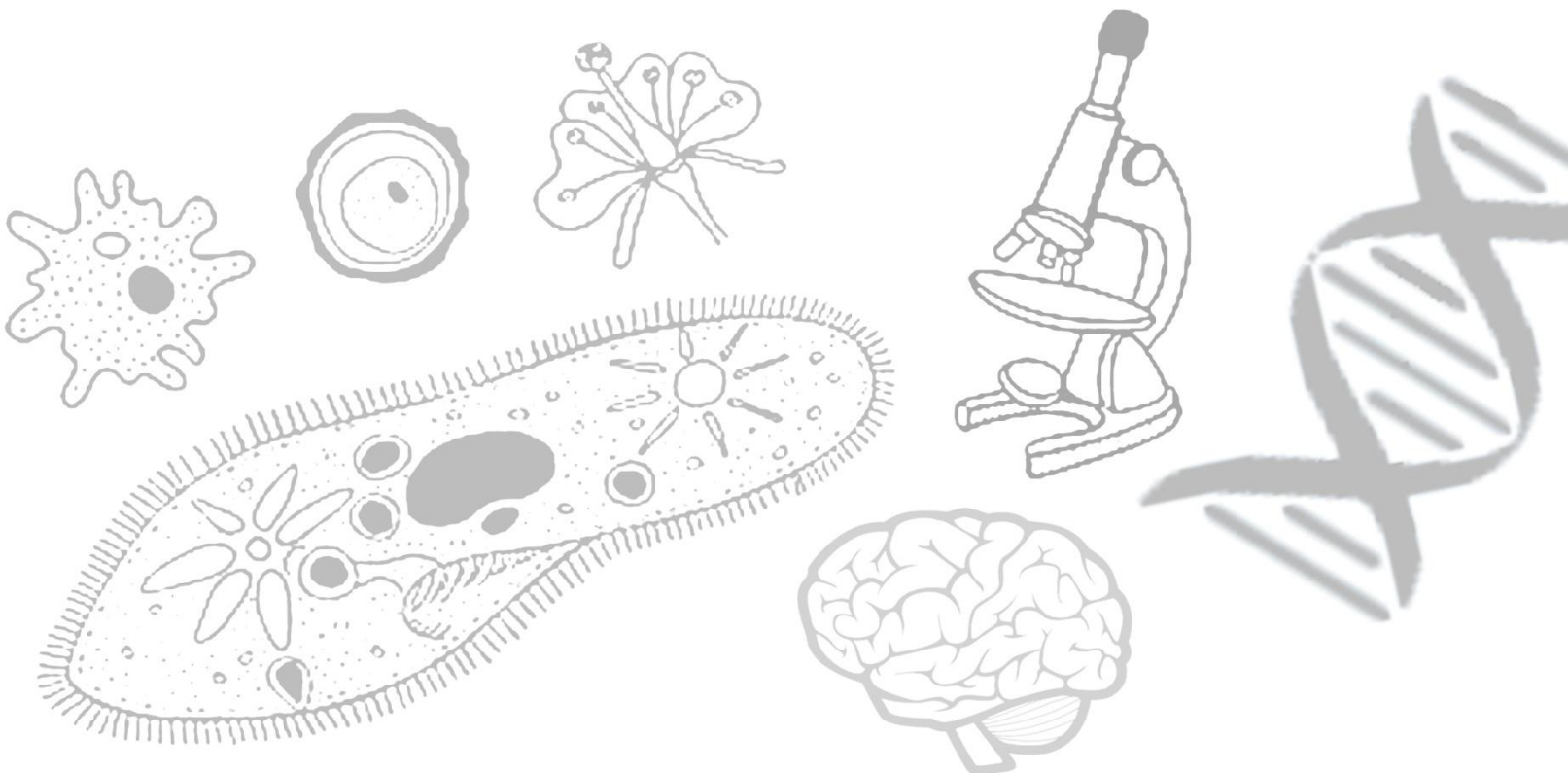
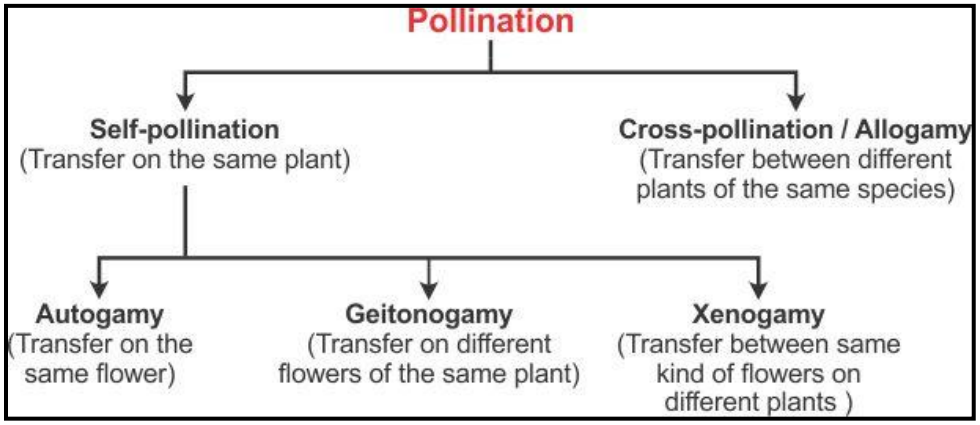
Chapter Notes

BIOLOGY



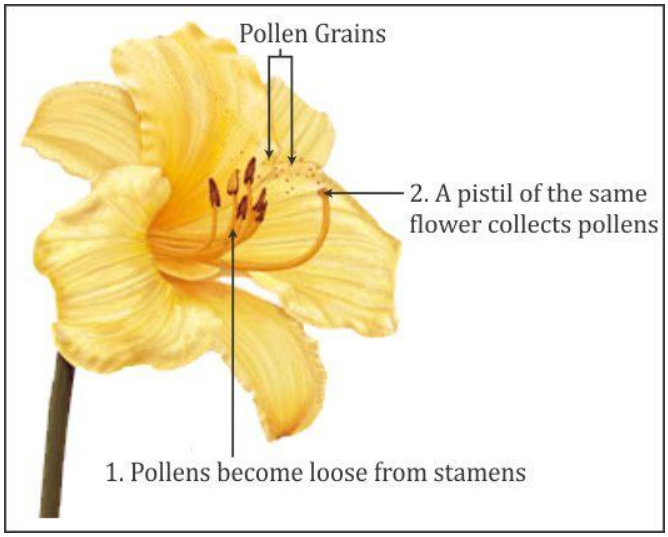
Pollination

- Pollination is the process of transfer of pollen grains from the anther of a stamen to the stigma of a carpel of a flower.



Self Pollination

- The transfer of pollen grains from the anther of a flower to the stigma of the same flower or another flower on the same plant is called self pollination.
- Examples: Wheat, Tobacco, Pea



Self Pollination

Conditions Favouring Self Pollination

- **Bisexuality, monoecious:** Bisexual, monoecious plants have both male and female reproductive parts on the same plant.
- **Homogamy:** The anther and stigma of a bisexual flower mature at the same time.
- **Cleistogamy:** The pollen grains pollinate the stigma of the same flower. In this case, the flowers never open.

Advantages of Self Pollination

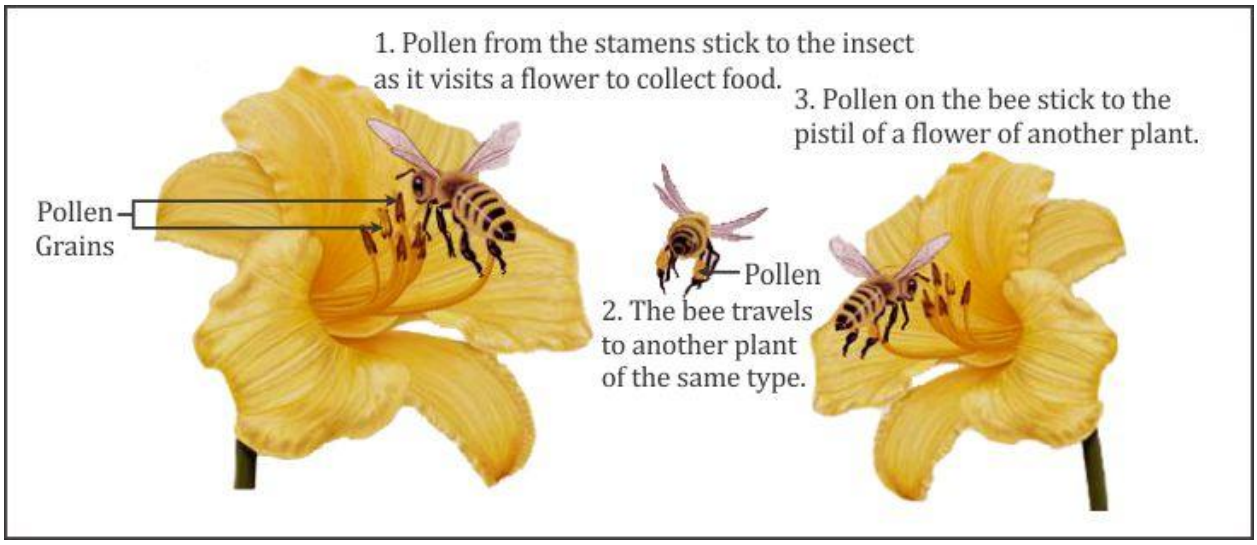
- It is a much surer method of pollination in bisexual flowers in which the stamens and carpels mature at the same time.
- The parental characters are preserved indefinitely.
- No wastage of pollen grains occurs as even a small quantity of pollen is sufficient.
- The flowers do not have to be large and showy.
- The flowers do not have to produce scent or nectar to attract insects.
- It is economical for plants as a lot of nutrient material which would otherwise be used to produce pollen, nectar, scent, large colourful petals etc. is saved.

Disadvantages of Self Pollination

- If self pollination continues for a long period of time, generation after generation, then it may lead to the weakening of the species.
- The seeds produced through self pollination would be of a poorer quality, and they would give rise to less vigorous offspring.
- Fewer seeds are produced.
- The endosperm is minute, and thus, the seeds produce weak plants.
- The weaker and defective characters of the variety cannot be eliminated.
- It does not yield new varieties. This leads to the degradation of the plant.
- Genetic traits of the same plant with no change or intermixing are passed on with little chance of improvement from one generation to the next.

Cross Pollination

- The transfer of pollen grains from the anther of a flower on one plant to the stigma of a flower on another plant of the same species is called cross pollination.
- Examples: Hibiscus, China rose, Brinjal, Tomato, Lady finger



Cross Pollination

Conditions Favouring Cross Pollination

- **Unisexuality:** Unisexual flowers have either male or female flowers borne on a separate plant. Examples: Cucumber, Papaya
- **Self-sterility:** In this case, even if the stigma receives pollen from the anther of the same flower, the pollen germinate or undergo further growth. Examples: Ray florets of sunflower, Orchid
- **Self-poisoning:** Plants produce substances similar to antibodies that inhibit the development of pollen on their own stigma.
- **Heterostyly:** The stigma and anthers grow at different heights which does not favour self pollination. Examples: Primrose, Oxalis
- **Herkogamy:** The pollen of the flower is unable to reach the stigma of the same flower. Example: The Pansy flower has a hood that covers the stigma and acts as a mechanical barrier.
- **Dichogamy:** The anthers and stigma of the same flower do not mature at the same time.
  - **Protandry:** The anthers of the flowers mature earlier than the stigma. Examples: Lady finger, Salvia, Sunflower, Sweet pea
  - **Protogyny:** The stigma of flowers mature earlier than the anthers. Examples: Custard apple, Peepal

Agents of Cross Pollination

AGENT	METHOD	EXAMPLES OF PLANTS
Insects	Entomophily	Sweet pea, *Dahlia*
Wind	Anemophily	Maize
Water	Hydrophily	*Vallisneria*
Bird	Ornithophily	*Bignonia*, Canna
Bat	Chiropterophily	*Agave*, Saguaro
Snail	Malacophily	*Volvulopsis nummularium*
Elephant	Elephophily	Rafflesia
Bee	Melittophily	Apple, Almond
Butterfly	Psychophily	*Asclepias tuberosa*, *Echinacea purpurea*
Moth	Phalaenophily	*Liatris spicata*, *Camassia scillioides*
Fly	Myophily/Sapromyophily	*Habenaria obtusata*, *Trichopoda* sp.
Beetle	Cantharophily	Pond lily, *Magnolia*

Differences between Wind-Pollinated and Insect-Pollinated Flowers

WIND-POLLINATED FLOWERS	INSECT-POLLINATED FLOWERS
• Flowers are usually unisexual, dull coloured and do not have any nectar or scent.	• Flowers are brightly coloured, scented and secrete nectar.
• Pollen grains are small, light and smooth.	• Pollen grains are larger, sticky and spiny.
• Pollen grains are produced in abundance, and so, some are wasted.	• Pollen grains are fewer in number as they are transported mechanically by insects.
• The stigma of flowers is feathery, sticky and hang out of the petals.	• The stigma of flowers is small and deep within the corolla.
• The stamens are long and protrude out of the flowers.	• The stamens are within the corolla tube.
• Examples: Maize, Wheat, Rice, Grass	• Examples: Sunflower, China rose, Salvia, Pea

Advantages of Cross Pollination

- The offspring are healthier.
- The seeds are produced in larger number and are more viable.
- The seeds develop and germinate properly and grow into better plants.
- Results in new varieties because cross pollination can be carried out between two different varieties of the same species or even two species.

Disadvantages of Cross Pollination

- It is not always certain as a pollinating agent is always required, and it may or may not be available at the suitable time.
- Pollen grains have to be produced in abundance to ensure chances of pollination. This results in lot of wastage of pollen.
- It is uneconomical for plants as they have to produce flowers that are large, perfumed and with nectar to attract insects.

Differences between Self Pollination and Cross Pollination

SELF POLLINATION	CROSS POLLINATION
• It is the transfer of pollen grains from the anther to the stigma of the same flower.	• It is the transfer of pollen grains from the anther of one flower to the stigma of another flower of a different plant of the same species.
• It does not require any external agent, such as wind, water and insects, to carry out pollination.	• It requires an external agent for pollination to occur.
• It can take place even when the flower is closed.	• It can occur only when the flower is open.
• In self-pollinated flowers, the anther and stigma mature at the same time.	• In cross-pollinated flowers, the anther and stigma mature at different times.
• It preserves parental characters	• It does not preserve parental characters.
• New varieties are not possible.	• New varieties can be produced.
• As new variations are not possible, the offspring cannot adapt to changing environmental conditions.	• As new variations are possible, the offspring are healthier and are able to adapt to changing environmental conditions.