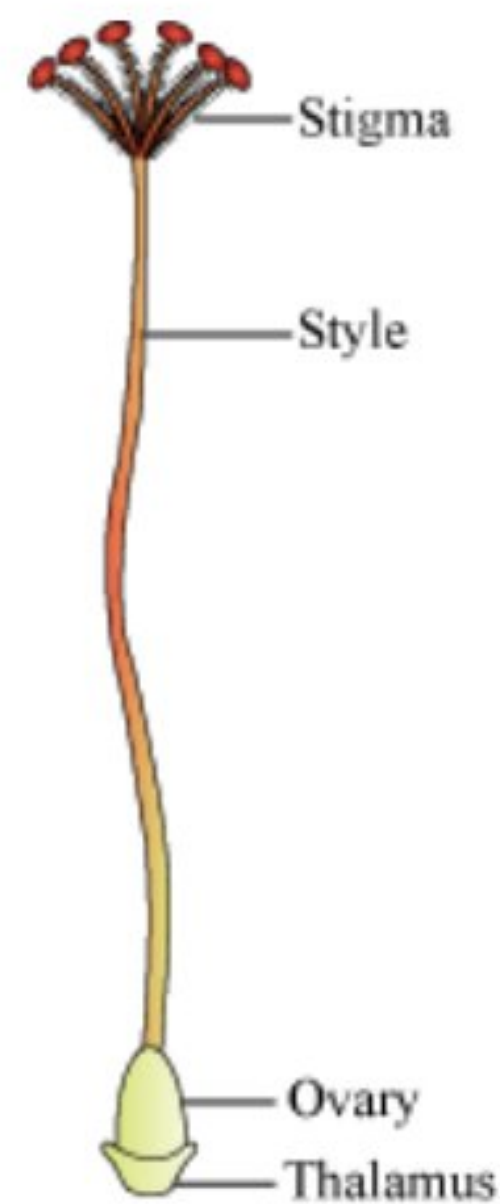


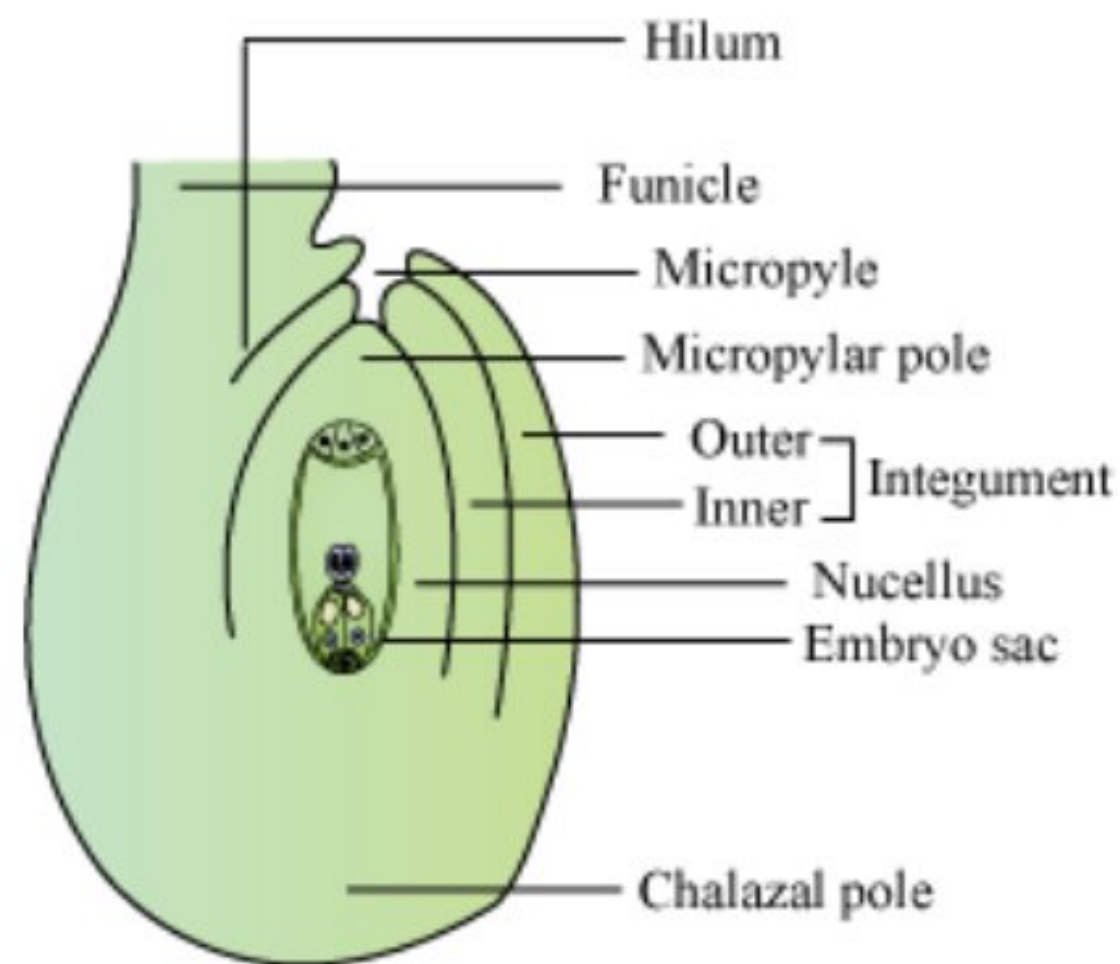
## Gynoecium and Formation of Female Gametophyte

- The gynoecium represents the female reproductive part of a flower.
- It may be mono-carpellary (one pistil) or multi-carpellary (many pistils). In multi-carpellary, the pistils may be fused in one (syncarpous) or free (apocarpous).
- Each pistil consists of:
  - **Stigma** – Receives the pollen grains
  - **Style** – Elongated, slender part below the stigma
  - **Ovary** – Bulged basal part containing the placenta, which is located inside the ovarian locule (cavity)
  - The placenta contains the megasporangia or ovules.



## Megasporangium

- The ovule is attached to the placenta by the **funicle**. The junction of the ovule and the funicle is called **hilum**.
- Each ovule has one or two protective layers, called **integuments**, which cover the rest of the ovule, except for a small opening called **micropyle**.
- The **chalaza** lying on the opposite side of the micropyle end represents the basal part of the ovule.
- **Nucellus** is present within the integuments and contains reserved food. The **embryo sac** or female gametophyte is located within the nucellus.



## Megasporogenesis

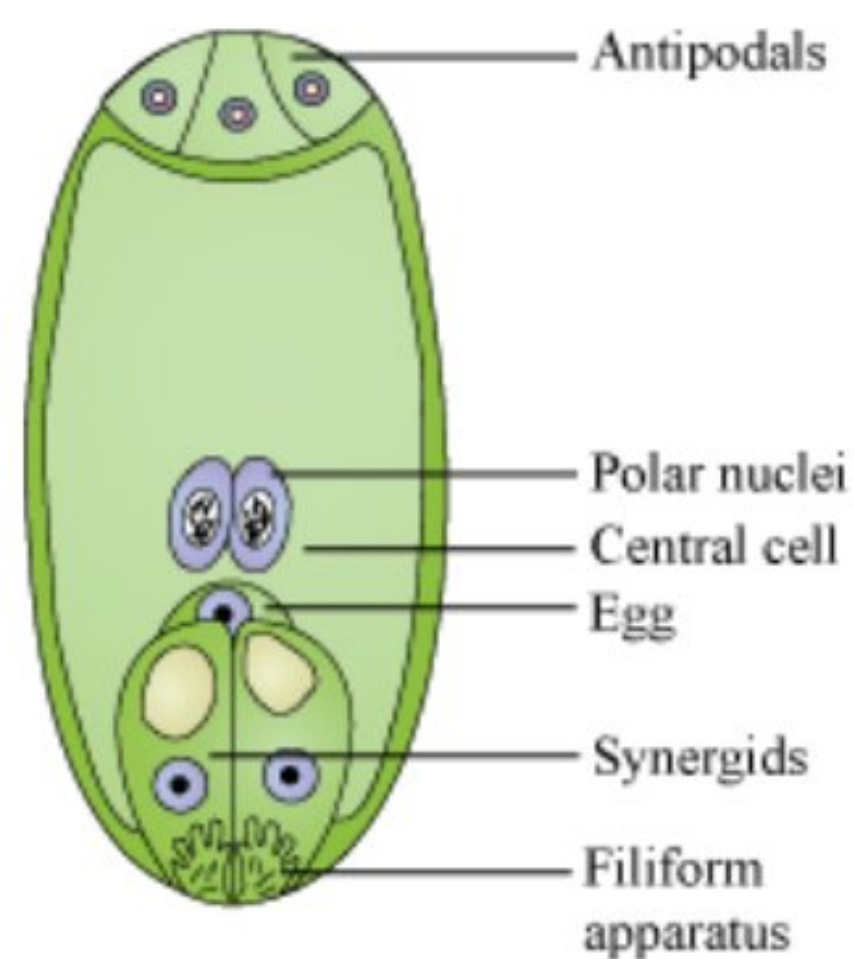
- The **megaspore mother cell** (MMC) gets converted into megaspores by the process of megasporogenesis.
- The MMC is large and contains a dense cytoplasm and a prominent nucleus. It undergoes meiosis to produce four megaspores.

## Female Gametophyte

- In most flowering plants, only one megaspore is functional while the other three degenerate.
- The single functional megaspore develops into the female gametophyte. This kind of development is called monosporic development.
- The nucleus of the functional megaspore divides mitotically to form 2 nuclei, which move towards the opposite ends, forming a 2-nucleate embryo sac. Two more mitotic divisions ensue, leading to the formation of 4-nucleate and 8-nucleate embryo sacs.
- After the 8-nucleate stage, the cell walls are laid down and the typical female gametophyte (embryo sac) gets

organised.

- Six of the 8-nuclei get surrounded by the cell wall and the remaining two, called **polar nuclei**, are situated below the egg apparatus in the large **central cell**.
- Three of the six cells are placed at the micropylar end and constitute the **egg apparatus** (2 **synergids** + 1 **egg cell**).
- The synergids have special thickenings at the micropylar end. These are together called the **filiform apparatus**. It helps in leading the pollen tubes into the synergids.
- Three cells are at the chalazal end, and are called **antipodal cells**.
- A typical angiosperm female gametophyte is 7-celled and 8-nucleated at maturity.



## Pollination

- It is the process of transfer of pollen grains from the anther to the stigma.
- Depending on the source of pollen, pollination can be divided as follows:
  - **Autogamy** – It is the transfer of pollen grains from the anther to the stigma of the same flower. Autogamy

requires the anther and the stigma to lie close. It also requires synchrony in the pollen release and stigma receptivity.

Plants like *Viola*, *Oxalis*, etc., produce two kinds of flowers—**chasmogamous flowers** (with exposed anther and stigma) and **cleistogamous flowers** (which do not open at all and only autogamy occurs).

- **Geitonogamy** – It is the transfer of pollens from the anther of one flower to the stigma of another flower in the same plant. Genetically, it is similar to autogamy, but it requires pollinating agents.
- **Xenogamy** – It is the transfer of pollen grains from the anther to the stigma of a different plant. Pollination causes genetically different types of pollens to be brought to a plant.

### **Agents of Pollination**

- Plants use air, water (abiotic agents) and animals (biotic agents) for pollination.
- **Pollination by wind**
  - It is the most common form of abiotic pollination.
  - Plants possess well-exposed stamens and large, feathery stigma.
  - Pollens should be light and non-sticky to be carried easily by winds.
  - Wind-pollinated flowers often have single ovule in the ovary and numerous flowers packed in an inflorescence.

- It is common in grass.
- **Pollination by water**
  - It is rare in flowering plants, except for some aquatic plants like *Vallisneria* and *Hydrilla*.
  - In most water-pollinated plants, the pollen grains are long and ribbon-like, and are protected from wetting by mucilaginous covering.
  - In a majority of water plants like water hyacinth and water lily, flowers emerge above the water level and are pollinated by insects.
- **Pollination by animals**
  - Majority of flowering plants use butterflies, bees, wasps etc., for pollination.
  - Most of the insect-pollinated flowers are large, colourful, fragrant, and contain nectar to attract the animal pollinators. These are called floral rewards.
  - Floral reward can be in the form of providing safe places to lay eggs (example: the tallest flower, *Amorphophallus*)
  - A symbiotic relationship exists between the plant, *Yucca* and its pollinator moth. The moth is dependent on the plant since the moth deposits its eggs in the locule of the ovary of the plant, and in return, the plant is pollinated by the moth.
  - The pollen grains are sticky and get stuck to the body of the pollinator.