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RESEARCH ARTICLE

FATTY ACID PROFILE AND TOTAL FAT CONTENT IN PAYANGKAHFISH *(Ophiocaraaporos)* NIKE FROM TONDANO LAKEIN NORTH SULAWESI

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ABSTRACT

The study on fatty acid composition of Payangka fish (*O aporos*) nike has been performed. The payangka fish (*O aporos*) nike from Tondano Lake was taken from fish farmers as much as 10 kg. Preparation techniques which conducted involve reception, selection aside from fish samples as follow-up material (dirt) and washing. The sample preparation process was taken in considering to equipment sanitation and hygiene. Samples are washed and then drained and dried at 40^0C for 24 hours. All parts of the fish body used for analysis. Determination of total fat content using (soklet extraction methods) and identification of fatty acid using Gas chromatography–mass spectrometry(GCMS). Based on analysis result, the chromatogram peak data indicate that amount of fatty acids components in fish payangka (*O aporos*) nike from Tondano lake in Minahasa, North Sulawesi was detected at least 19 components.

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INTRODUCTION

Fish can be categorized under its place of life, viz., freshwater and marine fish. The most real difference between freshwater and seawater is salinity factor. Salinity in simple terms is the amount of salt content in water. In freshwater, the number of salt content is lower (low salinity) while in seawater its salt content is high (high salinity). Tondanolake is located in Minahasa district, Province of North Sulawesi has water area of 4,600 ha with the depth average of 16 m, it is important resource for community of North Sulawesi, especially community who live in Minahasa and Manado City. The fish production from Tondanolake during 2009 reached 1,234 tons, or reaching 87 percent from total fish production of lake in North Sulawesi in 2009 was 1420.9 tons. According to the Living Environmental Status report of North Sulawesi Region the fish existed in Tondanolake is Payangkah (*Oaporos*), Sepat (*T.trichopterus*), Mujair (O. mossambicus), Tilapia (*O.niloticus*), Cork (*O. striatus*), Nilem (*O. hasselti*), Catfish (*C. batrachus*), Goldfish (*C. carpio*), Betok (*A. testudineus*). According to Soeroto (1988) the nike of payangkah fish has size 10-35 mm and the payangkah fish has size > 35 mm where its population as if will never run out, since this assumption is starting from the fact that Nike is very easy to find and arrested in the outskirt of lake throughout the year. Hendra and Kartamihardja (2002) state that payangkah fish (*O.aporos*) nike from Tondano lake consists of 6 size groups with an average of size distribution to each group of 18:05 mm; 24.70 mm; 30.22 mm; 34.13 mm; 39.86 mm and 57.34 mm. The fish meat chemical composition can vary in the same fish species depend on the season, age, sex and habitat. The fish meat is generally containing four basic material in various main proportion of nutrients such as water (70-80%), protein (18-20%), fat (5%) and mineral (5%) and nutrition minor such as vitamins, carbohydrates (Khurseed J and Mosharaff 1998). The fats contained in fish are generally unsaturated fatty acids commonly known as Omega-3. Omega-3 fatty acids have special meaning in science of nutrition because it contains fatty acids are related to health and intelligence. The fatty acids are related to health is EPA (*EicosaPentaenoic Acid*). While fatty acids are associated with intelligence known with DHA (*DocosaHexaenoic acid*) (Nettleton, 1995). The fatty acids are long-chain organic acids which have carbon atoms 4-24 that has single carboxyl group and long-nonpolar hydrocarbon ends, causing almost all lipids are insoluble in water and looked oily or fatty (Johnson and Davenport, 1971). The fatty acids are long chain components of hydrocarbon that structuring the lipid. The fatty acids have important functions in human body, such as linoleic (omega-6) and linolenic (omega-3) were used to maintain structural parts of cell membranes, as well as having important role in brain development. Some of benefits of omega 3 fatty acids are able to cure atherosclerosis, prevent cancer, diabetes and strengthens the immune system (Imre and Sahgk 1997).

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Linolenic fatty acids have two derivatives of EPA (*Eicosa Pentaenoic Acid*) and DHA (*Docosa Hexaenoic Acid*), which is needed by human body because it has some benefits, ie it can educate the brain, helps the growth period and reduce triglycerides (Leblanc *et al*., 2008). The fats contained in fish generally are unsaturated fatty acids commonly known as Omega-3. The fatty acids composition from fish oily (especially PUFA) its response varied to its habitat like change in water temperature, salinity and lipids dietary (Tocher, 2003). Freshwater fish containing Omega-3 fatty acids lower than in marine fish (Wang, 1990). According to Ackman (1994) the fatty acid composition of freshwater fish contains a high C_{16} and C_{18} content, while C_{20} and C_{22} is low, otherwise the fatty acid composition of sea water fish containing high C_{20} and C_{22} and lower C_{16} and C $_8$. This is caused by differences in the type of consumed fat composition from its living environment. The omega-3 fatty acids are fatty acids that can inhibit blood clotting and prevent the brain selebrum clogging and hardening the arteries (Harper, *et al*., 2002). This research is important because the lack of published data on the fatty acids composition of payangkah fish nike derived from Tondano lake in North Sulawesi.

MATERIALS AND METHODS

The payangkah fish (*O aporos*) nike derived from Tondano lake in North Sulawesi, Heksane p.a., *boron trifluoride catalyst*, filter paper, distilled water, methanol.Fresh fish is taken directly from Tondanolake, selected and cleaned from sticking dirt. The fatty acid analysis conducted in two phases, i.e., preparation and analysis. The preparation stage includes hydrolysis and esterification using sodium hydroxide reagent in methanol and boron trifluoride catalyst to produce fatty acid esters in hexane solvent. Further analysis using gas chromatography preset condition.

with 4 ml of hexane. The mixture is then shaken using vortex and let for about 30 minutes to separate into two phases. The top layer, FAME is then taken for analysis using GC. Samples were manually injected into the GC cavity.

RESULTS AND DISCUSSION

Total fat content of the Payangkah Fish (*Ophiocaraaporos*) Nike

The analysis results about total fatty of payangkah fish (*O aporos*) nike in this study was obtained of 2.72%. Based on categorizing the fish fat content by Ackman (1994), the payangkahfish nike including the low fat fish species, that its fat content is between 2-4%. This is because in the small fish or in a growth period, the feed utilization used for energy is much greater than amount of fat stored in body (Suprayudi *et al.,* 1994).

The fatty acid composition of payangkah fish (*Ophiocaraaporos*) Nike

The fatty acid composition in the payangkah fish nike from Tondano lake was done using GCMS instrument. The analysis results indicates that there are at least 19 components of fatty acids in the payangkah fish (*O.aporos*) nike. The chromatogram GC of Payangkah fish (*O.aporos*) nike is presented in Figure 1. Furthermore, identification of components is done by combining the analysis results of samples mass spectrometry with computers library that stores mass spectra data from the pure compounds has been known.This identification is also performed by comparing images of mass spectra obtained in literature based on retention time and prices contained in literatures. Table 1 shows that there are at least 19 chemical compounds in payangkah fish (*O aporos*) nike with retention time begins at

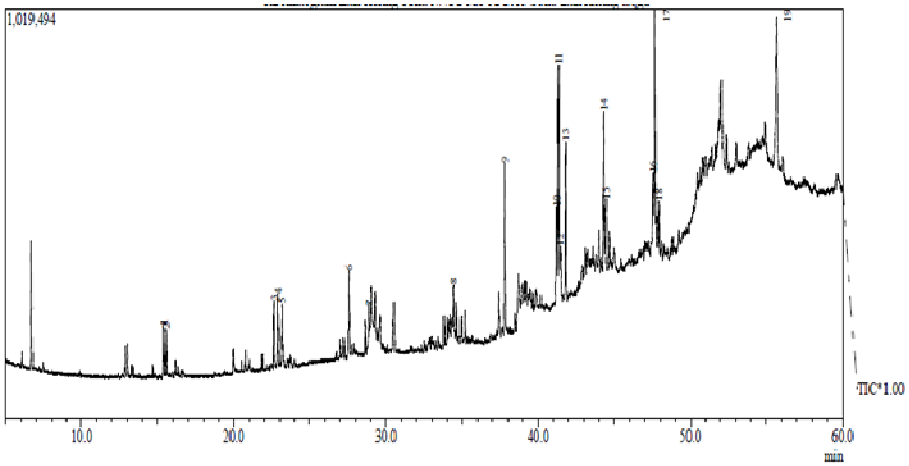

Figure 1. GC-MS Chromatograms of Payangkah Fish (*O. aporos*) Nike

Sample 3g is weighed and put into timble. A clean fat pumpkin put into the oven, then add boiling stones and weighed as an empty bottle. Thimble put into soklet, then the fat pumpkin connected with soklet and added 150 ml of hexane solvent through soklet. The fat pumpkin and soklet connected with the bath and extracted for 6 hours. When extraction is completed, the fat pumpkin evaporated to remove the solvent. Furthermore, the fat pumpkin put into oven in temperature of 105^{o}C for 1 hour. After cold weighed as final weight (weight of pumpkin and fat). Fat sample 0.2 g is weighed and diluted

minute 15 to minute 47.Among predominant fatty acids found in samples of payangkah fish (*O aporos*) nike is methyl eicosa-5,8,11,14,17-pentaenoate; 10-octadecenoic acid, methyl ester; Cholesterol n-propionate; Hexadecanoic acid, methyl ester. According to Asgar, *et al.,* (2011) a spectrum period of octadecenoic acid shows molecular ion peak at m/z 296.49 in accordance with formula of C_{19} H_{36} O_2, and shows two molecules of unsaturation degree in molecule. Ackman (1994) stated that

Table 1. The identification results of volatile compounds of Payangkah fish (*O.aporos*) nike by GC-MS

No	R.time(menit)	%Relatifcomponen	Mw	formula	SI	Component name
1	15.407	2.05	168	$C_{12}H_{24}$	90	1-Decene, 2,4-dimethyl
2	15.551	1.85	182	$C_{13}H_{26}$	90	2-Undecene, 4,5-dimethyl
3	22.657	2.69	158	$C_{10}H_{22}O$	88	2-Propyl heptanol
4	22.903	3.76	214	$C_{14}H_{30}O$	89	2-Hexyl-1-octanol
5	23.150	2.28	186	$C_{12}H_{26}O$	88	5-(Hydroxy methyl) undecane
6	27.553	2.95	218	$C_{15}H_{22}O$	87	BHT-quinone-methide
7	28.858	0.60	298	$C_{20}H_{42}O$	86	3,7,11,15-Tetramethylhexadecanol $$
8	34.449	1.34	298	$C_{20}H_4O$	88	3,7,11,15-Tetramethyl hexadecanol
9	37.822	9.05	270	$C_{17}H_{34}O_2$	96	Hexadecanoic acid,methyl ester
10	41.228	4.91	322	$C_{21}H_{38}O_2$	92	11,14-Eicosadienoic acid, methyl ester
11	41.338	12.94	296	$C_{19}H_{36}O_2$	96	10-Octadecenoic acid, methyl ester
12	41.440	2.32	296	$C_{19}H_{36}O_2$	95	13-Octadecenoic acid, methyl ester
13	41.812	8.24	312	$C_{20}H_4O_2$	95	Methyl nonadecanoate
14	44.332	8.78	318	$C_{21}H_{34}O_2$	92	5,8,11,14-Eicosatetraenoic acid, methyl ester
15	44.460	3.83	332	$C_{22}H_{36}O_2$	86	5,8,11,14-Eicosatetraenoic acid, ethyl ester
16	47.563	3.88	318	$C_{21}H_{34}O_2$	83	5,8,11,14-Eicosatetraenoic acid, methyl ester,
17	47.693	14.35	316	$C_{21}H_{32}O_2$	87	Methyl eicosa-5,8,11,14,17-pentaenoate
18	47.914	4.10	292	$C_{19}H_{32}O_2$	85	Linolenic acid methyl ester
19	55.647	10.09	442	$C_{30}H_{50}O_2$	88	Cholesterol n-propionate

the fatty acid composition of freshwater fish contain a high C_{16} and C_{18} content while C_{20} and C_{22} is lower, otherwise the sea water fish contain a high C_{20} and C_{22} content and C_{16} and C_{18} is lower. This difference is caused by the differences in the fat types composition consumed from its living environment. Osman *et al.* (2007) states that freshwater fish contain plural unsaturated fatty acids (PUFA) content which lower than sea water fish. The differences caused by the fact that freshwater fish consuming more herbs while sea water fish consuming zooplankton which rich in PUFA. The high unsaturated fatty acids content in fish is most useful for human body when consumed as unsaturated fatty acids derived from fish has multifunctions that useful for the body. The fatty acids have important functions for the body, an essential fatty acids is used to maintain structural parts of cell membrane and to make materials such as hormones (hormone like) called *eicosanoids*. Eicosanoids help to regulate blood pressure, blood clotting process, fat in blood and immune response to injury and infection (Whitney *et al.* 1998). The high unsaturated fatty acids content can inhibit HMG-CoA reductase activity (Ide *et al*, 1978; Siscovick*et al,* 1995) which is a regulatory enzyme in the cholesterol biosynthesis. Because the cholesterol biosynthesis in liver, PUFA plays important role in maintaining a normal blood cholesterol levels (Nestel, 1990).

Conclusion

The analysis results on total fatty of payangkah fish (*Oaporos*) nike was 2.72%. The identification results of volatile compounds in payangkah fish (*Oaporos*) nike consists of 19 organic compounds. Based on the relative components, the mots compound obtained was methyl eicosa-5,8,11,14,17-pentaenoate of (14%); 10-octadecenoic acid, methyl ester (12%) and cholesterol n-propionate (10%).

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