# PLANT KINGDOM - INTRODUCTION AND CLASSIFICATION

**PLANT KINGDOM**

- Plants show variation in their ecological habitats, size, structure, form and reproduction as a result of evolution.

**Plant Body**

- It is either unicellular or multicellular. If multicellular it may be differentiated into root stem and leaves or undifferentiated. Undifferentiated plant body is known as **Thallus**.
- If plant body is differentiated, it may or may not possesses vascular tissues.
- Plants with vascular tissues (Tracheophytes) are more advanced over others.

**Reproduction**

- Plants reproduce vegetatively, asexually and sexually

**1. Vegetative Reproduction**

- In this a portion of plant body is detached from the parental plant and develops into a new plant. Special reproductive cells are not formed.
- It takes place by fragmentation, bulbils, suckers etc.
- It helps in maintaining the same genotype in successive generations.

**2. Asexual Reproduction**

- It takes place by asexual reproducing units known as spores.
- These are of various types such as Aplanospores, Zoospores, Chlamydospores, Conidia, blastospores etc.
- Spores are liberated, dispersed, germinate and develop into new plants. The offspring formed through does not show considerable genetic variation.
- This method helps in geographic distribution of plants.

**3. Sexual Reproduction**

- It is union of male and female gametes. It is known as syngamy or fertilization or amphimixis. It results in the formation of zygote. The gametes may be motile or non – motile.
- Based on the morphology and behaviour of gametes, it is classified into the following four types.

**I.** **Isogamy**: It is fusion of morphologically and functionally similar gametes.

**II.** **Physiological anisogamy**: It is fusion of morphologically similar and functionally different gametes.

**III.** **Anisogamy:** It is fusion between morphologically and functionally different motile or non –motile gametes.

**Oogamy:** It is fusion between very small motile or non – motile male gamete and very large and always non – motile female gamete. It is of two types known as Zooidogamy and Siphonogamy.

**a)** **Zooidogamy:** Male gamete is motile and pollen tube is not formed

**b)** **Siphonogamy:** Male gamete is non – motile and pollen tube is formed.

- Sexual reproduction brings about recombination and there by variations in the offspring. These variations lead to evolution due to natural selection.

**Classification of Plant Kingdom**

- Plant Kingdom has cell or cells with cell walls that show absorptive type of nutrition.
- Bacteria, Fungi and Lichens are placed in plant kingdom.
- Eichler divided plant kingdom into two sub–kingdoms known as Cryptogamae and Phanerogamae

**I. Sub kingdom Cryptogamae**

- Seeds, flowers and fruits are absent
- They reproduce asexually through spores and sexually through gametes.
- Have hidden reproductive structures.
- Water is essential for fertilization.
- Siphonogamy and Endosperm are absent.
- It is divided into three divisions.

**1. Division Thallophyta**

- It is the largest division of cryptogams with simplest and most primitive plants.
- Plant body is thallus. It is either unicellular or multicellular
- Vascular tissues are absent (**Atracheophytes**).
- Zygote never develops into embryo (**Non – embryophytes**).
- Sex organs are usually unicellular and jacket is absent.
- Show haplontic life cycle.
- This division is divided into two sub – divisions known as Algae and Fungi.

**A. Algae**

- They live in water bodies

- Thallus is either unicellular or multicellular and shows much variation in morphology.
- Show **autotrophic** nutrition.
- Plastids and photosynthetic pigments are present.
- Cell wall mainly consists of **cellulose**.
- Reserve food material is usually **starch**.
- Show progressive development in the method of sexual reproduction which ranges from **isogamy** to **Oogamy**.

### B. Fungi

- These occur in almost every habitat where organic material is available.
- Thallus is unicellular or multicellular. It is known as **Mycelium**. Each filament of mycelium is known **hypha**.
- Show **heterotrophic** nutrition. It may be saprophytic, parasitic or symbiotic (as in lichens and Mycorrhizae). Exhibit extracellular digestion .
- Cell is mainly made of **Chitin**.
- Reserve food materials are usually **glycogen** and **oil** droplets.
- They show **progressive degeneration of sexual reproduction**. It ranges from gametogamy (isogamy to oogamy) to somatogamy.

**2. Bryophyta**

- These are primitive land plants that grow in moist shady places. Hence known as **'Amphibians of the plant kingdom'**.
- They show heteromorphic alternation of generations with dominant gametophyte and nutritionally dependent sporophyte.
- Life cycle is haplo-diplontic.
- Gametophyte is either thalloid or differentiated into leaf like (phylloid), stem like (cauloid) and root like (rhizoid) structures.
- Plant body has simple parenchymatous tissue.
- Sex organs are multicellular, stalked and jacketed. Male sex organ is **antheridium** and female is **Archegonium**.
- Sexual reproduction takes place by **zooidogamous oogamy**. Zygote is formed in the archegonial venter. It develops into undifferentiated embryo and later into sporophyte.
- Sporophyte produces only one type of spores. Hence it is **homosporous**.
- Spore is the first cell of gametophytic gneration
- Spore germinates and produces the gametophyte directly or through a juvenile gametophytic stage known as **protonema**.

**2. Pteridophyta**

- These are first true land plants.
- Diploid Sporophyte is the dominant stage in the life cycle. It is differentiated into leaf, stem and roots. Root system is adventitious and leaves are microphyllous or megaphyllous (fronds)
- Vascular tissues are present (**First tracheophytes**). Xylem lacks vessels and phloem companian cells. They are the only vascular cryptograms
- Sporangia are developed on the leaves known as sporophyllys. Sporangium is developed from a single initial (**leptosporangiate**) or from a group of initials (**Eusporangiate**). In each sporangium the spores are formed by **meiosis**. Plants may be **homosporous** or **heterosporous** (With micro and megaspores)
- Spores germinate and form haploid gametophyte known as **Prothallus**. Homosporous species produce either monoecious or dioecious prothallus. Heterosporous species produce dioecious prothalli referred as male and female gametophytes.
- Sex organs are multicellular, jacketed and **without stalk**. Male sex organ is **antheridium** and female is **archegonium**.
- Water is essential for fertilization. It takes place in the archegonial venter by **zooidogamous** type of Oogamy.
- Zygote develops into embryo in the archegonial venter that later develops into sporophyte.
- They show **diplohaplontic** life cycle and heteromorphic alternation of generations. Both sporophyte and gametophyte are **independent**.

## II. Sub-kingdom Phanerogamae

- Flowers or cones are present.
- Have exposed reproducing structures.
- Mainly reproduce through seeds (**Spermatophytes**).
- Water is **not essential** for fertilization.
- Show **siphonogamous** type of fertilization.
- Exhibit heteromorphic alternation of generations and diplohaplontic life cycle. Sporophyte is dominant and gametophyte is dependent on sporophyte for nutrition.
- Multi cellular seed is formed with an embryo.

- Dominance of seed files on earth is due to
    a. Development of xylem and phloem tissues in root and stem
    b. Water not required for fertilization
    c. Development of seed habit
- This subkingdom has only one division known as **spermatophyta** which is further divided into two subdivisions known as **Gymnospermae** and **Angiospermae**.

**i) Subdivision Gymnospermae**

- These are perennial, xerophytic, evergreen woody plants.
- Main plant body is sporophyte with tap root system, stem and macrophyllous leaves.
- Vascular tissues are well developed with tracheids in the xylem. Phloem lacks companion cells. Vessels are seen in **Gnetales**.
- These are **heterosporous** with sporophylls usually aggregated into **cones** or **strobili**.
- Microspores are released at **more than 2 – celled stage**. Pollination is direct and anemophilous.
- **Ovules** are exposed, **unitegmic, orthotropous** and **crassinucellate**. They are present on the megasporophylls.
- Female gametophyte formed from megaspore is called as **endosperm**. It is pre – fertilised product. It is haploid and has **archegonia**. It provides nourishment to embryo.
- Sexual reproduction is siphonogamous. Cycas shows both **siphonogamy** and **zooidogamy**.
- **Fruits** and **ovaries** are absent.
- Diploid zygotes develop into an embryo while still enclosed with in the ovule
- Seeds are naked without a fruit wall

**ii) Sub – Division Angiospermae**

- These are herbaceous or woody and grow in every kind of habitat.
- These have true flowers with perianth.
- **Megasprorophylls** are known as carpels which are together known as gynoecium. It is differentiated into ovary, style and stigma. Ovules are produced inside the ovary.
- **Microsporophylls** are called as stamens. Each stamen has an anther, filament and connective. Anther has microsporangia that produce pollen grains.
- Pollination is **indirect**. It may be zoophilous, hydrophilous and anemophilous.
- Pollen grains are released at **2-celled** stage. Developed male gametophyte has **three cells** or nuclei.
- Female gametophyte is produced from megaspore and known as embryosac. It has only one egg cell.
- **Double fertilization** is seen. Fertilization is siphonogamous. Endosperm is **triploid** and post fertilised product.
- Embryo has one or two cotyledons.
- Life cycle is diplohaplontic and alternation of generations is heteromorphic.