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by Rini Umiyati

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Physical and Chemical Characteristics of Biscuits with Catfish Flour (*Clarias batrachus*) Addition

Putri Fara Dila¹, Dani Satrio Wicaksono, Rizky Muliani Dwi Ujianti, Khoiron Ferdiansyah, Rini Umiyati*

¹Food Technology Department, Faculty of Engineering and Informatics, Universitas PGRI Semarang, Jl. Sidodadi-Timur No.24 Semarang, Central Java 50232, Indonesia

* riniumiyati@upgris.ac.id

Abstract. Biscuits are a snack that is preferred by many people because they have a more dominant carbohydrate content and relatively lower protein content, so it is necessary to add flour with a high protein content, one of which is catfish flour. The purpose of this study determines the effect of different characteristics of catfish flour biscuits with the addition of each concentration treatment on the physical, chemical and organoleptic properties of catfish biscuits (0%, 5%, 10%, 15%). The research method used a Completely Randomized Design of One Component Factors with four treatments B0, B1, B2 and B3. Research analysis carried out included chemical properties (moisture content, ash content, protein content, fat content) and color test. The results of this study indicate that biscuits with the addition of catfish flour obtained a moisture content between 4.96-4.53%, ash content 2.19-4.07%, fat content 62.95-78.23%, protein content 6.74 -8.68%, Color between 10.73-7.73%, Texture between 24.01-23.18%. The color test results with the addition of catfish flour can reduce the value of the color test. This shows that the addition of catfish flour is effective in increasing the protein content of biscuits.

Keywords: biscuit, cat fish, cat fish flour

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1. Introduction

Fish flour is an important source of animal protein because it contains complex amino acids such as lysine and methionine, which are found in animal and fish feeds. According [1], fish flour has not been widely developed for use as human food, currently people only use it as fish feed [1]. Catfish protein (*Clarias* sp.) which is a by-product of fish processing is known as catfish flour. The use of catfish flour as a source of protein in the manufacture of catfish flour biscuits offers a promising alternative for the production of biscuits and the use of fish flour as a food ingredient. Fish flour is a fish product that has been processed so that it has a longer shelf life. According to [2] good catfish flour is used, namely from the head and body of the fish which contains protein between 56-64%.

The addition of food ingredients from food ingredients is one way to improve the nutritional quality of the community, which can be done by fortifying proteins, minerals and vitamins. The addition of protein itself can be done by adding vegetable protein from soybeans which are high in protein and can also be from animal protein from fish. One of them comes from catfish, a superior fresh water product that is easy to cultivate, inexpensive, and has sufficient protein (17.7 percent) in its body. The use of catfish flour itself has benefits as a source of animal protein in addition to making biscuits which has not been done much. By making a light breakfast with a high protein content using a combination of medium protein flour and catfish flour, people can overcome the problem of malnutrition due to biscuits.

Biscuits are dry baked goods made with cake batter made from wheat flour (can be substituted). Permitted food additives may also be used. Margarine, powdered milk, powdered sugar, egg yolks, salt and baking powder can all be used to make biscuits. This product has a low moisture content, less than 5%, and is dry. All ages, both children and adults, can consume this product with various types of biscuits [3].

One food ingredient that has sufficient protein content and can be used as an additional component in biscuits is catfish. Lysine is an amino acid found in catfish in high proportion (10.5%) along with a relatively high amount of protein (17 percent). Because of catfish's high water content (76 percent), which makes it susceptible to spoilage, coating catfish flesh is the best way to work catfish when preparing biscuits. The protein content of catfish itself is quite high, namely 63.83% [4]. Improving the nutritional condition of toddlers can be influenced by consuming biscuits to replace catfish flour for 88 days, according to [5].

Based on this context, a study was conducted with the effect of adding catfish flour to the characteristics of catfish biscuits. This study aims to determine the differences in the addition of catfish flour to chemical characteristics.

2. Methods

The instruments used in chemical analysis are Knives, cutting boards, mixers, spoons, tins, biscuit molds, incubators, erlemeyers, filter paper, scales, label paper, tissue, cotton, and blenders are the tools used to make catfish flour and biscuits. Soxhlet, circular flask, china dish, oven, desiccator, analytical balance, mortar, circular flask, aluminum foil, filter paper, kjehdahl flask, pipette, Erlenmeyer and ruler. The ingredients used are fresh catfish obtained from Pasar Kobong Semarang (Fish Market), Eggs, Low Protein Wheat Flour (Blue Key Brand), Refined Sugar, Butter, Baking Soda (Kopoe-Kopoe Brand), Salt.

Three steps are involved in producing biscuits: making the dough, molding it, and baking it. The procedure for combining and mixing the ingredients is the first step in making the dough. According to [6] the creaming method and the all-in method are the two basic approaches to mixing dough. The basic elements are combined gradually when using the cream method. Fat and sugar are mixed first, then flavorings and coloring are added, then milk and aerating agents are added, as well as salt which has been dissolved in water. The final step is to add flour. According to [7] in [8] this technique produces dough that prevents excessive gluten formation, making it suitable for biscuits. The all-in approach is done by combining all the ingredients and then stirring them until they become a dough that lives up to its name.

The analysis carried out included chemical and physical analysis which included physical analysis, texture and color, chemical analysis including water content, fat content, protein content. The analysis carried out included chemical analysis, physical analysis, then statistical analysis data testing was carried out using One Way Anova to evaluate the test data. Continue with the DMRT test at the 5% level if the analysis results show a significant difference between treatments. SPSS 26.0 was used for data analysis.

3. Results and Discussion

3.1. Systematics of the Article

The water content included in food products is the water content which is usually expressed as a percentage. Water content can affect appearance, texture, and taste in food. Based on the results of water content can be seen in Table 1.

Table 1. Value of Chemical Analysis of Catfish Biscuits

Sample	Chemical Analysis			
	Water Content	Ash Content	Fat	Protein
0%	4,95 ± 0,83a	2,19 ± 0,23 ^a	62,95 ± 0,58 ^a	6,74 ± 0,03 ^a
5%	4,92 ± 0,86a	2,34 ± 0,00 ^a	64,70 ± 0,59 ^b	7,46 ± 0,00 ^b
10%	4,60 ± 0,46a	3,76 ± 0,63 ^b	67,48 ± 1,17 ^c	8,24 ± 0,00 ^c
15%	4,75 ± 0,46 ^a	4,07 ± 0,92 ^b	78,22 ± 0,76 ^d	8,68 ± 0,02 ^d

At this value it can be seen that the water content in the biscuit with the addition of catfish flour was not significantly different. Based on the value of the water content has decreased, this is due to the higher content of catfish flour, the lower the resulting water content. At a concentration of 0% biscuits without the addition of catfish flour the water content was 4.96% while at a concentration of 5% -15% it decreased significantly. In this study, there was a decrease in water content, namely the higher the addition of catfish flour [6]. This was due to the raw material used, namely the water content in wheat flour, the water content was 11.82% so the water content in 0% biscuits has a high value, this can also be caused during the baking process denaturation occurs with the addition of catfish flour, this is due to the fact that there are quite a lot of substitutions for catfish flour so that the water content obtained is low. According to [6] in this study the water content of catfish biscuits was 4.00-1.63% during roasting and the temperature used was lower so it was lower, it was feared that it would affect the protein contained in the catfish flour.

The ash content values of 2.35 percent and 4.07 percent increased from the addition of 5 percent concentration to an additional 15 percent concentration. The amount of catfish flour increased the ash content of the fortified catfish flour biscuits, therefore the higher the concentration of catfish flour added, the higher the ash content of the catfish biscuits. This is due to the high mineral content in catfish biscuits. The result of the addition of biscuit ash content is due to the addition of minerals contained in catfish flour. Based on these findings, the ash content of biscuits exceeds or does not meet the quality standards set out in SNI 01-2973-1992 by the National Standards Agency (1992), which states that the ash content of biscuits may not exceed 1.5 percent [9]. According to [10], despite the high ash concentration, the ash content of other biscuits can range from 0.5 percent to 4.3 percent.

The fat content in the table shows the fat content of the biscuits after being enriched with catfish flour. With the addition of catfish flour, the fat content in the biscuits is drastically different. Where at the biscuit concentration value of 0% the fat content was 62.95% and at a concentration of 5-10% there was an increase in the value of the fat content which was 64.7-67.49% while the fat content value of the biscuit with the addition of catfish flour increased the fat content quite high, namely 78.2% where the fat content of 15% is high. [4] stated that the addition of catfish flour can also increase the fat content of the biscuits. This is due to the high fat content of catfish flour (20.83%). This can also occur due to the addition of raw materials such as eggs and margarine which have a high fat content due to the high fat content. According to BSN (1992) the fat content has been set at a minimum of 6% so that biscuits with the addition of catfish flour meet the quality standards of biscuits. This also happened in research [11] where the value of the fat content increased in the manufacture of MPASI biscuits with the addition of catfish, which was 16.5-21.0%.

The protein content in the biscuits with the addition of catfish flour showed significantly different results from the protein content in the catfish flour biscuits. It can be seen in the diagram that the more catfish flour added, the higher the protein content in the biscuit. At a concentration value of 0% without the addition of catfish flour, the protein content value is 6.74%, while at 5-10% the protein content value

increases, namely 7.46-8.68%. This is because the protein content in catfish flour is a high quality protein source, so it can increase the protein content in these biscuits. According to [6] the protein content in catfish body is 63.83% greater than catfish head flour which is 56.04%. According to the biscuit quality requirements based on SNI 01-2973-1992 where the protein content is at least 6%. The results of research on making biscuits with the addition of catfish flour that meet SNI standards for protein content in biscuits show this. The protein content value of 0-15% has fulfilled the SNI quality standard of 6.74-8.68%. This may also be because raw materials containing protein found in eggs are used to increase the value of the quality of protein content

3.2. Color Analysis

Biscuit color testing with the addition of catfish flour was carried out using a color reader, knowing the values of L*, a* and b*. The results of the biscuit color analysis can be seen in Table 2.

Table 2. Color Analysis

Sample	Parameter		
	L*	a*	b*
0%	60,92 ± 0,75 ^a	10,73 ± 0,04 ^a	24,01 ± 0,77 ^a
5%	55,77 ± 0,11 ^a	10,26 ± 0,28 ^b	23,64 ± 0,40 ^a
10%	55,68 ± 0,30 ^a	9,65 ± 0,11 ^c	23,63 ± 0,83 ^a
15%	55,63 ± 0,12 ^b	7,73 ± 0,21 ^d	23,18 ± 0,91 ^a

The L* notation indicates how light or dark a color is. The L* notation states the brightness parameter which has a value between 0 (black) to 100 (white). The L* value of the biscuits was 55.63-60.92 which indicated that the biscuits with the addition of catfish flour were less bright or dull in color. When baking biscuits, the addition of catfish flour had a significant effect on the brightness level of the finished product compared to biscuits without the addition of catfish flour. This could be due to the inclusion of catfish flour which has a low brightness level, making the biscuits less bright than the control biscuits, or the absence of catfish flour. In addition, the Maillard reaction occurs during the baking of biscuits, turning them brown. When lysine, an amino acid with a high concentration in catfish flour, is roasted with sugars including fructose, maltose, and lactose, the Maillard reaction occurs.

With the addition of catfish flour, it can be seen in Table 2 that the value of a* shows a decreasing value. This causes the color of the biscuits with the addition of catfish flour to tend to be reddish in color. When catfish flour is added during the preparation of these biscuits, the value of a* will increase the more catfish flour is added and the less flour is added. According to [12] this occurs due to reactions between the amino groups in acids from catfish flour, wheat flour, eggs, skim milk with glycosidic hydroxyl groups in sugar which can result in the formation of polymers brown nitrogen is called the Maillard reaction. When catfish flour is added, the color is dirtier than without flour. Catfish flour which contains brown flour pigment makes the biscuits look blackish brown spots.

Based on the b* value, the color of the biscuits with the addition of catfish flour has a b* value above the biscuits with the addition of catfish flour which has a positive b* value, which means the chromatic color is yellow and shows a b* value in catfish biscuits with the addition of catfish flour which has a tend to be brown. Biscuits added with catfish flour caused a decrease in b* value which was not significantly different. biscuits with the addition of catfish flour in the manufacture of these biscuits where the higher the addition of catfish flour and the lower the addition of wheat flour, the a* value increases. According to [12] this occurs due to reactions between the amino groups in acids from catfish flour, wheat flour, eggs, skim milk with glycosidic hydroxyl groups in sugar which can result in the formation of polymers brown nitrogen is called the Maillard reaction.

4. Conclusion

Based on the research results it can be concluded that the addition of wheat flour with a concentration of 0%, 5%, 10%, 15% can affect the water content, ash content, fat content, protein content, color of the

material. biscuits. The results of the best biscuit chemical analysis showed that the addition of catfish flour was able to reduce the water content and ash content. While the fat content and protein content can increase the protein and fat content in biscuits. The results of the color analysis test showed that the highest L* value was parameter 0 with the addition of catfish, while the lowest value was biscuits with the addition of 15%. The highest a* value is 0% and the lowest a* value is 15%. The highest b* value is 0% while the lowest b* value is the addition of 15% catfish flour.

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