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RESEARCH AND UPDATES ON KELULUT HONEY

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Abstract

The Prophet PBUH encouraged the consumption of honey. Nowadays, there are various types of honey all over the world. The honey composition from stingless bees or Kelulut honey is different since the honey's geographical and botanical sources are not identical. In this presentation, findings from the electronic literature search on Kelulut Honey is presented. The chemistry of the Kelulut Honey and consumer's behavior towards honey is provided. A suggestion on designing spoons containing Kelulut Honey is also included. It is hoped that the prophetic practice could be revived utilizing sadaqah, business and entrepreneurship of honey.

Keywords: kelulut, review, spoon, stingless & sunnah

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INTRODUCTION

Honey plays an essential role in our lives. As mentioned in Al-Quran, Surah An-Nahl, verse 68 to 69 (‘Ali, 1999), Your Lord inspired the bee, saying: “Set up hives in the mountains and the trees and in the trellises that people put up. Then suck the juice of every kind of fruit and keep treading the ways of your Lord which have been made easy.” There comes forth from their bellies a drink varied in colors; wherein there is healing for men. Verily there is a sign in this for those who reflect”.

It is proven that honey has many advantages to the human being. Honey has antimicrobial properties, promotes autolytic debridement and moist wound healing, stimulates wound growth for the healing process, and anti-inflammatory effect (Maringgal et al., 2019). Muslims have practiced curing illness for thousand years ago (Fatima et al., 2017). Honey is a natural product with medicinal values and the composition of which varies according to several

factors such as floral source, geographical origin, and storage condition (Ismail et al., 2016). There are many types of honey. It differs according to the properties of the honey such as the color, odor, and the taste. The honey also differs according to the bees that collected it. One type of bees is the stingless bee, which is categorized in the Apidae family (Maringgal et al., 2019). There are around 500 species of the stingless bee genus, which can be found mainly in Latin America, Australia, Africa, and Eastern and Southern Asia (Rasmussen et al., 2010). In Malaysia, 45 species of stingless bees from 14 genera are recorded and identified (Samsudin et al., 2018).

LITERATURE REVIEW

Stingless bee in Malaysia is mainly from *Heterotrigona itama* and *Geniotrigona thoracica,* followed by *Trigona terminata*, *Trigona laeviceps* and *Hypotrigona scintilla.* The most locally available is *Heterotrigona itama* (Ahmad Jailani et al., 2019), and it is suitable for UiTM Terengganu campus surroundings (Buletin Info Usahawan, 2020). Nevertheless, the ratio of each stingless bee species varies in different places and environments. Stingless bee honey has more light texture, slow crystallization, and a different taste and odor than regular honey (Biluca et al., 2014). The honey produced by a stingless bee is known with various names such as Meliponini honey, stingless bee honey and pot honey. In Malaysia, it is called 'Kelulut' honey (Zulkhairi Amin et al., 2018). *Kelulut Honey* is from *Meliponini* tribe, *Trigona* (Kek et al., 2014). *Kelulut Honey* can be divided into various types depending on its physical and chemical composition. Honey components and properties are closely related to many factors such as the floral source, the geography of the species of the bees, climate, bee habitat and the conditions of the ecosystem processing and storage (Kek et al., 2017).

In Malaysia, stingless bee honey has caught people attention day by day. It is an increasingly new income source for farmers (Abdul Hamid, 2019) and interest increased due to its stinglesness (Biluca et al., 2014). Stingless bee honey has been recognized to have economic potential due to its growing availability, mainly through cultivation (Ng et al., 2017). The main reason for the facts mentioned above is the benefits of stingless bee honey over normal bee (Basrawi et al., 2017). In Sabah, farmers are paid RM30 and RM60 per kilogram of bee and *Kelulut Honey*, respectively. *Kelulut Honey* fetches a higher price of more than RM120 per kilogram (Najib et al., 2016; Abdul Hamid, 2019). Since *Kelulut Honey* received much attention, the demand for its honey is also increased. Hence, the people of the industry think of the solution to cultivating honey production.

As a result, *meliponiculture* is introduced. It is the activity of stingless beekeeping (Kelly et al., 2014), where the colony of stingless bees is extracted from the wild for domestication. The colony is transferred from the log into the artificial house (beehive) and undergo colony splitting or multiplication that may sustain the ecosystem (Ahmad Jailani et al., 2019). The stingless bee is put into wooden boxes with a hole at the center and placed on top of the trunk (Kek et al., 2017; Mahmud, 2019) (Figure 1). Stingless bee farmers commercialize three stingless bees: honey, bee bread, and propolis (Kelly et al., 2014). The honey products give benefit to our life, especially in the medicinal field and food industry. The use of honey in medical treatment is called Apitherapy. The later has focused on folk and preventive medicine in treating specific conditions and diseases (Hussein et al., 2011). This is also to promote health

and well-being. In this paper, a literature review on the *Kelulut Honey* and its phytochemical profile is performed.

Figure 1: Kelulut hive in Kampung Bukit Belah, Machang, Kelantan

METHOD

The literature review was performed for stingless honey via electronic search (e.g. Science Finder, Medline, Scopus, and Google Scholar) to study phytochemistry and consumer behavior related to honey, while content analysis was accomplished to gain the results.

RESULTS AND DISCUSSION

The Antioxidant Studies on Bee's Honey

There are higher numbers of antioxidant studies (Table 1) on *Kelulut Honey* than its review appearances. The reviews described stingless bee honey's therapeutic properties compared with European bee honey (Zulkhairi Amin et al., 2018) and how the stingless bee honey acts as a protective agent against DNA damage (Eteraf-Oskouei et al., 2013). The phenolic compound in Kelulut Honey shows a medical purpose; for example, antioxidant potential (Ismail et al., 2016; Abu Bakar et al., 2017). The presence of organic acids adds some acidity to the honey. Although organic acids' quantity is low, these acids influence the honey flavor and antimicrobial activity (Cianciosi et al., 2018).

Table 1: The antioxidant studies on bee's honey

	Key Points	Reference
1	Phytochemical composition and antioxidant activities of Malaysian stingless bee honey	Maringgal et al., 2019
2	Comparative characterization of total antioxidant capacity and phenolic profile using liquid chromatography-mass spectrometry between Malaysian stingless bee and Tualang honey	Ranneh et al., 2018

3	Physicochemical and antioxidant potential of raw unprocessed honey from Malaysian stingless bees	Abu Bakar et al., 2017
4	Evaluation of the phenolic contents and antioxidant capacities of Malaysian Gelam and Coconut honey	Aljadi et al., 2014
5	Composition and antioxidant activity of honey from Africanized and stingless bees in Brazil	Duarte et al., 2012
6	Antioxidant capacities and total phenolic contents increase with gamma irradiation in Malaysian Gelam and Nenas honey	Hussein et al., 2011

Chemical Composition of *Kelulut Honey*

Phenolic compounds are products of plants' secondary metabolism and are essential to treat infection, injuries, and UV radiation (Duarte et al., 2012). Phenolics are divided into two groups which are flavonoids and non-flavonoids, also known as phenolic acid (Cianciosi et al., 2018). The phenolic compounds present in honey correspond to the plants' botanical resources that the bees get from, such as the pollens, nectars, resins, and oil. This leads to different honey, possessing different bioactive properties (Aljadi & Kamaruddin, 2004).

Local *Kelulut Honey* contains benzoic acid, ellagic acid and *hesperetin* (Figure 1) (Ismail et al., 2016). It has a significant amount of phenolic compounds due to the small size of the bees that manage to stretch themselves inside more significant numbers of flowers, thus varying the bioactive compounds collected to produce the honey (Yazan et al., 2016). *Kelulut Honey* has a higher number of phenolic components than Tualang honey (Ranneh et al., 2018). This study is parallel with another study (Kek et al., 2014) that shows that Kelulut Honey contains the highest phenolic compounds than other honey types.

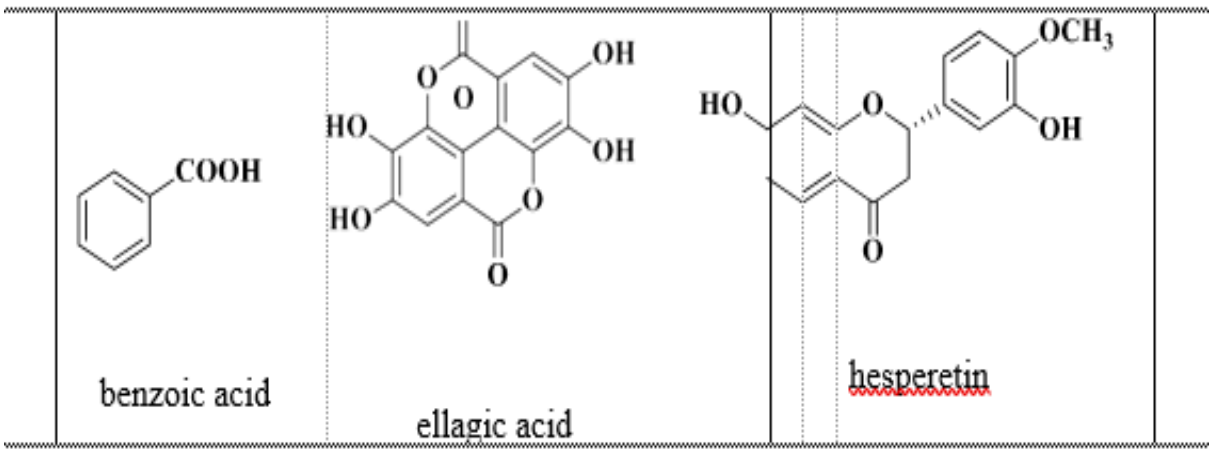

Figure 2: The chemical structures of some phenolics in Kelulut Honey

However, the phenolic compounds' values differ; it depends on geographical and the botanical origin (Biluca et al., 2014). Maringgal et al. (2019) show the significant differences between total phenolic and total flavonoid compounds in stingless bees from five different

states in Malaysia. Their study shows that *Kelulut Honey* from Malaysia's south region possesses the highest amount of total phenolic and flavonoid compounds.

Research and Instrumentation For Kelulut Honey

Kelulut Honey's phytochemicals were screened using Thin Layer Chromatography (TLC) to detect various compound classes (Ibrahim et al., 2016). TLC is a liquid chromatography where the mobile phase is liquid, and the stationary phase is a thin layer of silica gel placed on a flat plate. The solute's speed of moving through the stationary phase depends on the force of the mobile phase. The mobile phase dissolves the solute and moves it up along the plate. The phenolic compound was isolated by using solid-solid phase extraction (Ismail et al., 2016). The honey extracts were subjected to High-Performance Liquid Chromatography (HPLC). The honey contains phenolics, including syringic acid, *p*- coumaric acid, ferulic acid, benzoic acid, ellagic acid, *and hesperetin* (Figure 2), naringenin, kaempferol and apigenin. However, the HPLC the method in the study is not suitable for Kelulut honey (Ismail et al., 2016). This is due to the enormous diversity of polyphenol structures, including isomers and some compounds challenging to be separated in the column chromatography. Thus, the volume of acidified water and methanol is increased to remove carbohydrates and the phenolic content.

Najib et al., (2016) performed a different way for honey's property detection based on odor profile using an electronic nose that mimics the human nose. The sample was filled in the sample compartment and preheated at a constant temperature in the e-nose. The sample was ensured not to be exposed to the external contaminant to reach the right measurement. Based on the study conducted, the summary of the result shows that the *Kelulut Honey* odor-profile classification has achieved 100% inaccuracy, specificity, and sensitivity.

Consumer Preferences on Honey

There is a correlation between the honey products' quality, pricing, brand reputation and local consumers' medical condition, concerning the purchasing behavior (Chiang Yeow et al., 2013). While in Western Australia, an exploratory factor analysis revealed three main ideas which were most influential consumer's decision in purchasing honey: brand reputation, origin, and value for money (Batt & Liu, 2012). Minzhu (2018) found that the main factors of various types of honey purchase intentions include the Chinese consumers' attitudes, behavior, health consciousness, trust and awareness on honey issues. It is timely to explore the role and potential for crafting spoons containing *Kelulut Honey* (Figure 15.3), to help consumers enjoying its benefit and address societal concerns (Hasan et al., 2018).

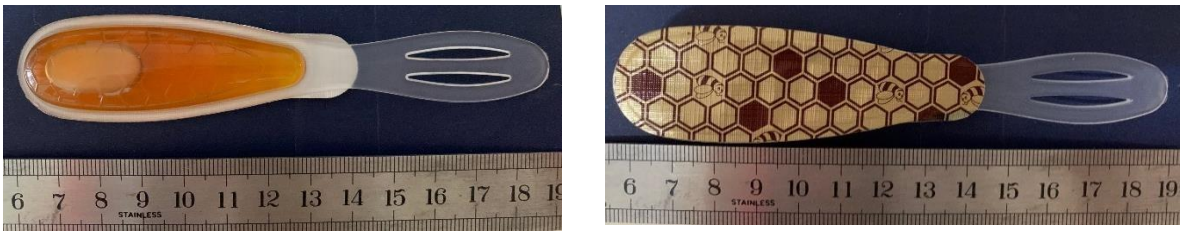

Figure 3: An example of a honey spoon (right: front view). It is sealed for protection, with easy peelable, plastic foil (left: back view).

Should honey always be kept in jars, then this suggestion is a solution for consumers to appreciate a convenient and handy *Kelulut Honey*, when in need. The honey stick, wand, or dipper, either stainless steel, plastic, or silicon, can be getting less common since they require space in the kitchen drawer. Sometimes, they may be not within reach. By providing the alternative in honey packaging, a small spoon representing an amount of *Kelulut Honey*, a single person can consume could be designed. The viscous liquid *Kelulut Honey* could be collected and placed on a tablespoon, equivalent to about 20 grams.

This spoon could be vacuum sealed for protection. The disposable honey spoon may fulfil personal requirements daily, such as being stirred in tea (Ferreira et al., 2018) or accompanying bread and biscuits. This practice could avoid the honey dripping on the dining table, thus providing comfort and control when drizzling the *Kelulut Honey*. One can even carry the spoon across places, without dribbling the *Kelulut Honey*. This spoon should be relatively cheap, lightweight, sturdy, and environment-friendly, for instance, made by sustainable bamboo. The green material could be stain- and heat-resistant, in addition to its ergonomic property. Moreover, spoon handlers are not obliged to wash them after use or store them with other utensils.

CONCLUSION

The biotechnological explorations would lead to *Kelulut Honey's* production as the health products for antimicrobial, anti-inflammatory, and antioxidant agents. The chemistry of *Kelulut Honey* depends on the bee species, and it is essential to recognize the compounds in the honey. By knowing its natural composition, beneficial uses of *Kelulut Honey* can be understood for future studies. It is hoped that the prophetic practice could be revived utilizing sadaqah, business and entrepreneurship of honey. In short, any design of *Kelulut Honey* spoon in consideration should be plastic-free and family dishwasher safe for recycling purpose. This proposed spoon is not going to leave users, youngsters, or elderly, with a sticky hand.

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