



## Acceptance Of Mochi With Substitution Of Beet Flour Substitution

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**Abstract.** Mochi is a typical Japanese food which is quite famous in Indonesia for its chewy texture and semi-wet nature. Mochi comes from the Japanese word for muaci. Objective: To determine the physical and chemical characteristics (color, aroma, taste, texture, water content, ash content, fat, folic acid, potassium) of mochi with the substitution of beetroot flour. Method: This type of research is an experimental study with a Completely Randomized Design (CRD), with 4 treatments and 2 repetitions, resulting in 8 experimental units in making mochi with beet flour substitution. The research was carried out in September 2023 at the Helvetia Health Institute, then chemical tests were carried out at the Bioprocess Engineering Laboratory of the Medan Industrial Chemical Technology Polytechnic. In this research, there are hedonic and hedonic quality then proximate tests. Data analysis used Anova and continued with the Duncan test. Results: The hedonic test shows that the F1 formula is the best formula with an average hedonic test value of 3.80 in the like category, while the hedonic quality test shows that the F1 formula is the best formula with an average hedonic quality test value of 3.72 in the purple, aroma category. typical beet flour, sweet taste and chewy texture. The nutritional content of mochi is 20.72% water content, 3.42% ash content, 8.36% fat, 0.186 mg/gr folic acid, and 8.753 mg/gr potassium. Conclusion: The most preferred mochi based on hedonic tests and hedonic quality is the F1 formulation which can be used as an additional food for teenagers and pregnant women because it contains folic acid (0.186 mg/gr).

**Keywords :** Mochi, Beet Flour, Substitution

### INTRODUCTION

Indonesia is rich in various types of local food which have great potential for development. This food diversification is carried out by paying attention to existing local resources, namely by paying attention to existing local resources, namely by improving processing technology into unique and interesting food and increasing public awareness to consume a variety of foods with balanced nutrition . Food is material consumed every day by individuals that comes from biological sources and water that is processed so that it can be consumed and is the most important basic human need.

*Mochi* is a typical Japanese food that is quite famous in Indonesia. Mochi comes from the Japanese word muaci, initially there were two types of mochi sold on the market, namely mochi without filling and mochi filled with a mixture of roasted and mashed peanuts with the addition of granulated sugar and mochi sprinkled with roasted cornstarch. The advantages of Mochi It has a legit taste with a chewy texture and is semi-wet. Mochi is a food that is currently very popular among people because the era of mochi has progressed, which was originally only sold filled with nuts, but is now filled with various types of food such as various fruit jams, fresh fruit, ice cream and chocolate..

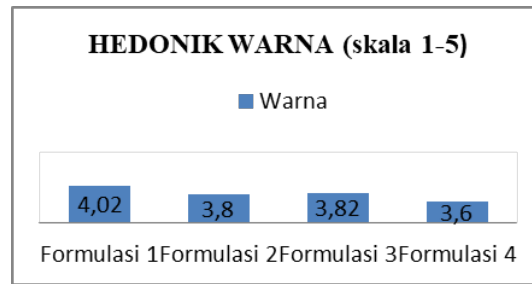
Beetroot, known as beet root and red beet, is a plant from the Amaranthaceae group and has the Latin name *Beta Vulgaris*. Beetroot (*Beta Vulgaris* L) is a plant with purplish red tubers that have a sweet taste but have a pleasant earthy taste (Earthy Taste), and many people don't know about beetroots. Beetroot contains various kinds of nutrients, including vitamins, minerals, carbohydrates, protein, antioxidants, anticarcinogenic, and silica. The nutritional content in 100 grams of beetroot is 109 mg folic acid, 282.0 mg potassium, 27.0 mg calcium, 43.0 mg phosphorus, 10 mg vitamin C, 1.6 g protein, 0.1 g fat, 9.6 g carbohydrates, 2.6 g fiber, 1.0 mg iron. The carotenoid and flavonoid content in beetroot can help reduce oxidation of LDL cholesterol (low density lipoprotein) which can cause damage to artery walls, heart attacks and strokes. The dark red color of beetroot contains betacyanin which has an anticarcinogenic effect, namely it can prevent colon cancer. Beetroot also contains silica which makes a person's skin, hair, nails and bones healthier.

From the explanation above, it is beetroot contains various kinds of nutrients which is good for body health so the author is interested in choosing beetroot as a food product and people usually only process beetroot by making juice or boiling it, because of the lack of innovation in society to process beetroot into food products so the author makes mochi products from beetroot flour, the reason for making mochi products because mochi products are now being talked about a lot and are popular with people of all age groups.

## **RESEARCH METHODS**

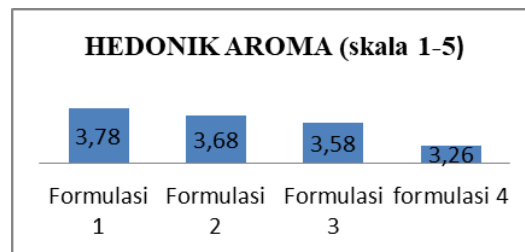
This type of research is an experimental study with a Completely Randomized Design (CRD), with 4 treatments and 2 repetitions, resulting in 8 experimental units in making mochi with beet flour substitution. Organoleptic testing of mochi in this research was carried out at the Food Technology Laboratory on the Helvetia Health Institute Campus with the criteria of 25 somewhat trained panelists consisting of 6th and 8th semester student panelists and the nutritional content test was carried out at the PTKI Medan Microbiology/Bioprocess Technology Laboratory. This research was carried out in September 2023.

## RESULT AND DISCUSSION



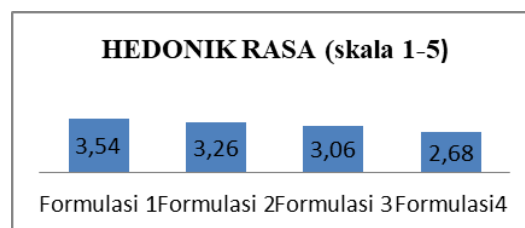
**Figure 1. Graph of the Average Value of Mochi Color Hedonic Test with Beet Flour Substitution**

Based on the picture above, the results of the hedonic test obtained by the formula that has the lowest acceptance in the color parameter is the F4 formulation which is mochi with 40 grams of beet flour with an average value of 3.6 with a somewhat favorable classification. Meanwhile, the mochi formula that has the highest acceptance is the F1 formulation which is mochi with 10 grams of beet flour with an average value of 4.02 with a liking classification.



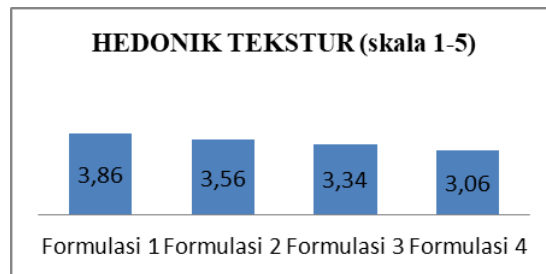
**Figure 2. Graph of the Average Value of the Mochi Aroma Hedonic Test with Beet Flour Substitution**

Based on the picture above, the results of the hedonic test obtained by the formula that has the lowest acceptance in the aroma parameter is the F4 formulation which is mochi with 40 grams of beet flour with an average value of 3.26 with classification kinda like it. Meanwhile, the mochi formula that has the highest acceptance is the F1 formulation which is mochi with 10 grams of beet flour with an average value of 3.78 with a liking classification.



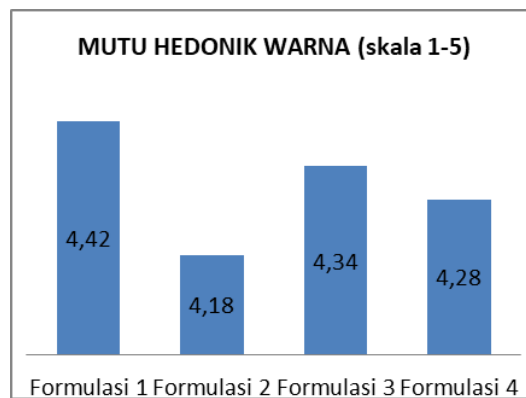
**Figure 3. Graph of the Average Value of Hedonic Test for Mochi Flavor with Beet Flour Substitution**

Based on the picture above, the results of the hedonic test show that the formula that has the lowest acceptance in terms of taste parameters is formulation F4, which is mochi with 40 grams of beet flour with an average value of 2.68 with a dislike classification. Meanwhile, the mochi formula that has the highest acceptance is the F1 formulation which is mochi with 10 grams of beet flour with an average value of 3.54 with a somewhat favorable classification.



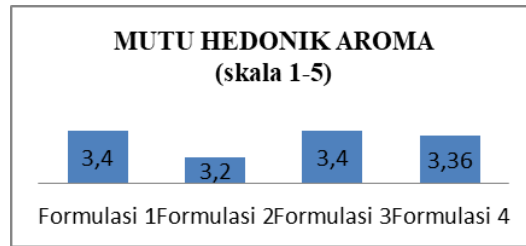
**Figure 4. Graph of the Average Value of the Mochi Texture Hedonic Test with Beet Flour Substitution**

Based on the picture above, the results of the hedonic test show that the formula that has the lowest acceptance for texture parameters is the F4 formulation which is mochi with 40 grams of beet flour with an average value of 3.06 with a somewhat favorable classification. Meanwhile, the mochi formula that has the highest acceptance is the F1 formulation which is mochi with 10 grams of beet flour with an average value of 3.86 with a liking classification.



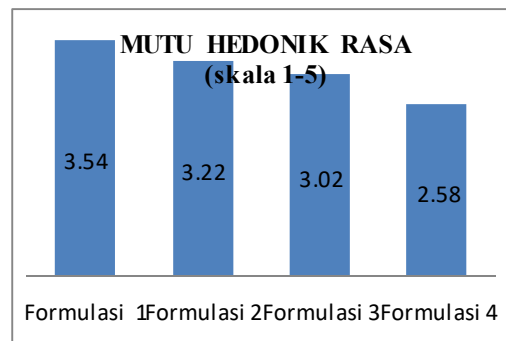
**Figure 5. Graph of Average Hedonic Quality Value of Mochi Color with Beet Flour Substitution**

Based on the picture above, the results of the hedonic test obtained by the formula that has the lowest acceptance in the color parameter is the F2 formulation which is mochi with 20 grams of beet flour with an average value of 4.18 with a slightly purple classification. Meanwhile, the mochi formula that has the highest acceptance is the F1 formulation which is mochi with 10 grams of beet flour with an average value of 4.42 with a purple classification.



**Figure 6. Graph of Average Hedonic Quality Value of Mochi Aroma with Beet Flour Substitution**

Based on the picture above, the hedonic test results show that the formula that has the lowest acceptance in the aroma parameter is the F2 formulation which is mochi with 20 grams of beet flour with an average value of 3.2 with a rather typical classification of beet flour. Meanwhile, the mochi formula that has the highest acceptance is the F1 and F3 formulation which is mochi with 10 grams of beet flour with an average value of 3.4 with a rather typical classification of beet flour.



**Figure 7. Graph of Average Hedonic Quality Value of Mochi Flavor with Beet Flour Substitution**

Based on the picture above, the results of the hedonic test obtained by the formula that has the lowest acceptance in terms of taste parameters is the F4 formulation which is mochi with 40 grams of beet flour with an average value of 2.58 with a classification of not sweet. Meanwhile, the mochi formula that has the highest acceptance is the F1 formulation which is mochi with 10 grams of beet flour with an average value of 3.54 with a slightly sweet classification.



**Figure 8. Graph of Average Hedonic Quality Value of Mochi Texture with Beet Flour Substitution**

Based on the picture above, the results of the hedonic test show that the formula that has the lowest acceptance for texture parameters is the F4 formulation which is mochi with 40 grams of beet flour with an average value of 3.04 with a slightly chewy classification. Meanwhile, the mochi formula that has the highest acceptance is the F1 formulation which is mochi with 10 grams of beet flour with an average value of 4.52 with a chewy classification.

**Table1. Average Hedonic Test Values for Color, Aroma, Taste and Texture Mochi**

| Treatment           | Color | Aroma | Flavor | Texture | Average |
|---------------------|-------|-------|--------|---------|---------|
| F1 (90g : 10g : 6g) | 4.02  | 3.78  | 3.54   | 3.86    | 3.80    |
| F2 (80g : 20g : 6g) | 3.8   | 3.68  | 3.26   | 3.56    | 3.58    |
| F3 (70g : 30g : 6g) | 3.82  | 3.58  | 3.06   | 3.34    | 3.45    |
| F4 (60g : 40g : 6g) | 3.6   | 3.26  | 2.68   | 3.06    | 3.15    |

Based on the selected mochi, it is determined based on the panelists' liking test for mochi. The best mochi is mochi formula F1 using 90 grams of glutinous rice flour, 10 grams of beetroot flour, 6 grams of rice flour. The best formula can be seen from the recapitulation of the average value of the level of liking for color, aroma, taste, texture. Based on the average organoleptic test value, it shows that F1 is the best selected formula with an average hedonic test value of 3.80 in the like category.

**Table 2. Average Hedonic Quality Test Values for Color, Aroma, Taste and Texture of Mochi**

| Treatment                  | Color | Aroma | Flavor | Texture | Average |
|----------------------------|-------|-------|--------|---------|---------|
| <b>F1 (90g : 10g : 6g)</b> | 4.42  | 3,4   | 3.54   | 3.52    | 3.72    |
| <b>F2 (80g : 20g : 6g)</b> | 4.18  | 3,2   | 3.22   | 3.22    | 3.46    |
| <b>F3 (70g : 30g : 6g)</b> | 4.34  | 3,4   | 3.02   | 3.32    | 3.52    |
| <b>F4 (60g : 40g : 6g)</b> | 4.28  | 3.36  | 2.58   | 3.04    | 3.32    |

Based on the results of the average value of the organoleptic assessment of the selected mochi, namely the F1 formulation using 90 grams of glutinous rice flour, 10 grams of beetroot flour, 6 grams of rice flour. The selected mochi is determined based on organoleptic hedonic quality tests by panelists on mochi. The best formula can be seen from the recapitulation of the average value of the level of liking for color, aroma, taste, texture. Based on the average organoleptic test value, it shows that F1 is the best selected formula with an average hedonic quality test value of 3.72 in the category of purple color, distinctive aroma of beet flour, sweet taste and chewy texture.

**Table 3. Average Organoleptic Test Values for Mochi Color, Aroma, Taste and Texture**

| Treatment           | Organoleptic Test Values |
|---------------------|--------------------------|
| F1 (90g : 10g : 6g) | 3.76                     |
| F2 (80g : 20g : 6g) | 3.52                     |
| F3 (70g : 30g : 6g) | 3.49                     |
| F4 (60g : 40g : 6g) | 3.23                     |

Based on the results of the organoleptic test value of mochi with beet flour substitution, the best selected formula was obtained, namely F1 of 3.76. The results of the best formula for this organoleptic test will then be followed by a proximate test.

**Table 4. Nutritional Content of Mochi with Beet Flour Substitution.**

| Proximate Test | SNI (%) | AKG      | F1 Results  |
|----------------|---------|----------|-------------|
| Water content  | 40      | -        | 20.72%      |
| Ash Content    | 3       | -        | 3.42 %      |
| Fat            | 3.0     | -        | 8.36 %      |
| Folic acid     | -       | 400 mcg  | 186,000 mcg |
| Potassium      | -       | 4,700 mg | 8.753 mg/gr |

The results of the analysis of the nutritional content of the best formulation mochi (F1) show that the water content, ash content, fat, folic acid and potassium in the mochi meet the quality requirements in Indonesia as regulated in the Indonesian National Standard (SNI), namely SNI 01-4309-1996.

## COLOR

Color is one of the main attributes of food that determines consumer acceptance because it shows the quality of the food. The more beet flour added to the dough will produce a mochi product with a darker (dark) purple color. This is greatly influenced by the number of color pigments in the mochi. The more concentration of extract given, the more purple the mochi color will be. Color pigments also indicate the large anthocyanin or betacyanin content contained in the extract. This is also in line with the amount of total phenol or antioxidant activity.

## AROMA

Aroma is one of the parameters that determines whether a food is delicious or not. Aroma is also an important indicator in the industry food because it can quickly provide assessment results whether the product is acceptable or not. Apart from that, beet tubers contain the compound geosmin, which is a secondary metabolite compound that is aromatic,

this compound is produced by microbes in the soil so that beet tubers give off an earthy taste in beet tubers. Because of this compound, beet tubers have a distinctive aroma.

## **FLAVOR**

Taste is often defined as the aroma of food that comes from food when it is in the mouth and then received by the sense of smell through the nasal and oral passages. Even if the color, aroma and texture are good, if the taste is not good then the food will not be accepted. This mochi product has a slightly unpleasant or earthy taste due to the geosmin compound in beetroot.. Even though this mochi product has an unpleasant or earthy taste that the panelists don't like, the best formula for the mochi product can still be well received by the panelists.

## **TEXTURE**

Texture is a component that plays a role in determining the quality of a food and can be felt by using the mouth when biting, chewing and swallowing or can be felt by feeling the texture of the product.. Texture is also a sensory indicator that can influence the taste of food (Zulistina, 2019). The chewy texture found in mochi comes from glutinous rice flour. Ingredients with high amylopectin will also affect the elasticity of the product. The higher the amylopectin in the ingredient, the chewier the resulting product will be. The more beet flour added to each formula will produce a different level of elasticity, but in the best formula the mochi product is well accepted by the panelists.

## **WATER CONTENT**

Water content has an important role in product durability. The water content in food ingredients determines the acceptability, freshness and durability of the ingredients. The water content in food affects the food's resistance to microbial attack. Water content is the amount of water contained in food, expressed in percentage form. Water content affects the appearance, texture, freshness, taste and durability of food, because water content is the most important characteristic of food. Bacteria, yeast and mold will easily breed if the water content is high, therefore it can cause changes in food ingredients.

## **ASH CONTENT**

Determination of ash content is carried out with the aim of determining whether a processing process is good or not, knowing the type of material used, and being used as a



parameter for the nutritional value of food ingredients. Ash is the result of the remains of burning organic materials in the form of inorganic substances. Ash content is also related to the minerals in the material. The purpose of measuring ash content is to determine the amount of minerals contained in the material. The ashing method and materials used will determine the composition and ash content of the material.

## **FAT**

A balanced carbohydrate intake can provide a countermeasure effect in increasing blood glucose which can reduce the release of stress hormones in the central nervous system. Increased insulin concentrations induced by carbohydrates can also inhibit adipose tissue and hormone sensitive lipase to reduce the breakdown of triacylglycerols to prevent circulating free fatty acid concentrations.. Fat is a very important food substance because fat will produce energy for the body. Fat damage in food can occur during the processing and storage of this product. Fat can improve the physical structure of food such as swelling, softness and aroma.. The addition of margarine to the dough makes the mochi product have a fairly high fat content, namely 8.36%, this result is higher than the SNI, which is 3%.

## **FOLIC ACID**

Beets are a powerful food ingredient for anemia and strengthen the body's immune system(15). Folic acid is a nutrient needed for DNA synthesis, so a deficiency of folic acid will cause disruption of DNA synthesis which inhibits cell division. During pregnancy, folic acid is needed for the formation of cells and the nervous system in the fetus, during the first trimester the fetus will need additional folic acid as much as possible 400 mcg/day. Folic acid plays a role in the metabolism of amino acids which are needed in the formation of red blood cells (Mahenaz & Ismail 2011).

## **POTASSIUM**

Potassium is an intracellular ion and is associated with the sodium exchange mechanism. Increasing potassium intake in the diet has been associated with a decrease in blood pressure because potassium triggers natriuresis, which can trigger sodium loss through urine. Meanwhile, the antioxidants contained in betalain pigments are compounds that can protect the biological systems in the body. The presence of oxidative stress, namely an imbalance between free radicals and antioxidants in the body, can disrupt vasorelaxation from the endothelium which can result in hypertension.

## MOCHI PRICE DISCUSSION.

Making mochi requires production costs to purchase basic ingredients of Rp. 74,000 and to make mochi formula F1 it costs Rp. 10,212, each formulation produces 15 pieces of mochi weighing 20 grams each. The selling price of commercial mochi is IDR 7,000 and the selling price of mochi with beetroot substitute is IDR 5,000 compared to the commercial price, the price of mochi beetroot is cheaper, the profit from selling this mochi product is IDR 64,788. The target of this mochi product with beet flour substitution is aimed at teenagers and pregnant women aged 15-49 years.

## CONCLUSION

Based on the results of the research that has been carried out, the following conclusions are obtained:

1. Results of the organoleptic test analysis of mochi with 10% beet flour substitution: the best formula was obtained, namely F1 (10% beet flour) with a value of 3.76 in the category of purple color, slightly sweet taste, distinctive aroma of beet flour, chewy texture.
2. The results of the hedonic quality analysis of mochi substituted with beet flour obtained the best formula, namely F1 (10% beet flour) with a value of 3.76 in the category of purple color, chewy texture, slightly sweet taste and distinctive aroma of beet flour.
3. The results of the nutritional analysis of mochi with 10% beet flour substitution were 8.36% fat, 20.72% water content, 3.42% ash content, 0.186 mg/gr folic acid and 8.753 mg/gr potassium.
- 4.

## THANK-YOU NOTE

To the Head of the PTKI Medan Microbiology/Bioprocess Technology Laboratory who has given permission to researchers to conduct research.

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