Adaptations

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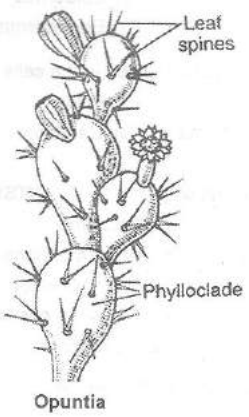
The modification in the shape, size, colour, structure or habit of organisms to adjust to a certain environment is known as adaptation.

- Adaptation may be defined as the characteristics of living forms to develop, over a period of time certain morphological, anatomical , physiological, and ecological features which enable them to survive and reproduce within the limits of a particular environment, e.g. fish, whales, aquatic plants are adapted to live in water, birds and bats in air, and cacti, insects, camels in desert.

(a) Adaptations in plants:

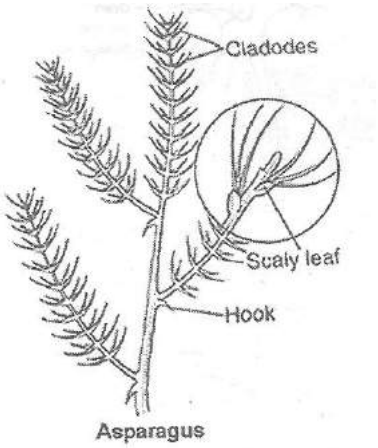
(i) Xerophytes: plants that grow in deserts or dry places are called xerophytes. Such plants have particular adaptations to withstand long periods of drought.

- The roots of these plants have extensive tap roots which go deep into the soil in search of moisture.
- The stems of these plants are fleshy, thick and green.
- The stems are provided with a thick cuticle which prevents loss of water.
- Stems act as the photosynthetic organ and store water.
- The leaves of these plants are reduced to thorns to prevent transpiration of water.
- The leave have sunken stomata.
- Common xerophytes are opuntia, agave, asparagus,, euphorbia and yucca.



Opuntia

- The leaves are reduced to spines (Opuntia) or scales (Euphorbia). This helps to prevent loss of water from the leaf surface.



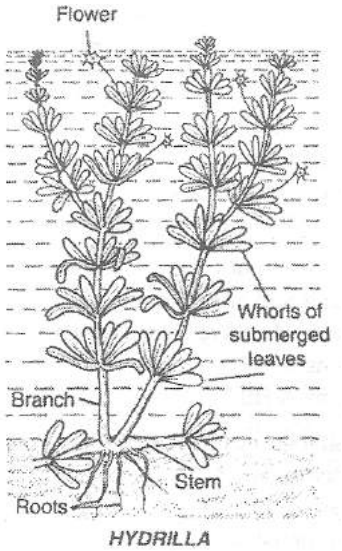
Asparagus

- Some xerophytic plants remain dormant either as seeds or as roots. This helps to overcome scarcity of water particularly in summer months. When it rains then they sprout.

(ii) Hydrophytes: Plants that grow and live in water are called hydrophytes. These plants may be submerged in water or partly submerged or floating. Hydrophytes may be further categorized into three groups:

(A) Submerged plants:

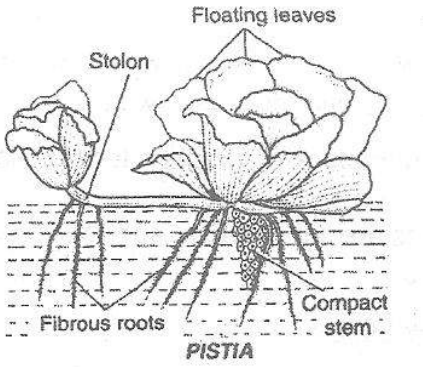
- Submerged floating plants are though completely submerged in water but not anchored in the mud, e.g. Utricularia, Ceratophyllum etc.
- Submerged rooted plants remain completely submerged in water and are anchored at the bottom, e.g. Hydrilla, Vallisneria, Potamogeton etc.



HYDRILLA

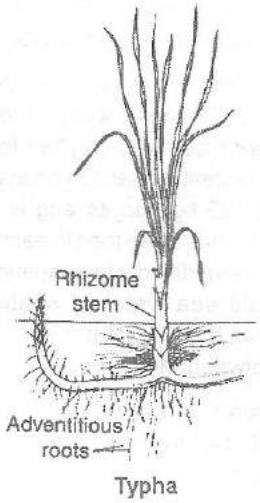
(B) Floating Plants:

- Free floating hydrophytes not rooted below. They float freely on the surface of water, e.g. Pistia, Trapa, Eichhomia etc.



- Floating, leaved, rooted plants are anchored at the bottom, but their leaves float on the surface of water, e.g. Lotus etc.

(C) Rooted emergent hydrophytes: These plants grow in shallow water and their shoot extend above the surface of water wholly or partially, e.g. Typha, Ranunculus etc.



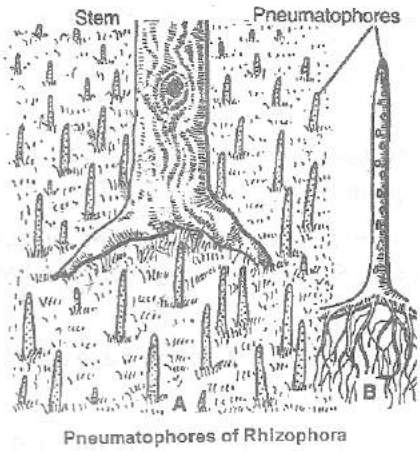
- Characters of hydrophytes:
- Root system is not well developed or poorly developed, as they do not have to grow in search of water. E.g., Utricularia, Hydrilla.
- Root caps replaced by root pockets.
- Stems are soft and spongy, containing a large number of air spaces. This helps the plant to keep afloat.
- The sub-merged leaves are either ribbon like or finally dissected, e.g. Vallisenaria.
- Floating leaves are generally large, broad and thick e.g. Victoria etc.
- Plants are dull, pale green in colour to absorb maximum of light falling on them.
- In the plants having huge, disc like or circular leaves that float on the surface of water like Giant water lily (Victoria regia), which has got the largest leaves in the plant kingdom have oily covering over the surface of leaves that makes it water proof and also protect it against decaying in water.
- The leaves have stomata on upper surface only.
- The conducting tissues xylem any phloem are also poorly developed.

(iii) Mesophytes: These plants are found in average conditions of temperature and moisture and grow in soil that has nowater logging.

- The root system of mesophytes is well developed, branched and provided with root cap.
- Shoot system is well organized. The stem is generally aerial, branched, straight, thick and hard.
- Leaves are thin, broad in middle, dark green and of variable shape and measurement. Example of mesophytes are banyan, mango, plum, peach, etc.

(iv) Adaptations in Halophytic plants:

- Such plants usually grow in salty or marshes or along the margins of salt lakes.
- They do not get sufficient oxygen from the soil.
- So they have negatively geotropic breathing roots or pneumatophores (Respiratory roots), e.g. Rhizophora etc.
- These. Plants are called as mangroves. In these plants, seeds germinate inside the fruit while still attached to plant to show viviparity.



Pneumatophores of Rhizophora

(b) Adaptations in Animals: Like plants, animals too adapt themselves in different ways. There are five types of habitat adaptations in animals:

(i) Aquatic (ii) Terrestrial
(iii) Amphibious
(iv) Desert (v) Aerial

(i) Aquatic adaptations in animals: These adaptations are shown by those animals which live in water. E.G. fisher, whales, crabs, octopus, etc.

- These animals show the following modification:
- They have a streamlined body that help in swimming in water e.g. fish. Streamlined body gives least resitance to swim in water.
- Locomotion is either by webbed feet e.g. ducks, frogs or by fins e.g. fish. The fins at the sides help in speed and in changing direction.
- Respiration occurs with he help of gills.
- Some fish (bony fish) have air bladder as a hydrostatic organ.
- Some fishs and water insects carry air bladder in their bodies that help in the buoyancy of the animal in water.
- Hair and skin glands sweat and oil-glands are absent as in whales.

(ii) Terrestrial animals: Animals that live on land are called terrestrial animals.

- These animals have lungs for breathing.
- The body is covered with scales or hair.
- They have a well developed nervous system with sense organs for responding to the various environmental changes.

(iii) Desert animals: Animals that live in deserts show xeric adaptations.

- These animals live in excessive heat, so they develop a protective covering around the body to check water loss by evaporation.
- The desert lizard has hygroscopic skin to absorb water.
- They have no sweat glands in their skin.
- They store water in all the cells of their body. E.g. camel.
- Most of these animal are nocturnal sothey avoid the day temperature.
- For defence, they have poisons or some other mechanism. Snakes, spiders, scorpions have poison glands or stings.
- Some of the desert insects can make use of metabolic water.
- Some of the desert animals like rats dig holes and burrows in the sand and live within.
- In holes and burrows the temperature is less and it is moist also. So these animals avoid the excessive heat of the day.
- These animals, either become active when water is available and remain dormant or adapt for water storage and water conservation.
- Certain animals like desert rabbit and wood rat derive water by eating succulent plants.

(iv) Amphibious Animals: Animals which live both on land and water are called amphibious animals.

- These animals have moist and slimy skin, which helps in breathing. They can breath through gills or lungs also.
- The feet of these animals serve as paddles for swimming. They are cold-blooded animals. Frogs, toads and salamanders are examples of amphibians.

(v) Adaptations in Birds:

- They have a streamlined body covered with feathers. Forelimbs are modified into wings.
- These animals are adapted for the aerial mode of life.
- The bones are light, hollow, spongy and contain many air cavities.
- They have lungs for breathing.
- Nervous system and sense organs are well developed. Examples: bat, sparrow, penguin.
- The smallest bird is hummingbird, 6cm from bill-tip to tail.
- The largest bird is Ostrich, 2.5 m high and weights 150kg.
- The fastest bird is peregrine which files at a speed of 180km/h. Birds include a variety of forms which can be divided into the following two main groups:

(i) Flightless birds: These are usually large and have legs. They have reduced wings and curly feathers. Ostrich is a huge bird with only two toes in each foot. It is one of the fastest runner. On an average the ostrich weighs about 125kg. and its egg is the largest cell. Emu of Australia has three toes in each foot. Penguins have their wings modified into swimming paddles. They live in the cold sea water of southern pole. Most

penguins do not build nests but incubate their eggs in fold of skin between their feet.

(ii) Flying birds: They are most of the modern birds and are found in all the parts of the world. They show various types of adaptations. Some common flying birds are pigeon, kite, cuckoo, house sparrow, crow, parrot, dove, sunbird, cattle egret, swifts, kingfisher, bulbul etc. The humming bird is the smallest flying bird.

- Some Important Points: The vegetations growing in tundra and on the ice covered high hill tops is known as cryophytes.
- Oxylophytes are plants growing on acidic soil.
- Chasmophytes are plants growing in rock. Crevices.
- Hibernation (winter-sleep) is the period of dormancy during winter.
- Aestivation (summer-sleep) is the period of dormancy during smmer moths so as to escape from scorching heat of sun.
- Camouflage (Cryptic appearance) is the ability to blend with the surrounding or background. Examples of camouflage are Praying Mantis, Dead Leaf Butterfly etc.
- Mimicry is the resemblance of one species with another in order to obtain advantage, especially against predators.
- Plants growing in bright light are called sun plants or heliophytes, while plants growing in partial shade of low intensity light are called shade plants or sciophytes.

EXERCISE

1. Vivipartiy is found in –
(A) Hydrilla (B) Nerium
(C) Rhizophora (D) Aloe

2. The delicate, flexible and thin stem is the characteristic feature of
(A) mesophytes (B) hydrophytes
(C) halophytes (D) Xerophytes

3. Plants adapted to open, sunny habitats are
(A) sciophyetes (B) heliophytes
(C) mesophytes (D) epiphytes

4. Plants growing under shade of other plants are
(A) epiphytes (B) semi-epiphytes
(C) mesophytes (D) sciophytes

5. Sun plants have
(A) More mechanical tissues
(B) extensive root system
(C) abundant flowering
(D) all the above

6. Root system of hydrophytes.
(A) Well develop (B) Poorly develop
(C) None (D) All of the above

7. In aerial animals the forelimbs are modified into-
(A) wings (B) hind limbs
(C) body (D)air- chambers

8. Organisms that live on trees are called-
(A) aerial (B) arboreal
(C) terrestrial (D) aquatic

9. Extensively develop root system is characteristic feature of-
(A) sciophytes (B) xerophytes
(C) mesophytes (D) epiphytes

10. Aerenchyma is found in which plants?
(A) sciophytes (B) hydrophytes
(C) mesophytes (D) epiphytes

11. Pneumatophores are the modification of –
(A) roots (B) leaves
(C) stems (D) rhizomes

12. Sunken stomata are present in which plants?
(A) mesophytes (B) Hydrophytes
(C) Halophytes (D) Xerophytes

13. Which one of the following is the example of xerophyte?
(A) opuntia (B)Hydrilla
(C) Vallisneria (D) Potamogeton

14. Stems are soft and spongy, containing a large number of air spaces, is the modification of which plants?
(A) Mesophytes (B) Hydrophytes
(C)Halophytes (D) Xerophytes

15. Animals have moist and slimy skin, which helps in breathing are the adaptations of –
(A) Aquatic animals (B) Aerial animals
(C) Amphibians animals (D) All of these

16. The hones are light, hollow, spongy and contain many air cavities, are the adaptations of-
(A) Aquatic animals (B) Aerial animals
(C) Amphibians animals (D) All of these

17. The flightless birds are –
(A) Ostrich (B) Emu

(C) Penguins (D) All of these

18. Hibernation means-
(A) winter-sleep (B) summer-sleep
(C) A & B (D) None of these

19. Aestivation means-
(A) winter-sleep (B) summer-sleep
(C) A & B (D) None of these

20. Respiratory organs of amphibians are-
(A) lungs (B) gills
(C) skin (D) all of these

21. Wool yielding animals bear thick coat of hair because
(A) The animal carry a lot ofhair follicles on body only
(B) it protects them from the predators
(C) hairs trap a lot of air, which is a poor conductor of heat
(D) the animals can sleep happily on the rough surfaces

ANSWER KEY

ADAPTATION

Q.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A.	C	B	B	D	D	B	A	B	B	B	A	D	A	B	C
Q.	16	17	18	19	20	21									
A.	B	D	A	B	D	C									