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Safety Assesment of Jambal Roti Salted Fish in Solo City

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Abstract: Salted fish is one of the common processed fish, such as *Ariidae Fish* can be processed into *Jambal Roti*. Salted fish which made by traditional processing will affect the quality and safety of food. The criteria of safe food was the presence or absence of hazardous components either physical, chemical and microbiological. This study aimed to determine the water content, formalin content, salt content, total plate count, *Escherichia coli*, and *Salmonella* sp from salted fish jambal roti that sold in Solo City. The results of formalin test showed that 21 samples (87.5%) are contained formaldehyde. Salt content in salted fish are range from 4 to 16.9% and it was still lower than the SNI that was set salt content in salted fish by 20%. Water determination results showed 23 samples (95.83%) have higher water content than SNI obligation which was 40%. Total plate count showed that 1 sample was known upper than the SNI maximum standard was $1 \cdot 10^5$ CFU/g. *Salmonella* sp on Salted fish was negative whether *E. coli* test report that 25% of the samples were contain *Escherichia coli*.

Keywords: *E.coli*, formaldehyde, salted fish, *Salmonella* sp, TPC

1 INTRODUCTION

Fish is one food that has a high protein content value of about 15-24% (Syahril *et al.*, 2016). Fish commodities are very susceptible to quality damage, so processing is needed to extend the shelf life. One type of fish processing is salted fish. *Ariidae Fish* is one if the basic fish (demersal) that can live in fresh water, estuaria, and sea. *Ariidae fish* has low fat (0.2-2.9 g/100 g) and high protein (12.7-21.2 g/100 g) (Amir, 2014). Jambal roti is one of salted fish processed from *Ariidae fish*. The term of jambal roti appears because after frying, the texture of jambal roti crumbly like a toast (Burhanuddin *et al.*, 1987). Jambal roti is very popular in Java. The production centers of jambal roti are Pekalongan, Cilacap, Cirebon,

Pangandaran, Rembang, and along the North Coast of Java.

Suprihatin and Romli (2009) stated that salted fish processing in the traditional way relies on drying with sunlight depending on weather conditions. Changes in unpredictable weather conditions resulted in incomplete drying of salted fish. To cover the disfavour, some processors use harmful chemical preservatives, such as formaldehyde and bleach (Yuliana *et al.*, 2011). Consumers like jambal roti because of its crunchy texture, but jambal roti still needs to be analyzed by food safety.

Food safety standards of salted fish products include: chemical factors and microbiological factors. Expired of salted fish is influenced on the water content and the salt content. Indonesian National Standard was set water

content in salt fish as much as 40%. Water content affects the quality of food, in terms of preservation usually water content of product will be reduced until it reaches a limit, so microorganisms can't grow (Tutianvia, 2006). Salted fish that has high water content but can last a long time require additional ingredients preservatives. The use of salt as a preservative is particularly dependable in its ability to inhibit bacterial growth and the activity of the decaying enzymes found in the body of salted fish (Afrianto and Liviawati, 1989). The addition of salt in the process of salted fish can inhibit the growth of *Salmonella* sp and *Escherichia coli*. Some salted fish product that has high water content are suspected to contain elements of preservatives or other chemical capable of inhibiting the activity of decomposing microbia. The aims of the research was to analyzed water content, formaldehyde content (qualitatively and quantitatively), salt content, TPC, *Salmonella* sp, and *Escherichia coli*.

High salt content also affects the safety of salted fish. Indonesian National Standard determines salt content in salted fish not more than 20%. High salt will trigger high blood pressure disease that can lead to heart problems and stroke (Riana, 2015).

High formaldehyde content in the body can cause stomach irritation, allergies, carcinogenic (causing cancer) and mutagenic (causing changes in cell function), as well as people who consume can be vomit, diarrhea mixed with blood, blood mixed urine, and deaths caused the failure of blood circulation (Cahyadi, 2009).

Salmonella sp is a gram negative, rod shaped diameter 1 -3.5 μm x 0.5- 0.8 μm , moves with peritrichous flagellum, is easy to grow in ordinary seedlings and grows well in bile-containing seeds. *Salmonella* sp grows in aerobic and facultative anaerobic atmosphere at

15 - 41 $^{\circ}\text{C}$ with optimum growth temperature of 37.5 $^{\circ}\text{C}$ and growth pH 6 - 8 (Murti, 2017).

Widyani and Suciayaty (2008) argue, *E. coli* is normally present in the human intestine. *Escherichia coli* is a short-gram-negative (kokobasil) bacterium, measuring 0.4 to 0.7 μm , anaerobic facultative and has peritrichous flagella, usually not spores (Kaiser et al., 2005).

2 RESEARCH METHOD

This research is an observational research. Samples were taken from 11 markets in Solo City with a total of 24 samples of jambal roti.

2.1 Tools

Scales (Ohaus), measuring cups, oven (Mettler), muffle (Nabertherm), Spectrophotometer (Thermo Scientific), vortex, petridish, electric stove, test tube, Erlenmeyer, glass beaker, autoclave (All American), incubator (Mettler), tweezers, water bath (Mettler), desiccator (30cm), and clamp.

2.2 Ingredients

Jambal roti, *Plate Count Agar* (Merck), *Salmonella Shigella Agar* (Merck), *Violet Red Blue Agar* (Merck), NaCl (pa), kalium khromat (pa), and chemicals for analysis used in this research was pro analysis quality.

2.3 Research Method

Jambal roti has investigated for two aspects including, chemical factors and microbiological factors. Microbiological factor research used serial dilution method with pour plate method which include TPC (*Plate Count Agar*, Merck), *Salmonella* sp (*Salmonella Shigella Agar*, Merck), and *Escherichia coli* (*Violet Red Bile Agar*, Merck).

For the chemical safety assessment aspects, jambal roti was analyzed its water content used thermogravimetry method (AOAC,

1992), salt content used Kohman method (Sudarmadji *et al.* 1997), and qualitative and quantitative levels of formaldehyde content (Riana, 2015).

Qualitative levels of formaldehyde content, analyzed by the phenilhydrazine method (Riana, 2015). Twenty to thirdly grams of samples fed into distillation flasks and then add with 200 ml of aquades. The filtrate then acidified with 85% of phosphoric acid solution as much as 10 ml. The solution is distilled slowly. Ten millilitres of distilled taken and added with 1 ml of 1% phenyl hydrazine, 5 ml of HCl 50% and 2 ml of 5% $K_3Fe(CN)_6$. Solution will turn into red when there is formaldehyde.

Quantitative levels of formaldehyde content analyzed by the spectrophotometry method (Riana, 2015). Standard solution of formaldehyde made by using 0.027 ml of 37% of formaldehyde and adding 500 ml of aquades or 20 ppm in concentration. Standard curves which describe the relation between formaldehyde content and absorbance made by using serial dilution of the standard solution. All of the serial solutions then add with 1 ml of 1% phenyl hydrazine, 5 ml of HCl 50% and 2 ml of 5% $K_3Fe(CN)_6$. Absorbance was measured at wavelength of 520 nm.

4 RESULTS AND DISCUSSION

4.1 Qualitative Formaldehyde Test

Table 1. Qualitative Formaldehyde Test.

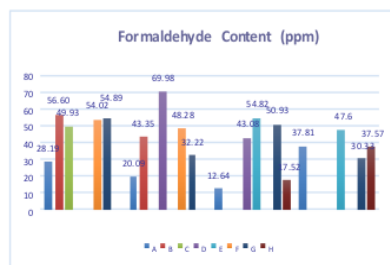
Market	Code	Results
Market A	111	(+)
	112	(+)
	113	(+)
	114	(+)
Market B	115	(+)
	116	(+)
Market C	117	(-)

	118	(+)
Market D	119	(+)
	120	(+)
Market E	121	(+)
	122	(+)
Market F	123	(+)
	124	(+)
	125	(+)
Market G	126	(+)
	127	(+)
	128	(+)
	129	(+)
Market H	130	(+)
	131	(+)
Market I	132	(+)
Market J	133	(-)
Market K	134	(-)

Based on results on Table 1, 21 samples (87.5%) are contained formaldehyde. This is contrary with regulation of the minister of health number 1168/MenKes/PER/X/1999, who explained that formaldehyde was harmful chemical preservatives. Then samples that has positive results continue with quantitative test for formaldehyde.

4.2 Quantitative Formaldehyde Test

Picture 1. Formaldehyde content of jambal roti sold in Solo.



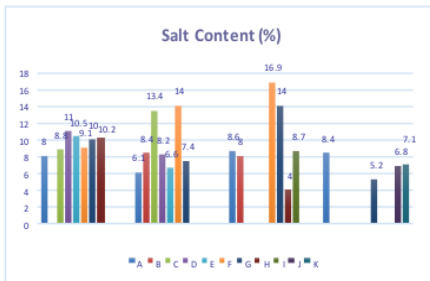
Based on the results of clinical trials, the dose of human body tolerance on the use of formaldehyde continuously was 0.2 mg / kg of bodyweight.

On the results of the quantitative test, found that salted fish are contained by formaldehyde still spread in the market in Solo. Concentration of formaldehyde was between 12.64 to 69.98 ppm.

High formaldehyde content in the body will react chemically with almost any substance in the cell suppress cell function and causing poisoning (Antoni, 2010).

4.3 Salt Content

Picture 2. Salt Content of Jambal Roti Sold in Solo

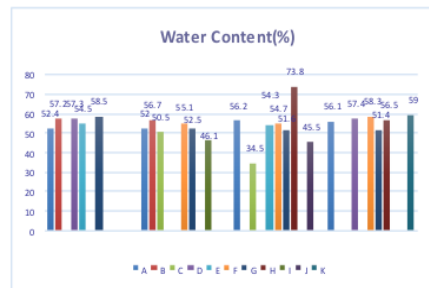


Salt content of Jambal Roti sold in was between 4-16.9% and still satisfy the SNI stipulating that salt content in salted fish shouldn't be more than 20%. So, consumers don't have to worry if consuming excessively.

But if this salt content is linked to formaldehyde test, low salt levels because salt functions as a preservative has been replaced by formaldehyde.

4.4 Moisture Content

Picture 3. Water Content of Jambal Roti Sold in Solo City.



SNI was established water content in salted fish are 40%. Twenty tree of twenty four samples had high moisture content (95.83%). High moisture content caused by imperfect drying process. Moisture content affects the durability of a foodtuffs. The higher the moisture contents the shorter the lifetime of the food. So, it is necessary to make the moisture content as low as possible to exten the long life the food. With high value of moisture contents, one has to use of presevative. Some producers will decide to use chemicals such as formaldehyde to prolong the shelf life of Jambal Roti.

4.5 TPC

Table 2. TPC

Market	code	Results (CFU/g)
A	111	$1.9 \cdot 10^3$
	112	$5.6 \cdot 10^2$
	113	$1.5 \cdot 10^2$
	114	$1.3 \cdot 10^4$
B	115	$1.0 \cdot 10^3$
	116	$2.9 \cdot 10^3$
C	117	$1.4 \cdot 10^4$
	118	$1.7 \cdot 10^2$
D	119	$3.9 \cdot 10^2$
	120	$1.2 \cdot 10^2$
E	121	$1.9 \cdot 10^3$

	122	$7.6 \cdot 10^2$
F	123	$3.4 \cdot 10^3$
	124	$1.0 \cdot 10^5$
	125	$5.1 \cdot 10^2$
G	126	$1.8 \cdot 10^3$
	127	$5.8 \cdot 10^2$
	128	$1.6 \cdot 10^3$
	129	$3.1 \cdot 10^2$
H	130	$6.4 \cdot 10^3$
	131	$1.3 \cdot 10^3$
I	132	$9.4 \cdot 10^2$
J	133	$2.3 \cdot 10^3$
K	134	$1.3 \cdot 10^5$

Table 2 showed 95,8% sample still qualify of SNI 1×10^5 . Low yields may be associated with used formaldehyde in sample. But when viewed with the discovery of formaldehyde content in the sample, it is possible to low levels of contamination in samples.

4.6 *Salmonella* sp

Table 3. *Salmonella* sp

Source	Kode	Results
A	111	(-)
	112	(-)
	113	(-)
	114	(-)
B	115	(-)
	116	(-)
C	117	(-)
	118	(-)
D	119	(-)
	120	(-)
E	121	(-)
	122	(-)
F	123	(-)
	124	(-)
	125	(-)
G	126	(-)

	127	(-)
	128	(-)
	129	(-)
H	130	(-)
	131	(-)
I	132	(-)
J	133	(-)
K	134	(-)

Existence of *Salmonella* sp in salted fish ruled by SNI was negative. Based on Table 3 have been known 24 sample of jambal roti was negative from *Salmonella* sp. The result of this research agree with research from Edita *et al.* (2015) in Samarinda the explained the result of salted fish sample was negative from *Salmonella* sp.

4.7 *E. Coli*

Table 4. *E.coli*

Source	Kode	Result
A	111	$1 \cdot 10^{-1}$
	112	Negatif
	113	Negatif
	114	Negatif
B	115	Negatif
	116	Negatif
C	117	Negatif
	118	Negatif
D	119	Negatif
	120	Negatif
E	121	Negatif
	122	$4,5 \cdot 10^{-1}$
F	123	$1.0 \cdot 10^{-1}$
	124	Negatif
	125	$2.0 \cdot 10^{-2}$
G	126	Negatif
	127	$1.0 \cdot 10^{-1}$
	128	Negatif
	129	Negatif
H	130	Negatif
	131	Negatif
I	132	Negatif

J	133	Negatif
K	134	$0.5 \cdot 10^{-1}$

Based on Table 4 have been known 75% sample of jambal roti was negative from *E. coli*, but 25% sample of jambal roti was positive from *E. coli*. SNI itself said that existence of *E. coli* in salted fish was < 3 , with the result that the existence of *E. coli* in 25% sample still qualify from SNI.

5 CONCLUSION

Although in several tests was found the result still qualify, but with the discovery of formaldehyde content in sample of jambal roti, can be concluded that jambal roti that sold in Solo City was not safe.

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