

B- Topographic factors

These factors are concerned with the physical geography of the earth in the area. Earth's surface is not plain in all regions but shows a lot of variation. The common topographic factors are as follows:

Altitude

This is concerned with the height of mountains chains. With an increase in the height of mountains the climate changes i.e. temperature, pressure, wind velocity and humidity vary with altitude. In mountains, temperature drops by one degree with 100meters of ascent. Wind velocity and humidity increase with altitude. Because of the interaction of various climatic factors, mountains show different vegetation zones at different heights.

Direction of mountains

Mountains deflect winds into different directions and capture moisture from winds. This moisture in the form of vapor may accumulated into preferred direction as clouds and come down as rain. Every landscape zone has its own specific climate and vegetation due to variable effects of mountains.

Steepness of slope

Steepness of a slope affects the amount of solar radiation received during the day. It also influences soil characteristics primary through its effects on water flow. The degree of slope and its smoothness determine the degree of run off or surplus rain water and also hydration of the soil. The steeper the slope, the higher shall be the velocity of the run off. The steepness of slope also determines vegetation. For example, steep northern slope is characterized with virgin forests and hygrophilous ground vegetation as these are protected from sun, while the southern facing slope which are heated by sun can support only a xerophytic vegetation. Soil erosion is also affected with the steepness of slope.

C- Edaphic factors

All these factors which relate to the structure and composition of soil are called edaphic factors. Soil is very complex medium and land plants are completely dependent on soil for anchorage, water and minerals. Soil microbes also have a decisive effect on plant life. The physical and chemical composition of soil differs in different regions. Soil contains mineral matter, organic matter, water and air. Sand, silt and clay determine mineral matter of the soil sand gravel provide physical support to the plant. Silt and clay determine water holding capacity and nutrient ability of the soil. Important soil factors may be summarized as follows:

Soil texture

Soil texture is determined by the relative proportion of mineral particles of different size found in the soil. There is a direct relationship between soil texture and soil water, aeration and root penetration. Soil texture also affects nutrition of soil.

Soil moisture

Soil moisture is held within the soil by attractive forces of soil particles. The plants through their roots absorb water from the soil and grow. When the soil particles become extremely fine. Their water retention capacity is considerably increased and area may get water-logged. The plant may die due to unsuitable aeration.

Chemical nature of soil

Chemical nature of soil also important for plant growth. Acid, alkali and mineral contents of the soil influence plant growth. Ca, K, S and P are important for plant life.

Soil temperature

Soil temperature influence greatly the microbial activity, seed germination and rate of growth of underground portions of the plant body. The maximum metabolic activities and absorption of water by the root take place generally between 20°C to 30°C.

Soil Air

Absorption of water is much better in well aerated soils because oxygen is needed for the respiration by root cells. Oxygen deficiency in soils retards growth and development of fresh roots and even metabolic activity is disturbed.

Soil organisms

A large number of organisms live in the soil. these include bacteria, fungi. Algae, nematodes, mites, earthworm. These microbes decomposed dead organic matter and increase fertility of the soil.

D- Biotic factors

The factors which depend directly on the action of living organisms are called biotic factors. These include interactions plant and plants, plant and animals and plant and microorganisms. pollination, seed dispersal, grazing, symbiosis, parasitism and fire are some common examples of such interactions. Human also affects vegetation in a number of ways either by his direct or indirect activities. In fact, human has realized the importance of maintenance of ecological balance in nature and is taking step to restore or even improve upon the existing ecological inbalance. Deforestation, over grazing, invasion, industrialization, colonization and atmospheric pollution have attracted the attention of policy makers and government.

Plants not only provide food but also control the physical environment for human and animal inhabitation. All animals depend upon plants directly or in indirectly for their food. Therefore, growth and development of plants are affected by the activities of animals. Grazing animals like goat, cow, buffalo, birds, insects and rodents cause considerable damage to the plants. Various types of relations, interactions and reactions which occur among plants are competition, mutualism (symbiosis), commensalism, amensalism, saprophytisms, parasitism. Interactions which occur between plants and animals are numerous.

Interactions among living organisms are grouped into two major groups:

- Positive interactions
- Negative interactions

I. Positive interactions

Here the populations help one another, the interaction being either one way or reciprocal. These include (i) Commensalism, (ii) Proto co-operation and (iii) mutualism.

1. Commensalism

In this one species derives the benefits while the other is unaffected.

Eg. (i) Cellulolytic fungi produce a number of organic acids from cellulose which serve as carbon sources for non-cellulolytic bacteria and fungi.

(ii) Growth factors are synthesized by certain microorganisms and their excretion permits the proliferation of nutritionally complex soil inhabitants.

2. Proto-cooperation

It is also called as non-obligatory mutualism. It is an association of mutual benefit to the two species but without the co-operation being obligatory for their existence or for their performance of reactions.

Eg. N₂ can be fixed by *Azotobacter* with cellulose as energy source provided that a cellulose decomposer is present to convert the cellulose to simple sugars or organic acids.

3. Mutualism

Mutually beneficial interspecific interactions are more common among organisms. Here both the species derive benefit. In such association there occurs a close and often permanent and obligatory contact more or less essential for survival of each.

Eg. (i) Pollination by animals. Bees, moths, butterflies etc. derive food from nectar, or other plant product and in turn bring about pollination.

(ii) Symbiotic nitrogen fixation:

Legume - *Rhizobium* symbiosis. Bacteria obtain food from legume and in turn fix gaseous nitrogen, making it available to plant.

II. Negative interactions

Member of one population may eat members of the other population, compete for foods, excrete harmful wastes or otherwise interfere with the other population. It includes (i) Competition, (ii) Predation, (iii) Parasitism and (iv) antibiosis.

(i) Competition

It is a condition in which there is a suppression of one organism as the two species struggle for limiting quantities of nutrients O₂ space or other requirements.

Eg. Competition between *Fusarium oxysporum* and *Agrobacterium radiobacter*.

(ii) Predation

A predator is free living which catches and kills another species for food. Most of the predatory organisms are animals but there are some plants (carnivorous) also, especially fungi, which feed upon other animals.

Eg. (i) Grazing and browsing by animals on plants.

(ii) Carnivorous plants such as *Nepenthes*, *Darlingtonia*, *Drosera* etc. consume insects and other small animals for food.

(iii) Protozoans feeding on bacteria.

(iii.) Parasitism

A parasite is the organism living on or in the body of another organisms and deriving its food more or less permanently from its tissues. A typical parasite lives in its host without killing it, whereas the predator kills its upon which it feeds.

Eg. Species of *Cuscuta* (total stem parasite) grow on other plants on which they depend for nourishment.

Parasitism may occur even within the species. Hyperparasites which are chiefly fungi growing parasitically on other parasites, (ie) Parasite on a parasite.

Eg. *Cicinnobolus cesatii* is found as hyperparasite on a number of powdery mildew fungi.

(iv) Antibiosis

The phenomenon of the production of antibiotic is called as antibiosis. Antibiotic is an organic substance produced by one organism which in low concentration inhibits the growth of other organism.

Eg. Streptomycin - *S. griseus* , Penicillin - *P. notatum* , *Trichoderma harzianum* inhibits the growth of *Rhizoctonia* sp.