Original Research Article

Difference in Types of Freshwater Fish as Raw Materials for the Preference Level of Korean Fish Cake

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ABSTRACT

Aims: This research aims to determine the effect of different types of freshwater fish as raw material for making Korean fish cake to the level of preference of panelists.

Place and Duration of Study: Fisheries Product Processing Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University in February-March 2019.

Methodology: The method used in the research was the experimental method with the treatment of three different freshwater fish raw materials, namely freshwater pomfret, catfish and red tilapia. Data processing using Friedman Test and Bayes Test. The observations made are the hedonic test which includes appearance, aroma, texture and taste. Physical tests in the form of a folding test and bite test, chemical tests include tests of water, protein and fat levels.

Results: The results showed that Korean fish cake with raw materials of red tilapia was Korean fish cake which was most preferred by panelists with an average score of appearance, aroma, texture and taste are 7.50; 6.70; 7.30 and 6.90. Folding test with a value of 5 (very rubbery), bite test with a value of 8 (strong). Chemical test results of water content is 38.38%, protein level is 15.64% and fat level is 9.05%

Conclusion: Korean fish cake with raw materials of red tilapia was Korean fish cake which was most preferred by panelists.

Keywords: freshwater fish, korean fish cake, preference level, raw materials, surimi

1. INTRODUCTION

The level of fish consumption in Indonesian society according to the results of Widya Karya Nasional Pangan dan Gizi (WKNPG) VII of 2000 is still largely below the standard. The Ministry of Maritime Affairs and Fisheries (KKP) targets fish consumption of Indonesian people to reach 50.8 kilograms (kg) per capita per year by the end of 2018. In 2017, fish consumption is still at 47 kg, the figure is still below Singapore reach 80 kg and Malaysia with 70 kg consumption per capita per year.

The low consumption of fish in Indonesia is caused by a lack of public interest in eating fish. Diversification is an effort to increase market absorption or increase demand. Fish is one of the very good and potential food ingredients to meet the protein needs of the community. The development of processed fish products can be used as an effort to grow fish eating habits. Another benefit of developing various processed fish products is as an effort to

improve community nutrition through consumption of protein from fish. (Peranginangin et al. 1999)[1].

One alternative in diversifying processed fish products is production of Korean Fish Cake. Korean Fish Cake or often known as Eomuk is a street-snack from South Korea that is currently in great demand by the Indonesian people, especially young people. This type of processed product is made from minced meat or surimi with the addition of various kinds of flavor and through several processing processes and called as one of the diversified products that are processed to increase public consumption of fish (Trilaksani 2004)[2].

Freshwater fish have characteristics that are high protein content, low fat, white and thick meat, have a neutral aroma. Therefore, in making the Korean Fish Cake, three freshwater fish are used as raw materials to be carried out in this research, namely catfish (*Pangasius hypophthalmus*), red tilapia (*Oreochromis niloticus*) and freshwater pomfret (*Colossoma macropomum*).

Catfish is one of the freshwater consumption fish found in Indonesia which also has good taste, is easily cultivated and has a high nutrient content. According to KKP (2013), catfish farming has increased significantly, amounting to 651,000 tons from 2006 to 2012. Besides, fresh catfish meat is also a good source of animal protein because it contains complete essential amino acids (Suryanti 2010)[3].

Red tilapia is a fish that is easy to grow and maintain compared to other freshwater fish. Besides that, red tilapia also has attractive colors, tasty meat, a few thorns and also contains high nutrition (Suyanto 1994)[4]. Tilapia is known as white flesh fish which is very resistant to environmental changes because it contains thick meat with the potential as a source of raw materials for the processing managed industry (BPPT 2011). Red tilapia is potential to be developed because of its rapid growth.

Freshwater pomfret is one type of fish that is often consumed by the people of Indonesia. The reason is it has thick meat, not too fishy and has a fine meat texture. Freshwater pomfret has a tasty meat taste although it has thorns in its meat. Freshwater pomfret is used as an option because it has a price that is relatively cheap and more affordable by society, easy to cultivate and has a high nutrient content (Anggraini 2002)[5].

According to Winarno (1997)[6] testing of foodstuffs is not only seen from the chemical aspects, but also from the taste and aroma. Therefore it is important to test the level of preference to find out whether a new product is acceptable to the society or not.

Based on this research's background, research on the effect of different types of fish as raw material on the level of Korean Fish Cake needs to be done which can be used as a basic material and reference in determining the raw materials in the production of Korean Fish Cake.

2. MATERIAL AND METHODS

2.1 Time and Locations

This research was held at the Fisheries Product Processing Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University, Indonesia in February-March 2019.

2.2 Tools and Materials

Materials used were catfish, red tilapia and freshwater pomfret, shallots and garlic, carrots, salt, sugar, pepper, flour, cornstarch, egg white, cooking oil, ice cubes. The tools used were meat grinder, food processor, filet knife as fish cutters, cutting boards, digital scales, gauze, basin, frying pan, stove, baking sheet, skewers, questionnaire sheets and styrofoam plates.

2.3 Procedur

According to Suzuki (1981)[7], the procedure of making surimi starts from dozing the fish, washing twice, stirring periodically, reducing water. Eomuk making according to Maangchi (2018)[8] starts from putting surimi into a food processor, mixing with flavors, adding flour, spread eomuk dough into baking sheet, steaming and Eomuk frying.

2.4 Methods

The experimental method was by measuring the panelist preference level which included appearance, aroma, texture, color and taste, physic test such as folding test, bite test and chemical test which included protein, fat and water content. In the hedonic test using 20 panelists as a test. Three treatments based on the type of raw material surimi, i.e.
Treatment A: Freshwater pomfret surimi
Treatment B: Catfish surimi
Treatment C: Red Tilapia Surimi

3. RESULTS AND DISCUSSION

3. RESULTS

3. 1. Hedonic Test

Organoleptic characteristics are parameters that are tested to determine the level of preference in a product. The things observed in organoleptic testing are appearance, taste, aroma, and texture. The hedonic test analysis was carried out using the Friedman test. Data from the Korean fish cake that will called Eomuk next hedonic test results can be seen in Table 1.

Table 1. Hedonic test of *Korean fish cake* results

Treatments	Appearance		Aroma		Texture		Taste	
	Average	Median	Average	Median	Average	Median	Average	Median
Freshwater pomfret	4,90 a	5	6,10 a	5	4,70 a	5	6,00 a	7
Catfish	6,50 b	7	6,30 a	7	5,90ab	6	6,00 a	7
Red Tilapia	7,50 c	7	6,70 a	7	7,20 b	7	6,90 a	7

Notes : The value of average that followed by letter shows the difference each treatments according to Friedman test with 5% error degree

3.1.1 Appearance

Based on the hedonic test of Eomuk appearance, the highest average value was found in the treatment of red tilapia surimi at 7.50 followed by catfish surimi at 6.50 and the lowest average was found in the treatment of freshwater pomfret surimi at 4.90.

The difference types of freshwater fish as raw material gives an effect for appearance of eomuk. The appearance of eomuk with red tilapia surimi has a yellowish white color, a whole shape and flat surface which preffered by panellist. The appearance of eomuk with catfish surimi has yellow color, a whole shape and flate surface. The appearance of eomuk with freshwater pomfret has dull white color, less intact and broken when sticked by skewers. According to Andarwulan et al (2011)[9] differences of produced color due to color of materials and product which formed by natural pigments in food or coloring ingredients added to food. Binding materials can also affect the appearance produced by the product (Anjarsari 2010)[10] so that it can be concluded that the appearance is affected by the raw material of fish and white degree in flour and binder in making Eomuk.

3.1.2 Aroma

Based on the hedonic test of Eomuk aroma, the highest average value was found in the treatment of red tilapia surimi at 6.70 followed by catfish surimi at 6.30 and the lowest average was found in the treatment of freshwater pomfret surimi at 6.10.

According to statistical test results, three treatments did not have significant differences in the acception of Eomuk Aroma and three of them were accepted by panellist. The produced aroma doesn't leave a fishy smell. Characteristics of materials aroma and volatile components contained in it are one of the important factors in determining the quality of food ingredient. The aroma components can influence the organoleptic characteristics of a food, thus giving a role in the level of acceptance and consumption of the final product (Pratama 2018)[11]

3.1.3 Texture

Based on the Eomuk texture observations, different results were obtained for each treatment. The treatment of raw material for freshwater pomfret has a median value of 5 with an average of 4.70, the raw material for catfish has a median value of 6 with an average of 5.90 and the raw material of red tilapia has a median value of 7 with an average of 7, 20. The results stated that the texture of the three treatments was acceptable to the panelists.

The treatment of raw materials for freshwater pomfret produces a texture that is slightly rough, brittle and easily cracked. The treatment of raw material for catfish produces a chewy texture, strong enough and not easily cracked. The texture produced by Eomuk with the raw material of red tilapia is springy, strong and not easily cracked. This is presumably because red tilapia and catfish have moderate gel strength, while freshwater pomfret has low gel strength. The resulting texture can be caused by the formation of protein gel and gelatinization process in flour when heated, high and low water content and folds. According to Anjasari (2010)[9] binder is a material used in the product to bind the water contained in the dough and serves to improve the stability of the emulsion, according to shrinkage during steaming and forming a dense texture.

3.1.4 Taste

Based on the observations of the Eomuk taste, the results of the three treatments were favored by the panelists and the results of the statistical tests showed that the taste of Eomuk between the treatments of freshwater pomfret, catfish and red tilapia had no significant differences. Non-volatile flavor compounds influence the flavor characteristics of a product and usually originate from compounds from free amino acid groups, peptides, and nucleotides (Pratama et al. 2018)[12]. The taste of Eomuk with different raw material treatments produces a taste that is not significantly different from the taste of fish, savory and all three are favored by panelists. There is no real difference in taste from the three treatments of the raw material allegedly because additional ingredients such as flour, seasonings and other ingredients have the same composition, so the resulting taste tends to be the same. This result has a same result with study of Kwon and Lee (2013)[13] about the characteristics of Eomuk quality with the addition of rice flour where different treatments were 50%, 75%, 100% which did not give a significant difference to the taste of Eomuk, but did differ in texture.

Physical tests were conducted to determine the texture quality related to gel strength in Eomuk. Textures that are closely related to the strength of the gel or strength of ashi are important factors in determining the quality of surimi and kamaboko. Physical tests carried out in the research were folding test and bite test.

3.2 Physical Test Results

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3.2.1 Folding Test

The folding test aims to determine the elasticity of Eomuk from different raw materials that are physically tested. This test is done by folding the sample slices with a thickness of ± 5mm slowly until cracks appear. The results of the Eomuk folding test score are presented in Table 2.

Table 2. Results of Korean Fish Cake Folding Test

Treatments (raw material)	Score Average	Elasticity Level
Freshwater pomfret	2	Less rubbery
Catfish	4	Rubbery
Red Tilapia	5	Very rubbery

Based on the average Eomuk folding test score the highest score was found in Eomuk with red tilapia surimi which is 5 (very rubbery), followed by catfish surimi with a score of 4 (rubbery) and the lowest in Eomuk with freshwater pomfret with a score of 2 (less rubbery). The folding test results are in line with Sahlan's research (2018)[14] which is kamaboko red tilapia produces the highest elasticity with an average value of 5 (very rubbery).

The difference in the results of the folding test from the three different raw materials is due to the strength of the gel produced from the three fishes that are made into this raw material is different. Red tilapia and catfish have moderate gel strength, while freshwater pomfret has low gel strength so the results of the folding test show that Eomuk with the raw material of red tilapia and catfish has high elasticity while Eomuk with ingredients raw freshwater pomfret has low elasticity.

3.2.2 Bite Test

Based on the average Eomuk bite test score, the highest average score was found in Eomuk with the raw material of red tilapia which is 8 (strong), followed by the raw material of catfish with a score of 6 (normal) and the lowest in the raw material of pomfret fresh water with a score of 4 (weak). The process of making meat paste before becoming a product is thought to be related to the height and low value of the bite test produced by all Eomuk (Sitompul 2016)[15]. According Balai Pembinaan dan Pengawasan Mutu Hasil Perikanan (2001), commercial products that are still acceptable have bite test values of 5-6, so that of the three products in the research, two of them are acceptable to consumers, they are Eomuk with raw materials of red tilapia and catfish surimi while Eomuk with raw material for freshwater pomfret is not classified as consumer acceptance because it has a bite test value below 5. The results of the bite test analysis can be seen in Table 3.

Table 3. Results of Korean Fish Cake Bite Test

Treatments (raw material)	Score Average	Elasticity Level
Freshwater Pomfret	4	Weak
Catfish	6	Normal
Red Tilapia	8	Strong

3.3 Chemical Test

Chemical tests conducted on Eomuk with different freshwater fish raw materials are water content, protein content and fat content. Several factors that can affect the nutritional content of fish meat besides genetics, age, season, environment and also feed which is a nutrient intake for fish can also affect the chemical composition or nutrient content of fish meat (Thammapat et al 2010)[16]. The results of the Eomuk chemical analysis with the best treatment of raw materials, red tilapia is presented in Table 4.

Table 4. Results of Korean Fish Cake Chemical Tests

Type of Test	Unit	Result
Water	% b/b	38,38
Protein	% b/b	15,64
Fat	% b/b	9,05

3.3.1 Water Content

Water content testing aims to determine the characteristics of Eomuk water content. According to Winarno (1997)[6] water is the main component in food ingredients that affects

texture, appearance and taste in processed products. The results of the Eomuk water content test were 38.38%.

The addition of salt during washing in the manufacture of surimi can affect the water content in the product. When washing the salt added is 0.3%. According to Muliani (2013) that the more salt added, the less the water content produced. The function of salt here is to draw water so that the addition of salt can cause a less water content. The lower the water content produce, the growth of microorganisms would be slow and food could last longer. Otherwise when water content was higher, microorganisms growth faster and makes decay process takes place quickly.

3.3.2 Protein

The results of testing Eomuk protein levels obtained a percentage of 15.64%. In making Eomuk, fish meat protein itself has the function of coating or emulsifying fat and binding water so that Eomuk is stable and does not break during cooking. The value of protein content is influenced by the type of fish, fish with the highest protein content is sea water fish, followed by brackish water fish and freshwater fish species, so that in the processing process the role of each fish meat can affect the protein value (Sitompul 2016)[15]. The protein content of whole red tilapia is 17.80% (Astawan 2003)[17]. There was a decrease in protein levels during processing to 15.64%. This decrease was allegedly due to the addition of a salt solution during the washing process in making surimi. The myofibril protein found in fish is bound by saline solution and dissolves in wasted laundry water so that protein content is reduced (Suryanti 2010)[3].

3.3.3 Fat

Based on the testing of fat content in Eomuk that has been done, the results of fat content are 9.05% per 100 grams. The washing process in making surimi is a critical stage where a number of waters used can remove sarcoplasmic protein, blood, fat and other components of fish pulp. Red tilapia has a fat content of 2.80% (Sahlan 2018)[14] then after being processed into Eomuk there is an increase that occurs due to the frying process. This result is different from the research conducted by Wijayanti (2012)[18] where the fat content in making African catfish surimi was reduced from 7.19% to 3.39% after washing 3 times. While in this research washing process is only done twice and oil was added when frying so that the fat content is not reduced.

3.4 Decision Making

Decision making is done by multiple comparison tests (Pairwise comparison) to know the value of the alternative weight of Eomuk's appearance, aroma, texture and taste criteria and to decide the most influential criteria in Eomuk's assessment. The calculation results on the weight of Eomuk's appearance, aroma, taste and texture are presented in Table 5.

Table 5. Calculation results on weight criteria

Criteria	Priority
Appearance	0,16
Aroma	0,13
Texture	0,15

Taste	0,56

Based on the calculation of the criteria weights for the appearance, aroma, texture and taste of Eomuk shown in Table 5 the results showed that the taste has the highest criteria weight, which is 0.56 followed by appearance of 0.16, texture 0.15 and aroma with the lowest weight, namely 0 , 13. This shows that the taste criteria are the most influential criteria in Eomuk's assessment. Winarno (1997)[6] explains that in product selection, taste criteria are the main consideration. In the test of preference there are other criteria in the Eomuk assessment, but if the panelists don't like it, the product will be rejected. After knowing the most important taste parameters, then proceed with calculating the criteria weight of each treatment. The results of the calculations are presented in Table 6.

Table 6. Results of calculation of criteria weight per treatment

Treatment	Criteria				Alternative Value	Priority Value
	Appearance	Aroma	Texture	Taste		
Freshwater Pomfret	5	5	5	7	6,11	0,31
Catfish	7	7	6	7	6,85	0,34
Red Tilapia	7	7	7	7	**7,00**	**0,35**
Criteria Value	0,16	0,13	0,15	**0,56**	19,96	1,00

Based on the results of calculations using the Bayes method above, it is found that Eomuk with the raw material of red tilapia has an alternative value and the highest priority value is 7.00 and 0.35. Followed by Eomuk the raw material of catfish with an alternative value of 6.85 and a priority value of 0.34 and the lowest is the treatment of raw material for freshwater pomfret with an alternative value of 6.11 and a priority value of 0.31. From that results it can be concluded that Eomuk with raw materials of red tilapia is Eomuk which is preferred by panelists compared to the other two treatments because it has a high alternative value. This is in line with Sahlan's research (2018)[14] which shows that the most preferred result of kamaboko is kamaboko red tilapia.

4. CONCLUSION

Based on this research, the results showed that Korean fish cake with raw materials of red tilapia was Korean fish cake which was most preferred by panelists with an average score of appearance was 7.50, aroma was 6.70, texture was 6.70 and taste was 6.90. Folding test with a value of 5 (very rubbery), bite test with a value of 8 (strong). Chemical test results of water content is 38.38%, protein level is 15.64% and fat level is 9.05%

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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