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CLASS 11 & 12th



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CLASS 11th

Plant Kingdom

misostudy



01. Introduction

In this chapter we will study in detail the classification within the plant kingdom. Earlier, Fungi and members of the Monera and Protista having cell walls were put under the kingdom Plantae. But now they have been excluded from the kingdom. So, the cyanobacteria that are also referred as blue green algae are not 'algae' any more. The plant kingdom has been classified in various ways by different scientists. Here, we will describe Plantae under Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

02. Classification Systems

There are three main types of systems of classification i.e. artificial, natural and phylogenetic.

Artificial System of Classification

- (a) **Basis** : The earliest systems of classification were **artificial** and involves usage of one or few morphological characters for grouping of organisms. for example, classification within the angiosperms was based only on gross superficial morphological characters such as habit, colour, number and shape of leaves etc. Such systems were based mainly on vegetative characters or on the androecium structure (system given by Linnaeus).
- (b) **Proponents** – Scientists who gave artificial system: **Aristotle, Linnaeus.**

Natural System of Classification

- (a) **Basis** : Organisms in this system are classified on the basis of natural affinities and consider not only external but also internal features like ultrastructure, anatomy, embryology and phytochemistry.
- (b) **Proponents** : **George Bentham** and **Joseph Dalton Hooker** gave such a classification for angiosperms.

Phylogenetic System of Classification

- (a) **Basis** : At present phylogenetic classification systems are acceptable which are based on evolutionary relationships between the various organisms, belonging to the same taxa have common ancestor. The fossils play important role in elucidation of evolutionary relationships.
- (b) **Proponents** : Engler and Prantl, Hutchinson, Takhtajan

03. Branches of Taxonomy

Numerical Taxonomy (Phenetics) : It involves usage of numerical methods for the evaluation of similarities and differences between species with the help of computers.

Steps involved in numerical taxonomy :

- (i) Numbers and codes are assigned to all the observable characters like plus (+), minus (-), data not available (0).
- (ii) All possible characters are compared by computers by giving equal importance.
- (iii) The organisation and analysis of data forms core of this taxonomy.

One of the major benefits of the taxonomic method is that hundreds of characters can be considered at the same time.

Cytotaxonomy/karyotaxonomy : It is based on cytological information like chromosome number, structure, behaviour etc.

Chemotaxonomy : It is based on the chemical constituents of the plant. For example DNA sequence, chemical nature of proteins, crystals (Calcium oxalate or calcium carbonate) and aromatic compounds are used by scientists to resolve confusions in classification.

04. Algae

Algae are chlorophyll containing, simple, thalloid (plant body not differentiated into root, stem and leaf) and autotrophic organisms.

The main characteristics of algae are :

- (i) Algae are largely aquatic, either marine or fresh water. They also occur in habitats like moist stones, soils and wood. Some of them also occur in association with fungi (lichen) and animals (e.g., on sloth bear).
- (ii) Algae are of variable size and forms. The size ranges from the microscopic **unicellular** forms like *Chlamydomonas*, to **colonial** forms like *Volvox*. Each mature *Volvox* colony is composed of numerous flagellate cells. They may be filamentous also like *Ulothrix* and *Spirogyra*. A few of the marine forms such as **kelps** form massive plant bodies.
- (iii) Vascular tissues are absent. Being aquatic, water conduction is not required even in giant forms.
- (iv) Algae reproduce by vegetative, asexual and sexual methods.
- (v) **Vegetative reproduction** is by fragmentation. In fragmentation, the parent body breaks into two or more fragments. Each fragment develops into a thallus.
- (vi) **During the asexual reproduction** different types of spores are produced. Spores are released from the parent body which, on germination give rise to new plants. The most common spores produced are the **zoospores**. They are flagellated (motile) spores and on germination give rise to new plants.
- (vii) Sex organs are non-jacketed and unicellular. Sexual reproduction takes place through the fusion of two gametes. Sexual reproduction can be :
 - (a) **Isogamous** : Fusion of two gametes which are similar in size, either flagellated or non-flagellated is termed as isogamous. e.g., *Chlamydomonas* (gametes are flagellated and similar in size), *Spirogyra* (gametes are non-flagellated and similar in size).
 - (b) **Anisogamous** : Fusion of two gametes which are dissimilar in size is termed as anisogamous. e.g., some species of *Chlamydomonas*.
 - (c) **Oogamous** : When a small, motile or non-motile male gamete fuses with a large non-motile female gamete, such type of reproduction is known as oogamous. e.g., *Volvox*, *Fucus*, *Polysiphonia* (both gametes non-motile)

Algae are mainly classified on the basis of their pigments. Flagellation, storage products and chemistry of cell wall are also taken into account. The three classes of algae are **Chlorophyceae** (green algae), **Phaeophyceae** (brown algae) and **Rhodophyceae** (red algae).

05. Chlorophyceae

- (i) These pigments are present in definite chloroplasts. Chloroplasts are greenish plastids (cell organelle).
- (ii) The members of chlorophyceae are commonly called green algae. The pigments, chlorophyll-a, chlorophyll-b, carotene and xanthophyll are present in them. They are usually grass green in colour due to the dominance of pigments i.e., chlorophyll a and b.
- (iii) The plant body may be unicellular, colonial or filamentous.
- (iv) The shape of chloroplast varies in different species. It can be discoid, plate-like, reticulate, cup-shaped, spiral or ribbon-shaped.
- (v) In some green algae, food is stored in the form of **oil droplets**.
- (vi) Most of the green algae have one or more storage bodies called **pyrenoids** located in the chloroplasts. Pyrenoids contain **protein** and **starch**.
- (vii) Vegetative reproduction usually takes place by fragmentation.
- (viii) Green algae usually have a rigid cell wall made up of an inner layer of cellulose and an outer layer of pectose.
- (ix) Asexual reproduction takes place by flagellated zoospores produced inside the zoosporangia (cells in which the zoospores are produced).
- (x) Sexual reproduction shows considerable variation in the type and formation of sex cells and it may be isogamous, anisogamous or oogamous.
- (xi) Some commonly found green algae are : Chlamydomonas, Volvox, Ulothrix, Spirogyra and Chara

06. Phaeophyceae

- (i) They possess the pigment chlorophyll a and c, carotenoids and xanthophylls.
- (ii) The members of phaeophyceae are commonly called **brown algae**. Brown algae are found primarily in marine habitats.
- (iii) They show great variation of size and form. In Ectocarpus the body is simple branched and filamentous whereas in **kelps** the body is profusely branched e.g., Laminaria, Macrocystis. Kelps may reach a height of 100 metres.
- (iv) They vary in colour from olive green to various shades of brown depending upon the amount of the xanthophyll called **fucoxanthin**.
- (v) Brown algae have cell wall made up of cellulose which is usually covered on the outside by a gelatinous coating of algin. Algin is a hydrocolloid which has good water holding capacity.
- (vi) Food is stored as complex carbohydrates which may be in the form of **laminarin** or **mannitol** (alcoholic sugar).
- (vii) The plant body is often differentiated into **holdfast** for attachment to a substratum, **stipe** (stalk) and leaf-like photosynthetic organ called **frond**.
- (viii) Their protoplast (the living contents of a cell enclosed by the plasma membrane i.e., the cytosol, organelles and nucleus) contains plastids, a centrally located vacuole and nucleus.
- (ix) Vegetative reproduction takes place by fragmentation.
- (x) The large forms often possess **air bladders** for providing **buoyancy**.