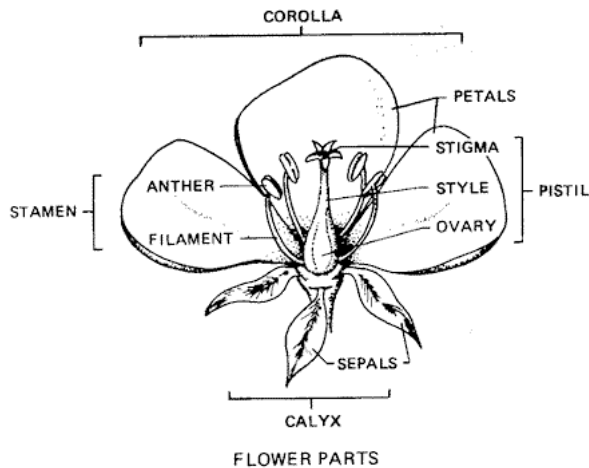


# Reproduction in Flowering Plants

## Sexual Reproduction

Flowers are reproductive shoots that are usually composed of 4 kinds of organs :

- Sepals: Constitute the outermost and lowest whorl on a floral shoot. Cover and protect the flower parts when the flower is a bud. Leaf like in shape and are often green.
- Petals: Broad, flat and thin. Varied in shape and frequently brightly colored. Attract pollinators.
- Stamens: The male reproductive organ. Composed of a *filament* on top of which is the *anther* in which pollen grains are formed.
- Carpels(pistil): Female reproductive organ. Bear ovules which are structures with the potential to develop into seeds. Has 3 sections – stigma, style and ovary.



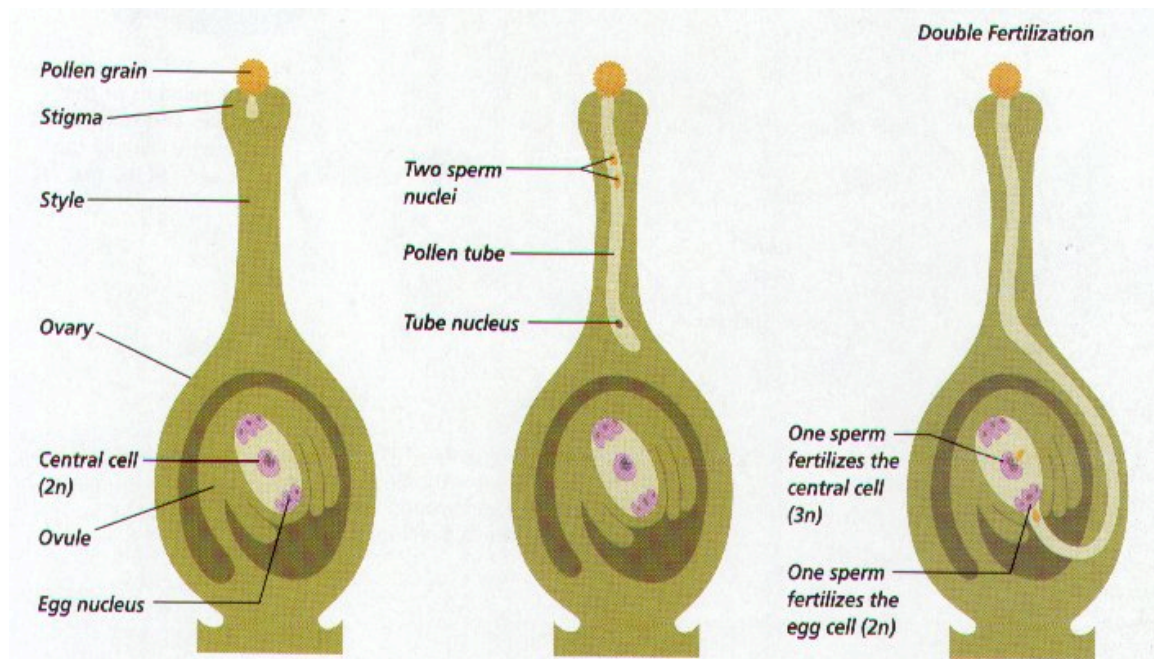
## Pollination

- The transfer of pollen grains from anther to stigma
- Before fertilization can occur, pollen grains must travel from the anther to the stigma.
- Plants are self pollinated if pollination occurs within the same flower or a different flower on the same individual plant.
- When pollen grains are transferred to a flower on another individual of the same species, it is cross pollinated.
- Beetles, bees, flies, butterflies, other insects, birds, bats, snails, rodents, wind and water are agents that aid in pollination.
- Flowers pollinated by animals have features to attract their pollinators – showy petals and scent.
- Insects pollinate about 70% of all flowering plant species.
- Flowers pollinated by birds are usually red, orange or yellow because birds see well in this range of light.
- Bat pollinated flowers bloom at night because bats do not see well. They have dull white petals and a strong scent.

- Wind pollinated plants have large feathery stigmas to trap wind borne pollen grains. They produce a large amount of pollen grains.

#### Fertilization

- Once pollen grains have been transferred from anther to stigma, the tube cell grows a thin pollen tube into an ovule.
- The 2<sup>nd</sup> cell within the pollen grain divides to form 2 male gametes which move down the pollen tube and enter the ovule.
- The egg within the ovule unites with one of the sperm cells and forms a zygote that will develop into an embryonic plant in a seed.
- The 2 polar nuclei in the central cell of the ovule fuses with the second sperm cell to form the endosperm – tissue with nutritive and hormonal functions that surrounds the developing embryonic plant in a seed.
- This process in which 2 separate cell fusions occur is called double fertilization.
- After double fertilization has occurred, the ovule develops into a seed, and the ovary surrounding it develops into a fruit.



#### Embryonic Development

- Flowering plants produce a young plant embryo complete with stored nutrients in a compact package, the seed that develops from the ovule after fertilization.
- Development of the embryo and endosperm following fertilization is possible because of the constant flow of nutrients into the developing seed.
- The 2 cells that are formed as a result of the 1<sup>st</sup> division of the fertilized egg est. polarity in the embryo
- The large basal cell develops into a suspensor – multicellular structure that anchors the embryo and aids in nutrient uptake from the endosperm
- Apical cell becomes actual embryo
- The mature embryo consists of: a short embryonic root (radicle), an embryonic shoot, and one or two cotyledons (seed leaves).
- The short portion connecting the radicle to the cotyledons is the hypocotyls.
- The shoot apex or terminal bud is the plumule.

- After the radicle, hypocotyls, cotyledons and plumule have formed, the young plant's development is arrested and when conditions are right, germination begins.
- The cotyledons serve as storage organs and become large, thick and fleshy as they absorb the food reserves. Seeds that store nutrients in cotyledons have little or no endosperm at maturity.

#### Fruits

- After double fertilization takes place within the ovule, the ovule develops into a seed and the ovary surrounding it develops into a fruit.
- The 4 different types of fruits are :
- Simple Fruit – develops from a single pistil. May be fleshy or dry. A berry is a fleshy fruit that has soft tissues and contains a few seeds.
- Aggregate Fruits – Formed from a single flower that contains several carpels. After fertilization, each ovary enlarges and many fuse together to form a single fruit.
- Multiple Fruits – Formed from the ovaries of many flowers that grow in proximity on a common floral stalk. Ex: pineapple
- Accessory Fruits: Differ from other fruits in that other plant tissues in addition to the ovary tissue make up the fruit. Ex: apples and pears

#### Disadvantages of Sexual Reproduction

- Too costly □ Both male and female gametes are required and the gametes have to meet for reproduction to occur. The many adaptations of flowers for different modes of pollination represent one of the costs of sexual reproduction
- Produces some individuals with genotypes that are well adapted to the environment but also those that are less well adapted.
- High death rates among offspring.

#### Key Terms--

**Sepals**--protect the flower (on the outside)--Protect the flower during bud stage

**Petal**--protect the flower--they are thin, broad, and flat barriers--useful in reproduction

**Stamen**--male reproductive organ--

**Filament**--think stalk in the stamen

**Anther**--top of the filament--saclike structure in which pollen grains form

**Pollen Grains**--the "semen" of the plant--they travel from one plant to another

**Pistil**--Female part of a flower--most consist of a single carpel

**Carpels**--female reproductive organs

**Ovules**--structures with the potential to develop into seeds

**Stigma**--place where pollen grains land

**Style**--neck like structure through which the pollen tube grows

**Ovary**--jug like structure that contains one or more ovules and that has the potential to develop into a fruit