Department of biology

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((Plant groups))

Stage (2)

((Fourth lecture))

Chlorophyta (Green algae)

By

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Chlorophyta (Green algae)

It is a division of the multicellular algae that belong to the plant kingdom. It is an algae that contains chlorophyll pigments and stores the food stored in it in the form of true starch in special centers for collecting starch in plastids, and its cell walls are compose cellulose.

Environment and presence

- Members of this phylum are distributed in different environments, and include 425 genera and 6,500 species, the majority of which are found in **(Fresh water, while marine species constitute only 10%).** They grow either planktonic or attached to **(Rocks, soil, plants, or aquatic invertebrates).**

General Characteristics

1. Members of this division are eukaryotic and contain various cell organelles.
2. Plastids are specific and varied in shape; they may be cup-shaped, parietal, stellate, spiral, band shape or discoid.
3. Plastids contain pigments such as Chlorophyll A and B and β - Carotene and pigments xanthophyll such as (Lutein, Zeaxanthin, Neoxanthin)
4. Stored food consists of carbohydrate compounds in the form of spores, which is similar to the stored food in seed plants. It may be stored in the cytoplasm or within starchy centers (pyrenoids), which are found singly or multiples within the plastid.
5. The cell wall is cellulose and may also contain pectin, in addition to other substances.

6. Flagella are found in some motile genera or motile reproductive stages, and are in the form of one or two pairs of smooth, Acronematic type, of equal length.
7. Motile genera contain an Eye Spot and contractile vacuoles at the front of the body.

Vegetative Form

1- Unicellular Form:

A-Motile unicellular: such as *Chlamydomonas*

B- Non-Motile unicellular: such as *Chlorella*

2- Colonial Form:

A- Pallmelloid Form: such as Palmella

B- Definite colonies Coenobium, perhaps definite motile colonies (*Volvox*) and perhaps definite non-motile colonies (*Pediastrum*).

3-Filamentous Forms: In some genera, the cells are arranged in the form of unbranched filaments, such as

(*Ulothrix*), or branched, such as (*Cladophora*), or they are unicellular such as (*Heterotrichous*).

4-Siphonous Form: Where the cells are arranged in the form of a tube, such as (*Enteromorpha*).

5- Thallus Form: Where the alga has a branched, perpendicular axis, such as (*Chara*).

Cellular Structure

The cellular structure of the unicellular motile alga Chlamydomonas, which has all the characteristics of green algae, is studied in terms of its internal structure. Under the light microscope, this alga appears as a spherical or oval cell with a goblet plastid containing a single starchy center. At the front of the body, inside the plastid, is the eye spot. A pair of smooth, equal-length flagella protrude from the front of the body.

Phottaxis

In genera that contain eyespots that are sensitive to light, these genera have the ability to orient or phototropism, which occurs in two ways:

1- In genera that contain flagella, orientation or phototropism of the algae (positive or negative) is achieved by the movement of the flagella, which is the movement of the algae body.

2- As for movement in genera that lack flagella, such as desmids, the body slides by secreting gelatinous substances through holes on the cell surface.

Growth

Growth occurs in green algae in two ways:

1- **Generalized growth method**, as in ***Ulva*** **.**

2- **Localized growth method**, which is either (Apical, Basal or Intercalary) growth.

Reproduction

Green algae reproduce in the following ways:

1- Vegetative Reproduction: This type of reproduction occurs by cell simple division, or fragmentation.

2-Sexual Reproduction: Occurs by the formation of different types of motile and non-motile spores.

3-Sexual Reproduction: It occurs in its various types, where gametes are formed and unite to form the fertilized egg.

A- Isogametes: The union of similar motile gametes.

B- Anisogametes: The union of different motile gametes.

C- Zoogamy: The union of a small motile male gamete with a large quiescent egg cell.

Class Green Algae

Members of the green algae class Chlorophyceae were placed within 14 orders by the scientist (Fritsch) 1945, and the scientist (Smith) 1950 and the scientist Bold (1985) within 15 orders. The classification was based on:

1 -Vegetative form

2 -Cellular structure

3 -Methods of reproduction

4 -Life cycles

From these **orders**, we will study some of them:

1- Order: Volvocales

Distinctive characteristics:

1 . This order includes motile unicellular genera or specific motile colonies.

2 . Most of them are found in fresh water, and some of them are found in salt water.

3 . The cells are usually surrounded by a cellulose wall.

4. The cells contain 2-8 smooth Achronematic flagella.

5. The cells are uninucleate and contain chloroplasts of various shapes, and there is an eyespot at the base of the flagella.

6. Members of this order reproduce by simple cell division, or asexually by the formation of motile or non-motile spores. Sexual reproduction occurs in three types: Anisogamy, Isogamy, Oogamy.

2- Order: Chlorococcales

Distinctive characteristics:

1. This order includes unicellular genera or non-motile colonies.

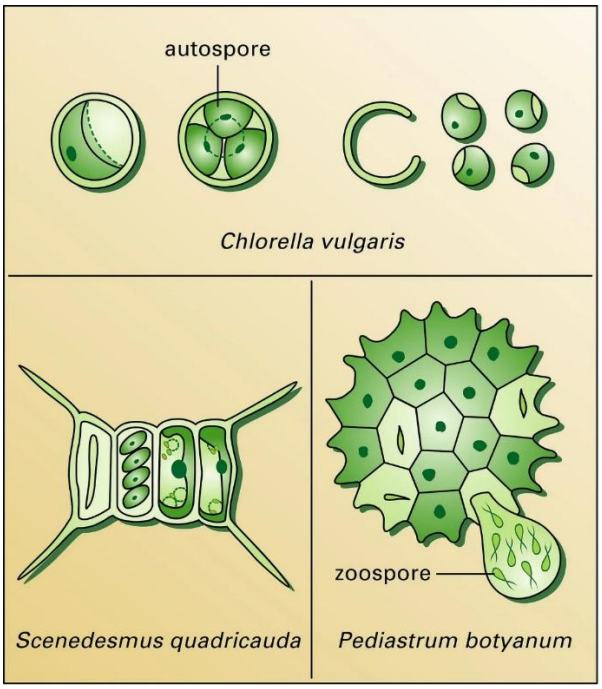
2. The cells are surrounded by a cellulose wall.

3. The cells do not contain flagella in the vegetative state.

4. Uninucleate cells in some genera and multinucleate in other genera and do not contain an eye spot.

5. Plastids come in different shapes, single or multiple in the cell.

6. Its individuals reproduce asexually by forming motile or non-motile spores. Sexual reproduction is of the type Anisogamy or Isogamy.

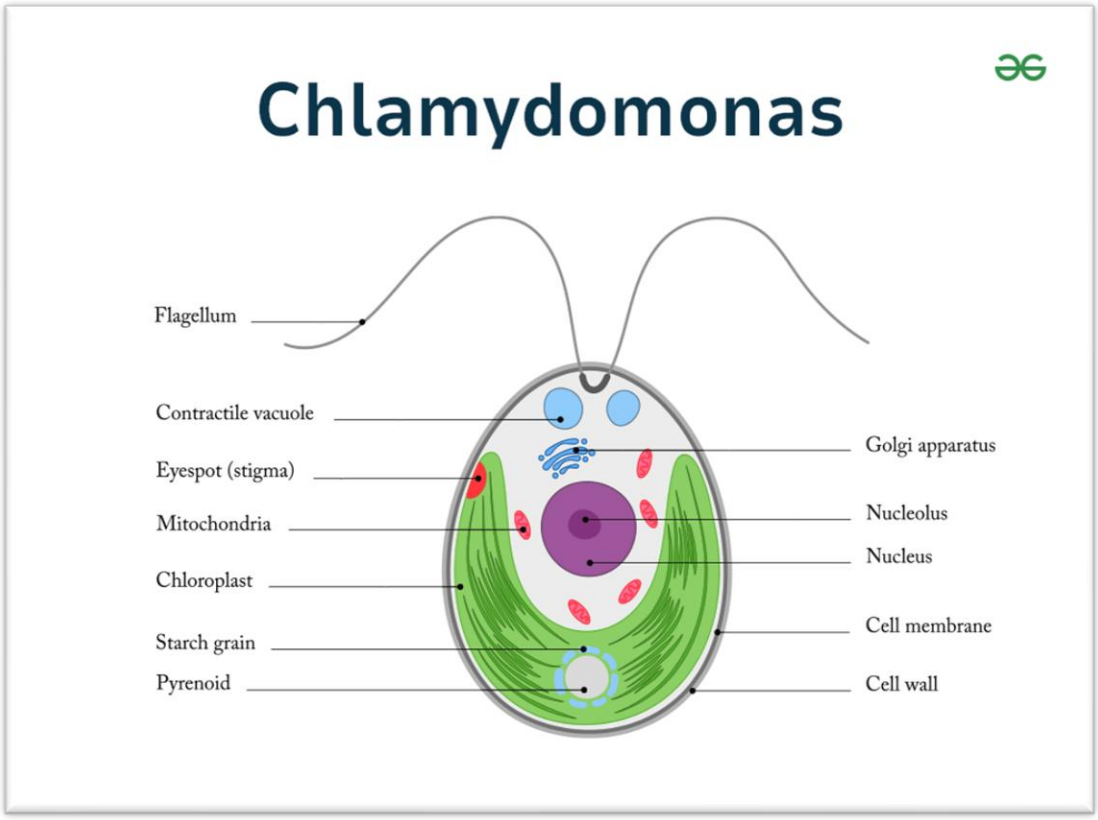


Classification of Chlorophyta

- Division : Chlorophyta
- Class : Chlorophyceae
- Order :Volvocales
- Family: Chlamydomonaceae
- Genus: ***Chlamydomonas***

1- Genus: *Chlamydomonas*

Unicellular pear-shaped alga motile, has a cup-shaped plastid with a single starch center, the eye spot (stigma) is located inside the plastid . There are two flagella of equal length of smooth type in front of the body of the moss.



2- Genus: *Volvox*

Spherical colonies with hollow center (hollow ball), colony motile , there are specialized cells within Volvox colony vegetative cells: most of colony cells specialized for nutrition and movement, generative cells: a-gonidia larger but fewer than vegetative cells, specialized for asexual reproduction.

3- Genus: *Eudorina*

Globular motile colonies contain a number of spherical vegetative cells, their number ranges from 8-64 cells are arranged inside a gelatinous sheath, cells have a pair of flagella.

4- Genus: *Pediastrum*

An alga that exists in the form of specific immobile colonies, often found in fresh water, Each cell has a parietal plastid with one starch center.