Exercise 17

Aim: To study the ecological adaptations in plants living in xeric and hydric conditions

Principle: Successful adjustment of plants and animals under prevailing environmental conditions is known as **adaptation**. For terrestrial plants, the habitats vary from extremely dry conditions as in deserts to extremely wet conditions as in marsh lands. For aquatic plants the habitats may vary from deep water bodies like oceans and lakes to shallow ponds and pools. The plants are adapted to diurnal, seasonal or annual fluctuations of the habitat conditions. For land plants the main limiting factor is the availability of soil water whereas, for aquatic plants the main limiting factors are the fluctuations in water level, availability of gases like CO_2 and O_2 and the light intensity. Adaptation of land plants are primarily for conservation of available soil water, avoidance of bright sunlight and intense heat and for aquatic plants, adaptation are for conservation of gases and efficient utilization of available sunlight.

On the basis of availability of water, plants are classified as:

(a) Xerophytes: These are plants growing in extreme dry conditions throughout the year. For example, plants growing in deserts (psammophytes), on rock (lithophytes) or alpine plants growing above 14000 feet altitude.

(b) Mesophytes: These are plants growing in soils with optimum soil water conditions prevailing for major part of the year.

(c) Hydrophytes: These are aquatic plants growing in fresh to marine water.

The morphological, anatomical and physiological attributes of terrestrial plants are different from the aquatic plants.

Requirement: Plant specimens from xeric and hydric habitat conditions. The specimens from xeric condition may include a few cacti, succulents (Euphorbia, *Bryophyllum*, Kelancho) cycas leaves, pine needles, twigs of *Acacia*, *Nerium*, *Parkinsonia*, *Casuarina* etc. The aquatic plants: *Salvinia*, *Eichornia*, *Pistia*, *Hydrilla*, *Vallisnaria*, *Utricularia*, *Lymnophila;* some reeds like *Typha*, *Phragmites*, amphibious plants like *Marsilea* and halophyte like *Rhizophora*. Beakers, glassjars, microscope, slide, coverslips and rajor blades

Procedure

Prepare temporary stained transverse sections of leaf, stem and root of the specimens. Study the morphological and anatomical features of the plants

collected and look for the following adaptations. Write the name of the plant in which a particular adaptation is observed.

Observations

Record your observation in the given tables:

Xerophytes

Adaptations	Modifications (Morphological/Anatomical)	Examples (from the specimen collected)
1. Conservation of Water	a. Leaves few or absent or represented by spines only b. Petiole modified into leaf like structure c. Stem reduced, branching sparse d. In some cases stem flattened, leaf like, green, photosynthetic in nature	------
2. Storage of Water	Thick, fleshy and succulent leaves as well as stem	--------
3. Prevention of loss of water by transpiration	a. Intercellular spaces reduced b. Spongy parenchyma/ palisade parenchyma present c. Stomata on lower surface, sunken in stomatal pits d. Leaves needle like e. Thick cuticle on leaf surface	---------
4. Prevention of excessive heat	a. Leaves covered with dense hairs; b. Leaf surfaces shiny or glaborous c. Leaf blade remains rolled during the day	----------
5. Efficient mechanism of water absorption	a. Long and profusely branched roots b. Dense root hairs c. Well developed xylem	----------

Hydrophytes

Adaptations	Modifications (Morphological/Anatomical)	Examples
1. Buoyancy and resistance to currents of water	a. Leaves long and cylindrical b. Petioles flexible to withstand currents of water and to carry the leaf blade on the surface of water c. Petioles are modified into air pockets d. Leaf blade pale green in colour, finely dissected e. Leaf blade waxy with thin cuticle	
2. Transpiration	a. Stomata absent b. Stomata present on upper surface of leaves	
3. Absorption of water	a. Poorly developed roots b. Root hairs absent c. Roots with air pocket to help in buoyancy	
4. Gaseous circulation and storage of air	Parenchymatous tissue of stem, roots, petioles and leaves modified into aeranchyma in the form of air channels in a. Root b. Stem c. Petiole d. Leaf	
5. Mechanical tissues	a. Poorly developed xylem b. Poorly developed sclerenchyma c. Sclerides present	

Questions

1. Give three adaptive features of water hyacinth suitable to aquatic life.
2. What are the features present in plants of xeric habitat for the prevention of loss of water?
3. What is the importance of succulent leaves and stem for a xerophytic plant?
4. Why is air stored between tissues in aquatic plants?