



Impact of Patin Fish Flour on Mocaf Semprit Cookies

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Abstract. This study aims to determine the differences in preference, protein content, and water content in Mocaf flour Semprit cookies with the addition of Patin fish flour, evaluated based on taste, color, texture, and aroma. Mocaf flour and Patin fish flour are expected to produce high-protein, locally sourced Semprit cookies as a healthy snack. The objects of this study were Mocaf flour Semprit cookies with the addition of Patin fish flour at 0%, 10%, 15%, and 20%. The experimental design used was completely randomized. The independent variable in this study is the addition of Patin fish flour at 0%, 10%, 15%, and 20%, a count of the total Mocaf flour used in making Semprit cookies. The dependent variables are the differences in preference, protein, and water content of the experimental Semprit cookies. The experimental design used was completely randomized. Data collection methods included preference testing and testing for protein and water content. The data analysis methods used were the Kruskal-Wallis and Mann-Whitney tests. Protein content was tested using the Kjeldahl method, and water content was tested using the gravimetric method. The results showed differences in color, texture, aroma, and taste preference indicators. Protein content test results for the 0% formula were 8.79%, 10%: 9.06%, 15%: 10.41%, and 20%: 12.3%. Water content was 5.58% for 0%, 5.9% for 10%, 6.34% for 15%, and 6.61% for 20%.

Keywords: Semprit cookies, Mocaf flour, Patin fish flour.

INTRODUCTION

Semprit cookies are a type of dry biscuit made from wheat flour, fat, eggs, and sugar. Classified as rich biscuits due to their high-fat content, they use fat equal to half the weight of the flour (Prasetya & Purwidiani, 2014). These small cookies come in various shapes, created by pressing the dough through molds or piping, known as the pressed cookies method. Semprit cookies are known for their sweet and savory flavor, with the sweetness derived from sugar and the savory taste from margarine (Atmaja & Melinita, 2022).

According to Gayati (2014), Semprit cookies can be made from flours other than tapioca flour that do not contain gluten, as dry cookies do not require leavening. Mocaf flour (modified cassava flour) is one such flour that can be used as a base for Semprit cookies. Mocaf flour is made from cassava modified through fermentation, resulting in altered characteristics such as increased viscosity (adhesiveness), protein absorption, gelling ability, rehydration capacity, and solubility (Seveline et al., 2020). It also has a better texture compared to regular tapioca or cassava flour (Suarti & Masyhura, 2015). However, using Mocaf flour as the main ingredient in Semprit cookies has a drawback due to its lower % protein content of 1.2%, compared to low-protein wheat flour, which contains 7-8.5% protein (Salim, 2024).

This study aims to develop traditional Semprit cookies from tapioca flour to enhance flavor variety and increase protein content, making them nutritious snacks that meet Semprit cookie standards. The cookies will be made by

adding fish flour, specifically from the high-protein Patin fish (*Pangasius hypothalamus*), a freshwater fish well-known in Indonesia. Patin fish have abundant white flesh and are a prominent commodity for cultivation. The nutritional content of processed Patin fish flour per 100g includes 68.6% protein, 5.8% fat, 3.5% ash, and 59.3% water. Therefore, using Mocaf flour as a substitute for wheat flour with Patin fish flour in Semprit cookie production is expected to increase the protein content to meet the SNI 2973:2022 standard and provide a nutritious snack alternative.

The research focuses on developing Mocaf Semprit cookies by incorporating varying amounts of Patin fish flour (0% as control, 10%, 15%, and 20% of the total Mocaf flour). The objectives are twofold: first, to assess public preference regarding the color, texture, aroma, and taste of the cookies with different levels of added Patin fish flour, and second, to analyze the protein and water content of the cookies with the varying levels of added fish flour. This study aims to enhance the nutritional value and consumer appeal of Mocaf Semprit cookies, potentially offering a healthier snack alternative.

METHOD

The study employs an experimental research design, specifically a completely randomized design. The independent variable is the addition of Patin fish flour at 0%, 10%, 15%, and 20%. The dependent variables are the differences in preference levels, assessed through indicators of texture, taste, aroma, color, protein content, and water content. The control variable in this study includes the control of the fish flour itself, which was processed by heating in an electric drying apparatus at 60°C for 4 hours and sieved to a particle size of 100 mesh. The cookies were shaped using a star-shaped piping tip. Data collection involved preference testing with 80 untrained panelists. Data analysis was conducted using the Kruskal-Wallis test with Mann-Whitney post hoc analysis. Protein content was analyzed using the Kjeldahl method, while water content was determined gravimetrically. These analyses were conducted at the Food and Nutrition Study Center Laboratory, Universitas Gadjah Mada, Yogyakarta.

RESULT AND DISCUSSION

The research was conducted at the Food and Beverage Education Study Program Laboratory, Faculty of Engineering, Universitas Negeri Semarang. The assessment of preference differences towards Semprit cookies with added Patin fish flour was carried out by 80 untrained panelists from the surrounding community of UNNES. The panelists assessed the level of preference for Semprit cookies with added Patin fish flour based on the indicators of color, texture, aroma, and taste. Each assessment indicator consisted of 5 levels of scoring. A score of 1 indicated the lowest value, while a score of 5 indicated the highest value.

Data was collected by providing observation sheets to 80 untrained panelists. After the data was collected, data analysis was performed using the Kruskal-Wallis test with Mann-Whitney post hoc analysis. The panelists provided assessments of preference differences, including aspects of color, texture, aroma, and taste, for Semprit cookies with added Patin fish flour in formulations of 0%, 10%, 15%, and 20%, as follows:

1. Formula 0%: Semprit cookies made with 100% Mocaf flour and 0% added Patin fish flour.
2. Formula 10%: Semprit cookies made with 100% Mocaf flour and 10% added Patin fish flour.
3. Formula 15%: Semprit cookies made with 100% Mocaf flour and 15% added Patin fish flour.
4. Formula 20%: Semprit cookies made with 100% Mocaf flour and 20% added Patin fish flour.

The preference assessment for Mocaf flour Semprit cookies with added Patin fish flour was conducted by 80 untrained panelists, including 50 students from the UNNES Food and Beverage Education Program and 30 untrained panelists from the surrounding community of UNNES. The aspects assessed included color, texture, aroma, and taste, rated on a scale of 1 (dislike) to 5 (like). The summary of the average preference test results from the assessment of 80 untrained panelists for the experimental Mocaf flour Semprit cookies can be seen in **TABLE 1**.

The Average Results of Preference Testing for Mocaf Flour Semprit Cookies with Added Patin Fish Flour

TABLE 1. Average Results of Preference Testing for Mocaf Flour Semprit Cookies with Added Patin Fish Flour

No	The addition of Patin fish flour	Preference Aspect				Average Preference Aspect
		Color	Texture	Aroma	Taste	
1	0%	8.91	7.87	7.67	8.54	8.25
2	10%	7.16	6.66	6.71	7.23	6.94
3	15%	4.93	5.8	4.49	4.24	4.87
4	20%	4.41	6.09	4.29	4.54	4.83

Based on the data above, it can be seen that the highest average preference level for Mocaf flour Semprit cookies is for cookies without Patin fish flour or with 0% added flour, with an average of 8.25. This is followed by adding 10% Patin fish flour with an average of 6.94, then 15% Patin fish flour with an average of 4.87, and 20% Patin fish flour with an average of 4.83. If we observe the table above regarding the average preference aspect, the higher the addition of Patin fish flour, the lower the preference level for texture. Looking at the ratings for each preference aspect, the highest score for color preference was obtained for the addition of 0% Patin fish flour (8.91), followed by 10% Patin fish flour with a score of 7.16, then 15% Patin fish flour with a score of 4.93, and the lowest score was for 20% Patin fish flour with a score of 4.41. For texture preference, the highest score was obtained for the addition of 0% Patin fish flour (7.87), followed by 10% Patin fish flour with a score of 6.66, and the lowest score was for 15% Patin fish flour with a score of 5.8.

Regarding aroma preference, the highest score was for adding 0% Patin fish flour (7.67), and the lowest was for 20% Patin fish flour. Similarly, the highest score for taste preference was for adding 0% Patin fish flour (8.54), while the lowest was for 15% Patin fish flour (4.24). Based on the experiment results, the graph in **FIGURE 1** below provides a more precise visualization of the preference ratings for Mocaf flour Semprit cookies with added Patin fish flour.

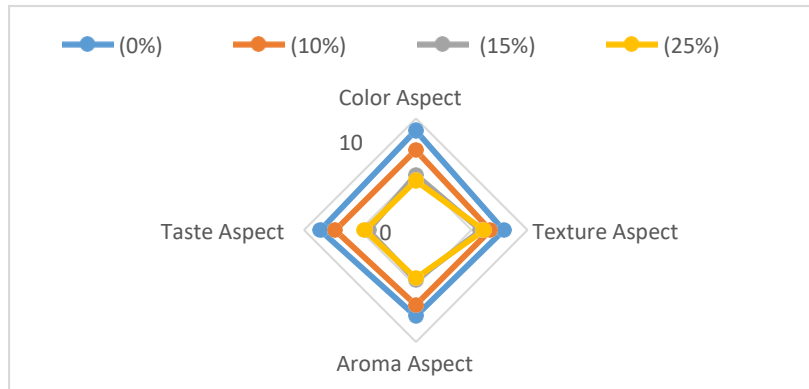


FIGURE 1. Graph of Experimental Semprit Cookie Preference Levels

The Difference in Preference for Semprit Cookies Between Formula 0% and Formula 10%

Below is a summary of the research findings regarding the preference difference between Mocaf flour Semprit cookies with added Patin fish flour between Formula 0% and Formula 10%. The calculation results using the Mann-Whitney post hoc test are presented in **TABLE 2**.

TABLE 2. Summary of research results between formula 0% and formula 10% .

Formula 0% and 10%			
α count: α table			
Color	Texture	Aroma	Taste
0.001<0.05	0.001<0.05	0.001<0.05	0.001<0.05

From the data analysis using the Mann-Whitney test between Formula 0% and Formula 10%, the result α count < α table was obtained, indicating a difference in preference for Mocaf flour Semprit cookies with added Patin fish flour in terms of color, texture, aroma, and taste. The addition of Patin fish flour in Formula 0% (no added Patin fish flour) compared to Formula 10% in Mocaf flour Semprit cookies shows a difference in preference. This indicates that using Patin fish flour in Mocaf flour Semprit cookies affects the preference level regarding color, texture, aroma, and taste.

The Difference in Preference for Semprit Cookies Between Formula 0% and Formula 15%

TABLE 3. Summary of research results between formula 0% and formula 15% .

Formula 0%: Formula 15%			
α count: α table			
Color	Texture	Aroma	Taste
0.001<0.05	0.001<0.05	0.001<0.05	0.001<0.05

The result of the data analysis between Formula 0% and Formula 15% is the same as between Formula 0% and 10%, where α count < α table. This indicates a difference in preference for Mocaf flour Semprit cookies with added Patin fish flour in terms of color, texture, aroma, and taste.

The Difference in Preference for Semprit Cookies Between Formula 0% and Formula 20%

TABLE 4. Summary of research results between formula 0% and formula 20% .

Formula 0%: Formula 20%			
α count: α table			
Color	Texture	Aroma	Taste
0.001<0.05	0.001<0.05	0.001<0.05	0.001<0.05

The result of the data analysis between Formula 0% and Formula 20% is the same as between Formula 0% and 10%, as well as 0% and Formula 15%, where α count < α table. This indicates a difference in preference for Mocaf flour Semprit cookies with added Patin fish flour in terms of color, texture, aroma, and taste.

The Difference in Preference for Semprit Cookies Between Formula 10% and Formula 15%

TABLE 5. Summary of research results between formula 10% and formula 15% .

Formula 10%: Formula 15%			
α count: α table			
Color	Texture	Aroma	Taste
0.001<0.05	0.001<0.05	0.001<0.05	0.001<0.05

Based on the analysis between Formula 10% and Formula 15%, the result is α count < α table, indicating a difference in preference for Mocaf flour Semprit cookies with added Patin fish flour in terms of color, texture, aroma, and taste. Adding Patin fish flour affects the preference levels for Mocaf flour Semprit cookies, impacting aspects such as color, texture, aroma, and taste.

The Difference in Preference for Semprit Cookies Between Formula 15% and Formula 20%

TABLE 6. Summary of research results between formula 15% and formula 20%.

Formula 15%: Formula 20%			
α count: α table			
Color	Texture	Aroma	Taste
0.015<0.05	0.20<0.05	0.015<0.05	0.015<0.05

Between Formula 15% and Formula 20%, the result is α count < α table, indicating a difference in preference for Mocaf flour Semprit cookies with added Patin fish flour in terms of color, texture, aroma, and taste. The result is consistent with those between Formula 0% and 10%, 15%, 20%, and 10% and 15%, 20%.

Protein and Water Content Analysis Results

TABLE 7. Results of protein and water content analysis.

Sample	Analysis	Repetition 1	Repetition 2	Average
0%	Protein	8.7	8.89	8.79
0%	Water	5.58	5.83	5.58
10%	Protein	9.48	8.65	9.06
10%	Water	6	6.62	5.9
15%	Protein	10.33	10.49	10.41
15%	Water	6.37	5.43	6.34
20%	Protein	11.34	13.26	12.3
20%	Water	6.4	6.29	6.61

Based on the table above, the protein content in Semprit cookies increases with the addition of Patin fish flour, averaging 0%: 8.79, 10%: 9.06, 15%: 10.41, and 20%: 12.3. This indicates that the higher the addition of Patin fish flour to Mocaf flour Semprit cookies, the higher the protein content.

Observing **TABLE 7**, it is evident that the water content in Semprit cookies increases with the addition of Patin fish flour. The water content increases as follows: 0% (5.58), 10% (5.90), 15% (6.34), and 20% (6.61). Based on these results, the experimental products do not meet the SNI water content requirement, which stipulates a maximum of 5%.

Discussion

Based on the results of the preference test for each aspect, the scores for color preference are as follows: the highest score was achieved with no addition of Patin fish flour (0%), with a score of 8.91. This was followed by a 10% addition of Patin fish flour, scoring 7.16, a 15% addition, scoring 4.93, and the lowest score was for a 20% addition, which scored 4.41. Observing the preference scores for Semprit cookies with increasing amounts of Patin fish flour, it is evident that higher additions of Patin fish flour result in lower preference scores. This indicates that the higher the amount of Patin fish flour added to Mocaf Semprit cookies, the higher the level of dislike for the cookies.

This study shows that adding Patin fish flour at 0% (no addition), 10%, 15%, and 20% to Mocaf flour Semprit cookies results in different colors. The addition of Patin fish flour at 0% (no addition) produces a golden yellow color, which received the highest rating as it is the original color of the Semprit cookies. Meanwhile, the lowest rating for color was for the addition of Patin fish flour at 20%, resulting in darker cookies. This indicates that the more Patin fish flour added to Mocaf flour Semprit cookies, the darker the color of the cookies. This is consistent with a study by Ningrum et al. (2017), which found that the more Patin fish flour added, the browner the color becomes. This aligns with research by Ernisti et al. (2018), which found that adding Patin fish flour to biscuits increases the protein content, leading to a Maillard reaction that darkens the color of the cookies.

Texture is an essential indicator in assessing the quality of food products, influencing product acceptance (Guiné, 2022). The texture is the characteristic of a product resulting from a combination of several physical properties, including size, shape, quantity, and elements of material formation that can be sensed by the touch and taste senses, including the mouth and sight (Midayanto & Yuwono, 2014).

The research results indicate that for texture preference, the highest score was also obtained from adding 0% Patin fish flour (no addition), which scored 7.87, followed by adding 10% with a score of 6.66. The lowest score, 5.8, was obtained by adding 15% Patin fish flour. This means that the more Patin fish flour was added to Mocaf flour Semprit cookies, the less the panelists liked it.

Regarding aroma preference, the research results show that the highest rating of 7.67 occurred with adding 0% Patin fish flour to Mocaf Semprit cookies (no addition). Meanwhile, the addition of 15% resulted in a rating of 4.49, and the lowest rating was obtained with the addition of 20% Patin fish flour to Mocaf flour Semprit cookies. Patin fish has a distinctive aroma, so the higher the ratio of Patin fish flour added, the more pungent the aroma produced (Ningrum, 2020). However, even with the addition of 10% Patin fish flour, the rating was still relatively high at 6.7. The sample treated with 20% Patin fish flour showed a noticeable decrease in preference. This is consistent with a study by Hasibuan et al. (2022) on cookies' chemical and sensory characteristics with varying levels of Patin fish flour addition. The study revealed that increased use of Patin fish flour reduces the likability of cookies, as it imparts a stronger Patin fish aroma to the cookies.

The highest preference for taste was also found in adding 0% Patin fish flour (8.54), while the lowest was in the 20% addition (4.24). The 10% formula received a relatively high rating of 7.23 for taste preference. Semprit cookies are a type of snack popular among the public. Cookies are known by many people, both children and adults, living in rural and urban areas. Taste is a response to nerve stimulation that includes flavors like sweet, bitter, and sour. Taste is the most important component in consumer decisions to accept or reject a food or product (Drewnowski & Monsivais, 2020). The taste levels measured in the research were sweetness and savouriness.

According to Rumadana & Salu (2020), the taste of Semprit cookies is generally sweet. The Semprit cookies from this experiment are sweet with an additional flavor, namely the distinctive taste of Patin fish flour. This research is supported by Saputra et al. (2014) on the effect of adding Patin fish flour to biscuits, which found that adding Patin fish influenced the taste. The more Patin fish flour is used to replace wheat flour in biscuits, the more the biscuit product tastes fishy and tends to be fishy.

The analysis of protein content in Semprit cookies with the addition of Patin fish flour (0%) yielded a result of 8.79%. With the addition of 10% Patin fish flour, the protein content was increased to 9.06%. Furthermore, the addition of 15% Patin fish flour increased to 10.30%, and the highest increase, reaching 12.30%, occurred with the addition of 20% Patin fish flour. This indicates that the more Patin fish flour added to the mocaf Semprit cookies, the higher the protein content of the cookies. If we observe the addition of Patin fish flour to the Semprit cookies, the protein content increased from 8.79% with 0% addition to 12.30% with 20% addition, showing an increase of 28.54%. According to the standard SNI Biscuit 2973 th 2022, the research results meet the standard, as the minimum value is 4.5%.

The high protein content in these Semprit cookies can be utilized as a healthy snack, especially for toddlers and children. The daily protein requirements vary for each individual, with toddlers, children, and teenagers needing protein for growth and development. If these Semprit cookies are consumed in a 100-gram serving, they can contribute significantly to one's daily protein intake. The increase in protein content in the experimental Semprit cookies can be attributed to the amount of Patin fish flour used, as Patin fish flour contains a protein content of 67.6% (Nurhidayati, 2011).

The research results regarding the water content of Semprit cookies after the addition of Patin fish flour are similar to their protein content. The more Patin fish flour added to the cookies, the higher the water content of the cookies. For instance, with 0% Patin fish flour, the water content is 5.58%, while with 10% addition, it increases to 5.59%. With a 15% addition, it rises to 6.34%; with the highest addition of 20%, the water content reaches 6.61%. The increase in water content in Semprit cookies due to the addition of Patin fish flour is acceptable because Patin fish inherently has a high water content, making it constantly wet. Therefore, the more Patin fish flour added to the Semprit cookies, the higher the water content.

Semprit cookies are a type of dry cookie that can be stored for a relatively long time, provided their water content is low. Water content is an important quality parameter because it can decrease the quality of food ingredients. The lower the water content in a product, the longer its shelf life. According to the Indonesian National Standard (SNI) No. 2973 of 2022, the water content in kokis cookies should be a maximum of 5 (five) or less than 5 (semprit cookies are included in this category). Therefore, the standard follows the SNI biscuit standard No. 2973 of 2022.

Regarding the still high water content exceeding the standard, a solution should be implemented to reduce the water level in the cookies by adding fish flour. The water content can influence the high water content in the fish flour, as fish flour contains a water content of 59.3% (Apriani, 2015). Therefore, initial treatment of the fish flour is necessary to reduce its water content. The water content determines the shelf life of a food product. The water content can also determine the quality of flour. Drying can reduce water content.

CONCLUSION

The conclusions of this study are as follows: 1) There are differences in the preferences of people for Mocaf flour Semprit cookies with the addition of patin fish flour at 0%, 10%, 15%, and 20%, in terms of color, texture, aroma, and taste. 2) The more patin fish flour added to the mocaf flour spritz cookies, the lower the level of liking for the cookies, as seen in color, texture, aroma, and taste. 3) The protein content of the Mocaf flour spritz cookies with the addition of patin fish flour at 0%, 10%, 15%, and 20%, is 8.79%, 9.06%, 10.41%, and 12.3% respectively. 4) The more patin fish flour added to the mocaf flour spritz cookies, the higher the protein content of the cookies. 5) For the cookies with 0% patin fish flour, the water content is 5.58%; for 10% addition, it is 5.9%; for 15% addition, it is 6.34%; and for 20% addition, it is 6.61%. 6) The more patin fish flour added to the mocaf flour spritz cookies, the higher the water content of the cookies.

The suggestions in this study are as follows: 1) To improve the aroma of the spritz cookies to be liked by the public, further research is needed by treating the fish beforehand with lime juice before washing. The recipe formula should include good-quality butter and grated kaffir lime zest. 2) Further research is needed to reduce the water content for the longer shelf life of the mocaf flour spritz cookies with the addition of patin fish flour by treating the fish flour with drying as a preliminary treatment. 3) To increase the protein content in the spritz cookies, adding patin fish flour can be done.

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