Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.31, 2014

PERFORMA (Paper Test Kit Formalin) as the Alternative Selection to Improve the Quality of Food Ingredients

Randi Dwi Anggriawan*, Citra Dewi Anggraini, Susiana, Putri Yurida Sari, Muhamad Firdaus & Abdul Rahem Faqih

Faculty of Fisheries and Marine Science, University Of Brawijaya, Jl. Veteran, Postal Code 65145 Malang, East Java, Indonesia
* E-mail of the corresponding authors: dwirandi@gmail.com

Abstract

Research on "PERFORMA" or Paper Test Kits Formalin is as an alternative to recognize the quality of food selection. This aim of this study was to produce a paper test kit that can detect formaldehyde containing in foodstuffs practically, fast and easy. The method used in this study was an exploration method which is part of an exploration method that aims to manipulate and control variables. The data collection is based on the research and the observation of the color change on the paper test kit is generated from Schiff reagent test, in which the paper test kit will give a purple color response when tested on foodstuffs containing formalin. Thus, this research paper expects that formalin test kit can be easily applied and used by the community at large.

Keywords: formalin; paper test kits; reagents Schiff; foodstuff

1. INTRODUCTION

Foodstuffs are a product that is needed by humans to survive. Foodstuffs should be high in nutrients to support human health. However, the essential *perishable* foodstuffs are classified as material (easily broken). It is caused by microorganisms consisting in food, either from the food itself or contaminants. Because food is *perishable*, it needs effort in processing or preservation techniques using preservation techniques. One example of food preservation is using chemical compounds. It is inevitable that people nowadays are currently using formaldehyde for food preservation. Meanwhile, a compound to preserve the food that they used is *cadaver* formalin (for corpse). Formalin is not classified as a food additive, so that it should not be used in food. Food such as tofu, noodles, meatballs, chicken, fish and sweets are containing formaldehyde which will cause health problems. Formalin can react quickly to the mucus lining the digestive tract and the respiratory tract. But, chronic effects of foods that contain formaldehyde could feel in a few years later. (Hastuti, 2010).

So far, there has been a tool for detecting the formaldehyde contained in foodstuffs, such as Schiff reagent. However, the use of detection devices is still quite complicated for people in general because the shape Schiff reagent solution will turn into purple reaction with *aldehydes*. So this test requires certain conditions (laboratory) because they have to be mixed with reagents one another. Besides testing using the reagents is quite time consuming and the prices that is unaffordable by the community.

2. PROBLEM FORMULATION

Foodstuffs have characteristics of *perishable.* Thus, we need to preserve as an effort to overcome this problem. There are two kinds of preservations: natural and synthetic. Formalin is a synthetic preserver which is widely misused by people to preserve the food. In fact, formaldehyde is carcinogenic if it is consumed continuously in a long term. Hence, it should not be contained in the food.

Reagen Schiff is one of the aldehyde reagents. The usage of this reagent in the formalin test is used as simply as used in the form of *paper test kit.*

3. RESEARCH OBJECTIVES

To produce the *paper test kit* formaldehyde content in foodstuffs practical, fast and easy

4. EXPECTED OUTCOMES

Expected outcomes of this research is to get the formalin detection (*paper test kit)* that can be applied easily by people in general and to get an official patent for the *paper test kit* formaldehyde in foodstuffs.

5. THE ADVANTAGES OF THE RESEARCH

a) For students, they are supposed to be able to get a *paper test kit* for detecting the formaldehyde content in foodstuffs practical.

b) For the people in general, they are supposed to use *paper test kit* easily at an affordable price.

6. LITERATURE REVIEW

a) Food Ingredients

In Indonesia, there are a lot of damaging food from agricultural products (including livestock and fisheries) before it is consumed. Data shows that there are about 35-40% damaging vegetables and fruits and they cannot be used. Similarly, milk, eggs, meat, fish, tubers as well as fishing, and other agricultural products which can be consumed by human but in some parts and the rest is wasted. In such circumstances, it is commonly happened for food because it is easily damaged *(perishable food).* Without any further processing, the food will change over time due to the influence of physiological, mechanical, chemical, microbiological which can cause further damage and cannot be consumed (Lopez, 2009).

Foodstuffs or food which is safe for consumers can be viewed from the aspect of nutrition (nutrition) and contamination (contamination). In terms of nutrition, nutritional content of food should not lack or excess which can cause a variety of diseases such as malnutrition and protein energy deficiency (PEM), iron deficiency anemia (ABG), a result of iodine deficiency disorders (GAKI), and degenerative diseases (i.e. heart, Diabetes Mellitus, cancer, etc.). 'Safety using' here means free from physical contamination, intrinsic and extrinsic form of natural toxic and anti-nutritional substances in food, biological contaminants, microbiological, chemical, heavy metals and other contaminants that could interfere with, harmful, and harmful for human health (Anwar, 1991).

b) Preservation Techniques

Preservation principles can be explained into various food preservation techniques that can be grouped naturally, biologically, and chemically. Those three techniques have the same function that is to slow the growth of microorganisms in food (as antimicrobial) and to reduce and prevent the oxidation process. Natural preservation techniques are done by setting the temperature, moisture content, and air flow, for instance: cooking, refrigeration, freezing, drying, and canning. Biological preservation such as fermentation, not only extends the storing, but also increases the nutritional value of food. Finally, the chemical preservation is generally using Food Additives (Winarno, 1992).

Principally, further processing or preservation of food *(food preservatives)* is *technology* the lengthy time food storage before the usage. For food which is going to be prepared or consumed instantly, it should be let in a fresh and living conditions. If it is not possible, be cleaned and then packaged and stored in a refrigerator. To use it for a longer period, it is necessary to reduce the decay caused by microorganisms (Arpah, 2001).

c) Formalin Detector

One of the reagents that can be used to detect formalin is Schiff reagent. The type of formalin detection with Schiff's reagent is using quantitative methods. However, this method is less effective because the slightest concentrations of formaldehyde should not be presented in foodstuffs.

Schiff reagent is a *Fuchsin* dye that changes color when sulfur oxide is passed into. If there is a bit of an *aldehyde*, the color will turn in a bright-purplish-red. Schiff reagent is made by basic *fuchsin* containing *parafuchsin* (*triamino-triphenyl-methane-chloride*) with sulfuric acid which then gives the color when it is reacted with an *aldehyde* in the cells or tissues (Nganro, 2009).

7. METHOD

Model or approach used in this study was *experimental,* a part of quantitative method. It is aimed at manipulating and controlling variables.

a) Research Design

It was one experimentally. The design of the research was using the difference in the formalin concentration and Schiff reagent concentration.

b) The study sample

The sample of this study was food (fish and tofu) containing formaldehyde.

c) Research Variables

The variables in this study are as follows:

1. *Independent Variabl :*Independent variable in this study was the Schiff reagent concentration.
2. *Dependent Variable:* The dependent variable in this studywas the change of reagents to the presence of formaldehyde in food.

d) Research Mechanism

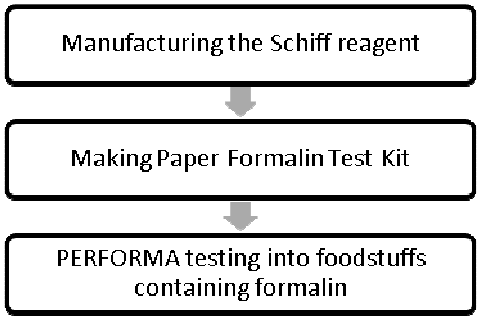

Figure 1. The PERFORMA Research Mechanism

e) Data Collection Techniques

Data was collected based on the research.

f) Data Analysis

Data analysis in this study using variance data analysis obtained which was expressed as mean ± standard deviation with confidence level of this study is stated at α 5%.

g) Inference and Interpretation of The Research Results

From the research has been done, it was got an interpretation of the results: the *test kit* will responded a purple color when it tested on foodstuffs containing formalin.

8. THE IMPLEMENTATION OF THE RESEARCH

a) Time and Place of Implementation Research

Time : February 23rd to June 28th 2013

Setting : Laboratory of Microbiology, Faculty of Fisheries and Marine Sciences, Brawijaya University.

b) Instruments

The tools and materials used in this study were divided into several stages: (a) For the implementation of Schiff reagent manufacturing and *paper* manufacturing *test kit* were: 250 mL (2), 500 mL (2), and 1000 mL (2) of glass beaker; glass measuring 100 mL (3); pipette 10 ml volume (4); serological pipettes; spoons horn (4); petri dishes (32); spatula (4); suction ball (4); digital scales (1); oven (1); tray (6); digital camera (1); scissors (2); ruler (2); and lab coats (2), (b) The ingredients include: 10 g crystal sodium disulfite; 37% HCl; distilled water; fuchsin; fine filter paper (4 sheets); 1 *pack* gloves; 1 *pack* masks, plastic, yarn, scrap paper, and aluminum foil (4 *rolls*),(c) tools and materials used for recording the research are 4 *pack* of pens; *log book*; scrap paper; ruler; and four markers, (d) tools and materials used in the packaging and exploration of cooperation are: PERFORMA paper; aluminum foil; laptop; *flash drive (2)*; and CD-RW (1).

9. RESULTS AND DISCUSSION

a) Manufacturing the Schiff reagent

Manufacturing the Schiff reagent begins with weighing crystals as much as 1 g of sodium disulfide which are then inserted into the glass beaker. Then, 2 N HCl was added with as much as 1 mL. After that, add 0.1 gfuchsin. Then dissolved it with distilled water to 100 mL. Mix the chemicals and homogenize it using a spatula

until evenly distributed. To remove *Pearscolor,* the Schiff reagent which has been let for 24 hours before was fortified into the filter paper.

b) Manufacture of *Paper Test Kit* Formalin

Prepare filter paper cut to a size of 4 x 4 cm. Then, prepare Schiff reagent and then put it in a petri dish. Then fortify the Schiff reagent into the filter paper with a smooth immersion in a petri dish, which contains Schiff reagent, for ± 15 minutes. After that, put a paper which contains Schiff reagent on a petri dish and dry it for 24 hours at room temperature. Finally, the *paper formalin test kit* is successfully produced (PERFORMA).

c) PERFORMA testing into Foodstuffs Containing Formalin

Prepare *Paper* formalin *test kits* and the samples (consisting of fish and tofu). Dilution of 37% formalin solution to 18.5%, 9.25%, 4.62%, 2.31%, 1.16% and 0.58%. Fish and tofu were soaked in different concentrations of formaldehyde for 20 minutes and allow let it for 15 minutes. After that, test the food (tofu and fish) which is containing formaldehyde (tofu and fish in fresh state) by using the *Paper Formalin Test Kit* (PERFORMA). Then, The changing of the color in paper test kit was observed. The changes of purple color on the paper test kit showed the positive samples contained formaldehyde. On the other hand, if the color of paper test didn't change, then the samples showed negative contamination of formaldehyde.

Fish and tofu that contain 37% formaldehyde detected by PERFORMA which is indicated by the changing of color from white paper bones become dark purple. It was followed by fish and tofu which contained 18.5% formalin, PERFORMA detected it by generating rather dark purple color. It also happened to the fish and tofu that contain formaldehyde as much as 9.25% and 4.62%, PERFORMA detected by producing brighter purple than before. Until the concentration of formalin gained 2.31%, 1.16% and 0.58%, PERFORMA detected its presence by producing the colors: mauve, purple fades, the purple and white. The newest experiment result PERFORMA which is able to detect formaldehyde under the concentration of 1 PPM. The color change on the PERFORMA occured at the tenth second up to the sixtieth second which is indicated by dark-purple color.

This study has conducted 3 times repetitions. Repetition is done to ensure the correctness of the formalin test in foodstuffs done by PERFORMA. It also aimed to create a *pattern of* PERFORMA, a standard used to match colors when PERFORMA successfully detect the presence of formalin in food, and shows the concentration of formaldehyde contained in the food.

10. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusion

Through the studies that have been carried out, it can be concluded that PERFORMA can detect formaldehyde contained in foodstuffs by characterizing the color changes from white to purple bone. PERFORMA can detect up to 0.58% formaldehyde. PERFORMA can detect the formaldehyde upto 1 PPM. It shows that PERFORMA is very potential to detect even the smallest unit of a food, it can be used as an alternative kits to recognize the safety of food, which means that it can prevent the consumption of foodstuffs containing formalin.

2. Suggestions

To make the sustainable research based on food safety, it is important to support the research required the participation of food safety experts, educators, students and the community in the implementation of the use of *paper formalin test kit* continuously. It also needs the role of the government, especially the Ministry of Health to provide more attention to the sustainability of this study. In addition, to support the truth (validity) of PERFORMA, it is important to do the further research.

References

Arpah. 2001. *Determination Expired Food Products.* Bogor: IPB.

Dolaria, Nanin and Fairdiana Andayani. Of 2012. *How to Quickly Detect Formalin In Fishery Products.* Product Processing Research Center for Maritime Affairs and Fisheries, and Biotechnology.

Hastuti, Sri. 2010. *Qualitative and Quantitative Analysis of Formaldehyde on Salted Fish in Madura.* Bangkalan Faculty of Agriculture: University Trunojoyo.

Lubis, Nenni Dwi Aprianti. , 2009. *Preserving Food Safely.* Field: the University of North Sumatra.

Marliyati, SA, A. Sulaiman & F. Anwar. , 1991. *Household Level Food Processing.* Bogor: PAU - IPB.

Nganro, Noorsalam R. , 2009. *Methods Reef Marine Aquatic Ecotoxicology.* Bandung: Bandung Institute of Technology.

Winarno, FG 1992. *Chemistry of Food and Nutrition.* New York: Scholastic

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar