

Study of Organoleptic Properties and Nutritional Content of Banana Brownies AS Healthy Snacks for School Children

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ABSTRACT

Background: Snacks can help meet the nutritional needs of children who do not bring food to school. However, many snacks circulating in the community still need to be guaranteed for their safety or nutritional content. Efforts are required to meet nutritional needs by developing a product in the form of brownies as a healthy snack for school children using local food in the form of Ambon bananas as a substitute in making brownies. This research aims to determine the organoleptic properties and nutritional content of banana brownies as a healthy snack for school children.

Research Methods: This study used an experimental method in the laboratory with a completely randomized design (CRD). Ambon banana puree substitution was carried out with three levels of treatment (25%, 50%, and 75% of the total flour), with three repetitions. Data on organoleptic properties were collected by organoleptic test using the hedonic method and statistically analyzed using Analysis Of Variance (One Way Anova) at the 95% confidence level ($\alpha = 0.05$).

Research Result: The results of the study of the organoleptic test of banana brownie products with 25% Ambon banana puree substitution of total wheat flour (20 grams) obtained a significant texture (≤ 0.05), while color, aroma, and taste were not substantial (> 0.05).

Conclusion: The study of the organoleptic properties of banana brownies found that panelists preferred the treatment level, namely t1 (substitution of Ambon banana puree 25% of total flour). The nutritional value in 1 serving of 100 grams of banana brownies is 402.9 kcal of energy and 6.8 grams of protein.

BACKGROUND

Giving proper nutrition to school children must be considered to support their growth and development. Children aged 6-12 years experience significant growth and development, so they need more nutrients, especially energy and protein. (Anugrah and Suryani, 2020).

This vital nutrient can also be found in fruits and vegetables. Daily consumption of fruits and vegetables provides many health benefits for children. However, not all children like fruits and vegetables. So, it can affect the nutritional needs of children due to a lack of consumption of fruits and vegetables (Jakri et al., 2022).

Healthy snacks are needed for children who do not have breakfast and do not bring food with them. Snacks can contribute energy and protein to school children. The nutritional contribution of these snacks should ideally reach 15-20% of the daily dietary adequacy of school children. Currently, many snacks are circulating in the community, but not all are guaranteed for their safety and nutritional content. Therefore, the

community needs to pay special attention to the development of snacks to overcome this problem and ensure the development of Indonesia's human resources in the future (Paratmanitya et al., 2020).

Based on the results of Damat et al.'s research, 2020 in 17 elementary schools in Malang Regency, it was shown that 46.86% of school children's snacks were positive for using borax, 17.7% were positive for using formalin, and 22.2% were positive for using rhodamine b. For this reason, it is necessary to have special supervision from the government regarding school children's snacks circulating in the community so as not to endanger the health of school children.

The 2018 Basic Health Research (Riskesdas) results show that the proportion of fruit/vegetable consumption among school children in NTB Province is still low (5.27% per day). The low consumption of fruit and vegetables in school children greatly influences the problem of fulfilling children's nutrition. The Dietary Guidelines for Americans recommend consuming at least five servings of fruits and vegetables daily. This is similar to the recommendations for the Balanced Nutrition Pyramid, which recommends drinking 5-8 servings of fruits and vegetables or the equivalent of 400-600 grams a day (Chandradewi & Adiyasa, 2022). So, it is necessary to meet nutritional needs by developing products such as brownies as snacks for school children using local food as a substitute ingredient in making brownies.

One of the local foods sourced from fruits and widely available in West Nusa Tenggara (NTB) is bananas. According to the West Nusa Tenggara Province Agriculture and Plantation Office, in 2021, banana fruit production will reach 1,188,480 quintals. This data shows that the total production of bananas in 2021 is higher than in 2020, which is 837,839.1 quintals. In West Nusa Tenggara (NTB), bananas' utilization and processed products are still low. Usually, local people consume bananas directly or make them into fried bananas.

Banana is a fruit that has a soft texture, easily digested by the body, easy to get, and enjoyed by all ages. Bananas have good nutritional value because the energy contained in bananas is more than other fruits (Lestari et al., 2021). One widely preferred type is the Ambon banana because of its sweet taste, soft texture, and more pungent aroma compared to other bananas. Ambon bananas contain high levels of potassium, vitamin A, vitamin C, and vitamin B6, so they can be used as substitutes for making brownies (Kurnia, 2019). Based on the description above, this study aims to find a formulation for making brownies as a substitute for Ambon banana puree as a snack made from local food. The aim is to analyze the nutritional content of banana brownies so that they can be used as healthy snacks for school children and the nutritional content following the nutritional adequacy of school children.

MATERIAL AND METHODS

This type of research is an experiment or experiment (Experiment research) in the Laboratory with an experimental design in the form of a Completely Randomized Design (CRD) involving one factor, namely the substitution of Ambon banana puree, which consists of 3 treatment levels, namely:

T1: Substitution of Ambon bananas as much as 25% of the total flour.

T2: Substitution of Ambon bananas as much as 50% of the total flour.

T3: Substitution of Ambon bananas as much as 75% of the total flour.

Each treatment level was carried out three repetitions each so that nine experimental samples were obtained. The formulation for each level of treatment for making banana brownies can be seen in the table below:

Table 1. Banana Brownies Formulation with Ambon Banana Substitution

No	Material	Treatment		
		t1	t2	t3
1	Ambon banana	25% of total wheat flour (20 grams)	50% of total wheat flour (40 grams)	75% of total wheat flour (60 grams)
2	Flour	75% of total wheat flour (60 grams)	50% of total wheat flour (40 grams)	25% of total wheat flour (20 grams)
3	Chicken eggs	200 gram	200 gram	200 gram
4	Dark chocolate	75 gram	75 gram	75 gram
5	Cocoa powder	35 gram	35 gram	35 gram
6	Margarine	120 gram	120 gram	120 gram
7	Sugar	150 gram	150 gram	150 gram
8	Sweetened condensed milk	38 gram	38 gram	38 gram
9	baking powder	3 gram	3 gram	3 gram
10	SP	5 gram	5 gram	5 gram
11	Powdered vanilla	3 gram	3 gram	3 gram

RESULTS

Organoleptic Properties

The organoleptic test was carried out, namely through the hedonic test. The parameters assessed were banana brownies' color, aroma, texture, and taste. The hedonic test was conducted at the Food Technology Science Laboratory, Poltekkes Kemenkes Mataram, with 15 trained panelists.

The significance of the effect of Ambon banana puree substitution on the organoleptic properties of banana brownies can be seen in the following table:

Table 2. Significance of the Effect of Ambon Banana Puree Substitution on the Organoleptic Properties of Banana Brownies

Parameter	P (value)	Notation
Color	0.788	NS
Aroma	0.328	NS
Texture	0.010	S
Flavor	0.453	NS

Information :

NS = Non Significant : Not Significantly Different

S = Significant : Significantly different

The organoleptic property analysis for color, aroma, and taste parameters has a p-value > 0.05. This shows that banana puree substitution does not significantly affect color, aroma, or taste. While the texture has a p-value ≤ 0.05 , it is known that the effect of banana puree substitution at each treatment level affects the texture of banana brownies.

The best product from 3 treatment levels with three repetitions using the average value of all organoleptic property tests (color, aroma, texture, and taste) can be seen in the following table:

Table 3. Average Value of Panelists' Favorites for Banana Brownies

No	Treatment	Parameter Test				Total	Average
		Color	Aroma	Texture	Flavor		
1	t1 (25%)	3.7	4.0	4.3	4.3	16.3	4.1
2	t2 (50%)	3.7	3.6	3.7	4.2	15.2	3.8
3	t3 (75%)	3.9	3.8	3.5	3.9	15.0	3.8

Table 3 shows that the best product of the three treatment levels and three repetitions is at the t1 treatment level with the highest average score for each parameter (color, aroma, texture, and taste), namely 4.1.

Nutrient Content

The selected banana brownie products were then empirically calculated for their nutritional value using the Indonesian Food Composition Table (TKPI). The results of calculating the nutritional value per serving of banana brownies can be seen in the following table:

Table 4. Calculation Results of The Nutritional Value of 100 gram Banana Brownies

No	Composition	Nutritional Value
1	Energy	402.9 kcal
2	Proteins	6.8 gr

Based on table 4, it shows that 100 grams of Ambon bananas contain 402.9 kcal of energy and 6.8 grams of protein. The nutritional value of 1 portion of 100 grams of banana brownies can already be used as PMT for elementary school children aged 6-12. PMT for school children is given to meet 15% of energy needs from the Adequacy of Nutrition Rate (RDA), namely 260.6 kcal of energy and 6.4 grams of protein. Meanwhile, if given $\frac{1}{2}$ portion of 50 grams of banana brownies, it can be used as a distraction for school children with a nutritional value of 201.45 kcal of energy and 3.4 grams of protein.

DISCUSSION

Organoleptic Properties

Color

The color of the banana brownies that the panelists liked the most was the level of t3 treatment with the most banana puree substitution, which was dark brown. The color of the banana brownies produced at each treatment level was the same. The resulting color comes from mixing ingredients such as Ambon banana, dark chocolate, and cocoa powder so that the banana puree substitution does not significantly affect the color of the brownies.

In line with research by Moniharapon et al. in 2018, it was found that adding cocoa powder as an additional ingredient in the brownie-making process caused the formation of a brown color. Apart from mixing the ingredients, brownies' brown color can also result from non-enzymatic and enzymatic browning processes. This reaction occurs when banana puree is added in large quantities, resulting in a darker brown color when making banana brownies. This enzymatic reaction is caused by polyphenol oxidase enzymes in various plants, including apples, pears, and bananas (Lestari et al., 2021).

On the other hand, a non-enzymatic browning reaction can occur during the steaming process, as it triggers the Maillard reaction. The Maillard reaction is believed to have occurred due to the increased use of banana puree, which causes the opening of the active protein sites in the mixed ingredients. This causes an increase in the amount of reducing sugars, which react with the amine groups and eventually result in the formation of melanoidins, which are brown compounds. The more banana puree used, the darker the product color (Arsa, in Lestari et al., 2021).

Aroma

The panelists' most preferred aroma of banana brownies was the t1 treatment level with the fewest banana puree substitutions, namely banana flavor, which needed to be stronger. The aroma of banana brownies produced at each treatment level differed because the more banana puree substitutes used, the more pungent the distinctive aroma of bananas. You can also smell the aroma of other ingredients, such as dark chocolate, cocoa powder, vanilla powder, and margarine. The analysis with the One Way Anova test shows that banana puree substitution has no significant effect on the aroma of banana brownies.

In line with Lestari's research, et al. in 2021 stated that substituting Ambon banana puree at each treatment level affected the product's aroma, from having a banana scent, which was not too strong until it smelled strongly of banana. This is because the distinctive aroma of bananas comes from volatile elements in bananas, which are aroma elements in the form of amyl acetate, amyl butyrate, and acetaldehyde. Amyl

acetate is the main element or essential active compound that produces the aroma of bananas. These elements are abundant in perfectly ripe bananas (Zulaikhah et al.; R., 2020).

Texture

The texture of the banana brownies that the panelists liked the most was the level of treatment t1 with the minor substitution of banana puree. That is, the texture was soft enough compared to the other treatments' levels. The texture of the banana brownies produced at each treatment level differed because the more Ambon banana puree substitutes had a different texture, ranging from soft to soft. This is because the water content in Ambon bananas affects the final texture. The more substitutes for puree Ambon bananas, the more water content, and the texture of the banana brownies becomes too soft. Based on the analysis with the One Way Anova test, it shows that banana puree substitution has a significant effect on the texture of banana brownies.

In line with Ferawati's research (in Lestari et al. 2021) stated that bananas have a very high water content, so the banana brownie product has very wet dough characteristics.

Flavor

The banana brownie flavor the panelists liked the most was the t1 treatment level with the fewest banana puree substitutions, namely having a sweet taste and not too distinct from Ambon bananas. The taste of the banana brownies produced at each treatment level was slightly different because the more substitutions of Ambon banana puree, the stronger the distinctive banana flavor. The taste also comes from other ingredients such as chocolate bars, cocoa powder, vanilla powder, and margarine. The analysis with the One Way Anova test shows that banana puree substitution has no significant effect on the taste of banana brownies.

In line with Lestari's research, et al. (2021) stated that substituting Ambon banana puree at each treatment level produced a different taste. It ranges from an apparent banana flavor once it is very pronounced. The sweet taste of Ambon banana brownies is due to the presence of sugar resulting from starch degradation into simple sugars, namely sucrose, glucose, and fructose. In the early stages of the cooking process, the most sugar is sucrose, but in the later stages, it is more glucose and fructose (Nurhamidah, in Lestari et al. 2021).

Nutrient Content

The calculation of the nutritional value of banana brownies in this study was only at the best treatment level, namely t1 with 25% Ambon banana puree substitution of the total flour. The parameters calculated include energy and protein.

Energy

Energy is needed for daily physical activities, mainly from food sources rich in carbohydrates, fats, and proteins (BPOM RI, 2013). Based on calculations using the 2017 TKPI, the energy content of nutrients in 1 serving (100g of banana brownies) can be used as PMT for school children aged 6 to 12 years of 402.9 kcal and already meets the energy needs for PMT for school children. If given, $\frac{1}{2}$ portion (50g banana brownies) can be used as a distraction for school children with an energy nutritional value of 201.45 kcal.

Proteins

This protein is essential for the growth and replacement of damaged cells and can be obtained from animal and vegetable sources (BPOM RI, 2013). Based on calculations using TKPI in 2017, the nutrient content of protein in 1 portion (100 grams of banana brownies) as PMT for school children aged 6 to 12 years is 6.8 grams and already meets the protein needs for PMT for school children. If given $\frac{1}{2}$ portion (50 grams of banana brownies), it can be used as a distraction for school children with a protein nutritional value of 3.4 grams.

CONCLUSIONS

Ambon banana puree substitution had no significant effect on the color, aroma, and taste parameters ($p > 0.05$), while the texture parameters had a significantly different effect ($p \leq 0.05$). Banana brownies at the t1 treatment level, namely by substituting Ambon banana puree, as much as 25% of the wheat flour had organoleptic test scores including color, aroma, texture, and taste that the panelists most liked. The

nutritional value in 1 serving of 2 pieces of banana brownies weighing 100 grams is 402.9 kcal of energy and 6.8 grams of protein.

SUGGESTION

The nutrient content in 1 100-gram portion of banana brownies, namely 402.9 kcal of energy and 6.8 grams of protein, can be used as PMT for school children. If given 50 grams of banana brownies, they can be used as a distraction for school children with an energy nutritional value of 201.45 kcal and 3.4 grams of protein. In making brownies, the substitution of Ambon banana puree can be replaced using the substitution of Ambon banana flour.

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