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Study gets the buzz on stingless bee honey

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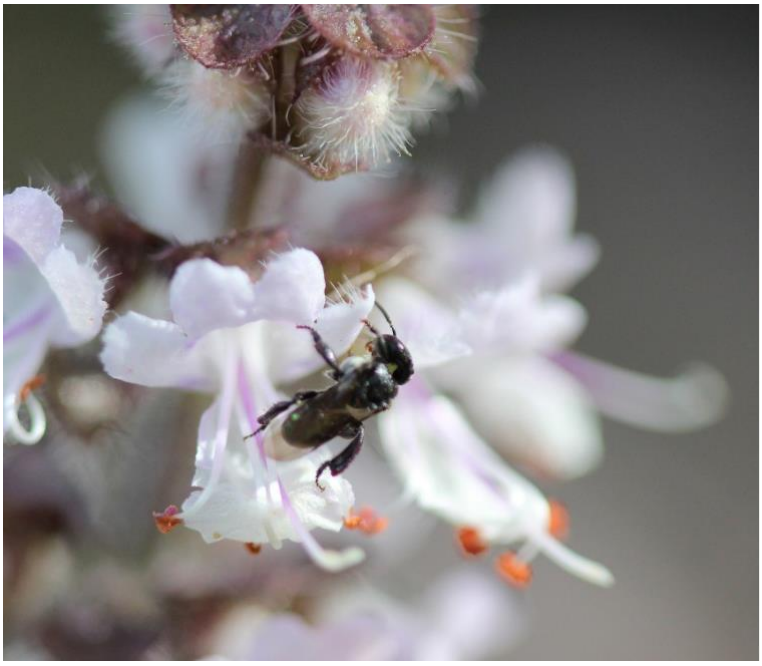
Stingless bee honey contains high levels of a rare special sugar called trehalulose, not normally found in in any other food. For the first time, this low glycemic index sugar has been identified as a major component in honeys from five different stingless bee species. The abundance of trehalulose is tangible evidence supporting traditional health claims attributed to stingless bee honey.



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Given that honeybees (*Apis mellifera*) are so infamous for their stings, they are loved nonetheless for their golden honey. The much smaller stingless bees (Meliponini) produce honey as well, but are remarkable for their lack of sting! Like the more well-known honeybees, stingless bees are eusocial, living in permanent hives, with a queen bee and workers to collect pollen and nectar to feed larvae and store within the hive. The stingless bees store their delicious honey in clusters of small resin pots at the fringes of their nest. Their honey production is however much less than that of *Apis* honeybees. Some stingless species produce less than one kilogram of honey per year!

Stingless bees inhabit tropical and sub-tropical parts of the world, including South-East Asia, Australia, Africa and South America. Various regional terms are used to describe stingless bee honey: Meliponine honey, pot-honey, sugarbag honey (in Australia), and Kelulut honey (in Malaysia), with this honey having a long history of indigenous consumption. In many cultures the honey has been recognized for its health benefits, including purported therapeutic properties such as antidiabetic and antioxidant activity. In

addition, the honey has a distinct sweetness, with sour and acidic overtones imparting a unique depth of flavour, valued by modern chefs.

We were interested in understanding the chemical composition of stingless bee honey that could impart these beneficial properties. We collected stingless bee honey from two Australian native stingless bee species (*Tetragonula carbonaria* and *Tetragonula hockingsi*), two from Malaysia (*Heterotrigona itama* and *Geniotrigona thoracica*) and one from Brazil (*Tetragonisca angustula*), and measured the sugar content using a technique known as liquid chromatography-mass spectrometry. This technique enables us to separate and identify, from a chemical point of view, each of the compounds that are in a mixture.

Our chemical examination of this honey revealed a new remarkable quality of stingless bees. Their honey contained high levels of trehalulose, an unusual disaccharide. Sucrose (table sugar) and trehalulose are both similar disaccharides formed when glucose and fructose are joined by a chemical linkage. The chemical linkage in trehalulose is however different from the linkage in sucrose, altering its properties. Our identification was confirmed by a technique called Nuclear Magnetic Resonance spectroscopy. The trehalulose content was a remarkable 13 to 44 grams per 100 grams of stingless bee honey!

Trehalulose is a relatively rare sugar and is not found as a major component in any other food. It features a low glycaemic index which means that it helps keep blood glucose levels more stable (relative to sucrose, glucose, or starch). This is especially important for diabetes management. Trehalulose is even more remarkable in that it is acariogenic, meaning it does not cause tooth decay, and it also possesses antioxidant properties. The presence of trehalulose, as a key stingless bee honey component, is therefore a likely contributor to health properties ascribed to these honeys.

This novel finding of trehalulose as a distinctive marker compound will strengthen the stingless bee honey market, providing a means to authenticate and help the growing industry to set a food standard for stingless bee honey. Like sucrose, trehalulose has a sweet taste and similar organoleptic properties. As a natural alternative sweetener, trehalulose offers substantial health benefits when compared to sucrose. Trehalulose has previously been produced biosynthetically, but the finding that it is naturally present in high amounts in stingless bee honey is novel and will create new prospects for the honey, and for natural trehalulose production. The future is bright for stingless bee honey!

In tropical and sub-tropical regions, the keeping of native bees has been rapidly increasing in popularity for their role as pollinators and for their unique honey. As pollinators, stingless bees help to assure crop yields and to maintain plant biodiversity, and so natural populations, beekeeping and honey harvesting need to be carefully balanced for these species. Our finding of the rare beneficial sugar, trehalulose, in stingless bee honey is sure to increase the popularity of these bees and their honey. It turns out that stingless bees are remarkable for their honey as well as for their lack of sting.