Algal Structure

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The Structure of Algae

Most are Eukaryotes

Phycology = Study of Algae
All algae are eukaryotic.

Found in freshwater, marine, and moist soil habitats.

Photoautotrophs that produce oxygen (except for the water molds, which are fungus-like chemoheterotrophs).

Contain chloroplasts (which are structures that generate energy for the cell).

The pigment used for photosynthesis can even vary, resulting in algae that appear green, red, or brown.
Algae

Macroalgae
• e.g. Seaweed

Microalgae
• e.g. Chlorella
Algae

► How are algae similar to higher plants?

► How are algae different from higher plants?
Similarities

- Presence of cell wall - mostly cellulosic. Most green algae have a cellular wall, with cellulose content ranging up to 70% of the dry weight. While marine, red, and brown algae the cellulose content is rather low.

- Autotrophs/primary producers - carry out photosynthesis.

- Presence of chlorophyll a.
Differences

- Algae lack the roots, stems, leaves, and other structures typical of true plants.
- Algae don’t have vascular tissues - non vascular plants.
- Variations in pigments.
- Variations in cell structure - unicellular, colonial, and multicellular.
Eukaryotic Algae Structure

- **Eukaryotes.**
- Distinct chloroplast, nuclear region, and complex organelles.
  - Thylakoids are grouped into grana.

Diagram showing:
- Outer membrane
- Inner membrane
- Stroma
- Granum
- Thylakoid
- Pyrenoids
Cellular organization

- Flagella – organs of locomotion.
- Chloroplast - site of photosynthesis. Thylakoids are present in the chloroplast. The pigments are present in the thylakoids.
- Pyrenoid - structure associated with chloroplast. It contains carboxylase, proteins, and carbohydrates.
- Eye-spot - part of chloroplast. It directs the cell towards light.
Reproduction

3 types

Vegetative cell divisions/Fragmentation - Part of the filament breaks off from the rest and forms new filaments.

Asexual reproduction - Zoospores after losing their flagella, forms new filaments. No sexual fusion.

Sexual production - Gametes
Asexual reproduction

- Sporangium
- Zoospores
- Germ tube
Sexual reproduction

- **Isogamy** - Both have flagella and similar size and morphology.

- **Anisogamy** - Gametes

- **Oogamy** - Gametes with flagella (sperm) fuses with a larger, non-flagellated gamete (egg).
Morphological Characteristics

- **Unicellular Algae:**
  - Motile
  - e.g. *Chlamydomonas* sp., *Euglena* sp.
  - Non-motile
  - e.g. *Chlorella* sp.

- **Multicellular Algae:**
  - Colonial
  - e.g. *Volvox* sp.
Morphological Characteristics

- **Filamentous Algae:**
  - Single algae cells that form long visible chains.
  - e.g. *Spirogyra sp.*

- **Coenocytic Algae:**
  - Composed of one large cell without cross-walls.
  - e.g. *Vaucheria sp.*
Morphological Characteristics

- **Multicellular Algae:**
  - Have large, complex, leaf-like thallus.
  - e.g. *Ulva* sp.

- **Diatoms:**
  - Have silica cell walls.
  - e.g. *Diatoma* sp., *Cyclotella* sp.
Examples
Chlamydomonas sp.

- Unicellular, motile cells.
- Cup-shaped chloroplast, with pyrenoid.
Chlorella sp.

- Unicellular, non-motile cells.
- Cup-shaped chloroplast, with pyrenoid.
Nostoc sp. & Anabaenae sp.

- Filamentous cyanobacteria.
- Exists as a plankton.
- Under N2 limitation conditions, vegetative cells differentiate into heterocysts.

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Spirogyra sp.

- Filamentous green algae.
- Spiral-shaped chloroplast.
Zygnema sp.

- Filamentous green algae.
- Star-shaped chloroplast.
Volvox sp.

- Multicellular colony.
Baciilariophytae (Diatoms):

- منظر حزامی
- منظر مصراعی