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Formalin Analysis of Food Ingredients In Palu

Rismawaty Sikanna[1*], Ivone Venita Sarapun[2], Dwi Juli Puspitasari[3]

[1]Dept. of Chemistry, Faculty of Science and Technology, UIN Alauddin Makassar
[2]Research Lab. Dept. of Chemistry. Faculty of Matematics and Natural Science
Universitas Tadulako Palu
[3]Dept. of Chemistry. Faculty of Matematics and Natural Science
Universitas Tadulako Palu
[*]*E-mail: rismawaty.sikanna@uin-alauddin.ac.id*

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Abstract: *Research on formalin analysis of food ingredients in Palu has been conducted. The purpose of the research is to find out formalin content in several food. The analyzed samples were foods that marketed in Palu, such as salt fish, noodles, mujair fish, and tofu obtained from several places in Palu. The qualitative analysis of formalin done before measured of formalin quantitatively. The data of formalin found by UV-Vis spectrophotometer with the wavelength of 385 nm. Formalin content of salted fish, noodles, Mujair fish, and tofu were 2,005 ± 0,187ppm, 2,183 ±0,231ppm, 1,931 ±0,174 ppm, and 1,957 ±0,254 ppm, respectively.*

Keywords*: Formalin, salt fish, noodles, tofu, mujair fish.*

1. INTRODUCTION

Food is very important for human to nourish the body. Processed food products such as fish, tofu and noodles are high nutrition foodstuff often consumed by society. 100 g of mujair fish contains 86 g of water and 16 g of protein, while the protein of salt fish is higher, at 42%.Tofu consists of 8-12 % of protein and 86% of water. 35% of water and 3% of protein are presented on noodles. Development of food technology aims to fulfill the nutrition demand that keeps increasing. The food materials have a high nutrition of protein and water. It makes them susceptible to microorganism growth, so it has shorter shelf life (Nurrahman, 2007). Therefore, to lengthen the preservation time, it needs special treatment by adding the additive. According to PERMENKES RI No.722/MENKES/PER/1X/1998, one of the hazardous food additives forbidden to use is formalin because it is a toxic compound and carcinogen.

Food containing formalin can be visually differentiated by certain characteristics such as chewy texture, less rigid, unbreakable, strongly odorous, longer preservation time, and being avoided by flies (BPOM, 2003). Based on the characteristics, the food such as tofu, mujair fish, noodles and salt fish in Palu city is suspected to contain formalin. It is supported by research of Sikanna (2015) which said that about 66% tofu in Palu contained formalin that is used for preservative. Therefore, researcher will conduct a quantitative analysis of formalin of the food in the Palu city which is suspected containing the substance.

2. MATERIALS AND METHOD

Materials

The materias of research are foods such as salted fish, noodles, mujair fish, and tofu were taken from seven different places, aquadest, NaOH 0,1 N (Merck), $K_3Fe(CN)6$ 0,3 N (Merck), $KMnO_4$ 0,1 N (Merck), Hydrazine phenyl p.a. (Merck), alcohol isoprophyl 45% (Merck) and filter paper. The tools used in this study are glass tools such as volume pipettes, measuring flasks, watch glass, test tubes, spatula, bulp, analytical balance (Adventures), a set of centrifuge (Ependorf), blender (Kirin) and UV-Vis spectrophotometer (PG Instruments T92+).

Experimentals

Qualitative Analysis Of Formalin In Sample (Sikanna, 2015)

Two test tubes were prepared and coded A and B. On test tube A was inserted a drop of $KMnO_4$ solution and 2 mL of distilled water. In reaction tube B added 5 g sample and 10 ml of distilled water, stirred then filtered and taken filtrate. The filtrate is then combined into reaction tube A and allowed to stand for 30 minutes. Further observed changes that occur.

Quantitative Analysis Of Formalin In Sample (Antoni modified, 2010).

Samples of 2 g and 10 mL of 45% isopropyl alcohol were inserted into centrifuge tubes and then centrifuged at 2600 rpm for 10 min. Next the mixture is filtered and the filtrate is taken as much as 2 mL. A further 10 mL of isopropyl alcohol of 45% and 5 mL of phenyl hydrazine was added to the filtrate and allowed to stand for 10 min, 0.3 mL of Potassium Ferrisianida 0.3 N and sterilized 5 min, then 2 mL of NaOH was added for 4 minute. The mixture was then incorporated in a 100 mL measuring flask and was added with 45% isopropyl alcohol to the limit marker. The solution was then measured using a UV-Vis spectrophotometer at 385 nm wavelength.

3. RESULTS AND DISCUSSION

Qualitative analysis of formalin content in samples (Sikanna, 2015).

Qualitative analysis with the addition of chemical reagents $KMnO_4$ solution. The results of the analysis can be seen in Table 1.

The results of qualitative analysis indicates a change of color in all samples analyzed which means positive results of formalin content. It is characterized by a loss of purple color from $KMnO_4$ which used in this method. The color change that occurs is caused by the oxidation of formaldehyde groups from formalin by $KMnO_4$. This proves that all samples analyzed contain formalin.

Table 1. Qualitative analysis of formalin content in food.

No.	Sample code	Observation	No.	Sample code	Observation
1.	A1	Faded purple	15.	C1	Faded purple
2.	A2	Faded purple	16.	C2	Faded purple
3.	A3	Faded purple	17.	C3	Faded purple
4.	A4	Faded purple	18.	C4	Faded purple
5.	A5	Faded purple	19.	C5	Faded purple
6.	A6	Faded purple	20.	C6	Faded purple
7.	A7	Faded purple	21.	C7	Faded purple
8.	B1	Faded purple	22.	D1	Faded purple
9.	B2	Faded purple	23.	D2	Faded purple
10.	B3	Faded purple	24.	D3	Faded purple
11.	B4	Faded purple	25.	D4	Faded purple
12.	B5	Faded purple	26.	D5	Faded purple
13.	B6	Faded purple	27.	D6	Faded purple
14.	B7	Faded purple	28.	D7	Faded purple

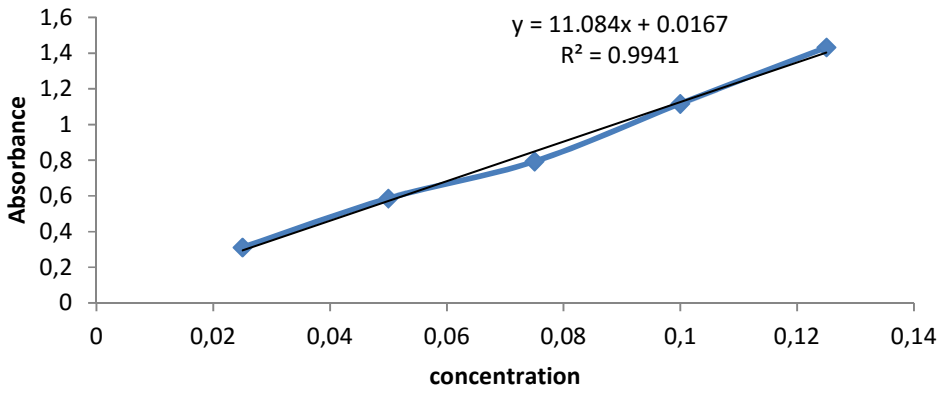
Description: A= Salted Fish
B= Noodles
C= Mujair Fish
D = Tofu

Quantitative analysis of formalin content in the sample.

The quantitative analysis of formalin content in the sample was performed by using spectrophotometric method using modified Schryver reagent.Prior to the measurement of formalin content, there were several stages performed as initial and supportive steps to obtain accurate analysis results. The steps consist of making standard solutions, determining maximum wavelength and making calibration curves.

This study was preceded by the determination of maximum wavelength or maximum absorption using UV-Vis spectrophotometer at wavelength 350-500 nm. After measurement, it was obtained at a wavelength of 385 nm. The maximum wavelength selection is performed in order to know the formaldehyde region which produce a color absorption that can be absorbed by the UV-Vis spectrophotometer.

In addition to the maximum wavelength, validation of assay was made by making calibration curve and linearity determination. The calibration curve made shows the relationship between the absorbance value of the analyte to the concentration of the analyte. If the correlation value (R) is close to 1, then the absorbance value is directly proportional to the increase of concentration. The calibration curve generated in this study is shown at picture 1.



Picture 1. The curve of formalin concentration relationship with absorbance.

The standard concentration of formadehide series used was a multilevel concentration with a range of 0.025, 0.050, 0.075, 0.100, and 0.125 ppm. The results obtained show an increase in absorbance value as the concentration increases. From calibration curve, it is obtained the equation of Y = 11.084x + 0.0167 with correlation coefficient (R^2) = 0.9941. This equation is then used to determine the concentration of formalin in the sample based on the measured absorbance value of each sample.The absorbance value of each sample is substituted into the equation Y = 11.084x + 0.0167. The result of concentration obtained can be seen in Table 2.

Table 2. Result of quantitative analysis of formalin content in sample.

Sample	Sample code	Concentration (ppm)	Average concentration (ppm)	Deviation standard
Salted fish	A1	1.859		
	A2	2.268		
	A3	2.068		
	A4	2.061	2.005	0.187
	A5	1.694		
	A6	1.963		
	A7	2.127		
Noodles	B1	2.183		
	B2	2.539		
	B3	2.317		
	B4	1.974	2.183	0.231
	B5	2.356		
	B6	1.929		
	B7	1.984		
Mujair fish	C1	2.044		
	C2	1.901		
	C3	1.718		
	C4	1.828	1.931	0.174
	C5	1.799		
	C6	2.235		
	C7	1.995		
Tofu	D1	1.808		

D2	1.813		
D3	2.187		
D4	1.975	1.957	0.254
D5	1.763		
D6	1.741		
D7	2.414		

The result of this research shows the formalin content in all samples tested, with salted fish contained 2.005 ± 0.187 ppm, noodles was 2.183 ± 0.231 ppm, mujair fish was 1.931 ± 0.174 ppm and tofu was 1.957 ± 0.254 ppm.

These results indicates that the formalin content in the sample exceeds the body's acceptable threshold. According to International Programe on Chemical Safety, the limit of formalin tolerance in the body is 0.1 mg / L (1 ppm = 1 mg / L).

Formalin can reaction with almost any substance in the body, and the accumulation in large quantities can lead to cell function disturbance and cause death of cells. High content of formalin in the body can cause stomach irritation, allergies, blood-mixed diarrhea, blood-mixed urine and death caused by circulatory failure (Cahyadi, 2009). In addition, formalin can also cause cancer, allergies, stomach irritation, nausea, can even cause death (Handayani, 2006).

However, it is important to note that formaldehyde bound to proteins in food that form methylene may experience breaking of the bonds due to heating process, causing the formaldehyde to evaporate and consequently diminishing its content. (Purawisastra, 2011). Research conducted by Muntaha *et. al.* (2015) showed that the decrease of formalin content in formalin tofu after boiling for 10 minutes was 64.77% and the decrease of formalin content in formaldehyde with 10 minutes soaking in hot water was 33.1%.

4. CONCLUSION

From this research, it can be concluded that some foods in Palu contain formalin such as in salt fish, noodles, fish mujair, and tofu were 2.005 ± 0.187 ppm, 2.183 ± 0.231 ppm, 1.931 ± 0.174 ppm and 1.957 ± 0.254 ppm, respectively.

Suggestion

For further research, it is necessary to analyze the natural ingredients that can be used as additional ingredients for preserving as a replacement of formalin, such as determination of save time of food with or without additional natural ingredients.

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