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ARTICLE REVIEW, CHARACTERISTICS OF OIL FROM FRESH WATER FISH WASTE

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ABSTRACT

Waste from the fishing industry that uses raw materials from freshwater fish such as catfish and catfish in the fillet industry and surimi has the potential to be extracted for its oil. The purpose of this article is to review the stages of the oil/fat extraction process, and the characteristics of the resulting oil/fat. The method used is citing various articles that have been published in national and international journals. Based on the results of literacy, it was found that the stages of extracting oil from fish waste from the fillet or surimi industry consisted of stages of oil extraction and purification. A distinctive characteristic of freshwater fish oil is that it contains high levels of oleic, palmitoleic and arachidonic fatty acids. The fatty acid composition consists of SFA (*Saturated fatty acid)*, MUFA (*Monounsaturated fatty acid*), PUFA (*polyunsaturated fatty acids*). There are three parameters that determine the value of fish oil, namely the provisions of CRN (*Council for Responsible Nutrition*), GOED (*Global Organization for EPA and DHA Omega-3*), and IFOS (*Internal Fish Oil Standards*).

Keywords : fillet industry, waste, omega 3, standard oil

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CHAPTER I
INTRODUCTION

1.1. Background

Generally, the waste generated from fish processing can reach 50 – 60% of the total weight of the processed fish. Waste from fish processing can be used as raw material for making oil (Zuta et al. 2003). This is because the fish processing waste contains abdominal fat deposits in the abdomen, as well as organs in the fish body such as liver, digestive tract, gills and eggs. According to Hwang et al. (2004), abdominal fat deposits, fish stomach contents including the digestive tract, liver and bile are potential sources of fat or oil for extraction. Fish oil is high in omega 3s.

The fat content and fatty acid composition of fish are influenced by several factors including (1) the environment in which they live (2) species (3) body tissues (4) food (Hadiwiyoto 1993). Generally, fat is stored in the body of fish for the purposes of long migration and to build certain glands. For example, shark liver oil contains up to 80% of total fat in the form of squalene. Fat deposits in fish tend to be stored in the abdomen (abdomen) with a weight of about 7% of the total body weight of fish. Depot fat itself is generally found along the structure of fish meat with content that varies between species (Ratna 1998).

Several types of fish from freshwater which are processed into raw materials for the fishing industry are catfish, catfish and tilapia. These types of fish are included in the high-fat fish group. Thus, the waste generated from the fishing industry that uses raw materials from these fish such as the fillet industry, surimi, and others has the potential for oil extraction. The purpose of this article is to review the stages of the oil/fat extraction process, and the characteristics of the resulting oil/fat. The method used is citing various articles that have been published in national and international journals.

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Potential of Land Fish to Fish Oil.

Several studies have been reported (such as Hwang et al. (2004)) that the stomach contents of catfish contain more fat and unsaturated fatty acids. plural (PUFA) compared to the meat. Sathivel et al. (2002) analyzed the fatty acid composition of crude oil extracted from the stomach contents of catfish with a weight of about 14% of its body weight. The extraction results showed that the total unsaturated fatty acids from catfish stomach oil was about 26.13% while that from filet meat was around 25.93%. The results of this study indicate that different body parts will provide different characteristics in terms of their fatty acid profile and composition.

Kamini et al. (2016) also published that the largest proximate content of catfish offal is fat. Fatty acid profile with composition order SFA>MUFA> PUFA with the highest content is oleic acid. The best characteristics of catfish oil extracted from dry rendering were obtained at a temperature of 50°C for 2 hours with quality that meets international standards (IFOS). Thus, this opportunity can be utilized, not only marine fish that can be used as quality fish oil. However, land fish can also be used as raw material for making fish oil.

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Fish Oil Extraction Fish

oil is a fat component in fish body tissue that has been extracted in the form of oil. Fish oil has more diverse types of fatty acids than other types of oil, with omega 3 fatty acids, namely EPA and DHA which are commonly found in fish oil (Estiasih 2009).

The process to get fish oil with good quality there are 2 important stages that must be considered, namely the oil extraction process and the oil refining process. Extraction is a way to get oil or fat from a material that is suspected to contain oil or fat. Purification*(refining)*is a process that aims to eliminate the taste and unpleasant smell, color is not attractive and to extend the shelf life before it is consumed or used as raw materials in industry (Ketaren 1986). According to Estiasih (2009), to make the crude fish oil produced suitable for consumption, purification is necessary. This purification needs to be done because the oil or fat produced in the extraction process generally contains impurities that are also extracted and these impurities can cause damage which results in the quality of the oil produced will decrease.

Fish oil obtained as a by-product of processing fishmeal and canned fish often contains large amounts of impurities. Impurities in fish oil can be grouped into three, namely first, impurities that are not soluble in oil (physical impurities, water and protein), secondly impurities in the form of colloidal suspensions in oil (phosphatides and carbohydrates) and thirdly impurities dissolved in oil. namely free fatty acids, pigments,

mono, and diglycerides, compounds resulting from oxidation, metals, and materials that are not saponified (Irianto 2002). The quality of fish oil can be improved so that it is suitable for human consumption by purifying it by several methods.

Fish Oil Purification Fish

oil purification is carried out to remove unwanted components or impurities because they have a detrimental effect on the overall quality of the oil (Estiasih 2009). The fish oil refining process can be carried out by following the steps of the gum removal process, free fatty acid removal, bleaching, and deodorization or choosing between them and then combining them to get the best results. The following is an explanation of the stages of the fish oil refining process.

Gum removal Gum

removal is the process of separating sap and slurry consisting of phosphatides, proteins, carbohydrate residues, water, and resins without reducing the amount of free fatty acids in the oil. Gum removal was carried out by adding 8% NaCl to fish oil at 60 C for 15 minutes. The NaCl solution was added as much as 40% of the volume of the purified oil and during degumming was stirred.

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Removal of Fatty Acids

Removal of free fatty acids is a process to separate free fatty acids from oil or fat by reacting free fatty acids with bases or other reagents to form soap (*soap stock*). Neutralization is done by adding 1N NaOH solution to the oil that has undergone a degumming process. 1N NaOH solution was added to fish oil at 60 C for 15 minutes. The amount of NaOH added is determined by the following formula:

$$\%NaOH = \%FFA \times 0.142$$

Furthermore, the neutralized oil is left for a while so that the resulting soap separation occurs. The soap layer is on the bottom layer and the oil layer is on the top. Then the soap is taken. To remove the remaining soap, hot water is added to the fish oil while stirring and then left to separate the oil and water. After that the separated water is discarded.

Bleaching

Bleaching is an oil refining process that aims to remove or blanch an undesirable color (Windsor and Barlow 1981). Bleaching is done by adding an adsorbent, generally carried out in a boiler equipped with a steam pipe and an air vacuum. The oil is heated at 105 C for 1 hour. Adsorbent is added when the oil

reaches a temperature of 70-80 C as much as 1-1.5% of the weight of the oil. In addition to color, colloidal suspensions and products of oil degradation such as peroxides are also absorbed.

Deodorization

Deodorization is a stage of the oil refining process that aims to remove unpleasant odors and tastes in oil. The principle of the deodorization process, namely the distillation of oil with hot steam at atmospheric pressure or in a vacuum. The deodorization process is carried out by pumping oil into a deodorizing kettle. Then the oil is heated at a temperature of 200-250 C at a pressure of 1 atmosphere and then at a low pressure (approximately 10 mmHg), while flowing hot steam for 4-6 hours to transport volatile compounds. After the deodorization process is complete, the fish oil is then cooled so that the temperature becomes approximately 84 C and then the fish oil is removed.

Characteristics of Fish Oil

According to Bimbo (1998), fish oil to be consumed must meetstandards *food gade*. These standards are based on the characteristics of the fish oil produced, adapted to the processing method and source of the fish oil. Several things that affect the quality of the fish oil produced are the type of fish whether wild or cultivated, the season when the fish is caught or the age of the fish.

Meanwhile, according to Abdulkadir et al., (2010), that there are several factors that can affect the fat content in fish, namely seasonal changes, natural cycles, maturity stage, geographical location, and the feed given during cultivation. According to Crexiet al., (2010), the distinctive characteristic of freshwater fish oil is that it contains high levels of oleic, palmitoleic and arachidonic fatty acids. The fatty acid composition consists of SFA (*Saturated fatty acid)*, MUFA (*Monounsaturated fatty acid*), PUFA (*polyunsaturated fatty acids*).

Freshness of fish oil can be measured by looking at the value of peroxide, anisidin, acid (*acid*), and totox.

- Peroxide value is a measure of rancidity that occurs during storage. This amount should be less than 5 meq/Kg. If it is higher, then the oil has oxidized.
- Anisidin value is a value that measures the rancidity of fish oil from chemical properties other than peroxide. This value should be less than 20 meq/Kg. If it is more than 20 meq/Kg, the oil will become unstable and smelly.

- Acid value, the more rancid the fish oil becomes, the greater the acid content in the oil. Acid value should be less than 3 mg KOH/gram. If more than 3, then the oil is definitely rancid.
- Totox value is the value of the calculation between the value of peroxide and anisidin. The totox value should be less than 26 meq/Kg.

There are three parameters that determine the value of fish oil, namely CRN (*Council for Responsible Nutrition*), GOED (*Global Organization for EPA and DHA Omega-3*), and IFOS (*Internal Fish Oil Standards*).

Apek Value	**Standard Value**	
	CRN	**IFOS**
Peroxide	<5 mEq / kg	<3.75 mEq / kg
Anisidin	<20 mEq / kg	<15 mEq / kg
Acid (acid)	<3 mg KOH / g	<2:25 mg KOH / g
Totox	<26	<20

Benefits Fish Oil

Irianto (2002), showed that the levels of DHA and EPA in fish or fish oil supplements have several benefits, namely:

- Lowering triglyceride levels.
- Slows the formation ofplaqueinblood vessels.
- Lowerspressureblood.
- Reduces the riskof heart attackandstrokein people with known heart disease.
- Protect skin.
- Improve brain function.
- Prevent and delaydementia.
- Prevents inflammation.
- Dilate arteries and veins.
- Helps increase appetite.

CHAPTER III

CONCLUSION

3.1. Conclusion

Based on the results of literacy, it was found that the stages of extracting oil from fish waste from the fillet or surimi industry consisted of stages of oil extraction and purification. A distinctive characteristic of freshwater fish oil is that it contains high levels of oleic, palmitoleic and arachidonic fatty acids. The fatty acid composition consists of SFA (*Saturated fatty acid),* MUFA (*Monounsaturated fatty acid*), PUFA (*polyunsaturated fatty acids*). There are three parameters that determine the value of fish oil, namely the provisions of CRN (*Council for Responsible Nutrition*), GOED (*Global Organization for EPA and DHA Omega-3*), and IFOS (*Internal Fish Oil Standards*).

REFERENCES

Abdulkadir, M., Abubakar, GI, & Mohammed, a. 2010. *Production and characterization of oil from fishes.* Journal of Engineering and Applied Sciences, 5(7), 1–5.

Bimbo AP. 1998. Guidelines for characterizing food-gade fish oil. INFORM. International News on Fats, Oils and Related Materials. Vol 9,number 5.pp 473 – 483.

Crexi, VT, Monte, ML, Soares, LA de S., & Pinto, LAA 2010. *Production and refinement of oil from carp (Cyprinus carpio) viscera*. Food Chemistry, 119(3), 945–950.

Estiasih T. 2009. Fish oil. Technology and its application to food and health. First edition. Graha Ilmu. Yogyakarta

Hwang, KT, Kim, JE, Kang, SG, Jung, ST, Park, HJ and Welleer, CL (2004). Fatty acid composition and oxidation of lipids in Korean Catfish. Journal of American Oil Chem. soc. 81: 123-127.

Irianto HE 2002. Utilization of fish oil for the pharmaceutical, food, feed and non-food industries. Marine Fisheries News. Vol 2. No.1. Marine Fisheries Research Institute. Agricultural Research and Development Agency. Agriculture department. Jakarta.

Kamini, Pipih S., Joko Santoso, and Sugeng HS 2016. Extraction of Dry Rendering and Fish Oil Characterization from Offal Fat by the Processing of Siam Patin Salad. Indonesian Journal of Fishery Products Processing. 19(3), 196-205.

Ketaren. 1986. Food Oils and Fats. UI Press. Jakarta

Sathviel S, Prinyawiwatkul W, King JM, Grimm CC, Lloyd S. 2003. Oil production from catfish viscera. Journal Am Oil Chem Soc 80 (4): 277-382.

Windsor and Barlow S. 1981. Introduction to fishery by product. Fishing news Books Ltd. Surrey. England.

Wu TH and Bechtel PJ. 2008. Salmon by-product storage and oil extraction. Journal of Food Chemistry 111:868-871.

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