

Chapter 12

MINERAL NUTRITION

Symbiotic biological nitrogen fixation:

Several types of symbiotic biological nitrogen fixing associations are known the most prominent among them is the legume bacteria relationship, Rhizobium bacteria fix nitrogen in legume plants such as Alfalfa, Sweet clover, Sweet pea lentils, Garden pea, Broad bean, Clover bean etc.

Frankia fix nitrogen in non-legume plants like Alnus.

Both rhizobium and Frankia free living in soil but also can form symbiotic associations.

Root nodule formation in legume plants:

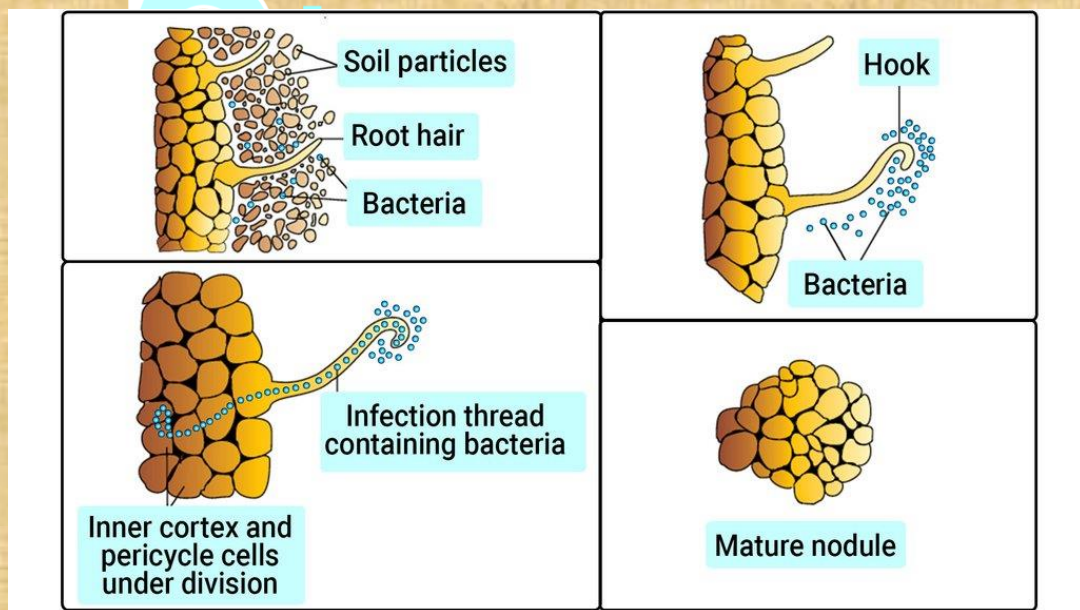


Fig. Development of root nodules in soyabean

Step I:

Roots of legume releases, sugars, amino acids, flavonoids into soil.

Step II:

Bacteria get attracted to these substances and reach the root hairs.

Step III:

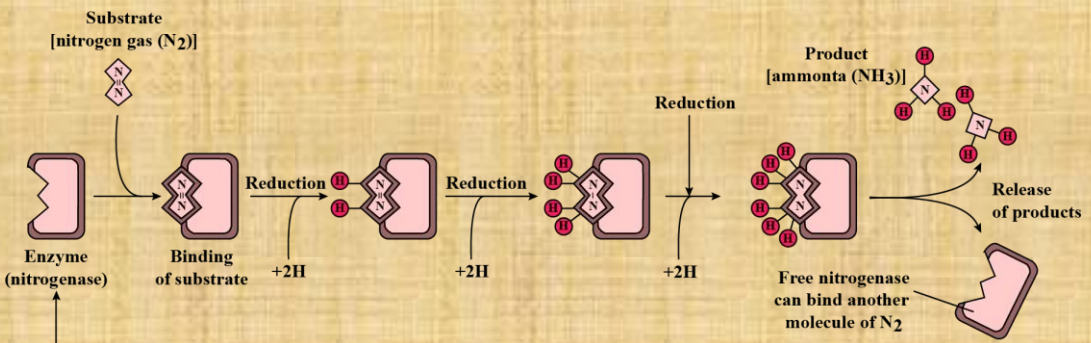
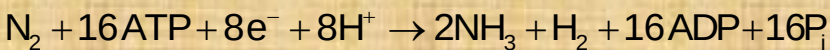
Bacteria undergo binary fission and make colonies around the root hairs this is called colonisation, as a result curling of root hair occurs.

Step IV:

Bacteria form infection thread and enters into the cortex of root in cortex growth regulators are released by both bacteria and plant cortical cells differentiate and form root nodules, these nodules establish vascular connections,

Bacteria secrete nitrogenase enzyme (Moxie protein).

Nitrogenase is sensitive to molecular oxygen to protect this enzyme, leghaemoglobin will be released.



Steps of conversion of atmospheric nitrogen to ammonia by nitrogenase enzyme complex found in nitrogen-fixing bacteria