Research article

Pollen Food Source Diversity of Stingless Bee *Tetragonula pegdeni* and *Lepidotrigona terminata* in Cultivated Area

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Received 23 February 2015 Accepted 31 May 2015 (*Corresponding Author)

Abstract Stingless bees play an important role in pollination of local economic crops. During rainy season, numbers of stingless bee population decline because of lack of food plants. It can lead to colony collapse situation. The main purpose of the first study was to survey the pollen food source of stingless bees in the beginning of rainy season (June) to dry season (December) in the rambutan orchard plantation area in Chantaburi province. The result revealed that 11 species of blooming flowers in observation area were visited by stingless bees in June, five species in October, and four species in December. The second study aimed to identify species of pollen food source from pollen load collected from stingless bees (*Tetragonula pegdeni* and *Lepidotrigona terminate)* colonies in vegetable planting area. It was found that the most favorite plants that stingless bees collected as their pollen food source were amaranth *(Amaranthus lividus*) and corn (*Zea mays*. Linn).

Keywords pollen food source, diversity, stingless bee

INTRODUCTION

Pollination for fruit and seed set is very important for most crop plants. It has been estimated that about 30% of human food is derived from bee-pollinated crops (Kearns and Inouye, 1997). Stingless bee is a kind of bees considered as an important pollinator of the native flora in tropical and subtropical parts of the world. Stingless bees have been used as insect pollinators of many crops (Heard, 1999). In eastern part of Thailand, stingless bees have been kept and used as insect pollinators especially for rambutan for decades (Sawatthum, 2004). In Chantaburi province, several stingless beekeepers sell or rent out stingless bee hives. To be able to use stingless bees for commercial pollination purpose, proper management of colonies in hives is very important. As this type of bees can form perennial colonies from which they forage for food all year-round. Nectar and pollen are food of adult bees as they feed their larvae with pollen. For the bees, an understanding of their main pollen sources allow us to establish plantations providing them with pollen and consequently leading to the stability of the colonies (Kerr et al., 1986). There are a few plants blooming during rainy season in Thailand. Moreover, it is hard for stingless bee workers to fly out when it rains. These cause lack of storage food situation for all members in the colonies, especially pollen for the larvae. These conditions weaken the colonies and have an affect on the survival of the colonies due to the scarcity of pollens. To reduce these problems, the stingless beekeepers need to know the pollen sources in rambutan plantation (Meliponiary) and in vegetable farms in order to plant them to support pollen for the bees. Pollens from viable sources are vital inputs that stingless beekeepers should sustainably manage so that the stingless bee colonies can be protected and promoted for economic and ecologicalpurposes.

OBJECTIVES

This research was implemented with the following objectives:

1. Observation on flower visited by stingless bees in rambutan plantation
2. Studies of pollen sources of 2 stingless bees in vegetable farm

METHODOLOGY

Plant and Pollen Specimens Collection

Pollen specimens collection: Pollen was collected during the period of greatest pollen scarcity (fewer species in the flowering phase). The collecting expedition took place from June to December 2010. The collection locations were Meliponiary of stingless beekeeping in Wang-Pla sub-district, Thamai district, Chantaburi province and stingless bee nests were kept in vegetable farm nursery of Crop Production Department, Faculty of Agricultural Technology, Rajamagala University of Technology. Pollen was collected from bloom flowers around 300 meters far from Meliponiary rambutan plantation in the beginning of rainy season (June), beginning of dry season (October), during dry season (December), and blooming flowers 300 meters around vegetable farm nursery all year round to be used as reference pollens. Another pollen samples were collected from bee pollen loading from worker bees in front of the nests. Two species of stingless bees were chosen, namely: *Tetragonula pegdeni* (8 colonies) and *Lepidotrigona terminate* (4 colonies). The pollen samples were chemically processed via acetolysis (applied from Erdtman, 1952 and Brown, 1960). The samples were then mounted in glycerin jelly and sealed with paraffin. Three slides were prepared for each sample. Pollen types were determined by comparing each slide to reference slides (known flowers) and by consulting the specialized literature in this field.

Plant specimens collection: Flowering plant specimens were collected from both sites at the same time as collected pollen samples. Five specimens per plant were collected and preserved as herbarium specimens and identified with the help of specialized literature.

Pollen Sources of Stingless Bees Analysis

Data on flowering plants, types of pollen from pollen loads were matched to the analyzed pollen sources of both stingless bees.

RESULTS AND DISCUSSION

Flowering plants around Meliponiary in rambutan plantation in Wang-Pla sub-district, Thamai district, Chantaburi province, visited by stingless bees were observed and sample were collected in June, October, and December; 2010. The small numbers of blooming flowers visited by stingless bees was shown in those three observations. Eleven species were found in June, five species in October, and four species in December (Table 1).

The Pollen Source Analysis

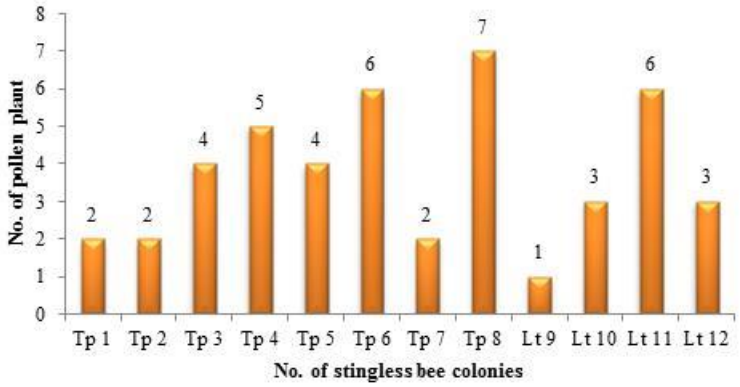
The pollen load collected in front of 12 colonies from two species of stingless bee (*T. pegdeni* and *L. terminata*) in vegetable farm showed that pollen of 17 plant species was found in pollen load species and colonies of stingless bees showed individual character of collecting the various species of pollen plants.

Table 1 Blooming flowers visited by stingless bee

Month of observation	Plant		
	Common name	Scientific name	Family
June	Sulfur Cosmos	*Cosmos spp*.	Asteraceae
	Goat Weed	*Ageratum conyzoides Linn*.	Asteraceae
	Bird Chilli	*Capsicum annuum*	Solanaceae
	Hairy Basil.	*Ocimum basilicum* L.f. *var*. *citratum Back*.	Labiatae
	Holy basil, Sacred Basil	*Ocimum sanctum* L.	Labiatae
	Java Tea, Kidney tea, Cat' s Whiskers	*Orthosiphon aristatus* (Blume) Miq. Bolding	Labiatae
	white gourd, wax gourd	*Benincasa hispida*	Cucurbitaceae
	White Popinac, Lead Tree, Wild Tamarind	*Leucaena leucocephala* (Lamk.) de Wit.	Leguminosae
	Angel face pin	*Cynoglossum lanceolatum* Forssk	Boraginaceae
	Common Purslane,Verdolaga, Pigweed, Little Hogweed, Pusley	*Portulaca oleracea* L.	Portulacaceae
	Unknow		
October	White Popinac, Lead Tree, Wild Tamarind	*Leucaena leucocephala* (Lamk.) de Wit.	Leguminosae
	Rose	*Rosa hybrids*	Rosaceae
	Hairy Basil	*Ocimum basilicum* L.f. var. citratum Back.	Labiatae
	Purslane, Pussley, Rose mose, Sun plant, Eleven-o'clock	*Portulaca oleracea* L.	Portulacaceae
	Unknown		
December	Water lily	*Nymphaea lotus* L.	Nymphaeaceae
	Coral Vine, Pink Vine	*Antigonon leptopus*. Hook. & Arn	Polygonaceae
	white gourd, wax gourd	*Benincasa hispida*	Cucurbitaceae
	banana blossom	*Musa sapientum* L.	Musaceae

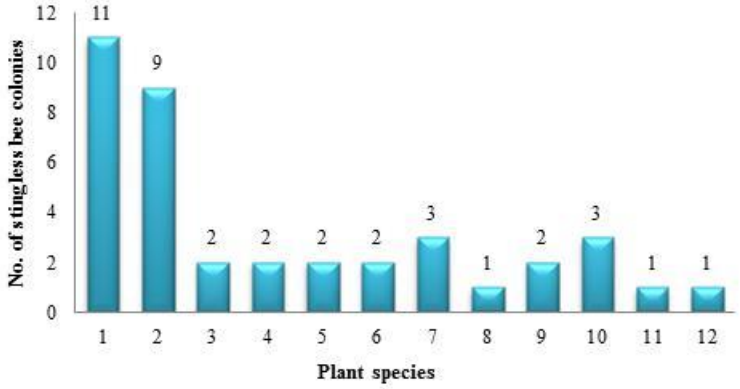
Tetragonula pegdeni colony number 8 collected the highest variety of pollen plants (seven species) while *L. terminata* colony number 11 collected six species of pollen plants (Fig. 1). Figure 2 shows the most favorite plants found in pollen load in yellow flame. (*Peltophorum pterocarpum* (DC.) Backer ex K.Heyne) and Corn (*Zea mays*. Linn), respectively. The observation in the field showed that amaranth (*Amaranthus lividus* Linn.) was the favorite place of visiting of the stingless bees.

In southeastern Brazilian Atlantic Forest, stingless bees *Tetragonisca angustula* preferred to visit Asteraceae and Anacardiamore than others (Braga J. A., et.al., 2012) while in manmade plantation in Thailand, the two stingless bee species preferred Leguminosae (*Peltophorum pterocarpum*), Poaceae (*Zea mays*), and Amaranthaceae (*Amaranthus lividus*). Therefore, corn and amaranth could be pollen plants providing pollen food sources for bees during pollen-scared season, as both of them were easy to grow in almost every kind of environment.



[1]* Tp = *Tetragonula pegdeni*
Lt = Lepidotrigona terminata

Fig. 1 Number of plants found in pollen loads collected from worker stingless bees in front of the stingless bee colonies



* 1 = *Peltophorum pterocarpum* (DC.) K. Heyne
2 = *Zea mays* Linn.
3 = POACEAE
4 = NYMPHAEACEAE
5 = *Vaccinium sprengelii* (G.Don) Sleumer
6 = Unknow 1
7 = Unknow 2
8 = *Luffa acutangula* (Linn.) Roxb.
9 = *Antigonon leptopus* Hook. & Arn.
10 = SOLANACEAE
11 = *Pterocarpus indicus* Willd.
12 = *Maoutia puya* (Wall. ex Hook.) Wedd.
13 = AMARYLLIDACEAE
14 = *Solanum torvum* Sw.
15 = Unknow 3
16 = Unknow 4
17 = *Mikania micrantha* H.B.K.

Fig. 2 Numbers of stingless bee colonies collected pollen from each pollen plant

CONCLUSION

Results of floral diversity using as pollen source of two stingless bees *T. pegdeni* and *L. terminata* showed a small number floral plants visited by stingless bees during observation. There were eleven species in June, five species in October, and four species in December. The most common pollen types found in stingless bee pollen loads were *Peltophorum pterocarpum* (DC.) and K. Heyne and *Zea mays* but the most popular plant visited by stingless bees found in vegetable farm was amaranth.

ACKNOWLEDGEMENTS

This work was supported by Rajamangala University of Technology research fund. The author would like to thank Assoc. Prof. Danai Vannavanich for his comments.

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