AGENTS FOR POLLINATION

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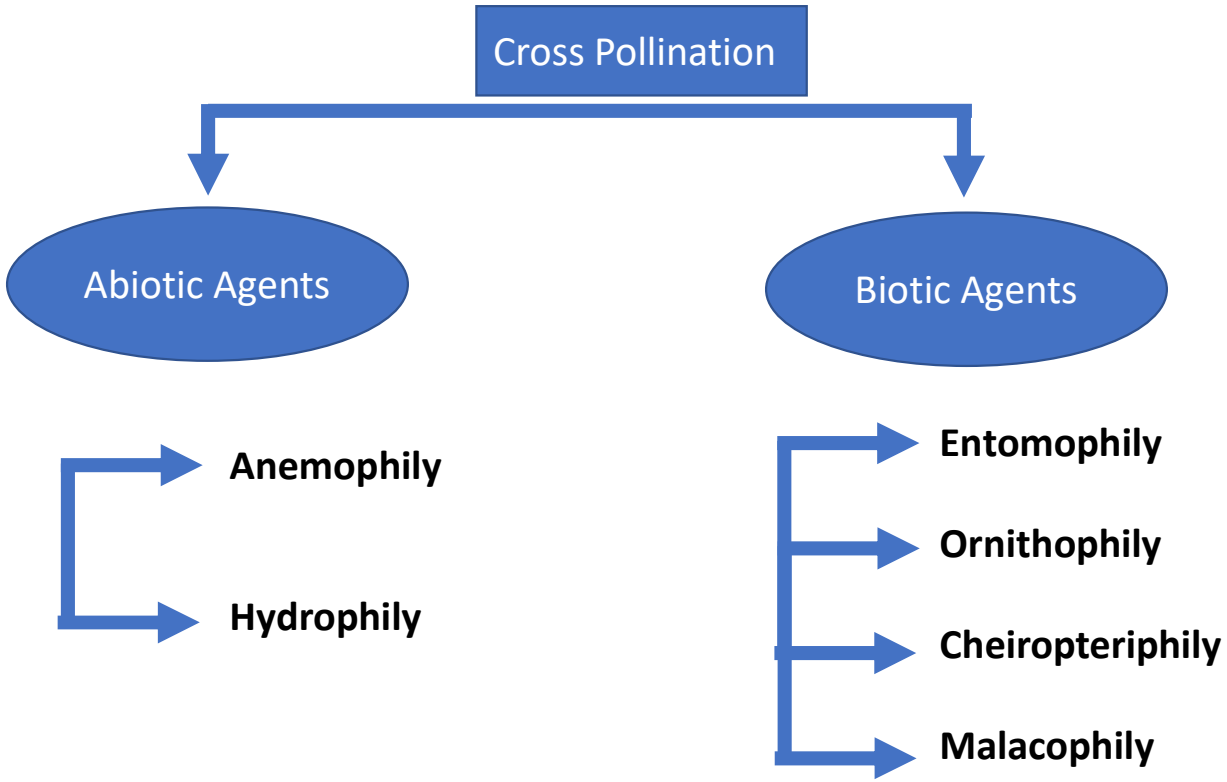
Agents for Pollination

As the pollen is not capable of locomotion, pollination involves some agents for transfer of pollen grains especially in case of cross pollination.



ABIOTIC AGENTS

Anemophily (Pollination by air/ wind)

Adaptation

- Flowers- inconspicuous, usually not brightly coloured or scented
- Petals are either small and green or absent
- Male flowers are more numerous than female
- Anther are versatile so that they swing freely by air currents
- Pollen grains are smooth walled, relatively light, small and dry so they can be easily blown away by wind.
- In grasses, pollen grains are relatively heavy and hence are not suitable for transport by wind. To overcome this problem, the male flowers are borne in the upper part of the inflorescence and the female in the lower part.
- Examples; Most cereals and palms, Member of Salicaceae (Poplar, willow), Betulaceae (Alder, hazel, birch), Fagaceae (Oak, beech), Ulmaceae (Elm), Urticaceae (Urtica) etc.

Hydrophily (Pollination by water)

Hydrophilous flower are small and inconspicuous like anemophilous

Hypo-hydrophily

- Pollination takes place completely under water.
- More common
- Pollination of flower below water level and is found in submerged plants like *Najas, Ceratophyllum* and *Zostera*
- Aerenchyma present in anther- float

Epi-hydrophily

- Pollination of flower at the surface of water
- Example - *Vallisneria*
- Whole male flower break and float on the surface.
- Female flower are raised to the surface by a long spiral stalk.

BIOTIC AGENTS

Most important agent for pollination

- **Entomophily: pollination by Insects**
- **Ornithophily: pollination by birds**
- **Chiropteriphily: pollination by bats**
- **Malacophily: pollination by slug and snail**

Entomophily (Pollination by insects)

- Most frequent in Angiosperms.
- Small amount of pollen grains.
- Pollens are sticky with a rough surface so they may easily stick to insect limbs.
- Special relationship between flowers and insects (Coevolved during evolution)
- Insects visit flowers to secure food in the from of pollen sap and nectar, to deposit their eggs and for shelter etc.

Insect pollinated flowers are made attractive to insects in many ways

Conspicuous Flowers: Large and brightly colored

- Aggregation of small flowers forming inflorescences as capitula.
- Petals: Most common
- Sepals in *Mussaenda*
- Bracts in *Bougainvillea*
- Spathe of the inflorescence in *Musa*
- Insects see only UV wavelengths
    - Bee – blue colour
    - Butterflies – Red
    - Flies – brown and purple

Scent

- In some species scent is more specific then colour.
- Flies seem to be attracted by the nauseous odour produce by certain flowers like *Rafflesia.*
- Certain flower emit a strong scent during night and are found to be pollinated by night flying moths. For Example – *Nyctanthes, Cestrum* and *Ampelopsis*

Nectar

Nectar glands are situated in different positions of flowers secreting as sugary fluid called nectar.

Nectar is the most valuable thing for which insects visit flowers. Bees collect nectar and elaborate it into commercial honey.

Nectar glands are located on the thalamus, on the outside of sepals, at the bases of sepals, petals, carpels and even in the septa within ovaries.

Nectar is often concealed within corolla tube or spur so that insects have to do much searching for this and thereby get thoroughly dusted with pollens.

Edible sap

Some flowers do not have nectaries but secrete an edible sap. For example- *Orchis, Hyacinthus, Anagallis, Verbascum and Erythraea*

They secrete juice and sticky substances which cause pollens to stick to the body of insect.

Edible pollen

- Some flower produce numerous pollen.
- They are eaten by insects and some pollens are stick to the body for pollination.
- Examples: *Clematis, Anemone* and *Salix*

Special mechanisms

Bi-fid stigmas of *Bignonia* close the two flaps on being touched by insects. If not pollinated, they open again

Pistil of *Centaurea of Asteraceae bends and exposes the stigma on touched by insects*

Lever mechanism in *Salvia* of Labiatae (Sage Flower)

- *Salvia* has bilabiate corolla with two epipetalous stamens. The stamen and pistil remains hidden under the upper lip.
- The short epipetalous filament of each stamen is connected to the distractile connective which is long and lever like, its two unequal arms separating the two anther lobes.
- The upper lobe of the anther is fertile and lower is sterile.
- When bee enter in flower for nectar at the end of the corolla tube. They push against the united lower anther lobes thereby bringing down the fertile anther lobes which dust the bee's back with pollens.
- When this pollen containing bee visited another flower where pistil is matured, the stigmas protrude out of the upper lips so that bee pollinating them

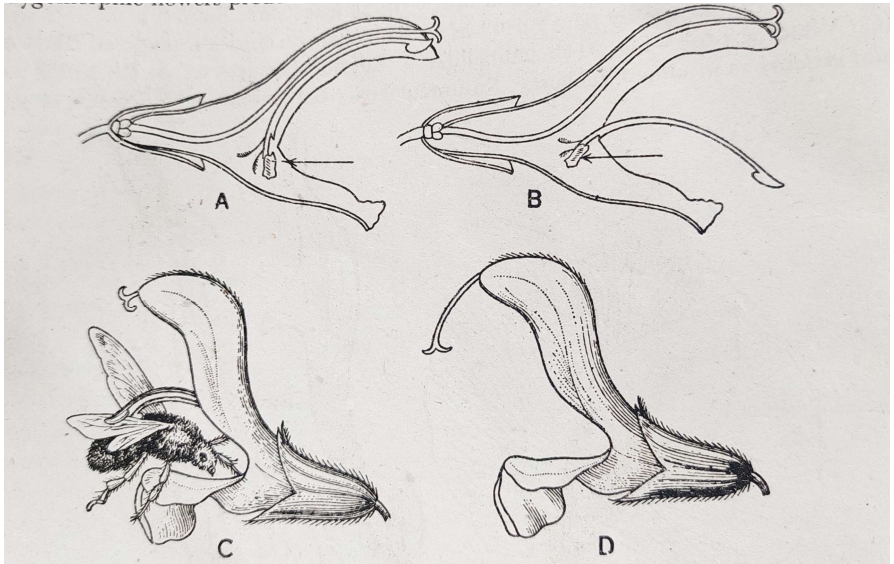


FIG. 397. Pollination in *Salvia*. A & B. L.s. of flower showing immature pistil and movement of stamen when pressed in the direction of the arrow. C. A bee becoming dusted with pollen. D. A flower with mature stigma.

Trap Mechanism in *Aristolochia*

- This possess special traps for Diptera flies.
- Flower of *Aristolochia clematitis* is protogynous and having odour smell
- When flies enter in the young upright flower, the flies crawl down the corolla tube pushing the downward pointed hairs but they cannot come out until these hairs wither away.
- When the anthers mature, pollens bursting out and smeared the flies.
- After anthesis flower bending down and the flies come out with pollens.
- They can enter into another flower and pollinate its stigma

Relationship between Ficus spp. and Fig wasp

- Flower of *Ficus* plants of moraceae are enclosed within the hollow flask shaped hypanthodium inflorescences and open through a small terminal pore.
- Three types of flowers- male, female and gall (Sterile female flower).
- The male flower are located on the top near opening pore while lower down are the long-styled female flowers and the short-styled gall flowers.
- Figs are pollinated by the gall wasp (Blastophaga) which crawl into the receptacle and lays eggs inside the ovules of the gall flowers. The eggs develop larvae which feed on the ovules and form galls.
- When larvae develop into mature wasps, they came out from the fig. During this process they brush against the male flowers near the opening pore carrying away pollens on their bodies.
- These pollen-laden wasps then enter into the fresh figs where they pollinate the long styled female flowers.

Ornithophily (Pollination by birds)

- Not many in number. Pollen grains are attached on beaks/ mouth
- Small birds like humming birds and honey thrushes feed on the nectar of flowers like *Bignonia capreolata* and pollinate them
- Large flowers of *Strelitzia* (Musaceae) are pollinated by honey bird.
- Silk cotton, *Erythrina* and few other trees are visited by birds and these birds may play some role in pollination.

Cheiroteriphily (Pollination by bats)

- Anthocephalus cadamba, Kigelia Africana, Bauhinia megalandra and some other trees are known to be pollinated by bats.

Pollination by other animals

- Malacophily: Pollination by snails
- Myremecophily: Pollination by ants
- Pollination by squirrels

References

- Bhojwani SS, Bhatnagar SP (2011). The Embryology of Angiosperms, Vikas Publishing House, Delhi.
- Singh V, Pande PC, Jain DK (2014). A text book of botany: Angiosperms, Rastogi Publication, Meerut
- Gangulee HC, Das KS, Datta C. (2011). College Botany Volume I, New Central Book Agency, Kolkata

Thank You