

ALGAL NUTRITION

- From the view point of their nutrition the algae are autotrophic
- They synthesize their food from inorganic materials such as carbon dioxide, water and minerals by means of photosynthesis
- Chlorophyll is the most common pigment in all the algae
- Some times, the green colour of the plastids is masked by other pigments, such as, **fucoxanthin** a yellow pigment which dominates in brown algae
- **Phycoerythrin** and phycocyanin pigments are found in red and blue green algae respectively

- The aquatic species of algae obtain water and carbon dioxide by osmosis and diffusion processes respectively from the water in which they grow
- The algae, like other chlorophyllous plants, require C, H, O, P, K, N, S, Ca, Fe and Mg and also traces of Mn, Bo, Zn, Cu and Co
- For certain algae, additional elements are required such as Si for diatoms and Mo for Scenedesmus
- The algae also synthesize oil and proteins from the carbohydrates which they manufacture and soluble forms of nitrogen and other minerals available in solution in the water in which they are found

Modes of Nutrition in Algae

- **Osmotrophy:** It is a common form of feeding mechanism in algae living in aquatic habitats. Organisms undergoing osmotrophy obtain nutrition by the movement of dissolved organic compounds from the water via osmosis. Aquatic algae-like *Zygnema*, *Vaucheria*, and *Cladophora* etc., generally undergo osmotrophy to make food.
- **Photoautotrophy:** It is also called “light eating”. Organisms undergoing photoautotrophy obtain nutrition by the light energy (sunlight) and inorganic sources like atmospheric CO₂ and H₂O to prepare their food. Aerial algae-like *Phyllosiphon*, *Trentipohlia*, *Chaetophora* and *Scytonema* etc., undergo photoautotrophy.

Heterotrophy: Algae follow heterotrophic strategies to acquire nutrients from organic carbon and nitrogen sources such as carbohydrates, proteins and fats.

Phagotrophy: It is another type of feeding mechanism found in algae. Organisms undergoing phagotrophy obtain nutrition by engulfing large food particulates from the cell surrounding through phagocytosis or food internalization. Dinoflagellates, Diatoms, and Euglenoids etc., undergo phagotrophy.

Mixotrophy

- Now it is widely accepted that algae use a complex spectrum of nutritional strategies, combining photoautotrophy and heterotrophy, which is referred to as mixotrophy
- Some mixotrophs are mainly photosynthetic and only occasionally use an organic energy source
- Some algal forms require certain growth factors like vitamins, essential amino acids and fatty acids for their growth

ALGAE MODE OF NUTRITION

Autotrophic

- Uses sunlight, CO₂ and H₂O
- Build carbohydrates

Heterotrophic

- Uses small organic molecules
- Build oil, protein and fat

Mixotrophic

- Uses atm. CO₂ and organic carbon
- Build carbohydrates, proteins, lipids and fat

However, the principal mode of nutrition in algae is through “Photoautotrophy” or “Self-feeding”. The others may show some different feeding mechanisms, based on which algae are classified into the following **major types**:

1. Obligate phototrophs: Algae belonging to this group primarily obtain nutrition via utilizing inorganic sources like CO₂, H₂O and sunlight or through photosynthesis. In case of limited sunlight, obligate phototrophic algae sustain life through phagotrophy or osmotrophy. Examples: *Dinobryon divergans*, *Heterokontophyta*, etc.

2. Obligate heterotrophs: Algae belonging to this group primarily obtain nutrition by a heterotrophic mode. In conditions of limited heterotrophy, they sustain themselves by undergoing phototrophy. Examples: *Dinophyta*, *Gymnodium gracilellum*, etc.

3. Facultative mixotrophs: Algae belonging to this group obtain nutrition through photoautotrophy as well as heterotrophy.

Example: *Dinophyta*

4. Obligate mixotrophs: Algae belonging to this group primarily obtain nutrition through photoautotrophy and need B-complex vitamins, amino acids, and fatty acids for growth.

Examples: *Euglena gracilis*, *Euglenophyta*, etc.

On the basis of nutritional strategies, algae are classified into following groups

1. Obligate heterotrophic algae – These algae which do not synthesize their protoplasm solely from inorganic sources but require some of the essential elements, usually carbon and nitrogen.

Ex. *Gymnodium*, *Grecilentum*,

2. Facultative heterotrophic algae – These are primarily heterotrophic but are capable of sustaining themselves by phototrophy when prey concentrations limit their growth.

Ex. *Dinophyta*

3. Facultative phototrophic algae – The primary mode of these algae are phototrophy, but they can be supplement growth by phagotrophy /or osmotrophy when light is limiting.

Ex. Dinobryon

4. Obligate photoautotrophic algae – The algae which grow in an entirely inorganic medium in the presence of light are known as photoautotrophic. In other words, using light energy they synthesize their protoplasm from exclusively inorganic sources.

Ex. Members of green algae, Cyanobacteria

5. Facultative mixotrophic algae – These can grow equally well as phototrophs and heterotrophs.

Ex. *Fragilidium*

6. Obligate mixotrophic algae – These are also known as photoauxotrophic algae. These algae require in addition certain vitamins, usually B-12, thiamine or biotin for their growth. Several algae (e.g., species of *Ocaromonas*) digest solid particles of food and are known as phagotrophic.

Ex. *Euglena*, *Euglenophyta*

7. Parasitic Algae – Parasitic Algae are grown parasitically on various plants and animals.

Ex. *Cepheleuros* parasitic on Mango, Tea, Coffee, pepper and Rhododendron leaves