Study of gamatophytic structure of Riccia sp:

**Vegetative Structure:**

Plant body is thallose, dorsiventrally differentiated, prostate with dichotomous branched.

Each dichotomy is linear to wedge-shaped and the median portion is thickened. There is a prominent longitudinal furrow on the dorsal side.

The ventral surface bears a corresponding ridge and a transverse row of scales, one cell in thickness, which are more crowded near the apex and overlap the growing point. Lower down, the scales are in two marginal rows, violet in colour. In addition, there are two types of rhizoids – smooth walled and tuberculate, being on the ventral ridge of the thallus.

In T.S. through the thallus, the following layers can be seen:

(a) Dorsal side bears a tissue in which there are a few vertical rows of chlorophyllose cells separated by narrow vertical air canals, so that the top of the thallus is porose. This is chlorophyllose or assimilatory tissue.

(b) Ventral region of the thallus is formed by a compact colourless parenchymatous tissue which serves as the storage region and often contains starch. One cell thick scales and unicellular rhizoids (smooth walled and tuberculate) are developed from the outermost layer of the ventral surface. Upper epidermis is one layered with colourless cells. Air pores are bounded by four epidermal cells as seen in tangential section. Lower epidermis is a continuous layer.

**Reproductive Structure:**

Plants are mostly monoecious but rarely dioceious. Sex organs develop singly and acropetally in a linear row on the dorsal median furrow. The mature antheridium is stalked, pear-shaped and its single layered jacket (wall) encloses a number of sperm or androcyte mother cells.

Mature archegonium is flask-shaped with a short stalk, a swollen basal venter containing the large egg together with a ventral canal cell and an elongated neck containing a row of four neck canal cells. Sex organs are embedded within the thallus and included in air chambers (antheridial and archegonial chambers).

Sporogonium is somewhat round, sac-like and embedded within the thallus. It contains a single layered jacket (gametophytic cells) enclosing many spores which are often in tetrads. Mature spores show 3 layers exosporium (outer­most), mesosporium (middle) and endosporium (innermost). Spores often remain in tetrads.

**Identification:**

Thallus dorsiventrally flattened and prostrate; sporophytes simple and always of limited growth, columella absent inside capsule.

CLASS: HEPATICOPSIDA

Plant body prostrate, ribbon-shaped, dichotomously branched, dorsiven­trally flattened; dorsal tissue layers green and with air canals or cham­bers; thallus with scales and rhizoids on ventral surface, sex organs on dorsal surface (embedded), sporophyte devoid of columella or elaterophore.

ORDER: MARCHANTIALES

Sporophyte having only sac-like capsule and embedded within the gametophytic thallus; thallus dicho­tomously branched with sex organs along the entire length of the median furrow.

FAMILY: RICCIACEAE

Thallus linear to wedge-shaped internally composed of vertical rows of cells on the dorsal side, air canal present in between two vertical rows of cells; sporophyte sac-like and having one-layered jacket surrounding spores and nurse cells.

GENUS: RICCIA

*Object:* Study of external features of gametophyte of *Riccia* sp.

**Work procedure.**

Study the external features of the gametophyte, both from dorsal and ventral surfaces. Observe the two types of rhizoids and violet coloured scales.

**Comments**

1. The plant body is thalloid, dorsiventral, prostrate and ribbon-like.
2. A rosette is formed due to repeated dichotomies of the thalli.
3. The thallus is linear to wedge shaped with an apical notch at the apex and thickened midrib in the sagittal axis. On the dorsal side, the midrib is traversed by a mid-dorsal groove.
4. On the ventral side, scales and rhizoids are present. The scales are present at the margins. The rhizoids arise from the midrib region.
5. Each scale is violet coloured, multicellular and one celled thick.
6. Rhizoids are of two types--(i) smooth walled and (ii) tuberculate. The smooth walled rhizoids have inner smooth walls whereas tuberculate rhizoids produce tuber-like or peg-like ingrowths of their inner wall which project into the lumen of the rhizoids.
7. Sex organs are present in the mid-dorsal groove and are embedded in the thallus. The sporophytes, however, may be seen as black dots, when mature, under the dissecting microscope.

*Object:* Study of anatomy of thallus of *Riccia* sp.

**Work procedure**

Place the thallus in pith. Cut T.S. and stain either in safranin or fast green. Mount in glycerine and study.

**Comments**

1. The thallus is boat-shaped in a vertical transverse section.
2. It is thick in the midrib region and gradually thins out towards the margins.
3. The thallus is dorsiventrally differentiated into an upper green photosynthetic region and a lower colourless storage region.
4. The lower epidermis bounds the storage region on the lower side and bears the usual two types of rhizoids (smooth walled and tuberculate) in the centre.
5. The storage region consists of compactly arranged parenchyma. These cells contain starch.
6. The photosynthetic region consists of vertical rows of unbranched assimilatory filaments, separated by narrow air chambers. The cells of the filaments are barrel-shaped and each possesses numerous chloroplasts.
7. The air chambers open to the outside through simple air pores which are the intercellular spaces between the upper epidermal cells.
8. The uppermost cells of the assimilatory filaments are somewhat large. They lack chloroplasts and are thus colourless. These form an ill-defined upper epidermis.
9. On the two margins of the boat shaped section, violet coloured scales are present.

*Object:* Study of antheridium.

**Work procedure**

Cut L.S. of thallus through mid-dorsal groove. Stain in fast green, mount in glycerine and study the antheridia.

**Comments**

1. The thallus is monoecious, both the sex organs being situated in the mid-dorsal groove. *(R. bischoffi* and *R. curtisii* are dioecious).
2. The antheridium is present inside a cavity called antheridial chamber which opens outside by antheridial pore.
3. The antheridial chamber with antheridium, lies embedded partly in the tissue of the photosynthetic region and partly in the tissue of the storage region.
4. A mature antheridium consists of a small stalk and a globular or club-shaped body.
5. The stalk is short and few celled. The body is composed of a central mass of either androcytes or antherozoids, surrounded by a single layer of sterile jacket. The cells of the jacket are tangentially elongated.

*Object* : Study of archegonium.

Work procedure

Cut L.S. of thallus through mid-dorsal groove, stain the section in fast green, mount in glycerine and study the archegonium.

Comments

1. The thallus is monoecious and both the sex organs are situated in the mid-dorsal grrove.
2. A nearly mature archegonium is flask-shaped.
3. Archegonium is shortly stalked and consists of a broad venter and a long neck.
4. Wall of the venter is one celled. The venter has one venter canal cell and an egg cell.
5. The neck consists of 6 vertical rows of cells and is 6-9 cells in height. It possesses 4 neck
6. canal cells.
7. The neck is surmounted by four cover cells.
8. Before fertilization, all the axial cells except the egg cell degenerate and the cover cells spread open to facilitate the entry of antherozoids.

*Object* : Study the stmcture of sporophyte.

Work procedure

Cut L.S. of the thallus through mid-dorsal groove, stain in safranin or fast green, mount in glycerine and study the sporophyte.

Comments

1. The sporophyte is embedded in the tissue of the thallus. It is present in the venter of fertilized archegonium.
2. Sporophyte is represented only by the capsule, foot and seta being absent.
3. The young capsule has a jacket layer and a 2-layered calyptra, derived from venter.
4. The mature sporophyte has spore tetrads arranged tetrahedrally (except *R. pearsonii)* or spores. These remain surrounded only by outer layer of calyptra, the inner layer of calyptra and the jacket disintegrates.
5. The spores are discharged only after the disintegration of the thallus.
6. Each spore ranges from 0.05 to 0.012 mm in diameter and consists of spore wall, enclosing within a rich cytoplasm and a nucleus.
7. The spore wall is three layered. The outermost layer is the exosporium which is thin and cutinized. The middle mesosporium is thick and the innermost endosporium is thin and homogenous. The entire spore wall is irregularly thickened and folded.

**Identification**

Division-Bryophyta. (1) True roots absent, (2) True vascular

strands absent.

Class-Hepaticopsida. (1) Mostly thalloid, (2) Rhizoids without

septa, (3) Chloroplasts without pyrenoids, (4) No columella

in capsule.

*Order-Marchantiales.* (1) Scales present, (2) Two types of

rhizoids present, (3) Air chambers and air pores present.

Family---Ricciaceae. (1) Air pores are simple, (2) Sex organs

in the mid-dorsal groove, (3) Sporophyte composed only

of capsule, foot and seta being absent.

*Genus-Riccio:.* (1) Scales on the margins, (2) Assimilatory

filaments are unbranched and vertical.