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Fatty Acid Composition of Oil Extracted from Murrel Fish (*Channa striata*) From Marathwada Region

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Abstract: The Murrel fish (*Channa striata*) is a of freshwater fish species, native to South Asian region and it contains high nutritional values. The murrel fish is a good source of Omega fatty acids and proteins, omega fatty acids and proteins helps to speed up the healing processes. For the present study Murrel Fish is purchased from local market of Aurangabad (MS) India. The fatty acid composition of oil extracted from Murrel fish has been investigated. Fatty acid composition of the oil is determined by Gas Chromatography. It is found that the Murrel Fish is rich in Palmitic acid, Stearic acid, Oleic acid, and Linoleic acid. Arachidonic acid, Behenic acid & Ricinoleic acid are also found in Murrel fish.
Keywords: Murrel fish (*Channa striata*), Fatty acid composition, Gas Chromatography.

INTRODUCTION

The freshwater Murrel fish (*Channa striata*) commonly known as snakehead fish, it belongs to the family Channidae. Murrel fish is one of the economically important fish species. It is found in different habitats ranging from rivers, ponds, swamps, canals, land of rice fields and lakes. Their natural populations are widely distributed across southern Asia, India, southern China, Indochina, and Sunda Islands. [1–6]. Murrel fish is one of the tasty and popular fresh water fish. Indians consume Murrel fish as important protein food. In India, during the beginning of every rainy season Murrel fingerlings have been used in fish medicine. Indians believe that the medicine is good for curing asthma, a respiratory disease.

In recent times, we used supercritical fluid extraction technology [instrument name: SFC L-tex Japan] in order to extract compounds from various biological material such as plants and animals and also analyzed fatty acid composition of some animals [7-13]. The aim of this study is to analyze fatty acid composition of oil extracted from Murrel fish.

MATERIALS AND METHODS

The Murrel Fish are purchased from local market, at Aurangabad District (Maharashtra) India. The meat of Murrel fish is dried in oven for 8 hours at 50 ^{o} C. After proper drying, the dried fish meat is subjected to supercritical fluid extraction process in order to obtain fish oil. Extraction is performed using SFC (L-tex, Japan) instrument. Carbon dioxide gas is used as supercritical fluid; Hexane is used as a modifier (co-solvent). Extraction is performed at constant flow rate, Constant temperature and constant pressure. Extraction Conditions: flow rate of carbon dioxide = 1 ml/min, flow rate of hexane = 1 ml/min, temperature = 40^{0} C and pressure = 25 Mpa. Extracted oil from the fish is used as a sample for fatty acid composition analysis.

Preparation of Methyl Esters (Method A)

500 mg sample is added to 100 ml boiling flask. 8 ml methanolic NaOH solution and boiling chip is added to the flask. Condenser is attached to the flask and refluxed until fat globules disappear (about 5–10 min). 9 ml BF solution is added through condenser and continued boiling for 2 min. Add 5 ml hexane is added through condenser and boiled for 1 more min. The boiling flask is removed and ca. 15 ml saturated NaCl solution is added. Stopper is placed on the flask and shaken vigorously for 15 s while solution is still tepid. Add additional saturated NaCl solution is added to float hexane solution into neck of flask. 1ml upper hexane solution is transferred into a small bottle and anhydrous Na_2SO_4 is added to remove H_2O.

Injection of Standards and Samples into GC

The syringe is rinsed three times with hexane, and three times with the reference standard mixture (25 mg of 20A GLC Reference Standard FAME dissolved

in 10 ml hexane). 1 ml of standard solution is injected, syringe is removed from injection port, and then start button is pressed. The syringe is rinsed again three times with solvent.

The syringe is rinsed three times with hexane, and three times with the sample solution prepared by Method A. 1 ml of sample solution is injected, syringe is removed from injection port, then start button is pressed. Syringe is rinsed again three times with solvent.

DATA AND CALCULATIONS

Retention times and relative peak areas are reported for the peaks in the chromatogram from the FAME reference standard mixture. This information is used to identify the peaks in the chromatogram [14].

RESULTS

The oil is tested for fifteen fatty acids out of which only ten fatty acids are found in the fish oil namely: Myristic acid, Palmitic acid, stearic acid, Behenic acid and Erucic acid which are saturated fatty acids, Oleic acid and Erucic which are monounsaturated fatty acid, Linoleic acid and Arachidonic acid which are polyunsaturated fatty acids, Linolenic acid & Ricinoleic acid are also unsaturated fatty acid. The concentrations of fatty acids are given in table 1. The chromatogram obtained from Murrel fish has been given in figure 1.

Table-1: Fatty acid Composition

Sr. No.	Parameter	RT (minute)	Width (minute)	Height	Area	percentage
	Fatty acid Composition:					
	Methyl esters of					
1.	Caproic acid	2.924	0.04	3.45	8.75	0.11
2.	Caprillic acid	0.00	0.00	0.00	0.00	0.00
3.	Capric acid	0.00	0.00	0.00	0.00	0.00
4.	Lauric acid	0.00	0.00	0.00	0.00	0.00
5.	Myristic acid	0.00	0.00	0.00	0.00	0.00
6.	Palmitic acid	20.896	0.07	405.95	2226.00	28.38
7.	Stearic acid	24.509	0.08	158.56	929.18	11.85
8.	Oleic acid	27.899	0.08	275.07	1374.46	17.52
9.	Linoleic acid	25.680	0.07	86.08	463.59	5.91
10.	Linolenic acid	26.785	0.08	24.54	148.37	1.89
11.	Arachidonic acid	27.860	0.08	7.06	46.68	0.60
12.	Behenic acid	31.551	0.11	10.26	88.08	1.12
13.	Erucic acid	0.00	0.00	0.00	0.00	0.00
14.	Lignoceric acid	0.00	0.00	0.00	0.00	0.00
15.	Ricinoleic acid	37.510	0.16	17.08	225.06	2.87

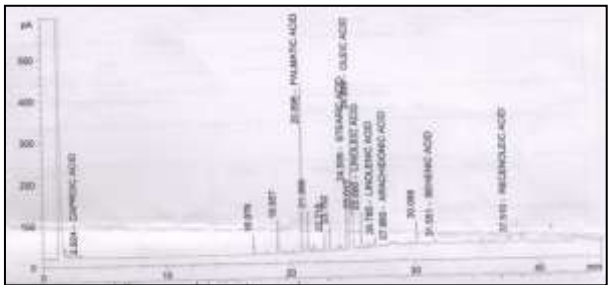

Fig-1: Chromatogram of Fatty acid Composition of Oil Extracted from Murrel Fish

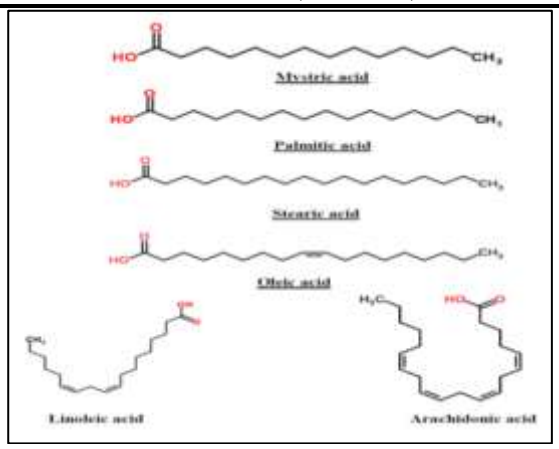

Fig-2: Chemical Structures of Identified Compounds

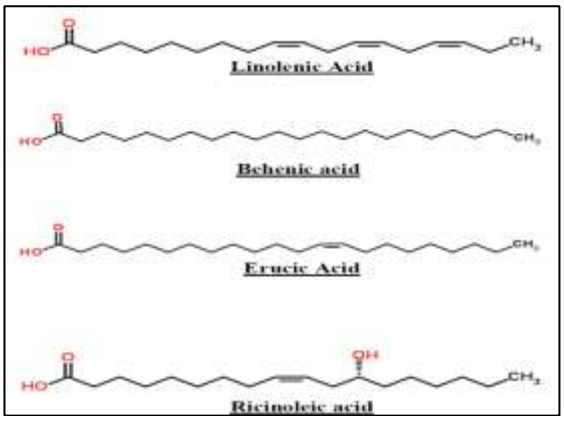

Fig-3: Chemical Structures of Identified Compounds

CONCLUSION

Fats are important part of our diet and are important for better health. There are basically two types of fats, namely: saturated fats and unsaturated fats. Unsaturated fats are an essential part of a healthy food. Unsaturated fats help lower the risk of heart disease and lower cholesterol levels. Unsaturated fats are of two types namely: monounsaturated fats and polyunsaturated fats. Monounsaturated and polyunsaturated fats are good, important and beneficial for human body.

As we know that unsaturated fatty acids are good for health. These fatty acids help decrease heart diseases, reduce cholesterol levels and have other health advantages. Unsaturated fatty acids remain liquid at room temperature; on the other hand saturated fatty acids remain solid at room temperature. Oleic acid is strong antioxidant and free radical hunter [15]. Unsaturated fatty acids are essential for good health; they lower LDL cholesterol (Low density lipoproteins are referred to as bad cholesterol) but do not lower HDL cholesterol (High density lipoproteins are referred to as good cholesterol) [16]. Linoleic acid and Arachidonic acid are members of the omega 6 family of polyunsaturated fatty acids [17]. Omega 6 fatty acids have achieved significant interest in recent years. These fatty acids are necessary for good health. These fatty acids cannot be created by human body. These fatty acids have to be taken in food [18].

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