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Addition of carrageenan flour on preference level of mackerel nugget

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ABSTRACT

This study aims to determine the preference level of mackerel nuggets supplemented with carrageenan. This research was conducted at the Fisheries Processing Laboratory of the Faculty of Fisheries and Marine Sciences and Central Laboratory of Padjadjaran University, in August - September 2018. The research method used was the experimental method with five treatments of carrageenan flour addition - about 0%, 0.5%, 1%, 1.5%, and 2% based on mackerel fish surimi weight. The parameters observed were the level of preference which included appearance, aroma, texture and taste of mackerel fish nuggets. The panelists used in this study were 20 semi-trained individuals. The results showed that the addition of carrageenan flour treatment by 0.5% of the surimi weight produced the most preferred mackerel fish nuggets according to panelist selection.

Keywords: mackerel nuggets, carrageenan flour, elasticity level

1. INTRODUCTION

Fish is a commodity fisheries subsector that is rich in protein, essential amino acids needed by the body, have a biological value of 90% with a little connective tissue so that the fish are easier to digest. According Howara (2013), the fish is a source of protein that has a weakness, one of the drawbacks of fish is that the fish meat has high water content and pH close to neutral therefore that the fish is considered as a good medium for the growth of spoilage bacteria and other organisms which could cause fish easy to deteriorate. The meat of fish contain unsaturated fatty acids that are very high levels susceptible to oxidation, such conditions cause rancidity in fish body.

Processing fish meat into nuggets is one of the alternative utilization of fish products that are intended to extend the shelf life of the product becomes longer. Nugget is a type of food products made from meat and have a relatively long shelf life for the treatment of storage at freezing temperatures.

Raw materials that can be utilized in the processing of these products one of which is mackerel. Mackerel is a pelagic fish economically valuable and important in Indonesia and even the world because it contains high levels of protein and good for growth (Nugroho, 2014). Mackerel has a water content of 76.5%, 21.4% protein, 0.56% fat, 0.61% carbohydrate and ash content of 0.93 %, Mackerel can be processed into crackers, dumplings and pempek (Deden and Nurilmala 2015).

Nugget as a form of processed meat products which is a form of oil-in-water emulsion. Problems often arise in the manufacture of emulsion is unstable emulsion system dough. This resulted in the outbreak of the emulsion system at the time of processing and storage. Prevention efforts that the emulsion system is not broken and last a long time is by adding an emulsifier. Emulsifiers are substances that can maintain the stability of a product, and therefore the processing of mackerel fish nuggets need additional emulsifier so that the resulting dough has good stability, one emulsifier is carrageenan.

According Agustin *et al.* (2017), carrageenan is a compound that includes a group of galactose polysaccharide extracted from seaweed. The polysaccharide used in the food industry as a function of characteristics that can control the water content in the main food ingredients, texture control, and stabilize food. The addition of carrageenan to mackerel fish nuggets or other food materials can affect the texture of the resulting product, thus affecting the panelists also to the level of preference. The purpose of this study was to determine the rate of addition of carrageenan in the manufacture of mackerel fish nuggets on the level of preference (Ardiansyah, 2019; Hakim, 2018).

2. MATERIALS AND METHODS

2. 1. Time and Place of the Research

The study was conducted in August - September 2018 in the Laboratory of Fishery Products Processing Technology of the Faculty of Fisheries and Marine Sciences, Padjadjaran University and in the Institute for Research and Community Service, Bogor Agricultural University.

2. 2. Tools and Materials

The tools used in the research are knives, cutting boards, food processors, steamer stands, pans, molds, basins, scales, meat grinders, Paris cloths, stoves, styrofoam plates and blenders. The ingredients used are mackerel fish, carrageenan flour, tapioca flour, panir flour, garlic, onions, salt, pepper and eggs from the nearest local market.

2. 3. Research Methods

The method used in this study was the experimental method with five additional treatments of carrageenan flour including 0%, 0.5%, 1%, 1.5%, 2% of the surimi weight. The parameters observed were the level of preference for appearance, aroma, texture and taste of

mackerel fish nuggets. The panelists used were semi-trained panelists of 20 people. Favorite level scales range from 1-9, which are most preferred (9), Preferred (7), normal (5), slightly dislike (3) and dislike (1).

2. 4. Data Analysis

Data obtained from the level of preference were analyzed using Friedman's two-way non-parametric statistics. The statistical formula used based on Sudrajat (1999) is as follows:

$$x^2 = \frac{12}{bk(k+1)} + \sum_{i=1}^t (R_j)^2 - 3b(k+1)$$

Description:

- X^2 = Friedman test statistics
- b = Repetition
- k = Treatments
- RJ^2 = Total Rank of each Treatments

If there is the same number, a correction factor (FK) is calculated using the following formula:

$$FK = \frac{\sum T}{1 - (k^2 - 1)} x^2_c = \frac{x^2}{FK}$$

Description:

- $T_i = t_{i3} - t_i$
- T_i = Amount of similar number for a rating under i-block

If the value of $X_{n2} < X_{t2} (\alpha, k-1)$ then accept H_0 and reject H_1 , and if $X_{n2} > X_{t2} (\alpha, k-1)$, then H_0 is rejected and H_1 is accepted. If H_1 is accepted, there is an influence between treatments on the appearance, aroma, texture and taste of mackerel fish nuggets. The next test is followed by a multiple comparison test with the following formula:

$$|R_i - R_j| = \leq Z_{\left\{ \frac{\alpha}{k(k-1)} \right\}} \sqrt{bk(k+1)/6}$$

Description:

- $|R_i - R_j|$ = Total rank
- R_i = Total rank from sample to-i
- R_j = Total rank from sample to-j
- α = Experiment
- b = Amount of repetitions
- k = Amount of treatments

The decision of the panelists on the most preferred product criteria from the appearance, aroma, texture and taste parameters was carried out by the Bayes method. The Bayes method formula is as follows:

$$\text{Total } i \text{ value: } \sum_{j=i}^m (\text{Kritj})$$

Description:

Total Value I = Total Final Value of Alternative 1

I_j value = Value of Alternative 1 in J-Criteria

Criteria-J = To-J Criteria Weight)

I: 1,2,3,..., N; N = amount of alternative

I: 1,2,3,..., M; M = amount of criteria

3. RESULTS AND DISCUSSIONS

3. 1. Level of Preference for the Appearance of Mackerel Fish Nugget

Arnesih (2018), states that appearance is the first characteristic assessed by panelists in consuming a product. The first parameter observed by consumers is appearance or color because it is a parameter that determines the reception of the panelists. The average level of preference for the appearance of mackerel fish nuggets is presented in Table 1.

Table 1. Average Value of the Level of Preference for appearance Mackerel Nugget from the Treatment of Carrageenan Flour addition

| Carrageenan Flour Addition (0%) | Median | Average |
|--|---------------|----------------|
| 0% | 7 | 7,3 a |
| 0,5% | 7 | 7,5 a |
| 1% | 7 | 7,1 a |
| 1,5% | 7 | 7,2 a |
| 2% | 7 | 7,4 a |

Description:

The number followed by the same letter in the direction of the column shows no significant difference according to the multiple comparison test at the 95% confidence level.

Based on the results of multiple comparison tests show that all treatments were not significantly different at the 95% confidence level. The results of the two-way friedman test showed that the addition of carrageenan flour had no effect on the appearance of mackerel fish nuggets which means the panelists had the same level of preference for all the appearance of

mackerel fish nuggets. This is because carrageenan flour, tapioca flour and surimi have white color which causes the appearance of mackerel nuggets to have the same color (white) for all treatments.

The results of this study are in the same line with the results of research by Ririsanti (2017) regarding the addition of carrageenan flour to pempek catfish which also showed that there was no effect of adding carrageenan flour to the appearance of pempek catfish. According to Nurhuda (2017), she stated that the addition of carrageenan flour did not affect the appearance of manyung fish meatballs that were suspected that way because carrageenan flour had a white color.

3. 2. Level of Preference for the Aroma of Mackerel Fish Nugget

The aroma of food products mostly comes from the raw materials used and the spices added when making dough, the delicacy of a food is determined by the aroma factor, in general the aroma is the main attraction in determining the delicious and unpleasant taste of a food (Iffa 2018). The average value of the preference level for the aroma of mackerel nuggets is presented in Table 2.

Table 2. Average Value of the Level of Preference for Aroma Mackerel Nugget from the Treatment of Carrageenan Flour addition

| Carrageenan flour addition (0%) | Median | Average |
|--|---------------|----------------|
| 0% | 7 | 6,4 a |
| 0,5% | 7 | 7,7 a |
| 1% | 7 | 7,1 a |
| 1,5% | 7 | 7,0 a |
| 2% | 7 | 6,5 a |

Description:

The number followed by the same letter in the direction of the column shows no significant difference according to the multiple comparison test at the 95% confidence level.

Based on the results of multiple comparison tests show that all treatments were not significantly different at the 95% trust level. Meanwhile, according to the Friedman test showed that the addition of carrageenan flour did not affect the aroma of mackerel fish nuggets, which means the panelists had the same level of preference for the aroma of mackerel fish nuggets with the addition of carrageenan.

This is because carrageenan flour has a neutral and odorless aroma, but the addition of herbs used such as garlic, onions, pepper and flavorings can also affect the aroma of mackerel fish nuggets.

This research is in line with Ririsanti' research (2017) regarding to carrageenan flour addition towards pempek catfish which also showed that there was no effect of adding carrageenan flour to the aroma of it.

3. 3. Level of Preference for the Texture of Mackerel Fish Nugget

Texture is one of the criteria in organoleptic assessment. Texture is a sensation of pressure that can be observed with the mouth and fingers. The measurement of the texture by mouth is done by being bitten, chewed and swallowed, while the measurement of texture with the fingers is done through touching. The texture of 'fish jelly' products in general has a texture that is more supple and easy to chew. The average value of the preference level for the texture of mackerel fish nuggets is presented in Table 3.

Table 3. Average Value of Preference Level on the Mackerel Nugget Texture from the Treatment of Adding Carrageenan Flour

| Carrageenan Flour Addition (0%) | Median | Average |
|--|---------------|----------------|
| 0% | 7 | 6,5 a |
| 0,5% | 9 | 8,0 b |
| 1% | 7 | 7,4 ab |
| 1,5% | 7 | 6,8 ab |
| 2% | 7 | 7,5 ab |

Description:

Numbers followed by the same letter in the direction of the column show no significant difference according to the multiple comparison test at the 5% level.

Based on the results of multiple comparison tests showed that the addition of 0% carrageenan flour was significantly different from the 0.5% treatment. The addition of carrageenan flour with a treatment of 1%, 1.5% and 2% did not have a significant difference in the assessment of the texture of mackerel fish nuggets. As for friedman test shows that the addition of carrageenan flour affects the texture of mackerel fish nuggets, which means the panelists have different levels of preference for the texture of mackerel fish nuggets. This is due to the influence of adding carrageenan flour.

According to Ririsanti (2017) carrageenan can be used as a gelling agent because it contains stronger sulfate esters, which is 25-30%. With high esters, carrageenan can form a gel well. Texture changes are caused by loss of water or fat content or due to the breakdown of emulsions or gels, hodrolisis of carbohydrate polymers and coagulation or protein hydrolysis.

3. 4. Level of Preference for the Taste of Mackerel Fish Nugget

Taste is the tongue's response to stimuli given by food. Taste is a factor that is also important in the organoleptic assessment of a product because if other factors are good, but the taste are not, at the end of the day the product will be rejected by consumers. This taste is usually used as a determinant of consumer acceptance of food products. Taste assessment aims to determine the panelist's assessment of a product by using the taste buds (Ririsanti 2017). The average value of the preference level for mackerel fish nuggets is presented in Table 4.

Table 4. Average Taste of Mackerel Nugget Based on Carrageenan Flour Treatment

| Carrageenan Flour Addition (0%) | Median | Average |
|--|---------------|----------------|
| 0% | 7 | 6,7 a |
| 0,5% | 7 | 7,2 a |
| 1% | 7 | 6,5 a |
| 1,5% | 7 | 6,9 a |
| 2% | 7 | 6,3 a |

Description:

Numbers followed by the same letters show no significant difference according to multiple comparison tests at 95% confidence level.

Based on the results of multiple comparison tests show that all treatments were not significantly different at the 95% trust level. As for the results of the Friedman test, it was pointed out that the addition of carrageenan flour had no effect on the taste of mackerel fish nuggets which means the panelists had the same level of preference for the taste of mackerel fish nuggets with the addition of carrageenan. This is because the formulation of the addition of seasonings is added together so that there is no taste difference in mackerel fish nuggets.

3. 5. Decision Making Using the Bayes Method

According Risnawati (2018), Bayes method is one technique that can be used to carry out analysis in making the best decisions from a number of alternatives. The goal of Bayes methods is to obtain optimal results by considering various criteria. Their organoleptic characteristics which include appearance, aroma, texture and taste are the criteria to be considered in the selection of the best mackerel fish nuggets that are based on the acquisition of the highest value of each treatment. The calculation of the weight criteria for mackerel fish nuggets is presented in Table 5.

Table 5. Weight Value Criteria for Mackerel Fish Nugget

| Criteria | Criteria Quality |
|-----------------|-------------------------|
| Appearance | 0,16 |
| Aroma | 0,11 |
| Texture | 0,18 |
| Taste | 0,56 |

Based on the calculation results of the weight criteria it was found that taste is the most important criterion that determines the final decision of the panelist in choosing mackerel fish nuggets with a weighting criteria of 0,56, followed by texture, appearance and aroma with the weight of each criterion ie 0,18; 0,16 and 0,11. Panelists choose the taste criteria as the main consideration in choosing mackerel fish nugget products compared to other criteria, this is because taste is a determinant of consumer acceptance of food products. If the criteria for appearance and other criteria are good but the taste criteria are not, then the product will be rejected by the consumer. This result is in accordance with Nurhuda's (2017) study regarding the addition of carrageenan flour to the level of manyung fish meatballs preference which shows that the most important criteria in choosing a product is a taste. The calculation results in determining the best treatment taking by considered appearance criteria, aroma, texture and taste of mackerel fish are presented in Table 6.

Table 6. Assessment Decision Matrix with Bayes Method.

| Treatments | Criteria | | | | Alternative Value | Priority Value |
|-----------------------|-------------------|--------------|----------------|---------------|--------------------------|-----------------------|
| | Appearance | Aroma | Texture | Flavor | | |
| 0% | 7,30 | 6,40 | 6,50 | 6,70 | 6,73 | 0,19 |
| 0,5% | 7,50 | 7,70 | 8,00 | 7,20 | 7,44 | 0,21 |
| 1% | 7,10 | 7,10 | 7,40 | 6,50 | 6,82 | 0,20 |
| 1,5% | 7,20 | 7,00 | 6,80 | 6,90 | 6,94 | 0,20 |
| 2% | 7,40 | 6,50 | 7,50 | 6,30 | 6,71 | 0,19 |
| Criteria Value | 0,16 | 0,11 | 0,18 | 0,56 | 34,64 | 1,00 |

Based on the calculation of the Bayes method, it was found that the addition of 0.5% carrageenan flour treatment on mackerel fish nuggets obtained the highest alternative value of

0.21 followed by the addition of 1.5%, 1%, 0% and 2% carrageenan flour. Overall it can be concluded that the addition of 0.5% carrageenan flour on mackerel fish nuggets is the most preferred treatment by panelists compared to the other treatments.

4. CONCLUSION

Based on the results of the research it can be concluded that the addition of carrageenan flour by 0.5% of the surimi weight on mackerel fish nuggets is the most preferred treatment.

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