

Plant Kingdom

Classification

- Artificial systems of classification are mainly based on vegetative characters or on the androecium structure.
- Natural systems of classification are mainly based on natural affinities among living organisms.
- Natural system of classification for flowering plants was given by Bentham and Hooker.
- Numerical taxonomy is the classification based on quantifiable characters.
- Cytotaxonomy is the classification based on cytological characters such as number, structure, and behaviour of chromosomes.
- Chemotaxonomy is the classification of organisms according to demonstrable differences and similarities in their biochemical compositions.
- The kingdom Plantae is divided into many divisions - Thallophyta (algae), Bryophyta, Pteridophyta, Gymnospermae, and Angiospermae.

Algae

- Algae are chlorophyll-bearing, thalloid organisms that are mainly aquatic.
- The commonly found spores for asexual reproduction are zoospores.
- Sexual reproduction is via fusion of gametes, which can be isogamous (example, *Chlamydomonas* and *Spirogyra*) or anisogamous (example, some *Chlamydomonas* species) or oogamous (example, *Volvox*).
- This group includes three classes named as Chlorophyceae, Phaeophyceae, and Rhodophyceae.
- Many members have haplontic life cycle.
- **1. Chlorophyceae (Green algae)**
- Dominant pigments include chlorophyll a and b.
- Cell wall is made of cellulose and pectose.

- Stored food is in the form of starch stored in pyrenoids found in chloroplast. Pyrenoids also store proteins.
- Vegetative reproduction is through fragmentation; asexual reproduction is through zoospores; and sexual reproduction may be isogamous, anisogamous, or oogamous.
- Examples- *Chlamydomonas*, *Volvox*, *Spirogyra*

2. Phaeophyceae (Brown algae)

- Dominant pigments include chlorophyll a, c and fucoxanthin.
- Cell wall is made of cellulose and algin.
- Stored food is in the form of mannitol and laminarin.
- The plant body mainly consists of holdfast (for attachment), stipe (stem-like structure), and frond (for photosynthesis).
- Vegetative reproduction is through fragmentation; asexual reproduction is through biflagellate zoospores; and sexual reproduction may be isogamous, anisogamous, or oogamous.

Examples - *Ectocarpus*, *Laminaria*, *Sargassum*

3. Rhodophyceae (Red algae)

- Dominant pigments include chlorophyll a, d and phycoerythrin.
- Cell wall is made of cellulose.
- Stored food is in the form of floridean starch.
- Vegetative reproduction is through fragmentation; asexual reproduction is through non-motile spores; and sexual reproduction is oogamous.
- Examples - *Polysiphonia*, *Gracilaria*, *Gelidium*

• Pteridophyta

- Pteridophytes are plants with vascular tissues that reproduce through spores.
- Require cool, damp, and shady place to grow.
- This group includes horsetails and ferns.
- Life cycle is haplo-diplontic type.
- Male reproductive organ is antheridium and female sex organ is archegonium.
- The main plant body is a sporophyte that bears sporangia in leaf-like appendages called sporophylls.
- Though pteridophytes are homosporous, but genera such as *Selaginella* and *Salvinia* show heterospory.
- Heterospory is the development of spores of two different sizes (microspores and megaspores) by the sporophyte.

- **Pteridophyta can be further divided into four classes.**

- Psilopsida: includes *Psilotum*
- Lycopside: includes *Selaginella*
- Sphenopsida: includes *Equisetum*
- Pteropsida: includes *Dryopteris*

Life cycle patterns

Haplontic life cycle:

- It takes place in *Spirogyra*, some species of *Chlamydomonas*, and *Volvox*.
- In haplontic life cycle, haploid individuals form haploid gametes by mitosis during gametogenesis. Then, these gametes (n) fuse and form zygote that is diploid. This zygote undergoes meiosis to form haploid adult. Hence, adult is haploid and exhibits zygotic meiosis.

Diplontic life cycle:

- It takes place in all seed-bearing plants such as gymnosperms and angiosperms.
- In diplontic life cycle, diploid individuals form haploid gametes by meiosis during gametogenesis. Then, these gametes (n) fuse and form zygote that is diploid, which by mitosis forms diploid adult. Hence, adult is diploid and exhibits gametic meiosis.

Haplo-diplontic cycle:

- It takes place in bryophytes and pteridophytes. In this, both haplontic and diplontic type of life cycle alternate with each other.