BISCUIT OF SPINACH (Amaranthus Sp) WITH NILA FISH (Oreochromis Sp) BONE FLOUR ADDITION AS HIGH CALCIUM ALTERNATIVE SNACK

Biskuit Bayam (*Amarantus Sp*) Dengan Penambahan Tepung Tulang Ikan Nila (*Oreochromis Sp*) Sebagai Alternatif Makanan Selingan Tinggi Kalsium

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ABSTRACT

Intake of nutrients has an important role in the growth and development of human one of them is calcium. Adequate calcium intake can help produce higher bone mass, helping to maintain bone density. In general, making biscuits using only wheat flour which only contains macro nutrients and contain few other nutrients. Through the addition of fish bone meal is expected to increase the nutritional value of biscuits, especially calcium. The objective to know the effect of addition of bone meal of tilapia fish to calcium level and acceptance on spinach biscuits as alternative of high calcium interlude food. The method used in this study was experimental laboratories with 4 treatments ie without the addition of fish bone meal, the addition of fish bone meal 25g, 50g and 75g. The organoleptic test using the VAS (Visual Analog Scale) method was performed by 30 semi trained panelists. The results showed the addition of different fish bone meal gave a real effect (p <0.05) on the quality and content of calcium in biscuits. Treatment with 75g fish meal bone meal resulted in the highest calcium value of 7.63%. While the results of the acceptance test of biscuit treatment with the addition of 25g fish bone meal is the most preferred biscuit overall. The conclusion a more fish bone meal in the biscuit dough the higher the calcium value.

ABSTRAK

Secara umum pembuatan biskuit hanya menggunakan tepung terigu tanpa penambahan tepung lainnya sehingga zat gizi yang dihasilkan masih kurang terutama pada kalsium. Melalui penambahan tepung tulang ikan dan aun bayam ini diharapkan dapat menambah nilai gizi biskuit. Tujuan mengetahui pengaruh penambahan tepung tulang ikan nila terhadap kadar kalsium dan daya terima pada biskuit bayam sebagai alternatif makanan selingan tinggi kalsium. Metode yang digunakan pada penelitian ini adalah *experimental laboratories* dengan 4 perlakuan yaitu tanpa penambahan tepung tulang ikan, penambahan tepung tulang ikan 25g, 50g dan 75g. Uji organoleptik menggunakan metode VAS (*Visual Analog Scale*) dilakukan oleh 30 orang panelis agak terlatih. Hasil penelitian menunjukan penambahan tepung tulang ikan yang berbeda memberikan pengaruh yang nyata ($p<0,05$) terhadap mutu serta kandungan kalsium pada biskuit. Perlakuan dengan penambahan tepung tulang ikan 75g menghasilkan nilai kalsium tertinggi yaitu 7,63%. Sedangkan hasil dari uji daya terima biskuit perlakuan dengan penambahan tepung tulang ikan 25g adalah biskuit yang paling disukai secara keseluruhan. Kesimpulan semakin banyak penambahan tepung tulang ikan pada adonan biskuit semakin tinggi nilai kalsiumnya.

Kata Kunci: biskuit, kalsium, tepung tulang ikan

Keywords: biscuit, calcium, fishbone flour

BACKGROUND

One of the nutrients intakes needed in the body is calcium. Adequate calcium intake can help to produce higher bone mass, helping to maintain bone density, especially in the pelvic area, where most of the fragmentation occurs (Felicia, 2009). Disadvantages in children and adolescents can cause growth disorders, the process of hardening of the bones becomes inhibited and cause rickets. Deficiency in the adult group will cause osteoporosis that is contracted by bone hardness and brittle against fracture events if the patient fell (Almatsier, 2003).

Calcium is the mineral needed in the highest amount compared to other minerals. Given the high demand for calcium and the severity of the impact caused by deficiencies, it is necessary to develop a product to increase the diversity of food products people can eat to meet the body's needs (Ferazuma et al., 2012).

Fish flour is one of the products of fish that until now has not been utilized optimally for food (Kusharto & Marliyati, 2012). The manufacture of the fish meal based on red tilapia can be an alternative form of food. The use of fish meal as a supplementary ingredient in biscuit making is one of promising alternative uses, arising from the quality of the nutrients produced.

Biscuits can be accessed as a good medium as one type of food that can meet the special needs of humans. By adding certain foods such as the fish meal in the process of making biscuits, biscuits can be produced with added value is good for health, in this case, is calcium (Kusharto & Marliyati, 2012). Biscuits are a practical food because they can be eaten anytime and with good packaging, biscuits have a relatively long shelf life.

METHODOLOGY

Materials and Instrumens

The material used in the manufacture of red tilapia fish flour is the result of fresh tilapia filleting obtained from the traditional market. The ingredients used in the manufacture of biscuits include wheat flour, red tilapia flour, refined sugar, eggs, margarine, milk powder, baking powder, and vanilla. In addition to ingredients for the manufacture of fish meal and biscuits, also used materials for chemical analysis.

The tools used among others are used to make the fish bone meal consisting of cutting board, knives, pans, blenders. The equipment used for making biscuits consists of scales, mixers, cake molds, baking pan, dough stirrer spoon. Other supporting tools used for the manufacture of products consist of a gas stove, oven, plastic container, spoon, sieve, stopwatch. Equipment for analysis of proximate test used is glassware, spatula, desiccator, condenser, soxhlet, distillation device.

Making a Nila Fishbone Flour

The way of making a Nila fishbone flour is fish bones soaked first using lime solution for 15 minutes to remove the smell of rancid, then fish bones that have been cleaned from the fins, flesh and other parts that are not needed, washed with water. The cleaned fish is boiled for 30 minutes at 100°C, then put in presto for 2 hours to soften the fish bone. After presto fish bones dried by the oven for 30 minutes with a temperature of 120^{o}C, then

milled using a blender until the fishbone into flour after it sifted using a sieve (100 mess) so that fishbone flour with fine grains.

Biscuit Formulation

At this phase do spinach biscuit formulation of wheat flour and spinach powder with the addition of Nila fishbone flour. Comparison of flour and Nila fishbone flour used is: F0 flour 100 gram with concentrations of 0 grams Nila fishbone flour, F1 flour 75 gram with concentrations of 25 grams Nila fishbone flour, F2 flour 50 gram with concentrations of 50 grams Nila fishbone flour, F3 flour 25 gram with concentrations of 75 grams Nila fishbone flour. While other materials used for each formula are the same, except wheat flour.

The sequence of the process of spinach biscuits as follows: margarine and refined sugar in the mixer until flat and then add vanilla and cake developers until fluffy. Then input the egg yolk and stir with the mixer so it is flat. Then add flour, Nila fishbone with the addition of F0 (0 g), F1 (25 g), F2 (50 g), F3 (75 g), spinach powder, milk powder, then stirred by hand using gloves. Once the dough is easily molded with a cake mold, put on a baking sheet and then baked in an oven at a temperature of 120^{o}C for 25 minutes.

Analysis Data

The results of the organoleptic test (hedonic and hedonic quality) using One Way ANOVA Test because the data is in the form of a comparative more than 2 interconnected samples. If the ANOVA test yields a p-value <0.05, then proceed with a Post Hoc analysis using Bonferroni. If data is not eligible for a parametric test, then test alternative one way ANOVA test that is Kruskal-Wallis test.

Table 1. The composition of Spinach Biscuit with the addition of Nila Fishbone Flour

Bahan (g)	Kode Perlakuan			
	F1	F2	F3	F4
Tepung tulang ikan	0	25	50	75
Tepung terigu	100	75	50	25
Bayam	50	50	50	50
Telur	32	32	32	32
Margarin	35	35	35	35
Gula halus	20	20	20	20
Susu bubuk	25	25	25	25
Pengembang kue	2	2	2	2
Vanili	1	1	1	1

RESULTS

The nutritional value of spinach biscuits

Test the nutritional value is done on all biscuit formulations, the goal is to see the difference of each formulation and then compare with SNI about the quality requirements of biscuits. Mean Value ± SD test result of the nutritional value of spinach biscuit with the addition of red tilapia fish meal in Table 2.

Carbohydrate

The results of spinach biscuit carbohydrate levels with the additional treatment of Nila fishbone showed no significant effect with more Nila fishbone in each formulation, considering that fishbone flour contains low carbohydrate with the main ingredient of wheat flour which has higher carbohydrate value. This is in accordance with the statement of Kusharto and Damayanti (2017) which states the level of carbohydrate biscuit with a substitution of fish meal is lower. The decrease in carbohydrate levels is due to the outbreak of wheat flour which is the main source of carbohydrates in biscuits.

However, from the four biscuit formulation has fulfilled the requirements of biscuit quality according to SNI. 01-2973-92 that is at least 70%.

Protein

The values of the four biscuit formulations have significant. Protein content is strongly influenced by raw material formulation. Protein content found in the fishbone flour is higher than wheat flour. According to the requirement of biscuit quality based on SNI, the minimum protein content in biscuits is 9.00%. Levels of biscuit protein produced in this study are highest at 11.88%. Compared with the requirement of the minimum protein content of biscuits with wheat flour only (SNI), the biscuit protein content of this study is higher than the minimum protein level in SNI biscuit. This is in agreement with Nugroho et all (2016) and Pratama et all (2017) fish meal derived from fresh fish has a high protein content that will affect the protein content of a food product.

Tabel 2. Mean and Standard Deviation of Nutritional Value of Biscuit with Addition of Nila Fishbone Flour

Nilai Gizi	*Mean*±SD(%)				Sig	Syarat Mutu SNI
	F0	F1	F2	F3		
Karbohidrat (g)	72.08±0.60	71.64±0.01	72.01±0.01	72.03±0.16	0.838	Min 70%
Protein (g)	11.67±0.06[a]	11.81±0.01[a]	11.82±0.06[a]	11.88±0.01[a]	0.038	Min 9%
Lemak (g)	14.47±0.01[a]	14.42±0.02[a]	14.38±0.01[b]	14.34±0.01[b]	0.005	Min 9,5%
Kalsium (mg)	3.41±0.06[a]	4.49±0.02[b]	5.56±0.07[c]	7.63±0.05[d]	0.0001	-

Notification:
- The above data is the result of the mean twice repetition ± standard deviation
- Superscript with different letters shows a real difference
- Data not accompanied by Superscript letters show insignificant results

Fat

The results of the fat content of spinach biscuits with additional treatment of red tilapia fishbone showing a significant influence on the quality of Nila fishbone flour in each formulation. Wheat flour has higher fat content than Nila fishbone flour, the less nutritional value of fish bone flour used in the formulation will be a little bit fat content produced.

Calcium

The values of the four biscuits formulations, showing the significance or significance of different results between each formulation, the four biscuit formulations that are supplemented with the use of fish bone meal. The results of four biscuits formulations, the content of the formulation of F3 of 7.63% with the additional components of fish meal 75g (additional fish bone meal of the highest). The higher formulation of fishbone flour the level of calcium owned by the biscuit. Calcium levels are not included in SNI. 01-2973-92 because they can not be used as a requirement of the quality of biscuits. This is in agreement with Baskoro (2008) in Justicia et al (2012) Nila fishbone flour has a calcium content of 9.02%. The addition of Nila fishbone flour to fresh bread can increase the calcium content in food products.

Organoleptic Spinach Biscuits

The result of the hedonic quality test and hedonic test to a parameter of

color, flavor, aroma, and texture of biscuit by Average ± SD acceptance of all treatment. Mean ± SD values of hedonic quality test results and hedonic test of spinach biscuits with the addition of red tilapia fish bone meal are presented in Tables 2 and 3.

Tabel 3. Results Mean And Standard Deviation Hedonic Quality of Biscuits With the Addition of Nila Fishbone Flour

Parameter	*Mean*±SD(mm)				Sig
	F0	F1	F2	F3	
Warna	76,44±11,87[a]	72,31±13,17[ac]	65,05±14,80[bd]	58,67±15,32[c]	0,000
Aroma	71,92±13,86[a]	60,72±23.94[ac]	48,85±23,09[bd]	38,51±18,35[c]	0,000
Rasa	33,08±18,41[a]	49,90±23,90[b]	70,36±17,09[c]	66,46±17,22[c]	0,000
Tekstur	70,87±12,67[a]	73,77±15,64[a]	62,92±16,91[a]	45,77±22,94[d]	0,000
Keseluruhan	64,26±16,92[a]	68,97±13,88[a]	57,13±16,52[c]	53,10±19,10[d]	0,000

notification: Different superscript on the same line shows a noticeable difference (p <0.05)

Tabel 4. Results Mean And Standard Deviation Hedonic of Biscuits With the Addition of Nila Fishbone Flour

Parameter	*Mean*±SD(mm)				Sig
	F0	F1	F2	F3	
Warna	69,41±14,46[a]	62,05±19,71[b]	55,85±19,80[b]	54,21±21,60[b]	0,002
Aroma	67,26±15,43[a]	50,90±24,16[b]	53,90±20,56[b]	49,46±25,37[b]	0,001
Rasa	68,59±17,13[a]	53,10±25,87[a]	46,26±23,79[c]	42,00±26,60[d]	0,000
Tekstur	71,23±19,04[a]	62,69±18,41[a]	54,36±19,81[c]	53,41±23,00[c]	0,000
Keseluruhan	67,85±12,62[a]	66,13±12,24[a]	55,13±17,84[c]	51,03±21,66[d]	0,000

notification: Different superscript on the same line shows a noticeable difference (p <0.05)

Color

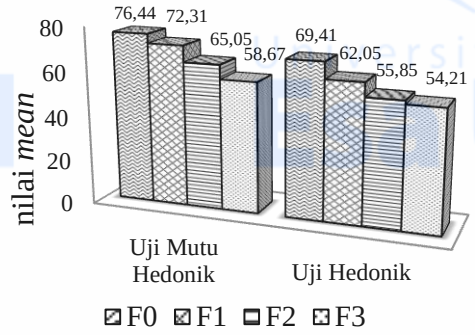

Figure 1. Graph of Mean Color Parameter Test

Color is the first visual character that can be judged by the eye. The appearance of the color of a foodstuff is a major factor that rates before.

Based on the graph beside, the average color of the spinach biscuits is highest to the quality and the level of biscuit color preferences in the formulation of F0 ie biscuits without the distribution of Nila fishbone. This is in harmony with research Maulida (2005) that is by addition of fish bone meal will be brightness level of biscuit color. The panelist's favorite level of biscuit color is known by the collection of fish meal where the Ca^{++} particles will decrease the brightness of the biscuit color.

The result of the hedonic test and hedonic quality of spinach biscuit color parameter on all treatment based on one way ANOVA statistical test there is an influence of tilapia flour to spinach biscuit color. The more substitution of the Nila fishbone flour is added to the spinach biscuit formula then the color of the biscuit will become darker. Fishbone flour causes the color of the biscuit to become dark due

to Maillard reaction, ie non-enzymatic browning reaction due to the reaction of reducing sugar with amine-free groups of amino acids or proteins (Fitri and Purnawati, 2017).

Aroma

The aroma of food derived from molecules that evaporate from food which is then captured by the nose as a sense of smell. The smell of food is one aspect of the taste of food. The scent that is spread by the food results in a very strong attraction and is able to create the sense of smell to grow appetite.

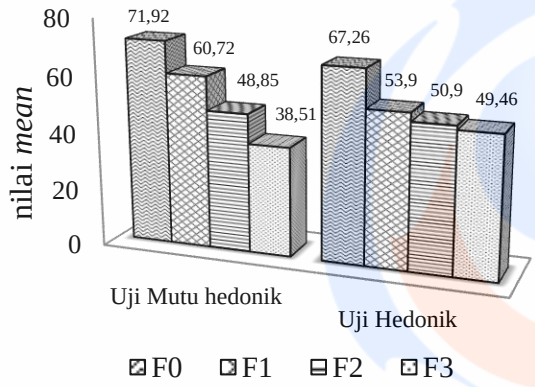

Figure 2. Graph of Mean Aroma Parameter Test

Based on the graph above, the average yield of aroma of biscuits is in the highest quality of the fish. Formulation with the addition of red tilapia fish bones is not preferred because there is a fishy aroma produced in biscuits. The aroma is produced on the products of spinach biscuits according to the contents of tilapia fish. This is in line with Asmoro et al (2012) research, the higher concentration of anchovy added to the biscuit formulation than the average acceptability of the biscuit aroma is getting smaller. The higher the substitution of Nila bone meal in the biscuit formulation will be more pronounced the distinctive aroma of fish that is fishy and relatively sharp. If viewed from the panelists' assessment, the panelists do not know the fish biscuits because in general, the fish biscuits are not yet many inhabitants

Flavors

Flavour is a response to chemical stimuli that reach the taste buds of the tongue, especially the basic flavors of sweet, salty, sour, and bitter.

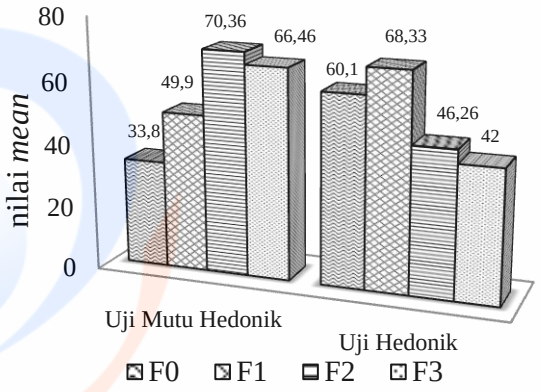

Figure 3. Graph of Mean Flavors Parameter Test

The test parameters of hedonic taste quality given are from not savory to savory. It is seen clearly in the above graph with the average result of the quality of biscuit, the lowest result in the control biscuit with the flavor of the biscuit which is not in accordance with the result of an F2 formulation is the addition of fish bone meal as much as 50g. It should taste very tasty on the F3 formulation, but from some panelist features, the flavor generated on the savory F3 formulation is more dominated by the fishy taste. Fishiness is due to the amount of fish bone meal that is added to the dough. The highest taste level

of taste is biscuits with a 25g fish bone meal. Can be concluded that happened.

Texture

The texture is defined as the nature of food ingredients done by the skin and muscles in the mouth, including roughness, smoothness, graininess and so on. The texture and concentration of a material will occur the taste generated by the material.

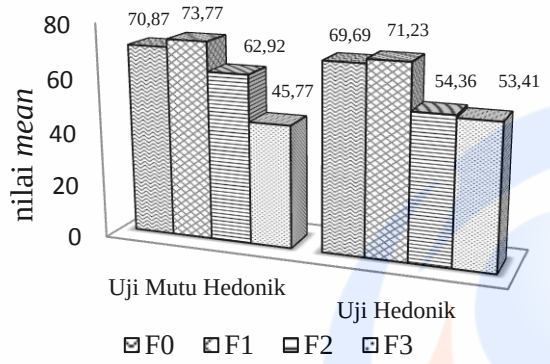

Figure 4. Graph of Mean Texture Parameter Test

The result of a hedonic quality test to spinach biscuit texture parameters on all treatment based on one way ANOVA statistical test there is an influence of tilapia flour to spinach biscuit texture. Because there is influence then proceed with Bonferroni test with biscuit result there is a real difference that is only on F3 formulation whereas in formulation F0, F1 and F2 same texture. The resulting texture of these spinach biscuits is that more fish meal added to the dough cannot be reduced by the crunchiness of the biscuit, but the distribution of the most formulated fishbone flour (F3) makes the texture of a little gritty biscuit caused by Nila fishbone flour. the same as Hardoko et al (2017) study, related to bone meal size can affect abrasive or sandy taste in a food product. The level of panelist's preference for texture between very dislike to very like. The highest level of preference to texture is in spinach biscuits with the addition of the least fish meal bone and the addition of flour most fishbones.

CONCLUSION

The results of laboratory tests for nutrition, protein, fat have the standard of biscuit quality based on SNI standard no. 01-2973-92. The results of this research can be obtained from the treatment of F3 formulation that is equal to 7.63%, but based on the claims of nutrient content of processed foods from all biscuit

According to the hedonic quality organoleptic test, the aroma, taste, and texture of formulations, while the most preferred overall acceptance test receipt is the formulation of F0 and F1 with the lowest value calcium results. Biscuits formulations F3 tend not preferred as there is still fishy flavor on this product.

RECOMMENDATIONS

Advanced research is suggested to examine the effect of storage duration on biscuits and to make flavor or aroma of biscuits using the most fish bone meal or highest calcium content to be preferred and can eliminate the fishy fishbone flour by adding liquid vanilla extract.

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