

Identification of Formalin in Food by Thin Layer Chromatography

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ABSTRACT

Formalin is a non-food preservative that is now widely used to preserve food. Formaldehyde is the trade name of formalin consisting of a mixture of formaldehyde, methanol and water. Formaldehyde on the market has various formaldehyde levels, between 20% - 40%. Formalin is a preservative that is prohibited for use in food products. However, there are traders who use formaldehyde in food products. The purpose of this study was to identify formaldehyde in food sold in Ciamis District. This study is a description of the phenomena found in the field, namely the presence of foods containing formalin. The method used was KmnO_4 reagent and Thin Layer Chromatography. The results showed that of the 5 food samples tested using KmnO_4 , positive results were obtained for tofu, salted fish, fresh fish, and chicken meat which were marked by a loss of purple color during testing. With the Thin Layer Chromatography method, the Rf value of tofu was 0.60, salted fish was 0.61, fresh fish was 0.61 and chicken meat was 0.62.

Keywords : Formalin, Thin Layer Chromatography, salted fish, tofu, wet noodles, fresh fish, chicken meat.

INTRODUCTION

Food additives are substances added to food to affect the nature or form of food or food products (Menteri Kesehatan Republik Indonesia, 2012). Food safety is an important factor to be considered and applied in the food processing process. Street food is a type of food that is sold on street vendors, on the roadside, at stations, in markets, residential areas, and similar locations. Food safety is important to pay attention to. To keep the body healthy, food must not only have high nutritional value. However, in food traded by the public, especially processed food, it is often found that it contains harmful additives that violate food safety criteria (Paratmanitya & Veriani, 2016).

Some hazardous additives that are not indicated for food products are added to food, such as formalin, borax, rhodamine B and methayl yellow. Formalin is a type of hazardous additive that is still often used freely by irresponsible traders or food processors. This is because formalin is much cheaper than other preservatives, easy to use because it is in the form of a solution and traders have low knowledge about the dangers of formaldehyde. The purpose of using hazardous chemicals such as formalin in food is usually done to improve the color and texture of food and inhibit the activity of microorganisms so that food products can be stored longer.

Formalin is a non-food preservative which is now widely used to preserve food. Formalin is the trade name for a mixture of formaldehyde, methanol and water. Formalin on the market has varying levels of formaldehyde, between 20% - 40%. Symptoms of formalin poisoning that can be seen include nausea, abdominal pain accompanied by vomiting, bloody diarrhea and circulatory disorders. At high doses of formalin can cause bloody diarrhea, urine blood, vomiting blood and eventually cause death (Nurdin & Utomo, 2018)

The effects caused by formalin depend on the level of formalin that accumulates in the body. The higher the level of formalin that accumulates, the more severe the consequences. ACGIH (American Conference of Governmental and Industrial Hygienists) set a safe threshold for formalin in the body is 0.4 ppm. Meanwhile, according to IPCS (International Program on Chemical Safety), a special agency of three United Nations organizations, namely the ILO, UNEP and WHO who are concerned with the safety of the use of chemicals, that in general the safe

threshold of formalin in food that can still be tolerated in the adult body. is 1.5 mg to 14 mg per day while formalin in the form of drinking water that can still be tolerated in the body is 0.1 ppm (Menteri Kesehatan Republik Indonesia, 2012).

The use of food additives that are appropriate and in accordance with the rules will produce products with the expected quality. However, if the use is wrong and excessive will result in the product is no longer safe for consumption. This is caused by the compounds classified as synthetic chemical compounds which when used in excessive amounts or not in accordance with the rules can be fatal to health (Kim et al., 2011)

Formalin can be used as an effective disinfectant against vegetative bacteria, fungi or viruses, although it is less effective against bacterial spores (Urrahmah, 2019). Formaldehyde is used as a disinfectant or germ killer (Pinckaers, 2019), so that it can be used for cleaning floors, ships, warehouses and clothing and exterminating flies and various other insects, hardening gelatin and paper coatings, preservatives for cosmetic products and nail hardeners, as an antiseptic for sterilizing medical equipment, as a germicide. and fungicides on plants and vegetables and the preservation of biological specimens, including corpses and skins

TOOLS AND MATERIALS

Salted fish, tofu, wet noodles, fresh fish, chicken pieces, formaldehyde, aquades, potassium permanganate, N Hexan, Methanol.

METHOD

Preparation of Formalin Standard Solution Formalin solution 1000 ppm was made by taking 0.27 ml of 37% formaldehyde solution, put it in a 100 ml volumetric flask and add aquadest to the mark.

Preparation of KMnO₄:

Solution Weighed 0.02 grams put into an Erlenmeyer then added as much as 20 ml of distilled water.

Sample Preparation

Sample preparation of salted fish, tofu, fresh fish, wet noodles, and chicken pieces: Each sample was ground until smooth, then weighed as much as 5 grams and put into an Erlenmeyer and added 10 ml of distilled water and then filtered with filter paper and the filtrate was taken.

Identification With KmnO_4 :

Each sample was taken as much as 5 drops and put into a test tube then add 5 drops of KmnO_4 solution, shake it until the KmnO_4 solution and the sample are mixed. Observe the color change that occurs, if positive is indicated by the loss of purple color from KmnO_4

Qualitative Identification with TLC:

The first step is to prepare a chromatography vessel, at the sampling stage, first prepare chromatography paper with a size of 12 cm, then a starting line is made with a distance of 1-2 cm at the bottom of the plate and a diameter is made, the sample and standard formalin solution are spotted on the TLC plate. using a micropipette, then allow some time to dry. The TLC plate which already contains the sample is put into a chamber which has previously been saturated with the mobile phase in the form of (N hexane: Methano=4: 2), left until the plate is completely eluted, then the TLC plate is removed and dried, then sprayed with a vapor stain viewer. iodine and observed for color visually under UV light. Then the stains and the R_f values of the samples and standards were calculated and then compared (Delbono et al., 2022).

Qualitative Test Using UV-Vis Spectrophotometry

Qualitative test using UV-Vis Spectrophotometry, carried out with the following steps:

a. Sample preparation

Each sample was ground until smooth, then weighed as much as 5 grams and put into an Erlenmeyer and added 10 ml of distilled water and then filtered with filter paper and the filtrate was taken (N Rosli, 2021).

b. Preparation of standard formalin solution

1) Make a 1000 ppm formalin solution by taking 0.27 ml of 37% formaldehyde solution, put it in a 100 ml volumetric flask and add aquadest to the mark.

2) Blank solution using aquadest

c. Determination of Operating Time

1 ml of Fehling's reagents A and B were taken each, then 1 ml of 50 ppm standard solution of Formalin was taken, then the absorbance value was measured every 5 minutes until a constant absorbance value was obtained.

d. Determination of Maximum Wavelength

Pipette 2 ml of the standard solution, put it into a 50 ml volumetric flask, add distilled water to the limit mark of 50 ml plus 1 ml of Fehling's solution A and 1 ml of Fehling's solution B. The absorbance was measured at a wavelength of 400-450 nm using a blank aquadest. Then the identification of the prepared sample was carried out by adding 1 ml of Fehling A solution and 1 ml of Fehling B input into the cuvette using UV-Vis spectrophotometry with a wavelength range of 400-450 nm. Then compared with the standard solution

RESULT

Table.1 The Result of formalin test with KMnO₄

| No | Sample | Observation | Result |
|----|--------------|-------------|--------|
| 1 | Tofu | White | + |
| 2 | Salted fish | Brown | + |
| 3 | Fresh Fish | Brown | + |
| 4 | Wet Noodles | Purple | - |
| 5 | Chicken meat | Brown | + |

Note:

+ : Positive contains Formalin

- : Negative contains Formalin

Tabel.2 Rf Value in sample with TLC

| No | Sample | Rf Formaldehyde (cm) | Rf Sample(cm) |
|----|--------------|----------------------|----------------|
| 1 | Tofu | 0,62 | 0,60 |
| 2 | Salted fish | 0,62 | 0,61 |
| 3 | Fresh fish | 0,62 | 0,61 |
| 4 | Wet Noodle | 0,62 | - |
| 5 | Chicken meat | 0,62 | 0,62 |

DISCUSSION

Identification by color test is done by making 20 ml of KMnO₄ solution by weighing 0.02 grams put into Erlenmeyer and then adding aquadest to the mark. Next, 5 drops of each sample were taken and put into a test tube and then add 5 drops of KMnO₄ solution, shake it until the KMnO₄ solution and sample are mixed and then observe the color changes that occur. If positive

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is indicated by a color change from purple to brown or clear white. Of the five samples, only wet noodle samples did not change color.

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In color test, samples were obtained from salted fish, tofu, wet noodles, chicken pieces and fresh fish, there were several samples containing formalin including samples of tofu, salted fish, fresh fish, and chicken pieces due to a change in color to brown or white clear.

Identification by TLC, results of research on identification of Formalin in foodstuffs sold in the Ciamis market using the Thin Layer Chromatography method, the following shows the results of Chromatography which is the result of the comparison of sample R_f with R_f Formalin identified using the mobile phase N hexane: methanol in a ratio of 4:2 which is allowed to saturate before use. from the identification results there were four samples that had the same R_f value as the standard R_f value, namely tofu, salted fish, fresh fish and chicken meat. while one sample, namely wet noodle did not have the same R_f value as the standard.

CONCLUSIONS

From the results of the study, it can be concluded that from the six research samples, formalin content has been identified. There were four positive samples containing formalin among them tofu, salted fish, fresh fish and chicken. One sample does not contain formalin, namely wet noodles

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