

*WELCOME*

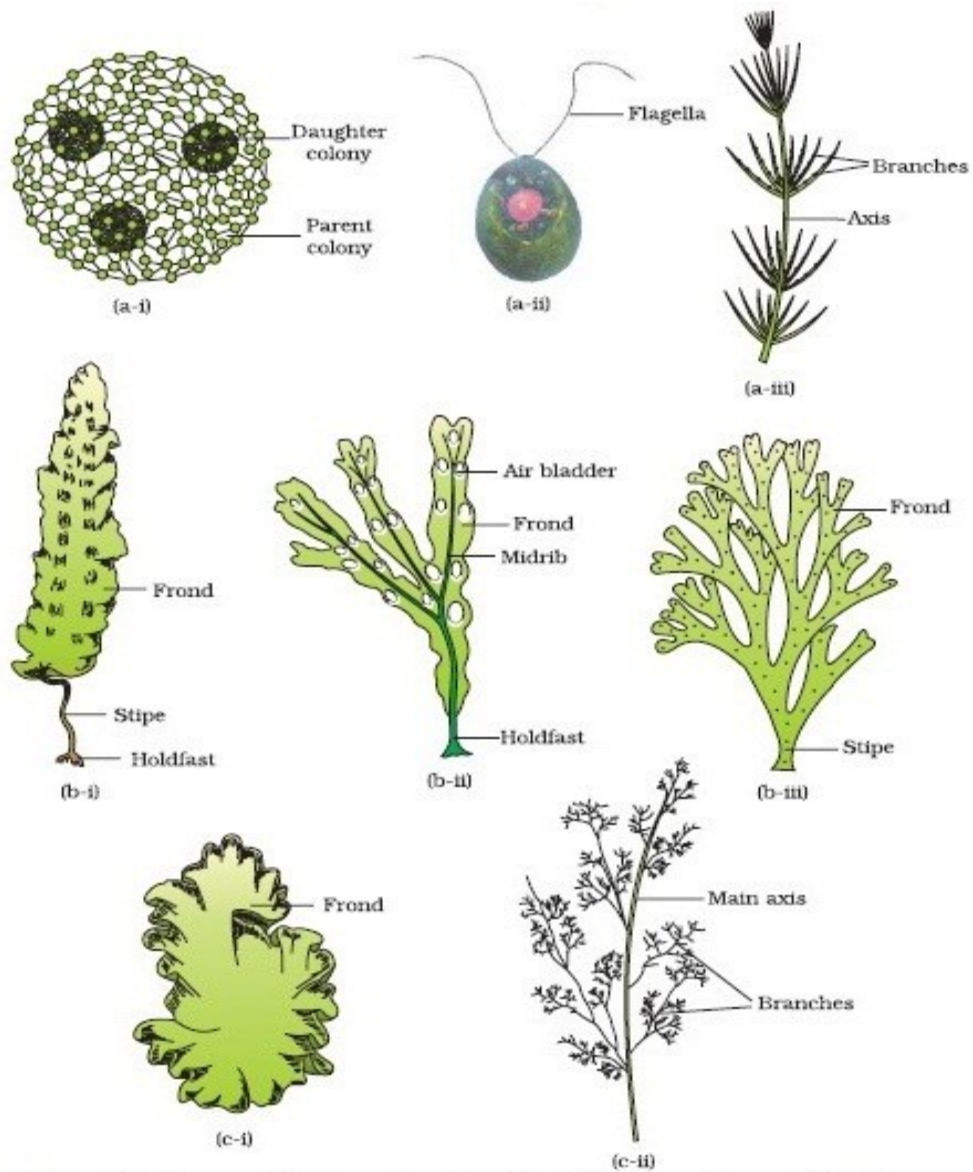
Thallus Organization and  
Morphological  
Variations: Ecological and  
Evolutionary Trends Of  
Algae

# INTRODUCTION

- *Algae are chlorophyll bearing organisms which are thalloid.*
- *They are important member in plant world.*
- *Plant body shows no differentiation into true tissues.*
- *It never forms true roots, stems and leaves.*
- *This plant body is called thallus.*
- *The thallus is non vascular and thus has a no element for the transport of fluids.*
- *They are active only in very most places.*

# ORGANIZATION OF THALLUS

- *They exhibit a great diversity in the organization of the plant body.*
- *Simplest forms are motile or non – motile unicells (Chlamidomonas and chlorella).*
- *In many species, the cells are grouped into aggregations called colonies (Volvox, Pediastrum).*
- *These assumes various forms and may be a hollow sphere, a flat plate or a filament.*
- *Filaments are multicellular and simple or branched or aggregation of filament.*
- *In some multicellular forms, the cells perform both functions of vegetative and reproductive organism.*
- *While in another special reproductive cells are present (Chara, Sargassum).*



**Figure 1. Algae :** (a) Green algae (i) *Volvox* (ii) *Chlamydomonas* (iii) *Chara*  
 (b) Brown algae (i) *Lamnaria* (ii) *Fucus* (iii) *Dictyota*  
 (c) Red algae (i) *Porphyra* (ii) *Polysiphonia*

- *Highly differentiated marine algae exhibit external differentiation and considerable size.*

*Eg: Sargasam, Laminaria.*

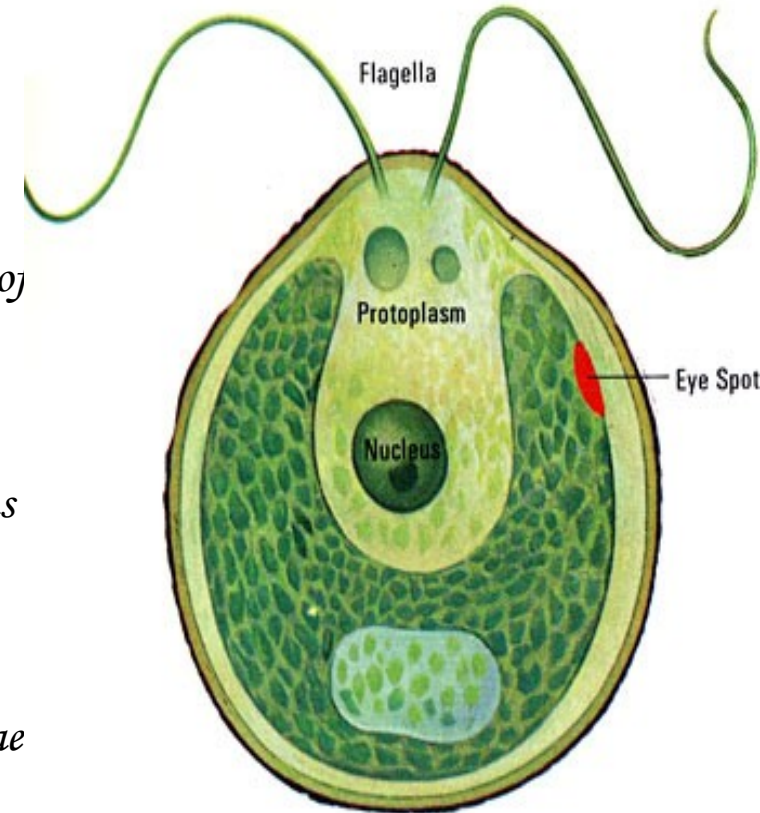
- *Some of them possess a plant kingdom consisting of parts that bear a superficial resemblance to the roots, leaves and stem of higher plants.*
- *The length of main axis equal or surpasses the height of tallest tree.*

*Eg: Thalli of *Macrocystis purifera**

# THALLUS VARIATION

## 1. *UNICELLULAR MOTILE FORMS*

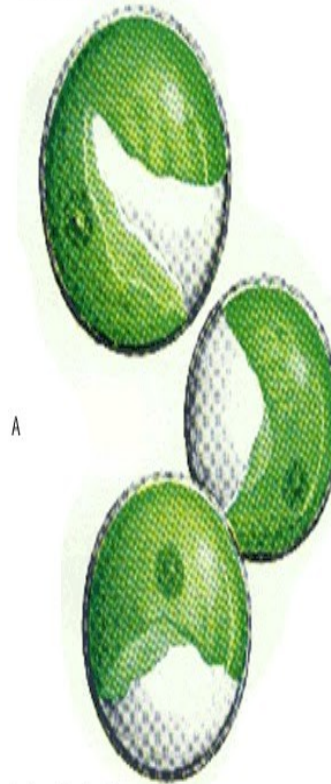
- *Unicellular motile forms are found in all major groups except phaeophyceae, rhodophyceae, bacillariophyceae.*
- *The presence of unicellular plant body bearing means of motility ie, flagella*  
*Eg: Chlamidomonas*
- *Flagella may be equal as in chlorophyceae or unequal as in xanthophyceae or Dinophyceae.*
- *Number of flagella may be one as in some chrysophyceae to four as in some chlorophyceae.*



## 2. Unicellular non – motile forms

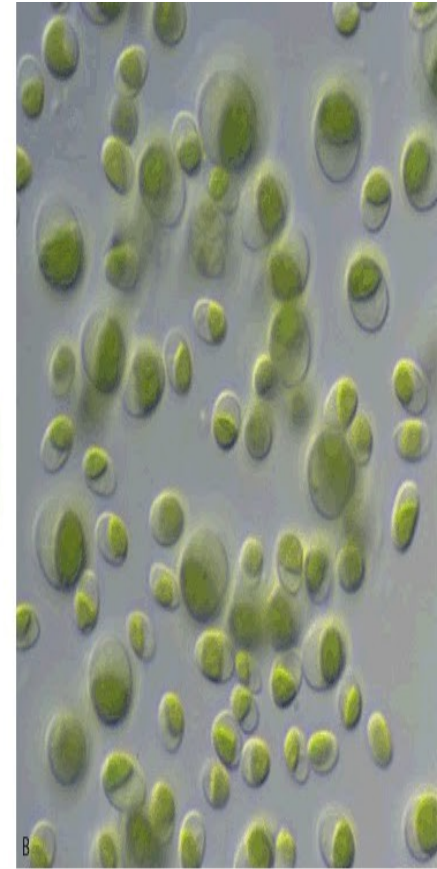
- *Unicellular non – motile thalli are found in many algal groups including chlorophyceae, chrysophyceae, cyanophyceae, xanthophyceae, bacillariophyceae and rhodophyceae.*
- *They possess unicellular plant body with no flagella*  
*Eg: Chlorella*
- *Chlorella which possess microscopic spherical cells each with nucleus and cup shaped chloroplast.*  
*Eg: Synechococcus of myxophyceae*

Chlorella



A after Mervin Palmer (1962)

B © National Institute for Environmental Studies, see <http://www.nies.go.jp/biology/mcc/home.htm>





# MULTICELLULAR FLAGELLATED OR COLONIAL FORMS

- *These are colonial members of algae. Whose cells bear flagella, colonial habitat have been developed by the other aggregation of many motile forms.*
- *Innumerable number of cells are present in the body.*
- *Colony with definite number of cells and having constant shape and size is called coenobium.*



- *Multicellular motile forms belonging to chlorophyceae, chrysophyceae and dinophyceae*

*Eg: Volvox*

- *In volvox, definite number of cells are interconnected with protoplasmic connections. Coenobium is hollow and spherical.*

*Eg: Ceratium and Gonyaulax of Dinophyceae*



# MULTICELLULAR NON - FLAGELLATED FORMS OR NON - FLAGELLATED COLONIES

- *Plants bear definite number of cells and represent a coenobium. The cells are non – motile and do not have flagella.*

*Eg: Hydrodictyon*

- *In which the cells of net remain connected in the forms of groups of 5 or 6 forming pentagonal or hexagonal.*
- *Non – flagellated colonial habitat developed by the aggregation of unicellular non – motile cells.*

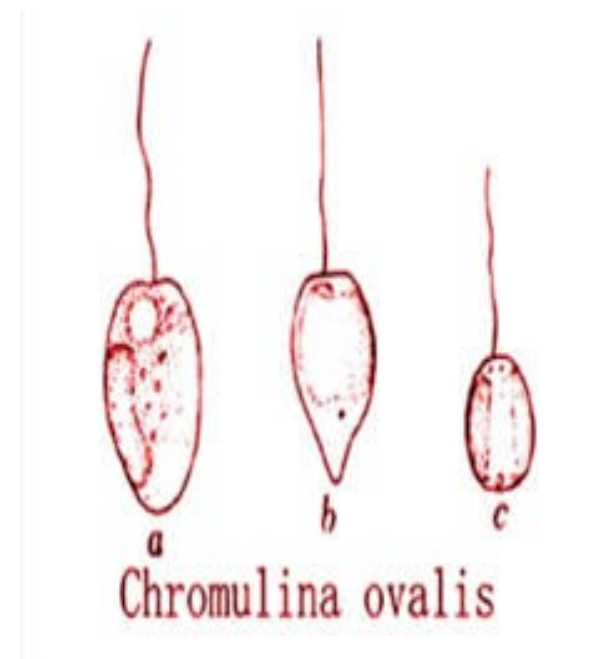


# PALMELLOID FORMS

- *These are the colonial members of algae in which in non – motile cells remain embeded in an amorphous gelatinous.*
- *In this form neither the number nor the shape and size is constant.*
- *Cells aggregated in mucilaginous envelop.*

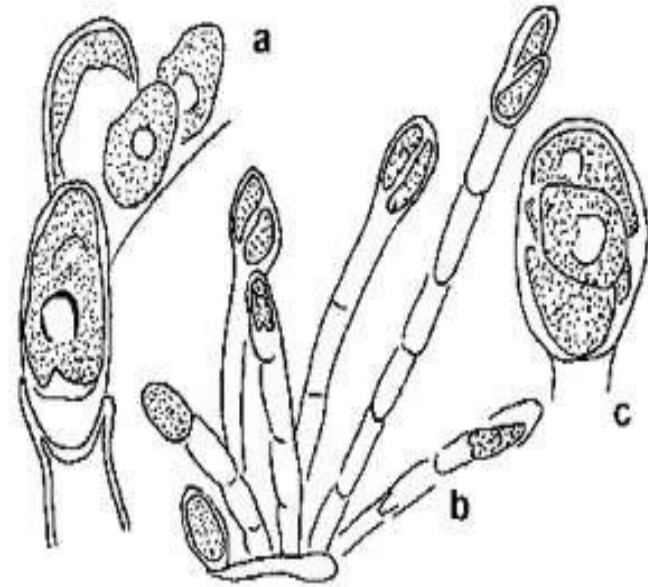
*Eg: Chlamidomonas, Chromulina*

- *According to Klebs(1886), Scroder and Virieux(1910) the mucillage in palmoid forms is secreted eigther by the protoplast of the cell or develop by gelatinization of their membraines.*



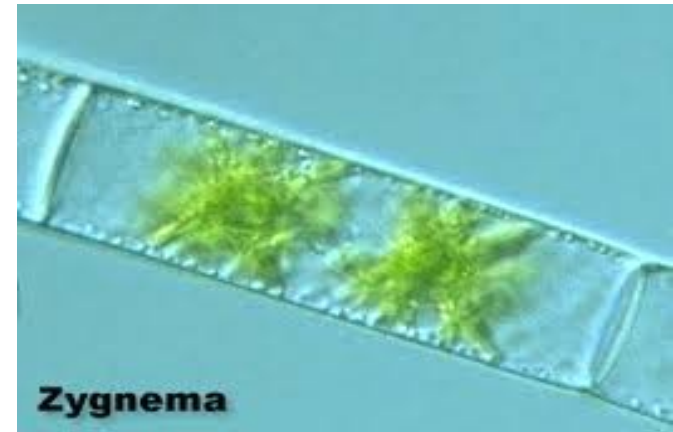
# DENDROID FORMS

- *Dendroid means tree – like.*
- *In prasinocladus, Eebollocystis etc the plant body appears like a microscopic tree.*
- *Mucilage in such cases is restricted only locally, generally at the base of cell.*



# FILAMENTOUS FORMS

- *Many cells arranged one upon the other in a definite sequence or uniseriate row constitute a filament.*
- *Filamentas may be unbranched and branched.*
- *Unbranched filament found spirogyra zygeneea, Mongeotia, Ulothrix, Oedogonium, Nostoc etc*



- *In ulothrix, oedogonium etc the filaments remain attached the substratum with basal specialized cell but in zygnema, Spirogyra they are free flotting.*
- *Branched filamentous are found in chladophoro, phecothamnion etc.*
- *In some genera of myxophyceae such as scytonema, false branching is observed.*



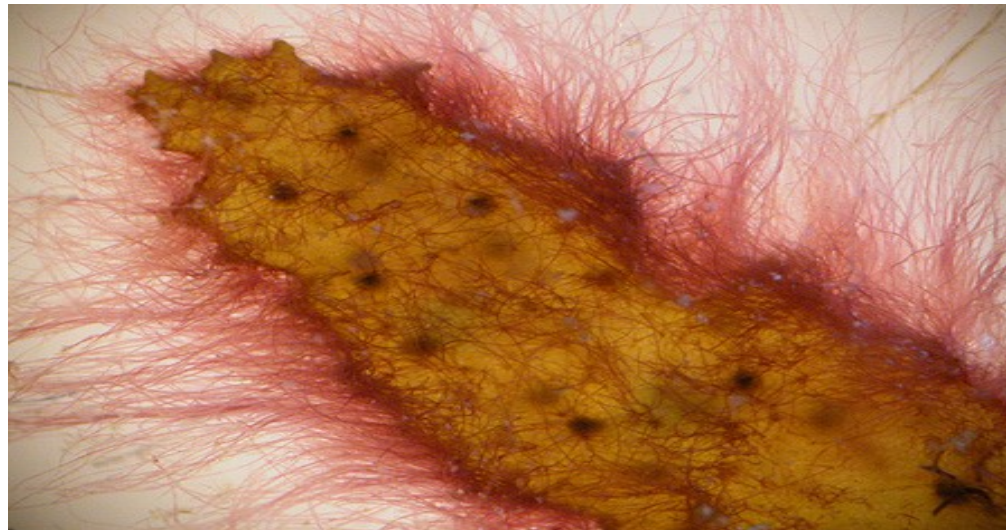
# HETEROTRICHIOUS FORMS

- *“Hetero” means differentiated and “trichous” denote filament.*
- *In some algae plant body exhibit more than one type of filament and thus represent heterotrichous habit.*
- *It is characteristic feature of chaetophorales of chlorophyceae.*



- *In general, the plant body of prostrate system develop an erect system of filaments. The erect system is called primary projecting , this may be devided into many branches is secondary projecting system and tertiary projecting system.*

*Eg: Erythrotrichia, Draparnaldia, Tilopteris*



# SIPHONOUS FORMS

- *In siphonous forms the plant siphon body enlarges considerably without the formation of any septa because the presence of many nuclei ie, coenocyte.*
- *A large central siphon like vacuole is present in the thallus.*
- *This algal thalli are found only in some chlorophyceae and xanthophyceae.*

*Eg: Voucheraria- coenotypic plant (body encloses a siphon like vacuole.), Botrydium, Valonia, Codium, Bryopsis.*

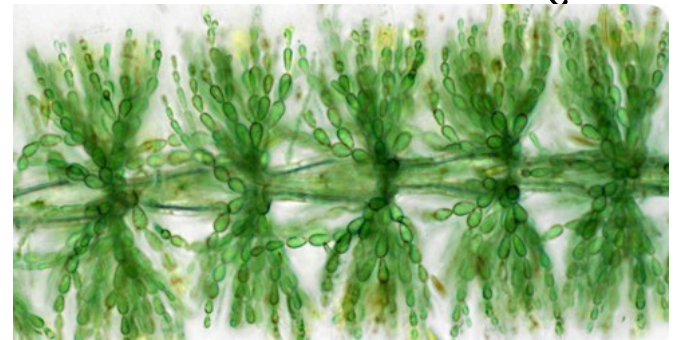


*Botrydium*

# UNIAXIAL FORMS

- *Uni means one and axial pertains to axial.*
- *In some rhodophyceae, plant body is made up of such pseudo parenchymatous thalli and there is present on the main axis and all other side branches.*

*Eg: Batrachospermum*



- *Uniaxial forms of thalli must have been originated from the filamentous habit during the course of evolution.*

# MULTIAXIAL FORMS

- *Multi stands for more than one and axia pertains to axis.*
- *In some algae the thallus construction present a number of threads in close juxtaposition giving the appearance of more than one axis.*
- *Different filament of the central and side axis form more or less a compact cortex.*

*Eg: Codium, Polysiphonia, Nemaion*



# PARENCHYMATOUS FORMS

- *Abundant septation of filament in two or more planes results in the formation of parenchymatous body in some algae.*
- *Such plants may ultimately be foliose and flat (*Ulva*) or tubular (*Enteromorpha*).*

*Eg: Chara, Porphyra, Dictyota, Sargassum*



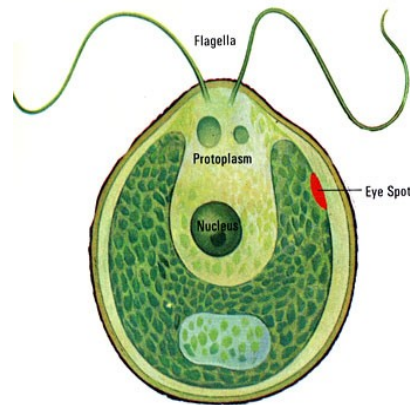
# ECOLOGY OF ALGAE

- *Algae are almost throughout the world, being most common in aquatic and are found in fresh or salt waters.*
- *Algae can be categorized ecologically by their habitates.*



# Aquatic Algae

- *Aquatic algae usually occur in ponds, pools, tanks, ditches, streams.*
- *Most of the marine forms are sea weeds. In marine forms are either floating on the surface or attached with rocks or any other substratum.*
- *Planktonic microscopic algae grow suspended in the water. Where as newstonic algae grow on the water surface.*
- *Example:*



# **Terristrial Algae**

- *The algae forms occuring on the surface of moist soil.*
- *Example: Voucharia, Botrydium, Fritschiellia*





# Aerophytic

- *Some algal forms are adapted for aerial mode of life and get their water and carbondioxide requirments directly from atmosphere.*
- *Trentepohlia is found on the bark of trees in miost condition.*
- *Scytonema and Hapalosiphon grow on bark of tee along with Bryophytes.*

# Cryophytes

- *The algal genera occurring in snow and ice. they occur in mountain peaks and gives attractive colour to the mountain, Haematococcus nivalis give red colour to Arctic and Alpine region.*
- *Clamydomonous yellow stonensis along with some spaces give green colour to the mountains of European countries.*

# Thermophytes

- *The algal genera occurring in hot spring at quite high temperature.*
- *Example: Oseillatoria, Haplosiphon.*

## ALGAE OF UNUSUAL HABITS

### **Halophytic algae**

- *Algae found in saline water containing high percentage of salts.*
- *Example: Dunaliella, Stephanoptere.*

# Lithophytic algae

- *The algae grow on moist rocks, wet walls and other rocky surfaces.*
- *Example: Rivularia, Gloeocapsa,*

# Epiphytic algae

- *Some algal forms which grow on the other aquatic plants.*
- *Example: Oedogonium, Bulbochaeta.*
- *Greenalgae Coleochaeta nitellarum occurs on Chara and Netella.*
- *Some are grown on Angiospermic plant,*
- *Chaetophora is found on the leaves of Nelumbo and Vallisneria.*

# Epizoid algae

- *Many algae grow on the shells of molluscs, turtles and fins of fishes.*
- *Chladophora is found on snails and shells of bivalves.*

# Endozoic algae

- *The algae are found inside the aquatic animals.*
- *Zoochlorella is found inside Hydra viridis.*
- *Zooxanthella is occur inside the fresh water sponges.*
- *About 15 species of blue-green algae occur in the digestive and respiratory tracts of vertebrates.*



# Parasitic algae

- *Cephaleuros virescens* which causes red rust of tea foliage in assam and near by states.
- Other examples are *Chlorochytrium*, *Phyllosiphon*.

# Symbiotic algae

- *Several members of algae grow in association with other plants.*
- *Lichens exhibit good example.*
- *Nostoc is found with in the thalli of Anthoceros and Notothylas.*
- *Anabaena cycadeae is present in the corolloid root of cycas.*

*Algal abundance and diversity vary from one environment to the next.*

- *Abundance and diversity vary from tropical to deserts*
- *Terrestrial vegetation is influenced most by precipitation and temperature .*
- *Aquatic vegetation is influenced by light and nutrients.*
- *When nutrients are abundant as in some polluted waters, algal cell numbers can become great enough to produce patches of algae called blooms*

# **Evolutionary trends in algae**

- *The fossil record for some group of algae has hindered evolutionary studies , and the realization some algae are closely related to protozoa or fungi than they are to other algae came late.*
- *Producing confusion in evolutionary thought and delays in understanding the evolution of the algae.*
- *The colourless englenophyceae are believed to an ancient lineage of algae.*

- *Some scientist consider the red algae , which little resemblance to any other group of organisms to be very primitive eukaryotes that evolved from the prokaryotic blue green algae evidence support is photosynthetic pigments and similar starches among the red algae and blue green algae.*
- *Red algae evolved from the cryptophyceae with the loss of flagella, or from fungi by obtaining chloroplast.*
- *The green algae classes are evolutionarily related, but their origins are unclear.*

- *The cryptophyceae are an evolutionary enigma, they have no fossil record and phylogenetic data are conflicting.*
- *Some workers align them are near the red algae, because both group possess phycobiliproteins in their chloroplasts.*
- *Some of the green algal classes are also very old.*
- *Specific groups of algae share features with protozoa and fungi.*
- *That without the presence of chloroplasts and photosynthesis.*

Thank you

