

# Organoleptic and chemical properties test on cookies made from Mocaf and oyster mushroom flour

*by M F Kurnianto*

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## Organoleptic and chemical properties test on cookies made from Mocaf and oyster mushroom flour

M F Kurnianto<sup>1</sup>, R Wijaya<sup>1</sup>, A M Handayani<sup>1</sup>, B Hariono<sup>1</sup>, and A Brilliantina<sup>1</sup>

<sup>1</sup> Department of Agricultural Technology, Politeknik Negeri Jember, Jl. Mastrip 164 Jember, East Java, Indonesia

\* email: rizza.wijaya@polije.ac.id

**Abstract.** The purpose of our study was to characterize the quality of oyster mushroom flour dried using the hybrid fluidized bed dryer with a UV lamp. Making cookies was implemented by oyster mushroom flour and modified starch flour called mocaf. Methods in our study using Completely Randomized Design with comparison modified starch flour (mocaf) and oyster mushroom flour (100% of mocaf flour; 95% of mocaf flour and 5% of oyster mushroom flour; 90% of mocaf flour and 10% of oyster mushroom flour; 85% of mocaf flour and 15% of oyster mushroom flour; 80% of mocaf flour and 20% of oyster mushroom flour; 75% of mocaf flour and 25% of oyster mushroom flour. Water content, fat content and fiber content were analyzed as chemical properties of cookies. Organoleptic test was designed by 25 panelists using hedonic test to characterize sensory properties. The results showed that chemical properties consist of water content about 3.3 - 7.1%, fat content about 20.65 - 28.9%, fiber content about 3.03 - 6.55%. Observations on aspects of physical properties carried out by organoleptic tests on the parameters of taste, color and aroma through the Kruskal Wallis test showed no effect. In the texture parameter of cookies products, the variation in the amount of mocaf flour and oyster mushroom flour treatment has an effect.

### 1. Introduction

Indonesia has the potential for abundant and diverse food sources, but in reality, staple food production in Indonesia almost always relies on imports to meet the food needs. Indonesia's natural wealth has not been utilized and managed optimally. This can be seen from the dependence on various imported food ingredients which is still very high. People's dependence on imported food is wheat flour or wheat flour [1]. Wheat flour/wheat flour as a food ingredient has entered all aspects of life of every level of society in Indonesia. The food diversification program based on local products has not been successful, so the consumption of wheat-based food continues to increase. Currently, Indonesia's wheat consumption per year reaches 21 kg/capita, the second largest after rice. All wheat needs in Indonesia are still 100 percent imported. The imports of wheat seeds reached 6.3 million tons with a value of 2.3 billion USD. Some people have used cassava as an ingredient substitute for rice because of the economic inability to buy rice. Cassava has been developed into a modified form of flour [2]. Cassava flour that has been modified by microbial fermentation is usually referred to as mocaf flour (Modified Cassava Flour). Cassava flour is limited to food ingredients, such as flour substitution by 5% in instant noodles and pastries. Mocaf is used as raw material for noodles, bakery, cookies and semi-wet food. Bowness, steamed cakes, sponge cake, made from mocaf mixture up to 80%. Mocaf produces good quality when using the sponge dough method, which is the use of a dough starter. Mocaf dough is better done with warm water (40-60°C). the process of fermenting cassava into mocaf flour using a fermentation process using *Lactobacillus*



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Plantarum can increase protein levels up to 3.39% [3]. The cassava fermentation process causes changes in the characteristics of the flour which increases viscosity, rehydration, and ease of dissolving and the taste of mocaf flour become neutral by covering the cassava taste up to 70% and has characteristics similar to flour so that it can be used as a substitute for flour or flour mixture [4].

Cookies are a type of product made from a soft dough that uses flour-based, has a heavy texture, tends to be dense and melts in the mouth. Cookies are generally favored by many people, ranging from children to even adults, this product is preferred because it is practical and easy to serve, has a slightly sweet and savory taste and has a soft texture and has a long shelf life of 3-6 months. The main parameters of snack products in the form of physical properties that refer to texture/crispy as well as taste and aroma can be obtained from organoleptic testing of these products so that the innovation of snack products made from corn and cassava in the form of mocaf chips can be accepted by consumers. This study aims to determine the characteristics of making cookies with mocaf flour and mushroom flour as raw materials. The observed characteristics are in the form of the physical and chemical properties of the resulting product. Cookies are made from a mixture of mocaf flour and oyster mushroom flour with various compositions. This research will produce a recipe or product development formula cookies using a mixture of mocaf flour and oyster mushroom flour [5].

### 1.1. Mocaf Flour

Mocaf flour has a competitive edge that has high added value by using the biotechnology principle of LAB (*Lactic Acid Bacteria*) fermentation technique. This technology is inspired by the original technology of cassava and cassava sour starch from Brazil. Mocaf is an edible cassava flour product. The color of mocaf is whiter than the color of ordinary cassava flour. The use of mocaf flour can reduce the consumption of wheat flour. Besides being able to be produced from local agricultural products, the use of mocaf flour has many advantages over wheat flour. In mocaf flour there is no gluten protein which often has to be avoided by certain people who have allergies to gluten, children with autism, and people with celiac disease. MOCAF (Modified Cassava Flour) is modified cassava flour through a fermentation process by lactic acid bacteria so that it changes its functional properties and can be used to replace wheat in the manufacture of food products made from wheat [6]. MOCAF does not contain gluten so MOCAF cookies can't expand so Therefore, to help its development, soluble flour is used. Soluble flour has high starch digestibility of 84.35%, low amylose content of 29.67-31.34%, and low amylose content. The high flower content of 54% makes cookies softer, crunchy, and easy to digest. MOCAF and this soluble flour do not have a binding power and crunchiness, therefore maltodextrin is added [7].

### 1.2. Oyster Mushroom Flour

White oyster mushroom (*Pleurotus ostreatus*) is currently quite popular and much loved by people in the world, besides being delicious, it is also full of nutrients, high in protein, and low in fat. Each 100 g of dried mushrooms contains 7.8-17.72 g protein, 1-2.3 g fat, 5.6-8.7 g crude fiber, Ca 21 mg, Fe 32 mg, thiamin 0.21 mg, riboflavin 7.09 mg, and 57.6-81.8 g carbohydrates, with 328 -367 kcal of energy. This mushroom can increase metabolism and regulate autonomic nervous function. It is also for the treatment of hepatitis, digestion, duodenum, and stomach. Oyster mushrooms are very good for cardiovascular heart sufferers and cholesterol control. Oyster mushrooms contain mevinolin and similar compounds that are potent inhibitors of HMG CoA (3-hydroxy-3-methylglutaryl coenzyme A reductase), the main enzyme in cholesterol biosynthesis. Beta Glucan Health Center states that oyster mushrooms contain pleural compounds, protein (19-30%), carbohydrates (50-60%), amino acids, vitamins B1, B2, B3 (Niacin), B5 (pantothenic acid), B7 (biotin). ), Vitamin C, minerals calcium, iron, Mg, phosphorus, K, P, S, and Zn. It also acts as an anti-tumor, antioxidant and lowers cholesterol. Consumption of this food mushroom can be done in various ways, depending on the taste and purpose of consuming the oyster mushroom in question. Some are consumed fresh, usually for side dishes mixed with meat, fish, or other vegetables [8]. Some are dried, usually, if you want to cook mushrooms at any time, dried mushrooms are poured with hot water. Another way is in the form of powder or flour, usually for making food.

Oyster mushrooms are perishable foodstuffs, like other types of vegetables. A few days after harvesting, the quality of the oyster mushroom drops rapidly until it is unfit for consumption. Changes in the quality of oyster mushrooms include wilting, the color becomes brown, soft and the taste changes, in Indonesia there is not much preservation of commercial food mushrooms, in supermarkets, mushrooms are usually stored at a cold temperature of 15-20°C. At this temperature, mushrooms can only survive (still fit for consumption) for 3-5 days, even though they have been packaged in polyethylene plastic [9]. To overcome this problem, further processing is needed so that the shelf life of oyster mushrooms can be extended. One way to extend the shelf life of oyster mushrooms is to process oyster mushrooms into oyster mushroom flour. Making oyster mushroom flour is one of the efforts to extend the shelf life, improve the quality of food, provide convenience in handling, and expand the application of oyster mushrooms in a variety of products. The process of making oyster mushroom powder is considered quite important in its optimization because oyster mushrooms have the potential as a dietary nutrient (nutriceutical), which is currently popular and quite attractive to the public. The optimization here is related to how the process of processing oyster mushrooms into flour, without or minimally eliminating the nutrients contained when in the form of fresh oyster mushrooms. To produce mushroom flour, in general, there are 7 stages, namely (1). Selection of good, healthy mushrooms, uniform in size, and the attached dirt removed, (2). Washing with clean running water, then drained until the water is gone. (3). Mushrooms were sliced thinly (shredded), then blanched with hot water containing 2000 ppm sodium bisulfite (0.2%) for 5 minutes, then drained. (4). The mushrooms were dried in a drying oven by setting the initial temperature to 30°C and gradually increasing to 60°C for 13 hours. Drying can also be done directly by drying in the sun for 3-5 days depending on the weather until the mushrooms dry brownish. (5). Dried mushrooms are stored in tightly closed containers. (6). For the manufacture of mushroom flour, dried oyster mushrooms are then mashed with a food grinder. (7). Mushroom flour is packed in clean and food-grade packaging [10].

### 1.3. Cookies

Cookies (pastries) are one type of snack that is very popular with people both in urban and rural areas. Cookies can be produced using a variety of flours including flour that does not contain gluten because cookies do not require development. Therefore, cookies have the potential to be made with various local flours. Cookies are one of the most popular dry food products in the market. Various studies have carried out the substitution of wheat flour with local ingredients. The use of local materials is in line with the food diversification program to realize food security in Indonesia. The cookies used in this study were made from mocaf flour substituted with oyster mushroom flour.

## 2. Material and Methods

This study used a RAL research design (Completely Randomized Design) to determine the differences in a cookie formula made from mocaf flour and oyster mushroom flour based on chemical properties and level of preference for color, aroma, taste, and texture categories. The research design was chosen because the research was conducted at the Jember State Polytechnic's food analysis laboratory so that the homogeneity of the units can be guaranteed. In addition, the experiment involved a small experimental unit [11]. Levels of pleasure categories of color, aroma, taste, and texture form the basis for analyzing the acceptability of cookies products made from mocaf flour and oyster mushrooms [12].

### 2.1. Research Procedure

The first stage of research is to conduct product development experiments. The formula determination development process did not go through the QDA (Quantitative Descriptive Analysis) stage because the product to be made already had a standard recipe from the home industry, therefore direct experiments were carried out by providing 5 different formula comparisons between mocaf flour and oyster mushrooms.



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## 2.2. Research Location

This research was conducted at the TEFA Bakery Laboratory and the Food Analysis Laboratory of Politeknik Negeri Jember.

## 2.3. Tool and Material

The main ingredients used in this study were mocaf flour and oyster mushroom flour which were produced by the team for the basic ingredients for making cookies. The tools used are proximate analysis equipment, Atomic Absorption Spectrophotometer (AAS) Shimadzu ASC-7000, High Performance Liquid Chromatography (HPLC) Agilent 1200 series with Agilent multi-wavelength detector (MWD) type detector, millipore, 0.45 m filter, Texture Analyzer, organoleptic testing equipment, incubators and desiccators.

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## 2.4. Research Methodology

The research was carried out in several stages, namely: The first stage of making cookies using raw materials in the form of mocaf flour and oyster mushrooms as a mixture with various variations of additions. The variations are A1 = 100% Mocaf Flour (Control), A2 = 95% Mocaf Flour : 5% Oyster Mushroom Flour, A3 = 90% Mocaf Flour : 10% Oyster Mushroom Flour, A4 = 85% Mocaf Flour : 15 Oyster Mushroom Flour , A5 = 80% Mocaf Flour: 20% Oyster Mushroom Flour, A6 = 75% Mocaf Flour: 25% Oyster Mushroom Flour. Respondents include the parameters of taste, color, aroma and texture of the product. Each experiment and test was carried out 2 times [12].

## 2.5. Proximate Analysis

The analyzes carried out where water and ash content using the oven method, fat using the Soxhlet method, and crude fiber. The analysis followed the guidelines of the Association of Official Analytical Chemistry (AOAC 2012).

## 2.6. Organoleptic Test

Tests on the acceptance of cookies were carried out by organoleptic tests including taste, color, texture/crisp, and aroma. The evaluation was carried out using a semi-trained panel of 25 people. The assessment is based on the level of preference by giving a scoring based on the criteria tested: score 5 = very much like; score 4 = like; score 3 = somewhat like, score 2 = dislike and score 1 = strongly dislike [14].

## 3. Result and Discussion

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Research observations on the response ratio of mocaf flour (modified cassava flour) and oyster mushroom flour in the manufacture of cookies include the chemical and organoleptic properties of the product. The chemical properties observed included water content, fat content and crude fiber. While the organoleptic parameters include taste, color, aroma and taste texture. Based on data analysis on chemical properties according to ANOVA, it showed that the ratio of mocaf flour and oyster mushroom had no significant effect on water content but had a very significant effect on crude fiber content.

### 3.1. Chemical Properties

#### 3.1.1. Water Content

The average moisture content of cookies with various ratios of mocaf flour and oyster mushrooms ranged from 3.3% - 7.1% (Table 1). The highest water content was obtained from the A4 treatment, the ratio of mocaf flour and oyster mushroom flour was 85:15. While the lowest level was found in the A5 treatment, the ratio of mocaf flour and oyster mushroom flour was 80:20.

The ratio of mocaf flour and oyster mushroom flour had no significant effect on the moisture content of cookies (Table 1). Based on the control of pure mocaf flour (100%) it produces the average water content is 3.7%, which means there is no difference between treatments A2, A3, A5 and A6. In the treatment with variation, A4 obtained a large water content with a value of 7.1%.

**Table 1.** Water Content (%)

Treatment	Water Content (%)			
	Repetition 1	Repetition 2	Total	Average
A1 (CONTROL)	3,6	3,8	7,4	3,7
A2 (95%:5%)	3,4	3,5	6,9	3,45
A3(90%:10%)	4,7	4,9	9,6	4,8
A4(85%:15%)	7	7,2	14,2	7,1
A5(80%:20%)	3,3	3,3	6,6	3,3
A6(75%:25%)	5	5	10	5

### 3.1.2. Crude Fiber

The average crude fiber content of various ratios of mocaf flour: oyster mushroom flour ranged from 3.02% - 6.55% as shown in Table 2. The highest crude fiber content was obtained from the ratio of mocaf flour: oyster mushroom flour as much as 75: 25, namely the treatment A6 by 6.55%. While the lowest crude fiber content was found in the treatment ratio of 20: 80, namely in treatment A2 which had a crude fiber content value of 3.55%.

**Table 2.** Crude Fiber Value

Treatment	Crude Fiber (%)			
	Repetition 1	Repetition 2	Total	Average
A1 (CONTROL)	3,045	3,01	6,055	3,0275
A2 (95%:5%)	3,61	3,5	7,11	3,555
A3(90%:10%)	4,53	4,6	9,13	4,565
A4(85%:15%)	5,21	5,15	10,36	5,18
A5(80%:20%)	5,88	5,73	11,61	5,805
A6(75%:25%)	6,59	6,51	13,1	6,55

The crude fiber content of cookies with the composition of mocaf flour: oyster mushroom flour 100:0 (A1) was significantly different from treatments A2, A3, A4, A5 and A6 all treatments gave very significantly different results. The difference is due to the different compositions of fiber in mocaf flour and oyster mushroom flour. The higher the ratio of mocaf flour with oyster mushroom flour, the higher the crude fiber content produced. The crude fiber content in mocaf is around 1.9-3.4%, the results of observations of steamed brownies states that the crude fiber content is 2.27-6.93%. This difference is very real in the steamed brownie cake which has been substituted with mocaf flour. The amount of crude fiber increased with increasing concentration of mocaf flour. The increase in crude fiber was also due to an increase in mocaf flour which contains fiber. The manufacture of dry noodles with mocaf substituted with edamame produces a fiber content of 3.85%, this is almost equivalent to the proportion of mocaf and flour in the manufacture of steamed brownies with a proportion of 40:60. This is influenced by each fiber in different composition and comes from the materials used [13].

### 3.1.3. Fat level

The average fat content of various ratios of mocaf flour: oyster mushroom flour ranged from 20.65% - 28.9% as shown in Table 3. The highest fat content was obtained from the ratio of mocaf flour: oyster

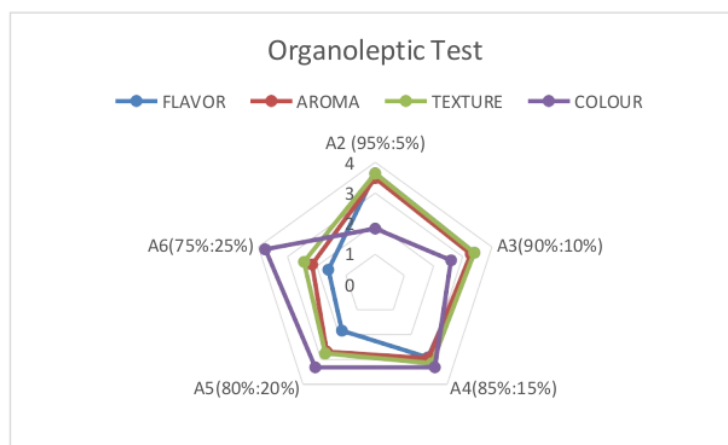
mushroom flour as much as 85: 5, namely treatment A2 of 28.9%. While the lowest fat content is found in the treatment ratio of 85: 15, namely in the A4 treatment which has a fat content value of 25.15%.

**Table 3.** Fat Level

Treatment	Fat Level (%)			
	Repetition 1	Repetition 2	Total	Average
A1 (CONTROL)	20,8	20,5	41,3	20,65
A2 (95%:5%)	29	28,8	57,8	28,90
A3(90%:10%)	26	26,1	52,1	26,05
A4(85%:15%)	25	25,3	50,3	25,15
A5(80%:20%)	27	27,4	54,4	27,20
A6(75%:25%)	27	27,2	54,2	27,10

### 3.2. Organoleptic Test

The organoleptic test is also called sensory assessment because it involves the senses in humans. This assessment involves panelists. The panelists taken were untrained panelists. The parameters used in the organoleptic assessment are aroma, taste, color and texture. The assessment criteria used started from liking, liking, neutral, disliking and very disliking. The range of values that must be entered also varies from 5 – 1 (very much like to very dislike). The results of the organoleptic test can be seen in Figure 1 with 4 test parameters.



**Figure 1.** Organoleptic Test

#### 3.2.1. Aroma

Aroma is one of the parameters of the level of consumer preference for a food ingredient. The results of the research on aroma cookies that appear during steaming are accepted by the panelists at different scales. The higher the ratio of mocaf flour, the intensity of the aroma of cassava flour is getting stronger and conversely the lower the ratio of mocaf flour to oyster mushroom flour, the intensity of the aroma of cassava flour is getting weaker. In contrast to the results that have been cooked and cooled, the aroma that appears has a neutral smell. In this study the samples were given in cold conditions.



**Table 4.** Aroma Organoleptic Test Results

Sample	Aroma
A2 (95%:5%)	3,48
A3(90%:10%)	3,28
A4(85%:15%)	2,96
A5(80%:20%)	2,68
A6(75%:25%)	2,16

The percentage of the lowest level of preference for the aroma of cookies was obtained from the ratio of mocaf flour to oyster mushroom flour (75:25), which has an average value of 2.16. While the highest level of preference in the treatment of mocaf flour: oyster mushroom flour (95:5), which is 3.48. The existence of an average value of 2.68 indicates that the panelists' preference for the aroma of cookie products is neutral. Test Kruskal Wallis obtained  $p$  value =  $0.406 > \alpha = 0.05$ , this indicates the ratio of mocaf flour and oyster mushroom flour has no significant effect on cookie products.

### 3.2.2. Flavor

Flavor is one of the factors determining the level of consumer acceptance of the product. Differences in taste that arise in a test of a product can be caused by subjective traits in humans, such as lack of concentration, feeling tired or tired. Panelists' assessments tend to be individual subjective. It is also influenced by individual sensitivity and preference for objects (cookies). Therefore, the panelist's assessment is carried out by trained consumers in the market group. The scale used in the hedonic test is 5: very much like, 4: like, 3: neutral, 2: dislike, 1: very dislike. The results of the organoleptic test for the taste of cookies had the highest average value of 3.64% in the ratio of mocaf flour: oyster mushroom flour (95:5). While the lowest average is 1.6% in the ratio of mocaf flour: oyster mushroom flour (75:25) as in Table 5. This is due to the presence of a distinctive mushroom taste in oyster mushroom flour, so that with the high ratio of oyster mushroom flour to mocaf flour, a distinctive mushroom taste appears in cookie products.

**Table 5.** Flavor Organoleptic Test Results

Sample	Flavor
A2 (95%:5%)	3,64
A3(90%:10%)	3,40
A4(85%:15%)	2,92
A5(80%:20%)	1,84
A6(75%:25%)	1,60

The results of the Kruskal Wallis test showed that the  $p$  value =  $0.372 > \alpha = 0.05$ , this indicates that the flavor has no significant effect on the taste of the cookie product.

### 3.2.3. Texture

The average level of panelists' preference for texture cookies ranged from 3.44 to 3.64. The lowest percentage of preference level is found in the ratio of mocaf flour and oyster mushroom flour as much as 80:20 with a value of 2.76. While the highest level of texture preference is in the ratio of mocaf flour and oyster mushroom flour 95:5 with a value of 3.64. The panelists' organoleptic test results on the texture of these cookies can be seen in Table 6.

**Table 6.** Texture Organoleptic Test Results

4 Sample	Texture
A2 (95%:5%)	3,64
A3(90%:10%)	3,40
A4(85%:15%)	3,16
A5(80%:20%)	2,76
A6(75%:25%)	2,44

The decreasing proportion of flour causes the gluten content in flour to decrease. This gluten functions as an air trap. As a result, the less the number of cavities in the cookies, this is what causes the cookies to be harder and less desirable. The results of the observations showed that the value of  $P = 0.002 \leq 0.05$ , this means that this texture has a significant effect on the quality of cookies.

#### 3.2.4. Color

Color is the first thing or sensory thing that is seen which also determines the acceptability of the product. If the appearance is less attractive, it is usually not liked by consumers even though sometimes the product has a good taste and has high nutritional value. The results of this color test use a scale hedonic and are assessed by trained panelists. The hedonic scale used is 5: very much like, 4: like, 3: neutral, 2: dislike, 1: very dislike. The average organoleptic color can be seen in Table 7.

The results showed that the best color according to the panelist test was the ratio of mocaf flour: oyster mushroom flour as much as 75: 25 with an average of 3.76. While the color that has the lowest value in the ratio of mocaf flour: oyster mushroom flour is 95: 5 with an average of 1.84. The results of the Kruskal Wallis test showed that the value of  $p = 0.524 > 0.05$  this means that the ratio between mocaf and mushroom flour has no significant effect on the color of cookies.

**Table 7.** Color Organoleptic Test Results

11 SAMPLE	COLOR
A2 (95%:5%)	1,84
A3(90%:10%)	2,6
A4(85%:15%)	3,32
A5(80%:20%)	3,32
A6(75%:25%)	3,76

#### 4. Conclusion

From the results of this study it can be concluded The treatment on various variations did not cause significant differences related to the amount of mocaf flour and wheat flour on the chemical properties of cookie products. In crude fiber parameters, variations in the amount of mocaf flour and oyster mushrooms can affect it. Observations on aspects of physical properties carried out by organoleptic tests on the parameters of taste, color and aroma through the Kruskal Wallis test showed no effect. In the texture parameter of cookies products, the variation in the amount of mocaf flour and oyster mushroom flour treatment has an effect.

#### 5. Acknowledgments

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