Journal of Local Therapy
Vol. 04, No. 01, 2025
p-ISSN: 2809-3240; e-ISSN: 2810-0875
pp: 20-24

FORMALIN ANALYSIS ON SHRIMP SAMPLES At The SURABAYA I KIPM CENTER

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Abstract: *Formaldehyde, better known as formalin, is a prohibited food additive. The use of formalin in food can cause poisoning in the human body, namely acute abdominal pain accompanied by vomiting, the emergence of nervous system depression or circulatory failure. The purpose of this study was to identify the formalin content in shrimp tested at the KIPM Surabaya I Center. This study was conducted using a test kit method, namely formalin main reagent. The principle is to add liquid (reagent) to food suspected of containing formalin. The reaction between chromatophore acid and formalin produces a purple complex compound of 3,4,5,6-dibenzoxanthylium . The results of this study showed that negative shrimp samples contained formalin, indicated by the absence of color changes in the samples analyzed and compared with the positive controls that had been made.*

Keywords: Formalin, Test kit, Shrimp

INTRODUCTION

Indonesia is an archipelagic country that has abundant marine wealth. Indonesia is known as an agricultural and maritime country. The territory of the Republic of Indonesia, which is mostly ocean, has led to the growth of the fishing industry. Fish that have just died are at their maximum freshness level, meaning that the freshness of the fish cannot be increased but can only be maintained through the application of good and correct handling principles (Pulungan, 2024).

Preservatives are a type of food additive that is often used. Material Food additives are intended for several functions, for example, preservatives. used to increase the shelf life of food products and antioxidants used for protect food against oxidation which can cause food to become rancid. According to Regulation of the Minister of Health of the Republic of Indonesia Number: 033 of 2012 concerning Food Additives, preservatives are food additives to prevent or inhibit fermentation, acidification or other decomposition of food caused by microorganisms. Preservatives permitted for food include benzoic acid, Na-benzoate, K-benzoate, propionic acid, sorbate and its salts. The permissible dosage for these preservatives varies depending on the nature of the products. Preservatives that are not permitted to be added to food products include formalin, borax, boric acid and salicylic acid (Teshome et al., 2022).

According to the Regulation of the Minister of Health (MenKes) Number 1168/ MenKes/ PER/ X/ 1999 formalin is a chemical whose use is prohibited for food products. The use of formalin in food can cause poisoning in the human body, namely acute abdominal pain accompanied by vomiting, the emergence of nervous system depression or circulatory failure (Utama et al., 2021).

According to previous research at the Simple Market in Bandung City, fish suspected of containing formalin were analyzed using the MERCK Formaldehyde Test Kit and 6 out of 25 samples tested positive for formalin. This was evidenced by the color change to purple that occurred after the test was carried out (Mai et al., 2021).

Based on the description of the incident above, the author is interested in conducting research on the presence or absence of formalin in

shrimp tested at the KIPM Surabaya I Center and in determining the level of sensitivity and superiority of the MERCK test kit in formalin content analysis. Testing is carried out qualitatively and semi-quantitatively to identify the presence or absence of formaldehyde in shrimp samples using Fo1 (NaOH) and Fo2 (chromatropic/chromatopic acid) as reagent solutions. Chromatropic acid is used to bind formalin so that it is released from materials suspected of containing formalin. Formaldehyde also reacts with chromotropic acid to produce a complex compound that is dark purple.

METHODS

This research was conducted using qualitative and semi-quantitative methods to determine the presence of formalin content and concentration if it is said to be positive in shrimp samples at the Surabaya KIPM Center I. This research was conducted in March 2023. This research was conducted at the Chemistry Laboratory of the Surabaya KIPM Center I.

The tools used in this research are: stomacher/blender, Setrifuge, votrex, test tube, test tube rack, filter paper/formalin sample, dropper, analytical balance, measuring pipette.

The materials used in this study are: shrimp samples, sterile distilled water, Carrez solution I, Carrez solution II, Fo1 reagent and Fo2 reagent.

The method used in this analysis is qualitative, namely by using colorimetry, and semi-quantitative with the results of the comparison between reactions on the test paper with a color scale. Colorimetry is a comparison method using the difference in color of a substance as a comparison.

Colorimetry is the determination of the concentration of a substance by measuring the relative absorption of light in relation to the concentration of a particular substance. In visual colorimetry, natural or artificial white light is generally used as a color reagent and the determination is usually carried out with a simple instrument called a colorimeter or color comparator. In the formaldehyde test , the color reagent used is 4-amino-3-hydrazino-5-mercapto-1,2,4-triazole. The color change occurs due to the formation of a formaldehyde bond with 4-amino-3-hydrazino-5-mercapto-1,2,4-triazole to form a purple-red tetrazine color (Ajit Pal Singh, 2021).

Formalin testing is semi-quantitative where the results of a positive formalin sample test can be determined by the value of the formalin concentration using an indicator. In the indicator there are reading values, namely 0; 0.10; 0.25; 0.4; 0.6; 1 and 1.5 with units of mg/L. Where the reading results can be processed again using the formula (Tongdee et al., 2024).

Research Procedures

Determination of formalin levels in Fishery Products using a test kit based on IK/SBY I/LP/8/M.35 using the colorimetric principle. Where this standard is used to determine the presence or absence of food preservative additives in fishery products.

The research procedures carried out are as follows

a. Weigh a sample of 0.5 grams
b. Add 8 mL of distilled water into a 15 mL test tube, homogenize using vortex or manual shaking.
c. Carrez solution 1 (*Potassium Hexacyanoferrate*) was added as much as 0.4 mL and Carrez solution 2 (*Zink Sulphate*) as much as 0.4 mL and stirred until homogeneous.
d. Aquadest is added until the final volume reaches 10 mL.
e. Homogenize using vortex for 1 minute
f. Centrifuge for 5 minutes at 5500 rpm
g. Take 5 mL of the centrifuge results and put them into a sample tube and a blank tube.
h. Add Fo 1 reagent (*NaOH*) until pH 13 (approximately 5 drops)
i. 1 measuring spoon of Fo 2 reagent (*chromatophic acid)*
j. Shake for 1 minute, let stand for 5 minutes and read the color change on the kit indicator.

RESULTS AND DISCUSSION

Formaldehyde content testing was taken based on the shrimp population tested at the Fish Quarantine, Quality Control and Safety of Fishery Products Center Surabaya 1. The samples tested were 17 samples taken from different markets. The results of the shrimp sample testing can be seen in the following table :

Table 1. formalin test results

No	Sample Code	Sample Type	Test Results
1	1815	Shrimp	-
2	1845	Shrimp	-
3	1850	Shrimp	-
4	1856	Shrimp	-
5	1861	Shrimp	-
6	1920	Shrimp	-
7	1949	Shrimp	-
8	1954	Shrimp	-
9	2003	Shrimp	-
10	2028	Shrimp	-
11	2092	Shrimp	-
12	2104	Shrimp	-
13	2229	Shrimp	-
14	2242	Shrimp	-
15	2245	Shrimp	-
16	2251	Shrimp	-
17	2336	Shrimp	-

Based on the tests presented in the table, it can be seen that of 17 shrimp samples tested, they were declared negative for containing formalin. This is proven by the absence of a color change to purple and has been compared with the positive control that has been made.

According to the Regulation of the Minister of Health of the Republic of Indonesia No. 033 of 2012, formalin is a food additive that is prohibited for use in food. Formalin is a prohibited food additive added to food because it has negative effects on human health humans. Nowadays, many food producers want to profit but don't want to lose by adding food additives, which are prohibited from being added to food so that the food they produce is more durable. This test was conducted to determine the presence of formalin content in fishery products, especially shrimp (Babarinde G. O. et al., 2023).

In formalin testing at the Chemical Laboratory of the Fish Quarantine Center, Quality Control and Safety of Surabaya Fishery Products I used the test kit method, namely the formalin main reagent. The working principle of the test kit is the colorimetric method, namely by adding liquid (reagent) to samples suspected of containing formalin, with the final result of a change in color, namely purple if positive and clear color but very sensitive when used if the sample is negative. The working principle of the colorimetric KIT test is the reaction between formaldehyde and 4-amino-3-hydrazino-5-mercapto-1,2,4-triazole to form a tetrazine red-purple color. The concentration of formaldehyde is known through quantitative measurements with the results of the comparison between the reactions on the test paper and the color scale (Celik et al., 2023).

Test preparation is done by weighing the sample. After weighing the sample, distilled water is added. The purpose of adding distilled water itself is so that samples suspected of containing formalin can dissolve in distilled water (Hasanah et al., 2025). After adding distilled water, the sample is added with Carez solution 1 and Carez solution II. The purpose of adding Carez solution I and Carez solution II is as a food sample clarifier, which functions to precipitate protein. Carez solution I itself contains potassium hexacyanoferrate (II), and Carez solution II itself contains zinc sulfate. After adding Carez solution 1 and Carez solution II, the sample is then added with distilled water. Furthermore, the sample is homogenized by vortexing. The purpose of vortexing is to homogenize the sample. Then the sample is centrifuged. The purpose of centrifugation is to separate the supernatant and pellet. Furthermore, the supernatant is taken for testing in the sample tube and for the blank (Rahman et al., 2022).

The supernatant taken from the sample tube is then tested using Fo1 reagent and Fo2 reagent. Where Fo1 reagent is NaOH and Fo2 is chromatropic acid. After adding Fo1 reagent and

Fo2 reagent, the sample tube is left for 5 minutes and read using an indicator. Formalin testing is semi-quantitative, where the results of a positive formalin sample test can be determined by the value of the formalin concentration using an indicator. In the indicator there are reading values, namely 0; 0.10; 0.25; 0.4; 0.6; 1 and 1.5 with units of mg/L. Where the reading results can be processed again using the formula.

Previous research conducted in Bali showed that out of 15 samples tested from 3 different markets, there was 1 sample of salted anchovies containing formalin at a level of 10 ppm, exceeding the human tolerance limit. The measurement results showed that lemuru fish marketed in fresh form had an average size of 21/kg with a total length of 17.77 cm. The sample containing formalin came from market A, namely from salted anchovies with a content of 10 ppm (Utari & Agustin, 2024).

CONCLUSIONS

Based on the results of the research conducted by the Chemical Laboratory of the Fish Quarantine, Quality Control, and Safety of Fishery Products Center, Surabaya I , it can be concluded that of the 17 samples that have been tested, they were declared negative for containing formalin, indicated by the samples not experiencing a color change to purple, and have been compared with the positive control that has been made.

CONFLICT OF INTEREST STATEMENT

A conflict of interest, also known as a competing interest, is a situation in which an interest or connection—direct or indirect—could influence your research.

ACKNOWLEDGEMENTS

You may wish to thank those who have supported you and your work.

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