



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2019; 7(1): 498-500

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Received: 13-11-2018

Accepted: 15-12-2018

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## Time spent by stingless bees, *Tetragonula laeviceps* for nectar and pollen collection from musk melon flower

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### Abstract

With a view to know the time spent per flower by stingless bees for collecting nectar and pollen, the study of foraging behaviour of stingless bees, *Tetragonula laeviceps* Smith on muskmelon flowers in net house condition was carried out at Navsari Agricultural University, Navsari during March 2013 to December 2014. The mean time spent per flower by stingless bees for collecting nectar and pollen from muskmelon flower was varied between 9.90 to 11.17 seconds with an average of  $10.74 \pm 0.38$  seconds and 15.98 to 18.16 seconds with an average of  $17.20 \pm 0.65$  seconds, respectively.

**Keywords:** Stingless bees, *Tetragonula laeviceps*, time spent and musk melon

### Introduction

Stingless bees, *Tetragonula laeviceps* are the smallest of the honey producing bees. They are highly social insects like honey bees, living in permanent colonies, nesting in old walls, logs, crevices and such other concealed places. Stingless bees are hymenopterous insects belong to the super family Apoidea, family Apidae and sub family Meliponinae. Meliponinae consists of two genera *Melipona* and *Trigona* which belong to the tribe *Meliponinae* and *Trigonini*, respectively. *Meliponinae* include eight genera having fifteen sub genera and more than five hundred species<sup>[8]</sup>. Until now, it has been reported that *T. irridipenis* is the only species found in India but recent identification stingless bees collected from South Gujarat region revealed the presence of *T. laeviceps* in India<sup>[5]</sup>. The colonies of stingless bee are perennial and usually consist of hundreds or thousands of workers<sup>[8]</sup>. They are found in colonies ranging from a few dozen to 100,000 or more workers and are highly social bees<sup>[4]</sup>. Recently in book Pot-honey: a legacy of stingless bees; Genus *Tetragonula* also includes 30 other stingless bee species that are found in our region, such as New Guinea, Indonesia, The Philippines, The Solomon Islands, Malaysia, Thailand, Sri Lanka and India<sup>[6]</sup>.

Stingless bees have advantages over other bees as these bees lack a functional sting which help in easy management compared to other type of honey bees and are suitable for pollination of crops that are cultivated in inhabited areas and in enclosures such as cages and greenhouses<sup>[2]</sup>. Stingless bees, *T. laeviceps* has ability to visit a wide range of flowers like, vegetable crops, fruit crops, oil seed crops, pulse crops, forage crops, weed crops and ornamental and flower plants. In the lowland neotropics, 52 species of plants visited by *Melipona* and 108 of the 128 species visited by other stingless bee species<sup>[7]</sup>. Melendez-Ramirez *et al.* recorded the bee visitors of pumpkin (*Cucurbita moschata* Duchesne), cucumber (*Cucumis sativus* L.), melon (*Cucumis melo* L.) and watermelon (*Citrullus lanatus* L.), on 14 sites in Yucatan, Mexico<sup>[3]</sup>. Considering the importance of stingless bees, *T. laeviceps* as pollinator, a study was carried out to know the time spent by stingless bees for collecting nectar and pollen from musk melon flower.

### Materials and Methods

The time spent per flower by stingless bees for collecting nectar and pollen, the study of foraging behaviour of stingless bees, *T. laeviceps* Smith in net house condition were carried out at Navsari Agricultural University, Navsari during March 2013 to December 2014. The three colonies of *T. laeviceps* were kept in net house with initiation of flowering of musk melon crops. The observations on time spent by individual bees for collecting nectar and pollen were recorded from ten randomly selected musk melon flowers at one hour interval

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starting from 06 00 h to 17 00 h for a period of five minutes. These observations were recorded at weekly interval throughout the flowering period. The data obtained were pooled and statistically analyzed considering one colony as replication using Completely Randomized Design (CRD).

### Results and Discussion

The observations on time spent per flower by individual stingless bees for collecting nectar and pollen was recorded (Table 1) with initiation of flowering to throughout flowering period on musk melon flower.

During *kharif* - 2013, there was no any activity of stingless bees, *T. laeviceps* with pollen and nectar during 06 00, 07 00 and 08 00 h. The activity of stingless bees with pollen and nectar commenced from 09 00 h. The time spent by individual bees for collecting pollen and nectar was ranged from 9.47 to 11.53 seconds with an average of  $10.57 \pm 0.63$  seconds and 15.52 to 18.34 seconds with an average of  $17.12 \pm 0.84$  seconds, respectively. The maximum time spent by stingless bees for collecting pollen and nectar on musk melon flower was 11.53 seconds at 12 00 h and 18.38 seconds at 09 00 h, respectively (Table 1).

During *rabi* - 2014, there was no any activity of stingless bees, *T. laeviceps* with pollen and nectar foraging during 06 00, 07 00 and 08 00 h. The activity of stingless bees with pollen and nectar commenced from 09 00 h. The time spent by individual bees for collecting pollen and nectar was ranged from 9.98 to 11.65 seconds with an average of  $10.90 \pm 0.59$  seconds and 15.68 to 18.25 seconds with an average of  $17.27 \pm 0.97$  seconds, respectively. The maximum time spent by stingless bees for collecting pollen and nectar on musk melon flower was 11.65 seconds at 17 00 h and 18.25 seconds at 17 00 h, respectively (Table 1). Considering the pooled data of *kharif* - 2013 and *rabi* - 2014, the time spent by individual

bees for collecting pollen and nectar was varied between 9.90 to 11.17 seconds with an average of  $10.74 \pm 0.38$  seconds and 15.98 to 18.16 seconds with an average of  $17.20 \pm 0.65$  seconds, respectively (Table 1). The maximum time spent by stingless bees for collecting pollen and nectar on musk melon flower was 11.17 seconds at 15 00 h and 18.16 seconds at 09 00 h, respectively. There was no any activity of stingless bees, *T. laeviceps* with pollen and nectar during 06 00, 07 00 and 08 00 h. The activity of stingless bees with pollen and nectar commenced from 09 00 h. From the above results it can be extracted that the stingless bees, *T. laeviceps* Smith spent little more time for collecting nectar as compared to collecting pollen. Bomfim *et al.* (2014) reported that the length of each time for nectar collection visit by a *Scaptotrigona* sp. nov. forager varied between 2.27 and 43.95 seconds, with an average of  $13.10 \pm 8.86$  seconds ( $n = 68$ )<sup>[1]</sup>.

Among the foragers, the floral handling time varied between the foragers in green house cucumber which collected nectar ( $7.8 \pm 1.6$  seconds in TNAU orchard and  $7.4 \pm 1.7$  in Srivilliputhur) and pollen ( $3.9 \pm 0.5$  seconds in TNAU orchard and  $3.5 \pm 0.3$  in Srivilliputhur)<sup>[2]</sup>.

### Conclusion

The observation on time spent per flower by individual stingless bees for collecting nectar and pollen was recorded on musk melon flowers. The time spent by individual bees for collecting pollen and nectar was varied between 9.90 to 11.17 second with an average of  $10.74 \pm 0.38$  second and 15.98 to 18.16 second with an average of  $17.20 \pm 0.65$  second, respectively. The maximum time spent by stingless bees for collecting pollen and nectar on musk melon flower was 11.17 second at 15 00 h and 18.16 second at 09 00 h, respectively. There was no any activity of stingless bees, *T. laeviceps* with pollen and nectar during 06 00 h, 07 00 h and 08 00 h.

**Table 1:** Time spent per flower by stingless bees, *T. laeviceps* for nectar and pollen collection from musk melon flower

| S. No.         | Time spent (seconds) |                  |                 |                  |                  |                 |
|----------------|----------------------|------------------|-----------------|------------------|------------------|-----------------|
|                | Kharif - 2013        |                  | Rabi - 2014     |                  | Pooled           |                 |
|                | Pollen               | Nectar           | Pollen          | Nectar           | Pollen           | Nectar          |
| 06 00          | --                   | --               | --              | --               | --               | --              |
| 07 00          | --                   | --               | --              | --               | --               | --              |
| 08 00          | --                   | --               | --              | --               | --               | --              |
| 09 00          | 10.60                | 18.34            | 11.30           | 17.98            | 10.95            | 18.16           |
| 10 00          | 9.47                 | 17.26            | 11.44           | 18.22            | 10.45            | 17.74           |
| 11 00          | 10.57                | 17.40            | 10.78           | 16.47            | 10.67            | 16.93           |
| 12 00          | 11.53                | 15.52            | 10.05           | 16.43            | 10.79            | 15.98           |
| 13 00          | 10.83                | 16.93            | 10.63           | 17.83            | 10.73            | 17.38           |
| 14 00          | 10.57                | 17.28            | 11.15           | 16.60            | 10.86            | 16.94           |
| 15 00          | 11.18                | 17.42            | 11.15           | 17.97            | 11.17            | 17.69           |
| 16 00          | 9.82                 | 17.80            | 9.98            | 15.68            | 9.90             | 16.74           |
| 17 00          | 10.58                | 16.15            | 11.65           | 18.25            | 11.12            | 17.20           |
| Min.           | 9.47                 | 15.52            | 9.98            | 15.68            | 9.90             | 15.98           |
| Max.           | 11.53                | 18.34            | 11.65           | 18.25            | 11.17            | 18.16           |
| Av. $\pm$ S.D. | $10.57 \pm 0.63$     | $17.12 \pm 0.84$ | $10.9 \pm 0.59$ | $17.27 \pm 0.97$ | $10.74 \pm 0.38$ | $17.2 \pm 0.65$ |

### Acknowledgements

The authors thank the Director of Research & Dean P. G. Studies Navsari Agricultural University and the Principal, N. M. College of Agriculture, Navsari Agricultural University, Navsari (Gujarat) for encouragement and provision of facilities to carry out the research.

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