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Quality and Food Safety of Fishery Products Marketed in Selayar Islands Regency

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***Abstract*— *Food safety is an obligation that much be carried out by the food industry, especially in the fisheries sector to ensure that the products marketed are safe for consumption by consumers. Public safety and health must be protected from food that does not meet the requirements and from losses due to improper food production, distribution and trade. This study aims to identify the use of dangerous chemical materials like formalin and rhodamine B in processed fishery products, as well as to determine the origin of suppliers of products sold in the Selayar Islands Regency. The method used in this research was observation. Determination of the location and sampling used accidental sampling. Samples was taken from several traditional markets that sold fishery products in Selayar Islands Regency. The samples were analyzed the quality and safety parameters in the Laboratory of the Center Implementing the Quality of South Sulawesi Fisheries Products, the Laboratory for Animal Husbandry at Hasanuddin University, the Microbiology Laboratory Department of TPHP Pangkep, and the South Sulawesi Health Laboratory. The result shows that the parameters of quality and food safety products are in accordance with SNI and there is not used of formalin and rhodamine B in any fishery products.*

***Keywords*— formalin, rhodamine B, fishery products, Selayar Islands Regency.**

I. INTRODUCTION

Selayar Islands is one of the regencies in South Sulawesi Province which is located between 5°42' - 7°35' South Latitude and 120°15' - 122°30' East Longitude bordering Bulukumba Regency to the North, The Flores Sea to the East, the Flores Sea and the Makassar Strait to the West and East Nusa Tenggara Province to the South with an area of 1,357.03 km^2. The potential of the district's marine resources is very large, so that the majority of the residents of the Selayar Islands have the main livelihood of the fisheries sector [1].

The production of capture fisheries in the Selayar Islands in 2020 reached 18,729.2 tons and increased in 2021 by 20,883.8 tons [2]. The high production of capture fisheries allows it to be used as raw materials for processed fishery products. One of them is by the method of salting or drying fish. Processors traditionally, generally pay less attention to food safety issues of the products produced.

The high production of capture fisheries in Selayar Islands Regency allows it to be used as raw material for processed fishery products. One of them is the method of salting or drying fish. Traditional prrocessors generally pay less attention to food safety issues for the products they produce.

The use of chemicals such as formaldehyde, sorbic, benzoic, and propionic acid is widely abused by traders [3]. The misuse of dangerous chemicals has become a classic phenomenon that has not been resolved because until now the use of added ingredients in food, especially formalin, is still being used as a preservative.

Public safety and health must be protected from food that does not meet the requirements and from losses due to improper ways of producing and distributing food can harm and endanger public health. Guaranteeing quality and safe food is the responsibility of the government, the food industry and consumers, in accordance with their respective duties [4]. However, this is not the case in the field, where there is still misuse of the use of chemicals that can endanger public health [5]. The process of food safety, also known as efforts to maintain the durability of a material so that many preservatives appear which aims to extend the shelf life of a food ingredient. In practice in society, there are still many who do not understand the difference between the use of preservatives for food and non-food ingredients. Formalin is a non-food preservative which is now widely used to preserve food [6].

The misuse of harmful chemicals has become a classic phenomenon that has not been resolved because until now the use of additives in food, especially formalin, is still being used as a preservative. This study aims to identify the use of harmful chemicals including formalin, borax, and rhodamin B in processed fishery products, as well as find out the area of origin of suppliers of products sold in the Selayar Islands Regency.

II. MATERIALS AND METHODS

2.1 Samples Collection

Sampling of fishery products is carried out in traditional markets and places of production of fishery products in the Selayar Islands Regency. Samples are determined based on the types of products that are widely sold and produced in the Selayar Islands. The fishery products that are sampled from the market are fishery products produced in the Selayar Islands Regency. There are 3 places for marketing fishery products in Selayar, namely, Bonehalang market, Bonea market, and Padang market, these three markets are the marketing center for all the needs of the community in the Selayar Islands.

Sampling of fishery products is carried out by the accidental sampling method, namely by taking samples of fishery products found at the sampling location. Sampling for quality and food safety tests is by taking fishery products in each market. The sample to be tested is then put into an HDPE plastic zip to prevent contamination and taken to a laboratory for testing.

2.2 Water Content Analysis [7]

Set the oven at 105°C until it reaches a stable condition. Put the empty dish in the oven for 2 hours. Transfer the empty cup to a desiccator for 30 minutes until it reaches room temperature and weigh the empty weight (A). Weigh the sample that has been mashed as much as 2 gram into the cup (B). Put the cup that has been filled with the sample into a vacuum oven at 105°C for 24 hours. Transfer the cup using tongs to a desiccator for 30 minutes and then weigh (C).

$$\%\ water\ content = \frac{B-C}{B-A} \text{ x } 100\%$$

A = weight of empty cup (gr)
B = weight of the cup + initial sample (gr)
C = weight of the cup + dry sample (gr)

2.3 Salt Content Analysis [8]

5 grams of the sample was mashed and then extracted using 15 ml of hot distilled water (100°C). Let stand for 15 minutes until all the NaCl salt is dissolved and separated from the sample. This stage was carried out 88 times. Collect the extraction liquid in a container and add 3 ml of 5% potassium chromate. Titrate with 0,1 N $AgNO_3$ slowly until the color becomes brick red.

NaCl percentage using the equation:

$$\%\ NaCl = \frac{(\text{ml AgNO3 x } N \text{ AgNO3 x 58,46})}{(\text{gram bahan x 1000})} \text{ x 100 \%}$$

2.4 Total Plate Count (TPC) Analysis [9]

Sample of as much as 25 g was weighed aseptically and added with 225 ml of Butterfield's phosphate-buffered solution, then homogenized for 2 minutes. This homogenates was a 10^{-1} dilution solution. Using a sterile pipette, 1 ml of the homogenate was taken and put into a bottle containing 9 ml of Butterfield's phosphate-buffered solution so that a sample with a dilution of 10^{-2} was obtained. At each dilution, shaking was carried out at least 25 times, then the same was done for the 10^{-3}, 10^{-4}, 10^{-5}, and so according to the sample conditions. Furthermore, 1 ml of each dilution was put into a sterile petri dish in duplicate using a strerile pipette. Into each petri dish containing the sample, 12-15 ml of Plate Count Agar (PCA) media which has been cooled to 45°C were added. After the agar solidified, the petri dish was put into an incubator in an inverted position for 48 hours at 35°C. After incubation the number of bacterial colonies in the petri dsih wash counted using a colony counter. Only the petri dishes containing the bacterial colonies ;psz/xbetween 25-250 colonies were used in the calculation of the total plate count (TPC).

The TPC was calculated with the following equation:

$$TPC = \frac{\sum C}{[(1 \text{ x n1}) - (0{,}1 \text{ x n2})] \text{ x (d)}}$$

TPC = Total plate count, expressed in colony per g
ΣC = Number of colony in all plates counted
nl = Number of plates in the first dilution calculated
n2 = Number of plates in the second dilution calculated
d = First dilution

2.5 Formaldehyde Content Analysis [10]

Take 10 gr of sample then add 20 ml of distilled water. Homogenize with a blender. Put the homogenate into a glass breaker, then add 2 ml of Carrez I and II solution, stir with spatula. Adjust the pH between 7.5-8 with a solution of NaOH and HCl. If the pH is appropriate, add 6 ml of distilled water and then blend again until homogeneous. Put the homogenate into the centrifuge bottle. Centrifuge at 3000 rpm for 5 minutes. Strain the supernatant with filter paper into a new glass breaker. Separate the filtrate and put into 2 tubes of 5 ml each. Tube 1 is the sample and tube 2 is the control. Add 5 drops of Fo1 solution, shake gently and adjust pH to 13 with 1 N NaOH. Add 1 microspoon of Fo2 solution. Shake for one minute and let sit for five minutes. Record the results of reading and processing the data according to the formula formalin content (ppm) can be known by the formula:

The dilution factor is calculated by the formula:

Fp = (g sample + V (aqua+carrez)) sample weight (g)

Formalin content = Reading result x fp

2.6 Rhodamine B Content Analysis [11]

Determination of Rhodamine B levels using the Spectrophotometry method. Previously, the manufacture of a test solution was carried out, as much as ±5 gr of sample was put into Erlenmeyer 250 ml. the sample is then added 100 ml of 2% ammonia solution in 70% ethanol and let stand until all dyes are dissolved. The colored solution is filtered using Whatman filter paper into Erlenmeyer. The filtering results are transferred to a measuring cup and then evaporated on a hot plate for 4 hours at a temperature of 65°C. the sample that becomes concentrated during the evaporation process is then dissolved with 30 ml of aquades. The solution is introduced into a split funnel of 250 ml, then 6 ml of 10% sodium hydroxide solution is added and shaken. The solution is extracted with 30 ml of diethyl ether then shaken and allowed to stand until the solution forms 2 layers, namely a layer of clear ether (top) and a layer of red water (bottom). The water layer is then discharged through the split funnel faucet so that there is only a layer of ether called ether extract. Ether extract is washed with 0.5% NaOH solution of 5 ml by shaking and then allowing it to stand. From the washing, 2 more layers will be formed, namely a layer of clear ether (top) and a layer of brownish water (bottom). The lower water layer is discharged through the split funnel faucet so that there is only ether extract which is then extracted 3 times, each time with 10 ml of 0.1 N hydrochloric acid until the ether layer is colorless again. The ether layer is removed, the hydrochloric acid extract is accommodated in a measuring flask of 50 ml and 0.1 N hydrochloric acid is added until the mark. Then continue to make a raw solution of rhodamine B made with a concentration of 1000 mg / l / from this raw solution is made a raw solution between with a level of 20; 40; 80; 120 μg/ml. furthermore, a series of working raw solutions with a concentration of 0.4 each is made; 0,8; 1,6; 2.4 μg/ml. as a solvent, an HCl solution of 0.1 N. After completion of the above stages, it is continued with the stage of determining the level of rhodamin B dye by determining the level of rhodamine B, namely each solution is measured by visible light spectrophotometry at a wavelength of 538 nm. As for calculating the rhodamine level B in the sample, it was calculated using a calibration curve with the regression equation: y + bx ± a.

2.7 Data Analysis

The data obtained from the results of this study were then analyzed systematically descriptive to get an overview of the research results aand presented in the form of tables and graphs.

III. RESULT AND DISCUSSION

The water content, salt content, total plate count (TPC), formaldehyde content and rhodamine B content of the fishery products samples preserved with different icing methods were presented in the following tables.

Table 1. The results of testing the quality and food safety of salted fish products marketed in the Selayar Islands District

Samples	Water Content (%)	Salt Content (%)	Total Plate Count (coloni/gr)	Formaldehyde (ppm)
A1	35,42	0,28	$3{,}9x10^2$	0
A2	31,43	0,28	$3{,}4x10^2$	0
B1	32,38	0,29	$2{,}6x10^2$	0
B2	19,62	0,29	$4{,}4x10^2$	0
C1	17,41	0,24	$2{,}8x10^2$	0
C2	18,21	0,24	$2{,}4x10^2$	0

D1	23,37	0,36	4,8x10^2	0
D2	29,43	0,33	1,1x10^2	0
E1	26,88	0,31	5,0x10^2	0
E2	26,88	0,31	5,0x10^2	0

Table 2. The results of testing the quality and food safety of shrimp paste products marketed in the Selayar Islands District

Samples	Water Content (%)	Salt Content (%)	Total Plate Count (coloni/gr)	Rhodamine B (ppm)
A1	29,12	0,16	3,5x10^2	0
A2	26,07	0,16	3,9x10^2	0
B1	22,43	0,15	4,1x10^2	0
B2	27,12	0,18	2,9x10^2	0

3.1 Water Content Analysis

The water content in foodstuffs determines the freshness and shelf life of these foodstuffs, high water content makes it easy for bacteria, molds, and yeasts to breed, so that changes will occur in foodstuffs [12]. The water content is kept as low as possible to minimize the possibility of microbial spoilage breeding [13]. The high and low appearance value of the salted fish product is strongly influenced by the water content in the product. The drying time will affect the appearance, texture, taste and smell of the product. The most influential factor on the durability of a processed product is the water content. The lower the water content, the slower microbial growth so that the material can last longer. On the other hand, the higher the water content, the faster the microbes will multiply and cause decay and take place more quickly [14].

A research found that the average water content of dried anchovy (Stolephorus indicus) marketed in three markets in Barru Regency ranged from 10-12% [15]. a research states that changes in water content are strongly influenced by concentration and duration of salting. During the salting process there is a decrease in the water content because the balance in the material is disturbed due to the addition of salt, where the salt will draw water from the material and enter the tissue [16].

The results showed that the average water content of salted lencam (Lethrinus sp) and dried salted grouper (Plectropomus leopardus) marketed in the three traditional markets of the Selayar Islands ranged from 17-35%. The water content of dried salted fish based on the Indonesian National Standard is 40%. Based on the results of the water content test, the dried salted fish products marketed in the three traditional markets of the Selayar Islands are in the range of good quality and fit for consumption [17].

The preservation method that has been applied to dried salted fish is through the process of salting and drying. Salting and drying have the same goal of reducing the water content of fish food. The water content of foodstuffs has a close relationship with the durability of foodstuffs. Foods with low water content will last longer than those with high water content. This happens because the enzymatic and chemical processes as well as bacterial growth require a certain amount of water. The decrease in the water content in an ingredient will prevent the growth of bacteria and spoilage of the food [18].

3.1 Salt Content Analysis

Salt is a major factor in the process of salting fish. As a preservative in the salting process, the purity of salt greatly affects the quality of the salted fish produced. The purpose of salting foodstuffs such as fish is to reduce the water content, so that microbes, especially types of bacteria, cannot grow. Salting can also inhibit the enzyme reshuffle process so that the fish will be more durable and last longer when stored [19].

The use of low-quality salt causes dry salted fish to quickly grow red color-forming bacteria which produces an unpleasant appearance and odor. Dried fish may not be too dry as long as the salt content in the fish meat is high enough and high-quality salt is used if you want a product that lasts longer. The purity of the salt produced is highly dependent on the conditions of the seawater used and the method of salt production carried out.

Small fishermen in Selayar Islands catch fish by fishing and using nets. Some of the catches are sold in the market and some are preserved as dried salted fish. Preservation of fish is done by salting and drying. The main purpose of salting is to extend shelf life. Fish that go through the salting process are durable because salt can inhibit and kill microbes that cause fish spoilage. After salting is complete, the fish are dried by utilizing sunlight and drying them on tarpaulins or on shelves placed in the open field.

This method is less effective due to the temperature and airflow velocity that cannot be regulated because it only depends on weather conditions and also the dried salted fish produced is prone to contamination from flies, dust, etc. organoleptic will decrease. The low quality of fish will reduce the selling price of the product [20].

3.2 Total Plate Count (TPC) Analysis

The process of processing dried salted fish carried out by producers starting from cleaning the fish has not been carried out hygienically, In the drying process using direct sunlight which is placed in an open field it is very prone to fly attacks and contamination of dirt and dust during drying so this can affect the durability save fish. If the drying / drying is not perfect, it can actually cause the fish to rot more easily, especially due to attacks by fungi, bacteria, maggots and fleas.

The occurrence of contamination by microbial pathogens, microbial toxins or heavy metal contamination and chemicals may occur during food storage, transportation, distribution or when served to consumers in traditional markets without using good packaging [21]. A raw or processed food material becomes unsafe for consumption if it has been contaminated by microorganisms. Microorganisms found in fishery products can come from various sources such as soil, surface water, dust, digestive tracts of humans and animals, and the environment where they are reared/cultivated, prepared, processed or stored.

To maintain the microbiological quality of dried salted fish products, they must be handled properly and properly. The thing to note is that when marketing salted fish in the market, it is best not to display it in an open state without using packaging, this can invite flies to come and land on the salted fish. Flies will lay eggs on salted fish that are infested and eventually salted fish contain maggots. In addition, microbiological contamination through the air and dirty places is also easy to occur, so that many salted fish are marketed to change in brown color and the formation of yellow or red stains. This occurrence is often found in salted fish products marketed in the traditional markets of the Selayar Islands.

3.3 Formaldehyde Content Analysis

After analyzing the formalin content of dried salted fish, both those taken from producers and traders, it showed that the formalin content in all samples was negative (no formalin). Formalin content in dried salted fish both in producers and traders in Selayar Islands shows a value of 0 ppm. This means that dried salted fish produced and traded inSelayar Islands is free from the use of formalin.

However, it is not certain that all salted fish sold in the market do not contain formalin. Several studies that have been conducted in the traditional market of the Selayar Islands, have found samples of dried salted fish that contain formaldehyde so that people must remain careful in buying salted fish sold in the market. Some traders admit that during the rainy season, producers usually use formalin so that the fish they preserve can dry quickly. The producers complain that the drying process is disturbed, the drying process in the rainy season takes about one week longer than during the dry season, which on average only takes 1-3 days for the drying process.

The use of formalin by salted fish producers is due to the manual method of production, drying of fish still depends on the weather. During the rainy season, drying can take days. As soon as it rains, producers immediately cover the fish that are being dried with plastic so they don't get wet. If the drying process is not perfect, the food will be easily overgrown with fungus. Foodstuffs are easily dented and destroyed, especially when the packaging is not neat and must be sent out of town. By adding formalin, the fish does not grow mold and is more durable. The use of formalin is also believed to speed up the drying process and make the physical appearance not easily damaged [22].

3.4 Rhodamine B Content Analysis

Rhodamine B is an additive coloring agent that is prohibited from being used in food products, but is widely used as a food coloring agent because of its striking color and relatively cheap price. one of the foods suspected of containing rhodamine B is shrimp paste. The basic ingredients used for the manufacture of shrimp paste are generally rebon or types of small shrimp which are processed through a fermentation process accompanied by a process of grinding and drying the shrimp paste. Shrimp paste is usually reddish brown in color, solid in shape with a slightly rough texture, and has a distinctive sharp aroma but tastes savory [23].

Based on the test results, rhodamine B levels produced 0 ppm in all tested samples. All samples from both producers and traders were tested negative for rhodamine B. Producers in the village of Dopa admitted that they did not know about the dye rhodamine B, they only knew about kesumba which is a natural dye derived from the seeds of the kesumba plant (Bixa orellana) which produces a reddish-orange color. Even so, the producers in Dopa village do not add kesumba in making shrimp paste, they only use rebon shrimp and the brown color in the shrimp paste is the result of the raw material for rebon shrimp.

IV. CONCLUSION

From the results of tests carried out with several parameters, it can be concluded that dried salted fish products and shrimp paste show that they are safe for consumption by the public in accordance with the quality and safety standards that have been set by the Indonesian National Standards.

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