

# **Subject- Botany**

## **Chap 1- Introduction**

### **Paper I- Plant Life and Utilization II**

**Term II, Sem – II**

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**By**

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# Chap 1- Introduction

## Learning Objectives

- .1.1 Introduction to plant diversity
- .1.2 Diversity to Pteridophytes
- .1.3 Sprophyte
- .1.4 Phanerogams
  - .1.4.1 Gymnosperms
  - .1.4.2 Angiopserms

# 1.1 Introduction to plant diversity

.Biodiversity is defined as " Variation of life at all levels of biological organisation".(i.e. Molecular, population, species and ecosystem)

.Types of Diversity: 1. Ecosystem Diversity

•                   2. Species Diversity

•                   3. Genetical Diversity

.Genetic diversity can be defined as " the diversity of alleles, genes and organisms and the study of processes such as mutation and gene transfer that drive evolution.

## 1.3 Sprophyte

- The **primary root** is **short-lived** and is soon replaced by **adventitious roots**
- Stem** may be aerial or underground.
- The **leaves** may be scaly (*Equisetum*), simple and sessile (*Lycopodium*) or large and pinnately compound (*Ferns*).
- The leaves in pteridophyta are small(**microphylls**) as in *Selaginella* or large(**macrophylls**) as in *Ferns*.
- In pteridophytes, the xylem consists of only **tracheids** and phloem consists of **sieve cells** only.
- Secondary growth is not seen** in Pteridophytes due to **absence of cambium** except on *Isoetes*.
- The vasculature of the sporophyte may be a simple protostele, siphonostele, dictostele or polycyclic stelar organisation.

## **.Gamatophyte:**

•The **sporophyte** shows **asexual** reproduction and produces **spores** by meiosis from which the gametophyte develops.gametophyte is called as prothallus.

•The **gametophyte** is **haploid, recessive but independent**, and reproduces **sexually**. Product of sexual reproduction, i.e. **zygote** produces **diploid sporophyte**.

•The gametophytes bear male and female sex organs called **antheridia** and **archegonia**, respectively.

•**Water** is required for transfer of **antherozoids** - the male gametes released from the **antheridia**, to the mouth of **archegonium**.

•Fusion of **male gamete** with the **egg** present in the archegonium result in the formation of **zygote**.

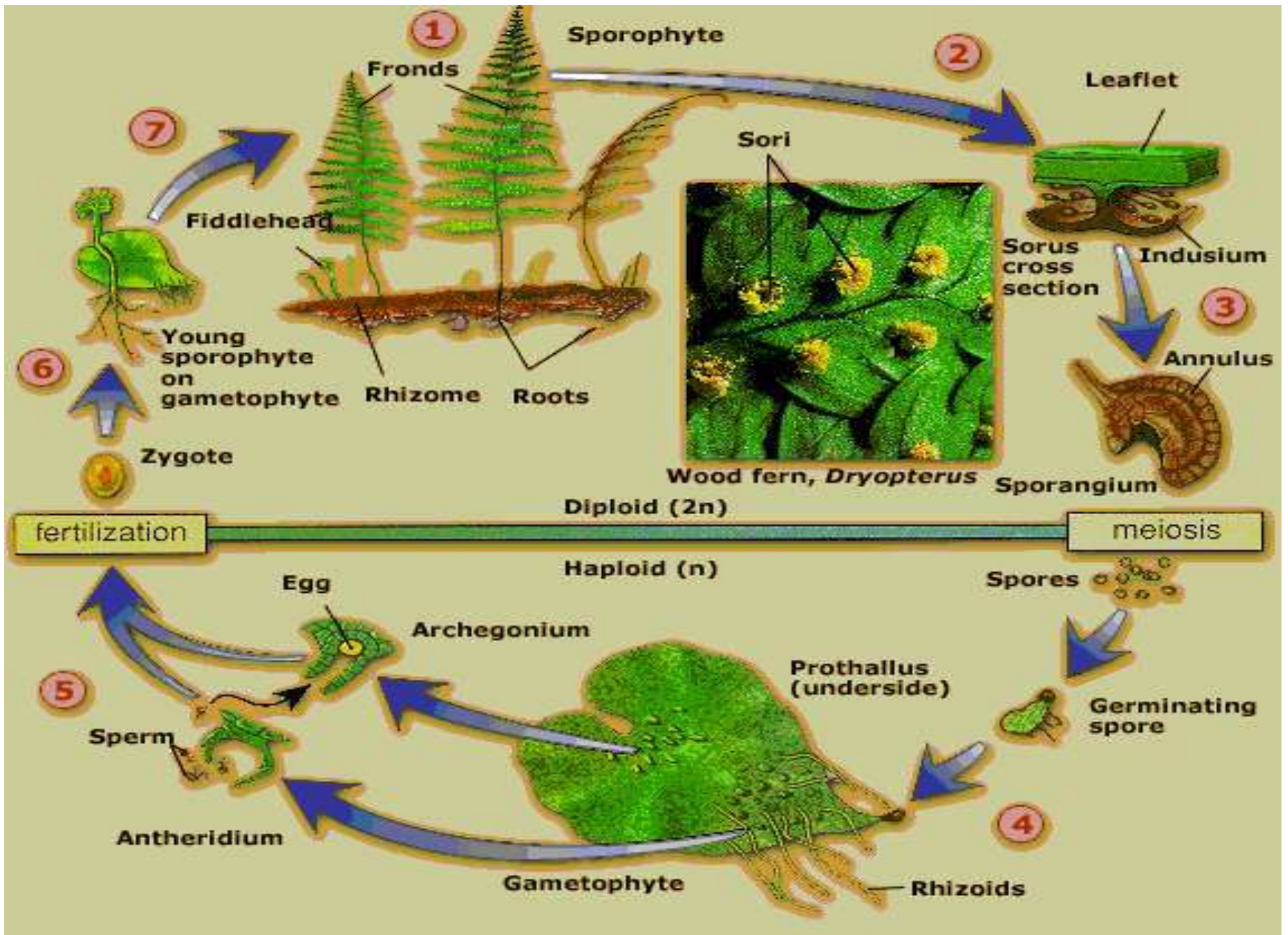
•The homosporous pteridiophytes genrally have monoceciuous prothalli i.e.prothalli bear both anthredia and archiginia e.g.*Psilotum, Equisetum*.

•*In heteropsorus* forms, male and female prothali are seprate.e.g. *Selaginella, Marsellia*

## Reproduction-

- Pteridiophytes reproduce vegetatively, asexually and sexually.
- Vegetative reproduction in most species takes place through bulbils. These bulbils are leaf-derived structures and produced in leaf axils.
- Pteridiophytes reproduce by spores and these spores are produced in sporangia which develop on the lateral side of leaf such leaf is called as sporophyll.
- In majority of the pteridophytes, all the spores are of similar kinds; such plants are called **homosporous**. Genera like *Selaginella* and *Salvinia* which produce two kinds of spores, macro (large) and micro (small) spores, are known as **heterosporous**. The **megaspores** and **microspores** germinate and give rise to **female** and **male gametophytes**, respectively.
- Two types of sporangia based on development- **Eusporangiate**: Develop from group of initial cells and **Leptosporangiate**: develop from single initial cell.
- Sexual reproduction takes place in gametophyte. The gametophytes bear male and female sex organs called **antheridia** and **archegonia**, respectively.
- Fusion of **male gamete** with the **egg** present in the archegonium results in the formation of **zygote**.

# HETEROMORPHIC ALTERNATION OF GENERATION



# 1.4 Phanerogams

The term phanerogams or phanerogamae is derived from the Greek , phanerós meaning "visible", in contrast to the cryptogamae from Greek kryptós = "hidden" together with the suffix gameo, "to marry". phanerogams (taxon Phaenogamae), comprise those plants that produce seeds, hence the alternative name seed plants

## **Following are the characteristic features of phanerogams:**

- They have well-differentiated plants i.e. the plant body is divided into distinct root, shoot, and leaves.
- These are multicellular, eukaryotic and chlorophyll containing plants.
- These are photoautotrophic and produce own food by photosynthesis.
- These are flowering plants.
- These have vascular system i.e. xylem and phloem tissues.
- These are higher terrestrial plants and can be found in deserts, on mountains, and in rainforests.
- Here the reproductive organs are found in the flowers and are visible.



•The life cycle of phanerogams is completed in two generations sporophytic generation and gametophytic generation. This is also known as alternation of generation.

- The plant body is a sporophyte and diploid.
- The gametophytic phase is much reduced in phanerogams.

•Phanerogams are classified into two groups such as:

- Gymnosperms (naked seed plants)
- Angiosperms (covered seed plants)

## 1.4.1 Gymnosperms

•The term gymnosperm comes from the composite word in Greek: gymnos, 'naked' and sperma, 'seed' literally meaning 'naked seeds'.there are about 1,000 species categorized into 4 divisions: Cycadophyta, Coniferophyta, Gnetophyta, and Ginkgophyta.

•Sporophytic Diversity:

•The plant body i.e. sporophyte is differentiated into root, stem and leaves

•Root System:Specialized *Coralloid roots of Cycas* show association with *N<sub>2</sub>-fixing blue-green algae* and *Pinus* show association with *endophytic fungi called mycorrhizae* and normal Tap root system which absorb water and anchorage the plant.

•STEM :The gymnospermic stem is mostly erect, aerial, solid and cylindrical.In *Cycas*, it is *unbranched*, while in *Pinus*, *Cedrus* and *conifers* it is *branched*.

•LEAVES :The leaves are dimorphic.The foliage leaves are simple, needle like or pinnately Compound Scale leaves are small, membranous and brown.

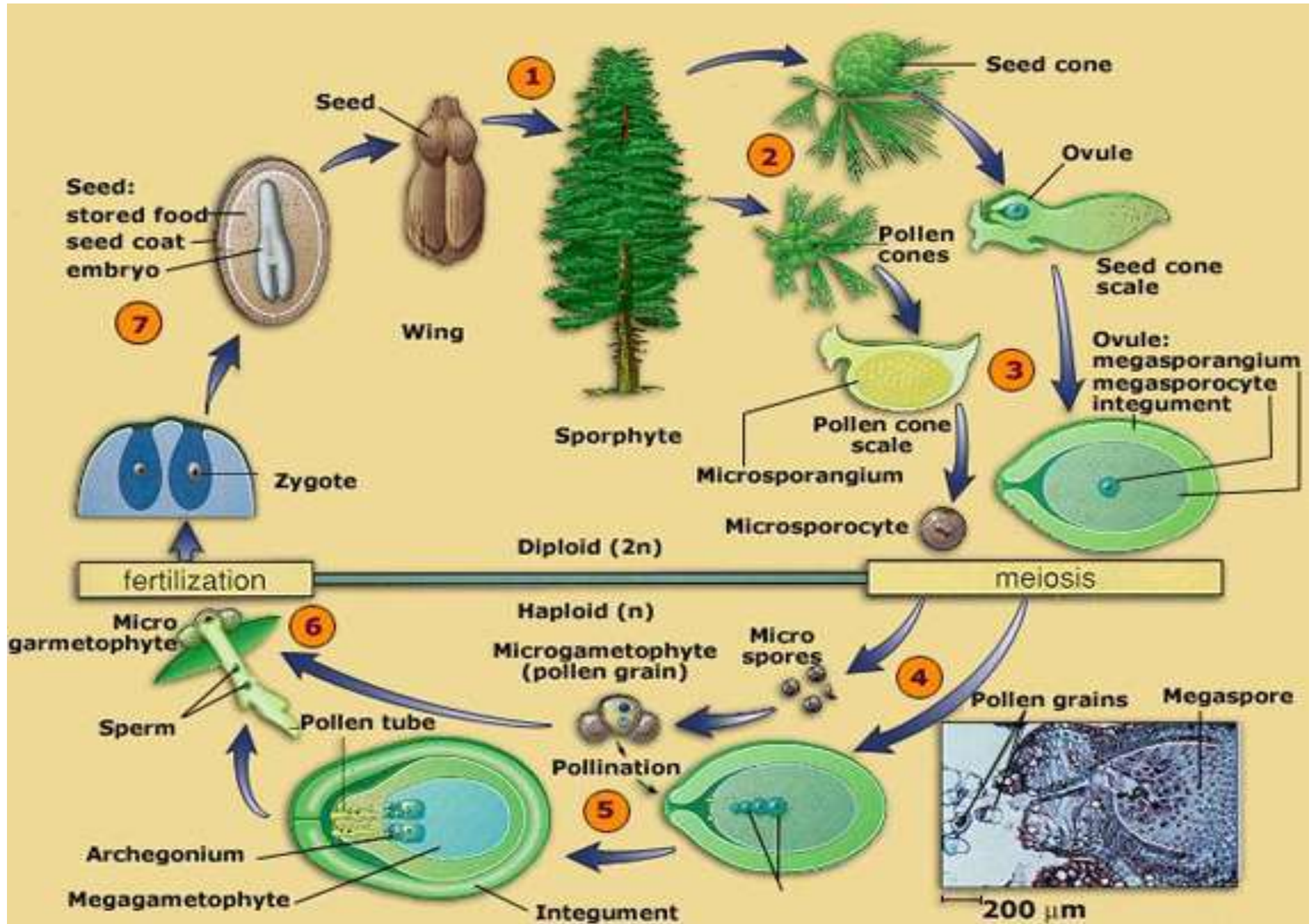


# Reproduction

- In cycadales two types of reproduction occur, namely: Vegetative and Sexual.
- Vegetative reproduction is take place through bulbils. These bulbils are developed all over the stem from base to apex on old plants.
- Sexual reproduction takes place by the formation of male cone or microsporangiate or strobilus and female cone or megasporangium or female strobili..there is variation in structure of sex organ in gymnosperms.



# HETEROMORPHIC ALTERNATION OF GENERATION



## 1.4.2 Angiosperms

• Flowering plants or angiosperms are the most recent, most advanced, most evolved, most diverse group of land plants, with 64 orders, 416 families, approximately 13,000 known genera and 300,000 known species. Like gymnosperms, angiosperms are seed-producing plants. They are distinguished from gymnosperms by characteristics including flowers, endosperm within their seeds, and the production of fruits that contain the seeds.

• Habit of Angiosperm: It is determined by height, duration and nature of stem. In habit the plants are of three main categories- herbs, shrubs and trees. Other types are trailers, creepers, twiners, climbers, lianas and epiphytes.

### •1. Herbs:

• They are small plants with soft and pliable stems which normally grow to a height of less than 2m. Herbs may be annual (e.g., Wheat, Buttercup), biennial (e.g. Henbane) or perennial (e.g., Canna). The perennial herbs have either water conserving mechanism or possess underground stem which produces new shoots every year.

### •2. Shrubs:

• Plants are of medium height with perennial woody stems. A trunk is absent. Many stem branches of equal height may arise from near the base. They are woody below and herbaceous near the apices. Shrubs are also called bushes, e.g., Capparis, Jasmine, and Rose.

### .3. Trees :

.Plants are of great height with a thick woody main stem called trunk. The trunk may remain un-branched when it is called caudex or columnar, e.g., Palm.

.In ex-current form the trunk produces narrow lateral branches which do not compete with the former. The appearance is cone-like, e.g., Pinus, Casuarina, and Eucalyptus. In deliquescent type the trunk disappears after some distance so that the crown appears dome shaped, e.g., Dalbergia, Banyan.

.4. Trailers spread over the ground without rooting of prostrate stems, e.g., Tribulus, Euphorbia.

.5. Creepers have prostrate stems which root at intervals, e.g., grass.

.6. Twiners are weak stemmed plants where stems twine around the support, e.g., Ipomoea.

.7. Climbers rise up their support by means of special clinging or coiling structures e.g., Grape Vine.

.8. Lianas are woody twiners or climbers, e.g., Hiptage, Phanera.

.9. Epiphytes are plants that live on other plants for space, e.g., Vanda.

# CLASSIFICATION OF KINGDOM PLANTAE ON BASIS OF HABIT



TOMATO PLANT



ROSE PLANT



MANGO TREE

## **Habitat Diversity:**

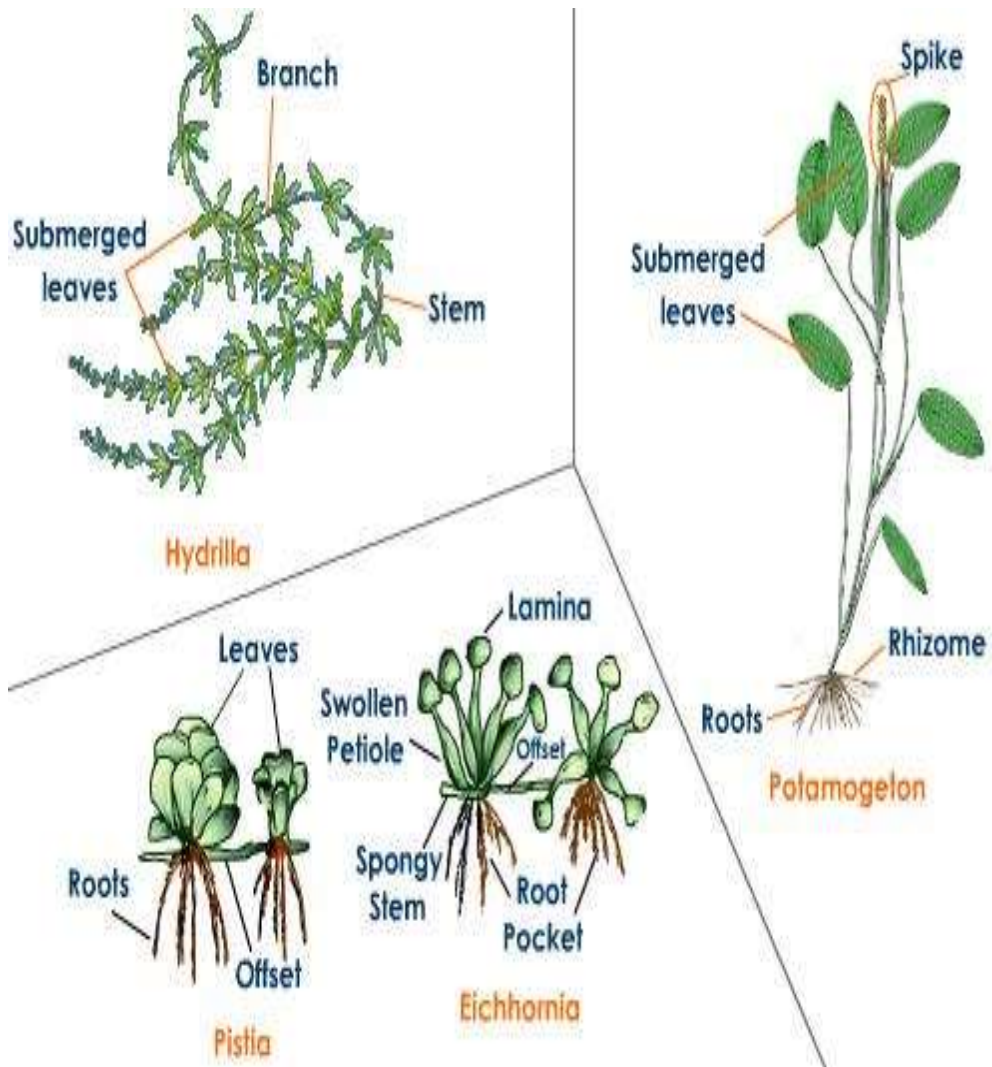
•It is a natural home or abode of the organisms. Angiosperms are mostly terrestrial. A few are aquatic. The aquatic forms are called hydrophytes. In sea only two angiosperms are recorded.

They are *Zostera* and *Thalassia*.

•More angiosperms occur in fresh water, e.g. *Wolffia*, *Lemna*, *Pistia*, *Hydrilla*, *Nelumbo*, *Trapa*. Plants of terrestrial habitats are of several types. Mesophytes are plants of moist habitats like tropical rain forests, many crop plants and ornamentals, e.g., *Sunflower*, *Artocarpus*, and *Mulberry*. Xerophytes are plants of dry habitats, e.g., *Alhagi*, *Capparis*, *Acacia*.

•Some of them store mucilage and water. They are called succulents, e.g., *Euphorbia*, *Opuntia*. Halophytes are plants of saline habitats. They may be terrestrial (e.g., *Salsola*) or found in marshy habitats along sea shore. The latter are called mangrove plants, e.g., *Rhizophora*.





*Acacia*



*Calotropis*



*Opuntia*

**Figure 6.5** Xerophytes

## **Diversity on the basis of Nutrition :**

- Angiosperms are mostly autotrophic plants or autophytes as they are green and capable of manufacturing their own organic food from inorganic raw materials with the help of chlorophyll and sunlight.
- A few angiosperms are heterotrophic. They obtain a part or whole of their nourishment from outside. Heterotrophs are of three types- saprophytes, parasites and insectivorous. Saprophytes obtain their nourishment from dead decaying organic matter.They are also called humus plants e.g., Monotropa, Neottia.
- Parasites obtain their food requirements from other living organisms. Holoparasites or total parasites get water, minerals and organic food from their host. Cuscuta is a total stem parasite. Rafflesia is a total root parasite. Hemi-parasite or partial parasites get a part of their nourishment from host, e.g. water and mineral salts.
- Insectivorous plants are green autotrophic plants which supplement their nitrogen supply by catching and digesting small animals. Insectivorous plants commonly grow in nitrogen deficient habitats e.g. Drosera, Nepenthes, Utricularia.

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*Cuscuta*



*Rafflesia*



*Orabanche*



*Loranthus*



*Viscum*



*Santalum album*

**Figure 12.10: Parasitic Mode of Nutrition**

# Reference

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