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THE ROLE OF MYOFIBRILS IN THE FORMATION OF GEL OF SURIMI GIANT TREVALLY (*Caranx* sp)

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ABSTRACT

Giant trevally (*Caranx* sp) is one type of by-catch fish that is often thrown back into the sea. To increase the economic value of this fish, one of the alternatives is making surimi. This study aims to study the effect of inhibition of softening gel (Modori) of surimi by egg white protein with various concentrations. The method used is an experiment with 2 treatments, namely the addition of egg white protein (A) with a concentration of ; A1 = 1%, A2 = 2% and A3 = 3% and the gelling temperature (B) is 45ºs C for 20 minutes - 85º C for 15 minutes. Completely Randomized Design (CRD) was used to analyze the data with two replications and continued Analysis of diversity (ANOVA). The parameters analyzed in this study include objective parameters, namely water content, protein content and subjective parameters of color, folding test and texture. The results showed that water content, color, texture and folding test increased while protein content decreased.

Keywords: Egg White, Sarcoplasm, Elasticity.

I. INTRODUCTION

Surimi is a processed product made from white-fleshed fish [1]. One fish that has important economic value that is often used in making surimi is giant trevally (*Caranx* sp) because it has a soft and white flesh texture and does not have red meat. Fish that have white flesh usually contain a lot of myofibrillar protein which plays a very important role in the gel formation process [2], while red meat has poor gelling ability. It is necessary to add certain additives, in this case egg white protein which will help in the process of forming fish surimi gel. One of the obstacles that will be faced in the manufacture of surimi based products from surimi giant trevally (*Caranx* sp.) is the formation of a soft gel as a result of the activity of protease enzymes during heating. This softening of the gel occurs when the surimi is cooked at a temperature of about 60^0C. The protease enzyme works actively and is stable at a temperature of 60^0C [3]. Actually this is not a major problem in the manufacture of products with surimi-based ingredients, because surimi-based products are usually cooked at high temperatures (90^oC), but it will be a problem if surimi is used as an ingredient in the manufacture of products in the form of an emulsion from red meat which is usually slowly -land until a final temperature of about 70^oC is reached. The occurrence of softening of the gel (modori) can be inhibited by the addition of certain ingredients such as egg white protein containing 2-macroglobulin protein such as plasma hydrolyzate. This aims to assist in the gel formation process

2. RESEARCH METHOD

Time and Place

This research was conducted in February 2022, in the THP lab.

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Method

The method used in this study is an experimental or experimental method. Two treatments were tried, namely:

Treatment A (egg white protein concentration):

A1 = 1% egg white protein
A2 = 2% egg white protein
A3 = 3% egg white protein

Treatment B (gel formation temperature): B = 45^0C 20 minutes - 85 ^{0}C 15 minutes

Research Procedure

Surimi that is ready to be substituted for protein content with egg white protein. Before being substituted with egg white protein, the surimi was separated into three parts according to the research plan. The first part is substituted with 1% egg white protein; the second part was substituted with 2.0% egg white protein. The third part is substituted with 3% egg white protein; after that, the three-surimi mixtures were added with a 3.0% salt solution and mixed. Then each of the surimi mixture was put into the casing and then cooked using a temperature of 65^0C for 20 minutes.

Moisture Analysis Procedure

The weighing bottle and the lid were washed and then dried in an oven (dryer) at a temperature of 110-115^0C for 10 hours. Then the weighing bottle was put in a desiccator for 30 minutes using a clamp, then weighed (A). The sample of fish meat is weighed in the bottle (closed condition) as much as 2 g (B). Then put in a drying oven for approximately 16 hours until it reaches a constant weight, taken with a clamp, then put in a desiccator for about 30 minutes, then weighed (C). The water content can be calculated as follows [4].

$$\text{Water content} = \frac{(B+A)-C}{B} \times 100\%$$

Protein Analysis Procedure (Kjeldhal Method)

Extrusion is carried out by adding 1-2 g of sample, 3 g of a mixture of dextration and 20 ml of sulfuric acid in a Kjeldhal flask and dextrating until the black solution turns clear. After digestion, the Kjeldhal flask was cooled and the solution was mixed until homogeneous.

Distillation was carried out by inserting the extracted solution into the flask, adding 3 drops of phenolphthalein indicator to the destination, pairing the container solution in a 300 ml beaker containing 50 mL of 2% boric acid and 5 drops of tashiro indicator. Gradually the packet NaOH solution was poured into the distillation flask and distillation was carried out. Distillation ends when the distillate dripping on the end of the cooling column reacts neutrally to red litmus, the color of the holding solution changes to green.

The distillate was then distilled using a 0.1 N HCl solution until the color of the solution changed back to pink, then carried out as follows [4].

Folding Test Analysis Procedure (Folding Test)

Ripe surimi sliced 3 mm thick and folded into quadrants was given the highest score of 6, while the lowest value of 1 was given to surimi that fractured when subjected to any pressure [5].

Figure 1. Folding Test Standard for Cooked Surimi

Note: Folding test standard for cooked surimi. 3 mm thin sheet of surimi for good testing when folded: 1) cracks with any kind of crease; 2) cracks immediately when fully folded; 3) crack with folds at an angle of 900; 4) slowly crack; 5) circle in half easily; 6) coil in quadrants easily

Color and Texture Analysis Procedure

To analyze color and texture, the panelists UI used a hedonic scale by distributing score sheets to 15 panelists. The surimi sample was cut into cubes with a thickness of about 4 mm, then the sample was placed in a container (plastic) and ready to be tested by the panelists. Panelists will fill out the questionnaire sheet with the ones that have been prepared. Then determine the concentration of egg white and boiling temperature on the surimi gel color parameters (1. Chocolate; 2. Brownish yellow; 3. Yellow; 4. Pure white).

Surimi samples were cut into cubes with a thickness of about 4 mm, and then the samples were placed in a container (plastic) and ready to be tested by the panelists. Panelists will fill out the questionnaire sheet with the ones that have been prepared. For the concentration of egg whites and the boiling temperature on the surimi gel texture parameters can be assessed as follows (1. No; 2. Less chewy; 3. Chewy; and 4. Very chewy).

Data Analysis

Data analysis using CRD (Completely Randomized Design) with 2 treatments and 2 replications, followed by a one way anova test to see whether the effect is real or not by using IBM SPSS software version 23.

3. RESULT AND DISCUSSION

Surimi is a processed product resulting from food diversification that is in great demand by various circles of society. One of the characteristics of surimi is that it has a surimi gel with good gel elasticity. Good gel elasticity can be obtained by adding certain additives such as egg white protein.

Water content

From the results of the study in Figure 2 below, it can be seen that the water content value increases with the addition of egg white concentration, and the highest water content is in the A3B treatment which is 78.5 this is because the boiling process of surimi using a temperature of 45ºC causes the functional properties of the protein. Fish meat changes so that the water content of the surimi produced increases [6]. Based on the results of the analysis of diversity (Anova) it can be seen that the calculated F (0.11) is greater than Ftable (0.013) at an alpha of 0.05 indicating a significant effect. This is because in the A3B treatment, the addition of a 3% solution during the fish meat washing process causes the water content of the fish surimi gel to increase [7].

Protein Content

The results of the analysis of variance (Anova) showed that the calculated F (0.02) was smaller than the F table (0.16) at alpha 0.05 indicating an insignificant effect, because the myofibrillar protein that functions in gel formation was reduced due to the process of gelling, boiling, and also washing [8].

Color

From the results of the study in Figure 4 below, the color of the surimi product produced in this study is also influenced by the concentration of egg white protein. The use of a concentration of 3% egg white (A3B) resulted in an increase in the color of the surimi because a greater concentration of egg white resulted in the addition of myofibril proteins, especially myoglobin that gives color to fish meat. According to [9] the whiter color is due to washing with a 3% salt solution so that it can reduce the fat content and water content and the resulting surimi is lighter in color.

Based on the results of the analysis of diversity (Anova) it can be seen that the calculated F (0.052) is smaller than the f table (0.152) at alpha 0.05 so it does not

have a significant effect, because the color of a good surimi gel is largely determined by the amount of meat protein itself [2].

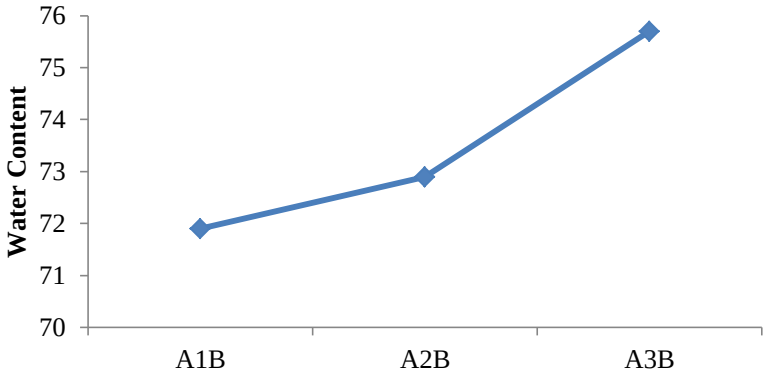

Figure 2. Parameters of Moisture Content

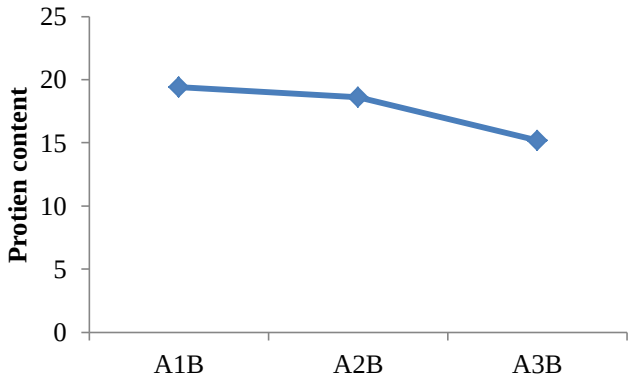

Figure 3. Graph of protein content parameters

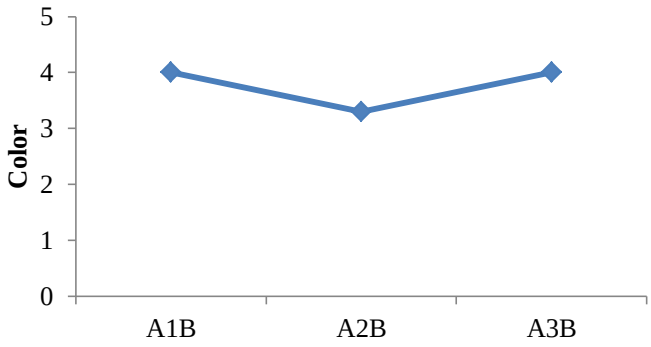

Figure 4. Color Parameter Graph

Texture

From the results of the study in Figure 5 below, it can be seen that the texture value in the A3B treatment decreased with increasing egg white protein concentration, this was due to the heating process at 45º C where modori often occurred, namely the reduced ability to form gel so that the texture decreased. [11] An increase in heating temperature causes the protein to be denatured and the resulting texture is soft.

Fold Test

Based on the results of the study in Figure 6. Below it can be seen that the folding test value increases with the addition of egg white concentration. The A3B treatment has a high folding test value because an increase in the concentration of

egg white will form a matrix bond between meat proteins thereby increasing the elasticity of the gel. three-dimensional network to produce an elastic gel

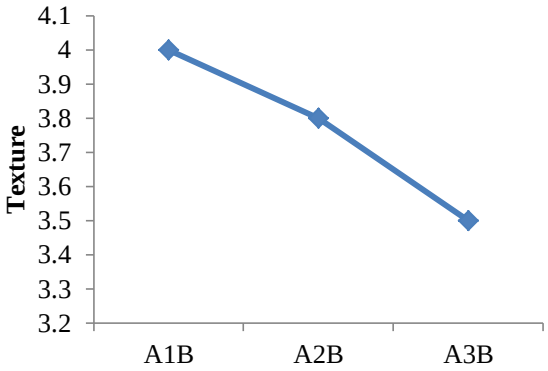

Figure 5. Texture parameter

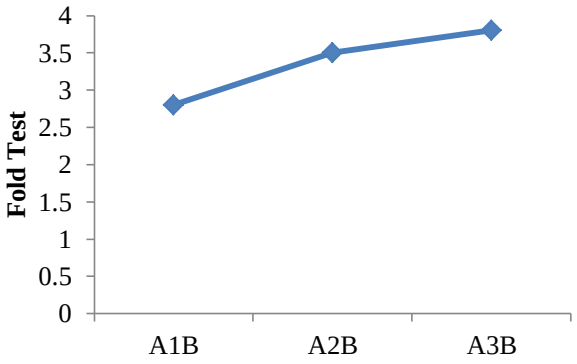

Figure 6. Graph of Folding Test Parameters

4. CONCLUSION

From the results of this study it can be concluded as follows to the public about the importance of myofibrils in the formation of fish gel. The addition of 3% egg white concentration will produce good water content, color and texture folding test but the protein content is reduced.

REFERENCES

1. Kataryzna, W., Krystyna, S. (2008). The Application of Wheat Fibre and Soy Isolate Impregnated with Iodine Salts to Fortify Processed Meats. *Meat Science*, 80(4): 1340–1344.
2. Park, J.W. (2014). *Surimi and Surimi Seafood: Third Edition.* New York (US): CRC Press.
3. Nagahisa, E., Sachico, N.J., Fujita, T. (1981). Kamaboko - Forming Ability of The Je Lied Meat of Pacific Hake Bull Jap. *Soc Sci Fish* 46: 901.
4. [AOAC] Association Official Analitical Chemistry. (2005). *Official Methods of Analysis.* Arlington, New York.
5. AFDF. (1987). Its American Now Alaska Fisheries Development Foundation Inc. USA.
6. Kusnandar, F., Andarwulan, N., Herawati, D. (2011). *Kimia Pangan.* Jakarta: PT. Dian Rakyat.
7. Lestari, S. (2011). Penggunaan Bahan Pencuci Alkali dan Perendaman Fillet dalam Pembuatan Surimi Pada Formulasi Pempek Patin (*Pangasius Pangasius*).
8. Suryaningrum. (2009). Prospek Pengembangan Usaha Pengolahan Pempek Palembang.
9. Ramadhan, W. (2013). *Perubahan Mutu dan Pendugaan Umur Simpan Surimi Kering Beku Ikan Lele (Clarias Sp.). Skripsi.* Fakultas Perikanan dan Ilmu Kelautan. Institut Pertanian Bogor. Bogor.
10. Hosseini-Shekarabi, S.P., Hosseini, S.E., Soltani, Valinassab, T.M., Kamali, A. (20140. A Comparative Study on Physicochemical and Sensory Characteristics of Minced Fish and Surimi from Black Mouth Croaker (*Atrobucca nibe*). *Journal of Agricultural Sciences Technology*. 16: 1289-1300.