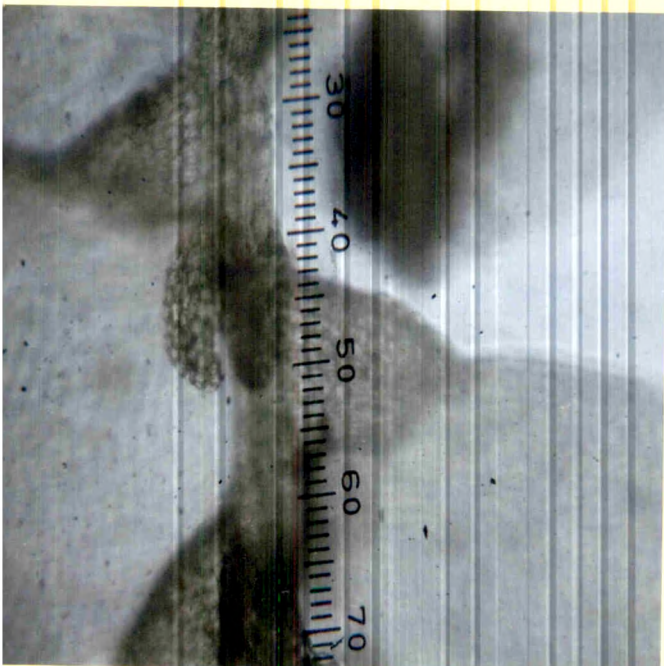
Rhizoid 10X



Single leaf cell 10X



Sporophyte 10X



An amphigastria 10X



Female shoot 10X



Family: Porellaceae

Plant large, stem usually regularly bi or tri pinnate. Rhizoids scarce, arising from the base of the amphigastria. Leaves incubous, antical lobe large, postical (lobule) flat, much smaller, nearly parallel to the stem. Amphigastria resembling the lobules but broader, frequently decurrently at the base. Androecia short, lateral bracts nearly equally bilobed, apposite.. Antheridia solitary. Archaeogonial clusters terminal on very short lateral branches; bract usually single pair. Perianth sub oval, more or less compressed. Capsule shortly pedicellate, globose, 4 valved, valve irregularly split. Elaters short trispiral.

Genus : *Porella* (L.)

The family is represented by a single genus *Porella* therefore Characters are same as family.

***Porella platyphylla* (L.) Dum**

Green on bark, stem 9 cm. Leaves arranged in three rows. The ventral leaves are well developed and usually decurrent at the base. The dorsal leaves are incubous and bilobed, closely and irregularly bipinnate, lower pinna short, upper long. The rhizoids are scarce and spring from the lower side of the stem in tufts generally near the base of the ventral leaves. The antheridia are in solitary. The archeogonia arise in a terminal cluster on small lateral branches. All the archeogonia in a cluster are surrounded by a common Perianth with a biabiate and dorsiventrally compressed mouth. Perianth pyriform mouth truncate, more or less coarsely dentate. The seta is short. Amphigastria lunate, inserted by a deep notch, longly decurrently on both sides, margin entire, apex rounded. Spore yellow 40 μ m diameter Elater bispiral 150 μ m long

Habitat: On bark of tree.

Class: Anthocerotae

Order : Anthocerotales

Class: Anthocerotae

Plant body simple, irregular green to dark green, only smooth walled rhizoides are observed, *Nostoc* colonies present. The sex organ sunken in gametophytic tissue. Sporophyte usually elongated, cylindrical. Sporangium with bulbous foot. Columella present (Except *N. leveri*.)

Order : Anthocerotales

Thallus without air- chambers and scales, but possessing slit like pores on the under surface. Each cell with a large chloroplast. Rhizoid smooth. Antheridia in cluster . in closed cavities near the dorsal side. Archegonia embedded in the tissue of the thallus on the dorsal side. Sporangium with bulbous foot, long capsule dehiscing from the apex downward by two valves. Columella well developed. (except in *Notothylas* where the columella is often absent). Capsule wall usually green. *Nostoc* colonies are often embedded in the thallus.

Family: Anthocerotaceae

Character same as Order.

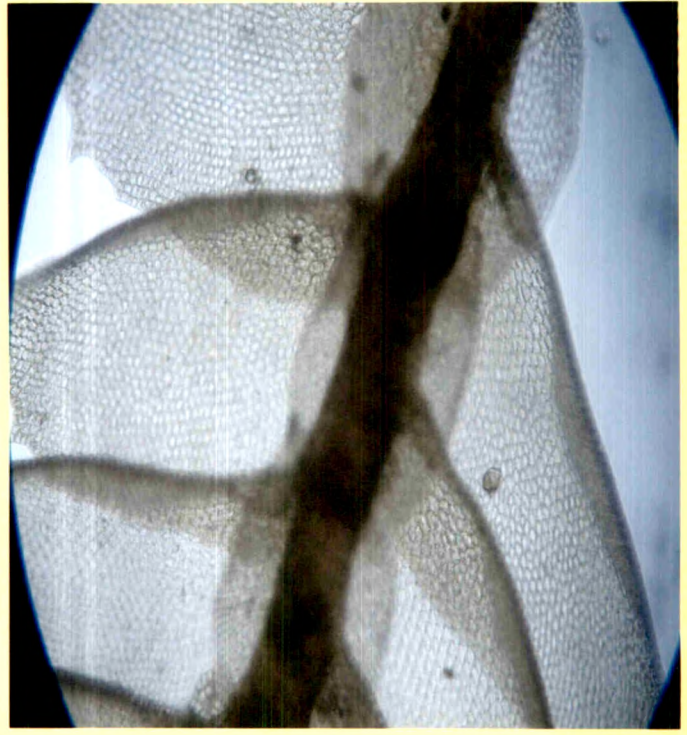
Genus : *Anthoceros* L.

Thallus sub orbicular lobes more divided, without sharp midrib. *Nostoc* colonies scattered in thallus. Capsule linear bi-valved much longer than involucre. Columella well developed. Pseudo-elaters with or without spiral band. Spores usually with various projections. Antheridia in closed chambers. Involucers dorsal cylindrical

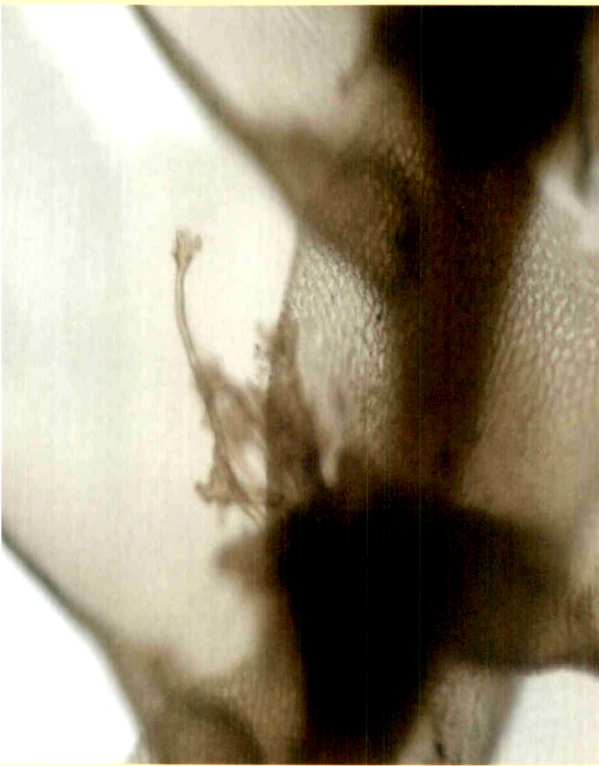
Porella platyphylla (L.) Dum



Plant with male & female bract



Arrangement of leaves
45X



Rhizoid 45X



Perianth 10X

Anthoceros erectus Kash.

Dioecious in dense cluster, thallus thick, fleshy canerous raised thick stalk like structure and expanding cup like body, more generally ascending or prostrate. margin arising from the base. Deeply lobed up to 8 mm broad. Male plant small. Transverse section show *Nostoc* colonies, large chambers in thallus filled with mucilage lumps. In section these chambers are very easily seen. Capsule slender, acute. Spores black 37 μ in diameter . Pseudo elaters thin walled 11 μ long, simple.

Habitat: Dense cluster on damp earth.

Genus : *Notothylas* Sull.

Plant thallose, thin, prostrate, much branched, thick at the base. Antneridia large, oval, shortly pedicellate. Capsule marginal, conical, with a large foot, never exerted, bi-valved. Stomata absent. Columella (except *N. levieri*) Androecial chamber often solitary . Spore large tetrahedral. Elaters equal. Spore yellowish.

Notothylas levieri Schiff (MS)

Dioecious, plant thin, delicate, closely overlapping in small thick patches. Largest plants circular up to 12 mm , smaller plants usually obovate, margin lobed, lobes narrow small *Nostoc* colonies scattered. Sporangia marginal between the lobes. Epidermis without stomata. Collumella absent. Four rows of special thick walled elongated cell along the margin of each valve Transverse section show *Nostoc* colonies. Only smooth walled Rhizoid are seen. Spore opaque, dark brown, minutely granulate 3 μ in diameter.

Habitat: on moist rock.

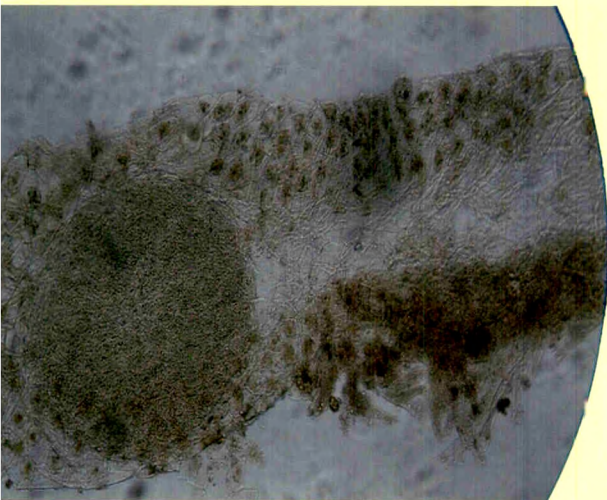
Anthoceros erectus Kash.



Plant in natural habitat



Cup like body



S with *Nostoc* colony 45X

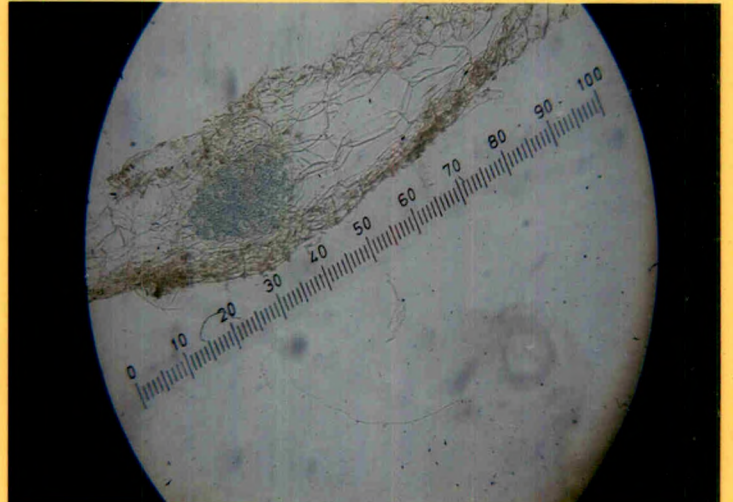


Spore and pseudoelater 45X

Notothylas levieri Schiff (Ms)



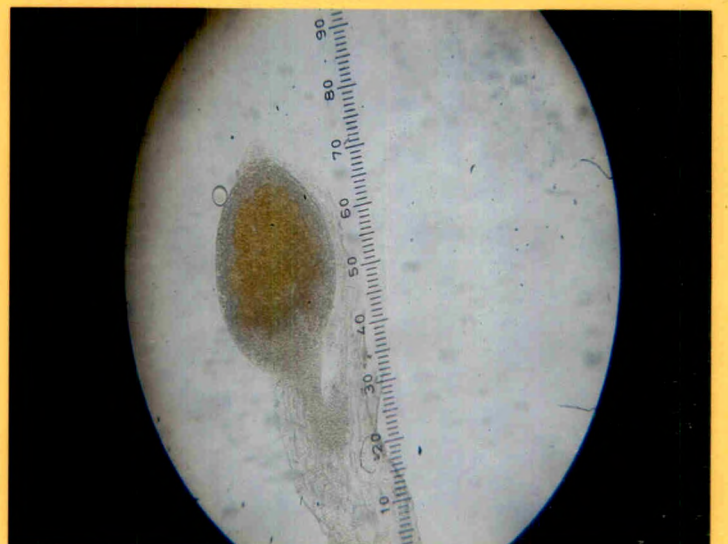
Natural habitat



T.S. with *Nostoc* colony 10X



Sporophyte 10X



L.S. of sporophyte 10X

