Sensory Analysis of Tomato Sauce with Added Banana Waste as A Thickener

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Abstract
Tomato sauce may be used as a side dish for a number of cuisines. This tomato sauce, however, is off-limits to diabetics due to its high sugar content, which can significantly raise blood sugar levels. As a result, the researchers created tomato sauce with the addition of banana peel waste. The goal of this study is to process banana peel and develop a diabetic-friendly sauce composition. In this study, 5 different treatments were used, with the percentage of tomato sauce and banana peels varying as much as 90%:10%, 80%:20%, 70%:30%, and 60%:40%. The following tests were done is organoleptic test. Based on the organoleptic testing, the sauce containing 40% banana peel was deemed to be the most favored, with an overall value of 3.8. The banana peels are included as a natural thickening agent with functional value. The sensory analysis of tomato sauce uses for developing sauce for diabetic patients.

Keywords: Banana Peel, Diabetics, Sorbitol, Tomato Sauce

1. Introduction

Diabetes is a disease that is becoming more prevalent by the year. Diabetes mellitus is a disease that causes excessive blood sugar levels and causes the patient's body to produce insufficient insulin. Diabetes is becoming more common in Indonesia and around the world. Indonesia ranked eighth in 2015, with up to 10 million diabetics, and is anticipated to reach 16.2 million by 2040 (Nurjana & Veridiana, 2019). Diabetics are also restricted from eating certain foods since they can easily cause blood sugar levels to spike. Sauce is one of the forbidden foods. Sauce is a condiment for a variety of foods and snacks. Unfortunately, diabetics are often not permitted or heavily restricted from consuming sauces. This is due to the sauce's high sugar content, which can induce a spike in blood sugar levels. As 1 tablespoon of tomato sauce has 4.6 grams of sugar, according to the Singapore Nutrient Databases in (Laraspasti, 2021). As a result, it is required to create a diabetic-friendly sauce. One of them is to add banana peels to the tomato sauce that will be created, as well as to use low-calorie artificial sweeteners.

Banana is one of the fruits grown extensively in Indonesia. According to BPS data, Indonesia will produce 8.74 million tons of bananas in 2021. This figure climbed by 6.82% year on year. With an increase in banana output comes an increase in banana peel trash. As a result, this banana peel might be manufactured and used as a food ingredient. The banana peel waste is potential being used as a natural thickener. This is due to the high pectin content in banana peels, which is 22.4%. Diabetics can also drink this sauce with the addition of banana peels. This is due to the high quantities of alpha glucosidase and flavonoids found in banana peels, particularly

Kepok banana. These flavonoids may have a hypoglycemic impact, suppressing cell death in beta cells without altering the beta cell cycle in the pancreas (Panjaitan et al., n.d.). The trash from banana peels has a high useful value. According to the findings of Pakpahan, (2017), ripe Ambon banana peel extract at a dose of 400 mg/kg NW was able to drastically lower blood glucose levels in mice. Furthermore, a similar study done by Panjaitan (2018) found that Kepok banana peel extract at a dosage of 500 mg/kg NW had a greater effect on glucose levels in white male Wistar rats than bay leaf extract. Furthermore, (Rizani et al., 2018) discovered that the IC50 values of Ambon banana peels, Kepok banana, and plantains were 44,764, 68,470, and 99,687μg/mL, respectively.

Researchers will use sorbitol, a natural sweetener, to create tomato sauce with the addition of banana peel waste sauce. Natural sweeteners are used because they are better for diabetes and contain little or no calories (Nurjannah, 2012). The purpose of this study is to convert banana peel trash that is now still being wasted into something more valuable. Furthermore, it possesses organoleptic features that are acceptable and enjoyed by the general population and may be used to make suitable sauce formulations for diabetics. The benefits of this research include the use of previously discarded banana peel trash and the development of a diabetic-friendly sauce.

2. Research Method

Materials

The ingredients used to make the sauce are fresh tomatoes, water, banana peels, garlic, salt, pepper, margarine, sorbitol sweetener, and lime juice. While the tool used in this study were blenders, pans, stoves, spoons, container, spatula, knife, sieve with a hole diameter of 1 mm.

Method

a. Making Banana Peel Pulp

The banana peel that will be used is washed thoroughly. Then blanching for five minutes and scraped. Next, the banana skin is smoothed using a blender with the addition of water 1:1 for 1 minute until it becomes pulp.

b. Making Tomato Sauce

Tomatoes are sorted and selected which are still good. Next, the tomatoes are washed up clean and then boiled until soft together with the garlic that has been peeled. Then, the tomatoes and garlic are pureed using a blender. After that, the tomatoes that have been smooth are mixed with the banana peels that have also been mixed mashed according to the dosage for each formulation. After thoroughly mixed, the sauce is cooked for 15 minutes until thickened.

c. Organoleptic Test

The level of acceptance was measured using a 5-point hedonic test. Twenty-five participants were asked to score the color, flavor, viscosity, taste, and liking of the product. The preference scale was 1 (extremely dislike), 2 (dislike), 3 (neutral), 4 (like), and 5 (like very much).

Research Methods

In this study, several comparisons of the composition of tomatoes and banana peels were given to get the best tomato sauce results.

Table 1.Composition tomato and banana peels as treatment

Treatment	Tomato	Banana Peels
I	90%	10%
II	80%	20%
III	70%	30%
IV	60%	40%

The Organoleptic Test

The organoleptic test performed was a preference test or hedonic test performed on untrained panelists. The total panelists used were 100 untrained panelists. In this hedonic test, panelists will be asked to give their assessment of texture, taste, color, aroma, and preference on the five formulations that have been made.

3. Results and Discussions

Table 2. Two way anova test

Tests of Normality						
	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Standardized Residual for Result	,128	2500	,200	,933	2500	,518

a. Lilliefors Significance Correction

Based on the output of the Test of Normality above, the value of Sig. Shapiro Wilk is 0.518. Because the value of 0.518 is greater than > 0.05, it can be concluded that the standard residual values are normally distributed. Thus the standardized residual normality requirements in the two way ANOVA have been fulfilled.

Table 3. Between-subject factors

		Value Label	N
Percentage of Banana Peel	1,00	Control	500
	2,00	10%	500
	3,00	20%	500
	4,00	30%	500
	5,00	40%	500
Color, Taste, Texture, Aroma and Overall	1,00	Color	500
	2,00	Taste	500
	3,00	Texture	500
	4,00	Aroma	500
	5,00	Overall	500

In the output above we are informed about the results of the subjects in the study. The subjects in the study were included in the data analysis according to the different factors between each variable.

Table 4. Homogeneity test

	Levene Statistic	df1	df2	Sig.
Based on Mean	15,166	24	2475	,563
Based on Median	10,439	24	2475	,635
Based on Median and with adjusted df	10,439	24	2434,216	,638
Based on trimmed mean	15,727	24	2475	,542

Based on the output above, it is known that the Significance value (Sig.) is 0.563 > 0.05, so it can be concluded that the variance in the percentage of banana peels is the same or homogeneous. Because the variance is homogeneous, it means that the requirements in the two-way ANOVA test have been fulfilled**.**

Table 5. ANOVA test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	85,074[a]	24	3,545	2,252	,000
Intercept	28506,946	1	28506,946	18109,613	,000
Percentage of Banana Peels	26,230	4	6,558	4,166	,002
Color, Taste, Texture, Flavor and Overall	10,086	4	2,522	1,602	,021
Percentage of Banana Peels* Color, Taste, Texture, Flavor and Overall	48,758	16	3,047	1,936	,014
Error	3895,980	2475	1,574		
Total	32488,000	2500			
Corrected Total	3981,054	2499			

a. R Squared = ,021 (Adjusted R Squared = ,012)

1. Based on the output above, the value of Sig. the percentage of banana peels is 0.021 <0.05, so it can be concluded that there are differences in the data obtained based on the percentage of banana peels.
2. Sig. a difference of 0.021 <0.05, so it can be concluded that there are differences in the data obtained based on color, taste, texture, flavor and overall.
3. Sig. the difference is 0.014 <0.05, so it can be concluded that there are differences in the data obtained based on the percentage of banana peels as well as color, taste, texture, flavor and overall.

Table 6. Organoleptic test of tomato sauce with addition banana peel with different concentration

Parameter	Treatment				
	Control	10%	20%	30%	40%
Color	3.91	3.72	3.67	3.26	3.44
Taste	3,28	3.32	3.35	3.57	3.36
Texture	3.66	3.18	3.33	3.35	3.37
Flavor	3.59	3.39	3.48	3.25	3.39
Overall	3.4	3.32	3.49	3.2	3.8
Total	**17.84**	**16.93**	**16.37**	**16.63**	**17.36**

According to the table, the most preferred treatment based on color is the control treatment, with an average value of 3.91, while the least liked treatment is the treatment with the addition of 30% banana peel, with an average value of 3.26. The treatment with the addition of 30% banana

peel had the highest average value of 3.57, while the control treatment received the lowest average value of 3.28. The control treatment received the greatest texture rating with an average value of 3.66, while the treatment with 10% banana peel received the lowest texture rating with an average value of 3.18. The control treatment has the highest aroma evaluation, with an average value of 3.59, while the treatment with 30% banana peel has the lowest, with an average value of 3.25. Overall, the treatment with 40% banana peel is the most favored, with an average value of 3.8, while the treatment with 30% banana peel is the least preferred, with an average value of 3.2. A total value was obtained from the five aspects, with the control sauce having the greatest total value of 17.84, followed by a sauce containing 40% banana peel having a score of 17.36. According to this finding, tomato sauce with 40% banana peel is the most favored sauce after the sauce that is widely diffused in society today.

According to SNI 01-3546-2004, a good tomato sauce must meet numerous sensory quality characteristics, including scent, taste, and color that are generally associated with tomatoes. Even with the inclusion of banana peels, this must still be met in tomato sauce. Color, taste, texture, scent, and overall qualities were assessed in this study.

Color

Based on SNI 01-3546-2004, Color is one of the physical qualities of tomato sauce products. This color attribute has an influence on the panelists' interest in choosing a food product, including sauce. The color of this tomato sauce is bright red to brownish red, according to the ratio of the addition of banana peels. The more banana peels added, the darker or darker the color will be. This is because the higher the addition of banana peels, the lower the tomato content in the sauce. This has an impact on the red color of the tomatoes will also be lower while the brown color of the banana skin is increasingly dominant. The red color of this sauce is caused by the presence of carotenoids in tomatoes.

This is also consistent with the findings of Usman's (2019) research, which revealed that the more tomato paste used, the redder the sauce created. Furthermore, the cooking time may influence the darker color. This is due to the fact that the longer the sauce cooks, the more banana skins it contains. As a result, the Maillard reaction in tomato sauce with more banana peels will be stronger (Rasyid, 2020).

The control treatment was the most desired treatment based on the color attribute, with a score of 3.91, and the higher the amount of banana peels, the lower the level of color acceptability. This may be influenced by the panelists' judgment of the color that is most akin to the tomato sauce that is commonly consumed as the most appealing or delicious tomato sauce.

Taste

Taste is a qualitative factor that influences whether or not a consumer would accept a food product. Taste or flavor is a stimulus that arises when food enters the mouth and is perceived by the taste and smell senses. There are four flavors: salty, sweet, bitter, and sour. Table 6 shows that the average values for the five treatments are not significantly different based on the panelists' evaluations. This suggested that all treatments obtained reasonably comparable taste ratings from the panelists and that the presence of the therapy had no significant effect on taste preference.

According to SNI 01-3546-2004, the flavor of tomato sauce meets the standard tomato standards. Based on the panelists' preferences, which were not significantly different, it can be assumed that the taste of the five treatments was almost same. As a result, whether or not banana peels are included has no effect on the flavor of the sauce. As a result, the inclusion of banana peels has no discernible effect on the flavor of the sauce.

Texture

Texture is a qualitative element that may be evaluated by touch. The texture that is meant in the evaluation of tomato sauce extract from banana peel waste is the smoothness and level of thickness of the sauce. The texture of the 0% control treatment was chosen by the panelists with a significant difference in value, according to the results of Table 6. The tomato sauce with 50-80% banana peel extract has a more liquid feel than the control treatment.

Flavor

Flavor is a quality trait that is evaluated using the sense of smell. According to the table, the most favored scent is the control treatment, which contains no banana peels. The treatment with the addition of 30% banana peel was the least preferred. This could be due to the scent of the sauce being affected by the inclusion of banana peels. As can be seen, panelists prefer sauces with a robust tomato flavor. This result, however, had no effect on all therapies. This is evident in the treatment with 20% banana peel, which is the second preferred sauce after the control treatment.

Overall

Overall, this tomato sauce product with 40% banana peel was the most popular treatment. This total evaluation is influenced by all elements in tomato sauce, so the overall acceptability shows how people perceive this product. According to the table, the acceptance of tomato sauce with 40% banana peels was higher than the acceptance of tomato sauce without banana peels. This demonstrates that the panelists prefer tomato sauce containing 40% banana peels over pure tomato sauce.

4. Conclusions

The results of the organoleptic tests show that the sauce with the inclusion of 40% banana peel has approximately the same level of sensory acceptability as pure tomato sauce. This demonstrates the merit of additional research and improvement of tomato sauce with 40% banana peel.

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