

THE EFFECT OF CARRAGEENAN FLOUR ADDITION ON THE PREFERENCE LEVEL OF RED TILAPIA (*Oreochromis niloticus*) ROLADE

Pengaruh Penambahan Tepung Karagenan Terhadap Tingkat Kesukaan Rolade Ikan Nila Merah (*Oreochromis niloticus*)

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ABSTRACT

Fishery product diversification refers to the variety of processed fishery products. One of the fishery commodities that can be used as a raw material for diversification products is red tilapia. Red tilapia meat can be used as a raw material for making roulade. This research aims to determine the optimal percentage of carrageenan flour addition in the production of red tilapia fish rolls to yield the most preferred product by panelists. The study was conducted at the Fishery Product Processing Laboratory of Building 2, Faculty of Fisheries and Marine Sciences, Padjadjaran University. The research method employed was experimental, with four treatments of carrageenan flour addition: 0%, 0.75%, 1%, and 1.25%. The observed parameters were the preference levels for red tilapia fish rolls from all treatments, consisting of appearance, aroma, taste, and texture preferences. Preference level observations were conducted through assessments by 20 semi-trained panelists. Research results indicate that the 1% carrageenan flour addition was most preferred by panelists, with average preference scores for appearance (6.5), aroma (6.6), taste (7.1), and texture (7.6).

Keywords: Hedonic Test, Red Tilapia, Rolade

ABSTRAK

Diversifikasi produk perikanan merupakan penganekaragaman produk olahan hasil perikanan. Salah satu komoditas perikanan yang dapat dijadikan bahan baku produk diversifikasi adalah ikan nila merah. Daging ikan nila merah dapat digunakan sebagai bahan baku pembuatan rolade. Penelitian ini bertujuan untuk menentukan pengaruh penambahan persentase penambahan tepung karagenan yang tepat pada pembuatan rolade ikan nila merah untuk menghasilkan produk yang paling disukai oleh panelis. Penelitian ini dilaksanakan di Laboratorium Pengolahan Hasil Perikanan Gedung 2 Fakultas Perikanan dan Ilmu Kelautan Universitas Padjadjaran. Metode penelitian yang digunakan adalah metode eksperimental dengan 4 perlakuan penambahan persentase tepung karagenan sebesar 0%; 0,75%; 1%; dan 1,25%. Parameter yang diamati adalah tingkat kesukaan rolade ikan nila merah dari semua

perlakuan, terdiri dari tingkat kesukaan kenampakan, aroma, rasa, dan tekstur. Pengamatan tingkat kesukaan dilakukan dengan penilaian oleh 20 orang panelis semi terlatih. Hasil riset menunjukkan bahwa persentase penambahan tepung karagenan sebesar 1% merupakan yang paling disukai oleh panelis dengan nilai rata-rata tingkat kesukaan kenampakan (6,5), aroma (6,6), rasa (7,1), dan tekstur (7,6).

Kata Kunci: Uji Hedonik, Ikan Nila Merah, Rolade

INTRODUCTION

Diversification of fishery products is the diversification of processed fishery products, either through the development of new products or developing existing products or can be called value-added products (Ismanthono & Noviatno, 2006). One of the fishery commodities that can be used as raw materials for diversified products is red tilapia. According to (Soetjipto et al., 2019) the largest amount of tilapia production in 2018 was dominated by the regions of West Java, West Sumatra, South Sumatra, Central Java, North Sulawesi, North Sumatra, West Nusa Tenggara, East Java, South Kalimantan, Bengkulu, and DI Yogyakarta. Red tilapia (*Oreochromis niloticus*) is a type of freshwater fish that has thick, compact meat, and is easily separated from bones and spines, making it suitable for fillets for raw materials for diversified products such as nuggets, roulades, dim sum, and others. Red tilapia is included in low or medium fat fish because it has a fat content of 4.1% (Astawan 2003).

Red tilapia fish meat can be used as a raw material for making roulade. Rolade is a product made from minced meat or ground meat, with or without other food ingredients and additives, then rolled with an omelette or other ingredients, cooked and formed whole or sliced, served or frozen (BSN, 2018). This is one of the developments in raw materials for roulade which are generally made from beef or chicken. Raw materials for making fish meat roulade have advantages over chicken or beef. One of the advantages of using fish meat is because the protein fiber content (stroma) is less than other animal meat. In a study Anggaditama et al. (2023) related to making patin fish roulade, it was found that the resulting product had a less compact texture and less smooth fish fibers. This may be due to the less than optimal processing of minced meat. To overcome this problem, the addition of carrageenan flour in the roulade making formulation can be a solution.

Carrageenan is known to have the ability to increase water binding capacity, form gel structures, improve texture, increase product stability, and increase elasticity. With the addition of carrageenan, it is expected that a more compact fish roll will be produced, with a smooth texture, and have better overall quality. In making red tilapia roll, carrageenan flour functions as a stabilizer and thickener that has been socialized as a substitute for borax in diversified products or other processed products (Putra, 2015). In the study Ramasari et al. (2012), carrageenan flour was used as an emulsifier or substance that can maintain the stability of a product so that the dough has good stability. Carrageenan flour was chosen because of its ability to improve the texture and elasticity of the product gel, and can increase water binding capacity (Saputro et al. 2018).

According to Vatria & Nugroho (2022), emulsion stability and elasticity levels are the most important criteria for fish jelly products. Therefore, the addition of carrageenan to red tilapia roll products is needed to improve the texture of the product as the main function of carrageenan. This study aims to determine the right percentage of carrageenan flour addition in the manufacture of red tilapia roulade to produce the most preferred product. With the addition of carrageenan, it is also expected to produce a better product and can cover the weaknesses of the previous product, namely the roulade product with a less dense texture.

METHODS

This research was conducted in August at the Fisheries Product Processing Laboratory, Building 2, Faculty of Fisheries and Marine Sciences, Padjadjaran University. The research method used was an experimental method with 4 treatments of additional percentage of carrageenan flour of 0%; 0.75%; 1%; and 1.25%, these treatments were obtained from the results of preliminary research on the level of preference for red tilapia roulade with 4 treatments referring to research Putra (2015) namely 0%; 0.5%; 1%; and 1.5% which showed that the 1% treatment was the most preferred treatment by the panelists. From the results of the preliminary research, the product treatment interval was reduced to 0.25 from the previous most preferred treatment, so the concentration of carrageenan flour addition in this study was four treatments of 0% (control), 0.75%, 1%, and 1.25% in 20 semi-trained panelists.

The research procedure includes the preparation stage of tools and materials and the stage of making roulade with the addition of different carrageenan flour. The formulation of making red tilapia roulade refers to Ratnasari et al. (2017) which has been modified and presented in Table 1.

Table 1. Rolade Formulation

Ingredient	Formulation (g)			
	Ri	Ri	Ri	Ri
Red tilapia meat	500 g	500 g	500 g	500 g
Salt	10 g	10 g	10 g	10 g
Cornstarch	10 g	10 g	10 g	10 g
Carrageenan flour	-	3.75 g	5 g	6.25 g
Carrots	10 g	10 g	10 g	10 g
Garlic	20 g	20 g	20 g	20 g
Pepper powder	2 g	2 g	2 g	2 g
Chicken eggwhite	2 pcs	2 pcs	2 pcs	2 pcs
Chicken egg (for omelet)	3 pcs	3 pcs	3 pcs	3 pcs
Wheat flour (for omelet)	70 g	70 g	70 g	70 g
Cornstarch (for egg)	20 g	20 g	20 g	20 g
Water (for omelet)	150 ml	150 ml	150 ml	150 ml

The process of making tilapia roulade according to Rasyid (2018) is as follows:

- 1) Tilapia is cleaned, then cleaned from dirt and washed clean.
- 2) Tilapia is filleted to remove the meat and separated from the bones.
- 3) Grind the filleted tilapia until smooth.
- 4) Mix the other ingredients that have been prepared in a container.
- 5) Carrageenan flour is added to each dough with different concentrations that have been determined, then the dough is stirred until homogeneous.
- 6) Tilapia dough is rolled using an omelette skin and wrapped in aluminum foil or banana leaves.
- 7) Next, the roulade is steamed for 45 minutes on medium heat at a temperature of 180°C.

The data obtained were analyzed using the Friedman non-parametric statistical method with a 95% confidence level. The use of the Friedman test in this study aims to evaluate whether there is a significant difference in the level of preference. If the results of the two-way Friedman variance analysis are significant, then to determine the differences in each treatment, a further multiple comparison test is carried out (Ririsanti et al., 2017). Panelists' decision-making on the criteria for preferred products is carried out by pairwise comparison (Multiple Comparison). Then it is carried out using the Bayes method. The Bayes method is used to determine the best treatment.

RESULTS

Analysis of Preference Level of Rolade

The assessment of preference level or hedonic test is assessed through several parameters, including appearance, aroma, taste, and texture. These four parameters play a role in determining the red tilapia roulade with the treatment most preferred by the panelists. The results of the analysis of preference level are in Table 2.

Table 2. Analysis of Preference Level of Appearance, Aroma, Taste, and Texture of Red Tilapia Rolade in Each Treatment

Treatment	Average Value			
	Appearance	Aroma	Flavor	Texture
0%	6.0 ± 1.02a	6.3 ± 0.97a	6.3 ± 1.17a	5.7 ± 1.17a
0.75%	6.2 ± 1.00a	6.0 ± 1.02a	6.6 ± 0.82a	6.6 ± 0.82a
1%	6.5 ± 1.10a	6.6 ± 0.82a	7.1 ± 0.78a	7.6 ± 0.78b
1.25%	6.3 ± 1.17a	6.5 ± 0.88a	6.8 ± 0.89a	6.3 ± 0.89a

Based on the results of the analysis of the level of appearance preference in Table 2, the average value of the appearance of fish roulade ranges from 6.0 to 6.5, which indicates that overall the appearance of tilapia roulade can be well accepted by the panelists. With the specification of the highest average value in the treatment of adding carrageenan flour of 1%, namely 6.5 (quite like to like), then followed by the treatment of 1.25%, namely 6.3 (quite like to like), then the treatment of 0.75%, namely 6.2 (quite like to like), and the lowest average value in the treatment of 0%, namely 6.1 (quite like to like).

The average value of the aroma of fish roulade ranges from 6.0 - 6.6 with the highest value in the treatment of 1% of 6.6 and the smallest average value in the treatment of 0.75% of 6.0. The average value of fish roulade taste ranged from 6.3 - 7.1 with the highest value in the 1% treatment of 7.1 and the smallest average value in the 0% treatment of 6.3. The average value of fish roulade texture ranged from 5.7 - 7.6 with the highest value in the 1% treatment of 7.6 and the smallest average value in the 0% treatment of 5.7.

Decision Making with the Bayes Method

The Bayes method is one of the techniques that can be used to conduct analysis in making the best decision from a number of alternatives (Marimin, 2004). The purpose of the Bayes method is to obtain optimal results by considering the criteria of a number of alternatives. The alternatives considered in this research are appearance, aroma, texture, and taste. The results of the calculations that have been obtained are in Table 3.

Table 3. Priority Value of Red Tilapia Fish Rolade

Treatment	Average Likeability Rating				Priority Value
	Appearance	Aroma	Flavor	Texture	
0%	6	6.3	6.3	5.7	23.22
0.75%	6.2	6	6.6	6.6	24.42
1%	6.5	6.6	7.1	7.6	26.86
1.25%	6.3	6.5	6.8	6.3	24.77
Weight	0.25	0.25	0.18	0.32	

Based on Table 3, the results obtained showed that the highest priority value was found in the addition of carrageenan flour to red tilapia roulade products with a treatment of 1%.

DISCUSSION

Appearance

The appearance criterion is an organoleptic parameter that is quite important to be assessed by the panelists. Good appearance and preferred by the panelists tends to encourage further evaluation of other organoleptic parameters, such as aroma, texture, and taste. This is because appearance acts as an initial stimulus that can influence the assessment of other sensory attributes, but does not absolutely determine the level of consumer preference for the product (Rochima *et al.*, 2015). The results of the Friedman Test showed that all treatments did not have a significant effect on the appearance of red tilapia roulade with the addition of carrageenan flour. This result is in line with the results of the study by Nurhuda *et al.*, (2017), regarding the addition of carrageenan to manyung fish meatballs which also showed results that were not significantly different in the appearance criteria. The addition of carrageenan flour did not affect the appearance of red tilapia roulade because carrageenan flour has a neutral color, so the addition of carrageenan in this study which was not more than 1.25% did not have a significant effect on the appearance of red tilapia roulade.

According to the Indonesian National Standard (SNI) 8504: 2018 concerning the quality requirements for the appearance of roulades, namely intact, clean conditions, and having a normal color according to the type of fish used, the shape of the roulade that meets the standard must also be uniform, generally cylindrical or according to the mold with a consistent size. In general, the red tilapia roulade from the study has met these criteria, but the size of the red tilapia roulade is less uniform, this is because the roulade is cut manually using a kitchen knife. However, the appearance of the red tilapia roulade can be liked by the panelists.

Aroma

The aroma in food products mostly comes from the spices added to the dough (Soekarto, 1985). The results of the study showed that the percentage of carrageenan flour added to the red tilapia roulade was well liked by the panelists. The red tilapia roulade produced all had a distinctive fish aroma and also the aroma of the spices added to the making of the red tilapia roulade without any other aroma. The results of the Friedman Test showed that all treatments had no significant effect at a 95% confidence level, meaning that the panelists had almost the same level of preference for the aroma of red tilapia roulade added with carrageenan flour. This indicates that the variation in the addition of carrageenan flour does not provide a significant difference in aroma in red tilapia roulade.

These results are in line with the results of a study by Nurhuda *et al.* (2017) on the addition of carrageenan flour to manyung fish meatballs which also showed results that were not significantly different in aroma criteria. The addition of carrageenan flour does not affect the aroma of red tilapia roulade because carrageenan flour has a neutral aroma, in addition, the addition of 0.75%-1.25% does not affect the aroma of the resulting red tilapia roulade. Based on the Indonesian National Standard (SNI) 8504: 2018 concerning fish roulade, the criteria for a good roulade aroma must have a distinctive smell or aroma of fish roulade products according to the type of fish used.

Taste

Taste is a response felt by the sense of taste to stimulation from chemical compounds in food ingredients and is more often assessed using the sense of taste or tongue (Bahmid *et al.* 2019). In this study, the treatment of the percentage addition of carrageenan flour was well accepted by the panelists. The results of the two-way Friedman test showed that all treatments were not significantly different at the 95% confidence level, meaning that the panelists had almost the same level of preference for the taste of red tilapia roulade added with carrageenan flour. These results are in line with the research of Nurhuda *et al.*, (2017) on the addition of carrageenan to manyung fish meatballs which also showed results that were not significantly different in taste criteria. The addition of carrageenan flour does not affect the taste of tilapia

roulade because carrageenan flour has a neutral or bland taste so it does not affect the taste of the resulting product (Nurhuda et al., 2017).

Based on the Indonesian National Standard (SNI) 8504: 2018, the criteria for good roulade taste must have a distinctive taste of fish roulade products. This taste should reflect the characteristics of the fish used, without any foreign or deviant taste. This standard emphasizes the importance of taste balance, where no taste component is too dominant. Red tilapia roulade in the study generally met these criteria, namely having a balance between the distinctive taste of fish and the taste of spices, and there were no foreign tastes.

Texture

Texture is a physical characteristic of the material that can be felt by the senses of touch, taste, mouth, and sight. This includes the size, shape, quantity, and components of the material (Midayanto & Yuwono, 2014). The treatment of adding 0% carrageenan flour was significantly different from the 1% treatment. Meanwhile, the addition of carrageenan flour with treatments of 0.75% and 1.25% did not have a significant difference in the assessment of the texture of red tilapia roulade. According to the Friedman test, the addition of carrageenan flour affected the texture of red tilapia roulade, meaning that panelists had different levels of preference for red tilapia roulade. The texture of red tilapia roulade with the addition of 1% carrageenan flour was preferred by the panelists. This result is in line with the results of research obtained by Ririsanti et al. (2017), regarding the addition of carrageenan to the level of preference for catfish pempek which showed the effect of the addition of carrageenan flour on the texture of catfish pempek.

The texture of red tilapia roulade is also influenced by the additional ingredients contained in it such as carrageenan flour and cornstarch. According to Anggadireja et al. (2006), carrageenan functions as a thickener where the elasticity of carrageenan in forming a gel is distinguished from strong to brittle with a soft and elastic type. According to Winarno (2008) carrageenan can be used as a gel former because it contains a stronger sulfate ester, namely 25-30%. With high esters, carrageenan can form a good gel.

Decision Making with the Bayes Method

The treatment of adding 1% carrageenan flour has the highest priority value among other treatments. This is because the 1% treatment has the most significantly high texture value. The results of this study are in line with research Vatria et al. (2023) on the physical and hedonic quality characteristics of tilapia dimsum which shows that the addition of a percentage of carrageenan flour of 1% is the best treatment preferred by panelists. Also in line with research Nurhuda et al. (2017) on the addition of carrageenan flour to manyung fish meatball products which shows that the 1% treatment of adding a percentage of carrageenan flour is the best treatment preferred by panelists.

CONCLUSION

The results of the hedonic test of the level of preference for red tilapia roulade based on the parameters of appearance, aroma, taste, and texture showed that the percentage level of carrageenan flour addition of 1% to red tilapia roulade was the treatment most preferred by the panelists, with an average value of the level of preference for appearance (6.5), aroma (6.6), taste (7.1), and texture (7.6).

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