

# Pollination in Angiosperms

## Learning Objectives:

At the end of this session, you will be able to

- Define Pollination.
- Classify pollination with proper definition
- Differentiate between Self pollination and Cross pollination
- Write the advantages and disadvantages in self and cross pollination
- Write characters of flowers pollinated by a) wind b) Insect and c) water
- Write devices favouring cross pollination in plants.

## Discussion:

Pollination is the transfer of pollen grains from anther to stigma of a flower. This transfer may occur within the same flower, between flowers of the same plant or between flowers borne on two different plants.

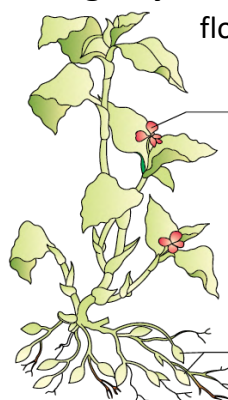
Pollination results into fertilization. After fertilization, fruit and seeds are formed. These are the steps followed in sexual reproduction.

Later we will discuss how fruits and seeds may be developed without the act of pollination and fertilization. Here we will discuss Pollination in details.

## Types of Pollination:

- 1) Self Pollination
  - a) Autogamy
  - b) Geitonogamy
- 2) Cross Pollination

**Autogamy:** Here the pollen grains are transferred from anther to stigma within the same flower. There are several self pollinating plants. Under certain conditions self pollination is obligatory. For example **Cleistogamous flowers** do not open at all. So cross pollination is not possible naturally and are completely automatic self pollinated. *Commelina*, *Viola* and *Oxalis* are typical examples of cleistogamous flowers.



**Geitonogamy:** Here the pollen of a flower is transferred to stigma of another flower. Here both the flowers are borne on the same plant. This transfer may occur between the male flower (unisexual) and female flowers (unisexual) on the same plant. Such plants exhibit

**monoecious** condition.

### Advantages and Disadvantages of Self pollination

Advantages	Disadvantages
1. Success in pollination is quite high 2. Prevents mixing of traits thus purity is maintained 3. Flowers need not be large, showy or develop any features to encourage pollination 4. Relatively less number of pollen grains are required even for higher success rate 5. Dependency on external factors are nil	1. continued self pollination causes inbreeding depression i.e. weaker offspring 2. will not lead to development of new varieties or species

**Cross Pollination:** When the pollen is transferred from a flower borne on one plant to the stigma of the flower on other plant, it is called Cross pollination or **Xenogamy** or **Allogamy**. Here the two plants are involved.

### Advantages and Disadvantages of Cross pollination

Advantages	Disadvantages
1. causes mixing of new traits to evolve new varieties 2. Healthier and plants with more adaptability (Hybrid vigour) 3. Solution to self sterile plants to produce seeds	1. Plants have to develop certain adaptive features to allow cross pollination 2. Pure lines are not maintained 3. Unwanted / undesired traits may express

### Features of a flower promoting Cross pollination

In bisexual flower, a natural tendency for self pollination exists. In spite of such, cross pollination occurs in such flowers. In this discussion let us try to understand under what conditions the flower opts for cross pollination.

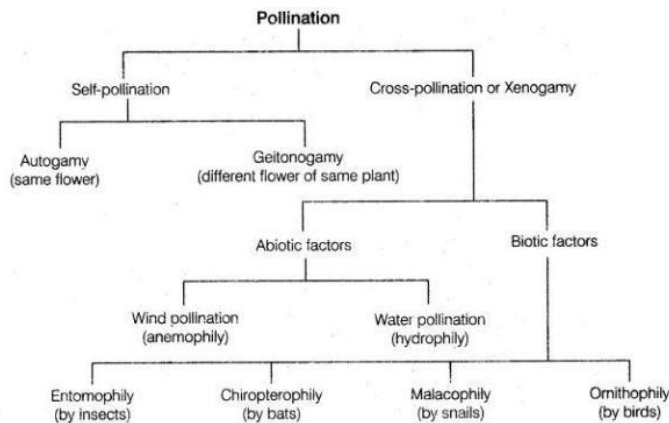
- 1) **Heterostyly:** When styles and filaments differ in length
- 2) **Herkogamy:** Presence of some physical barriers between stamen and pistil and preventing self pollination
- 3) **Dichogamy:** maturation of anther and stigma of the same flower at two different times and thus preventing self pollination. When pistil matures before the anthers it is called **protogyny** and when anther matures before stigma it is **protandry**.
- 4) **Self-Incompatibility:** it is also called self- sterility. It is the inability of fertile pollens to fertilize the same flower.

5) **Male sterility:** In certain species, the pollen grains are non functional i.e. sterile . Such condition is known as male sterility

6) **Dicliny.** It refers to unisexual flowers which are of two categories: viz. i) monoecy and ii) dioecy. When staminate and pistillate flowers are present on two different plants, it is called **dioecy**. In such flowers, cross pollination is the only natural choice.

### Agents for Cross Pollination in Angiosperms:

During cross pollination, the pollen is transferred to the stigma of a different flower on a different plant. In other words, the pollen has to travel some distance. Under such a condition



the pollen requires to take help of certain travel agents to land onto the stigma. The agents causing cross pollination is generally divided into two main groups-

1) Abiotic Agents (wind, water etc.)

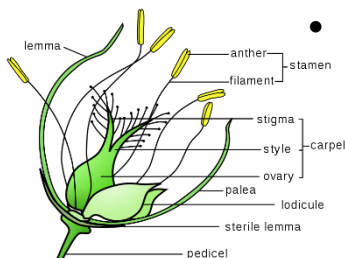
2) Biotic Agents (different animals like insect, bird, bat, snail etc.)

### Wind Pollination (Anemophily)



Since the pollens are to be carried by wind current may be upto far off distance, the anther and stigma need to be exposed to wind by reducing the accessory floral parts. A large number of pollen grains will be wasted in the process. So the flower should have the following adaptive features:

- Flowers are generally small, colourless, odourless and lack nectar
- Accessory whorl (calyx, corolla) are highly reduced or absent to allow exposure of essential whorls



- Pollen grains are small, dry, numerous and dusty, often winged to be blown to long distances
- Stamens with long filament and versatile anther
- Stigma exposed, hairy or feathery to catch pollen in air
- Male flowers are more than female flowers
- Example- maize, paddy, sugarcane, bamboo, coconut

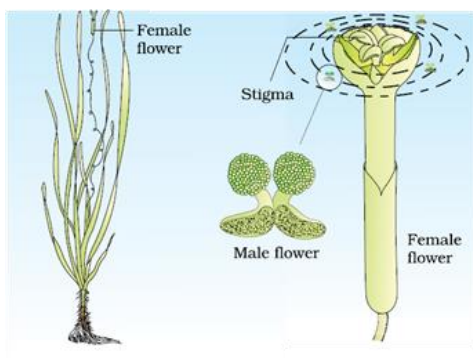
palm etc

## Water Pollination (Hydrophily)

Pollination caused by water is hydrophily. Such flowers are hydrophilous. It is found only in a few aquatic plants like *Hydrilla*, *Zostera*, *Vallisneria* etc.

Flowers pollinated by water have the following adaptive features

- These flowers are usually small, colourless and odourless
- Floral parts do not get wet
- Stigmas are usually long and sticky type
- In *Zostera*, the marine plant remains submerged and have long pollen grains. The



pollen grains are devoid of exine. They float below water surface but when come in contact with the stigma, they coil around it and then germinate.

- *Vallisneria* is a submerged fresh water plant. Male and female plants are separate (dioecious species), so male and female flowers are borne on separate plants. On maturation the male flowers get detached and float on the water surface. Mature female flowers with sticky stigma

also float on water but are held to the substratum by long stalks. Male flowers burst their anthers on contact with female flowers. Pollination thus occurs on the water surface and the female flowers are pulled down into the water due to coiling of the long stalks.

## Insect Pollination (Entomophily)

When insects act as pollinators, the flowers are entomophilous. Butterflies, beetles, moths, bees are the most common agents. To attract the insects the flowers require some special adaptations as listed below:



- Flowers are usually large, showy, colourful. If small, they are borne in cluster to provide a good landing ground for the insects.
- Where small flower do not form clusters, colourful bracts solves the purpose of attraction
- These flowers are highly scented
- These flowers provide nectar to the visitors
- Pollen grains of certain flowers are also eaten by insects (Rose, Magnolia)
- Outer surface of the pollen grains are usually spiny or sticky so that it attaches easily on the body surface of insects.
- In plants like *Viola*, special marging on petals attracts insects to pay a visit.

- Certain relationship with colour of the flower and visiting insects have been found. Moths are usually attracted by white flowers while butterflies and wasps visits red flowers.
- Angiosperm pollen also possess **pollenkit** a yellow sticky substance which acts as insect attractor and gets attached to the insect body.

### Bird Pollination (Ornithophily)

Birds like parrot, Humming bird, Sun bird, crow, bulbul etc. visits flowers and causes pollination. Such flowers are ornithophilous. These flowers are also specially adapted to attract birds and get pollinated.



important attractant.

- These flowers are naturally large in size having funnel shaped corolla
  - Colour of these flowers are bright so that they are visible from a long distance. Flowers mostly attracted are red, blue, orange, yellow etc.
  - Visitors are served with abundant nectar which is an
- Stamen and Pistil are so oriented that they easily contact the pollinator during visits
  - Flowers are generally drooping or hanging type
  - Flowers are generally without fragrance
  - Examples- Botthe brush (*Callistemon*) , *Butea*, *Bombax*, *Bignonia*, *Agave*

### Bat Pollination (Chiropterophily)

Bats are nocturnal mammals and so visits flowers at night. They are capable of transporting pollen grains to very far of distances. Bat pollinated flowers also have certain adaptations to attract the pollinators.



- These flowers are usually strongly scented, and dull coloured
- They produce huge amount of nectar
- The flowers usually opens after sunset
- Examples- *Adansonia*, *Anthocephalous*, *Bauhinia*, *Kigellia* etc.

## Snail Pollination (Malacophily)



These flowers are pollinated by snails and slugs. *Chrysanthemum*, *Lemna* and *Arisaema* are good examples.

### Image Sources:

Biology Class XII, NCERT

[https://en.wikipedia.org/wiki/File:Choeronycteris\\_mexicana,\\_Mexican\\_long-tongued\\_bat\\_\(7371567444\).jpg](https://en.wikipedia.org/wiki/File:Choeronycteris_mexicana,_Mexican_long-tongued_bat_(7371567444).jpg)

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