

# SCIENCE

## SEXUAL REPRODUCTION IN PLANTS

### Reproduction in a flowering plant :

Sexual reproduction takes place through the agency of flowers in angiosperms (flowering plants).

**Flower** is a specialized condensed reproductive shoot of flowering plants on which the essential reproductive parts are inserted.

A typical flower has four whorls arranged on the **thalamus**.

Non essential organs

1 Calyx

2 Corolla

Essential organs

3 Androecium

4 Gynoecium

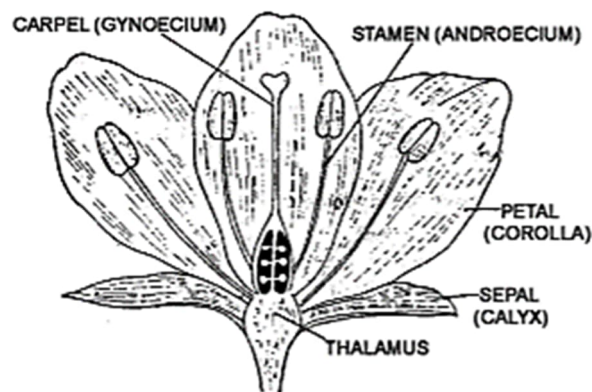


Fig.: A vertical section of a typical flower

- **CALYX**

It is the outermost whorl consisting of **sepals**.

Sepals are green and leaf like structure.

Calyx protect the flower bud before it opens.

- **Corolla**

It is the second whorl. It consists of coloured petals. They are normally large often fragrant and bright coloured. Their primary function is to attract animals and insects for pollination.

- **ANDROECIUM**

It is the third whorl, inner to corolla, consisting of male reproductive parts called **stamens**.

Each stamen has two parts – Filament and anther.

Anther is lobed structure present at the tip of filament. Each anther has pollen sacs (microsporangia) which contain pollen grains (microspores).

Each pollen grain produces two male gametes/ male germ cells.

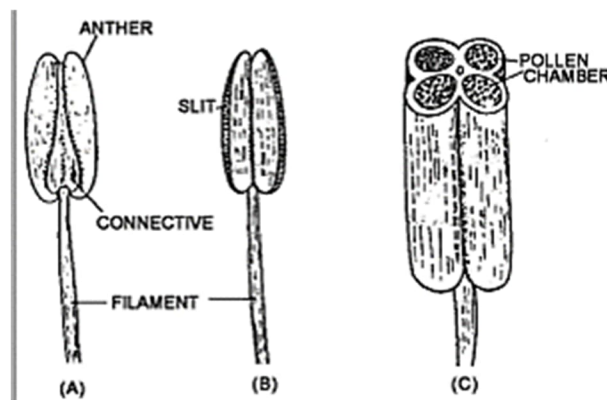


Fig.: (A) Ventral view showing connective (B) dorsal view (C) t.s. of anther showing pollen chambers

### **GYNOECIUM**

It is the fourth and innermost whorl consisting of **carpels**.

Carpel is present in the centre of flower.

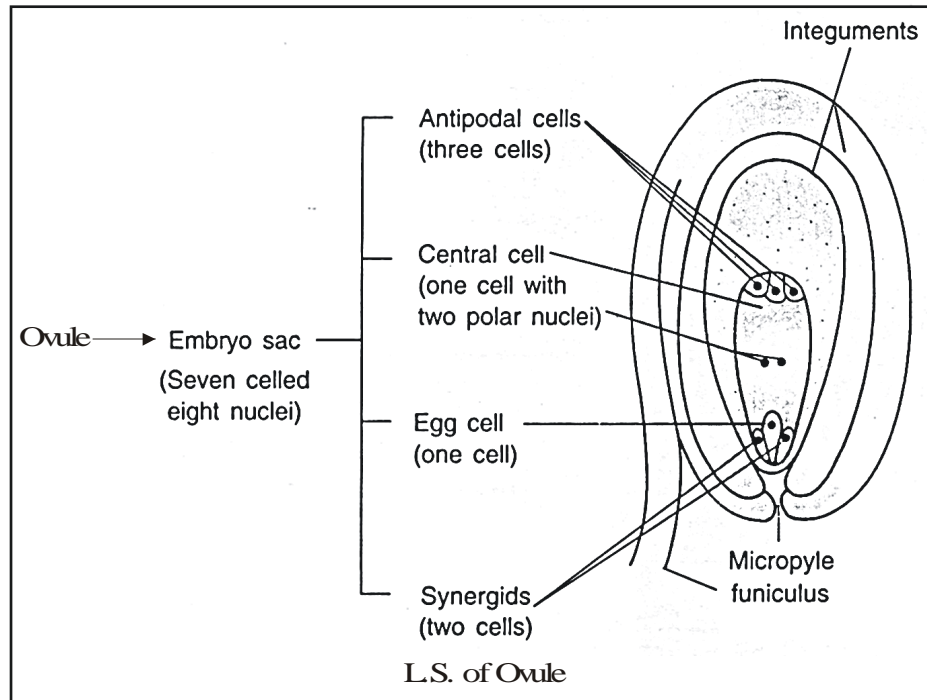
Each carpel has three parts – Ovary, Style and Stigma.

**Ovary** is a swollen basal part of carpel. It contains ovules which are attached to placenta.

Each ovule contain an embryosac that bears a haploid egg (female gamete).

**Style** is the middle part of the carpel. It has stigma above it and ovary below it.

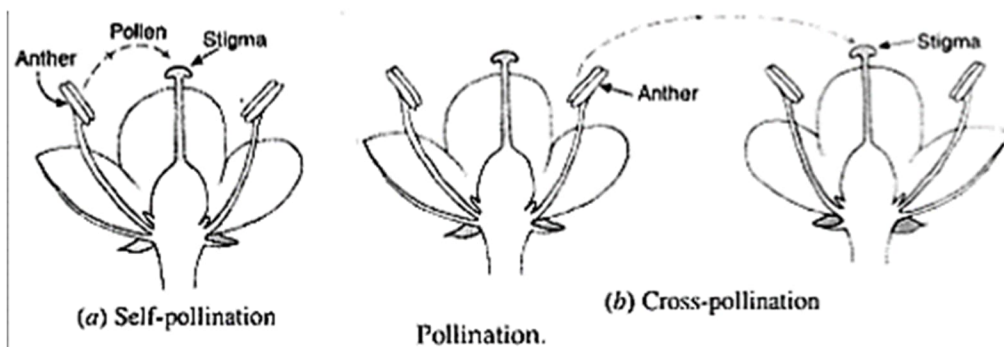
**Stigma** is the apical part of carpel. It receives pollen grains.



(ii) **Pollination** : The transfer and deposition of pollen grains from the anther to the stigma of a flower is called as pollination.

- **Types of pollination** : Pollination is of two types -

(i) **Self pollination** : It is the process of transfer of the pollen grains from the anther to the stigma of either the same or genetically similar flower. It is further divided into two types :



1. **Autogamy** : It is a type of self pollination in which the pollen grains are transferred from the anther to stigma of the same flower e.g. Wheat, rice, pea etc.

**2. Geitonogamy :** It is a type of self pollination in which the pollen grains are transferred from the anthers of one flower to the stigma of another flower borne either on the same plant.

**Significance of self pollination :**

- It maintains purity of race.
- It also maintains the superiority of variety once developed.

**(II) Cross pollination :** It is the process of transfer of the pollen grains from the anther of one flower to the stigma of another flower borne on a different plant of the same species. The transfer of pollen grains occurs through various ways, which may be biotic or abiotic.

**1. Abiotic factors**

**Technical terms**

Wind

Anemophily

Water

Hydrophily

**2. Biotic factors**

**Technical terms**

Insects

Entomophily

Birds

Ornithophily

Bats

Chiropterophily

Snails

Malacophily.

**Significance of cross pollination :**

- Increase in yield and adaptability.
- It eliminates defective traits and produces new varieties.
- It also leads to the hybrid production.

DIFFERENCES BETWEEN SELF POLLINATION & CROSS POLLINATION		
s.no.	Self - pollination	Cross-pollination
1.	Pollen grains are transferred from the anther to the stigma of the same flower (autogamy) or another flower borne on the same plant (geitonogamy).	Pollen grains are transferred from the anther of one flower to the stigma of another flower borne on a different plant of the same species (allogamy).
2.	It can occur even when the flowers are closed.	It occurs only when the flowers are open.
3.	External agent is not required for self-pollination.	An external agent abiotic or biotic, is essential for cross-pollination.
4.	Self-pollination ultimately results in same progenies which are pure-lines i.e. homozygous.	Cross-pollination produces the offsprings which are hybrids i.e., heterozygous. They show variations in characteristics.
5.	It cannot eliminate useless or harmful characters.	It can eliminate useless or harmful characters.
6.	Highly useful characters get preserved in the race.	Useful characters cannot be preserved in the progenies.
7.	Self-pollination does not introduce any variations and hence the offsprings are unable to adapt to the changed environment.	Cross-pollination introduce variations in the offsprings. These variations make these plants to adapt better to the changed environment for the struggle for existence.
8.	Self-pollination never helps in the production of new varieties and species.	Cross-pollination is a mechanism of producing new varieties and species among plants.
9.	Both the anther and stigmas mature simultaneously	The anthers and stigmas mature at different times.

## FERTILIZATION

Fertilization is the process of fusion of the male and female gametes, which takes place in the **embryosac** present in the ovule.

After pollination, pollen grains germinate on the stigma by producing pollen tube.

The nucleus in the pollen tube divides into two male gametes.

Pollen tube penetrates the stigma and passes through the style and enters the ovule through micropyle.

It releases two male gametes in embryo sac.

One male gamete fuses with egg cell and second male gamete fuses with the two polar nuclei.

One male gamete + Egg cell = Zygote.

Second male gamete + Two polar nuclei = Triploid nucleus (Primary Endosperm Nucleus)

Syngamy + Triple fusion = Double fertilization.

## **POST FERTILIZATION CHANGES IN THE FLOWER**

Sepals, petals and stamen withers off.

Style and stigma degenerates.

Ovary develops into fruit.

Ovule grows into seed.

The seed contains the future plant or embryo which develops into a seedling under appropriate conditions.