Volvox

Systematic Position

Class: Chlorophyceae
Order: Volvocales
Sub-order: Chlamydomonadinae
Family: Volvocaceae
Genus: Volvox

Occurrence:

Volvox is free floating fresh water green algae. Volvox grows as planktons on surface of water bodies like temporary and permanent ponds, lakes and water tanks. During rainy season due to its fast growth the surface of water bodies become green. The Volvox colonies appear as green rolling balls on surface of water. Volvox is represented by about 20 species.

Structure:

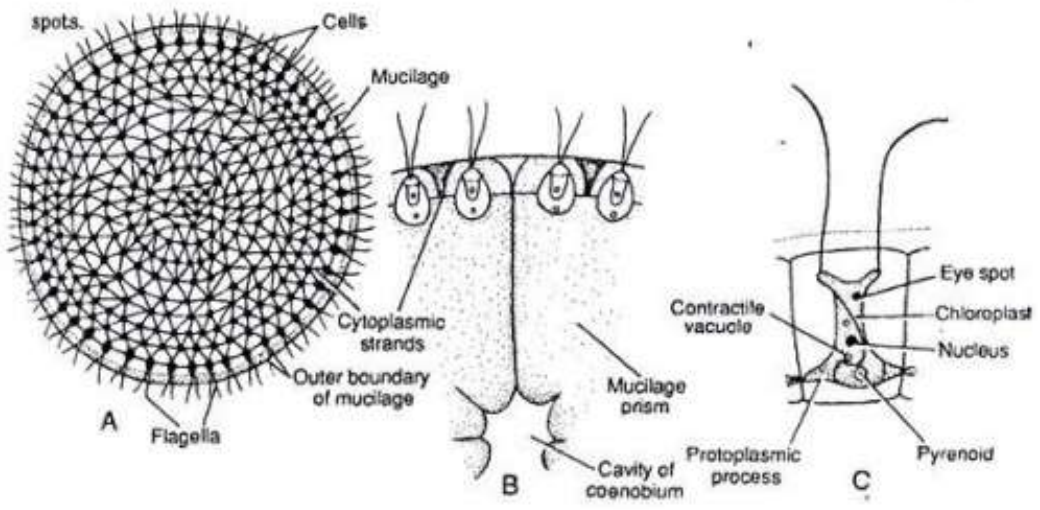

Fig. 1. (A-C) *Volvox*. A. A colony; B. A part of colony; C. Single cell.

- Volvox thallus is a motile colony with definite shape and number of cells. This habit of thallus is called coenobium.
- The colony is hollow, spherical or oval in shape and the size of colony is about the size of a pin head. The number of cells in a colony is fixed. Depending upon the species of Volvox the cells can be 500-60,000. The central part of

colony is mucilaginous and the cells are arranged in a single layer on periphery of the colony.

- The cells of anterior end possess bigger eye spots than those of posterior end cells. The cells of posterior side become reproductive on maturity. Thus, spherical or round colony of Volvox shows clear polarity. The cells of Volvox colony are Chlamydomonas type. Every cell has its own mucilage sheath.
- The cells are connected to each other through cytoplasmic strands.
- The cells of colony are usually pyriform with narrow anterior end and broad posterior end. The cells are biflagellate, the two flagella are equal, whiplash type and project outwards. The protoplasm of cell is enclosed within plasma membrane.
- Each cell contains one nucleus, a cup shaped chloroplast with one or more pyrenoids, an eye spot and 2-6 contractile vacuoles.

Reproduction in Volvox:

- Volvox reproduces both asexually and sexually. The asexual reproduction takes place under favourable conditions during spring and early summer. In Volvox mostly the cells of posterior part of colony take part in reproduction. These reproductive cells can be recognized by their larger size, prominent nuclei, dense granular cytoplasm, more pyrenoids and absence of flagella.

Asexual Reproduction:

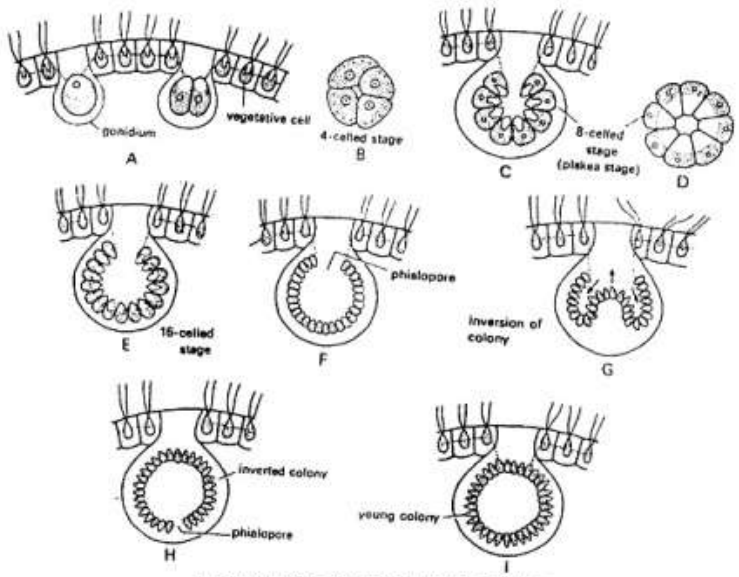

Fig. 2. (A–I) *Volvox*. Asexual reproduction in *Volvox*

- During asexual reproduction some cells of the posterior part of colony become reproductive. These cells enlarge up to ten times, become rounded and lose flagella. These cells are called gonidia (Sing, gonidium). The gonidia lose eye spot. Pyrenoids increase in number.
- The gonidia are pushed towards interior of the colony. The division of gonidium is longitudinal to the plane of coenobium and forms 8 celled stage.
- These 8 cells are arranged in **curved plate-like structure and are called plakea stage**. Each of these 8 cells divides by longitudinal division forming 16 cells arranged in the form of a hollow-sphere
- The sphere is open on exterior side as a small aperture called phialopore
- The inversion of colony starts with formation of a constriction opposite to phialopore. The cells of posterior end along with constriction are pushed inside the sphere, till the whole structure comes out of the phialopore. After inversion, the anterior pointed end of the cell faces periphery.
- After inversion the cells develop cell wall, flagella and eye spot. The cells become separated due to development of gelatinous sheath around each cell. This newly developed colony is called daughter colony
- The daughter colonies are released in water after the disintegration of parent colony or through the pores.

Sexual Reproduction:

The sexual reproduction in Volvox is oogamous type.

Development of Antheridium:

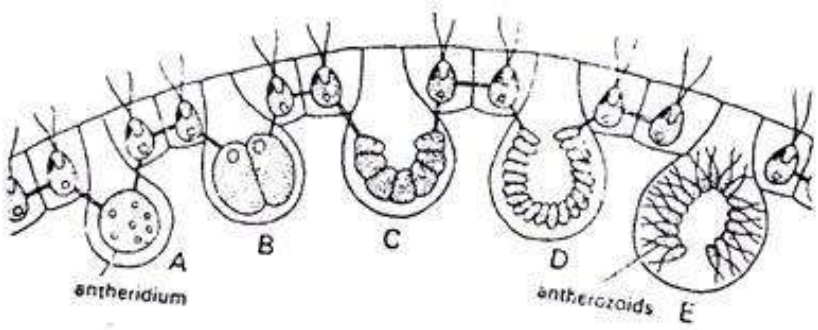

Fig. 4. (A–E). *Volvox*. Development of antherozoids

The development of antheridium starts with formation of antheridial initial or androgonidial cell mostly in posterior side of the colony. The initial cells enlarge, lose flagella, protoplasm becomes dense and nucleus becomes larger. The protoplast of

antheridial initial divides, longitudinally to form 16-512 elongated cells. Each cell differentiates in antherozoid or spermatozoid.

Development of Oogonium:

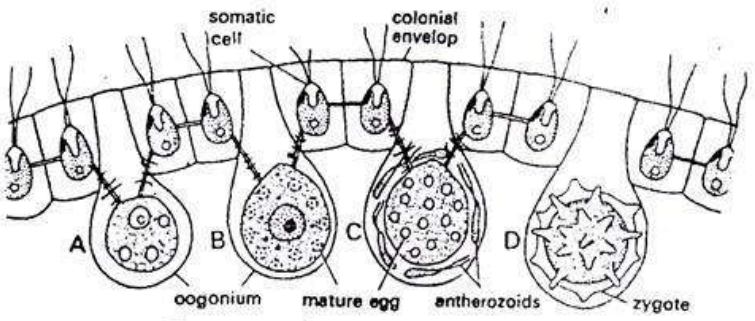

Fig. 5. (A–D). *Volvox*. Oogonium and fertilization

- The oogonia also differentiate mostly in posterior side of the colony. The oogonial initials enlarge, nucleus becomes larger, protoplast becomes dense, flagella are lost, eye spot disappears and many pyrenoids appear. The mature oosphere or ovum is round or flask shaped structure. The egg is uninucleate structure, the beak of flask shape oogonium functions as receptive spot.

Fertilization of Volvox:

After liberation from antheridium, the antherozoids swim freely on surface of water. Only one antherozoid enters inside the oogonium through receptive spot. Fusion of male and female cytoplasm and karyogamy i.e., fusion of male and female nuclei take place. This results in formation of diploid zygote. The zygotes are released by the disintegration of parent colony. Then zygotes undergo a period of dormancy.

Germination of Zygote:

The dormant zygote germinates on approach of favourable climatic conditions. The diploid nucleus of zygote undergoes meiotic division forming four haploid cells. The four haploid cells migrate with the vesicle. The development of new volvox colony from zygote is formed.

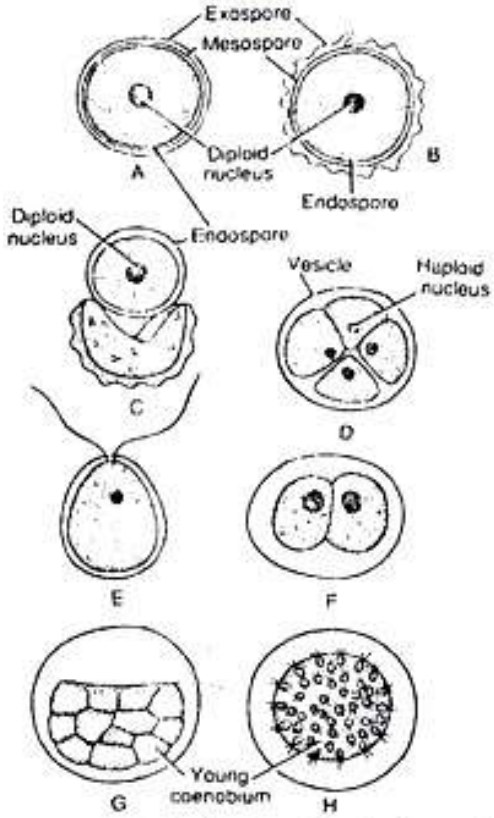

Fig. 6 (A–H). *Volvox*. Gemination of zygote and formation of young coenobium.

Life Cycle of Volvox:

Volvox is haploid (n) algae, the haploid gametes fertilize to make diploid zygote (2n) which divides by meiosis to make haploid cells (n) which mature into haploid Volvox colony.

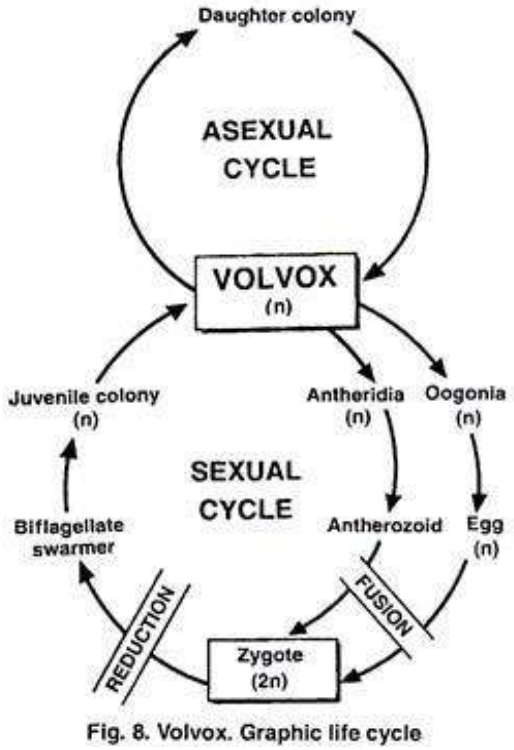

Fig. 8. Volvox. Graphic life cycle