

Course: M.Sc. (III semester)

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ECOLOGY & ECOSYSTEM

The term ecology was coined by a zoologist, Earnest Haeckel (1869). It is derived from the Greek word *Oikos*- dwelling; *logos*- study. Hence, ecology is the study of home. Home is the habitat of individual where it lives. It is applicable to all the living organisms which include micro organisms, plants and animals. According to Haeckel "ecology is the study of the reciprocal relationship between living organisms and their environments". Odum has defined it as the "study of the structure and the function of nature".

Ecosystem is the system which includes both the living and non living components of a specific area. An organism is always in perfect balance with its environment. Every organism lives in nature in association of other organisms and there is reciprocal relationship between the organism with its living and non living surroundings. This gave the concept of ecosystem; the term was first used by A.G.Tansley (1935). Ecosystem is the major ecological unit having both structure and function. The structure includes the species diversities and the function is related with the flow of energy and cycling of materials through structural components of the ecosystem. The term ecosystem has no limits. There are many microorganisms in a drop of water or it may include a pond, a river or the ocean. Therefore an ecosystem may be conceived and studied in the habitat of various sizes, e.g. , one square metre of a grassland, a pool, a large lake, a large tract of forest, an aquarium, a river or even an ocean. When we deal with the ecosystem, we must have an idea of levels of organisation in ecology. Individual organism can rarely be seen in nature surviving alone. Many individuals live together in a specific area. Group of single species is called population. Similarly different species also exist and form population of such species. Group of different populations constitute community. Therefore, population of different plant species in a particular area form plant community.

Likewise, different animal population including micro fauna and macro fauna form animal community. The plant community, the animal community and the Abiotic components of that area forms the ecosystem.

An ecosystem is a combination of different communities, such as microbial community, plant community, animal community which are interacting with each other and the environment. The ecosystem is always in dynamic equilibrium, which is the resultant of all such interactions.

Components-

The structure of an ecosystem is basically a description of the organisms and physical features of the environment including the quantity and distribution of nutrients in a particular habitat. From the structural point of view all ecosystems consists of two basic components-

1. Abiotic component
2. Biotic component

Abiotic component –

These are physical and chemical components. These include atmosphere, temperature, water, humidity and edaphic factors. The radiant energy coming from the Sun is received in the visible range between 400nm to 760 nm. The total irradiance from the sun coming at the upper boundary of the atmosphere is 1360 W m^{-2} (Watt per square meter, the solar constant) including UV and infrared wave lengths. Of this only about 900 W m^{-2} reach plants. Out of these plants receive only $400\text{-}500 \text{ W m}^{-2}$ photosynthetically active radiation. Light is unavoidable to plants. Algae reflect visibly detectable response to light reaching different depths. It has been estimated that about 1- 5 % of solar energy reaching earth atmosphere is utilized by plants. Light is essential for photosynthesis, but at the same time it inhibits plant growth. In a dense forest there is thick canopy of leaves inhibiting light access to plants of small size. This promotes the growth of woody climbers (lianas), which reach the top of canopy by climbing trees. Hence an ecosystem is greatly influenced by the availability and duration of light. Duration of light is also an important factor because it influences flowering.

Edaphic factor includes the effects of soil on plants. It includes all the physico-chemical components of soil which are available in the soil. Soil consists of many inorganic (minerals) and organic compounds. All of them may or may not be available to plants. The inorganic elements are grouped into micronutrients /micro elements and macronutrients/macro elements.

Mn, Zn B, Cu, Mo, Fe Co are micro nutrients which are required in very less quantity, hence these are also referred as trace elements. They are harmful when present in larger quantity in the soil.

Of the inorganic compounds, carbon, nitrogen phosphorus are present at any given time and are known as standing state.

Organic matter present in the soil is also essential for plants. Organic matter arises due to microbial breakdown of plant and animal residues. The resultant product may be in the form of humus. Humus is amorphous dark coloured jelly like decomposed organic matter which is rich in nitrogen, carbon, amino acids and many other nutrients. This supports good microbial flora and plant growth.

pH of the soil or aquatic medium is also an important factor which governs the acidity or alkalinity. This is important for the microbial flora which is greatly influenced by pH of their growth medium. Not only this, availability and uptake of inorganic elements are also affected by pH condition. The basic iron and aluminium phosphates have minimum solubility around pH 3-4. At higher pH values some of the phosphates is released and the fixing capacity is somewhat reduced.

Annual rainfall (precipitation) is one of the important components, which governs the structure of an ecosystem. Heavy rainfall geographical areas develop into rain forests, evergreen forests having giant size trees with dense canopy. It also promotes the growth of woody climbers (lianas). Scanty rainfall areas develop into deserts with the mostly xerophytes, succulent and smaller size plants having deep root system. The ecosystem prevailing there consists of only such type of organisms which can survive in such conditions.

Forest vegetation in India is classified on the basis of temperature and rainfall into following types

1. Tropical forests- moist tropical and tropical dry deciduous forests.

2. Sub tropical montane forests

3. Temperate forests

4. Alpine forests

All the above forest vegetation show marked diversity which is due to prevailing temperature and rainfall.

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