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Fatty Acid Profile of Jellyfish (*Aurelia aurita*) as a Source Raw Material of Aquatic Result Rich Beneft

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Abstract

Jellyfish (*Aurelia aurita*) is a marine animal which thought to have a good content of fatty acids. Jellyfish are usually exported in the form of fresh or has undergone simple processing such as by salting to improve durability and simplify further processing. The Purpose study was to determine the characteristics and composition of fatty acids found in jellyfish (*Aurelia aurita*). Observations were made on the proximate content (water content, ash content, fat, protein and carbohydrates) and fatty acids in jellyfish fresh meat and dry meat that has been treated the addition of alum and salt with ratio of 1:5 from the total weight of jellyfish. Proximate result of jellyfish fresh meat was 87.50% of water content, ash content was 1,76%, fat was 2,03%, 5.31% protein and 3.40% carbohydrates, while the proximate result of jellyfish dried meat was 67.33% of water content, 3.26% ash content, 9.20% fat, 4.67% protein and 13,54% carbohydrates. Based on testing with gas chromatography method obtained the highest saturated fatty acids content in the jellyfish, was palmitic acid 15,36% on fresh meat and 15.35% on dry meat. The content of linolenic acid in jellyfish was small compared with the others unsaturated fatty acids (PUFA), which is arachidonat, linoleat and EPA. EPA content of fresh meat and dried jellyfish was 0.30% and 0.32% respectively.

Keywords

Aurelia aurita, Fatty Acids, Proximate Analysis

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1. Introduction

Indonesian region has excellent fishing potential to contribute to the fulfillment of people's nutrition. One of the aquatic biota of valuable but not widely used in Indonesia are jellyfish (*Aurelia aurita*). Jellyfish have a good potential to be used as a source of foreign exchange through exports. Jellyfish are exported in the form of fresh or with simple processing, ie by salting to improve durability and ease the process of further processing (Solihat 2004). Jellyfish suspected to contain high nutritional value, which includes proteins, amino acids, fatty acids, vitamins and minerals. Jellyfish are found in several locations fishing in Indonesia is still a commodity by a catch that required further research in order to be useful food ingredient. Typical nutrient jellyfish content are fatty acids (Imre and Saghk 1997). Fatty acids are long-chain organic acids having a carboxyl group (COOH) at one end and a methyl group (CH3) at the other end. Fatty acids are divided into saturated fatty acids and unsaturated. Fatty acids have important functions for the human body, including linoleic (omega-6) and linolenic (omega-3) are used to maintain the structural parts of the cell membrane, as well as having an important role in brain development. Omega-3 fatty acids can cure atherosclerosis, diabetes and strengthens the immune system (Imre and Saghk 1997). Linolenic acid has a derivative EPA (eicosapentaenoic) and DHA (docosahexaenoic), which is needed by the human body because it has several benefits, namely educating the brain, helping future growth and lowering triglycerides (Leblanc et al. 2008). Information about the nutritional jellyfish contained were limited so that the resource can't be utilized optimally, but the fact that this species has the

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potential as a source of nutrient-rich foods that have high economic value. One effort that can be done to increase the added value of jellyfish is to conduct research on the fatty acids contained in these organisms. This study aimed to determine the characteristics and composition of fatty acids in meat jellyfish (Aurelia aurita) fresh and dried.

2. Methods

Time and Place Research The research was conducted between February and April 2011 at the Laboratory of Industrial Raw Material Characteristics of Aquatic Product, Laboratory of Aquatic Product Biochemistry, Microbiology Laboratory of Aquatic Product, Aquatic Product Technology Department, Faculty of Fisheries and Marine Sciences; Inter-University Laboratory of Biology, Faculty of Agriculture, Bogor Agricultural University; and Integrated Mathematics Laboratory, Baranangsiang, Bogor. Materials and Equipment The materials used in this study consists of the main ingredient, namely jellyfish (*Aurelia aurita*) and materials for proximate analysis such as distilled water, HCl, NaOH, selenium catalyst, H2SO4, H3BO3 and hexane solvents and materials used for testing of fatty acids among others ethanol, isooktan, NaCl, NaOH, BF3 and distilled water. The tools used include digital scales, oven, desiccator, erlenmeyer glass, Kjeldahl tube, burette, mortar, Whatman 42 filter paper, fat-free cotton, Soxhlet tube, plastic, homogenizer, bottle vial, waterbath, syringes and gas chromatographic devices 2010 Shimadzu (identification of fatty acids).

Scope of Research

The research was carried out in several parts, namely making jellyfish (Aurelia aurita), determination of size and weight, sample preparation, calculation of yield and chemical analysis consisting of proximate analysis and analysis of fatty acids, other than that portion of meat fresh jellyfish treated through drying and giving salt to remove mucus and increase durability. Methods of fatty acid analysis by Gas Chromatography (GC) have changed the principle of fatty acids into derivatives, namely methyl esters that can be detected by means of chromatography. The results of the analysis will be recorded in a chromatogram sheet connected to a recorder and demonstrated through several peaks at retention time specified in accordance with the character of each fatty acid.

3. Results and Discussion

3.1. Characteristics Jellyfish

Jellyfish were used in this study has a soft texture, transparent white, slimy body and when touched can cause itching. Jellyfish dealt with fresh water washing was continued into salt water for several stages to remove mucus and itching of the body. Jellyfish that have been dried to have a lighter weight than fresh, it was because some of the water in the body of jellyfish have been vaporized by heat when drying, the water content is free water which is removed through the drying process (Winarno 2008).

3.2. The Yield of Jellyfish

The yield is the percentage of body parts of raw materials that can be utilized. The yield is a parameter to determine the economic value and effectiveness of a product or material. Yield calculation is based on the percentage ratio of the weight of the total weight of the sample. The greater the yield, the higher the economic value of the product, and vice versa, the lower the yield, the lower the economic value or effectiveness of a product or material. The yield of most of jellyfish is the meat, which is 87.96% and the rest is the yield filaments (entrails and offal) of 12.04%. Jellyfish have the greatest yield of meat, this is because almost the entire body of jellyfish counted as meat that can be fully (Solihat 2004).

3.3. Chemical Composition of Jellyfish

Good raw materials are materials that have a nutritional composition which includes water, fat, ash, protein and carbohydrates. Each of these components must be known amount of order fulfilment in the body's nutritional needs can be met appropriately. The nutritional composition can be determined by proximate analysis. Carbohydrates are calculated by difference. The results of the proximate analysis of jellyfish fresh and dry can be seen in Table 1.

Table 1. The chemical composition of meat jellyfish fresh and dried.

Parameters	Jelly Fish Fresh (%)	Jelly Fish Dry (%)
Moisture content	87.5	67.33
Fat	2.03	9.2
Protein	5.31	4.67
Ash	1.76	3.26
carbohydrate	3.4	13.54

Water is an important component in foodstuffs, because water can influence the appearance, texture, and flavor. The results of the analysis of water content contained in the jellyfish fresh meat and dried respectively by 87.50% and 67.33%. The high water content can be caused habitat jellyfish in the waters his entire life there. Drying treatment can also eliminate the water contained in food. The longer the drying time is done; the water content contained in a food would be lower. The process of granting salt can also cause a reduction in the water content contained in the jellyfish. Salt is hygroscopic so it can absorb the water contained in the material and then lowering the water activity of the material (Nurhasan et al. 2004). Fat is a substance that is important

and is a more effective source of energy for the body than carbohydrates and proteins. Fat content obtained from the proximate fresh jellyfish at 2.03% lower than the fat content found in jellyfish that has been dried, amounting to 9.20%. The drying process causes the water content contained in the meat jellyfish down, causing the fat dried jellyfish increased, not least due to the fat content is inversely proportional to the water content contained in a material. Fat in the living body is usually kept at 45% around the organs and the abdominal cavity (Winarno 2008). Proteins are macromolecules formed from amino acids that bind peptides. The results of the analysis of protein content obtained on jellyfish fresh meat that is equal to 5.31%, while the meat dried jellyfish at 4.67%, the result of this study is higher than Solihat study (2004) of 5.26%. Differences in the levels of this protein may be caused by differences in age, size and treatment of samples. Ash is a waste products of combustion of organic substances an organic material. The ash content and composition depending on the type of material analyzed. Most food stuffs, approximately 96% consisting of organic matter and water. The rest consists of mineral elements, also known as inorganic elements (gray). Burning organic components, but not because the inorganic component that is called ash (Winarno 2008). Proximate analysis results indicate that the ash content in meat fresh jellyfish lower, amounting to 1.76% compared to the ash content in meat dried jellyfish is worth 3.26%, it can be caused by the accumulation of minerals from salt given the drying treatment jellyfish to remove mucus and itching, other factors that can affect the environment and is the sampling time. In general, animals obtain minerals from plants and then stack them in their tissues. Ash content in meat jellyfish results of this study is lower than Solihat study (2004) that is equal to 4.64%, this is due to the differences in habitat, sampling time and environmental conditions of the organism. Each organism has a different ability to regulate and absorb minerals into the body, so it will have an impact on the ash in each material. Carbohydrates play an important role in nature because carbohydrates are the main energy source for animal and human being, besides carbohydrates also plays an important role in determining the characteristics of foodstuffs such as appearance, color and texture. Carbohydrates serve to prevent excessive protein breakdown, loss of minerals and helps metabolize fats and proteins (Winarno 2008). Carbohydrate levels on jellyfish fresh meat and dried in the amount of 3.40% and 13.54%, the difference in carbohydrate content can be due to differences in age, treatment and habitat sampling sites. Two-thirds of the carbohydrates contained in the form of glycogen stored in the muscles of animals and the rest in the liver. Glycogen is also known as animal starch is produced from glucose in the body. Glycogen is used by animals to supply energy while on the move. Carbohydrate levels in meat jellyfish these results is low at 3.54% and 13.54% compared with the results of research Solihat (2004), amounting to 16.93% and 17.08%, this is due to the levels of carbohydrates calculated basis by difference.

3.4. Fatty Acid Composition of Jellyfish

Fatty acids are long-chain components that make up lipid, consisting of a straight hydrocarbon chain having a carboxyl group (COOH) at one end and a methyl group (CH3) at the other end. Results of analysis of fatty acids in meat jellyfish fresh and dried shows there saturated fatty acids (Saturated Fatty Acid / SAFA), monounsaturated fatty acids (Monounsaturated Fatty Acid / MUFA) and polyunsaturated fatty acids (Polyunsaturated Fatty Acid / PUFA). Saturated fatty acids consist of lauric (C12: 0), myristic (C14: 0), palmitic (C16: 0) and stearic (C18: 0). Monounsaturated fatty acids consisting of palmitoleic (C16: 1) and oleic (C18: 1). Polyunsaturated fatty acids of meat jellyfish consists of linoleic (C18: 2), linolenic acid (C18: 3), arachidonic (C20: 4) and EPA (C20: 5, n-3) (Rahman et al. 1994). The diversity of the fatty acid composition of jellyfish can be influenced by several factors, such as age, treatment and size of jellyfish (Ozogul and Ozogul 2005). Saturated fatty acid content of the smallest that can be detected by the GC is lauric acid (C12: 0) of 0.06% on fresh meat and 0.07% on the dried meat.

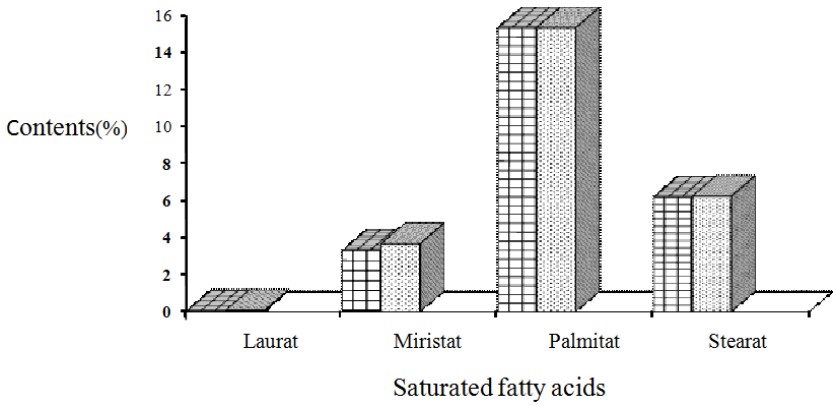

Figure 1. Saturated fatty acid content of the meat (fresh ☐ and jellyfish dried jellyfish ⊡).

Figure 1 shows the highest saturated fatty acid content of jellyfish, namely palmitic (C16: 0) of 5.82% on fresh meat and 5.67% on the dried meat. Myristic acid (C14: 0) in jellyfish fresh meat and dry, that is equal to 3.33% and 3.68%; palmitic (C16: 0) 15.36% and 15.35%; stearic (C14: 0) of 6.20% and 6.24%. Palmitate is a saturated fatty acid most commonly found in foodstuffs, which is 15-50% of all fatty acids that exist. The diversity of the resulting fatty acid composition of meat jellyfish fresh and dry can be influenced by several factors, such as age, size and treatment of these jellyfish (Winarno 2008). Monounsaturated fatty acids found in meat jellyfish is palmitoleic and oleic. Figure 2 showed that content of palmitoleic found in jellyfish fresh meat and dry, which equal to 3.31% and 3.20%. This difference may be caused by differences in treatment, the size and age of the jellyfish, but it is also influenced by the temperature of the living biota and habitat (Haliloglu et al. 2004).

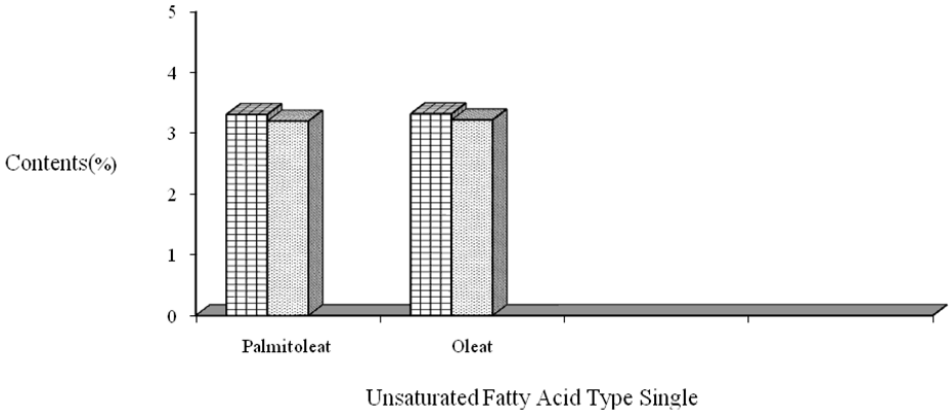

Figure 2. The content of monounsaturated fatty acids meat (Jelly fish fresh ⊟ dan Jelly fish dry ⊡).

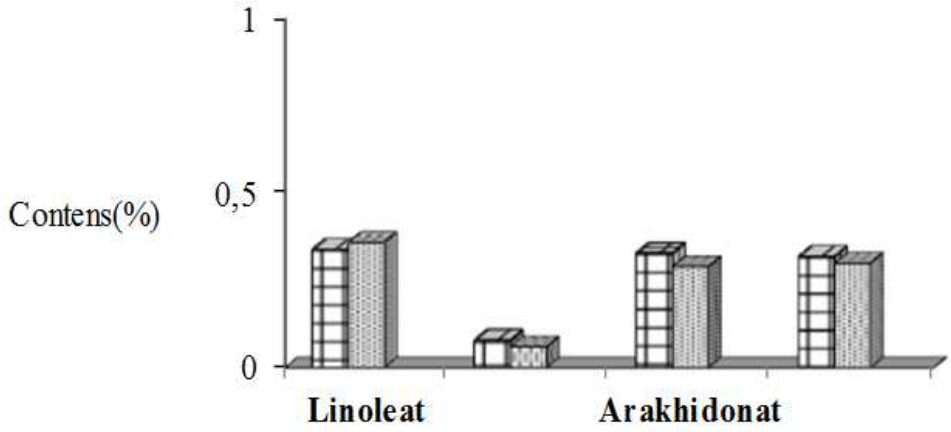

Figure 3. The content of polyunsaturated fatty acids of meat (Jelly fish fresh ⊟ dan jelly fish dry ⊡).

Test results of oleic acid on jellyfish fresh and dry of 3.32% and 3.22%. Oleic acid value difference is caused by differences in treatment, age and size of the jellyfish. Oleic acid is more stable than linoleic and linolenic acids, seen from its role in increasing HDL cholesterol and lowering LDL greater blood cholesterol Oleic acid also serves to lower the cholesterol levels in the body and precursor formation of PUFAs (Farouk et al. 2007). Polyunsaturated fatty acids found in jellyfish fresh meat and dried consisting of linoleic, linolenic, arachidonic and EPA. Linoleic and linolenic fatty acids are essential fatty acids because it is needed by the body, while the body can't synthesize. Arachidonic acid desaturation and elongation is the result of linoleic acid, while EPA and DHA in the body jellyfish can only be converted from α-linolenic acid. Desaturation is the process of adding a double bond in the fatty acid by the enzyme, while the elongation is an extension of two carbon chain. The human body can only convert α-linolenic acid is less than 5-10% 2-5% EPA and DHA (Winarno 2008). Figure 3 shows the content of linoleic on meat jellyfish is quite high compared to other fatty acids, namely 0.34% on fresh meat and 0.36% on the dried meat. Linolenic acid of jellyfish fresh and dried by 0.08% and 0.06%; arachidonic 0.33% and 0.29%; and EPA of 0.32% and 0.30%. EPA and DHA serves as a builder of most of the cerebral cortex of the brain (the part used to think) and for normal growth of organs (Imre

and Saghk 1997). The content of unsaturated fatty acids are quite high in meat jellyfish fresh and dried as oleic and linoleic very useful to the human body when taking them. Essential fatty acids are used to maintain the structural parts of cell membranes and to make materials such as hormones called eicosanoids. Eicosanoids helps regulate blood pressure, blood clotting, blood fat and immune response to injury. Essential fatty acid deficiency in the body can cause neurological disorders as well as inhibit the growth (Nurimala et al. 2009).

4. Conclusion

Jellyfish were used in this study has a soft texture, transparent white body color, slimy and has tentacles. The chemical composition of the highest for jellyfish fresh meat is moisture and protein, while for meat dried jellyfish is the highest ash, fat and carbohydrates. Meat jellyfish in this study also detected containing saturated fatty acids (lauric, myristic, palmitic and stearic), monounsaturated fatty acids (palmitoleic and oleic) and polyunsaturated fatty acids (linoleic, linolenic, arachidonic and EPA).

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