

Organoleptic Analysis of The Honeycomb Cake (*Kue Sarang Semut*)

Anni Faridah¹, Raudhatul Jannah², Merisa Marlis²

¹Faculty of Tourism and Hospitality, State University of Padang,
Jl. Prof. Dr. Hamka, Padang, West Sumatera, Indonesia.

²Family Welfare Study Program, Faculty of Tourism and Hospitality, State University of Padang
Email: faridah.anni@fpp.unp.ac.id

ABSTRACT

The Honeycomb Cake or Caramel Cake or widely known in Indonesia as "Kue Sarang Semut" is a type of cake that preferred by many people and has a distinct colour, texture and aroma. Some of its main ingredients are caramel and wheat flour. But the caramel-making is generally sugarcane-based, and the flour is still usually from wheat, which its availability is always depended on import traffic and its import activity is now increasing. Therefore, it is necessary to research the cake's organoleptic test using different types of sugar and the flour substitution of tofu dregs. This research is classified as a pure experiment and conducted in two stages and uses Completely Randomised Design, which is consisted of four treatments. The first stage uses four different types of sugar (granulated sugarcane, aren sugar, palm sugar, and rock sugar) and the second stage is four types of tofu dregs flour amount (0%, 15%, 30%, and 45%) used, with three-time repetition. The obtained data later tabulated into a table and will be examined using Analysis of Variance test. If there is any significant difference, the Duncan test will then applied. This research concludes that the different types of sugar significantly affect the colour and aroma quality. Furthermore, the amount of the wheat flour substitute of tofu dregs flour significantly affect the volume, colour, aroma, chewiness texture, hollow texture, and taste satisfaction. The best treatment of the Honeycomb Cake is obtained from the usage of pam sugar and 15% amount of tofu dregs flour.

Keywords: honeycomb cake; caramel cake; organoleptic test; types of sugar; tofu dregs flour.

INTRODUCTION

The Honeycomb Cake (Caramel Cake or "Kue Sarang Semut" [lit. "Anthill Cake"]) is one of the local snacks made of wheat flour, bicarbonate, eggs, margarine, milk, water, and sugar. It is included as the "Wet Kue" that has a distinct caramel aroma. Thus it is also called as caramel cake. This cake has a somewhat chewy texture and pores shaped like an inside of the anthill and has the colour of dark brown (Al-Hilal, 2013). The dark brown colour is obtained from the caramelised granulated sugar (Will, (2010); (Kocadağlı & Gökmen, 2016).

Caramelisation is the non-enzymatic browning reaction. According to Kocadağlı & Gökmen (2016) and (Zhang, Chen, & Wang, 2013), the formation of caramel is from the heated sugar, which then dehydrated and increased in concentration and its boiling point. This state will occur until all water content evaporates. If the heating is still happening, the sugar will melt. Different types of sugar also bring a different melting point. The melted sugar that heated until 200 degrees centigrade will be caramelised.

The caramelisation due to sugar heating will result in a distinct colour and aroma. Audemar et al. (2017) explains that sugar decomposition will result in the formation of volatile (caramel aroma) and brown colour compound (caramel colour). Besides its distinct colour and aroma, Honeycomb Cake has a distinct texture, which is chewy and porous like the inside of an anthill.

Type of sugar that generally used in the cake is the sugarcane-based granulated sugar. A recent statistic shows that the national consumption on granulated sugar has

increased (Asosiasi Gula Indonesia, 2018), so some efforts on searching for the alternative for this type of sugar (such as palm sugar, aren sugar, and rock sugar) is suggested. The availability of sugar is generally still high but still dominated by the granulated sugar. Therefore, it is necessary to research on other sugar's utilisation in the making of the Honeycomb Cake (Hartati, 2018). Besides sugar, flour also should be taken into account since the main ingredient from this cake is wheat flour. Indonesia is the world's largest wheat importer nation (United States Department of Agriculture, 2019). Based on the data from the Central Bureau of Statistics, the demand for imported wheat is increasing annually despite the inadequate domestic wheat production to cover the wheat demand. This inadequacy creates an enormous dependency on imported wheat. Therefore, it is necessary to push down import demand by increasing the utilisation of Indonesia's local commodities (Hartati, 2016). One of the forms of food diversification is by utilising local potential is the substitute ingredient of tofu dregs flour on the making of Honeycomb Cake (Fadjar Kurnia Hartai, Arlin Besari Jauhari, Meithianan Indrasari, 2019).

Tofu dregs flour is the result of tofu dregs flouring process. The tofu dregs it self is a solid left over of the tofu making process. Indonesian Health Ministry (2010) stated that tofu dregs flour contains 17.7 grams of protein and 3.23 grams of crude fibre. This is significantly higher than the wheat flour, which only contains 8.9 grams of protein and 0.4 grams of crude fibre. The high content of protein and crude fibre can help in fulfilling daily fibre needs and nutrition alternative as a daily protein source (Sofnitati, 2018). Furthermore, the utilisation can be counted as an effort to reduce the pollution from the tofu dregs waste.

This research aims to conduct an organoleptic test of the Honeycomb Cake through the utilisation of sugarcane-based granulated sugar substitutes on the first stage and flour substitutes on the second stage.

METHODS

Ingredients, tools, and places

The tofu dregs are gathered from the tofu-making factories and later self-floured. Other components, such as wheat flour et cetera, are described in Figure 1. Tools used in this research are the general cake making tools, using the baking pan. The research is conducted in the Cookery Workshop, Family Welfare Study Program, Faculty of Tourism and Hospitality, State University of Padang.

Methods

This research is categorised as a pure experiment. It is conducted in two stages and utilises Completely Randomised Design that consists of four treatment. The first stage is using different types of sugar (granulated sugar, aren sugar, palm sugar, and rock sugar). The second stage is using the different percentage amount of tofu dregs flour (0%, 15%, 30%, and 45%) of the total used flour with three-time repetition. The process of cake making can be seen in Figure 1.

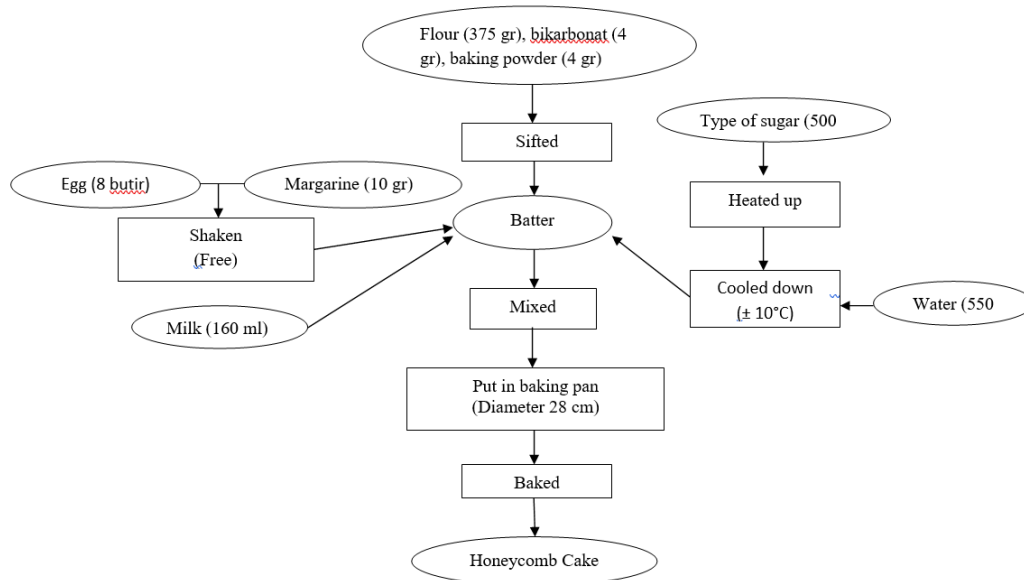


Figure 1. A process on the making of Honeycomb Cake

Data used for this research was the primary data, which involves 30 semi-trained panellists. The data then analysed using the Analysis of Variance (ANOVA). If the result has a significant difference, then the test continued to the Duncan Test.

The making of caramel from all types of sugar used in this research (granulated sugar, palm sugar, aren sugar, and rock sugar) are prepared following the measures and water amounts. Each sugar is heated up to 200 degrees centigrade (Jatmiko, 2017) and later mixed with water. Afterwards, cooked it until the sugar dissolves and the sugar water is boiled before cooled it with a temperature of 10 degrees centigrade (Jatmiko, 2017).

The making of tofu dregs flour is through the squeezing the tofu dregs with a cloth until the water content inside the dregs stopped dropping. The dregs later sun-dried and blend it before later sifted by smooth sifter.

The making of Honeycomb Cake can be seen in Figure 1. Spread margarine into the baking pan and evenly sprinkle some flour before pouring the dough into the baking pan. Bake the dough using medium fire for about 40 minutes. Afterwards, chill it before served.

The second stage is conducted after the first one finished (the best type of sugar on the early stage will be used on the second stage). The cake making process is the same, only the wheat flour is substituted by the tofu dregs flour, using different amount.

RESULTS AND DISCUSSIONS

Stage 1 (Sugar type effect)

The usage of different types of sugar provides a different average score of the organoleptic test between the treatments (see Figure 2).

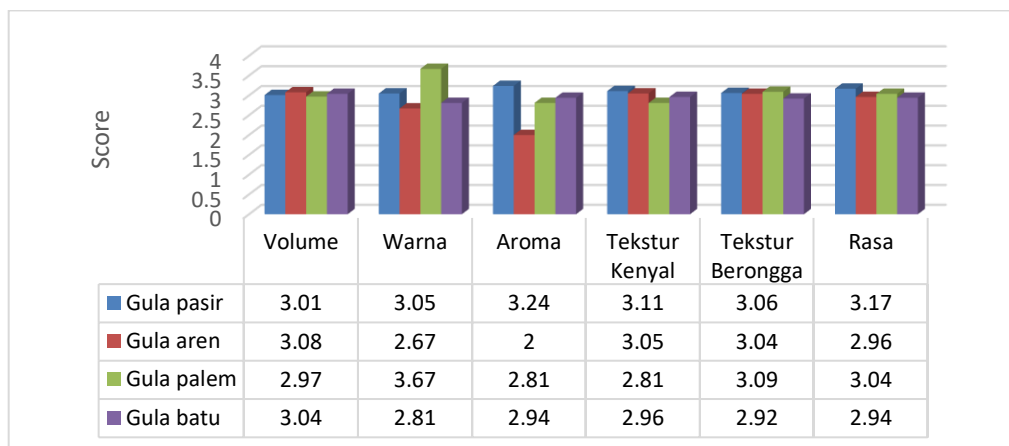


Figure 2. Average score of Honeycomb Cake's organoleptic test using the different types of sugar

Figure 2 indicates that the average scores of the Honeycomb Cake are 2.97-3.08 in volume, 2-3.4 in aroma, 2.89-3.11 in texture elasticity, 2.92-3.09 in texture hollowness, and 2.94-3.17 in flavour. The colour and aroma quality has a large range of score when taste, volume, texture elasticity, and texture hollowness has a smaller range of score. Figure 2 also thoroughly illustrates that the best type of sugar in the Honeycomb Cake making is the granulated sugar. Furthermore, the usage of this sugar created a shinier appearance than other types of sugar.

The ANOVA result shows that the dark brown colour and the aroma of the Honeycomb Cake indicates the significant difference in the type of sugar used towards the result's quality. Meanwhile, on the indicators of volume, texture elasticity, texture hollowness, and taste, there is no significant difference. Table 1 showed the advanced Duncan Test towards the colour and aroma quality.

Tabel 1. Duncan Test of Honeycomb Cake by the different types of sugar used in ingredients.

Type of sugar	Colour	Aroma
Granulated Sugar	3.05b	3.24a
Aren sugar	2.67d	2c
Palm sugar	3.67a	2.81b
Rock sugar	2.81c	2.94b

Note: The letters behind the numbers indicates the difference

Figure 2 and Table 1 explains that the colour and aroma quality of the cake has a significant difference by the using of different type of sugar. The highest colour score comes from palm sugar, which resulted in a dark brown colour. This is undoubtedly due to the nature of the palm sugar itself even before the caramelisation process. Another significant colour comes from the granulated sugar, from white to dark brown. The aren sugar itself changed less significant (light brown to dark brown). For aroma, the highest score comes from granulated sugar because, during the caramelisation process, this sugar formed more volatile, compared to other types of sugar.

From the colour and aroma aspect illustrated in Table 1, it can be concluded that the best caramelisation or non-enzymatic browning is the granulated sugar. This difference is due to the different structural formers on all four types of sugar.

Stage 2 (Effect from the tofu dregs flour substitute)

The tofu dregs flour substitute shows the significant difference towards indicators such as volume, dark brown colour, pleasant aroma, pleasant taste, texture elasticity, and texture hollowness. There is no significant difference in uniformity shape, texture smoothness, and sweet flavour. The average score can be seen in Figure 3.

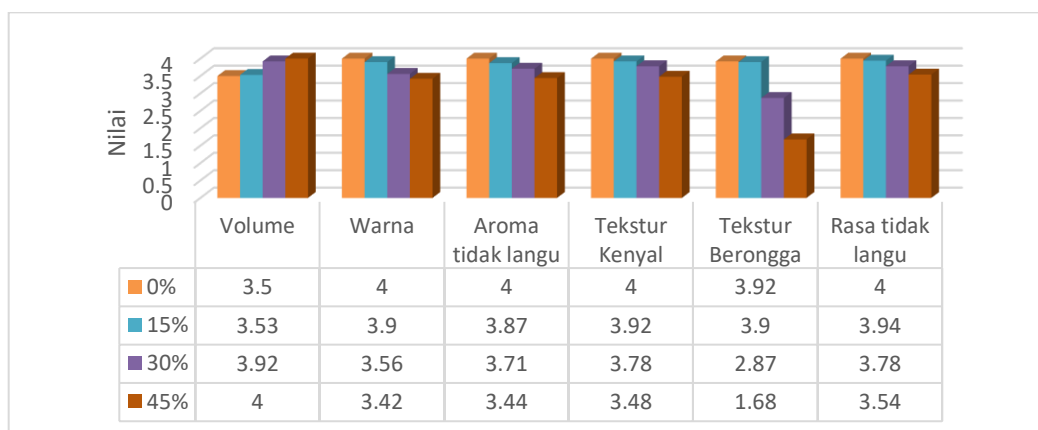


Figure. 3 Average score of Honeycomb Cake's organoleptic test using the different amount of tofu dregs flour substitute.

Figure 3 illustrates that the best scores are the cake swelling on X_1 treatment (45%) with a score of 4.00, shape uniformity on 0% with the best score of 3.09. The best score on dark brown colour is 0% treatment with 3.96 (X_0). Pleasant aroma best score is 0% treatment with 4.00. Smooth texture best score is the 0% treatment with 3.82. The best score on texture elasticity is on X_0 treatment with a score of 4.00. Texture hollowness reached the highest score of 3.92 on the treatment X_0 . The best sweet taste is from the X_0 treatment with a score of 4.00, and the best pleasant taste comes from the X_0 treatment with a score of 4.00.

Table 2: Duncan Test of Honeycomb Cake Quality by the different amount of tofu dregs flour substitutes

Tofu dregs flour substitute proportion	Volume	Colour	Pleasant aroma	Texture elasticity	Texture hollowness	Pleasant taste
0%	3.5b	4a	4a	4a	3.92a	4a
15%	3.53b	3.9a	3.87b	3.92a	3.9a	3.94a
30%	3.92a	3.56b	3.71bc	3.78b	2.87b	3.78b
45%	4a	3.42b	3.44c	3.48c	1.68c	3.54c

Note: The letters behind the numbers indicate the difference

On the tofu dregs flour substitute, the statistics show that there are significant differences in the quality of volume, colour, pleasant aroma, texture elasticity, texture hollowness, and pleasant taste. Meanwhile, there is no significant difference in shape, caramel aroma, smooth texture, and sweet taste. Table 2 is the Duncan Test as the

continuation to which six indicators are significant differences such as volume, colour, pleasant aroma, texture elasticity, texture hollowness, and pleasant taste.

Discussion

Volume

The volume of the Honeycomb Cake using different types of sugar did not create a significant difference statistically but has a different end score still (see Fig. 2). Tofu dregs flour has a significant difference in the volume. Table 2 shows that treatments of 30% and 40% substitution have a different result with the treatments of 0% and 15% substitutions. This is due to the different content of starch, gluten, and fibre of both types of flour. The volume expansion is influenced by those three elements added with fat and water. On cake processing, its volume also influenced by the mixing techniques because the stirring techniques must be stabilised to maintain its good cake swelling. One of the ingredients that influence the volume of Honeycomb Cake is the egg. According to (Oyeyinka et al., 2019), eggs is foam maker and baking ingredient that made as a characteristic of a cake.

Furthermore, the usage of other baking ingredients such as baking powder and bicarbonate also influence its swelling volume. As a baking ingredient, baking powder (with contains sodium bicarbonate) will be activated when interacted with liquid and heat so it will produce carbon dioxide. This carbon dioxide itself will swell the cake (Solihah, 2015).

Colour

The caramelised sugar influences the dark brown colour on the Honeycomb Cake. The ANOVA result stated that the different types of sugar and proportions of tofu dregs flour significantly differences the colour quality of the cake. This cake colour is formed by Maillard reaction and sugar caramelisation as sweetener and baking ingredients. Caramelisation is a non-enzymatic browning process due to the sugar heating that has passed its melting point. According to (Kocadağlı & Gökmen, 2016), the caramelisation process started when the sugar is dehydrated and ended by the formation of large molecules consisted of smaller molecular order. Some of these molecules produce a brown colour.

Table 1 stated the different colour score from the different types of sugar used in this research. This may occur due to the different simple sugar composition. Roos, Y. H., & Drusch (2016) report that fructose, glucose, and sucrose have different melting points, which are 127, 158, and 190 degrees centigrade, respectively. On the usage of tofu dregs flour substitution, the more flour substitutes used the less dark brown brightness of the cake. This is due to the Maillard reaction, which is the browning reaction of foodstuffs that contains sugar and protein (Kocadağlı & Gökmen, 2016). The tofu dregs flour contains higher protein than the wheat flour (Kementertian Kesehatan RI, 2010).

Aroma

The ingredient that influences the Honeycomb Cake's aroma is the caramel. (Audemar et al., 2017) explain that the aroma of sugar is shaped during the caramelisation process. (Kocadağlı & Gökmen, 2016) explain that a sugar during the caramelisation process (heated higher than 120 degrees centigrade) tend to melt and in its process releases a unique taste, brown colour, and distinct aroma. This also occurs when the sugar is becoming caramel, where the granulated sugar released the unique aroma of the honeycomb cake and has a shinier surface, compared to other types of sugar.

Tofu dregs flour substitute in the making of honeycomb cake influence the caramel's distinct aroma; where more flour substitute being used, less caramel aroma will be released,

and the unpleasant smell of the tofu dregs will be more apparent. This is due to the lipoxidase enzyme hydrolyse or separating soy fat into compounds that release unpleasant aroma (Xu, Jin, Gu, Rao, & Chen, 2020).

Texture

The utilisation of different types of sugar has no significant effect on the cake's texture, so the texture all cakes are still fluffy, hollow, and soft. However, the flour substitute significantly affects the fluffiness/elasticity and hollowness texture. The more flour substitute added the texture would be less elastic and less hollow will appear. (Sulaiman & Syahrumsyah, 2014) explain that these changes on texture are due to the fibre's characteristic that easy to absorb liquids. Tofu dregs flour has a higher rough fibre content than the wheat flour. Therefore, the flour substitute tends to absorb more liquid on the cake, so it made the cake (with higher proportions) less chewy and less hollow.

The usage of baking ingredients such as baking powder and bicarbonate influence hollow texture. According to (Diez-Sánchez, Llorca, Tárrega, Fiszman, & Hernando, 2020), both ingredients contain sodium bicarbonate, which will be activated when contacted with water and heat, and this activation will produce carbon dioxide. This carbon dioxide will make a cake to rise and creating hollow texture. Therefore, it is concluded that the more tofu dregs flour substitute used in the dough, the more liquid absorption happened, which leads to the reduction in the bicarbonate activity in the formation of carbon dioxide. Hence the less hollow texture.

Taste

The sweet taste of the cake has no significant effect from the usage of different types of sugar and tofu dregs flour substitution. Even though on the average score of sweetness recorded low on the usage of rock sugar. This is due to the sweetness level of the rock sugar is lower than the other three types of sugar. The sweet taste in the cake making process comes from sugar and milk. Luo, Arcot, Gill, Louie, & Rangan (2019) stated that sugar changes the flavour in food into sweet. (Vatankhah, Garavand, Mohammadi, & Elhamirad, 2017) also explain that one of the function of sugar in food is to give a sweet taste. Therefore, the flavour produced by the honeycomb cake either using the usual ingredients or modified version such as in this research will always produce sweet taste.

The different outcome is the "degree" of sweetness when the different proportion of the flour substitution added into the cake mixture. The more flour substitutes added, the less sweet and more unpleasant the taste would be. This is due to the base ingredient of the flour substitute itself: soybeans, which can be recognised during the eating. The lipoxide enzyme in the soybeans produces an unpleasant taste in the cake (Xu et al., 2020).

CONCLUSION

The usage of different types of sugar has a significant difference on the quality of colour and aroma and has no significant difference on the quality of volume, shape, chewy texture, hollow texture, and flavour. Meanwhile, the tofu dregs flour substitute has a significant difference on the quality of volume, colour, aroma, chewy texture, hollow texture, and pleasant taste and has no significant difference on the quality of shape, caramel aroma, smooth texture, and sweet taste.

The highest scores of the organoleptic characteristics of the Honeycomb Cake on stage 1 (different types of sugar) are the quality of volume (by aren sugar), dark brown

colour (by palm sugar), caramel aroma (by palm sugar), smooth texture (by aren sugar), chewy texture (by aren sugar), hollow texture (by palm sugar), taste (by palm sugar). Meanwhile, the best treatment from the tofu dregs flour substitute's proportions is the quality of volume (by the 45% treatment), uniform shape (by the 30% treatment), dark brown colour (by the 15% treatment), caramel aroma (by the 15% treatment), pleasant aroma (by the 15% treatment), smooth texture (by the 15% treatment), chewy texture (by the 15% treatment), hollow texture (by the 15% treatment), sweet taste (by the 15% treatment), and pleasant taste (by the 15% treatment). Therefore, this research concluded that the best treatment in the making of the Honeycomb Cake is obtained from the usage of palm sugar and 15% proportion of tofu dregs flour substitute.

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