Amino Acid Marshmallow Profile from Grouper Bone Gelatin

Eddy Suprayitno

Department of Fisheries Technology
Faculty of Fisheries and marine science
Brawijaya university Indonesia
eddysuprayitno@ub.ac.id

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Abstract- Gelatin is a water-soluble protein obtained from animal collagen through a controlled hydrolysis process. Groupers are one of the large pelagic fish that are used as fillet products, while for waste that can be used to make gelatin. Gelatin is then used as a raw material for Marshmallows. Marshmallow is a kind of candy which has a texture like soft foam. The purpose of this study was to study the amino acid profile and the nature of the chemical composition of marshmallows from grouper bone gelatin. The highest amino acid profile of grouper gelatin marshmallow bone is arginine 3360.48 mg / kg and the lowest amino acid is histidine 389.93 mg / kg. While the highest composition of non essential amino acids is glycine 9650.06 mg / kg and the lowest is tyrosine 270.67 mg / kg. The results of the chemical composition of Marshmallow from grouper bone gelatin is content were water content of 26.82%, ash content of 0.05%, protein content of 3.88%, calcium content of 69.02%, and fat content of 0.23 %.

Index Terms- gelatin, marshmallow, amino acid, chemical composition

I. INTRODUCTION

Gelatin is a water-soluble protein obtained from animal collagen through a controlled hydrolysis process. Gelatin is a gelling agent or a non-gelling agent. Gelatin is a polymer of amino acids found in collagen in animal skin and bone tissue. Gelatin can be obtained by hydrolysis of skin and bone tissue using acidic or basic solutions, which are then denatured (Siregar and Eddy, 2019).. As an alternative source of halal gelatin, gelatin from fish is now starting to get attention from industry circles. Fish gelatin can be produced from the skin and bones as a by-product of fish fillet processing. The content of collagen in hard fish bones (*teleostei)* ranges from 15-17%, while that in cartilage bones (*elasmobranch*) ranges from 22-24%. Fish bones that can be used as gelatin are grouper bones. Grouper fish (*Ephinephelus* sp.) Is one of the high economical fish species that lives in coral reef waters, and its spread is almost in all Indonesian waters. Besides, grouper fish is one of the most popular types of fish in the local and international markets. Grouper fish belong to the family Serranidae, their bodies covered by small scales (Anggraini *et al*., 2018). Grouper fish have a type of cycloid scales Cycloid scales have two main constituent layers, namely the skin surface and fibrous layer on the inside.

Grouper bone gelatin is then used as raw material for making marshmallows. Marshmallow is a type of candy (including soft candy) based on gelatin and sugar, especially sucrose and several different types of glucose. The origin of the naming of this product is derived from a plant called Marshmallow (Althea officinalis) (McWilliams 1989). Marshmallow is a kind of candy which has a textured texture such as soft foam, light, chewy in various shapes, aromas, flavors and colors so that it is classified in confectionery products. Marshmallow when eaten melts in the mouth because it is the result of a mixture of sugar or corn syrup, egg whites, gelatin and flavorings that are shaken until fluffy (Rochima and Azizah, 2013).

II. MATERIALS AND METHODS

2.1 Material

The main raw materials used are grouper fish bones (*Ephinephelus* sp.) Obtained from the fish processing industry in Surabaya and Tuban, 1% citric acid and aquadest. The ingredients for making marshmallows are gelatin from fish bones from the results of the first phase of research with the best physical and chemical characteristics, glucose syrup, sucrose, strawberry flavor, water and refined sugar. The materials used for analysis include potassium sulfate (K2SO4), NaCl, H2SO4, 3% boric acid, indicators of Methylene Blue and Methylene Red, 0.02 N HCl, hexane, methylated spirits, aquades, physiological solutions and cotton.

The research method used is the experimental method. This research was divided into two stages. The first step is making gelatin from grouper bone (*Ephinephelus* sp.) The second step is making marshmallow by adding grouper bone gelatin. Furthermore, amino acid testing and chemical characteristics testing were carried out.

2.1.1 Making Fish Gelatin

Making gelatin from the bones of grouper fish (Ephinephelus sp.) Using an acid process that is 1% citric acid (C6H8O7) with a soaking time for 24 hours. The steps taken are as follows. The grouper bones (Ephinephelus sp.) each cleaned of dirt in the form of leftover meat, fat layer and outer skin, followed by cutting size to 1 cm x 1 cm and washed with running water. This reduction did to facilitate the dissolution of collagen proteins contained in the skin. The fish skin is then soaked in 1% citric acid (C6H8O7) for 24 hours at a ratio of 1: 3 (w / v). Skin rinsing is carried out with running water to a neutral pH and then an extraction step with aquadest at a ratio of 1: 3 (w / v) at 70 ºC for 6 hours using a water bath. Furthermore, the filtering process is carried out with an calico cloth and followed by drying using an oven at 60 oC for 48 hours. Gelatin is then mashed using a grinder.

2.1.2 Making Marshmallow

The addition of gelatin in marshmallows serves as a gel maker. In this study gelatin was added with a concentration of 6%. The steps taken are as follows. Make gelatin at a concentration of 6%, then add 75 gram sucrose and 150 ml glucose syrup heated to a temperature of 80ºC. The solution is stirred using a mixer until evenly distributed and expands for ± 15 minutes. When the mixing process is added, the flavor is then poured into a container that has been sprinkled with refined sugar and then left for 12 hours. Marshmallow then tested the amino acid profile and chemical characteristics test which included water, ash, protein, fat and carbohydrate content.

III. RESULT AND DISCUSSION

3.1 Composition of Amino Acid Marshmallow

Amino acids are the smallest units that make up proteins. The composition of amino acids is very important in the characteristic properties of gelatin. Gelatin contains 9 of the 10 types of essential amino acids the body needs. One essential amino acid that is almost not contained in gelatin is tryptophan. Determination of amino acids is done by using Ultra Performance Lyquid Chrtography (UPLC) technique. The results of marshmallow amino acid composition with the addition of grouper bone gelatin are presented in Table 1.

Asam Amino	Unit (mg/kg)
Leucine	2073,13
Tyrosine	270,67
Proline	4459,51
Threonine	1371,01
Histidine	389,93
Serin	1847,48
Glutamic Acid	4330,05
Phenylalanine	1048,95
Isoleucine	914,09
Valine	1268,64
Alanin	3627,31
Arginine	3360,48
Glycine	9650,06
Lysine	1544,30
Aspartic acid	2226,01

Marshmallow has 8 essential amino acids out of a total of 10 known essential amino acids. The highest amino acid in marshmallow gelatin grouper bone is arginine 3360.48 mg / kg and the lowest is histidine 389.93 mg / kg. While the highest non-essential amino acid composition is glycine 9650.06 mg / kg and the lowest is tyrosine 270.67 mg / kg. Marshmallow structure is dominated by amino acids which include 14% hydroxyproline, 16% proline and 26% glycine, it depends on the composition of gelatin contained in the raw material. Gelatin contains 35% glycine and about 11% alanine and the proline content is quite high. Gelatin has a range strength, a special structure that contains hydroxilisin and hydroxyproline, which are amino acids that are not present in other proteins.

3.2 Chemical Characteristics of Marshmallow

Marshmallow chemical characteristics include carbohydrate content, protein content, ash content, fat content and water content. The chemical characteristics of Marshmallows are presented in Table 2.

Chemical Characteristics	Content	Unit
Carbohydrate	69,02	%
Protein	3,88	%
Ash content	0,05	%
Energy from fat	2,07	Kcal/100 g
Total fat	0,23	%

Water content	26,82	%
Total energy	293,67	Kcal/100 g

3.2.1 Water Content

The results of marshmallow water content analysis with the addition of grouper bone gelatin of 26.82%. The water analyzed in determining the water content is free water present in the material. This also includes water which is physically bound, that is, water contained in gelatin micelles in marshmallows. The greater the amount of gelatin added, the more water is bound to the gelatin micelles.

3.2.2 Ash Content

Results of marshmallow ash content analysis with grouper bone gelatin levels of 0.05%. Ash content in marshmallows can be obtained from gelatin. At the time of gelatin extraction, the remaining the remaining ash type are associated with reactive groups of gelatin molecules such as OH, COOH and NH2 groups. This means that the more gelatin is added the higher the ash content. In addition ingredients in marshmallows such as flour can also increase values of marshmallow ash. According to the Indonesian National Standard for Soft Jelly Sugar (SNI 01-3547-1994), ash content for sweets has a maximum limit of 3%. Marshmallow ash content with the grouper bones gelatin has a value that meets the standards set by SNI.

3.2.3 Protein Content

The results of the analysis of marshmallow protein levels with the addition of grouper bone gelatin of 3.88%. High levels of protein in marshmallows are caused by the addition of gelatin concentration. The largest constituent component of gelatin is protein. This means that the greater the amount of gelatin added, the higher the protein content produced.

3.2.4 Carbohydrate

Results of marshmallow carbohydrate analysis with the addition of grouper bone gelatin of 69.02%. This shows that the marshmallows from gelatin grouper bones produced have high carbohydrate levels. High levels of carbohydrates are influenced by the basic ingredients in making marshmallows namely sucrose and glucose syrup which are sources of carbohydrates. Coating added to marshmallows in the form of sugar flour can also affect the levels of carbohydrate marshmallows produced.

3.2.5 Fat Content

Hasil analisis kadar lemak marshmallow dengan penambahan gelatin tulang kerapu 0,23%. Ini menunjukkan bahwa marshmallow dari tulang kerapu gelatin memiliki kandungan lemak rendah. Ikan kerapu sebagai bahan utama dalam pembuatan gelatin adalah jenis ikan air laut yang memiliki kadar lemak kecil yaitu sebesar 0,4% (Direktorat Jenderal Perikanan 1990). Jadi kandungan rendah lemaknya berasal dari gelatin tulang kerapu yang ditambahkan ke marshmallow.

IV. CONCLUSION

The highest amino acid profile in marshmallow gelatin grouper bone is arginine 3360.48 mg / kg and the lowest is histidine 389.93 mg / kg. While the highest non-essential amino acid composition is glycine 9650.06 mg / kg and the lowest is tyrosine 270.67 mg / kg. The results of marshmallow chemical composition analysis with the addition of grouper bone gelatin are water content of 26.82%, 0.05% ash content, protein content of 3.88%, carbohydrate content of 69.02%, and fat content of 0.23 %

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