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Physicochemical Properties of Patchouli and Trigona's Honey Functional Hard Candy

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Abstract. *Consumers are experiencing increased awareness of healthy food, including healthy candy. Therefore, sugar in candy was reduced by adding isomalt and trigona honey. Natural flavors such as patchouli oil are also added to replace synthetic flavors in hard candy. This research aims to determine the physicochemical and descriptive properties of patchouli and trigona's honey hard candy. The data were analyzed descriptively. The result shows that the low-calories hard candy containing Trigonas Honey and Patchouli Oil has yield value range 67.66% - 63.10%, with density value range 2.35 (g/cm3) - 2.18 (g/cm3) and pH value range 4.56 - 3.86. It can be concluded that the hard candy that containing trigona's honey and patchouli oil has the physicochemical properties that high yield, relatively low density, slightly acidic so further reseach are needed to overcome deficiencies in the physicochemical properties of these functional hard candies.*

Keywords: *organoleptic, natural flavor, essential oil, pogostemon cablin, stingless bee*

1. Introduction

Currently, consumers are experiencing increased awareness of healthy food, including adopting a diet low in sugar and free of food additives. Candy is a food product high in sugar content. Therefore, in this research, sugar in candy was reduced by adding substitute sugar in the form of isomalt and natural sweetener in the form of trigona honey. Flavoring is also needed in candy making. The flavors generally used are synthetic flavors. However, in this study, the flavor used was natural flavoring from patchouli oil (Pogostemon cablin Benth) which is one of the superior essential oil products of Aceh Province, Indonesia (Adhayani et al., 2021; Juliani, Irmayanti, & Musliyadi, 2022; Juliani & Irmayati, 2022; Kedokteran & 2019, n.d.).

Based on texture, candy is classified into 2 types, namely hard candy and soft candy. Hard candy is a type of solid candy made from sugar as the main ingredient or a mixture of sugar and with the addition of other sweeteners, while soft candy is a solid candy made from sugar as the main component or a mixture of sugar with or without the addition of sweeteners and other food ingredients that have a relatively soft texture or can be chewed (Amir et al., 2017; Henny et al., 2014; Livia Engka et al., n.d.).

Food during processing can experience physicochemical and structural changes depending on the type of food being processed in solid or liquid form and its constituents. There are many physicochemical properties in food, for example, hydration properties (Zhu et al., 2010), rheological behavior of liquids (Zheng, 2019), mechanical properties (Sagis & Scholten, 2014), optical properties (Wang et al., 2017) and thermal properties (Mohsenin, 2020). Physical and chemical changes in each ingredient are the result of the processing process and often cause physical, sensory and nutritional changes to the food which then determine its quality. Therefore, each type of food needs to be characterized

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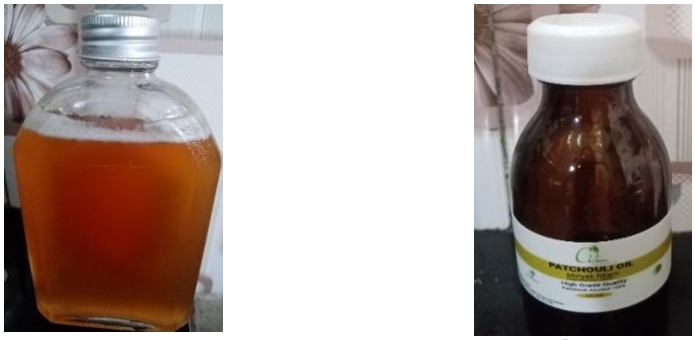
by studying its physicochemical properties such as yields, density and pH analysis (Igual & Martínez-Monzó, 2022).



a b

Figure 1. Hard Candy Local Ingredients (a. Trigona's Honey; b. Patchouli Oil)

The physicochemical characteristics of candy are carried out by calculating the yield and pH analysis of the candy. The yield calculation aims to determine the final weight of the candy product, while the pH test aims to determine the acidity level of the candy product (Akib et al., 2015; Sulistyowati et al., 2019). Density analysis was also carried out to determine the sensory compactness of the hard candy (Rahmawati & Adi, 2016).

2. Method

Samples

The material used in this research consisted of Trigona's honey from Trigona itama, patchouli oil, peppermint oil, fructose syrup, isomalt, sucrose, and aquadest. The food processing equipment used in this research were pans, digital scales, thermometers, knives, stoves, candy moulds, slide anchors and other equipment used in candy analysis.

Table 1. Research Design

Candy Formula	N1= 0.2 mL	N2 = 0.4 mL	N3 = 0.6 mL	N4 = 0.8 mL
G1 = 50% sucrose; isomalt 20%: fructose syrup 20%; 10% trigona's honey	G1N1	G1N2	G1N3	G1N4
G2 = sucrose 35%: isomalt 35%, fructose syrup 15%; trigona's honey 15%	G2N1	G2N2	G2N3	G2N4
G3 = sucrose 20%; isomalt 50%: syrup fructose 10%; 20% trigona's honey	G3N1	G3N2	G3N3	G3N4

Research Procedure

Candy Processing

Sucrose, isomalt and fructose syrup based on the formula were dissolved in 30 mL of water and heated to 160°C, then the temperature was lowered to 100°C. Trigona's honey was added when the temperature was lowered to 80°C. Peppermint oil (0.2 mL) and patchouli oil were added according to the formula and stirred until homogeneous. The candy solution was poured into the mold and cooled at room temperature until hardened. Then, removed the candy from the mold, wrapped in candy paper and stored in an airtight condition (Juliani, Irmayanti, & Musliyadi, 2022; Juliani & Irmayati, 2022). Low-calorie Formula (G) and Patchouli Oil (N) concentrations of hard candy can be seen in Table 1.

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Samples Analysis

Yields, Density and pH Analysis

The yield is determined by calculating the candy produced from each treatment expressed as a percentage. Density analysis is determined by measuring the mass (g) divided by the volume of candy (cm3). The pH of candy is measured with a pH meter until it shows a constant number (Sistanto et al., 2014).

Data Analysis

Data were analyzed descriptively and presented in the table using Microsoft Office Excel 2010

3. Results and Discussions

Yield Analysis

Yield is the difference between the initial weight of the material and the final weight of the product after processing which is reported as a percentage (Sistanto et al., 2014). There was no real difference in the yield percentage. The highest yield was 67.66% and the lowest was 63.10%. This shows that the addition of trigona's honey (10 mL-30 mL) and patchouli oil (0.2 mL- 0.8 mL) as sweetener and flavor does not have a significant effect on the yield of hard candy. Candy yield is influenced by the raw materials for making candy. The proportion of solid materials added tends to produce a higher yield (Sulistyowati et al., 2019). In this study, trigona's honey and essential oil that were added were not high enough to make a difference so the yield of hard candy produced was relatively the same.

Table 2. Yield analysis of hard candy (%)

Hard Candy Formula	N1	N2	N3	N4
G1	64.61±10.52	65±8.87	68.46±15.72	63.10±5.62
G2	66.54±6.97	68.66±12.43	64.61±5.79	66.92±7.46
G3	66.15±4.50	67.69±9.78	60.77±14.14	64.61±11.38

Density Analysis

Density analysis is carried out to determine the uniformity of candy products. Density measurement refers to the density of candy where the product is expected to have the same shape and weight. In the case of functional foods, product uniformity is very important considering that each product contains active compounds with certain health benefits (Neha et al., 2021). Consumers expect the health benefits of each product to be the same if not more.

Table 3. Density analysis of hard candy (g/cm3)

Hard Candy Formula	N1	N2	N3	N4
G1	2.35±0.35	2.33±0.43	2.35±0.50	2.36±0.34
G2	2.27±0.33	2.29±0.39	2.26±0.34	2.29±0.39
G3	2.18±0.28	2.17±0.37	2.16±0.46	2.18±0.38

The highest density was 2.35 (g/cm3) and the lowest was 2.18 (g/cm3). The results of this candy density analysis can be as an indication that differences in candy formulations result in this decreasing density from G1 to G3 sugar formulations. The G3 sugar formulation contains a higher proportion of isomalt and trigona's honey which can cause a decrease in the density value of hard candy.

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According to (Sulistyowati et al., 2019) high water content can reduce the density value. Isomalt as a sugar substitute in candy formulation when stirred quickly can trap air, thus forming bubbles in hard candy. The presence of these bubbles can reduce the weight of the candy which affects the density value (Juliani, Irmayanti, & Musliyadi, 2022).

pH Analysis

Hydrogen Potential (pH) is a measure of the concentration of hydrogen ions in a food which indicates whether the food is acidic, basic or neutral. pH is very closely related to food ingredients. Food ingredients with a low pH generally have a sour taste and are more resistant to spoilage or even have antibacterial activity (Juliani, Irmayanti, & AK, 2022; Rahadian et al., 2017).

The highest pH of hard candy was 4.56 and the lowest was 3.86. The analysis results showed that all candy formulations had an acidic pH (below 7). The acidity of the candy can be caused by the addition of trigona's honey as a substitute of fructose syrup. However, the pH results of the candy from this study are similar to those reported by other researchers that hard candy made from Heterotrigona itama honey has a pH of around 4.45 (Rahmatullah, n.d.; Yalliza, 2023).

Table 4. pH analysis of hard candy

Hard Candy Formula	N1	N2	N3	N4
G1	3.88±0.78	4.22±1.08	4.51±0.50	4.30±0.90
G2	4.56±0.72	4.13±1.08	4.09±0.80	4.14±0.43
G3	4.14±1.02	4.08±0.90	3.88±0.45	3.86±0.92

4. Conclusions

Functional hard candy containing trigona's honey and patchouli oil has physicochemical properties of yield relatively high because mainly contains solid materials such as sucrose. Functional hard candy containing trigona honey and patchouli oil has physicochemical properties with a relatively high yield, relatively low density and pH. Therefore, this functional hard candy has a slightly sour condition as is generally the case with stingless bee honey-based ingredient candy. The bubbles in the candy result in a low density of the candy which needs to be researched further so that customers get the same health benefits in each candy.

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