

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

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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 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.

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Keywords: Minced catfish, Pangasius sp., Preference level, Protein content, Tortilla chips

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1. INTRODUCTION

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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].

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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.

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36 Fish meat is a protein source and essential fatty acids food that is very important for human
37 body [3]. Catfish (*Pangasius* sp.), as a fresh water fish contains high level of protein [4]. The
38 catfish meat (*Pangasius* sp.) contains protein content of 12.54%, fat content of 0.89%, dan
39 water content of 75.53% [5].
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41 The option to add catfish (*Pangasius* sp.) meat in tortilla chips is not just because of its
42 high level of protein, but also because of the characteristics of the meat itself. Catfish meat
43 are very favored by Indonesians because it has a unique, savory, and delicious taste [6], the
44 meat does not have many bones [7] and the few that do exists are easy to remove which
45 greatly helps the processing and it is relatively cheap and easy to obtain [8]. Catfish is easy
46 to obtain due to the fact that many Indonesian cultivate catfish. In 2011, the catfish
47 production rate in Indonesia reaches 229.266 tones which contribute 16.11% of the global
48 catfish production rate [9]. The addition of catfish meat in tortilla chips are hoped to increase
49 the nutritional values of tortilla chips, especially protein, so that it could fulfill the consumer's
50 nutritional needs. The purpose of this study is to identify the amount of catfish meat addition
51 into tortilla chips that is most favored by the panelists.
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54 **2. MATERIAL AND METHODS**

55 **2.1 Time and Locations**

56 This research was held at the Fisheries Product Processing Laboratory, Faculty of Fisheries
57 and Marine Sciences, Padjadjaran University, Jatinangor, Indonesia in May until July 2018.
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59 **2.2 Tools and Materials**

60 Materials used in this research were catfish (*Pangasius* sp.), corn flour, tapioca flour, salt,
61 sugar, garlic powder, water and cooking oil. The tools used were knives, cutting boards,
62 scales, basins, meat grinder, oven, pan, and stove.
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64 **2.3 Procedure**

65 **2.3.1 The Minced Fish Productions**

66 According to Kurniawati dkk [10], the procedure of making minced fish starts from weeding
67 the fish, washing and making it into fillet. After that, removing the fish skin in order to obtain
68 the fish meat. Then washing it again, draining, and mincing using meat grinder.
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70 **2.3.2 Tortilla Chips Productions**

71 Tortilla chips making according to Wahyuni [11] starts from mixing all the ingredients
72 according to the formulas, stirring the premix until homogen, molding the dough using rolling
73 pin with the thickness of $\pm 1-2$ mm, molding with the length ± 35 mm and the width ± 25 mm,
74 ovening the tortilla chips at temperature 125°C for 5 minutes, and frying the tortilla with deep
75 frying method for 5-10 seconds.
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77 **2.4 Methods**

78 The experimental method was by measuring the panelist preference level which included
79 appearance, aroma, texture, and taste, chemical test which included protein and water
80 content, and the yield. In the hedonic test, using 20 panelists as a test. Five treatments
81 based on the corn flour, i.e.
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- 83 Treatment A: 0% of meat addition
 - 84 Treatment B: 5% of meat addition
 - 85 Treatment C: 10% of meat addition
 - 86 Treatment D: 15% of meat addition
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3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 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.

3.1.2 Hedonic Test

3.1.2.1 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 below.

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

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

3.1.2.2 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].

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

145 **Table 2. The Tortilla Chips Aroma Mean in Each Treatment**

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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

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

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151 Based on the result above, all of the treatment was still accepted by the panelist with median
152 ranging between 5 to 7, which were in the “neither liked or disliked to liked” category. The
153 mean of tortilla chips aroma ranges between 6.0 and 6.5. The overall results of statistic tests
154 showed that all treatments were not significantly different, which means that the addition of
155 minced catfish didn't give noticeable difference in aroma based on the panelist judgement of
156 tortilla chips.

157
158 The 15% dan 20% treatment, the fish aroma is getting stronger and the corn aroma is
159 decreasing, and it makes the mean value decrease. The higher amount of catfish added, the
160 fishy aroma get stronger, and the panelist do not like it. The aroma caused by volatile
161 components can disappear during the heat treatment process [16].

162 3.1.2.3 Texture

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

166 **Table 3. The Tortilla Chips Texture Mean in Each Treatment**

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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

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

172
173 Based on the table above, it is shown that the median for texture is between 5 and 7, with
174 the average ranging from 5.60 to 7.20, which means that the tortilla chips texture in each
175 treatment are moderate or acceptable to favored by the panelists. The 5%, 10%, and 15%
176 treatment did not have a significant impact toward the 0% and 20% treatment. However, the
177 0% treatment has a significant difference with the 20% treatment.

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

185 3.1.2.4 Flavor

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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.

3.1.3 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 5 below.

Table 5. 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

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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UNDER PEER REVIEW