NOSTOC

* Systematic Position:

Class — Cyanophyceae

Order — Nostocales

Family — Nostocaceae

Genus — Nostoc

* Occurrence:

Nostoc species occur in fresh water as well as terrestrial habitat. Aquatic species occur either as free-floating thalli or lies at the bottom attached to submerged vegetation. Terrestrial species such as Nostoc commune grows on damp soil. They also grow in rice fields. They have the capability to fix atmospheric nitrogen and some live as a symbionts with the roots of Cycas.

* Trichome:

The trichomes of Nostoc are uniseriate, usually contorted and twisted in various ways. Each trichome is usually enclosed by its own mucilaginous sheath and is called a filament. A prominent constriction occurs between the adjacent cells. The trichomes are characterised by the presence of heterocyst which may be intercalary, terminal or lateral in position.

* Cell structure:

The cells are spherical or rounded and exhibit typical cyanophycean cell structure. The cell consists of the cell wall surrounding the protoplast. The protoplast is differentiated into the outer pigmented cytoplasmic region called the chromoplasm and the inner colourless centroplasm. True nucleus is absent. The chromoplasm contains the pigments (phycocyanin, chlorophyll-a, etc.). It also contains the colourless granules cyanophycean starch and the cyanophycin granules of proteinaceous nature. The centroplasm is not separated from the chromoplasm by any kind of membrane.

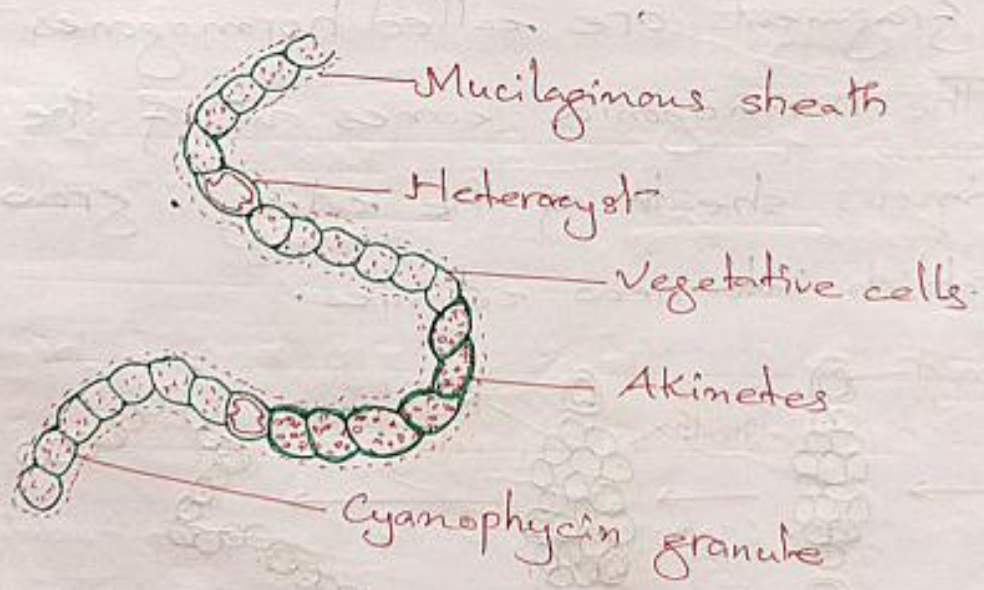

Fig: Trichome of Nostoc sp.

* Reproduction:

Nostoc reproduces entirely by vegetative means, sexual reproduction is completely absent. The vegetative reproduction takes place by the following methods —

1) Colony fragmentation:

The Nostoc colony as it gets larger may break into small fragments due to mechanical, physiological and other factors. Each fragment has the capability to develop into a new colony.

2) Hormogonia:

The trichomes break into small fragments due to the degeneration of intercalary heterocyst. This multicellular fragments are called hormogones or hormogonia. The hormogonia comes out of the enclosing gelatinous sheath of the colony, grow rapidly and establish into new colonies.

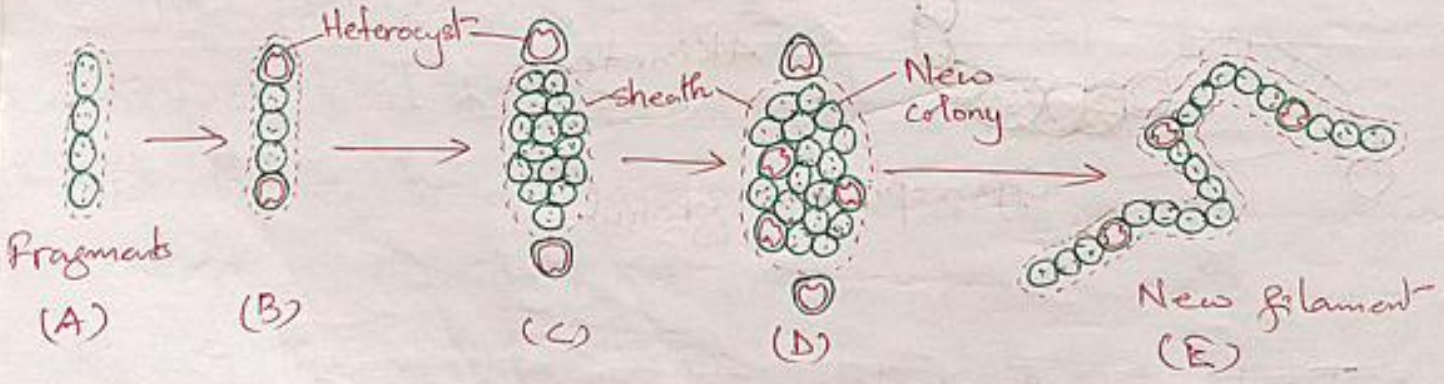

Fig: (A-E). Reproduction by hormogonia

3) Akinetes:

Under unfavourable conditions, some cells of the trichome becomes enlarged and each cell secretes a thick, highly resistant wall around it. Such specially modified vegetative cells are called akinetes or resting spores. The protoplasm of these cells are full of reserve food materials. The akinetes have the capability to resist against cold and drought. With the return of favourable conditions, each akinete germinate to form a new filament of Nostoc.

4) Heterocyst:

In some species of Nostoc, the heterocyst becomes functional and germinates to form a new filament. First, it divides by transverse wall to form two cells and later a four cell germling is formed. Then the thick wall of the heterocyst ruptures and the germling develops into a new trichome.

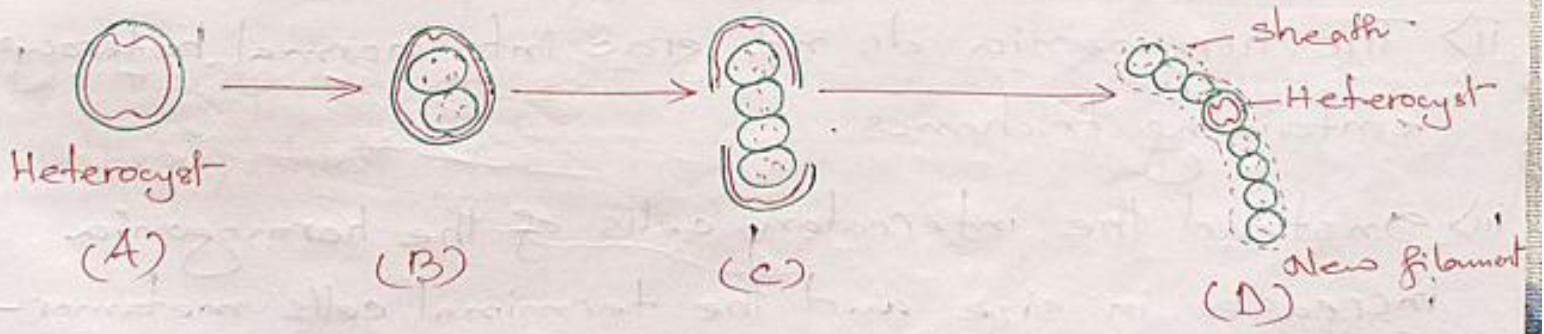

Fig. (A–D). Reproduction by heterocyst

5) Endospores:

In some species of Nostoc such as N. Commune and N. microscopicum, the heterocyst divides to produce endospores. Unlike akinetes, the endospores are thin-walled and hence cannot be regarded as a resting spore. The endospores, on liberation give rise to neo filaments.

* Life cycle of Nostoc.

⇒ Nostoc passes through a regular sequence of development changes which can be grouped into two phases —— heterocystous phase and sporogenous phase. These two phases regularly alternate with each other in the developmental cycle.

1) Heterocystous phase:

i) In this phase, the trichomes break up at the heterocysts to form motile hormogonia.

ii) The hormogonia do not grow into normal heterocyst containing trichomes.

iii) Instead the intercalary cells of the hormogonia increase in size and the terminal cells metamorphose into heterocysts.

iv) The intercalary cells of the hormogonia separate and undergoes meiotic division.

v) Each intercalary cell thus produces four cells.

vi) The cells divide further to form a packet of several undifferentiated cells.

vii) The cells in the packet may occur singly or in chains. This is the aseriate stage.

viii) The cells gets liberated from the packet and forms new filament.

2) Sporogenous phase:

i) This phase starts with two or four cell long chains of the aseriate stage.

ii) These cells may grow to form long trichomes without heterocysts.

iii) The trichomes break up into fragments.

iv) The end cells of these fragments may change into heterocyst.

v) The intercalary cells develop into spores.

vi) The spores on germination form 2-3 celled germlings, which gives rise to a new filament.