INCREASING THE POTENTIAL OF BAJI-BAJI FISH (*Grammoplites scaber*)AS A SOURCES OF FOOD PRODUCTS FOR CHEMICAL COMPOSITION AND AMINO ACID CONTENT

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ABSTRAK

Diana A, Lubis AF., 2018. Baji-baji fish (*Grammoplites scaber*) is a type of fish caught by fishermen sold locally. This fish is widely sold in the traditional market of Tanjungbalai city. The price of baji-baji fish is relatively cheap and the local community's interest in this fish is still low, for this reason it is necessary to increase the potential of this fish through an assessment of the chemical composition and amino acids to be able for a value-added food product. The purpose of this research were to determine the chemical composition and amino acids in baji-baji fish and compare with other high-protein fish.The results of this study were studies conducted namely Baji-baji fish had 15.45% protein, 5.66% fat, 64.34% moisture content, 4.79% ash content, and 9.77% carbohydrate. Baji-baji fish also has a very good amino acid content. the value of essential and non-essential amino acids in baji-baji fish contains many types of lysine (0.6), methionine (0.27), aspartate acid (0.91), arginine (0.48), serine (0.30)), and cysteine (0.16) compared to cork and milkfish. Based on the amino acid content, Baji-baji-fish are a source of highly nutritious raw materials that the body needs to inhibit viral growth and treatment of Herpes, help in breaking down fat, increase stamina, normal immune system activity needed for wound healing, improve the system immune by helping in the production of antibodies and immunoglobulins, as well as protecting against radiation.

Keywords: Baji-baji Fish (*Grammoplites scaber*), Chemical Composition, and Amino Acid Content

A. INTRODUCTION

Tanjungbalai City is a city located near asahan river of North Sumatra. The potential of Tanjungbalai city in the fisheries sector is possible to develop rapidly because it is supported by the potential of available natural resources, so that in the future it will be able to be a mainstay sector for the economic driving force of Tanjungbalai City. The main potential of the fisheries sector is supported by marine fisheries in the form of fishing, shellfish and shrimp. According to the Central Statistics Agency (2017) ofTanjungbalai region is one of the largest fisheries centers in North Sumatra with 34.643,70 tons of marine fisheries production, 16.97 tons of land (public waters), 107.20 tons of cultivation.

Various types of fish and shrimp caught by fishermen in Tanjungbalai are mostly exported. About 12 tons of exported fish a day. The exported fish are the best quality fish, which are gembung fish, guring, cencaru, bawal, senangin, pekcogerapu, shrimp, and crab (metro, 2017). In addition to commercially valuable fishes, there are also fish caught by the fishermen of Tanjungbalai which are only sold locally, non-commercial fish, which are generally rucah fish, bijinangka fish, tamban fish, gulamah fish, and baji-baji fish.

Baji-baji fish (Grammoplitesscaber) is one of the strategic commodities to meet relatively inexpensive protein needs. Fish plays an important role in fulfilling the sources of nutrition and life security for humans in developing countries (Gandotra et al., 2012). Fish is one of the important sources of nutrients for human survival. Humans have used fish as food for centuries. As food ingredients, fish contain the main nutrients in the form of protein, fat, vitamins and minerals (Nurjanah, 2011).

Fish contain high protein. Protein in fish besides being a source of nutrition also has functional properties that are important for health (Chasanah et al., 2015). Protein is a food substance that is very important for the body because this substance besides functioning as fuel also functions as a building agent and regulator. Protein is a source of amino acids that contain elements of C, H, O and N that do not have fat or carbohydrates (Winarno, 2004)

Types of fish that contain high protein are tuna, mackerel, threadfin bream, and other types of marine fish (cod, coalfish, haddock, red fish, catfish, plaice, halibut, ling, tosrk, and mackerel). These fish are very commercial and include export quality fish that are in great demand because of their attractive taste and appearance. Other types of fish that contain high protein and have high albumin are snakehead fish. According to Harianti (2011) snakehead fish is a fish that is not in demand because ugly appearance and the fishy smell that makes it's everyone dislikes it, but the attention to snakehead fish has increased since the 1990s because of the benefits of snakehead fishwhich are no longer just fish consumption, but also used in medicine.

Various studies of fish as protein foods that are good for health that can increase the commercial value of fish have been carried out various tests, especially on the chemical composition and nutritional content of fish. In a study conducted by Asfar (2014) the higher

commercial value of snakehead fish because of its content has been clinically proven in several diseases, Snakehead fish has a high protein content, especially albumin and essential amino acids, fat, especially essential fatty acids, minerals especially zinc (Zn) and some vitamins that are very good for health.

As with snakehead fish, baji-bajiare also less desirable because they have ugly appearance and fishy smell. Efforts need to be made to increase the potential for baji-baji fish. According to Pamijiati (2009) also explained that fish is much loved by most Indonesian people because it has high nutritional content and complete and important protein for the body. The main nutrients in fish include protein, fat, vitamins and minerals. Thus an assessment of the increase in the potential of baji-baji as a source of food products for chemical composition and amino acid content has to be conducted. According to Pertiwi (2015) the diversity of fish yields can provide added value to the community if marketed in the form of fresh, semi-processed or processed in the form. Raw materials that can be used in fish processing are baji-baji fish. The fish can be used by the market by turning it into semi-finished food products or in finished form.

B. MATERIALS AND METHODS

This research method was carried out in four stages, namely:sample preparation; proximate analysis; amino acid analysis and writing method used by the author is a descriptive method that describes and explains the theoretical studies that are conceptual through literature search, collects literature from various literature sources, such as books, journals, articles from the internet, and other related sources of literature with this writing.

Materials and tools

The ingredients used are fish Baji-baji - Baji-baji (Grammoplitesscaber), ice block, distilled water, Aqua bides, BSA (Bovine Serum Albumin), CuSO4, methyl red indicator, Brom Cresol Green indicator, K2SO4, H3BO3 solution, HCl solution, concentrated H2SO4 solution , NaOH solution. The tools used are analytic balance, bath coat, evaporator, desiccator, aluminum foil, glass beaker, separating funnel, ball pipette, autoclave, burette, funnel, erlenmeyer, measuring cup, plastic bag, Kjeldahl flask, mortar and stamper, pH meter, drop pipette, pasteur pipette, Mohr pipette, knife, a set of LC-MS tools.

Moisture Content

The first step to analyze the moisture content is to dry the porcelain cup in the oven at 105 C for 1 hour. The cup is placed in the desiccator (approximately 15 minutes) and left to cool then weighed. The cup is weighed back to its constant weight. A total of 5 grams of sample was put into the cup, then dried in an oven at 105 C for 5 hours, then the cup was put into the desiccator until it cooled and then weighed again (AOAC, 2012)

$$\%\text{Moisture Content} = \frac{(B1-B2)}{B} \times 100\%$$

Information:

B = sample weight (gram)
B1 = weight (sample + cup) before drying
B2 = weight (sample + cup) after drying

Ash Content

The drying plate was dried in an oven for 1 hour at 600 C, then cooled for 15 minutes in a desiccator and weighed until a constant weight was obtained. A sample of 5 grams was inserted into the ignition cup and sprinkled over the flame until it was no longer smoky. After that it is put into a furnace with a temperature of 600 C for 1 hour, then weighed to a constant weight (AOAC, 2012)

$$\text{Ash Content} = \text{final sampel weight} - \text{empty weight}$$

Fat Content

A sample of 5 grams is put into filter paper at both ends of the wrapper covered with fat-free cotton and then the wrapped sample is put into a fat flask that has been weighed in fixed weight and connected to a Soxhlet tube. The fat sleeve is inserted into the Soxhlet tube extractor chamber and doused with a fat solvent, then reflux for 6 hours. The fat solvent in the fat flask is distilled off until all the fat solvents are evaporated. At the time of distillation the solvent will be stored in the extractor chamber, the solvent is removed so it does not return to the fat flask, then the flask is dried in an oven at 105 C, after which the flask is cooled in the desiccator until the weight is constant.

$$\%\text{Fat Content} = \frac{W3 - W2}{W1} \times 100\%$$

Information:

W1 = sample weight (gr)
W2 = the weight of empty boiling flask(gr)
W3 = weight of boiling flask (gr)

Protein Content

The stages carried out in protein analysis consist of three stages, namely destruction, distillation and titration. Protein content measurements were carried out using the Kjeldahl micro method. The sample was weighed as much as 0.25 grams, then put into a 100 mL Kjeldahl flask, then added one kjeltab and 3 mL concentrated H2SO4. The sample was extracted at 410 C for approximately 1 hour until the clear solution was cooled. After cool, 50 mL of distilled water are added to the kjeldahl flask and 20 mL 40% NaOH, then the distillation process is carried out at a distillator temperature of 100 C. The distillation results in a 125

mL Erlenmeyer flask containing a mixture of 10 mL 2% boric acid (H3BO3) and drops indicator of bromcherosol green methyl red which is pink. After the distillate volume reaches 40 ml and has a bluish green color, the distillation process is stopped. Then the distillate was titrated with 0.1 N HCl until it changes into pink color.

$$\%N=\frac{(ml\ HCL-ml\ blanko)x\ N\ HCL\ x14\ x\ fp}{x100\%\ mg}$$

Contoh

%Protein Content = %N x faktor konfersi (6,25)

Amino Acid

Amino acid analysis that is still commonly used today is chromatography with various techniques such as paper chromatography, thin layers and columns. Lately amino acid analysis using high performance liquid chromatography or better known as High Performance Liquid Chromatography LC-MS.

C. RESULTS AND DISCUSSION

Fish is one of the important sources of nutrients for human survival. Humans have used fish as food for several centuries. As food ingredients, fish contain the main nutrients in the form of protein, fat, vitamins and minerals (Nurjanah, 2011).

Baji-baji fish (*Grammoplitesscaber L*) has the upper body color of brown and the lower part is brightly colored. The shape of the head and body are flatten with the body and tail on the upper part covered by stenoid scales and cycloid scales on the flat bottom.

Fish produced and preserved are generally very popular with the community because the end product has special characteristics, namely changes in meat properties such as smell, taste, shape and texture. Raw materials that can be used in fish processing are Baji-Baji Fish.

Baji-baji (Grammoplitesscaber) is one of the strategic commodities to meet relatively inexpensive protein needs (figure 1). Baji-baji fish can be as a food ingredient, is a source of nutrients that are important for the process of human survival.

Various methods are used to determine the quality of food materials. Broadly speaking, the determination of quality can be done physically, chemically and biologically. A chemist in determining the quality of food ingredients will consider the quality of materials in terms of protein, fat content or other food substances. Like a nutritionist they will then also think about the quality of the food based on its biology aspects such as its digestibility and other biological values.

Baji-bajifish has good nutritional content as a source of raw materials. This chemical composition will vary depending on the type of biota, species, age, and water conditions where the biota lives (Zaitsev et al., 1969 cit. Septarina, 1999). Like tuna and mackerel is a type of fish that contains good nutrition and high enough protein.

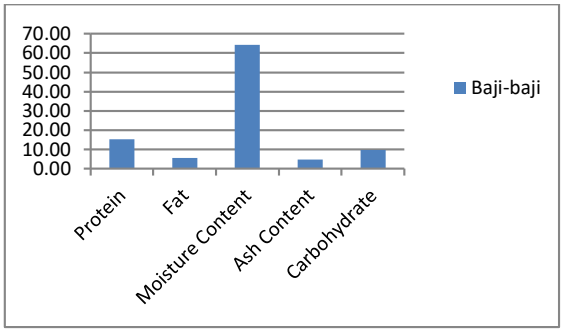

Figure 1. Nutritional content of Baji-bajiFish

In the comparison of nutrient content, tuna belong to fish with very high protein and low fat (Stansby&Olcott 1963). Tuna and mackerel have relatively the same levels of protein, fat, ash, and carbohydrates except the moisture content in the mackerel that more than tuna. Mackerel fish are easily deteriorated because the chemical composition can change. Fish quality deterioration includes physical, chemical and organoleptic changes in the order starting from pre-rigor, rigormortis, enzyme activity, microbial activity, fat oxidation, and hydrolysis (Huss 1995).

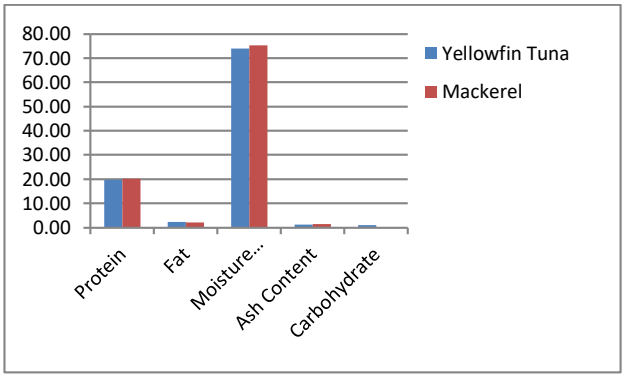

Figure 2. Nutritional Content of Tuna Yellowfin Fish (Wahyuni, 2011) and Mackerel (Purwaningsih, 2010)

Based on nutritional content assessment, baji-bajifish has a superior value than tuna and mackerel. Judging from the assessment baji-baji fish has lower protein, but superior in fat, ash, and carbohydrate content.The moisture content of baji-baji is less than tuna and mackerel. Water is an important source of components in food ingredients that can affect the appearance, texture and taste of food. Moisture content in food ingredients also determines the freshness and long-term durability of the food ingredients (Winarno 1991).

According to Pertiwi (2015) the diversity of fish yields can provide added value to the community if

marketed in the form of fresh, semi-processed or processed. Raw materials that can be used in fish processing are baji-baji fish. The fish can be used by market participants by turning it into semi-finished food products or in finished form. Commercial fish that have high nutritional content, namely threadfin bream, marine fish (10 best types according to sikorski in huda, 2003), snakehead and milkfish.

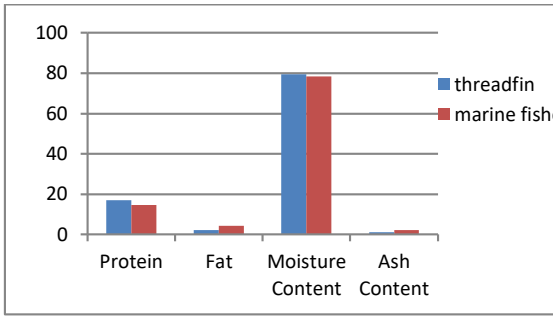

Figure 3. Nutritional content of threadfin bream and marine fishes (Huda, 2003)

Based on the nutritional content of baji-baji, fish are superior to threadfin bream fish and other marine fish on fat, ash and carbohydrate levels. Fish protein content is closely related to fat and moisture content. Fish that contain high fat on average have a large amount of protein. Fish meat has very little tendon so that it is easily digested by autolysis enzymes. The results of autolysis are a suitable medium for the growth of microorganisms (Adawyah 2006).

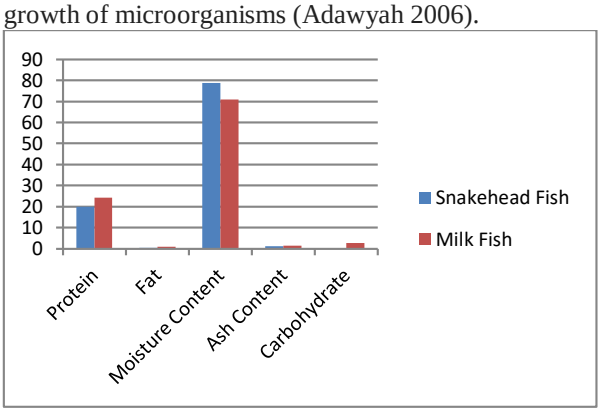

Figure 4. Nutritional content of snakehead fish (Chasanah, 2015) and milk fish (Hafiludin, 2015)

Judging from the content of protein nutrients in snakehead and milkfish.Baji-baji fish are superior in fat, ash, and carbohydrate content. The high fat content has the potential to contain essential fatty acids because it is only obtained in high fat fish. Ash is included in the basic data of nutrients as one of the proximate components in food. baji-baji fish are superior in ash content. According to Fenema (1996) ash content provides an estimate of the total food mineral content. Minerals in ash are in the form of metal oxides, phosphates, nitrates, sulfates, chlorides and other halides.

Increasing the potential of fish baji-baji can also be assessed in terms of amino acids. Amino acids are compounds that make up proteins, which form cells of the human body and animals. Amino acids are divided into two main groups, which are essential and nonessential amino acids.

Essential amino acids are amino acids that cannot be synthesized by our body so they must be in the food we eat and non-essential amino acids are amino acids that can be synthesized from other amino acids. Essential amino acids cannot be produced by the body so they must be supplied through food, while nonessential amino acids can be produced. Various types of amino acids combine in the peptide bond to produce protein. Acids - essential amino acids needed by the human body are histidine, isoleucine, leucine, lysine, methionine, arginine, phenilalanin, threonine, tryptophan, and valine, whereas non-essential amino acids are alanine, aspargin, cysteine, glutamic acid, glutamine, aspartic acid, glycine, hydroxyproline, and tyrosine (Purwaningsih, 2010).

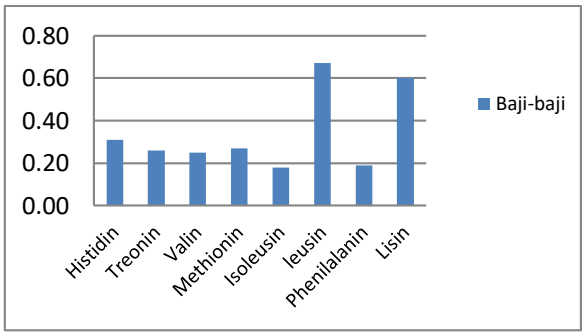

Figure 5. Essential Amino Acid Content of baji-baji Fish

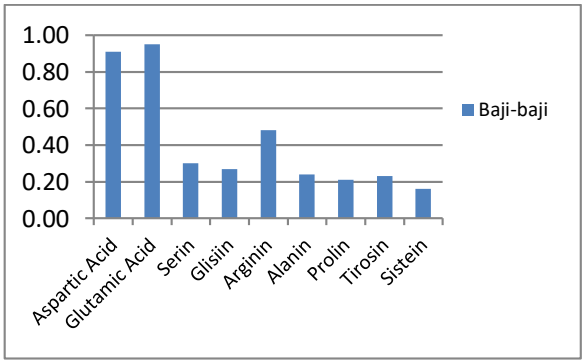

Figure 6. Non-essential amino acid content contained in baji-baji

The difference in the composition of amino acids in fish meat is due to several factors, namely internal factors including age, size, condition of the fish and external factors, namely the environment (habitat). Chyuan et al. (1996) explained that in red meat and white meat, liver, heart and other organs in fish have different amino acid

compositions. The highest content of amino acids for red meat and white meat of fish is in histidine and taurine, while the highest amino acids for other parts of the organ (liver, testin, and heart) is taurine.

The amino acid content of mackerel fish is greater than tuna lysine. Lysine plays a role in crosslinking proteins in carnitine biosynthesis, curing genital herpes. Valine plays a role in anemia, replacing the position of glutamic acid in hemoglobin. Methionine acts to produce sulfur, maintain metabolic normality, as an antioxidant and stimulate serotonin so that it can eliminate sleepiness (Chasanah, 2013).

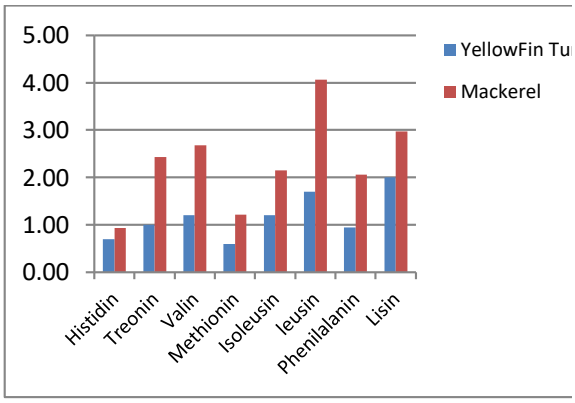

Figure 7. Essential Amino Acid Contents in Yellowfin Tuna (Wahyuni, 2011) and Mackerel (Purwaningsih, 2010)

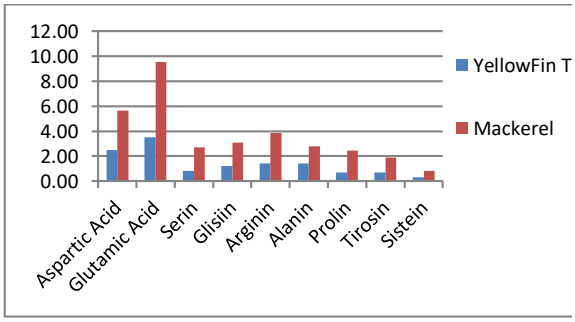

Figure 8. Non-essential Amino Acid content contained in Yellowfin Tuna (Wahyuni, 2011) and Mackerel (Purwaningsih, 2010)

Glutamate contributes to the production of inter-conversion in amino acids, proline precursors, ornitine, arginine, polyamine, α-amino butyrate neurotransmitters (GABA), NH3 sources. Serine plays a role in phospholipid components, sphingolipid precursors, ethanolamine and kholin precursors. Judging from its role, the protein content of mackerel fish is very beneficial for health (Chasanah, 2013).

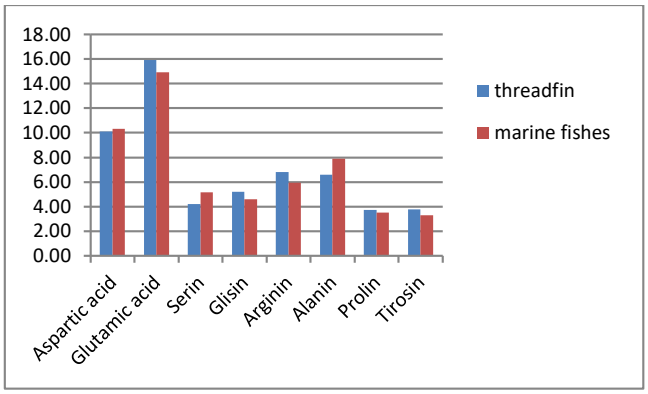

Figure 9. Essential Amino Acids contained in threadfin bream fish and other marine fish (Huda, 2003)

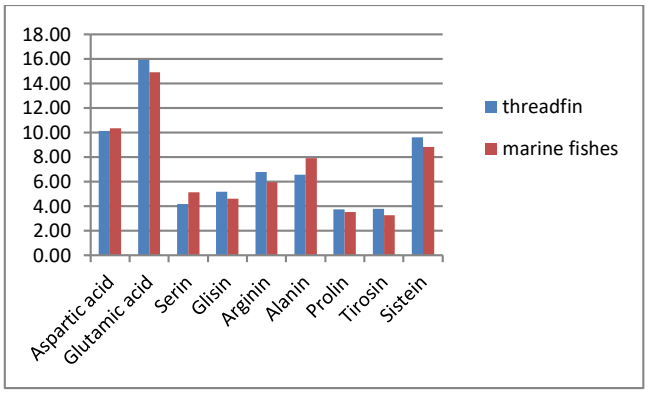

Figure 10. Non-essential Amino Acid content contained in threadfin bream fish and other marine fish (Huda, 2003)

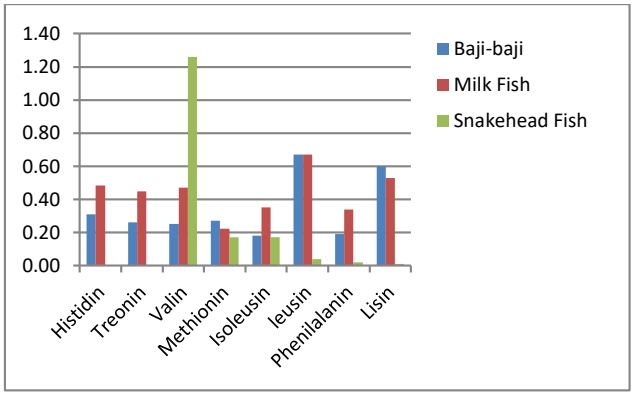

Figure 11. Essential Amino Acid Contents in Snakehead Fish (Chasanah, 2015) and Milk Fish (Hafiludin, 2015)

Based on data the highest value of valine is found in snakehead fish, but there is little histidine, threonine, and lysine content in snakehead fish. Baji-baji fish has superior lysine and methionine content compared to snakehead and milkfish. Baji-baji fish have complete amino acids.

The amino acids possessed by baji-baji fish are lysine and methionine. According to Mulyadi (2015) explained that lysine is one of the most important amino acids among all 20 common amino acids. This works against the herpes virus by giving the body the necessary nutritional supplements. The main function of lysine is inhibiting the growth of the virus and, as a result, is used in the treatment of Herpes Simplex, as well as viruses associated with chronic fatigue syndrome, such as: Epstein-Barr virus, Cytomegalo virus, and HHV6 virus, L-carnitine is formed from lysine and vitamin C , helps form collagen, connective tissue that is present in bones, ligaments, tendons, and joints.

Methionine is an essential amino acid which functions to begin the translation of messenger RNA and its main function helps in the breakdown of fats, precursors of the amino acids cysteine and taurine, helps reduce blood cholesterol levels, antioxidants, and helps in the elimination of toxic waste from the liver (Mulyadi, 2015).

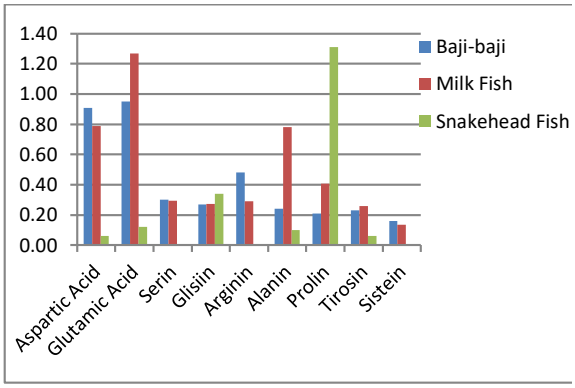

Figure 21. Non-essential Amino Acid content contained in snakehead fish (Chasanah, 2015) and milk fish (Hafiludin, 2015)

The content of non-essential amino acids which higher in baji-bajitypes of non-essential amino acids compare to snakehead and milk fish are aspartate, arginine, serine and cysteine. According to Mulyadi (2015) describes aspartic acid is one of two amino acids belonging to a group of 20 common amino acids, increases enzyme activity, maintenance of body solubility, and homeostasis in the ionic character of protein and the main function of aspartate acid can be exchanged with asparagine, and therefore these two amino acids have many of the same functions and also can increase stamina.

Arginine is synthesized normally in the body, arginine is known as a semi-essential amino acid. But it's more needed than normal production. This lack of amino acids may cause poor wound healing from our body, muscle weakness, hair loss, irritation of the skin, and constipation and the main function of arginine: important for normal immune system activities needed for wound healing (Mulyadi, 2015).

Serin is closely related to various body functions such as fat metabolism, tissue growth, increased immune system and more. This is an important element of brain protein and the main function of serine as one of the 3 most important glycogenic amino acids, the others are alanine and glycine, is to maintainblood sugar levels and to improve the immune system by helping the production of antibodies and immunoglobulins (Mulyadi, 2015).

Cysteine is present only at a rate of 2.8% to protein but provides 3-dimensional stability of protein molecules. Sitein plays an important role in the metabolic process of is important enzymes and the main function of cysteine are an antioxidant and protective against radiation, pollution, ultraviolet light and other causes of increased free radical production (Mulyadi, 2015).

Reviewing the value of essential and non-essential amino acids in baji-baji contains many types of lysine, methionine, aspartic acid, arginine, serine and cysteine compared to snakehead and milkfish.

Conclusion, fish baji-baji are fish that are less desirable because they have ugly appearance and fishy smell. There needs to be an effort to increase the potential of baji-bajifish to introduce its high nutrition content and it complete protein which is important for the body. The main nutrients in fish include protein, fat, vitamins and minerals. Based on the text, baji-baji fish has 15.45% protein, 5.66% fat, 64.34% moisture content, 4.79% ash content, and 9.77% carbohydrate. Baji-baji fish also has a very good amino acid content. the value of essential and non-essential amino acids in baji-baji fish contains many types of lysine (0.6), methionine (0.27), aspartate acid (0.91), arginine (0.48), serine (0.30)), and cysteine (0.16) compared to snakehead and milkfish. Based on the amino acid content, baji-bajifish is a source of highly nutritious materials that the body needs to inhibit viral growth and treatment of Herpes, help in breaking down fat, increase stamina, normal immune system activity needed for wound healing, improve the system immune by helping in the production of antibodies and immunoglobulins, as well as protecting against radiation.

D. ACKNOWLEDGEMENTS

This work was supported financially by the Ministry of Research, Technology and Higher Education of the Republic of Indonesia through the Beginning Lecturer Research (PDP) 2018. The authors were grateful to the entire academic community of the Fishery Product Polytechnic Technology Processing Program of Tanjungbalai.

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