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PHYSICAL CHARACTERISTICS OF ARGYROSOMUS AMOYENSIS SURIMI BASED-EDIBLE PACKAGING

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KeyWords
Argyrosomus amoyensis, edible film, edible coating, physical characteristics, tensile strength, percent elongation, packaging

ABSTRACT

Argyrosomus amoyensis is a native fish from Pangandaran waters which is quite abundant but has low economic value. To increase the added value, it can be used as surimi as raw material for edible packaging. The purpose of this study was to determine the physical characteristics of edible packaging made from surimi *Argyrosomus amoyensis.* The method used in this research was an experimental, with four treatments and three replications. The treatments given are Argyrosomus amoyensis surimi concentration of 2%, 6%, 10% and 14%. Pangandaran's local fishery product, Argyrosomus amoyensis fish extracted into surimi (myofibril) can be used as material for making edible packaging. The resulting edible packaging has physical characteristics that comply with edible packaging standards based on the Japan International Standard (JIS). The average viscosity value is 3.87-13.24 Cp, the average thickness is 0.0016-0.0065 cm, the tensile strength value is 158.22-6328.12kgf /cm^2, and the elongation percent value is between 2.12-77.82%.

INTRODUCTION

Edible packaging (film and coating) made from biodegradable materials is increasing in the food packaging industry [1]. Polysaccharides-based polymers that are potentially used for packaging systems or can be combined include starch, alginate, cellulose, chitosan, carrageenan, and protein-based polymers [2], [3]. Fishery products are a high source of protein, one of which can be obtained from wet protein concentrates or known as surimi.

Fishery products in their role as edible packaging must have characteristics that are suitable for packaging for food products. Edible coating materials must have the ability to form a good gel and have a bright color. Furthermore, edible film material must have high tensile strength, transparency, and elasticity. These things are the basic criteria of an edible package. The level of confidence that can be used to determine edible packaging materials that fit the characteristics of the packaging is to choose the most suitable packaging raw materials. Thus the analysis of the selection of edible packaging raw material types from fishery products is very important to know.

Pangandaran waters is one area that has abundant potential of local fishery products, thus can be used as an area for exploration of edible packaging material resources. Abundant local fisheries products include gulamah fish (*Argyrosomus amoyensis*). Gulamah fish (*Argyrosomus amoyensis*) is a native fish from Pangandaran waters, but has low economic value. To increase the added value, it can be used as surimi as raw material for edible packaging. Thus the physical character needs to be known so that it can be optimally applied in its function as an edible package. So it is necessary to do research on the physical characteristics of edible packaging made from surimi Gulamah fish (*Argyrosomus amoyensis*). The purpose of this study was to determine the physical characteristics of edible packaging made from surimi Gulamah fish (*Argyrosomus amoyensis*).

Materials and Method

Materials

The material used to making surimi that will be used as raw material for edible packaging is gulamah fish (*Argyrosomus amoyensis*) with a size of 300 grams / head as much as 5 kg. *Argyrosomus amoyensis* fish was obtained from a fish auction place in Pangandaran, ice, water, salt, aquades, glycerol, and NaOH 1 M.

The tools needed for making surimi protein edible packaging are analytical balance, thermometer, spatula, grinder, washing container, calico cloth, freezer, knife, cutting board, polyethylene bag, measuring cup, beaker glass, hot plate, magnetic stirrer, pH meter, dropper pipettes, oven, molds (13 cm × 22 cm × 2.5 cm), digital micrometer, UV spectrophotometer, and orbital shaker.

Method

The method used in this research was an experimental, with four treatments and three replication with a comparative descriptive method for analysis. The treatments given are *Argyrosomus amoyensis* surimi consentration of 2%, 6%, 10% and 14%.

Preparation of *Argyrosomus amoyensis* surimi based-edible Packaging

The method of making edible packaging made from surimi protein (myofibril) from plump fish (*Argyrosomus amoyensis*) originating from Pangandaran waters is a modification of the research method [4], who found that a stable edible film had been successfully formed from the alaska pollack protein with a concentration of 2%. The results of the study [5] showed that selected edible films from trash fish surimi were edible with an additional surimi concentration of 10%. The results of the research [6], based on the hedonic test and color test, obtained the results that the surimi concentration on the edible coating most preferred by panelists and produced the highest level of brightness and color was 14%. Based on these results, the range of surimi additions for edible packaging is used in 2, 6, 10, and 14% (w / v). Surimi which is frozen is thawing for 20 minutes. Dissolution of surimi (2, 6, 10, and 14% (w / v)) into aquadest to 150 ml and 1 M NaOH to pH 11 and glycerol 1% added. Then stir for 30 minutes at a temperature of 55^{o}C. Surimi suspension is filtered with nylon 150 mesh size. Filtrate of protein solution is obtained and divided in two. Filtrate in the form of suspension is an edible coating and the viscosity is tested. Furthermore, some of the filtrate was put into a glass film mold, dried in an oven at 50^{o}C for 20 hours, and edible film was obtained for testing. The packaging of edible film made from surimi produced was then analyzed by thickness, tensile strength, and elongation percent.

Data Analysis

Quantitative data from the analysis of the characteristics of edible packaging (film and coating) of each treatment will be discussed descriptively and compared with the Japanese Industrial Standard (JIS).

Result and Discussion

A. Edible Packaging Viscosity Made from Surimi (Myofibril) *Argyrosomus amoyensis*

Viscosity measurements used Viscometer Brookfield spindle no.2 with a rotational speed of 30 rpm. Dissolved sample (surimi solution that has been made until the filtering stage) is inserted into the viscometer tube, then the viscometer is turned on. Viscosity is affected by the amount of solute present in the solution. The average value of edible coating viscosity of edible coating surimi is presented in **Figure 1.**

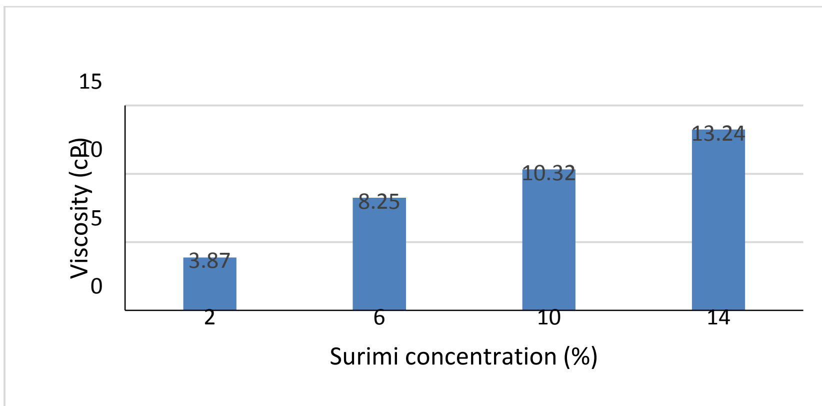

Figure 1. Average edible coating viscosity value of *Argyrosomus amoyensis* surimi

Edible coatings are made from surimi with various concentrations, namely 2%, 6%, 10%, and 14%. Edible coating that is formed is clear and the higher the concentration, the more turbid it looks. Edible coating of surimi Argyrosomus amoyensis is presented in **Figure 2.**

Figure 2. Edible coating of *Argyrosomus amoyensi* surimi (myofibril)

The greater the concentration of surimi added, the edible coating viscosity increases (**Figure 1**). This is caused by the amount of surimi protein added to the solution being denatured by the base added in the process of making edible coatings. The molecular bonds are damaged, then the molecule will expand and the development of this molecule results in increased viscosity [7]. The increasing amount of surimi as the solute added also increases the amount of dissolved solids in the edible coating. Viscosity is influenced by the substances that are dissolved in the solution, if the more dissolved substances and the thicker the solution the higher the value of the viscosity produced. Colloidal suspension in solution can be increased by thickening the liquid. Development of solute molecules results in increased viscosity [7].

B. Thickness of Edible Films Made from *Argyrosomus amoyensi* Surimi

Thickness is an important parameter that influences the formation of edible film. The thickness value of edible film made from *Argyrosomus amoyensi* Surimi is presented in **Figure 3.**

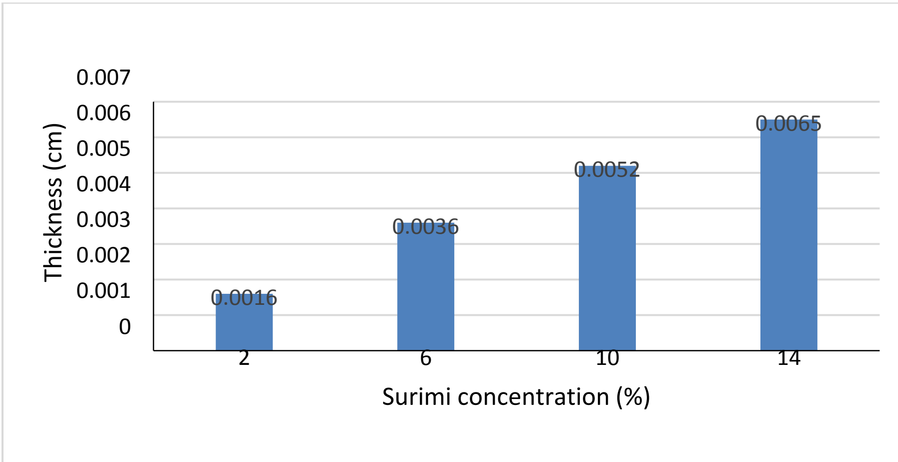

Figure 3. Value of edible film thickness from *Argyrosomus amoyensi* Surimi

The higher the addition of surimi concentration to the edible film formulation, the higher the thickness value is produced. The greater the amount of surimi added will increase the amount of protein in the edible film solution, so that more deposits occur as forming edible film. The thickness of the edible film is also influenced by viscosity, the higher the viscosity value, the resulting edible film will also be thicker. The thickness of the film is affected by the area of the mold, the volume of the solution, and the total amount of solids in the solution. Edible film thickness values obtained in all treatments were <0.25 mm. This value meets the Japanese Industrial Standard (JIS). Edible film thickness value> 0.25 mm are not good because they can limit the exchange of gas produced by respiration so that the product can be easily damaged.

C. Tensile Strength *Argyrosomus amoyensi* Surimi Based on Edible Packaging

One important mechanical property of edible film is tensile strength (tensile strength) because it can reflect the resistance of the film and the ability of packaging to maintain compactness of food [8]. The tensile strength value of edible films from surimi (miofibril) plump fish is presented in **Figure 4.**

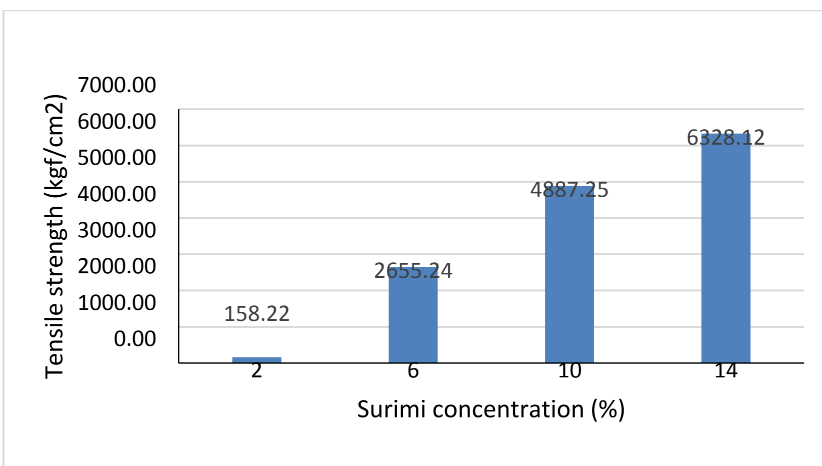

Figure 4. Average tensile strength of edible films from *Argyrosomus amoyensi* Surimi

The greater the concentration of surimi added, the tensile strength of the edible film produced will also increase. This happens because the amount of protein present in the formulation becomes higher. The resulting tensile strength is influenced by the film formulation. Myofibril protein consists of 20 amino acids and contains cysteine and methionine which is quite large. Amino acids affect the bonds between myofibril proteins, so many disulfide bonds are formed which cause protein bonds to become stronger. This causes the tensile strength of edible films from myofibril protein to be high [9].

D. Percent Elongation Edible Film made from *Argyrosomus amoyensi* Surimi

Percent elongation is a condition where the film is broken after experiencing a change in length of the actual size at the time of stretching [10]. Percentage values of edible film elongation from *Argyrosomus amoyensi* surimi are presented in **Figure 5**.

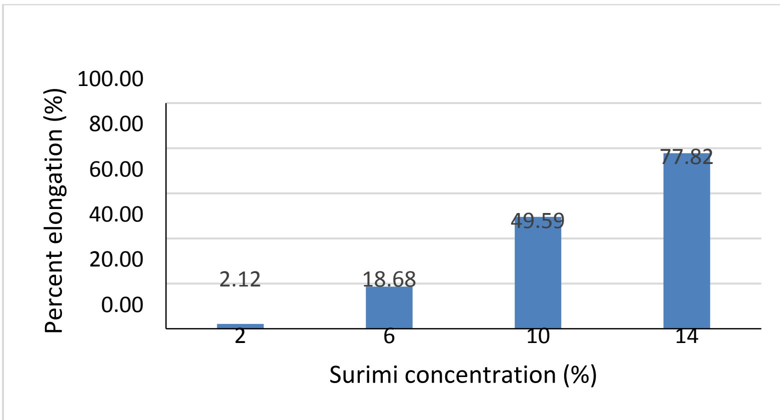

Figure 5. Average percent elongation of edible films from *Argyrosomus amoyensi* Surimi

The higher the concentration of surimi used, the greater the percentage of elongation produced. According to [7], this can happen because the resulting polymer matrix is getting stronger and causing the intermolecular tensile strength to become stronger, so that the stretching ability of the film also increases.

Conclusion

Pangandaran's local fishery product, plump fish (*Argyrosomus amoyensis*) extracted into surimi (myofibril) can be used as material for making edible packaging. The resulting edible packaging has physical characteristics that comply with edible packaging standards based on the Japan International Standard (JIS). The average viscosity value is 3.87-13.24 Cp, the average thickness is 0.0016-0.0065 cm, the tensile strength value is 158.22-6328.12kgf /cm^2, and the elongation percent value is between 2.12-77.82%.

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