BOTANY GENERAL
Paper: E 601 (Theory)
(Ecology and Utilization of Plants)

ASSIGNMENT: 1. Structure and function of ecosystem. Marks-10

ASSIGNMENT: 2. Make a note on Teak, Sal, Rauvolfia, Neem, Cinchona-their uses and botanical sources. Marks-10

INTERNAL ASSESSMENT-20 MARKS

Answer any five of the following. Marks -4 each

1. Explain pond is an example of ecosystem.
2. What is Ecological succession? Discuss its types and pattern.
3. Explain food chain and food web.
4. What is xerophytes plants? Explain their special features with examples.
5. Discuss the classification of plants on the basis of their botanical sources and uses.
6. Write scientific name and uses of Cotton, Jute, Rubber, Bamboo, and Jatropha.
7. Write a note on Coffee and Tea and their uses.

.....

SEND TO : [Write in brief (short) as possible]

Dr Bipul Saikia, Email : bipul_sai@yahoo.com (within 15 days from date of uploading)

SOME HINTS:

Structure of Ecosystem:

From the structure point of view, all ecosystems consist of the following basic components:

1. Abiotic components (such as soil, water, oxygen, calcium carbonates, phosphates and a variety of organic compounds (by-products of organic activities or death).
2. Biotic components (all living organisms)

From nutrition point of view, the biotic components can be grouped into two basic components:

(i) Autotrophic components, and

(ii) Heterotrophic components

The autotrophic components include all green plants which fix the radiant energy of sun and manufacture food from inorganic substances. The heterotrophic components include non-green plants and all animals which take food from autotrophs.

So biotic components of an ecosystem can be described under the following three heads:

1. Producers (Autotrophic components),
2. Consumers, and
3. Decomposers or reducers and transformers

Function of Ecosystem:

An ecosystem is a discrete structural, functional and life sustaining environmental system. The environmental system consists of biotic and abiotic components in a habitat. Biotic component of the ecosystem includes the living organisms; plants, animals and microbes whereas the abiotic component includes inorganic matter and energy.

Abiotic components provide the matrix for the synthesis and perpetuation of organic components (protoplasm). The synthesis and perpetuation processes involve energy exchange and this energy comes from the sun in the form of light or solar energy.

Thus, in any ecosystem we have the following functional components:

(i) Inorganic constituents (air, water and mineral salts)

(ii) Organisms (plants, animals and microbes), and

(iii) Energy input which enters from outside (the sun).

Thus the principal steps in the operation of ecosystem are as follows:

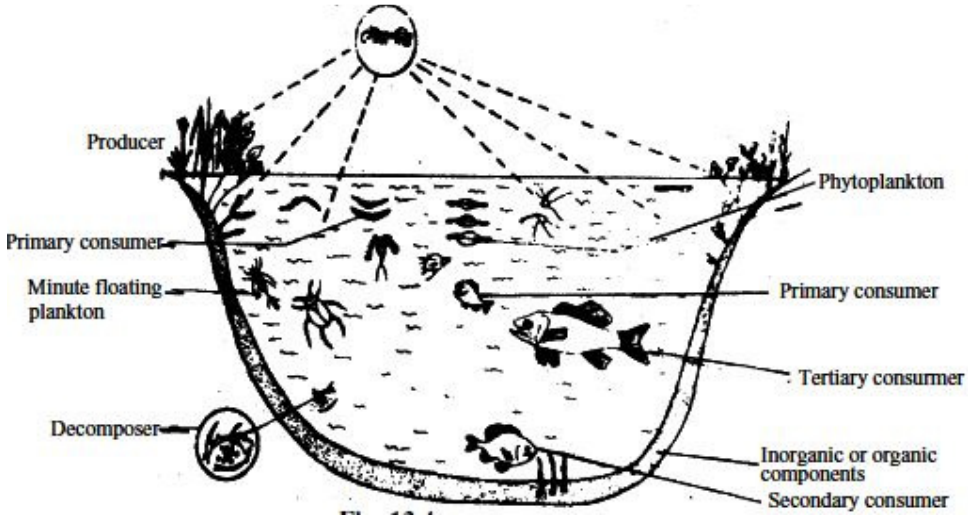
(1) Reception of radiant energy of sun,

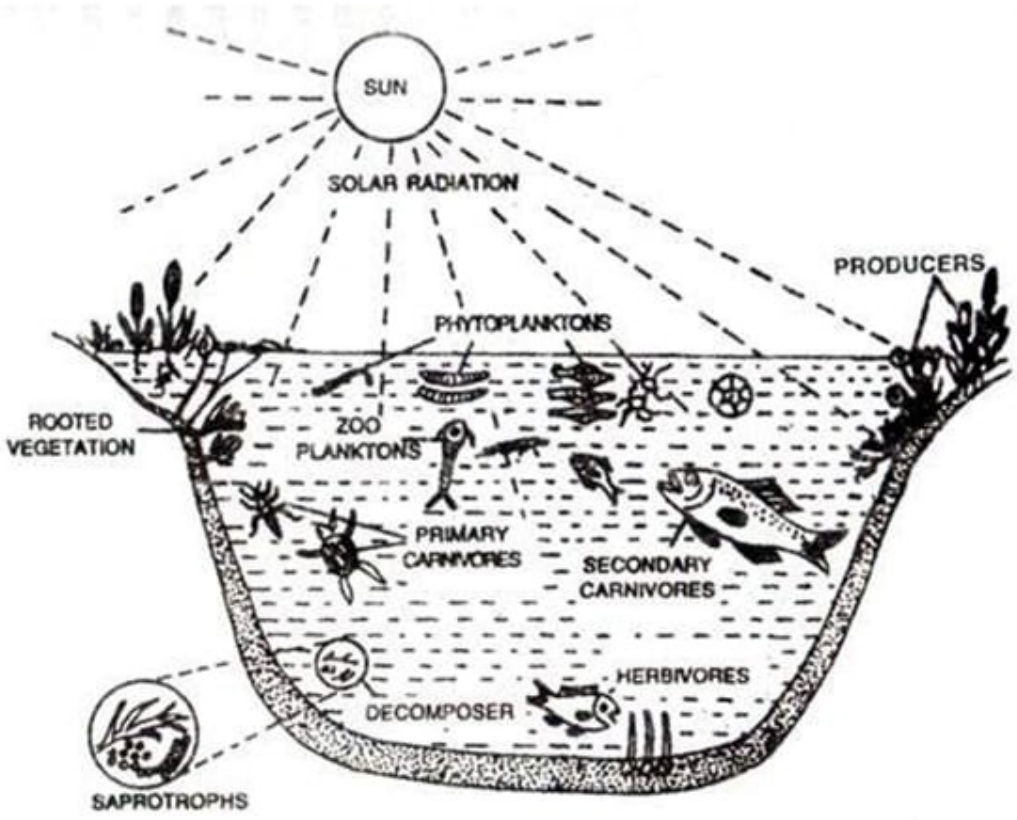
(2) Manufacture of organic materials from inorganic ones by producers,

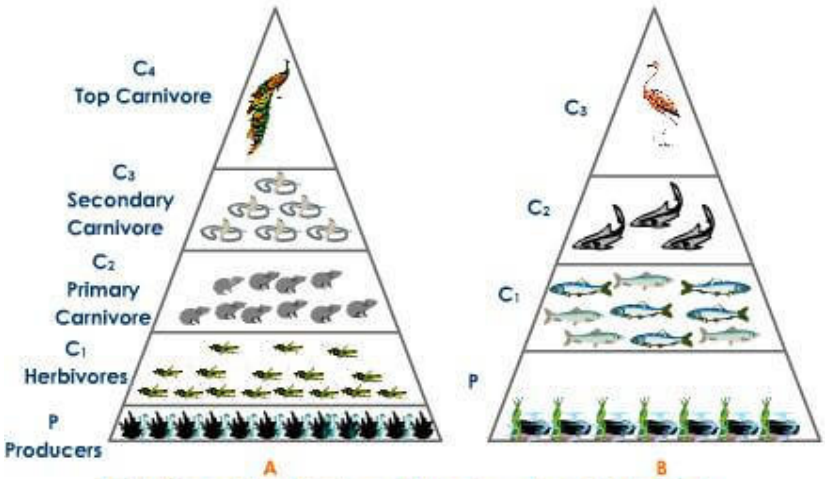
(3) Consumption of producers by consumers and further elaboration of consumed materials; and.

(4) After the death of producers and consumers, complex organic compounds are degraded and finally converted by decomposers and converters into such forms as are suitable for reutilization by producers.

POND AS AN ECOSYSTEM

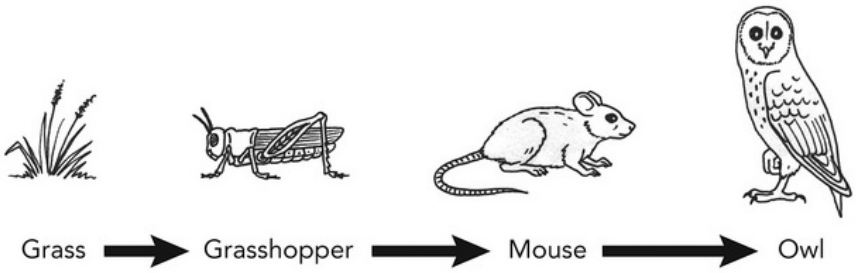




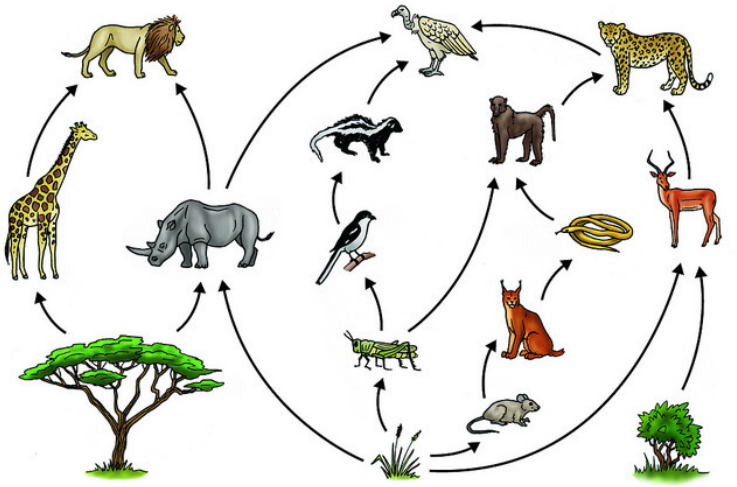


Upright Pyramids of Numbers. (A) In a Grass Land (B) In a Pond

FOOD CHAIN



FOOD WEB



What is the Difference Between Food Chain and Food Web?

Food chain possesses a single pathway that shows several organisms depend on each other for food. On the other hand, food web has many food chains, and it is a complex network of food chains. Therefore, this is the key difference between food chain and food web.

Furthermore, food chain represents a small number of organisms while food web represents a large number of organisms. Food chain is straight while food web is very complex. Thus, it is another difference between food chain and food web.

XEROPHYTIC PLANTS CHARACTERS:

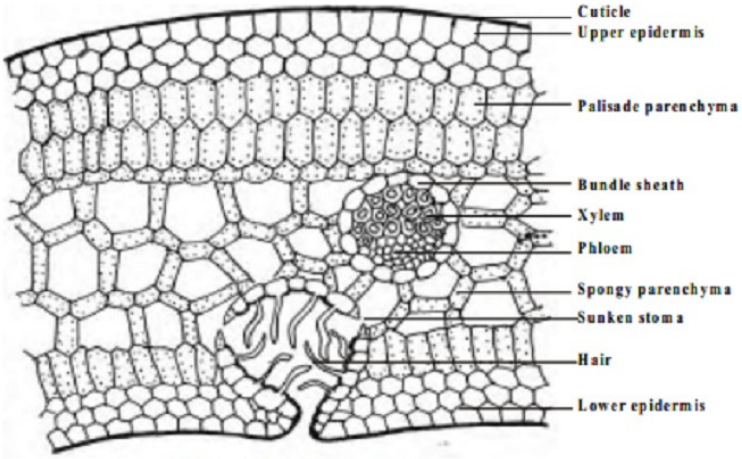


Fig : T.S> of Nerium leaf

Morphological Adaptations of Xerophytes

1. The root system is very well developed with root hairs and root caps. e.g. ***Calotropis*.**
2. The roots are fasciculated as in ***Asparagus***.
3. Stems are stunted, woody, dry, hard, ridged, and covered with thick bark, may be underground, e.g. ***Saccharum***. In ***Opuntia***phylloclade is covered with spines.
4. Stem is covered with thick coating of wax and silica in ***Equisetum*** or dense hairs as in ***Calotropis***.
5. Stems may be modified into a thorn e.g. ***Ulex*** or cladodes e.g. ***Asparagus.***
6. Leaves are very much reduced, small scale-like, appearing only for a brief period (Caducous) sometimes modified into spines or scales as in ***Casuarina, Ruscus, Asparagus***.
7. Lamina may be narrow or needle like as in ***Pinus*** or divided into many leaflets as in ***Acacia*** or succulents as in ***Aloe***.
8. In ***Euphorbia*** and ***Zizyphus jujuba*** stipules become modified into spines.
9. Xerophytes like ***Calotropis*** have hairy covering on the leaves and stems to check transpiration.

Anatomical Adaptations of Xerophytes

1. Root hairs and root caps are well developed in ***Opuntia***.

2. Roots may become fleshy to store water as in ***Asparagus***

3. In succulent xerophytes, stems possess a water storage region (thin walled parenchyma cells)

4. Stems of non-succulent xerophytes show a very thick cuticle, well developed epidermis with thickened cell wall, several layered and sclerenchymatous hypodermis e.g. ***Casuarina***.

5. The stems have sunken stomata and well developed vascular and mechanical tissues.

6. Leaves show well developed cuticle, succulent leaves in ***Aloe***, multilayered epidermis in ***Nerium***, sclerenchymatous and several layered hypodermis in ***Pinus***, bulliform cells in Sugarcane.

7. Mesophyll is well differentiated and vascular tissues and mechanical tissues are well developed.

Physiological Adaptations of Xerophytes

1. The stomata of these plants open during night hours and remain closed during the day. This unusual feature is associated with metabolic activities of these plants.

2. In xerophytes, the chemical compounds of cell sap are converted into wall forming compounds (eg) Cellulose, Suberin etc.

3. Some enzymes, such as catalases, perioxidases are more active in xerophytes than in mesophytes.
4. The capacity of xerophytes to survive in long period of drought is due to the resistance of the hardened protoplasm to heat and desiccation.

ECOLOGICAL SUCCESSION

Succession refers to change in a community following either physical or biological disturbance, when a farmland is abandoned, a forest develops after a series of temporary communities.

Like an organism every plant community has a developmental history; this developmental history is called plant succession. A plant community first comes into existence with the colonization of a bare area by spore-bearing or seed-bearing plants. The bare area may be a rock, open soil surface or a shallow pool or lake; it is successively occupied by different plant communities.The concept of succession was largely developed by the botanists Warming (1909) and Cowles (1899), who studied the stages of sand dune development.

PROCESS OF PLANT SUCCESSION:

Major steps in a autotrophic succession are as follows:

1. Nudation:
An area is exposed.

2. Migration:
The process of dispersal of seeds, spores and other structures of propagation of the species to bare area is known as migration.

3. Germination:
It occurs when conditions are favourable.

4. Ecesis:
Successful germination of propagules and their establishment in a bare area is known as ecesis.

5. Colonisation and Aggregation:
After ecesis, the individuals of the species increase in number as the result of reproduction.

6. Competition and Co-action:
Due to limited resources, species show both inter and intraspecific competition. This results into elimination of unsuitable and weaker plants.

7. Invasion:
Various other types of plants try to establish in the spaces left by the elimination of plants due to competition.

8. Reaction:
The newly arrived plants interrupt with the existing ones. As a result of reaction, environment is modified and becomes unsuitable for the existing community which sooner or later is replaced by another community.

9. Stabilisation:
Finally, there occurs a stage in the process when the climax community becomes more or less stabilized for a longer period of time and it can maintain itself in equilibrium with the climate of the area. As compared to seral stage community, the climax community has larger size of individuals, complex organization, complex food chains and food webs, more efficient energy use and more nutrient conservation.

TYPES OF ECOLOGICAL SUCCESSION

- Ecological succession happens when new life takes over an environment. ...
- Primary succession begins in barren areas, such as on bare rock exposed by a retreating glacier. ...
- Secondary succession follows a major disturbance, such as a fire or a flood.

BASED ON HABITATE SUCCESSION MAY FOLLOWING TYPES:

Types of Seres	Explanation
Hydrosere	Succession in aquatic habitat.
Xerosere	Succession in dry habitat.
Lithosere	Succession on a bare rock surface.
Psammosere	Succession initiating on sandy areas.

Halosere	Succession starting in saline soil or water.
Senile	Succession of microorganism on dead matter.
Eosere	Development of vegetation in an era.

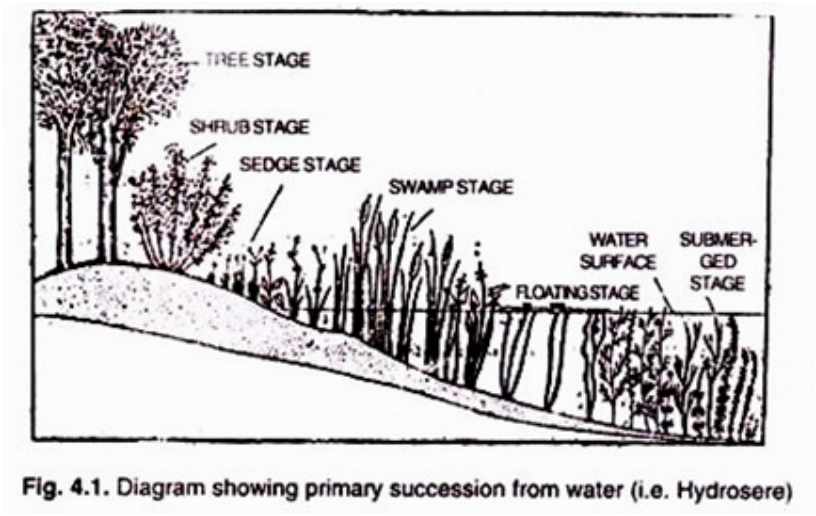


Fig. 4.1. Diagram showing primary succession from water (i.e. Hydrosere)