Chapter 3
Antimicrobial Activity From Five Species of Stingless Bee (*Apidae meliponini*) Honey From South East Asia (Thailand)

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ABSTRACT

In Thailand, there have been limited investigations on the antibacterial properties of stingless bee honey. The purpose of this research is to investigate the physicochemical and antibacterial characteristics of five stingless bee species, including Lepidotrigona flavibasis, L. doipaensis, Lisotrigona furva, Tetragonula laeviceps species complex, and T. testaceitarsis complex from two geographical locations in Thailand: North (Chiang Mai) and Southeast (Chanthaburi). The moisture content from five species of stingless bee ranged from 27.6 to 32.0 g/100g. The range of pH in stingless bee

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honey was 3.5 to 3.8, which is slightly lower than the pH of Apis mellifera honey. The total acidity of stingless bee honey ranged from 44.0 to 216.9 meq/kg. The antimicrobial property of honey samples was investigated by the agar disc-diffusion method followed by MIC/MBC assay. Notably, with the exception of L. furva, stingless bee honeys were shown to exhibit antibacterial against the Gram-negative bacteria greater than Gram-positive bacteria.

INTRODUCTION

Most tropical and subtropical parts of the world possess stingless bees. There are now over 500 species described (Michener, 2013). The Neotropics of Central and South America have the richest diversity of meliponines, with 400 recognized species. The remaining species are found in Africa and Indo-Australian regions (Cortopassi-Laurino et al., 2006; Michener, 2013; Pauly et al., 2013). For Thailand, (Rasmussen, 2008) listed 32 species within 10 genera. Humans have been keeping stingless bees for centuries with some species being managed before A. mellifera was distributed worldwide (Cortopassi-Laurino et al., 2006). Stingless bee beekeeping is known as meliponiculture. In Thailand, it is considered to be in a developmental state (Chuttong et al., 2014). Stingless bees have been known for their honey, pollen and wax (cerumen) production. Comparing honey production between the stingless bees and A. mellifera (the western honey bee), honey is insignificant. Stingless bee honey is not yet included in international standards and establishing such a standard requires a better understanding of its composition and qualities (Chuttong et al., 2016; Souza et al., 2006). Tetragonula laeviceps species complex is the most predominant species reared in a box hives in Thailand. T. testaceitarsis, T. fuscobalteata, L. flavibasis, L. doipaensis, and L. furva are among the other species managed in wooden boxes or horizontal and vertical log hives.

Honey contains sugars and other constituents such as enzymes, amino acids, organic acids, carotenoids, vitamins, minerals, and aromatic substances. The composition and quality of honey depend on its nectar origin, honey maturity, production methods, climatic conditions, and processing and storage conditions (Bogdanov et al., 2008; Nombré et al., 2010; White & Doner, 1980). The properties of different types of honey have been indicated by many scientists (Bogdanov et al., 2008). Most of the previous research on honey quality and properties has concentrated on the western honey bee (A. mellifera). According to the European Codex Honey Standards by Alimentarius (2001), the primary criteria to determine honey's quality are moisture content, ash content, electrical conductivity, carbohydrates, acidity, diastase activity, and hydroxymethylfurfural content.