Dr. Namita Kumari
Department of Botany
Magadh Mahila College
Patna University, Patna

Environmental or Ecological Factors 1

- The environmental factors which influence the life and development of plants and organisms are grouped into four main classes which are as follows-
- **1.Climatic factors** (related to aerial environment),
- **2.Edaphic factors**(related to soil conditions),
- **3. Physiographic (topographic factors**), and
- **4. Biotic factors**(influence of living organisms).

Biotic factors(influence of living organisms) 2

- The **biotic factors include the influence of living organisms, both plants and animals, upon the vegetation**. Any activity of the living organism which may cause marked effects upon vegetation is known as **biotic effect**. The biotic effects modifying the vegetation can be discussed in the following heads-
- **1)Interaction between plants and local animals & man.**
- **2)Interaction between plants growing in a community.**
- **3)Interaction between plants and soil micro-organisms.**

Biotic Factors

1)Interaction between plants and local animals & man – These can be described under the following heads-

- i) Effects of grazing and browsing by animals.
- ii) Role of animals in the pollination.
- iii) Role of animals in the dispersal of seeds and fruits.
- iv) Insects and carnivorous plants.
- v) Effects of human activities on vegetation.
- vi) Myremecophily.
- vii) Miscellaneous effects.

2)Interaction between plants growing in a community-

- i) Action of lianas.
- ii) Effects of some epiphytes.
- iii) Effects of parasitic plants.

3)Interaction between plants and soil micro-organisms –

- i) Symbiotic influence.
- ii) Mycorrhizal association influence.

Grazing & Browsing

Biotic factors

1)Interaction between plants and local animals & man. 5

- i) Effects of grazing and browsing by animals-

Grazing means eating away of unharvested herbs as forage by animals, ex-eating away grasses by goats, whereas browsing refers to similar use of shrubs or trees by animals, ex-eating away of leaves and small twigs of Margosa(Neem) by camels, twigs leaves by horses, deers etc.

The animals destroy a large part of vegetation by grazing and browsing and also change the vegetational pattern of that area . Murphy(1951)is of opinion that SAHARA desert developed as a result of unchecked and excessive grazing by goats, sheep and camel in that area.

Unrestricted grazing and browsing are the main causes for the Eastward spread of desert in the part of Punjab, Delhi and Rajsthan.

Trampling causes complete destruction of small and weak annual herbs by the hoofs, paws and feet of animals, but shrubs and trees are little affected.

Insectivorous -Pitcher plant & Drosera 6

Biotic factors

1)Interaction between plants and local animals & man. 7

- ii) Role of animals in the pollination- A large number of plants depend on insects, birds, and a number of animals and man for their pollination. These plants developed coloured flowers. The flowers posses scents, nectar, sap, edible pollens and many other characteristic structures for attracting insects towards them.
- iii) Role of animals in the dispersal of seeds and fruits- Many animals, such as birds, bats, monkeys act as important agents for disseminating the seeds, fruits and spores and thus play important role in the migration of plants.
- iv) Insects and carnivorous plants- Semi autotrophic insectivorous plants, as for ex Pitcher plant, Drosera , Aldrovanda, Bladderwart etc grow in the habitats which are deficient in nitrogenous compounds. These plants have some specialised organs and mechanisms for trapping and assimilating the preys(insects).

Fire in forest

Biotic factors

1)Interaction between plants and local animals & man. 9

- v) Effects of human activities on vegetation- Man affects vegetation in the following ways-

a) By cutting, felling and replanting the forest trees

b) Cultivation- Now man has adopted a number of advanced method of cultivation of plants. Cutting, budding, grafting etc proved beneficial for certain plants. Destruction of weeds by man, during cultivation , eliminates the competition among the plants.

c) Fire- Fire is a biological factor rather than a physical factor because it is mostly caused by man's activity. Lightning initiated fires have destroyed plants and animals since their early appearance on earth, ex - so many times in the forests of America and Africa, which completely destroy and change the vegetation.

The branch of ecology which deals with the effects of the fire on ecosystem is called Ecopyrology. Plants having ability to withstand fire with little or no damage are referred to as Pyrophytes. A number of pyrophytes are known to occur in Siwalik hills, ex- *Cochlospermum religiosa, Combretum nanum,Grewia sapida* etc.

d) Man also clears the vegetation for making houses, roads etc.

Myremecophily

Biotic factors

1)Interaction between plants and local animals & man. 11

- vi) Myremecophily- Sometimes ants take their shelter on some trees such as mango, litchi, jamun etc. These ants act as body guards of the plants against disturbing agent. In lieu of this defence, the plants provide food and shelter to these ants. This phenomenon is known as myremecophily.
- vii) Miscellaneous effects- The animals also affect the plant life in many other ways. Some animals as bark eater, rodents may kill a large number of trees. Juice sucking insects, woodpeckers, bud eating birds, sparrow, squirrel and other animals cause great harm to the vegetation. Elephants detach and uproot the gigantic trees. The insects, birds, squirrels, mice and rodents eat abundant seeds and even destroy at the showing time. Termites are chief agents for destroying seeds, seedlings and standing crop plants in the fields.

Miscellaneous effects-

woodpecker, Squirrel, rodents & termites 12

Biotic factors

2)Interaction between plants growing in a community. 13

- i) Action of Lianas- Lianas are woody climbers. In tropical evergreen forest, lianas grow at the top of the trees and form the top layer of the forest canopy. This habit enables these lianas to get sufficient light. The lianas affect other plants also because they cast their shadow and check the light from reaching to the plants of lower storeys. So, lianas also affects the vegetation.

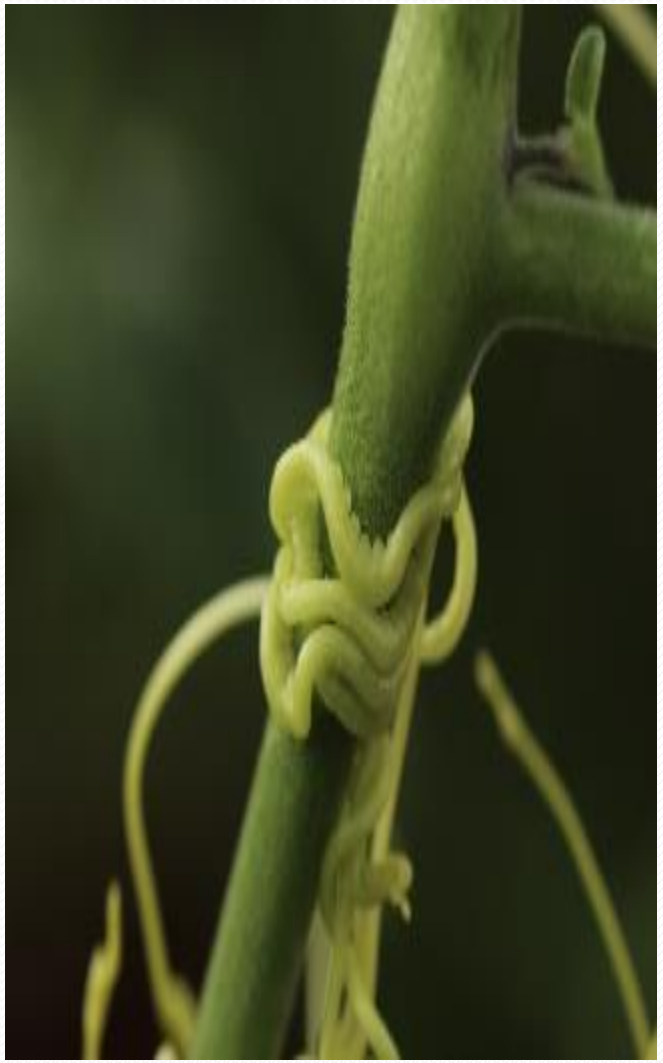
- ii) Effects of some epiphytes- The epiphytes grow on the leaves and stems of other plants. They are autotrophic and are dependent on other plants only for support, ex- Orchids.

- iii) Effects of parasitic plants- Some plants are heterotrophic and are dependent on other plants for their food requirements. They are called parasites. These parasites take their food from host plants, check the growth and ultimately cause the death of their host plants. Ex- Cuscuta is a parasitic plant on Acacia, Zizyphus and a number of other angiospermic plants. Orobanche grows very commonly on the roots of crucifers and solanaceous plants.

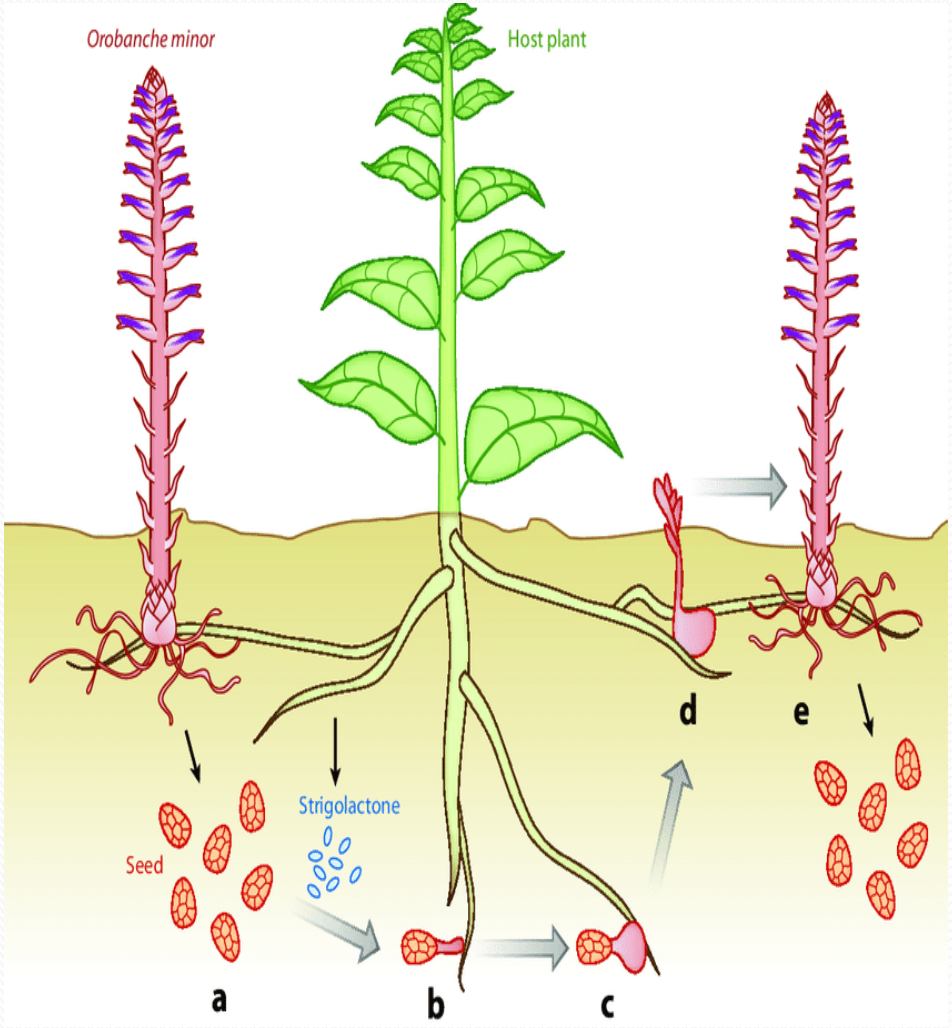
Lianas forming canopy on trees in forest 14

Epiphytes- Orchid on tree trunk 15

Cuscuta- stem parasite 16



Orobanche– root parasite 17



Biotic factors

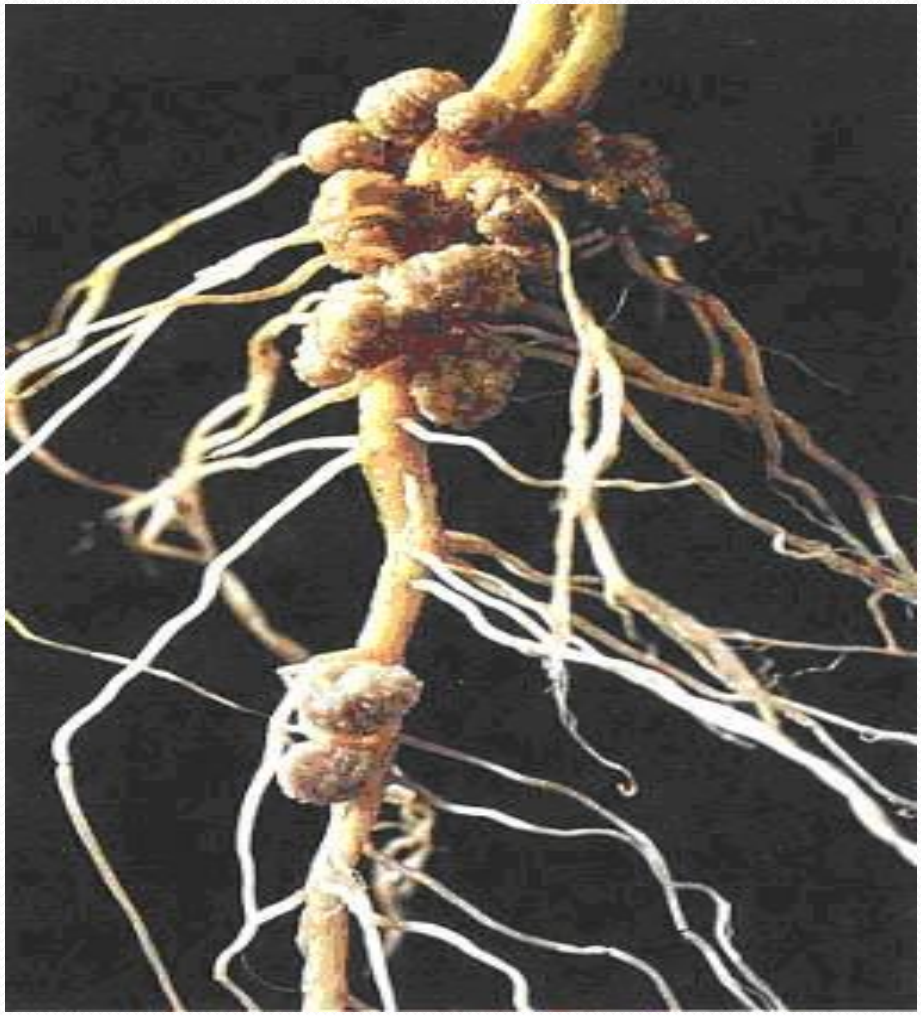
3)Interaction between plants and microorganisms 18

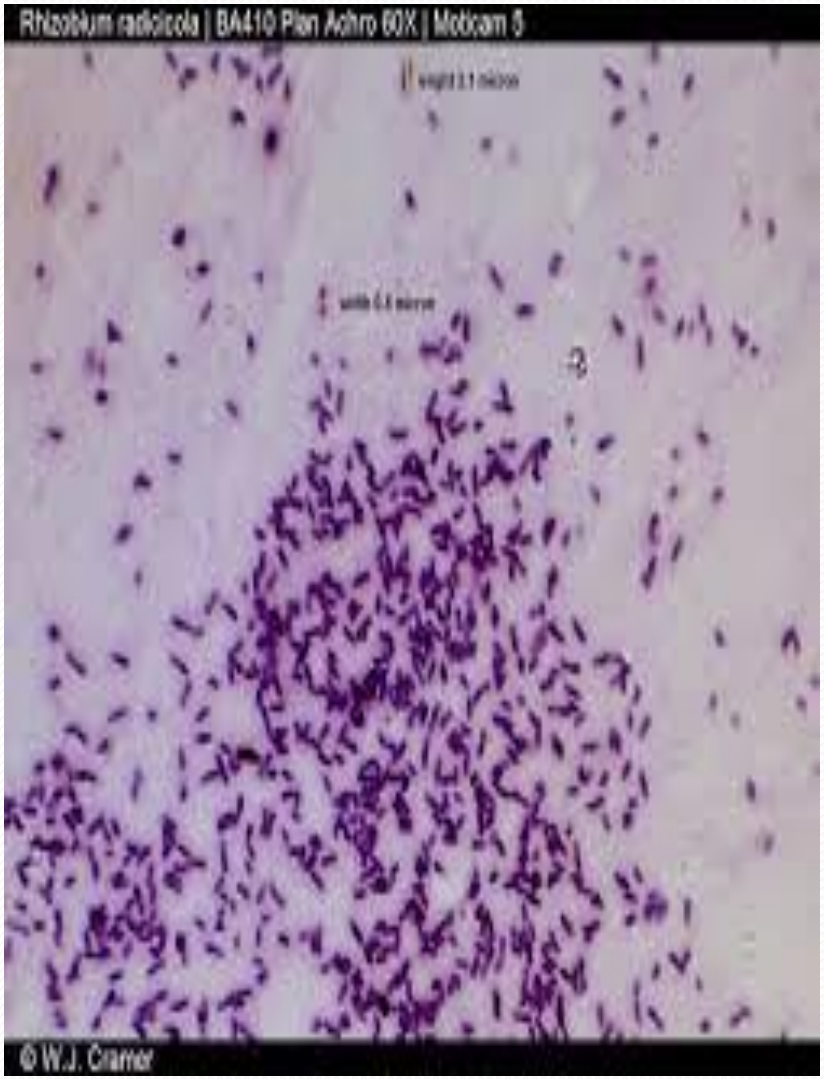
- Various kinds of bacteria, protozoa, algae, fungi, worms, nematodes and other soil microbes act as important agents which alter the physical and chemical properties of the soils, and increase or decrease their fertility. These changes in the soil properties have great impact on the nature and growth of vegetation.

  Some microbes secrete growth stimulating substances in the soil which influence the growth of plants. Besides these there are also two phenomena-

i) Symbiotic influence- Some soil microbes live in close association with plants, both benefitting each other. In this association both the organisms are interdependent and they do not harm each other. This mutual relationship between two organisms is known as symbiosis and interdependent organisms are called symbionts. For ex- The nodulated roots of legumes contain nitrifying bacteria- Rhizobium. These bacteria fix atmospheric nitrogen into nitrogenous compounds and benefit the legumes by supplying nitrogenous compound in usable form. The leguminous plants, in return provide nutrients, water and shelter to bacteria.

Symbiosis- Rhizobium bacteria in root nodules & under microscope 19





Biotic factors

3)Interaction between plants and microorganisms 20

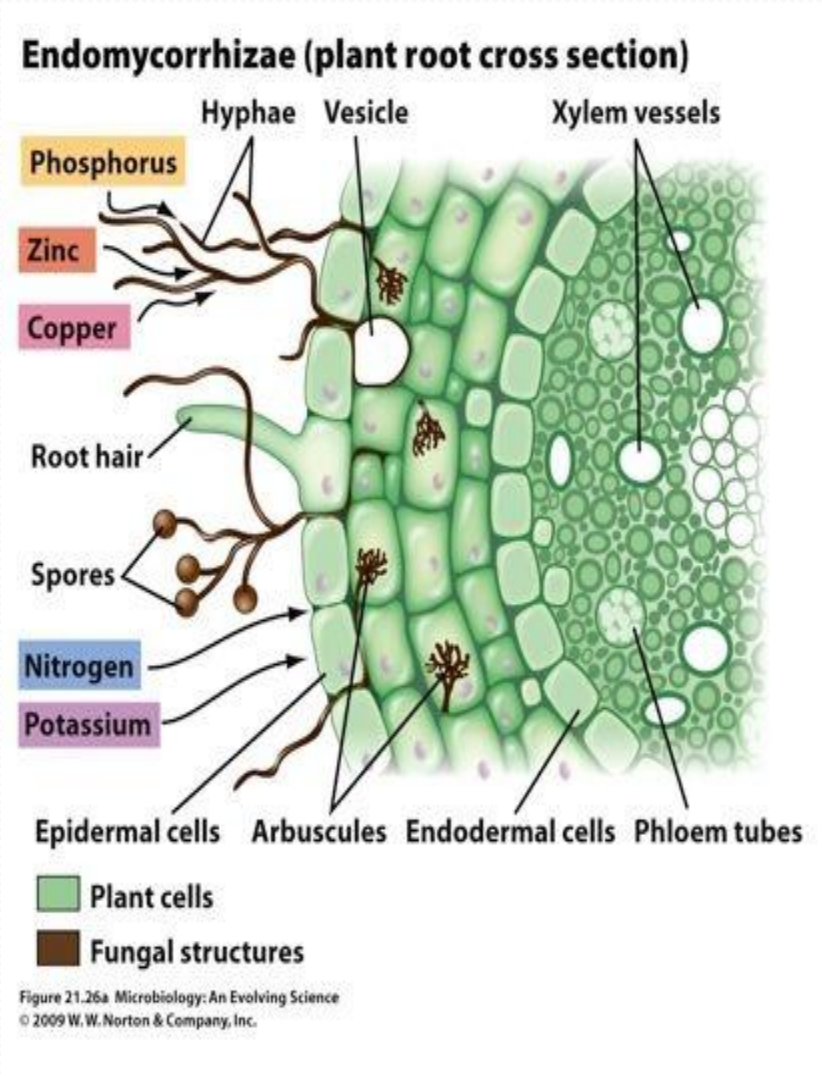
- ii) Mycorrhizal association- Sometimes fungi grow on the surface or inside the roots of higher plants. They are called mycorrhizae. Two types-

a) Ectotrophic mycorrhiza- Fungus lives on the surface of roots of higher plants.

b)Endotrophic mycorrhiza- Fungus penetrates the deeper tissues of the roots and rhizomes.

The roots with mycorrhiza are unbranched and without root caps and root hairs. Fungus hyphae in this association act like root hairs, absorb water and minerals from the soil and supply them to the roots. The roots in return, provide food and shelter to the mycorrhizae. It has been estimated that some species of plants in about 80 percent families of seed plants have mycorrhizal association. For ex- Blue berries cannot grow without mycorhhiza.

Ectotrophic & Endotrophic mycorrhiza



Thanks