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Chemical Characteristics And Total Amino Some Kind Of Smoked Sea Cucumber

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Abstract

BACKGROUND: Improving the quality of products processed dried smoke sea cucumber needs to be done through the development of relevant agencies so that the value of the processed products can be priced the same as refined products from other countries.

AIMS: This study is intended to empower sourcepower to be mass-produced sea cucumbers into trepang smoke processed products of quality and ready to be commercialized as a valuable export product. The findings are expected from this research are: product quality smoked sea cucumber, sea cucumber processing technology of some kind of smoke, storage techniques and shelf life.

MATERIALS AND METHODS: The characteristics of sea cucumbers smoke of sea cucumbers in white, black sea cucumber and chocolate sea cucumber, which consist of water content, ash content, fat content, protein content and carbohydrate were analyzed.

RESULTS: The results showed that sea cucumbers were used in this study has a water content for trepang white 41.34%, 54.38% black sea cucumbers, and sea cucumbers 57.37% chocolate. The quality of sea cucumbers can be seen from the lower water content water content of the sea cucumber product produced smoke can last longer. Low water levels can suppress or reduce damage to the smoke of sea cucumbers, for example, to avoid their mikroorganism activity. Also the lower the moisture content, it can extend the shelf life of products and to maintain the quality of sea cucumber product. Results fumigation of all three types of sea cucumbers sea cucumbers have the best value based on the proximate analysis and analysis of the white sea cucumber amino.yaitu acid fumes that the water level is lower than the black and brown sea cucumber is also the highest protein content in the white sea cucumber which is 33.78% while the black sea cucumber and sea cucumber brown lower, respectively 32.70, 26.83. Amino acids of the three species of sea cucumber smoke contains 15 components essential amino acids and non-essential amino acids. Essential amino acids are 8 components, histidine, leucine, treosin, valine, metheonin, isoleucine, arginine and lysine, while non-essential amino acids numbered seven components, including aspartic acid, glutamic acid, serine, glycine, alanine, tyrosine, and phenylalanine. Most amino acids which are glycine is 5.04%, the black sea cucumber and the sea cucumber and sea cucumber white chocolate 4.36% 2.51%

Keywords: Functional food, Nutrition, Cucumber smoke, Fumigation, Chemical constituents, Amino acid

Introduction

Sea cucumbers is one commodity export of marine products that need to be developed processing method [1]. This is necessary in view of the economic value which is quite high in the overseas market. Dried sea cucumber and smoke turned out to have potential as a supplement and a drug for a complete nutritional content so that it can be used as a supplement to prevent various diseases. Fumigation sea cucumber is one

of preservation and processing methods that have been utilized by local communities, including in North Sulawesi. Sea cucumbers are known commodity fishery products quickly damaged or perishable. Quality deterioration process can not be stopped completely but this does is slow down the process by means of processing and preservation. One technique is the preservation and processing by means of the process of curing [2]. Sea cucumber production in 2013 amounted to 4,390 tons and increased in 2014 to 5.428 tons [3].

Fumigation of sea cucumbers in North Sulawesi is generally done traditionally, which uses direct heat curing methods aimed at preserving and flavoring of the smoke of sea cucumbers. According to [4], fumigation sea cucumbers and other foodstuffs which was originally intended to extend the shelf life of products, has been progressing objective being to obtain a particular appearance and taste of smoke on groceries. Several studies conducted by [5] and [6] showed that the fumigation on food products is a preservation method which not only increase the shelf but also gives a taste and desired color on products smoke because of their phenolic compounds and carbonyl. Sea cucumbers smoke is a product processed through the penetration process of volatile compounds in cucumbers produced from burning wood or smoker/other fuel, resulting in flavor, color and specific flavor and long shelf life for their anti-bacterial activity is generated from wood smoke. Cucumber is one of the commodities of fishery products with the potential to be used as food, even in the form of dried sea cucumbers has been one commodity exports fisheries with main markets are Hong Kong, Singapore, South Korea, Malaysia, Japan, America, and some European countries. Based on the results of sea cucumber nutrient content is as high as in dry conditions: moisture content of 8.9%, 82% protein content, fat content of 1.7%, ash content of 8.6% and 4.8% carbohydrate. This is what makes cucumbers into one of the high value commodity. The development of sea cucumber Indonesian exports increase every year. Based on Ferdouse report (2004) in 2000, Indonesia is the largest producer of sea cucumber exports reached 2,500 tons. Nearly 50% of consumers are China, Hong Kong and Malaysia. Increased demand for Asian markets broadly encourage increased exploitation of sea cucumbers efforts in various countries. North Sulawesi is one of the largest sea cucumber potential in Indonesia. According [7] sea cucumber fishing activities began much done. However, the sea cucumber fishing activities are increasing each year, it is feared will lead to excessive exploitation that can lead to resource scarcity sea cucumbers. It can also affect the existing sea cucumber fishing effort, therefore, research and development Fumigation Sea cucumber necessary. This effort is useful to know how the process of arrests carried out by fishermen, management, and marketing dilakukan. Sea cucumber is a food that contains a lot of nutrients, but lower calorific value of fish, mollusks and squid [8]. Besides sea cucumbers also contain vitamin B12, thiamin, ribovlavin, minerals, phosphate, iron, arsenic, iodine, calcium, magnesium and copper. One export commodity sub-sector is developed separately potential is sea cucumber. Utilization of sea cucumbers as one of the high-protein food ingredient has been known since long that pengusahaannya has grown in the Indo West Pacific and has grown into a source of revenue high enough for the fishermen. Sea cucumbers are foods that contain a lot of nutrients, but lower calorific value of fish, mollusks and squid. Besides sea cucumbers also contain vitamin B12, thiamin, ribovlavin, minerals, phosphate, iron, arsenic, iodine, calcium, magnesium and copper [9].

RESEARCH METHODS

Materials and Devices Research

This research was conducted at the Laboratory Center for Testing and Implementation of Fisheries Bitung and laboratory IPB Bogor, while samples were taken from the village smoked sea cucumbers Darunu Wori District of North Minahasa Regency. Where since the sampling process sea cucumbers until the analysis process takes as long as 3 months. The main materials used are three species of sea cucumber smoke, other than that chemicals are used such as NaOH, $K2CO_3$, NaBr, KI, NaCl, KCl, and $BaCl_2$ (Merck Darnstad Germany).

Then there are also some tools that are used as analytical Scales Ohauss; buret; Oven; Test tube; desiccator; Soxlet; Drop pipette; etc.

Research Implementation

Previous research has been conducted in a way pengambilan product samples of sea cucumbers in the village Darunu smoke then do tests proximate and amino acid test of the three species of sea cucumber sea cucumber smoke fumes to determine the best sample. This study uses a completely randomized design consisting of 3 treatments with 3 repetitions, white sea cucumbers smoke, black sea cucumbers smoke, and chocolate sea cucumbers smoke.

Analysis Procedure

Water Content (Oven Method) [10]

The first phase was conducted to analyze the water content is dry the porcelain dish in oven at 105ºC for 1 hour. The cup is placed into a desiccator (± 15 min) and allowed to cool and then weighed. The cup is weighed again until its weight is constant. 1 gram sample is inserted into the cup, then dried in an oven at 105ºC for 5 hours. Cup put in desiccator until cool and then weighed again.

$$\text{The Water Content } (\%) = \frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \text{ x } 100\%$$

Protein Levels (Kjedahl Method) [10]

A total of 0.5 grams of sample is introduced into the flask kjeldahl, then added a kjeltab and 10 mL of H_2SO_4. Flask containing the solution was put in a heater at a temperature of 410ºC and added as much as 10 mL. This process is performed until the solution becomes clear. Clear solution was cooled, then added 50 mL of distilled water and 20 mL of 40% NaOH and distilled. Distilled accommodated in a 125 mL flask containing 25 mL of boric acid (H_3BO_3) containing 2% mixture indicator of Bromocresol green 0.1% and 0.1% methyl red with a ratio of 2: 1. Distillation is done by adding 50 mL of $NaOH_2S_2O_3$ into distillation equipment to be accommodated 40 mL of distillate in the flask with a bluish-green distillate results. The resulting distillate was titrated with 0.09 N HCl until the color of the solution changes color to red muda.Volume titrant is read and recorded. The calculation of the protein content is as follows:

$$\%\text{Nitrogen} = \frac{(\Delta \text{ HCl})\text{x N HCl x } 14}{\text{mg of Sample}} \text{ x } 100\%$$

$$\%\text{ Protein} = \%\text{N x Conversion Factor } (6.25)$$

Fat Content (Soxhlet Method) [10]

Pumpkin fat to be used dried in an oven at 110ºC, put in a desiccator, and weighed. The sample is weighed 5 grams, wrapped with filter paper and fed into an extraction (soxhlet) already contain hexane. The process is done reflux until a clear solution and a solvent present in the fat pumpkin colored clear. Pumpkin fat containing the extracted fat is heated in an oven at a constant temperature of 105ºC and weighed, then put in a desiccator and weighed.

$$\text{Fat Content } (\%) = \frac{\text{Final Weight} - \text{Container Weight}}{\text{Initial Sample Weight}} \text{ x } 100\%$$

Ash Levels (Dry Method) [10]

Ashing cup dried in an oven for 1 hour at 60°C, then cooled for 15 minutes in a desiccator and weighed to obtain a constant weight. A total of 5 grams of sample is introduced into the cup ashing. Cup containing the sample was burned on an electric stove until no smoke and inserted into the incineration furnace at a temperature of 600ºC for 1 hour. The next cup is inserted in the desiccator and weighed.

$$\text{Ash Content (\%)} = \frac{\text{Initial Weight} - \text{Final Cup Weight}}{\text{Sample Weight}} \text{ x } 100\%$$

Carbohydrate Levels (By Difference)

Carbohydrate content analysis performed by difference, which results in a reduction of 100% moisture content, ash content, protein content and fat content, so that the levels of carbohydrates depending on the reduction factor. This is because carbohydrates are very influential on other nutrients. Analysis of carbohydrate levels can be calculated using the formula:

$$\text{Carbohydrates (\%)} = 100\% - (\text{Moisture} + \text{Ash} + \text{Protein} + \text{Fat Content})$$

Amino Acid Analysis

Amino acid analysis was determined by using HPLC, according to the standard procedure of analysis of the Integrated Chemical Laboratory, IPB.

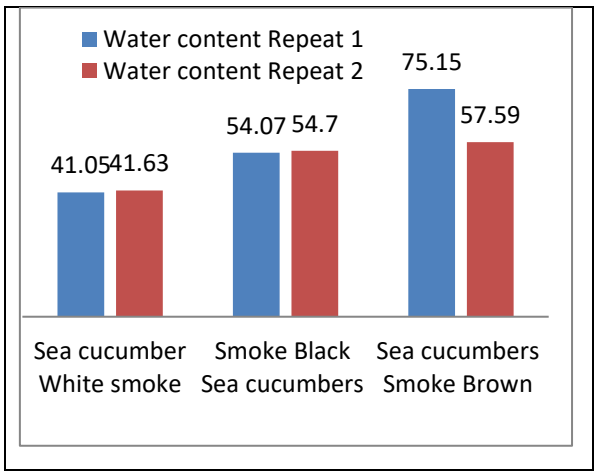
RESULTS AND DISCUSSION

Proximate analysis results of smoked sea cucumbers can be seen in Table 1 – 5.

Table 1. Results of Water Content Analysis of Some Types of Smoked Sea Cucumbers

Samples / Treatment	Water Content (%)		Mean ± Standard Deviation
	Repeat		
	1	2	
Sea Cucumbers White Smoke	41.05	41.63	41.34 ± 0.05
Smoke Black Sea Cucumbers	54.07	54.70	54.38 ± 0.09
Sea Cucumbers Smoke Brown	75.15	57.59	57.37 ± 0.12

Figure 1. Graph of Water Content Analysis of Some Types of Smoked Sea Cucumbers



Based on the analysis, it can be seen that the water content of smoked sea cucumber ranged from 41.34 to 57.37% where sea cucumbers mtertinggi white smoke, that is 57.37%. Low water levels will have an impact on the length of sea cucumbers during storage durability. Increasingly dry product, then durability will be longer [11]. The water content also affect the texture of the final product. If the moisture content is too high, then the texture of dried sea cucumbers become mushy and not compact thus affecting consumer acceptance of such products. Drying including fumigation to eliminate water contained in food [12] explains that the longer the drying time is done, the water content contained in a food would be lower.

Table 2. Ash Content Analysis Some Types of Smoked Sea Cucumbers

Samples / Treatment	Ash Content (%)		Mean ± Standard Deviation
	Repeat		
	1	2	
Sea Cucumbers White Smoke	20.57	20.21	20.39 ± 0.36
Smoke Black Sea Cucumbers	7.48	7.30	7.39 ± 0.16
Sea Cucumbers Smoke Brown	14.13	13.66	13.90 ± 0.14

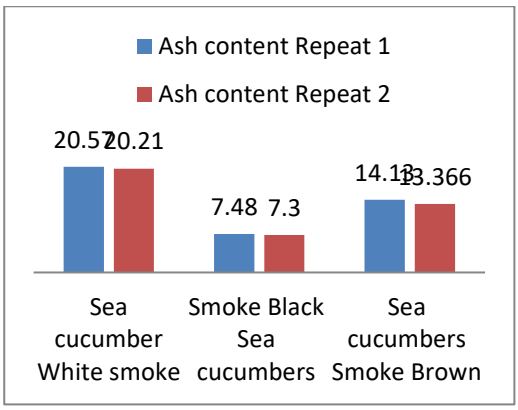


Figure 2. Graph of Ash Content Analysis of Some Types of Smoked Sea Cucumbers

Analysis of ash content cucumbers smoke white smoke indicates that sea cucumbers have the highest ash content, the ash content of 20.39% while the lowest was in the sea cucumber black smoke, which is 7.39%. The higher the ash content contained in a food the mineral content generated more [13]. According to [14], sea cucumber contains mineral substances such as chromium, ferum, cadmium, manganese, nickel, cobalt and zinc. Research by [15] adds that the mineral content in sea cucumbers in the form of phosphorus, magnesium, calcium, iodine, iron and copper.

Table 3. Fat Content Analysis of Some Types of Smoked Sea Cucumbers

Samples / Treatment	Fat Content (%)		Mean ± Standard Deviation
	Repeat		
	1	2	
Sea Cucumbers White Smoke	1.05	1.00	1.02 ± 0.79
Smoke Black Sea Cucumbers	0.98	1.10	1.04 ± 0.20
Sea Cucumbers Smoke Brown	0.49	0.57	0.53 ± 0.33

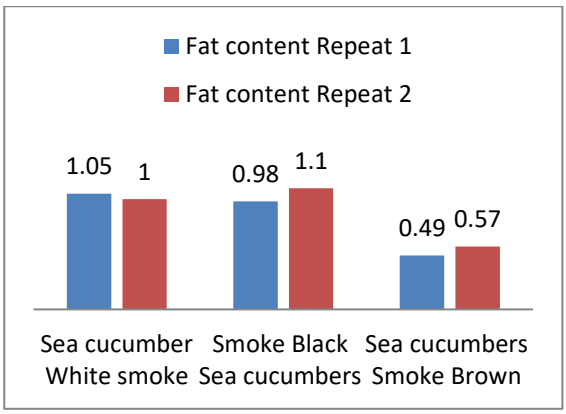


Figure 3. Graph of Fat Content Analysis of Some Types of Smoked Sea Cucumbers

The highest levels of fat cucumbers smoke black smoke tertdapat the sea cucumber with a value of 1.04%, while the lowest fat levels found in sea cucumbers brown fumes, namely 0.53%. Compared to other sea cucumbers, sea cucumbers fat content is relatively low, 1,7g/100g dried sea cucumber, but quite rich in omega-3 fatty acids [16]. Fat has many important functions, among others as a source of energy that is more effective than carbohydrates and protein (9:4), lubricating joints and other critical functions [17]. [18] says differences in nutrient content in cucumbers attributed to differences in sea cucumber species and biological conditions, such differences can also be due to the availability of food in the waters and sea cucumber species itself.

Table 4. Results of Analysis of Protein Some Types of Smoked Sea Cucumbers

Samples / Treatment	Protein Content (%)		Mean ± Standard Deviation
	Repeat		
	1	2	
Sea Cucumbers White Smoke	33.78	33.78	33.78 ± 0.25
Smoke Black Sea Cucumbers	32.70	32.70	32.70 ± 0.16
Sea Cucumbers Smoke Brown	26.74	26.92	26.83 ± 0.42

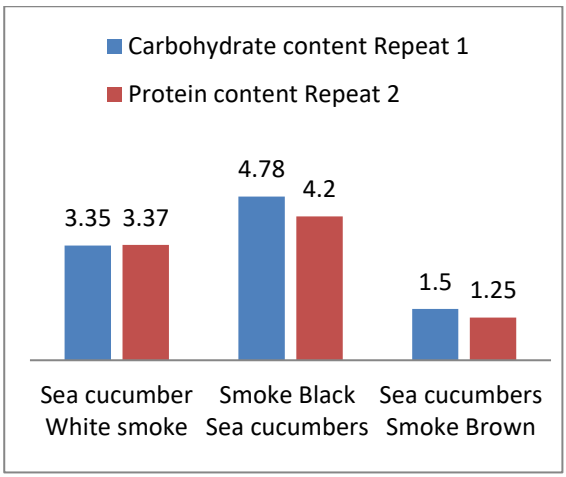


Figure 4. Graph of Protein Content Analysis of Some Types of Smoked Sea Cucumber

The highest protein content found in the sea cucumber white smoke, that is 33.78%, while the lowest was in the sea cucumber brown fumes, ie 26.83%. Sea cucumbers are products that contain high protein, as well as other fishery products. Protein is a nutrient that is essential for the body because it serves as a source of energy, and regulatory builder substance [19]. The sea cucumber protein has a complete amino acid, amino acids both essential and non essential amino acids [20]. Fogging is one method of hydrolysis of proteins, proteins that can be converted into value-added products through enzymatic hydrolysis, which is widely used to improve and enhance the nutritional properties of proteins. Converting sea cucumber protein into a product that has economic value, biomedical applications, and the antioxidant properties of hydrolysis of sea cucumbers [21].

Table 5. Results of Analysis of Carbohydrates Some Types of Smoked Sea Cucumbers

Samples / Treatment	Carbohydrate Content (%)		Mean ± Standard Deviation
	Repeat		
	1	2	
Sea Cucumbers White Smoke	3.35	3.37	3.46 ± 0.25
Smoke Black Sea Cucumbers	4.78	4.20	4.49 ± 0.16
Sea Cucumbers Smoke Brown	1.50	1.25	1.37 ± 0.42

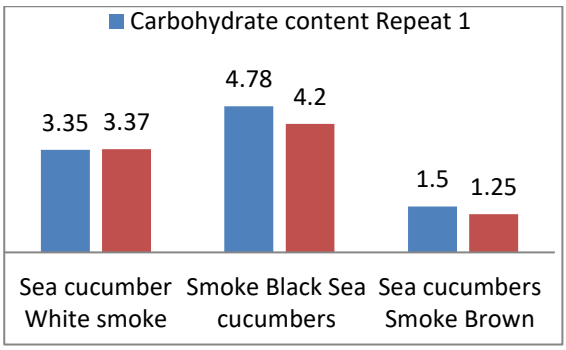


Figure 5. Graph of Carbohydrate Content Analysis of Some Types of Smoked Sea Cucumbers

Carbohydrate determination of the amount of carbohydrates in food using the method by difference. Based on the analysis, the lowest carbohydrate found in sea cucumbers brown smoke that is 1.37%, while the highest are in the sea cucumber which is 4.49% of black smoke. [22] describes the analysis of amino acids is very important, because the quality of a food protein is determined by the levels of amino acids it contains. In terms of nutritional amino acids are divided into two categories, namely non essential amino acids and essential amino acids. Non-essential amino acid is an amino acid that can be provided by the body of the organism through a complicated process of biosynthesis of nitrogen compounds contained in food, and essential amino acids, is an amino acid that can not be synthesized by the body. A protein quality food ingredients one of which was determined by the availability of amino acids that can be absorbed by the body. Results of testing three types of sea cucumbers amino acids can be seen in Table 6. Table. 6. The Results of the Analysis of Amino Acid White Sea Cucumber, Sea Cucumber Sea Cucumber Black and Brown

Amino Acid Type	White Sea Cucumbers	Black Sea Cucumbers	Brown Sea Cucumbers
Aspartic Acid	3.37 ± 0.04	3.59 ± 0.03	2.10 ± 0.29
Glutamic Acid	4.68 ± 0.02	4.83 ± 0.03	2.81 ± 0.38
Serine	1.29 ± 0.02	1.36 ± 0.02	0.85 ± 0.01
Glycine	0.29 ± 0.34	0.34 ± 0.012	0.21 ± 0.10
Alanine	4.36 ± 0.03	5.04 ± 0.06	2.51 ± 0.26
Tyrosine	1.45 ± 0.02	1.77 ± 0.04	0.92 ± 0.01
Phenylalanine	2.60 ± 0.38	2.76 ± 0.029	1.55 ± 0.02
Arginine	2.74 ± 0.32	2.77 ± 0.30	1.56 ± 0.02
Histidine	0.84 ± 0.01	0.97 ± 0.01	0.51 ± 0.07
Threonine	0.43 ± 0.05	0.42 ± 0.05	0.32 ± 0.06
Methionine	1.37 ± 0.03	1.36 ± 0.03	0.90 ± 0.01
Valine	0.87 ± 0.23	0.96 ± 0.020	0.54 ± 0.07
Isoleucine	0.96 ± 0.21	0.99 ± 0.021	0.64 ± 0.07
Leucine	1.53 ± 0.04	1.58 ± 0.03	1.01 ± 0.02
Lysine	0.48 ± 0.05	1.12 ± 0.03	0.63 ± 0.04
Amino Acid Total	7.27 ± 0.16	29.86 ± 0.20	17.06 ± 0.11

The results show that, in the sample studied for three types of smoked sea cucumber contains 15 essential amino acid components, namely histidine, threonine, arginine, methionine, valine, i-leucine, leucine and lysine. In addition, there is a component of non-essential amino acids such as aspartic acid, glutamic acid, serine, glycine, alanine, tyrosine and phenylalanine. Most amino acids which are glycine is 5.04 on the black sea cucumber, 4.36 in the white sea cucumbers, and 2.51 in brown sea cucumber.

The results show that, in the samples of sea cucumbers white smoke, black and chocolate contains 8 essential amino acid components, namely histidine, threonine, arginine, methionine, valine, i-leucine, leucine and lysine. In addition, there are seven components of non-essential amino acids such as aspartic acid, glutamic acid, serine, glycine, alanine, tyrosine and phenylalanine. Table 6 indicates that the sample studied for sea cucumbers black smoke higher total amino acid that is 29.86% compared to 27.27% of white smoke of sea cucumbers and sea cucumber brown fumes of 17.06%. Asam glutamate including amino acid charged (polar) together with aspartic acid. This is evident from isoelectric point Low, where the acid is very easy to capture electrons (which are acid). In addition, asam glutamate can be produced by the human body that are not considered essential. In general, the more vegetable protein contains amino acids such as arginine, glycine, and alanine, while animal proteins contain many lysine and methionine. Past research has noted that the amino acids lysine and methionine tend to raise cholesterol levels, while arginine showed the opposite effect. Methionine is the precursor of homocysteine is a risk factor. It explains the causes of hypercholesterolemia are more animal food than vegetable food. This is evident from isoelectric point low, where the acid is very easy to capture electrons (which are acid). In addition, asam glutamate can be produced by the human body that are not considered essential. Amino acids are the basic building blocks of protein and substance can be produced by the body for the purposes of metabolism and is found in all protein-containing foods. Based on the interest in the feed divided by 2 is an amino acid essential amino acids and non-essential amino acids. Glutamic acid is classified in non essential amino acids. Glutamic acid is an essential element of a protein in an assortment of vegetables, fruit, meat, fish and milk. 11-22% of animal protein containing glutamic acid whereas 40% of vegetable protein containing glutamic acid. Glutamic acid is a non essential amino acid that is most important as a flavor enhancer [23]. Provision of glutamic acid can increase the sense of unease in the flesh [24]. This happens because of glutamic acid in free form is not bound to other amino acids in proteins that have the effect of sense amplifier.

In addition to taste, glutamic acid plays an important role in the synthesis of amino acid for glutamic acid as a source of effective non-specific nitrogen [25].

Common proteins found in animal products and plant products. Proteins are polymers of approximately 20 different types of amino acids connected by peptide bonds. Amino acids with a peptide bond is akanmembentuk primary structure of proteins. Amino acids are divided into two groups, namely non-essential amino acids and essential amino acids. A total of 12 types of nonessential amino acid produced by the body, while the 8 amino acids are essential amino acids that must be obtained through food. Non-essential amino acid produced by the body among other tyrosine, cysteine, serine, proline, glycine, glutamic acid, aspartic acid, arginine, alanine, histidine, glutamine and asparagine. Essential amino acids are not produced by the body include tryptophan, threonine, methionine, lysine, leucine, isoleucine, phenylalanine, and valine. White sea cucumbers containing amino acids such as isoleucine (20.4 mg), leucine (48 mg), lysine (29.6 mg), threonine (24.8 mg), triptopan (13.6 mg), valine (32 mg), histidine (14 mg), arginine (35.2 mg), alanine (29.2 mg), aspartic acid (84 mg), glutamic acid (60 mg), glycine (30 mg), proline (23.6 mg), and serine (34 mg) [26].

Amino acid analysis is very important, because the quality of a food protein is determined by the levels of amino acids it contains. In terms of nutritional amino acids are divided into two categories, namely non

essential amino acids and essential amino acids. Non-essential amino acid is an amino acid that can be provided by the body of the organism through a complicated process of biosynthesis of nitrogen compounds contained in food, and essential amino acids, is an amino acid that can not be synthesized by the body. In this study, a 15 amino acids contained in the smoke of sea cucumbers are shown in Table 6 is known that there are eight types of essential amino acids contained in the smoke of sea cucumbers that histidine (0.9% of white sea cucumbers, sea cucumbers 0.34 black, brown sea cucumber 0.21), leucine (1.53 white sea cucumbers, sea cucumbers 1.58 black, brown sea cucumber 0.01), threonine (1.45 white sea cucumbers, sea cucumbers 1.77 black, brown sea cucumber 0.92), valine (white sea cucumbers 1, 37, black sea cucumber 1.36, 0.90 brown sea cucumber), methionine (0.43 white sea cucumbers, sea cucumbers 0.42 black, brown sea cucumber 0.32), isoleucine (0.96 white sea cucumbers, sea black cucumbers 0.99, brown sea cucumber 0.64), fenilalanine (0.87 white sea cucumbers, sea cucumbers 0.96 black, brown sea cucumber 0.54), arginine (2.60 white sea cucumbers, sea cucumbers 2.76 black, brown sea cucumber 1.55) and 7 non essential amino acids, namely acid Serine (1.29 white sea cucumbers, sea cucumbers 1.36 black, brown sea cucumber 0.85), aspartate (3.37 white sea cucumbers, sea cucumbers 3.59 black, brown sea cucumber 2.10), lysine (white sea cucumber 0.48, 1.12 black sea cucumbers, sea cucumbers 0.63 brown), acid glutamate (4.68 white sea cucumbers, sea cucumbers 4.83 black, brown sea cucumber 2,81), glycine (4.36 white sea cucumbers, sea cucumbers 5.04 black, brown sea cucumber 2.51), alanine (2.74 white sea cucumbers, sea cucumbers 2.77 black, brown sea cucumber 1.56), tyrosine (0.84 white sea cucumbers, sea cucumbers 0.97 black, brown sea cucumber 0.51).

CONCLUSION

Of the three species of sea cucumber in the smoke get that white sea cucumber produces the best chemical parameter values where the value of the water content of 41.34% 33.78% protein content lipid 20.39 1.02% ash content and carbohydrate content of 3.46%. Overall cucumbers analyzed fumes have quality standards that are in accordance with the SNI.

The three species of sea cucumber components of smoke are 15 amino acids, among others, there are 8 essential amino acids, namely: histidine, threonine, arginine, methionine, valine, i-leucine, leucine and lysine. In addition, there are seven components of non-essential amino acids such as aspartic acid, glutamic acid, serine, glycine, alanine, tyrosine, and phenylalanin,and most acids alanine (5.04) for the black sea cucumber total amino acids is 29.86. respectively ie white sea cucumbers and sea cucumbers 4.36 chocolate is 17.06.

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