Structure & Life Cycle of Anthoceros
Anthoceros
General Characters

Gametophytic Plant Body (The Adult gametophyte)

Vegetative Structure: External Features

- It occurs in moist, shaded habitats in sub-tropical and warm temperate regions.
- The gametophyte are dorsiventral and are often rosette-like.
- On the ventral surface, many smooth walled rhizoids are present which help in fixation.
- Scales and tuberculate rhizoids are absent.
Gametophytic Plant Body

Vegetative Structure: External Features

- Some species of *Anthoceros* are unisexual and others are bisexual.
- The antheridia and archegonia are sunken on the dorsal surface of the gametophyte.
- Numerous sporophytes may develop on the same gametophyte.
Gametophytic Plant Body

Vegetative Structure: Internal Features

- Thallus is not differentiated into photosynthetic zone and storage zone.
- All cells are green and contain chloroplasts.
- Chloroplasts are associated with pyrenoids which is a unique feature of Anthocerotales.
- There are no air chambers or pores.
- Schizogenous cavities filled with mucilage are present. These are often inhabited by Nostoc (cyanobacteria), which supply nitrogen through nitrogen fixation to their host plants.
Thallus showing mucilage cavity
Vegetative Reproduction:

- **Fragmentation** - occurs through progressive death and decay of posterior portion of thallus.

- **Tubers** – develop at the end of growing seasons. Under unfavorable conditions, they perennate and grow in the next growing season.

- **Gemmae** – borne on short stalks on dorsal surface and along margins of thalli. They detach and germinate to produce new plants.

- **Persistent growing apices**

- **Apospory** – from cells of sporophyte, usually from intercalary meristem.
Sexual Reproduction:

- It is oogamous type.
- Male sex organs are **antheridia** and female are **archegonia**.
- Formation of sex organs are dependent on specific photoperiods.
- Anthoceros being a short day plant, sex organs develop in winters.
Sexual Reproduction:

Antheridia

- Occurs on dorsal surface of thallus in an acropetal succession inside closed cavities called antheridial chambers.
- Group of antheridia inside antheridial chamber are called androecia.

P—351, fig. 4.4, 4.5
Sexual Reproduction:

Structure of mature antheridium

- It is differentiated into a long stalk and club-shaped body.
- The stalk is multicellular, slender and consisted of 4 vertical rows of elongated cells.
- The club shaped body of antheridium has single layered sterile jacket enclosing a mass of androcytes which metamorphose into biflagellated curved anthrozoids.
Sexual Reproduction:

Dehiscence of antheridium

- Mature antheridia comes to central position surrounded by young antheridia.
- The roof of antheridial chamber breaks and opens on dorsal surface.
- The antheridium absorbs water and distal cells of jacket separate creating aperture through which mass of androcytes ooze out.
Sexual Reproduction:

Archegonia

- These are embedded on dorsal surface of thallus in an acropetal succession near growing point.
- The archegonial chambers are absent.
- It is flask shaped consisted of neck and venter.
- It contains 4-6 neck canal cells, a venter cell and an egg.
- At maturity, the neck canal cells disintegrate and become mucilagenous.
- The mucilage if filled in archegonial cavity and forms a mound at its opening.
Fertilization:

- The anthrozoids swim in water film.
- Some of these reach mature archegonium.
- The mature archegonium is characterized by mucilagenous mound at its apex.
- The anthrozoids pass through mucilage and enter its wide open canal.
- Single anthrozoid fuses with egg to form a diploid zygote.
The sporophyte is differentiated into 3 distinct regions:

- **Foot:** It is basal, bulbous parenchymatous structure found deeply embedded in the gametophyte. It helps in attaching the sporophyte to gametophyte and in absorption of water and nutrients from it.
- **Intermediate or intercalary zone:** A narrow zone of meristematic cells located between the basal foot and the upper capsule. These cells help in the continuous growth of the sporophyte.
- **Capsule:** It is the fertile, major and conspicuous part of the sporophyte which is long and cylindrical. It is green when young, but turns grey or brown on maturity. The capsule is composed of the following structures:
Parts of Capsule

a) Columella: It is central solid core of sterile cells, consisting of 16 vertical rows of cells. It extends from the base to almost to the tip of the capsule.

b) Sporogenous tissue: It is the mass of fertile spore-forming cells surrounding the columella, like a dome. At the base of the capsule, it is single layered and called archesporium. It becomes 2-4 layered and develops into diploid spore mother cells upwards. Towards the tip of the capsule, the spore mother cells divide by meiosis and produce haploid spores. Along with spores, chains of sterile cells called pseudo-elaters are also present. They are without spiral thickenings and are nutritive in function.

c) Capsule wall: It is the outer wall of the capsule which is 4-6 layers in thickness. The outermost layer is called epidermis which is interrupted by stomata. The inner layers consist of chlorenchymatous cells and are photosynthetic. Therefore, the sporophyte of anthoceros is partially autotrophic or semi-independent.
Dehiscence of Sporophyte and germination of spores:

- The spores ripen and mature basipetally, from top downwards.
- The mature part loosens water, shrinks and ruptures or splits longitudinally, exposing the spores. The splits extend downwards.
- The exposed spores are blown away by the wind.
- The dispersed spores germinate during the next moist season.
- During germination, they absorb water and swell. The exospore ruptures and the endospore comes out in the form of a germinal tube.
- The tip of the germinal tube divides repeatedly forming a young thallus.