



# Bhagalpur National College, Bhagalpur

(A Constituent unit of Tilka Manjhi Bhagalpur University, Bhagalpur)

PPT Presentation for B.Sc. I- Evolution of Bryophytes

## Evolution of bryophytes



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# INTRODUCTION



Bryophytes are small, non vascular land plants, that require water for reproduction. The defining features of bryophytes are that their life cycle featuring alternating haploid and diploid generations with a dominant, branched gametophyte stage. The term "bryophyte" has its origin in the Greek language, referring to plants that swell upon hydration.

# ORIGIN OF BRYOPHYTES

The bryophytes are quite soft and delicate and, therefore, they lack fossil records. All the views based on the evidence under the following three heads :-

- **Evidence from comparative morphology of the living plants**
- **Evidence from ontogeny of the living plants**
- **Evidence based on analogies with the living plants of other groups**

Bryologists are divided into two school of thoughts on the origin of bryophytes.

One school of thoughts support Pteridophytean hypothesis and one support Algal hypothesis of the origin of bryophytes.

## ❖ PTERIDOPHYTEAN HYPOTHESIS

According to this the bryophytes have been descended from pteridophytes by means of reduction. They formulated their argument on the basis of the following two features :-

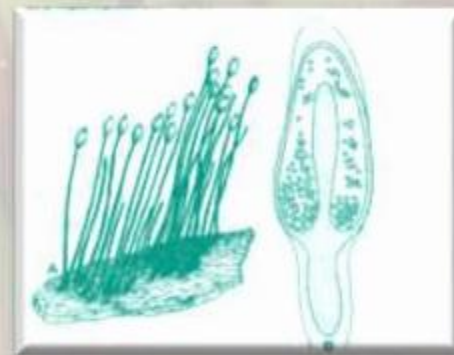
1. Close similarity between the sex organs of the two groups.
2. Resemblance between sporogonium of *Anthoceros*, *Sphagnum* and terminal sporangium of fossil pteridophytes – *Sporogonites* and *Horneophyton*



*Anthoceros*



*Sphagnum*



*Sporogonites*



*Horneophyton*

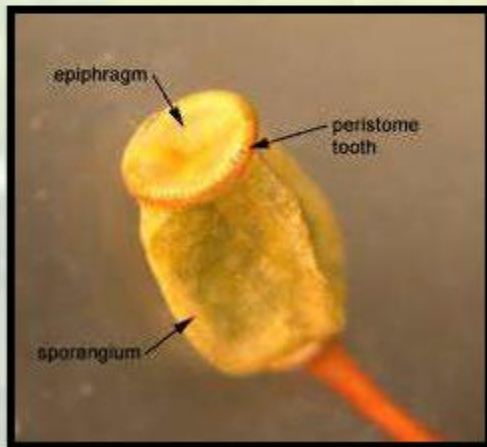
This theory is strongly supported by some of the scientists such as Lang(1917), Kidston and (1917), Scott(1923), Haskell(1949) and Kashyap(1919).

## Affinities

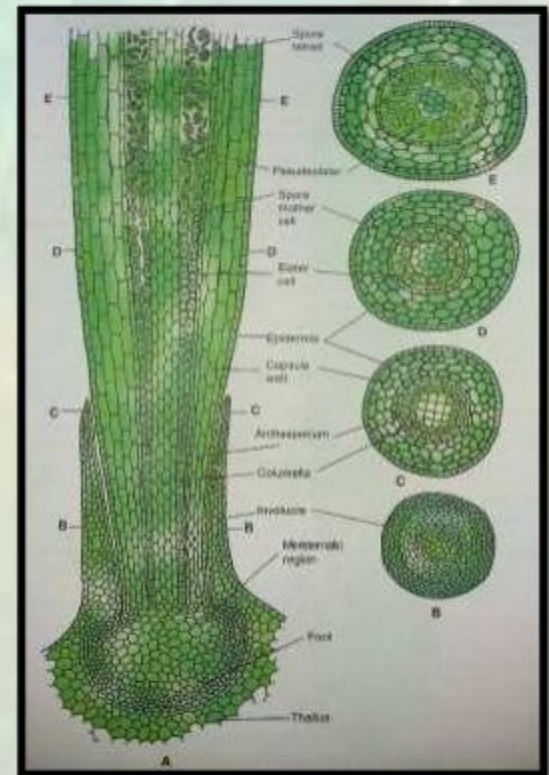
- Similarity of their pigments
- Structure of cell wall
- Food reserves
- Reproductive methods
- Life cycle

### Scott introduce the idea (1911)

- Presence of chlorophyll and plastids in the sporogonium of mosses and *Anthoceros*
- Presence of stomata on the sporogonium of *Anthoceros* and the apophysis region of capsule of mosses



Sporogonium of Mosses



L. S. of Sporogonium of *Anthoceros*

**Kashyap (1919)** →



**Haskell(1949)**- He advanced the origin of the bryophytes from the algae through the Psilophytales by simplification.

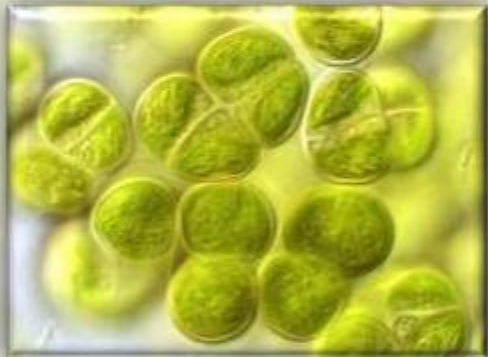


## ❖ ALGAL HYPOTHESIS

### *Similarities* ↪

- Amphibian nature
- Presence of flagellated spermatozoid
- Presence of free water at the time fertilization
- Alga like protonema

**Bower (1908):** Bryophytes show resemblance with green algae (Chlorophyceae)



- Photosynthetic pigments like chlorophyll  $\alpha$ , Chlorophyll b, Carotene, leutine and violaxanthin
- Starch as reserve food materials
- Filamentous protonema in the juvenile stage

## Fritsch's view (1916, 1945) based on comparative study of various algal groups →

- Gradual reduction of conductive tissue in aerial plants (as in Sargassum)
- Heterotrichous habit (as in chaetophorales)
- Parenchymatous structure of erect filaments ( as in Laminariales and Fucales)



Sargassum



Chaetophorales



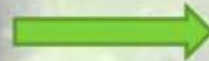
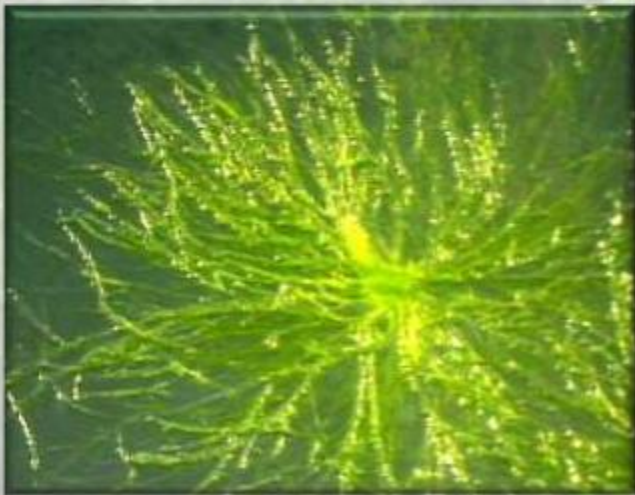
Fucales



## Smith (1955) →

Bryophytes have originated from **chlorophyceae**, primitive form established in area having plenty of water and gradual changes from aquatic to terrestrial, this led to the establishment of more massive plant body and abundance of moisture

As per Smith, *Fritschiella*; a member of chaetophorales may be probable nearer to the primitive ancestor for bryophytes



Again the supporters of this hypothesis also believed that sex organs of Bryophytes have been evolved from *Ectocarpus* algae.

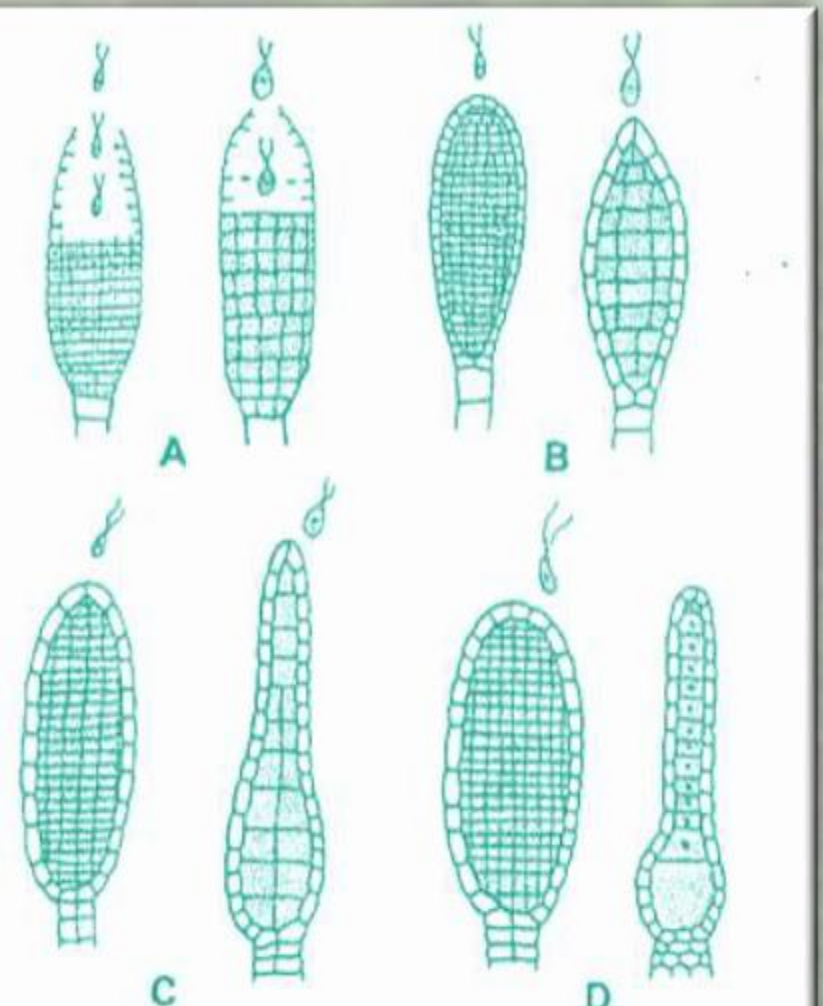


Fig. Origin of bryophytes. Diagrams (A-D) illustrating the hypothetical origin of the antheridium and archegonium from the plurilocular sporangium of certain Phaeophyceae (*Ectocarpus*).

## ❖ EVOLUTION OF BRYOPHYTES

There are two theories regarding Evolution of bryophytes:

- I. The first theory is **Up-grade or Progressive evolution theory**
- II. The second one is **Down-grade or Regressive evolution theory.**

### ➤ Progressive evolution theory

There is progressive evolution which means that it starts with simple forms and terminates in complex forms. **Cavers(1910)** **Campbell(1940)** and **Smith (1955)** supported this.

This theory revealed that the first evolved bryophyte was *Sphaero-Riccia* a hypothetical type which combined the present day Genus *Sphaerocarpos* (Proskauer,1954).



**Carves(1910)** Proposed progressive Theory and showed a Phylogenetic line of Evolution in bryophytes.

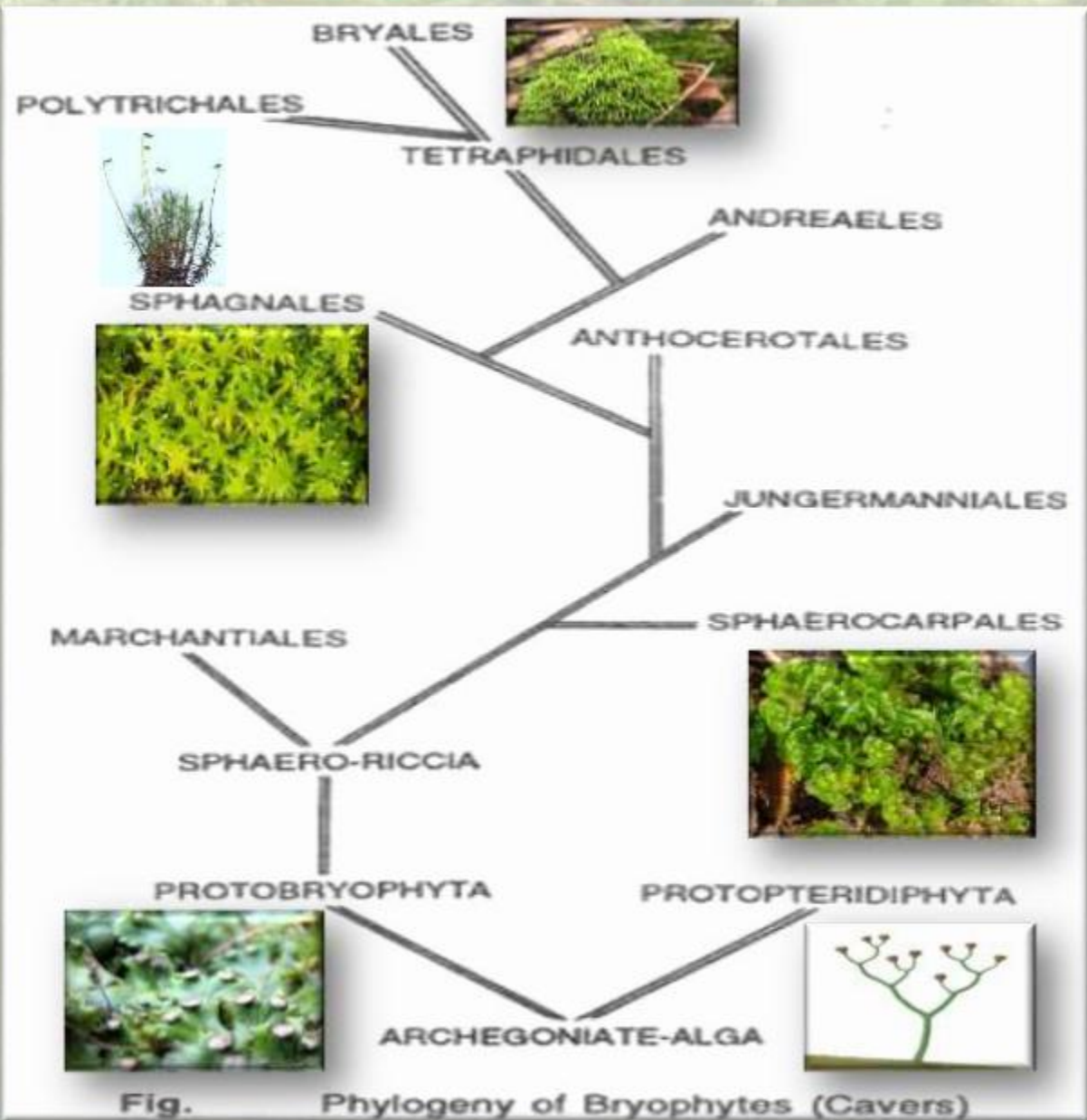
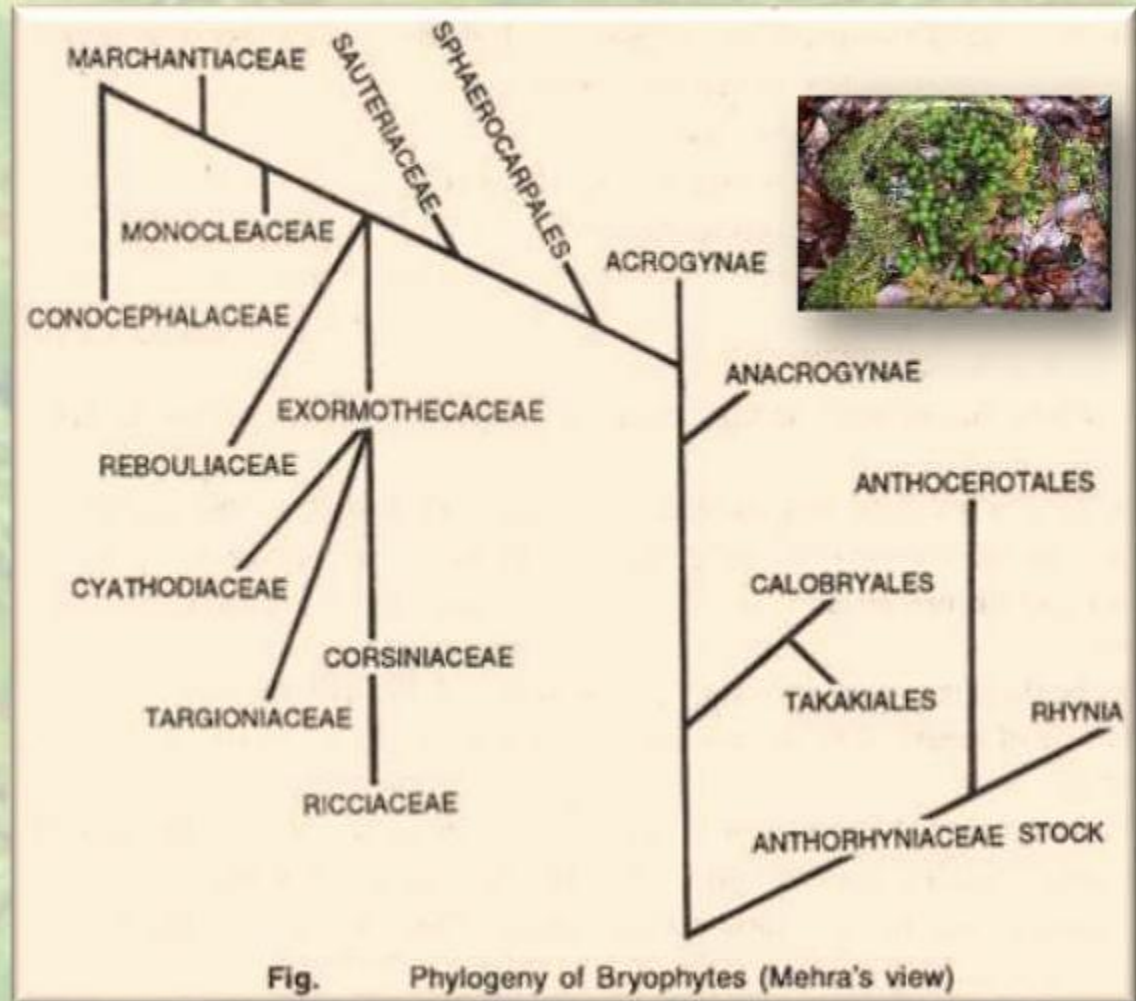


Fig. Phylogeny of Bryophytes (Cavers)

## ➤ Regressive (Down-Grade) Evolution Theory

The primitive bryophytes were mass-like in appearance.

This view has been supported by **Wettstein (1908)**, **Kashyap (1919)**, **Praskauer (1960)**, **Zimmerman (1966)**, **Mehra (1957)** etc.



# PRESENT DAY CLASSIFICATION OF BRYOPHYTES

## Bryophyte

### Hepaticopsida

330 genera; 8000 species



#### Order

Calobryales (Moss like hepatics)

Jungermanniales (Scale moss hepatics)

Metzgeriales (Multiform thallus)

Marchantiales (Chambered hepatics)

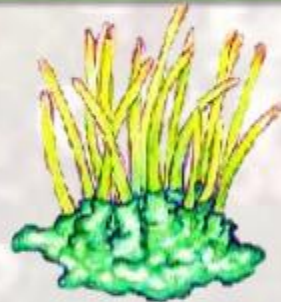
Sphaerocarpaceales (Bottle shaped)

Monocleales (Giant thallose)

Based on the structure of gametophyte

### Anthocerotopsida

7 genera and a single order



#### Order

Anthocerotales

### Bryopsida

700 genera 14000 speceis



#### Order

Spahagnales

Archidiales

Tetraphidiales

Andreales

Bryales

Polytrichales

Takakiales

Based on the characters of gametophyte and sporophyte, especially peristome



THANK  
YOU ALL