Fisheries Journal, 15 (2), 763-769 (2025)
http://doi.org/10.29303/jp.v15i2.1454

FORMALIN CONTENT OF PROCESSED FISH PRODUCTS IN JAMBI TRADITIONAL MARKETS USING TEST KIT

Kandungan Formalin Produk Olahan Ikan di Pasar Tradisional Jambi Menggunakan Test Kit

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(Received March 6th 2025; Accepted April 27th 2025)

ABSTRACT

Fish is a fishery product that has high nutritional value. Fish can be processed into various processed products. Processed fish products generally have the characteristic of not lasting long when stored at room temperature so that in the food processing, additives are added. Hazardous food additives that are often used in processed fish products are formalin. Formalin is a preservative that can cross-link with protein so as to prevent damage to product and can extend its shelf life. This study aims to determine the formalin content in processed fish products, namely fish meatballs and salted fish in traditional markets in Jambi City. The research method used laboratory experiments with 4 treatments and 3 replications. The results showed that the samples of fish meatballs and salted fish as a whole were positive for formalin. This shows that the food safety of processed products in traditional markets in Jambi is still low. The knowledge and awareness of the fisheries processing community about hazardous food additives is still low.

Keywords: Fish Meatballs, Formalin, Preservatives, Salted Fish

ABSTRAK

Ikan merupakan hasil perikanan yang memiliki gizi tinggi. Ikan bisa diproses menjadi aneka jenis produk olahan. Produk olahan ikan umumnya memiliki karakteristik pada suhu ruang cepat rusak sehingga proses pengolahannya ditambahkan bahan tambahan pangan. Bahan tambahan pangan tidak aman untuk kesehatan sering ditambahkan pada makanan khususnya ikan yaitu formalin. Formalin merupakan pengawet yang mampu berikatan silang dengan protein sehingga mencegah kerusakan pada suatu produk dan dapat memperpanjang umur simpannya. Penelitian bertujuan untuk mengetahui keamanan pangan bakso ikan dan ikan asin di pasar tradisional di kota Jambi terhadap formalin. Metode penelitian menggunakan eksperimental laboratorium dengan 4 perlakuan dan 3 kali ulangan. Bakso ikan dan ikan asin pada penelitian ini secara keseluruhan positif formalin. Hal ini menunjukkan bahwa keamanan pangan produk olahan di pasar tradisional Jambi masih rendah. Pengetahuan dan kesadaran masyarakat pengolahan perikanan terhadap formalin tentang bahan tambahan pangan

berbahaya masih rendah.

Kata Kunci: Bakso Ikan, Formalin, Ikan Asin, Pengawet

INTRODUCTION

Fish Port is a fishery product that has high nutritional value. Fish contains protein, fat, EPA, DHA, vitamins A, B1, B2, B6, B12, D, E, niacin, folic acid, biotin, pantothenic acid, minerals in the form of Ca, Fe, Mg, Mn, Na, K, P, Se, Zn. Fish has an important role in human health, namely anti-inflammatory, preventing heart disease, and good for pregnant women (Andhikawati *et al.*, 2021). Fish is processed into various kinds of processed fish products. Processed fish products include fish balls (Nugroho *et al.*, 2019). fish nuggets, fish sausages, (Syahril *et al.*, 2020), salted fish (Indrastuti *et al.*, 2019). Processed products made from fish have a low shelf life at room temperature so that the products do not last long for sale in traditional markets (Rahmawati *et al.*, 2022).

Fish processed products are favored by the public, including fish balls and salted fish. Fish balls are a food that is very popular with all groups. Fish balls are sold as snacks with high purchasing power by various levels of society. Fish balls are made from mashed fish fillets, added with flour and spices, then kneaded, molded, and boiled (Nugroho *et al.*, 2019). The water content of fish balls is high at 57-62% (Wijayanti *et al.*, 2024). Fish balls at room temperature have a low shelf life. Salted fish is a fishery product that has high demand. Salted fish is a processed fish product that goes through salting and drying in the sun (Nurfitriyani *et al.*, 2024). In its processing, fish balls and salted fish are often added with food additives to extend their shelf life.

Food additives are additional ingredients that are added to food so that they affect changes in shape and properties. One of the unsafe food additives is formalin (Muluk *et al.*, 2023). Formalin is prohibited for use in food because it contains hazardous substances that can cause irritation, damage the nervous system, and disrupt the reproductive system (Fauziyya & Saputro, 2020). Formalin can function to extend shelf life, but its use as a food preservative causes carcinogenic effects and is harmful to health (Wardani & Mulasari, 2016). Formalin as a preservative has the ability to cross-link proteins, thereby stopping cellular processes and preventing decomposition. Formalin has an unpleasant odor. The main component of formalin in the form of formaldehyde is a carcinogen in humans (Satapathy & Kar, 2023). Formalin causes poisoning in children with symptoms of burns in the mouth, pharynx, epiglottis, esophagus, and stomach (Sahu *et al.*, 2022).

The presence of formalin in food can be determined by conducting a formalin test. Formalin testing is an important method for measuring the level of formaldehyde in a material. The presence of formalin can be determined by conducting tests carried out using quantitative and qualitative methods. Qualitative formalin is tested using the 0.1 N potassium permanganate ($KMnO_4$) method and the test kit method (Putra *et al.*, 2020), while quantitative testing uses the titration method (Hardinata *et al.*, 2021). Testing formalin using a test kit has the advantage of good accuracy and efficiency. Formalin testing using the AT89S51 microcontroller can detect formaldehyde levels with an error of less than 10% (Iswanto *et al.*, 2020). Formalin testing with a test kit is easy to implement and inexpensive (Pal *et al.*, 2022). Formalin testing is carried out by comparing the titration method using sodium sulfite with commercial methods such as formaldehyde test strips and drop count titration kits. The test results showed that the kit method was superior because of its fast results and small sample size (Finkelde & Waller, 2020).

Processed fish products, especially fish balls and salted fish, are often added with dangerous preservatives such as formalin. Previous research showed that salted anchovies in traditional markets have a formalin content of 7.14 mg/l (Junianto & Karlina, 2024). The sale

of fish balls and salted fish in traditional markets in Jambi is widely carried out. The food safety of fish balls and salted fish in traditional markets in Jambi is not yet known, so it is necessary to detect the presence of formalin in traditional markets in Jambi, especially for fish balls and salted fish. This study aims to determine the presence of formalin in traditional markets in Jambi, especially fish balls and salted fish.

METHODS

The formalin testing research was conducted in December 2024 at the Animal Husbandry Laboratory of University of Jambi. The materials used were herrings fish meatballs, snapper fish meatballs, salted jambal fish, and salted mackerel fish, formalin test kits. The tools used were test tubes, test tube racks, beaker glasses, spatulas, knives, cutting boards, distilled water, vortex, mortars, test tube racks, and test tubes.

The research method used was an experimental method in the laboratory. This method is carried out in the laboratory to control unwanted variables. This method uses 4 treatments of processed fish products as independent variables, namely herrings fish meatballs, snapper fish meatballs, salted jambal fish, and salted mackerel fish with 3 replications. Samples were obtained from traditional markets in Jambi City. The study consisted of 2 stages, namely: 1) sample preparation; 2) sample testing.

The first stage is sample preparation. Snapper fish meatball and herrings fish samples were each put into a mortar and ground. The ground samples were then weighed as much as 10 grams of sample. The sample was put into a beaker glass. The sample was added with 100 mL of distilled water. The salted jambal and mackerel fish samples were each chopped into small pieces using a knife, then ground using a mortar and weighed as much as 10 grams. The sample was put into a beaker glass. The sample was added with 100 mL of distilled water. All samples were stirred with a stirring rod until mixed and completely dissolved. The sample was left for 15 minutes.

A test tube was prepared and labeled. Taking a solution of all samples as much as 5 mL was put into a test tube and 1 drop of formalin reagent 1 was added, then stirred. Furthermore, the sample was added with 3 drops of Formalin reagent 2 and left for 15 minutes. The sample will change color to light purple to dark purple which indicates positive formalin. The positive control, namely the standard formalin sample of 1 ml was added with 4 mL of distilled water then left for 15 minutes, the color change was observed and recorded and documented.

The data obtained in this study were qualitative data. The resulting data were then analyzed descriptively. Descriptive analysis is an analysis by presenting the data produced in the actual form of tables, graphs, or images. In this study, the data is presented in the form of tables and images.

RESULTS

Formalin is one of the unsafe food additives that is often added by the public to preserve food. Formalin testing of fish meatball and salted fish products in Jambi traditional markets using test kits can be seen in Figure 1 and Table 1.

Table 1. Formalin Test Results

No.	Sample	Code	Result
1.	Salted jambal fish 1	IAJ 1	++++
2.	Salted jambal fish 2	IAJ 2	++++
3.	Salted jambal fish 3	IAJ 3	++++
4.	Salted mackerel 1	IAK 1	++++
5.	Salted mackerel 2	IAK 2	++++
6.	Salted mackerel 3	IAK 3	++++

No.	Sample	Code	Result
7.	Snapper fish meatball 1	BIK 1	++
8.	Snapper fish meatball 2	BIK 2	++
9.	Snapper fish meatball 3	BIK 3	++
10.	Herrings fish meatball 1	BIP 1	+
11.	Herrings fish meatball 2	BIP 2	+
12.	Herrings fish meatball 3	BIP 3	+

Figure 1. Results of Formalin Testing on Processed Fish Products

DISCUSSION

Every processed fish product is a highly perishable fishery product so that at room temperature it has a short shelf life. Processed fish products are generally sold in traditional markets at room temperature including fish balls and salted fish. Both of these processed products are popular foods and have high demand. The low shelf life of fish balls and salted fish causes people who produce them to often add dangerous preservatives such as formalin.

The results of formalin detection tests for processed fish products in Jambi traditional markets showed positive results for all samples, although the level of color change was different. Positive formalin testing was indicated by a change in the color of the sample from clear to light purple or dark purple. The results of the formalin detection test showed a light purple color which indicated positive. Overall, the presence of formalin was mostly indicated by the increasingly dense color of salted jambal fish, followed by salted mackerel, snapper fish balls, and herrings fish balls. Putra *et al.*, (2020) stated that formalin testing using a test kit showed positive results if the color of the solution changed color to light purple to dark purple and negative if the color of the solution was clear.

The formalin content appears to be more concentrated in salted jambal fish compared to salted mackerel. This is because the condition of salted jambal fish is much drier than salted

mackerel. Drier salted fish indicates that it has gone through a longer drying process. A longer drying process causes more formalin content to be bound to the raw materials. We can see this visually, the texture of salted jambal fish is drier than salted mackerel. According to Nurfitriyani *et al.,* (2024) the process of making salted fish is through drying with sunlight. The drying process goes through two stages, namely the process of transferring water mass from the inside of the product to the outer surface of the product and the process of evaporating water on the surface of the product. The 48-hour drying process produces a water content of salted jambal fish of 6-9%. Fatimah *et al.,* (2017) stated that in the process of soaking with formalin, there is a binding between the formalin compound and the protein compound in the fish. The formalin compound that binds to the protein causes the fish to become hard and durable. Sari & Dira (2017) stated that testing 3 samples of salted mackerel, two of which contained formalin. Widiarti & Dur (2022) stated that the salted mackerel content was 9%.

The formalin content in snapper fish meatballs is higher than that in herrings fish meatballs, as seen from its darker color. In addition, this can be seen from the appearance of snapper fish meatballs which are whiter and chewier and last longer than herrings fish. Snapper fish meatballs have better gelling ability than herrings fish meatballs so that the formalin that binds to snapper fish protein is stronger than herrings fish. Wibowo *et al.,* (2015) stated that the gel strength of snapper fish is better than other fish.

The formalin content in salted fish is higher than in fish meatballs based on the light purple color which looks thicker. This is because salted fish has a much drier condition compared to fish meatballs. The processing of salted fish goes through a drying process with sunlight so that the water content is much lower than that of fish meatballs. The fish meatball samples used only go through a boiling process so that the water content is higher than that of salted fish. Nurfitriyani *et al.,* (2024) explained that salted fish has a water content of 6-9%. Putalan *et al.,* (2022) explained that salted fish has a water content of 5-7%. Ningrum *et al.,* (2019) stated that in the process of making salted fish, there is a salting and drying process that reduces the water content of the ingredients. Nugroho *et al.,* (2019) explained that the water content of fish meatballs is high at 64-67% because in the manufacturing process only boiling and draining processes are carried out.

Formalin is a substance that is reactive to DNA and protein. Formalin will form high reactivity so that its permeability is high into cells and tissues. Protein cross-linking with formalin forms a methylene bridge between two proximal amino acids (R1-CH2-R2). The structure of protein-bound formalin shows that formaldehyde cross-linking is formed through the dimerization of two imines in the lysine side chain to produce a product with a mass of 24 Da (Tayri-Wilk *et al.,* 2019). The mechanism of formalin in preserving a material is that formaldehyde works by chemically cross-linking several proteins by inserting a methylene bridge (-CH2-) between nitrogen in adjacent protein amino groups. The end result is the conversion of protein into high molecular cross-links of inert solid material that can no longer function as food for bacteria or as a substrate for enzyme activity. Autolytic enzymes that are protein-based are deactivated by this mechanism (Pal *et al.,* 2022).

The results of this study are in accordance with previous studies that processed fishery products sold in traditional markets were detected using formalin. Dewi (2019) stated that 2 samples of fish meatballs and salted fish gave positive results for formalin while 1 sample of fish meatballs and salted fish did not contain formalin. Fauziyya & Saputro (2020) stated that out of 30 meatball samples, 10 samples contained formalin. Junianto & Karlina (2024) stated that salted anchovy meatball samples from Kosambi Market, Gedebage Market, Simpang Dago Market, and Caringin Market. Lestari *et al.,* (2022) explained that formalin testing was carried out in several markets in Jambi City showing that all salted fish samples were positive for formalin and the highest formalin content was in salted stonehead fish.

The results of qualitative formalin content testing in all samples were positive. The presence of formalin in all samples shows that public awareness of the use of formalin is still low. The community still prioritizes production methods with low costs but maximum results. Public awareness of fisheries processing towards the use of hazardous food additives is still low.

CONCLUSION

The results of the formalin test on processed fish products in Jambi traditional markets showed positive results for all samples. The sample with the most intense color was salted jambal fish, followed by salted mackerel, snapper fish meatballs, and herrings fish meatballs. This shows that the food safety of processed fish products in Jambi traditional markets is still low. Public awareness of the use of hazardous food additives in processed fish products is low.

ACKNOWLEDGEMENT

Thanks are expressed to all parties who helped with this research.

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