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Caste System and Nesting Behavior of Stingless Bees

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Abstract

Apiculture is rapidly growing in India as a small scale industry. European and Indian honey bees are highly domesticated across India. But now a day's domestication of stingless bee is eye catching as they can be easily handled and honey produced by them has many medicinal properties and has wide range of applications. Domestication of stingless bees is not so popular due to lack of knowledge among the people about their behavior and nest characters.

Introduction

Stingless bees are the smallest of honey producing bees. They are also called as Dammer bees, as they collect resin from plants for construction of nest; Stingless honey bees or simply Meliponines, as they belong to the tribe Meliponini. As the sting is reduced or modified or nonfunctional for stinging, so they are termed as "stingless bees".

They are highly social insects living in permanent colonies, nesting in dark places like pre-existing cavities in tree trunks, empty logs, cracks and crevices in old walls etc., unlike other honey bees of the genus *Apis*, they construct numerous elliptical cells for storing pollen and honey by using a special material "cerumen". Stingless bee colonies are perennial and usually consist of hundreds or thousands of workers. They can be domesticated in hives like Indian bee *Apis cerena* Fab. and European bee *Apis mellifera* L. Beekeeping with stingless bees is called melliponiculture, which has been practiced for many centuries in various parts of Latin America, where these bees are considered as very valuable domestic species. They differ from *Apis* species in biology and nesting characteristics.

Diversity and Distribution

Stingless bees are highly diverse and abundant group of eusocial bees that occupy the tropical and subtropical parts of the world, originated from Africa. There are more than 500 species of stingless bees in the worldwide. They are more adopted to varying climatic conditions compared to other pollinators (honeybees and bumble bees).

Castes of Stingless Bees

All stingless bees live in colonies, consisting of hundreds to thousands of workers, few males and usually only one queen. Workers and males are reared in similar cells in the same cluster or comb, whereas queens reared in few larger irregular brood cells.

As in case of *Apis*, where progressive feeding of grub takes place but in stingless bees, there is mass provision with a mixture of honey, pollen and protein-rich secretions from

hypopharyngeal glands. Once a cell is provisioned by worker, the queen oviposits at centre of cell and worker seal the cell in two to three minutes. There will be no physical contact between grub and adult bees due to closing of cells after egg laying. Immediately after emerging, the young adults are creamish to ash coloured and later after eight days turn into darker colour. Usually 20-25 days age old bees starts removing the waste materials, dead bees and involved in cell construction, provisioning and 35-40 days age old bees starts foraging (Roopa et al., 2015).

Gruter et al., 2012 reported that there are guards or soldiers' caste in stingless bees; around four to eight bees always guard the nest entrance hole by facing head outside. During the night, workers guarding the nest entrance draw back and seal the entrance. The propolis sealing is removed each morning and built again in the evening (Kwapong et al., 2010).

Stingless Bee Nest

They usually construct nests in dark places like in tree trunk cavities, empty logs, cracks and cervices in old walls may be stone wall or mud brick wall, even in door or window rim of house and also in underground cavities, exposed nests of ants or termites and in electric pipes. Overall their main preference is pre-existing empty logs or cavities or cervices.

The generalized architecture of stingless bee nest: At centre there will be brood cells and these brood cells covered by involucre. Surrounding the brood cells, there will be storage pots which includes both honey pots and pollen pots, batumen sheet or coat will be coating to entire nest as sealing material for nest and also a nest entrance for movement of bees in and out. But this architecture varies according to the pre existing cavity or cervices due cluster like cells can accommodate in any type of cavities or cervices.



Figure 1: Stingless bee nest/ brood structure

Queen plays an important role in regulating cell construction and discharge of larval food by workers. In the absence of queen, the cell construction will be ceased and the colony will

diminish day by day. Usually stingless bee workers take two to two and half hours for construction of single cell. The queen inspect the brood cells during construction, for inspecting cells queen move over the cells by fluttering her wings in a rhythmic manner (Roopa et al., 2015).

Multiplication of stingless bee colonies is continuous process when strength of the colony is more. Usually few of workers from the parent colony fly and search for new site for dividing the colony. They carry construction materials from the parent colony to new colony for construction of new colony in repeated trips. Nest entrance is constructed first which is characteristic feature of each colony. After completion of nest construction, unmated young queen from the parent colony flies to new nest and soon mates in the new nest. Workers fly continuously from new colony to parent colony until the new colony becomes complete independent.

Stingless bees secrete wax from the wax glands located in dorsal surface of the abdomen, for nest construction. They collect resin and propolis from vegetation, which is mixed with wax produced, is called cerumen. But few species along with cerumen they also use mud, feces, dead insects etc. to produce hard and brittle or soft and pliable for construction of different components of nest.

Domestication of Stingless Bees

Domestication of stingless bees is not so popular due to lack of knowledge among the people regarding these bees and also as they are poor honey yielders. But in India, Kerala and few parts of Karnataka and Tamil Nadu domestication is carried in homesteads. Local people especially in South India use coconut shells, tree logs, split bamboo and clay pots for rearing. Few commercial domestication structures are also available like rectangular wooden hive, fiber box hive, PVC pipe hive and square wooden hive.



Figure 2: Rectangular wooden hive



Figure 3: Mud pot hive



Figure 4: Split bamboo hive

Conclusion

Information on different nesting sites, nesting characteristics, biology and activities of stingless bee will be more helpful in melliponiculture. Especially, to design suitable bee hives. Apart from their honey, stingless bees play vital role in pollination of many plants and trees which are more helpful in agriculture and also indirectly conserve biodiversity. So, conserving the natural nesting sites is very important for their utilization in the pollination as well as in honey production.

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