

B.Sc. Botany
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Paper-I: CRYPTOGAMS
GROUP-A

CLASSIFICATION OF ALGAE

Nitu Bharti
Assistant Professor
Department of Botany

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The classification of algae has continually been modified since its beginning in the 1753 edition of Linnaeus Species Plantarum. In the classification of plants given by Oswald Tippo (1942) first seven phyla of subkingdom Thallophyta are algae. Smith (1955) classified algae into seven divisions. Fritsch (1935) ranked algae as a division and classified it into eleven classes on the basis of type of pigments, flagella, nature of reserve food material, mode of reproduction etc., which is commonly followed. The classification is published in his book titled “The Structure and Reproduction of Algae”. This classification is as follows:-

1. Class: Chlorophyceae (Green Algae) *Isokontae*

- i. **Occurrence:** Most forms are fresh water and a few are marine.
- ii. **Structure:** Unicellular motile to heterotrichous filaments. Cell wall consists of Cellulose. Pyrenoids are commonly surrounded by starch sheath. Motile cells have equal flagella (whiplash type) (2-4).
- iii. **Pigments:** Chief pigments are chlorophyll a and b and carotenoids (yellow pigments)
- iv. **Reserve food:** Starch
- v. **Reproduction:** Sexual reproduction ranges from isogamous to advanced oogamous type.

Example: Chlamydomonas, Volvox, Chlorella.

2. Class: Xanthophyceae (Yellow green algae) *Heterokontae*

- i. **Occurrence:** Most forms are fresh water but a few are marine.
- ii. **Structure:** Unicellular motile to simple filamentous. Cell wall rich in pectic compounds and composed of two equal pieces overlapping at their edges. Motile cells have two very unequal flagella. Pyrenoids absent.
- iii. **Pigments:** Yellow xanthophyll is found abundantly.
- iv. **Reserve food:** oil
- v. **Reproduction:** Sexual reproduction is rare and always isogamous.

Example: Microspora, Botrydium

3. Class: Chrysophyceae (Golden brown algae)

- i. **Occurrence:** Most forms occur in cold fresh water but a few are marine.

- ii. **Structure:** Plants are unicellular motile to branched filamentous. Flagella are unequal attached at front end. Cells commonly contain one or two parietal chromatophores.
- iii. **Pigments:** Chromatophores are brown or orange colored. Phycochrysin serves as chief accessory pigments.
- iv. **Reserve food:** leucosin.
- v. **Reproduction:** Sexual reproduction seldom occurs but is of isogamous type.
Example: Chrysosphaera

4. Class: Bacillariophyceae (Diatoms)

- i. **Occurrence:** In all kind of fresh water, sea, soil and terrestrial habitats.
- ii. **Structure:** All the members are unicellular or colonial. Cell wall is partly composed of silica and partly of pectic substances. It consists of two halves and each has two or more pieces. Cell wall is richly ornamental
- iii. **Pigments:** Chromatophores are yellow or golden brown (diatomin). Nature of accessory pigments is not very definite.
- iv. **Reserve food:** Chrysolaminarin.
- v. **Reproduction:** Forms are diploid. Sexual reproduction is special type, occurs by fusion of protoplasts of the ordinary individuals.

Example: Pinnularia

5. Class: Cryptophyceae (algae of uncertain systematic position)

- i. **Occurrence:** Both in marine and fresh water
- ii. **Structure:** Represented by motile cells and most advanced forms are coccoid, flagella are slightly unequal. Each cell consists of two large chloroplasts with pyrenoids.
- iii. **Pigments:** Chl a and c ,Chromatophores show diverse pigmentation. It may be some shades of brown. Chromatophores are usually parietal.
- iv. **Reserve food:** Solid carbohydrates or in some cases starch.
- v. **Reproduction:** Isogamous in the reported cases.

Example: Cryptomonas

6. Class: Dinophyceae

- i. **Occurrence:** Plants occur widely as sea water planktons. A few

may be fresh water forms.

- ii. **Structure:** mostly unicellular
Cell wall of dinoflagellates is very unusual consisting of sculptured cellulose cell plate imbedded in the cell membrane
Most sps. have 2 flagella of unequal length, which lie in two grooves
Nucleus is large
There are many disc like chromatophores
- iii. **Pigments:** Chromatophores are dark yellow, brown, etc., and contain a number of special pigments (chl a & c, carotenoids).
- iv. **Reserve food:** Starch and oil
- v. **Reproduction:** Sexual reproduction is of isogamous type. it is rare and not very definite.

Example: Peridinium, Glenodinium

7. Class: Chloromonadineae

- i. **Occurrence:** fresh water forms only.
- ii. **Structure:** motile, flagellate with two almost equal flagella.
- iii. **Pigments:** Chromatophores are bright green in colour and contain an excess of xanthophyll.
- iv. **Reproduction:** Reproduction takes place by longitudinal division.
- v. **Reserve food:** Oil

Example: Trentonia

8. Class: Euglenoideae

- i. **Occurrence:** Only fresh water forms are known
- ii. **Structure:** Motile flagellates, flagella may be one or two arising from the base of canal like invagination at the front end. Complex vacuolar system and a large and prominent nucleus. Cellulosic cell wall absent, pellicle present. Chloroplast have three membranes.
- iii. **Pigments:** Each cell has several chromatophores. Chl a & b, carotenoids
- iv. **Reserve food:** Paramylon
- v. **Reproduction:** Sexual reproduction is not substantially known.

It is isogamous type.

Example: Euglena

9. Class: Phaeophyceae (Brown algae, giants of the algal world)

- i. **Occurrence:** Mostly marine
- ii. **Structure:** The plants may be simple filamentous to bulky parenchymatous forms. Several plants attain giant size, external and internal differentiation.
- iii. **Pigments:** chl a, c, carotenes, xanthophylls, not chl b
- iv. **Reserve food:** Mannitol as well as laminarin and fats
- v. **Reproduction:** Sexual reproduction ranges isogamous to oogamous. Motile gametes have two laterally attached flagella. Varied types of alternation of generation. No resting period in zygote.
Example: Ectocarpus, Sargassum

10. Class: Rhodophyceae (Red algae, deepest dwelling plants)

- i. **Occurrence:** Few forms are fresh water and others are marine.
- ii. **Structure:** Simple filamentous to attaining considerable complexity of structure. Motile structures are not known.
- iii. **Pigments:** Chromatophores are red blue containing pigments like red phycoerythrin and blue phycocyanin, Chla & d, carotenes.
- iv. **Reserve food:** Floridean starch
- v. **Reproduction:** Sexual reproduction is advanced oogamous type. The male organ produces non motile gametes and the female organ has a long receptive neck. After sexual reproduction special spores (carpospores) are produced
Example: Batrachospermum, Polysiphonia

11. Class: Myxophyceae (Cyanophyceae or Blue green algae)

- i. **Occurrence:** Found in sea and fresh water,
- ii. **Structure:** Simple type of cell to filamentous, some of the filamentous forms show false or true branching, very rudimentary nucleus, no proper

- chromatophores, the photosynthetic pigments being diffused throughout the peripheral position. No motile stages.
- iii. **Pigments:** Chlorophylla , carotenes, xanthophylls, and phycocyanin and phycoerythrin. The ratio of last two pigments exhibits colour variation, commonly blue green.
 - iv. **Reserve food:** Myxophycean starch & protein cyanophycean granules.
 - v. **Reproduction:** There is no sexual reproduction.
Example: Oscillatoria, Nostoc

It has now become clear that characteristic of vegetative cells (pigments, reserve food material, number and position of flagella) and the morphology of motile reproductive cells are fundamental bases upon which algae should be classified. But recently , trend has changed to classify algae taking into account molecular characters as well. Research using electron microscopes has demonstrated differences in features, such as the flagellar apparatus, cell division process, and organelle structure and function , that are important in the classification of algae.