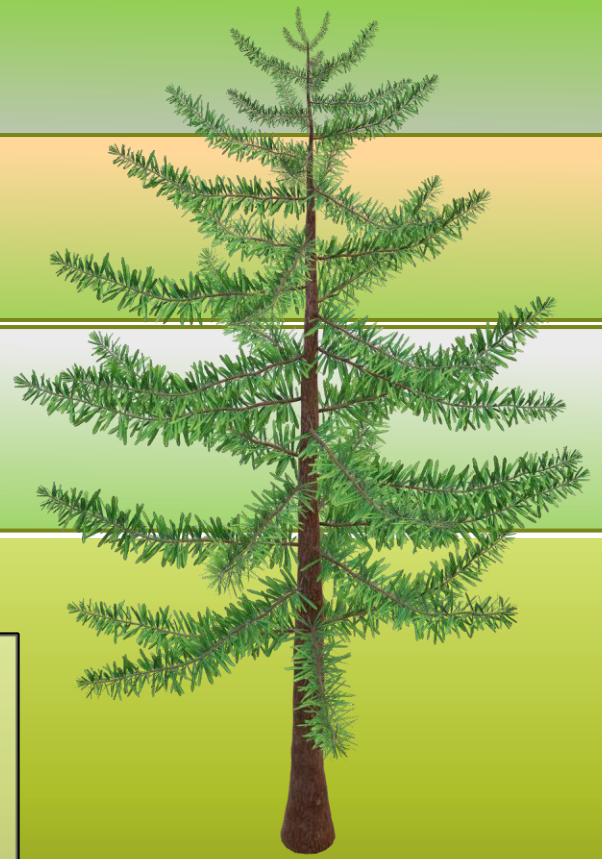
ATOMIC ENERGY CENTRAL SCHOOL, INDORE

CLASS XI BIOLOGY

MODULE 3.1

UNIT – I DIVERSITY IN THE LIVING WORLD

CHAPTER 3. PLANT KINGDOM

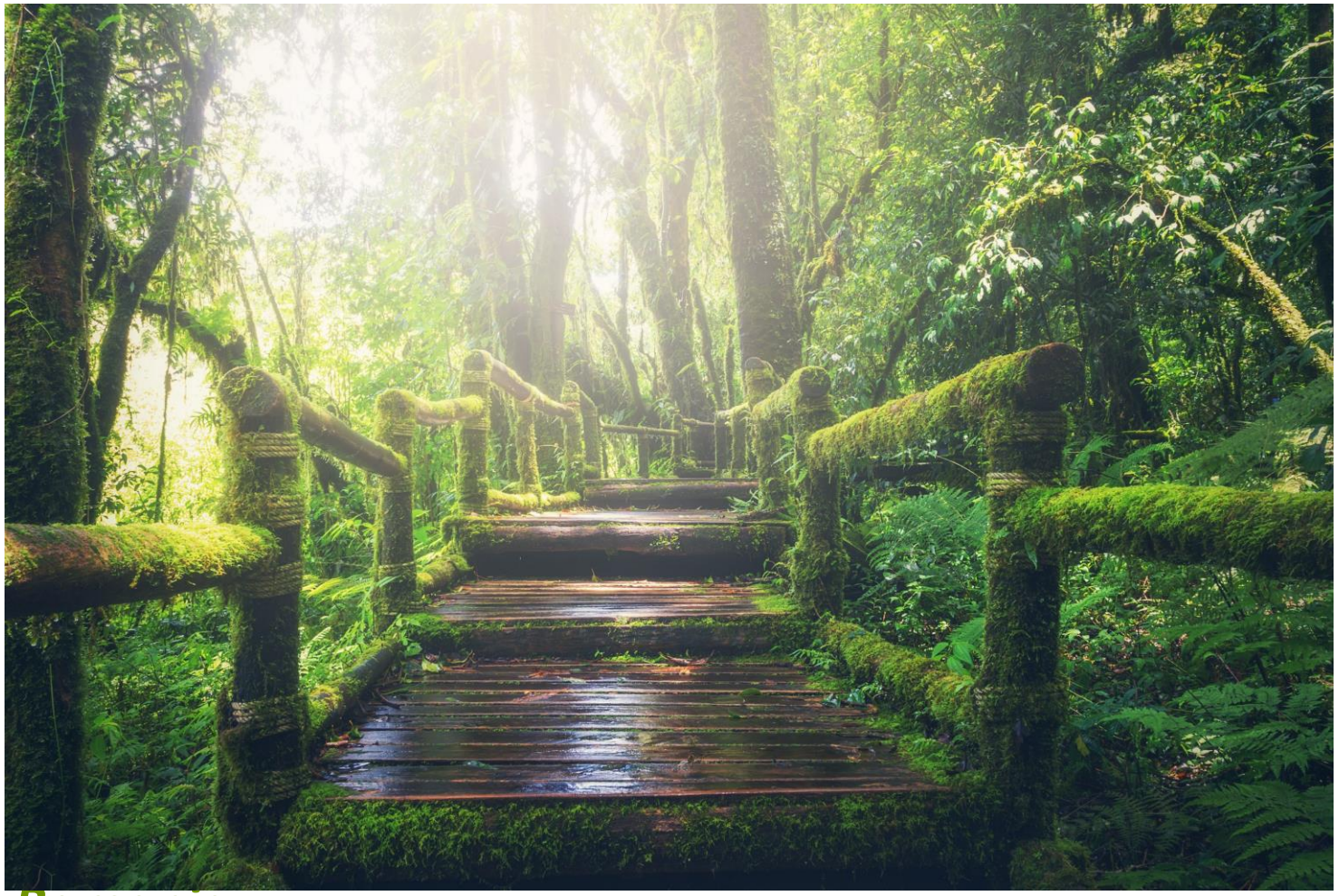


PREPARED BY-

NEERAJ KUMAR BAMANIA

PGT(SS) - BIOLOGY

CHAPTER 3. PLANT KINGDOM



- Nearly all are multicellular
- Vast majority are photoautotrophs
  - Energy from sun
  - Carbon dioxide from air
  - Minerals dissolved in water

Systems of Biological Classification

1. Artificial System
2. Natural System
3. Phylogenetic System

Systems of Biological Classification

Carl Linnaeus

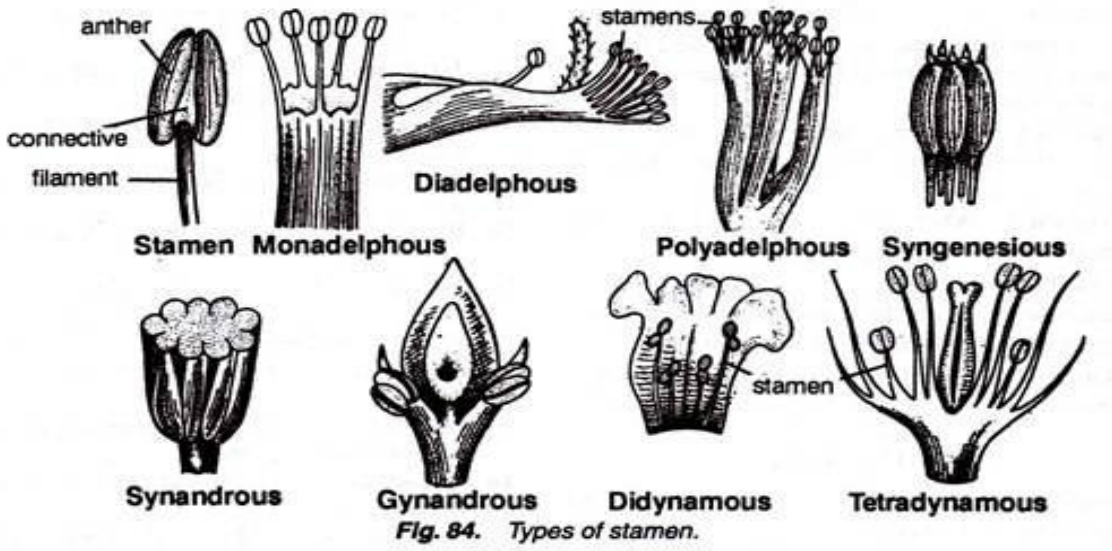


Fig. 84. Types of stamen.

1. Artificial Classification Systems

- Earliest systems of classification.
- They were based on **vegetative characters or superficial morphological characters** such as habit, colour, number and shape of leaves, etc.
- **Linnaeus's artificial system** of classification was based on the **androecium structure.**

Systems of Biological Classification

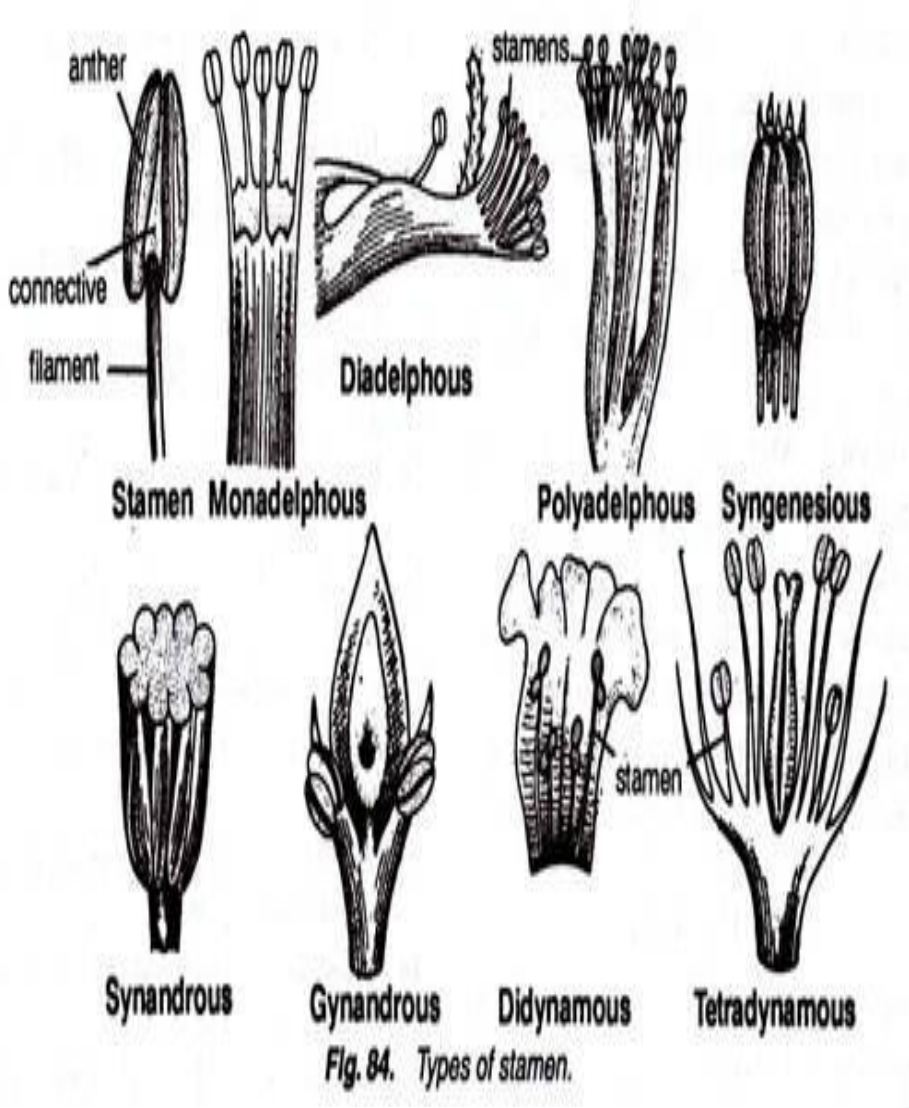


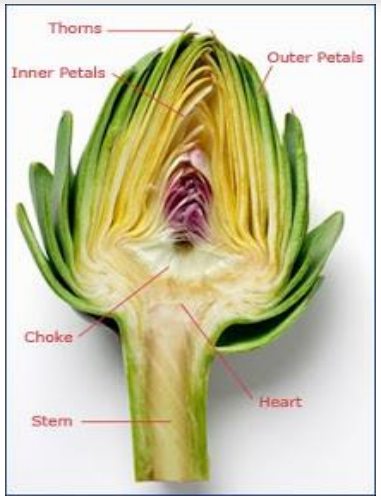
Fig. 84. Types of stamen.

1. Artificial Classification Systems

Drawbacks:

- They separated the closely related species since they were based on a few characteristics.
- Equal weightage to vegetative & sexual characteristics. This is not acceptable since the vegetative characters are more easily affected by environment.

Systems of Biological Classification



George Bentham

Jospeh Dalton Hooker

2. Natural Classification Systems

- These are based on **natural affinities** among organisms.
- It considers **external features and internal features** (ultrastructure, anatomy, embryology & phytochemistry).
- E.g. Classification for flowering plants given by **George Bentham & Joseph Dalton Hooker.**

Systems of Biological Classification

Taxa	Characters									
	1	2	3	4	5	6	7	8	9	10
A	+	+	+	+	+	+	+	+	+	-
B	+	+	+	-	-	+	+	+	-	-
C	+	+	+	+	-	+	+	+	-	+
D	+	+	-	-	-	+	-	-	-	-
E	+	+	-	-	-	-	+	-	-	-

Other sources to resolve the problems in classification

- **Numerical Taxonomy:** It is based on **all observable characteristics.** It is carried out using computers. Number & codes are assigned to all the characters and the data are processed. Thus hundreds of characters can be equally considered.
- **Cytotaxonomy:** It is based on **cytological information** like chromosome number, structure, behaviour etc.
- **Chemotaxonomy:** It uses the **chemical constituents** of the plant.

3.1 ALGAE

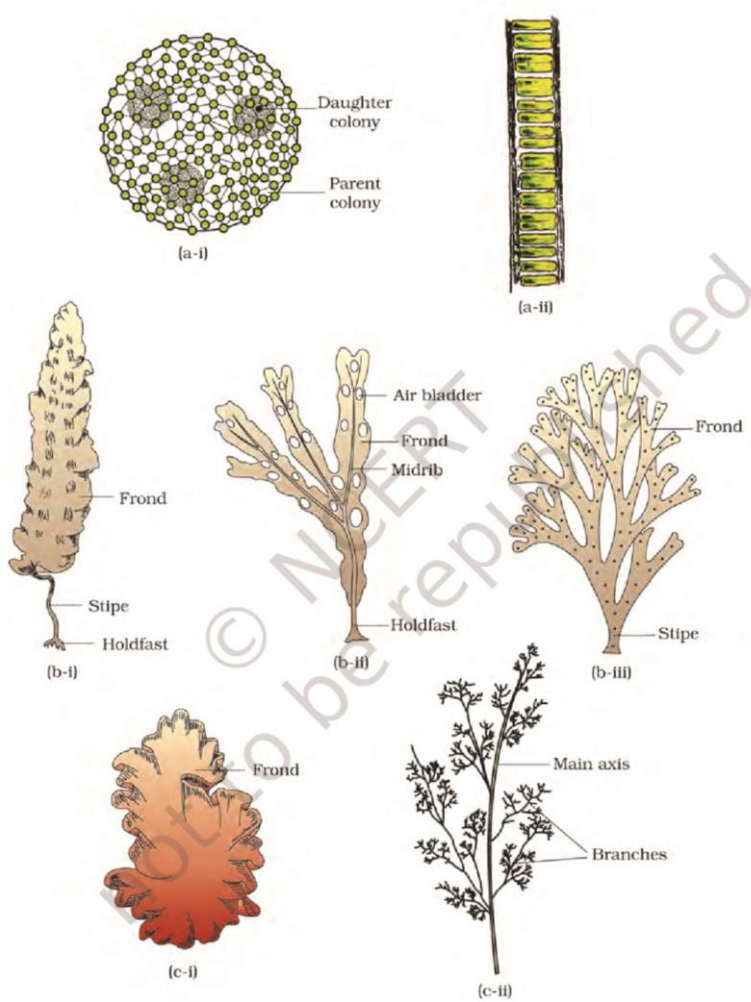
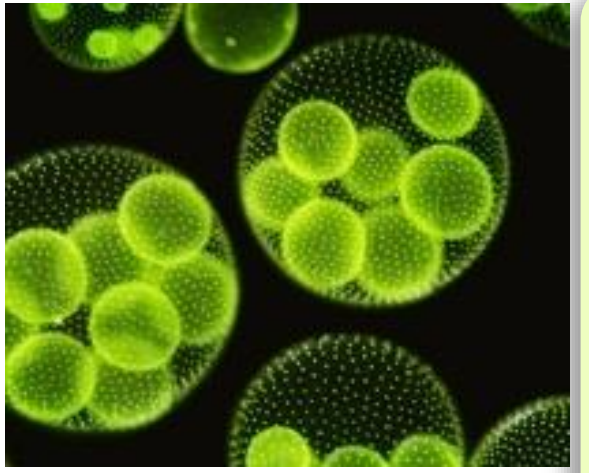


Figure 3.1 Algae : (a) Green algae (i) *Volvox* (ii) *Ulothrix*
(b) Brown algae (i) *Laminaria* (ii) *Fucus* (iii) *Dictyota*
(c) Red algae (i) *Porphyra* (ii) *Polysiphonia*

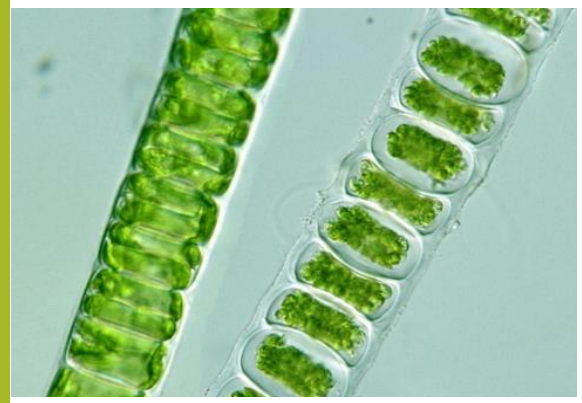
- Simple, thalloid, autotrophic, chlorophyll-bearing and aquatic (fresh water & marine) organisms.
- They also occur in moist stones, soils & wood.
- Some occur in association with fungi (lichen) and animals (e.g. on sloth bear).

3.1 ALGAE

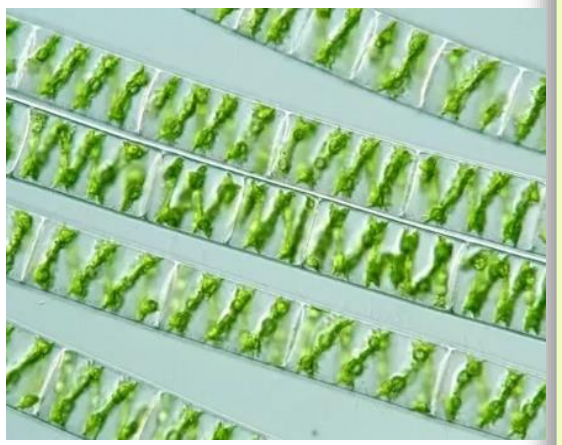
Chlamydomonas



Volvox



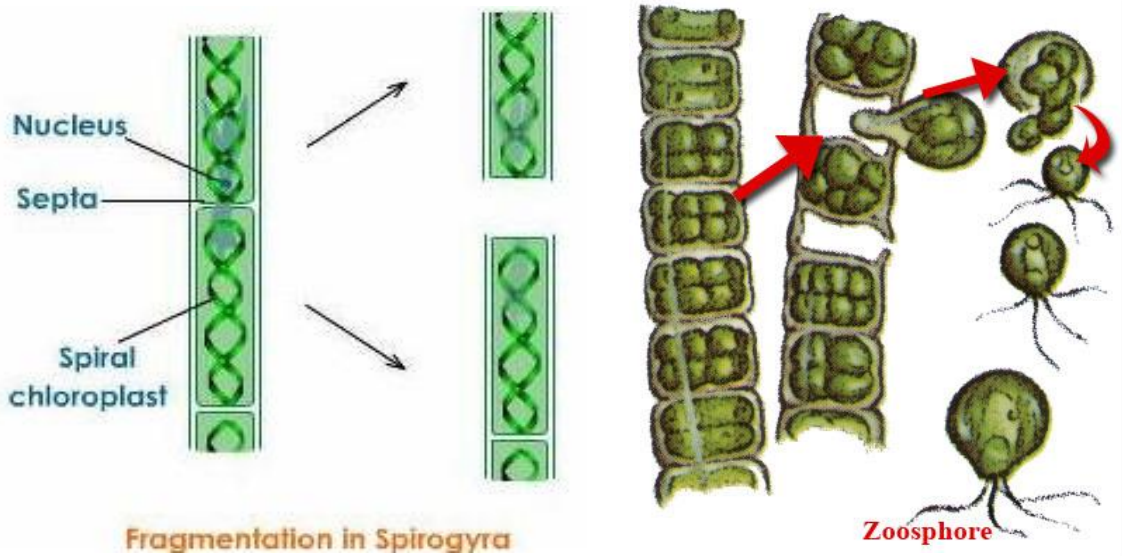
Ulothrix



Spirogyra

- The form and size of algae is highly variable.
  - Microscopic unicellular forms: E.g. *Chlamydomonas*.
  - Colonial forms: E.g. *Volvox*.
  - Filamentous forms: E.g. *Ulothrix* and *Spirogyra*.

3.1 ALGAE



Fragmentation in Spirogyra

Reproduction

- **Vegetative reproduction:**

  By **fragmentation.** Each fragment develops into a thallus.

- **Asexual reproduction:**

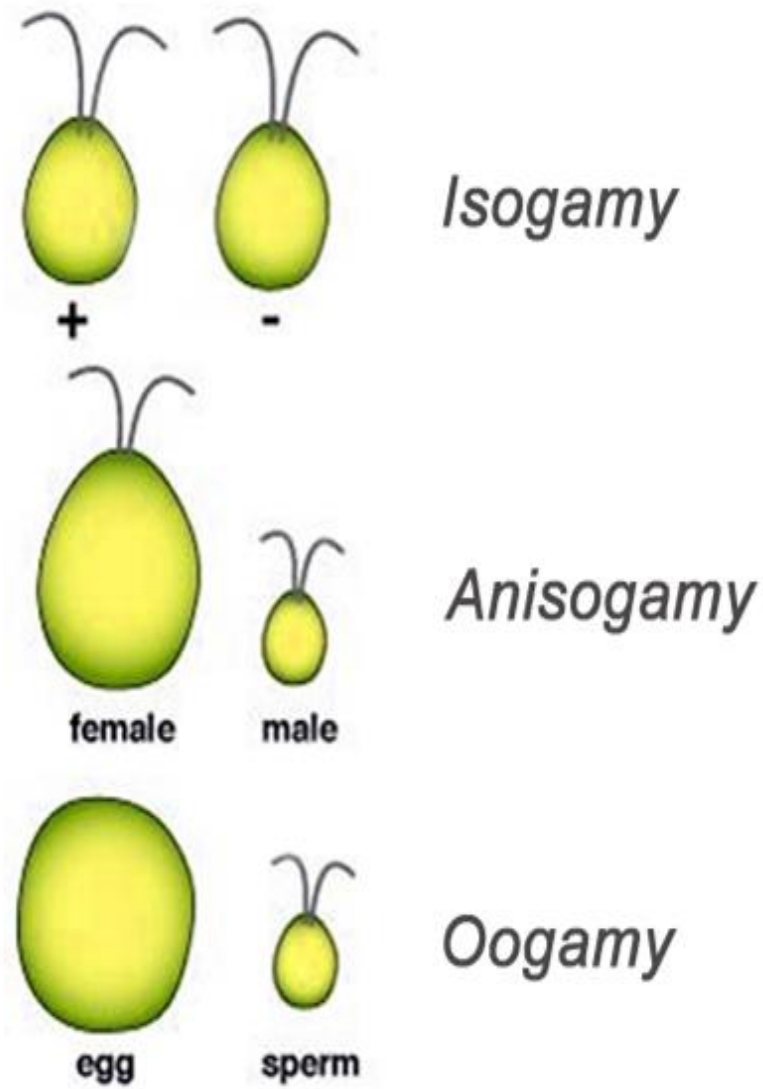
  By the production of **spores.**

  E.g. **zoospores** (most common). They are flagellated (motile). They germinate to give rise to new plants.

- **Sexual reproduction:**

  Through **fusion of two gametes.**

3.1 ALGAE



Reproduction

Sexual reproduction types:

- **Isogamous:** Fusion of gametes similar in size.

  They may be **flagellated** (e.g. *Ulothrix*) or **non-flagellated** (non-motile, e.g. *Spirogyra*).

- **Anisogamous:** Fusion of two gametes dissimilar in size.

  E.g. Some species of *Eudorina*.

- **Oogamous:** Fusion between one large, **non-motile (static) female gamete** and a smaller, **motile male gamete.**

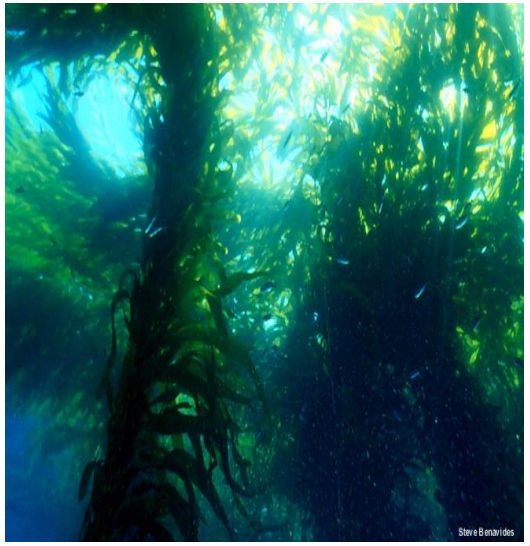
  E.g. *Volvox, Fucus.*

The Plant Kingdom

The oldest and most simple photosynthetic organisms on earth are algae.

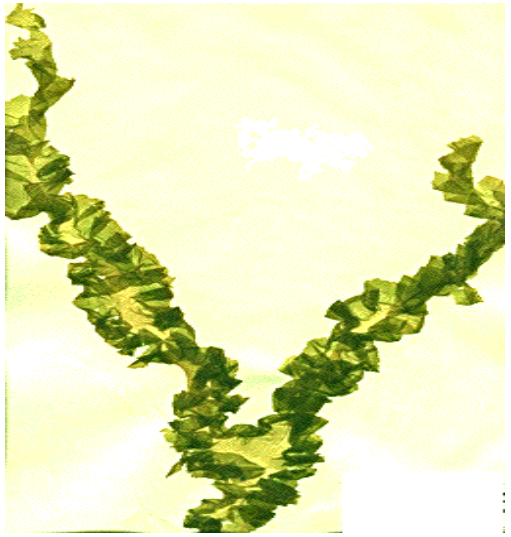
The multicellular algae are separated into divisions based on their photosynthetic pigments, food storage products, and cell-wall components.

The three major groups include:

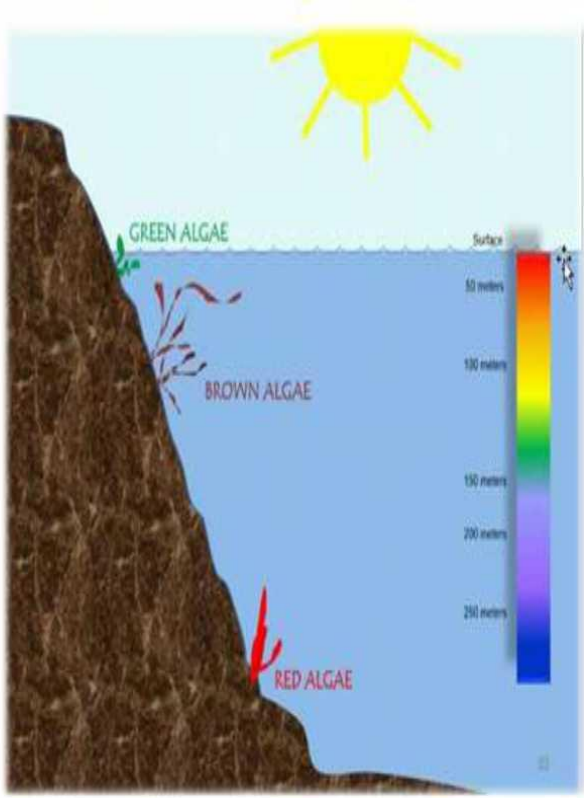


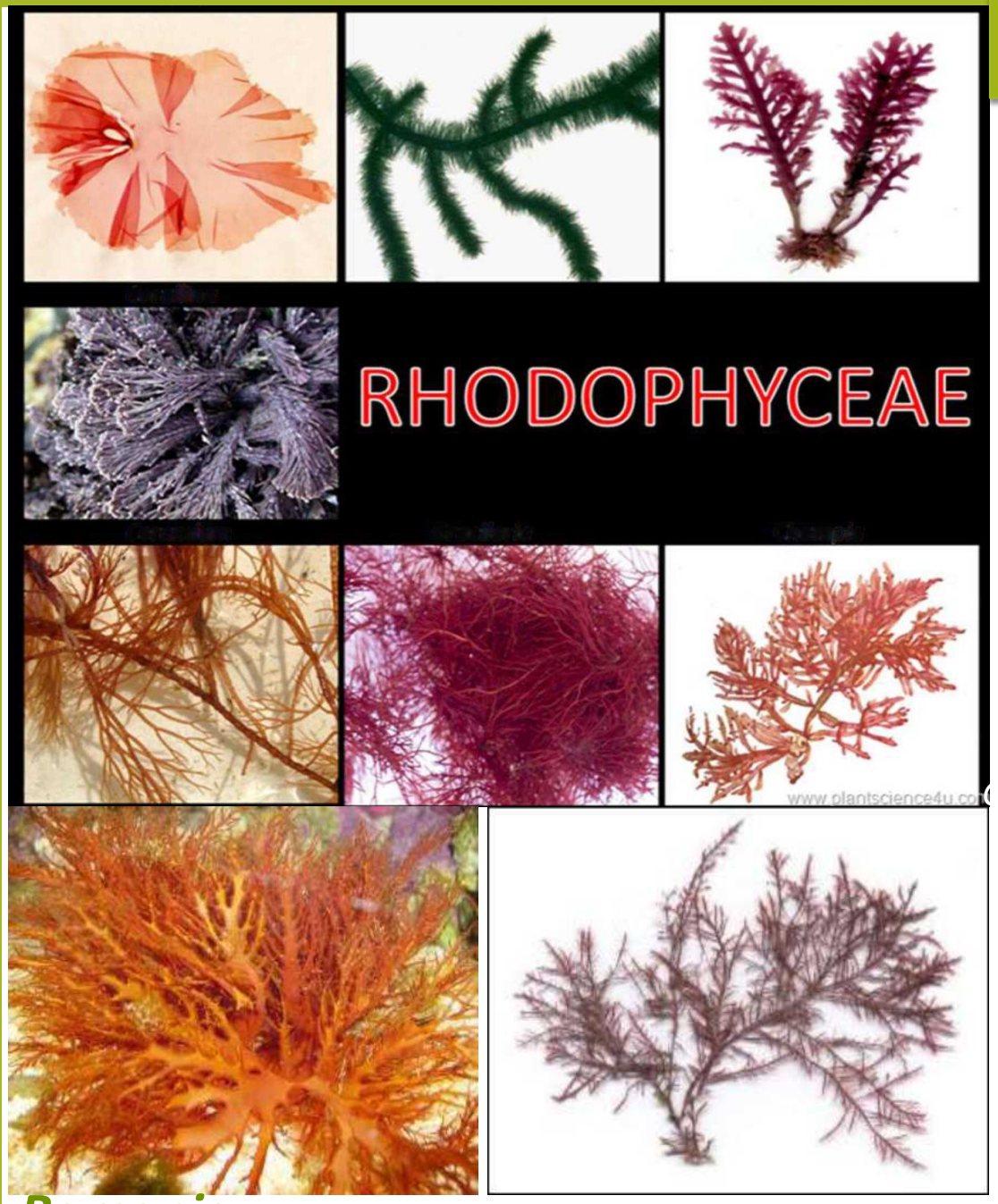
Brown algae

Red algae



Green algae

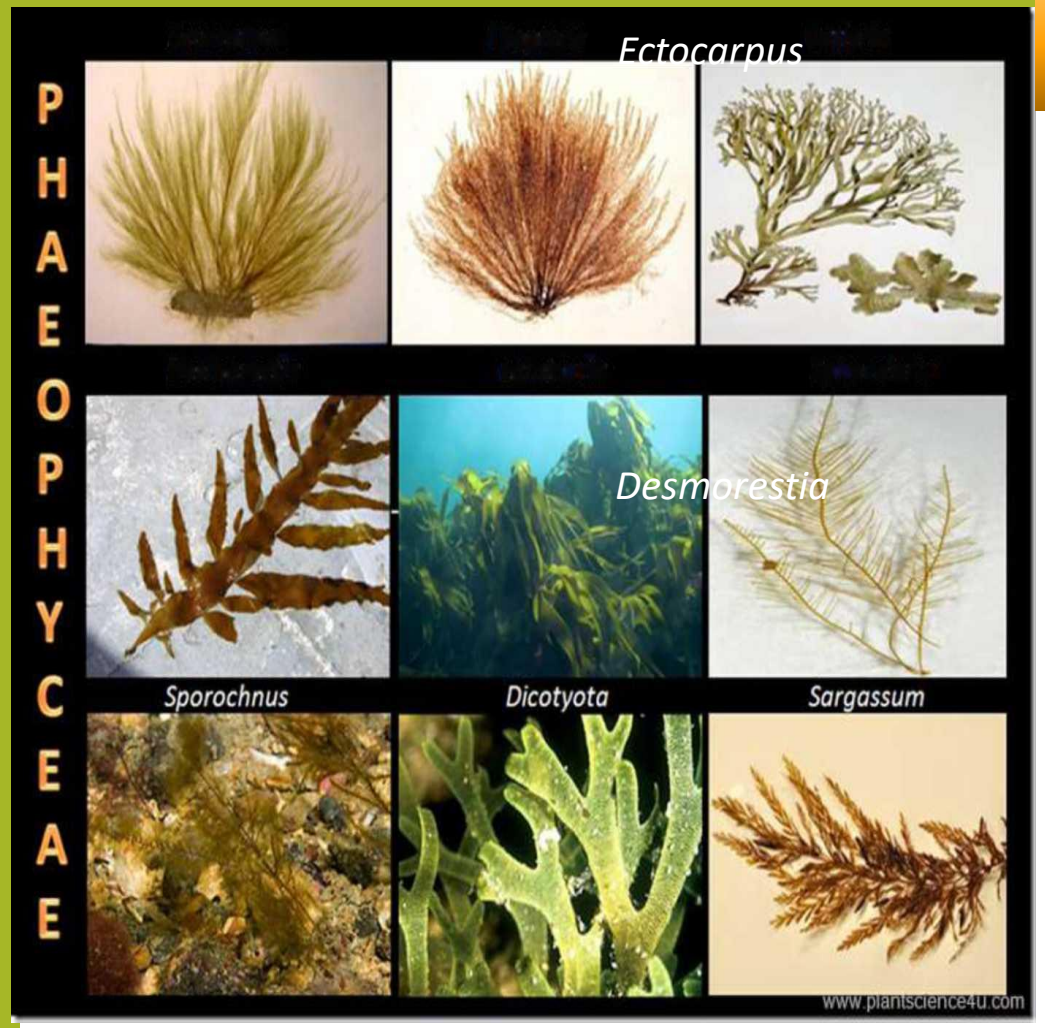




Rhodophyceae (Red algae)

1. The members of Rhodophyceae are commonly called red algae because of the predominance of the red pigment, i.e. phycoerythrin in their body.
2. Habitat Most of the red algae are marine with greater concentrations found in the warmer areas.
3. Thallus The red thalli of most of the algae are multicellular.
4. Cell Wall The cell wall contains cellulose, pectic compounds and certain mucopolysaccharides.
5. Photosynthetic Pigments These include chlorophyll-a, carotenes, xanthophylls and phycobilins. Phycobilins are water soluble and are of two types, i.e., red-coloured phycoerythrin and blue-coloured phycocyanin.

PHAEOPHYCEAE (BROWN ALGAE)

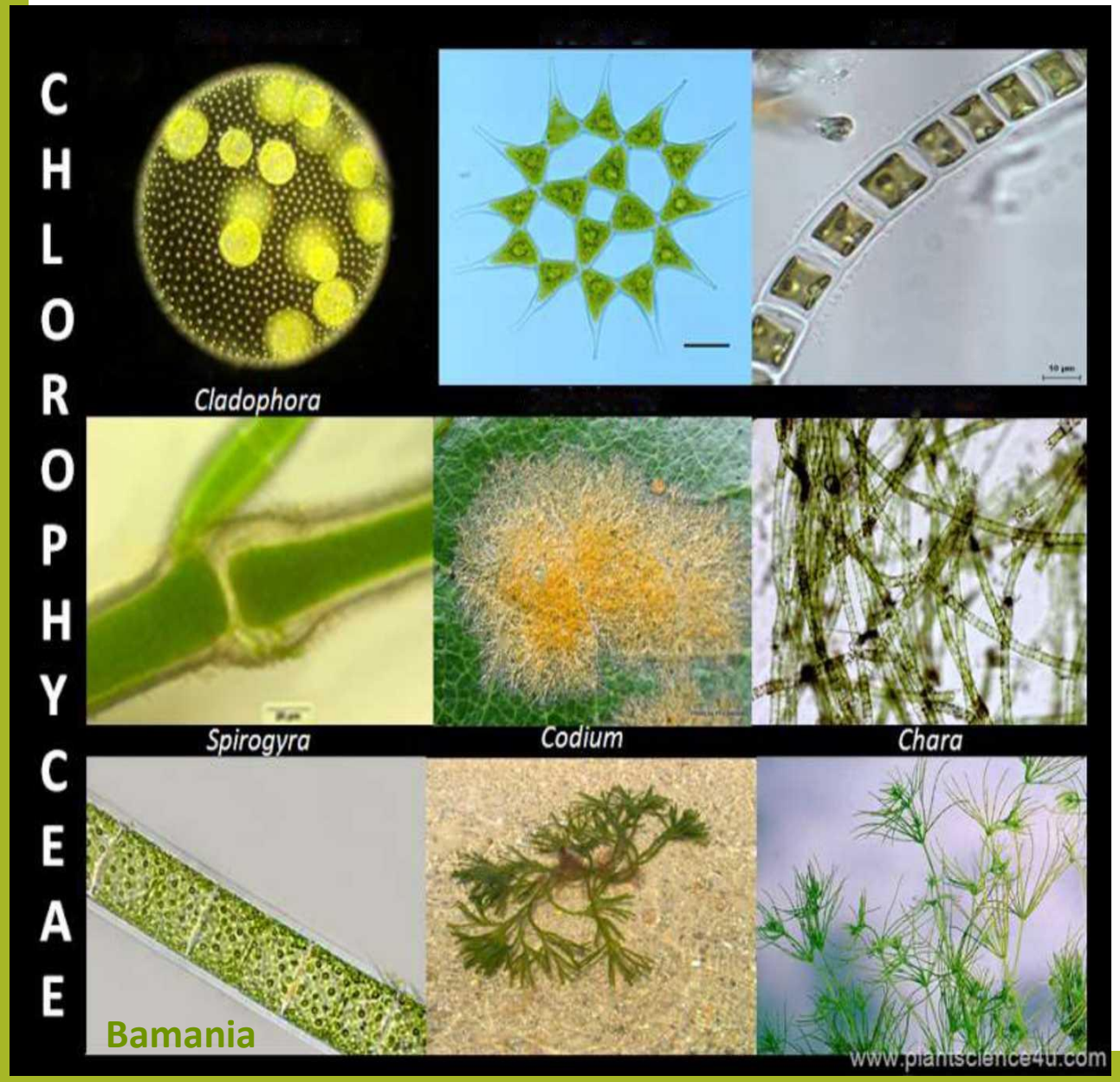


1. The members of Phaeophyceae are fucoxanthin and phycocolloid rich multicellular eukaryotic algae.
2. Its common members are seaweeds called kelps.
3. Habitat Brown algae are mostly marine. These are found mostly in colder seas or during cold seasons in tropical regions.
4. Cell Organisation All members are multicellular. Cell wall is composed of cellulose, pectose and phycocolloids.
5. Thallus It is heterotrichous filament with both prostrate and upright branches (Ectocarpus).
6. Food Reserve It remains in the form of complex carbohydrates such as laminarin or mannitol.
7. Reproduction Vegetative reproduction occurs through fragmentation (e.g., Sargassum), adventitious branches and stolons (e.g, Dictyota). Asexual reproduction by biflagellate zoospores, which are pear-shaped having two unequal laterally attached flagella.
8. Sexual reproduction is performed by isogamy, anisogamy and oogamy. Union of gametes may take place in water or within the oogonium (oogamons species). The gametes are pyriform (pear-shaped) and have two laterally attached flagella.

9. Life Cycle Isomorphic alternation of generation is found in some brown algae, e.g, Ectocarpus, Dictyota.

10. In many brown algae, the diploid generation or phase is dominant. The haploid phase is either microscopic or represented by gametes only (e.g., Fucus).

3.1.1 Chlorophyceae



- Unicellular / colonial / filamentous.
- Pigments - chlorophyll *a and b.*
- Chloroplasts may be discoid, plate-like, reticulate, cup-shaped, spiral or ribbon-shaped.
- Store bodies - pyrenoids, oil droplets.
- Rigid cell wall made of an inner layer of cellulose and an outer layer of pectose.
- Vegetative reproduction by fragmentation.
- Asexual reproduction by zoospores.
- Sexual reproduction by isogamous / anisogamous / oogamous.
- e.g. *Chlamydomonas*, *Volvox*, *Ulothrix*, *Spirogyra and Chara*.

Rhodophyceae (Red algae)

6. Reproduction Vegetative reproduction occurs by fragmentation, regeneration of hold fast and gemmae.
Asexual reproduction occurs by non-motile spores (carpospores, monospores, tetraspores and neutral spores).
Sexual reproduction occurs by non-motile gametes and is oogamous type.
The male sex organs is called spermatogonium or antheridium. The male produced is non-flagellated, called as spermatium.
The female sex organ is called carpogonium. After fertilisation, a new structure called carposporophyte is produced. It remains attached to the parent alga.
7. Life Cycle Life cycle has two or more phases such as haplohaplontic, haplohaplohaplontic, diplodiplohaplontic.

TABLE 3.1 Divisions of Algae and their Main Characteristics

Classes	Common Name	Major Pigments	Stored Food	Cell Wall	Flagellar Number and Position of Insertions	Habitat
Chlorophyceae	Green algae	Chlorophyll *a, b*	Starch	Cellulose	2-8, equal, apical	Fresh water, brackish water, salt water
Phaeophyceae	Brown algae	Chlorophyll *a, c,* fucoxanthin	Mannitol, laminarin	Cellulose and algin	2, unequal, lateral	Fresh water (rare) brackish water, salt water
Rhodophyceae	Red algae	Chlorophyll *a, d,* phycoerythrin	Floridean starch	Cellulose, pectin and poly sulphate esters	Absent	Fresh water (some), brackish water, salt water (most)

3.1 **ALGAE** (Benefits of Algae)

1. **Through photosynthesis, they fix half of the total CO_2 on earth and increase the level of dissolved oxygen.**
2. **They are primary producers and the basis of the food cycles of all aquatic animals.**
3. **About 70 species of marine algae are used as food.**

   E.g. *Porphyra*, *Laminaria* &*Sargassum*.
4. **Agar (from *Gelidium* & *Gracilaria)* is used to grow microbes and in ice-creams & jellies.**
5. Some marine brown & red algae produce **hydrocolloids** (water holding substances). E.g. **algin** (brown algae) & **carrageen** (red algae). These are used commercially.
6. Protein-rich unicellular algae like ***Chlorella* & *Spirullina*** are used as food supplements by **space travellers.**











Thank u.....

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