

## Classification Systems

### Artificial Classification System:

- ❖ Given by Carolus Linnaeus.
- ❖ Based mainly on vegetative characters or on the androecium structure
- ❖ Separated the closely related species since they were based on a few characteristics.
- ❖ Gave equal weightage to vegetative and sexual characteristics.

### Natural Classification System:

- ❖ Given by George Bentham and Joseph Dalton Hooker.
- ❖ Based on natural affinities among the organisms.
- ❖ Consider both external and internal features.

### Phylogenetic Classification System:

- ❖ Based on evolutionary relationships between the various organisms.
- ❖ Assumes that organisms belonging to the same taxa have a common ancestor.

### Numerical Taxonomy

- ❖ Carried out using computers and based on all observable characteristics.
- ❖ Each character is given equal importance and at the same time hundreds of characters can be considered.

### Cytotaxonomy

- ❖ Based on cytological information like chromosome number, structure, behaviour.

### Chemotaxonomy

- ❖ Uses the chemical constituents of the plant to resolve confusions.

Classification of Algae			
Features	Chlorophyceae	Phaeophyceae	Rhodophyceae
<b>Common name</b>	Green algae	Brown algae	Red algae
<b>Pigment</b>	Chl <i>a, b</i>	Chl <i>a, c</i> and fucoxanthin	Chl <i>a, d</i> and <i>r</i> -phycoerythrin
<b>Reserve food</b>	Starch	Laminarin, Mannitol	Floridean starch
<b>Flagella</b>	2-8, equal, apical	2, unequal, lateral	Absent
<b>Examples</b>	<i>Chlamydomonas</i> , <i>Volvox</i> etc.	<i>Ectocarpus</i> , <i>Sargassum</i> etc.	<i>Polysiphonia</i> , <i>Gracilaria</i> etc.

## Bryophytes

- ❖ Commonly called as **amphibians** of plant kingdom.
- ❖ Includes Liverworts and mosses.
- ❖ Vascular tissues are **absent**.
- ❖ Lack true stem, leaves and roots.
- ❖ Main plant body is **gametophyte**. **Sporophyte** is dependent on gametophyte for nutrition.
- ❖ Plant body attached to substratum by unicellular or multicellular **rhizoids**.
- ❖ Water is essential for fertilization.
- ❖ Sex organs are **multicellular**. Male-**antheridium** and female-**archegonium**.
- ❖ Fertilization produces zygote which develops into multicellular sporophyte.

### Liverworts

- ❖ Grow usually in moist and shady habitats.
- ❖ Plant body is thalloid which is dorsiventral and closely appressed to the substrate.
- ❖ Leafy members have tiny leaf-like appendages in two rows on the stem-like structures.
- ❖ Asexual reproduction through fragmentation.
- ❖ **Gemmae** are green, multicellular asexual buds.
- ❖ Sporophyte is formed as a result of sexual reproduction.
- ❖ Sporophyte is differentiated into foot, seta and capsule.
- ❖ After meiosis, spores are produced within the capsule which germinate to form free-living gametophytes. **E.g.,** *Marchantia*

### Mosses

- ❖ Protonema is the first stage of gametophyte that develops directly from spore.
- ❖ Leafy stage is second stage develops from secondary protonema as lateral bud.
- ❖ Vegetative reproduction through fragmentation and budding in secondary protonema.
- ❖ Sexual reproduction present.
- ❖ Have an elaborate mechanism of spore dispersal. **E.g.,** *Funaria*, *Polytrichum* and *Sphagnum*.

## Pteridophytes

- ❖ Includes horsetails and ferns.
- ❖ First vascular plants without seeds.
- ❖ Main plant body is sporophyte and distinguishes into root, stem and leaves.
- ❖ Reproduction is of vegetative, asexual and sexual type.
- ❖ Male gametes are flagellated.
- ❖ Sporangia produce spores by meiosis in spore mother cells.
- ❖ Spores germinate to give rise to inconspicuous, small but multicellular, free-living, mostly photosynthetic thalloid gametophytes called **prothallus**.
- ❖ Requires water for fertilisation.
- ❖ Development of the zygotes into young embryos take place within the female gametophytes which represents is a precursor to the seed habit. **E.g.,** *Psilotum*, *Lycopodium*, *Selaginella* etc.

## Gymnosperms

- ❖ Vascular plants with **naked seeds**.
- ❖ Redwood tree *Sequoia* is one of the tallest tree species.
- ❖ In *Pinus* roots have fungal association in the form of mycorrhiza.
- ❖ Coralloid roots are found in *Cycas* which are associated with  $N_2$ -fixing cyanobacteria.
- ❖ Male and female cones may be borne on same tree as in *Pinus* or in different tree as in *Cycas*.
- ❖ Male and the female gametophytes do not have an independent free-living existence.
- ❖ Zygote is formed after fertilisation of pollen grain and ovule.
- ❖ Zygote develops into an embryo and the ovules into seeds. These seeds are naked.

## Angiosperms

- ❖ In angiosperms, the seeds are enclosed in fruits, the pollen grains and ovules are developed in specialized structures called flowers.
- ❖ **Stamen** (male sex organ) consists of a filament and an anther and **carpel** (female sex organ) consists of a stigma, style and ovary containing ovules.
- ❖ **Double fertilization occurs in angiosperm**. One produces **zygote** and other forms **primary endosperm nucleus (3n)**.
- ❖ Fertilized ovules ripen into seeds and ovaries into fruit.
- ❖ Angiosperms are divided into two classes.

## Dicots

- ❖ They usually have two cotyledons.
- ❖ Flowers are generally pentamerous or tetramerous (floral parts in sets of 5 and 4 or their multiples).
- ❖ Leaves possess reticulate venation.

## Monocots

- ❖ The seeds contain one cotyledon.
- ❖ Flowers are usually trimerous (floral parts in sets of three or its multiples).
- ❖ Leaves possess parallel venation.

## Plant Life Cycles & Alternation of Generations

### Haplontic Life Cycle

- ❖ Sporophytic generation is represented only by the one-celled zygote.
- ❖ No free-living sporophytes.
- ❖ Meiosis in the zygote results in the formation of haploid spores.
- ❖ Haploid spores divide mitotically and form the gametophyte.
- ❖ Dominant, photosynthetic phase in such plants is the free-living gametophyte.
- ❖ Many algae such as *Volvox*, *Spirogyra* and some species of *Chlamydomonas* represent this pattern.

### Diplontic Life Cycle

- ❖ Diploid sporophyte is the dominant, photosynthetic, independent phase of the plant.
- ❖ Gametophytic phase is represented by the single to few-celled haploid gametophyte.
- ❖ *Fucus*, all seed bearing, plants i.e., gymnosperms and angiosperms follow this pattern.

### Haplo-diplontic Life Cycle

- ❖ Bryophytes and pteridophytes exhibit this pattern

### Bryophytes

- ❖ Dominant, independent, photosynthetic, thalloid or erect phase is represented by a haploid gametophyte.
- ❖ Sporophyte is short-lived, multicellular and totally or partially dependent on the gametophyte for its anchorage and nutrition.

### Pteridophytes

- ❖ Diploid sporophyte is represented by a dominant, independent, photosynthetic, vascular plant body.
- ❖ Gametophyte is multicellular, saprophytic/autotrophic, independent but short-lived.