Microorganisms: Friend and Foe

Nitrogen Fixation

Nitrogen Fixation

The process of converting atmospheric nitrogen into compounds of nitrogen, mainly nitrates, which can be easily used by plants is called nitrogen fixation. If can be fixed in two ways.

1. Natural fixation or Atmospheric fixation

2. Artificial fixation or Industrial fixation.

Natural Fixation of Nitrogen

In nature nitrogen of the atmosphere can be fixed by three methods which are listed below.

(i) Fixation of Nitrogen by Bacteria : The root nodules of certain legnminous plants like peas, beans, etc. contain nitrogen fixing bacteria called Rhizobium. The bacteria can directly fix nitrogen gas to nitrogen compounds which can then the utilised by the plants. Some non-leguminous plants like Alnus and Ginkgo also fix atmospheric nitrogen.

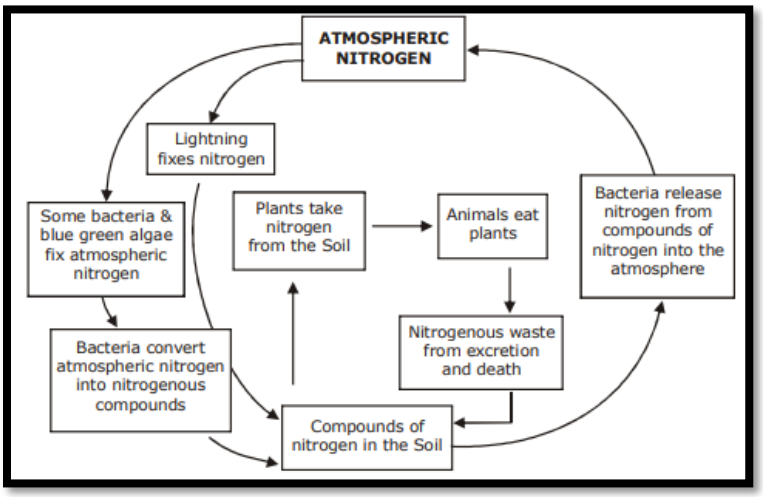
(ii) Fixation of Nitrogen by Blue - Green Alge : Blue-green algae like Nostoc and Anabaena can also help in nitrogen fixation. These are usually found in paddy fields. The fixation of nitrogen by bacteria and algae is called biological fixation of nitrogen. Most of the nitrogen in nature is fixed by this method

(iii) Fixation of Nitrogen by Lightning : During lighting in the sky, when high temperature is produced, the nitrogen gas of the atmosphere reacts with oxygen to form nitrogen oxide. This nitrogen oxide dissolves in rainwater to form a very dilute solution of nitric acid. The nitric acid thus formed reacts with alkalis present in the soil to form nitrates which are then absorbed by the plants.

Artificial fixation of Nitrogen : In this method the atmospheric nitrogen is made to combine with hydrogen gas to form ammonia (Haber's process). This ammonia can be oxidized to make nitrates or react with acid to form ammonium salts. The nitrates as well as ammonium salts contain fixed nitrogen and are used as fertilisers.

Nitrogen Cycle

The circulation of nitrogen through the living and non-living components of the biosphere (air, soil, water, plants and animals) is called nitrogen cycle. Nitrogen cycle maintain the percentage of nitrogen in the atomosphere more or less at a constant.



Steps Involved in Nitrogen Cycle

(i) The atomspheric nitrogen is fixed into nitrogen compounds like nitrates hy Rhizobium bacteria, blue-green algae, lightning or industrial method.

(ii) The plants absorb nitrate compounds from the soil and water and convert them into plant proteins.

(iii) The plants are eaten up by animals and thus plant protiens are used for making animal proteins.

(iv) When the plants and animals die, the putrefying bacteria and fungi present in the soil decompose the protiens of dead plants and animal into ammonia. This process is called ammonification.

(v) Ammonia thus formed is converted first into nitrites and then into nitrates by the action of Nitrosomonas and Nitrobacter bacteria respectively. The process is called nitrification. These nitrates are again absorbed by plants and the cycle is repreated.

(vi) The soil contians denirifying bacteria called Pseudomonas which convert nitrate form of nitrogen into free nitrogen which goes back into the atmosphere. The process is called denitrification.