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DEPARTMENT: MEDICAL LABOURATORY SCIENCE

COLLEGE: MEDICAL AND HEALTH SCIENCES

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1. Classification of plants according to Eichler's grouping of 1883:

DIVISION	CLASS
Thallophyta	Phycotinae(Algae) Mycotinae(Fungi)
Bryophyta	Hepaticae(Liverworts) Musci(Mosses)
Pteridophyta	Psilotinate(Psilotum) Lycopodinae(Lycopodium, Selaginella) Equisetinae(Horsetails) Filicinae(Ferns)
Spermatophyta	Gymnospermae(Gymnosperms) Angiospermae(Angiosperms)

2. Importance of algae to man

- Thickening agents in ice cream and shampoo.
- Algae have high iodine content therefore prevent goiter.
- Algae are considered nutritious because of their high protein content and high concentrations of minerals, trace elements and vitamins.
- Seaweeds are source of three chemical extracts used extensively in the food, pharmaceutical, textile and cosmetic industries.
- Brown algae yield Alginics acid which is used to stabilize emulsions and suspensions; found in products such as syrup, ice cream and paint.

- Different species of red algae provide agar and carrageen used for the preparation of various gels used in scientific research.
- Bacteria, fungi and cell cultures are commonly grown on agar gels.
- Agar is also used in the food industry to stabilize pie fillings and preserve canned meat and fish.
- Carrageenan is also used as a thickening and stabilizing agent in products e.g. puddings, syrups and shampoos.
- Algae have been used for centuries, especially Asian countries, for their purpoted powers to cure or prevent illnesses e.g. cough, gout, gallstones, goiter, hypertension and diarrhea.
- Algae have been surveyed for anticancer compounds, with several cyanobacteria appearing to contain promising candidate.
- Diatoms have been used in forensic medicine, as their presence in the lungs can indicate a person died due to drowning.

3. Description of a unicellular form of algae

Chlamydomonas represents the unicellular and motile forms of green algae.

- They are found in stagnant water usually along with other forms.
- Flagella are the structures for mobility.
- The cell is bounded by a cellulose cell wall; contains organelles e.g. nucleus, mitochondria, stigma(eyespot), cup-shaped chloroplast, pyrenoid etc.
- The nucleus carries the genetic programme of the cell
- The stigma is for photoreception.
- The mitochondria meditate the elaboration of energy molecules.
- Manufactured sugar is processed into starch on the pyrenoid.

4. REPRODUCTION

In chlamydomonas, reproduction can either be vegetative (asexual) or sexual

VEGETATIVE REPRODUCTION

This results in the production of daughter cells in which the amount and quality of genetic material in the nucleus of the mother cell is maintained in the daughter cells.

The kind of cell division which maintains the quantity and quality of genetic material is called mitotic divisions. It is responsible for the increase in number of cells in unicellular organisms and for increase in size of multicellular organisms. In chlamydomonas, a cell about to divide loses its flagella. The cell undergoes mitotic division leading to two nuclei, cell walls are elaborated which delimit cytoplasm around each nucleus i.e. two daughter cells (zoospores) are released. Increase in the population of cells in a colony is achieved by repeated mitotic divisions.

SEXUAL REPRODUCTION

Certain environment conditions e.g. lack of nutrients or moisture may trigger the haploid daughter cells to undergo sexual reproduction. Instead of forming into spores, the haploid daughter cells form gametes that have two different mating strains which are structurally similar and are positive and negative strains.

Sexual reproduction involves union of sex cells (gametes). These cells pair by their posterior (flagellated) ends. This pairing is said to be isogamous because the pairing cells are morphologically identical. The cytoplasm of the pairing cells fuse (plasmogamy) and the flagella are lost. The two nuclei fuse (karyogamy); this situation is essential so that a zygote is formed. After karyogamy, sometimes, the zygote undergoes two successive cell divisions the first division restores the haploid condition by halfing the nuclear material in the two resulting nuclei (reduction division) while in the second division each haploid nucleus undergoes a normal mitotic division. This two division who end up as four daughter cells with n quantity of nuclear material are together known as meiosis. They are released as zoospores.

5. Differences between the two colonial forms

   i. **Pandorina** usually occurs in water bloom. The colony consists of 16 cells attached to one another.

      Vegetative reproduction

      This is achieved through 4 successive mitotic divisions of each of the 16 cells in the colony therefore producing 16 daughter colonies. This colony within a colony is analogous to the mythology of the pandora's box and that's where the alga's name is derived from- pandorina. When the right time comes, each daughter cell is released from the matrix of the mother colony to become independent

      Sexual reproduction

      This is achieved by anisogamous pairing (pairing by the flagella ends). When conditions are favorable, the single cells in the colonies assume gametic functions and pair by their flagella ends. Plasmogamy (fusion of cytoplasm) and karyogamy (fusion of nuclei) occur which is followed by meiosis. The colony may

be unisexual in some specie or bisexual.

Meanwhile

ii. Volvox

The genus volvox (also green colonial form) shows more complex form than pandorina.

- There are more cells in the colony, number may run into thousands and connected with cytoplasmic strands that run through the cells. Not all cells form new colonies; but the larger cells at the posterior ends(gonidia) are the only ones that divide to form new colonies. Other cells remain vegetative throughout the life of the colony.
- Sexual reproduction is oogamous i.e. the male gamete is motile while the female gamete (egg) is not mobile.
- Sperms are formed by repeated divisions of cells in the colony to form motile sperm platelets containing many sperms.
- The platelets move to egg colonies where fertilization takes place.
- Colonies of volvox may also be either unisexual/bisexual.

Volvox is concluded to be evolutionarily more advanced than pandorina with the departures between them especially as the cells show greater levels of differentiation and specialization.

6. Complex form of alga

Fucus

A genus of brown algae whose species are often found on rocks in the interdital zones of the sea shores. The plant body is flattened, dichotomously-branched thallus with a mid rib, a vegetative apex, a reproductive apex at maturity) and a multicellular disk(hold fast) with which plant is attached to rock surface. The plant body also has air bladders which is believed to aid the plant to float on the water. Various species of focus exist; vary in size from a few centimeters to about 2metres in length. They also vary in terms of whether the sex cells are found in the same sexual chamber or in different sexual chambers on different plant bodies. Sexual reproduction is oogamous.