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Optimizing the Potential of Kabocha Pumpkin in Lembang Through Culinary Product Modifications

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ABSTRACT

Kabocha mochi donuts are product innovations and modifications that combine kabocha with white sticky rice flour to optimize kabocha use in the Lembang area This study is quantitative and uses an experimental method by carrying out a kitchen project. Testing involved 32 semi-trained panelists as samples for an organoleptic test (sensory evaluation) covering hedonic tests on taste, aroma, color, texture, and appearance, then the results were calculated using the ANOVA and Duncan methods. The results of this research revealed that the recipe formulation that had been carried out in the organoleptic test of kabocha mochi donuts showed that the most preferred formulation was the DMPK 1 formulation with a ratio of 70%: 30% between white sticky rice flour and kabocha.

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1. INTRODUCTION

Lembang District is located in West Bandung Regency, West Java Province. The natural resources in Lembang District are extensive and are one of the areas in the tourism sector because they are visited by many tourists from outside the region. Apart from that, natural resources in Lembang District are one area with quite high potential in the agricultural sector to support food needs in Bandung City, outside Bandung City, and abroad (Septian, 2021). Lembang District is located in a highland area in West Java Province with fertile land that produces food needs such as vegetables, fruit, and animal products (Sumiati, 2023).

The cultural diversity and richness of natural resources in Lembang are supporting factors for the development of unique and competitive local culinary products. However, to maintain competitiveness amidst changing consumer preferences and rapidly developing culinary trends, innovation in culinary products is very important (Khun, et al., 2024). One commodity that has the potential to be developed is kabocha pumpkin (*Cucurbita maxima*), a local plant that is rich in nutrients but has not been utilized optimally in typical regional culinary products.

Japanese pumpkin, also known as kabocha, is a plant that has many seeds in the flesh of the fruit. Kabocha is a fruit plant that can grow in areas at an altitude of around 1,000 meters above sea level with moderate rainfall. Apart from that, kabocha can survive in drought areas so kabocha does not need a lot of water, which makes kabocha not too sensitive to standing water. Therefore, kabocha can be planted during the dry season and can be planted in all regions of Indonesia (Mulyawan et al., 2023). One of the kabocha-producing areas in the Lembang area is Cibedug Village, Cikole Village, Lembang District, West Bandung Regency, West Java.

Kabocha squash, also known as "Japanese pumpkin," has a soft texture and sweet taste that is suitable for use in various food preparations, especially in making cakes and snacks. In addition, kabocha pumpkin is rich in vitamins A, C, and fiber, so it offers high health benefits (Putra, 2020). However, even though kabocha pumpkin is abundantly available in Indonesia, especially in the Lembang area which is known as an agricultural center, its use in culinary products is still limited to traditional preparations such as soup or fried foods. This raises the need for diversification of kabocha-based culinary products that are more innovative and in line with current market tastes.

One culinary product innovation that has the potential to be developed is mochi donuts made from kabocha pumpkin. The chewy texture and distinctive taste of mochi donuts provide a different culinary experience from conventional donuts. Mochi donuts are usually made from sticky rice flour, which gives them their chewy texture and can be combined with various other ingredients to enrich the taste and texture (Sari, 2019). This combination not only provides added value in terms of taste and texture but can also extend the shelf life of the product and increase the nutritional content (Svanberg & Ståhlberg, 2024).

By seeing the great potential of this mochi kabocha donut culinary product, this research aims to develop optimal recipes and production methods, as well as analyze the market potential for this product in Lembang. It is hoped that the development of this product can support local economic growth through the culinary industry, as well as enhance Lembang's culinary identity as a tourist destination that offers innovative and distinctive culinary experiences.

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2. LITERATUR REVIEW

2.1. Culinary Tourism

Culinary tourism is a form of behavior that combines culinary delights and tourist attractions to introduce new cultures and tastes simultaneously as a form of marketing and a strong strategy in marketing a tourist destination (Alia et al., 2018). This is because culinary and shopping tourism are tourist destinations that provide tourists with a taste of culture from a tourist destination (Bessi, V G., et al., 2022). It can be said that culinary tourism is a supporting tourism product (Hsu, F.C., and Scott, N., 2020).

Five elements influence culinary tourism trips to get memorable experiences, namely consuming drinks and food, location, colleagues, opportunities, and tourist units. Culinary can influence tourist satisfaction when traveling, so they make repeat visits and provide recommendations to other people (Recuero-Virto & Valilla Arróspide, 2024).

2.2. Product Modification

Modification of food is an activity in changing the size and taste of less attractive food to become more attractive with a better appearance than its original form (Demartini et al., 2018). Recipe modification is an activity that changes a food in terms of taste, aroma, or appearance to increase its acceptability to consumers and reduce food waste without changing its nutritional value (Florença et al., 2024). Modification of food types is one of the bases for industrial development in the catering service sector. Apart from that, food modifications must continue to be carried out according to the times or consumer demands which tend to be dynamic (Nabilah et al., 2022). The taste of food can be changed by making modifications to the shape, spices (measurement, type), composition, or technique (Nabila & Tsaniah, 2024).

2.3. Product Quality

Product quality can play a role in a product in supporting the quality and suitability of food to be served to customers (Fisher & Potgieter, 2024). Food quality is an important concept in food because people will choose based on its quality (Fajri et al., 2020). Food producers pay close attention to consumer preferences to gain as much market share as possible and be an advantage in covering all the characteristics of food (Suryani & Priatini, 2020).

2.4. Doughnut

Donuts are a type of quick bread, round in shape with a hole in the middle like a ring, the typical shape of donuts in general (Youssef & Spence, 2023). There are two types of donuts as follows:

a. Bread doughnut, a type of donut made from high protein flour and fermented with a leavening agent using yeast.
b. Donut cake, a type of donut made from cake flour and baking powder.

Donuts are one the processed foods as a snack that is well known in society for consumption by children to adults.

2.5. Kabocha

According to Mulyawan et al. (2023), kabocha is classified as a species of pumpkin, specifically *Cucurbita maxima L.* It is characterized by its grooved, round, and flat morphology, with a stem length of approximately 3-5 m and a thick, yellow exterior. Apart from that, kabocha is a true single fruit that has many seeds. Kabocha can be stored at cold temperatures

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by using a storage technique using vacuum cooling which can extend the shelf life of kabocha to a maximum of 8 weeks (Kusumaningsih et al., 2017).

2.6. White Sticky Rice

White sticky rice flour comes from pounded white sticky rice, usually used as a basic ingredient for making dodol or mochi to produce a chewy texture (Cuevas et al., 2017). Glutinous rice flour is different from rice flour because it contains amylopectin or fiber which makes cake dough stickier (Fitriani et al., 2023). The texture of sticky rice flour is heavier because it contains starch (Devi et al., 2022).

2.7. Recipe Formulation

Recipe standards are a support in making food accurately which explains the use of raw materials, stages of cooking, as well as the desired quality standards for the final food result (Gusnita & Mariana, 2020). The standard recipe has gone through repeated trials to obtain a quality and tested product even though it has been tested in large quantities (Himashree, P., Sengar, A. S., & Sunil, C. K., 2022).

2.8. Organoleptic Test

Organoleptic is a test in tasting a product based on liking and desire using the five senses or sensors to measure consumer acceptance of a product. The senses used in the organoleptic test are sight through the eyes, smell through the nose, taste through the tongue, and touch through the fingers (Álvarez et al., 2024).

Organoleptic tests are carried out by panelists to assess the products produced using the five senses (Nadira. K.P, 2022). Groups of people based on their expertise are called panels and their members are called panelists.

3. METHODS

The research method applied in this study is an experimental method with a quantitative approach. The quantitative approach focuses on collecting, analyzing, and interpreting data in the form of numbers. Quantitative data is used to describe the phenomena being measured, validate hypotheses, and present results in statistical form (Sugiyono, 2017). The experimental method itself aims to test the cause-and-effect relationship (causality) between the independent variable (X) and the dependent variable (Y) through controlling experimental conditions (Arikunto, 2016).

Researchers used a purposive sampling technique in determining the research sample, namely a sample selection technique based on certain criteria. For research related to food products, the sample consists of individuals who have expertise in the culinary field and can provide an objective assessment of the product (Ferdinand, 2019).

In terms of panelists, there are several categories commonly used in organoleptic research, such as individual panelists, limited expert panelists (usually 3-5 people), trained panelists (15-25 people with good sensory sensitivity), semi-trained panelists, panelists untrained (25 people from various backgrounds), consumer panelists (30-100 people depending on the target market), as well as a panel of children (aged 3-10 years) (Setyaningsih et al., 2014). In this study, researchers involved 32 semi-trained panelists who had a background in the food and beverage industry for organoleptic tests.

In this research, experiments were carried out by developing a mochi donut product that added kabocha pumpkin as the main ingredient. After the product is made, an organoleptic test is carried out to obtain an assessment from trained and semi-trained panelists. Data from

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the panelists' assessments in the organoleptic test will be tested using the ANOVA (Analysis of Variance) test method to determine the real or non-real effect of the treatments used in the research. The ANOVA test is a form of statistical hypothesis testing by drawing conclusions based on data or statistical groups (Septiadi & Ramadhani, 2020). The type of ANOVA used is one-way ANOVA to compare more than two groups of data and is a further development of the t-test (Palupi & Prasetya, 2022). If the alpha value is <0.05, then there is a treatment that has a real effect, so Duncan's further test is carried out to find out which treatment is significantly different or most preferred (Huda et al., 2022).

4. RESULTS AND DISCUSSION

4.1. Recipe Formulation

Three kabocha mochi donut formulations with three different ratios with the DMPK code (Mochi Donuts Added Kabocha) as follows:

a. Formulation 1 (DMPK 1): Comparison between Kabocha 30% : White Glutinous Rice Flour 70%
b. Formulation 2 (DMPK 2): Comparison between Kabocha 50% : White Glutinous Rice Flour 50%
c. Formulation 3 (DPMK 3): Comparison between Kabocha 70% : White Glutinous Rice Flour 30%

4.2. Organoleptic Test Results

a. Color

The following are the results of the hedonic test based on color characteristics:

Table 1. Hedonic Test Results Based on Color

Parameter	Variations in Color Comparison			Anova Result
	DMPK 1	DMPK 2	DMPK 3	Sig.0.70
Color	4.03±0.89[a]	3.21±0.94[b]	2.53±0.98[c]	

Source: Data processed by the author, 2024

The results of testing the three formulations using ANOVA concluded that the color parameter had P<0.05, namely <0.001, so there was a significant real difference between the DMPK 1, DMPK 2, and DMPK 3 formulations. Therefore, a further test was carried out, namely Duncan, so that the data above showed an average -The largest average score was obtained from the DPMK 1 formulation with a score of 4.03, while the lowest score was obtained from the DMPK 3 formulation at 2.53.

The sense of sight functions to perceive objects and colors in products to increase interest in products that will be consumed by the public. The color produced from mochi kabocha donuts is yellow and tends to be golden. Based on the results of the suggestions and input provided by the panelists, the assessment of the color characteristics of the DMPK 1 sample was superior to the other samples. This is due to the addition of kabocha which contains beta-carotene which produces an orange-yellow color (Mulyawan et al., 2023).

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b. Aroma

The following are the results of the hedonic test based on aroma characteristics:

Table 2. Hedonic Test Results Based on Aroma

Parameter	Variations in Aroma Comparison			Anova Result
	DMPK 1	DMPK 2	DMPK 3	Sig.0.001
Aroma	3.56±0.71[a]	3.46±0.87[a]	3.37±1.07[a]	

Source: Data processed by the author, 2024

The results of testing the three formulations using ANOVA concluded that the color parameter had P>0.05, namely <0.708, so there was no significant real difference between the DMPK 1, DMPK 2, and DMPK 3 formulations. The data above also shows that the largest average score was obtained from the formulations. DPMK 1 with a score of 3.56 while the lowest score was obtained from the DMPK 3 formulation of 3.37. The calculation results of the panelists' liking levels are shown in the DMPK 1 sample with the highest score.

Aroma is an important aspect of the sense of smell which can increase interest in products for public consumption. The aroma produced from kabocha mochi donuts is a sweet aroma from the addition of powdered milk and vanilla essence because kabocha has no aroma so as a substitute for the aroma, use powdered milk and vanilla essence. The aroma of the product is one of the important factors in increasing consumer acceptance as a determinant of food preferences through the aroma produced (Asnawati et al., 2024).

c. Taste

The following are the results of the hedonic test based on taste characteristics:

Table 3. Hedonic Test Results Based on Taste

Parameter	Variations in Taste Comparison			Anova Result
	DMPK 1	DMPK 2	DMPK 3	Sig. 0.117
Taste	3.84±0.95[a]	3.81±0.89[a]	3.40±0.94[a]	

Source: Data processed by the author, 2024

The results of testing the three formulations using ANOVA concluded that the taste parameters had P>0.05, namely <0.117, so there was no real significant difference between the DMPK 1, DMPK 2 and DMPK 3 formulations. The data above also shows that the largest average score was obtained from the formulations. DPMK 1 with a score of 3.84 while the lowest score was obtained from the DMPK 3 formulation of 3.40.

Taste is an important aspect of the sense of taste that can increase interest in products for public consumption. The taste produced by this product is a sweet taste that comes from sugar. Sugar is used as a sweetener in making bread. Apart from that, sugar can speed up the ripening process and encourage yeast to be active during fermentation (Kusnedi, 2021).

d. Texture

The following are the results of the hedonic test based on texture characteristics:

Table 4. Hedonic Test Results Based on Texture

Parameter	Variations in Texture Comparison			Anova Result
	DMPK 1	DMPK 2	DMPK 3	Sig. 0.001
Texture	3.75±1.01[a]	4.03±0.99[b]	3.09±1.05[b]	

Source: Data processed by the author, 2024

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The results of testing the three formulations using ANOVA concluded that the texture parameters had P<0.05, namely 0.001, so there was a significant real difference between the DMPK 1, DMPK 2, and DMPK 3 formulations. Therefore, a further Duncan test was carried out so that the data above also showed an average -The largest average score was obtained from the DPMK 2 formulation with a score of 4.03, while the lowest score was obtained from the DMPK 3 formulation at 3.09. The addition of too much kabocha compared to other formulations than DMPK 3 caused the mixture to be too runny so the panelists didn't like it.

e. Presentation

The following is the presentation of a kabocha mochi donut:

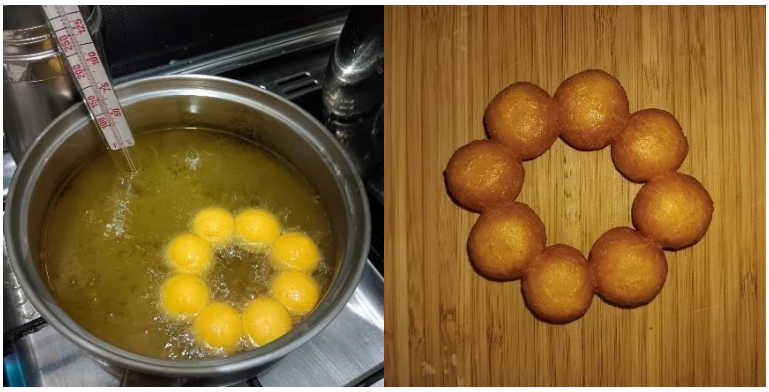

Figure 1. Kabocha Mochi Donut Display

Source: Data processed by the author, 2024

The following are the results of the hedonic test based on presentation characteristics:

Table 5. Hedonic Test Results Based on Presentation

Parameter	Variations in Presentation Comparison			Anova Result
	DMPK 1	DMPK 2	DMPK 3	Sig. 0.001
Presentation	3.75±1.01[a]	4.03±0.99[b]	3.09±1.05[b]	

Source: Data processed by the author, 2024

The results of testing the three formulations using ANOVA concluded that the presentation parameters had P<0.05, namely <0.001, so there was a significant real difference between the DMPK 1, DMPK 2, and DMPK 3 formulations. Therefore, a further test was carried out, namely Duncan, so that the data above showed an average -The highest average score was obtained from the DPMK 1 formulation with a score of 4.21, while the lowest score was obtained from the DPMK 3 formulation with a score of 2.71.

4.3. Descriptive Test Analysis Results

The following are the results of the descriptive test analysis:

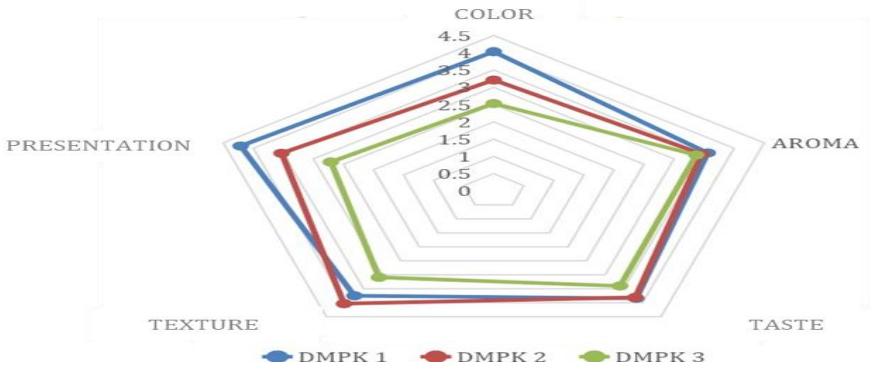

Figure 2. Descriptive Test Analysis Results Graph

Source: Data processed by the author, 2024

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The graph in picture 2 shows the results of the organoleptic test analysis using ANOVA obtained from the most preferred average value of the three formulations that have been tested for each characteristic. Graph 4.1 shows that the DMPK 1 formulation has the most favorable value from the type of characteristic assessment tested compared to the DMPK 2 and DMPK 3 formulations.

5. CONCLUSION

The conclusion of this research shows that the kabocha mochi donut formulation with a composition of 70% white sticky rice flour (157 gr) and 30% kabocha (67 gr), or the DMPK 1 formulation, is the most preferred by the panelists. Based on the organoleptic test results, the DMPK 1 formulation is superior in terms of attractive color, appetizing sweet aroma, balanced taste, and attractive appearance. Therefore, the DMPK 1 formulation will be used as a standard reference for the kabocha mochi donut recipe, compared to the DMPK 2 and DMPK 3 formulations.

The results of this research have significant implications for the development of culinary products in Lembang. By using the DMPK 1 recipe as a standard, kabocha mochi donut product can become a regional culinary innovation that can attract tourists. This unique kabocha mochi donut can utilize the potential of local ingredients such as kabocha and sticky rice flour, while creating a product that has a taste and appearance that suits consumer preferences. This innovation has the potential to strengthen Lembang's culinary identity, increase competitiveness in the local culinary market, and support economic growth through food-based creative industries.

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