

## Hedonic Quality Analysis of Flour-Based Longgi Brownies Cake substituted with Tilapia

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### Abstract

This study aims to determine the effect of substitution of tilapia (*Oreochromis niloticus*) flour to the organoleptic characteristics of Longgi (*Xanthosoma sagittifolium*) flour-based brownies cake. The hedonic quality organoleptic analysis of the data used is the Kruskal-Wallis test parameters, namely the taste, texture, aroma and color. Duncan further test using the test. The results showed that the use of tilapia flour has a real effect on the value of the hedonic quality of taste, texture, aroma and color. Hedonic quality characteristics of the brownies with tilapia flour substitution are of different values range from 5.48 to 8.28 with the criteria for taste "less sweet" to "no sweet taste"; 6.36 to 8.24 with the criteria of texture is less dense to dense; 7.48 to 8.28 with the criteria of color brown to blackish brown and smelling the aroma from 5.36 to 8.04 with the criteria "no scent" to "fragrant aroma".

Keywords: Brownies; longgi; *Xanthosoma sagittifolium*; tilapia; *Oreochromis niloticus*; fish flour; quality; substitution; organoleptic.

### Introduction

In general, only the fish meal used as feed for livestock, but the fish meal can also be used for food to increase the intake of nutrients that people consume (Kurnia and Purwani, 2008). The protein content of essential amino acid complex in fish, such as amino acids lysine and methionine. Besides that, it also contains minerals and B-complex vitamins, especially vitamin B 12 (Purnamasari et al, 2006). According Orias (2008), in addition to having a high mineral content, especially calcium content of the fish bones it forms complex phosphorus in the form of apatite or trikalsiumfosfat. In this form the fish meal is easily absorbed by the body and the rate of absorbance ranged between 60-70%.

Production of tilapia in the Gorontalo in 2014 amounted to 14435.41 tons (DKP, 2014). Tilapia are used as flour for the making brownies in this study is a small-sized tilapia ( $\pm$  9 cm). According to the observations in the lake Limboto, tilapia are fish that have not cultivated anymore due to the condition of the aquatic environment is not feasible as its habitat, moreover the selling price is still relatively cheap and its use is still limited mostly only as food such as fried fish. It is necessary to do efforts to diversify other fishery processed products such as fish meal.

Utilization of taro in Gorontalo is still very minimal. One effort to improve the utilization of taro is by utilizing taro tuber to be used as flour. Taro starchy tuber can produce a product that is more durable because of high water binding power (Richana, 2012). With the utilization of taro to be used as flour are expected to increase their use by the public taro taro flour that is using this as a substitute for wheat flour in various food processing.

One tuber of taro which has been used as flour is belitung taro tuber. Gorontalo people know taro Belitung as Longgi. The high content of carbohydrates in belitung able to make the taro flour taro flour belitung become a food source of carbohydrate substitute for wheat flour. Taro starch containing amylose and amylopectin 21.44% 78.56% (Hartati and Prana, 2003). In addition belitung taro flour free of gluten (Winarno and Agustinah, 2008).

Brownies is one type of cake blackish brown with a texture slightly harder than the cake because the brownies did not require developers or gluten (Astawan, 2009). In addition brownies is also one snack food favored by many people and can last two to three days without preservatives (Sufi, 2009).

This research will be making brownies baked using Longgi flour substituted with tilapia flour. In this case, the use of Longgi flour and tilapia flour is one

form of supplementary food processing to provide additional nutrients needed. The purpose of flour substitution of tilapia in brownies made from taro flour is to add the nutrients such as protein and calcium in brownies. Disadvantages of the brownies are made from taro flour is the lack of nutritional value of protein and calcium needed by the body.

The purpose of this research is to determine the effect of substitution of tilapia fish flour to the hedonic quality characteristics of Longgi flour-based brownies cake.

### Research Methodology

This study was carried out in September until January 2016. Making brownies and flour products carried out in the Laboratory of the Polytechnic

Gorontalo and organoleptic testing laboratory housed in the Department of Fishery Product Technology Faculty of Fisheries and Marine Sciences, State University of Gorontalo.

This research was done in 2 stages: preliminary and main research. The preliminary study which is making Longgi flour and Tilapia flour and making brownies. This preliminary study was conducted by trial and error with two experiments to determine the concentration of Longgi flour and tilapia flour.

The main research is the manufacture Longgi brownies with the substitution of tilapia fish flour consisting of 4 treatments, the concentration of the control (no substitution), 30%, 50%, and 70% as the treatment can be seen in Table 1.

Table 1. Formulation brownies made from flour of high and tilapia

Tilapia flour (%)	Longgi flour	Ingredients					
		Sugar	Egg	Margarin	C powder	C bar	Vanilla
30%	70%	150gr	3	200gr	40gr	200gr	½ ts
50%	50%	150gr	3	200gr	40gr	200gr	½ ts
70%	30%	150gr	3	200gr	40gr	200gr	½ ts

Hedonic quality organoleptic test was conducted based on the score sheet hedonic. Data form the panel assessment results obtained from hedonic organoleptic test were analyzed using non-parametric statistical methods Kruskal-Wallis test (Walpole, 1993). If the results of the treatment significantly affect the hedonic value then tested further by using Duncan test to find out which treatments are significantly different with the parameters analyzed.

### Results and Discussion

Brownies made from flour Longgi with flour substitution of tilapia consist of a control formula (flour Longgi 100%, flour tilapia 0%), formula A (flour Longgi 70%, flour tilapia 30%), formula B (flour Longgi 50%, tilapia fish flour 50%), and the formula C (30% Longgi flour, flour tilapia 70%). As well as controls without the use of tilapia fish flour. The hedonic quality testing performed by semi-skilled panelists who totaled 25 people.

#### Hedonic quality of color

Color is one of the attributes considered by consumers to determine the degree of preference for

brownies. The color histogram brownies with flour substitution of tilapia can be seen in Figure 1.



Figure 1 Histogram of brownies colour. Same alphabet indicator show non-significant difference and vice-versa.

Figure 1 shows the hedonic value of the organoleptic quality color brownies in the range of 7:48 to 8:28. The highest color organoleptic value contained in the formula C (flour substitution of tilapia 70%) is 8:28. While the organoleptic value was lowest for the control formula (without flour substitution of tilapia) is 7:48. Brownies formula A, B and C have the same value, namely eight criteria sepia, brownies control formula has a value of 7 criteria brown color.

Kruskal Wallis test results showed that the substitution ratio of flour and flour Longgi different

tilapia significantly affect the resulting color brownies (Appendix 5). The results of Duncan test showed that control formula significantly different from the formula A (30%), formula B (50%) and C (70%), but the formula A (30%), formula B (50%) and C (70%) not significantly different.

Color brownies with flour substitution of tilapia different show the same color is dark brown, in contrast with the color of the flour brownies without tilapia that is brown. Brownies without substitution of tilapia a brown color because Longgi flour contains saponins that when experiencing warming will cause a brown color. Colour significantly different from the control brownies brownies color formula A, B, and C. The existence of substitution of tilapia fish flour so dark brown brownies. This is according to research conducted by Justicia, et al. (2012) found that white bread flour is added to the red tilapia fish is more a brown color.

The emergence of brown color on the product can also be caused by the browning reaction (the Maillard reaction) because of the presence of protein (amino acids) and sugars in the manufacture of brownies. Maillard reaction is a reaction that occurs between carbohydrates (reducing sugar) and protein (amino acids) found in food so that it will produce a brown color called melanoidin (Winarno, 2002).

#### Hedonic quality of taste

The taste is a sensory attributes that determine consumer acceptance, although other attributes have hedonic value of good quality, but if the bad taste of the food product, then the product was not accepted by the consumer. Histogram flavor brownies with flour substitution of tilapia can be seen in Figure 2.



Figure 2 Histogram of brownies taste. Same alphabet indicator show non-significant difference and vice-versa.

Figure 2 shows the hedonic quality organoleptic taste of brownies in the range of 5:48 to 8:28. Organoleptic taste value is highest in the formula A (substitution of tilapia fish flour 30%) is 8:28. While

the organoleptic value was lowest for the formula C (flour substitution of tilapia 70%) is 5:48. Brownies control formula and formula A has the same value that is eight criteria sweet taste does not taste of fish flour and taro flour, brownies formula B has a value of 7 with the criteria of sweetness rather feels fishmeal and tasted flour Longgi and formula C has a value of 5 with criteria tasted less sweet fish flour and not feel Longgi flour.

Kruskal Wallis test results showed that the substitution ratio of flour and flour Longgi different tilapia significantly affect the taste of brownies generated (Appendix 5). Duncan test results showed that the control formula and formulas A (30%) did not differ significantly, but significantly different from the formula B (50%) and C (70%). While the formula B (50%) was significantly different from the formula C (70%).

Brownies different flavors due to the substitution of different tilapia fish flour. The more flour used tilapia organoleptic taste value decreases as well. Attributes taste of food consisting of taste salty, sour, sweet, bitter and savory. Justicia, et al. (2012) states that white bread flour with the addition of red tilapia fish are more likely to make a fishy taste or flavor of the fish are strong when eaten.

Attributes flavor is mainly determined by the formulation used and is usually not affected by the treatment process (Hariyadi 2001). The sweet taste found in brownies caused by their constituent material, namely sugar. This is according to research conducted by Astawan, et al., (2004) on the jam and dodol seaweed, that sugar in jam making and dodol can act as flavoring.

Sweet taste and is formed by the reaction of caramelization According Kusnandar (2011), the caramelization reaction formed when sugar is heated at high temperatures (170°C), there will be a series of chemical reactions which caused flavor in food.

#### Hedonic quality of aroma

Aroma brownies brownies determine deliciousness itself. Histogram aroma of brownies with the substitution of fish bone meal can be seen in Figure 3.

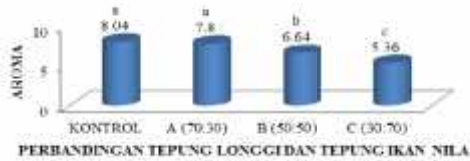


Figure 3 Histogram of brownies aroma. Same alphabet indicator show non-significant difference and vice-versa.

Figure 3 shows the value of the hedonic quality organoleptic aroma of brownies in the range of 5:36 to 8:04. Aroma organoleptic value highest in the control formula (without flour substitution of tilapia) is 8:04. While the organoleptic value was lowest for the formula C (flour substitution of tilapia 70%) is 5:36.

Kruskal Wallis test results showed that the substitution of flour and flour Longgi different tilapia significantly affect the resulting aroma of brownies (Appendix 5). Duncan test results showed that the control formula and formulas A (30%) did not differ significantly, but significantly different from the formula B (50%) and C (70%). Formula B (50%) was significantly different from the formula C (70%).

Aroma brownies on the control and formulas A did not differ significantly because brownies control formula and formulas A (substitution of tilapia fish flour 30%) have the same value, namely eight criteria does not smell fragrant aroma of tilapia fish flour and flour Longgi. But significantly different with brownies formula B (flour substitution of tilapia 50%) and the formula C (flour substitution of tilapia 70%), while the formula B and C are also significantly different, it is because the formula B has a value of 6.64 approaching 7 criteria fragrant less smelling the aroma of tilapia fish flour and odorless aroma Longgi flour and formula C has a value of five criteria smelling aroma tilapia fish flour and do not smell the scent of flour Longgi.

Factors that influence the aroma of the products produced, namely flour brownies tilapia. Flour tilapia has a stronger aroma so that the higher the concentration of tilapia fish flour produced causes the aroma of brownies tend to be stronger.

The aroma of fish flour tends to be stronger due to the reaction of decomposition of protein and fat compounds into volatile compounds (Kusnandar, 2011). This is according to research conducted by

Khalishi (2011) that rengginang written songs more fishmeal to produce a strong aroma smelled of fish.

Besides flavor to brownies due to the Maillard reaction. Maillard reaction is the main reaction between reducing sugars with amino acid components which accelerated with rising temperatures and decreasing water content (Mottram 1994). Maillard reaction has contributed to the aroma, even according to Oliveira et., Al. (2014) nearly half of volatile compounds formed in foods is a product of the Maillard reaction. Maillard reactions occur widely, especially in the food.

#### Hedonic quality of texture

Data analysis results organoleptic quality texture hedonic brownies made from starch flour Longgi substituted tilapia can be found in appendix 4. Histogram texture brownies with the substitution of fish bone meal can be seen in Figure 4.

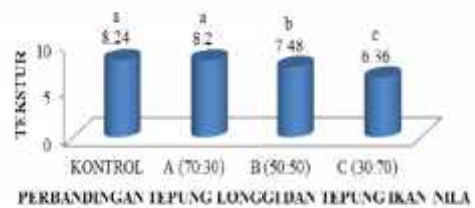


Figure 4 Histogram of brownies texture. Same alphabet indicator show non-significant difference and vice-versa.

Figure 4 shows the value of the hedonic quality organoleptic texture brownies in the range of 6:36 to 8:24 with the criteria of less dense until solid. Aroma organoleptic value highest in the control formula (without flour substitution of tilapia) is 8:24. While the organoleptic value was lowest for the formula C (flour substitution of tilapia 70%) is 6:36.

Kruskal Wallis test results showed that the substitution ratio of flour and flour Longgi different tilapia significantly affect the texture of the resulting brownies (Appendix 5). Duncan test results showed that the control formula and formulas A (30%) did not differ significantly, but significantly different from the formula B (50%) and C (70%). As well as the formula B (50%) was significantly different from the formula C (70%).

Texture brownies control formula and formulas A (substitution of tilapia fish flour 30%) was not

significantly different because it has the same value that is eight criteria dense texture. But significantly different with brownies formula B (substitution of tilapia fish flour 50%) and the formula C (flour substitution of tilapia 70%). While brownies formula B was significantly different from the formula because the formula C B has a value of 7:48 with a rather solid criteria and formula C has a value of less dense 6:36 criteria.

The more flour tilapia used hedonic value on the texture quality has declined, because the starch content decreases. Taro flour contains starch are high, so it will affect the texture of the brownies. According to Herath (2009) of food products produced from starch with a high amylose content have less dense texture when compared to food products produced from starches with lower amylose content. Generally, strengthening the ability of this texture is closely linked to the ability of the water holding capacity of starch, the greater water holding capacity, the larger the capacity reinforcement texture.

This is consistent with research Windaryati, et., Al., (2013) that the more the concentration of flour brownies gembolo then the less dense texture, because the flour gembolo have starch with high amylose content.

Besides the addition of fish flour will also affect the texture. It is appropriate research Maulida (2005),

the addition of bone meal of tuna 20% have hedonic value is very low on the parameters of texture of the konsentrasi 10%, because the more the addition of bone meal of fish then the resulting product is getting harder, because the fish flour containing calcium and phosphorus so that the texture of the products produced will change according to the number of additional fish bone meal.

### Conclusion and Suggestion

Based on the results of this study concluded that substitution Longgi flour and flour brownies tilapia on effect on the characteristics of the hedonic quality organoleptik. Karakteristik brownies with flour substitution of tilapia different values from 5.48 to 8.28 with the criteria for taste less sweet tasted fishmeal and not tasted sweet Longgi until no fishmeal and Longgi; 6.36 to 8.24 with the criteria texture is less dense to dense; 7.48 to 8.28 with the criteria color brown to blackish brown and smelling the aroma from 5.36 to 8.04 with the criteria until fragrant aroma of the fish does not smell the scent of fish and Longgi.

For further research, it is advisable to seek the use of other additives that can improve characteristics brownies

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