TESTING TOTAL PLATE COUNT OF CATFISH MEATBALL

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ABSTRACT

Fishery products are products that have high protein content and environmental conditions that are very suitable for the growth of spoilage microbes. Fish ball is one of the diversified fishery products that is favored by the community, so it is necessary to test its microbial content for food safety. The purpose of this study was to determine the safety of consumption of catfish meatballs based on the results of the Total Plate Count (TPC) test. The research was conducted at the Fishery Processing Technology Laboratory, Faculty of Fisheries and Marine Science, Universitas Padjadjaran. Samples of catfish meatball based on purposive method, tested with total plate count (TPC) agar with pour plate method. The TPC of each samples were examined two times. The results showed that there are differences in the number of bacteria before and after the process of making catfish meatballs. The number of bacteria before the meatball processing process are in fresh catfish is 4,5 x 10^3 CFU/g and on the catfish meatball dough 2,8 x 10^4 CFU/g. The number of bacteria after catfish meatball processing, in class A meatballs 5,8 x 10^3 CFU/g, class B 3,4 x 10^3 CFU/g and class C 3,2 x 10^3 CFU/g The result of testing total plate count, all samples was under maximum of SNI 5 × 10^4CFU/g. Conclusion of the research is catfish meatballs based on the Indonesian National Standard are safe for consumption.

Keyword : - *catfish, food safety, meatball, total plate count*

1. INTRODUCTION

Fish is a food that undergoes a process of decay (highly perishable food), this is caused by several things such as high protein content and environmental conditions that are very suitable for the growth of spoilage microbes. The water content contained in fish is the main factor causing food spoilage. The higher the water content of a food, the greater the possibility of damage, both as a result of internal biological activity (metabolism) and the entry of destructive microbes [1].

Quality or microbiological standards are parameters that are not visible to the eye but greatly determine the safety and durability of food ingredients [2]. Microbiological quality deviations result in food products being unfit for marketing and consumption. Many studies show that the consumption of food whose microbiological values deviate or exceed the standard can cause diarrhea, dizziness, vomiting, nausea and fever. Even certain bacteria can cause fainting, nerve cell damage to death [3].

The government through The Food and Drug Monitoring Agency (BPOM) has required microbiological criteria for most food ingredients and products. In general, the criteria for the analysis of food products are total microbial value or total plate count, total mold and yeast, and coliform bacteria. Certain products also require an analysis of the presence of pathogenic bacteria. Food products that require microbiological criteria include fresh products, processed products ready for consumption, semi-finished products such as flours and food additives [4].

Meatball is a very popular food in Indonesian society. According to SNI 01-3819-1995, Fish balls are round-shaped food products obtained from a mixture of fish meat and starch or cereal flour with or without the addition of other food ingredients and permitted food ingredients [5]. Catfish meatballs are one of the diversified products of fishery products that have long been known by the wider community.

Catfish meatball is a product that is susceptible to microbial growth due to raw materials derived from fish and flour, and contamination during the processing. Therefore, it is necessary to test samples of catfish meatballs (including raw materials, dough, and final product) to determine the feasibility of consumption of catfish meatballs which refers to the number of bacteria using the Total Plate Count (TPC) test method of bacteria in meatballs. The purpose of this study was to determine the safety of consumption of catfish meatballs based on the results of the Total Plate Count (TPC) test.

2. MATERIALS AND METHOD

2.1 Sample's Preparation

The materials used in this study were catfish (*Clarias gariepinus*) from Cirata Reservoir, tapioca flour, spices such as onion, garlic, salt, ginger, pepper, and ice. Materials for testing Total Plate Count (TPC) include Plate Count Agar (PCA), Butterfiel's phosphate buffered solution, aquadest. The tools used in the study were a cool box, knife, meat grinder, basin, stove, and equipment for TPC analysis.

Catfish were transported from the Cirata reservoir alive. Then it was acclimatized and aerated for one day in the laboratory. Fish were then putted in a cool box filled with slurry ice for 30 minutes. Furthermore, catfish were filleted and their skin was removed to obtain the meat portion. The fish meat was washed, drained, and minced with a meat grinder to produce mincemeat.

The procedure for making catfish meatball is that the mincemeat mix with spices and tapioca flour in the food processor. After the dough is formed, molded round shape and then boiled in 2 stages, namely the first boiling at 40 ^{o}C for 20 minutes. Followed by a second boiling at 90 ^{o}C for 10 minutes. After cooking (floating meatballs), the meatballs are removed and drained. Then the TPC test was carried out.

The objects tested by TPC are raw materials (catfish), dough, final product (upper class meatballs (A), middle class meatballs (B), and lower class meatballs (C)). The composition of the ingredients based on the class of catfish meatballs according to [6] is presented in Table 1.

Table -1: Composition of the Ingredients Based on the Class of Catfish Meatballs

Material	Meatball Class		
	High Class (A)	Middle Class (B)	Lower Class (C)
Catfish meat(g)	3000	3000	3000
Tapioca flour (g)	300	750	1200
Onion (g)	100	150	150
Garlic (g)	100	150	150
Pepper (g)	20	20	20
Salt (g)	30	40	50
Sodium Tripoliphosphate (g)	9	12	15

2.2 Procedure of Total Plate Count (TPC) Test

The procedure for testing Total Plate Count (TPC) includes analysis stage and calculation or interpretation of the results. The procedure for testing the Total Plate Count according to SNI 01-2332.3-2006 [7] as follows.

- TPC Analysis

In this study, total plate count was examined by counting the number of colonies that grew on plate count agar (PCA) from sample dilution with the pour plate method. Sample testing is done in duplicate. The stages of analysis are as follows 25 grams of sample and 225 mL of sterile Butterfiel's Phosphate Buffered solution were homogenized using a stomacher. 1 mL of the suspension was pipetted into the Butterfiel's phosphate buffered solution to obtain a 10^{-2} dilution. Next, the dilution (10^{-3}) was prepared by taking 1 mL of the sample from the 10^{-2}

dilution using a sterile pipette and put into 9 ml of the Butterfiel's phosphate buffered solution. 1 mL of each dilution was put into a sterile petri dish which was carried out in duplicate for each dilution. Each plate that already contains the sample solution, is added 12-15 mL of PCA and then shaken so that it is evenly distributed. Then it was incubated in incubator with a temperature of 35ºC for 48 ± 2 hours. Then, the counts were carried out on the plates having the number of colonies from 25 to 250 by counting the colonies.

- Calculation of Bacteria

Reporting a microbiological analysis result uses a standard that explains how to count colonies on a plate and how to select existing data to count colonies in a sample. Instructions for calculating and reporting the Total Plate Count in the usual case:

1. Plate less than 25 colonies
   If duplicate plates of low dilution produce less than 25 colonies, count the number of plates in each dilution. Average the number of colonies per plate and multiply by the dilution factor to determine the estimated Total Plate Count.
2. Plate more than 250 colonies
   If the number of colonies per plate is greater than 250 in all dilutions then report the result as too many to count, but if one of the dilutions has a colony count close to 250 report it as an estimated TPC.
3. Plate more than 250 colonies
   If the number of colonies per plate is greater than 250 in all dilutions then report the result as too many to count, but if one of the dilutions has a colony count close to 250 report it as an estimated TPC.

Spreaders

Colony spread is usually divided into three forms:

a. Colony chain, the colonies are connected to each other caused by bacteria grouping together
b. The spreader comes from the water layer between the agar and the bottom of the plate.
c. Spreader comes from a layer of water on the side or edge of the plate or on the surface of the agar. If the plate is overgrown with a spreader greater than 25% then report it as a spreader.

- Spreader type 1, if there is only one chain then declare it as one colony.
- If one or more chains appear to come from different sources, report each source as a colony.
- Type 2 and 3 spreaders generally originate from different colonies and report each as a single colony.

Plates with 25 to 250 colonies and spreader free. Record the dilution used and count the total number of colonies. Calculation of the following Total Plate Count:

$$N = \frac{\sum C}{[(1xn_1) + (0{,}1xn_2)]x\,(d)} \quad \text{.....(1)}$$

N = colonies number of the product, expressed in colonies per ml or colonies per gram
$\sum C$ = number of colonies in all plates counted
n_1 = number of plates in the first dilution calculated
n_2 = number of plates in the second calculated dilution
d = first dilution calculated

- Result Interpretation

1. Round the number to 2 appropriate numbers if the third number is 6 or above, then the third number becomes 0 and the second number increases by 1, for example 456 becomes 460.
2. If the third number is 4 or below, then the third number becomes 0 and the second number is even, for example 445 becomes 440.

3. If the third number is 5, then the third number becomes 0. The second digit increases by 1 digit, for example 456 becomes 460.

2.3 Data Analysis

Data were analyzed descriptively and compared with Standard Nasional Indonesia (SNI) to determine the safety of consumption of catfish meatballs.

3. RESULT AND DISCUSSION

The Total Plate Count (TPC) test is carried out on a diversified fishery product that is well known to the public, namely catfish meatballs. Meatball is made with 3 class classifications. There are 5 objects tested using the Total Plate Count (TPC) test method, namely the raw material for meatballs is coded (M), catfish meatball dough is coded (N), upper class meatballs (A), middle class meatballs (B), and lower class meatballs (C).

After going through the incubation stage for 48 hours at a temperature of 35ºC, the readings and calculations of the number of bacteria in the petri dish were carried out. The results of reading and calculating the Total Plate Count (TPC) on meatball products are presented in Table 2.

Table -2 :The Number of Bacteria in The Raw Materials and Products of Catfish Meatballs

Code	Product	Total of Bacteria (CFU/g)
M	Raw material (catfish meat)	$4{,}5 \times 10^3$
N	Catfish meatball dough	$2{,}8 \times 10^4$
A	Upper class meatballs	$5{,}8 \times 10^3$
B	Middle class meatballs	$3{,}4 \times 10^3$
C	Lower class meatballs	$3{,}2 \times 10^3$

The Total Plate Count (TPC) test used refers to SNI 01-2332.3-2006. Based on Table 2. there is a change in the number of bacteria from raw materials and dough to the final product of catfish meatballs. The number of bacteria decreases after becoming meatball products, this is due to one of the processes of making meatballs, namely boiling. The number of bacteria is reduced because they die due to hot temperatures during boiling. According to [8], at least the bacteria will die or stop their activities at a temperature that is lowered to 0°C or increased above 100°C.

According to table 2, the highest number of bacteria in the final product of meatballs is found in upper class meatballs (A), which is 5.8×10^3 CFU/gram which does not exceed the threshold for the number of bacteria present in food products, while the lowest number of bacteria is found in lower class meatballs, which is 3.2×10^3 CFU/gram, this amount also does not exceed the normal threshold for the amount that must exist in accordance with SNI.77557 (2013) regarding fish balls, which is 5.0×10^4 CFU/gram. Referring to the SNI regarding the standard of the number of bacteria in meatballs, all the final products of catfish meatballs with various classes made in this study are feasible and safe for consumption based on the number of bacteria they contain. If the number of bacteria in the product exceeds the standard that has been set, the person consuming it will experience diarrhea, nausea, fever, and so on. [9]stated that deviations in microbiological quality resulted in food products being unfit to be marketed and consumed. Many studies show that the consumption of food whose microbiological values deviate or exceed the standard can cause diarrhea, dizziness, vomiting, nausea and fever. Even certain bacteria can cause fainting, nerve cell damage and even death [3] .

The catfish meatballs produced have a bacterial count of 10^3 CFU/g, this number is included in the number of bacteria that tends to be low in the product. This is because the catfish meat used as raw material is fresh meat with a bacterial count of 4.5×10^3 CFU/g. The level of freshness of fish will affect the product produced, both on the quality of microbiology, chemistry, physical and organoleptic.

If the raw materials quality used is not good due to improper handling of the fish from the time the fish is caught until it reaches the consumer, the resulting product will be of low quality. According to [10] mishandled or inappropriate fishery products are one of the causes of the low quality of most fresh and processed fishery products.

Fish as a food ingredient must be kept fresh, one of which is by continuing to apply the cold chain during the handling process to the consumer. By applying the cold chain, the growth of the number of spoilage bacteria in

fish can be inhibited. Furthermore, during the fish processing process, a good sanitation and hygiene system must always be applied so that the resulting product will be safe for consumption.

4. CONCLUSIONS

The Total Plate Count (TPC) test method is used to determine the number of bacteria in foodstuffs including catfish meatballs. Based on the TPC test on raw materials, dough, and catfish meatballs, all samples met the requirements and were still within safe limits for consumption

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