Chapter 8. Pollination and Fertilization

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Solution 1:
Pollination is the transfer of pollen grains from the anther to the stigma of the same or another flower.
The male gametes are produced inside pollen grains located in the anthers of androecium whereas the female gametes are produced in the ovules located in the ovary of gynoecium. For forming zygote, the male gametes need to be transferred to the gynoecium for fusing with the female gametes. This is achieved through pollination. Pollination occurs through insects, wind or other agents.
There are two types of pollination – **Self pollination and cross pollination.**

Solution 2:
The two modes of pollination are:

(i) Self-pollination – It is the transfer of pollens produced within the anther of a flower to the stigma of the same flower or to the stigma of another flower of the same plant. In such flowers, pollination is ensured since the flowers bear similar genetic characters. Self pollination can occur in bisexual or monoecious flowers. Examples of plants showing self pollination are Mirabilis, Arachis etc.
(ii) Cross pollination – It is the transfer of pollen grains from the anthers of a flower of one plant to the stigma of a flower of another plant. Cross pollination occurs in unisexual or dioecious flowers such as papaya, maize, jasmine, rose etc.

Solution 3:

Self pollination	Cross pollination
It occurs between anther and stigma of the same plant.	It occurs between anther and stigma of different plants.
External agent is not required.	External agent is required.
Anther and carpel mature at the same time.	Anther and carpel mature at different times.
This pollination preserves the parental characters.	This pollination does not preserve the parental characters.
Pollen grains are produced in less quantity.	Pollen grains are produced in large quantity.

Advantages of self pollination:

(i) Purity of race is maintained.
(ii) Wastage of pollen grains is avoided.
(iii) Less chances of failure of pollination
(iv) Flowers need not produce scent, nectar or be coloured.

Disadvantages of self pollination:

(i) Continued self pollination leads to weakening of the progeny.
(ii) Poor quality of seeds are produced
(iii) Defective or weaker characters cannot be eliminated.

Advantages of cross pollination:

(i) Production of stronger and healthier progeny
(ii) Production of many viable seeds
(iii) New varieties produced with desirable characters.
(iv) This pollination is employed for crop production.

Disadvantages of cross pollination:

(i) It is a highly uneconomical process since large quantities of pollen grains need to be produced to compensate for the wastage.
(ii) External agents are needed; hence there is no surety of success of pollination.
(iii) Large amount of energy is wasted by the plant to adapt various devices to bring about pollination.

Solution 4:

Adaptations required by self pollinated plants are:

- **Bisexuality** – Self pollination occurs only in bisexual flowers.
- **Homogamy** – Both anther and stigma need to mature at the same time.
- **Cleistogamy** – Flowers which are bisexual and never open are called cleistogamous flowers. They are small, colourless, odourless and without nectar. The pollen grains fall on the stigma inside the closed flower. Example – Arachis

Adaptations required by cross pollinated plants are:

- **Unisexuality** – The stamens and carpels are found in different flowers. The male and female flowers may be borne on the same or different plants.
- **Dichogamy** – In bisexual flowers, stamens and carpels mature at different times.

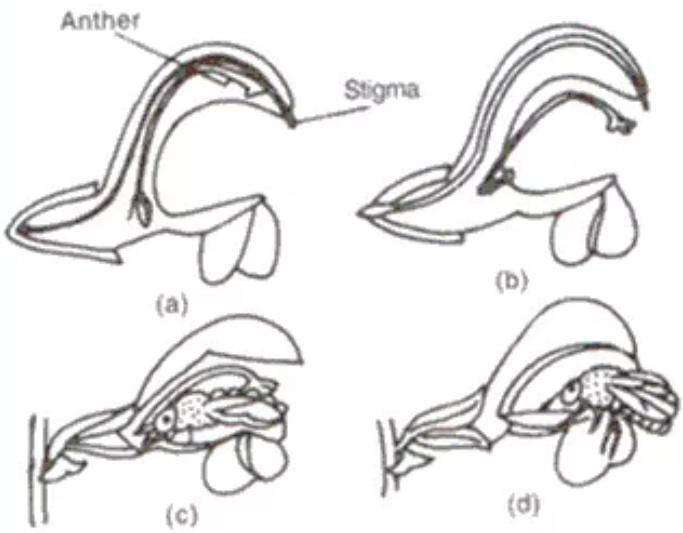
It is of two kinds:

1. **Protandry** wherein stamens mature before carpels. E.g – jasmine
2. **Protogyny** wherein carpels mature before stamens. E.g. – Rose

- Heterostyly – Here the style is either longer or shorter, thereby preventing self pollination.
- Herkogamy – Stigma and stamen mature at the same time, but some type of barrier prevents self pollination. E.g. – In caryophyllaceous flower, the stigma projects beyond the stamens so that pollens cannot fall on it.
- Self-sterility – Pollen of one flower cannot fertilize the female gametes of the same flower.

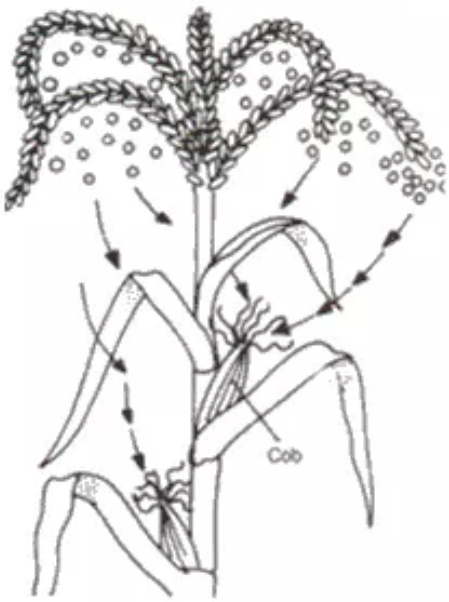
Solution 5:

Pollination in *Salvia* – Insects bring about pollination in *Salvia*. Flowers of *Salvia* have corolla whose upper part is bilipped and lower part is tubular where two stamens are attached. Upper lip forms a hood like structure while lower lip serves as a landing platform for insects. Of the two stamens, the fertile one is situated under the hood like upper lip of corolla. When an insect sits on the lower lip and pushes its proboscis into the corolla tube for collecting nectar, its back touches the fertile anther, which gets dusted with pollen grains. When this insect visits another flower for nectar, the style bends down and touches the back of the insect, as a result pollination occurs.



Pollination in Salvia: (a)–(b) – L.S. of flower showing immature pistil and mature stamen, (c)–(a) Bee carrying pollen, (d)–(a) Flower with mature stigma

Pollination in Maize – Pollination in maize is brought about by wind. Maize plant is monoecious. The cluster of male flowers called tassel are borne terminally whereas the female inflorescence i.e. cobs are borne laterally at lower levels. Silky thread like styles project out of the female flowers. Male flowers produce many heavy pollen grains, which get released during mild winds and fall down vertically. They fall on stigma, bringing about pollination.



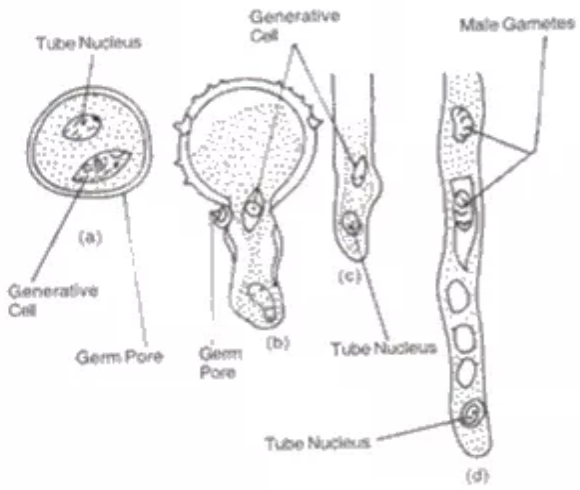
Maize (Wind pollination)

Solution 6:

Fertilisation is defined as the fusion of the male and female gametes.

Solution 7:

Pollen grains deposited on the stigma absorb water and swell, due to which its exine ruptures and intine grows out as pollen tube. Pollen tube grows through the style by secreting enzymes that digest reserve food in the tissues of stigma and style. The vegetative nucleus moves to tip of the pollen tube followed by the generative nucleus which divides into two male nuclei. Now the pollen tube enters the ovule through the micropyle and discharges the two male gametes into the embryo sac.



Germination of pollen grain

Solution 8:
In angiosperms, during fertilization, one male gamete fuses with the egg cell and forms diploid zygote in a process called syngamy. The other male gamete fuses with the two polar nuclei to form a triploid nucleus called primary endosperm nucleus. This process is called triple fusion. Since fertilization takes place twice here, so this process is called double fertilization.
Significance – Due to double fertilization, triploid nucleus develops into endosperm which serves as nutrition for embryo.

Solution 9:
Fruit is a ripened ovary containing one or more seeds.

Solution 10:
After fertilization, ovary undergoes two important changes:

- The ovules develop into seeds
- The ovary walls thicken and ripen into pericarp or fruit wall.

Solution 11:
Yes, fruits are important for the plant since the seeds mature inside it. Fruits are colourful and tasty and hence eaten by animals. This helps in far and wide dispersal of the seeds.

Solution 12:
(i) (c) entomophily
(ii) (a) bats
(iii) (a) ornithophily
(iv) (a) syngamy
(v) (c) pomology
(vi) (b) true fruits