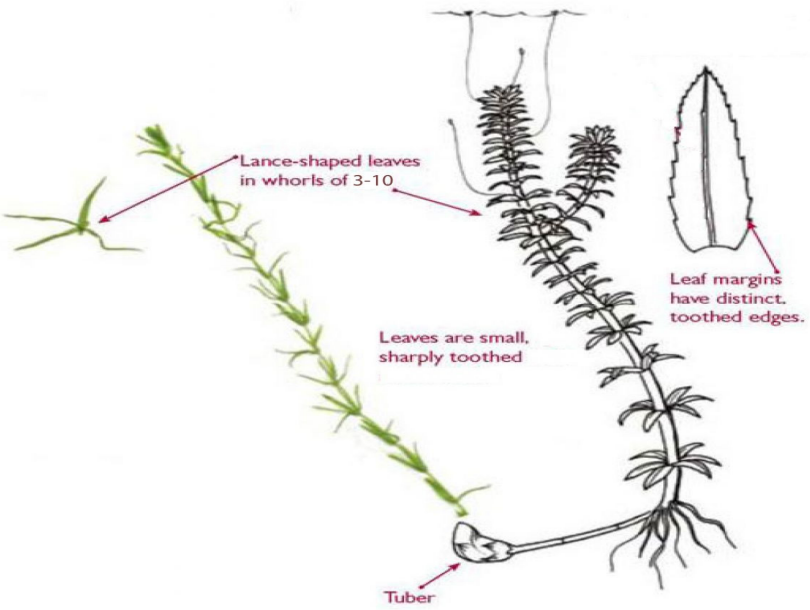
Hydrilla – Ecological Adaptations

Hydrilla is also known as water thyme, scientifically it is named as *Hydrilla verticillata* (L.f.) Royle Hydrilla's scientific name is made up of the Greek word "hydro" meaning "water" and the Latin word "verticillus" that means "the whorl of a spindle". Appropriately named, it is an aquatic plant with leaves that are whorled around the stem. Hydrilla is in the Frog's Bit family, or Hydrocharitaceae. It is the only species of the genus *Hydrilla* in the world though it resembles many of the other species in the family.

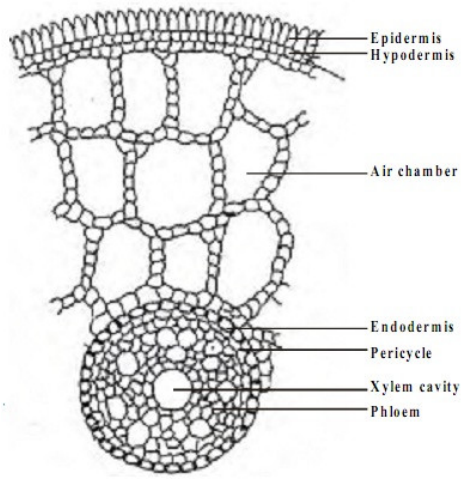
Ecological Adaptations:
Morphological :

1. It is a submerged hydrophyte found attached to the substratum by adventitious roots in fresh water ponds.
2. The growth of *Hydrilla* enables it to compete effectively for sunlight. It can elongate very rapidly, upto an inch a day, until it nears the water surface, where it gets sunlight.
3. Peculiar hairs are presents on leaf and stem
4. Leaves are whorled, 5 in bunch
5. Leaf is roughly textured
6. The stem is long, slender, spongy and flexible to move with water currents
7. The leaves are thin, long and ribbon shaped to provide least resistance to the flow of water
8. The roots are either poorly developed, they only needed for anchorage, not for absorption of nutrients and water
9. Plants produce seeds that can float
10. The whole plant is covered over by mucilage. It prevents epiphytic growth and protects the plant against the rotting effect of water.

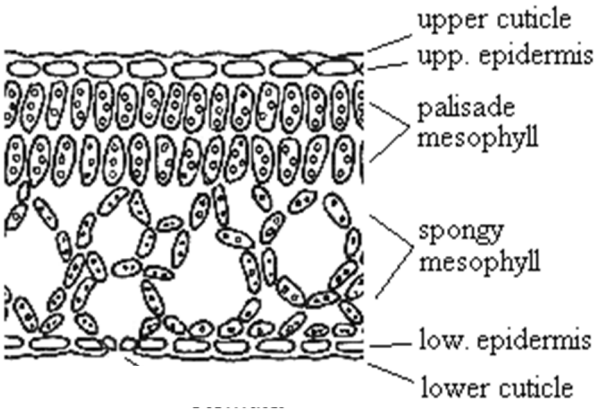


Anatomical:

1. Leaves lack cuticle for easy absorption
2. Stomata are absent because water is abundant and therefore there is no need
3. Mechanical tissues are completely absent
4. Excessive development of parenchyma and elaborate system of arenchyma (air space)
5. Chlorophyll found in all the tissues
6. Mucilage canals and mucilage cells are present which secrete mucilage to protect the plant body.
7. Vasculature is very poorly developed.
8. The reserve food is in the form of starch grains which occur in cortex and pith. Cystoliths (sclereids) of various shapes are seen in leaves and other tissues.



T. S. Of Stem



T. S. Of Stem

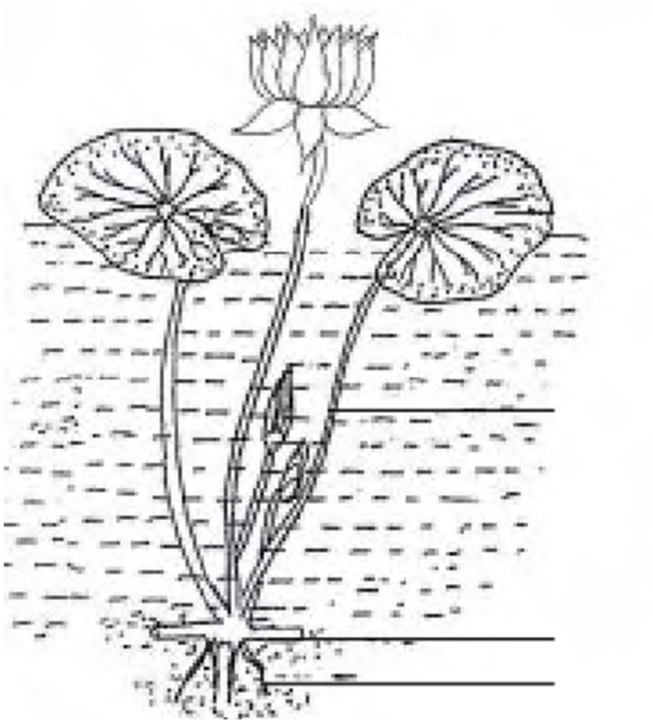
Nymphaea – Ecological Adaptations

Introduction:

Nymphaea is an aquatic perennial plant with floating leaves and branched creeping rhizomes. The horizontal creeping and branching rhizomes (2-3cm in diameter) are attached by adventitious roots arising in groups below the leaf bases and the rhizomes are densely covered with short black hairs. The petioles leave crescent-shaped scars on the rhizome when shed. Mature leaves are spherical, cleft at the base, smooth to 25cm across, and usually purple on the lower surface. Leaves are attached to underwater stalks rising from thick fleshy rhizomes. Flowers rise on long solitary stalks and are borne at the surface of the water or elevated slightly above it. Flowers measure up to 25cm across and have yellow centers surrounded by 25 or more petals. Flowers are fragrant and can be white or pink with yellow centers. After the flower has finished, the stalk forms a spiral and draws the fruit below the water.

Ecological Adaptations:

Morphological:



1. It occurs in shallow water
2. Plant is submerged, floating, rooted hydrophyte
3. Stem is rhizomatous, growing horizontal under the pond soil
4. Roots are adventitious
5. Leaves are long, large and flexible petiole
6. Lamina is cordate in sheath
7. Leaves have waxy coating to avoid water penetration
8. Upper leaf surface is shiny and reflecting light
9. Lower leaf surface is coloured
10. Flowering shoots float on the water surface.

Anatomical

T. S. of Leaf:

1. Outermost epidermis is made up parenchymatous thin walled and barrel shaped compactly arranged cells
2. Epidermis is covered by cuticle and Stomata present on upper epidermis only
3. Few layered chlorenchymatous cell are forming hypodermis of compactly arranged palisade and loosely arranged mesophyll
4. Chief mechanical tissue is collenchymatous cells

5. Lower side consists of large air spaces providing buoyancy to the leaves to float on the water surface
6. Trichoscleride crystal of Calcium Oxalate showed accumulation of salts from the water in the leaf
7. Vascular tissue contains large vessels and very small amount of phloem.

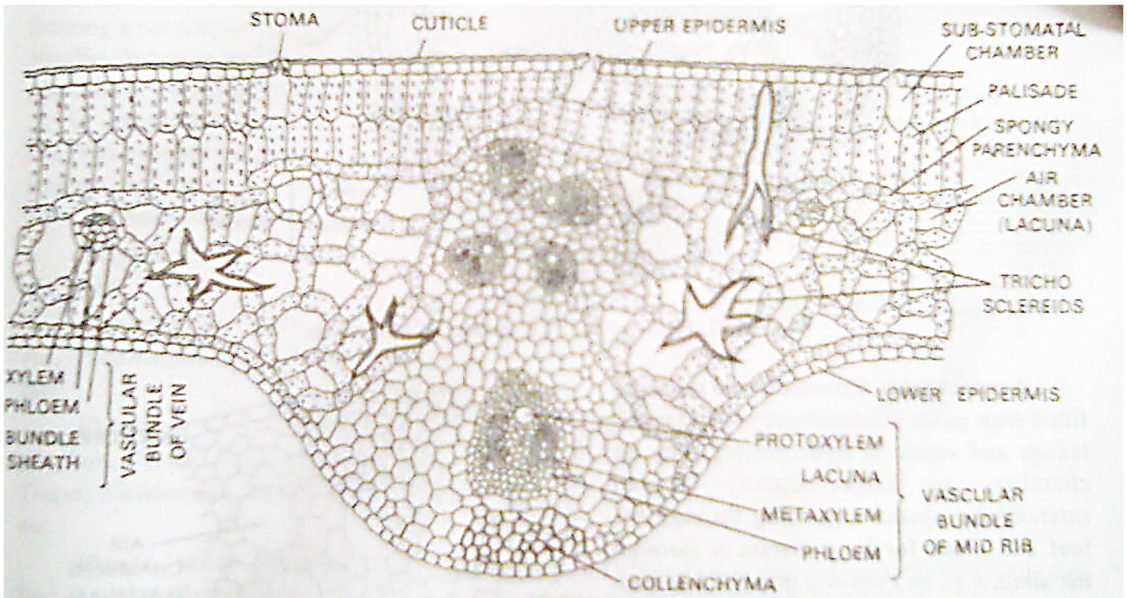


Fig. 10.15. Cross-section of Nymphaea leaf (a floating hydrophyte).

T. S. of Petiole

1. One to two layered epidermis of paranchymatous cells
2. Single celled hairs were found
3. 2-3 layered thick walled collenchymatous hypodermis was compactly arranged
4. Big air chambers are separated by one to two layered partition.
5. Trichoscleride crystal of Calcium Oxalate showed accumulation of salts from the water in the leaf
6. Vascular bundles are arranged in a ring and center with large vessels.

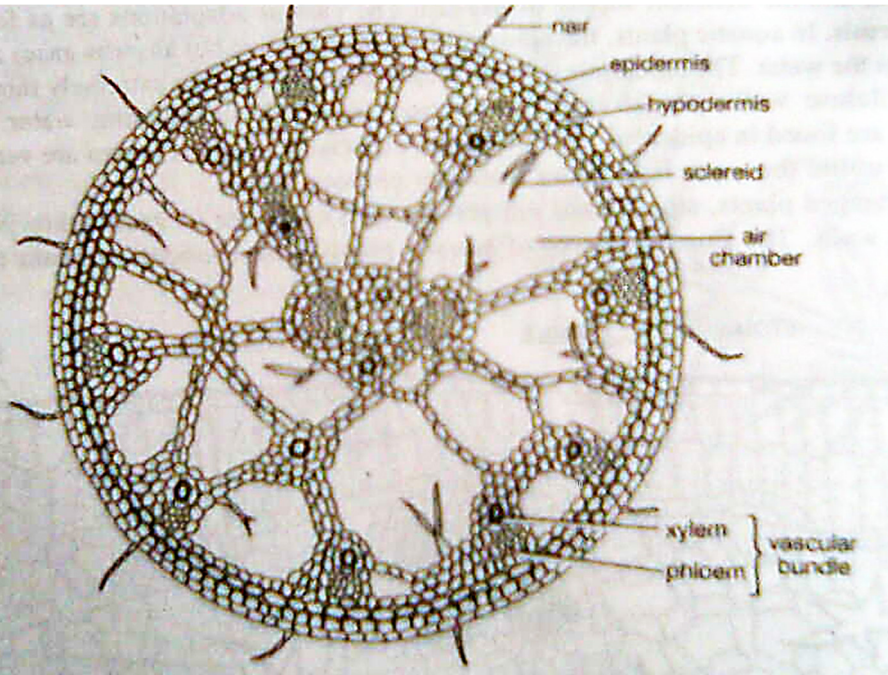


Fig. 16.17. Hydrophytes. T.S. petiole of *Nymphaea*.

Xerophytes

The plants which are growing in xeric (dry) environment (habitat) are called Xerophytes. Deserts are the best examples for xeric environment, where plant face inadequate water and excessive transpiration .xerophytes are classified into the following three categories- Ephemerals [the plants complete their life cycle within a short period. they also called "drought escapers" or "drought evaders"], Succulents [these plants have succulent, fleshy organs, to store to store high amount of water accumulated during rainy seasons. these xerophytes suffer dryness only in external environment],true xerophytes[these plants which are able to live under extreme dry conditions and high temperature].the xerophytes show the following adaptations.

Nerium:

Morphological adaptations

1. It is small tree with well developed root system.
2. Stem is woody covered with thick bark
3. Slight coating of wax was observed on the herbaceous stem
4. Leaves are lantiolate and thick with shiny surface on upper side to reflect light
5. The leaves are succulent and fleshy serves to store water
6. It is drought resistant plant.

Anatomical adaptations

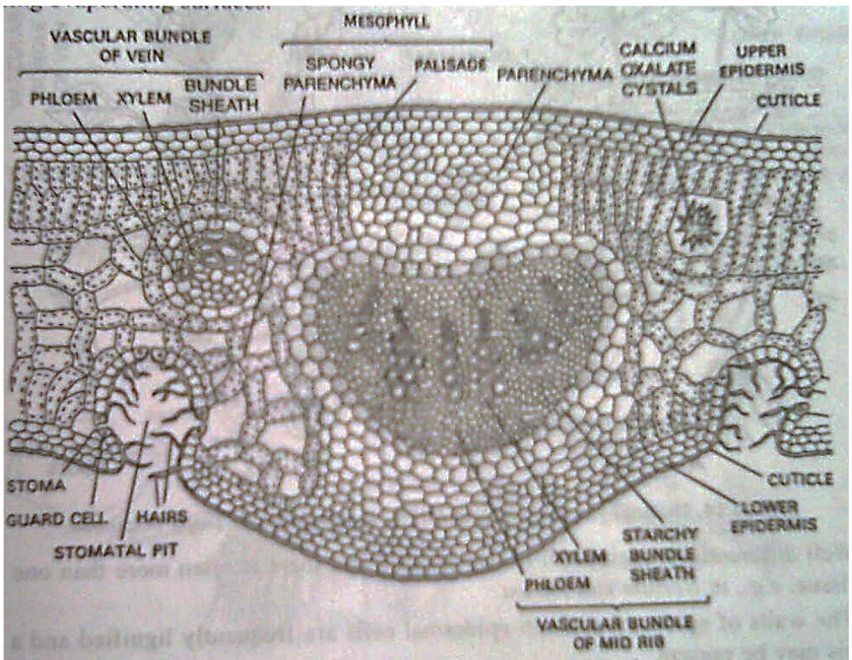


Fig. 10.12. C.S. of *Nerium* leaf showing xerophytic characters.

1. Presence of thick cuticle on the upper surface of leaves.
2. The epidermal cells are thick walled.
3. Multiple epidermal layers are seen on both upper and lower surface of leaves.
4. Stomata are reduced in numbers and are sunken type.
5. The stomata pits are filled with number of hairs.
6. Thick walled sclerenchyma cells are seen in the hypodermis. E.g. pinus needle
7. Few spongy parenchyma cells with small inter cellular spaces.
8. Presence of many layered palisade parenchyma
9. The cells are relatively smaller in size and vacuoles are small.
10. Well developed vascular tissues are present.

Asparagus

Morphological Adaptations

1. In the drier climate the Asparagus genus evolved into thorny, drought-adapted species.
2. It varies in appearance, from unarmed herbs to wiry, woody climbers with formidable hooked spines that earn them vernacular names such as "cat thorn".
3. Stems may be modified into cladodes.
4. Leaves are very much reduced, small scale-like, appearing only for a brief period (Caducous) sometimes modified into spines or scales, to reduce the transpiration area
5. It has photosynthetic flattened stems, called phylloclades, instead of true leaves.
6. Root tubers are developed as storage organs
7. Roots are a valuable source of moisture and nutrition for growing under drought conditions.
8. The roots are fasciculated.
9. It is non-succulent.

Anatomy

1. Epidermis is covered by thick cuticle
2. The epidermal cells are thick walled.
3. Mechanical tissue, like bast fibres, is extensively developed.
4. Outer cortex is chlorenchymatous to keep it photosynthetic
5. Inner cortex is thick walled sclerenchymatous providing mechanical strength
6. The vascular system is well developed and differentiated.
7. The xylem possesses broad and large vessels with very much thickened walls.

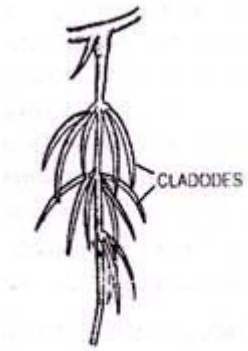
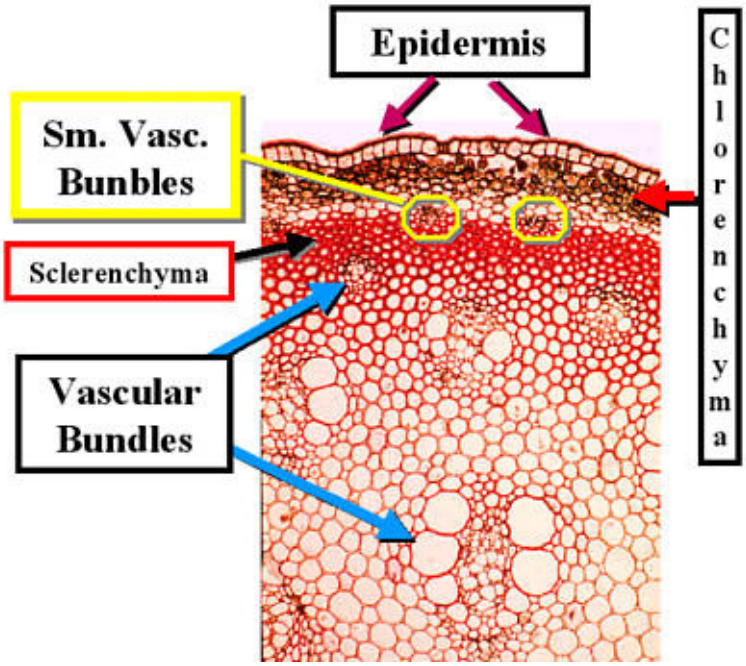


Fig. 2.16. Cladodes of *Asparagus*



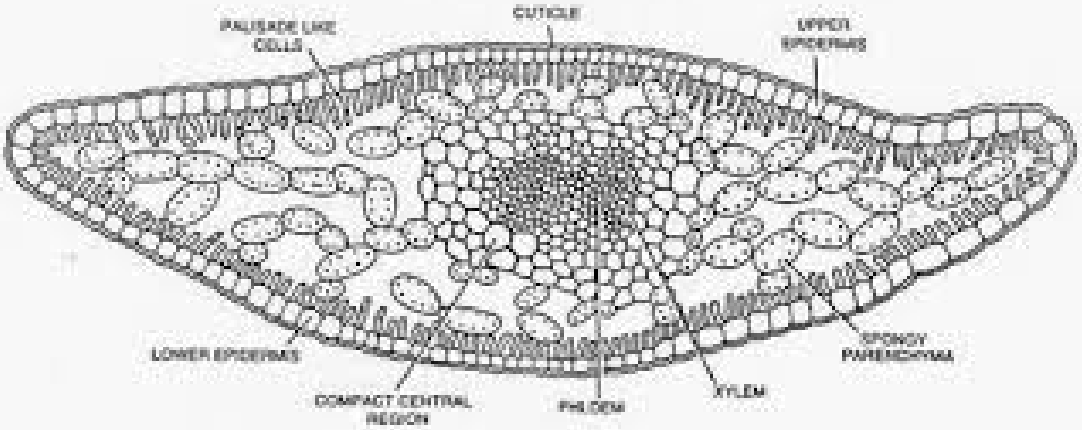


Fig. 40.32. T.S. of phylloclade of *Asparagus* (monocot).