Vol. 4, No. 3, September 2026, pp. 1304-1318
INTERNATIONAL JOURNAL OF
POST AXIAL
FUTURISTIC TEACHING AND LEARNING
https://journal.amorfati.id/index.php/postaxial | | ISSN 3025-7549

The Effect of Taro lour Substitution on the Quality of Nona Manis Cake: Family Welfare Education

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Article History:
Received:
31-07-2026
Revised:
27-08-2026
Accepted:
05-09-2026

Keywords:
Traditional Cakes, Nona Manis Cake, Sensory Quality, Local Food, Taro Flour, Welfare Education

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Abstract: Nona Manis cake is one of Indonesia's traditional cakes that commonly uses wheat flour as its main ingredient. The utilization of local food ingredients as substitutes can increase the use of local commodities, one of which is taro flour. This study aimed to analyze the effect of substituting taro flour at levels of 0%, 15%, 30%, and 45% on the organoleptic quality and acceptability of Nona Manis cake. The study employed an experimental method using a Completely Randomized Design (CRD), consisting of four treatments with three replications. Organoleptic quality was assessed using a rating test, while acceptability was evaluated through a hedonic test involving 30 semi-trained panelists. The data were analyzed using Analysis of Variance (ANOVA) at a significance level of 0.05, followed by Duncan's Multiple Range Test (DMRT) when a significant effect was observed. The organoleptic test results showed that taro flour substitution had no significant effect on shape, green color, aroma, and taste, but had a significant effect on white color and texture. Increasing the level of taro flour substitution resulted in decreased scores for white color and texture. The hedonic test results showed that taro flour substitution significantly affected the panelists' acceptance of texture and white color, while no significant differences were observed in the acceptance of the other attributes. The 15% taro flour substitution treatment produced the best overall results and received good acceptance from the panelists. Therefore, taro flour has the potential to be used as a substitute ingredient in the production of Nona Manis cake at a substitution level of 15%.

Introduction (مقدمة)

Traditional cakes are an important part of Indonesia's culinary heritage, each with distinctive characteristics in terms of shape, color, aroma, texture, and taste. One such traditional product is Nona Manis cake, which is characterized by its soft texture and sweet, savory flavor. The cake consists of two main components: a green layer flavored with pandan and a white layer made with coconut milk (Yuli, 2024). Wheat flour is commonly used as one of the main ingredients in its preparation. Given that wheat is not widely cultivated in Indonesia and wheat flour is largely dependent on imports, the use of locally available food resources as alternative ingredients is important for promoting food diversification and reducing reliance on imported raw materials.

Taro is one local food resource with considerable potential as a substitute for wheat flour. It is a tuber crop widely cultivated in Indonesia, including West Sumatra. According to the *West Sumatra in Figures 2026* published by the Central Statistics Agency, Tanah Datar, Solok, and Agam are among the regencies with substantial taro production. Taro is rich in carbohydrates and starch, making it suitable for processing into flour as an alternative carbohydrate source. Its relatively high starch content may influence the physical characteristics of food products, particularly their texture and structure (Nurhidayanti et al., 2022). Converting fresh taro into flour can also extend its shelf life and increase the added value of this local commodity. Nevertheless, taro contains calcium oxalate, an antinutritional compound that may cause itching and irritation. Appropriate processing is therefore necessary to reduce calcium oxalate levels before taro is used as a food ingredient (Marzuki et al., 2024; Noviasari et al., 2024). Fresh taro is also susceptible to postharvest deterioration due to moisture loss, discoloration, respiration, and microbial growth (Putri et al., 2017; Faiha et al., 2025). Processing taro into flour may therefore serve as an effective approach to extending its shelf life while enhancing its utilization as a food ingredient.

The potential of taro flour as a wheat flour substitute has been investigated in a range of bakery and traditional cake products. Saputri (2018) examined its incorporation into *mini rainbow roll cake*, while Hadijah and Andriani (2019) investigated its use in the traditional cake baroncong. Rahmatika (2021) also studied the substitution of wheat flour with taro flour in steamed blooming cake. These studies demonstrate the potential of taro flour for use in various cake products. Meanwhile, a recent study on Nona Manis cake investigated the substitution of wheat flour with mocaf (modified cassava flour) (Oktiyanda & Saleha, 2025). However, to the best of our knowledge, the use of taro flour as a wheat flour substitute in Nona Manis cake has not yet been reported. Because different substitute flours have distinct physicochemical properties, their incorporation may result in different changes in the quality of the final product. Therefore, the effect of taro flour substitution on Nona Manis cake warrants further investigation.

The novelty of the present study lies in the use of taro flour as a wheat flour substitute in Nona Manis cake at substitution levels of 0%, 15%, 30%, and 45%. In addition to evaluating organoleptic quality—including shape, color, aroma, texture, and taste—this study also assesses consumer acceptability of the resulting products. This is particularly relevant because replacing wheat flour with taro flour may alter the physical and sensory characteristics of Nona Manis cake, especially its color and texture. Determining an appropriate substitution level is therefore essential to obtain a product that maintains desirable quality while remaining acceptable to consumers.

This study is expected to contribute to the development of traditional food products based on local resources by demonstrating the potential of taro flour as an alternative to wheat flour. The use of taro flour may support food diversification, increase the added value of locally cultivated taro, and encourage innovation in traditional Indonesian food products. Accordingly, this study aimed to determine the effect of taro flour substitution at levels of 0%, 15%, 30%, and 45% on the organoleptic quality and acceptability of Nona Manis cake.

Research Method and Experimental Design

Method (منهج)

This study employed a true experimental method with a quantitative approach. A Completely Randomized Design (CRD) was used, consisting of four treatments with three replications. The treatments comprised 0% taro flour substitution (X0) as the control, and 15% (X1), 30% (X2), and 45% (X3) taro flour substitution.

The substitution levels of 0%, 15%, 30%, and 45% were determined based on the results of a preliminary study conducted to establish feasible substitution levels for the production of Nona Manis cake. The 0% treatment served as the control to determine the characteristics of Nona Manis cake without taro flour substitution. The 15%, 30%, and 45% substitution levels were selected to observe progressive changes in product quality as the proportion of taro flour increased. The 45% level was established as the highest substitution level based on the preliminary study, taking into consideration the workability of the batter and the characteristics of the resulting cake.

Research Location and Period

The study was conducted in July 2026 at the Culinary Arts Laboratory, Department of Family Welfare Sciences, Faculty of Tourism and Hospitality, Padang State University, Indonesia.

Materials and Equipment

The equipment used in this study included a digital weighing scale, blender, steamer, measuring spoons, spatula, Nona Manis cake molds, pastry brush, stove, mixing bowls, saucepan, measuring cup, kitchen cloth, spoon, and sieve.

The taro variety used in this study was kimpul or Belitung taro (*Xanthosoma sagittifolium*). This variety was selected because of its relatively high starch and carbohydrate content, which makes it a potential local food resource for use as an alternative to wheat flour. Yanti and Putra (2023) reported that kimpul taro contains approximately 68.50% starch. Therefore, kimpul taro is considered suitable as a raw material for producing taro flour and other processed food products.

Research Procedure

1. **Taro Flour Production**

   The production of taro flour began with the selection of good-quality, undamaged taro roots. The taro was peeled and thoroughly washed, then sliced into thin pieces approximately 0.1 cm thick to facilitate drying. The taro slices were soaked in a salt solution for approximately 30 minutes and then drained The slices were subsequently dried using a food dehydrator until completely dry and brittle. The dried taro was ground using a blender to produce flour and then sieved through an 80-mesh sieve to obtain a more uniform particle size. The resulting taro flour was then used as a substitute for wheat flour in the preparation of Nona Manis cake.

2. **Preparation of Nona Manis Cake with Taro Flour Substitution**

   The experimental procedure consisted of three stages: preparation, processing, and sensory evaluation.

   a. Preparation stage

   All ingredients were prepared and weighed according to the formulation specified for each treatment.

   b. Processing stage

The processing began with the preparation of the green batter. Pandan leaves and suji leaves were blended and strained to obtain a natural green extract. The extract was then combined with cornstarch, water, and salt and cooked until the mixture reached a boiling point and began to bubble vigorously.In a separate bowl, eggs and sugar were beaten together. Wheat flour and taro flour were then added, followed by medium-thick coconut milk. The green mixture was combined with the egg mixture and then strained to obtain a smooth batter.The white batter was prepared by combining all ingredients and cooking the mixture until it reached a boiling point and began to bubble vigorously. The green batter was then poured into cake molds that had been lightly greased with oil, followed by the addition of the white batter in the center. The cakes were steamed for approximately 18–20 minutes.

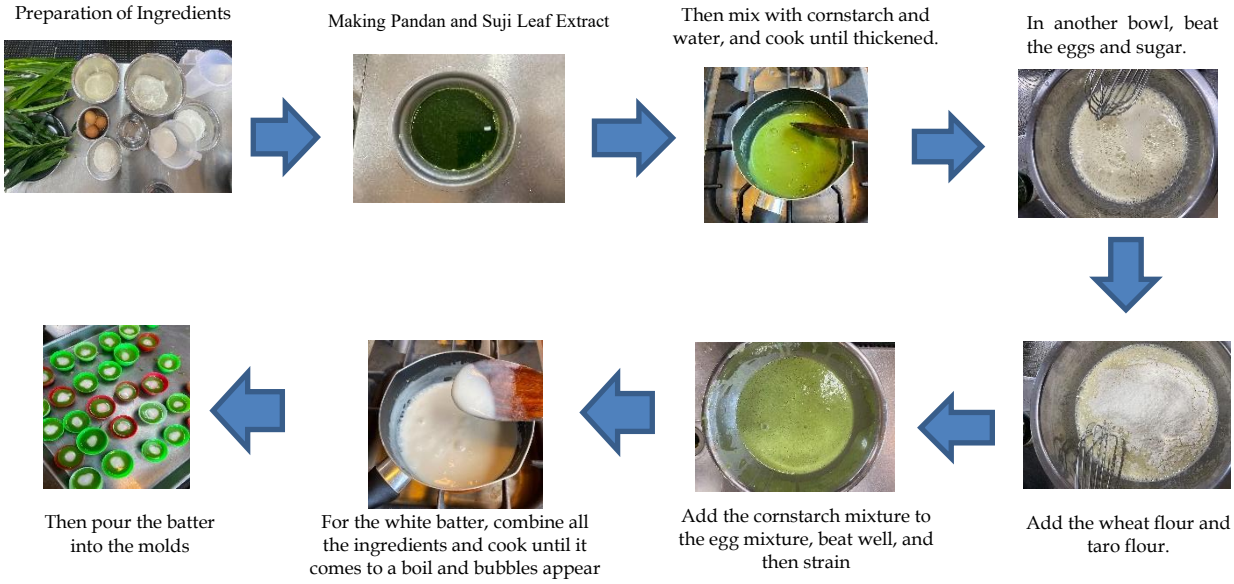
c. Sensory evaluation stage

The final stage involved sensory evaluation of all samples. The products from each treatment were evaluated by the panelists through organoleptic testing to determine their sensory characteristics and acceptability. The ingredients used in the preparation of Nona Manis cake are presented in Table 1.

Table 1. Composition of Ingredients for Nona Manis Cake with Taro Flour Substitution

Bahan	Persentase			
	0%	15%	30%	45%
Green Batter				
Wheat flour	300 gr	225 gr	210 gr	165 gr
Taro Flour	-	45 g	90 gr	135 gr
Cornstarch	55 gr	55 gr	55 gr	55 gr
Granulateed Sugar	300 ml	300 ml	300 ml	300 ml
Eggs	3 eggs	3 eggs	3eggs	3 eggs
Medium-Consistency Coconut Milk	500 ml	500 ml	500 ml	500 ml
salt	½ sdt	½ sdt	½ sdt	½ sdt
Water	200 ml	200 ml	200 ml	200 ml
Suji Leaves	30 leaves	30 leaves	30 leaves	30 leaves
Pandan Leaves	10 leaves	10 leaves	10 leaves	10 leaves
White Batter				
Wheat Flour	20 gr	17 gr	14 gr	11 gr
Taro Flour	-	3 gr	6 gr	9 gr
Thick Coconut Milk	500 ml	500 ml	500 ml	500 ml
Granulated Sugar	20 gr	20 gr	20 gr	20 gr
Salt	½ sdt	½ sdt	½ sdt	½ sdt

Process of Making Nona Manis Cake



Data Analysis Technique

The data in this study were obtained through organoleptic evaluation, consisting of a ranking test and a hedonic test using a 1–7 Likert scale. The evaluation was conducted by 30 semi-trained panelists comprising undergraduate (S1) and diploma (D3) students majoring in Culinary Arts. Each sample was presented using a random code, and the panelists were asked to independently evaluate the samples using the provided instruments.

The organoleptic test data were tabulated and analyzed using Analysis of Variance (ANOVA) to determine the effect of taro flour substitution on the quality of Nona Manis cake. If the ANOVA results showed that the calculated F-value (F_{calculated}) was greater than the critical F-value (F_{table}), the analysis was continued using Duncan's Multiple Range Test (DMRT) to identify significant differences among treatments.

Result (نتائج)

This study evaluated the quality of Nona Manis cake supplemented with taro flour through organoleptic testing, including assessments of shape, color, aroma, texture, and taste.

Ranking Test

The following presents the final tabulated results of the ranking test for Nona Manis cake with taro flour substitution, as shown in Figure 1.

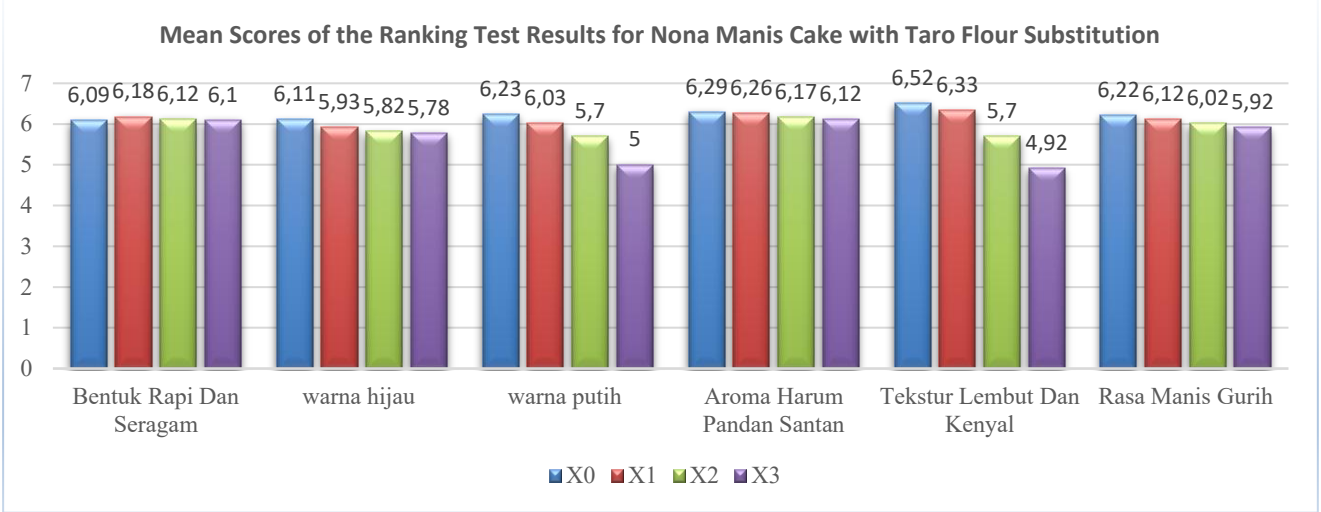


Figure 1. Results of the Ranking Test for Nona Manis Cake Quality with Taro Flour Substitution

a. Shape Quality

The results showed that taro flour substitution did not significantly affect the shape of Nona Manis cake. This finding is supported by the analysis of variance (ANOVA) presented in **Table 2**, which showed that the calculated F-value was lower than the critical F-value (0.28 < 2.71). Therefore, taro flour substitution of up to 45% was still able to maintain the shape of Nona Manis cake. The mean scores for all treatments in the neat and uniform category were 6.09 (X0), 6.18 (X1), 6.12 (X2), and 6.10 (X3).

Table 2. Analysis of Variance for the Shape Quality of Nona Manis Cake with Taro Flour Substitution

Source of variation	DF	SS	MS	Fvalue	Fcritical
Samples	3,00	0,14	0,05	0,28	2,71
Panelists	29,00	9,37	0,32	1,94	1,60
Eror/Residual	87,00	14,47	0,17		
Total	119,00	23,99			

This finding is consistent with Nurazizah (2022, as cited in Hendri et al., 2026), who stated that a neat and uniform shape reflects the proper and consistent processing of the dough, including kneading, rolling, and molding. In addition, Anggraini (2025) reported that shape uniformity is influenced by the rolling technique, dough thickness, and the use of the same mold throughout the production process. In this study, the Nona Manis cake was molded using the same mold, resulting in a relatively uniform shape across all treatments.

b. Green colour Quality

The results showed that taro flour substitution did not significantly affect the green color of Nona Manis cake. As presented in **Table 3**, the calculated F-value was lower than the critical F-value (1.40 < 2.71), indicating that taro flour substitution of up to 45% did not significantly alter the green color of the product. The mean scores were 6.11 for X0, 6.07 for X1, 5.94 for X2, and 5.88 for X3. The relatively small differences among treatments indicate that the green color was consistently maintained across the substitution levels.

Table 3. Analysis of Variance for the Green Color Quality of Nona Manis Cake with Taro Flour Substitution

Source of variation	DF	SS	MS	Fvalue	Fcritical
Samples	3,00	1,04	0,35	1,40	2,71
Panelists	29,00	9,17	0,32	1,28	1,60
Eror/Residual	87,00	21,57	0,25		
Total	119,00	31,78			

Taro flour substitution of up to 45% still produced the characteristic green color of Nona Manis cake. This was primarily attributed to the use of pandan and suji leaf extracts as natural colorants, which provided a dominant green color to the batter. The green pigments from these extracts likely masked the relatively dull color of taro flour, allowing the characteristic green color of Nona Manis cake to be maintained even at the highest substitution level.

c. White Color Quality

The results showed that taro flour substitution significantly affected the white color of Nona Manis cake. As presented in **Table 4**, the calculated F-value was higher than the critical F-value (32.83 > 2.71), indicating a significant effect of taro flour substitution. As the substitution level increased, the quality of the white color slightly decreased. The mean scores for the white color attribute were 6.23 for X0, 6.03 for X1, 5.70 for X2, and 5.00 for X3, showing a gradual decrease in white color intensity with increasing taro flour substitution.

Table 4. Analysis of Variance for the White Color Quality of Nona Manis Cake with Taro Flour Substitution

Source of variation	DF	SS	MS	Fvalue	Fcritical
Samples	3,00	26,36	8,79	32,83	2,71
Panelists	29,00	8,46	0,29	1,09	1,60
Eror/Resisual	87,00	23,28	0,27		
Total	119,00	58,10			

Based on the ANOVA results indicating a significant difference, Duncan's Multiple Range Test (DMRT) was conducted to identify differences among treatments. The results presented in **Table 5** showed that each treatment was assigned to a different statistical group, indicating significant differences in the white color quality of Nona Manis cake. Increasing the proportion of taro flour resulted in a progressive reduction in white color quality, with X3 producing a slightly duller white color, followed by X2, X1, and X0.

Table 5. Duncan's Multiple Range Test (DMRT) for the White Color Quality of Nona

Treatment	Mean	LSR + Mean	notation
X3 (45%)	5,00	5,29	a
X2 (30%)	5,70	5,98	b
X1 (15%)	6,03	6,30	c
X0 (0%)	6,23		c

Manis Cake Substituted with Taro Flour

In this study, increasing the substitution level of taro flour up to 45% resulted in a decrease in the quality of the white color of the Nona Manis cake, making it slightly duller. This was presumably related to the color characteristics of taro flour, which contributed to the color of the batter. The higher the amount of taro flour used, the greater its contribution to the final color of the product. This finding is consistent with the opinion of Arisandy and Estiasih (2016), who stated that enzymatic browning reactions are caused by the presence of phenolic compounds, such as phenolase enzymes, in food materials. Phenolase enzymes present in tubers become active in the presence of oxygen, resulting in a browning reaction. In addition, the heating process during steaming may cause color changes in the flour components, resulting in a less bright white color. Therefore, the increasing use of taro flour can affect the appearance of the white color of Nona Manis cake, although this change does not occur in the green color because the green color of the product is predominantly derived from the use of pandan extract and suji leaves.

d. Tekture Quality

The results showed that the substitution of taro flour had a significant effect on the texture of Nona Manis cake. This finding was supported by the analysis of variance (ANOVA) results presented in **Table 6**, which showed that the calculated F-value was greater than the F-table value (93.26 > 2.71). Therefore, the higher the level of taro flour substitution, the more the texture quality of the Nona Manis cake decreased slightly. The mean scores for all treatments in the soft and chewy texture category were 6.52 for X0, 6.33 for X1, 5.70 for X2, and 5.49 for X3.

Table 6. Analysis of Variance of the Texture Quality of Nona Manis Cake Substituted with Taro Flour

Source of variation	DF	SS	MS	Fvalue	Fcritical
Sampls	3,00	47,02	15,67	93,26	2,71
Panelists	29,00	3,09	0,11	0,63	1,60
Eror/Residual	87,00	14,62	0,17		
Total	119,00	64,73			

Based on the ANOVA results indicating a significant difference among treatments, the analysis was continued using Duncan's Multiple Range Test (DMRT) to determine which treatments differed significantly. The results of the Duncan test presented in **Table 7** show that each treatment was assigned to a different group. Therefore, it can be concluded that increasing the amount of taro flour resulted in a significant difference in the soft and chewy texture of Nona Manis cake. Treatment X3 produced a slightly denser texture, followed by X2, X1, and X0.

Table 7. Duncan's Multiple Range Test (DMRT) for the Texture Quality of Nona Manis Cake Substituted with Taro Flour

Treatment	Mean	LSR + Mean	notation
X3 (45%)	4,92	5,15	a
X2 (30%)	5,70	5,92	b
X1 (15%)	6,33	6,54	c
X0 (0%)	6,52		c

The decrease in the texture quality of Nona Manis cake occurred at 30% and 45% taro flour substitution levels, resulting in a less chewy texture. This was attributed to the reduced proportion of wheat flour, which led to a less soft and chewy product. This finding is consistent with Hadi et al. (2023), who explained that wheat flour contains gluten and is therefore a primary ingredient in cake production. Gluten plays an important role in forming a soft and smooth texture in cake products. Excessive substitution of wheat flour with taro flour may cause the texture of Nona Manis cake to become denser, thereby reducing the desired soft and chewy characteristics.

e. Aroma Quality

The results showed that the substitution of taro flour had no significant effect on the aroma of Nona Manis cake. This finding was supported by the analysis of variance (ANOVA) results presented in **Table 8**, which showed that the calculated F-value was lower than the F-table value (0.75 < 2.71). Therefore, taro flour substitution of up to 45% was still able to maintain the characteristic aroma of Nona Manis cake, namely the fragrant aroma of pandan and coconut milk. The mean scores for all treatments in the fragrant pandan and coconut milk aroma category were 6.29 for X0, 6.26 for X1, 6.17 for X2, and 6.12 for X3.

Table 8. Analysis of Variance of the Aroma Quality of Nona Manis Cake Substituted with Taro Flour

Source of variation	DF	SS	MS	Fvalue	Fcretical
Sampel	3,00	0,54	0,18	0,75	2,71
Panelis	29,00	4,15	0,14	0,60	1,60
Galat/Residual	87,00	20,66	0,24		
Total	119,00	25,35			

The taro flour production process in this study used a *food dehydrator*, resulting in taro flour with a less pronounced aroma. This was attributed to the short and enclosed drying process, which prevented the taro from being exposed to or contaminated by other odors that could cause undesirable aromas. This finding is consistent with Erni (2018), who stated that the use of a *cabinet food dehydrator* helps prevent taro from being contaminated by other odors. In addition, the dominant characteristic aroma of pandan and coconut milk may mask the aroma of taro flour. Therefore, taro flour substitution of up to 45% did not substantially affect the aroma quality of Nona Manis cake as perceived by the panelists.

f. Taste Quality

The results showed that the substitution of taro flour had no significant effect on the taste of Nona Manis cake. This finding was supported by the analysis of variance (ANOVA) results presented in **Table 9**, which showed that the calculated F-value was lower than the F-table value (1.50 < 2.71). Therefore, taro flour substitution of up to 45% was still able to maintain the characteristic taste of Nona Manis cake, namely a sweet taste. The mean scores for all treatments in the sweet taste category were 6.22 for X0, 6.12 for X1, 5.98 for X2, and 6.02 for X3.

Table 9. Analysis of Variance of the Taste Quality of Nona Manis Cake Substituted with Taro Flour

Source of variation	DF	SS	MS	Fvalue	Fcritical
Samples	3,00	1,07	0,36	1,50	2,71
Panelists	29,00	6,97	0,24	1,01	1,60
Eror/Residual	87,00	20,74	0,24		
Total	119,00	28,78			

This indicates that taro flour substitution of up to 45% did not affect the taste quality of Nona Manis cake. In addition, the taste of Nona Manis cake was predominantly sweet due to the sugar and savory due to the salt and coconut milk used in the batter, resulting in a product that retained its characteristic sweet and savory taste. This finding is consistent with Dana (2018), who stated that taro flour has a neutral taste similar to wheat flour; therefore, its use as a substitute does not impart a strong taste to the product.

Hedonik Test

The following presents the final data tabulation results of the hedonic test for Nona Manis cake with taro flour substitution, as shown in **Figure 2**.

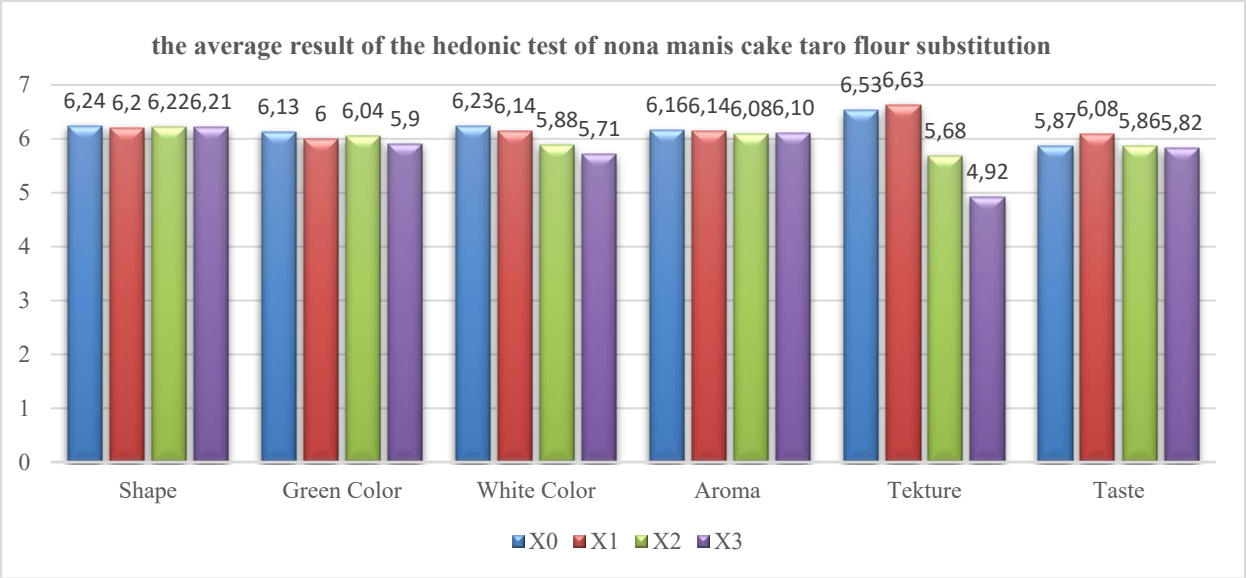


Figure 2. Research Results Graph of the Quality Ranking Test for Nona Manis Cake with Taro Flour Substitution

a. Shape Preference

The hedonic test results showed that taro flour substitution did not reduce panelists' acceptance of the shape of Nona Manis cake. The mean scores were within the "liked" category, with X0 scoring 6.24, X1 scoring 6.20, X2 scoring 6.22, and X3 scoring 6.21. The analysis of variance (ANOVA) results presented in **Table 10** showed that the calculated F-value was lower than the F-table value (0.05 < 2.71). This indicates that taro flour substitution of up to 45% was not sufficient to significantly alter the shape of Nona Manis cake. Therefore, the characteristic shape of Nona Manis cake remained stable and was still well accepted by the panelists.

Table 10. Analysis of Variance of Panelists' Preference for the Shape Preference of Nona Manis Cake with Taro Flour Substitution

Source of variation	DF	SS	MS	Fvalue	Fcritical
Samples	3,00	0,03	0,01	0,05	2,71
Panelists	29,00	5,97	0,21	1,03	1,60
Eror/Residual	87,00	17,44	0,20		
Total	119,00	23,44			

Based on the results of the analysis of variance (ANOVA), there was no significant difference among the treatments. Therefore, the analysis was not continued with Duncan's multiple range test. This finding indicates that although taro flour was substituted at different concentrations, the panelists gave relatively similar evaluations of the shape of the Nona Manis cake. Thus, the substitution of taro flour at levels of up to 45% did not significantly affect panelists' preference for the shape of the Nona Manis cake.

b. Preference For Green Colour

The green color of the Nona Manis cake was more dominant than the color contributed by the taro flour. This was indicated by the mean panelists' preference scores across treatments, namely 6.13 for X0, 6.00 for X1, 6.04 for X2, and 5.90 for X3. The results of the analysis of variance (ANOVA), presented in **Table 11**, showed that the calculated F-value was lower than the F-table value (1.39 < 2.71). These results indicate that there was no significant difference among the treatments in terms of panelists' preference for the green color of the Nona Manis cake.

Table 11. Analysis of Variance of Panelists' Preference for the Green Color of Nona Manis Cake with Taro Flour Substitution

Source of variation	DF	SS	MS	Fvalue	Fcritical
Samples	3,00	0,85	0,28	1,39	2,71
Panelists	29,00	7,09	0,24	1,20	1,60
Eror/Residual	87,00	17,68	0,20		
Total	119,00	25,62			

Based on the ANOVA results, the analysis was not continued with Duncan's multiple range test because the calculated F-value was lower than the F-table value. This indicates that there was no significant difference among the treatments in terms of panelists' preference for the green color of the Nona Manis cake. Therefore, all treatments resulted in relatively similar levels of acceptance of the product's green color.

c. Preference For White Color

The acceptability of the white color of Nona Manis cake slightly decreased as the level of taro flour substitution increased. This was indicated by the mean panelists' preference scores for each treatment, namely 6.23 for X0, 6.09 for X1, 5.91 for X2, and 5.92 for X3. The results of the analysis of variance (ANOVA) presented in **Table 12** showed that the calculated F-value was greater than the tabulated F-value (6.23 > 2.71). These results indicate that taro flour substitution had a significant effect on the panelists' preference for the white color of Nona Manis cake.

Table 12. Analysis of Variance of Panelists' Preference for the White Color of Nona Manis Cake with Taro Flour Substitution

Source Of Variation	DF	SS	MS	Fvalue	Fcritical
Samples	3,00	5,20	1,73	6,32	2,71
Panelists	29,00	9,02	0,31	1,13	1,60
Eror/Residual	87,00	23,88	0,27		
Total	119,00	38,10			

Based on the ANOVA results, the analysis was continued with Duncan's multiple range test to determine which treatments resulted in significant differences in panelists' preference for the white color. The Duncan's test results presented in **Table 12** show that the treatment with up to 45% taro flour substitution began to show a decrease in the level of preference for the white color compared with the other treatments. Meanwhile, treatments X0 and X1 still had relatively higher levels of acceptance of the white color.

Table 12. Duncan's Multiple Range Test (DMRT) of Panelists' Preference for the White Color of Nona Manis Cake with Taro Flour Substitution

Treatmen	Mean	LSR + Mean	Notation
X3 (45%)	5,71	6,00	a
X2 (30%)	5,88	6,16	b
X1 (15%)	6,14	6,41	c
X0 (0%)	6,23		c

This indicates that a higher level of taro flour substitution may reduce panelists' preference for the white color of the Nona Manis cake. The decrease in quality was associated with the less soft and less elastic texture produced in treatments X2 and X3.

d. Preference Aroma

The hedonic test results showed that taro flour substitution did not decrease the panelists' acceptance of the aroma of Nona Manis cake. The mean scores were within the "liked" category, with X0 scoring 6.16, X1 scoring 6.14, X2 scoring 6.08, and X3 scoring 6.10. The results of the analysis of variance (ANOVA) presented in **Table 13** showed that the calculated F-value was lower than the tabulated F-value (0.24 < 2.71). This indicates that taro flour substitution of up to 45% was not sufficient to significantly alter the aroma of Nona Manis cake. Therefore, the characteristic aroma of Nona Manis cake, particularly the fragrant aroma of pandan and coconut milk, remained dominant and was well accepted by the panelists.

Table 13. Analysis of Variance of Panelists' Preference for the Aroma Quality of Nona Manis Cake Substituted with Taro Flour

Sourtion of variation	DF	SS	MS	Fvalue	Ftcritical
Samples	3,00	0,12	0,04	0,24	2,71
Panelists	29,00	5,26	0,18	1,07	1,60
Eror/Residual	87,00	14,80	0,17		
Total	119,00	20,18			

Based on the ANOVA results, there was no significant difference among the treatments. Therefore, the analysis was not continued with Duncan's multiple range test. This finding indicates that although taro flour was substituted at different concentrations, the panelists gave relatively similar ratings for the aroma of Nona Manis

cake. Thus, taro flour substitution of up to 45% did not significantly affect the panelists' preference for the aroma of Nona Manis cake.

e. Preference Texture

The acceptability of the texture of Nona Manis cake slightly decreased as the level of taro flour substitution increased. This was indicated by the mean panelists' preference scores for each treatment, namely 6.53 for X0, 6.36 for X1, 5.68 for X2, and 4.92 for X3. The results of the analysis of variance (ANOVA) presented in **Table 14** showed that the calculated F-value was greater than the tabulated F-value (78.09 > 2.71). These results indicate that taro flour substitution significantly affected the panelists' preference for the texture of Nona Manis cake.

Table 14. Analysis of Variance of Panelists' Preference for the Texture Quality of Nona Manis Cake Substituted with Taro Flour

Source of variation	DF	SS	MS	Fvalue	Fcritical
Samples	3,00	48,33	16,11	78,09	2,71
Panelists	29,00	6,21	0,21	1,04	1,60
Eror/Residual	87,00	17,95	0,21		
Total	119,00	72,49			

Based on the ANOVA results, the analysis was continued with Duncan's Multiple Range Test (DMRT) to determine which treatments differed significantly in terms of panelists' preference for texture. The results of the Duncan test presented in **Table 15** showed that the treatment with 45% taro flour substitution began to show a decrease in texture acceptability compared with the other treatments. Meanwhile, treatments X0 and X1 still received relatively higher levels of acceptance for texture.

Table 15. Duncan's Multiple Range Test (DMRT) of Panelists' Preference for the Texture Quality of Nona Manis Cake Substituted with Taro Flour

treatment	Mean	LSR + Mean	Notation
X3 (45%)	4,92	5,18	a
X2 (30%)	5,68	5,92	b
X1 (15%)	6,36	6,59	c
X0 (0%)	6,53		c

This indicates that increasing the level of taro flour substitution may negatively affect the panelists' preference for the texture of Nona Manis cake. The decrease in texture quality may be attributed to the less soft and less chewy texture observed in treatments X2 and X3.

f. Preference Taste

The hedonic test results showed that taro flour substitution did not decrease the panelists' acceptance of the taste of Nona Manis cake. The mean scores were within the "liked" category, with X0 scoring 5.94, X1 scoring 6.14, X2 scoring 5.89, and X3 scoring 5.90. The results of the analysis of variance (ANOVA) presented in **Table 16** showed that the calculated F-value was lower than the tabulated F-value (1.96 < 2.71). This indicates that taro flour substitution of up to 45% was not sufficient to significantly alter the taste

of Nona Manis cake. Therefore, the characteristic taste of Nona Manis cake, namely its sweet and savory flavor, remained dominant and was well accepted by the panelists.

Table 16. Analysis of Variance of Panelists' Preference for the Taste Quality of Nona Manis Cake Substituted with Taro Flour

Sourcce of variation	DF	SS	MS	Fhvalue	Fcritical
Samples	3,00	1,28	0,43	1,96	2,71
Panelists	29,00	3,42	0,12	0,54	1,60
Eror/Residual	87,00	18,86	0,22		
Total	119,00	23,55			

Based on the ANOVA results, there was no significant difference among the treatments. Therefore, the analysis was not continued with Duncan's Multiple Range Test (DMRT). This finding indicates that although taro flour was substituted at different concentrations, the panelists gave relatively similar ratings for the taste of Nona Manis cake. Thus, taro flour substitution of up to 45% did not significantly affect the panelists' preference for the taste of Nona Manis cake.

Conclusion And Advice (خاتمة)

Based on the research findings, 15% taro flour substitution (X1) was identified as the best treatment for maintaining the quality and panelists' acceptance of Nona Manis cake. Increasing the level of taro flour substitution tended to decrease panelists' acceptance of the white color and texture. The white color became slightly duller at higher substitution levels, which was presumably caused by phenolic compounds and the activity of phenolase enzymes in taro flour, which can produce brownish discoloration. However, the green color was maintained due to the dominance of the color derived from pandan and suji leaf extracts. The decrease in texture acceptance was presumably caused by the absence of gluten in taro flour and its high starch content, so that increasing the level of taro flour substitution resulted in a less elastic dough structure.

The hedonic test results showed that all treatments were still accepted by the panelists and were categorized as "liked." A 15% taro flour substitution level was selected as the best treatment because it provided good panelist acceptance without causing a substantial decrease in product quality. Therefore, taro flour has the potential to be used as a substitute ingredient in the production of Nona Manis cake while supporting the utilization of local food resources and food product diversification.

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