



Physical Quality Characteristics of Pure and Impure Trigona Bee Honey

AUTHORS INFO

Nuraini

Universitas Sembilanbelas November Kolaka
nuraini@gmail.com
+6282293207541

Hastuti

Universitas Sembilanbelas November Kolaka
hastutijalla@gmail.com
+6285255092481

Husnaeni

Universitas Sembilanbelas November Kolaka
husnaeni.hasja@gmail.com
+6285299984299

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Abstract

This study aims to determine the physical quality characteristics of pure and impure honey bee Trigona. The material used in this research is pure honey and impure honey. This study consisted of 2 treatments with five replications where X1 (pure honey) and X2 (unpure honey). Parameters observed included soluble test, heating test, hexagon test, and ant test. Data analysis using t-test. Based on the results of the analysis of variance, it shows that each soluble test is X1 = 1.6 and X2 = 3.8, the heating test is X1 = 4.6 and X2 = 2.4, the hexagon test is X1 = 2 and X2 = 1, 8, the ant test is X1 = 3.2 and X2 = 4.2. The study results can be concluded that the effectiveness of the honey purity test using several simple methods that most meet the requirements are the soluble test method, the heating test method, and the ant test. In contrast, the hexagon test does not give a response at all.

Keywords: pure honey, impure honey, Trigona bee

A. Introduction

Consumption of honey in the community continues to increase, triggering an increase in the need for honey. Data from the Indonesian Bee Association (API) 2005 reported that Indonesia's honey consumption rate ranged from 7000-15,000 tons per year. Meanwhile, Indonesia's honey production in 2002 only reached 4,000-5,000 tons/year. Under these conditions, there is a shortage of honey. Although imported honey is met to overcome the shortage of honey, it is estimated that there are not many circulations of impure honey in Indonesia. It is supported by the selling price of honey which reached Rp. 45,000/600 ml.

The bee of the *Trigona* genus comes from Asia, and this bee has a black color with a relatively smaller body size compared to the bees of the *Apis* genus. Honey is a good drug for health in the form of a sweet liquid resulting from the nectar collection by honey bees (Gebremariam & Barhane, 2014). Honey is a naturally sweet liquid derived from plant nectar (flora nectar) produced by honey bees or other materials from plants (flora and nectar) (BSN, 2004).

Honey is a thick natural sweetener produced by bees after consuming flower nectar and other sweet ingredients from plants. Honey is a complex mixture containing nutrients and bioactive compounds such as carbohydrates (mainly fructose and glucose), enzymes, proteins, amino acids, organic acids, minerals, vitamins, aromatic substances, polyphenols, pigments, waxes, and pollen. on color, aroma and taste (Pavlova et al., 2018).

Pure honey is liquid flower nectar sucked by honey bees into the honey bag in their body (Andriani, 2011). Impure honey is honey that has been mixed with sugar and other original ingredients. This impure honey is made without the help of bees or using sugar as nectar. Generally, this impure honey has the same color as pure honey. Therefore, for ordinary people, it is difficult to distinguish between pure honey and impure honey. Impure honey is made with engineering so that it has properties, taste, and aroma that are very similar to pure honey (Maun, 1999). Therefore, we must know to distinguish between pure honey and impure honey.

In addition, honey also has Physico-chemical and microbiological characteristics that can be used as honey quality parameters. Various studies have been conducted to determine the quality of certain honey (Andriani, 2011; Amalia, 2016).

Some people have many methods of distinguishing pure honey and simple impure honey developed by word of mouth (Astuti, 2015; Wahyuni 2015). There are many tricks and tips on distinguishing pure honey and impure honey using several simple methods in electronic media such as television, so there is no need to wait long to distinguish between pure and impure honey. Therefore, further research is needed to distinguish pure honey from impure honey, and one can only use a simple method without passing laboratory tests. Currently, there are a lot of pure honey testing methods circulating among the public and have been trusted for generations to date.

The community's methods were (1) the ant test by pouring honey into a container and then letting it sit for a while. If there are ants that land on the honey, the honey is considered pure and vice versa. (2) the newspaper test is done by pouring honey on the surface of the newspaper. Honey does not penetrate to the back of the newspaper. The honey is pure. (3) the heating test is done by pouring honey into a spoon and then heated using a candle. If the honey boils and spills to the bottom, the honey is pure. (4) the cooling test by adding honey into the freezer. If the honey freezes, then it is considered that the honey is not pure and vice versa. As a supporter, the honey used is pure, tested for purity, and impure honey is not pure. This study aims to determine the physical quality characteristics of pure and impure honey bee *Trigona*.

B. Methodology

1. Research Design

This study was structured using two treatments with five replications for each treatment. Treatment 1 (X1) : Pure honey; Treatment 2 (X2) : Honey is not pure. Unpure honey is a mixture of 40% pure honey + 60% sugar water.

2. Procedure of Research

The manufacture of impure honey begins with making liquid sugar, namely by preparing 200 grams of granulated sugar and 60 ml of water, then cooking it until it boils over low heat until the honey turns brownish-yellow and thickens allowed to stand. After the cold sugar solution is mixed with pure honey with a composition of 40%, pure honey added 60% sugar water, stirred until evenly distributed.

3. Parameters of Research

a. Dissolve test

The method used in this study uses references from Hujjatur Rofiq et al. (2019). Honey is poured into a bowl of one spoon or about 5 mL into a glass containing 100 mL of water. While the height of the bowl is 10 cm and the height of the water is 8 cm. The testing place is in the room, and then honey is poured into a bowl filled with water. If the honey dissolves quickly with water, then the honey is impure. If the honey does not dissolve in water, then the honey is pure, observed using a likker scale.

b. Heating Test

Honey is poured into a tablespoon of as much as 5 ml. Then, the spoon containing the honey was heated on a candle from the surface of the fire. If the honey does not immediately spill (does not spill from the spoon), then the honey is not pure, but if the foam is formed and spills from the spoon, then the honey is pure and observed using a likker scale.

c. Hexagon Test

5 mL of honey, poured into a petri dish and then given water until the honey sinks; the petri dish is moved until it forms a hexagon eight times. If the hexagon formed quickly disappears and is not clear, then the honey is not pure slowly. However, if the honey is formed in terms of six and very clear and does not disappear quickly, the honey is pure and then observed using a Liker scale.

d. Ant Test

Honey is poured into a petri dish as much as 5 ml, then put the petri dish in an open room so that young ants can approach, then look at the number of ants in the honey and then observe using a likker scale.

4. Data Analysis

To compare the value between pure and impure honey used the t-test (two-party comparison test) as Sudjana's (2005) formula is as follows:

$$T \text{ count} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2} \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

C. Result and Discussion

1. Dissolve test

Based on the study results, the average comparison of pure and impure honey values in the soluble test can be seen in Table 1.

Table 1. Average Comparison of Soluble Test Values

Repeat	Treatments	
	Pure Honey	Impure Honey
1	1	3
2	1	3
3	2	4
4	2	4
5	2	5
Average	1,6	3,8

Source: Primary data (2021)

Based on the results of the analysis of variance using the t-test, it was found that X1 and X2 showed significant differences ($P < 0.05$). The results of the soluble test on pure honey and impure honey show a flow when pure honey is poured into the bowl to the bottom of the bowl due to the content of pure honey, which is difficult to dissolve in water. It followed the opinion (Prabowo et al., 2019), which states that pure honey has low solubility due to thick honey and high viscosity and other components in honey bee wax, protein, vitamins, and minerals.

Unlike the case with impure honey, it showed no flow when it was poured into the bowl until it reached the bottom of the bowl. It slowly blends with the water, and this is because impure honey, which has a high solubility level, is characterized by a change in the color of the water that is cloudy. Rahmani (2004) & Sihombing (2005) states that impure honey has a high solubility because impure honey is more dilute and contains much water. It is different from the opinion (Getachew, 2012), which states that high water content does not indicate the presence of adulteration of honey by adding water, but because at harvest time, not all honey is covered with wax.

2. Heating Test

Based on the study results, the average comparison of pure and impure honey values in the heating test can be seen in Table 2.

Table 2. Average Comparison of Heating Test Values.

Replications	Treatments	
	Pure Honey	Unpure Honey
1	4	2
2	4	2
3	5	2
4	5	3
5	5	3
Average	4,6	2,4

Sumber: Primary data (2021)

The analysis of variance using the t-test showed that X1 and X2 were significantly different ($P < 0.05$). The heating test of pure honey and impure honey showed that pure honey and impure honey were heated for the same time of 1 minute 14 seconds, showing a different response, namely pure honey boils and overflows. In contrast, impure honey does not overflow when heated. The formation of foam until it overflows is due to the sugar in pure honey during heating. There had been a reduction in water content marked by the formation of foam. It is because pure honey is thicker than impure honey. The water content is less or less; it is different from impure honey, which has more water content due to the addition of water during the manufacture of impure honey. It is also expressed by (Prabowo et al., 2019) that when heating, the water content in honey will decrease, protein will be denatured, and there will be a decrease in surface tension so that foam is formed causes honey to spill from the spoon.

3. Hexagon Test

Based on the study results, the average comparison of pure and impure honey values in the hexagon test can be seen in Table 3.

Table 3. Average Comparison of Hexagon Test Values.

Replications	Treatments	
	Pure Honey	Impure Honey
1	1	1
2	2	1
3	2	2
4	2	2
5	3	3
Average	2	1,8

Source: Primary data (2021)

Based on the results of the analysis of variance using the t-test on X1 and X2, it showed that there was no significant difference ($P > 0.05$) on the observation of pure honey and impure honey. It showed that pure and impure honey was moved in a dish containing honey and water eight times. The absence of a hexagon response in both samples does not have the characteristics of a hexagon, while they formed is not clear and disappears within 5 seconds. The absence of hexagons in pure honey and impure honey is due to the absence of bee wax content in honey, following the opinion (Rahmani, 2004) that the absence of hexagons in honey is caused by the absence of bee wax content in honey.

It is different from research (Prabowo et al., 2019), which states that the hexagon shape formed in water is clear in pure honey. It is because the specific gravity is much higher than water, which is around 1.42%, and does not make the water turn cloudy even though it has been mixed with honey because of the low water activity of the honey. In addition, it was also influenced by several factors. Namely, the difference in the samples tested and not all honey has the same level of composition and is caused by the geographical area of the nectar source and the environmental conditions of the hive when the bees take the juices from flowers or plants—big enough water.

4. Ant Test

Based on the study results, the pure honey ant test and impure honey (Table 4) showed that pure honey and impure honey, which were left for 1 hour, showed a different response, namely the presence of ants. However, there were many ants in pure honey, and on impure honey, very many ants. The analysis of variance using the t-test showed that X1 and X2 were

significantly different ($P < 0.05$). The average comparison value of pure honey and impure honey in the ant test can be seen in Table 4.

Table 4. Average Comparison of Ant Test Values.

Replications	Treatments	
	Pure Honey	Unpure Honey
1	2	3
2	3	4
3	3	4
4	4	5
5	4	5
Average	3,2	4,2

Source: Primary data (2021)

The sweet taste of sugar honey causes the presence of ants in pure honey and impure honey, but the sugar content in pure honey is glucose, and the sugar content in non-pure honey is sucrose. It followed the opinion (Suranto & Adji, 2004) that the glucose content in pure honey is more visible than impure honey. The sucrose content in impure honey is more prominent than pure honey.

The glucose contained in pure honey comes from flower nectar. In contrast, the sucrose contained in impure honey comes from granulated sugar, so that ants prefer impure honey to pure honey because ants prefer sucrose/sugar. It followed the opinion (Rustam et al., 2014) that dominant ants prefer impure honey to pure honey because the sucrose content in pure honey is less or low, where sucrose is very favored by ants.

D. Conclusion

Based on the study results, it can be concluded that the effectiveness of the honey purity test using several simple methods that most meet the requirements are the soluble test method, the heating test method, and the ant test. In contrast, the hexagon test does not give a response at all.

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