

Lecture: 8

Embryophyta (land plants): They are monophyletic assemblage with in the green plants. The first colonization of plants on land during the Silurian period,400 million years ago .

The land plants divided into two main groups:-

1-Non- Vascular land plants 2-Vascular land plants.

group ****Non- Vascular land plants or Bryophytes :-** they are paraphyletic defined by the absence of true vascular tissue and having the gametophyte as the dominant phase, which is also photosynthetic, persistent, and free living phase of the life cycle.

Bryophytes usually include liverworts, mosses and hornworts.

(A)-Liver worts (Hepaticae):- they are monophyletic which relatively minor components of the land plant flora.

They are growing mostly in moist shaded areas, there are two basic morphological types of gametophyte phase in liverworts: **thalloid** and **leafy**.

The **thalloid** shape consist of:

1-Thallus (a flattened mass of tissue, the gametophyte here bears rhizoids, which function in anchorage and absorption.

2- Pores in the upper surface of thallus of some species function in gas exchange (lack stoma).

3- Liverworts thalli superficially resemble the lobes of a liver.

The leafy shape gametophyte in liverworts consist of:

1- stem axis bears 3 rows of thin leaves (single layer of undifferentiated cells)

2-They have prostrate leafy shoots and rhizoids

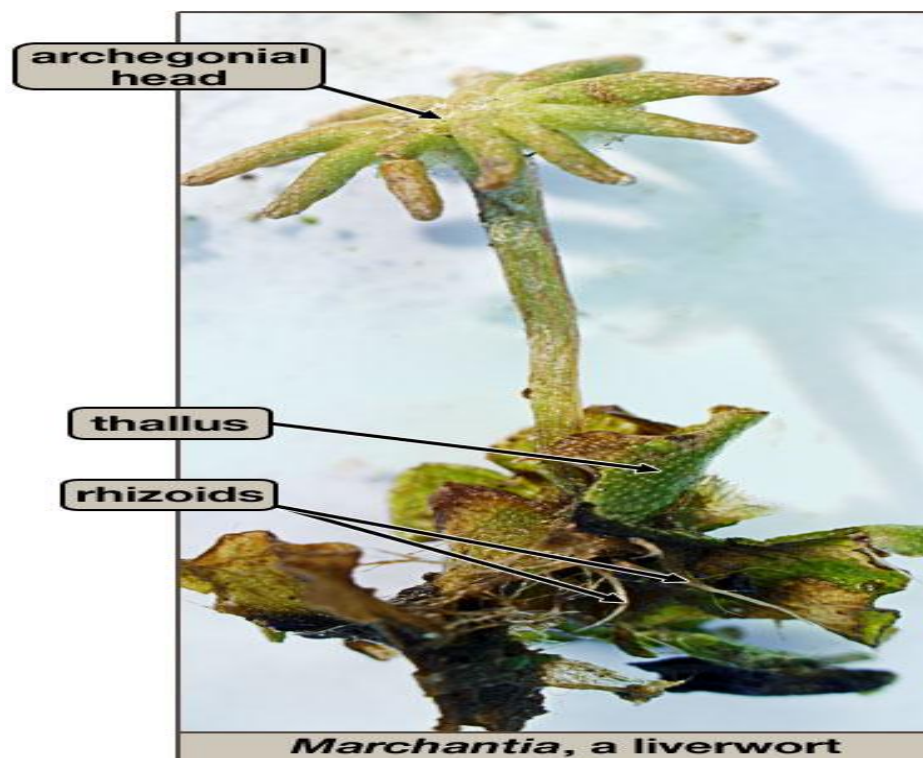
3- sexual reproduction involves production of **archegonia** and **antheridia** on the haploid gametophyte.

The liverworts represented in Iraq in Ricciaceae and Marcentiaceae and other families.

****Marcantia** is the most famous genus which is characterized by:

1-it has specialized structure called gemma cups, these structures function in vegetative (asexual reproduction),when a droplet of water falls in to the gemma cup, the gemma will separate and disperse away, growing in to haploid gene clone of parent.

2- The antheridia and archegonia are on separate plants.



Marchantia polymorpha showing gemmae cups



****MOSESSES:-** they are the most distributed groups of Bryophytes that inhabit a number of ecological niche. it is about 15000 species around the world and approximately 157 species in Iraq.

****Mosses can be characterized by :-**

1-/ Each individual has rhizoid (tiny hair –like, absorptive structure) and stem like structure that bears leaf like blades which consists of single layer of undifferentiated cells. Normally, they don't have true stem and leaf.

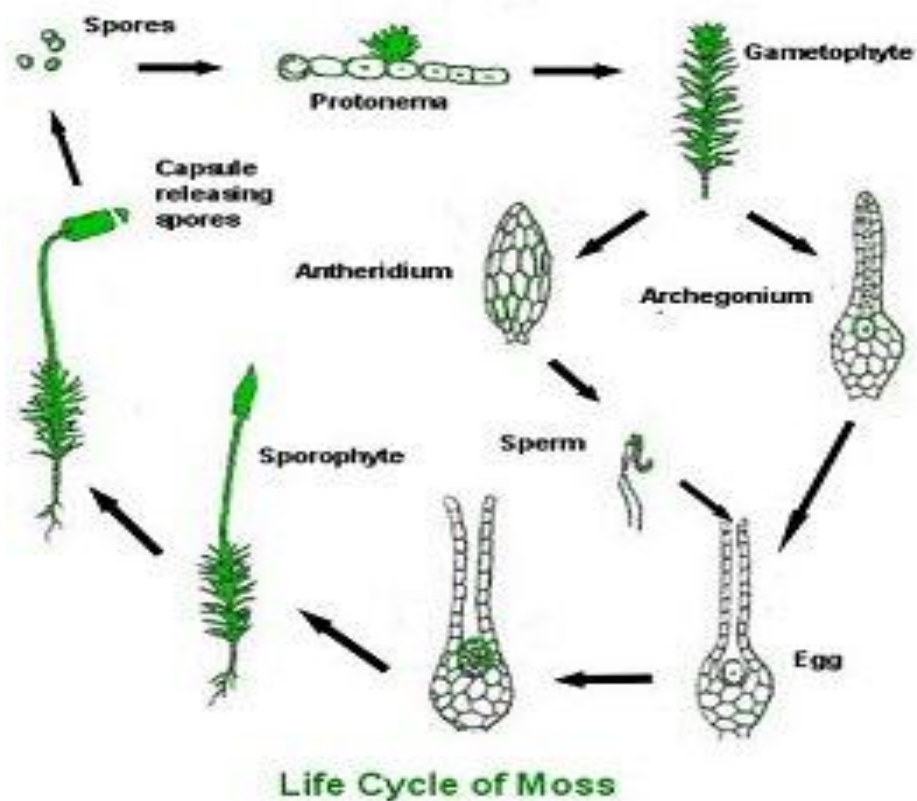
2-/ Alternation of generation is clear in the life cycle of mosses, the moss gametophyte (is usually leafy, green, perennial that often bears its gametangia at the top of the plant, while the sporophyte phase green and photosynthetic, but turn golden brown at maturity a mosses sporophyte plant is composed of the following:

1- **foot** ,which anchors the sporophyte to the gametophyte and absorbs minerals and nutrients from it.

2-**seta or stalk.**

3-capsule or the sporangium spore case, that contains spore mother cell.

Botanists consider the gametophyte generation is the dominant one as it is larger, more persistent and nutritionally independent of the sporophyte.



*****Vascular plants :-** they are usually divided into the following :

a-/ seedless vascular plants (spore-forming).

b-/ seeded vascular plants.

*****seedless vascular plants:-** plants that reproduce by forming spores rather than seeds. The most important adaptation found is the presence of specialized vascular tissues (xylem and phloem).

According to the modern taxonomy, spore –forming vascular plants have classified into different groups which represented in Iraq with monilophytes (ferns).

****Monilophyta or Monilophytes (ferns):-** it is a monophyletic group of vascular plants that are inclusive of four major lineages :-

***Equisetopsida**

**** Psilotopsida** (whisk ferns)

*****Marattiopsida** (marattioid ferns)

******Leptosporangiate** (poly podsopsida).

Ferns usually characterized by:-

1-the presence of true leaves which are in two types:

a-microphyll:- it is usually small and has single vascular strand (single vein), it is believed to evolve from small, projecting extensions of stem tissues , **lycophytes** are the only groups of living plants with microphylls.

b- megaphylls:- they have a vein system consisting of more than one vascular strand evolved from stem branches that gradually filled with additional tissues to form more leaves.

2-the life cycle of ferns involves clearly alternation of generation with dominant sporophytes.

3- Sporophyte consists of:-

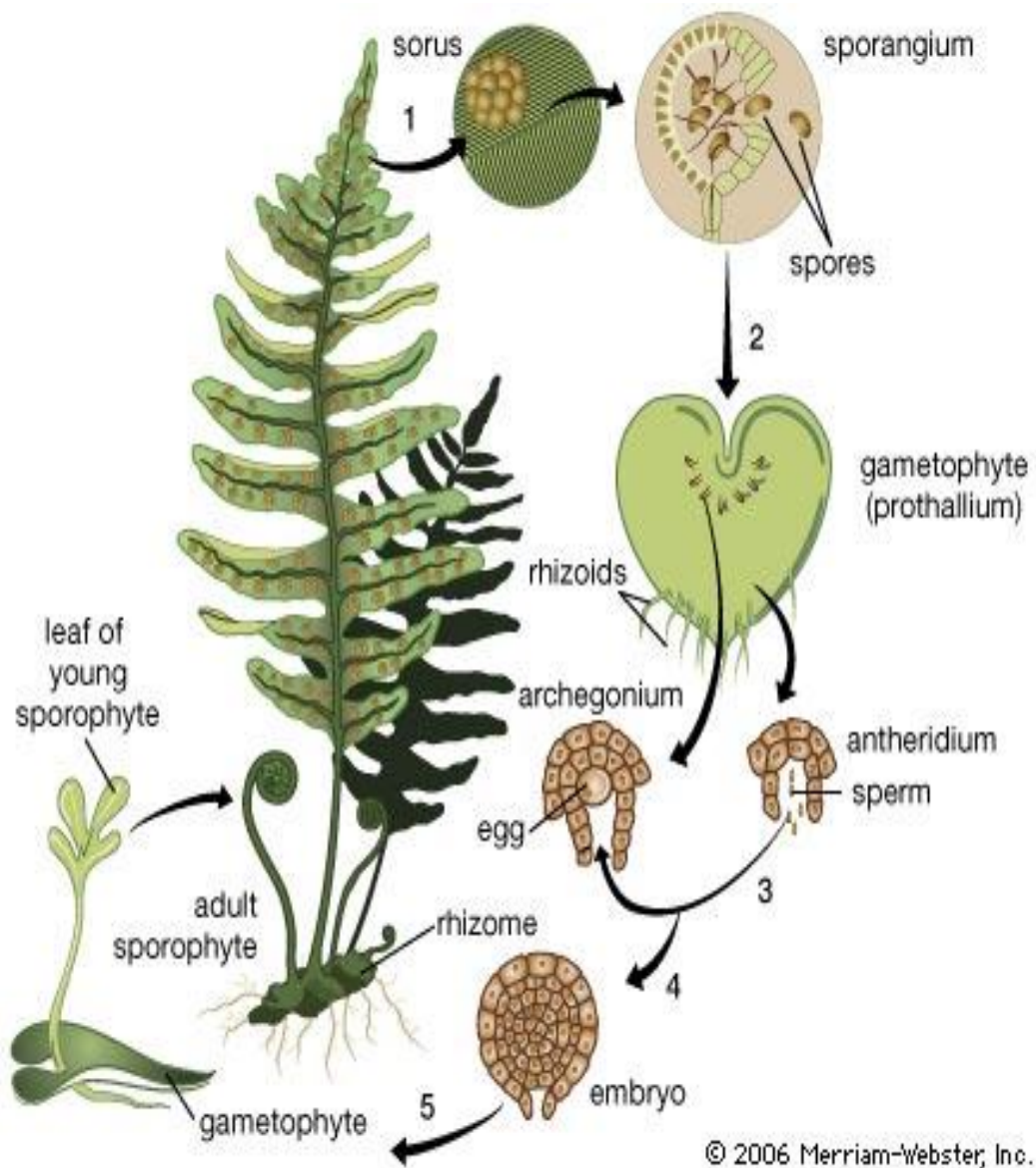
a- a horizontal underground stem called rhizome, that bears thin, wiry roots and relatively large leaves (megaphylls) called **fronds** .fronds have 2 functions in synthesis and reproduction.

b- it has sporangia which develop spores by meiosis, many species bear sporangia in cluster called **sori** ,the sori are covered by a protective membranous covering called **indusim** .

c-Sporangia is characterized by **annulus** (a row of cells with unevenly thickened cell walls).

d-the gametophyte generation of fern is tiny, green with structure called **prothallus** (heart-shaped structure that grows flat against the ground).

e-the fern life cycle alternates between the diploid sporophyte with its rhizome, roots and fronds and the haploid gametophyte (prothallus).

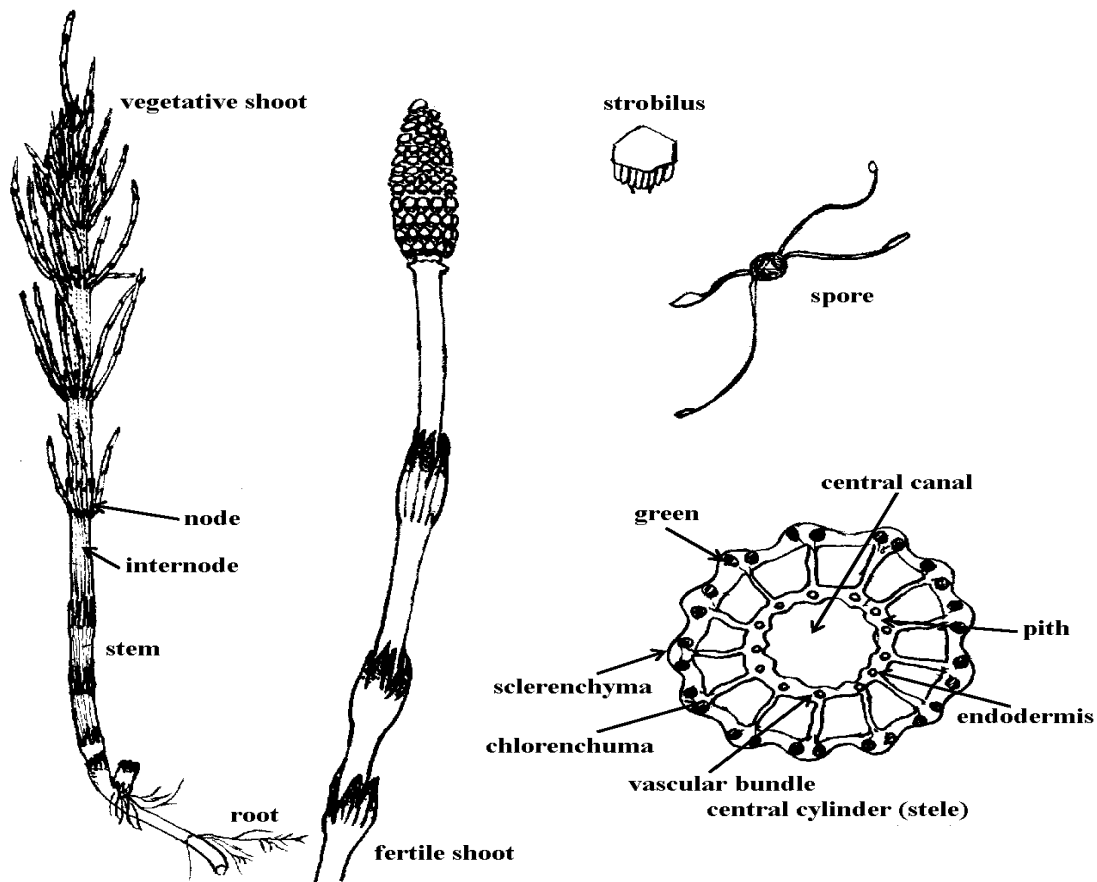


Equisetopsia (Horsetails):-

They are commonly called the Equisetophytes which are monophyletic group that diverged early in the evolution of vascular plants, considered another contributor to coal deposits. Today, the only remaining Equisetophytes are the genus **Equisetum** with 15 species in the family Equisetaceae.

The characters of Horsetails are:-

- 1-**they have true roots, stem (both rhizomes and erect aerial stems) and small leaves.
- 2-**hollow jointed stem which are impregnated with silica which gives them a gritty texture, the green stem is the main organ of photosynthesis.
- 3-**the aerial stems of Horsetails are either vegetative (sterile)or reproductive (fertile). Each reproductive branch bears terminal cone like structure called **strobilus** which consists of stalked – umbrella shape sporangia.
- 4-** sterile stems have whorls of branches that give the appearance of a bushy horses tail, and that is why they named horsetails.



Equisetum life cycle

***Seed plants:-

The **spermatophytes** commonly called Seed plants which are monophyletic lineage within angiosperms (woody plants).

*Seeds are the most important characters in spermatophytes.

*Seeds are reproductively superior to spores because:

1- seed contain a well- developed multicellular young plant ,where a spore is a single cell.

2- a seed contain an abundant food supply while minimal food reserves exist in spore.

3- a multicellular seed coat surrounds and protects a seed which can survive for extended periods at reduced rates of

metabolism and germinate when conditions become favorable.

Spermatophytes are composed of two sister groups:

1- Gymnosperms are called so because the ovules are not enclosed by a surrounding carpel layer at the time of pollination but seeds are often enclosed by megasporophylls or ovuleiferous scales after pollination .

2- Angiosperms or flowering plants.