EXPERIMENT

AIM

To study adaptation of pollination by different agencies (wind, insects, bird).

MATERIAL REQUIRED

Flowers of different plants, microscope, forceps, needle.

THEORY

Pollination: The transfer of pollen from an anther (male part) of a plant to the stigma (female part) of a plant, later enabling fertilization and the production of seeds, most often by an animal or by wind. Transfer of pollen grains from the opened anther of stamen to the receptive stigma is called pollination. It is of three types:

- **Self-pollination (Autogamy):** It refers to the fusion of two gametes that come from one individual. Geitonogamy: Geitonogamy is when pollen is exported using a vector (pollinator or wind) out of one flower but only to another flower on the same plant. It is a form of self-fertilization.
- **Cross-pollination (Xenogeny, Allogamy):** Cross-pollination is the process of applying pollen from one flower to the pistils of another flower. Pollination occurs in nature with the help of various agents like wind, water, animals, insects, etc.

1. **Anemophily:** When the way of pollination is through wind, it is called anemophily. Anemophilous flowers have following adaptations:
   - **(i)** Flowers small, colourless, odorless and nectar less.
   - **(ii)** Calyx and corolla reduced.
   - **(iii)** Stamens-many with pollen grains-small, light, dry, dusty sometimes winged so can be blown away by wind to long distances.
   - **(iv)** Pollens produced in huge quantities.
   - **(v)** Stigma-large, well exposed, hairy, feathery to catch pollen. e.g. Grasses, sugarcane, bamboo, coconut palm, date palm, maize, Cannabis.
2. **Hydrophilic:** Pollination by water.
   - **(i)** Small, colourless, inconspicuous, odorless, nectar less flowers.
   - **(ii)** Calyx, corolla-unlettable.
   - **(iii)** Stigma long and sticky. e.g., Vallisneria, Zostera, Ceratophyllum, Hydrilla.
3. **Entomophily:** Pollination by insects.
   - **(i)** Large, conspicuous, brightly coloured and showy flowers to attract insects.
   - **(ii)** Petals-large and attractive.
   - **(iii)** Flowers blossom at a specific time when particular pollinator is available.
   - **(iv)** Flowers produce specific odour to attract insects.

(v) Pollen edible.

(vi) Nectar secreted from nectaries of flower as source of food for insects.

(vii) Pollen surface rough, spiny or covered by yellow sticky substance called pollenkit which acts as insect attractant and as an adherent to insect body eg., Salvia, Rosa, Magnolia, Sunflower, Bougainvillea.

4. **Ornithophily:** Pollination by birds.

(i) Flowers large with tubular or funnel-shaped corolla.

(ii) Flowers brightly coloured and produce abundant watery nectar.

(iii) Odourless e.g., Agave, Bignonia, Bombax, Callistemon.

PROCEDURE

1. Take a flower and observe its parts with the hand lens.
2. Extract the pollen and the pistil and observe under the microscope.

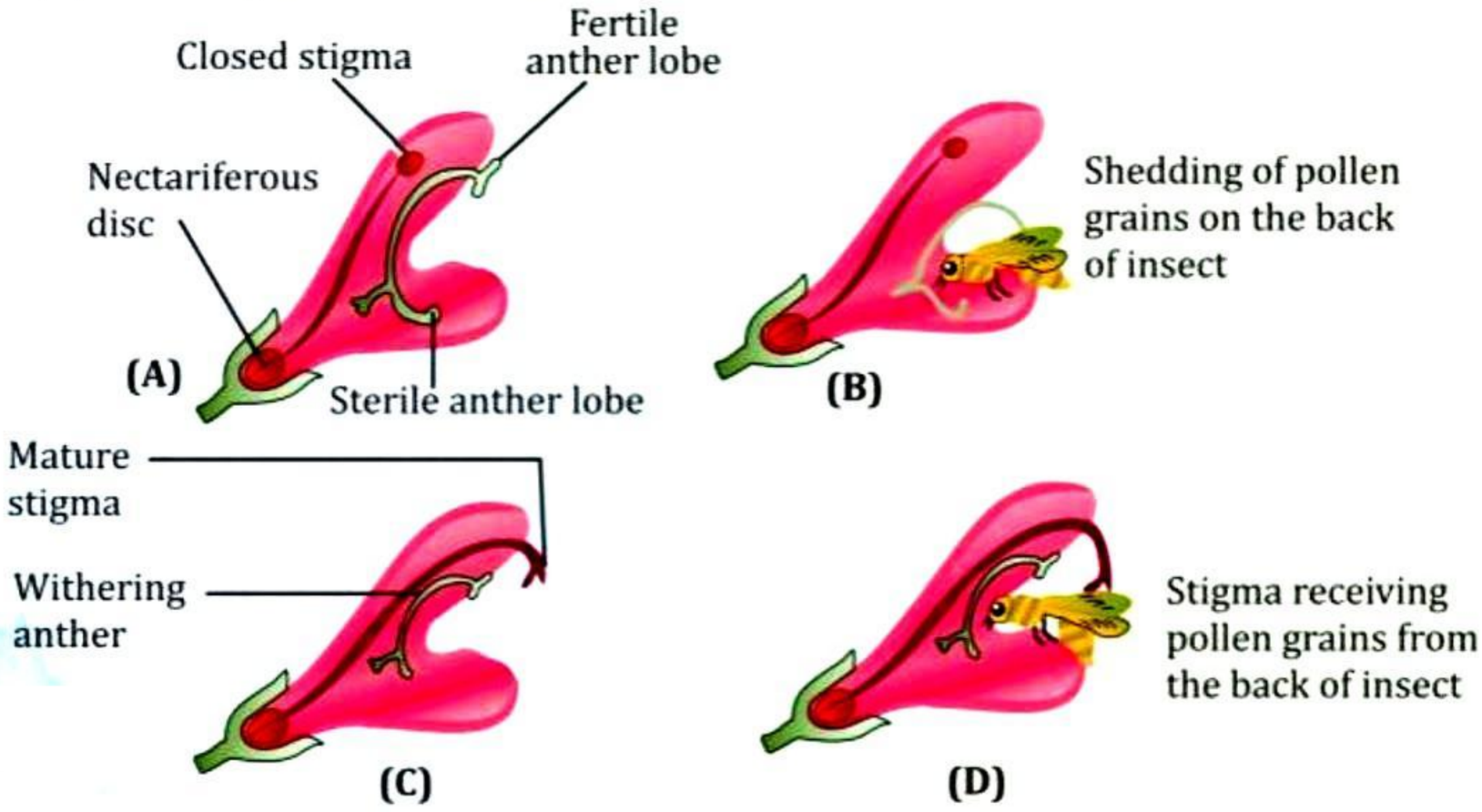
OBSERVATIONS

Entomophily (Polination by Insect)

1. **Salvia:** Pollinated by honeybees.

Adaptations in flowers are:

(i) Gamopetalous corolla which is two lipped (bilabiate). Lower lip provides platform for insect.



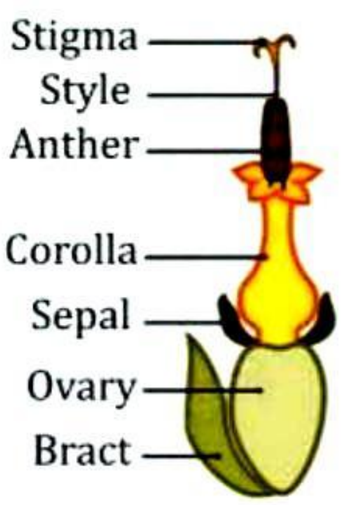
Pollination is Salvia : A. flower with mature anthers, closed stigma and short style, B. shedding of pollen grains on the back of entering insect, C. flower with mature stigma and withering anthers, D. stigma receiving pollen grains from the back of entering insect

(ii) Each flower has two epipetalous stamens (stamens attached to petals by filaments). Each stamen has short filament and elongated connective. Half the anther is sterile and half the anther is fertile; both the lobes are separated apart due to elongation of connective. Upper arm of connective bears fertile lobe of anther and lower arm of connective bears sterile lobe. Sterile lobes of both anthers form a plate above the lower lip. When a bee lands on lower lip to suck nectar, sterile plate is pushed down, bringing down the fertile anther which dusts the pollen on back of bee. In flowers which have

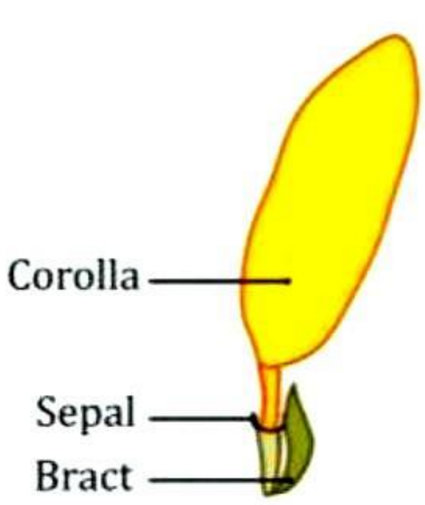
dispersed their pollen, stigma hangs down. When bee loaded with pollen visits such a flower, stigma gets pollinated from its back.

2. **Sunflower:** Pollination by insects (honeybees). Small flowers bloom in bunches and are condensed together to form a head or capitulum so that a single insect pollinates large number of flowers. Stigma is hidden and immature to avoid self-pollination. The inflorescence has two types of flowers arranged on receptacle.

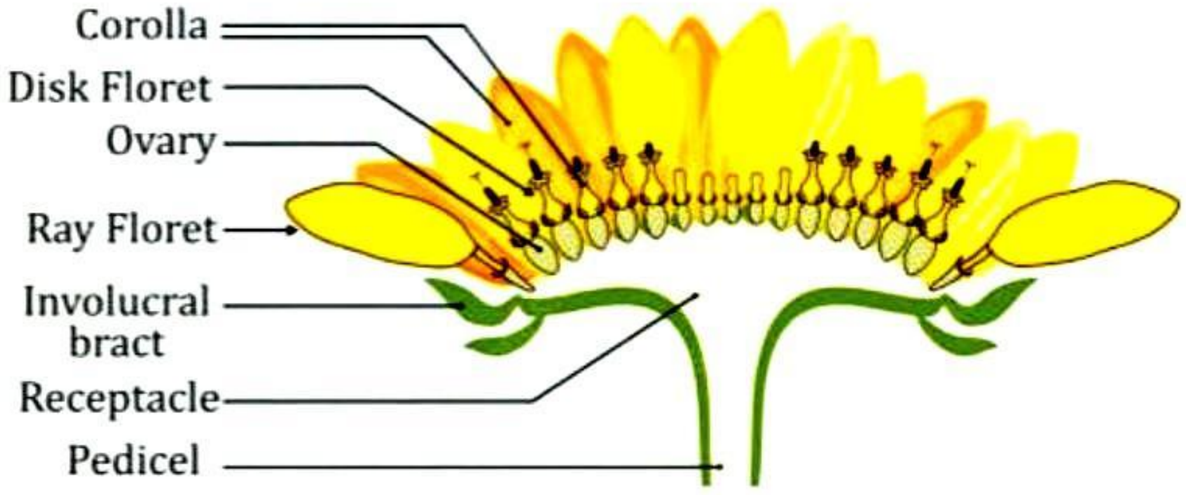
Ray florets- brightly coloured; arranged on periphery of receptacle; to attract insects.



Disk Floret



Ray Floret



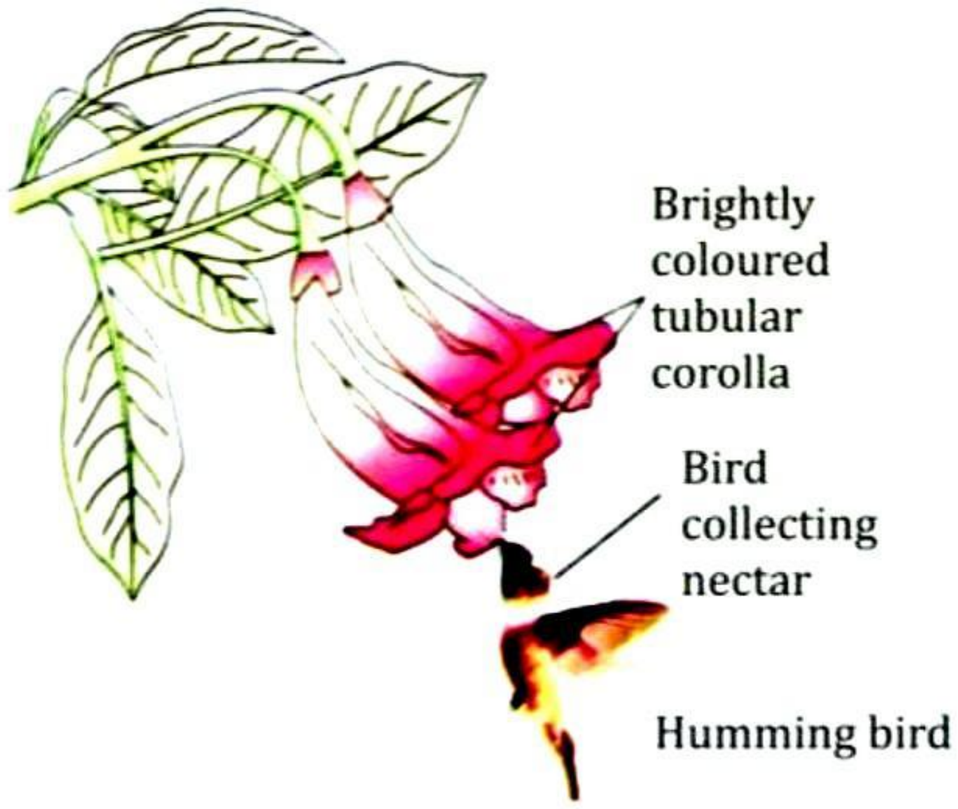
Inflorescence

Disc florets - arranged in central region of receptacle; contain long style with two stigmas and nectary at base of style. So when insect visits the inflorescence to collect nectar it receives pollen over its legs and under surface of abdomen, thus pollen reaches the stigma of other flowers. Stamens ripen before stigma to prevent self-pollination.

Omithophily (Pollination by Birds)

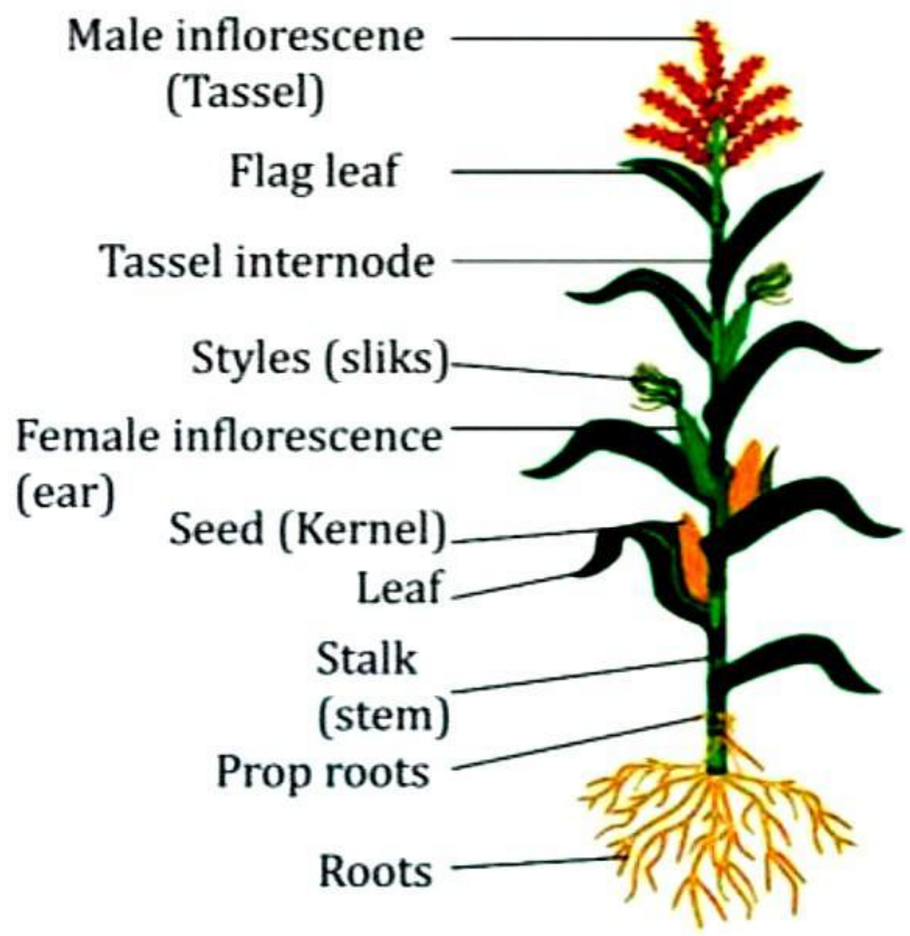
Bignonia

1. The flowers are big and brightly coloured red, orange, yellow or blue.
2. The flower parts are thick and leathery especially corolla.
3. The flower produced abundant nectar and may also have certain edible parts. Birds visit flowers for feeding on this nectar.
4. The flowers are usually odourless (without any fragnance or scent).



Anemophily (Pollination by Wind)

1. **Maize(Zea Mays)**: Pollination by wind.
   (i) Flowers inconspicuous, non-showy and not brightly coloured.
   (ii) Flowers devoid of scent and nectar.
   (iii) Pollen produced in large number.
   (iv) Stigma shows silken threads to catch pollen from atmosphere.
2. **Pinus(Pine)**: Pollination by wind.
   (i) Pollen is produced in large number.
   (ii) Pollen is light weight and have wings, so, can be carried to far off places.
3. **Grasses(Wheat and Rice)**: Pollination by wind.
   (i) Flowers inconspicuous, non-showy, not brightly coloured.
   (ii) Flowers do not produce nectar and do not have scent.
   (iii) Pollen produced in large number; are light weight.
   (iv) Stigma feathery to catch pollen.



RESULT

The different types of flowers adapt themselves according to their habitat, availability and the type of pollinators. In this way, they show great variations in their morphological features along with special adaptive features.

PRECAUTIONS

1. The fresh flowers should be taken to study the morphological features.
2. The pollens should be gently dusted on slide with a drop of water before observing them under the microscope.

VIVA VOCE

Q1. How is autogamy different from allogamy?

Ans. In autogamy, the pollen grain reaches to the stigma of same flower and pollinates it whereas, in

allogamy pollination is between the flowers of different plants but of the same species.

Q2. Why is cross pollination preferred over self-pollination?

Ans. The cross pollination brings about the variability in the successive generation by the phenomenon of heterosis.

Q3. Name the different agents of pollination.

Ans. The plants are pollinated by various agents such as wind, water, insects, birds and animals.

Q4. What are anemophilous flowers?

Ans. The flowers in which pollination occurs through wind are called anemophilous flowers and this phenomenon is called anemophily.

Q5. Give examples of anemophilous flowers.

Ans. All grasses. Cannabis, sugarcane, bamboo, coconut, Pinus, maize, etc. are anemophilous flowers.

Q6. Why do anemophilous flowers produce pollen in huge numbers?

Ans. The wind pollinated flowers produce large number of pollens because chances of pollen getting wasted are higher.

Q7. How does pollination occur in wheat and rice?

Ans. Wheat and rice get pollinated by wind.

Q8. Why does wheat have feathery stigma?

Ans. The feathery stigma helps to catch wind borne pollens of wheat to bring about pollination in the plant.

Q9. The flowers of some plants are brightly coloured and also produce scent. What the likelihood of pollination agency in this flower?

Ans. The brightly coloured flowers generally attract insects. These insects visit the flowers for its fragrances also. In this process, they bring about pollination. So, these flowers are pollinated by insects.

Q10. How does pollination occur in Salvia?

Ans. The pollination is done mostly by honeybees in Salvia.

Q11. What is ornithophily?

Ans. The pollination done by birds is called ornithophily, e.g., Callistemon (bottle brush plant), Bombax malabarica, gave and Bignonia.

Q12. Why do aquatic plants have long coiled stigmatic flowers?

Ans. These plants produce female flower in such a way that the female part of the floats on the surface of water in order to catch the pollens.