Topic 24: Sexual reproduction in plants

Competency: The learner understands that the flower is the specialized organ in which all events of a plant's sexual reproduction occur, leading to the formation of an embryo located in the seed.

NOTES ABOUT SEXUAL REPRODUCTION IN PLANTS

Sexual reproduction in plants

Sexual reproduction in plants is a fascinating and essential biological process that ensures the continuation of plant species from one generation to the next. It involves the fusion of male and female sex cells (gametes), resulting in the formation of a seed that contains a developing embryo. This process takes place in a highly specialized structure the **flower**.

The flower: A specialized reproductive organ

The flower is the main organ for sexual reproduction in flowering plants (angiosperms). It contains both male and female reproductive structures that facilitate the processes leading to fertilization and seed development.

- **Male part of the flower (stamen)**: Composed of the **anther**, which produces pollen grains (contains male gametes), and a **filament** that holds the anther head in the right position to dispense the pollen.

Structure of a typical flower

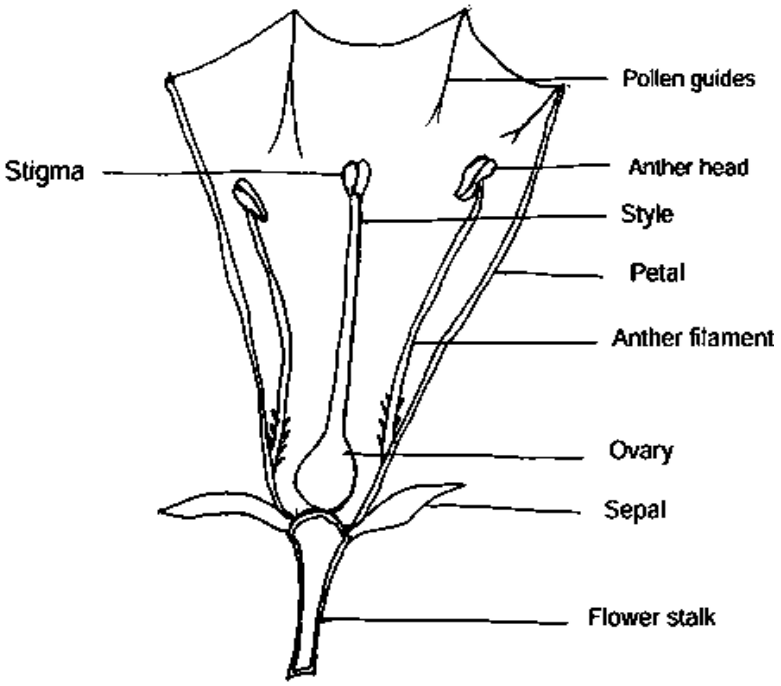

Fig 24.1 typical flower structure

- **Female part (carpel/pistil)**: Consists of the **stigma** (where pollen lands during pollination), **style** (a tube connecting stigma to ovary), and **ovary**, which contains **ovules** After fertilisation, the ovary develops into a fruit and ovules into seeds (female gametes).

Some flowers have both male and female parts (bisexual), while others may have only one type (unisexual).

Key processes of sexual reproduction in plants

1. **Pollination**: This is the transfer of pollen grains from the anther to the stigma. It can occur through agents like wind, insects, water, birds, or animals. There are two types:

a) ***Self-pollination*:** Pollen is transferred on to the stigma of the same flower or another flower on the same plant.
b) ***Cross-pollination*:** Pollen is transferred from one plant to the stigma of a flower on another plant of the same species.

2. **Fertilization**: After pollination, the pollen grain germinates on the stigma and grows a pollen tube down the style to the ovary. The male gamete travels through this tube to reach the ovule. Here, it fuses with the female gamete to form a **zygote**.
3. **Formation of the embryo**: The zygote develops into an **embryo**, which is the early form of a new plant. The surrounding ovule becomes the **seed**, and the ovary develops into a **fruit**, which protects the seed.

Significance of sexual reproduction in plants

- **Genetic variation**: Because it involves the combination of genes from two parent plants, sexual reproduction introduces genetic diversity. This variation is key to plant survival, evolution, and adaptation.
- **Seed production**: Seeds contain embryos that can grow into new plants, ensuring the survival of plant species.
- **Fruit formation**: Fruits not only protect seeds but also aid in their dispersal by wind, animals, or water.

Sexual reproduction in plants is a highly organized process that begins and ends in the flower. From pollination and fertilization to the development of seeds and fruits, every step is crucial for forming new plants. Understanding this process allows learners to appreciate the beauty, diversity, and continuity of plant life on Earth.

Activity 24.1

A PDM group of farmers in Dolwe Island is struggling with low fruit yield in their passion fruit plantation. Many flowers fall off before fruits form. The flowers have unusually short filaments, and their anthers often stay enclosed. Bees rarely visit the flowers. In frustration, one farmer suggests using a small brush to transfer pollen between flowers manually. Others argue that nature should handle it without human intervention.

Tasks and responses

a) From the situation described, identify the floral structures that might be failing and explain their normal roles in the plant reproduction process.

Floral structures that might be failing and their normal roles in plant reproduction

- The short filaments may prevent the anthers (pollen-producing parts) from extending out of the flower where pollinators can access them. Normally, filaments position the anthers to release pollen effectively.
- The enclosed anthers suggest that pollen is not being exposed for transfer, which disrupts pollination.
- The absence of bees indicates poor pollinator attraction, possibly due to reduced nectar, scent, or flower visibility.

Normal roles

- Anthers produce and release pollen grains that contain the male gametes
- Filaments support the anthers, ensuring proper pollen positioning.

- ❖ Pollinators (like bees) carry pollen between flowers, enabling pollination and eventually fertilization to occur, which leads to fruit and seed formation.

b) Explain how the farmers' idea of using a brush relates to cross- and self-pollination, and state one advantage of cross-pollination for their passion fruit crops.

Brush pollination, its relation to pollination types, and advantage of cross-pollination

- ❖ The farmer's idea of using a small brush is like what the bees do, transferring pollen from one flower to another.
- ❖ If the brush is used between flowers on different plants, this will be cross-pollination.
- ❖ If used within the same flower or plant, it results in self-pollination.

Advantage of cross-pollination

It increases genetic variation, which can lead to stronger, healthier plants with better fruit yield and disease resistance ideal for boosting productivity on the passion fruit farm.

c) Propose a practical solution for improving pollination on the farm and explain how this would support successful fruit and seed development.

Practical solution and how it supports pollination:

Introduce or attract more pollinators, especially bees, by:

- Planting bee-friendly flowering plants (e.g., sunflowers, or wildflowers) near the passion fruit.
- Avoiding use of harmful pesticides, especially during flowering season.
- Creating bee habitats using logs and small hives.

How this is helpful

- ❖ It boosts natural cross-pollination, increasing the chances of fertilization.
- ❖ Leads to more fruit production and seed development, improving overall yields and quality.

Activity 24.2

Students participating in a forest restoration project on Mt. Elgon area are collecting fruits and seeds for replanting. One group mistakenly plants entire jackfruit pods, while another buries mango seeds in the wrong orientation. They also find seeds floating in water pools and some hooked onto their socks. A visiting botanist encourages them to sort seeds by dispersal method before planting, but the students are unsure how to do this.

Tasks:

a) Using the jackfruit and mango examples, distinguish between fruits and seeds in terms of structure and function, and explain why planting the whole fruit or a wrongly positioned seed may fail the project.

b) Identify two dispersal methods suggested by the scenario and explain how specific fruit or seed structures support each method.

c) Explain why seed dispersal is important in a forest restoration project and how understanding dispersal strategies can improve the success of their planting efforts.