



Research Paper

## The stingless bee species *Trigona spp.* on various species of flowering plants in Baturaja City, Ogan Komering Ulu District, South Sumatra

Elsa Febriani<sup>1</sup>, Yulia Pujiastuti<sup>2\*</sup>

<sup>1</sup> Formerly student at Department of Plant Protection, Agricultural Faculty, Sriwijaya University, Jl. Raya Palembang-Prabumulih Km. 32 Indralaya, Ogan Ilir, South Sumatra, Indonesia

<sup>2</sup> Department of Plant Protection, Agricultural Faculty, Sriwijaya University, Jl. Raya Palembang-Prabumulih Km. 32 Indralaya, Ogan Ilir, South Sumatra, Indonesia

\*Corresponding author: [yulia.pujiastuti@unsri.ac.id](mailto:yulia.pujiastuti@unsri.ac.id)

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### Abstract

*Trigona* bee (*Trigona spp.*) is a species of honey-producing bee that does not have a sting (Stingless bees). This bee is small in size and plays an important role as pollinator insects of flowering plants. The research was conducted from June-July 2021 in Baturaja City, Ogan Komering Ulu Regency, South Sumatra. The purpose of this research was to study the species of *Trigona* bees (*Trigona spp.*) visiting various flowering plants and the species of flowering plants visited by these bees. The research method was purposive sampling and direct observation in the field. Observations were made by observing bee species that exist in several flower plants. The plants often used as food for *Trigona* bees were mainly plants in the flowering phase because they produce a lot of nectar and pollen. Results of observations in the field found 11 species of flowering plants favored by *Trigona* bees, namely *Kembang kertas* (*Zinnia elegans*), *Jambu air* (*Syzygium aqueum*), *Air mata pengantin* (*Antigonon leptopus*), *Kelengkeng* (*Dimocarpus longan*), *Melinjo* (*Gnetum gnemon*), *Cabai* (*Capsicum annum*), *Seri* (*Muntingia calabura*), *Palem* (*Dypsis lutescens*), *Matahari* (*Helianthus annuus*), *Santos lemon* (*Xanthostemon chrysanthus*), and *Belimbing* (*Averrhoa carambola*). The most commonly found *Trigona spp.* species was *Heterogona itama* in the bridal tears flower (*Antigonon leptopus*).

### Keywords

Stingless bees, *Trigona spp.*, flowering plants, behavior, honey

## 1. INTRODUCTION

Honey bees are insects of the Apidae family that produce honey as a result of collecting and converting nectar or secretions of parts of a plant. In general, the Apidae family is grouped into two, namely the genus *Apis* or stinging honey bees and the genus *Trigona* or non-stinging honey bees (Priastomo et al., 2020). Honey bees are a group of insects that act as pollinating agents for flowering plants, thus increasing the production of these plants. Honey bees and plants have a mutually beneficial relationship, with plants providing bee food in the form of nectar and pollen, while honey bees carry out the process of pollination (Agussalim et al., 2017).

In Baturaja, South Sumatra, *Trigona* bees (*Trigona spp.*) are usually known as klanceng bees. According to Syafrizal et al. (2012), *Trigona* bees (*Trigona spp.*) in Indonesia have several regional names, namely gala-gala (Sumatra), klanceng, lenceng (Java), and teuweul (Sunda). In the world, there are about 150 species of *Trigona*, and Indonesia has approximately 37 species spread across various islands. For

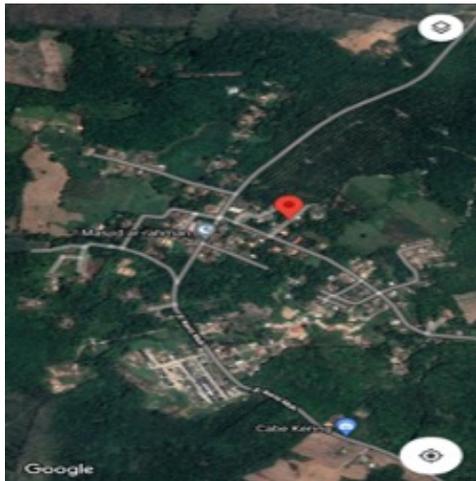
example, on the island of Java, about nine *Trigona* species are known, Sumatra has 18 *Trigona* species, Kalimantan has 31 *Trigona* species, and Sulawesi has two *Trigona* species (Istikowati et al., 2019). This number may be even higher as each region has different species diversity (Sihombing and Nurrachmania, 2021).

*Trigona* bees (*Trigona spp.*) are social insects that live in groups within a colony. They are stingless bees and are typically found in tropical and subtropical climates (Nining et al., 2019). If disturbed, *Trigona* bees will bite but not sting. In Ogan Komering Ulu Regency, especially in West Baturaja and East Baturaja Districts, *Trigona* bees have not been widely cultivated, as indicated by the lack of *Trigona spp.* bee products in the market. According to Syuhriatin (2019), *Trigona spp.* products such as honey and propolis have relatively higher prices than other bee products due to their difficulty in obtaining and their significant benefits.

Klanceng bees mainly act as pollinators, and they are also known for producing honey and propolis (Kerisna et al., 2019). The production of honey and propolis by *Trigona spp.* bees is determined by the availability of food

sources, both near and far from the nest. This is related to the opinion of Syafrizal et al. (2014) that an abundance of food sources can affect the increase in honey and propolis production.

Flowering plants, especially those in bloom that produce ample nectar and pollen, are often used as food sources for *Trigona* bees. This is supported by the statement of Rustom and Pramono (2018) that the color, smell, and size of pollen are factors that attract *Trigona* bees to visit flowers. Some common food plants visited by honey bees include water girlfriend (*Impatiens balsamina*), papaya (*Carica papaya*), *Ageratum houstonianum*, guava (*Psidium guajava*), sunflower (*Helianthus* sp.), acacia (*Acacia* sp.), *Caliandra brevipes*, putri malu (*Mimosa pudica*), chili (*Capsicum* sp.), and coconut (*Cocos nucifera*) (Nugroho and Soesilohadi, 2014). The research aims to study the species of *Trigona* bees (*Trigona* spp.) that visit various flowering plants and the types of flowering plants visited by these bees.



**Figure 1.** Research location  
Source: Google Maps

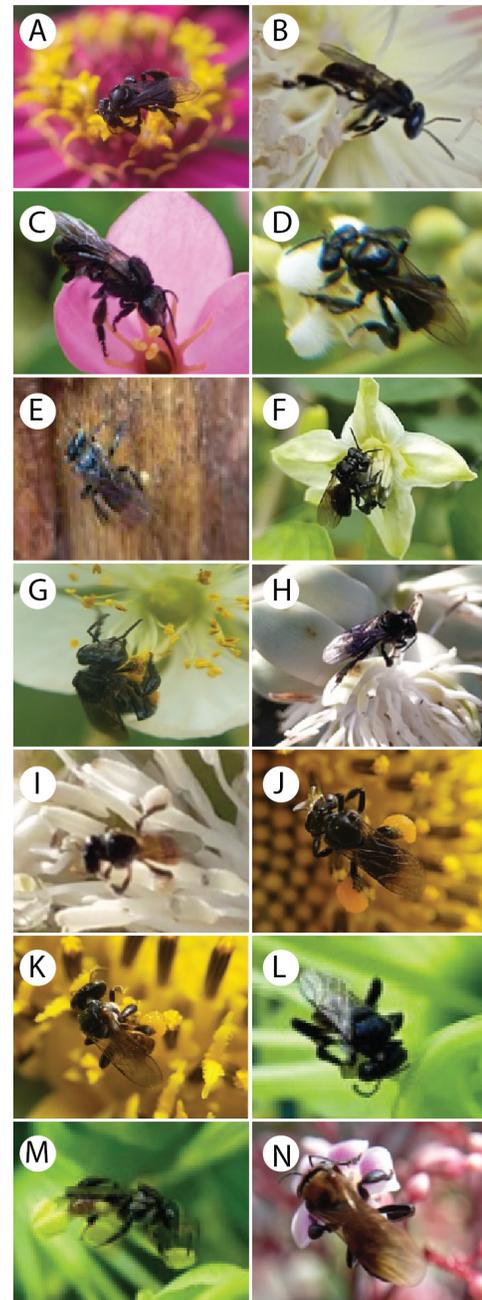
## 2. EXPERIMENTAL SECTION

### 2.1 Research location

Survey was conducted in three sub-districts of Baturaja City, Ogan Komering Ulu Regency, South Sumatra Province (Figure 1) in June-July 2021, with details of the locations as follows (Table 1).

### 2.2 Sampling method

The survey was conducted by using purposive sampling and direct observation in the field. Observations were made on bee species in several flower plants and using the sampling method using insect nets to obtain specimens of *Trigona* spp. to be identified in the laboratory. Observations were made directly (visually) by observing the types of flowering plants in three different villages of Baturaja City, Ogan Komering Ulu Regency, South Sumatra. Observations



**Figure 2.** Various flowering plants visited by *Trigona* spp. *Heterotrigona itama* (A) *Kembang kertas* (*Zinnia elegans*), (B) *Jambu air* (*Syzygium aqueum*), (C) *Air mata pengantin* (*Antigonon leptopus*), (D) *Kelengkeng* (*Dimocarpus longan*), (E) *Melinjo* (*Gnetum gnemon*), (F) *Cabai* (*Capsicum annum*), (G) *Kersen* (*Muntingia calabura*), (H) *Palem* (*Dypsis lutescens*), (I) *Matahari* (*Helianthus annuus*), (J) *Santos lemon* (*Xanthostemon chrysanthus*), *Trigona laeviceps* on plants (K) *Palem* (*Dypsis lutescens*), (L) *Matahari* (*Helianthus annuus*), and (M) *Santos lemon* (*Xanthostemon chrysanthus*), and *Geniotrigona thoracica* on plants (N) *Belimbing* (*Averrhoa carambola*).

were made in the morning (07.00-09.30 WIB) and afternoon (16.00-17.30 WIB). Sampling was done using an insect net (Sweep net) on plants visited by *Trigona spp.* and taking specimens of these bees to be identified in the laboratory. Documentation was used to strengthen and support the data obtained, in the form of photos of *Trigona* bees in flowers.

### 2.3 Observation parameters

1. Species of bees in the flower: Record the species of bees observed visiting the flowers. Note down the different bee species present and their frequency of visits.
2. Type of flower visited by *Trigona spp.*: Identify and document the specific types of flowers that are visited by *Trigona spp.* bees. Note the flower species and their characteristics.
3. Time of visit of *Trigona spp.* bees: Observe and record the time of day when *Trigona spp.* bees are most active in visiting flowers. Note any patterns or preferences in their visitation times.
4. *Trigona spp.* bee visit activity: Monitor and document the behavior and activity of *Trigona spp.* bees during their visits to flowers. Record aspects such as flight patterns, foraging behavior, interactions with other bees or insects, and any notable behaviors or characteristics observed.

**Table 1.** Location of stingless bee survey in Baturaja city, Ogan Komering Ulu District

Sub district	Village	Ordinates	Altitude (m asl)
Baturaja Barat	Batu Kuning	4°06'53.3"S 104°07'00.1"E	82.3
Baturaja Timur	Sekar Jaya	4°05'38.0"S 104°14'42.8"E	67.0
Baturaja Timur	Tanjung Baru	4°08'37.2"S 104°12'37.8"E	77.5

## 3. RESULTS AND DISCUSSION

### 3.1 Species of Plants Observed and Plants Visited by *Trigona spp.*

Based on the results of the survey that has been carried out, there are plants or plants that grow around the yard and yard of the house that feed *Trigona spp.*. The potential feed for *Trigona spp.* can be seen in Table 2 below.

Based on the survey results listed in Table 2, there are plants or plants that grow around the yard and yard of the community that have the potential to become *Trigona spp.* feed. In the village where cultivation takes place, there is land overgrown with plants that produce nectar and pollen around the yard of the house, which has the potential to feed *Trigona spp.*. Honey bees are a group of insects that

act as pollinators of flowering plants and are expected to increase the production of these plants.

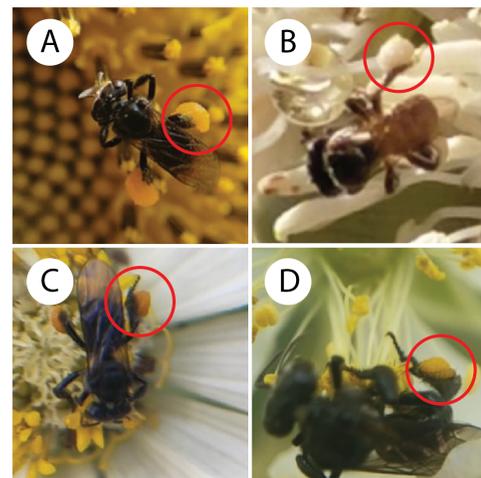
It can be seen in Table 2 that there are many flowering plants found in people's yards, but only a few plants are visited by bees and serve as food for *Trigona spp.*. Plants visited by *Trigona* bees include paper flowers (*Zinnia elegans*), bridal tears (*Antigonon leptopus*), flowers on coconut plants (*Cocos nucifera*), and so on (Table 2). However, some flowers, such as jasmine flowers (*Jasminum sp.*) and roses (*Rosa sp.*), are not visited by *Trigona* bees at all.

### 3.2 *Trigona spp.* Bees on Flowering Plants Found

*Trigona* bees have different times in visiting flowers. The difference usually lies in the type of flowering plants they feed on. If the food source is abundant, it can affect the increase in honey and propolis production. It can be seen in Table 3 that flowering plants, especially those in bloom that produce ample nectar and pollen, are often used as food sources for *Trigona* bees.

Based on Table 3, several plants are visited by *Trigona spp.* bees to find food, including both nectar and pollen. The visiting time of *Trigona spp.* bees varies, with many bees actively searching for food in the morning compared to the afternoon, as shown in Table 3. To study the activity of *Trigona spp.*, observations were conducted for approximately one week with two observations each day: in the morning (07:00-09:30) and in the afternoon (16:00-17:30). Each *Trigona spp.* has a different time for finding food, as indicated in Table 3. The preference for morning activity is influenced by the intensity of sunlight (Syafrizal et al., 2014).

After the observations, *Trigona* bees were found to be active throughout the day in Palm (*Dypsis lutescens*), Bride's tears (*Antigonon leptopus*), Sunflowers (*Helianthus annuus*), and Seri (*Muntingia calabura*). However, for other plants,



**Figure 3.** *Trigona* bees when carrying pollen: (A) Sunflower, (B) Palm, (C) Paper flower, (D) Seri.

**Table 2.** Potential plants available and visited by *Trigona spp.*

Common name	Scientific name	Baturaja	Baturaja	Baturaja
		Barat/Batu Kuning	Timur/Sekar Jaya	Timur/Tanjung Baru
Kembang Kertas	<i>Zinnia elegans</i>	✓	✓	✓
Bougenvil	<i>Bougainvillea glabra</i>	-	-	*
Mawar	<i>Rosa sp.</i>	-	*	-
Jambu air	<i>Syzygium aqueum</i>	✓	✓	-
Alamanda	<i>Allamanda cathartica</i>	-	-	-
Air mata pengantin	<i>Antigonon leptopus</i>	✓	✓	✓
Kumis Kucing	<i>Orthosiphon aristatus</i>	-	*	-
Kelengkeng	<i>Dimocarpus longan</i>	✓	*	✓
Kelapa	<i>Cocos nucifera</i>	✓	✓	✓
Cabai	<i>Capsicum annum</i>	✓	*	*
Kamboja	<i>Adenium obesum</i>	-	*	-
Kersen	<i>Muntingia calabura</i>	✓	✓	*
Pisang	<i>Musa sp.</i>	-	✓	-
Kencana	<i>Ruellia simplex</i>	-	-	*
Palem	<i>Dyopsis lutescens</i>	*	✓	*
Matahari	<i>Helianthus annuus</i>	*	✓	*
Putri Malu	<i>Mimosa pudica</i>	-	-	-
Melati	<i>Jasminum sp.</i>	-	-	-
Santos lemon	<i>Xanthostemon chrysanthus</i>	*	*	✓
Kancing	<i>Gomphrena globosa</i>	*	*	-
Mangga	<i>Mangifera sp.</i>	-	*	✓
Kembang Sepatu	<i>Hibiscus rosasinensis</i>	*	-	*
Belimbing	<i>Averrhoa carambola</i>	*	✓	-
Tahi ayam	<i>Lantana camara</i>	-	-	*
Asoka	<i>Saraca asoca</i>	-	*	*
Kenikir	<i>Tagetes erecta</i>	-	-	-

**Notes:** ✓ = visited, – = not visited, \* = none

*Trigona* bee activity was only observed in the morning, and they were no longer found on those plants when the sun was hot (Table 3). This is supported by the opinion of Anendra (2010), who stated that the peak activity of pollen and nectar collection occurs from 08:20 to 10:00 local time.

### 3.3 Various Types of Flowering Plants Visited by *Trigona spp.* Bees

Some types of flowering plants visited by *Trigona spp.* bees have striking colors and unique petal shapes (Figure 2).

Based on Figure 3, flowering plants visited by *Trigona spp.* bees are mostly flowers that have striking colors and blooms. The bees visit these flowers to find food, including nectar and pollen. Palm plants (Figure 2H), sunflowers (Figure 2J), and santos lemon (Figure 2L) were observed to be visited by two bee species, namely *H. itama* and *T. laeviceps*. During observations after rainfall, *Trigona* bees were seen flying around the flowers but not landing to collect nectar or pollen. This behavior is likely due to the flowers still being wet from the rain. Weather factors, such as temperature and humidity, also influence the visits of

*Trigona* bees to flowering plants. According to A'yunin et al. (2019), various weather factors including temperature, light intensity, wind, and relative humidity are reported to affect bee visiting activities. The sweet liquid substance called nectar is the part of the plant that feeds *Trigona* bees. Additionally, these plants and flowers also contain pollen.

### 3.4 Behavior of *Trigona spp.* Bees on the Plants They Visit

Flowering plants, especially blooming flowers, are essential for bees as they serve as a source of food. Each bee species may exhibit different behaviors when visiting plants, but one of the more dominant behaviors observed is the collection of nectar from each plant. The behaviors of bees can be observed and summarized in Table 4 below.

To determine the activity of *Trigona spp.*, observations were conducted for approximately one week with two observations each day: in the morning (07:00-09:30) and in the afternoon (16:00-17:30). Each species of *Trigona* has its own preferred time for finding food, as indicated in Table 3. *Trigona spp.* bees are more active in the morning compared to the afternoon, which is influenced by the intensity of

**Table 3.** Number of stingless bee found on observation

Common name	Scientific Name	Trigona Species	Number (Individu)	
			Morning (07.00 - 09.30)	Evening (16.00 - 17.30)
Kembang Kertas	<i>Zinnia elegans</i>	Heterotrigona itama	+	-
Jambu air	<i>Syzygium aqueum</i>	Heterotrigona itama	++	-
Air mata pengantin	<i>Antigonon leptopus</i>	Heterotrigona itama	+++	+++
Kelengkeng	<i>Dimocarpus longan</i>	Heterotrigona itama	++	-
Melinjo	<i>Gnetum gnemon</i>	Heterotrigona itama	++	-
Cabai	<i>Capsicum annuum</i>	Heterotrigona itama	+	-
Kersen	<i>Muntingia calabura</i>	Heterotrigona itama	+	+
Palem	<i>Dypsis lutescens</i>	Heterotrigona itama	+++	++
		Tetragonula laeviceps	++	++
Matahari	<i>Helianthus annuus</i>	Heterotrigona itama	++	+
		Tetragonula laeviceps	+	+
Santos lemon	<i>Xanthostemon chrysanthus</i>	Heterotrigona itama	+++	++
		Tetragonula laeviceps	++	++
Belimbing	<i>Averrhoa carambola</i>	Geniotrigona thoracica	+	-

**Notes:** + = 1–5 individuals, ++ = 6–10 individuals, +++ = more than 10 individuals

**Table 4.** Bee behavior on visited plants

Plants			
Common name	Scientific name	Insect Behavior	Time
Zinnia	<i>Zinnia elegans</i>	Collecting nectar, pollinating	Morning
Palem	<i>Dypsis lutescens</i>	Collecting nectar and pollen	Morning-evening
Matahari	<i>Helianthus annuus</i>	Collecting nectar and pollen	Morning-evening
Kersen	<i>Muntingia calabura</i>	Collecting nectar and pollen	Morning-evening
Santos lemon	<i>Xanthostemon chrysanthus</i>	Collecting nectar and pollen	Morning
Jambu air	<i>Syzygium aqueum</i>	Collecting nectar and flying around flower	Morning
Air mata pengantin	<i>Antigonon leptopus</i>	Collecting nectar and pollen	Morning-evening
Belimbing	<i>Averrhoa carambola</i>	Collecting nectar	Morning
Melinjo	<i>Gnetum gnemon</i>	Sap picking	Morning
Cabai	<i>Capsicum annum</i>	Collecting nectar	Morning

sunlight (Syafrizal et al., 2014).

After the observations, *Trigona* bees were found to be active throughout the day on Palm (*Dyopsis lutescens*), Bride's tears (*Antigonon leptopus*), Sunflowers (*Helianthus annuus*), and Seri (*Muntingia calabura*). However, for other plants, *Trigona* bee activity was only observed in the morning, and they were no longer found on these plants when the sun was hot (Table 3). This is in line with the statement by Anendra (2010) that the peak activity of *Trigona* bees in search of pollen and nectar occurs from 08:20 to 10:00.

*Trigona* bees exhibit various behaviors, including the collection of pollen from the plants they visit. Pollen is obtained from the anthers of flowers, which act as the male reproductive organs of plants (Ferdyan et al., 2021). If pollen is visible on the bee's legs, it indicates that the bee has collected pollen from the visited flowers (Figure 3). *Trigona* bees carry pollen by depositing it on their legs.

Pollen exhibits variations in shape and color, which are determined by the specific plant species it comes from. When *Trigona* bees visit flowers with yellow petals, the pollen they carry will also be yellow (Figure 3A). Similarly, when they visit flowers with white petals, such as palms (Figure 3B), the pollen visible on their legs will be white. Activities of *Trigona* bees can be described as behaviors such as nectar collection, pollination, and pollen gathering on the flowers they visit (Figure 3). The pollen collected from each flowering plant differs based on the color of the flowers they visit. For example, when *Trigona* bees visit palm plants (*D. lutescens*) with white flowers (Figure 3B), the pollen seen on their legs will also be white. Similarly, pollen carried to the nest will be yellow if the bees visit plants with yellow flowers, such as sunflowers (*H. annuus*) (Figure 3A).

#### 4. CONCLUSIONS

Observations conducted on flowering plants in Baturaja City revealed the presence of three species of *Trigona* bees: *H. itama*, *G. thoracica*, and *T. laeviceps*. The observed species of flowering plants visited by these bees include bridal tears (*Antigonon leptopus*), paper flowers (*Zinnia elegans*), longan (*Dimocarpus longan*), palm (*Dyopsis lutescens*), Seri (*Muntingia calabura*), water guava (*Syzygium aqueum*), chili (*Capsicum annum*), sunflower (*Helianthus annuus*), Santos lemon (*Xanthostemon chrysanthus*), and star fruit (*Averrhoa carambola*). Among these species, *T. itama* was found to be the most dominant *Trigona* bee, as it was present in every observed flowering plant. *Trigona* bees primarily engage in pollination activities on flowers, while also serving as collectors of nectar and pollen. The number of *Trigona* bees visiting flowering plants was highest in the morning, with a lower number observed in the afternoon.

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