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Investigation of Fatty Acid Content in the Edible Portion of Long-Whiskered Catfish *Sperata aor*

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The composition of fatty acid of *Sperata aor*, a fish consumed as food by the people of gangetic West Bengal, India was investigated to determine its nutritional value. Our investigation shows the presence of PUFA's namely EPA (0.22%), DHA (0.74%), Linolenic acid (0.39%), Linolelaedic acid (30.45%), ã-Linolenic acid (0.24%), Eicosatrienoic acid (0.38%), Arachidonic acid (0.55%) in the fish. The biosynthetic pathway for the synthesis of prostaglandins and cell membranes in mammals requires the presence of Linolelaidic acid which is present in good quantity in this fish. However, its high concentration in human body may lead to heart ailments also. Arachidonic acid, associated with growth, development and health of infants as well as adults is present in the fish. Palmitoleic acid (C16:1) a constituent of adipose tissue in humans, is also present in the fish (42.29%), has the ability to suppress inflammation, and is also known to combat obesity. Though presence of low total SFA (6.20%) is positive nutritional aspect the consumption of this fish however should be restricted due to its not so healthy ù-3:ù-6 ratio (1:4).

Keywords: *Sperata aor*, fatty acid profile, PUFA, Palmitoleic acid, Linolelaidic acid, Arachidonic acid.

By virtue of possessing numerous health benefits unsaturated fatty acids are now considered as essential nutrients in both human and animal diet[1-5]. These fatty acids have cardio protective properties[6] – can block dangerous heart rhythms and excessive sodium calcium currents in the heart[7]. Anti-atherosclerotic[6], anti-thrombotic[8] anti-inflammatory and anti-arthritic[9] properties of fatty acids are well known too. Risk of diagnosis of dementia is reduced by fatty acid consumption[10]. It also helps in dealing with childhood autism.

However, all fatty acids are not beneficial. Saturated fatty acids can cause various health hazards like cardio vascular diseases. So, all sources of fatty acids may not be safe for consumption. Hence, screening of all dietary sources of fatty acids is an important task. Fishes are one of the most important natural sources of fatty acid. So, screening of fishes for their fatty acid content is a necessary task and we are involved in this task for the past 7 years.[11-13] The chief diet of gangetic West Bengal, India, being fish, it is absolutely necessary to screen fishes found in the area as these fishes are consumed in large volumes by the local residents.

We have chosen to study the fatty acid profile of *Sperata aor* – the long whiskered

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catfish or as it is the called Indian Shovelnose Catfish belonging to the family Bagridae. This fish is popularly consumed by the people of West Bengal. To the best of our knowledge, the fatty acid composition of the fish obtained locally from gangetic region is not yet studied.

MATERIALS AND METHODS

Six fish samples weighing (900 ± 51.64 gms) were procured from local fish market of Chinsurah, Hooghly, W. Bengal in India in the month of June, 2018. The fishes were stored at -30 ^{f}C in a freezer in the laboratory after being killed by hitting on their heads. The weight and total length of the fishes were measured and the proximate composition analyzed[14] after removing the edible portions from the viscera, bone, skin and head. The muscle tissues were chopped and minced in a sterilized blender for a minute. 5 grams of this finely grated flesh were treated with a mixture of chloroform and methanol following the procedure of Folch *et al.*[15] to extract the total lipid. The crude lipid thus obtained was then purified, air-dried and the amount obtained was noted using the methodology laid down by Folch *et al.* Esterification using BF_3- MeOH was carried out on the purified lipid mixture and recovered in heptanes[12]. The FAME mixtures thus obtained were subjected to gas Chromatography in a Shimadzu Gas Chromatograph (Model GC-2010 Japan), using a SP-2560 capillary column (100m long and 0.25 mm i.d) attached to a flame ionization detector (FID) on a split injector. The flow rate of the Nitrogen (oxygen free) carrier gas was 33.9 ml / minute. The oven temperature was slowly raised to 240 ^{f}C at a rate of 4 ^{f}C per minute and kept for 20 minutes. Finally, the injector and detector temperature were fixed at 260 ^{f}C. The injecting volume was 1 ìl and 1:30 was the split ratio. The unknown fatty acid esters present in the mixture were identified by matching their retention time with that of standard fatty acid methyl esters. The G.C. peak areas were used to calculate the

Table 1. Fatty acid content in muscle tissues of *Sperata aor*

FAME		*Sperata aor*
Caproic acid	C6:0	1.75 ± 0.02769
Caprylic acid	C8:0	0.73 ± 0.01862
Capric acid	C10:0	0.33 ± 0.02044
Undecanoic acid	C11:0	0.42 ± 0.02108
Lauric acid	C12:0	0.40 ± 0.01493
Tridecanoic acid	C13:0	0.33 ± 0.03128
Stearic acid	C18:0	0.93 ± 0.04003
Arachidic acid	C20:0	0.57 ± 0.03364
Heneicosanoic acid	C21:0	0.76 ± 0.02717
Σ SFA		6.20 ± 0.21666
Myristoleic acid	C14:1	3.12 ± 0.03904
Cis-10-Pentadecenoic acid	C15:1	1.61 ± 0.03235
Palmitoleic acid	C16:1	42.29 ± 0.04039
Elaidic acid	C18:1 n9E	11.03 ± 0.15900
Oleic acid	C18:1 n9Z	0.82 ± 0.02994
Σ MUFA		58.87 ± 0.25144
Linolelaidic acid	C18:2 n6	30.45 ± 0.11784
γ-Linolenic acid	C18:3 n6	0.24 ± 0.03138
Cis-8,11,14-Eicosatrienoic acid	C20:3 n6	0.38 ± 0.02845
Arachidonic acid	C20:4 n6	0.55 ± 0.03270
Σ n-6 PUFA		31.62 ± 0.20506
Linolenic acid	C18:3 n3	0.39 ± 0.02301
Cis-5,8,11,14,17-Eicosapentaenoic acid	C20:5 n3	0.22 ± 0.02182
Cis-4,7,10,13,16,19-Docosohexaenoic acid	C22:2 n6	0.74 ± 0.03073
Σ n-3 PUFA		1.35 ± 0.07374
n-3 / n-6		0.04 ± 0.00201

percentage compositions of the sample under investigations. Table 1 shows the results obtained on analysis.

RESULTS AND DISCUSSION

Analysis of *Sperata aor* (long whiskered catfish) shows its moisture content to be 75.35 ± 0.15, ash content to be 8.80 ± 0.01. The protein content was estimated to be 63.33 ± 0.03 and lipid content 12.57 ± 1.72.

The saturated fatty acids (SFA) found in the fish are Arachidic acid Capric acid, Caprylic acid, Caproic acid, Lauric acid, Undecanoic acid, Stearic acid, Tridecanoic acid, , Heneicosanoic acid which accounts for only 6.20 % of total fatty acids which is definitely a positive nutritional aspect of the fish as SFA's are considered hazardous to health.

The MUFA identified are Palmitoleic acid, Myristoleic acid, Elaidic acid, *Cis*-10-Pentadecenoic acid, Oleic acid which accounts for a considerable 58.87% of total fatty acids. Palmitoleic acid itself accounts for 42.29 % and Elaidic acid accounts for 11.03% of total fatty acids. Palmetoleic acid has the beneficial property of increasing insulin sensitivity in the human body as it can retard the destruction of pancreatic â-cells responsible for insulin secretion and suppressing inflammation[16]. It could also have a role as a signalling molecule affecting body weight[17]. A report received national media attention in Australia in 1998 which says that high Palmitoleic acid content may be useful in combating obesity.

A significant amount of n-6 PUFA (31.62 %) is found in the fish of which Linolelaidic acid accounts for 30.43% of total fatty acid. This fatty acid is essential for the biosynthesis of cell membranes and prostaglandins (26th edition, Stedman). However its presence is linked with heart diseases too. Another n-6 PUFA, Arachidonic acid, which is also present in this fish, has a definite role in neurological development, normal growth and development of infants.[18,19]

Sperata aor contains n-3 PUFA's (1.35 %) as well. n-3 PUFA's specially DHA and EPA has significant beneficial effects in different diseases like cardio vascular disorders, breast, colorectal and prostate cancer, asthma, inflammatory bowel disease, osteoporosis and rheumatoid arthritis. Both EPA (0.22%) and DHA (0.74%) is present in *Sperata aor*. Linolenic acid, another beneficial PUFA is also present in the fish.

It is evident from our experimental findings that *Sperata aor* is definitely rich in essential fatty acid content. However, it must be noted that n-6 fatty acid content of the fish is approximately 23 times more than n-3 fatty acid. Though n-6 fatty acids reduce blood cholesterol and also reduce lipoproteins to help prevent atherosclerosis and heart disease, they increase platelet activity which in turn increases the probability of blood clotting which is responsible for heart diseases. Hence food scientists recommend more consumption of n-3 fatty acid and fewer intakes of n-6 fatty acids. Though there is a controversy about the balanced ù-6 : ù-3 ratio, 4:1 ratio has been observed to reduce the mortality rate[20] by 70%. The n-6 : n-3 ratio of this fish is far from the balanced ratio. So, though the fish is a storehouse of fatty acid, its consumption should be restricted.

In this context it must be mentioned that in a recent work related to the nutritional characterization of *Sperata aor* obtained from Bangladesh[21] reports the ratio of ù-6 to ù-3 as 0.84 which is miles apart from our findings. Hence it is evident that the fatty acid contained in a fish in its natural habitat depends on the season, geographical area, water condition, temperature where it thrives.

CONCLUSION

Sperata aor is very popular as food fish for its great taste and less number of bones. It is a good source of protein and fatty acid specially PUFA's. But it must be kept in mind that the ratio of n-6 : n-3 is far from being a health friendly balanced one. So, its consumption must be restricted.

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