

The Addition of Snakehead Fish (*Channa Striata*) and Bitter Ginger (*Zingiber Zerumbet L*) to Fish Floss

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ABSTRAK

Latar Belakang: Abon ikan merupakan jenis makanan olahan yang terbuat dari ikan yang diberi beberapa bumbu, cara pengolahannya dengan pengukusan dan penggorengan. Ikan gabus mengandung protein yang lebih tinggi dibandingkan jenis ikan lainnya. Lempuyang gajah dapat digunakan untuk obat gatal, perut nyeri, disentri, sesak nafas, wasir, cacing dan penambah nafsu makan.

Tujuan: Untuk menganalisis skor dan uji perbedaan pada uji inderawi, uji hedonik, kadar albumin, kadar air, dan kadar abu pada abon ikan gabus dengan lempuyang gajah.

Metode: Desain penelitian yang digunakan adalah eksperimental dengan 2 faktor 3 taraf perlakuan terdiri dari daging ikan gabus 90%, 80%, 70% dan lempuyang gajah 10%, 20%, 30%.

Hasil: Hasil skor uji inderawi dari indikator aroma, tekstur, dan rasa tertinggi pada formula 1 (90% ikan gabus : 10% lempuyang gajah) dan dari indikator warna tertinggi pada formula 2 (80% ikan gabus : 20% lempuyang gajah). Sedangkan uji beda inderawi menggunakan analisis Kruskal Wallis untuk uji beda inderawi didapatkan hasil yang memiliki perbedaan signifikan yaitu aroma, tekstur dan rasa (P -Value < 0,05). Uji hedonik tertinggi di masyarakat umum termasuk dalam kategori suka (77%) dengan perbandingan ikan gabus 70% dan lempuyang gajah 30%, sedangkan pada mahasiswa gizi termasuk dalam kategori suka (69,57%) dengan perbandingan ikan gabus 80% dan lempuyang gajah 20%. Dari hasil penelitian ini untuk kandungan albumin tertinggi pada formula 1 sebesar 2,57%, kadar air ketiga formula belum sesuai dengan SNI 01-37707-1995 dan kadar abu ketiga formula sudah sesuai dengan SNI 01-37707-1995 pada produk abon.

Kesimpulan: abon ikan gabus dengan lempuyang gajah dapat diterima oleh masyarakat.

KATA KUNCI: abon ikan; albumin; ikan gabus; lempuyang gajah;

ABSTRACT

Background: Fish Floss is a type of processed food made from seasoned fish, which is processed by steaming and frying. Snakehead fish contain higher protein than other fish. Bitter ginger can be used for itching medicine, stomach pain, dysentery, asphyxiate, hemorrhoids, worm disease and appetite enhancer.

Objectives: For analyzing scores and test differences in sensory test, hedonic test (preference), albumin content, water content, and ash content in Snakehead fish with the addition of Bitter Ginger.

Methods: The research design that was used was experimental with 2 factors 3 treatment levels consisting of 90%, 80%, 70% snakehead fish' meat and 10%, 20%, 30% bitter ginger.

Results: the result of sensory test scores from indicators of the aroma, texture, and highest test in formula 1 (90% snakehead fish: 10% bitter ginger) and from the highest color in formula 2 (80% snakehead fish: 20 % bitter ginger). Meanwhile, the sensory difference test using Kruskal Wallis analysis for sensory difference test showed that the result had significant differences such as aroma, texture and taste (P -Value <0,05). While the highest hedonic test in general public was included in like category (77%) with the ratio of 70% snakehead fish and 30% bitter ginger, in nutritional science department students were included in like category (69.57%) with the ratio of 80% snakehead fish and 20% bitter ginger. From the result of this research for highest albumin content in formula 1 was 2.57%, water content for all formulas are not appropriate with SNI 01-37707-1995 in fish floss products because it has more than 7% and ash content

for all formulas are already appropriate with SNI 01-37707-1995 was less than 7%.

Conclusion: Fish floss with the addition of bitter ginger can be accepted by society.

KEYWORDS: albumin; Bitter ginger; fish floss; Snakehead fish

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INTRODUCTION

Globally in 2016, there were 10.4 million tuberculosis incidents which were equivalent to 120 cases per 100.000 population. There were five countries with the highest tuberculosis cases such as India, Indonesia, China, Philippines, and Pakistan. The cases of Tuberculosis in Indonesia were 420.944 cases in 2017 (1). Pulmonary tuberculosis sufferers have poor nutritional status so they need protein-containing food to accelerate the repair of cells and tissues damaged by tuberculosis bacteria. If the protein content is lacking (fewer albumins) the healing process is hampered (2).

One of the foodstuffs that can increase albumin content is snakehead fish. Protein content in snakehead fish reaches 25.5% and albumin content of snakehead fish reaches 6,22% (3). Besides snakehead fish, egg white also contains protein (4). Ovalbumin contents are mostly in egg white. Egg white of purebred chicken contains 100 g of egg white containing 10.5 g of protein and 95% is albumin (9.83 g) (5). The ingredient that was used in this research besides snakehead fish is bitter ginger. Bitter ginger can be used for itching medicine, stomach pains, dysentery, asphyxiate hemorrhoids, warm disease and appetite enhancer (6). Based on the research result, the *zerumbone* contained in bitter ginger can be used as an alternative that can be developed for the treatment of tuberculosis (7). The product that will be made from raw materials of snakehead fish and bitter ginger is floss meat. Floss (shredded meat) is a

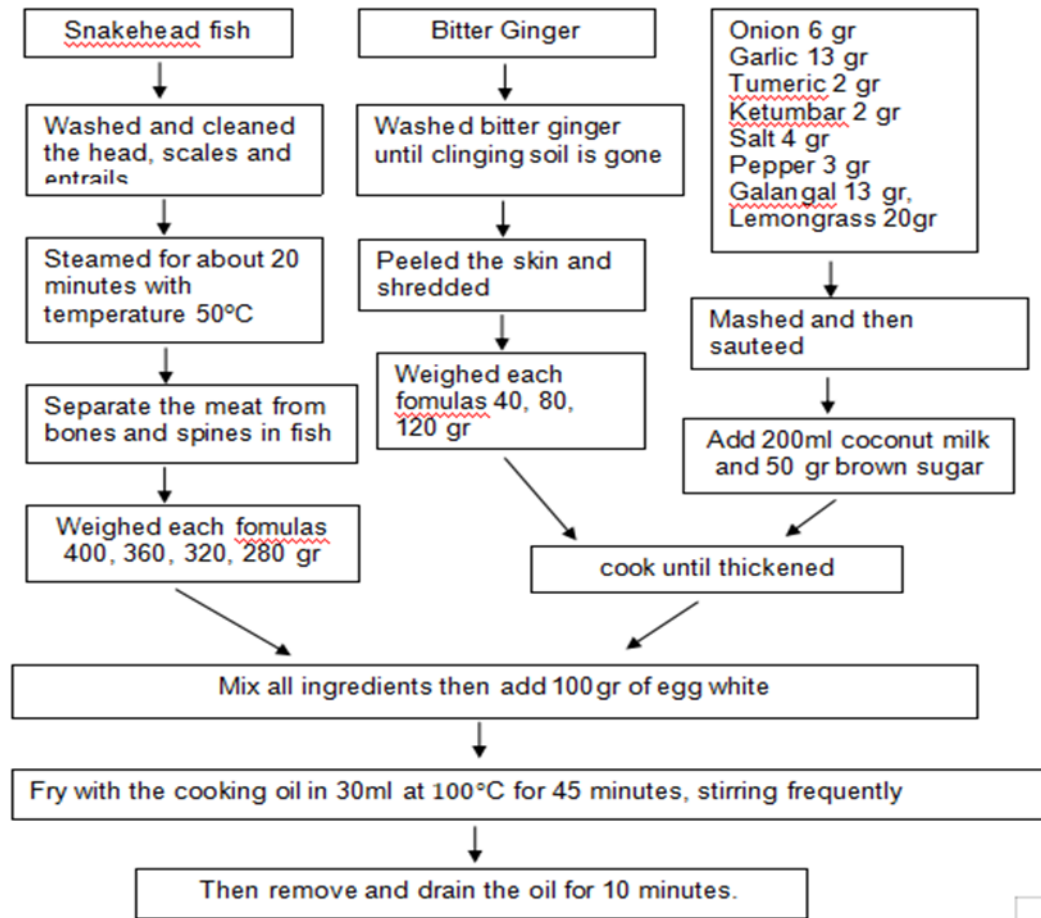
type of dry food processed from boiled, shredded, seasoned, fried, and pressed meat (8).

According to the background of the problems described, research on food innovation products entitled The Addition of Snakehead Fish (*Channa Striata*) and Bitter Ginger (*Zingiber Zerumbet L*) to Fish Floss.

MATERIALS AND METHODS

The research type that is used is true experimental design with 2 factors 3 treatment levels consist of 90%, 80%, 70% snakehead fish's meat and 10%, 20%, 30% bitter ginger. Research time was in March - July 2020. The research sample used untrained panelists with a total 35 people consisting of nutritional science department students of STIKes Mitra Keluarga for organoleptic and hedonic tests. Also 35 people are from the community around Mustika Jaya District for the hedonic test. Albumin, water and ash content were done in Gadjah Mada University Laboratory, Center for Food and Nutrition Studies. This research has received approval from the research ethics committee of Muhammadiyah University of Prof DR. HAMKA (KEPK-UHAMKA) Jakarta with the number: 03/20.03/04349.

The tools for making fish floss are digital scales, knife, basin, blender, and sieve. Cutting board, spatula, measuring cup, spoon, grater, stove, streamer, frying pan, oil drainer, stopwatch and thermometer. The procedure of making fish floss:



FigureImage 1. The procedure of making fish floss. (Modified: Suhan,2014)

The tools used in the organoleptic test and hedonic test are questionnaire sheets, pens and the material used for fish floss. The tools used in testing albumin, water and ash content tests: mortar and pestle, test tube, test tube rack, beaker glass, drop pipette, measuring pipette, filter paper, volumetric flask, Erlenmeyer, watch glass, analytical scales, bulb, spatula, centrifuge, spectrophotometer, stopwatch, oven, desiccator, and furnace. Na_2CO_3 10% 2 gram, NaOH 0,5 N 100 ml, CuSO_4 1% 1 ml, Kalium Natrium Tartrat 2% 1 ml, Folin 2N 1 : 1 aquades, BSA (*Bovine Serum Albumin*) 0.0306 gr, each sample formula 5 gr.

The processing of Sensory Score tests and

Hedonic tests were analyzed using a software computer to find out the organoleptic quality and product preference level. A sensory difference test was done to find out the hypothesis result by using Kruskal Wallis and Man Whitney as a further test.

RESULT AND DISCUSSIONS

Sensory Test

Sensory test in this research based on an assessment of 35 untrained panelists consisting of Nutritional Science Department students by using 3 different formulas with a range values of 1-4 in each indicator such as aroma, texture, taste, and color.

Table 1. The Result of Sensory Test Scores of Fish Floss and Bitter Ginger (n=35)

Formula (Snakehead Fish: Bitter Ginger)	Sensory Test Scores							
	Aroma	Information	Texture	Information	Taste	Information	Color	Information
1 (90%: 10%)	3.14	Quite flavorful of fish	3.41	Dry	2.93	Sweet enough savory	3.44	Light brown
2 (80%: 10%)	2.99	Quite flavorful of fish	3.16	Dry enough	2.76	Sweet enough savory	3.77	Light brown
3 (70%: 30%)	2.76	Less flavorful of fish	2.99	Dry enough	2.46	Sweet less savory	3.66	Light brown

In table 1, the data on the result of the organoleptic test on indicators aroma, texture, taste and color showed that panelists gave the highest assessment on aroma indicator in formula 1 with the average score of 3.14 (quite flavorful of fish) and lowest in formula 3 with the average score 2.76 (less flavorful of fish). Based on the texture indicator, the highest average score is 3.41 (dry) in formula 1 and the lowest average score is 2.99 (dry enough) in formula 3. Then based on the taste indicator, the highest average score is 2.93 (sweet enough savory) in formula 1 and the lowest average score is 2.46 (sweet less savory) in formula 3. Lastly, on color indicator, the highest in formula 2 with the average score is 3.77 (light brown) and the lowest in formula 1 with the average score is 3.44 (light brown).

Sensory Difference Test

In the result of the sensory difference test to find out the differences of each sample with the criteria of aroma, texture, taste, and color so it is necessary to do a statistical difference test by using *Kruskal Wallis* test and followed by Man Whitney.

Table 2. The Result of Sensory Difference Test of Fish Floss and Bitter Ginger (n=35)

Indicators	P-Value	Information
Aroma	0.010 < 0.05	Different
Texture	0.002 < 0.05	Different
Taste	0.001 < 0.05	Different
Color	0.949 > 0.05	No different

Based on table 2, the result of the sensory difference test using *Kruskal-Wallis* statistical

analysis test in indicators aroma, texture and taste have P-Value score < α (0.05), so can be concluded from indicators of aroma, texture and taste have a real difference so that can be done and continue to Man Whitney test to find out the differences between groups. Whereas the color indicator has p-value score > α (0.05), based on the results above, there is no difference in the color of the product due to the use of the same palm sugar formula in 3 samples. The color of the product is obtained from the use of brown sugar which has a brown color. It was suspected because snakehead fish meat and bitter ginger are covered by the use of spices and brown sugar that are used in each same formula and cooking time. So that snakehead fish and bitter ginger floss had no different color.

Table 3. The Result of Difference Test for Aroma Indicator

Formula Groups	Difference in mean rank	P-Value	Information
Formula 1 and Formula 2	7.72	0.084 > 0.05	No different
Formula 2 and Formula 3	6.46	0.137 > 0.05	No different
Formula 1 and Formula 3	13.14	0.004 < 0.05	Different

Based on table 3, the result of Man Whitney's continued test on aroma indicator, there are only differences in formula 1 and formula 3 where P-Value < α (0.05). Whereas for P-Value > α (0.05) there is no difference in formula 1 and formula 2, formula 2 and formula 3.

Table 4. The Result of Difference Test for Texture Indicator

Formula Groups	Difference in mean rank	P-Value	Information
Formula 1 and Formula 2	10.82	0.013 < 0.05	Different
Formula 2 and Formula 3	5.72	0.202 > 0.05	No different
Formula 1 and Formula 3	15	0.001 < 0.05	Different

Based on table 4, Man Whitney test on texture indicator, there is a difference in formula 1 with formula 2 and formula 1 with formula 2 and formula 1 with 3 where the P-Value < α (0.05). Whereas for p-value > α (0.05) there is no difference in formula 2 and formula 3.

Table 5. The Result of Difference Test for Taste Indicator

Formula Groups	Difference in Mean Rank	P-Value	Information
Formula 1 and Formula 2	9.92	0.028 < 0.05	Different

Table 6. Average Result of Public Preference Test from Addition of Snakehead Fish and Bitter Ginger to Fish Floss (n=35)

Formula (Snakehead Fish : Bitter Ginger)	Indicators				Total Percentage	Total Criteria
	Aroma	Texture	Taste	Color		
1 (90%: 10%)	3.63	3.29	3.26	3.71	69.42%	Like
2 (80%: 20%)	3.69	3.43	3.37	3.57	70.2%	Like
3 (70%: 30%)	3.71	4.11	3.63	3.94	77%	Like

Based on table 6, it is shown that sample with formula 3 with the ratio of 70% snakehead fish and 30% bitter ginger has the highest percentage that is 77% which are included in the like category.

Formula Groups	Difference in Mean Rank	P-Value	Information
Formula 2 and Formula 3	7.94	0.071 > 0.05	No different
Formula 1 and Formula 3	16.32	0.005 < 0.05	Different

Based on table 5 in taste indicator, there is a difference in formula 1 with formula 2 and formula 1 with formula 3 where the P-Value Score is < α (0.05). Whereas for P-Value Score > α (0.05) there is no difference in formula 2 and formula 3.

Hedonic Test

Hedonic test or preference test on fish floss product and bitter ginger were followed by 35 people of untrained panelists from the public community which is located in Mustika Jaya District and 35 people of Nutritional Science Department students of STIKes Mitra Keluarga.

Whereas in formula 1 with the ratio of minimal bitter ginger has the lowest percentage that is 69.42% which is included in the like category.

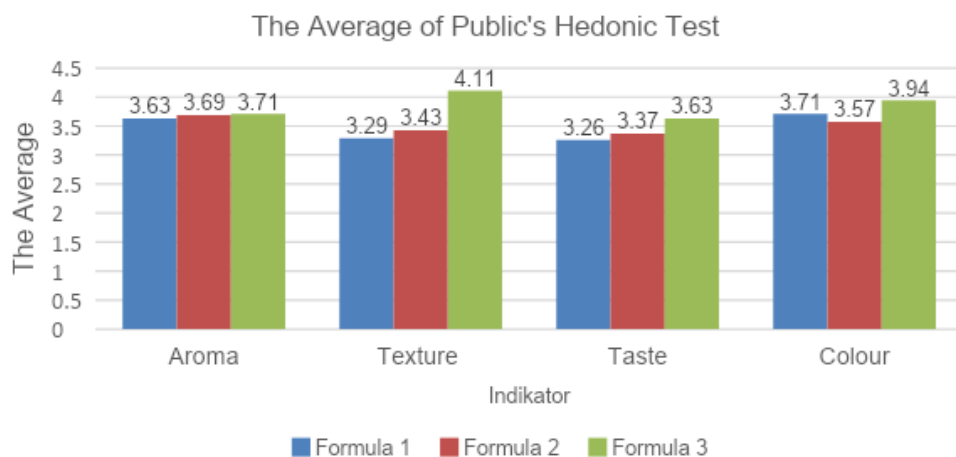


Image 2. The Result of Public's Hedonic Test

From image 1, it is shown that the highest average score from all categories, contained in formula 3 which consists of 70% snakehead fish and 30% bitter ginger. Whereas the lowest average score from indicators aroma, texture and taste

contained on formula 1 which consists of 90% snakehead fish and 10% bitter ginger. Whereas from lowest score of color indicator contained on formula 2 which consists of 80% snakehead fish and 20% bitter ginger.

Table 7. The Average Result of Nutritional Students Preference Test from Addition of Snakehead Fish and Bitter Ginger to Fish Floss (n=35)

Formula (Snakehead Fish : Bitter Ginger)	Indicators				Total Percentage	Total Criteria
	Aroma	Texture	Rasa	Color		
1 (90%: 10%)	3.06	3.26	3.34	3.46	65.57%	Like Enough
2 (80%: 20%)	3.51	3.23	3.31	3.81	69.57%	Like
3 (70%: 30%)	3.37	3.37	3.31	3.80	69.28%	Like

Based on table 7, it is shown that sample with formula 2 with the ratio of 80% snakehead fish and 20% bitter ginger has the highest percentage that is 69.57% included in the like category. Whereas in

formula 1 with the minimal bitter ginger has a lowest percentage that is 65.57% included in like enough category.

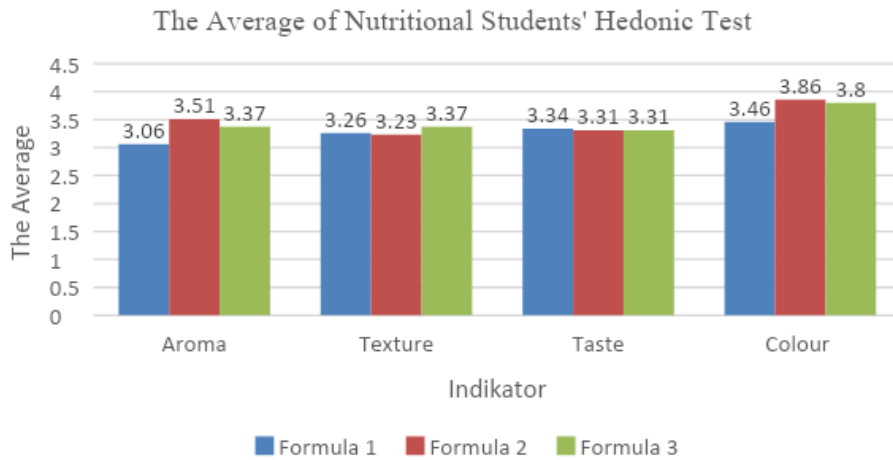


Figure 3. Nutritional Students' Hedonic Test

From the image above, it is shown that the highest average in aroma and color indicators on formula 2 is 80% snakehead fish and 20% bitter ginger. In texture indicator with the highest average contained on formula 3 with the ratio of 70% snakehead fish and 30% bitter ginger. Whereas in taste indicator with the highest average contained on formula 1 with the ratio of 90% snakehead fish

and 10% bitter ginger.

Albumin Content Test

Albumin content tests on three formulas were done by using the Lowry method at Gajah Mada University Laboratory, Center for Food and Nutrition Studies.

Table 8. The Average Result of Albumin Content Test on Snakehead Fish and Bitter Ginger Floss

Formula (Snakehead Fish : Bitter Ginger)	Repetition			Average
	I	II	III	
1 (90%: 10%)	2.58%	2.57%	2.57%	2.57%
2 (80%: 20%)	2.25%	2.25%	2.24%	2.24%
3 (70%: 30%)	2.44%	2.44%	2.45%	2.44%

Based on table 8, the highest albumin content contained in formula 1 was the ratio of 90% snakehead fish and 10% bitter ginger that is 2.57%. Whereas the lowest albumin content contained in formula 2 was the ratio of 80% snakehead fish and 20% bitter gingers that are 2.24%.

Water Content Test

Water content test on three formulas was done by using the gravimetric method at Gajah Mada University Laboratory, Center for Food and Nutrition Studies.

Table 9. The Average Water Content Result of Snakehead Fish and Bitter Ginger Floss

Formula (Snakehead Fish : Bitter Ginger)	Repetition			Average
	I	II	III	
1 (90%: 10%)	25.43%	25.48%	25.27%	25.39%
2 (80%: 20%)	28.64%	28.87%	28.73%	28.74%
3 (70%: 30%)	26.93%	27.08%	26.86%	26.95%

Based on table 9, the lowest average of water content contained in formula 1 with the ratio of 90% and 10% snakehead fish and bitter ginger is 25.39%. Whereas the highest water content contained in formula 2 with the ratio of 80% and 20% snakehead fish and bitter ginger is 28.74%.

Ash Content Test

Ash content test on three formulas was done by using the gravimetric method at Gajah Mada University Laboratory, Center for Food and Nutrition Studies.

Table 10. The Average Ash Content Result of Snakehead Fish and Bitter Ginger Floss

Formula (Snakehead Fish : Bitter Ginger)	Repetition			Average
	I	II	III	
1 (90%: 10%)	3.76%	3.83%	3.81%	3.80%
2 (80%: 20%)	3.55%	3.61%	3.54%	3.56%
3 (70%: 30%)	3.90%	3.82%	3.78%	3.83%

Based on table 10, it can be concluded that the lowest ash content of 3.56% is found in formula 2 with the ratio of 80% snakehead fish and 20% bitter ginger. Whereas the highest ash content of 3.83% is found in formula 3 with the ratio of 70% snakehead fish and 30% bitter ginger.

DISCUSSION

Sensory Test

The organoleptic test is a scientific measurement for analyzing and measuring food material characteristics and other materials judged by the senses of smell, touch, taste and sight. The organoleptic test was done by 35 untrained panelists with twice repetition to give an assessment on 3 sensory-tested formulas of snakehead fish and bitter ginger which was determined based on a numerical scale with scoring method (9). The scoring scale measures aroma, texture, taste and color. Aroma scale based on score 4 which means

very flavorful of fish, 3 indicated quite flavorful of fish, 2 indicated less flavorful of fish, and for score 1 indicated no flavor of fish. Texture scale based on score 4 which means dry, 3 indicated dry enough, 2 indicated less dry, and 1 indicated not dry. Taste scale based on score 4 which means sweet and savory, 3 indicated sweet enough savory, 2 indicated sweet less savory, and 1 indicated sweet, not savory. Color scale based on score 4 which means light brown, 3 indicated brown, 2 indicated dark brown and 1 indicated blackish brown.

Aroma testing is important because it can quickly provide an assessment of a product. Aroma is the smell of a food product. The smell is a response when volatile food enters the sense of smell then felt by the olfactory. Volatile compounds enter the nasal cavity when humans breathe and inhale them (10). Based on the calculation of average result on indicators aroma which was done by panelists with the highest score on formula 1 (3.14) and the lowest on formula 3 (2.76) with

the criteria enough flavorful of fish. In the different tests, there is only a difference between formula 1 and formula 3. Aroma average score obtained from snakehead fish and bitter ginger processing has decreased along with the increase of bitter ginger used so that the fishy aroma of snakehead fish has decreased. In Bachari et al's research in Zarirah, it was stated that one of the ways to reduce fishy smell was by adding spices such as ginger, galangal, lemongrass, bay leaf, and lime leaf. The distinctive aroma of floss occurs when cooking time due to the absorption of water by ingredients and spices with the help of water (coconut milk) and heat, thereby releasing volatile substances (11). In this research bitter ginger used itself has essential oil content which can cause a distinctive aroma of bitter ginger. According to Silalahi stated that essential oil is a type of terpenoid, especially sesquiterpenoid, found in Zingiberaceae. Essential oil because plants have a distinctive aroma which is used as a characteristic of plant species. So that the fishy smell on fish can be decreased (12).

Texture is a characteristic of material as a combination result of several physical properties such as size, shape, quantity and materials forming elements that can be felt by sense of touch and taste, including mouth and sight sense (10). Based on an assessment of the average texture indicator which was done by panelists, the average score from formula 1 was included in the dry category, while formula 2 and formula 3 decreased the average score which was included in the dry enough category. On different tests there was a difference on formula 1 with formula 2 and formula 1 with formula 3. Meanwhile, formula 2 and formula 3 were no different. On formula 1 with the ratio of 90% snakehead fish: 10% bitter ginger where the use of fish is more than another formula. This causes the texture of the floss to become rough. This is in line with Suhan's research which stated that generally fish floss has a soft texture, the spices that stick to the meat when processed can cause floss texture to become rough (13). Meanwhile, with the addition of bitter ginger so that the texture obtained is smoother because bitter ginger has a fibrous texture. In accordance with morphology of bitter ginger itself,

the outer part is yellowish brown to pale yellow and has long grooves and gives uneven and fibrous fracture marks (14).

Taste is one of organoleptic test method that use sense of taste (tongue) which can be valued with chemical stimuli responses. Taste is one of important factors in considering a product quality (9). From the average calculation result on taste indicator which was done by panelists there was average score on formula 1 and formula 2 had sweet enough savory category. Meanwhile, on formula 3 had sweet less savory category. On different test there was a difference on formula 1 with formula 2 and formula 1 with formula 3. While formula 2 and formula 3 had no difference. The resulting taste on formula 1 and 2 was sweet enough savory. It was because the use of fish more than formula 3 so that the savory taste was produced by the amount of fish meat and the use of spices. In line with Feta et al's research, stated that along with increasing concentration of snakehead fish given, it will have stronger taste and cause savory taste of a product. A stronger savory taste caused by protein content that is produced by snakehead fish. And the savory taste comes from the use of same spices in each formula. The savory taste produced in snakehead fish floss is due to the large amount of protein content, the addition of brown sugar and the use of fat (coconut milk) (15).

Color can be used to consider food quality, which can be used as an indicator of freshness of food ingredients, and good or not the method of mixing or processing of ingredients (16). From the average score results of color indicator which were done by panelists, there were all average score formulas had light brown category. In different test, color indicator had no significant differences. It was suspected because snakehead fish meat and bitter ginger are covered by the use of spices and brown sugar that used in each same formula and cooking time. So that snakehead fish and bitter ginger floss had no different color. Nur'aini et al stated that the cooking process caused a maillard reaction. Amino acid and lactose in fish meat during cooking process make a formation of volatile and brown polymers compound likewise fat content in

fish meat that will undergo oxidation to form radical compounds which then condense with each other to form a brown compounds (17).

Hedonic Test

The Hedonic test on public community obtained the highest percentage 77% on formula 3 (70% snakehead fish: 30% bitter ginger) included in the like category. This is presumably because panelists prefer aroma and taste on fish which is not too strong due to spices using brown sugar and the use of bitter ginger which is more than the other formulas. According to Prihandoko and Mawarti, the differences in sensory properties can be influenced by the addition of spices used in producing snakehead fish floss and can be caused by reduction of amino acid and fat content which is closely related with aroma and taste in fish meat so that it affects the preference level of panelists (18). The more bitter ginger, the fewer aromas and fish's distinctive taste. It is because bitter ginger smelled aromatic so the fishy smell in fish can be reduced.

The Hedonic test on Nutritional students obtained the highest percentage 69.57% on formula 2 (80% snakehead fish: 20% bitter ginger) included in the like category. This is presumably because panelists prefer the blend of aroma and taste from bitter ginger that is not too dominant. The more bitter ginger there is, the less distinctive the aroma of fish is. It is because bitter ginger smelled aromatic so the fishy smell in fish can be reduced. It can be concluded that panelists do not like the aroma of bitter ginger. The aroma produced by bitter ginger can be used as a food fragrance. Silalahi stated in the culinary field, *Zingiber zerumbet* is widely used as food flavoring and appetizer. The aroma in bitter ginger is an essential oil which is one characteristic of plant species (12). On texture indicators, panelists prefer texture that is not too soft and dry enough. This is presumably because the use of bitter ginger is not too much or too little compared to other formulas so the panelists prefer it. This is in line with Hutabarat who stated the fibrous texture of bitter ginger (14). If the use of bitter ginger is increasing, the fiber will be produced as well. Meanwhile, the color indicator which is liked by

panelists is light brown. This is presumably because the color in snakehead fish and bitter ginger floss likewise floss in general so that panelists like it. The color in bitter ginger itself is tawny so that when we add spices and brown sugar, the color can be covered due to the cooking process.

Albumin Content Test

Albumin content in snakehead fish and bitter ginger floss had the highest average score 2.57% on formula 1, while the lowest albumin content was 2.24% on formula 2 with 20 minutes of steaming time and 45 minutes of frying using 30 ml of oil. In his research, Suhan stated that albumin content in snakehead fish floss with 20 minutes of steaming time and 45 minutes of frying had albumin content of 1.509% (13). This is presumably because the use of snakehead fish on the previous researcher was 300 gr which was less than this researcher who used the fish meat as much as 360 gr, 320 gr and 280 gr and the use of egg white so it can affect albumin content in fish floss. The addition of snakehead fish caused albumin content to increase due to the composition of snakehead fish containing albumin (19). According to Salmatia et al, albumin has properties that can cause protein coagulation and denaturation when heated with a temperature range between 55-75° C (20). Suhan stated that albumin content from snakehead fish depends on amino acid composition, the presence of disulfide bond, salt bridge, heating time, water content and additives. Steaming process using high enough temperature and frying can cause albumin value to be low (13). Albumin is an indicator of nutritional status, both at the onset of malnutrition and when improvement begins (21). Albumin content in blood serum drops significantly in tuberculosis patients, and the cause of decreased albumin levels are nutritional factors (low food intake, anorexia, and increased catabolism), enteropathy and acute phase protein reaction (22). Wijaya's research stated that giving 500 mg of albumin extract in the morning, afternoon and evening for 30 days can increase albumin content of 1.10 g/dL in blood of pulmonary tuberculosis patients (23).

Water Content Test

Water content on snakehead fish and bitter ginger floss products had the lowest average of 25.39% on formula 1 and the highest was 28.74% on formula 2. Meanwhile, quality standard SNI 01-37707-1995 for floss product maximum 7%, so the water content must be below the standard because if it exceeds, it can damage the characteristic of the product and accelerate the damage process such as the growth of mold (24). The water content of snakehead fish and bitter ginger floss has not met the quality standard of floss. Generally, fish consists of 80% water content then after going through the drying process; water content will decrease up to 10%, especially in mechanical drying. The high water content is suspected to be a factor of floss's raw materials used which are snakehead fish and bitter ginger. Bitter ginger itself has a high enough water content so that the water content in snakehead fish and bitter ginger floss is getting higher. According to Hanwar in his research, the water content in bitter ginger is 9,33% (26). The use of pure coconut milk in this research also affects water content in snakehead fish floss products. This is in line with Salsabila who stated the water content in pure coconut milk is higher than commercial coconut milk at 13.47% (27). Food ingredients with high water content will absorb more oil because more empty space is left by the evaporating water during frying time so that it can affect the shelf life of the floss. Muchtadi in Zulistina, stated that the composition of fried food ingredients will determine the amount of oil absorbed (16).

Ash Content Test

Ash content produced by snakehead fish and bitter ginger floss had the lowest average of 3.56% on formula 2 (80% snakehead fish: 20% bitter ginger) and the highest average of 3.83% on formula 3 (70% snakehead fish: 20% bitter ginger). Meanwhile, the maximum SNI standard for ash content on the floss is 7% so it can be said that ash content on snakehead fish and bitter ginger floss can fulfill Indonesian National Standard for floss products. Ash content produced by snakehead

fish floss is the result of natural mineral content in snakehead fish itself. This is in line with the Master's statement that snakehead fish contains mineral zinc, and minerals such as iron, calcium and phosphorus (28). Salman et al, stated that snakehead fish meat contains iron of 9 mg/100 gr ingredient (29). According to Sulthoniyyah et al, the processing effect on ingredients can affect mineral availability. In the washing process, it can reduce mineral availability because mineral will dissolve by water used (30).

CONCLUSIONS AND RECOMMENDATIONS

Sensory test scores from indicators of aroma, texture, and taste had the highest average score on formula 1, meanwhile on color indicator had the highest average score on formula 2. In the sensory difference test there was a difference on formula 1 with formula 3 on aroma indicator, on the texture and taste indicators there were differences on formula 1 with formula 2 and formula 1 with formula 3. Meanwhile, on the color indicator, there was no difference in all formulas. Hedonic test by public panelists with the highest percentage with like category contained on formula 3, while the highest percentage on Nutritional students with like category contained on formula 2 with the ratio of 80% snakehead fish and 20% bitter ginger. The highest albumin content is 2.57% contained in formula 1. Water content on snakehead fish and bitter ginger floss products for all formulas (25.39%, 28.74% and 26.95%) has not fulfilled the Indonesian National Standard. Whereas, the ash content already fulfilled the Indonesian National Standard (3.80%, 3.56% and 3.83%). Suggestions from this research are it is better to do macronutrient test and intervention on snakehead fish floss product with the addition of bitter ginger to find out the changes in nutritional status and albumin content in the blood of tuberculosis patients and to reduce the water content on fish floss product so that it can fulfill Indonesian National Standard and extend shelf life.

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