1. Asexual and Sexual Reproduction in Plants

Learning Objectives

The learner will be able to

- ❖ Recall various types of reproduction in lower and higher organisms.
- ❖ Discuss different methods of vegetative reproduction in plants.
- ❖ Recognise modern methods of reproduction.
- ❖ Recall the parts of a flower.
- ❖ Recognise the structure of mature anther.
- ❖ Describe the structure and types of ovules.
- ❖ Discuss the structure of embryo sac.
- ❖ Recognise different types of pollination.
- ❖ Identify the types of endosperms.
- ❖ Differentiate the structure of Dicot and Monocot seed.

Important Notes and Points

- ❖ The unit of reproductive structure used in propagation is called **reproductive propagules** or **diaspores.**

- Scourge of water bodies / Water hyacinth **(***Eichhornia crassipes)* is an invasive weed on water bodies like ponds, lakes and reservoirs. It is popularly called “Terror of Bengal”. It spreads rapidly through off set all over the water body and depletes the dissolved oxygen and causes death of other aquatic organisms.
- *Scilla* is a bulbous plant and grows in sandy soils.
- The plant which is in contact with the soil is called **stock** and the plant used for grafting is called **scion.**
- The regeneration of a whole plant from single cell, tissue or small pieces of vegetative structures through tissue culture is called **micropropagation**.
- The stages involved in the formation of haploid microspores from diploid microspore mother cell through meiosis is called **Microsporogenesis**.
- Many botanists speak of a third type of tapetum called amoeboid, where the cell wall is not lost. The cells protrude into the anther cavity through an amoeboid movement. This type is often associated with male sterility and should not be confused with periplasmodial type.
- Palynology is the study of pollen grains. It helps to identify the distribution of coal and to locate oil fields. Pollen grains reflect the vegetation of an area.

- Liquid nitrogen (-196^{0}C) is used to preserve pollen in viable condition for prolonged duration. This technique is called **cryopreservation** and is used to store pollen grains (pollen banks) of economically important crops for breeding programmes.
- **Bee pollen** is a natural substance and contains high protein, carbohydrate, trace amount of minerals and vitamins. Therefore, it is used as dietary supplement and is sold as pollen tablets and syrups. Further, it increases the performance of athletes, race horses and also heals the wounds caused by burns. The study of honey pollen is called Mellitopalynology.
- **Pollen calendar** shows the production of pollen by plants during different seasons**.** This benefits the allergic persons. Pollen grains cause allergic reactions like asthma, bronchitis, hay fever, allergic rhinitis etc.,
- *Parthenium hysterophorus* L. (Family- Asteraceae) is commonly called Carrot grass is a native of tropical America and was introduced into India as a contaminant along with cereal wheat. The pollen of this plant cause Allergy.
- Ovule is also called megasporangium and is protected by one or two covering called **integuments**.
- Transfer of pollen grains from the anther to a stigma of a flower is called **pollination.**

❖ **Pollination – A composite event**

Pollination provides information about evolution, ecology, animal learning and foraging behaviour. Flowers not only supply nectar but also provide microclimate, site and shelter for egg laying insects. The association of insects benefits the flower by getting pollinated and ensures the propagation of its own progeny. The floral parts are well modified in shape, size to attract the pollinators to accomplish pollination .

❖ The relationship between *Yucca* and moth (*Tegeticula yuccasella*) is an example for obligate mutualism. The moth bores a hole in the ovary of the flower and lays eggs in it. Then it collects pollen and pushes it in the form of balls down the hollow end of the stigma. Fertilization takes place and seeds develop. Larvae feed on developing seeds. Some seeds remain unconsumed for the propagation of the plant species. It is interesting that the moth cannot survive without *Yucca* flowers and the plant fails to reproduce sexually without the moth.

❖ Similarly in *Amorphophallus*, flowers apart from providing floral rewards, also forms safe site for laying eggs. Many visitors consume pollen and nectar and do not help in pollination. They are called pollen / nectar robbers.

- In Bee orchid (*Ophyrus*) the morphology of the flower mimics that of female wasp (*Colpa*). The male wasp mistakes the flowers for a female wasp and tries to copulate. This act of pseudocopulation helps in polli nation.
- The fusion of male and female gamete is called **fertilization.**
- The receptacle becomes fleshy and edible around the fruit enclosing the seeds as in *Pyrus malus* (apple).
- The calyx may persist and enlarge (*Solanum melongena)* or may cover the fruit *(Physalis minima*).
- The flower stalk or axis below the gynoecium enlarges into a juicy pear shaped body which is edible (*Anacardium occidentale).* The Perianth becomes fleshy as in Jack fruit.
- Th e cells present at the tip of the outer integument around the micropyle develop into a fleshy structure called **caruncle**. (*Ricinus communis).*
- The funiculus develops into a fleshy structure which is oft en very colourful and called **aril**.
- Th e nucellar tissue is either absorbed completely by the developing embryo sac and embryo or small portion may remain as storage tissue. Th us the remnant of nucellar tissue in the seed is called **perisperm**. Example: Black pepper and beet root.
- Aleurone tissue consists of highly specialised cells of one or few layers which are found around the endosperm of cereals (barley

and maize). Aleurone grain contains sphaerosomes. During seed germination cells secrete certain hydrolytic enzymes like amylases, proteases which digest reserved food material present in the endosperm cells.

- Coconut milk is a basic nutrient medium which induces the differentiation of embryo (embryoids) and plantlets from various plant tissues. Coconut water from tender coconut is free-nuclear endosperm and white kernel part is cellular.
- Fresh weight of an orchid seed may be 20.33 microgram and that of double coconut (*Lodoicea maldivica*) is about 6 kg.