



Learning Objectives: At the end of the session, you will be able to:

- ✓ Explain the basic structure of Bryophyta & Pteridophyta.
- ✓ Differentiate between Bryophyta & Pteridophyta.
- ✓ Explain the modes of reproduction in Bryophyta & Pteridophyta.
- ✓ Explain economic importance of Bryophyta & Pteridophyta.
- ✓ Elucidate the life cycle pattern of Bryophyta & Pteridophyta.

DISCUSSION:

BRYOPHYTES : (Mosses & Liverworts)- Advancement over Algae.

- ☞ Bryophytes are commonly called 'Amphibians of plant kingdom' that grows in damp, humid places. They lack true roots, stem or leaves but are attached to substratum by Rhizoids (unicellular or multicellular). Main plant body is haploid & represents Gametophyte as it produces Gametes.
- ☞ Sex organs in bryophytes are multicellular.
 - **Male Sex Organ** is **Antheridium**- produce **numerous biflagellate antherozoids**.
 - **Female sex organ** is **Archegonium** (flask-shaped)-**produces a single egg**.

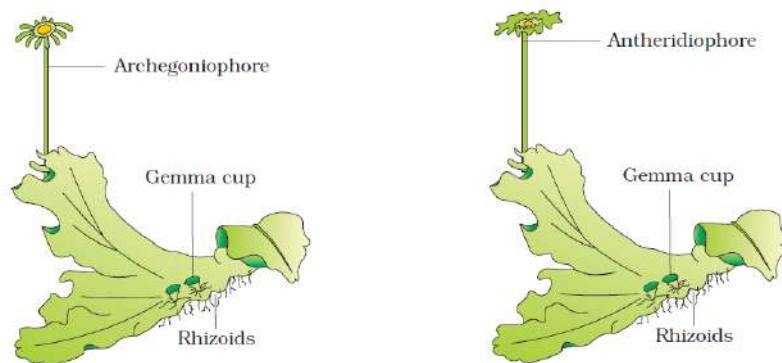


Fig: *Marchantia* (a) Female thallus

(b) Male thallus

- ☞ The antherozoids are released into water where they come in contact with archegonium to form Zygote.
- ☞ Zygote do not undergo meiosis immediately but divide to form **Multicellular Sporophyte**(remains attached to free living gametophyte)
- ☞ Some cells of Sporophyte develop & undergo meiosis to form haploid Spores that divide mitotically to form **gametophyte**.

@26.03.2020

ECONOMIC IMPORTANCE OF BRYOPHYTES

- ✓ **Food** for **herbaceous mammals** & birds.
- ✓ Sphagnum in form of peat is used as fuel and also used for trans-shipment of living material as it has water holding capacity,
- ✓ Mosses forms dense mat over rock & so prevent soil erosion,
- ✓ Mosses helps in **Pedogenesis**(Soil formation)
- ✓ Mosses along with lichens are first **colonizers on barren rocks**.(Ecological Succession)

BRYOPHYTA IS DIVIDED INTO TWO CLASSES

LIVERWORTS: (Riccia & Marchantia)

Habitat- moist, shady habitats such as banks of streams, marshy ground, damp soil, and bark of trees and deep in the woods.

Plant Body: Thalloid body, dorsiventral & appressed to substratum, e.g. Marchantia. Leafy members have tiny appendages in two rows on stem like structure.

Reproduction:

Asexual:

- ✓ By fragmentation of thalli, or by the formation of specialized structures called **gemmae** (sing. gemma).
- ✓ **Gemmae** 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

Sexual:

- ✓ Male and female sex organs are produced either on the same(Homothallic) or on different thalli.(Heterothallic)
- ✓ Antheridium releases antherozoids in water to reach oogonium fertilizes to form Zygote that forms
- ✓ multicellular sporophyte.
- ✓ The **sporophyte** is differentiated into a **foot, seta and capsule**.
- ✓ **After meiosis, spores** are produced **within the capsule**.
- ✓ These **spores germinate** to form **free-living gametophytes**.



MOSSES (Funaria, Polytrichum and Sphagnum)

Habitat: Damp places, rocks and humid shaded area

Plant Body: two forms

- ☞ **Filamentous protonema (developing directly from spore)** – creeping, green, branched, stage
- ☞ **Leafy stage** (develops from secondary protonema as lateral bud) having spirally arranged leaves & attached to soil by multicellular Rhizoids. **This stage bears Sex Organs**. e.g., **Funaria**.



@26.03.2020

Reproduction:

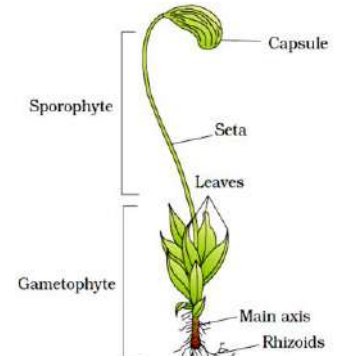
Asexual:

- ✓ fragmentation and budding in the secondary protonema

Sexual:

- ✓ Sex organs antheridia and archegonia are produced at the apex of the leafy shoots (**Leafy Stage**).
- ✓ After fertilization, the zygote develops into a **sporophyte**, consisting of a **foot, seta and capsule**.
- ✓ The sporophyte in mosses is more elaborate than that in liverworts. The capsule contains spores. Spores are formed after meiosis. **The mosses have an elaborate mechanism of spore dispersal.**

Examples of mosses are **Funaria**, Polytrichum and Sphagnum



Funaria, gametophyte and sporophyte

P^TERIDOPHYTES (horsetails and ferns)

Pteridophytes are first terrestrial plants to possess vascular tissues – xylem and phloem & can disperse spores. pteridophytes are flowerless & seedless plants and so they are sometimes referred to as "cryptogams", meaning that their means of reproduction is hidden.



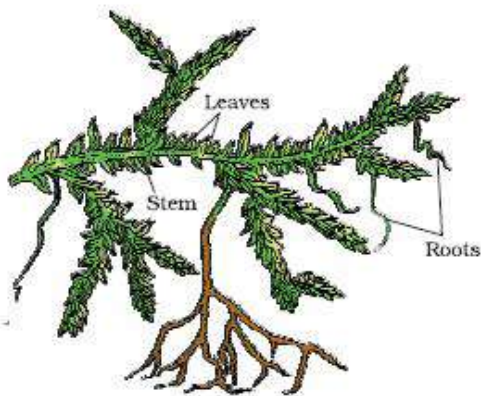
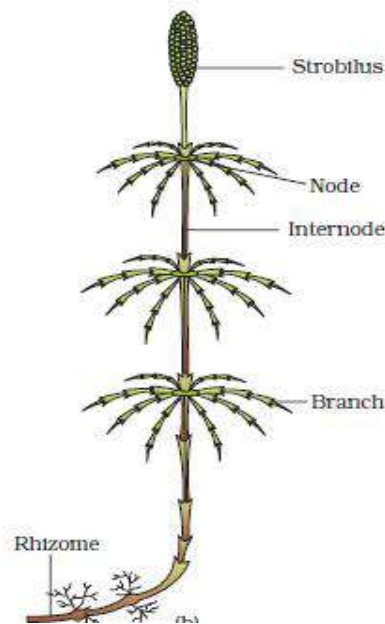
Habitat: cool, damp, shady places though some may flourish well in sandy-soil conditions.

Plant Body:

- ✓ Main plant body is sporophyte which is differentiated into true stem and leaves. It possesses true Vascular Bundle
- ✓ Leaves may be small (**microsporophyll**) as in **Selaginella** or large (**macrophyll**) as in **ferns**.
- ✓ Sporangia having spores are subtended by leaf-like appendages called sporophylls. (Sporophylls may be arranged to form **strobili** or **cones** as in Equisetum & Selaginella)
- ✓ In Sporangia, the spore mother cells give rise to spores after meiosis. The spores germinate to give rise to inconspicuous, small but multicellular, free-living, mostly photosynthetic thalloid gametophytes called prothallus.
(*Pteridophytes are limited to certain geographical area because they need water for fertilization)
- ✓ Prothallus bears antheridia and archegonia which bear antherozoids and egg cell respectively which on fertilization form zygote. **Zygote produces multicellular, well differentiated sporophyte.**



@26.03.2020

Fig: **Selaginella****Equisetum****Salvinia**

HETEROSPORY: Pteridophytes produce two kinds of spores i.e., large (macro) and small (micro) spores are produced. e.g., Selaginella and Salvinia.

The megaspore & Microspore give rise to Female and Male gametophyte.

SEED FORMING HABIT: The development of zygote into young embryos takes place within the female gametophyte which is retained on parent sporophyte. This is an important step in evolution and is found in Selaginella and Salvinia among the Pteridophytes.

ECONOMIC IMPORTANCE OF PTERIDOPHYTES:

- ✓ Pteridophytes are used for medicinal purposes and as soil-binders.
- ✓ They are also frequently grown as ornamentals.

CLASSIFICATION OF PTERIDOPHYTA:

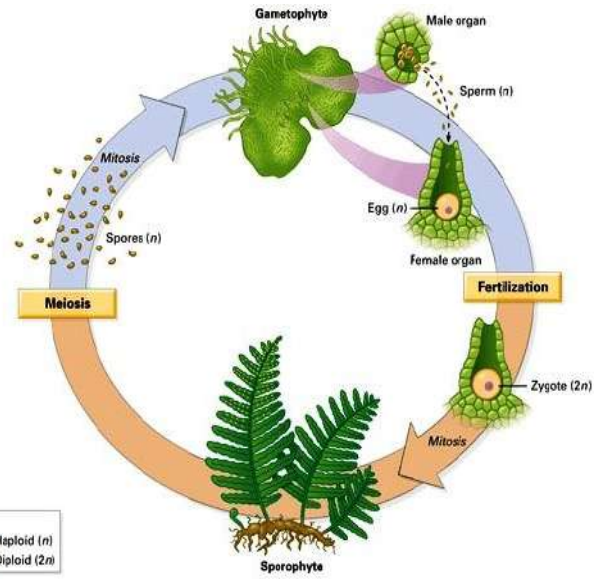
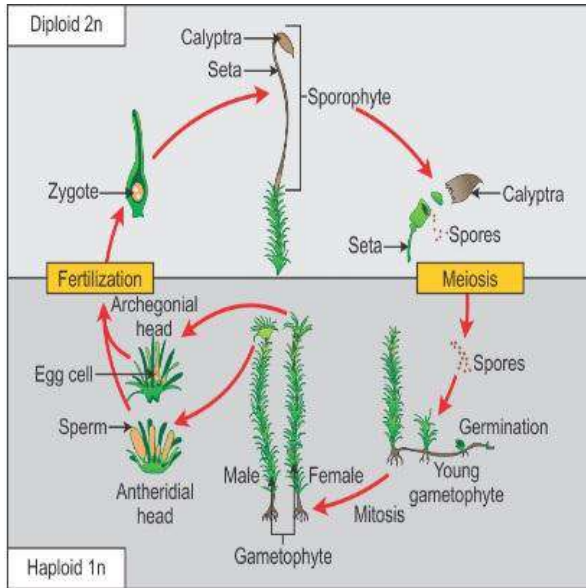
Pteridophytes are classified on the basis of **nature and relation of leaf and stem vascular anatomy and position of sporangia**. The four classes are:

- ✓ **Psilopsida** (Psilotum),
- ✓ **Lycopsida** (Selaginella),
- ✓ **Sphenopsida** (Equisetum) and
- ✓ **Pteropsida** (Pteris, Adiantum, Dryopteris).



@26.03.2020

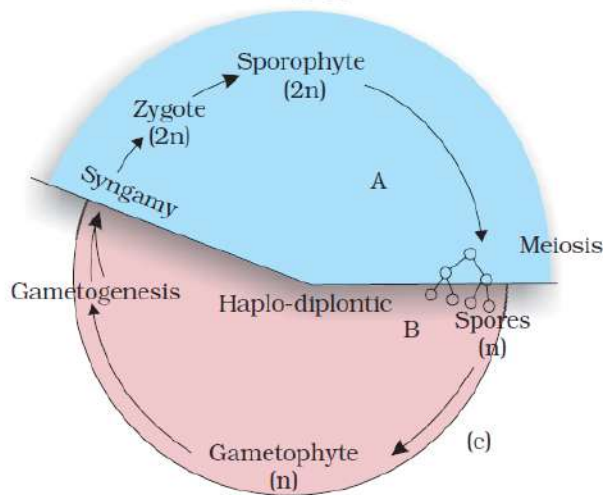
LIFE CYCLE PATTERNS IN BRYOPHYTA AND PTERIDOPHYTA



Life Cycle of **Bryophyta**

&

Pteridophyta



Bryophytes and Pteridophytes, interestingly, exhibit an intermediate condition (**Haplo-diplontic**); both phases are multicellular and often free-living. However, they differ in their dominant phases.

	BRYOPHYTA	PTERIDOPHYTA
SPOROPHYTE	Multicellular , short-lived Sporophyte which is Partially or Totally dependent on Gametophyte	Dominant, Independent, Photosynthetic and Vascular Plant that persists longer.
GAMETOPHYTE	Dominant, multicellular, thalloid, photosynthetic and erect phase	Multicellular, Saprophytic/autotrophic, short-lived , independent phase
Example	Mosses, Liverworts	Ferns, Horsetails etc





@26.03.2020

Images taken from the following sources

<http://bryophytes.plant.siu.edu/imMonocleaGottschei.html>

<https://thequietbranches.com/2015/10/12/small-green-important-and-fascinating-mosses/>

<https://www.merospark.com/content/478/funaria/>

<http://www.theplantlist.org/browse/P/>

<https://en.wikipedia.org/wiki/Selaginella>

<https://en.wikipedia.org/wiki/Equisetum>

<https://www.askiitians.com/biology/plant-kingdom/pteridophytes.html>

<https://www.topperlearning.com/answer/explain-the-life-cycle-of-bryophytes-pteridophytes-angiosperms-and-gymnosperms-in-a-cyclic-diagram/3734>

