

## Nature's Little Helpers: Pollinators Behind Rambutan Fruit Set

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Rambutan (*Nephelium lappaceum*) is an economically important tropical fruit crop widely cultivated in humid regions. Its successful fruit production depends largely on effective pollination, as natural self-pollination is limited. Among the various pollinators, stingless bees, commonly known as dammer bees, play a crucial role in ensuring efficient pollen transfer and fruit set. This article discusses the botanical features of rambutan including its tree structure, leaves, and flowers, and elaborates in detail the role and mechanism of pollination by dammer bees. Understanding the contribution of these natural pollinators can help improve orchard productivity and promote sustainable agricultural practices.

### Introduction

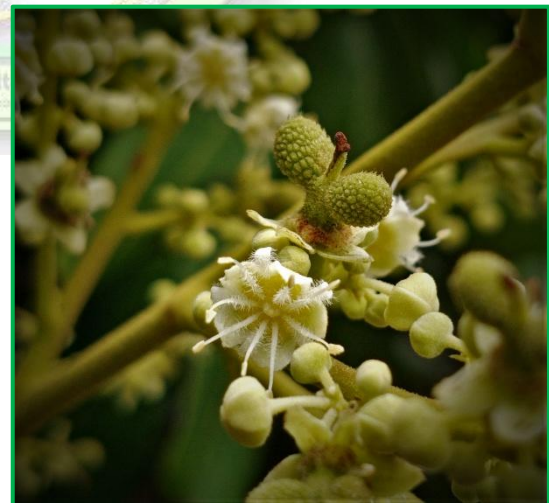
**Common Name:** Rambutan

**Scientific Name:** *Nephelium lappaceum*

**Family:** Sapindaceae

Rambutan is an evergreen tree, that grows up to a height of 15-24 m with a dense canopy. It is a tropical evergreen fruit crop with high commercial value in international trade. The name rambutan itself means "hair" - fruits covered with numerous hair-like projections. The tree is originated and mainly grown in Malayasia and Indonesia. The Rambutan trees possess an upright trunk with a thick, compact canopy. The vegetative structure of rambutan plays an important role in supporting reproductive development. The leaves are compound and arranged along the branches. Each leaf consists of several leaflets that are glossy, dark green, and elliptical in shape. These leaves are efficient in photosynthesis, contributing to the overall vigour and productivity of the tree.

The flowering pattern of rambutan is particularly significant in relation to pollination. The flowers are small, greenish-white, and borne in large terminal panicles. Rambutan exhibits complex floral biology, producing male, female, and sometimes functionally bisexual flowers. In many cultivated varieties, the presence of both pollen-producing and receptive flowers is essential for successful fruit set. The flowers produce nectar, which attracts various insect visitors, especially bees. However, natural self-pollination in rambutan is limited due to floral structure and physiological constraints. As a result, the crop heavily depends on external agents, mainly insects, for cross-pollination. Among these, stingless bees or dammer bees are considered the most efficient and reliable pollinators.



Flowers of Rambutan

## Dammer Bees: 'Key Pollinators in Rambutan Orchards'

Dammer bees, belonging to the genera *Tetragonula* and *Trigona*, are small, social, non-stinging bees commonly found in tropical and subtropical regions. They live in colonies and build nests in tree hollows, walls, or underground cavities. These bees are highly adapted to tropical environments and play a major role in the pollination of many horticultural crops, including rambutan. One of the most important characteristics of dammer bees is their small body size. This allows them to easily access the tiny rambutan flowers, which may not be effectively utilized by larger pollinators. Their lightweight bodies and agility enable them to move quickly from one flower to another within a panicle, increasing the efficiency of pollen transfer. Dammer bees are also known for their non-aggressive nature, making them safe for farmers and suitable for managed pollination systems. Their colonies can be maintained near orchards, which helps ensure a consistent presence of pollinators during the flowering period.

### Foraging Behavior of Dammer Bees

The effectiveness of Dammer bees as pollinators is largely due to their active and systematic foraging behaviour. These bees begin foraging early in the morning and continue throughout the day, with peak activity observed during periods of maximum nectar secretion. During foraging, Dammer bees visit a large number of flowers in a short time. They are attracted by the nectar produced by rambutan flowers and collect both nectar and pollen as food resources. While doing so, they repeatedly come into contact with the reproductive parts of the flower. An important behavioural trait of Dammer bees is floral constancy, which refers to their tendency to visit flowers of the same species during a single foraging trip. This behaviour enhances the chances of transferring compatible pollen between flowers, thereby increasing pollination efficiency.



**Pollination by Dammer bee**

### Mechanism of Pollination by Dammer Bees

The pollination process in rambutan involving dammer bees is both simple and highly effective. When a dammer bee lands on a flower to collect nectar, its body brushes against the anthers, which are the pollen-producing structures. Pollen grains adhere to the bee's body, especially on its legs, thorax, and fine hairs. As the bee moves to another flower, particularly a female or bisexual flower, the pollen grains are transferred onto the stigma. The stigma is a sticky and receptive surface, which facilitates the attachment and germination of pollen grains. This transfer of pollen is essential for fertilization, leading to the development of fruits.

The efficiency of this process is enhanced by several factors:

- The small size of dammer bees allows close contact with floral parts
- Their hairy body structure aids in pollen adherence
- Frequent and repeated visits increase the chances of successful pollen transfer
- Rapid movement between flowers ensures cross-pollination

Once pollen is deposited on the stigma, it germinates and forms a pollen tube, which grows towards the ovule, leading to fertilization. This ultimately results in fruit formation.

### Impact on Fruit Set and Yield

Effective pollination directly influences fruit set, fruit quality, and overall yield in rambutan. Orchards with active populations of dammer bees show significantly higher fruit set compared to those lacking sufficient pollinators.

Proper pollination ensures:

- Higher percentage of fruit set

- Uniform fruit development
- Improved fruit size and quality
- Reduced flower and fruit drop

In contrast, inadequate pollination can lead to poor fruit set, misshapen fruits, and reduced yield. Therefore, the presence of efficient pollinators like dammer bees is essential for maximizing productivity.

### Promoting Dammer Bees in Orchards

To enhance pollination in rambutan, it is important to encourage the presence and activity of dammer bees. Farmers can adopt several practices to support these pollinators:

- Avoid excessive use of chemical pesticides, especially during flowering
- Conserve natural habitats and nesting sites
- Introduce managed stingless bee colonies in orchards
- Maintain floral diversity to provide continuous food sources

These practices not only improve pollination but also contribute to ecological sustainability.

### Conclusion

Pollination is a critical factor in the successful cultivation of rambutan, and dammer bees serve as highly efficient natural pollinators. Their unique biological traits, active foraging behavior, and effective pollen transfer mechanism significantly enhance fruit set and yield. By understanding and promoting the role of these “nature’s little helpers,” farmers can achieve better productivity while maintaining an eco-friendly approach to agriculture. Sustainable management of pollinators is thus essential for the long-term success of rambutan cultivation.

### References

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