NEW ERA AGRICULTURE MAGAZINE

Exploring the Modes of Pollination in Fruit Crops

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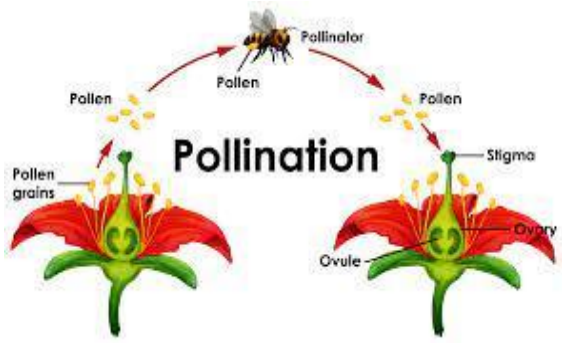
Introduction

Pollination is necessary for fruit sets in the majority of fruit crops. The movement of pollen grains from a flower's stigma, or female floral portion, to its anthers, or male floral part, is known as pollination. Pollen grains land on the sticky stigma surface, germinate and form a tube that descends the style and joins the ovary's female cell. Fertilization is the term for this union. The fruit grows larger and the seeds begin to form after fertilization.As it visits the blooms, the bee transfers more pollen from the anthers and rubs off the pollen onto the stigma. Every day, a honeybee might visit 5,000 flowers. There are usually enough wild bees in home fruit crop plantings to ensure sufficient pollination. To improve pollination and fruit set, beehives are typically positioned in commercial orchards throughout the blooming season of the trees. The wind also spreads pollen in certain fruit crops.

The most significant natural pollen carriers are honeybees. Pollen adheres to the bee's body hairs as it flies from one tree in the orchard to another's blossoms. Pollination is the process by which pollen is transferred from the male reproductive organ (anther) to the female reproductive organ (stigma) of a flower, leading to the fertilization of the ovules.The mode of pollination is a critical aspect of a plant's reproductive strategy and has evolved in response to environmental conditions and the availability of pollinators in a particular habitat.



Every fruit crop has different requirements for pollination, and some varieties within certain fruit harvests even have different requirements.

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The properties of fruit crop pollination are referred to by the following terms:

There are two main modes of pollination:

1. **Abiotic Pollination:**
   - **Wind Pollination (Anemophily):** In this mode, pollen is carried by the wind to reach the stigma of another flower. Plants that rely on wind pollination often produce large quantities of lightweight, small, and smooth pollen grains. Examples of wind-pollinated plants include Papaya, Date palm, Chesnut, Sapota, Aonla, Pomegranate and Jackfruit, etc.
   - **Water Pollination (Hydrophily):** Some aquatic plants are pollinated by water. The pollen is released into the water and carried to the female flowers. Coconuts are an example of plants that use water pollination.
2. **Biotic Pollination:**
   - **Insect Pollination (Entomophily):** Many plants have evolved to be pollinated by insects. Bees, butterflies, moths, beetles, and flies are common insect pollinators. These plants often have colourful and fragrant flowers, as well as nectar to attract pollinators. Examples include Citrus, Annona spp., Fig, Ber, Cherry, Apple, Pear, Peach, Plum and many other fruit trees.
   - **Bird Pollination (Ornithophily):** Some plants are adapted to being pollinated by birds. These flowers are typically brightly coloured, often red or orange, and produce large amounts of nectar. Hummingbirds are common bird pollinators, and examples of plants pollinated by birds include Banana and Pineapple, etc.

Mammal Pollination: While less common than insect or bird pollination, some plants are pollinated by mammals. Bats are an example of mammalian pollinators, and they play a crucial role in pollinating certain plants, particularly in tropical regions. For example:- Banana, etc.

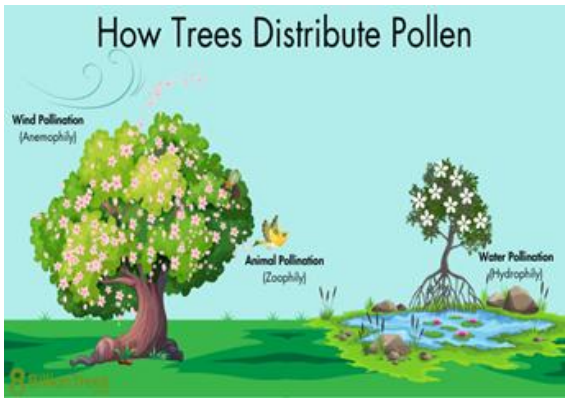

Figure: Representation of different modes of pollination

Pollination in different fruit crops:

1. **Pollination of Mango:** There appears to be some variation in the degree of self-fertility and sterility between different cultivars, though this has not been thoroughly investigated. However, self-sterility is not a significant issue for the percentage fruit set. Pollen must be transported to the stigma by an external agent, regardless of the cultivar's level of self-sterility. The data demonstrated that, for the majority of mango cultivars, cross-pollination is not essential; rather, a large number of pollinating insects are required to move pollen from anthers to stigma inside the cultivar to produce fruitful outcomes. The mango fruit set percentage increases considerably when bees pollinate the fruit. saw the blossoms as self-fertile as well.

2. **Pollination of Banana:** In bananas, pollination The most common insects to visit banana inflorescences were honeybees (A. cerana, A. mellifera, and A. dorsata), which accounted for 77.50% of visits, followed by wasps (Polistes hebraeus& Vespa orientalis), which visited 15.53% of the time. Other hymenopteran insects, such as stingless bees, made up the remaining insect visitors.

3. **Pollination of Apple:** It is recommended to cross-pollinate all varieties of apple trees with other apple or crabapple varieties. The largest and first blooming flower in the cluster, known as the king blossom, needs to be pollinated to produce the best fruit set on apple trees. The pollinizer's and the apple tree's king blossom's bloom times must therefore coincide. Two semidwarf apple cultivars that blossom at the same time should be planted 50 feet apart in backyard plantings. To ensure pollen flow between trees, two dwarf apple cultivars with identical bloom times should be placed less than 20 feet apart. Pollinization compatibility charts and recommended apple types for use as pollinizers are

common features seen in nursery catalogues.

4. **Pollination of Citrus:** Citrus fruits have a wide range of pollination requirements, from self-fertile (Valencia oranges) to nearly completely self-sterile (mandarin and mandarin-hybrid complex). For these self-sterile or partially self-sterile blooms to produce the most fruit, pollen from other suitable types must be transferred. Finally, some plants, like lemons, are not known to benefit from the transfer of foreign pollen to the stigma. In some cases, such as Washington navel oranges, the plant benefits if pollen is transferred from blossom to bloom within the cultivar or within the species.

5. **Pollination of Papaya:** Pollen must go from the staminate (male) flowers to the female (female) flowers for papaya fruit to grow. The fruit has the potential to yield up to 1,000 seeds and more than 1,000 pollen grains, which need to be transferred to the stigma while it is still open. Fruit with less than 300 seeds is typically unmarketable, while larger fruits have more seeds. Papaya plants can be wind- or insect-pollinated, or they can be bisexual and self-pollinating. Honey bees, wasps, midges, thrips, syrphid flies, and butterflies are examples of pollinators.

6. **Pollination of Guava:** In guavas, pollination The best pollinators for boosting fruit set and improving fruit quality were honey bees. Honeybees accounted for twenty to forty percent of pollination. Fruit features like girth and length also showed a considerable improvement with bee pollination compared to a non-pollinated fruit crop.

7. **Pollination of Pear:** The majority of pears are not self-fertile. All pears, however, work well as pollinizers for other types that bloom simultaneously. Seckel is an outlier and a poor pollinizer for Bartlett plants. While Anjou, Bartlett, and Kieffer can bear fruit on their own to some extent, cross-pollinating is necessary to ensure consistent and abundant yields. Only a limited amount of low-sugar nectar is produced by pear blooms. Pears require more pollinizers and bees than any other tree fruit because of this.

8. **Pollination of longan and litchi:** Litchi flowers have the potential to self-pollinate, but are usually considered self-sterile, requiring insects to move pollen from anther to stigma for fruit to develop. A cultivar experiences partial overlap between male and female flowering; hence, interplanting at least two distinct cultivars is necessary for an adequate fruit set. Fruit output and quality are increased by insect pollination. It has been reported that several insects, including Coleoptera, Hemiptera, and Lepidoptera, visit litchi flowers. It is commonly acknowledged that honey bees are the primary pollinators. Honey bee pollination of litchi crops has been shown in numerous studies to result in notable yield improvements.

References:

1. Halder, S., Ghosh, S., Khan, R., Khan, A. A., Perween, T., & Hasan, M. A. (2019). Role of pollination in fruit crops: A review. *The Pharma Innovation Journal*, 8(5), 695-702.
2. Lal, N., Gupta, A. K., Marboh, E. S., Kumar, A., & Nath, V. (2021). Effect of mode of pollination on fruit set and fruit characteristics in litchi. *Erwerbs-Obstbau*, 63(2), 227-232.

3. Lata, S., Shrama, G., Garg, S., & Mishra, G. (2018). Effect of different modes of pollination on fruit set and malformation of strawberry cultivars. *Research on Crops*, 19(3), 430-435.

4. Muthukumar, P. and Selvakumar, R. (2017). Glaustas Horticulture. 2nd ed. New Delhi, New Vishal Publications 564 p.

5. Warmund, M.R. (1914). Pollinating fruit crops. *Horticultural MU Guide*. 2/96/7M.