

Anatomical adaptations of hydrophytes

Hydrophytes:

(Greek, hydro = water and Phyton = Plant; water plant): Plants which grow in wet places or in water either partly or wholly submerged are called hydrophytes or aquatic plants.

Examples are *Utricularia*, *Vallisneria*, *Hydrilla*, *Chara*, *Nitella*, *Lotus*, *Ceratophyllum*, *Trapa*, *Pistia*, *Eichhornia* (water hyacinth), *Wolffia*, *Lemna*, etc. Aquatic environment provides a matrix for plant growth in which temperature fluctuation is at minimum and the nutrients occur mostly in dissolved state but light and oxygen become deficient with the increase in depth of water bodies. Zonation of aquatic vegetation with increasing depth is a device for maximum utilization of light energy. The aquatic environment is subject to water movements ranging from small vertical circulation to strong currents. Streams have a unidirectional movement and in seas the movement is reversible. The currents of water often abrade the inhabiting flora and varied modifications are encountered to withstand this abrasive action. Since water makes up a large proportion of the bodies of plants and animals (70 to 90% water in protoplasm), it affects all life processes directly.

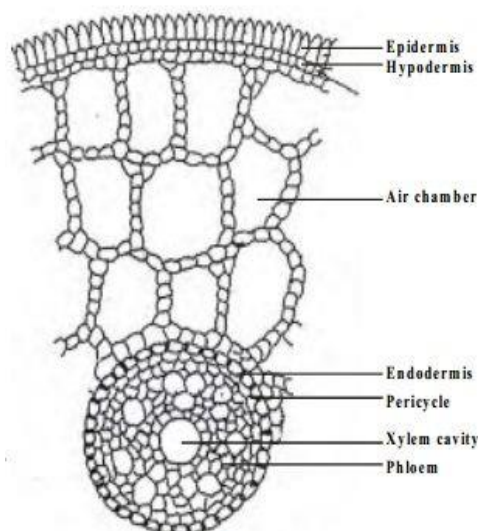


Fig : T.S. Hydrilla Stem

Anatomical adaptations

The following anatomical adaptations are observed

- (i) The reduction of protective tissue (epidermis here is meant for absorption and not for protection).
 - The root and shoot systems show common features such as cuticle which is very thin or absent.
 - Epidermis is usually a single layer of thin walled cells, not protective in function.
 - Cortex is well developed. It has numerous air chambers. It helps in buoyancy and rapid gaseous exchange.
 - Epidermal cells of leaves contain chloroplasts and they can function as photosynthetic tissue, especially where the leaves and stems are very thin. eg. *Hydrilla*
 - Stomata are totally absent in submerged, but in floating leaves, stomata are confined only to the upper surface. In amphibious plants stomata may be scattered on all the aerial parts.
 - Mucilage cells and mucilage canals secrete mucilage to protect the plant body from decay under water.
- (ii) The reduction of supporting or mechanical tissue (i.e., lack of sclerenchyma).
 - Mechanical tissues are generally absent.
 - In Water Lilly (*Nymphaea*) and some other plants, special type of star shaped lignified cells called astrosclereids is developed. It gives mechanical support to the plants.
- (iii) The reduction of conducting tissue (i.e., minimum development of vascular tissue).
 - In the vascular tissue, xylem vessels are less common. Only tracheids are present in submerged forms.
 - In amphibious form, the xylem and phloem are well developed (e.g.) *Limnophylla heterophylla* or vascular bundles may be aggregated towards the centre. (e.g. *Jussiaea*)

(iv) The reduction of absorbing tissue (roots chiefly act as anchors, and root hairs are lacking).

- The root-system in hydrophytes is poorly evolved and root hairs and root cap are absent. In some floating plants such as *Utricularia*, *Ceratophyllum*, etc., no roots are evolved, and in submerged plants such as *Vallisneria*, *Hydrilla*, etc., water dissolved mineral salts and gases are absorbed by their whole surface.
- In plants like *Pistia*, *Eichhornia*, etc., no root cap evolves, but root pocket is formed instead. An aquatic plant is, in reality, submerged in or floating up on a nutrient solution. In hydrophytes the root system is functioning mainly as holdfasts or anchors, and a large part of the absorption takes place through the leaves and stems.

(v) There is special development of air-chambers (aerenchyma) for aeration of internal tissues.

- In submerged leaves, air chambers are filled with respiratory and other gases and moisture.

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