

Unit-Algae

**B.Sc. (H) Biochemistry
Paper- Basic Microbiology
Sem V**

- Study of algae is known as phycology.
- Algae (singular, alga), many of them are unicellular can be upto few meters in height. Ubiquitous in nature covering oceans, seas, salt lakes, freshwater lakes, ponds streams, damp soil, on rocks, stones, tree bark, on other plants and animals, hot springs and high salt concentration.
- They are found where there is sufficient light, moisture, simple nutrients to sustain them.
- Contain chlorophyll and are photosynthetic in nature.
- Both modes of reproduction exist- sexual and asexual.
- Plankton-small aquatic forms make up a large part of the free-floating microscopic life in water called plankton. Phytoplankton- made up of plants (algal forms) and zooplankton- composed of animal organisms.
- Algae can produce undesirable tastes and odours in water supplies e.g., flagellated brown alga belonging to the genus *Synura*.

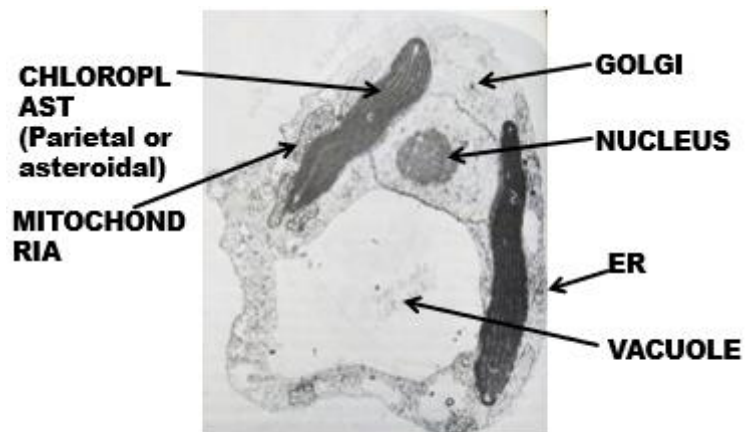
IMPORTANCE

- Algae are primary producers of organic matter.
- Commercial products from Algae- Agar, Alginic acid and carrageenan which are extracted from algal cell walls. Agar, and carrageenan are obtained from red algae and whereas alginic acid is obtained from the walls of brown algae. Diatomaceous earth is used primarily for filters or filter aids.
- As food source- red algae *Porphyra*. Known as Nori in Japan. Other edible algae are *Chondrus*, *Acanthopeltis*, *Nemalion*, and *Eucheuma*.

ALGAE AND DISEASES

- *Prototheca*- pathogenic to humans.
- *Cephaleuros*- parasitic on higher plants.
- Some extracellular inhibitors and toxins are also produced by some species.

Morphology of an algal cell



Ochromonas danica

Algal pigments

Table 18-1. Some Properties of Major Algal Taxonomic Groups (Divisions)

Taxonomic Group	Chlorophyll	Carotenoids*	Biloproteins	Storage Products	Flagellation and Details of Cell Structure
Chlorophyta† (green algae)	a, rarely d	β-carotene, zeaxanthin ± α-carotene	Phycocerythrin, phycocyanin	Floridean starch, oils	Flagella absent
Charophycophyta† (yellow-green algae)	a, c, rarely e	β-carotene, diadinoxanthin, heteroxanthin, vaucherixanthin ester		Chrysolaminarin, oils	2 unequal, apical flagella
Cryptophycophyta (golden algae)	a, c	β-carotene, fucoxanthin		Chrysolaminarin, oils	1 or 2 equal or unequal, apical flagella; in some, cell surface covered by characteristic scales
Phaeophycophyta (brown algae)	a, c	β-carotene ± α-carotene, rarely ε-carotene, fucoxanthin, violaxanthin		Laminarin, soluble carbohydrates, oils	2 lateral flagella
Bacillariophycophyta (diatoms)	a, c	β-carotene ± α-carotene, rarely ε-carotene, fucoxanthin		Chrysolaminarin, oils	1 apical flagellum in male gametes; cell in two halves; the walls silicified with elaborate markings
Rhizariophycophyta (dinoflagellates)	a, b	β-carotene ± γ-carotene diadinoxanthin		Paramylon, oils	1, 2, or 3 equal, slightly apical flagella; gullet present
Prasinophycophyta (green algae)	a, b	β-carotene ± α-carotene, rarely γ-carotene and lycopene, lutein		Starch, oils	1, 2, 4 to many, equal, apical or subapical flagella
Chlorophycophyta (chloromonads)	a, c	α-carotene ± β-carotene, rarely ε-carotene, alloxanthin	Phycocerythrin, phycocyanin	Starch, oils	2 lateral flagella; gullet present in some species
Chlorophycophyta (flagellates)	a, c	β-carotene, peridinin, neoperidinin		Starch, oils	2 lateral, 1 trailing, 1 girdling flagellum; in most, there is a longitudinal and transverse furrow and angular plates

CLASSIFICATION

Xanthophycophyta (The yellow-green algae)

- Exist as single cells, colonies and both branched and unbranched filaments
- Walls composed of cellulose and pectin
- Storage product is mainly oil or chrysolaminarin

Chrysophycophyta (The Golden algae)

- Mostly flagellates, some are amoeboid
- Reproduction is usually asexual (binary fission)
- Reserve food- oil or chrysolaminarin
- Incorporation of silica

Phaeophycophyta (The Brown algae)

- Marine, multicellular and contain brown pigment
- Structurally quite complex (kelps are very large)
- Reproduction -asexual by zoospores and sexual (isogamous & heterogamously)
- Uses: many varieties of kelps, food, medicinal preparations, fertilizers, source of iodine and mineral salts

Bacillariophycophyta (The Diatoms)

- Both fresh and salt water and in moist soil
- Unicellular, colonial, filamentous and occur in a variety of shapes
- Each cell has a single prominent nucleus and massive ribbonlike or smaller lens like plastids
- Deposits of these shells resulting from centuries of growth are called diatomite or diatomaceous earth

Euglenophycophyta (The Euglenoids)

- Unicellular, flagellated, cell division
- Plants like features as carry out photosynthesis in chloroplasts and is facultatively autotrophic
- Animal like features not rigid, absence of cell wall, outer membrane is organized periplast, gullet is present, prominent stigma or red eye spot, contractile vacuoles and fibrils

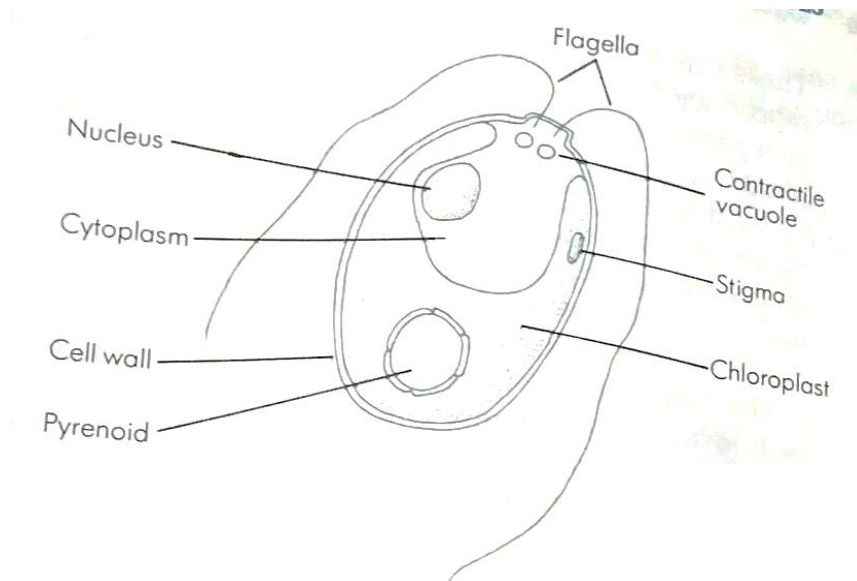
Chlorophycophyta (The Green Algae)

- Mainly freshwater species, seawater and terrestrial
- Nucleus, cell wall, generally 1 chloroplast per cell
- Shape of chloroplast- cup, laminate or reticulate
- Chloroplasts contain dense regions called pyrenoids, on which surface starch granules are formed

- Food reserve- starch

Chlamydomonas

- Unicellular, motile, distributed in soils and freshwater
- One nucleus, single large chloroplast cup shaped but may be star shaped or layered
- Cell wall contains cellulose



Cryptophycophyta (The Cryptomonads)

- Small group of biflagellate organisms
- Unequal flagella, tinsel type with stiff hairs
- Some forms have cellulose wall others don't. They have plasmalemma with a thin granular material on the outside
- 1-2 plastids with or without pyrenoids, per cell
- Food reserve – starch or oil

- Reproduction- longitudinal cell division or zoospores

Pyrrhophycophyta (The Dinoflagellates)

- It has both plant and animal like properties
- Cells are flattened and have a transverse constriction, the girdle, usually around the cell equator
- Distinctive feature is.... Flagella are inserted in the girdle and they are arranged with one encircling the cell and other one trailing