BRYOPHYTA

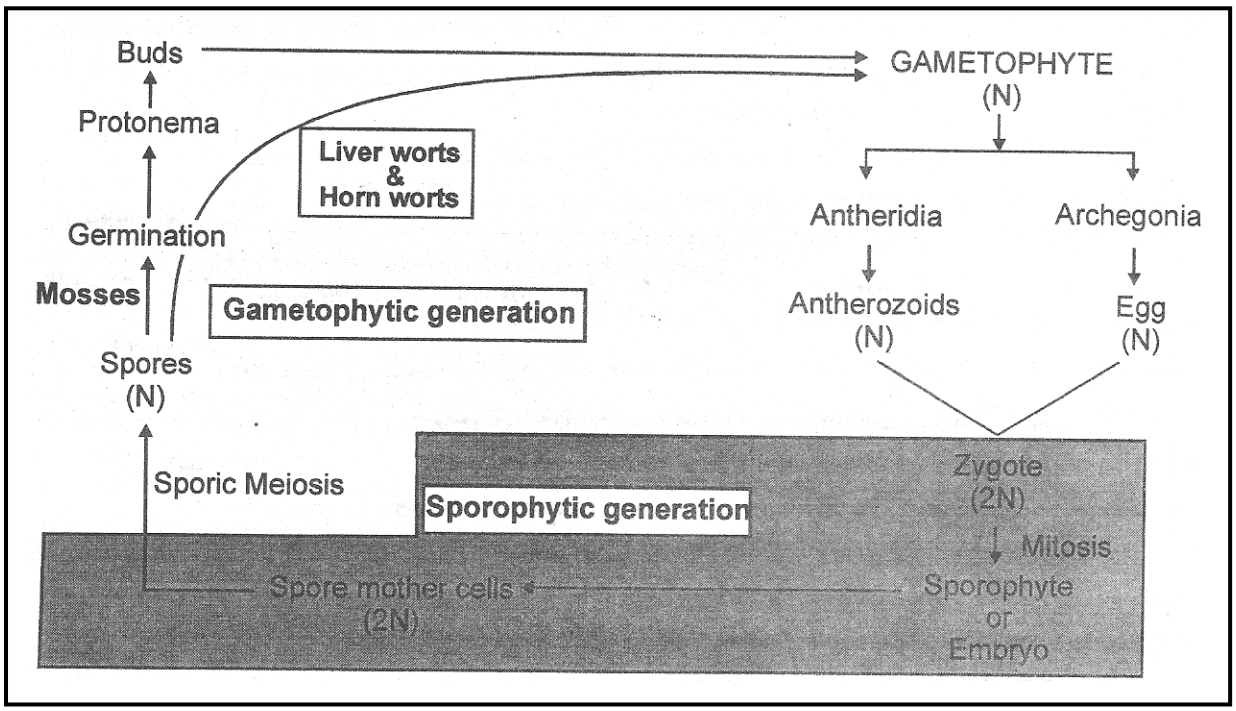
- The term **"Bryophyta"** was proposed by **"Robert Braun"**
- The study of Bryophytes is known as **Bryology.**
- **Hedwing** is considered to be the father of Bryology. But according to some scientist it is believed that **Cavers** is the father of Bryology.
- Father of Indian Bryology is **Prof. Shiv Ram Kashyap**

General characteriltics:

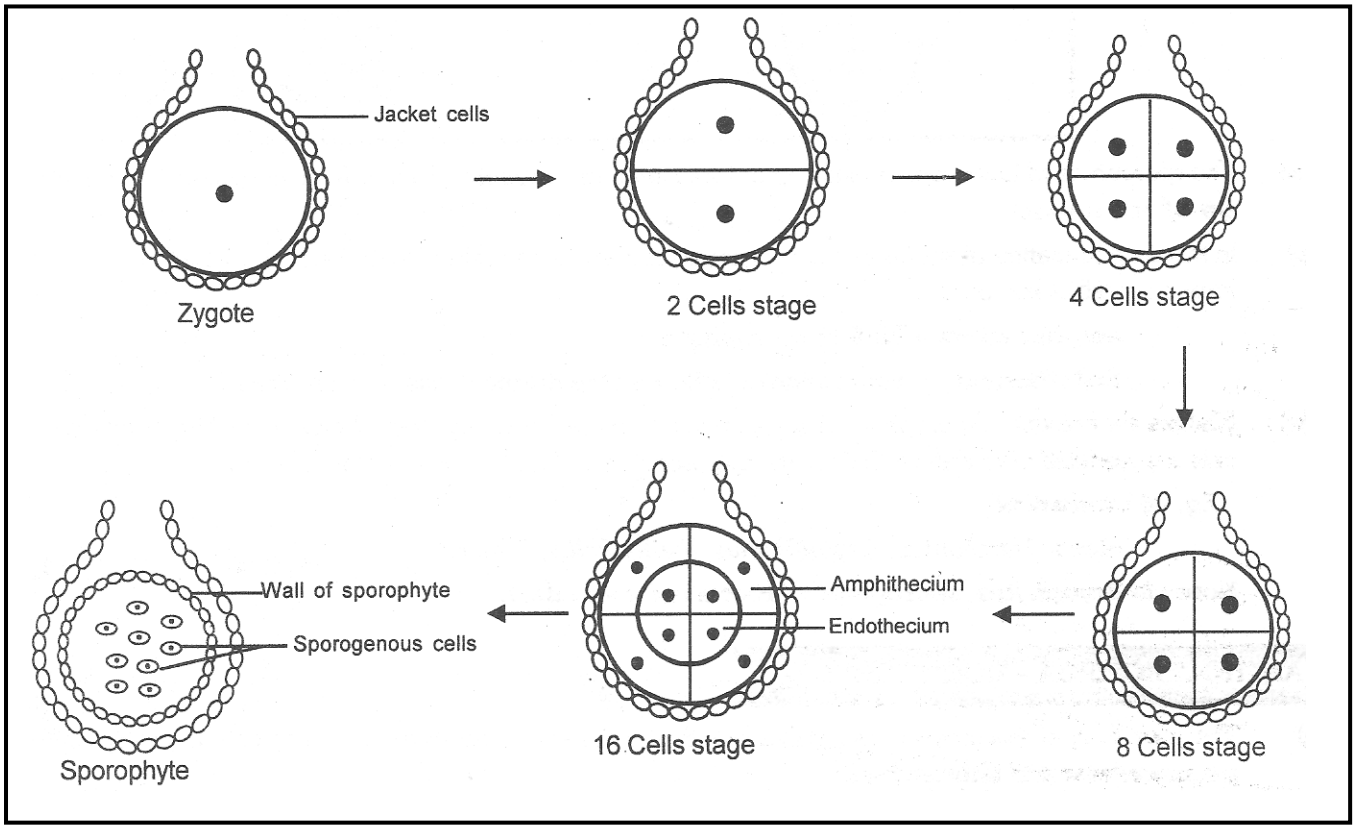
1. Bryophytes are the first land plant. It is believed that, they **originated from aquatic plant** and they come on land through water. Because some bryophytes have characters similar to aquatic plants (eg. presence of air canal)
2. Bryophtes are known as **amphibians** of the plant kingdom, because they need water to complete their life cycle. Mostly bryophytes are found on land.
3. Bryophytes are not considered as the successful land plants because **vascular tissue** is absent and they nead water for fertilization. Due to the absence of vascular tissue bryophytes can not grow very tall. The process of water conduction in bryophytes takes place with the help of **parenchyma.** Parenchyma is a living tissue.
4. Roots are absent in bryophytes. Stem and leaves of bryophytes are functionally similar to the stem and leaves of higher plants.
5. Bryophytes are sciophytes, i.e. bryophytes prefer to grow in moist (wet) and shady places.

Life cycle of Bryophytes :

1. The plant in bryophyte is gametophyte. It is haploid.
2. Sex organs re formed on gametophyte. Sex organs are multicellular and jacketed in bryophytes. Male sex organs are called as antheriudium and female sex organs are called as archegonium.
3. The male gametes of bryophytes are motile. These motile male gametes are called as **antherozoids,** Antherozoites re **comma shaped** and **biflagellate.** Female gamete is called **egg.**



4. In Bryophyta, fertilization is done by **zoodiogamy** i.e. male gamete reaches the female gametes and fertilizes it.
5. As a result of fertilization, a diploid zygote is formed. This zygote initiates the sporophytic generation. Sporophytic generation is a diploid stage.
6. Zygote is developed by mitosis and formes sporphyte, which is known as sporogonium or embryo (2N)
7. During the development first division is **transverse** in zygote and second division is **vertical.** Third division is also vertical but at right angle to second division, therefore an **eight called** embryo is formed.
   Now a periclinal division takes place in every cells of eight called embryo. As a result of it a 16 called embryo is formed. Now these sixteen cells are arranged in two layers.
   (i) Outer 8 cells - Called Amphithecium
   (ii) Inner 8 cells - Called Endothecium
8. Now cells of endothecium divided and form many cells which are known as sporogenous cells. Some sporogenous cells become sterile and called nurse cells.
   Remaining sporogenous cells function as spore mother cells. Now meiosis takes place in spore mother cells, result of it haploid spores are formed. Nurse cells provide nutrition to spores mother cells.
9. The germination of spores is **direct** or **indirect.** In **Liverwort** & **Hornworts** the germination of spore is direct i.e. each spore forms a gametophyte after germination i.e. each spore forms one thallus.



But the germination of spores in **Mosses** in indirect. In **mosses** a multicellular filament in formed after the germination of spore. This filament of known as **protonema.** Now **buds** are formed on every cells of protonema. Each bud develops and form a gametophyte plant. Indirect germination is **best** for survival. Mosses are **gregarious** in nature because they appear in group.

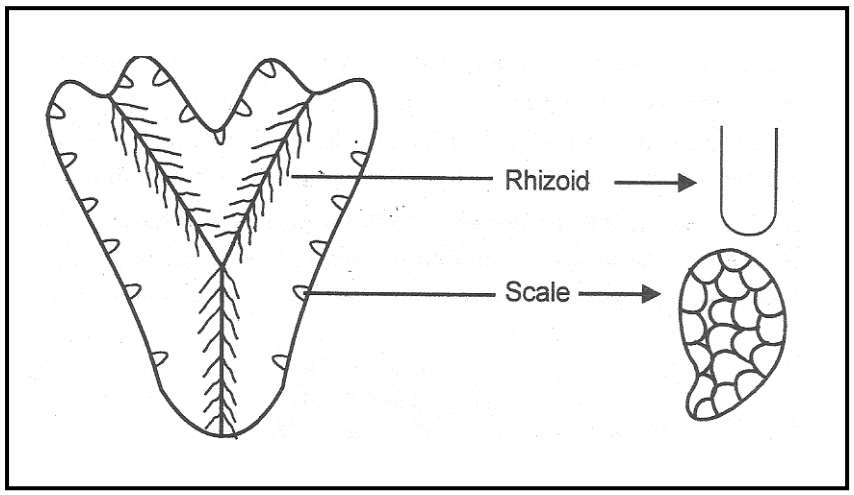
- **Sexual reproduction in bryophytes in oogamous type and life cycle in halplodiplontic type.**
- **In Bryophyta the sporophyte is depend on gametophyte This is a unique character of bryophyta.**

Bryophyta is divided in to three classes

1. Hepaticopsida	2. Anthoceropsida	3. Bryopsida or Musci

HEPATICOPSIDA- LIVAR WORTS

(i) All the bryophytes includes in this class have shape like **liver** so they are known as liverworts.
(ii) Plant body of this group is thallus like. Rhizoids and scales are present on thallus. Rhizoids are **unicellular** and **unbranched.** Scales are **multicellular.**
(iii) The sporophyte of Liverworts is **completely depend** on gametophyte i.e. it is depend on gametophyte for food, water and habitat.



(iv) The sprophyte of Liverwort is made up of **foot, seta** and **capsule.** (Except ***Riccia sprophyte is made up of*** only capsule).

(v) In this class formation of spores and nurse cells takes place by the cells of endothecium. Cells of emphithecium form only wall of sporophyte.
Amphithecium = Wall of sprophyte
Endothecium = sporogenous cells = spore mother cells + nurse cells

(vi) **Elaters** are present in sporophyte of some members of liverworts. (eg. ***Marchantia*** - In ***Marchantia*** nurse cells are modified in to elaters) Elaters are hygroscopic and they help in dispersal of spores.
Eg. Of Liverworts –

Riccia, Marchantia, Cryptothallus, Reilla, Pellia, Porella
Note : In Bryophytes, sporophyte of Riccia in the simplest.

ANTHOCEROPSIDA- HORNWORTS

(i) The plant body of this group is also thallus like. Scales are absent but rhizoids are present on thallus. Rhizoids re **unicellular** and **unbrahcned.**
(ii) The sprophyte of Hornworts is divided into **foot and capsule.**
(iii) The sporophyte of Hornworts is not completely depend on its gametophyte i.e. it is **semiparasite** because its sprophyte is photosynthetic therefore it can manufacture its own food. So it does not depend on gametophyte for food, It depends only for water and habitat.
(iv) In horn worts wall of sporophyte and spores are formed by cells of amphithecium. Cells of endotherium formed only elaters.

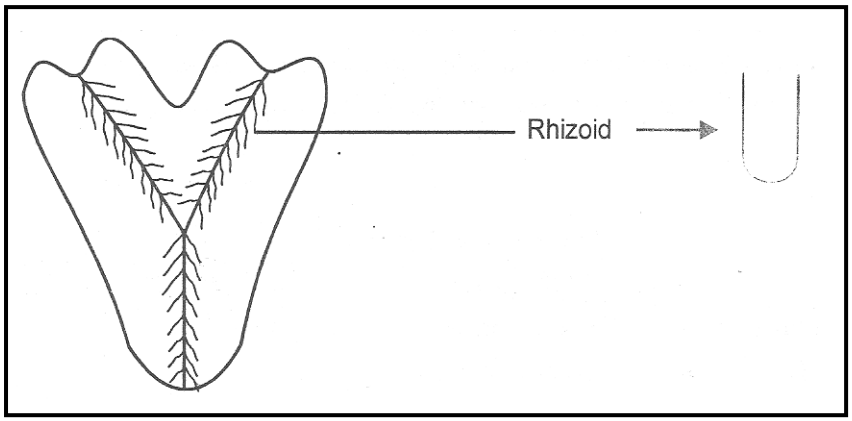
Amphithecium = Wall of sprophyte and spores

Endothecium = Elaters

(v) In hornworts spore forming cells and elaters forming cells are separate, so elaters are known as **pseudoelaters.** Pseudoelaters are structurally and functionally similar to true elaters.

(vi) In hornworts on the basal part of sprorophyte, a special type of **meristem** is present. Due to the activeness of this meristem, the sporophyte grows rapidly. It grows like the horn, of animals.

eg. ***Notothylus, Anthoceros***



Note : ***Anthoceros*** have some Algal like characters such as -
(i) Archegonia is jacketless
(ii) In each cell of *Anthoceros,* only one chloroplast is present which is a character of green algae. In the cells of higher plants, many chloroplast are present.
(iii) Pyrenoides (starch storing granules) are present in the chloroplast of *Anthoceros,* which in an algal character.
(iv) *Anthoceros* show ancestral characters i.e. bryophytes have originated from green algae.
Note : Due to these reasons class anthoceropsida also termed as synthetic archegoniatae.

BRYOPSIDA OR MUSCI- MOSSES

(i) All the **Mosses** are included in this class. The plant body of mosses is made up of **stem, leaves** and **rhizoid.** The Rhizoids present in the plants of this class are **multicellular** and **branched.** These rhizoid have **oblique septa.**

Note -
The **presence of leaves** in gametophyte is one of the unique character of Moss. In plant kingdom not a single gametophyte has leaves.

(ii) The sporaphyte of mass is brophyta is highly developed while the sprophyte of liverwort is the simples. The sporphyte of moss is divided into foot, seta, capsule.

(iii) The sporophyte of mosses is also **semparasite** like, hat of Hornworts. i.e. it is photosynthetic. The sporphyte absorbs the water from gametophyte with the help of foot.

(iv) **Capsule** is the **fertile part** of the sporophyte i.e. formation of spores takes place in it. **Foot** and **seta** are the **sterile part** of the sporophyte.

(v) Seta helps the capsule to remains in the air, due to which the dispersal of spores can take place conveniently.
(vi) In bryopsida cells of amphithecium form wall of sprophyte. Cells of endothecium form spores. Elaters and nurse cells re absent in bryopsida.

Ampithecium = Wall of sporophyte
Endothecium = Spores

Note :

(1) In ***Riccia,*** the sporophyte is made up of only capsule i.e. the whole sprophyte is **fertile** in it.

(2) During evolution there occur **gradual sterilization** of sporophyte i.e. gradual reduction of fertile part and gradual development of sterile part.

(3) Asexual reproduction in ***Marchntia*** takes places by fragmentation of thalli, or by the formation of specialized structures called **gemmae** (sing, gemma) Gemme are green, multicellular, asexual buds, which develop in small receptacles called gemma cups located on the thalli. The gemmae become detached from the parent body and germinate to form new individuals.

Eg. of Mosses :

- **Funari** - Rope moss or Cord moss
- **Andria** - Granite moss
- **Polytrichum** - Hair cupt moss
- **Fontinalis** - Brook moss
- **Dawsonia** - Australian moss - The highest bryophyte - 45 cm.
- **Buxbaumia** - Saprophytic moss - Phtosynthesis absent
- **Sphagunum** -

- **Bog moss** - It likes to grow on acidic bog.

- **Quaking bog**

- **Carpet moss or Turf moss -** It spreads like a carpet on bog due to which, the swamp cannot be easily seen.

- **Peat moss -** It is a fossil fuel that obtained from bog. The formation of peat takes place by the fossilization of ***Sphagnum. Sphagnum*** grows in acidic bog. The number of bacteria are lass in bog due to which the degradation of dead cell could not takes place. Hence it is present in the form of fossil.

- **Absorbent cotton - Sphagunum** can absorb water in very high amount. Therefore it is used in the form of absorbent cotton in Europe.

HABITAT OF SOME IMPORTANT BRYOPHYTES –

(1) Some bryophytes are found in water.

eg. ***Riccia fluitant, Riccia obuensis.***
Ricciocarpus natans, Riella, Fontinalis

(2) Some bryophytes are found in epiphytic form i.e. they grow on other plants -

eg. Dendroceros

(3) Some bryophytes are saprophytes (Non photosynthetic)

eg. Buxbaumia and ***Cryptothallus***