Chapter 11
Phenolic and Flavonoid Content of Propolis Extracts of *Heterotrigona itama* From Rubber Smallholding Area and Forestry Surrounding Area

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ABSTRACT

The various botanical origins may be influenced by the type of plant used as a food source, which affects the chemical composition of propolis. The purpose of this

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work was to determine the antioxidant activity, total phenolic content (TPC), and total flavonoid content (TFC) of propolis extracted from Indo-Malayan stingless bees, Heterotrigona itama, rearing at different botanical regions. Propolis was obtained from two different botanical origins: Forested area (H. Itama-FA) propolis from Taman Pertanian Sekayu, Terengganu and Hevea brasiliensis (HB) propolis from stingless bees that reared in the rubber smallholding at Bukit Berangan, Terengganu (H. Itama-HB). TPC and TFC concentrations were evaluated using a UV-Vis Spectrophotometer, whereas antioxidant activity was determined using the DPPH free radical assay method. The results showed that the propolis of stingless bees rearing in rubber smallholdings area and the wildly available in forest area have comparable quality in terms of promising sources of antioxidant compounds.

INTRODUCTION

The Indo-Malayan clade has more than 50 species of stingless bees. The most often domesticated and bred stingless bee species include Heterotrigona itama (H.Itama), Geniotrigona thoracica, Lepidotrigona terminate, and Tetragonula laeviceps (Slaa et al., 2006). In Malaysia, forests are the most popular domesticated areas for stingless bees, which contains various tree species that could support great biodiversity for the stingless bees colony production and survival. A heterogeneous culture in rubber plantations, such as mixing rubber trees with other plants or animals. A heterogeneous culture is one of the ongoing efforts to ensure the sustainability of rubber industry sectors and the socioeconomic well-being of smallholder farmers whose livelihoods are heavily reliant on rubber tapping. The farmers face significant obstacles due to the inherent vulnerability of rubber prices to global economic downturns, despite the numerous limits imposed by climate change and environmental concerns. There is a downward trend in latex pricing due to the decline in demand for the rubber industry. As a result, numerous initiatives and approaches have been made to integrate diverse activities with rubber plantations to provide additional revenue for farmers.

Since the early 1980s, the Rubber Research Institute of Malaysia (RRIM) has been integrating meliponiculture, such as stingless beekeeping, into rubber growing areas, mostly in rubber smallholder areas. Previous research and pilot programmes have demonstrated the feasibility and viability of growing stingless bees in rubber tree habitats (Rao & Vijayakumar, 1992). Thus, integrating stingless bees, particularly Heterotrigona itama, into rubber plantations might be considered a secondary source of revenue for rubber smallholders while simultaneously serving as an important pollination agent for the crop (Zaki & Razak, 2018). However, scientific facts and full knowledge of the Indo-Malayan stingless bees are still lacking in Malaysia. As a result, farmers have not yet benefited from successful information transfer about stingless beekeeping and rearing.

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