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The ratio of tuna white meat surimi and red meat surimi in the making of fish burger based on the preference level

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ABSTRACT

This research aims to determine the ratio percentage of white meat surimi and red meat surimi of tuna in the making of fish burger in the most preferred by the panelists. The method used for this research in experimental with 5 treatments, which are the usage of 100% content of white meat surimi and the combination of white meat surimi and red meat surimi with the percentage of 90%, 10%, 80%, 20%, 70%, 30%, 60%, 40% based on the weight of white and red surimi meat, involving up to 20 semi-trained panelists as rehearsal. The observed parameters are the yield calculation percentage of white and red tuna fillet, surimi's yield and fish burger's yield, hedonic test (preference level) based on organoleptic characteristic covering the appearance, aroma, texture and taste of tuna fish burger along with chemical test (protein value, fat value and water level) to fish burger. According to the result to the fish burger's level of preference it can be summarized that the comparison of tuna's white meat surimi and red meat surimi for every treatments are liked by the panelists, however the treatment of 80% white meat surimi and 20% red meat surimi tuna is the most preferred treatment by panelists with the median characteristic value of appearance, aroma, and texture of 7 (liked) and taste 9 (very liked). The amount of the protein value is 13.99%, fat value is 2.36%, and water value is 31.28%

Keywords: fish burger, white meat, red meat, Tuna fish, preference level, surimi, *Thunnus obesus*

1. INTRODUCTION

Tuna is a kind of fish with high protein value, ranging between 22,6 – 26,2 g/100 g meat and low fat between 0,2 – 2,7 g/100 g meat, calcium mineral, phosphorous, iron and sodium, vitamin A (retinol), and vitamin B (thiamin, riboflavin, and niacin). Tuna is a type of fish with high protein level and low fat (Department of Health Education and Welfare 1972). The low level of fat and calorie rich of protein and omega-3 are the reasons why tuna fish is high in demand. Tuna's meat owns a tasty flavor and pleasant aroma hence very suitable to be processed as various kinds of processed products.

Tuna is one of the commodities of big pelagic fish with high level of export number as relatively equal as cob and skipjack tuna. Tuna is widely used as many of processed food such as tuna can, tuna loin, steak tuna, fillet tuna or it can also be sold in fresh condition. Tuna lion is a chopped meat in quarter with no spine, bones, skin and red meat. The tuna loins are portions of the tuna flesh usually skinless and boneless and ready to be used (Emmanuelle *et.al* 2012). However the processing of tuna might produce high enough waste especially red meat, because during the processing of tuna only utilize its white meat. The amount of red meat waste which is produced is 23,1% (Kantun *et al.* 2014).

Red meat is a waste with high volume but holds low economical value. The utilization of red meat can be done with product diversification by producing surimi from tuna's red meat which is then processed to be fish burger. Fish burger is a mix of fish meat with no spine from various kinds of chopped and crushed fishes with the addition of starch and seasoning. Fish burger is almost preferred among the community. Fish burger is a very popular and tasty item in fast food industry (Haq *et. Al.* 2013). Fish burger's processing with additional red meat surimi is still rare to find. The characteristics of tuna red meat make it no acceptable for food product development. Red meat contains weaknesses such as striking colors, fishy aroma, low fat level, which consequently to be less demanded by consumer. Red meat contains myoglobin which easily oxidized so that red meat should be made to be surimi in order to keep in long-term safekeeping and to keep the product fresh for a whole (Nishioka *et. al.* 2007). Some types of seafood, surimi and other fish mince products (Hall and Ahmad 1992), may contain mixtures of muscle tissue from several species. Surimi originating from Japan. Surimi is a half-finished product (*intermediate product*) prepared from minced fish muscle by washing, dehydrating and stabilizing the myofibrillar proteins (Lee 1984). Washing or leaching process may eliminate fishy odor from fish, decreasing fat level and increasing gel and product texture. One of the surimi's excellences is the capability to be processed as many kind of other products in advance.

All this time, the raw material of making fish burger is only white-colored fish. Therefore, it is needed to conduct a research about the making of fish burger based on the preference level using tuna white surimi meat and red surimi meat as the raw material.

2. MATERIALS AND METHOD

2. 1. Tools and Materials

The tools used for the making of surimi are meat grinder, calico cloth, stirring wood, washbowl, filet knife, cutting board, thermometer and scale. The tools used to make fish burger are food processor, blender, gloves, scale, mold, knife, washbowl, cooking pot, stove, oven. The equipment used for preference level test are assessment sheet, Styrofoam plate and a cup

with mineral water. The materials used to make surimi are crushed white meat and red meat of big-eyed tuna (*Thunnus obesus*) 6006 gram, NaCl 0,3 % from water volume, ice cubes and water as needed. The materials used to make fish burger is tuna's white meat surimi and red meat surimi, tapioca flour, egg yolk, bread, milk, garlic, onion, leek, salt, flavored stock, nutmeg, pepper, ice and margarine.

2. 2. Research Method

The research consists of few phase which are the making of fillet, making of tuna's white meat surimi and red meat surimi and making of fish burger. The making of surimi starts with making filet and skinned meat, then after the meat is crushed with meat grinder. The next process is leaching, according to Suzuki (1981) the cleansing process of surimi is done twice. The first leaching is using 5-10 °C water temperature while the second is using salt (NaCl) 0,01 – 0,3 % with 4:1 water and meat ratio for 10 – 15 minutes while doing mixing, then filtered by using calico cloth.

The next phase is the making of fish burger is using white meat surimi and red meat surimi. The procedure of making fish burger refers to the research of Riesnawaty (2007) which had been modified that covers (1) the process of mixing all ingredients and seasonings according to the formulation until evenly distributed using a food processor, (2) giving ice cube as much as 10% during the grinding process. (3) dough molding with the thickness of 0,5-1 cm, (4) Steaming for 30 minutes in 100 °C heat, (5) draining for 30 minutes (5) before served, fish burger was spreaded by margarine and roasted using the oven with 150 °C temperature for 10-15 minutes.

The method used by this research is experimental which consists of 5 treatments and 20 semi-trained panelists as repetition. The hedonic test is a test that aims to determine the level of consumer preference for a product. Testing of the level of preference includes appearance, aroma, taste and texture. Value of consumer preferences that is: 9 (very like); 7 (likes); 5 (neutral/ordinary); 3 (dislike); and 1 (very dislike). The rejection limit for the hedonic test is 3, meaning that if the product being tested gets the same or smaller value (Kahkonen *et. al.* 1998). As for the treatments conducted are percentage comparison of tuna's white meat surimi and red meat surimi as stated below: A (the usage of white meat surimi 100%), B (the usage of white meat surimi 90%: red meat surimi 10%), C (the usage of white meat surimi 80%: red meat surimi 20%), D (the usage of white meat surimi 70%: red meat surimi 30%), E (the usage of white meat surimi 60%: red meat surimi 40%). The formula used to make tuna fish burger which have been modified in this research is shown in table 1.

Table 1. Composition of Fish Burger per 100 grams Tuna Meat

No.	Materials	Treatment (%)				
		A	B	C	D	E
1	Tuna white meat surimi (g)	100	90	80	70	60
2	Tuna red meat surimi (g)	0	10	20	30	40
3	Tapioca flour (g)	10	10	10	10	10

No.	Materials	Treatment (%)				
		A	B	C	D	E
4	Bread crumbs (g)	15	15	15	15	15
5	Egg yolk (g)	2,5	2,5	2,5	2,5	2,5
6	Leek (g)	3	3	3	3	3
7	Garlic (g)	4	4	4	4	4
8	Onion (g)	37,5	37,5	37,5	37,5	37,5
9	Nutmeg powder (g)	0,5	0,5	0,5	0,5	0,5
10	Pepper (g)	1	1	1	1	1
11	Broth powder/ flavored stock (g)	1,25	1,25	1,25	1,25	1,25
12	Salt (g)	2,5	2,5	2,5	2,5	2,5
13	Susu Cair (ml)	37,5	37,5	37,5	37,5	37,5
14	Bread (g)	15	15	15	15	15
15	Ice cube	10	10	10	10	10

Source: Riesnawaty (2007) with modifications

2. 3. Observation Parameters

The observed parameters covering the yield calculation of tuna's meat, yield of tuna's white meat and red meat fillet, yield of tuna's white meat surimi and red meat surimi, yield of fish burger. The hedonic test to measure the preference level of panelists based on the organoleptic characteristic such as appearance, aroma, texture, and taste from the produced fish burger. Chemical test (protein value, fat value and water value) of fish burger is treated with control and most favored using the AOAC 1995 method.

2. 4. Data Analysis

The hedonic test data were analyzed using Friedman non-parametric analysis to determine the panelists acceptance preference level of fish burger with the ratio of tuna white meat surimi and red meat surimi. The statistics used are using the formula (Singh 2013) as follows:

$$Xr^2 = \frac{12}{bk(k+1)} \sum_{j=1}^k (Rj)^2 - 3b(k+1)$$

Information:

- Xr^2 = Friedman Test Statistics
- b = Repeat
- k = Treatment
- R_j = Total ranking of each treatment

If the research data shows the same number, the following correction factors are calculated:

$$Fc = 1 - \frac{\sum T}{bk(k^2-1)}$$

$$X^2_c = \frac{x^2}{Fc}$$

Information:

- Fc = Correction Factor\
- T = $N(t_i^3 - t)$
- t = The same number frequency

Value X^2_c can be known using Chi-square tables with degrees of freedom $db = k - 1$;
l- a.

The decision rules for testing hypotheses are as follows:

- H_0 = Treatment gives identical or equal results at the level $\alpha = 0,05$
- H_1 = Treatment gives different results at the level $\alpha = 0,05$

If value $X^2_c < X_{(1-\alpha),(n-1)}$, then H_0 accepted and H_1 rejected. While if the value $X^2_c > X^2_c < X_{(1-\alpha),(n-1)}$, then H_1 rejected and H_0 accepted. If H_1 accepted, then there are differences among the treatments that should be done multiple comparison test to know the real difference significantly with the following formula:

$$|R_i - R_j| \geq Z \left[\frac{\alpha}{k(k-1)} \right] - \sqrt{\frac{bk(k+1)}{6}}$$

Information:

- R_i = Number of ranking conditions i
- R_j = Number of ranking conditions j

Decision making of panelists review to the product criteria of fish burger which is liked is done by doing pairwise comparison then to determine the best treatment is using the Bayes method. Bayes method is used to compare various criteria and choose one criterion to be prioritized or more preferred by using numbers to describe the relative importance of an element.

Meanwhile, comparative descriptive analysis is used to analyze the result of yield calculation and chemical test results (protein value test, fat value test, and water value test).

3. RESULTS AND DISCUSSION

3. 1. Yield Calculation

The greater the yield the greater the economy value or the effectivity of a material. The yield value calculation is comparison of weight ratio of the part of the commodity taken or obtained by the whole weight of the commodity raw material multiplied by 100% (Arnthorsdottir *et. al.* 2008). Yield calculation in this research aims to acknowledge the amount of tuna to be used as raw material to make surimi. The general equation to calculate yield is:

$$\text{Yield (\%)} = \frac{\text{Final weight}}{\text{Initial weight}} \times 100 \%$$

Fresh tuna yield is used to make fillet with no heads, spine, skin, fin and stomach contents is in the amount of 58.25% of whole tuna's weight with the length of ± 40 cm and weight of 1900 – 2140 gram each. The yield value of tuna's white meat and red meat from the whole tuna is 46.02% and 12.23%. The yield value of tuna's white meat and red meat to tuna's meat is in the amount of 79.005% and 20.995%. The total yield value of white surimi's meat and red surimi's meat generated is 50.69%. 38.60% is the yield value of white meat surimi and 12.09% red meat surimi) from the overall weight of tuna's meat fillet. Yield white meat surimi and red meat of tuna to white tuna's meat weight is 57.5% and 48.8%.

The yield value of tuna's meat depends on the species kind and feed, size and weight of the fish. Kusumamurni (2013) stated that the decrease of yield from the whole fish's weight to be surimi is due to the process of weeding and disposal of fish's parts which are not needed in the process to make surimi and also leaching.

Yield value of tuna's fish burger based on research results is in the amount of 91.97%. This result is achieved based on the calculation of whole tuna's fish burger after being steamed divided by fish burger dough's weight before steamed.

3. 2. Hedonic Test (Preference level)

a. Appearance

Appearance is the first characteristic which is rated by consumers in order to consume a product. Is the product in a good looking or not, because the commodity quality is judged by the appearance such as shape, size, and color. Generally consumer will choose to pick foods with attractive look (Soekarto 1990). The average value of hedonic test to the appearance of fish burger is shown in Table 2.

Based on the hedonic test results to appearance of tuna's fish burger, with the average appearance value between 7 and 7.8. The highest appearance fish burger value is 7.8 in treatment C with appearance of whole, neat, bright, smooth surface and attractive color after being toasted is yellowish bright brown color. Meanwhile the lowest average value of appearance is 7 in treatment E with the appearance of whole, neat, bright, smooth surface and yellowish to brown color after being toasted but a little bit darker, and in treatment A where in this treatment the produced fish burger is whole, neat, bright, and slightly hollow surface and

brownish colored after being toasted but looks a little bit pale compared to other treatments. In terms of integrity, all of produced fish burger from every treatment is neat and even.

Table 2. Average Appearance of Fish Burger Based on The Ratio of Tuna White Meat Surimi and Red Meat Surimi

The Ratio of Tuna White Meat Surimi and Red Meat Surimi (%)	Median	Average Appearance
100 : 0 (A)	7	7,00 a
90 : 10 (B)	7	7,70 a
80 : 20 (C)	7	7,80 a
70 : 30 (D)	7	7,50 a
60 : 40 (E)	7	7,00 a

Information: The average value of appearance followed by the same letter indicating is not significantly different according to the multiple comparison test at the level of 5 %

Based on Friedman test, all of the comparison treatment of tuna’s white meat surimi and red meat surimi do not give real effect to fish burger appearance according to panelists assessment, this happens because the leaching process will make the color of produced red meat surimi to be less bright or not too dark (Tahergorabi *et al.* 2012).

The number of materials used in formulation as a mix to make tuna’s fish burger dough such as adding fillers and binders that are capable to dissemble dark color that is produced from adding tuna’s red meat surimi. Roasting can caused fish burger color that is produced from every treatment to be the same that is fish burger color for every treatment to be brownish and no significant difference on the looks of the fish burger. Maillard reaction occurs in the roasting process.

According to Winarno (1997), Maillard reaction is non enzymatic browning process between reducing sugar and free amino group from amino acids or protein, so it produces food material color to be brownish. The appearance of tuna’s fish burger for all treatment is still liked by panelists with median value of 7, however panelists preferred the appearance of fish burger which had been mixed with 20% of red meat surimi.

b. Aroma

One of the factors that determined the quality of a product is acceptable by consumers is aroma. Food aroma determines the taste of the food itself (Winarno, 1991). Pleasant aroma from food may raise the consumers or panelists’ appetite to taste the food. The average value of hedonic test of fish burger’s aroma is shown in Table 3.

Table 3. Average Aroma of Fish Burger Based on The Ratio of Tuna White Meat Surimi and Red Meat Surimi

The Ratio of Tuna White Meat Surimi and Red Meat Surimi (%)	Median	Average Aroma
100 : 0 (A)	7	6,50 a
90 : 10 (B)	7	7,80 ab
80 : 20 (C)	7	7,90 b
70 : 30 (D)	7	7,90 b
60 : 40 (E)	7	7,10 ab

Information: The average value of aroma followed by the same letter indicating is not significantly different according to the multiple comparison test at the level of 5 %

According to hedonic test results of tuna's fish burger aroma the number of average value of aroma is between 6,5 to 7,9. The highest average value of tuna's fish burger aroma is 7,9 in treatment C and treatment D (preferred by panelists) with non-fishy fish burger's aroma, specific aroma of tuna, the adding of tuna's red meat surimi gives special aroma to produced fish burger. The lowest average value of fish burger's aroma is 6,5 in treatment A with non-fishy aroma and tuna's smell aroma.

According to Friedman test shown, several comparison treatments of tuna's white meat surimi and red meat surimi gives real effect to fish burger's aroma. Treatment A is significantly different with treatment C and treatment D. The addition of red meat up to 20% and 30% has the most preferred aroma by panelists, however by the adding of more red meat can cause decreasing level of panelist's preference towards fish burger's aroma.

The addition of red meat surimi with exact percentage will give special aroma to produced fish burger compare to fish burger without using red meat surimi. This is because red meat has higher fat value than red meat. The level of red meat's fat generally is in the amount of 12.8% (Suzuki 1981). This fat value produces pleasant aroma if processed well. Ordinary burger with the additional cow fat or other animal fat to add calories and fix taste and aroma.

The produced fish burger's aroma is not fishy because the handling process of red meat is using the right surimi leaching technique and by using fresh tuna as the raw material. The leaching process in surimi will fix the aroma (Suzuki 1981). The addition of seasonings will mask the red meat aroma. The addition of garlic to the product will raise the taste and aroma, as well as onion and leek. Other than that, the addition of nutmeg and pepper can give specific aroma to fish burger. Bread and milk that has been added will give perfect scent to fish burger. Fish burger contains carbohydrate and protein, food material which contain carbohydrate and protein if heated (Maillard reaction) will produce pleasant smell. Carbonyl component that is formed during cooking process may react with amino acids, amine and protein to produce which are desired (Negroni *et. al* 2001).

c. Texture

Texture is sensing related to touch. Texture is one of the factors that influence the consumers to choose foodstuffs. (Winarno 1991). The average value of hedonic test to fish burger's texture is shown in Table 4.

Table 4. Average Texture of Fish Burger Based on The Ratio of Tuna White Meat Surimi and Red Meat Surimi

The Ratio of Tuna White Meat Surimi and Red Meat Surimi (%)	Median	Average Texture
100 : 0 (A)	7	7,00 a
90 : 10 (B)	7	7,50 a
80 : 20 (C)	7	7,70 a
70 : 30 (D)	7	7,50 a
60 : 40 (E)	7	7,00 a

Information: The average value of texture followed by the same letter indicating is not significantly different according to the multiple comparison test at the level of 5 %

Assessment to tuna's fish burger texture is done by observing the level of compactness, tenderness and solidness from tuna's fish burger. According to hedonic test to tuna's fish burger texture, every treatment was accepted by panelists with average value of 7 to 7.7. The highest average value is 7.7 in treatment C with fish burger's texture that compact and tender and little bit chewy. While the lowest average value of fish burger's texture is 7 in treatment A with more chewy texture and less tender and in treatment E where texture is highly less chewy compare to any other treatments

According to Friedman test, it shows that every treatment is not significantly different to fish burger's texture. Fish burger's texture is affected by the use of fresh raw material, proper leaching of surimi process, the addition of fillers and emulsion ingredients, cooking process. The use of raw materials that have experienced a decline in quality of freshness will produce low quality products and soft texture. Every piece of raw material used in this research is fresh, so the produced fish burger's texture for every treatment is good.

White meat contains more myofibril protein, while red meat contains more fat. Myofibril protein plays a role in building gel process. Fish with rich fat usually tend to be low elasticity (Hafiluddin 2011). The quality of tuna's red meat can be improved by doing leaching with saline solution with the percentage of 0,3 (Wibowo 2004). Tuna's red meat surimi will make the texture of fish burger to be more tender. Specific kind of burger is the tenderness texture and not hard. Fat can be add to burger formulation, so the adding of red meat which contains more fat will affect the burger's tenderness and juiciness (Vural 2003). Steaming dough will

make dough to be compact. Steaming process gelatinization occurs which is an expansion and irregular process that occur in granule's starch when heated by water.

d. Taste

Taste is an assessed parameter that use the sense of taster or tongue. Taste is an important factor to determine whether the product is accepted or not by the consumers. Consumer preference towards a product's taste is supported by the interest of the color and aroma from the product. The smell that caught by olfactory nose cell and the color seen by the eye are able to stimulate the taste nerves (Winarno 1997). The average value of fish burger's taste is shown in Table 5.

Table 5. Average Taste of Fish Burger Based on The Ratio of Tuna White Meat Surimi and Red Meat Surimi

The Ratio of Tuna White Meat Surimi and Red Meat Surimi (%)	Median	Average Taste
100 : 0 (A)	7	6,9 a
90 : 10 (B)	8	8,0 ab
80 : 20 (C)	9	8,3 b
70 : 30 (D)	7	7,3 ab
60 : 40 (E)	7	7,1 ab

Information: The average value of taste followed by the same letter indicating is not significantly different according to the multiple comparison test at the level of 5 %

According to the hedonic test, tuna's fish burger taste has the average value between 6.9 and 8.3 (most preferred fish burger's taste). The highest average value of tuna's fish burger taste is 8.3 with the median value of 9 in treatment C where according to panelists have the most tasty fish burger's taste, delicious and fresh tuna's taste The lowest average value of tuna fish burger's taste is 6,9 with median number of 7 in treatment A which is still likeable by the panelist with tasty taste and fresh tuna's taste.

According to Friedman test show that comparison between tuna's white meat surimi and red meat gives real influence to the increase of panelists acceptance toward tuna's fish burger taste. Treatment A is significantly different against treatment C. The addition of red meat surimi to 20% may increase the level of taste likeness toward fish burger. However with the great amount of addition would cause the decreased level of panelists' likeness toward fish burger's taste. The taste of fish burger is influenced by the kind of fish that is used. Tuna contains higher glutamate acid compare with amino acid that contained in other fishes in the deep sea. This make tuna have more sweet and tasty aroma (Perkins 1992). According to Lechninger (1990) state that tasty taste is affected by the main component which is peptide and amino acid which are located in fish's meat. Flavor fish is caused by the bio-chemic reactions that occur inside

the fish. Beside of that fish flavor is produced by volatile and non-volatile compound. Fish generally contains fat acids that has high molecule weight. The amount of saturated fat is 17-21% and non-saturated fat is 79-83% from every fat acid that contained inside the fish's meat.

The level of freshness affects the taste of the burger fish produced. More likely red meat which contains myoglobin that causes the smell to be fishier. The fresher the fish used, the tastier the taste of products produced (Poernomo *et. al* 2013)

Winarno (1997) state that the addition of salt to foodstuffs is a component that is added and used as flavoring and preservative. As well as adding flavoring ingredients such as stock will increase the tastiness flavor to fish burger. Beside for fixing the texture, binders and fillers is a fraction of not meat that are added to tthe burger to stimulate the building of the flavor (Forrest 1975). Other than using tapioca flour, the characteristic of fish burger is the use of bread crumbs.

3. 3. The Decision-Making Using the Bayes Method

The calculation result to criteria of appearance, aroma, texture, and taste of fish burger is shown in Table 6.

Table 6. Value of Criteria for Tuna's Fish Burger

Criteria	Value Criteria Weight
Kenampakan	0,14
Aroma	0,17
Tekstur	0,10
Rasa	0,58

According to the calculation to criteria of appearance, aroma, texture, and taste of fish burger, the results shows that taste is the most important parameter to be assessed according to panelists by the value of 0.58.

Taste is the main consideration according to panelists to choose tuna's fish burger products by comparing white meat surimi and red meat surimi, so if tuna's fish burger taste was not likeable by the panelists then the products will not be accepted or will be rejected by panelists although the other assessment is well scored.

The calculation results will determine the best treatment with considering the criteria of appearance, aroma, texture, and taste of tuna's fish burger shown in Table 7.

According to calculation using Bayes Method, the result shows that treatment C (with the comparison of white surimi 80% : red meat surimi 20%) is the most preferred product by panelists with alternative score in the amount of 8.16 and priority value of 0.22 which is the highest value amongst other treatment. Even so, tuna's fish burger with the addition of 60% white meat surimi and 40% red meat surimi is still acceptable and likeable by panelists.

Table 7. Decision Matrix of Tuna’s Fish Burger with Bayes Method

The Ratio of Tuna White Meat Surimi and Red Meat Surimi (%)	Criteria				Alternatif Valu	Priority Value
	Appearance	Aroma	Texture	Taste		
100 : 0	7	7	7	7	7,00	0,19
90 : 10	7	7	7	8	7,58	0,21
80 : 20	7	7	7	9	8,16	0,22
70 : 30	7	7	7	7	7,00	0,19
60 : 40	7	7	7	7	7,00	0,19
Value Criteria Weight	0,14	0,17	0,10	0,58	36,74	1,00

3. 4. Chemical Test

Chemical tests of tuna fish burgers are carried out on the control treatment and most preferred treatment as a comparison. The chemical test which is conducted is protein level test, fat level test and water level test. The results of chemical test are shown in Table 8.

Table 8. Tuna’s Fish Burger Chemical Test Results

No	Chemical Test Parameters	Fish Burger Treatment		Beef Burger Nutrient Content Per 100 grams Meat
		100% : 0%	80% : 20%	
1.	Protein Level (%)	16.85	13.99	10.6
2.	Fat Level (%)	1.17	2.36	9.5
3.	Water Level (%)	34.60	31.28	45.5

a. Protein Level

The amount of protein level inside the food is one of the factors which can be used as consideration for consumers. Protein levels determine the quality for the foodstuffs itself, especially fishery products (Winarno *et. al.* 1997). Protein level in fish burger product in treatment A (100% white meat surimi) is in the amount of 16.85% while the protein level in the most preferred fish burger products is in treatment C (80% white meat surimi and 20% red meat surimi) is in the amount of 13.99%. Fish burger’s protein level decrease as the percentage of using red meat surimi increase.

This happens because white meat surimi contains more protein compared to red meat. This is in accordance with Akande (1998) in Hafiluddin (2011) who stated that protein composition in tuna's white meat is way higher than the red meat which is around 30.92% which opposes the fat value.

White meat and red meat both contains sarcoplasm protein, myofibrillar protein and stroma protein but the amount of content is different. The leaching process of surimi will eliminate the sarcoplasm protein which will detain the forming of surimi's gel. According to Suzuki (1981), Sarcoplasm protein is located inside muscle cell and water soluble. So this causes the decreases of protein level. The adding percentage of tuna's red meat surimi in the number of 20% to fish burger product is still qualified and protein level is greater than beef burger products.

b. Fat Level

Fat level in product will fix the taste and aroma, giving higher content of calorie. Fish burger fat level in treatment A (100% White meat surimi) is in the amount of 1,17% while fat level in most preferred fish burger product is in treatment C (80% white meat surimi and 20% red meat surimi) is in the amount 2.36%.

The difference of fat level in fish burger is occurred by the most preferred treatment where there is adding of red meat surimi. According to Suzuki (1981), fish red meat contains rich of fat level, with the number percentage of 12.8%. This number is higher compared to white meat fat level which only 2.9%. Price and Schweigert (1971) also stated that fat level of meat products is affected by the origin of its fat level. Fat level is inversely proportional with protein level and water level. Fish burger fat level from both treatment is still classified as low fat level products. The fat that contained inside fish meat in great number is a non-saturated fat that will give tasty taste and aroma towards the products. According to TKPI (2009), Beef burger fat level value is in the amount of 9.5%. This number is greater compared to tuna fish burger fat level produced in this research. Fresh beef fat level is higher compared to tuna's fat level, which is in the number of 14% per 100 gram of beef. The amount of maximum burger fat allowed according to FAO standard is 30%.

c. Water Level

Water is the most important element in the process. In the making of fish burger, is the functions of water are to form gluten and control to dough solidness. Water also determines the texture of the products produced. In addition, water level is also important to determine the durability of food ingredients because it affects the physical, chemical, microbiological changes and enzymatic changes (Winarno 1991). Water level value of fish burger with treatment of 100% tuna's fish white meat surimi is in the amount of 34.60%, this value is greater than fish burger water level in treatment with 80% of white meat surimi and 20% of tuna's red meat surimi which is in the amount of 31,28%. White meat contains higher water level than red meat so it will affect the fish burger water level along with the increased percentage of red meat surimi. The decreased water level of tuna after being processed as fish burger can be caused by the leaching of surimi using NaCl. The use of NaCl can produce carbon dioxide which may cause the degrading of fat level and decreasing water level (Beldso 2000). Water level content contained in Fish burger can be affected by steaming process. In steaming process, occurs water steaming which will cause water level to be decreased.

Water level contained in beef burger is in the amount of 45.5% which is higher compared to tuna's fish burger. Winarno (2004) stated that the water level of the product is affected by the raw material protein level used. Fresh tuna protein content or surimi's tuna is higher than beef protein content, so the water level is lesser.

4. CONCLUSION

According to research results it can be concluded that the comparison percentage of tuna's white meat surimi and red meat surimi in the making of fish burger which preferred by the panelists compared to other treatment is the treatment with the ratio of 80% white meat surimi and 20% red meat surimi of tuna with the value of preference level of appearance, aroma, and texture of 7 (liked) and aroma and texture of 9 (very liked). This research result shows the percentage value of comparing white meat surimi and red meat surimi of tuna is greater than hypothesis. Protein level (13.99%), Fat level (2.36%) and Water level (31.28%).

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