Lect-6-

Chrysophyta& Xanthophyta

1-General features of Chrysophyta

Golden brown chromatophores present, assimilation product fatty oil, flagella present.

A-Planktonic species are mostly motile (flagella), require Si (but less than diatoms), and are often mixotrophic (bacterivores)

B-Chrysophyta are slower-growing than diatoms but need less Si, suffer less sedimentation (almost none), and some can supplement their nutrition by mixotrophy.

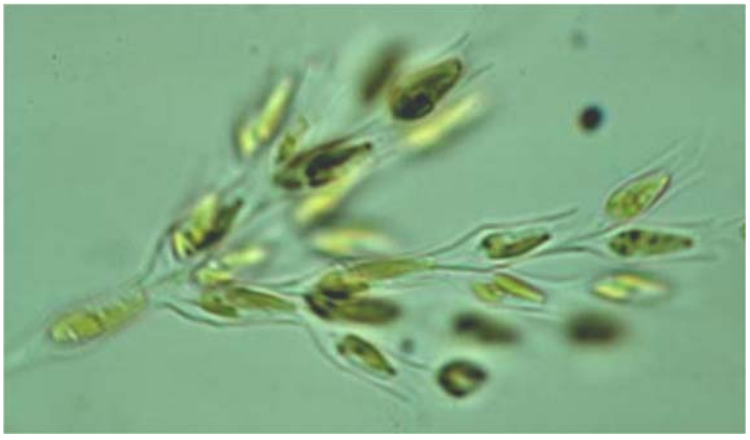
C-Early stages of fall mixing can stimulate a fall bloom, smaller in magnitude than spring bloom, as failing supply of sunlight and deepening of mixed depth curtail growth

D-Intolerant of eutrophic conditions.

E-Structure: Unicellular motile to branched filamentous.

F- Flagella: Present, Two in number, equal or may be unequal, inserted anteriorly.

G- Reproduction: Vegetative and Sexual (normally absent, but if present isogamous)



Chrysophytes, or golden algae, are common microscopic chromists in fresh water. Some species are colorless, but the vast majority are photosynthetic. As such, they are particularly important in lakes, where they may be the primary source of food for zooplankton. They are not considered truly autotrophic by some biologists because nearly all chrysophytes become facultatively heterotrophic in the absence of adequate light, or in the presence of plentiful dissolved food. When this occurs, the chrysoplast atrophies and the alga may turn predator, feeding on bacteria or diatoms.

2-Classification

Chrysophyceae

Key to order

1(2) The algae are branched filamentous organization of non-flagellated cells, with a single wall around all the cells. ----------**Chrysotrichiales**

2(1) The organisms are unicells or colonies.

3(4) The organisms are amoeboid-like unicells or colonies. ---------- **Rhizochrysidales**

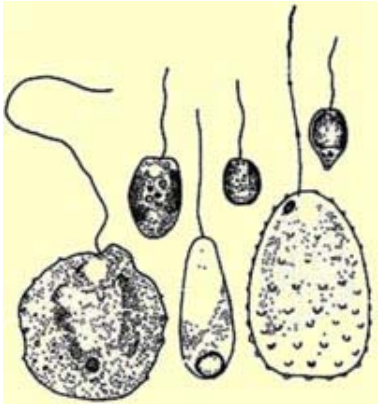
4(3) The organisms are unicells or colonies other than amoebiform.

5(6) The organisms are motile unicells or colonies. The vegetative cells possess flagella. ----------**Chrysomonadales**

6(5) The organisms are contained within a gelatinous matrix. In the vegetative phase the cells lack a flagellum. ----------**Chrysocapsales**

Chrysomonadales

The members of the Chrysomonadales are motile unicells predominantly with two heterokont flagella (one tinsel-type flagellum and one whip-type), and more rarely with a single flagellum, forming partial coenobia. Some genera are naked without cell walls, and they are able to produce silicified cysts. Most of them are phytoplanktons.

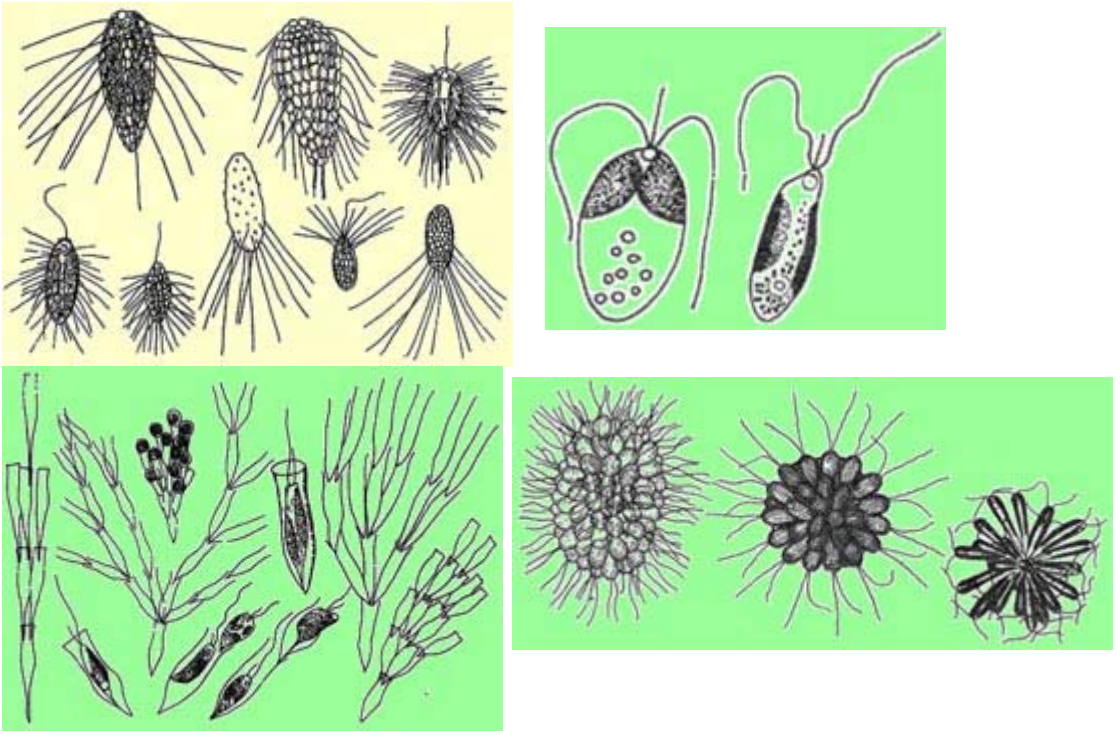


1.Chromulina: Chromulina may be considered typical of the uniflagellate group. The unicells typically contain one or two pyrenoid-bearing chloroplasts, an eyespot and contractile vacuole. The cell membrane is non-rigid to allow metabolic movements. The single flagellum is pleuronematic. Reproduction is by cell division, some species multiply by the production of endospores. Smooth-walled cysts also occur. There are one or two discoid chloroplasts in each cell. The leucosinin is located in the posterior part of the cell.

2.Mallomonas: Mallomonas is a genus with silicified scales, which in some species are composed of a dome, shield, and bristle. There are two chloroplasts in each cell, and they are discoid and parietal. The leucosinin is spherical and located in the posterior part of the cell.

3.Dinobryon: The species in Dinobryon have a lorica (an envelope around the protoplast, but not generally attached to the protoplast

as a wall is). In Dinobryon bushy colonies are formed by a series of empty loricas. The cells possess two chloroplasts and contractile vacuoles, an eyespot and heterokont flagella.



4.*Synura*: This is a floating colonial genus in which the sheaths are united by a pectinaceous material. The individual monads each have two flagella, which are slightly unequal, but heterokont and heterodynamic. The longer flagellum points to the front, the shorter to the rear. There are two discoid and parietal chloroplasts in each cell and a number of contractile vacuoles. The periplast is overlaid by a layer of finely sculptured scales that are both ellipsoidal and siliceous. The monad cell may divide within the colony or without to form a new colony. The storage product is leucosinin in vesicles in the posterior part of the cell.

5.Prymnesium: These cells have a well-developed haptonema and two equal smooth flagella. The tip of the heptonema is adhesive

and by this means the organism can become temporarily anchored. There are two chloroplasts in each cell, and they are discoid and golden-yellow. The storage product is leucosinin in vesicles in the posterior part of the cell. They are one of species that can cause red tide and produce ichthyotoxin.

3-Chrysophya structure

The chlorplasts are parietal and usually only a few in number, often only one or two. Chorophylls a, c, and b-carotene are present, with the main carotenoid being fucoxanthin. The storage product is oil and chrysolaminarin (leucosin), the latter one is a b-1, 3 linked glucan, supposedly found in a posterior vesicle, the so-called chrysolaminarin vescle. The single nucleus is pear-shaped with its narrow anterior end extended in the direction of the basal bodies. Because Chrysophyta encompasses so many species, there is no common cell structure. Some cell walls are comprised mainly of cellulose, with large amounts of silica, while some are amoeboid with no cell walls. If flagella are present, there may be one or two; if there are two they may or may not be similar. Diatoms are capable of reproducing sexually, but the chrysophytes commonly reproduce through cell division. Members of Chrysophyta tend to be photosynthetic, but some, especially the golden algae, become heterotrophic when there is inadequate light or if dissolved food is plentiful

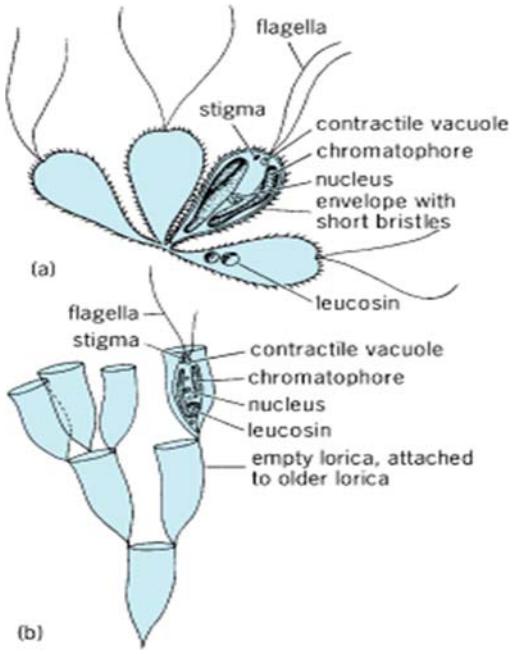
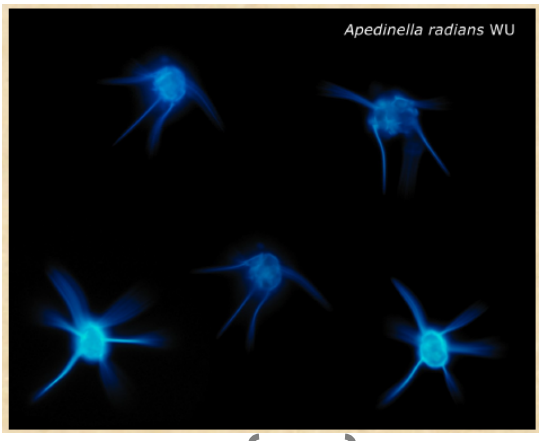


Figure 1: General Structure of Chyrysophyta

4-Life cycle and reproduction

Sexual reproduction has been infrequently recorded, and is isogamous. The representatives reproduce vegetatively by binary fission, or by planospores, which resemble the vegetative cells. The formation of a cyst or statospore or resting spore is one character by which a member of the Chrysophyta may be unequivocally recognized. Statospores are mostly spherical, ellipsoidal, or ovate in shape, and the outer surface may be smooth or variously ornamented with warts, spines, or arms. The statospore has a pore with a collar that is closed by a plug. A vegetative cell forms a statospore internally.

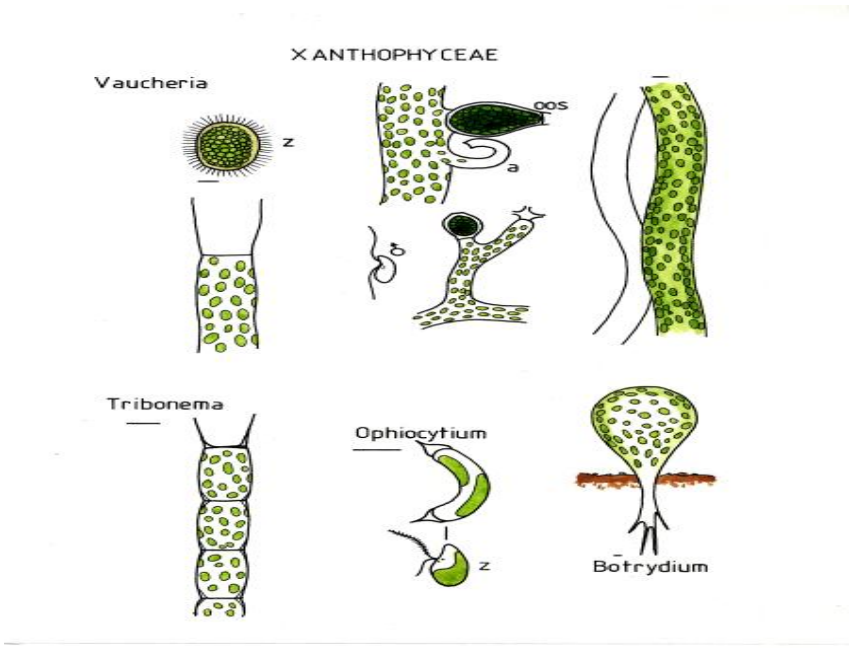


5-Xanthophyceae

5-1 General feautres

1- Occurrence: Mostly freshwater and a few marine representative
2- Pigments: Chlorophyll a, e, β carotene and xanthophylls
3- Pyrenoids: Usually absent
4- Reserve food material: Chrysolaminaran, Oil and fat
5-Cell wall: Rich in pectic compounds and composed of two equal pieces overlapping
at the edges.
6-Structure: Eukaryotic unicellular motile to simple filamentous,
7- Flagella: Present, two unequal, situated anteriorly. Longer one tinsel and shorter
one whiplash
8-Reproduction: Vegetative, Asexual and Sexual (Mainly Isogamous, Anisogamy is rare, Oogamous in Vaucheria)

Yellow-green algae or xanthophytes are an important group of heterokont algae. Most live in freshwater, but some are found in marine and soil habitats. They vary from single-celled flagellates to simple colonial and filamentous forms. Xanthophyte chloroplasts contain the photosynthetic pigments Chlorophyll a, Chlorophyll c, β-Carotene, and the carotenoid diadinoxanthin. Unlike other heterokonts, their chloroplasts do not contain fucoxanthin, which accounts for their lighter colour. Its storage polysaccharide is chrysolaminarin. Xanthophyte cell walls are produced of cellulose and hemicellulose. They appear to be the closest relatives of the brown algae.

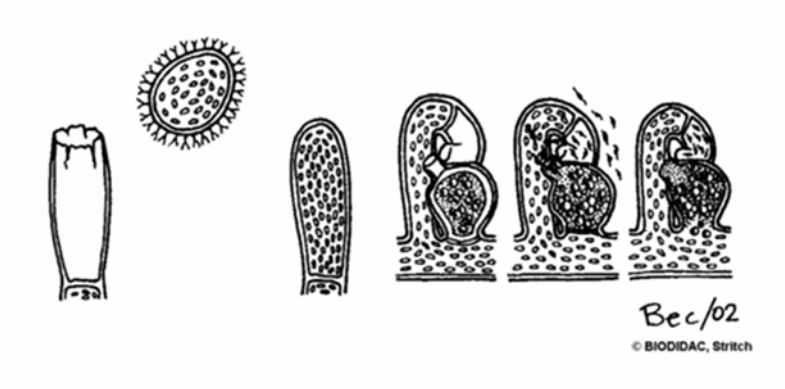


5-2 Cell Structure and Metabolism

Xanthophyceae are a photosynthetic group of yellow-green algae. Their photosynthate is stored as oils and the storage polymer chrysolaminarin. Most Xanthophyta are coccoid or filamentous, but some are siphonous, meaning that they are composed of multiple tubular cells with several nuclei. What makes up the cell wall is unknown but inside some there are two silica valves similar to those in diatoms. For the species that are filamentous the interlocking halves are in the shape of a H.

While not much is known about the life cycle of xathnophyta generally their reproduction is asexual, in which the cell divides bilaterally and creates and produces an endogenous cyst. Reproduction has only been observed in two xanothophtyes: in Vaucheria, it was found to be

oogamous, and Botrydium reproduces by means of bimastigote zoospores or aplanospores



5-3 Ecology

Xanthophyta are generally found in freshwater, wet soil and tree trunks, but there are several marine species. Most of the species occur singly and are found around other algae, making it difficult to find the same species twice. They do very well at low pH in habitats that are rich in iron. It was also found that Xanthophyceae loses its cytoplasmic streaming ability and organization of other vegetative filaments, when it is in an aluminum-rich environment. Many of them are found in late winter among floating mats in still water.

The species Vaucheria longicaulis has a unique characteristic in that it will send a larvae of Alderua modesta into spontaneous metamorphorosis when the larvae comes in contact with it. The adults can create two kinds of larvae, planktotrophic or lecithotrophic. Lecithotrophic clutches

contain a mix of larvae, some which settle spontaneously, and others that need to be exposed to Vaucheria longicaulis.There were other experiments done to test and see if other algae would have the same effect and out of the 17 none did except for Vaucheria longicaulis.

5-4 *Vaucheria* Sp.

Vaucheria is a genus of Xanthophyceae or yellow-green algae. It is one of only two genera in the family Vaucheriaceae. The type species of the genus is Vaucheria disperma.

Vaucheria exhibits apical growth from the tip of filaments forming mats in either terrestrial or freshwater environments. Its filaments form coenocytes with a large central vacuole pushing against the surrounding cytoplasm; the vacuole extends along the entire filament except for the growing tip. The chloroplasts are located on the periphery of the cytoplasm with the nuclei aggregating toward the center near the vacuole

5-4-1 *Vaucheria* Sp.life cycle

Sexual Reproduction:- It takes place by the method of fertilization i.e. by sharply differentiated male and female organs. Male organs are antheridia and female organs oogamia and these are developed at scattered intervals as lateral outgrowths. In monoecious species of vaucheria antheridia and oogamia usually arise side by side on same filament, or on short lateral branches of it.

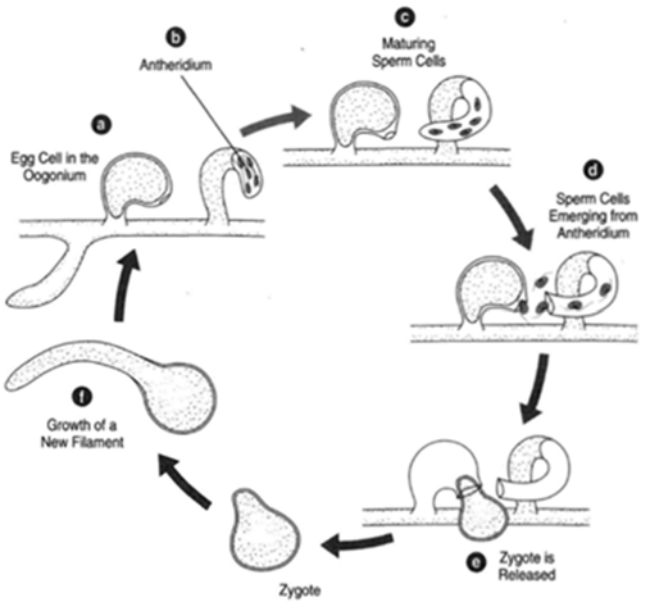


Figure 2: **Sexual reproduction in Vaucheria. (a) An egg cell in the oogonium; (b) antheridium; (c) maturing sperm cells; (d) sperm cells emerging from the antheridium; (e) and (f) the zygote and growth of a new filament.**

Asexaul reproduction:- It takes place by large solitary zoospore. During its development the apex of filament swells up, becomes club shaped and

is separated from rest of filament by a septum. This club shaped body is called zoosporangium. Its protoplasmic contents become rounded off forming a single zoospore wall of zoosporangium, ruptures at the apex, and the zoospore escapes by terminal pore and begins to rotate. Zoospore is an oval body of large size. Central part of it is occupied by large vacuole and in surroundings zone of protoplasm.

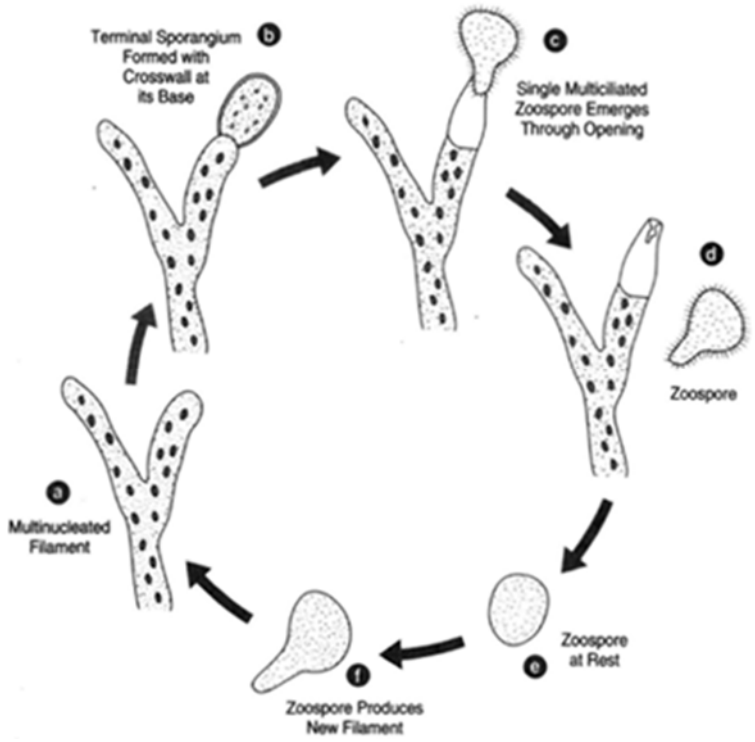


Figure 3: Asexual reproduction in Vaucheria. (a) The multinucleated filament. (b) A terminal sporangium forms and a cross wall develops at the sporangium's base. (c) A single, multiciliated zoospore emerges through an opening. (d) Zoospore at rest,(e), and producing a new filament, (f).

References

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