

Chapter 2

A Review on the Pollination Services by Stingless Bees, *Heterotrigona itama* (Hymenoptera; Apidae; Meliponini), on Some Important Crops in Malaysia

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ABSTRACT

Stingless bees (Hymenoptera, Apidae, Meliponini) are common pollinators in the Malaysian agricultural ecosystem. Stingless bees are regarded as a good candidate for commercial pollination because of their specialized foraging adaptations and frequent visitation to cultivated fields. Unlike honeybees and bumble bees, stingless bees have not yet been commercially bred on a large scale for pollination purposes. Several studies outside Malaysia have shown that stingless bees' foraging activities may increase the production and quality of fruits. However, the role of stingless bees in producing quality fruits in open fields or in greenhouse crops in the Malaysian agricultural ecosystem is still unknown. In this review, the authors

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*discuss the efficiency of stingless bees, *Heterotrigona itama*, pollination services on some important cultivated crops in Malaysia, namely chili (*Capsicum annuum*), cucumbers (*Cucumis sativus*), and rock melon (*Cucumis melo*) based on previous reports. The findings revealed that pollination by *H. itama* can increase fruit size and weight, seed number, and pericarp volume.*

INTRODUCTION

Chili (*Capsicum annuum*), cucumber (*Cucumis sativus*) and rock melon (*Cucumis melo*) are some of the important cultivated crops in Malaysia and is a source of income for thousands of Malaysian farmers. According to Department of Statistics Malaysia (Monthly Manufacturing Statistics Malaysia, 2014), chili and cucumber average per capita consumptions (kg/year) in Malaysia were 2.0 kg/year and 2.9 kg/year in 2014, respectively. Compared to imported chili and cucumber, only small quantities of these vegetables were exported, and this shows that chili and cucumber productions in Malaysia still cannot meet the high demand by local consumer. Meanwhile, rock melon or cantaloupe is one of the commercialized fruits in Malaysia, where increasing popularity offers the potential for high profit returns to farmers. The Malaysian government has recognized that rock melon could generate significant economic income for farmers and has invested millions of Malaysia Ringgit in the industry (Griffith & Watson, 2016).

In Malaysia, chilies and cucumbers are usually grown outdoors, while rock melon is generally cultivated in greenhouses. However, due to better control of plant growth and environmental conditions, chilies and cucumbers are grown in the greenhouse where bees are excluded. Even though the flowers of these crops are self-pollinated, the anthers need to be shaken to allow effective pollen release. To overcome the problems, most farmers use many workers to help in manual cross-pollination of the flowers which causes increase in hiring costs and time needed to pollinate the flowers. Thus, it has been suggested to use the stingless bees as the pollination agent in the greenhouse-cultivated crops as there are many researchers found that pollination by stingless bees can increase fruit size and weight, pericarp volume, high percentage of seed per fruits and fastens harvesting time (Slaa et al., 2006; Nicodemo et al., 2013; Nunes-Silva et al., 2013).

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