THE QUALITY OF "BITTER HONEY" FROM SUNGKAI FLOWER (*Peronema canescens*) COMPARED WITH OTHER KINDS OF HONEY

Siti Hamidah[1,2], Yudi F. Arifin[1,2], Eko Suhartono[2,3], Trisnu Satriadi[1,2], Violet Burhanuddin[1,2]

[1] Faculty of Forestry, Lambung Mangkurat University, Banjarbaru; [2] Center of Innovation, Technology, Commercialization, Management, Forest & Wetlands Lambung Mangkurat University, Banjarbaru; [3] Faculty of Medicine, Lambung Mangkurat University, Banjarbaru, INDONESIA.

yudifirmanul@ulm.ac.id

ABSTRACT

Bitter Honey is a type of honey produced from natural forests of Borneo, especially from the Loksado area, South Kalimantan. Honey is produced from wild honey bees with the nectar of flowers feed source forest plants, namely Sungkai (Peronema canescens). The taste of honey is bitter and color is more black than the other, similar to a bitter honey from Pelawan areas in Bangka Belitung. The bitter taste causes the honey is named Bitter Honey as a trade name. At the beginning of this honey is not sold on the market, because of the bitter taste of honey is considered unusual, so that when flowering Sungkai, honey production from natural forests is often wasted because it does not sell in the market. This research want to analisys the quality of the bitter honey from the flowers of Sungkai known as "Bitter Honey" and the content of antioxidants, anti-inflammatory and anti-diabetic, so that later can assist in the promotion and marketing of this honey. During the production of honey from traditional farmers, only sold just like that, without giving clear information about its quality. Therefore, testing the quality of honey, especially Bitter Honey is expected to make this honey can be sold on the market as there are definite information about the quality and usefulness. The results showed that the quality of honey Sungkai "Bitter Honey" that has not been sold on the market. It can meet the standard quality requirements of honey SNI 01-3545-2013, even in terms of water content better than honey bees forest food resources from other blossoms from the same place (Loksado), because the water content of Bitter honey can enter SNI standard (KA: 16%), whereas the water content of honey from natural forests is usually very high. The test results show the water content of the natural forest honey in the same place, but with other feed sources (durian flower), the water level is very high (39%). Another advantage of Bitter Honey is in terms of usefulness, which the results showed that the content of the antioxidant, anti-inflammatory and anti-diabetic is exceeds other honey from Loksado, even surpassing the famous brand of honey that has been widely circulated in the market.

Keywords: honey, bitter honey, honey quality, sungkai (*Peronemacanescens*)

INTRODUCTION

Honey is viscous liquid produced by honey bees from flower nectar. Bees suck on various kinds of flower juice and fruit, then collected in the body, then brought to the nest and formed into honey. Honey is a liquid food which is sweet, healthy and can be used also as medicine [38]. Honey is divided into several types based on the flower extracts produced by the bees, including kapok flower honey, klengkeng honey, rambutan honey, multi floral honey, forest honey, mahogany honey and others [41]. Most honey gives a sweet taste, some plants produce honey which tastes bitter [37].

ISSN: 2223-9944, e ISSN: 2223-9553

Bitter black honey and sweet black honey are mostly produced by *Apis dorsata* forest bees which until now have not been cultivated properly. This species can be found in villages directly adjacent to forest areas such as Muara Teweh, Central Kalimantan and Sumbawa [25]. Bitter honey is honey produced by bees that sucks Palawan flower nectar and mahogany nectar.

Kalimantan is famous for its bitter black honey and sweet black honey. Natural bee food makes bitter black honey and sweet black honey different from other regional honey. The food sucked by bees producing bitter black honey comes from various types of plants, one of which is baluntas (*Pluchea indica*), and the food sucked by honey-producing honey is dependent on the season, one of which is rambutan [19].

Bitter Honey or bitter honey is also one type of honey produced from the natural forests of Kalimantan, especially from the Loksado region, Hulu Sungai Selatan, produced from forest bees with nectar feed sources from the flowers of forest plants, namely Sungkai (*Peronema canescens*).

In early 2015, this honey was produced and developed by the Center for Excellence in Science and Technology Research Consortium for Sustainable Forest Management (PUI KR PHLB), as one of the superior products from non-timber forest products. The bitter taste of honey causes honey to be named Bitter Honey. In taste and appearance, this honey resembles bitter honey from the Pelawan area (Bangka, Belitung), tastes bitter and is blacker than other honey. As the name implies, this black honey taste is indeed bitter, giving it a distinctive honey flavour compared to other types of honey which generally have a sweet taste. The bitter taste of honey is obtained from the nectar of sungkai tree flowers and also other flowers that cannot produce fruit that can be consumed by humans.

Actually the Loksado people have known this bitter honey for a long time, but because of its bitter taste, this honey is not utilized and not sold if it is sold, consequently if the sungkai flower season, honey from natural forests is often thrown away. Based on this fact, the research team tried to find out the quality of bitter honey from Loksado, and its antioxidant, anti-inflammatory and antidiabetic content. The benefits of this study are expected to provide information about the quality and benefits of bitter honey from Loksado, so that later this honey can be of economic value, marketable and even have more selling value than other honey.

RESEARCH MATERIALS AND METHODS

Research materials are: honey (Bitter Honey, sweet honey from Loksado and X-brand honey which is honey with well-known brands on the market); materials for acidity testing (indicators PP or Fenolftalein and 0.1 N NaOH); and chemical chemicals for testing the levels of diastase enzymes (stock iod solution, iodine solution 0,0007 N, buffer acetate solution pH 5,3 (1,59), 0.5 M sodium chloride solution, starch solution).

Equipment needed is: photoelectric photometer, water bath, test tube (for acidity testing); calibrated analytic balance, calibrated 10 ml burette, 250 ml erlenmeyer (for testing levels of diastase enzymes), Refractometer PAL-22S for testing moisture content, and Refractometer PAL-OC for testing reducing sugar levels.

Honey quality testing based on SNI 01-3545-2013 standards, carried out at Cinotechcom Forwe Honey Laboratory (Center of Innovation, Technology, Commercialization, Management: Mangkurat University, Banjarbaru, Indonesia) Forest & Wetlands and Laboratory at the Center for Agro-Based Industry (CABI). Testing the antioxidant, anti-

ISSN: 2223-9944, e ISSN: 2223-9553

inflammatory and antidiabetic content based on the method of Harborne (1987) was carried out at the Biochemistry Laboratory of the Faculty of Medicine in ULM.

RESULT OF RESEARCH

Based on a series of test results, which have been carried out at the Laboratory of Biochemistry at the Faculty of Medicine, University of Lambung Mangkurat, the Bitter Honey (bitter honey) from Loksado, has several advantages over ordinary honey which is also produced from the Loksado region (sweet honey). The results of testing the quality of honey based on SNI 01-3545-2013 standards, in the three types of honey tested can be seen in Table 1.

Table 1. Result of quality tests of honey

Type of Tests	Bitter Honey from Loksado	Sweet Honey from Loksado	Honey with Brand X (Famous in the market)	Requirments of SNI 01-3545-2013
Diastaser enzyme activity (DN)	5	5	4	Min 3
Water content (% b/b)	16	39	15	Max 22
Reducing sugar (%b/b)	75.7	75.6	75.3	Min 65
Acidity (ml NaOH 1 N/kg)	35	36	17	Max 50

The results of testing the quality of honey (Table 1), indicate that Bitter Honey can meet the requirements of SNI honey quality standards 01-3545-2013, while sweet honey from Loksado does not meet the standards on parameters of water content. The quality of Bitter Honey (originally from Loksado) with sweet honey from Loksado, is generally almost the same, except for the water content, where the water content of sweet honey from Loksado is much higher (and does not meet standards), while Bitter Honey (Loksado's bitter honey) levels the water can meet the standard, and is much lower than sweet honey. Meanwhile, when compared with the quality of X-brand honey that is already well-known in the market, the comfort value of Bitter Honey and Loksado's sweet honey is very much higher.

The activity of diastase enzymes from Bitter Honey: 5 and sweet loksado honey: 5, is higher than the activity of the X-4 brand honey enzyme, while the minimum requirements are 3. The diastase enzyme is an enzyme added by bees during the honey ripening process. Diastase (amylase) digest maltose starch and is relatively stable against heat and storage time. This enzyme also catalyses the conversion of other sugars and is mainly responsible for the sugar pattern in honey. Diastase has an important role to assess the quality of honey and is used as an indicator of honey purity because the enzyme comes from the body of the bee. The minimum value of diastase in SNI is 3 diastase number (DN). The activity of these enzymes will be reduced due to the storage and heating of honey. In some countries the activity of diastase enzymes is used as an indicator for the purity and freshness of honey [9]. [1] states that diastase enzymes are produced by bee saliva and show that the higher the value of the enzyme, the more bee saliva found in honey. The higher the content of the diastase enzyme obtained, the honey reflects its purity. Heating at temperatures above 40ºC causes diastase enzyme activity to decrease even at high temperatures causing the enzyme to die. Heating also causes damage to honey which is characterized by an increase in the HMF (Hydroxy Methyl Furfural) indicator that occurs due to the degradation of honey sugar [15]. Different sources of nectar will affect the nature of honey produced by bees, including in terms of

ISSN: 2223-9944, e ISSN: 2223-9553

colour, taste, and components of honey. The composition of honey is determined by two main factors, namely, the composition of the nectar from the relevant honey and certain external factors [34], which is why Loksado forest honey (both sweet and bitter), contains different diastase enzymes with X-brand honey which is cultivated honey.

Water content of Bitter Honey: 16%) and brand-X honey: 15% far lower than Loksado sweet honey: 39%, where the maximum requirements based on standards are 22%. Water content is the amount of water contained in the material expressed in percent (%). Indonesian National Standard (SNI) 01-3545-2004 states that honey water content is good at a maximum of 22%. Water content in honey determines the durability of honey. Low water content of honey causes decay microbes to not live in it, plus honey also contains antimicrobial substances. Honey with high water content (water content of more than 25%) is easily fermented by yeast from the genus Zygosaccharomyces which is resistant to high sugar concentrations, so it can live in honey. Yeast cells will degrade sugar in honey (especially glucose and fructose) into alcohol (ethanol). If alcohol reacts with oxygen, the alcohol will form acetic acid which affects the acidity, taste and aroma of honey [24]. Low water levels are also caused by low humidity levels. Honey at high temperatures will be easier to experience liquefaction [34]. High water levels are caused by handling the harvest too early, that is, most nests are still not covered with wax [2].

The high water content of honey from Loksado, especially sweet honey compared to brand-X honey is caused by differences in honey and bee types, where honey from Loksado comes from forest bees (forest honey), and brand-X honey comes from bee cultivation (cultivation honey). Naturally the water content of honey depends on the source of nectar and weather conditions which range from 15-25%. The higher the relative humidity (Rh) of the environment, the higher the water content of honey [35]. [31]explained that Indonesia has a relatively high air humidity rate of 80%. Honey is hygroscopic which can absorb water around it, causing an increase in water content in honey. Forest honey is usually found in open spaces, so that the water content can be high, while cultivation honey is usually in the bee or nest that is closed and protected so that the levels.

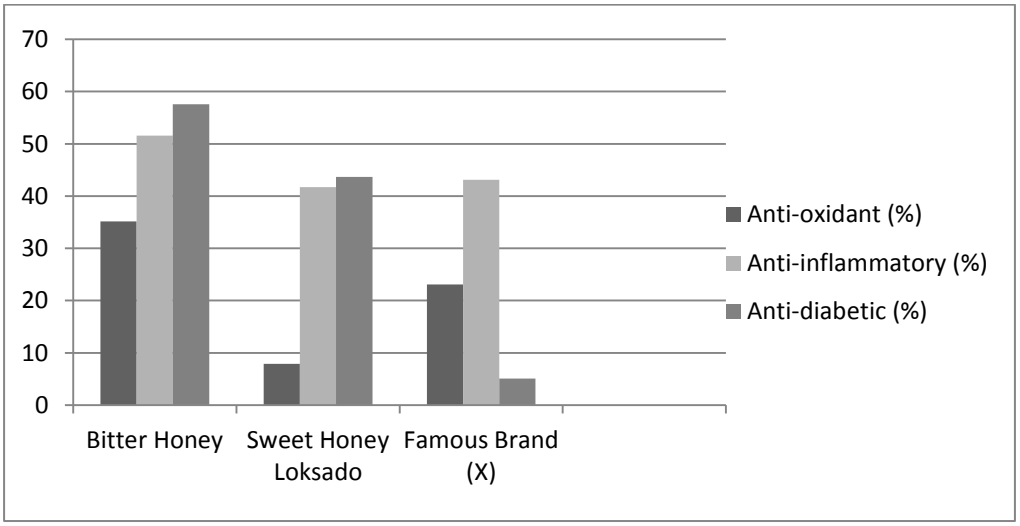

Figure 1. The content of antioxidant, anti-inflammatory & antidiabetic compounds of three types of honey

The results of testing the content of antioxidants, anti-inflammatory and antidiabetic compounds (Figure 1) Bitter Honey far exceeds ordinary honey (sweet honey) which is also produced from the Loksado region, even more than the famous brand honey that has been on the market. This is caused by different feed sources and also different environmental

ISSN: 2223-9944, e ISSN: 2223-9553

conditions. Bitter honey is produced from the nectar of sungkai flowers, while the sweet honey from Loksado is produced from durian flower nectar. Bitter honey is usually harvested in the dry season, while sweet honey (durian flowers) is usually harvested during the rainy season. Geographical location or environmental conditions and types of bees can also affect the content of antioxidant, anti-inflammatory and antidiabetic compounds from honey. This can be seen from the difference between Loksado honey (both sweet and bitter) with X-brand honey that is already known in the market produced from other regions. [26] stated that the composition and function of honey is influenced by differences in plant species, climate and environmental conditions. Meanwhile Viuda-Martos et al., (2008), states that the actual content of honey varies, depending on many factors such as pollen sources, climate, environmental conditions, and processing.

DISCUSSION

Honey contains enzymes such as catalase, glucose oxidase and peroxidase and non-enzymatic content such as carotenoids, amino acids, proteins, organic acids, Maillard reaction products, and more than 150 polyphenol compounds including flavonoids, flavonols, phenolic acids, catechins, and synamic acid derivatives [18]. This composition supports the antioxidant properties. Honey is beneficial for health because of the antioxidant ability of honey. According to [13] the nutrient content in honey which functions as an antioxidant are vitamin C, B3, organic acids, enzymes, phenolic acids, flavonoids, vitamin A and vitamin E. Antioxidant or free antiradical activity in honey varies. The difference in free antiradical activity depends on the source of flower nectar which is used as food by bees [13]. Antioxidant activity of honey can vary depending on the source of the flower. Honey is a material that contains high antioxidants. The antioxidant properties in honey are caused by various components in honey, including the components of flavonoids, phenolics, vitamin C, amino acids, enzymes, catalase, and others [16]. External factors that can influence include season, environment, and how to process it [20; 22; 13].

The results of the study of [32] showed that honey honey and kelengkeng honey had different antioxidant activities. With the many components in honey that provide these antioxidant properties, flavonoids are one of the most studied. Flavonoids in honey itself have many elements and are strongly influenced by geography, interest sources, climate, processing, etc. [14]. Honey also contains various phenolic compounds, which are good sources of antioxidants, making honey a good additive and increasing potential and use in ethnomedicine [29]. Honey also has significant antioxidant activity, recent studies show a strong correlation between the content of phenolic compounds in honey from various sources of interest and antioxidant capacity. Flavonoids are the main functional component of honey and can significantly contribute to total antioxidant activity and beneficial effects on human health. Honey also has significant antioxidant activity, recent studies show a strong correlation between the content of phenolic compounds in honey from various sources of interest and antioxidant capacity. Flavonoids are the main functional component of honey and can significantly contribute to total antioxidant activity and beneficial effects on human health [12].

Apart from antioxidants, honey also has other pharmacological activities, including antibacterial [39; 21; 10], antimutagenic and antitumor [40; 8], anti-inflammatory [3; 11], lowering cholesterol levels [5] and vasodilators [5; 5].

The results showed that Bitter Honey contained high anti-inflammatory or anti-inflammatory compounds as well. This has to do with the high content of antioxidant compounds in the honey. This is because honey is high in antioxidants

ISSN: 2223-9944, e ISSN: 2223-9553

CONCLUSION

The results showed that the quality of Sungkai honey "Bitter Honey" could comply SNI 01-3545-2013 honey quality requirements standards. The water content of honey "Bitter Honey" is better than forest honey bee with other flower feed sources that come from the same place (Loksado), because the water content of Bitter Honey can meet SNI standards (Moisture Content: 16%), even though the water content of honey is natural forests are usually very high. This is indicated by the high water content of other honey (durian flower honey which reaches 39%). Another advantage of Bitter Honey is its efficacy, which the results of the study show that its antioxidant, anti-inflammatory and antidiabetic content far exceeds other honey from Loksado, even surpassing famous brand honey that has been widely circulated in the market.

ACKNOWLEDGMENTS

Acknowledgments are conveyed to various parties, so that the research and writing of this article can be completed, including:

1. Chairman of PUI PT KR PHTB (Center for Excellence in Research Institute for Sustainable Tropical Forestry Consortium Science and Technology) Unlam for the assistance of funds for this research activity.
2. Chairman of LPPM ULM for support in this research
3. Dean of Faculty of Forestry ULM, for granting permission for the Research Team to conduct this research.
4. Staff of Biochemistry Laboratory, Faculty of Medicine, for assistance this research.
5. Collector of forest honey in Loksado, South Kalimantan for collecting honey samples
6. Various parties who have participated in the research and making of this scientific article.

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