Identification of Natural Compounds in Muscle Tissue of pickhandle barracuda (*Sphyraena jello*) in Bander Abbas in the south of Iran (Closed to the Persian Gulf)

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Abstract: Fish is a good source of omega-3 fatty acids. In this study, natural compounds from muscle tissue of pickhandle barracuda **(***Sphyraena jello)* from the port of Bandar Abbas in the south of Iran closed to the Persian Gulf in Oct 2012 were extracted using the method of Blight & Dyer. The compounds were identified using a combination of GC and GC/MS. Components were also identified in both male and female species. Ten compound reperesenting 96.00% of the extract of Muscle Tissue of *Sphyraena jello.* Docosahexaenoic acid (DHA) (20.60%), Palmitic acid (15.24%) and Squalene (13.50%) were the main constituents Muscle Tissue. The other main components was Eicosapentaenoic acid (EPA) (12.01%), Oleic acid (11.30%) and Octadecanoic acid (10.65%).
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1. Introduction

Barracudas (family Sphyraenidae and genus *Sphyraena*) are found in tropical and subtropical oceans worldwide. Barracudas are popular both as food and game fish. They are most often eaten as fillets or steaks (Pastore, 2009). The pickhandle barracuda (*Sphyraena jello*) is capable of quickly pursuing its prey using thrusts of the powerful, forked tail fin. The mouth of this species is large, reaching back level with the small eye, and is armed with long, sharp, dagger-like teeth. The dark bars that streak its sides are vertical in the lower half, but angled in the top half in the shape of a pick, giving this fish its common name (Campbell & Dawes, 2005). The pickhandle barracuda is light silver in color, which acts as camouflage, making it difficult to see from below against the surface light (Figure 1).

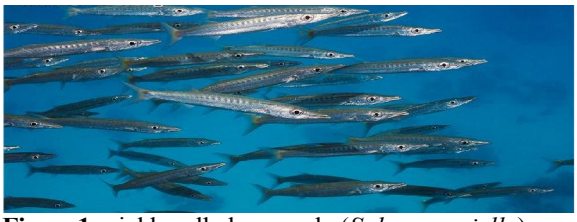

Figure1. pickhandle barracuda (*Sphyraena jello*)

The nutritive value of fish is determined by the content of fatty acids that are beneficial to health (Cornils & Lappe, 2006). Fish lipids are well known to be rich in long-chain (LC) n-3 polyunsaturated fatty acids (LC n-3 PUFA), especially eicosapentaenoic acid and docosahexaenoic acid (Visentainer, 2005).

Long chain, n-3 PUFA cannot be synthesized by humans and must be obtained from the diet (Martin et al., 2008). It is known that polyunsaturated fatty acids can regulate prostaglandin synthesis and hence induce wound healing (Baylin et al, 2003), These fatty acids have particular importance in fish since their consumption contributes in the reduction of appearance of cardiovascular diseases (Stancheva et al., 2010), anti-inflammatory and antithrombotic effects, reduction of blood cholesterol levels and cancer prevention (Nordov et al, 2001).The purpose of this study was to identify natural compounds, especially fatty acids in muscle tissue o pickhandle barracuda as one seafood in the port of Bander Abbas in the south of Iran.

2. Material and Methods

In this experimental study, 30 *Sphyraena jello* samples were obtained from the port of Bandar Abbas in the south of Iran (figure2).

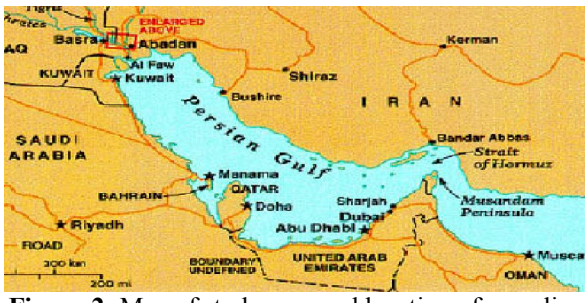

Figure 2. Map of study area and location of sampling station in Bander Abbas in the south of Iran

Initially the muscle tissue was weighed and mixed into a soft uniform mixture.

Mixtures of chloroform and methanol were added as lipid extract ants (Blight & Dyer, 1959).This solvent system allows for extraction of both polar and non polar compounds. The lower chloroform layer includes the lipids and the top methanol-water layer generally contains the non-polar components. The lipid in the chloroform layer is isolated using a separator funnel and then the solvent removed using a rotary evaporator under vacuum, at temperature of 40° C. The weight of the lipid was determined.

The lipid extract obtained was injected into chromatograph equipment with a mass spectra detector (GC- MS).components were identified by comparison of the retention time and mass spectra of the unknowns with those of authentic samples and also comparative analysis of kovats index & using references of Eight peak. It should be noted that the extraction and identification was performed separately for both sexes.

3. Results

Results of this investigation are indicated in Tables 1 and 2. Chloroform phase is discussed in this research because the fat content of the muscle tissue is extracted with chloroform (Blight & Dyer, 1959). The components identified in GC-MS analysis of the samples from female species is shown the below table.

Table 1. The compound identified in the chloroform phase of muscle tissue from the female pickhandle barracuda (*Sphyraena jello)* in Bander Abbas in the south of Iran

Compound	MF	KI	% of total
Fatty acid Saturated fatty acid			
Palmitic acid (Hexadecanoic acid)	$C_{16}H_{32}O_2$	1797	16.02
Stearic acid (Octadecanoic Acid)	$C_{18}H_{36}O_2$	1892	10.98
Mono-unsaturated fatty acid Oleic acid (9Z Octaecenoic Acid)	$C_{18}H_{34}O_2$	1915	11.60
Poly- unsaturated fatty acid Docosahexaenoic acid	$C_{22}H_{32}O_2$	1910	21.10
Eicosapentaenoic acid	$C_{20}H_{30}O_2$	1900	11.70
Ester			
Palmitic acid –methylester (Hexadecanoic acid, methyl ester)	$C_{17}H_{34}O_2$	1819	3.60
Stearic acid-methylester (Octadecanoic acid, methyl ester)	$C_{19}H_{38}O_2$	1894	2.90

Table 1. Continued.

Compound	MF	KI	% of total
Terpenes			
Vitamin E (2H-1-Benzopyran-6-ol,3,4-dihidro-2,5,7,8-tetramethyl-2-94,8,12-trimethyltridecyl) (α-Tocopherol)	$C_{29}H_{50}O_2$	2234	2.90
triterpene			
Squalene	$C_{30}H_{50}$	2154	14.50
Esterols			
Cholesterol (Cholesta-5en-3-ol (3.β)	$C_{27}H_{46}O_2$	1972	5.80

MF: Molecular Formula
KI: Kovats Index
%: Percent of the compound

Table 2 shows the components identified in GC-MS analysis of the samples from male species

Compound	MF	KI	% of total
Fatty acid Saturated fatty acid			
Palmitic acid (Hexadecanoic acid)	$C_{16}H_{32}O_2$	1797	15.34
Stearic acid (Octadecanoic Acid)	$C_{18}H_{36}O_2$	1892	10.65
Mono-unsaturated fatty acid, Oleic acid (9Z Octaecenoic Acid)	$C_{18}H_{34}O_2$	1915	11.30
Poly- unsaturated fatty acid Docosahexaenoic acid	$C_{22}H_{32}O_2$	1910	20.60
Eicosapentaenoic acid	$C_{20}H_{30}O_2$	1900	12.01
Ester			
Palmitic acid –methylester (Hexadecanoic acid ,methyl ester)	$C_{17}H_{34}O_2$	1819	3.10
Stearic acid-methylester (Octadecanoic acid, methyl ester)	$C_{19}H_{38}O_2$	1894	2.10

Table 2. Continued.

Compound	MF	KI	% of total
Terpenes			
Vitamin E (2H-1-Benzopyran-6-ol,3,4-dihidro-2,5,7,8-tetramethyl-2-94,8,12-trimethyltridecyl) (α-Tocopherol)	$C_{29}H_{50}O_2$	2234	2.50
triterpene			
Squalene	$C_{30}H_{50}$	2154	13.50
Esterols			
Cholesterol (Cholesta-5en-3-ol (3.β)	$C_{27}H_{46}O_2$	1972	4.90

MF: Molecular Formula
KI: Kovats Index
%: Percent of the compound

According to the results of the present study, most compounds identified are common between the two sexes such as polyunsaturated fatty acids docosahexaenoic acid (20.6% in female and male 21.1%) and eicosapentaenoic acid (11.7% in female and male 12.01%), mono-unsaturated fatty acid Oleic acid (11.3% in female and male 11.6%), saturated fatty acids Palmitic acid (15.34% in female and male 16.02%) and Stearic acid (10.65% in female and male 10.98%) ,two esters of fatty acid Hexadecanoic acid ,methyl ester (3.1% in female and male 3.6%) , Vitamin E (2.1% in female and male 2.9%), Cholesterol (4.9% in female and male 5.8%) and squalene (13.5% in female and male 14.5 %).

4. Discussions

In the present study, the dominant fatty acid was polyunsaturated fatty acid docosahexaenoic acid (20.6 -21.1 %). DHA is an omega-3 fatty acid and an essential fatty acid (Anneken et al, 2006). Docosahexaenoic acid is essential for the growth and functional development of the brain. DHA has a positive effect on diseases such as hypertension, arthritis, atherosclerosis, depression (Bousquet et al, 2008), adult-onset diabetes mellitus, myocardial infarction, thrombosis (Burdge &Calder, 2005), and some cancers (Simon et al, 2009). Comparison of this study results and similar studies by Soltan et al (2008) on some pelagic fishes in Australia indicated that the dominant fatty acid was polyunsaturated fatty acid, so the effectiveness using of seafood such as fishes in health and possibly to prevention and treatment of coronary heart diseases(Connor, 2000) acknowledges. The next dominant fatty acid was Palmitic acid (15.34 -16. 02%). According to the World Health Organization, consumption of palmitic acid can increase the chances of occurrence of cardiovascular diseases. Palmitic is used in different anti-psychotic medicines, especially in the treatment of schizophrenia (Bousquet et al., 2008).Palmitic acid is mainly used to produce soaps (Thomas, 2002), cosmetics, and release agents (Cornils & Lappe, 2006). Comparison of this study results and similar studies by Imre & Glik(1998) on some Turkish fish species in Turkey indicated that generally palmitic acid was the dominant saturated fatty acids in species.

The third dominant fatty acid was Squalene. It is a hydrocarbon and a triterpene. It is a natural and vital part of the synthesis of cholesterol, steroid hormones, and vitamin D in the human body (Matyas et al, 2004). Squalene is used in cosmetics, and more recently as an immunologic adjuvant in vaccines. Results of in this study showed that *Sphyraena jello* is one of the best seafood.

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