CHAPTER 7.1 – ADAPTATIONS OF PLANTS

Adaptations of plants

- ⊕ Adaptations is the adjustment of an organism to the environment
- ⊕ All organisms adapt
- ⊕ Animals and plants have unique structures and shapes to adapt to the environment to ensure the survival of the species

Classifications of plants based on habitats

HALOPHYTES

- ⌂ Plants that live in swampy habitats at the river mouth, the meeting point of fresh water and seawater
- ⌂ This swampy area is rich in salt content
- ⌂ Example: Mangrove tree

HYDROPHYTES

- » Plants that live in aquatic habitats, either on the water surface or submerged in the water
- » Example
  1) Lotus
  2) *Elodea* sp.

XEROPHYTES

- ◊ Plants that live in a habitat that is hot and dry with a minimum presence of water, that is, a place with very high temperatures (the desert)
- ◊ Example:
  i) Cactus
  ii) Kurma palm (date palm)

MESOPHYTES

- → Plants that live in a habitat that is not too dry nor too wet with an adequate supply of water
- → Most plants are mesophytes
- → Example
  a) Mango tree
  b) Hibiscus plant
  c) Rubber tree

Adaptive features of halophytes, hydrophytes and xerophytes

Adaptive features of halophytes

- Halophytes are plants that can live in a habitat with high concentration of salt and low oxygen content
- Mangrove trees are example of halophytes
- Mangrove trees have specific adaptive features to adapt to the environmental conditions
- This area is also exposed to high intensity of light

Mangrove tree

LEAVES

- Leaves with thick cuticle and sunken stomata can reduce the rate of transpiration
- Succulent leaves can store water
- Leaves with a special structure known as hydathode that eliminate excess salt
- Old leaves can store salt and fall off when the concentration of salt stored is too high

ROOTS

- The root system that branches widely and exists in various shapes and sizes
  - I. To provide support for the plants to continue living in the soft and muddy soils
  - II. To provide plants from being uprooted due to strong wind
- The root system of mangrove trees also produces hundreds of breathing roots that grow vertically upwards above the surface of the soil, called pneumatophores
- There are many pores on this root which are called lenticels to enable the exchange of gases with the atmosphere
- The cell sap of mangrove trees has a higher salt content than seawater
- Hence, the cell sap of the roots does not lose water by osmosis
- Instead, the mangrove trees receive water and mineral salts from the seawater entering their roots

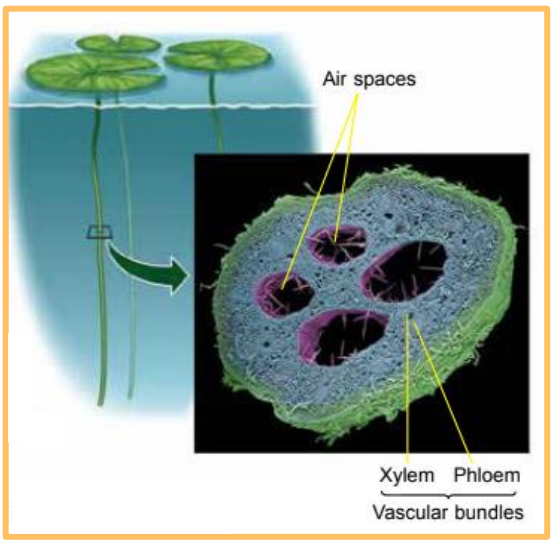
Adaptive features of hydrophytes

- ✓ Hydrophytes refer to plants that can adapt to their wet habitat, whether by floating on the water surface or sinking in the water
- ✓ Most hydrophytes have fibrous roots
- ✓ Fibrous roots provide a large surface area and trap air bubbles to enable the hydrophytes to be more stable and lighter
- ✓ The adaptation of the roots enables them to float or stay upright in the water as the buoyant force exerted by the surrounding water
- ✓ For example
  1) *Eichhornia* sp.
  2) *Hydrilla* sp.
  3) *Elodea* sp.

Eichhornia sp.

Hydrilla sp.

Elodea sp.



Lotus flower

ADAPTATION OF FLOATING PLANTS

- Floating plants (the lotus) are plants that grow by floating on the surface of the water surface with the roots no anchored to the bottom of the lake
- The leaves which are broad, thin and flat help these plants absorb maximum sunlight for photosynthesis
- Most of the stomata are distributed on the upper epidermis of the leaves
- The upper epidermis of the leaves is also covered by a waxy and waterproof cuticle to ensure the stomata are always open
- The stem of these plants consists of light tissue with plenty of air spaces between the cells
- These tissues are known as aerenchyma tissues

ADAPTATION OF SUBMERGED PLANTS

- Submerged plants (*Elodea* sp.) are plants that grow completely inside the water
- These plants have thin and small leaves that increase the total surface area per volume
- The thin and small leaves also increase the diffusion rate of water, mineral salts and dissolved gases directly into the plants through the epidermis
- The submerged plants do not have stomata and waxy cuticle on the leaves
- Their stems which are small and hollow help these submerged plants float upright in the water and help to reduce water flow resistance

Adaptive features of xerophytes

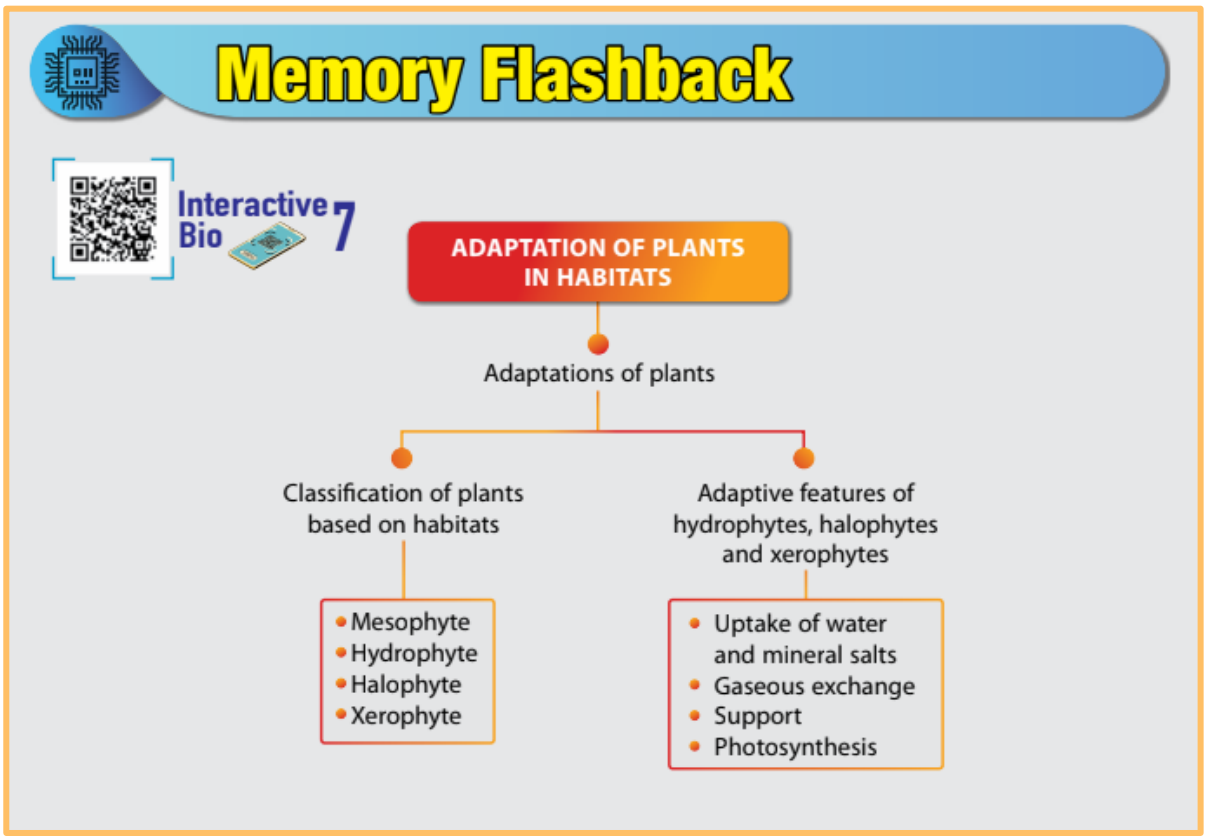
- The xerophytes live in the desert which an area that receives very little rainfall
- Xerophytes overcome this problem of extreme dryness by the growth of the roots
- For example
  I. Cactus
  II. Kurma palm (date palm)

Cactus

Kurma palm

ADAPTATION OF THE ROOTS OF THE XEROPHYTES

- The roots of xerophytes grow widely and can penetrate deep into the soil to absorb water and mineral salts
- The absorbed water is stored in the roots, stems and leaves
- Besides, the stem of the cactus carries out photosynthesis
- The cactus has small leaves and thick waxy cuticles on its stem and leaves
- There are also leaves modified into thorns
- This feature reduces the total surface area exposed to the sun and also reducing water loss
- The presence of thorns can also help the cactus to get water supply by collecting dew
- The dew will drop on the ground and is absorbed by the roots
- Besides, the thorns can also prevent the plant from being eaten by animals
- The stomata in the cactus are embedded to reduce water evaporation from the leaves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Interactive Bio 7
ADAPTATION OF PLANTS IN HABITATS
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Classification of plants based on habitats
Adaptive features of hydrophytes, halophytes and xerophytes
Mesophyte
Hydrophyte
Halophyte
Xerophyte
Uptake of water and mineral salts
Gaseous exchange
Support
Photosynthesis