

Review

A Comprehensive Review of Stingless Bee Products: Phytochemical Composition and Beneficial Properties of Honey, Propolis, and Pollen

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Abstract: The stingless bee has been gaining more attention in recent years due to the uniqueness and benefits of its products. Similar to the common honeybee, stingless bees also produce honey, propolis, and pollen, which offer superior benefits for direct or indirect consumption. However, reports on the benefits of stingless bee products are scarce. This article summarises recent reports on stingless bee products. The function and application of the properties of the products such as phenolic compounds, antioxidant properties, and chemical content are elucidated. The antimicrobial properties and anticancer potential of the products are also highlighted. Future trends, potential, and uniqueness of stingless bee products are discussed. Stingless bee honey is highlighted as a superfood that exceptionally has the potential to be an active ingredient in treating cancer. Stingless bee propolis has been extensively studied for its rich beneficial chemical compounds that contribute to its antioxidant properties. Though studies on stingless bee pollen are scarce, it has been reported that it also has the potential of being a functional food.

Keywords: stingless bee honey; stingless bee propolis; stingless bee pollen; antioxidant; antimicrobial; anticancer



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1. Introduction

European honeybees and stingless bees are the two most common bees amid other bees managed for honey. The European honeybee is grouped into the *Apis* genus, whereas the stingless bees may be classified into two genera, which are *Melipona* and *Trigona* [1]. A tribe of stingless bees—*Meliponini*, known as *Kelulut* in the Malay language—have been estimated to include approximately 500 species that may be found in the tropical and subtropical areas around the globe, of which 68 species have been identified in Malaysia alone [2]. Recently, the production of stingless bee honey has been growing, particularly in Southeast Asia. The growing production of stingless bee honey has brought stingless bee products into the limelight [3]. Some of the stingless bee species that are commercially bred by farmers are *Geniotrigona thoracica* (Smith, 1857), *Heterotrigona itama* (Cockerell, 1918), *Lepidotrigona terminata* (Smith, 1878), and *Tetragonula laeviceps* (Smith, 1857) [4]. The selling price of stingless bee honey (*Trigona* species) is about USD 100 per kilogram, which attracts progressive commercial development in Malaysia, the Philippines, and India [5]. Stingless bee honey also has been recognised as a superfood due to its highly nutritional and therapeutic properties [6].

Stingless bees have non-aggressive behaviour, due to which the colony can be manipulated easily through an artificial hive compared to common honey bees, which are