The Effect of Addition of Dextrin and Arabic Gum to The Quality of Crude Albumin Fish Cork (Ophiocephalus striatus)

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Abstract- Cork fish is a type of fish that is very high albumin. Making albumin powder is an alternative to consuming cork fish albumin so it is preferred and increases longevity. Making albumin powder can be done by foam drying method (foam-mat drying). In this study the addition of dextrin and arabic gum functions to protect albumin from heat damage. The purpose of this study was to obtain the concentration of dextrin addition with optimal arabic gum so it produced good cork fish albumin powder with the foam-mat drying method. Analysis of albumin powder produced on albumin levels, protein content, fat content, moisture content of ash content, amino acid profiles and organoleptics. This study uses a simple Randomized Design (CRD) with six treatments and four replications.

The results showed that the addition of dextrin concentrations with different arabic gums had a different effect on the quality of albumin powder. The best treatment was obtained at the concentration of dextrin and gum arabic 0.28%: 7.72% (E), with albumin levels of 0.55%, protein content of 4.54%, moisture content 10.18%, ash content 6.93% , yield of 10.33% and moisture absorption of 3.56%, color of 4.81 (rather like), aroma of 4.03 (rather like) and there are 9 amino acids in it

Index Terms- cork fish, dextrin, arabic gum, foam mat drying, albumin powder

I. INTRODUCTION

Albumin is one of the most common types of protein in blood plasma which is produced in liver and released directly into the blood circulation. Lack of albumin in serum can affect binding and transport of endogenous and exogenous compounds, including drugs. Procurement of albumin serum for surgical cases currently reaches 91%, 2/3 of albumin is used in the surgical section and the remaining 1/3 part is used for the treatment of internal diseases. So far in the market available HSA (Human Serum Albumin). According to Suprayitno (2014), the number of cork albumin can reach 6.24% at a temperature of 27-34 ° C. This amount is very high compared to other animal protein sources. The cork albumine crude produced from the usual extraction process is consumed in liquid form but smells fishy, so people don't like it.

The production of crude albumin powder is an alternative to consuming cork fish crude albumin, so it is preferred and increases durability. One method of drying liquid-shaped material can be done by foam drying (foam-mat drying) which was previously used as foam first by adding foaming agents (Zubaedah, 2003). This drying temperature is relatively low so that the color, aroma and nutritional components of the product can be maintained. To reduce albumin damage due to hot temperatures, fillers can be added to function as binding agent binders or binders. Dextrin and gum arabic can be applied as a protein binder (Chamidah and Hakim, 2013). Dextrin has a function to protect sensitive food components, reduce nutrient loss, add liquid components to solid forms that are easier to handle than other fillers (Latifah and Apriliawan, 2007). In addition to decorating, the commonly used material is arabic gum which is an effective emulsifier because of its ability to protect colloids and is often used in the food industry (Meliala et al., 2014).

II. MATERIALS AND METHODS

2.1 Material

The materials used in the study include materials for extracting crude cork albumin, ingredients for making powder, and materials for chemical analysis. Materials for extracting crude cork albumin in the study using cork fish (Ophicephalusstriatus) originating from Sidoarjo ponds were alive. The fish used weighs 210-650 g with a total lenghth (TL) of 27-42 cm. In addition, filter cloth and aquades are also needed. The material used for making powder is crude albumin obtained from extracting cork, dextrin, arabic gum, and tween 80 fish. The materials used in chemical analysis are crude powder albumin, cork fish, silica gel, aquadest, and filter paper and biuret.

2.2 Analysis of Albumin Levels

According to Suprayitno (2014), albumin levels were determined using the spectrophotometric method. that is. sample of 2 ml added to the reagent was added with biuret and heated at 37 ° C for 10 minutes. Cooled then measured with electronic 20 and recorded the absorbance with a length between 350-2200 nm, then calculated the albumin level with the formula.

$$(\%)\text{Albumin Levels} = \frac{\text{ppm x } 25}{\text{Sample weight x } 10^6} \times\ 100\%$$

2.3 Analysis of Protein Levels

Protein content analysis was carried out using the Spectrophotometric method. Measurement of protein levels was carried out by taking 0.9 ml of protein samples, first applying it with the addition of crystal ammonium sulfate. Then centrifuged for 10 minutes, separated the clear part (supernatant). The precipitate which is a protein is then reconstituted with acetic acid buffer pH 5 to 10 ml. In the test tube, 0.9 ml of each sample was added, 0.8 ml of biuret reagent was added and 1.3 ml of an acetic acid buffer solution was added. Let stand for 10 minutes, read the absorbance at the maximum wavelength on the detection screen.

$$(\%)\text{Protein Level} = \frac{\text{Vstandard} - \text{Vblanko x Nstandar x 14 x 6,25}}{\text{Sample weight x 1000}} \times 100$$

2.4 Analysis of Water Content

The method of analyzing water content was carried out by means of a dry oven method (thermogravimetric method). According to Aventi (2015), water content analysis using the thermogravimetro method can be done by weighing the initial weight of the sample (gram), place it in the oven tray where the dryer is approximately 110oC, put the oven tray sample into the oven, leave for 2 hours after 2 hours, until the sample is completely dry constant homogeneous. This is known from the constant weight (no change / decrease again), then calculated by the formula:

$$(\%)\text{Water content} = \frac{(\text{initial weight} - \text{final weight})}{\text{initial weight}} \times 100\%$$

2.5 Analysis of Fat Levels

Fat content analysis according to Shahidi (2001), was carried out by the goldfisch method by transferring the sample and then put it into a thimble and placed in a buffer tube with a hole in the bottom, then the solvent placed on the back of the buffer tube. cooled by a condenser so that the material will be moistened by solvents in lipids will be extracted and then will be accommodated in bekerglas again, after extraction is complete (3-4 hours), the heater is turned off and the following sample buffer. The heater is turned back on so that the solvent will be evaporated again and condensed and floated into the tank which is installed at the bottom of the condenser. Thus the floating solvent can be used for other extractions, the residue in the bekerglas installed on the heater is then dried in an oven 100oC until a constant weight is obtained. This residual weight is expressed as oil or fat contained in the material:

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

2.6 Analysis of ash content

The method used in the analysis of ash content is the kiln method. According to Nugraha (1997), the steps that must be taken beforehand the cup is dried in an oven at 85 ° C overnight, cooled in a desiccator until it reaches a new room temperature then weighs its empty weight (G). Approximately 2 grams of standard / dry sample material is weighed into a cup with known weight (W). The cup containing the sample was placed into the kiln and burned at 550 ° C for 16 hours (Method A), and at 600 ° C for 3 hours. The burned material is cooled in a desiccator (containing silica gel) to room temperature. Then weighed using a balance sheet. Calculation:

$$(\%)\text{ash content} = \frac{\text{weight of ash(g)}}{\text{sample weight (g)}} \times 100\%$$

2.7 Test for Water Absorption

Test of moisture absorption is carried out to determine the resistance of crude albumin powder to a moisture or air in the storage space. This is based on the hygroscopic powder properties so that it is necessary to test moisture absorption as a characteristic of crude cork albumin powder. Absorption of water vapor is inversely proportional to water content. The lower the water content, the more absorbable the moisture, the ability of the powder to absorb water depends on the product to be produced (Sari and Kusnadi, 2015).

2.8 Rendemen

The purpose of calculating the yield of crude cork albumin powder is to determine the effect of concentrations of arabic dextrin and gum and the efficiency of making crude cork albumin powder. The rendement calculation can be done based on the method carried out by Sudi et al., (2008), the formula used to calculate the yield as follows:

$$\text{Rendemen} = \frac{\text{ouput}}{\text{input}} \times 100\%$$

2.9 Organoleptic Analysis

Organoleptic testing can be done by scoring. Organoleptic testing with an autoleptic test scoring test method was carried out by giving a score on texture parameters such as taste, aroma and elasticity in each sample based on the numerical parameters chosen by the panelists, and drinking as a neutralizer after each sample test. Panelists were asked to fill out the form by stating the scent score as an example very very fishy = 7, very fishy = 6, not fishy = 5, rather fishy = 4, and somewhat fishy = 3, fishy = 2, very fishy = 1. Then (Suradi, 2007).

2.10 Analysis of Amino Acid Profiles

Analysis of amino acid profiles using HPLC consists of four stages, namely: the stage of making protein hydrolyzate by means of weighing 0.1 gram of sample and being crushed, then added with 10 mL HCl 6 and heated in an oven at 100oC for 24 hours. Then the drying phase of the sample aims to make the sample completely clean apart from the solids. The filter was taken as much as 30µL and added 30µL of the drying solution. The drying solution is made from a mixture of methanol, picotiocyanate and triethylamine (Babu et al., 2002). Solubilisation solution of 30 µL is added to the drying results, then mixed with methanol, sodium acetate and triethylamine, then diluted by adding 20mL 60% acetonitrile or buffer sodium acetate 1 M, then leave for 20 minutes. Then injection into HPLC was carried out by taking 40 µL of liquid to be injected into the HPLC, then calculating the amino acid concentration in the material was carried out by making a standard chromatogram using ready-made amino acids which experienced the same treatment as the sample (Bartolomeo and Maisano, 2006).

III. RESULTS AND DISCUSSION

3.1 Albumin

The results of albumin levels in crude albumin powder with the addition of dextrin concentrations and arabic gum reached 0.55%. The lower the concentration of dextrin and the higher the concentration of arabic gum, the higher the albumin level. Addition of dextrin with different arabic gum can protect the damage of albumin from heat treatment. Heat treatment on albumin will produce irreversible changes in structure, which can be seen with increasing water insoluble proteins (Nugroho, 2013). Based on research, Gum arab is able to increase albumin levels because arab gum can form a layer that can protect albumin from heat damage. Sugindro et al. (2008), states that the properties of arabic gum are good in fierce emulsions and form a film layer, so extract retention can still be maintained. Gum arabic also has the ability to inhibit oxidation and protect major components (Silalahi et al., 2014).

3.2 Protein

Analysis of proteins is important for the purposes of determining nutrition, knowing the functional properties and determining the biological properties of proteins (Andarwulan et al., 2011). The results of protein content in crude albumin powder with the addition of dextrin and arabic gum concentrations reached 4.54%. The more concentration of arabic gum, the greater the protection of AGP and GP which play a role in the addition of nitrogen in the product in the form of dissolved nitrogen, amino nitrogen and total protein. Gum arab has an arabinogalactan protein (AGP) group and glycoprotein (GP) that tends to bind to proteins (Rizki et al., 2014). According to Prabandari (2011), about 2% of the gum component is in the form of protein, while the remaining 98% is sugar.

3.3 Water Content

Water content in crude albumin powder with the addition of dextrin concentration with arabic gum reaches 10.18%. Food products in powder form with low water content have high resistance to microbiological damage because free water is used by microorganisms to live and grow (Faryake et al., 2001). Gum arabic has hydrophilic properties so that bound water is not easily released. Hydrocolloid or hydrophilic colloids are long-chain polymers that dissolve in water and are able to form colloids and gels (Puspasari, 2007). Wiyono (2007), added that the higher the addition of dextrin concentration, the lower the water content of the powder. Dextrin is also an ingredient that has the ability to bind to each other, so dextrin can reduce the value of water content (Meiyani et al., (2014).

3.4 Levels of ash

Ash content in crude albumin powder with the addition of dextrin concentration with arabic gum reached 6.93%. Ash content can be determined based on the dry weight of the material and expressed in percent. The lower the concentration of dextrin and the higher the concentration of arabic gum, the lower the ash content. The addition of dextrin stabilizers which can reduce the proportion of the mineral content of the starting material. The higher the concentration of dextrin added, the ash content of flour will increase as well (Naibaho et al., 2015). Syahputra (2008), added that the ability of dextrin to reduce the tendency of materials that are easily damaged due to heat treatment. Ash content is also known as inorganic or mineral substances. Minerals are not significantly affected by chemical and physical treatment during the processing process, nor do they affect nutritional value. Although some components of food are damaged in the process of food warming, the process does not affect the mineral content in food (Ramadhia et al., 2012).

3.5 Absorption of Steam Water vapor

Absorption in crude albumin powder with the addition of dextrin concentration with arabic gum reaches 3.56%. The high humidity of the storage room will absorb moisture from the air into the pores of the food so that it will cause food water content to increase (Retnani et al., 2010). The lower the concentration of dextrin and the higher the concentration of arabic gum is added, the absorption of moisture from crude powder cork fish albumin decreases. Gum arabic hydrocolloid will have a high water content. The higher the hydrocolloid concentration, the more water is bound up in the hydrocolloid tissue (Putra et al., 2015). So that in the drying process, water is difficult to evaporate and causes high water content. High water content has a tendency to absorb water lower (Firdaushi et al., 2015).

3.6 Rendemen

The yield of crude albumin powder with the addition of dextrin concentration with arabic gum reached 10.33%. The recovery is an indicator to determine the effectiveness of the method applied in a study, especially about the optimality in producing a product. The lower the concentration of dextrin, the lower the yield. Dextrin is a group of polysaccharides that function as fillers (fillers) and are inert which can maintain fragile parts of the material (Syahputra, 2008). Yana and Kusnadi (2015), adding that the more fillers added will increase the total solids. So that if the higher concentration of dextrin is added, the yield will increase (Naibaho et al., 2015).

3.7 Organoleptics

The organoleptic parameters of food products have an important role, due to the relationship with the reception of panelists to the products produced. Quality products are not determined by physical and chemical analysis, but are also determined by the level of color and aroma assessment The assessment of the senses carried out by consumers is an important factor in evaluating a product and determining the feasibility of the product on the market (Lawang 2013).

3.7.1 Color

Color is one component that can determine the quality of a material or food product. The organoleptic test results of color scoring on crude albumin powder with the addition of a concentration of dehydrate with different arabic gum obtained an average value of 4.667% to 5.342%. The lower addition of dextrin makes the powder darker. Increasing the concentration of dextrin fillers with arabic gum added causes the color of the product to tend to be younger (paler) Firdhausi et al. (2015). Added by Wiyono (2007); Drajat et al. (2014), the brightness level of powder increases with increasing dextrin concentration.

3.7.2 Aroma

The organoleptic scoring test results on crude albumin powder with the addition of dextrin concentrations with different arabic gum obtained an average value of 3,650% to 5.517%. The lower the concentration of dextrin and the higher the concentration of arabic gum is added, the scent score on crude powder of cork fish albumin decreases. This is because the use of arabic gum is less effective for binding scents than dextrin. Where arab gum is an additional ingredient that has no aroma, (Prasetyowati et al., 2014). The addition of Arabic gum microcapsules does not affect the taste and aroma of the product (Nurhasanah et al., 2011).

3.8 Amino Acid Profiles

Chromatography is an analytical technique based on molecular separation due to differences in the composition structure. Different compounds can be separated from each other as they move through the column. Chromatographic separation can be carried out using various stationary phases, including immobilized silica on glass plates (thin layer chromatography), volatile gas (gas chromatography), paper (chromatographic paper) and liquid (liquid chromatography) (Kupiec, 2004). The results of the analysis of amino acid profiles of crude cork albumin powder can be seen in Table 9.

Table 9. Results of Analysis of Profile of Amino Acids in Crude Powder of Cork Fish Albumin

No	Asam Amino	Nilai (mg/g)
1	Isoleusin	0,70
2	Leusin	0,59
3	Lisin	2,13
4	Fenilalanin	15,37
5	Arginin	0,41
6	Histidin	0,19
7	Aspartat	0,02
8	Sistein	0,03
9	Prolin	0,30

IV. CONCLUSION

The best treatment in this study was treatment E with the addition of dextrin concentration with arabic gum of 0.28%: 7.72%, with parameters of albumin levels of 0.55%, protein content of 4.54%, moisture content of 10.18%, levels of ash 6.93%, yield of 10.33% and moisture absorption of 3.56%. While the results of organoleptic tests, the results obtained for the color scoring scale 4.81 (rather like), aroma 4.03 (rather like). Albumin levels obtained the highest results in Phenylalanine 15.37, Lisin 2.13, Isoleucine 0.70, Leucine 0.59, Arginine 0.41, Histidine 0.19, Aspartate 0.02, Cysteine 0.03, Proline 0.3

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