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Effect of Soaking Time's Variation of Red Onion (*Allium Cepa* L) Extracts on Formalin Content in Mackerel Tuna (*Euthynnus Affinis*)

Indah Denissa Lestyaningrum[1], Kurnia Ritma Dhanti[2*], Retno Sulistiyowati[3], Kurniawan[4]
[1-4] Department of Medical Laboratory Technology, Faculty of Health Science, Univesitas Muhammadiyah Purwokerto, Indonesia
Jl. Raya Dukuh Waluh-Purwokerto Telp. 0281-636751
*Email: kurniard08@gmail.com

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ABSTRACT

Mackerel tuna (Euthynnus affinis) is one of the most popular foods in the community since it is affordable and has complete nutritional content. It is a frozen fish food product so the storage period of which is relatively short. In addition, it is possible to add formalin on which. Formalin is a substance that is prohibited from being used due to its dangerous effects. The content of saponin compounds found in red onions (Allium cepa L) can be used to reduce formalin levels. This study aimed to determine the effect of variations in the soaking time of red onion extract on the formalin level in mackerel tuna and the optimal soaking time for reducing formalin levels. This study used an experimental method with a posttest control group design. The treatment was given by soaking red onion extract at a concentration of 10% in mackerel tuna containing formalin with variations in soaking time of 1 hour, 2 hours, and 3 hours which were tested quantitatively using a UV-Vis spectrophotometer. Then, the data were analyzed using a one-way ANOVA statistical parametric test and a post hoc test using Duncan's test (DMRT). The decrease of the formalin levels by soaking the onion extract for 1 hour, 2 hours, and 3 hours was 10.61%, 41%, and 73%, respectively. The result showed that there was an effect of the soaking time of red onion extract on formalin levels (p-value 0.05), and the optimal time of soaking onion extract to reduce the formalin content of the samples was 3 hours.

INTRODUCTION

Food additives can be interpreted as ingredients added or mixed in food products to affect the nature or form of these food products. In general, the purpose of adding food additives is for product aesthetics, and also to extend the shelf life of food products (Wahyudi, 2017). Today there has been a lot of abuse of formalin chemicals by irresponsible food producers. Formalin chemicals are often used as preservatives in food products because they are easy to obtain, cheap, and easy to use. One of the food products that use formalin in the processing of fresh fish is mackerel tuna.

Mackerel tuna (*Euthynnus affinis*) is one of the most popular foods in the community because it has economic value and complete nutritional content. Mackerel tuna has a protein value of up to 26%, contains essential amino acids that function as building blocks for body cells, and has a low-fat content. In addition, mackerel tuna contains omega-3 fatty acids which are good for human intelligence and contain high levels of important mineral salts (Sitompul, Sugitha, and Duniaji 2020).

According to the Regulation of the Minister of Health of the Republic of Indonesia

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Number 033 of 2021 concerning Food Additives, formalin is prohibited from being used as a food preservative because it is carcinogenic. Formalin if swallowed can cause a burning feeling in the mouth and throat, headache, and stomach ache and can cause genetic disorders in humans and can cause cancer (Juliadi, Debby., Yuliasih 2016).

Red onion (*Allium cepa*) contains flavonoids, saponins, allicin, alliin, phosphorus, and phytosterols. This saponin compound found in red onions is used to reduce the formalin level found in fish. Saponins can reduce formalin levels by carrying out a soap formation reaction or saponification, namely by binding to formalin and then it will dissolve with water (Hanum, Ardiansyah, and Handayani 2019).

Samples of mackerel soaked in red onion filtrate showed the lowest formalin content of 0.10 mg/L obtained at 50% red onion filtrate concentration for 5 days of immersion (Anglania and Hanum 2019). These results indicate that there is a significant effect of the soaking process with red onion filtrate on formalin levels. Another study was conducted with samples of white shrimp soaked in 20% galangal solution for 60 minutes, which decreased formalin levels by 63%. Galangal contains saponins that can bind formalin in white shrimp samples (Jannah, ruf, and Surti 2014). This shows that the content of saponin compounds can influence and reduce formalin levels.

METHOD

This study used an experimental method with a posttest control group design. The research was carried out at the Laboratory of Analytical Chemistry, Faculty of Pharmacy, Universitas Muhammadiyah Purwokerto in April-May 2022. The tools and materials used include a UV-Vis spectrophotometer (Shimadzu), beakers, measuring cups, Erlenmeyer flask, test tubes, micropipette, analytical balance, rotary evaporator, water bath, timer, knife, dropper pipette, blender, mortar, and pestle. Materials needed include 37% formalin, Nash reagent, distilled water, red onions, 70% ethanol, and mackerel tuna samples. Analysis of saponin compounds in red onion plants was carried out using the FTIR (*Fourier Transmitted Infra-Red*) test.

Red onion extract is made from 2 kg of red onions, thinly sliced , and crushed with a blender to become powder. Put 200 grams of onion powder into a glass container and add 2 liters of 70% ethanol. The maceration process was carried out for 5 days with daily stirring. The maceration is filtered to separate the macerate from the precipitate. Macerate is evaporated using a Rotary evaporator at low temperature. Macerate was concentrated using a water bath to obtain a thick extract. Preparation of 10% red onion extract concentration is by adding 10 mg of red onion extract in a 100 ml measuring cup and then adding distilled water to a measuring limit of 100 ml then homogenizing.

Soaking the mackerel tuna sample using red onion extract was carried out by cutting the mackerel tuna sample with a size of 6 x 4 cm. Each piece of fish was put in a beaker glass and soaked in 100 ml of red onion extract with a variety of soaking times by 1 hour, 2 hours and 3 hours. Weighed 15 g of each sample and pulverized it then added 25 ml of distilled water, then filtered and 2 ml of filtrate was taken. Add 5 ml Nash reagent to each sample, heat for 20 minutes, and cooled. The absorbance of the sample was then measured using a spectrophotometer with a wavelength of 410 nm.

Preparation of formalin standard solutions as much as 1 ml, 1.5 ml, 2 ml, 2.5 ml, and 3 ml, and at each concentration added Nash reagent 4 ml and 10 ml aquadest. The mixture was incubated for 20 minutes at 37°C and then the absorbance was measured with a UV-Vis

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spectrophotometer at a wavelength of 410nm. The data were analyzed using the one-way ANOVA statistical parametric test and Duncan's Multiple Range Test.

RESULT AND DISCUSSION

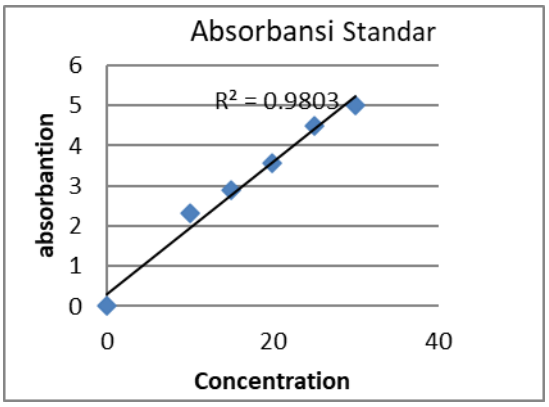

Figure 1. Standard Absorbance Curve

Based on Figure 1, it is known that the linear equation is y = 0.163x + 0.3126, with a value of R^2 = 0.9803. The coefficient value obtained is close to 1 so it can be said that there is a close relationship between the concentration and the measured absorbance value. All of the measurement results lie in a straight line.

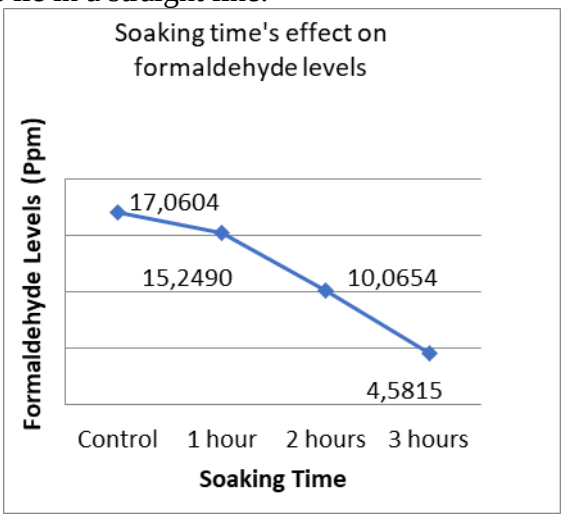

Figure 2. Effect of Soaking Time on Formalin Levels

Figure 2 shows that soaking red onion extract with time variations of 1 hour, 2 hours, and 3 hours affects reducing formalin levels in mackerel tuna.

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Table 1. Analysis of the Effect of Extract Soaking Time on Mackerel tuna Formaldehyde Levels

Treatment	Mean (SD)	*P Value*
K	17.06 (0.603)	
Group 1	15.24 (0.456)	0.000
Group 2	10.06 (0.528)	
Group 3	4.58 (0.691)	

Table 1 shows that the p-value <0.05 so that there is an effect of the soaking time of red onion extract on formalin levels.

Table 2. Formaldehyde Levels of Mackerel tuna

Treatment Group	Number of samples (N)	Mean (SD)
Control	18	17.06 (0.603)[a]
Group 1	18	15.24 (0.456)[b]
Group 2	18	10.06 (0.528)[c]
Group 3	18	4.58 (0.691)[d]

It is shown in Table 2 that the average formalin levels before soaking (control) is 17.0604 ppm. The average formalin content by soaking red onion extract showed that the formalin level obtained at Group 1 (soaking red onion extract for 1 hour) was 15.2490 ppm, then Group 2 (soaking red onion extract for 2 hours) was 10.0654 ppm, and Group 3 (soaking red onion extract for 3 hours) of 4.5815 ppm. This shows that the average yield of formalin levels before treatment (control) has higher levels than mackerel tuna treated with red onion extract immersion. The results showed that the longer the immersion, the lower the formalin levels (P, Ma'ruf, and Rianingsih 2013). The FTIR test results of red onions which are suspected of having saponin compounds show absorption at several wavelengths indicating the presence of OH, C-H, and CO groups.

The results of this study showed that the highest reduction in formalin levels was when soaking red onion extract for 3 hours with a percentage of 73.14%, then soaking for 2 hours by 41% and soaking for 1 hour by 10.61%. The results of this study were supported by research using samples of tilapia fillets soaked with African leaf extract at a concentration of 5% containing saponins, which resulted in a decrease in formalin levels of 68.75% (Mayasari and Priyono 2022).

Saponin compounds in red onion extract can reduce formalin levels in mackerel tuna through the surfactant mechanism. The surfactants present in this saponin compound have a hydrophobic group which can dissolve in a non-polar substance and a hydrophilic which can dissolve in a polar substance. The mechanism of this surfactant will bind to formalin by reducing the surface tension which makes the surfactant the potential to be a foaming agent

and emulsifier. The presence of both groups (non-polar and polar) in surfactants in saponin compounds has the qualifications to form water and formalin emulsions so that saponins have a role as emulsifiers (Juliadi et al., 2018).

The decrease in formalin levels in mackerel tuna occurred when it was soaked with red onion extract. The formalin will then be removed by the saponin compounds in the red onion extract and the saponin compounds will form micelles. The round part of the micelle is the head that points outward which then interacts with water and will wrap the formalin so that the formalin will dissolve together with the water (Zamhariroh and Ratmana Hanum 2018).

CONCLUSION

There was a significant effect of the soaking time of red onion extract on formalin levels in mackerel tuna (p-value <α 0.05). The most effective soaking time in reducing formalin levels in mackerel tuna samples was 3 hours with a reduction percentage of 73.14%.

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