VOLVOX

Q. What is Coenobium? Describe the structure and methods of reproduction in VOLVOX.

Ans: A definite number of identical, individual cells present in a colony is known as Coenobium. The colonial form may be non-motile (Hydrodictyon) or motile (Volvox). A ball like coenobium of Volvox consist of from 500 to 60000 cells which are placed at the periphery of hollow sphere. All the cells are physiologically similar and indepen-dent but mechanically held together in a gelatinous sheath and are ~~intercalary~~ inter-connected with cytoplasmic threads. The rolling movement of coenobium is an indivi-dual organism with the help of flagella and the direction of movement is takes place with the help of eye spot. In volvox a highly ~~evolved~~ evolved form of coenobium is found where ordinary cells are act as vegetative cells and specific cells are act as reproductive cells and individual cells of Volvox is quite similar to chlamydomonas cells but they are place in different families.

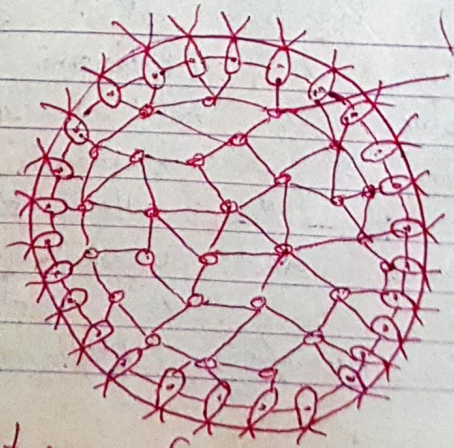

Fig - Structure of a Volvox colony

Occurrence and structure of the Thallus →

Volvox is a fresh water green algae which is known as rolling algae. Volvox plant looks very much like small, green, balls of pin head size and they are freely suspended in water. Each ball consist of a colony of 500 to 60000 cells. And volvox is found always in coenobium form. The term coenobium denotes the organization of known number of identical flagellate individual cells in a colony. About 20 species so far been reported out of them 3 species reported from India. The most common Indian species are Volvox globator, Volvox protificus and volvox africanus Volvox are very common in spring season and rainy season on pools, ponds, lacks etc. Each colony is motile and shows characteristic swimming and rolling movement. This is why Volvox is called a rolling algae and is autotrophic. The individual cells are physiologically independent from one another and they are mechanically held together in a gelatinous matrix and are inter connected by means of cytoplasmic strains. This show that volvox is not an individual but an association of a number of independent cells. All of the cells of young colony are green and vegetative in function. An individual cells of Volvox is pyriform, byflagellate (at anterior end

Volvox —

Habit & Habitat → • It is green algae.
- It is fresh water algae found in pool, lakes etc.
- It is a rolling algae.
- It appears as a green ball of pin head size.
- Its favourable season is spring and rainy.
- In summer season it is found in the form of zygospore.

Structure → • It is green colour algae, having number and arrangement of cells constant, such a type of colony is known as coenobium.
- It is the largest coenobium of the motile algae.
- Coenobium is hollow, spherical bounded by a delicate mucilaginous layer.
- Cell are arranged in a single layer along the periphery of the mucilage layer.
- Cavity of the coenobium is filled with the watery mucilage.
- The coenobium shows polarity at the time of asexual reproduction on the posterior side.
- All the cells of the coenobium are alike and they are chlamydomonas type.
- Respiration, excretion and nutrition of the individual cell are independent of each other.
- Each cell of the coenobium has its own mucilage rows covering inside the common gelatinous layer.
- Each cell of the coenobium is connected with its neighbouring cell by cytoplasmic strands or plasmodesmata.

Reproduction → The coenobium of volvox is considered to be the most highly evolved on the basis of great differenciation between vegetative and reproductive cells. In the young colonies all the cells are similar and vegetative in function. As the colony grow older some cells of them become enlarged and function as either Asexual or Sexual reproductive cells. They are recognize by their large size, large nuclei and dence cytoplasm. A coenobium have all its reproductive cells either entirely as asexual or all the sexual. So the volvox reproduces by two methods. That is —

1. Asexual (Season in favourable)
2. Sexual (End of growing season)

1. Asexual Reproduction → Under favourable condition a coenobium may develop 5 to 25 gonidia which is 10 times bigger than the vegetative cells. The enlargment in size is related to the heavy deposition of reserve food material. These non-motile, spherical gonadium, lais embedded in a flask shaped sheath which is towards the antarior of the colony.

Each gonadium further increase in size and undergoes repeated division but the first division is longitudinal and second division is vertical. So that a 4 celled

plate is form which is slibely in curve with concave surface is called plakea state. The next division is called structure forms a minute hollow sphere with distinct pore. The tabring pointed ends of all the daughter cells are found towards its cavity. Subsiquensly it divides and redivides contiously and forms a large number of cells.

Formation of daughter colony by invagination (Inversion) → When the cell division ceases The young colony starts ~~ing~~ invagination ether the cells towards the centre starts going inside out and lastly the whole sphere turns inside out. The entire process of invagination requires 3 to 5 hours.

The tapering ends of all the cells now directed out side and develop flagella and all the cells start separate from each other by the development of mucilaginous cell wall. In this way a new daughter colony is produced inside the parent cell within the enlargment of gonadial cell wall. ~~after~~ The gonadial cell wall after some time transform into mucilage envelop which surrounding the daughter colony. New daughter colony escape as a result of the rupture of the mucilaginous envelop and they leads to ~~indevel~~ independant.

2. Sexual Reproduction → This reproduction is oogamous. The coenobium may be either monoecious (V. globator) or dioecious (V. aureus). The sex organs which develops in these coenobia which have may or may not have gonidia.

Development of Oogonium → The position and structure of oogonium in a coenobium are quite similar to a gonidium. Its entire protoplast gets transform into an ovum which is uninucleate and haploid. The spherical ovum in initial stage greenish in colour but at maturity it enlarge slitely and develops a minute papillate, receptive spot which is ready for fertilization.

Development of Antheridium → At the initial stage the position and structure of an Antheridium is similar to oogonium. As a result of repeated division of the protoplast an antheridium may produced 64 to 512 antherozoids. Antherozoids are arranged in a hollow sphere which undergoes inversion similar to asexual reproduction. In some species they are arranged as a plate like colony. Each antherozoids is spindle shaped, uninucleate, byflagellate, pale yellow and yellowish green in colour. Flagella are apical or subapical. After the rupturing of mucilage sheath they comes out on the water and is ready for fertilization.

Fertilization → The antherozoids liberated in water and when they in contact with oogonium and benetrate the oogonium and one of them fuse with the ovum. The fertilized zygote being cytologically diploid (2x). which secrets a three layered wall and turns a orange red or reddish in colour due to the presence Haematoch pigment. It then goes rest for a period and retain in the mother colony. On liberation the zygote sinks to the bottom to the water where it takes ~~it~~ some time for maturation with the return of favour-able condition the zygote starts germination. Its exosporium and mesosporium rupture while the endosporium produced a thin, vesicle like structure. Then the diploid nucleus of zygote migrates to the vesicle and it divides and redivides in order to form a daughter colony. But the nuclear devision is always reductional. According to Pocock (1933) in case of V. compenelis the zygote produce 4 microspores in the vesicle of which 3 degenerate and the remaining 1 liberate from the vesicle which divides and redivides which form about 500 celled coenobium. Before the division of the cells the ~~zygote~~ zoospore with draw there flagella.