

(14)

* Structure of spore -

The spores are haploid, uninucleate, semicircular with triradiate mark. Each spore has two wall layers i.e. outer ^{thick} exospore and inner thin endospore. Inside wall layers, chloroplast, oil globules and food materials are found.

* Germination of spore.

After ^{liberation} germination, spore may germinate immediately (A. erectus) or undergo a resting period (A. fusiformis). At the time of germination spore absorb water and ^{exospore} ruptures at the triradiate mark. Endospore comes out in form of a germ tube which after many divisions forms Anthoceros thallus.

* Alternation of Generation in Anthoceros -

In the life cycle of Anthoceros, there is regular alternation of two morphologically distinct phases. One of these generations is haplophase (n) and the other is diplophase ($2n$).

Haplophase is dominant in Anthoceros and produces σ^7 & ρ^7 sex organs. These sex organs produce σ^7 gamete and ρ^7 gamete respectively. The fusion of the two forms a diploid ($2n$) zygote.

Zygote develops into sporophyte which produces haploid spores by meiosis in capsule. The spores (n) on germination forms the haploid gametophyte. Thus, Anthoceros shows alternation of generation in the lifecycle.

(12)

- On maturity the archesporium gives rise to spore mother cells ^(larger) and elater mother cells (smaller). which remain arranged in alternate layers.
- Spore mother cells are spherical/oval with dense cytoplasm and large nuclei. These all divide by meiotic division and form spore tetrads.
- Elater mother cells are elliptical with small nuclei. These cells divide and form ^{4-celled} elaters. Broken elaters are called pseudoeaters.
- In young stages the sporophyte is completely surrounded by involucre.

* Structure of Mature Sporophyte:-

The mature sporophyte consists of a bulbous foot and a smooth, slender, erect structure called capsule. Capsule varies in length from two to fifteen cm in different species. The whole structure looks like a "horn", hence, the species are called "hornworts". Each sporophyte is surrounded at its base by a tubular involucre.

~~Internal structure~~
A mature sporophyte has well developed bulbous (cup-like) foot and long, narrow and cylindrical capsule. ~~Though it is borne on gametophyte, yet it is not totally dependent on the thallus.~~

(i) Foot:- It is a rounded bulbous structure deeply embedded in the tissue of the thallus. It consists of a mass of parenchymatous cells. Foot has few rhizoids at the base. With the help of foot, sporophyte remains well anchored in the thallus.

19

On Line Study Material (e-content)

Name of the College: S.S. College, Jabod.

Date: 06.08.2020

Name of the Department: Botany

Time: 11.00-12.00

Subject: Bryophyta

Name of the Teacher: Dr. S.S. Sharma

Topic: Anthoceros; SPOROPHYTE


Class: B.Sc(Bot) H. - PI

Medium of Teaching: WhatsApp & College
Web-Site.

Biotechnology Sub - PI

ANTHOCEROS ; SPOROPHYTE.

(A) Development of sporophyte:-

- Zygote is the first cell of sporophyte. In Anthoceros, the first division of zygote is vertical rather than transverse as seen in other bryophytes.
- The second division is transverse so that a quadrant stage is formed. The upper two cells of quadrant are larger than the two lower cells. Again a vertical wall is laid down so that an octant is formed. Here, the eight cells are arranged in two tiers of four cells each. Further, development of sporophyte varies in different species.
- In A. erectus, the lower tier of four cells of octant forms the foot while the upper tier forms seta and capsule.
- In most of the species e.g. A. fusiformis, A. himalayensis and others upper tier of four cells divide by transverse division to form three tiers of four cells each. The lower most tier forms the ^{broad, bulbous parenchymatous} foot, middle tier forms meristematic zone  and upper most tier develops in to the capsule.

Seta is absent in Anthoceros sporophyte, instead a zone of meristematic cells is present, by the activity of which the capsule grows.

ii) Capsule:-

It forms the major and conspicuous part of the sporophyte. It is a long, slender, smooth, upright structure measuring up to 2-3 cm in length. The external structure shows tissue differentiation such as -

a) In the centre of the capsule there is a sterile mass of tissues known as "columella". It is usually 16-cells thick.

b) Surrounding the columella there is a cylinder of sporogenous tissue which is differentiated into alternative blocks of pseudobelters and spore tetrads.

c) The upper most layer consists of the capsule wall which is multilayered (4-6 layers of cells).

The outermost layer forms epidermis with distinct stomata. Cells below the epidermis contain chloroplast and perform photosynthesis.

Liberation of spores:- In dry condition the capsule dehisces by splitting into two halves exposing spores to the environment. Finally spores are shed by hygroscopic movement and dispersal takes place by air current.

- The uppermost tier of four cells which forms the capsule divide by one or two transverse divisions so that 2-3 tiers of cells are formed. This division is followed by periclinal division to form an outer amphithecium and inner endothecium. The entire endothecium develops into sixteen cells thick sterile columella.
- The amphithecium again divides by a periclinal division so that an outer sterile jacket initials and inner fertile layers are formed. It is called "archesporium".
- The cells of jacket initials divides by anticlinal and periclinal divisions to form 4-6 layered capsule wall. It is also known as epidermis and has stomata.
- In young sporophyte the archesporium overarches the columella. It may be single layered in thickness (*A. erectus*) or 2-4 layered (*A. hallii*) thick.

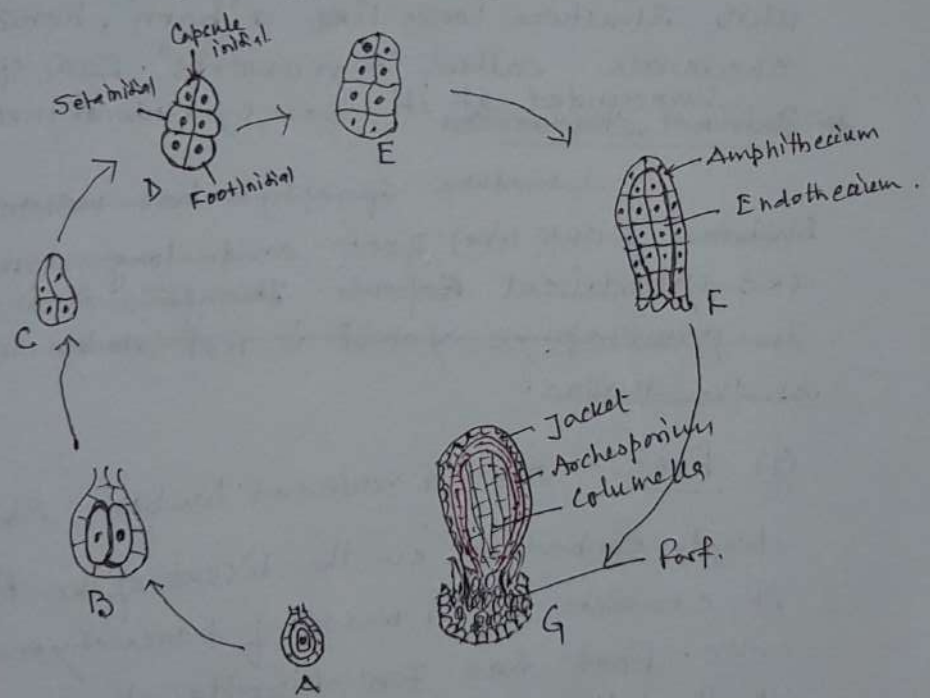


Fig. (A-G). Anthoceros: Developmental stages of sporophyte.