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MOCAF FLOUR AS AN ALTERNATIVE INGREDIENT: A STUDY ON BATIK-PATTERNED COOKIES

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ABSTRACT

The mocaf flour also known as modified cassava flour is flour that is modified by using microbial fermentation techniques. It has similar physical and chemical characteristics that could substitute wheat flour. This study aims to obtain the composition or formula in making batik – patterned cookies as well as attaining public acceptance of the product. A series of four combinations of mocaf and wheat flour were formulated and an acceptance test was carried out on 30 panelists in Yogyakarta within August and October 2019. The findings disclosed that the cookie sample X₃ with the combination of 150 gram mocaf flour and 50 gram wheat flour had the highest value (M = color: 3.37; aroma: 3.13; texture: 3.20; and taste: 3.33). This study is the first to assess the acceptance rate of batik – patterned cookies using mocaf flour. The significant results deepen our understandings of the demand of the consumers in order to increase selling value thus indirectly promoting the batik motifs to the consumers.

Keywords: Mocaf flour, modified cassava flour, batik, batik – patterned cookies, formulation.

INTRODUCTION

Batik has been a major attraction in Indonesia, especially after enlisted as one of the UNESCO Intangible Cultural Heritage in 2009 (Abas & Yuniastanti, 2019). Batik is a craft that is high in artistic value with sacred motifs as well as having intrinsic semiotic and symbolic meaning that people use it in a particular events (Yuliati & Yudisiani, 2018; Yunus & Tulasi, 2012). UNESCO has nominated batik for its values of special craftsmanship components and historical and sociocultural motifs (Maulia, 2009). Furthermore, the World Crafts Council designated Yogyakarta as the World Batik City in 2014 in which proves that Indonesia has become a well-known country in batik industry. Previous studies on batik suggested to promote batik as a valuable souvenirs for the visitors which indicates that batik has a significant impact on tourism (Hengky, 2015). Therefore, it is worthwhile to study on batik that could be a potential vehicle to attract visitors through events, festivals or tourism activities. Tourism attraction also can be portrayed through food. In fact, food is an integral part of the experience and provides major contribution to an individual's vacation (Cohen, 2003; Henderson, 2009; Robinson & Getz, 2014). It shows when travelers spend more than \$209 billion annually on food service in the United States with average of one-third fine-dining sales and almost a fourth of casual-dining sales (National Restaurant Association, 2015). That is, there is a symbiotic relationship between food and the tourism industry, which could be a promotional tool for a destination.

One of the food that draw people attention in Yogyakarta is their well known cookies made of wheat flour, sugar, eggs, and vanilla (Braker, 2003). In general, cookies have a sweet taste and crunchy texture, with the baking process carried out twice. Many cookies are sold in the market, but almost entirely made from wheat flour as the main ingredient. As a consequence, the consumption of wheat flour in Indonesia continues to increase when 95% of food made of wheat flour (Soesilowati et al., 2020). In fact, 100% of wheat is imported by Indonesia. The dependency on imported wheat flour by Indonesian exhibits a total of 934.7 tons with value of US \$167.2 million of wheat flour been imported in April 2017 (Soesilowati et al., 2020). Therefore, in means to reduce expenses and dependency on wheat flour, this current study aim to introduce batik-patterned cookies made of ingredient other than wheat flour. Therefore, the utilization of mocaf flour is recommended as a substitution of common flour used.

MATERIALS AND METHODS

The mocaf flour derived from modified cassava flour is flour made of cassava, which is made through a fermentation process by using bacteria from lactic acid (Subagio, 2009). The process is different from producing cassava flour that does not go through a fermentation process but uses bacterial microbes. The mocaf flour has good prospects in terms of three aspects: 1) the availability of cassava as an abundant source of raw materials, so that the availability of material is guaranteed because it is locally produced, 2) the price of mocaf flour on the market is relatively cheaper than the price of wheat flour or rice flour, and 3) mocaf flour has prospects in the local market because it can be absorbed by most food industries that still use flour as their main raw material (Subagio, 2011).

Several characteristics of mocaf flour are almost as the same as wheat flour that makes it a good substitute for flour. According to Subagio (2009), mocaf has been tested to be

used for a variety of pastries, such as cookies and cake. For instance, 50 – 100% use of mocaf flour is added in cookies, cheese sticks, steamed bread, and cakes such as dodol, candil porridge, and klepon, while only 30 – 40% use of mocaf flour is added in producing bread, pastry, and noodles. Mocaf flour is fermented cassava flour which is able to compete economically with wheat flour. With the source of cassava which is cheap and easily obtained and can use simple technology, the price of mocaf flour can be 40-60% cheaper than the price of wheat flour (Soesilowati et al., 2020). In addition, mocaf flour usage is considered economical due to the durability is much longer than cookies made of wheat flour. Moreover, higher sugar content in cassava will results in the more reasonable use of sugar or other sweetening ingredients while producing cookies (Soesilowati et al., 2020). Therefore, this experimental study through a complete randomized research design that was conducted between August and October 2019, tested the batik-patterned cookies with four combinations of wheat flour and mocaf flour, namely sample X₁ (0gm: 200gm); X₂ (100gm: 100gm); X₃ (150gm: 50gm); and X₄ (200gm: 0gm).

Materials

The following are the materials and tools used in this study:

Table 1.

Batik-patterned cookies ingredients

No	Material Name	Amount	Specification (Brand)
1.	Mocaf flour	1000 gram	KWT Kusuma
2.	Wheat	200 gram	Bunga sari
3.	Sugar	750 gram	Gulaku
4.	Egg	1 no	-
5.	Coconut milk	500 gram	Kara
6.	Cocoa powder	75 gram	van houten
7.	Salt	3 tsp	Revina

Table 2.

Batik-patterned cookies formula

No	Material Name	X ₁	X ₂	X ₃	X ₄
1.	Mocaf flour	0 gram	100 gram	150 gram	200 gram
2.	Wheat	200 gram	100 gram	50 gram	0 gram
3.	Egg		5 nos		
4.	Sugar		250 gram		
5.	Coconut milk		150 gram		
6.	Cocoa powder		25 gram		
7.	Salt		1 tsp		

Tools

The equipment used in carrying out this research was selected whose conditions are still good and hygienic, namely as follows:

Table 3.

The list of equipment for making batik-patterned cookies

No	Material Name	Amount
1.	Measuring scale	1
2.	Batter machine	3
3.	Mixer	1
4.	Measuring jar	1
5.	Brass	3
6.	Spatula	3
7.	Square steamer	1
8.	Oven	1

Testing Method

The tests have been carried out through organoleptic and hedonic tests (sensory) on the four samples as described above. The organoleptic properties included color, aroma, texture, and taste of batik-patterned cookies been verified from 30 panelists that were measured using a 4-point Likert scale ranging from 1 (very dislike), 2 (dislike), 3 (like), and 4 (really like). The data were analyzed using descriptive analysis and one-way ANOVA in order to examine the differences in each four samples of cookies with a posthoc test through Duncan Multiple Range Test (DMRT). The results were analyzed using statistical package for the social sciences (SPSS) version 21.

The process

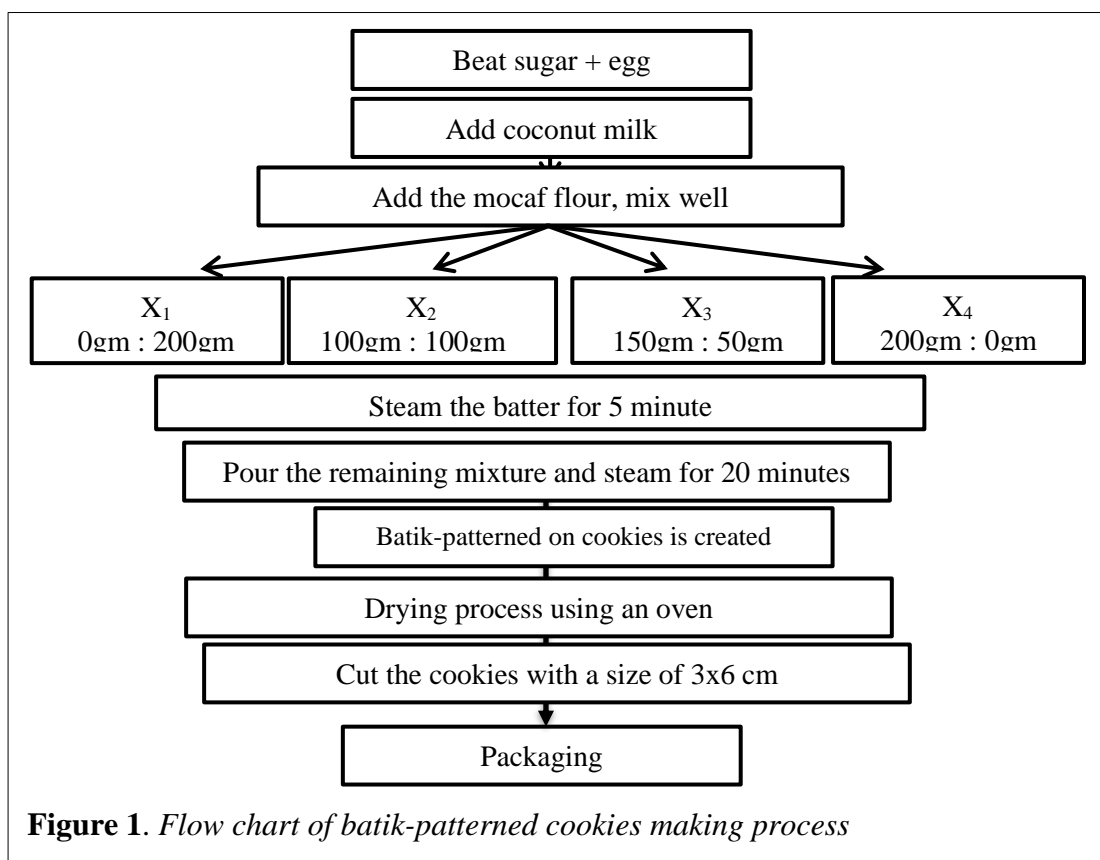


Figure 1. *Flow chart of batik-patterned cookies making process*

The steps and procedures of making the batik-patterned cookies with 3 different kinds of treatment are as shown in figure 1.

RESULTS AND DISCUSSION

Results exhibit the characteristics of four samples batik-patterned cookies including color, aroma, texture, and taste are described below:

Table 4.

Characteristics of batik-patterned cookies batik motifs with four formulas

Characteristic	Sample Test			
	X ₁	X ₂	X ₃	X ₄
Color	Brownish white	Opaque white	Pale white	Milk White
Aroma	The aroma of flour cake	The aroma of flour is mixed with a little cassava	The aroma of cassava is rather strong	Strong cassava aroma
Texture	Solid	Compact is a bit heavy	Compact, lightweight, comfortable	Lightweight and comfortable
Taste	The special taste of flour cake	Flavor the cake with a little cassava	A balanced combination of flour and cassava flavors	Cassava flavors

Notes:

X₁: The combination of batik-patterned cookies with 0gm mocaf flour and 200gm flour

X₂: The combination of batik-patterned cookies with 100gm mocaf flour and 100gm flour

X₃: The combination of batik-patterned cookies with 150gm mocaf flour and 50gm flour

X₄: The combination of batik-patterned cookies with 200gm mocaf flour and 0gm flour

Based on observations that have been made on the research sample, it can be seen that the formulation of mocaf flour and wheat flour can influence the color of the batik-patterned cookies. The color changed from brownish white in sample X₂, then changes to white according to the increasing amount of mocaf flour content, in order of the samples X₂ and X₃. Even the X₄ sample produced a milky white color. This happens because the addition of mocaf flour can make the cake whiter. By increasing the amount of mocaf flour added to the sample, it can increase the level of white in the resulting sample, even in sample X₄ producing batik-patterned cookies which is milky white because there is no flour which makes the cake batik-patterned cookies white brown. The aroma of batik-patterned cookies in sample X₁ tends to still be flavored with flour cakes, whereas in sample X₄ it has a strong cassava flavor. This is presumably because mocaf flour has a strong cassava aroma, so the aroma of cassava is getting stronger in accordance with the addition of mocaf flour.

The texture of batik-patterned cookies with the addition of mocaf flour variants produces the characteristics of batik-patterned cookies which is dense in sample X₁, dense slightly weakened in sample X₂, solid, light, weakened in sample X₃, and mild

and weakened in sample X₄. The addition of mocaf flour can reduce the density level of batik-patterned cookies so that it has a weak texture. The texture of cake in sample X₄ can adjust to the character of sponge cake which is not too dense but light.

The batik-patterned cookies of sample X₁ still shows the distinctive taste of wheat flour, while the batik motif of cookies with the addition of different mocaf flour shows a change in flavor which slowly reduces the taste of flour cake. Even up to sample X₄, it showed a sample of batik-patterned cookies with cassava flavor. A balanced flavor between flour and mocaf flour was found in sample X₃.

Color

Table 6.

Organoleptic test results of color of batik-patterned cookies

Criteria	Sample Test							
	X ₁		X ₂		X ₃		X ₄	
	F	%	F	%	F	%	F	%
Really Like	0	0,0%	0	0,0%	13	43,3%	5	16,7%
Like	8	26,7%	17	56,7%	15	50,0%	16	53,3%
Dislike	20	66,7%	12	40,0%	2	6,7%	9	30,0%
Very Dislike	2	6,7%	1	3,3%	0	0,0%	0	0,0%
Total	30	100,00	30	100,00	30	100,00	30	100,00
Average	2,20		2,53		3,37		2,87	

The hedonic test for the dry color of batik-patterned cookies shows that sample X₃ (150gm wheat flour: 50gm mocaf flour) had the highest average score of 3.37. These results indicate that the panelists preferred the dry color of the batik motif in sample X₃.

Table 7.

Test results for one-way ANOVA and Duncan test for dry color of batik-patterned cookies

Sample	N	Subset for Alpha = 0,05				F _{hitung}	F _{tabel}	Sig.
		1	2	3	4			
X ₁ (0gm : 200gm)	30	2,20						
X ₂ (100gm : 100gm)	30		2,53					
X ₄ (150gm : 50gm)	30			3,37		20,19	2,68	0,000
X ₃ (200gm : 0gm)	30				2,87			

Based on the one-way ANOVA test on samples of dry color of batik-patterned cookies, the value of F_{count} (20.19) > F_{table} (2.68) and Sig (0.000) < 0.05, which indicates that there are differences in the color of the batik-patterned cookies color on all four test samples. The post-hoc test continued with the DMRT test which showed that all four samples had significant differences. The color factor provides initial visuals on determining whether a food is nutritious, tasty, and has a very good texture. Conversely, if the food

has a color that is less attractive or gives the impression has deviated from the color that should be then it will not be eaten. This shows that the color has an important role in the reception of food. Apart from being a factor that determines quality, color can also be used as an indicator of the quality of mixing or processing through uniform and uniform food colors (Winarno, 2002).

Aroma

Table 8.

Organoleptic analysis of aroma of batik-patterned cookies

Criteria	Sample Test							
	X ₁		X ₂		X ₃		X ₄	
	F	%	F	%	F	%	F	%
Really Like	0	0,00%	1	3,33%	8	26,67%	5	16,67%
Like	13	43,33%	17	56,67%	18	60,00%	15	50,00%
Dislike	15	50,00%	12	40,00%	4	13,33%	10	33,33%
Very Dislike	2	6,67%	0	0,00%	0	0,00%	0	0,00%
Total	30	100,00	30	100,00	30	100,00	30	100,00
Average	2,37		2,63		3,13		2,83	

The hedonic test for the aroma of batik-patterned cookies showed that sample X₃ (150gm wheat flour: 50gm mocaf flour) produced the highest average score of 3.13. These results indicated that the panelists preferred the aroma of 150gm wheat flour: 50gm mocaf flour in sample X₃.

Table 9.

Results of one-way ANOVA test and Duncan test of aroma of batik-patterned cookies

Sample	N	Subset for alpha = 0,05			F _{hitung}	F _{tabel}	Sig.
		1	2	3			
X ₁ (0gm : 200gm)	30	2,37					
X ₂ (100gm : 100gm)	30	2,63	2,63		8,00	2,68	0,000
X ₄ (150gm : 50gm)	30		2,83	2,83			
X ₃ (200gm : 0gm)	30			3,13			

Based on the one-way ANOVA test on the sample of batik-patterned cookies aroma, the value of F_{count} (8.00) > F_{table} (2.68) and Sig value (0.000) < 0.05, which indicates that there are differences in the aroma of batik-patterned cookies of all four test samples. The post-hoc test continued with the DMRT test which showed that samples that were not significantly different were in sample X₁ and sample X₂; sample X₂ with sample X₄; and sample X₄ with sample X₃.

Panelists favored the batik-patterned cookies in sample X₃ because they had a strong aroma of flour but had a less strong aroma of cassava. This aroma is a new thing for panelists where most cakes rarely have the aroma of cassava, so it can be an attraction for consumers who want to try something new in food.

Texture

Table 10.

Results of organoleptic analysis of texture of batik-patterned cookies

Criteria	Sampel Test							
	X ₁		X ₂		X ₃		X ₄	
	F	%	F	%	F	%	F	%
Very Like	1	3,33%	2	6,67%	10	33,33%	4	13,33%
Like	11	36,67%	15	50,00%	16	53,33%	18	60,00%
Dislike	16	53,33%	12	40,00%	4	13,33%	7	23,33%
Very Dislike	2	6,67%	1	3,33%	0	0,00%	1	3,33%
Total	30	100,00	30	100,00	30	100,00	30	100,00
Average	2,37		2,60		3,20		2,83	

The hedonic test for the texture of batik-patterned cookies showed that sample X₃ (150gm wheat flour: 50gm mocaf flour) had the highest average score of 3.00. These results indicate that the panelists preferred the texture of the batik-patterned cookies in sample X₃.

Table 11.

Results of one-way ANOVA test and Duncan test of texture of batik-patterned cookies

Sample	N	Subset for alpha = 0,05			F _{hitung}	F _{tabel}	Sig.
		1	2	3			
X ₁ (0gm : 200gm)	30	2,37					
X ₂ (100gm : 100gm)	30	2,60	2,63		8,00	2,68	0,000
X ₄ (150gm : 50gm)	30		2,83				
X ₃ (200gm : 0gm)	30			3,20			

Based on the one-way ANOVA test on the sample texture of batik-patterned cookies, obtained F_{count} value (4,536) > F_{table} (2.68) and Sig value (0,000) < 0.05, which indicates that there are differences in the texture of dry batik cake texture on all four test samples. The post-hoc test continued with the DMRT test which showed that samples that were not significantly different were in sample X₁ and sample X₂; and sample X₂ with sample X₄.

The batik-patterned cookies in sample X₃ has the characteristics of texture, which is not too dense but light and weak. This can be an attraction of cake products with a light texture character, so panelists can enjoy sponge cakes that have a character that is not too dense but light and weak.

Taste

Table 12.

Results of organoleptic analysis of taste of batik-patterned cookies

Criteria	Test Sample							
	X ₁		X ₂		X ₃		X ₄	
	F	%	F	%	F	%	F	%
Very Like	0	0,00%	4	13,33%	12	40,00%	5	16,67%
Like	12	40,00%	15	50,00%	16	53,33%	14	46,67%
Dislike	17	56,67%	11	36,67%	2	6,67%	9	30,00%
Very Dislike	1	3,33%	0	0,00%	0	0,00%	2	6,67%
Total	30	100,00	30	100,00	30	100,00	30	100,00
Average	2,37		2,77		3,33		2,73	

The test for the batik-patterned cookies showed that sample X₃ (150gm wheat flour: 50gm mocaf flour) had the highest average score of 3.33. These results indicated that the panelists preferred the taste of batik-patterned cookies in sample X₃.

Table 13.

Results of one-way ANOVA test and Duncan test of taste of batik-patterned cookies

Sample	N	Subset for Alpha = 0,05			F _{count}	F _{table}	Sig.
		1	2	3			
X ₁ (5gm + 45gm)	30	2,37					
X ₄ (25gm + 25gm)	30		2,73				
X ₂ (10gm + 40gm)	30		2,77		10,48	2,68	0,000
X ₃ (15gm + 35gm)	30			3,33			

Based on the one-way ANOVA test on the taste of batik-patterned cookies samples, obtained F_{count} (10.48) > F_{table} (2.68) and Sig (0.000) < 0.05, which indicated that there are differences in the taste of batik motif cookies on all four test samples. The post-hoc test continued with the DMRT test which showed that samples that were not significantly different were in sample X₄ and sample X₂. The batik-patterned cookies in sample X₃ have a balanced blend of flour and cassava cakes. This is an interesting thing for panelists because most cake products are having a distinctive flour flavor, so that with a balanced combination between the taste of flour cakes and the taste of cassava cakes can make this sample the most preferred by panelists.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the study, it can be concluded in the organoleptic test that showed samples of batik-patterned cookies X₃ (150gm mocaf flour: 50gm wheat flour) were more preferred by panelists because they had a color that was not too white; the aroma of cassava is not too sharp; dense, light and flawless texture; and balanced flavor of flour cakes and cassava. Based on the results of the study, the suggestions in this study are: 1) To government institutions so that they can consider the use of mocaf flour as an alternative food ingredient besides wheat flour; 2) To researchers in order to be

able to socialize the use of mocaf flour as an alternative food ingredient in making batik motif cookies; 3) It is recommended for business people (UKM) to develop the mocaf flour industry through the substitution of flour with mocaf flour in the manufacture of processed food products, especially in the development of food products because it provides flavors that are not inferior to the original product.

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