Friday, 7 May 2021 7:33 AM

-: Pollination :-

self pollinated flower)

In flowering plant
- Male gamete — Produced in Pollen grain
- Female gamete — Produced in Embryo sac

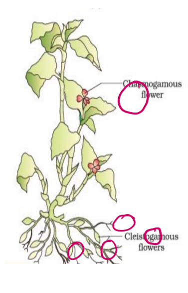
* Both type of gametes are non-motile. They have to be brought together for fertilization.
This is achieved by "Pollination" (mechanism/Process)

Transfer of pollen grains (shed from anther) to a stigma of a pistil is termed as pollination.

* Kinds of Pollination :- Depending on the source of pollen, pollination can be divided into ③ types.

(i) Autogamy — self pollination
(ii) Geitonogamy — self pollination
(iii) Xenogamy — cross-pollination

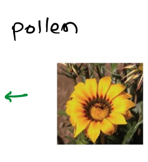
Autogamy :- (self marriage) In this type, pollination is achieved within the same flower. (Flower → Bisexual)
Transfer of pollen grains from the anther to stigma of the same flower.
"open flower or chasmogamous flower" ← In a normal flower which opens & exposes the anther and the stigma, complete autogamy is rather rare.
"Homo-gamy" ← * Autogamy is such flower require synchrony of pollen release & stigma receptivity & anthers & stigma should lie close to each other so that self pollination can occur.
The anther & stigma of open flower are brought together by Growth, Bending or Folding.
Some plant such as Viola (common pansy), oxalis and commelina
Produce two type of flowers
- chasmogamous — Flowers with exposed anthers and stigma
- cleistogamous (cleistogamy = closed marriage) — flowers which do not open (at all)



In such flowers the anthers & stigma lie close to each other. When anthers dehisce (open) in the flower buds, pollen grains come in contact with stigma to effect pollination. Thus cleistogamous flowers are (closed) invariably autogamous as there is no chance of cross-pollen landing on stigma. Cleistogamous flowers produce assured seed-set even in absence of pollinator. → Advantage
* flower do not develop devices to attract pollinators
* It is use to maintain pure line. (Homozygosity)
* Plant does not need to produce large number of pollen grains

Disadvantage :- 1. New useful characters are rarely introduced
2. Variability reduced ∴ adaptibility to change environment also reduced.

(ii) Geitonogamy :- (neighbour marriage) (Monoecious plant) Transfer of pollen grains from the anther to stigma of another flower of same plant.
Although geitonogamy is functionally cross-pollination involving a pollinating agent, Genetically It is similar to autogamy since the pollen grains come from the same plant.



(cross pollinated flower)

(iii) Xenogamy :- (strange marriage) (Cross pollination) Transfer of pollen grains from anther to stigma of a different plant. This is the only type of pollination which brings genetically different type of pollen grains to the stigma during pollination.
Cross-pollination is performed with the help of external agency.

* Flowering plants have evolved an amazing array of adaptation to achieve pollination. They make use of external agents to achieve pollination.

Agents of pollination

Abiotic (wind more common Among both)
- wind (Anemophily)
- water (Hydrophily)

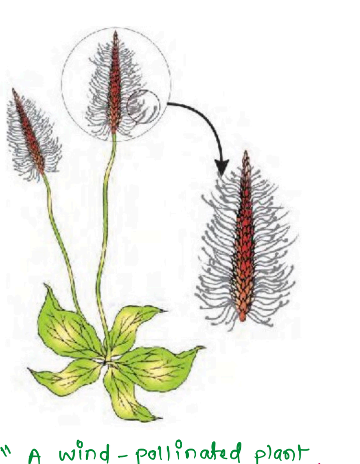
Biotic (Animals)
- Insects (Entomophily)
- Bats (chiropterophily)
- Birds (ornithophily)
- Snails (Malacophily)

Small proportion of plant use abiotic agent.
Majority of plant use Biotic agents.
Pollen grains coming in contact with the stigma is a chance factor in both wind and water pollination. To compensate for this uncertainities and associated loss of pollen grains, the flower produce enormous (large) amount of pollen when compared to the number of ovules available for pollination.

1 → 2	6 → 1
2 → 1	7 → 2
3 → 2	8 → 1
4 → 1	9 → 4
5 → 3	10 → 3

1. Wind pollination :→ Anemophily

* It is more common Amongst abiotic pollination
* characterstics of wind pollinated flower
- Flower is not very colorful.
- Flower do not produce nectar.
- Flowers are small and inconspicuous
① Pollen grains are light, small, non-sticky so that they can be transported in wind current.
② They often possess well exposed stamens so that the pollen are easily dispersed into wind current
③ They have large often feathery stigma so easily trap air-borne pollen grains.
uniovulate — wind pollinated flowers (often) have a single ovule in each ovary and numerous flowers packed into an inflorescence.
(familiar eg. is Corn Cob – The tassels we have seen are nothing but stigma & style which wave in the wind to trap pollen grains.)
- wind pollination is quite common in Grasses, other examples are coconut palm, Date palm, Maize.
- winged pollen grains of Pinus are found hundred of Kilometers away from the parent plants



" A wind-pollinated plant showing compact inflorescence and well exposed stamens."

2. Pollination by Water (Hydrophily) :→

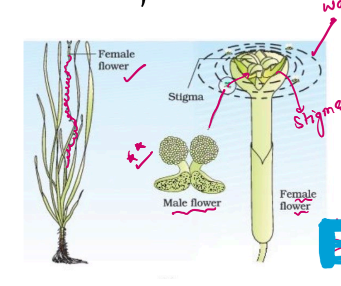
* It is quite rare in flowering plants and is limited to about (30) genera, mostly monocots.

> water is a regular mode of transport for male gametes among lower plant group such as algae, bryophytes and pteridophytes. It is believed that particularly some bryophytes and pteridophytes, their distribution is limited b/c of need of water for transport of male gamete and fertilization

characterstics :→
① Flowers are not very colorful → common
② Flowers do not produce nectar. → common
③ Flowers are small & inconspicuous
④ Pollen grains are naked (without exine)
- Thread like → For under water pollination
- spherical → For surface water pollination
⑤ In most of water-pollinated species pollen grains are Protected from wetting by a "mucilage covering"
⑥ Hydrophily is of two types.

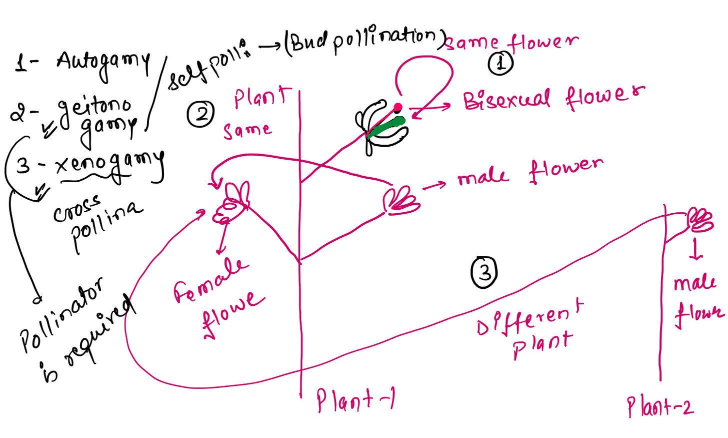
Hypohydrophily — occur below surface of water
Example: Zostera, — ceratophyllum (Submerged fresh water)
Zostera is marine sea grass
- Pollen grains are long ribbon like and without exine
- They are carried passively inside the water.
- stigma are long.
- Some of pollen grains reach the stigma & achieve pollination

Epihydrophily — occur over the surface of water
Example: Vallisneria & Hydrilla (Freshwater)
- Vallisneria is submerged dioecious plant.
- Female flower reach the surface of water by long stalk.
- male flower or pollen grains are released on to the surface of water.
- They are carried passively by water current, some of them evantually reach the female flower & stigma.
- After pollination, the female flower is pulled inside water by the coiling of its stalk.



"Pollination by Water in Vallisneria"

* Not all aquatic plant use water for pollination.
* In majority of aquatic plant such as water hyacinth and water lily, the flower emerged above the level of water and pollinated by insect or wind.



Zoophily :→

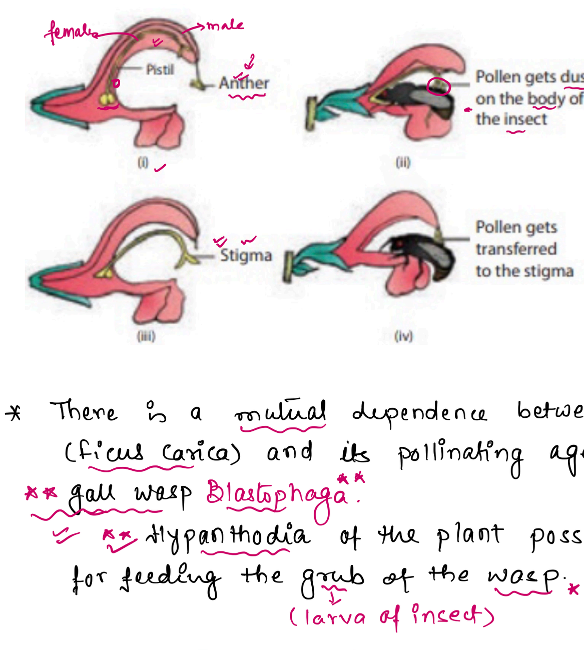
It is pollination through agency of animals. Majority of flowering plants use a range of animals as pollinating agents. (Insect → Bee, arbor)
* Bees, butterflies, flies, beetles, wasps, ants, moths, birds (sun birds and humming birds) and Bats are the common pollinating agents.
* Among the animals insects, particularly bees (Have pollen baskets) are the dominant biotic pollinating agents.
* Even larger animals such as some primates (lemurs), arboreal (tree-dwelling) rodents, or even reptiles (gecko lizard and garden lizard) have also been reported as pollinator in some species
* often flowers of animal-pollinating plants are specifically adapted for a particular species of animals.

Entomophily :→ (Insect pollination)

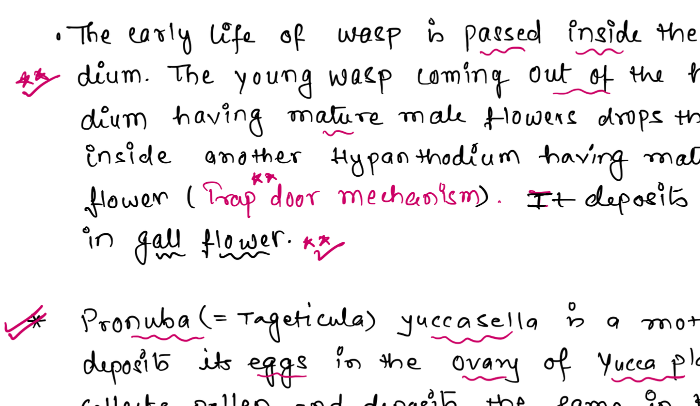
Characterstics :→
(1) Flower are showy or bright colored
(2) Flower are large. when the flower are small a number of flowers are clustered into an inflorescence to make them conspicuous.
(Insect / Bird — Large, more amt of Nectar)
(3) Flower are colorful, fragrant and rich in nectar
(4) Flowers pollinated by flies and beetles secrete foul odours to attract these animals. odour of Rafflesia attract Carrion flies (fly trap mechanism)
(5) To sustain animals visits, the flower have to provide rewards to the animals, Nectar and pollen grains are the usual floral rewards. For harvesting the rewards from the flower the animal visitors comes in contact with the anthers and the stigma. The body of animal gets a coating of pollen grains, which are generally sticky in animal pollinated flowers. When animal carrying pollen on its body comes in contact with the stigma, it brings about pollination.
(6) Pollen grains are Heavy and surrounded by yellow oily sticky substance called Pollenkit. → Tapetum

Special adaptation in Entomophilous flowers.

* Pollination Salvia by bees [turn pipe or lever mechanism]



* There is a mutual dependence between fig (Ficus carica) and its pollinating agent, female gall wasp Blastophaga. (++)
Hypanthodia of the plant possess gall flower for feeding the grub (larva of insect) of the wasp.



- The early life of wasp is passed inside the hypanthodium. The young wasp coming out of the hypanthodium having mature male flowers drops the pollen inside another Hypanthodium having mature female flower (Trap door mechanism). It deposits its eggs in gall flower.

* Pronuba (= Tageticula) yuccasella is a moth which deposits its eggs in the ovary of Yucca plant, it collects pollen and deposits the same in the hollow of stigma to effect pollination. The larvae of the moth come out of the eggs as seeds start developing (oviposition) (month & plant - can not complete their life cycle without each other.)
* other example where floral reward is providing safe places to lay eggs
Tallest flower of Amorphophallus (the flower itself is about 6 feet in ht) pollinated by Beetles.

> Flower grped into ③ category depend on floral reward
> - Food providing flower (Nectar/Pollen grain) → Salvia & bee; Humming birds & Bignonia; Sun bird & Strelitzia
> - Sex providing flower → Ophrys & Bee; Colpa wasp
> - Nursery providing flower → Yucca & Yucca moth; Amorphophallus & beetle; Fig and wasp
>
> example of (Coevolution | Co-extinction)

Cucumber, Mango, Peepal, Coriander, Papaya, onion, Lobia, Cotton, Tobacco, Rose, Lemon, (Insect)
Eucalyptus, Banana (Self pollinated)
└ Generally self pollinated 4 to 10% cross by Insect Pollination

** Many insects may consume pollen or the nectar without bringing about pollination. Such floral visitors are referred to as pollen/nectar robbers.