



The Impact of Ambon Banana (*Musa Accuminata Colla*) Puree Addition to Banana Bread Making on Physical Quality and Consumer Acceptance

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Abstract

The objective of this study was to analyze the impact of the addition of ambon banana puree in banana bread on physical quality and consumer acceptance. The method used was an experimental method with three types of treatments, namely banana bread adding 25%, 50%, and 75% ambon banana puree, conducted at the Pastry & Bakery Laboratory of Culinary Art Education, State University of Jakarta. The validity test was conducted using the organoleptic test to five lecturers of Culinary Art Education, State University of Jakarta, consisting of four external aspects and eight internal aspects, showing that banana bread adding 25% and 50% ambon banana puree excelled in various aspects. The physical quality test was conducted by measuring the volume of each product for three repetitions. The test results using the ANOVA test showed that there was no impact of the addition of banana puree on the quality of bread volume. The consumer acceptance test was conducted using the Friedman test, and data collection was done using the hedonic test for 30 panelists. The Friedman test results showed that there was an impact of the addition of ambon banana puree in banana bread on consumer acceptance in the aspects of volume, skin color, bread crust, skin characteristics, crumb color, crumb pores, crumb texture, and chewing quality. Furthermore, the results of Tuckey's test showed that banana bread adding 25% ambon banana puree was most preferred in terms of volume and chewing quality, banana bread adding 25% and 50% ambon banana puree was most preferred in terms of bread crust color, bread crust thickness, bread crust characteristics, crumb color, crumb pores, and crumb texture. Based on the results of this study, it is recommended that banana bread add 50% of banana puree products for further utilization of banana ambon.

Keywords: ambon banana puree, banana bread, consumer acceptance, physical quality

INTRODUCTION

Bananas are a fruit that is widely found in Indonesia. There are approximately 200 types of bananas that people can consume daily, and they are spread throughout the island (Gampur et al., 2022). Types of cultivated bananas include mas bananas, bakanghulu bananas, ambon bananas, barangan bananas, plantains, horn bananas, kapok bananas, siem bananas and castor / tarali / ustrali bananas (Poerba, Martanti, & Ahmad, 2018). Based on

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data from the Central Bureau of Statistics, bananas dominated domestic production from 1995 to 2012, and the figure continues to increase every year (KH, 2014).

Bananas are abundant in Indonesia, but bananas are also fruits that are prone to damage. The temperature condition for storage of ripe bananas is 15°C (Nugraheni, 2016). This condition means that bananas cannot last long at room temperature or temperature in the chiller. Because of this, ripe bananas also need to be processed into products that are more durable and preferred by the community before decaying so that they become no longer suitable for consumption.

Diversification/diversification of processed bananas continues to be carried out, such as banana bolen, banana satay, banana pastries, and banana cake, and can be expanded again (Masitoh, Yuniasih, Rahmawati, & Marino, 2022). Banana cake production in Indonesia is common and favored by the public because of the taste of bananas that are familiar to the people of Indonesia (Muztniar et al., 2018). Banana cake itself is a processed pound cake developed by adding bananas to the cake dough. It has a dense texture and moist cake crumbs (Muztniar, 2017). In its manufacture, the types of bananas chosen to be the material for making are ambonese bananas (*Musa accuminata* / *Musa AAA*) and plantains (*Musa AAB*) because they have a strong aroma (Lopes et al., 2020). Ambon bananas have soft flesh, a sweet taste, and a strong aroma compared to plantains, which have a rough fruit texture (Rai et al., 2023). The development of innovation and creation in making a banana cake can also be successfully carried out (Kono et al., 2023). The manufacture and development of this successful banana cake innovation have the potential to be processed into other products, namely bread.

Bread, according to the Indonesian National Standard (SNI), is defined as a product obtained from wheat flour dough that is leavened with baker's yeast and baked, with or without the addition of other foodstuffs and permitted foodstuffs (Faridah & Pramudia, 2019). Based on taste, bread is divided into sweet bread and white bread. Sweet bread is quite well known by people of various ages, with the largest proportion at the age of 21-30 years (Indrawijaya, 2012). The bakery business is also now starting to develop among the community with various innovations so that business competition is even higher (Hartanti et al., 2021). Bread processing innovation must also be done; the use of banana puree in banana cake can also be applied to make sweet bread. The application of banana cake into banana sweet bread is then called banana bread. Based on this description, the author conducted a study with the aim of analyzing the effect of adding Ambonese banana puree (*Musa Accuminata Colla*) on making banana bread on physical quality and consumer acceptability.

RESEARCH METHODS

This research uses an experimental method for the manufacture of *banana bread* products, adding ambon banana puree. The samples from this study were three types of banana bread with the addition of ambon banana puree by 25%, 50%, and 75%. The preliminary stage of research is to determine a good control product formula. The next stage is carried out by testing the product formula of adding an ambon banana puree.

The data collection technique in the acceptability test was carried out randomly (random sampling) by giving a different code to each sample using an organoleptic test (hedonic test) conducted by a rather trained panelist of 30 students of the Culinary Management study program, Faculty of Engineering, Jakarta State University. Aspects tested on *banana bread* with the addition of beet puree to acceptability include external aspects (volume, skin color, thickness of bread crust, characteristics of bread skin) and internal aspects (banana aroma, aroma of spices, crumb color, pores of crumbs, texture of crumbs, texture when felt, taste, and chewing quality). Analysis of acceptability test data using the Friedman test: if the results obtained differ markedly, then the test is continued with Tuckey's test to determine the most preferred product.

Physical quality test data collection was carried out using the grain method to determine the volume of bread, while the analysis of physical quality test data used the ANOVA test, and the analysis data was presented in descriptive form.

Table 1. Sweet Bread Formula

Material	Sum	
	%	Grams
High-protein wheat flour	100	500
<i>Instant yeast</i>	3	15
Salt	1.5	7.5
Sugar	20	100
Milk powder	4	20
<i>Bread Improver</i>	0.2	1
Chicken eggs	10	50
Ice water	45	225
Margarine	16	80

RESULTS AND DISCUSSION

The results of banana bread products adding ambon banana puree can be seen in Table 2. Aspects of research on the acceptability test include volume aspects, bread skin color aspects, bread crust thickness aspects, bread crust characteristics aspects, banana aroma aspects, specuk spice aroma aspects, crumb color aspects, crumb pores aspects, crumb texture aspects, texture aspects when felt, taste aspects, and chewing quality aspects. The research aspect of physical quality testing is the volume aspect.

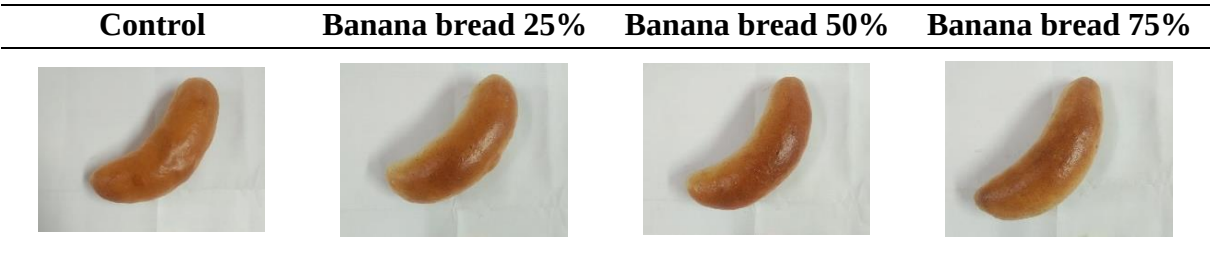


Figure 1.
Banana Bread Results

A. Volume Physical Quality Test

Based on the measurement results by the grain method, the average volume value of banana bread adding 25% ambon banana puree is 80 cm³. The average volume value of banana bread adding 50% ambon banana puree is 80 cm³, and banana bread adding 75% ambon banana puree is 76.67 cm³. The results of the ANOVA calculation obtained f count of 1 with significant degrees $\alpha = 0.05$; free degree of treatment (DPB) 2; and error-free degree (DBG) 6 obtained f table of 5.14. So it can be concluded that f count < f table, which means H₀ is accepted and H₁ is rejected, so it can be concluded that there is no significant effect on *banana bread*, the addition of *banana puree* on the physical quality of the volume aspect.

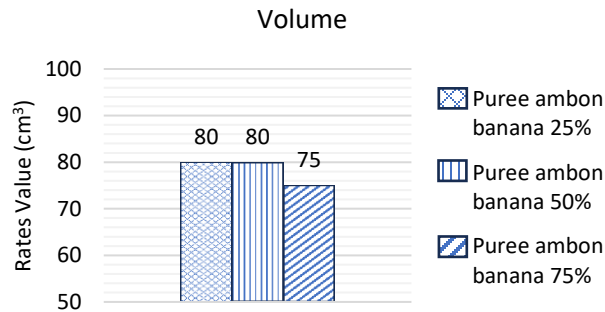


Figure 2.
Volume Value Graph

The development of a good bread volume is 2-3 times that of the initial dough (Arifin et al., 2023). In making banana bread, the addition of banana puree 25%, 50%, and 75% volume results do not show a significant difference, so it can be interpreted that the volume development of the three products is good.

B. Consumer Acceptability Test

1. Volume

The results of the assessment of the panelists' level of liking for *banana bread* from the aspect of volume can be seen in the following picture:

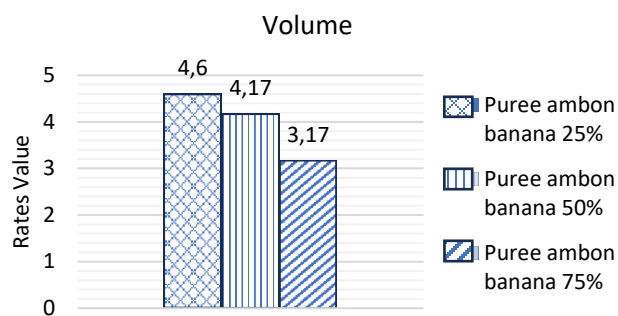


Figure 3.
Volume Favorability Value Graph

Based on the average calculation results, banana bread added 25% ambon banana puree has an average value of 4.6 with the assessment category of like and very like range, banana bread addition of ambon banana puree 50% has an average value of 4.17 with the assessment category of like and very like orange and banana bread addition Puree Pisang Ambon 75% has an average score of 3.17 with the rating category of the range of rather likes and likes. The results of statistical analysis show that there is an effect of adding ambon banana puree on making banana bread on consumer acceptance in terms of volume where $x^2 \text{ count} = 31.62 > x^2 \text{ table} = 5.99$ at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$. Tuckey's test results showed that banana bread products adding 25% ambon banana puree are the most preferred products in terms of volume. In making banana bread, the addition of banana fruit puree has a negative influence on increasing volume. This is because the level of fermentation efficiency decreases along with the addition of bananas to the dough (Choi, 2016). Bananas added to white bread dough with the same percentage of yeast have a negative influence on increasing volume (Choi, 2016).

2. Bread Skin Color

The results of the assessment of the panelists' level of liking for banana bread from the aspect of bread skin color can be seen in the following picture:

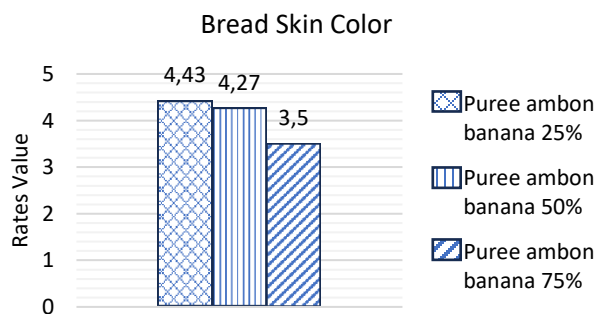


Figure 4.
Graph of bread skin color favorability value

Based on the average calculation results, banana bread added 25% Ambon banana puree has an average value of 4.43 with the assessment category of likes and very likes, and banana bread added 50% Ambonese banana puree has an average value of 4.27 with the assessment category of like and very like range and banana bread addition Puree Pisang Ambon 75% has an average score of 3.5 with the rating category of the range of rather likes and likes.

The results of statistical analysis show that there is an effect of adding ambon banana puree on making banana bread on consumer acceptance in terms of bread skin color where $x^2 \text{ count} = 15.27 > x^2 \text{ table value} = 5.99$ at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$. Tuckey's test results showed that banana bread addition of 25% and 50% ambon banana puree is the most preferred product in terms of bread skin color. In making banana bread, the more bananas that are added, the darker the results of the bread crust look; the color is less preferred because it gives the impression of bread taking too long in the oven. Ripe bananas have a high sugar content, which causes skin color to be brown due to the caramelization of sugar from bananas (Adubofuor et al., 2016).

3. Bread crust thickness

The results of the assessment of the panelists' level of liking for banana bread from the aspect of bread crust thickness can be seen in the following picture:

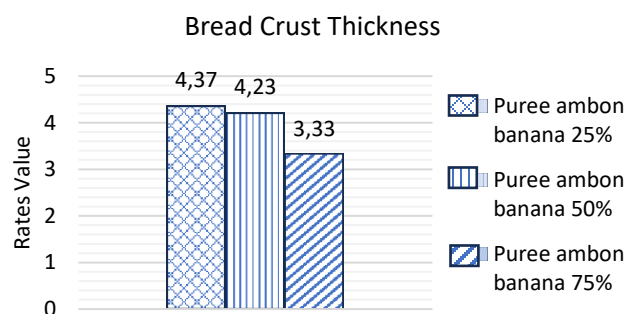


Figure 5.

Bread crust thickness favorability value graph

Based on the average calculation results, banana bread added 25% ambon banana puree has an average value of 4.37 with the assessment category of like and very like range, banana bread addition of ambon banana puree 50% has an average value of 4.23 with the assessment category of like and very like range and banana bread addition Puree Pisang Ambon 75% has an average score of 3.33 with the rating category of Kisaran rather like and like. The results of statistical analysis show that there is an effect of adding ambon banana puree on making banana bread on consumer acceptance in terms of bread crust thickness where $x^2 \text{ count} = 17.45 > x^2 \text{ table value} = 5.99$ at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$. Tuckey's test results

showed that banana bread addition of 25% and 50% ambon banana puree is the most preferred product in terms of bread crust thickness. Light reflection from banana bread, the addition of 25% and 50% Ambonese banana puree is good enough that it is preferable compared to banana bread, the addition of 75% banana puree, which has paler light reflection. Good bread has a thin bread crust because it provides good light reflection and gives the impression of soft bread (Yacoub & Mutiaradina, 2020).

4. Characteristics of bread crusts

The results of the assessment of the panelists' level of liking for banana bread from the aspect of bread skin characteristics can be seen in the following picture:

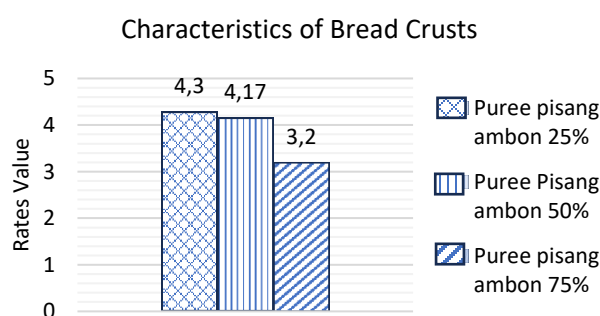


Figure 6.

Graph Of Favorability Values Characteristic Of Bread Crusts

Based on the average calculation results, banana bread added 25% ambon banana puree, which has an average value of 4.3, with the category of assessment range of likes and very likes. Banana bread with the addition of 50% Ambonese banana puree has an average value of 4.17 with the assessment category of the range of likes and very likes, and banana bread with the addition of 75% Ambon banana puree has an average value of 3.2 with the assessment category of the range of rather likes and likes. The results of statistical analysis show that there is an effect of adding ambon banana puree on making banana bread on consumer acceptability in terms of bread crust thickness where $x^2 \text{ count} = 21.35 > x^2 \text{ table value} = 5.99$ at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$. Tuckey's test results showed that banana bread addition of 25% and 50% ambon banana puree is the most preferred product from the aspect of bread skin characteristics. The characteristics of the bread crust are directly proportional to the thickness of the bread skin. A thin skin will give the impression of a soft bread crust (Yacoub & Mutiaradina, 2020).

5. Banana Aroma

The results of the assessment of the panelists' level of liking for banana bread from the aspect of banana aroma can be seen in the following picture:

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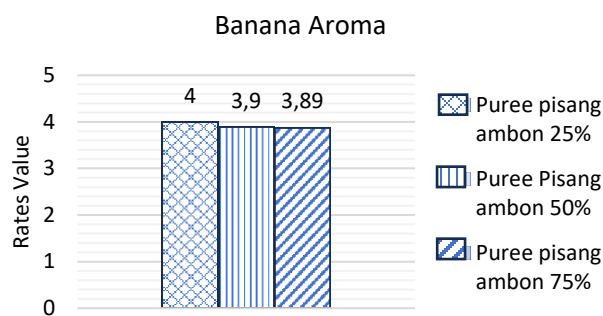


Figure 7.
Banana Aroma Favorability Value Graph

Based on the average calculation results, banana bread added 25% ambon banana puree has an average score of 4 with the category of like rating, banana bread addition of 50% ambon banana puree has an average value of 3.9 with the assessment category of a range of rather likes and likes, and banana bread added puree 75% Ambonese bananas have an average score of 3.89 with the category of rating range rather like and like. The results of statistical analysis show that there is no effect of adding ambon banana puree on making banana bread on consumer acceptability in terms of bread crust thickness where χ^2 count = 0.2 < χ^2 table value = 5.99 at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$. Although there is no significant difference, there is a decrease in the value of liking for the addition of banana puree, which can be caused by the aroma of bananas masking the original aroma of sweet bread. The high percentage of bananas on bread will add to the aroma of bananas to make them stronger (Adubofuor et al., 2016).

6. The aroma of the spekuk spice

The results of the assessment of the panelists' level of liking for *banana bread* from the aspect of the aroma of spekuk spice can be seen in the following picture:

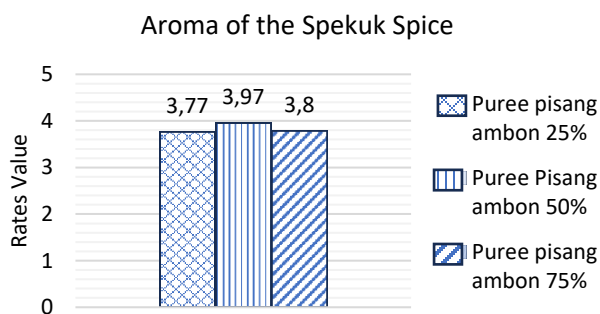


Figure 8.
Graph of the Favorite Value of the Aroma of Spekuk Seasoning

Based on the average calculation results, banana bread added 25% Ambonese banana puree, which has an average value of 3.77 with a range of assessment categories,

such as like and like. Banana bread with the addition of 50% Ambonese banana puree has an average value of 3.97 with the assessment category of the range of somewhat likes and likes, and banana bread with the addition of Ambonese banana puree 75% has an average value of 3.8 with the assessment category of the range of rather likes and likes. The results of statistical analysis show that there is no effect of adding ambonese banana puree on making banana bread on consumer acceptability in terms of bread crust thickness where χ^2 count = 0.6 < χ^2 table value = 5.99 at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$. Unstable baking temperatures can cause the aroma of banana bread to be non-uniform. Oven temperature has an influence on the quality of the aroma produced by bread (Astuti, 2015).

7. Crumb color

The results of the assessment of the panelists' level of liking for banana bread from the aspect of crumb color can be seen in the following picture:

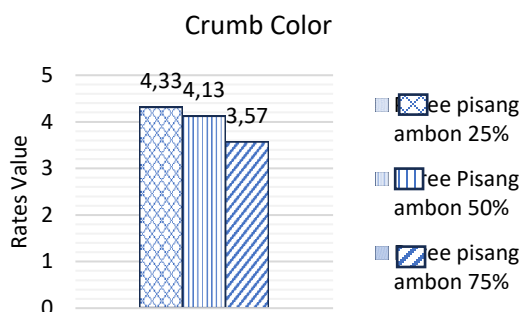


Figure 9.

Crumb Color Favorability Value Graph

Based on the average calculation results, banana bread added 25% ambon banana puree has an average value of 4.33 with the assessment category of like and very like, banana bread addition of ambon banana puree 50% has an average value of 4.13 with the assessment category of like and very like range and banana bread addition Puree Pisang Ambon 75% has an average score of 3.57 with the rating category of Kisaran rather like and like. The results of statistical analysis show that there is an effect of adding ambon banana puree on making banana bread on consumer acceptability in terms of bread crust thickness where χ^2 count = 12.72 > χ^2 table value = 5.99 at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$.

Tuckey's test results showed that banana bread addition of 25% and 50% ambon banana puree is the most preferred product in terms of crumb color. The brightness of the crumb color in banana bread decreases as the percentage of banana puree added increases. The brownish color of bananas from Ambonese banana puree arises due to browning reactions both enzymatically and non-enzymatically (Abu-Alruz, 2023). The browning reaction is enzymatically caused by the polyphenol oxidase enzyme that

occurs during the banana destruction stage (Abu-Alruz, 2023). The non-enzymatic browning reaction involves a Maillard reaction, which is a reaction between the carbonyl group of the reducing sugar and the amino group of the amino acid that produces the brown pigment melanoidin, which occurs due to heating (Abu-Alruz, 2023).

8. Pores of the crumb

The results of the assessment of the panelists' level of liking for banana bread from the aspect of crumb pores can be seen in the following picture:

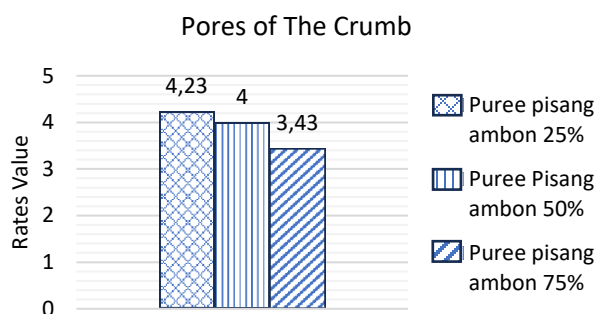


Figure 10.

Graph of the favorability value of the pores of the crumb

Based on the average calculation results, banana bread added 25% ambon banana puree, which has an average value of 4.23 with the category of assessment range of likes and very likes. Banana bread with the addition of 50% ambon banana puree has an average score of 4 with the category of like rating, and banana bread with the addition of 75% ambon banana puree has an average value of 3.43 with the assessment category of a range of rather likes and likes. The results of statistical analysis show that there is an effect of adding ambon banana puree on making banana bread on consumer acceptance in terms of bread crust thickness where $x^2 \text{ count} = 9.27 > x^2 \text{ table value} = 5.99$ at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$.

Tuckey's test results showed that banana bread addition of 25% and 50% ambon banana puree is the most preferred product from the aspect of crumb pores. The pores of crumbs in banana bread, the addition of 25% and 50% ambon banana puree, look small and more uniform compared to the pores of crumbs in banana bread, the addition of 75% ambon banana puree. A study by (Arifin et al., 2023) shows that the banana flour substitution with the highest percentage looks large and not uniform. This can happen because the decreasing gluten ratio will reduce the ability of the dough to hold gas and the formation of walls that hold gas to form pores (Amanda et al., 2018).

9. Crumb Texture

The results of the assessment of the panelists' level of liking for banana bread from the aspect of crumb texture can be seen in the following picture:

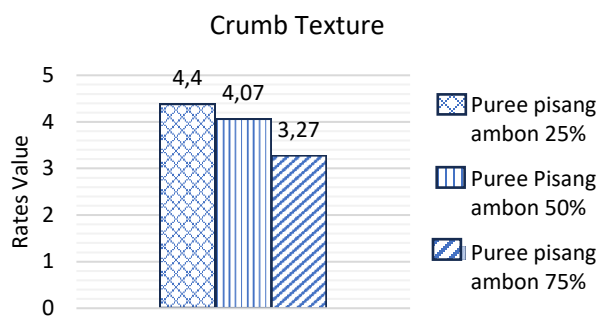


Figure 11.

Crumb texture favorability value graph

Based on the average calculation results, banana bread added 25% ambon banana puree has an average value of 4.4 with the assessment category of like and very like range, banana bread addition of ambon banana puree 50% has an average value of 4.07 with the assessment category of like and very like range and banana bread addition Puree Pisang Ambon 75% has an average score of 3.27 with the rating category of the range of rather likes and likes. The results of statistical analysis show that there is an effect of adding ambon banana puree on making banana bread on consumer acceptability in terms of bread crust thickness where x^2 count = 19.72 > x^2 table value = 5.99 at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$.

Tuckey's test results showed that banana bread addition of 25% and 50% ambon banana puree is the most preferred product in terms of crumb texture. The addition of banana puree will reduce the ability of gluten to bind water and cause the texture of bread to be not soft and smooth due to the absorption of water content due to banana fiber (Park, J. S., et al, 2010 referred to in Choi. I. J., 2016). A good texture of bread can be formed due to gluten derived from wheat and is elastic so that it can bind water and hold gas during fermentation (Yunita, et al, 2020).

10. Texture when Perceived

The results of the assessment of the panelists' level of liking for banana bread from the aspect of texture when felt can be seen in the following picture:

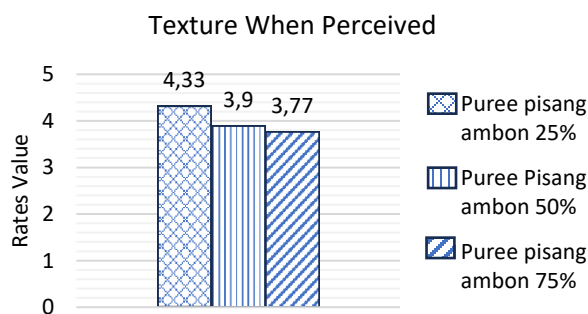


Figure 12.

Graph the value of texture liking when perceived.

Based on the average calculation results, banana bread added 25% Ambon banana puree has an average value of 4.33 with the assessment category of likes and very likes, and banana bread added 50% Ambonese banana puree has an average value of 3.9 with the assessment category of a range of rather likes and likes and banana bread additions Puree Pisang Ambon 75% has an average score of 3.77 with the rating category of the range of rather likes and likes. The results of statistical analysis show that there is no effect of adding ambon banana puree on making banana bread on consumer acceptability in terms of bread crust thickness where x^2 count = 5.27 < x^2 table value = 5.99 at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$.

In making banana bread, water trapped in banana puree causes bread that has gone through the baking process to still have a sticky taste left in the mouth. Ambon banana puree has compounds containing pectin, simple sugars, and probiotic fiber that absorb and retain water (Ong, Widjajaseputra, & Trisnawati, 2015). The water is bound by compounds from banana puree that are added to the dough without binding the water-binding components so that the water is trapped in short ripening (Ong et al., 2015).

11. Taste

The results of the assessment of the panelists' level of liking for banana bread from the aspect of taste can be seen in the following picture:

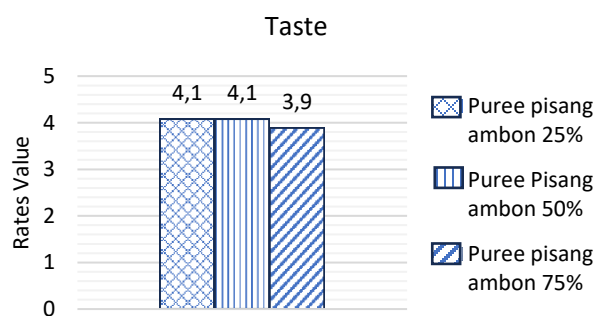


Figure 13.

Taste Favorability Value Graph

Based on the average calculation results, banana bread added 25% ambon banana puree has an average value of 4.1 with the assessment category of likes and very likes, and banana bread added 50% Ambonese banana puree has an average value of 4.1 with the assessment category of like and very like range and banana bread addition Puree Pisang Ambon 75% has an average score of 3.9 with the rating category of a range of rather likes and likes. The results of statistical analysis show that there is no effect of adding ambonese banana puree on making banana bread on consumer acceptability in terms of bread crust thickness where x^2 count = 1.22 < x^2 table value = 5.99 at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$.

In Banana bread, the addition of 25% and 50% ambon banana puree shows a high preference value in the aspect of sweetness, while in banana bread, the addition of 75% ambon banana puree shows a slight decrease because the sweetness of the bread is masked by the sour taste produced by the bread. According to (Hutapea, Harun, & Fitriani, 2021) with their research on snack bar products, the higher the ratio of green ambonese banana puree will increase the level of sweetness in the snack bar. In white bread making, the higher the amount of bananas added, the pH of the dough tends to decrease (Choi, 2016).

12. Masticatory Quality

The results of the assessment of the panelists' level of liking for banana bread from the aspect of chewing quality can be seen in the following picture:

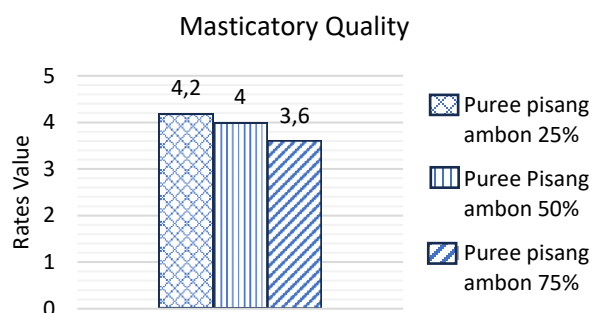


Figure 14.

Favorability Value Graph of Chewing Quality

Based on the average calculation results, banana bread added 25% ambon banana puree has an average value of 4.2 with the category of assessment range of likes and very likes, banana bread addition of ambon banana puree 50% has an average value of 4 with the assessment category of the range of likes and banana bread the addition of puree 75% Ambonese bananas have an average score of 3.6 with the category of rating ranges rather like and like. The results of statistical analysis show that there is an effect of adding ambon banana puree on making banana bread on consumer acceptability in terms of bread crust thickness where $x^2 \text{ count} = 7.12 > x^2 \text{ table value} = 5.99$ at a significant level $\alpha = 0.05$ with degrees of freedom $df = 3 - 1 = 2$. Tuckey's test results showed that bananas added 25% ambon banana puree, which is the most preferred product in terms of chewing quality. The level of hardness in white bread increases as the percentage of banana puree is added; this can occur because the replacement of water with banana puree results in a decrease in water content to bond with gluten (Choi, 2016).

CONCLUSION

The results of physical quality tests showed that there was no significant effect of adding Ambonese banana puree on making banana bread, as measured in terms of volume

using the grain method with three repetitions in three treatments. However, the results of the acceptability test using a hedonic test to 30 somewhat trained panelists revealed that banana bread with the addition of Ambonese banana puree by 25% showed the highest average score in a number of aspects, including volume, bread skin color, bread skin thickness, bread skin characteristics, banana aroma, crumb color, crumb pores, crumb texture, texture when felt, taste, and masticatory qualities. Meanwhile, banana bread with the addition of ambon banana puree by 50% gets the highest average score in the aspect of aroma, spices, and taste. Furthermore, the results of the acceptability test using the Friedman test revealed that the addition of Ambonese banana puree affects several aspects of banana bread quality, including volume, bread skin color, bread crust, bread skin characteristics, crumb color, crumb pores, crumb texture, and chewing quality. Based on these findings, it is recommended to use banana bread products with the addition of 50% ambon banana puree for further utilization of Ambonese bananas.

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