

Q. "Antheridia & Archegonia in Bryophytes are remarkably uniform in fundamental structure." Comment.  
or structure & position of sex-organ in Bryophytes.

Ans.

An important event in the life-cycle of gametophyte is the appearance of sex organ. The male & female organ formed respectively Antheridium & Archegonium, are remarkable uniform in fundamental structures throughout the bryophytes. They are generally provided with some protection. The protective devices concern & frequent aggregation of sex-organ in specialised part of the plant body commonly render the fertile region conspicuous. Although the essential organs of themselves are microscopic (Watson - 1971).

Structure of Antheridium:

The antheridium is a delicate sac including antherozoid-mother cells & ultimately matures male gametes. In its form it varies from sub-globose, oval or elliptical.

In most of the thalloid liverworts such as Riccia, Marchantia & Pellia, where the antheridia are sunk in antheridial cavity, the stalk is soft & bright & the antheridium is ovoid. In case of Pellia it is globose but the stalk is short.

In leafy liverworts (Junggermaniales) the antheridia are borne in the ~~axil~~ axil of concave leaf & the stalk is quite long. In case of Psella the wall of the antheridium may be locally 2 or 3 layers of cell thick (Parihar - 1956)

In case of Sphagnum the mature antheridia resemble those of leafy liverworts.

The shape of antheridium is also varies such as -  
a) Globose in Junggermaniales, Anthocerotales & Sphagnum  
b) sub-globose in Calobryum c) club shaped in many Marchantiales  
d) long narrow, elongated & club-shaped in Mosses.

The body of each antheridium consists of one layer of cell except Pellia, where it may be 2 or 3 layers. In case of Anthoceros the wall cell of antheridium consists of green plastids in young stage but becomes reddish or yellowish at maturity. Similar case is in Mosses (Funaria). The jacket of antheridium incloses a central mass of endocyte & each of them forms a single antherozoid. The antherozoids are generally cylinder & billiform. They are ciliated.

Position of Antheridium: → In most genera of mosses & liverworts dioecism is found i.e. antheridia & archegonia are found in separate patches or, separate thallus.

In Bryophytes the antheridium generally originates from a single cell normally superficial but in case of Anthoceros the antheridia is androgenous & are embedded in the dorsal surface of the thallus enclosed in cavity. This cavity may contain only one or, more than one antheridium.

The position of Antheridia in different members of Bryophytes (so far studied) may be discussed as follows: -

1. In thalloid liverworts: → In case of thalloid liverworts such as in Piccia the antheridia are enclosed in open antheridial chamber, they are scattered singly along the median line of the thallus. Each antheridial chamber consist of a single antheridium & the chamber open the surface of thallus by narrow canal. A/c to Watson (1917) "the sinking of Antheridium in pits or chamber provides protection & efficient discharge of antherozoids," such a position of antheridia is also found in case of Pellia:

(a) In some genera the antheridium is dorsal in position, also scattered along the mid-rib of gametophyte but they are not sunken. They are provided with a sessile flask-shaped involucre as in case of Sphaerocarpus.

(b) The further position of the antheridia can be noted with the presence of special short branches on which they are borne. These small branches may be known as

antheridiophore. The antheridiophore bear disc like structure of different shapes known as receptacle & here the antheridium is situated inside the antheridial chamber. In respect of the antheridiophore we find diff. variations in the member of Marchantiales as follows:—

- (1) In some member of Marchantiales are grouped in a sessile cushion like structure (Conocephalum).
- (2) In some cases the male receptacle are sub-sessile (Turmericia).
- (3) Where as ~~the~~ in case of Marchantia the antheridiophore is well developed, long & receptacle at the top of antheridiophore bearing the antheridia in definite & dorsal sequences.

2. In leafy-liverworts, (Jungermanniales): ✓

Antheridia are never embedded in the tissue of the Gametophyte but they come out in the axil of modified leaves. Known as Perigonial bracts. They may be single or in group.

3. In Sphagnales: → In case of Sphagnum the male branches are often conspicuous for their highly coloured leaves. Here also the antheridia is situated like the leafy liverworts.

4. In mosses: → In most of the Bryopsida (except Sphagnales) the antheridia are densely packed in a male receptacle, borne at the apex of the main stem or on the main branches (Funaria). The antheridium of mosses are surrounded by perichetial leaves forming a flower like structure, as such the apical cell of the branch bearing the antheridia is used up. However in case of Polytrichum the apical cell is not used up & there may be formation of another antheridial branch above the older antheridia. Protection of antheridia in mosses is provided by Bryophysis & Perichaetal leaf.

Structure of Archegonium: ✓

Position: → Like the antheridium Archegonium is normally originated from a single superficial cell but again Anthoceros is exceptional. In Anthoceros the archegonia is completely embedded in the tissue of the thallus. The position of Archegonia in bryophyte may be discussed as follows:—

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1. In thalloid liverworts, → (a) In Riccia the archegonia is borne singly & embedded in thallus at maturity. The antehedial chamber provide protection.
  - (b) In sphaerocarpaceae they are on the upper surface of the thallus, not embedded but provided with involucre.
  - (c) In Pellia the archegonia are form in groups of 4 to 12 on the dorsal surface of the thallus just behind the growing point they are also provided with involucre.
  - (d) In some Marchantiales as in Targionia small groups of archegonia are localised into definite areas of receptacle.
  - (e) In higher Marchantiales (eg - M. polymorpha) the archegonia are localised on special stalked archegoniophores. This is a specialised structure in respect of evolution of sexual structure in liverworts. In case of Marchantia spp. the young & mature archegonia are arranged ac to sequence of development i.e. youngest being nearest of the stalk.

2. In leafy liverworts, (Juggermaniales) → The archegonia is terminal in position & borne either at the apex of stem or branches. Here a small group of archegonia are found. In acrogynous form the apical cell is used up in the formation of archegonia. Protection is by involucre.

3. In Bryopsida, → In case of Sphagnum the position of archegonia is terminal & very similar to that of leafy liverwort.

4. In Bryidiales, → Here ~~the~~ also the situation is not very different but it is usual for large number to be involve i.e. even a cluster of 20-30 archegonia closely packed in the form of inflorescence, with Paraphysis are found in Funaria & Polytrichum.

Structure →

The archegonia is stalked, multicellular & generally flask-shaped organ. It has two essential parts. The basal, wide rounded venter which incloses the egg & the venter canal cell and the upper, long narrow neck. The archegonial jacket consist of an axial row of cells which are sterile. The neck consist of a variable no. of Neck-canal cells.

Each archegonia is a short stalk, in case of liverworts & Anthocerotopsida, But comparatively long &

massive in Bryopsida.

- (i) Ventral wall single layered in Marchantiales & Anthocerotales
- (ii) 2-3 layered in Jungermanniales.
- (iii) Generally 2 layered in Bryopsida.

Neck: →

(i) Generally short & narrow & sharply differentiated from the venter in case of liverworts & Anthocerotopsida.

(ii) In Bryopsida the Neck is long.

(iii) The Neck-canal cell single layered of 4 vertical rows of cells in case of Jungermanniales, 6 vertical rows of cells in Bryopsida & Marchantiales.

No. of Neck canal cell: →

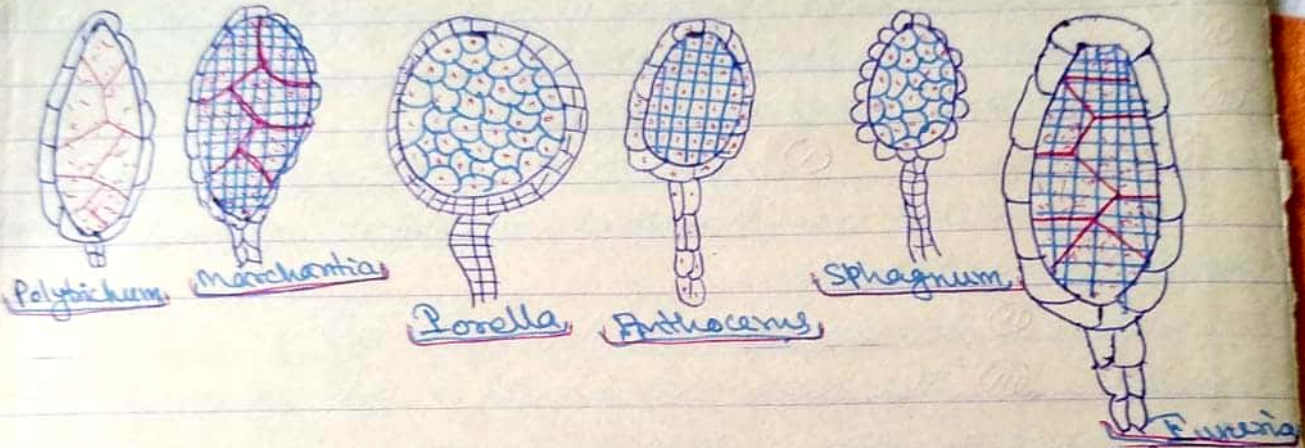
- (i) In Anthoceros the neck canal cell is only 4-6.
- (ii) In most of liverworts they are more in numbers but only 4 in some Marchantiales (Riccia).
- (iii) 10 or more Neck canal cells are found in some typical moss archegonia is more than 6 in most of the Bryopsida.

Conclusion: →

On the basis of above discussion it is evident that the structure & position of sex-organs in Bryophyte is vary greatly, but overall both sex's i.e. Antheridia & Archegonia are remarkable in structure.

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### Structure of Antheridium: ↴



### Structure of Archegonium: ↴

