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Lipid profiles of Threadfin bream (*Nemipterus japonicus*) organs

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Present study of the lipid content in different organs of marine fish Threadfin bream (*Nemipterus japonicus*) indicates that a major amount of lipids are accumulated in liver (6.22%) when compared with remaining organs like muscle (2.7%) and skin (1.0%). Cholesterol studies reveal that muscle (36.2%) is having more quantities than liver (32.4%) and skin (24%). Fatty acid composition reveals that the lipids of each organ of threadfin bream are enriched in the unsaturated fatty acids and all the organs were found to be rich in linoleic ($C_{18:2}$), oleic ($C_{18:1}$) and palmitic ($C_{16:0}$). The present study further elucidates that a considerable amount of two physiologically important n-3 PUFAs, i.e. EPA and DHA were found more in skin (1.6% and 0.5%) and liver (1.6% and 0.6%) than in muscle (1.4% and 0.4%).

[**Key Words:** *Nemipterus japonicus*, Lipids, Fatty acid composition, EPA, DHA]

Introduction

Threadfin bream (*Nemipterus japonicus*) is a well known common, edible marine fish found in the coasts of Tamilnadu, with the local name 'Sankara'. It is abundant in coastal waters and available throughout the year. It is a carnivores' species and its diet comprises of a wide range of animals like small fishes, crustaceans, molluscs and polychaetes. Studies on threadfin bream are very limited and especially the information of organ wise lipid and fatty acid composition is lacking. Nowadays omega-3 fatty acids have been the subject of volumes of international research, because of their medicinal importance. Being essential fatty acids (EFA's) these cannot be synthesized in human body. They must be derived by dietary sources. Plants are rich sources of omega-3 PUFA alpha-linolenic acid (ALA), whereas, Marine organisms provide varying amounts of omega-3 fatty acids in the form of docosahexaenoic acid (DHA) and eicosapentanoic acid (EPA). ALA cannot be directly utilized in human body, but, it can be metabolized into larger chains of EPA and DHA[1]. So, PUFA from marine fishes is preferred because of their immediate utilisation. The present study investigates the lipid percentage and its composition particularly the structural lipid like cholesterol and fatty acid composition of different organs of threadfin bream. In order to observe the level of lipid composition presence, the work has been compared with *Pampus argenteus*[7].

Materials and Methods

The fish *Nemipterus japonicus* was collected from Royapuram sea coast, Bay of Bengal (13° 6′ 26″ N, 80° 17′ 43″ E) during January, 2008. The length, breath and weight of *Nemipterus japonicus* were 16 cm, 5 cm, 70 g respectively whereas the number of individuals taken was seven. Muscle, liver and skin were dissected and collected separately from each fish, wiped with the blotting paper and weighed. Samples were then cut into small pieces (0.2 × 0.2 cm) and stored at -20°C. Lipids were extracted from each organ by the method of Bligh and Dyer[2]. Fifty grams of samples (skin, muscle and liver) were homogenized by adding 40 ml of water, followed by chloroform and methanol (1:2) and vortexed well for 10 min. To this mixture again chloroform and water (1:1) was added and centrifuged at 1000 rpm. Bottom phase was recovered and evaporated at 60°C in a water bath and isolated lipids were collected and stored.

Cholesterol was estimated according to the standard method of Zlatkis, *et al.*[10]. The working standards in varying concentrations of 0.5 ml to 2.5 ml were pipetted out into clean test tubes and required quantities of liver, muscle and skin samples were also taken. The volumes were made up to 5.0 ml with ferric chloride and 3.0 ml of concentrated sulphuric acid. The test tubes were allowed to incubate in room temperature for 15 minutes. The pinkish red colour formed was measured at 540 nm, Standard graph was drawn for the values obtained and from the standard graph the amount of cholesterol present in the samples was calculated.

The total fatty acid composition of the extracted lipids was determined by Gas Chromatography (GC) after derivatization into methyl esters[6.] The Chemito, 8610 GC was connected with a glass column (25m × 0.22i.d) packed with BPX-70 supported on chromosorb-WHP. The oven, injector and detector block temperatures were maintained at 160°C, 250°C and 260°C, respectively. Nitrogen was used as a carrier gas. The fatty acid esters peaks were identified and calibrated with standard methyl esters. The results of the statistical analysis are given as the mean ± standard deviation.

Results

Present work includes the lipid composition along with the determination of fatty acids of *Nemipterus japonicus*. The amount of total lipid and cholesterol content of the extracted lipids from different organs are shown in Table 1. Where the liver has shown more quantity of total lipid content and muscles has shown high quantity of cholesterol comparatively with other organs of *Nemipterus japonicus.* But, when compared with *Pampus argenteus* muscle (1.43% & 12.19%)[8] *Nemipterus japonicas* muscle is having high percentage of lipid and cholesterol levels.

In *Nemipterus japonicus* the liver, muscle and skin were subjected to Gas Chromatography are showing a variety of fatty acids as shown in Table 2. The chief fatty acids are linoleic ($C_{18:2}$), oleic ($C_{18:1}$) and palmitic ($C_{16:0}$) in all the three organs. The linoleic is more in muscle followed by skin and liver respectively. The polyunsaturated fatty acids are high in liver and skin than in muscle, but the physiologically important PUFAs like EPA and DHA are actually lacking in high percentage when compared with *Pampus argenteus* (11.2)[8].

Discussion

The present work shows a lipid content of muscle at 2.7% which was found to be better when compared with *Anadontostoma chacunda* (2.6%)[4], *Nibea soldado* (1.13%)[9]. The fish *Nemipterus japonicus* shows a high lipid content in muscle than in liver and skin. The total lipids of the liver, muscle and skin are showing some remarkable variation. This finding is in line with what has been reported by Kinsella *et al*.[5] showing that the distributions of lipid content from various parts of the fish body are different. But, the deposition of lipids as an energy reserve is encountered in the species of fish. The lipids besides providing energy serve as source of essential fatty acids in fish tissues. Fishes are often classified on the basis of their fat content into lean, medium and fatty fishes[6]. Fishes are termed as lean fish when total lipid is below 5% and fatty fishes when the fat content is more than 10%, while medium fish have 5-10% fat. So, on this basis *Nemipterus japonicus* is a lean fish.

Cholesterol content of each organ varies greatly. Where the muscle, skin and liver are showing mean values of 36.2, 24.0 and 32.4. The values are very high when compared with other fishes like Pomfret[7] and this variation in cholesterol percentage in the fish can be compared with other brackish water fishes[4]. The tissue specificity in cholesterol content exists in fish. The internal factors responsible for it may be the feeding habit and habitat. Here *Nemipterus japonicus* is carnivorous. Studies show that dietary lipids play an important role in energy production of carnivorous fish rather than herbivorous species[8]. So, lipids are playing a major role in the physiological activities of *Nemipterus japonicus.*

Detailed fatty acid composition is given in Table 2. The most important PUFA, DHA and EPA are present in all the three parts of the fish where skin is showing some slight difference with remaining parts, but their percentages when compared with other fishes

Table 1 — Percentages of Total Lipids Present in Different Parts of *Nemipterus japonicus*

	Organs		
	Muscle	Skin	Liver
Total Lipid	2.70 ± 0.18	1.01 ± 0.15	6.22 ± 0.45
Total Cholesterol	36.2 ± 0.70	24.0 ± 0.34	32.4 ± 0.67

Values are Mean ± S. D., n=5

Table 2 — Analysis of Fatty Acid Composition (%w/w) of the Lipid Present in Various Organs of *Nemipterus japonicus* from Gas Chromatography

Fatty Acids (%w/w)		Names of Organs		
		Muscle	Skin	Liver
Mysteric	14:1	0.7390	0.7846	0.7765
Palmitic	16:1	13.6313	12.9761	12.4144
Oleic	18:1	29.2262	31.5341	30.2100
Linoleic	18:2	34.0518	24.0628	23.0521
Stearic	18:3	4.4647	4.8117	4.6141
Linolenic	18:4	0.3843	9.2404	9.0503
EPA	20:5	1.4000	1.6460	1.6057
DHA	22:6	0.4973	0.5879	0.6136
Others	--	20.3781	14.3561	17.5788

like 'Duri'(*Lutianus agentimaculatus*), 'Kerapu' (*Cynoglossus lingua*)[4] the total PUFAs are very less this might be because of the difference in their food habits. For the case of saturated fatty acids like oleic, mysteric, palmitic were found to be the predominant ones for all types of fish studies. And the most abundant of all these are palmitic acid, which was supported by the works of Viswanathannair and Gopakumar[9] and Belling *et al*.[3]. But in the present study we found the presence of high content of oleic acid. So, the findings in the present study are revealed the presence of good amounts of fatty acids.

Conclusion

Sea food-origin proteins and fatty acids play a major role in the human diet. Results from this study revealed that fish lipids were not distributed uniformly in every part of whole fish body. The study shows accumulation of high lipid content in different organs of the edible fish *Nemipterus japonicus.*

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