STUDY ON FATTY ACIDS COMPOSITION OF LIPID CLASS IN FISH OIL, PROXIMATE ANALYSIS AND CALORIE VALUE OF KIJAR IN IRAN

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ABSTRACT

This aim of this research was to determine fatty acids and raw proximate composition and calorie value of fish Kijar in Iran. The fatty acids and proximate composition Kijar was determined. The established AOAC (Association of Official Agricultural Chemist, USA) methods were followed for composition bio chemical of fish. Mean moisture, fat, protein, ash, carbohydrate contents and calorie value of raw fish were 70.81%, 5.88%, 17.80%, 3.41%, 2.1% and 132.52 kcal, respectively. Among fatty acids, palmitic acid was a major fatty acid while stearic acid was the other major constituent. Unsaturated monoenoic fatty acids (oleic and palmitoleic acids were major constituents. Important unsaturated fatty acids such as EPA and DHA, were also identified. percentage composition of fatty acids in the lipid classes of oil of *Saurida undosquamis* which the saturated fatty acids ranges from 58% to 72.14%. Palmitic acid is predominant and its composition ranges 38.64% to 48.98% while stearic acid ranges from 11.35% to 19.50%. Among unsaturated fatty acids, monoenoic are the major fatty acids. Oleic acid ranges from 12.15% to 27.48%. It is concluded that fish kijar found as health seafood for Iranian southern peoples form point of view of nutritional values and valuable fatty acids. Therefore it is recommended people put this fish in diet basket and it consumed three times in the week.

Keywords: Kijar; biochemical composition; fish oil; oil fatty acids

INTRODUCTION

Fish is an essential, important, valuable, excellent and irreplaceable seafood item in the Iranian diet. Fish body composed of mainly water, lipid, vitamins, antioxidants, minerals (macro and trace), ash and protein though small amounts carbohydrates and non-protein compounds are present in a small amount (**Harris, 1997; Garc A-arias et al., 2003; Siddique et al., 2012**). The beneficial effects on health by including fish in a diet are well known and have been documented in several studies. Fish intake is associated with improved body health (**Damsgaard et al., 2006**). It is clear that, n-3 and n-6 polyunsaturated fatty acids are two families of essential fatty acids that must be provided in food such as seafood (**Kaur et al., 2012**). The highly unsaturated ω 3-polyunsaturated fatty acids (PUFA) docosahexaenoic acid (DHA, C22:6, ω-3), which is directly obtained from fish and other seafood and is essential and functional for body cells normal growth and development and may play an important and vital role in the prevention and treatment of coronary artery disease, hypertension, diabetics, arthritis, other inflammatory and autoimmune disorders ad cancer (**Wang and Jones, 2004**).

Food scientists who are interested in developing fish and other seafood into high-protein foods, while ensuring the finest quality organoleptic and safety obtainable with maximum nutritive value (**Elagba et al., 2010**). The aim of this research was to determination of fatty acids and raw proximate composition and calorie value of Kijar in Iran.

MATERIAL AND METHODOLOGY

Materials and preparation of sample

Kijar (approximately 8 kg) used in this research were purchased from a local fish market in Behbahan in Khuzestan, Iran on May 28 2012. The number of fish used was 12. They were kept inside the iced – boxes and transferred to the laboratory in 1.5 h. These fishes were chosen because they are readily available, cheap, affordable and within the reach of an average Iranian. On arrival to laboratory, fish were washed with tap water to remove adhering blood and slime. They were then prepared using common household practices, namely eviscerating and beheading. Cleaned fish were washed with tap water several times to remove blood. Raw samples were homogenized in blender and each group was analyzed. All samples were homogenized prior to analysis.

Figure 1 Fresh Kijar fish.

Analytical procedures

The recommended methods of the Association of Official Analytical Chemists were adopted for the analyses of the samples **(AOAC, 2000)**. Ash was determined by the incineration Kjeldahl of 1.0 g samples placed in a muffle furnace maintained at 550 °C for 5 h **(Kjeldahl, 1883)**. Moisture content was determined by heating 2.0 g of each sample to a constant weight in a crucible placed in an oven maintained at 105 °C. Crude fat was obtained by exhaustively extracting 5.0 g of each sample in a Soxhlet apparatus (High Performance Soxhlet Extractor grain oil testing apparatus Shanghai CC Instruments Co., Ltd. Chinese) using petroleum ether (b.p. 40 – 60 °C) as the extractant **(AOCS, 1979)**. Crude protein (% total nitrogen x 6.25) was determined by the Kjeldahl method, using 2.0 g samples. Energy value was calculated by Atwater method **(Falch Overrian et al., 2010)**.

Extraction of lipid

A homogenizer, Janke and kunkel IKA Wert Ultra Turax Type TP 18/10 (Germany) was used to homogenize the fish. .The homogenized tissues were shaken with CHCLE: MeOH (2:1,v/v) and the combined extract was fractionated and washed with distilled water to remove the impurities. The solvent layer was evaporated in vacuum, which in turn became enriched with the oil components **(Khan et al., 1970)**.

Identification of lipid component

In general, the components were identified. The total fatty acids composition of fish oil been known. Only after the development and widespread application of GLC(Gast Manufacturing Corp., Model 0211-V45F-G8CX). by co-chromatography with reference standards was it possible to identify these components. The results are quoted as an average of fish in all cases.

Fatty Acids Composition

Fatty acids composition was carried out by gas chromatographic (GC) method using BF3-methanol **(AOCS, 1979)**. 1 µL of extracted methyl-esters solution using BF3-methanol method was injected directly into a gas chromatograph (Hewlett Packard Series II) equipped with a flame ionization detector (FID) and capillary column 30 m long, 0.25 mm inner diameter and a 0.25 µm film (Omegawax 320). The column oven was programmed at 200 °C, injection temperature at 220 °C and detector temperature at 250 °C. Helium was used as carrier gas at a flow rate of 25 cm.sec^{-1}. Quantitative data were analyzed using Hewlett Packard 3396A model integrator against fatty acids standards.

% fatty acid composition = $(A/B) \times 100$

where, A = area of specific fatty acid; B = total area of fatty acids present.

Stastical analysis

Results are expressed as mean of triplicate trials. Data were analyzed by one way analysis of variance on the means of values ($p < 0.05$).

RESULTS AND DISCUSSION

The biochemical compositions of the different kinds of raw, roasted, boiled and fried cooked samples are shown in Table 1. Proximate composition of raw Kijar was determined as moisture, fat, protein, ash, carbohydrate contents and calorie value, 70.81%, 5.88%, 17.80%, 3.41%, 2.1% and 132.52 kcal, respectively. Rate of crude protein, crude lipid, moisture and ash of Kijar were found to be different to rate of crude protein (19.56%), crude lipid (4.72%) and moisture (73.80%), ash (1.39%) content of fish (*Engraulis encrasicolus*) **(Puwastien et al., 1999)**. Since fishes are consumed as a major protein source in seafood, it is very important that the protein content should not be compromised during table preparation. It is significant to note therefore that all the table processing different methods reduced the crude protein contents but the reduction did not follow a particular order or fish type. Fresh Kijar had the low crude protein content (Table 1).

Table 1 Proximate composition and calorie values of raw kijar.

	Moisture (%)	Crude Fat (%)	Crude Protein (%)	Crude Ash (%)	Carbohydrate (%)	Calorie (Kcal)
Raw	70.81 ±0.61[a]	5.88 ±0.68[a]	17.80 ±0.33[a]	3.41 ±0.11[a]	2.1 ±0.12[a]	132.52 ±0.21[a]

Note: The data are mean values ±Standard deviation (SD) of three replicates. a, b, c, d within the column, value with different letters are significantly different ($p < 0.05$).

Table 2 Fatty acids composition of lipid class in the oil of Kijar.

Fatty acids	Weight (%)					
	PL	MG	DG	FFA	TG	SE
Saturated						
$C_{12:0}$	2.56	0.37	0.16	0.04	0.32	3.80
$C_{14:0}$	2.33	2.24	1.47	0.09	1.95	8.10
$C_{16:0}$	58.46	51.01	50.95	35.50	47.47	40.88
$C_{18:0}$	11.49	10.61	11.07	10.05	0.96	13.51
Unsaturated						
$C_{16:1}$	15.92	9.12	11.49	13.32	16.02	7.46
$C_{18:1}$	4.82	20.36	22.98	0.35	29.06	18.52
$C_{18:2}$	-	0.65	-	55.07	-	0.81
$C_{18:3}$	-	0.22	0.34	-	0.29	-
$C_{18:4}$	1.56	1.32	0.85	0.08	0.59	1.64
$C_{20:2}$	2.15	2.13	1.32	-	0.72	2.45
$C_{20:3}$	-	2.76	1.62	1.24	-	2.08
$C_{20:4}$	0.51	0.70	-	3.93	0.24	-
$C_{20:5}$	0.68	0.39	-	-	0.19	0.89
$C_{22:1}$	1.05	0.45	0.21	-	0.15	-
$C_{22:5}$	2.25	1.25	1.45	0.63	-	3.93
$C_{22:6}$	0.52	0.95	2.43	-	0.09	1.05

The short hand designation of class lipids are represented as: PL: Phospholipids, MG: Monoglycerides, DG: Di glycerides, TG: Tri glycerides, Free fatty acids.

Disappearance of water soluble amino acids during high temperature of heat processing may be responsible for the reduction in amino acid content and consequently a reduction in the protein content. Table 2 shows the percentage composition of fatty acids in the lipid classes of oil of *Saurida undosquamis* which the saturated fatty acids ranges from 58% to 72.14%. Palmitic acid is predominant and its composition ranges 38.64% to 48.98% while stearic acid ranges from 11.35% to 19.50%. Among unsaturated fatty acids, monoenoic are the major fatty acids. Oleic acid ranges from 12.15% to 27.48%. Significant increase of oleic acid and palmitic acid in fried fish sample is due to the type of cooking oil used thus further explaining the fat-moisture exchange that happens during frying process and excess fat absorption from cooking oil **(Yanar et al., 2007)**. The dienoic and trienoic are minor constituents. Poly unsaturated fatty acids (PUFA) range from 5.28% to 16.26% in which EPA and DHA contain this class. However, monoacylglycerol, diacylglycerol, free fatty acids and sterylester fractions of lipid classes do not contain EPA. The same component has been examined in silver carp and bighead carp at similar ratios **(Kubow, 1992)**. The effect of cooking methods on fatty acids were not investigated, because research was limited.

CONCLUSION

Medicinally important fatty acids like PUFA and ω-3 are abundant in the marine fish. Diets enriched with fish would be helpful in avoiding preventing heart problems. The studied fish contains unsaturated fatty acids and and proximate composition such as ash, protein, fat and energy suitable values. Therefore, it can be conclued that the studied fish fillet was good form point of view of nutritive vlaue for Iran southern people consumption, for two times in a week for proples health.

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