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**MATRIC NUMBER: 19/MHS09/012**

**COURSE CODE: BIO 102**

1. **Classify plants according to Eichler’s Grouping of 1883.**

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

1. **How are algae of importance to man?**

Algae are important as food for fish. Certain species are harvested for food and cosmetics in the far East. It serves as food for people and livestock, thickening agents in ice cream and shampoo, drugs to ward off diseases. Algae are considered nutritious because of their protein content and high concentrations of minerals, trace elements and vitamins. Algae have high iodine content therefore prevent goiter.

Seaweeds are source of three chemical extracts used extensively in food, pharmaceutical, textile and cosmetic industries.

Brown algae yield alginic 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 t stabilize pie fillings and preserve canned meat and fish. Carrageen 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 purported powers to prevent illness e.g. cough, gout, gallstones, goiter, hypertension and diarrhea. Recently, algae have been surveyed for anticancer compounds, with several cyanobacteria appearing to contain promising candidates. Diatoms have been used in forensic medicine, as their presence in the lungs can indicate a person died due to drowning. They are also indicators of environmental problems in aquatic ecosystems.

1. **Describe a Unicellular form of algae?**

Clamydomonas

Clamydomonas represents the unicellular and motile form of green algae found in stagnant water usually along with other forms.

Flagella are the structures for mobility.

The cell is bounded by 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 mediate the elaboration of energy molecules.

Manufactured sugar is processed into starch on the pyrenoid.

1. **How does this unicellular algae described in Question 3 carry out its reproduction?**

Reproduction in Clamydomonas

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

**Vegetative reproduction:** This results in 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. Thus, if the amount of genetic material in the mother nucleus is n, the daughter cells also have n quality of genetic material.

The kind of cell division which maintains the quantity and quality of genetic material is called mitotic divisions. It is responsible for increase in number of cells in unicellular organisms and for increase in size in multicellular organisms. In Clamydomonas, 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 environmental 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. Opposite mating strains fuse in a process called *Isogamy*to form a diploid Zygote, which contains two sets of chromosomes. After a period of dormancy, the zygote undergoes meiosis, a type of cell division that reduces the genetic content of a cell by half. This cell division (i.e. meiosis) produces four genetically unique haploid cells that eventually grow into mature cells.

Sexual reproduction involves union of sex cells (gametes). In Clamydomonas, aggregation of cells (clumping) in a colony occurs under favourable conditions. These cells pair by their posterior (flagellated) ends. This pairing is said to be isogamous becausethe pairing cells (gametes) are morphologically identical. The cytoplasm of the pairing cells fuse (plasogamy) and the flagella are lost. The two nuclei fuse (Karyogamy); this situation is essentially a fertilization process so that a zygote is formed. In other word, two cells each with n quantity of genetic (nuclear) material undergo karyogamy to produce a single cell wall with 2n (diploid) nuclear material. The zygote secretes a thick cell wall called a zygospore and may remain dormant in that state for sometime.

After karyogamy sometimes, the zygote undergoes two successive cell divisions; the first division restores the haploid condition by halving the nuclear material in the two resulting nuclei (reduction division) while the second division, each haploid nucleus undergoes a normal mitotic division. These two divisions which end up with four cells and with n quantity of nuclear material are together known as meiosis. The four products of meiosis are released as haploid zoospores.

1. **Differentiate between the two types of colonial form of Algae.**

Differences between Pandorina and Volvox.

* Volvox is concluded to be evolutionarily more advanced than Pandorina with the departures between them especially as the cells of Volvox show greater levels of differentiation and specialization.
* A Pandorina colony consists of 16 cells, while the number in a Volvox colony may run into thousands.
* The cells in a Pandorina colony are attached directly to one another, while in a volvox they are connected with cytoplasmic strands that run through the cells.
* Each of the 16 cells in a Pandorina is involved in vegetative reproduction through four successive mitotic divisions therefore producing 16 colonies, while in a Volvox only the larger cells at the posterior ends (gonidia) are involved in the formation of new colonies during vegetative reproduction.
* Sexual reproduction in Pandorina is anisogamous, while in Volvox, sexual reproduction is oogamous.

1. **Describe a named complex form of Algae.**

Fucus

It is a genus of brown algae whose species are often found on rocks in the intertidal 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 plant attached to rock surface.

The plant body also has air bladders which are believed to aid the plant float on water.

Various species of Fucus exist, vary in size from a few centimeters to about 2 meters 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, sex cells are produced in conceptacles which have openings (ostioles) on the surface of the thallus.

In the male conceptacles, one of the diploid cells from outgrowth of the wall of the conceptacles, undergoes meiosis, the meiotic product undergo many mitotic divisions to produce antheridium having 64 cells of which each cell develops into a biflagellate sperm that swims out of the conceptacle through the ostiole.

In the female conceptacle, similar to the situation in the male conceptacle, leads to the production of an 8 celled oogonium- each becomes an egg which is the female sex cell.

Motile sperm cell from the antheridium move through the ostiole into the female conceptacle where the eggs fertilized and diploid zygote are produced.

Apart from the antheridia and oogonia, sterile multicellular filaments (paraphyse) are also produced in the conceptacles which are dispersed among the antheridial and oogonial outgrowth and at the entrance into the conceptacles.

The diploid zygote germinates into a new diploid Fucus plant making the diploid the dominant generation.

**LIFE CYCLE OF A FUCUS**

