



Bhagalpur National College, Bhagalpur

(A Constituent unit of Tilka Manjhi Bhagalpur University, Bhagalpur)

PPT Presentation for B.Sc. I- Classification and Ultrastructure of Algae



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Habit & Habitat

➤ Algal members are predominantly aquatic

➤ **Aquatic Algae:**

Completely submerged or free floating.

Fresh water algal forms- *Chlamydomonas*, *Volvox*, *Hydrodictyon*.

Slow Running Water- *Cladophora*, *Oedogonium*, *Ulothrix*.

Sea water- *Phaeophyceae*, *Rhodophyceae* members.

Planktons-Free floating - *Chlamydomonas*, *Cosmarium*.

Where do Algae live?

Marine habitats:

- seaweeds, phytoplankton



Freshwater habitats:

- streams, rivers, lakes and ponds



Terrestrial habitats:

- stone walls, tree bark, leaves, in lichens, on snow



Habit and Habitat

They may be free floating , free swimming or attached to the bottom in the shallow water.

According to habitat, algae can be classified as follows:

- **Aquatic algae**: Example:- *Chlamydomonas*.
- **Terrestrial algae** : Example:- *Fritschiella*.
- **Aerophytes** : Example:- *Scytonema*.
- **Cryophytes** : Example:- *Scotiella*.
- **Thermophytes** : Example:- *Oscillatoria brevis*.
- **Algae of unusual habit** : Example:- *Dunaliella* (Saline area)

General characteristics of algae

- Algae are photosynthetic eukaryotic organisms.
- They are commonly found in aquatic environments including freshwater, marine and brackish water.
- They are either motile or non-motile.
- Some of the motile and non-motile algae may form a colony known as Coenonbium.
- Algae possess the usual eukaryotic structures - Golgi apparatus, mitochondria, Endoplasmic reticulum and a nucleus.
- The algae includes both the microscopic unicellular to macroscopic multicellular organisms.
- Most of the algae are autotrophic characterized by their ability to use the carbon-di-oxide as a carbon source and light as an energy source.
- They reproduce both sexually and asexually.

3. Algae of unusual habitat.

They are found in different habitats like:

(a) Cryophytes or snow algae, like *Haematococcus nivalis*, *Rapidonema*, *Chlamydomonas yellowstonensis*, *Ancyclonema nordenskioldii*, *Protoderma*, etc. Some of these forms impart their own colour to the snow-fed mountains wherever they occur like red, pink, purple, yellow etc.

(b) Thermal algae, which are found at very high temperatures as high as 85°C especially in hot springs.

(c) Halophytic algae are found in water containing high concentrations like *Dunaliella*, *Stephnoptera*, *Chlamydomonas ehrenbergii* etc.

(d) Lithophytes are found attached to stones and rocky areas, like *Rivularia*, *Gloeocapsa*, *Prasiola*, *Vaucheria*, *Diatoms* etc.

CLASSIFICATION OF ALGAE PROPOSED BY FRITSCH

•F.E. Fritsch (1935, 1948) published his classification in his book entitled “**The Structure and Reproduction of the Algae**”.

•He divided algae into following 11 classes on following basis:

- Number and mode of attachment of flagella in the motile cells
- Thallus structure
- Chemical nature of pigments
- Reserve food materials
- Method of reproduction
- Variation in the life cycles

Fritsch classification of algae

- One of the best known algal classification was proposed by Fritsch who divided them into 11 classes(1945).
- Classification is based on pigments, flagella and reserve food material.

Eleven classes proposed by Fritsch are as follows:

1. Chlorophyceae
2. Xanthophyceae
3. Chrysophyceae
4. Bacillariophyceae
5. Cryptophyceae
6. Dinophyceae
7. Chloromonadineae
8. Euglenineae
9. Phaeophyceae
10. Rhodophyceae
11. Myxophyceae.

Classification of Algae by F.E Fritch (1935)

Class	Pigments	Flagella	Reserve food
Chlorophyceae (green algae)	Chlorophyll-a,b Carotene Xanthophyll	Two identical flagella per cell	Starch
Xanthophyceae	Chlorophyll-a, b Carotene Xanthophyll	Heterokont type, one whiplash type and other tinsel	Fats and Leucosin
Chrysophyceae (diatoms, golden algae)	Chlorophyll-a, b Carotenoids	One,two or more unequal flagella	Oils and Leucosin
Bacillariophyceae	Chlorophyll-a, c Carotenes	Very rare	Leucosin and fats
Cryptophyceae	Chlorophyll-a, c Carotenes and xanthophylls	Heterokont type- one tinsel and other whiplash	Starch
Dinophyceae (Dinoflagellates)	Chlorophyll-a, c Carotenoids Xanthophyll	Two unequal lateral flagella in different plane.	Starch and oil
Chloromonodineae	Chlorophyll-a, b Carotenes Xanthophyll	Isokont type	Oil
Euglenophyceae (Euglenoids)	Chlorophyll-a, b	One,two or three anterior flagella.	Fats and paramylon
Phaeophyceae (brown algae)	Chlorophyll-a Xanthophyll	Two dissimilar lateral flagella	Laminarin, fats
Rhodophyceae (Red algae)	Chlorophyll-a Phycocyanin Phycocerythrin	Non-motile	Starch
Myxophyceae	Chlorophyll-a, carotene, phycocyanin, phycocerythrin	Non-motile	Cyanophyce an starch

Smith's system of classification (1933, 51, 55)

Division	Class	Example
1. Chlorophyta	1. Chlorophyceae 2. Charophyceae	➤ <i>Volvox</i> , <i>Oedogonium</i> ➤ <i>Chara</i> , <i>Nitella</i>
2. Euglenophyta	1. Euglenophyceae	➤ <i>Euglena</i> , <i>Astasia</i>
3. Cyanophyta	1. Cyanophyceae	➤ <i>Nostoc</i> , <i>Anabaena</i>
4. Pyrrophyta	1. Desmophyceae 2. Dinophyceae	➤ <i>Desmomastix</i> ➤ <i>Dinophysis</i>
5. Chrysophyta	1. Chrysophyceae 2. Xanthophyceae 3. Bacillariophyceae	➤ <i>Chrysodendron</i> ➤ <i>Botrydium</i> ➤ <i>Pinnularia</i>
6. Phaeophyta	1. Isogeneratae 2. Heterogeneratae 3. Cyclospora	➤ <i>Ectocarpus</i> , <i>Dictyota</i> ➤ <i>Laminaria</i> ➤ <i>Fucus</i>
7. Rhodophyta	1. Rhodopyceae	➤ <i>Porphyra</i>

*** Vegetative structure and motile reproductive structure**

- 1980 - Lee used fine structural aspects of organelles such as chloroplast, ER, flagellum, eyespot and nucleus to classify the algae into 6 divisions and 15 classes.
- The 6 divisions are : Cyanophyta, Glaucophyta, Chromophyta, Rhododphyta, Chlorophyta and Charophyta.
- Rosowski and Parker (1982) classified algae into 15 classes.
- Van den Hoek (1995) classified algae into 11 divisions:
 - Cyanophyta
 - Prochlorophyta
 - Glaucophyta
 - Rhodophyta
 - Heterokontophyta
 - Haptophyta
 - Cryptophyta
 - Dinophyta
 - Euglenophyta
 - Chloroarachniophyta
 - Cholorphyta

Ultrastructure of Prokaryotic algae

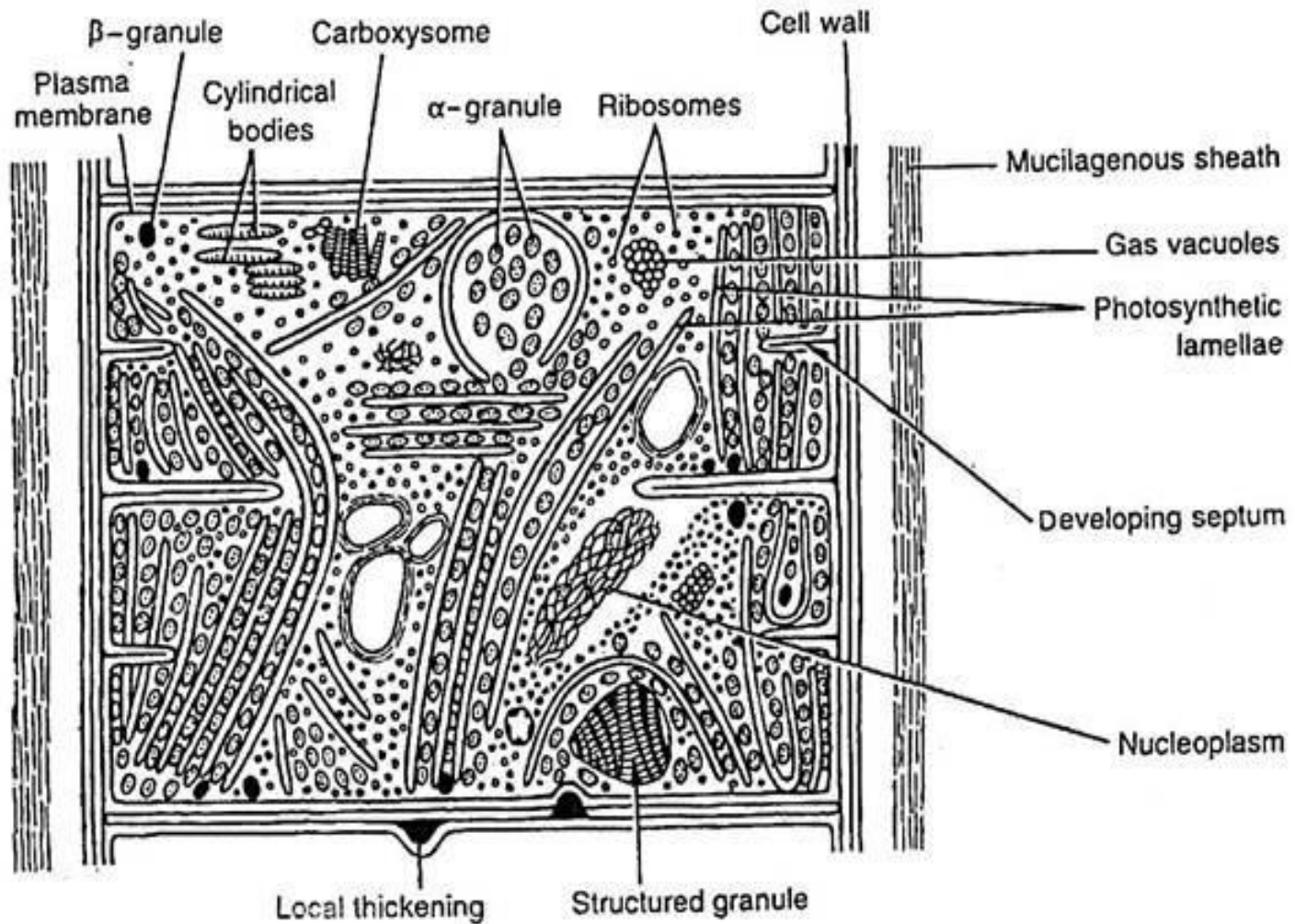


Fig. 3.10 : Structure of a prokaryotic cell (blue green alga) under electron microscope

Ultrastructure of Eukaryotic algae

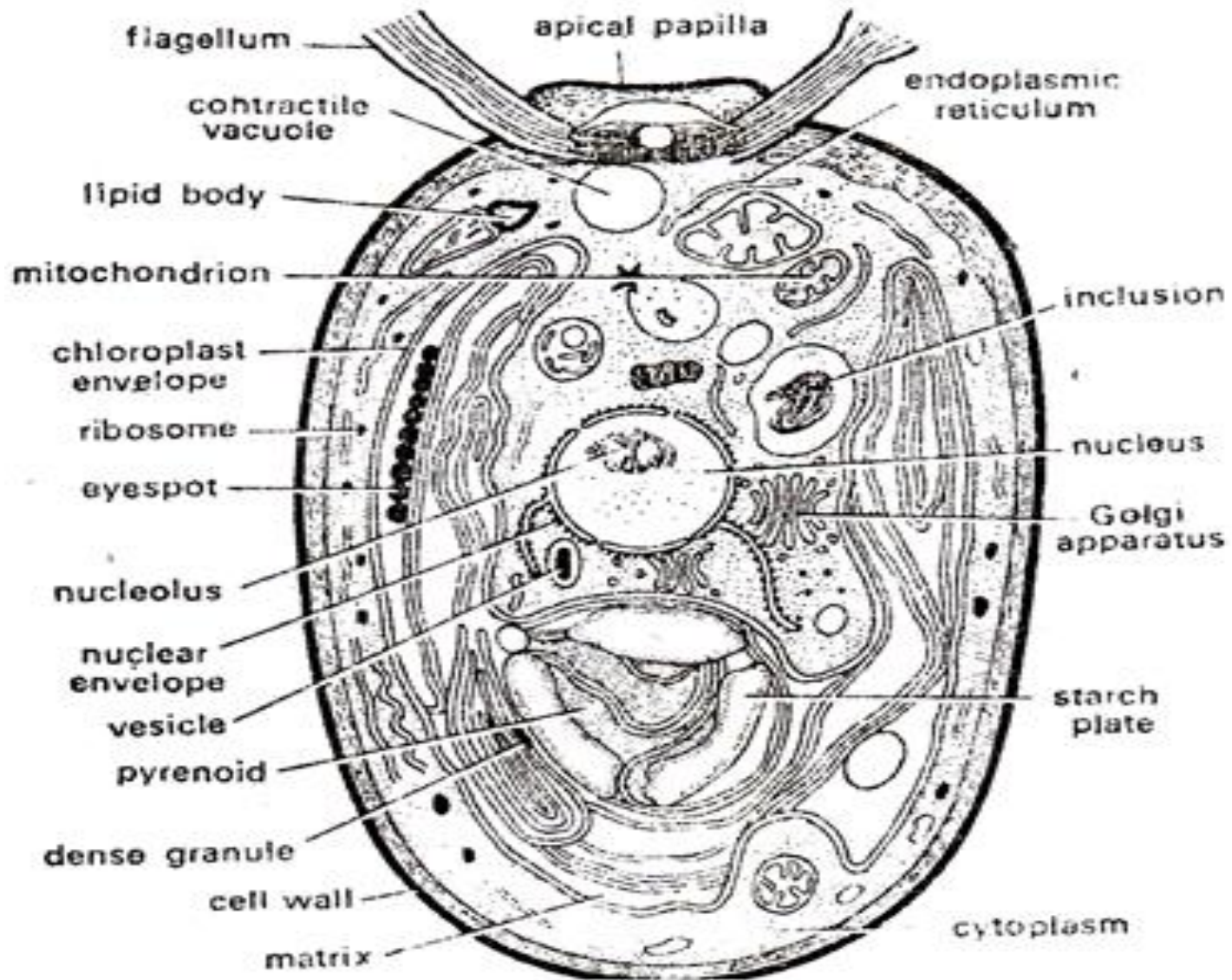


Fig. 1. *Chlamydomonas*. Ultrastructure of eukaryotic cell.

THANK YOU