

The Addition of Minced Catfish (*Pangasius sp.*) as a Protein Source on Tortilla Chips by Preference Level

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Original Research Article

ABSTRACT

Aims: This research aims to determine the addition of minced catfish (*Pangasius sp.*) that was added to the most preferred tortilla chips by the panelist.

Place and Duration of Study: Fisheries Product Processing Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University in May-July 2018

Methodology: The method used in this research was the experimental method with the five treatments, which were the addition of minced fish were 0%, 5%, 10%, 15%, and 20% and involving 20 semi panelists as replication. The addition of minced were calculated based on the weight of corn flour. The observed parameters were yield, hedonic test (appearance, aroma, texture, taste) and chemical characteristics (protein and water content) in control and most preferred treatment. Data processing using Friedman and Bayes Test.

Results: The results showed that tortilla chips with the addition of 10% of minced catfish was the most preferred tortilla chips by panelists with an average score of appearance, aroma, texture and

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taste are 7.00; 6.40; 6.70; and 7.60. The yield of tortilla chips is 75.77%. Chemical test results of protein content is 9.98% and water content is 2.28%.

Conclusion: Tortilla chips with the addition of 10% of minced catfish was tortilla chips which was most preferred by panelists.

Keywords: Catfish; fish meat; Pangasius sp.; preference level; protein content; tortilla chips.

1. INTRODUCTION

Snacks are favored by people because it's fast, mobile, and easily accessible. In addition, modern snacks have various appearances, shapes, flavors, and packaging in the market. World Health Organization stated that in 2007, Indonesians have a snack consumption rate of 11% which increases to 15% in 2008 [1].

Snacks are consumed to support the daily nutritional values, because it can be consumed between the main course (breakfast, lunch, dinner). However, the snacks that are sold in the market nowadays do not have a balanced nutritional value, full of calories and high in Monosodium Glutamate (MSG) [1]. This could be detrimental to health and could cause various illness if the snacks are consumed excessively. One of snacks that are consumed regularly by the general public is Tortilla Chips.

The tortilla chip is a corn-based snack that is crunchy and savory. Tortilla has an imbalanced nutritional value, which is that it is high in carbohydrates and low in protein, due to it uses corn as the main ingredient. The tortilla chip has a carbohydrate and protein content of 80/100 g and 11/100 g, respectively [2]. Because of this, it is necessary to add an ingredient that is rich in protein, one of which is fish.

Fish meat is a protein source and essential fatty acids food that is very important for human body [3]. Catfish (*Pangasius* sp.), as a fresh water fish contains high level of protein [4]. The catfish meat (*Pangasius* sp.) contains protein content of 12.54%, fat content of 0.89%, dan water content of 75.53% [5].

The option to add catfish (*Pangasius* sp.) meat in tortilla chips is not just because of its high level of protein, but also because of the characteristics of the meat itself. Catfish meat are very favored by Indonesians because it has a unique, savory, and delicious taste [6], the meat does not have many bones [7] and the few that do exists are easy to remove which greatly helps the processing and it is relatively cheap and easy to obtain [8]. Catfish is easy to obtain due to the fact that many Indonesian cultivate

catfish. In 2011, the catfish production rate in Indonesia reaches 229.266 tones which contribute 16.11% of the global catfish production rate [9]. The addition of catfish meat in tortilla chips are hoped to increase the nutritional values of tortilla chips, especially protein, so that it could fulfill the consumer's nutritional needs. The purpose of this study is to determine the addition of minced catfish that was added to the most preferred tortilla chips by the panelists.

2. MATERIALS 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, Jatinangor, Indonesia in May until July 2018.

2.2 Tools and Materials

Materials used in this research were catfish (*Pangasius* sp.), corn flour, tapioca flour, salt, sugar, garlic powder, water and cooking oil. The tools used were knives, cutting boards, scales, basins, meat grinder, oven, pan, and stove.

2.3 Procedure

2.3.1 The minced fish productions

According to Kurniawati dkk [10], the procedure of making minced fish starts from weeding the fish, washing and making it into fillet. After that, removing the fish skin in order to obtain the fish meat. Then washing it again, draining, and mincing using meat grinder.

2.3.2 Tortilla chips productions

Tortilla chips making according to Wahyuni [11] starts from mixing all the ingredients according to the formulas, stirring the premix until homogen, molding the dough using rolling pin with the thickness of $\pm 1-2$ mm, molding with the length ± 35 mm and the width ± 25 mm, ovening the tortilla chips at temperature 125°C for 5 minutes,

and frying the tortilla with deep frying method for 5-10 seconds.

2.4 Methods

The experimental method was by measuring the panelist preference level which included appearance, aroma, texture, and taste, chemical test which included protein and water content, and the yield. In the hedonic test, using 20 panelists as a test. Five treatments based on the corn flour, i.e.

- Treatment A: 0% of meat addition
- Treatment B: 5% of meat addition
- Treatment C: 10% of meat addition
- Treatment D: 15% of meat addition
- Treatment E: 20% of meat addition

3. RESULTS AND DISCUSSION

3.1 The Yield Calculation

Yield was obtained from percentage of the ratio of final weight with initial weight. The yield of fillet was 37.45%, the yield of minced fish was 35.43%, and the yield of tortilla chips was 75.77%. The results showed that the yield value of fillet and minced fish decreased. Decreasing the yield of the weight of whole fish into fillet and minced fish is because of the weeding process, and removing some parts of fish body that are not needed in the process of making fillet and minced fish.

3.2 Hedonic Test

3.2.1 Appearance

Appearance is one of important organoleptic parameters, because appearance is the first thing that consumers see. A food that contain of high nutrition, tasty, and have good texture, will be less enjoyed if it has an unpleasant color or gives an impression that deviates from the color it should be [13]. The result of appearance mean of tortilla chips can be seen in Table 1.

Based on the table above, it is shown that the median for appearance is between 5 and 7, with the average ranging from 6.00 to 7.00, which means that the tortilla chips appearances in each treatment are “neither liked or disliked to liked” by the panelist. The overall statistics test showed that every treatment do not have a significant effect toward the tortilla chips appearance, this is because of its whole, uniformed, and brownish yellow appearance that are favored by panelists.

The panelists favored the tortilla chips appearance in the 10% treatment, but the favorability decreases in the 15% and 20% treatment. The higher amount of catfish added, the color of the chips turns browner which makes it less appealing. The brownish yellow color could be due to the Maillard reaction. The Maillard reaction occurred when there is a reaction between the protein (Primary Amine Group) and the reducing sugar from the carbohydrates [14] that came from the catfish meat and the corn flour.

Table 1. The tortilla chips appearance mean in each treatment

Fish meat (%)	Median	Appearance mean
A (0)	5	6.00a
B (5)	7	6.70a
C (10)	7	7.00a
D (15)	7	6.80a
E (20)	7	6.60a

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

3.2.2 Aroma

Aroma of a food is captured by nasal olfactory cells, so it can stimulate the taste nerves and tongue's taste. Commonly, there are four main odors namely fragrant, sour, rancid, and charred [15].

The result of aroma mean can be seen in Table 2.

Table 2. The tortilla chips aroma mean in each treatment

Fish meat (%)	Median	aroma mean
0 (A)	7	6.50a
5 (B)	7	6.50a
10 (C)	7	6.40a
15 (D)	6	6.10a
20 (E)	5	6.00a

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

Based on the result above, all of the treatment was still accepted by the panelist with median ranging between 5 to 7, which were in the “neither liked or disliked to liked” category. The mean of tortilla chips aroma ranges between 6.0 and 6.5. The overall results of statistic tests showed that all treatments were not significantly different, which means that the addition of

minced catfish didn't give noticeable difference in aroma based on the panelist judgement of tortilla chips.

The 15% dan 20% treatment, the fish aroma is getting stronger and the corn aroma is decreasing, and it makes the mean value decrease. The higher amount of catfish added, the fishy aroma get stronger, and the panelist do not like it. The aroma caused by volatile components can disappear during the heat treatment process [16].

3.2.3 Texture

Texture can affect the taste of food [17]. The texture can be tested by breaking or biting the tortilla chips. The result of texture mean is shown in Table 3.

Table 3. The tortilla chips texture mean in each treatment

Fish meat (%)	Median	Texture mean
0 (A)	7	7.20 b
5 (B)	7	6.70 ab
10 (C)	7	6.70 ab
15 (D)	7	6.60 ab
20 (E)	5	5.60 a

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

Based on the table above, it is shown that the median for texture is between 5 and 7, with the average ranging from 5.60 to 7.20, which means that the tortilla chips texture in each treatment are moderate or acceptable to favored by the panelists. The 5%, 10%, and 15% treatment did not have a significant impact toward the 0% and 20% treatment. However, the 0% treatment has a significant difference with the 20% treatment.

The panelist prefer the 0% treatment tortilla chips more because of its crunchy characteristics when chewed, while the 20% treatment tortilla chips has a texture that is a little crunchy and harder to chew compared to the other treatments. The chips texture became harder when catfish meat was added, this is because the protein inside the meat slows the gelatinization process [10]. The more catfish meat added, the harder the tortilla chip texture became, which would decrease the panelist favorability.

3.2.4 Flavor

Flavor become the most important factor in determining consumer's decision to accept or

reject a food product. Even though the other parameters are good, but if the taste doesn't good, then the product will get rejected by the consumer [13]. The result of flavor mean can be seen in Table 4 below.

Table 4. The tortilla chips flavor mean in each treatment

The catfish meat (%)	Median	Flavor mean
0 (A)	7	6.30 ab
5 (B)	7	7.20 abc
10 (C)	7	7.60 c
15 (D)	7	6.90 abc
20 (E)	7	6.00 a

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

Based on the table above, it is shown that the median for flavor is 7, with the average ranging from 6.00 to 7.60, which means that the tortilla chips in each treatment are favored by the panelists. The 10% treatment is not significantly different from the 5% and 15% treatment, in that they all will be more savory with the increase of catfish meat. However, the 10% treatment is significantly different with the 0% and 20% treatment.

The 10% treatment was the most favored by panelists because the unique flavor of the corn still exists, it is savory and there is the distinct flavor of the fish, although it's not much. The more catfish meat added to the chips, the higher the favorability of the panelists, this is true until the 10% treatment, which then the favorability decreases in the 15% treatment.

3.3 Decision Making

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

Table 5. Calculation results on weight criteria

Criteria	Priority
Appearance	0.21
Aroma	0.12
Texture	0.22
Flavor	0.45

Table 6. The results of calculation of criteria weight per treatment

Treatment	Criteria				Alternative value	Priority value
	Appearance	Aroma	Texture	Flavor		
0%	6.00	6.50	7.20	6.30	6.46	0.19
5%	6.70	6.50	6.70	7.20	6.90	0.21
10%	7.00	6.40	6.70	7.60	7.13	0.21
15%	6.80	6.10	6.60	6.90	6.71	0.20
20%	6.80	6.00	5.60	6.00	6.08	0.18

Table 7. The Protein and Water Content on Tortilla Chips 0% and 10% Treatment

Chemical tested	Treatment	
	0%	10%
Protein Content	6.01	9.98
Water Content	0.36	2.28

Based on the calculation of the criteria weights for the appearance, aroma, texture, and flavor of Tortilla shown in Table 5, the results showed that the flavor has the highest criteria weight, which is 0.45 followed by texture of 0.22, appearance 0.21 and aroma with the lowest weight, namely 0,12. This shows that the flavor criteria are the most influential criteria in Tortilla's assessment.

In the test of preference, there are other criteria in the Tortilla's assessment, but if the panelists don't like the flavor, the product will be rejected. After knowing the most important is flavor parameter, then proceed with calculating the criteria weight of each treatment. The results of the calculations are presented in Table 6.

Based on the results of calculations using the Bayes method above, it is found that Tortilla with the addition of 10% of minced catfish has an alternative value and the highest priority value is 7.13 and 0.21. Followed by Tortilla with the addition of 5% of minced catfish with an alternative value of 6.90 and the priority value 0.21, and the lowest is the 20% treatment. From the results it can be concluded that Tortilla with the addition of 10% of minced catfish is Tortilla which is preferred by panelists compared to the other treatments because it has a high alternative value.

3.4 Chemical Test

Chemical analysis was carried out to know protein and water content on tortilla chips with control treatment and most preferred treatment. Based on the result, it is known that the 10% treatment is the most preferred treatment. The results of chemical test are shown in Table 7.

The protein content in the controlled treatment is 6.01%, while the protein content of the 10% treatment is 9.98%. The increase in protein is caused by the addition of catfish meat that contains high level of protein. The catfish meat has a protein content of 12.94% [5]. The increase of protein level in this study supports the previous study [18] that stated that the increase of protein in a product is caused by the increase of the catfish meat addition.

The results of the water content test showed that the water content of the 10% treatment tortilla chips is higher than the control treatment. This changing water content is caused by the addition of water from the added catfish meat and from the processing. The catfish meat has a 75.53% water content [5]. The process that occurred during the making of tortilla chips includes drying with an oven and frying. The drying with an oven causes the water inside the chips evaporate, and frying the chips further decreases the water content, causing the chips surface dried and becoming crunchy [19].

4. CONCLUSION

Based on the results of the research, it can be concluded that the yield of minced catfish is 35,43% and the most preferred treatment on the addition of catfish meat on tortilla chips is the 10% treatment, which has a preference level on appearance, aroma, texture and flavor with the score 7; 6,4; 6,7; and 7,6. From the of 2.28%.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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