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Perceptions on The Therapeutic Effects of Stingless Bee Honey and its Potential Value in Generating Economy among B40 Community of Kampung Bukit Kuin, Kuantan

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Abstract. Meliponiculture or keeping stingless bee in Malaysia is expanding and has the potential to generate money for the the bottom 40% of income earners (B40). The increased production of stingless bee honey as a complementary medicine as a therapeutic medium for health for a variety of reasons. Thus, this study aimed to explore the experiences and perceptions on the therapeutic effects of stingless bee honey and its potential value in generating economy among the B40 community. Semi-structured interviews were carried out among the B40 community who participated in the Desa Kelulut project of Kampung Bukit Kuin, Kuantan. The data were analysed using thematic analysis. A total of six respondents interviewed in the study out of 20 participants. Four themes emerged, namely, benefit of stingless bee honey; market supply and economy; sustaining the farm; and facilitate income. The participants valued the beneficial properties of the honey toward health and acknowledged the potential of the stingless bee honey to be marketed in



Malaysia as well as generating income for the B40 community of Kampung
Bukit Kuin, Kuantan.

1. Introduction

Honey is widely known for its therapeutic properties such as wound healing, anticancer, antioxidant and prevention of chronic disease [1,2]. It is also commonly used as a sweetener as its natural sweet taste not only brings up the flavour but also gives ample health benefits [2]. In Malaysia, the stingless bee farming or meliponiculture is a new emerging bee industry due to its convenient and simpler management as compared to sting bees in apiculture. Stingless bees are usually found in tropical and subtropical countries which include Malaysia, Brazil, Mexico, Africa, Southeast Asian regions and Northern Australia [3,4]. The meliponiculture in Malaysia was initially developed on a small scale until more researches were made on the benefits of stingless bee honey and its byproducts such as bee bread and propolis [3]. According to a report by Mustafa, et. al. (2018), the meliponiculture in Malaysia started in 2007 by Malaysian Agricultural Research and Development Institute (MARDI) and followed by a Universiti Sains Malaysia workshop on stingless bee honey production in 2010. The project gave an opportunity for the stingless bee honey industry to be a sustainable source of income for Malaysian beekeepers, especially small farmers with low income.

In Malaysia, the B40 community is considered as the bottom 40% of income earners. Department of Statistic Malaysia Official Portal (2020) reported that the income threshold for the B40 group in 2019 which comprising 2.91 million households was RM4,849 and covered only 16% of total income among the household gross income. The progressively developing stingless bee honey industry in Malaysia and its promising future directions, this industry has a potential to provide the opportunity for the B40 community as their source of income [3,4]. Furthermore, the simple and convenient management of meliponiculture ensuring this agriculture can be potentially sustained by the B40 beekeepers even with minimum knowledge. This further support the agenda by United Nations on Sustainable Development Goals (SDG) number 1,2 and 3 which to end poverty in all its form everywhere, to end hunger and promote sustainable agriculture, respectively as well as good health and wellbeing to the community that consume the stingless bee honey (United Nations 2018).

In meliponiculture, the techniques and knowledge in taking care the stingless bees need to be learnt to ensure a sustainable productivity from this farming. Apart from that, the attitude and interest of the beekeepers toward the usage of stingless bee honey also need to be considered to ensure the beekeepers acknowledge the health benefits of stingless bee honey that will be commercialized. The purpose of this study is to explore the experience and perceptions on the therapeutic effects of stingless bee honey and its potential value in empowering economy among the B40 community in Kampung Bukit Kuin, Kuantan.

2. Methods

Participants were purposely sampled 20 registered members for Desa Kelulut project. They were included if i) a resident of Kampung Bukit Kuin, Kuantan, ii) B40 community (Salary below RM2500) and excluded if refuse to participate in the interview. Semi-structured interviews were conducted within 45 to 90 minutes using an interview guide adapted from Buriro, Awan, & Lanjwani, (2017). The interview questions were prepared in Malay language to facilitate the respondents to avoid any language barriers, to be valued and encourage them to speak in their own voice. This study was approved by the Kulliyah of Nursing Postgraduate and Research Committee (KNPGRC) (Ref no.:IIUM/313/G/14/3/1 Dated 19th February 2021) and IIUM Research Ethic Committee (IREC) (Ref no: IREC 2021-KON/23). The data from the

interview were recorded, transcribed, translated and organized to make sure suitable concepts and themes for each topic are presented. The interviews were analysed in Malay to preserve the implicit and contextual semantics using Microsoft excel. Analysis was done through making note of the different ideas and meaning from each data, while considering the original speech patterns as possible. Associated themes in the categories were collapsed under one main-arching theme. The process of transcription, anonymization and analysis using thematic approach generates themes through step-by-step contrasting and comparing across the data which produced structured findings [6] The topics were developed from the research question which includes the participant experience related to stingless bees and its honey, the therapeutic effects of honey and the participants' perception on the stingless bee honey industry as potential income for the B40 community. The interviews were stopped once data saturation was achieved when there is no more new information discovered during the data analysis.

3. Results

Six participants were interviewed, who were Malay and could speak vocally in Malay. The participants ranged in age from 39 to 61 years old. One of the participants was a retiree, and others, such as lorry drivers and farmers, were still working with flexible hours. Pseudonyms were assigned to participants in order to keep the data and recordings confidential. Table 1 shows the demographic profiles of the participants. Four core themes that emerged from the analysis of the interview transcripts. These themes were developed from the research question which includes the properties of stingless bee honey, economy, maintenance of the farm and source of income for the B40. The findings eventually answered the research questions and met the research aims.

3.1 Theme 1: Benefit of Stingless Bee Honey

The participants described the therapeutic effect of honey based on their own experience with it, villagers' interactions, and customer desire. The majority of participants described stingless bee honey as nutritious and beneficial to one's health.

"It's good for our health; Alhamdulillah, Allah will bless us with a healthy body" (P3)

"Perhaps honey is good for our health, according to what I've heard." (P5)

The participants expressed the features of stingless bee honey through the honey's peculiar sour flavour which distinguishes it from other bee honeys. The participants stated that the size of the bee and the supply of nectar are determining the production.

"In terms of flavour it differs from sting bee honey..because they are smaller and can enter the flower more easily to extract the best nectar" (P2)

"There are different flavours, some are sour, some are sweet, they vary, possibly due to the source of nectar..." (P4)

Respondent	Age (years)	Gender	Occupation
P1	53	Male	Farmer
P2	44	Male	Driver
P3	57	Male	Driver
P4	39	Male	Labour
P5	61	Male	Farmer
P6	76	Male	Pensioner

Table 1: Participant Demographic Profiles

The participants also stated that honey is believed to have a soothing effect on the throat, contains antioxidant properties and provide energy nourishment:

“Recently a buyer came to buy honey to alleviate a cough...” (P1)

“..I know honey is nutritious, contains antioxidants....but stingless bee honey is superior to sting bee honey...” (P3)

“When we consume honey, our bodies will feel rejuvenated...people claim you still can work with vigour...” (P5)

Meanwhile, stingless bee honey also perceived to help in reducing the risk of hypertension and diabetes by regulating the causative factors of the metabolic syndrome. The honey needs to be taken one tablespoon twice daily, one during dawn or morning and then later in the evening or before bedtime. They also pointed that honey is sunnah (prophet Muhammad practise that being followed Muslims) food to which to be taken on daily basis.

“I also take honey, I am 56 years old now and do not have high blood pressure or diabetes...” (P2)

“..to prepare it as a medicine, take a spoon or two tablespoons, then take another at night ...as for now I don't have any ailment...” (P4)

“I also take honey on daily basis, previously I didn't take honey; but because honey is a Sunnah of the Prophet, why not give it a try? Now I don't even take supplements since they are too expensive.” (P5)

3.2 Theme 2: Market supply and Economy

The participants expressed that most of the common honey in the market has been adulterated while the stingless bee honey is remain authentic.

“In my opinion, it is difficult to find genuine honey because there is so much of fake honey. I am please since the honey that we sell is genuine.” (P3)

“If we look at (supply) it is insufficient...perhaps people have discovered the health benefits...the (supply) is insufficient since demand is high. People may believe that stingless bee honey is contaminated, as opposed to sting bee honey, therefore people will flock here to buy it or to any stingless bee farmer...” (P5)

The participants perceived the stingless bee honey sector as a burgeoning market in Malaysia with a lot of promise for long-term profits. The majority of participants stated that the market began to emerge large in the economy as small or individual farmers achieved success in their businesses.

“The Malaysian market is currently at its height due to great demand. The maintenance will take time but most successful (entrepreneurs) were individuals who succeeded in making products. For example, the seller at Maran, he builds kiosks and sells his product...” (P5)

As the market developed, most participants assumed that it was owing to a great demand for this honey. Moreover, there is a scarcity of stingless bee honey due to a shortage of farms.

“The current supply seems to be insufficient...Many people come and ask, sometimes the supply is not enough” (P6)

3.3 Theme 3: Sustaining the Farm

According to the participants, training such as seminars on beehive management are vital to guarantee the farmer has enough knowledge and expertise in running the farm. The majority of participants also agreed that theory practise on the farm should be accompanied by supervision. The participants said that they could not run the farm efficiently without direction and practise. The routine they learnt during the seminar should be put into practise to assess their learning and ensure that the farm will produce a harvestable output.

“we need to have knowledge on the maintenance...practical experience is required” (P4)

“If there is no practical, or the guidance from people who know it will be really difficult, because the maintenance is quite complicated” (P5)

Farm maintenance is an important practise for any farmer because several aspects must be considered in order to produce superior honey. The beehive must be free of predators such as mites, termites, ants, and frogs that could attack and kill the bees.

“...we need to look out for the termites or ants” (P1)

“...we need to look out for the termites or ants and add black oil at the surrounding area so they don't climb the trunks”(P5)

The participants also highlighted landscapes as crucial aspects that can affect the flavour of honey as well as honey production. The farmer regarded the regimen for maintaining stingless bees as critical, especially in ensuring honey production. Every farmer should be aware that beehives require regular maintenance. The participants stated that if they do not know the routine for maintaining stingless bees, the beehives may not become functional and the bees may die or escape from the hives, resulting in no honey production.

“Landscape is the most important, if we don't have good landscapes the bee won't be able to collect the nectar...The problem will be on the stingless bee's hive. The beehive will not be functional so we need to reprocess all...” (P4)

“...if we do not know the maintenance, the stingless bee will die...the stingless bee needs frequent care...” (P5)

3.4 Theme 4: Facilitate income

Participants stated that stingless bee honey products had a high potential for income generation among the B40 in Kampung Bukit Kuin, Kuantan. The farm does not necessitate extensive upkeep, and the farmers can take turns checking the farm according to their schedule. They can supplement their income while continuing to work in their primary job.

“Definitely it is good to generate (income) for B40, it's not much, but at least there is side income” (P3)

“It's okay, it may not be high but it is enough for those who are unemployed” (P4)

“Yes, it's good, because the maintenance did not take up to 24 hours, everyone will take turn to come and see” (P6)

Despite having training and practical in the care of stingless bees, the majority of participants stated that the passion is critical to the success of the stingless bee farm as a career opportunity. This farm requires a long period of care before they can harvest the yield, where commitment is paramount. The participants also described the mentality required for farmers, such as efforts and perseverance, in order for the farm to be a successful source of sustained revenue.

“...but it's better if the person who wants to participate in the stingless bee farm is really interested..” (P1)

“Actually interest is needed, if one is not interested it will not work. We have 20 participants, but less than 10 people who are truly involved.” (P5)

“... but if we want to make it happen we need to work hard” (P6)

Most participants feel that the government should help with the expansion of land and the installation of beehive trunks, all the way up to the national level, in order to advance the honey farm.

“Need to extent these kind of programs to help our community (B40), need to add more so it can grow” (P2)

“...it would be preferable if the government provided a small amount of help to encourage those who are interested in this (industry), give us a lot, like 5 to 10 lots. If an individual becomes interested, he or she will eventually expand the lot on their own” (P4)

The participants planned to create agritourism so that the farm could act as a hub for honey production as well as a source of additional income. They also expressed a wish to improve their farm's scenery, for visitors to watch how bees are reared. Free seminars, according to participants, could help get more people connected with and interested in honey farms.

“Improvements in the landscape are important...If the landscape is attractive we can make people interested to come, like in tourism...” (P1)

“I wholeheartedly support the government organising a seminar or course in the village, without payment; if there is remuneration, the locals will still not come” (P2)

“Everyone involved, not many people know about stingless bee honey, people only know the sting bees that we buy in the shop...” (P4)

4. Discussion

The sour taste of the honey is one of the distinguishing characteristics that draws people to stingless bee honey. The honey's pH value contributes to its sour flavour; it is discovered to be mildly acidic when compared to other honey, and it has a wide range of free acidity [7]. According to research, the phenolic composition of honey is the primary factor that influences the variety of colour, flavour, and functional characteristics of honey. This honey composition varies depending on the floral source and origin [8].

In terms of honey's therapeutic properties, all participants agreed that it is nutritious and advantageous to one's health. Honey is recognised for being healthy, having a high antioxidant content, being used to cure coughs, diabetes, being good for immunity, increasing performance and stamina, and maintaining blood pressure. This characteristic of honey is mostly attributable to the component of honey. Water, carbohydrates, proteins, enzymes, minerals, and microorganisms are some of the nutrients found in honey [1,9]. Furthermore, stingless bee honey has been found to have a high moisture content, a low pH with a wide range of free acidity, and a high electrical conductivity. Each of these components contributes to the honey's therapeutic influence on health [10].

The benefits of honey are also said to help with stamina when working, as the participants are adults and some work several jobs, they need a lot of stamina to do their tasks. The honey's antifatigue characteristics, evidence suggests that stingless bee honey can boost exercise tolerance in twenty male albino mice by increasing tissue

glycogen content while lowering blood lactate and maintaining blood glucose levels[11,12].

Since stingless bee honey is well known for its antioxidant capabilities, the antioxidant activities have been mentioned in various research. Stingless bee honey contains a high concentration of polyphenols, which contribute to its antioxidant qualities[13]. This phenolic antioxidant contributes to a variety of biological and pharmacological functions, including antiviral, antibacterial, immunoregulation, and anticancer activity [14].

Besides being soothing for colds and coughs, the antibacterial and antifungal qualities of stingless bee honey can also assist to improve the immune system. These qualities may also aid in combating the causal effect of the cold, which may emerge, for example, as a result of bacterial infection. When compared to other Malaysian honeys such as gelam and tualang, stingless bee honey has been found to be the most consistent in preventing bacterial development [15]. Furthermore, stingless bee honey was discovered to be the most effective in preventing fungal colony growth [16].

Stingless bee honey is also beneficial to diabetics due to its insulin-mimetic actions, which enhance metabolic rate and result in a significant reduction in body weight and BMI [17]. Fasting blood glucose (FBG), body weights, low-density lipoprotein cholesterol (LDL-C), total cholesterol, high-density lipoprotein cholesterol (HDL-C), triacylglycerol, and C-reactive protein (CRP) levels all improve when honey is administered to overweight patients [13,18]. Similarly, anti-obesity effects include improvements in systolic (SBP) and diastolic (DBP) blood pressure in obese rats [19].

When provided in a certain amount, honey also demonstrates its therapeutic effects on health. In a trial to lower blood sugar levels in sprague dawley (SD) rats, 1 g/kg/day kelulut honey was administered twice a day (morning and night) for eight weeks [17]. This demonstrates that a precise amount of honey is required to see the effects of honey.

The benefits of honey are also evaluated from a religious standpoint. Honey is consumed on a regular basis since it is the prophet's practise for Muslims, as reported by Jabir bin Abdullah in Sahih Bukhari Volume 7, Book 71, Number 587. After joining the programme, several of the participants began taking honey on a daily basis. This is a good method to health promotion, especially for the elderly with limited financial resources. This not only creates job opportunities, but it also promotes a healthy lifestyle by including honey as a supplement into their diet.

When it was discovered that many commercial honeys on the market had been contaminated with sucrose (adulterated), participants expressed their concern about the authenticity of honey on the market. The authenticity of stingless bee honey may be preserved because many of the bees are controlled by individual farmers. Adulterated honey, on the other hand, affects the physicochemical properties of the honey and may lose its therapeutic effectiveness. When tested for antibacterial capabilities, for example, the contaminated honey was ineffective against gram-negative bacteria, *E. coli*, whereas the legitimate honey was effective[10]. The participants were ecstatic to be able to witness and see the process of honey harvesting in their farm and encouraged others to come and view the process, especially those who are new to purchasing honey products.

Nonetheless, the participants acknowledged that the stingless bee honey industry is currently thriving in Malaysia and has a lot of potential to create cash for the B40 community of Kampung Bukit Kuin, Kuantan. The market gradually began to emerge in the economy as small or individual farmers achieved success in their companies. Individual farmers were permitted to market their own products, which encouraged participants to become more involved in the stingless bee honey farm, believing that it is a potential job prospect. According to Basrawi et al., (2017), in the economic analysis of meliponiculture in Malaysia, the profit gain will be shorter if the farm also provides products from bee by-products such as propolis and bee bread, as both of these components are profitable in the Malaysian market. In the long run, the farm will be able to produce more products from the bees rather than focusing solely on honey.

Training and practical in beehive maintenance are essential for participants because honey production is dependent on it. The structure of the nest entrance has a large influence on beehive enemies and other elements that can block the entrance, such as the age of the nest, symbionts, rain, wind, and sun [21,22]. The length, width, and tube length of the entrance tube must be appropriate for the bee genus, as a small entrance will aid to block the entry of invaders through the creation of resin [21].

The landscape affects varies amongst stingless bee species. Some species are drawn to the distance between the supply of honey from the beehives, while others are drawn to the richness of the food source [23]. The farmer will benefit from understanding bee behaviour when caring for beehives. Expanding the farm's land, tourism, and sponsored seminars will assist to promote the farm and attract more individuals interested in stingless bee products. The government should help with land extension so that they can add more beehives to their farm. Meanwhile, enhancing the area with flowers and putting up a notice board at the entrance to turn the farm into an agritourism destination. In Australia, they included the marketing of stingless bee honey through public nature education such as museums, exhibitions, parks, and schools. They also demonstrate the characteristics of the stingless bee and work to protect wild stingless bee colonies [24]. This demonstrates the growing interest in stingless bee honey, and they have the potential to expand for agritourism. Furthermore, because they can watch how the honey is harvested until it is packaged into the container, this strategy will assist to lessen people's concerns about whether the honey has been tainted. When people trust the items, they are more likely to buy honey and promote the stingless bee product itself.

The various products that can be generated from meliponiculture, which ranging from the honey until agritourism, has made this industry as a potential economic empowerment programme to achieve the aims of SDG in ending the poverty and hunger in Malaysia. Funding and technical supports by government and other agencies would be helpful in ensuring the programme to progressively expanding. The funding grant, like Hasanah Special Grant 2021, and good strategy in mobilizing the fund, like Desa Kelulut project, would further ensuring the monetary benefits can be channeled effectively to the beneficiaries. Based on the feedback from the Desa Kelulut participants in this study, this project is highly recommended and very feasible to be expanded to other B40 communities.

5. Conclusion

The health-promoting benefits of honey and the potential for stingless bee honey to be commercialised in Malaysia are perceived. Stingless bee honey is recognised for its nutritional value, high antioxidant content, use as a cure for cough, diabetes, boost immunity, improve performance and stamina, and adhering to the sunnah. With the success of small or individual farmers, the stingless bee honey market has begun to emerge large in the economy, perhaps opening up work opportunities for the B40 community in Kampung Bukit Kuin, Kuantan as well. It is advised that the government encourage and support this agricultural initiative in order to help the B40 community and promote stingless bee honey in the community.

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REFERENCES

- [1] Abd Jalil, M.A.; Kasmuri, A.R.; Hadi, H. Stingless bee honey, the natural wound healer: A review. *Skin Pharmacol. Physiol.* **2017**, *30*, 66–75, doi:10.1159/000458416.
- [2] Zulkhairi Amin, F.A.; Sabri, S.; Mohammad, S.M.; Ismail, M.; Chan, K.W.; Ismail, N.; Norhaizan, M.E.; Zawawi, N. Therapeutic properties of stingless bee honey in comparison with european bee honey. *Adv. Pharmacol. Sci.* 2018, 2018.
- [3] Ismail, W.I.W. A review on beekeeping in Malaysia: History, importance and future directions. *J. Sustain. Sci. Manag.* **2016**, *11*.
- [4] Mustafa, M.Z.; Yaacob, N.S.; Sulaiman, S.A. Reinventing the honey industry: Opportunities of the stingless bee. *Malaysian J. Med. Sci.* 2018, 25.
- [5] Buriro, A.G.; Awan, J.H.; Lanjwani, A.R. Interview: a Research Instrument for Social Science Researchers. *IJSSHE-International J. Soc. Sci. Humanit. Educ.* **2017**, *1*.
- [6] Gale, N.K.; Heath, G.; Cameron, E.; Rashid, S.; Redwood, S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med. Res. Methodol.* **2013**, *13*, 117, doi:10.1186/1471-2288-13-117.
- [7] Chuttong, B.; Chanbang, Y.; Sringarm, K.; Burgett, M. Physicochemical profiles of stingless bee (Apidae: Meliponini) honey from South East Asia (Thailand). *Food Chem.* **2016**, doi:10.1016/j.foodchem.2015.06.089.
- [8] Salgueiro, F.B.; Lira, A.F.; Rumjanek, V.M.; Castro, R.N. Phenolic composition and antioxidant properties of Brazilian honeys. *Quim. Nova* **2014**, *37*, 821–826, doi:10.5935/0100-4042.20140132.
- [9] Guerrini, A.; Bruni, R.; Maietti, S.; Poli, F.; Rossi, D.; Paganetto, G.; Muzzoli,

- M.; Scalvenzi, L.; Sacchetti, G. Ecuadorian stingless bee (Meliponinae) honey: A chemical and functional profile of an ancient health product. *Food Chem.* **2009**, *114*, 1413–1420, doi:10.1016/j.foodchem.2008.11.023.
- [10] Julika, W.N.; Ajit, A.; Sulaiman, A.Z.; Naila, A. Physicochemical and microbiological analysis of stingless bees honey collected from local market in Malaysia. *Indones. J. Chem.* **2019**, *19*, doi:10.22146/ijc.40869.
- [11] Fernandez, S.S.A. Anti Fatigue Activity Of Pure Honey And Honey Mixed In Mice. *Proceeding 1st. Int. ...* **2018**.
- [12] Priastomo, M.; Adnyana, I.K.; Sukrasno, S.; Kusnaedi, K. Pengaruh Pemberian Madu dari Lebah Apis mellifera, Apis cerana, dan Trigona sp. terhadap Beberapa Parameter Biokimia pada Mencit yang Diuji dengan Metode WFST. *MPI (Media Pharm. Indones.* **2020**, *3*, doi:10.24123/mpi.v3i2.3042.
- [13] Rao, P.V.; Krishnan, K.T.; Salleh, N.; Gan, S.H. Biological and therapeutic effects of honey produced by honey bees and stingless bees: A comparative review. *Brazilian J. Pharmacogn.* **2016**, *26*, 657–664, doi:10.1016/j.bjp.2016.01.012.
- [14] McLoone, P.; Warnock, M.; Fyfe, L. Honey: an immunomodulatory agent for disorders of the skin. *Food Agric. Immunol.* **2016**, *27*, 338–349, doi:10.1080/09540105.2015.1104653.
- [15] Zainol, M.; Mohd Yusoff, K.; Mohd Yusof, M. Antibacterial activity of selected Malaysian honey. *BMC Complement. Altern. Med.* **2013**, *13*, 129, doi:10.1186/1472-6882-13-129.
- [16] Hamid, Z.; Mohamad, I.; Harun, A.; Salim, R.; Sulaiman, S.A. Antifungal effect of three local Malaysian honeys on selected pathogenic fungi of otomycosis: An in vitro Evaluation. *J. Young Pharm.* **2018**, *10*, doi:10.5530/jyp.2018.10.91.
- [17] Rafie, A.Z.M.; Syahir, A.; Ahmad, W.A.N.W.; Mustafa, M.Z.; Mariatulqabiah, A.R. Supplementation of Stingless Bee Honey from Heterotrigona itama Improves Antiobesity Parameters in High-Fat Diet Induced Obese Rat Model. *Evidence-based Complement. Altern. Med.* **2018**, *2018*, doi:10.1155/2018/6371582.
- [18] Yaghoobi, R.; Kazerouni, A.; Kazerouni, O. Evidence for clinical use of honey in wound healing as an anti-bacterial, anti-inflammatory anti-oxidant and anti-viral agent: A review. *Jundishapur J. Nat. Pharm. Prod.* **2013**, *8*, 100–104, doi:10.1100/tsw.2011.78.
- [19] Ramli, N.Z.; Chin, K.Y.; Zarkasi, K.A.; Ahmad, F. The beneficial effects of stingless bee honey from Heterotrigona itama against metabolic changes in rats fed with high-carbohydrate and high-fat diet. *Int. J. Environ. Res. Public Health* **2019**, *16*, doi:10.3390/ijerph16244987.
- [20] Basrawi, F.; Ahmad, A.H.; Daing Idris, D.M.N.; Maarof, M.R.M.; Chand, M.; Ramli, A.S. Engineering economic analysis of meliponiculture in Malaysia

considering current market price. In Proceedings of the MATEC Web of Conferences; 2017; Vol. 131.

- [21] Kelly, N.; Farisya, M.S.N.; Kumara, T.K.; Marcela, P. Species diversity and external nest characteristics of stingless bees in meliponiculture. *Pertanika J. Trop. Agric. Sci.* **2014**, *37*.
- [22] Souza, B.; Roubik, D.; Barth, O.; Heard, T.; Enríquez, E.; Carvalho, C.; Villas-Bôas, J.; Marchini, L.; Locatelli, J.; Persano-Oddo, L.; et al. Composition of stingless bee honey: Setting quality standards. *Interciencia* **2006**, *31*, 867–875.
- [23] Basari, N.; Ramli, S.N.; Khairi, N. ‘Aina S.M. Food reward and distance influence the foraging pattern of stingless bee, heterotrigona itama. *Insects* **2018**, *9*, doi:10.3390/insects9040138.
- [24] Chapman, N.C.; Byatt, M.; Cocenza, R.D.S.; Nguyen, L.M.; Heard, T.A.; Latty, T.; Oldroyd, B.P. Anthropogenic hive movements are changing the genetic structure of a stingless bee (*Tetragonula carbonaria*) population along the east coast of Australia. *Conserv. Genet.* **2018**, *19*, doi:10.1007/s10592-017-1040-9.