

BIOLOGICAL FACTORS

By

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Associated organisms (plants and animals) have mutual relationships to each other and their environment and are known as a community. The organisms in a community are not only a part of the community but also a part of the environment of every other organism there. Both plants and animals are factors of the environment of any community. In the following we shall discuss the effects of plants, animals and man as factors of the environment.

Plants as factors of the environment

1) Competition

Competition results when several organisms require the same requirements (e. g. water, light or nutrients) in the same environment and their demands exceed the supply. Competition would be great between these organisms upon the same supply at the same time. On the other hand, competition is greatly reduced among plants that are with different heights. Competition is strong between species with similar life form such as grass with grass and shrub with shrub. It is less intense between species with different life form such as trees and herbs. The result of competition is a reduction in the size or number of individuals or complete disappearance of one or more species. Competition among weeds and cultivated crops may result in great losses in the yield. To reduce competition among cultivated crops and weeds, the density of planting should be decreased.

2) Parasites

A parasite is completely dependent upon its host for its existence. Parasitic fungi and bacteria may cause injury or even death of the hosts and may cause a change in dominance or complete destruction of a community.

Parasitic seed plants include holoparasites (*Cuscuta*) which is completely dependent upon their hosts, and partial parasites that are green and manufacture food. Some species are attached to their host at single point of contact often by roots. Others twine over the host and are connected to it at intervals by absorbing structures called haustoria. Still others may be contained inside the host and have their reproductive organs externally. Parasites cause the reduction of growth and vitality of host plants. Abnormal growth e. g. flattened or twisted branches is also common in the presence of parasites.

3) Epiphytes

Epiphytes depend upon larger plants for physical support only. Algae, fungi, mosses and lichens may grow on the bark or leaves of trees. Their presence is often related only to the relative humidity of the atmosphere in particular habitats. But they are frequently associated with certain communities or species. Epiphytes have special

structures that catch water from air. They do not usually cause harm to the supporting plants, but occasionally their weight may increase sufficiently to break down the branches.

4) Symbiosis

Symbiosis is the relationship of intimately associated dissimilar organisms that live together to their mutual advantage. The intimate association of unicellular blue-green algae with a fungus is known as lichen is an example of symbiosis. Lichens play a part in the development of vegetation on bare rock but they influence advanced communities very little. Mycorrhiza is a kind of association between a root and the mycelium of a fungus. The fungus may live around the root (ectotrophic mycorrhiza) or may occur within the cortical cells of the root (endotrophic mycorrhiza). Mycorrhiza must be present for the successful growth of many species, especially forest species. Tree seedlings do not grow well on poor soil unless the soil is inoculated with mycorrhizal fungi. Disappearance of mycorrhiza (e. g. due to alkaline or acid conditions) leads to the death of some plants. The presence of a proper nutrient medium could compensate for the absence of the fungus. This indicates that

mycorrhiza benefit the plant by improving nutrition.

Bacterial nodules are present on the roots of most leguminous plants (Family Fabaceae). The relationship between the plant and bacteria is symbiotic. The plant provides food for the bacteria and produces the nodules in which bacteria multiply. These nitrogen-fixing bacteria are able to take free nitrogen from the air and to combine it with other elements to form compounds that can be used by the plant. After the death of the plant, accumulated nitrogenous compounds are released in the soil and are used by other plants.

Leguminous plants and nitrogen-fixing bacteria are therefore important factors in improving soil fertility in natural or cultivated soils.

Animals as factors of the environment

1) Pollination

Some plants depend upon animals, especially insects, for pollination. The most important insects are bees and butterflies. Most animal-pollinated flowers are large in size and have bright colour, strong odour as well as nectar. These

characters serve to attract insects. Adaptations may occur in both insects and flower that limit the pollination of particular species to a single type of insects. The absence of pollinating insects results in the failure of reproduction of such plants.

2) Dissmination

Animals play a very important role in the dispersal of plants throught the world in the following ways:

a) By internal carriage (endozoic).

Some edible fruits pass through the alimentary canal of animals without being harmed. Berries and drupes are dispersed by this way. Herbivorous animals eat the foliage leaves mixed with seeds that become later evacuated.

b) By external adhesion

Some fruits and seeds are provided with spines or hooks or with a viscous or gummy secretions which cause them to adhere to animals.

Almost all groups of animals disseminate plants to some extent. The most important group is birds as they are abundant in all parts of the world. Birds can fly for long distances. For this reason, birds

are important to seed dispersal to islands. Mammals are important dispersal agent of herbaceous plants as they eat the foliage leaves mixed with the seeds. Mammals are also the main disseminators of plants with adhesive fruits and seeds. Aquatic animals cut parts of rhizomes and bulbs of hydrophytes that may grow vegetative in other places.

3) Grazing

In general, grazing is injurious to plants. Poisonous and spiny plants are avoided by grazing animals. The selective action of grazing (animals elect some plants for feeding and avoid others) may cause one or all of the following:

- a) Reduction of the total plant cover.
- b) Change of plant cover composition because palatable plants may disappear.
- c) Change of dominance as non-palatable and spiny plants increase in number and cover.

The damage caused by grazing depends on the life form of plants. Annuals are often destroyed. Perennials are injured to different degrees. Low shrubs may be kept in a dwarf conditions. Trees are little affected. On the other hand, grasses and

sedges that have underground rhizomes carrying buds suffer little damage from the removal of their above ground parts.

Man as a factor of the environment

The activities of man through removal of natural vegetation and agriculture, the construction of drainage and irrigation projects, canals, dams, cities, roads, harbours, etc. cause a great change in the environment. This resulted in a vast change in the flora of the world. Thus some species become exterminated, some rare plants become common and common plants become rare. The destruction of forests cause the disappearance of epiphytes and all the shade-tolerant plants. When land is ploughed for cultivation, the habitat conditions become modified and weeds will soon invade. Some introduced plants from America as *Ageratum conyzoides* is now spread over the whole world. *Opuntia* was introduced to Australia and is widespread. The waterhyacinth was introduced to Egypt as ornamental plant and is now a dangerous plant in irrigation canals.

