# Life Cycle of Nostoc

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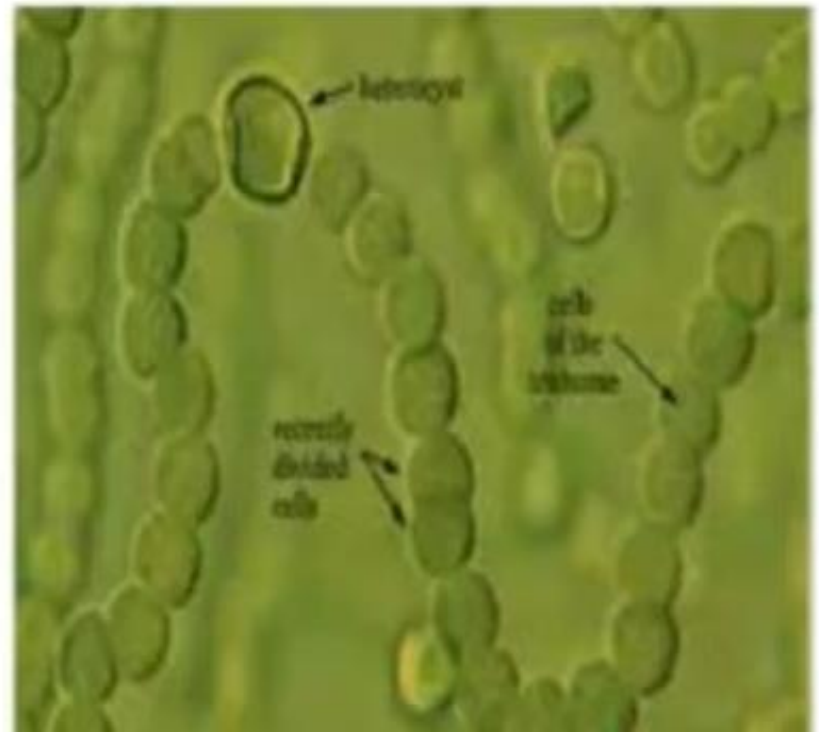
## 1. Classification

Nostoc are prokaryotic and are grouped with bacteria. They are kept in **cyanobacteria** as they are photosynthetic.

- DOMAIN- Bacteria
- PHYLUM- Cyanobacteria
- ORDER- Nostocales
- FAMILY- Nostacaceae
- GENUS-Nostoc



## 2. Occurrence

- They are **terrestrial or fresh water** and found as free-living colonies or attached to rocks or at the bottom of lakes. They are also found on tree trunks.
- Form symbiotic association with other organisms (Lichen, Fern, Bryo). It is also found in paddy fields where it helps in atmospheric nitrogen fixation.

*Nostoc azollae* forms symbiotic association with water fern.

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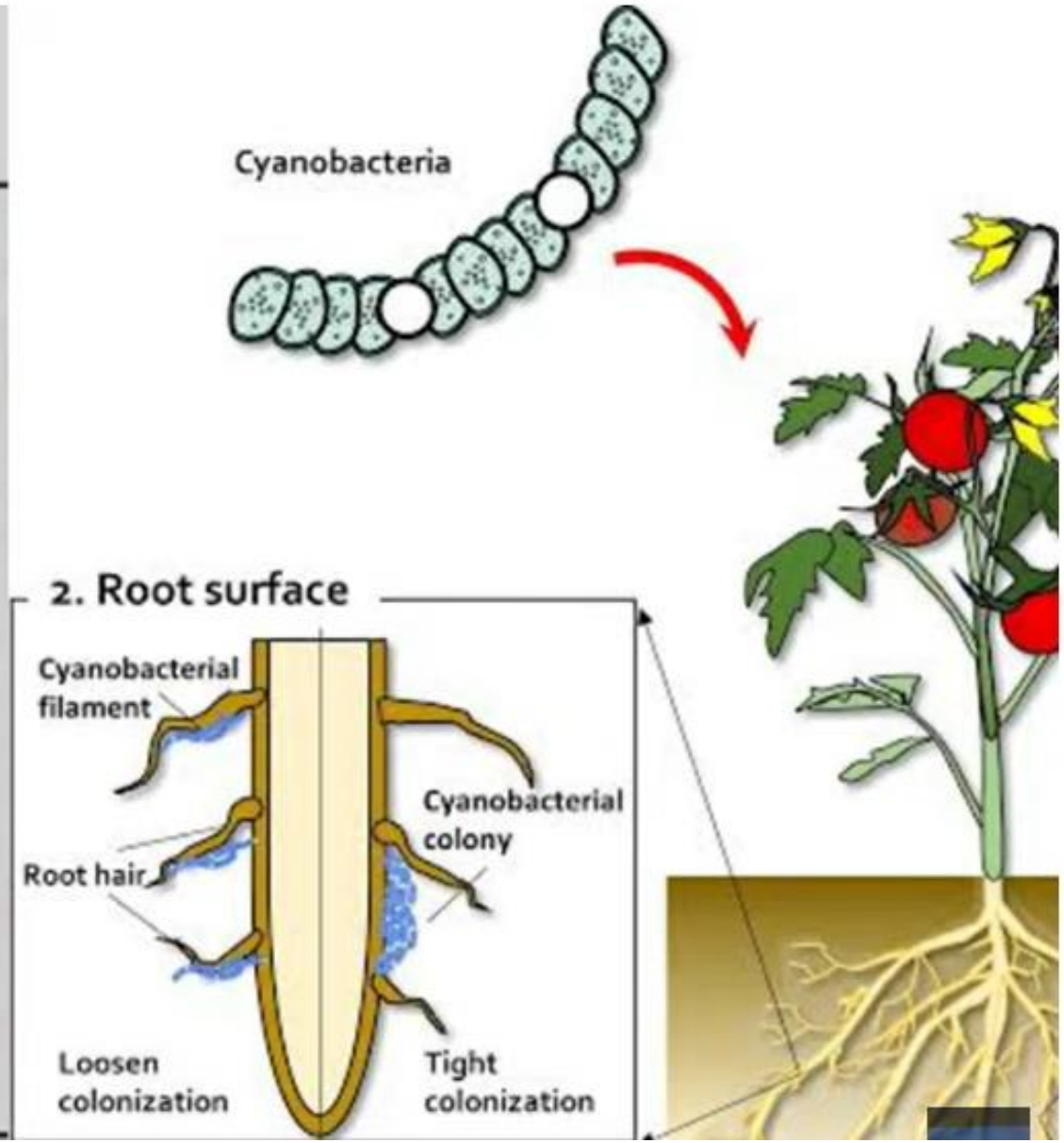

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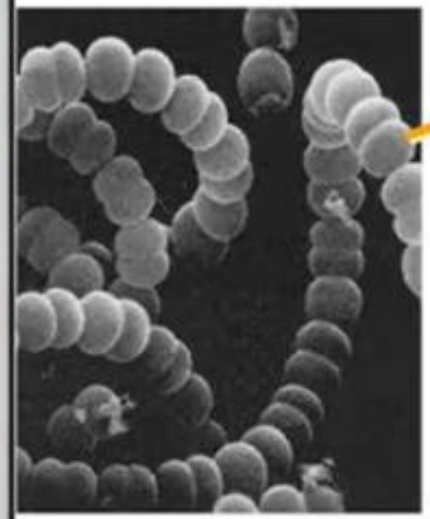
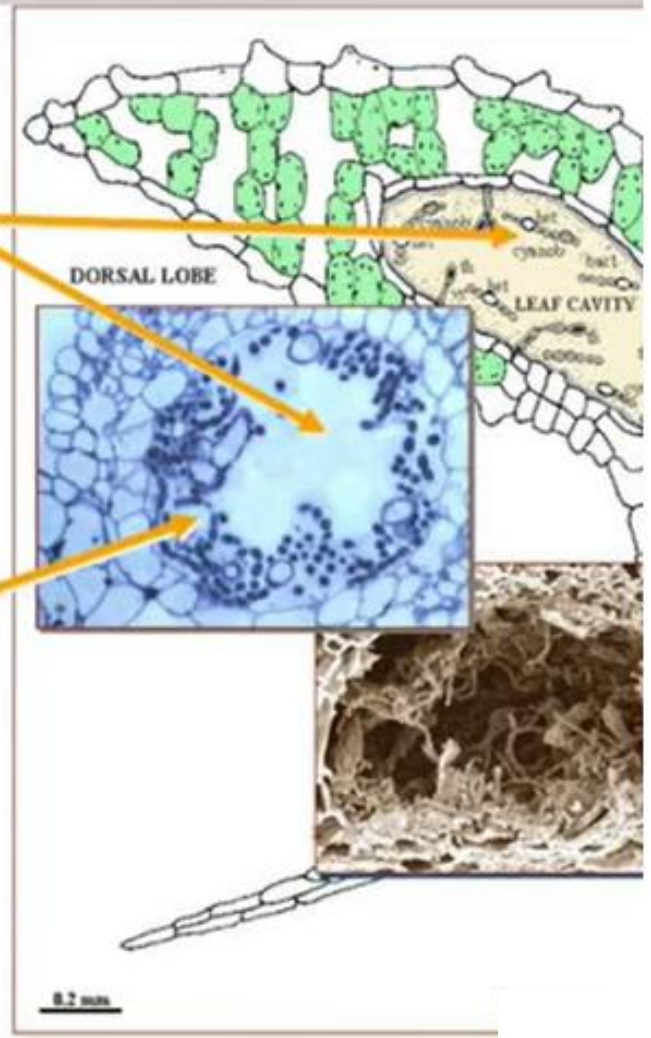
*Azolla* leaf



*Anabaena*



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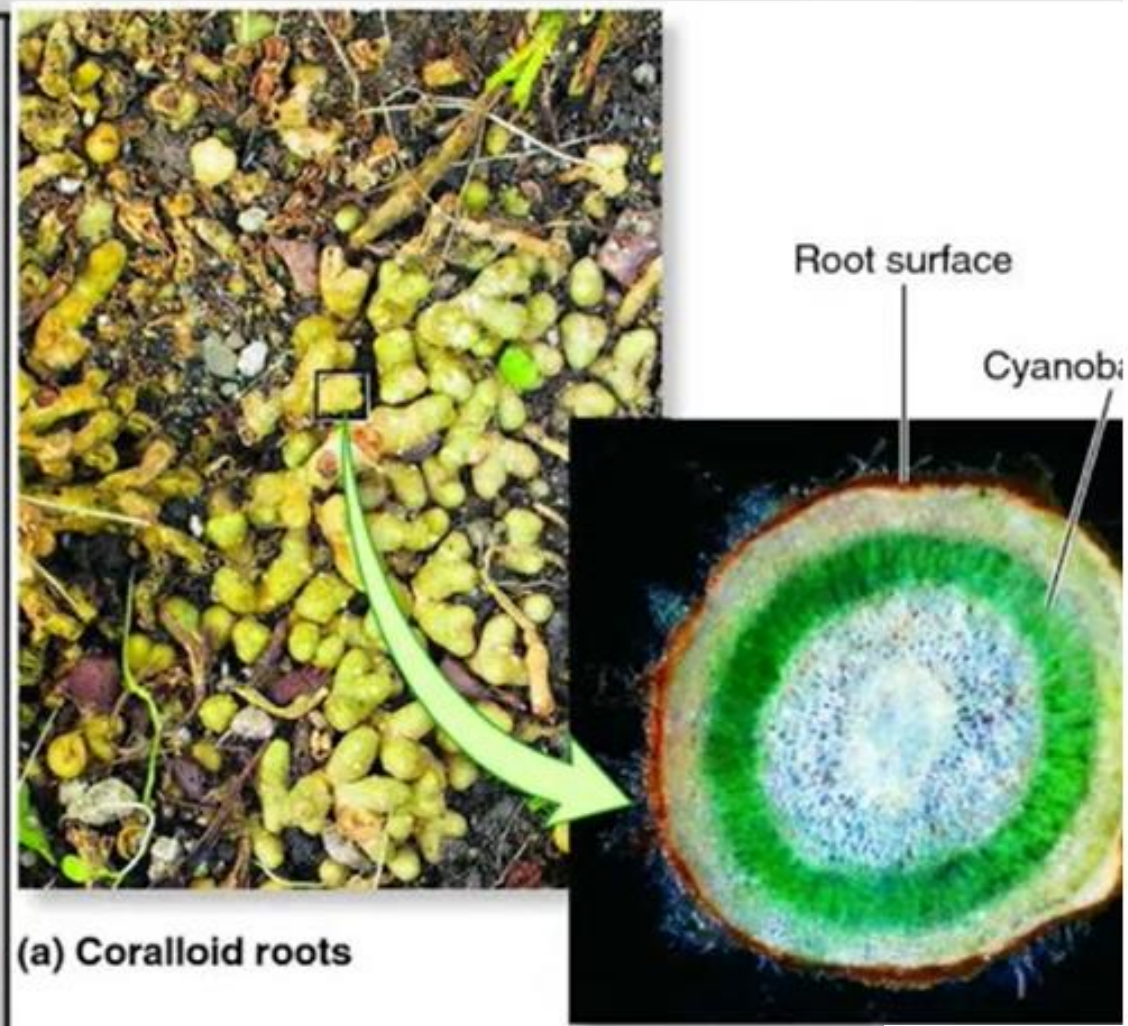


(a) Coralloid roots

(b) Coralloid root

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# Thallus Structure of Nostoc :-

1. Thalli are present in the form of colony.

2. Ball like colony is enveloped by a gelatinous sheath (Figs. 56, 57).

3. Balls are greenish to bluish-green in colour.

4. Each colony contains thousands of straight or twisted filaments or trichomes (Fig. 57).

5. Each trichome is surrounded by its individual sheath and called the filament.

6. A trichome is contorted and consists of many cells arranged in a beaded manner (Fig. 58).

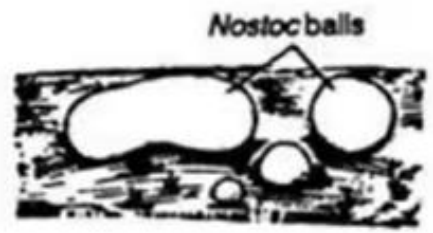



*Fig. 56. Nostoc balls.*

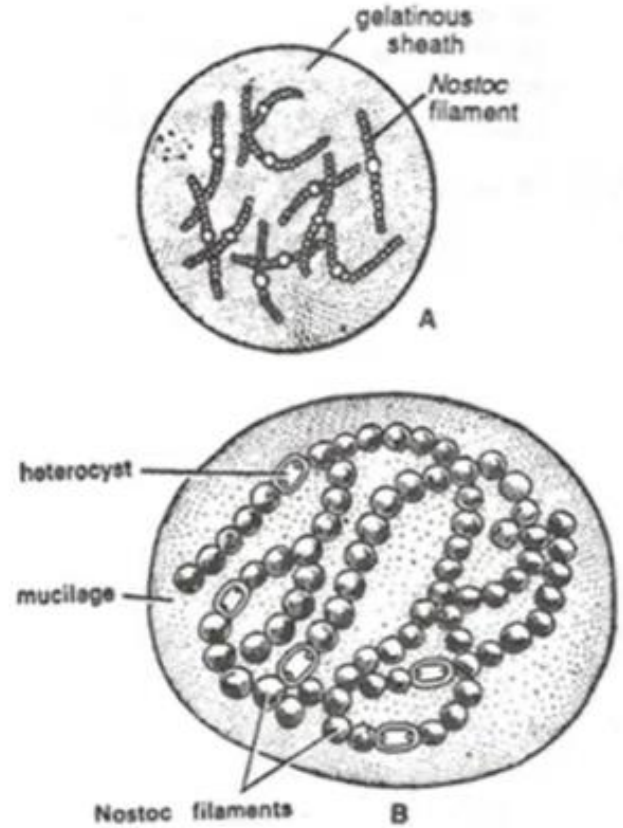



*Fig. 57. Nostoc. A, Part of a colony under low power; B, Part of a colony under high power.*

7. Each cell is somewhat cylindrical or spherical in shape.

8. In filaments there are present some large, spherical or cylindrical, colourless empty cells called hetero cysts.

9. Heterocysts are generally intercalary but in the young condition, they may be terminal.

10. Two polar nodules are present in each heterocvst (Fig. 59B).

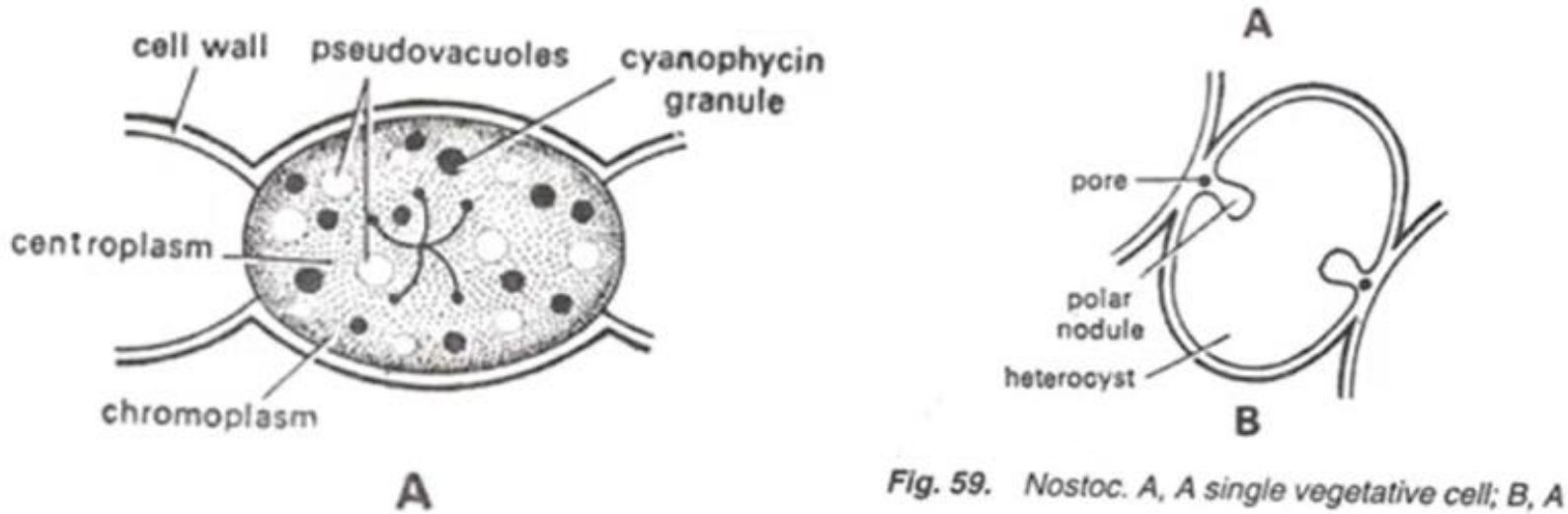



*Fig. 59. Nostoc. A, A single vegetative cell; B, A heterocyst*

11. Some cells of the filament become enlarged and filled with the food material. These thick-walled cells are called akinetes. Akinetes are generally present in chain.

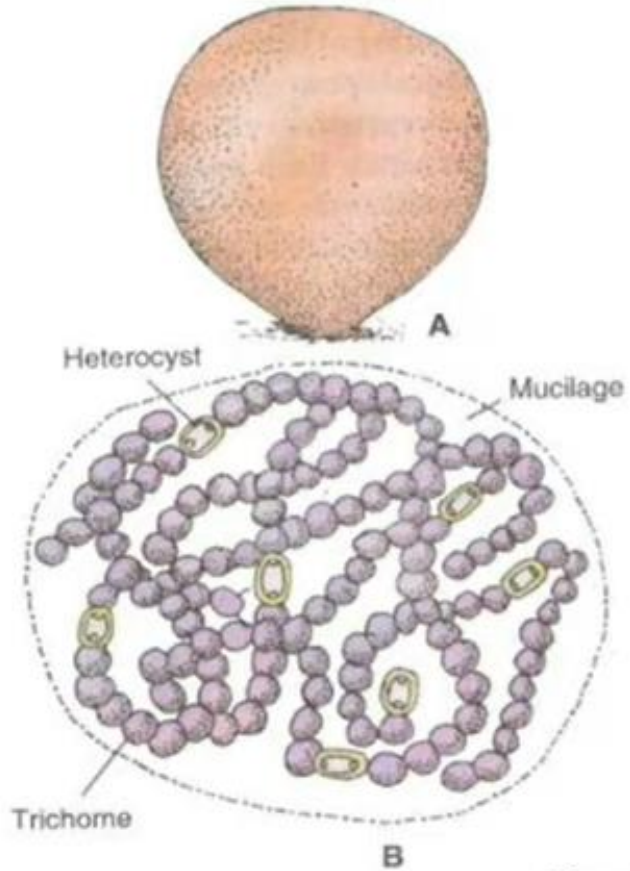



Fig : (A) Nostoc Ball,
(B) Portion of filament as seen under microscope

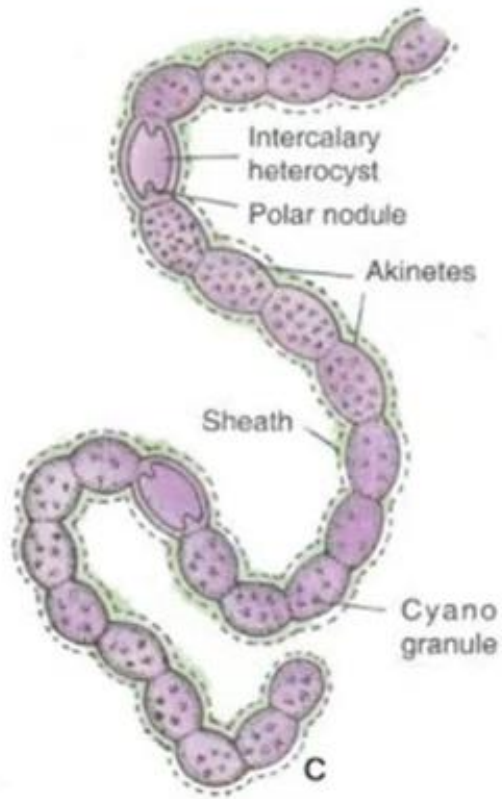



Fig : (C) A single filament with a trichome.

## 4. Single Cell:

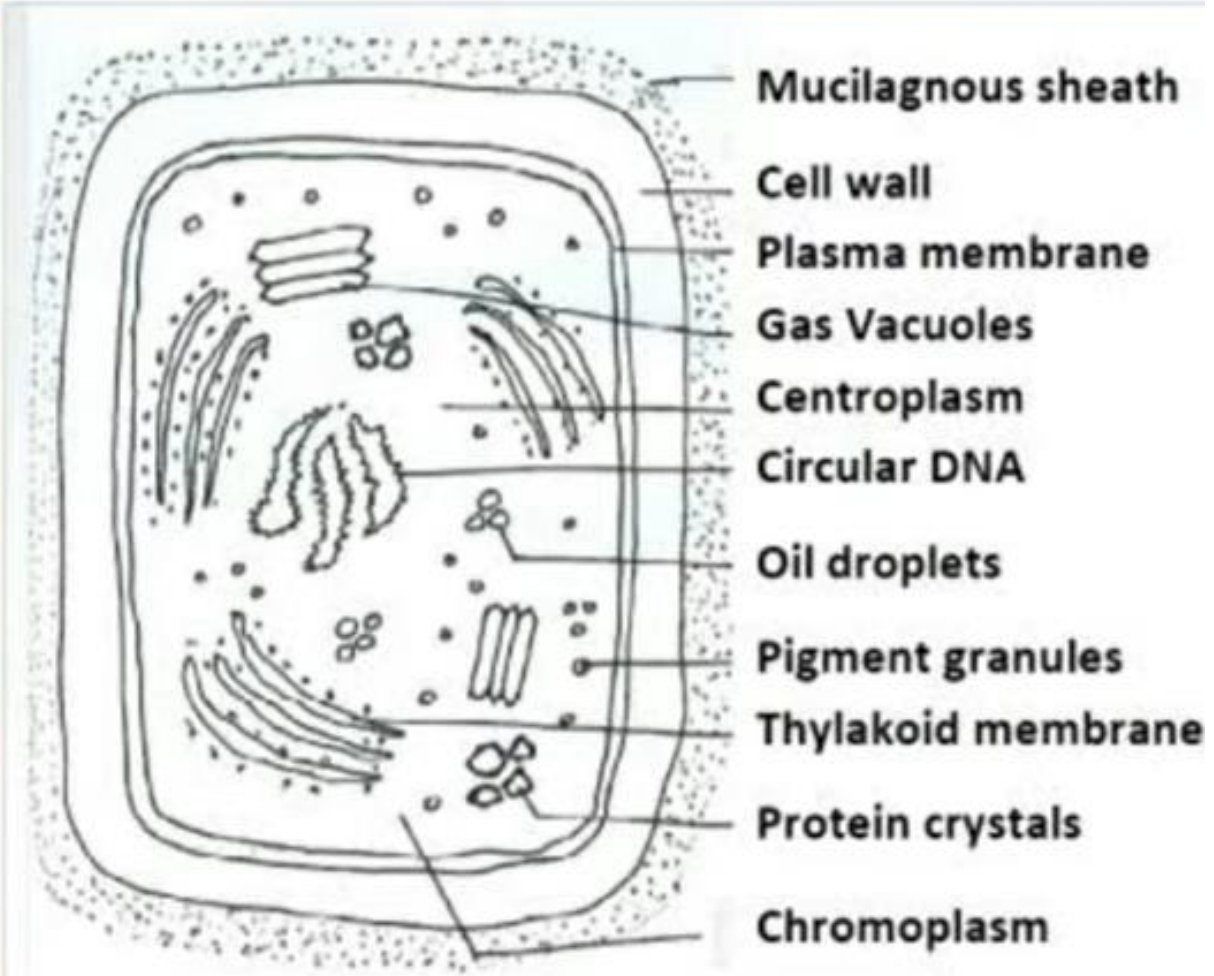
Cell is prokaryotic and similar to gram – ve bacteria.

Cell is surrounded by a cellulose cell wall and is somewhat cylindrical or spherical in shape.

Cells contain thylakoids and are unstacked.

Pigments: chlorophyll (green pigment), pycocyanin (blue) and phycoerythrin (red)

DNA is without histones (nucleoid)



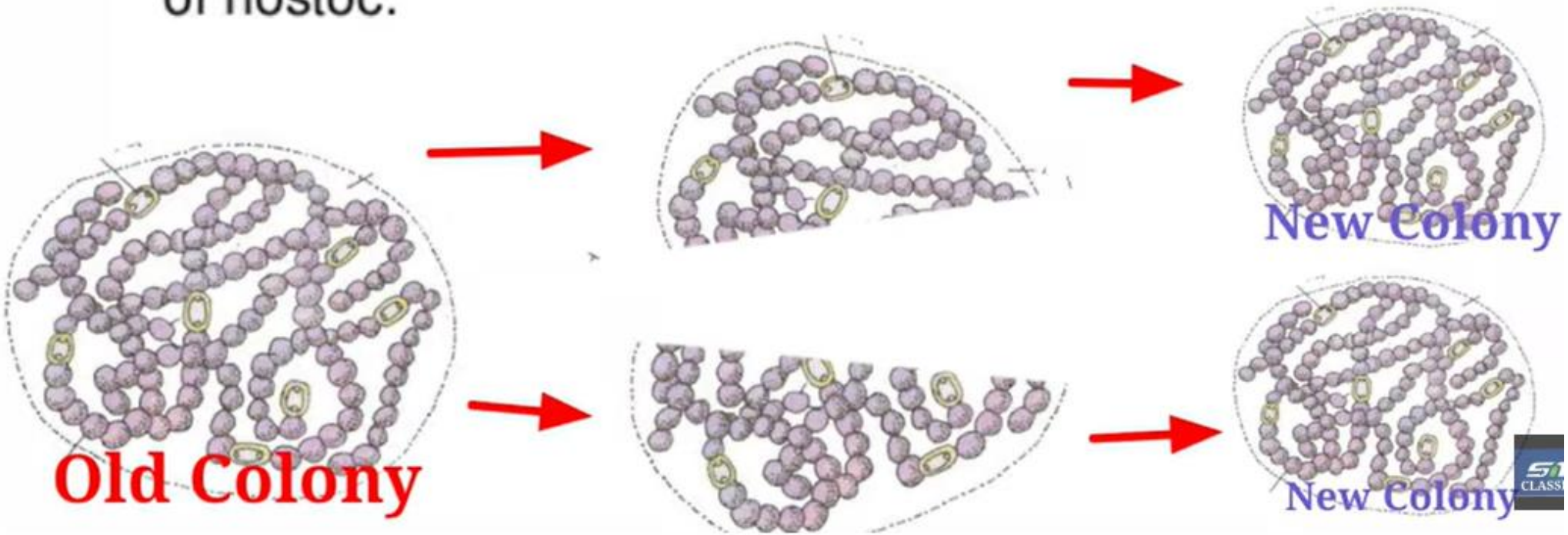

Ultra Structure of Nostoc Single Vegetative Cell

# REPRODUCTION

- Nostoc reproduces vegetatively & asexually.
- Sexual reproduction is absent.
- All the filaments of the colony reproduce simultaneously.
- The sexual reproduction is totally absent nostoc reproduce only vegetatively by following methods
- Framentation
- Horomogonia
- Akinetes
- Heterocysts

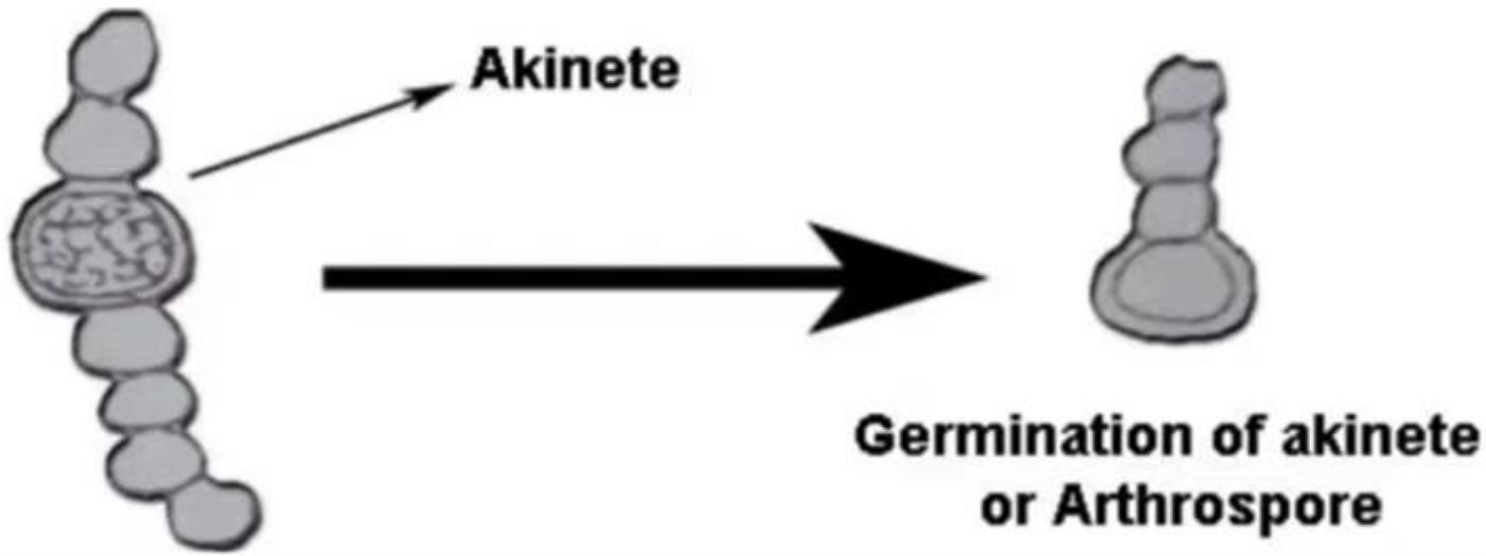
# FRAGMENTATION

- By mechanical , physiological or by the colony breaks into 2 or more fragments.
- Each of fragments is capable to develop into new colony of nostoc.



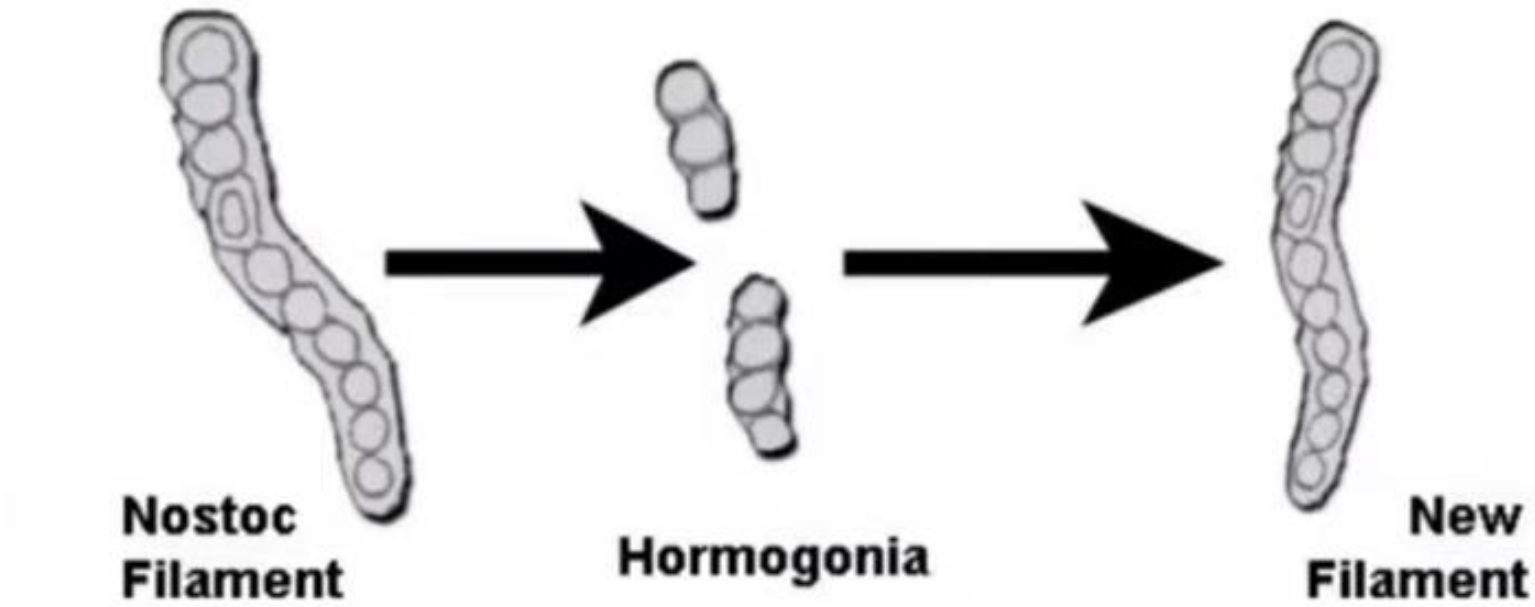
## 2. By Arthrospores OR by Akinetes Formation

During unfavorable conditions, some cells of filament become enlarge and they are covered by a thick wall, they are called ***Akinetes*** or ***Arthrospores*** or ***Resting Spores***. They also store food materials. They germinate during favorable conditions into new filaments.



## 1. By Hormogonia OR by Fragmentation

Hormogonia are formed by Fragmentation. The filament breaks at different points and each broken filament is called **hormogonia**. The filament breaks due to the decay and death of ordinary cells. Heterocyst may form the breaking point. Each hormogonium grows into a new filament by repeated cell division.



## 3. By Heterocyst

At the time of reproduction, the heterocysts are separated from the ***Nostoc filament***. These heterocysts are changed into normal reproductive cells. By the process of cell division, it is converted into a new filament.

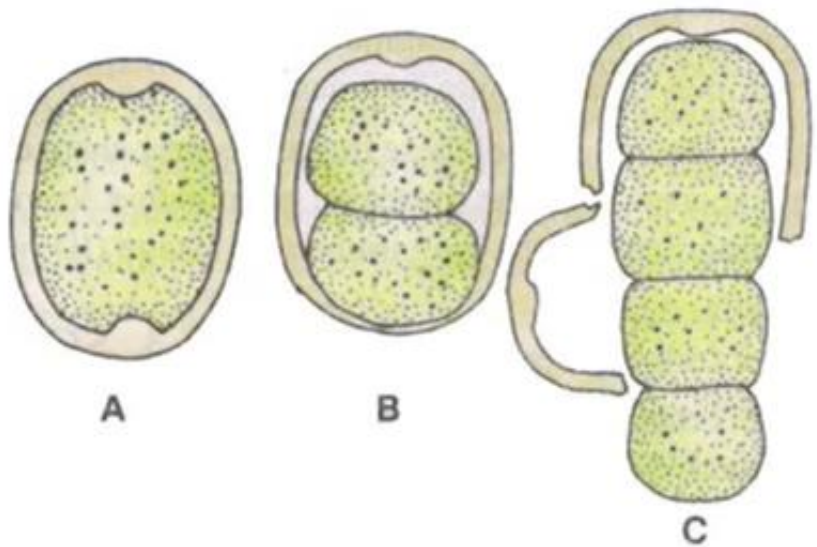
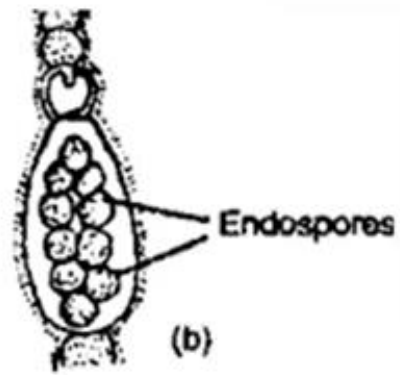



Fig : Stages in germination of heterocyst.

## Endospores:

In few species of *Nostoc*, heterocyst cell undergoes irregular cell division and forms thin-walled spores which are called endospores. Endospores come out by bursting thick wall of heterocyst and germination occurs and new trichome is formed.



## Ecological Importance

- *Nostocs are* important for their nitrogen-fixing ability. They are used in paddy fields and are also used to increase the nutrient value of soil.
- They are rich in proteins and vitamin C and are used as a delicacy in various Asian countries, e.g. *N. flagelliforme, N. commune, etc.*
- *N. muscorum* has shown to accumulate polyhydroxy butyrate, which is a precursor of plastic. It may have useful application in the industry
- Cyanobacteria can convert $CO_2$ to biofuels.
- They can be used for bioremediation of wastewater and degrade environmental pollutants
- Various species, e.g. *N. muscorum, N. commune, N. insulare, etc.* extracts have shown antibacterial or antiviral activity and may be used in future to prepare drugs.
- *Nostoc commune* is eaten as salad
- *Nostoc flagelliforme* is known as Fat choy. It is used as a vegetable in China

# THANK YOU