

NOSTOC

1994

Q. Describe the general habit, structure, reproduction and economic importance of Nostoc.

Ans → Systematic Position →

Class - Cyanophyceae or Myxophyceae or
Blue green algae ✓

Sub class - Haringgoneae ✓

Order - Nostocales

Family - Nostocaceae ✓

Genus - Nostoc

General Habit → Nostoc is a filamentous blue

green algae, which is found in aquatic as well as terrestrial. Several trichomes of Nostoc aggregated together to form a colony which is surrounded by a like mucilage sheath measuring about few mm to 8 cm. It is commonly found in stagnant water of ponds and ditches. Nostoc commune has been reported from 20 meter depth of the soil by Atwell in America. Nostoc microscopium is found as epiphytic and also in the bark of trees. Some species of Nostoc also occurs in symbiosis with the Fungi and forms Lichen. Some species of Nostoc also reported from pebbly field, which increases the fertility of the soil and some species of Nostoc occur in the thallus of Anthoceros and in the coralloid root of Cycas is known as an Endophytic Algae.

Structure of the Thallus

The thallus of Nostoc is filamentous, which is unbranched and found in large number imbedded

in mucilage sheath and lastly they form smooth and globose structure measuring about 15 cm in diameter (Setchell 1889). Many beaded chains of cells of various lengths are found in gelatinous sheath to form a Nostoc colony. Each filament is usually enclosed by its own mucilage sheath. Beaded Nostoc cells are various in cell shapes. Out of some are cylindrical and ~~beaded~~ barrel shaped. Which is known as heterocyst. The heterocyst is mostly intercalary but some times they are terminal. Both the terminal and intercalary heterocyst occur in Nostoc linzia, which bears one or two polar nodules. That polar nodules maintain cytoplasmic connection with the adjacent vegetative cells. Between two heterocyst large thick walled cells ^{wall} are also found. That is known as akinetes - where sufficient food are stored. They are autotrophic in nature.

Fig →

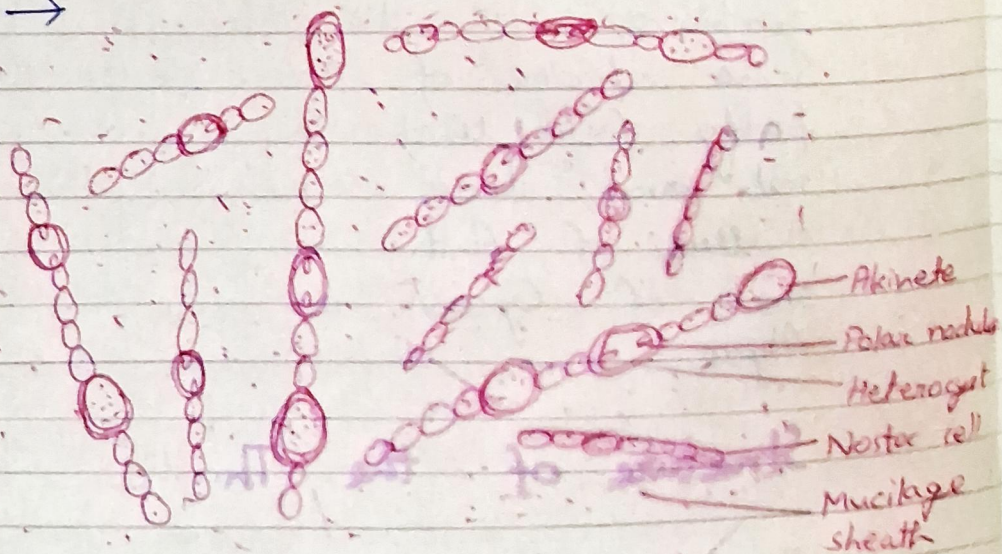


Fig - NOSTOC COLONY

Detail cell structure of Nostoc

The Nostoc cells are surrounded by mucilage sheath, cell wall and plasma membrane and in the inner protoplast is divided into a colourless centroplast (central) with an incipient nucleus and a pigmented chromoplast (Peripheral). The centroplast bears chromatin granules, which bears hereditary character and chromoplast bears photosynthetic pigments. They are Phycocyanin (blue in colour), Phycoerythrin (Red in colour), Chlorophyll (Green in colour), Xanthophyll (Yellow in colour) and Carotin (Red in colour). It also contains reserve food material and several Pseudovacuoles which helps in buoyancy. Due to above characters the Nostoc cell is Prokaryotic type.

Fig →

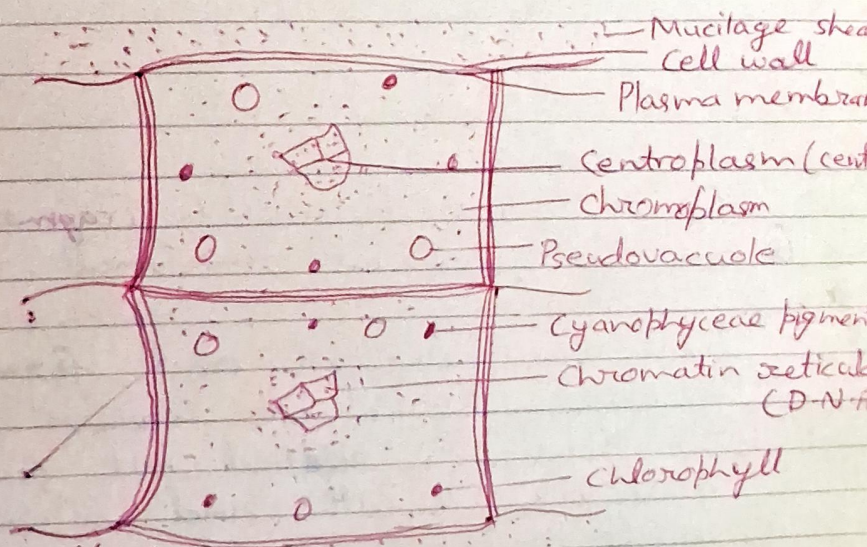
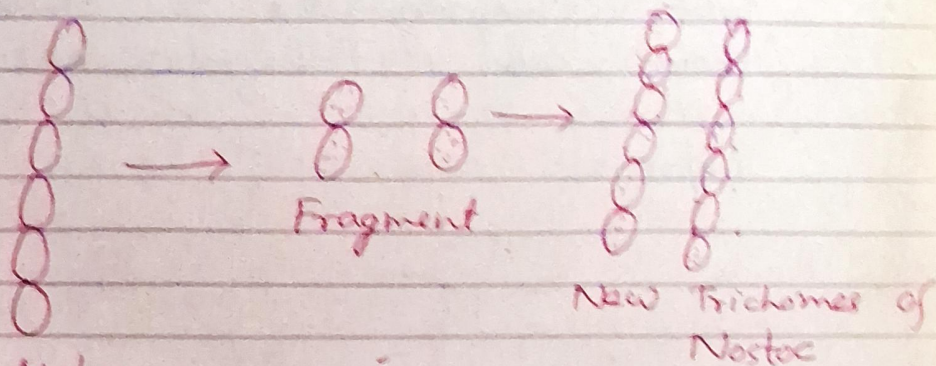


Fig - Detail Cell structure of Nostoc

Reproduction → Nostoc reproduced entirely vegetatively by the following methods:

By Fragmentation → Trichomes of Nostoc breaks into small pieces due to certain chemical changes in water or inactive in central cells or by water current or breaking trichomes by different insects. These pieces are known as fragments. And after returning suitable environment, each fragment germinates and forms a new trichome of Nostoc. Which is known as fragmentation.

→



Filament Nostoc

Fig - Vegetative Reproduction by Fragmentation in Nostoc

By Heterogonia → Small segment trichomes which breaks at the point of heterocyst and forms individual mucilage sheath is known as Heterogonia. This Heterogonia slipped out from the incising gelatinous sheath and after returning suitable environment forms a new colony by repeated cell division by a mitosis method. And lastly they form new colony of Nostoc.

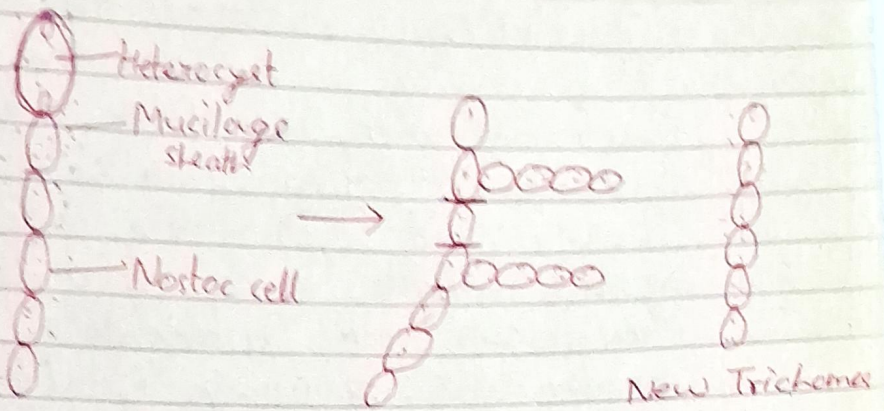


Fig - Vegetative Reproduction by Hormogonia in Nostoc

By **Akinetes (Resting spores)** → Under unfavourable condition any cell or some of the vegetative cell between two Heterocyst become enlarged due to heavy accumulation by reserve food material and each such cell secreted a thick cell wall around it. ~~such~~ Modified ~~such~~ vegetative cell are called akinetes or resting spores with the return of favourable condition each akinete germinate and to form a new trichome of Nostoc.

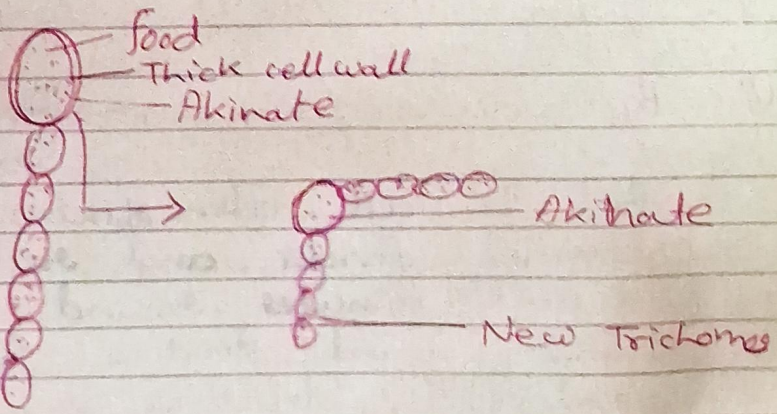
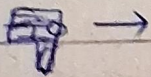


Fig - Vegetative Reproduction by Akinetes in Nostoc

④ By Heterocyst \rightarrow In Nostoc commune the heterocyst become functional and germinate to form a new trichomes. At first heterocyst divide transversely and form two cell. Later on it again divide ones and form four cells. That four cell filamentous structure is known as germling (Gulter 1921). These germling escapes either by the rupture of heterocyst wall at the apical region or by the gradual dissolving of the cell wall and each germling divides by a mitosis method and form a new trichomes of Nostoc.

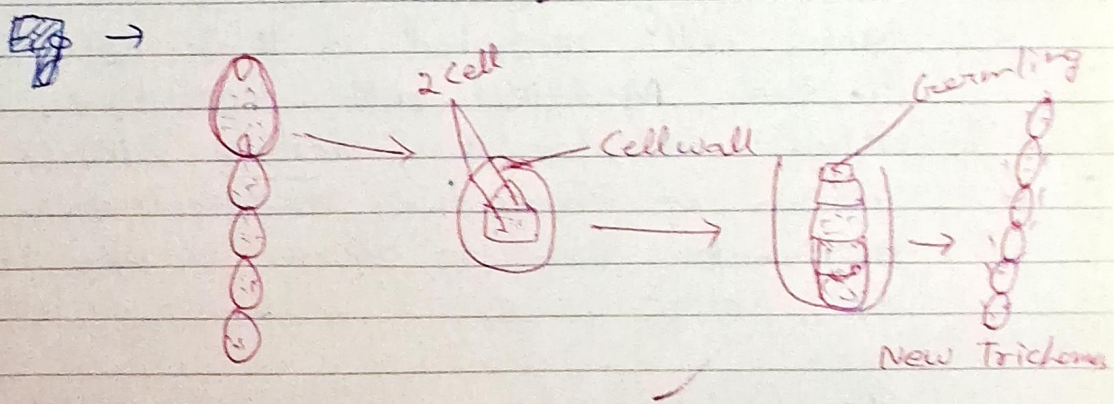


Fig - Vegetative Reproduction by Heterocyst in Nostoc

⑤ By Endospores formation \rightarrow Brand (1901) and Spratta (1911) reported that the cell content of Heterocyst in Nostoc commune divides and subdivides and forms several minutes round structure. That minute round structure forms a cell wall and each structure is known as an endospore. After returning suitable condition

the cell wall of heterocyst breaks off and each endospores give rise to several new trichomes of Nostoc.

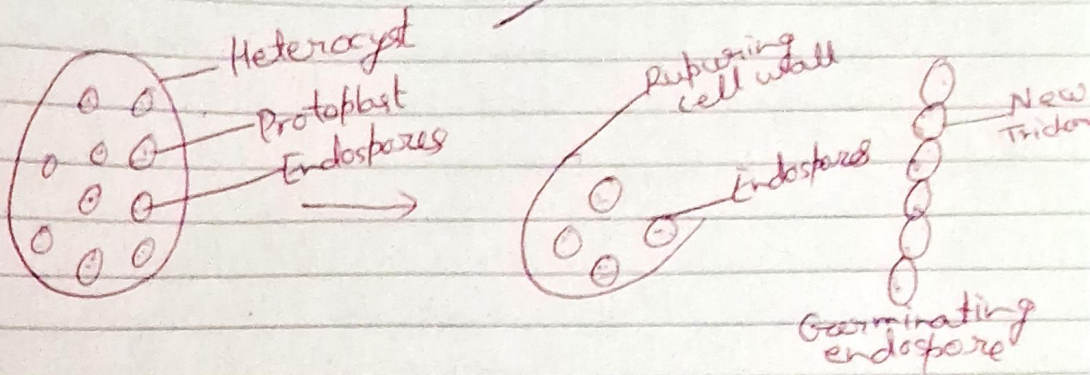


Fig- Vegetative Reproduction by Endospores in Nostoc

Economic Importance of Nostoc

1. Nostoc is used by the lower animals as food.
2. It is used for the purification of water.
3. It is used for nitrogen fixation.
4. It increases the fertility of the soil.
5. It is used as symbiosis which later form Lichens.
6. Some species are poisonous to fishes and other small animals.
7. It also contaminate water supply and destroy fish food.