AgriScope
Monthly e-Magazine on Agriculture and Interdisciplinary Sciences
Visit at us: www.agriscope.in
Email at us: agri4scope@gmail.com

Foraging Behaviour And Pollination Activities Of Stingless Bee Species

V.Amsagowri

*Assistant Professor, Pandit Jawaharlal Nehru College Of Agriculture And Research Institute, Karaikal-609603

Email: vasuviji0590@gmail.com

Article ID: 27004

Introduction

Stingless bees (Hymenoptera: Apidae, Meliponini) are eusocial corbiculate bees comprising more than 500 species, primarily distributed across tropical and subtropical regions. Although all stingless bee species lack the ability to sting, they retain a vestigial and non-functional sting apparatus (Michener, 2007). Stingless bees primarily depend on pollen and nectar as their main sources of nutrients, and their foraging behaviour generally involves pollen collection during the morning and nectar collection throughout the day.

Bees rely on floral resources throughout all stages of their life cycle (Michener, 2007). Nectar serves as the primary source of carbohydrates, whereas pollen provides proteins and vitamins essential for growth and development (Brodschneider & Crailsheim, 2010). In addition to pollen and nectar, stingless bees are known to collect resin and mud for constructing various nest components (Roubik, 2006; Leonhardt & Blüthgen, 2009). Resins also play a protective role within the nest by preventing predator intrusion and inhibiting the proliferation of pathogenic microorganisms (Leonhardt & Blüthgen, 2009).

Consequently, bees establish direct and essential relationships with their surrounding environment (Cole *et al*., 2017). Furthermore, stingless bees forage on a wide range of plant species and have been reported to utilize nearly 142 plant species, including vegetables, oilseed crops, spices, plantation crops, ornamental plants, forest trees, medicinal plants, and wild plants. Their pollination activities significantly contribute to crop productivity, enhancing vegetable yields by approximately 25% and increasing coconut yields by 20–40% (Devanesan *et al*., 2009).

1. Meliponiculture

Beekeeping with stingless bees is known as meliponiculture. *Tetragonula iridipennis* Smith is the most abundant stingless bee species in India and forages on diverse floral resources while exhibiting high floral fidelity (Layek & Karmakar, 2018).

Moreover, meliponiculture, the art and science of rearing stingless bees, has been practiced for centuries in many tropical and subtropical countries. Several tribal communities in the Western Ghats and northeastern regions of India possess extensive knowledge and experience in stingless beekeeping.

2. Pollination by Stingless Bees

Pollination plays a crucial role in sustainable agriculture, as the production and propagation of flowering crops depend on self-pollination or cross-pollination mechanisms. The expansion of protected cultivation systems worldwide has shifted crop production from open fields to enclosed environments. However, such conditions create physical barriers that limit access of natural pollinators to flowers.

Approximately 30% of human food production is derived from bee-pollinated crops. Both biotic and abiotic agents contribute significantly to pollination as an ecological service influencing crop productivity. About 80% of flowering plants depend on arthropods for pollination, while nearly 90% of pollination activity is supported by Apis and non-Apis bee species belonging to Hymenoptera.

Among these pollinators, *Tetragonula iridipennis* appears to be one of the most promising species. Approximately 500–600 species of Meliponini have been identified worldwide, and *Tetragonula iridipennis* Smith is the most common stingless bee species found in South India.

Similarly, another stingless bee species, *Tetragonula laeviceps*, can visit a broad range of flowering plants, including vegetable crops, fruit crops, oilseed crops, pulse crops, forage crops, weed species, ornamental plants, and flowering plants.

Additionally, stingless bees also serve as important pollinators in commercial crops belonging to families such as Leguminaceae and Cruciferae, where other honey bee species may be less effective. Arthropod pollinators improve both the qualitative and quantitative yields of chilli fruits.

3. Foraging Resources of Stingless Bees

Subsequently, a large proportion of tropical plant species, representing nearly one-fifth of local angiosperm flora, depends on pollination by stingless bees (Wilms *et al*., 1996; Corlett, 2004). Stingless bees play an important role in pollinating numerous horticultural crops by collecting nectar and pollen, thereby improving pollination efficiency and crop yields (Roubik, 1995).

Several agro-horticultural plants, including *Citrus aurantifolia, Coriandrum sativum, Lagenaria siceraria, Moringa oleifera, Citrus aurantium, Cucumis sativus,* and *Cucurbita pepo,* provide both pollen and nectar resources for stingless bees.

Furthermore, stingless bees contribute to the pollination of approximately 20 crop species and support pollination in an additional 60 crop species (Waykar and Baviskar, 2015). Likewise, they provide effective pollination services under protected cultivation systems for crops such as strawberry, eggplant, sweet pepper, tomato, and cucumber (Nunes *et al*., 2013).

4. Polylectic Behaviour of Stingless Bees

Stingless bees exhibit polylectic behaviour, meaning they collect pollen from a wide variety of floral species. They are considered manageable pollinators because of their adaptability to diverse environmental conditions and nesting habitats.

Moreover, the foraging activity of *Tetragonula iridipennis* varies according to time of day, seasonal changes, weather parameters such as wind speed, humidity, and temperature, as well as bee body size (Danaradi *et al*., 2011; Layek & Karmakar, 2018).

5. Foraging Time of Stingless Bees

The stingless bee *Tetragonula iridipennis* Smith was reported to forage for pollen primarily during the morning hours until noon (8:00 a.m.–12:00 p.m.) in Tamil Nadu, India. Resin collection activity mainly occurred between 8:00 a.m. and 11:00 a.m.

Likewise, maximum foraging activity among *Apis cerana indica* Fabricius, *Apis dorsata* Fabricius, and *Trigona* species was observed between 10:00 a.m. and 11:00 a.m., whereas *Apis florea* Fabricius exhibited peak activity between 1:00 p.m. and 3:00 p.m.

Conclusion

Stingless bees play an essential role in maintaining ecosystem stability and agricultural productivity through their efficient pollination services. Their broad floral range, polylectic foraging behaviour, adaptability to diverse environmental conditions, and effectiveness in both open-field and protected cultivation systems make them valuable pollinators for numerous agricultural and horticultural crops. *Tetragonula iridipennis*, one of the most abundant stingless bee species in India, demonstrates significant potential as a managed pollinator because of its high floral fidelity and adaptability. Furthermore, the practice of meliponiculture offers opportunities for sustainable agriculture, biodiversity conservation, and enhanced crop production. Therefore, understanding the foraging behaviour, floral resource utilization, and pollination efficiency of

stingless bees is important for promoting their conservation and wider application in modern agricultural systems.

References:

Brodschneider, R. and Crailsheim, K. 2010. Nutrition and health in honey bees. *Apidologie*, 41, 278–294.

Chole, H., Woodard, S.H. and Bloch. G. 2019. Body size variation in bees: regulation, mechanisms, and relationship to social organization. *Current Opinion in Insect Science,*

Corlett, R. 2004. Flower visitors and pollination in the Oriental (Indomalayan) Region. *Biological Reviews*, 79(3): 497-532

Danaraddi, C.S., Sangamesha, H, Biradar, S.B., Manjunath, T and Vinod, S.K. 2011. Studies on foraging behaviour of stingless bee, Trigona iridipennis Smith at Dharwad, Karnataka. *Int. J. For. Crop Improv*., 2(2): 163-169.

Devanesan, S., Shailaja, K.K. and Premila, K.S. 2009. Status paper on stingless bee Trigona iridipennis Smith. All India Coordinated Research Project on Honeybee and Pollinators. KAU, Vellayani, 80.

Layek, U. and Karmakar, P. 2018. Nesting characteristics, floral resources, and foraging activity of Trigona iridipennis Smith in Bankura district of West Bengal, India. *Insectes Soc*., 65:117-132.

Leonhardt, S. D. and Blüthgen, N. 2009.A Sticky Affair: Resin Collection by Bornean Stingless Bees. *Biotropica*, 41, 730–736.

Michener, C.D. 2007. The bees of the world. John Hopkins University Press, Baltimore and London

Nunes S.P, Hrncir M, Silva C. I, Roldao Y. S and Fonseca, V L, 2013. Stingless bees, Melipona fasciculata, as efficient pollinators of eggplant (*Solanum melongena*) in greenhouses. *Apidologie,* 44: 537-546.

Roubik, D.W. 1995. Pollination of cultivated plants in the tropics. *Food Agric. Org*., 118.

Waykar, B. and Baviskar, R.K. 2015. Diversity of bee foraging flora and floral calendar of Paithan taluka of Aurangabad district (Maharashtra), *India. J. Appl. Hortic.,* 17(2): 115-119.