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Utilization of belimbing wuluh (*Averrhoa bilimbi*) to reduce urea levels from shark (*Carcharhinus* sp.) meat in shredded processing

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Abstract. This research aimed to reduce the urea level in the shark meat and to find out the suitable concentration of *Averrhoa bilimbi* extract to reduce urea level in the shark meat for processing of shredded meat. Trehis research were to soak the shark meat in the *Averrhoa bilimbi* extract with 0% (without soaking), 20%, 40%, 60% by three repetitions for each treatment. Parameter that observed in this research were the amount of urea in the product and organoleptic test of colour, taste, flavour, and appearance. Soaking in the *Averrhoa bilimbi* extract of 60% could reduce the urea level in the product as much as 69.51%.

Keywords: *Averrhoa bilimbi*, shark meat, urea

1. Introduction

The unpleasant odor of shark meat is an inhibiting factor in shark meat consumption. The odor comes from ammonia resulted from degradation urea compound of the meat [1]. The content of urea in shark meat is around 2-2.5% while the urea content for the hard bony fish which is commonly consumed is 0.05%.

Urea is a colorless and not harmful to certain ingredients, but the urea in shark meat produces a sour bitter taste. Urea is a source of ammonia compound that have a strong odor [2]. Urea is dissolvable in water, alcohol, methanol, and pyrimidine but not in ether and fuel. The content of urea in shark meat can be removed or reduced with a number of ways, such as soaking in salt, washing with cold air repeatedly and soaking in acid solution, for example in tamarind solution, vinegar, lime [1, 3, 4].

This research aimed to reduce urea level in shark meat by soaking it in *Averrhoa bilimbi* extract acid solution so that it can be processed into shredded meat without sour bitter taste. *A. bilimbi* contains citric acid with pH 5.5-6.5 so it can be used to reduce urea contains in shark meat [4]. Shark meat can be processed into nutritious products because of high content of protein (20.1%), low fat (1.30%). Proportion of shark meat is up to 42% of shark body whereas the meat that can be used is 51% and the mineral content is around 0.6%-18% [1-3]. The information on the use of *A. bilimbi* extract for reducing the urea level in shark meat is expected to be useful in increasing the utilization of the raw meat from the shark.



2. Research and Methods

This research used shark meat, aquades, 4-dimethylaminobenzaldehyde (DMAB), sulfuric acid, Zn-acetate, phosphate buffer, and filter paper. The equipment used for this research were an analytical scales, spectrophotometer, 4-inch diameter funnel, pipette, and test tube and also the equipment used for shredded meat processed.

This research was divided into several three stages, i.e. experiments of shark meat soaked at 4 levels of *A. bilimbi* extract to measure the effect of the extract to the urea level in the shark meat, organoleptic test, and statistical analysis. The experiment applied complete random design with 3 replication. Levels of extract solution were 0%, 20%, 40% and 60%.

The meat sample was weighed with volumetric flask of 500 mL, added with 100 grams of active charcoal, 5 mL $K_4Fe(CN)_6$ and 5 mL $Zn(OAc)_2$. The ingredients were mixed together for about 30 minutes at a high speed and then was filtered with filter paper Whatman number 40. The clear filtrate on the filter paper was collected as much as 5 ml using a pipette. The filtrate was then put in a test tube and added with 5 mL DMAB. The tube test was shaken until the content became homogenous solution. Levels of urea were measured from absorbance at 420nm wavelength [6].

Organoleptic test [7] includes: color, taste, aroma and appearance. Organoleptic testing was carried out by 10 trained panelists who reported their final scores. Scores for color assessment: 1 = black brown, 5 = dark yellow; scores for taste: 1 = tasteless, 5 = tasteful; scores for aroma: 1: odor, and scores for appearance of typical shredded meat: 1 = not attractive, 5 = very attractive.

Data that obtained from organoleptic test were analyzed using Sign Test where:

$$\begin{aligned} x^2 \text{ calc} < x^2 \text{ table } 5\% \text{ and } 1\% &= \text{not significantly different,} \\ x^2 \text{ calc} < x^2 \text{ table } 5\% &= \text{very significantly different} \\ x^2 \text{ calc} > x^2 \text{ table } 5\% \text{ and } 1\% &= \text{significantly different.} \end{aligned}$$

The data of urea level were analyzed using analysis of variance (ANOVA).

Fresh shark meat was taken immediately to the laboratory and cleaned up. The meat was cut into steaks of 13 cm x 3 cm x 2 cm. The meat was soaked in the *Averrhoa bilimbi* extract solution for about 30 minutes. The extract was obtained by separating the liquid from the pulp with a juicer. The ratio between the solution and the meat was 2 : 1, i.e. 78 cc of solution and 39 cc of meat. After being soaked, the shark meat was steamed for 60 minutes. After that, the shark meat was let cool down and the skin was peel off and boned. The shark meat was then fried and stirred with coconut milk and seasoning (garlic, onion, coriander, salt, sugar, galangal and turmeric) until the coconut milk dried up.

3. Results and Discussion

3.1. Urea level

Analysis of variance revealed a very significant effect of the solution on the urea levels of shredded shark meat. Higher concentration of the *A. bilimbi* extract produced shark meat with lower level of urea (figure 1). Solution with no extract *A. bilimbi* shows the highest level of urea in the meat (1.7%) whereas solution with 60% extract shows the lowest level of urea in the meat (0.18%).

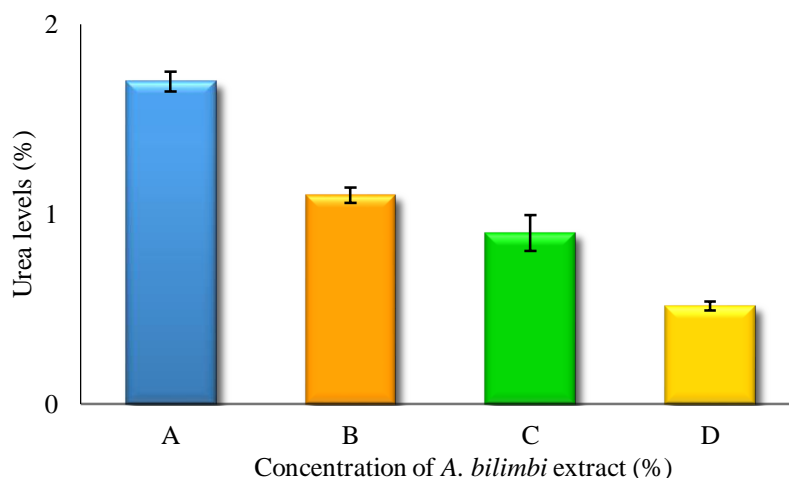


Figure 1. Test results of urea levels (%) shredded *shark* meat, (A) 0; (B) 20; (C) 40; (D) 60.

A. bilimbi contains citric acid with a pH of 5.5 to 6.5 [5]. If carboxylic acid is mixed with amine, salt will be obtained because the acid is the proton and amine is the recipient of the proton. Based on that reaction, the urea will become neutral. From the analysis results of urea levels of fresh shark meat taken from the tail, stomach and the back that already shredded showed the levels of urea were 1.181%. Decrease in urea levels due to heating when meat cut into shreds is only 0.2% from 1.8% to 1.6975%, because ammonia due to decomposition of urea will then evaporate [8] while the addition of seasoning is only flavor and aroma. From the results of research by soaking in a solution of 60% *A. bilimbi* extract can reduce levels of urea 1.69% (control) to 0.517% so as to reduce levels of urea as much as 69.51%. Urea is a class of colorless non-protein nitrogen compounds, it can decompose into biuret ($\text{NH}_2\text{CONHCONH}_2$) and ammonia by heat. Urea can also be hydrolyzed to CO_2 and ammonia by acids and bases [9].

Analysis of variance ($\alpha = 0.05$) shows that the immersion treatment with *A. bilimbi* extract had a significant difference between each treatment. It means that treatment given gave the significant influence on the urea level from the shark meat.

3.2. Organoleptic test

The average organoleptic test conducted by 20 panelists on flavor specifications showed that all shark meat soaked in the extract solution was accepted and favored by all panelists. From flavor point of view, the shark meat soaked in 40% extract (treatment C) had the highest score (3.60) while the meat soaked with no extract had the lowest score (2.55) (figure 2). All treatments successfully decreased the urea levels below 1.2%. This is why bitter taste was no longer present after the soaking. Urea which is alkaline plus acid will form a neutral salt.

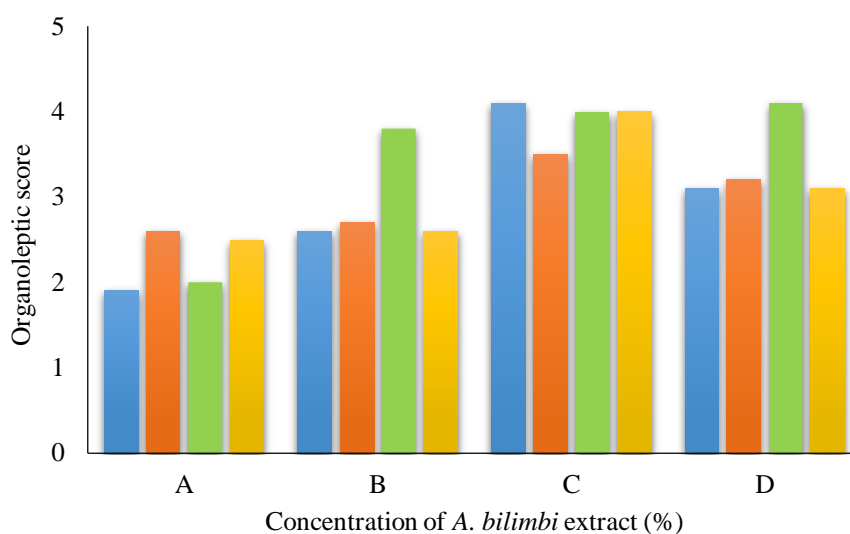


Figure 2. Result of organoleptic test shredded shark (■ color; ■ flavor; ■ smell; ■ appearance; (A) 0; (B) 20; (C) 40; (D) 60).

The organoleptic test on shark shredded meat concluded that the best meat was the meat treated with treatment D (score 4.2). All panelists preferred the meat with all type of treatment. If the urea content can be further lowered to below 1.2%, then the odor will be no longer smelled. Even with 1.4% urea content, the odor was sensed if the meat was added with seasoning [10]. In terms of color and appearance, the highest score was for the meat with treatment C (score = 4.20 and 4.05, respectively) while the meat with treatment A got the lowest scores (1.85 and 2.35, respectively). The Sign Test for data from organoleptic test concluded that there was no significant difference in among the meat with different treatments because the shark meat had been already in shredded form.

Table 1. Sign test analysis for organoleptic test.

| Combination of treatment | Specification | X ² Calc | X ² table | |
|--------------------------|---------------|---------------------|----------------------|------|
| | | | 5% | 1% |
| B – A | Appearance | 0.14 | 3.62 | 6.63 |
| C – A | | 0.81 | | |
| D – A | | 0.64 | | |
| B – D | | 0.56 | | |
| D – C | | 1 | | |
| B – A | Color | 0.64 | 3.62 | 6.63 |
| C – A | | 0.7 | | |
| D – A | | 0.7 | | |
| B – D | | 0 | | |
| D – C | | 1 | | |
| B – A | Smell | 0.78 | 3.62 | 6.63 |
| C – A | | 0.76 | | |
| D – A | | 0.78 | | |
| B – D | | 0.64 | | |
| D – C | | 0.78 | | |
| B – A | Flavor | 0.04 | 3.62 | 6.63 |
| C – A | | 0.78 | | |
| D – A | | 0.01 | | |
| B – D | | 0.69 | | |
| D – C | | 0.76 | | |

4. Conclusion

The extract solution of *Averrhoa bilimbi* effectively reduced the level of urea in the shark meat. Immersion of shark meat in in 60% extract solution if *A. bilimbi* could reduce urea content from 1.69% (control) to 0.517%. The higher the concentration of *A. bilimbi* extract, the lower the content of urea in shredded and the more favored by consumers.

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