

Research Article

Nesting habits and nest structure of stingless bee, *Trigona iridipennis* Smith at Dharwad, Karnataka

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ABSTRACT

The nesting sites of *Trigona iridipennis* Smith at Dharwad were tree trunks and wall cavities. The colonies nested in wall cavities (12 colonies) and tree cavities (5 colonies) were located at the mean height of 192.57 and 222.6 mm from the ground level, respectively. The mean cavity size in colonies nested in wall cavities was 132.65 x 143.30 x 165.05 mm. Of the 17 colonies observed, 11 colonies had an entrance tube. The length and width of the entrance tube was 96.55 and 3.32 mm in wall cavities and 108.80 and 5.08 mm in tree cavities. The brood cells were arranged in clusters and surrounded by pollen and honey pots. The mean dimensions of brood cells, pollen and honey pots were 2.14 x 1.70 mm, 7.26 x 4.49 mm and 7.73 x 5.04 mm in length and width, respectively.

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INTRODUCTION

Stingless bees which belongs to the family Apidae and sub-family Meliponinae, are the smallest of the honey producing bees. They are highly social insects like honey bees living in perennial colonies and nesting in concealed places. Stingless bee colonies usually consist of hundreds or thousands of workers (Wille, 1983). According to Michener (2000), size of stingless bee colonies ranged from a few dozen to more than 100,000 workers. Stingless bees besides yielding honey, are important and effective pollinators of many crop species. Nine species of crops are confirmed as effectively pollinated by stingless bees and they make a contribution to the pollination of nearly 60 other crops (Heard, 1988). More than 500 species of stingless bees occur throughout the world (Ruttner, 1988). However, *Trigona iridipennis* Smith is the only species that occurs in India. In order to exploit the stingless bees, both for pollination as well as for honey production, a sound knowledge on its nesting habits and

nest structure is essential. Hence, the present studies on these aspects were taken up at Dharwad and the results are presented in this paper.

MATERIALS AND METHODS

These studies were made during 2006-07 at Dharwad which is located in the transitional tract of Karnataka at 15° 26' N latitude and 75° 07' East longitude and at an altitude of 678 meters above the mean sea level. Colonies of *T. iridipennis* were searched in all the possible concealed places in and around the main campus of the University of Agricultural Sciences and the nesting habits were studied by recording the observations like, nesting place, number of colonies nested in each place, height from the ground level, cavity dimension (width, height and length of the cavity) and length and width of entrance tube

The internal structure of the nest was studied by opening the colonies in the wall cavities. Observations were

made on the dimensions of brood cells, pollen and honey pots, shape of the cells, colour of the cells, location of the cells in the cavity and density of cells.

RESULTS AND DISCUSSION

A total of 17 stingless bee colonies were studied for the nesting habits in Dharwad (Table 1). Of these, five were found nesting in tree cavities at the mean height of 222.6 mm from the ground. As many as 12 colonies were observed nesting in wall cavities at the mean height of 192.57 mm. Among nesting sites, wall cavities offered excellent place for *T. iridipennis*. Similar nesting behaviour of *T. iridipennis* was found at Bangalore (Roopa, 2002 and Gajanan *et al.*, 2005) and Tamil Nadu (Muthuraman, 2006). At one place, aggregation of two colonies was noticed on a single wall. However, aggregation of colonies on trees was not observed. Starr and Sakagami (1987) reported that aggregation of colonies of *T. fuscobalteata* and *T. sapiens* were found in bamboo cavities. The reasons for aggregation of nests in a site were the availability of nesting sites for long duration and short swarming distance.

Colonies nested in wall cavities had the cavity length which ranged from 47.00 to 325.00 mm with a mean of 165.05 mm. The width of the cavity ranged from 50.00 to 190.00 mm with a mean of 132.65 mm while the height ranged from 110.00 to 207.00 mm with a mean of 143.30 mm. The dimensions of the cavity of the colonies nested in trees could not be measured.

Roopa (2002) also reported a nest width ranging from 210.00 to 375.00 mm at Bangalore. The volume of the nests of *T. fuscobalteata* and *T. sapiens* varied from 0.70 to 3.00 litres (Starr and Sakagami, 1987). Similar observations were also reported by Gajanan *et al.* (2005).

In six colonies nested in wall cavities, a distinct entrance tube was absent. The remaining 11 colonies had a distinct entrance tube. The length of the entrance tube ranged from 90.00 to 121.00 mm with a mean of 108.80 mm. Similarly the width of the entrance tube in the wall cavities ranged from 2.00 to 6.00 mm with a mean of 3.32 mm while the length ranged from 56.00 to 145.00 mm with a mean of 96.55 mm. These findings endorse the reports of Roopa (2002) and Gajanan *et al.* (2005). However, in *T. gribodei* the entrance tube was shorter (6-25 mm) as reported by (Pooley and Michener, 1969). The length of the entrance tube appears to be a species specific character and also may depend on the type of nesting site. The colonies of *T. iridipennis* kept in earthen pots in the present study had shorter (50 mm) entrance tube.

All the colonies consisted of food storage zone and brood zone internally. The food storage zone was divided into pollen zone and honey zone. The honey and pollen were stored in separate pots, but these pots were often intermixed.

The pollen pots were oval and made up of soft cerumen which were dark brown in colour and usually were observed at the periphery of the colony. The length and width of pollen

Table 1 : Nesting habits of stingless bee, *Trigona iridipennis* at Dharwad

Nesting place	No. of colonies observed	Height from the ground (mm)	Cavity dimensions				
			Width (mm)	Height (mm)	Length (mm)	Entrance tube width (mm)	Entrance tube length (mm)
Tree Cavity	05	222.6 ± 44.47 (171.0 to 291.0)	-----	-----	-----	5.08 ± 1.13 (3.5 to 6.0)	108.80 ± 11.14 (90.0 to 121.0)
Wall Cavity	12	192.57 ± 93.32 (50.0 to 411.0)	132.65 ± 46.60 (50.0 to 190.0)	143.30 ± 49.09 (110.0 to 207.0)	165.05 ± 96.88 (47.0 to 325.0)	3.32 ± 1.39 (2.0 to 6.0)	96.55 ± 29.12 (56.0 to 145.0)

Figures in the parentheses are the range values

Table 2 : Internal structure of the nest of stingless bee, *Trigona iridipennis* at Dharwad

Parameters	Brood cells	Pollen pots	Honey pots
Dimensions			
Length	2.14 ± 0.33 (1.36 to 2.83)	7.26 ± 0.33 (6.04 to 8.63)	7.73 ± 0.34 (6.94 to 8.69)
Width	1.70 ± 0.20 (1.06 to 2.21)	4.49 ± 0.39 (3.45 to 6.14)	5.04 ± 0.30 (3.64 to 6.03)
Shape	Oval	Oval	Oval
Colour	Brownish	Dark brown	Dark brown
Location	Centre	Periphery	Inner Periphery
Density (cells/cubic inch)	20.10 ± 6.17 (12 to 33)	14.9 ± 2.46 (11 to 18)	3.53 ± 0.55 (2.9 to 4.9)

Figures in the parentheses are the range values

pots varied from 6.04 to 8.63 mm and 3.45 to 6.14 mm with a mean of 7.26 and 4.49 mm, respectively (Table 2). The density of pollen pots ranged from 11 to 18 cells with a mean of 14.90 cells/cubic inch. The pollen pots were compactly filled with pollen pellets and closed. Only few pots were found open which were used for storing incoming pollen. The pollen stored was little wet with sour taste. Pollen zone was usually more than honey zone, which indicated the surplus availability of pollen in the study area. Pollen pots were closed when they were full. New pots were built adjacent to them and sometimes they were intermingled. Similar observations were made by Dollin (1996) who reported that the cluster of the food pots resembled bunch of grapes and contained honey and pollen pots.

The honey pots were oval, dark brown and slightly larger than the pollen pots and located at the inner periphery of the colony and some were often intermixed with pollen pots. The length and width of honey pots ranged from 6.94 to 8.69 mm and 3.64 to 6.03 mm with a mean of 7.73 and 5.04 mm, respectively. Density of honey pots ranged from 2.90 to 4.90 cells/ cubic inch with a mean of 3.53 cells/ cubic inch. Like pollen pots, honey pots were also sealed after ripening of honey.

Brood cells were smaller than food pots. They were oval, brownish in colour and appeared like jowar grains and were arranged in a net work of narrow vertical pillars with horizontal connectives. These brood cells were found at the centre of the colony and were arranged in cluster with a space which facilitated easy movement of bees within the cluster. They were surrounded by the honey and pollen pots.

The cells containing eggs and larvae were brownish, while pupal cells were creamy white in colour. The brood cells measured from 1.36 to 2.83 mm in length and 1.06 to 2.21 mm in

width with a mean of 2.14 and 1.70 mm, respectively. Density of brood cells ranged from 12 to 33 cells with a mean of 20.10 cells/ cubic inch. These findings corroborate the reports of Roopa (2002), Gajanan *et al.* (2005) and Muthuraman (2006).

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