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Similarities Content of Anchovy Omega 3 between Regions of Indonesia

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Abstract

EPA and DHA are forming compounds of Omega 3 anchovy (*Stolephorus* Sp.) oil concentrate. Content analysis results of anchovy fatty acid 1% using spectrophotometer GC-MS, EPA identified at minute 14,43 with similarity index 27,5 %; and DHA identified at minute 15,50 with similarity index 42,6 %. Both of these compounds have m/e value peak base 79.

Keywords: Anchovy (*Stolephorus* Sp.); Spectrophotometer GC-MS; EPA; DHA.

1. Introduction

Indonesia known as the largest archipelagic country in the world, which is rich in marine natural resources. Indonesia also known as one of the world's largest marine fish producer. Year 2008, Indonesia in the third rank of the world after China and Peru as marine catch fish producer country [1]. However, it was not in line with fish oil production in Indonesia.

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Based on data, in 2011 imports value of Indonesia on fish oil was 4.666 ton with nominal 17.555 million US dollars. While the export value was 183,407 ton or equivalent to 589,132 million US dollars [2]. High import value show high demand of fish oil domestic market that were not fulfilled by Indonesian industry. This is a challenge and an opportunity for Indonesia to develop the fish oil potential to capture the domestic and international market. Indonesia is rich in various kinds of fish, especially pelagic fish, has the opportunity to become major producer of the world's fish oil. As known, fish oil that rich in Omega 3 has promotive and preventive health benefits, thus become one of the nutrasetikal that widely used by Indonesian and the world.

Pelagic Fish is fish that lived in between the sea surface to the ocean water column. Usually pelagic fish form schools (schooling) and migrating / *ruaya* into its migration area [3]. Generally, pelagic fish divided into two types, which are small pelagic fish and large pelagic fish. The small pelagic fish consists of Selar (*Selaroides leptolepis*) and Sunglir (*Elagastis bipinnulatus*), Anchovy (*Stolephorus* Sp.), Japuh (*Dussumieria* spp), Tembang (*Sardinella fimbriata*), Lemuru (*Sardinella Longiceps*) Siro (*Amblygaster sirm*), and group of Scrombroid such as Kembung (*Rastrellinger* spp), etc.

And large pelagic fish consist of Tuna (*Thunidae*), Cakalang (*Katsuwonus pelamis*), Marlin group (*Makaira* sp), Tongkol group (*Euthynnus* spp) and Tenggiri (*Scomberomorus* spp). Anchovy are pelagic and inhabit the coastal waters and estuaries, but some of them can live in low salinity between 10-15%. By its nature, fish live in groups, often migrating, so that anchovy has spread area that affected by the change of seasons in certain areas. Anchovy season pattern happen periodically every year [4, 5] Anchovy has wide spread area in the Pacific Ocean even up to the area of Tahiti and Madagascar. The spread of anchovy in Indonesia in the area between 95° east longitude – 140° east longitude and 10° north latitude – 10° south latitude, covers almost the entire territory of Indonesia. High quality fish oil is a fish oil that rich in fatty acids that has health benefits. Omega-3 is one of the unsaturated fatty acids that are essential for the body and required as nutrients that can prevent vascular sclerosis, for example to patients with high cholesterol. EPA and DHA are the most dominant Omega 3 type in fish oil. ALA as a source EPA and DHA do not produced by fish, but by marine plants like algae. The content of EPA and DHA in fish caused by the fish consumes algae that contain ALA as the source of these two fatty acids [5]. Therefore, it is not surprised if the type of herbivorous fish such as Lemuru and anchovy contain EPA and DHA higher than the carnivorous fish such as shark, and tuna. Considering the Indonesian great potential as fish oil producers, fatty acid of anchovy fish oil will be analyzed in this study. This study aims to find out whether omega-3 fatty acid content of anchovy fish oil located in eastern Indonesia have similarity with anchovy fish oil that were found by previous researchers, by Hutomo [4, 5] which states that anchovy (*Stolephorus* Sp.) as the local fishery products that are cheap and very easy to find. Anchovy that included in the group of oily fish contains high omega3 fatty acids particularly in Sinjai Regency (Sulawesi Selatan). Therefore, the quality of beneficial fatty acids such as EPA and DHA can be measured.

2. Materials and Methods

This research conducted at the Health Laboratory of Health Department of Sulawesi Selatan Province. First Anchovy dried up through the drying process by the sun. This drying method use only sun and wind. The drying fish are arranged on shelves and tilt $\pm 15^\circ$ to the wind direction.

Dried anchovy powdered using blender. Anchovy which has powdered extracted by maceration method using chloroform: methanol (2:1) solvents. The ratio of anchovy sample and solvent used is 1:2 (w:v), then allowed to stand for 24 hours. After that filtered, then rotary evaporated at 30°C with speed 60 rpm.

Derived extract of chloroform: methanol anchovy oil purified using NaOH solution (1:1) [6,7]. Soap or emulsion formed separated from the oil by centrifuges with speed 1500 rpm for 15 minutes. Purified fish oil saponified with NaOH solution in aqueous alcohol (120 gram NaOH and 1,25 gram Ethylene Diamine Tetra Acetic Acid (EDTA) dissolved in 400 ml aquades and 400 ml ethanol 96%). Ratio of anchovy oil and solution 1:2 (w:v). Saponification conducted at room temperature for 8 hours with constant stirring.

Saponification result added with HCl 6 N solution until pH reaches 1. After pH 1 reached, then added n-hexane, 200 ml (several times). The mixture evaporated with a rotary evaporator at 30°C. Fatty acid as saponification results added to hot urea solution (65 -70°C) (the ratio of urea / fatty acid 4:1) and 267 ml methanol. The mixture stirred until clear. Urea and urea complex compounds left on for 24 hours to crystallize at temperatures between -36°C to 36°C. After that, filtering. The liquid phase, vacuum evaporated at room temperature.

Concentrate added by HCl 0,1 N 125 ml and n-hexane 125 ml. Then n-hexane layer separated. The bottom layer re-extracted by 50 ml n-hexane. n-hexane phase mixture then vacuum evaporated at room temperature. Concentrates obtained is omega 3 fatty acid concentrate rich in EPA and DHA. Concentrate stored in closed containers at temperature -20°C.

Fatty acid content analyzed using Gas Chromatography Mass Spectroscopy (GCMS). First, fatty acid dissolved by using n-hexane (1 %), then injected as much as 1 µl using a direct system by injector 250°C, temperature detector 260°C, initial column temperature 140°C maintained for 6 minutes, increase in column temperature 30°C per minute until the final temperature 230°C and maintained for 20 minutes. Helium gas used as a carrier gas with pressure 1 kg/cm², while the pressure of hydrogen gas and air for FID are 0,5 kg/cm² each.

3. Results and Discussion

GCMS analysis result of fatty acid compound content of anchovy shown in Table 1. From table 1, it can be seen the molecular ion mass fragment peaks from both types of fatty acid as anchovy oil omega 3 concentrate sample component have similarity index 27- 43 % of literature database fatty acids. The high similarity index value indicating that the fatty acid structure offered by database can be accepted as representation of fatty acid structure of anchovy oil omega 3 concentrate components. From figure 1 and 2, it can be seen also that ion mass spectrum of sample fatty acid molecules to peak on retention time 15.50 and 14.03 has peak base 79. Peak base of mass spectrum of this fatty acids sample has the same peak base with database literature as seen in Table 1. Considering the high similarity between mass spectrum of sample fatty acid and database literature fatty acid (Table 1), accepted as true fact if fatty acid of anchovy oil omega 3 concentrate components consists of Dekosahexanoic Acid (601,57 ppm), and cis-5-8-11-14-17-Eicosapentaenoic acid (626,04 ppm). Thus, it is known that EPA and DHA compounds as components of anchovy (*Stolephorus* Sp.) oil omega 3 concentrate derived from Spektro GC-MS analysis. The results shown by researchers concerning high quality and high

content of anchovy omega 3, should be used by government as a basis to improve the quality of health development in promotion and prevention. Health promotion of anchovy (*Stolephorus* Sp.) consumption for 1000 days from the beginning of life create new intelligent generation and the adult prevention of degenerative diseases. By consume more anchovy (*Stolephorus* sp.) in daily will nourish them in their old age with more economical way.

Table 1: Identification Result of DHA and EPA compounds by Using Spectrophotometer GC-MS at 1% Omega 3 Concentrate

RT	m/ e*		Similarity Index (%)	Concentration (ppm)	BM/ Molecular formula	Compound name
	Database	Sample				
15.50	299, 284, 274, 259, 241, 227, 215, 192, 173, 159, 145, 131, 119, 105, 91, 79 , 67, 55	299, 280, 269, 259, 241, 225, 215, 192, 173, 159, 145, 131, 119, 105, 91, 79 , 67, 55	42,6	601,57	328,24/ C ₂₂ H ₃₂ O ₂	Docosahexanoic Acid (DHA)
14.03	298, 284, 273, 259, 248, 233, 220, 206, 185, 175, 166, 161, 147, 133, 119, 105, 91, 79 , 67, 55	302, 292, 273, 259, 248, 233, 220, 206, 180, 166, 147, 133, 119, 105, 91, 79 , 67, 55	27,5	626,04	302,22/ C ₂₀ H ₃₀ O ₂	cis-5-8-11-14-17-Eicosapentaenoic acid (EPA)

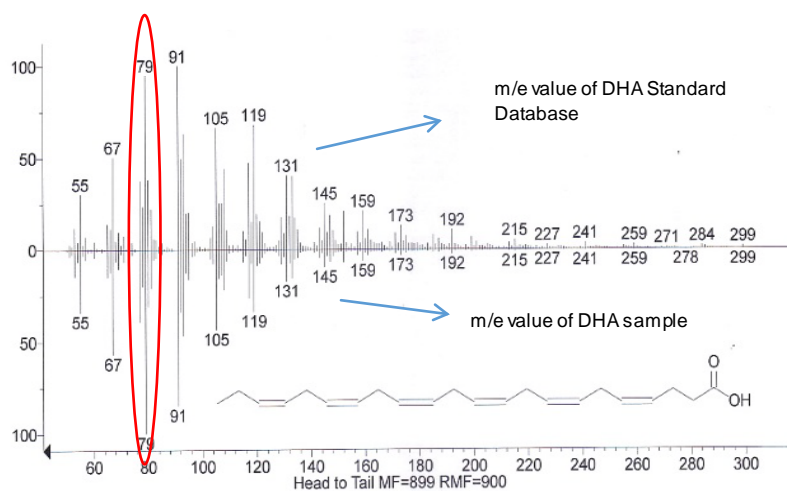


Figure1: Spectrophotometer GC-MS Result on DHA Compound

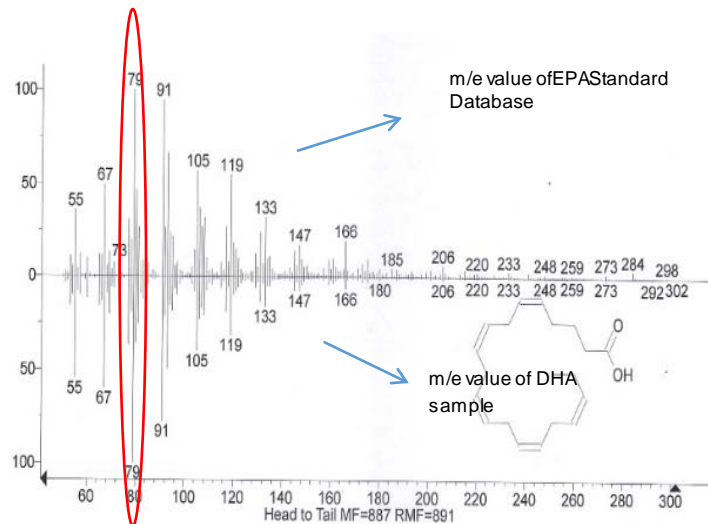


Figure 2: Spectrophotometer GC-MS Result on EPA Compound

Furthermore, in the field of economy and industry, it is expected to create technology in extracting the anchovy (*Stolephorus Sp.*) oil omega 3 as promotive and preventive step in health, affordable to the middle and lower economic communities wherever they are in the world.

4. Conclusion

Omega 3 derived from anchovy (*Stolephorus Sp.*) insulation oil shows a high similarity index with omega 3 standards (figured as results of spectrophotometer GC-MS). The omega 3 content, especially EPA and DHA of anchovy obtained from Sinjai Regency (Sulawesi Selatan) has significant similarities with omega 3 of anchovy as published by previous researchers which states that the anchovy (*Stolephorus Sp.*) is a cheap local fishery products and very easy to find. Anchovy classified as oily fish contains high category of omega-3 fatty acids.

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