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Comparison of the Proximate Composition of Liver and Muscle Tissue Contents in Freshwater and Brackishwater Tilapia, *Oreochromis mossambicus*

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The purpose of the study was to examine the closely related composition of freshwater and brackish fish *Oreochromis mossambicus*. The fish was brought to the lab and sacrificed for further research. The muscle and liver tissues were processed for moisture, ash, protein, carbohydrate and lipids estimations. The outcomes of the current study showed that the moisture (77.09%), ash (0.78%), protein (195.72mg/gm), lipids (23.07mg/gm) and carbohydrate (15.84mg/gm) content were

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higher in freshwater fish when compared to brackish water fish. Protein (205.19mg/gm), lipids (3.25mg/gm) and carbohydrate (0.42mg/gm) content were higher in freshwater fish when compared to the liver of brackish water fish. Brackish water fish's proximate composition in muscle and liver was protein, lipids and carbohydrates are significantly (P<0.05) decreased as compared with freshwater fish. As a result, the chemical composition of fish from brackish water sources has been affected by brackish water ecosystems and, at the same time, the dry matter content, in protein and protein as well as the declared carbohydrate and fat content have been reduced.

Keywords: Oreochromis mossambicus; freshwater; brackish water; lipids; protein; carbohydrate.

1. INTRODUCTION

"Fish is generally accepted as a good source of protein and other elements for maintaining a healthy body" [1]. "This fishing is necessary so that protein-rich foods receive valuable forex" [2]. "Fish is very different from other animal feed sources. They deliver calories with high-quality protein that contains all essential amino acids in an easily digestible form. Therefore, they are an advantageous source of nutrients" [3]. In India, the biochemical components of fish are mainly analyzed for the nutritional value of fish. Fish protein is relatively digestible and is believed to have high biological and growth-promoting levels [4], including all ten essential amino acids in the desired amount for human consumption [5].

"Now consumers with one-day syndrome want to know the nutritional value of the products and ensure that they eat. In general, the biochemical composition of the entire body shows the quality of the fish. Therefore, the close biochemical composition of a species helps to assess its nutritional value and eating value in relation to energy units compared to other species. Variations in the biochemical composition of fish meat can also occur in the same species, depending on the age and gender of the fishing area, the fishing season, the individual and the reproductive state. Knowledge of the biochemical composition is very useful in assessing the nutritional value of species that can not only help fish, but can also assess the quality and optimal use of these natural resources" [6]. Biochemical studies in fish will help assess the environmental impact. The biochemical examination of fish tissues is very interesting due to their peculiarities with regard to the food value of fish and the assessment of their physiological needs in different lifetimes. Hence, the present investigation has been undertaken to study some macronutrient of protein and cholesterol along with mineral content of iron in the muscle and liver tissues of locally available fresh and brackish water fish such as *Oreochromis mossambica.*

2. MATERIALS AND METHODS

2.1 Collection Fishes

Fishes were weighing (370.50 ± 34.70 g) and (25.32 ± 4.12 cm) long *Oreochromis mossambicus,* a brackish water and fresh water environment 5 to 8 months old in the Indian district of Thiruvarur, Tamil Nadu. Fish were collected from brackish and freshwater environments using an experimental network with multiple plates and mother filaments. This technique is known as 'non-selective' fishing technique and uses nets with different mesh sizes of 16w150mm telescopic net, so that the sample represents the fish population. The network was set to U800 0600 h overnight for about 12 hours and removed the next day. The fish were then removed from different panels and divided into separate trays depending on the type and size. Individual *Oreochromis mossambicus* fish were identified and collected from the research area and transported to the laboratory for biochemical analysis.

2.2 Sample Collection

Up to 10 fish were collected with the weight of, their tissues were synthesized for analysis. The collected fish must be placed in a clean, labeled polyethylene bag, which is handled by the staff with latex gloves. Fish must also be dissected with a thin 3 hour catch.

2.3 Preparation of homogenate

Muscle and liver Samples of fish analysis were taken from the left side of each fish, the meat was dissected and washed with ice-cold saline. The 1 g fabric was weighed and homogenized using a Teflon homogenizer. Tissue homogenates were produced in a 0.1 m Tris Hcl

buffer (pH 7.4)) and used to estimate various biochemical parameters.

2.4 Determination of Moisture Content (Loss on drying)

The tissue material (10 g) was placed in a moisture bowl and dried in the oven at 100 - 105 °C to a certain weight. The weight loss of the dry air mg / g was calculated as: moisture content = initial weight of the sample – final weight of the sample / sample weight x 100.

2.5 Determination of Total Ash

The tissue material (2g) was accurately weighed and placed in a crucible. The materials was spread in an even layer and it was ignited to a constant weight by gradually increasing the heat to 500-600°C until it was white indicating the absence of carbon. The residual ash was allowed to cool in a desiccator. The content of total ash in mg/g of air-dried material was calculated as follows: Percentage of total ash = Weight of ash/ Weight of sample takenx100.

2.6 Proximate Commposition

The protein is calculated using the Lowry et al. [7] estimated. All lipids in the tissue were developed using the Folch et al. [8] estimated. To estimate the amount of carbohydrates present in a particular sample, using the anthron method from Yemm and Willis [9].

2.7 Statistical Analysis

The value is expressed as the average ± SD of 10 fish. The data were calculated by the student's t-test (independent sample, P-value 2 tail) using MS-excel. 2013. Statistically significant level 0. 05.

3. RESULTS

Table 1 represents the proximate composition of *Oreochromis mossambicus* muscles tissue in brackish and freshwater. In the present study, the moisture (77.09%), ash (0.78%), protein (195.72mg/gm), lipids (23.07mg/gm) and carbohydrate(15.84mg/gm) content were higher in freshwater fish when compared to the moisture (76.85%), ash (0.75%), protein (171.15mg/gm), lipids (20.09mg/gm) and carbohydrate (11.63mg/gm) content in muscles of brackish water fish. Brackish water fish moisture and ash content were non-significantly decreased in muscle while protein, lipids and carbohydrates are significantly (P<0.05) decreased as compared with freshwater fish.

Table 2 represents the proximate composition of *Oreochromis mossambicus* liver tissue in brackish and freshwater. In the present study, the protein (205.19mg/gm), lipids (3.25mg/gm) and carbohydrate (0.42mg/gm) content were higher in freshwater fish when compared to the protein (197.22mg/gm), lipids (0.35mg/gm) and carbohydrate(11.63mg/gm) content in liver of brackish water fish. Brackish water fish protein was non-significantly decreased in liver while lipids and carbohydrates are significantly (P<0.05) decreased as compared with freshwater fish.

4. DISCUSSION

Biochemical research is very important from the point of view of nutrition. It is known that the biochemical composition of the animals varies depending on the season, the size of the animal, the stage of maturation, the temperature, the availability of food, etc. The approximation analysis showed that water and ash form the highest components of the proximal composition in freshwater fish compared to brackish fish. It has been observed that the moisture content of brackish fish is significantly reduced, which is probably due to the absorption of moisture from the cold atmosphere.

“Fish is the main source of high quality protein, and fish plays an important role in human nutrition. It is essential for the preservation of life and therefore exists in the maximum amount of all nutrients as part of the human body” [10]. The increasing demand for good animal proteins for the exploding population has led to an effective and increasing use of aquatic resources. The susceptibility and easy digestibility of fish protein is very valuable in combating protein nutrition, especially in children. Protein offfish has a high biological value due to its growth-promoting ability. Fish is an important part of the protein supply to the syndrome worldwide and accounts for about 10% of the total protein supply. About 60% of the population in developing countries source more than 40% of their total animal protein supply from fish. The average protein content in fish is between about 8 ～ 23 g / 100 g wet edible protein. In this study, the protein (205.19 mg / content in freshwater fish was higher than the protein content (197.22 mg / gm) in the liver of brackish fish, the proximal

Table 1. Proximate analysis of *Oreochromis mossambicus* muscles tissue in brackish and freshwater

Proximate	*Oreochromis mossambicus* muscles tissue	
	Freshwater	Brackish water
Moisture (%)	77.09±2.36	76.85±2.98 ^{NS}
Ash (%)	0.78±0.11	0.75±0.15^{NS}
Protein (mg/gm)	195.72±1.63	171.15±1.55*
Lipids (mg/gm)	23.17±0.78	20.09±0.64*
Carbohydrate (mg/gm)	15.84±0.31	11.63±0.37*

*The value is expressed as the mean standard deviation ± from N = 10. The data were calculated by the student's t-test (independent sample, P-value 2 tail) using MS-excel. 2013. Statistically significant level 0. 05. *P < 0.05 statistically significant difference and NS noticed as not significant*

Table 2. Proximate analysis of *Oreochromis mossambicus* liver tissue in brackish and freshwater (N =10)

Proximate	*Oreochromis mossambicus* liver tissue	
	Freshwater	Brackish water
Protein (mg/gm)	205.19±2.42	197.22±2.57 ^{NS}
Lipids (mg/gm)	3.25±0.49	2.83±0.31*
Carbohydrate (mg/gm)	0.42±0.05	0.35±0.03*

*Values are expressed as Mean ± standard deviation for N = 10. Data was calculated by student t-Test (Independent sample, P value two tail) using MS-excel ver. 2013. Statistically significant level 0.05. *P<0.05 statistically significant differences and NS Non- significant*

composition of fish varied by species and varied by individual [11] even within the same species. According to Graves [12], the body composition of fish seems to be of age, gender, Spend the season and diet.

“Lipids are transported in combination with proteins in the form of lipoproteins in the blood. The pattern of blood lipids is based on the distribution of fats and cholesterol between different lipoproteins. Lipids are an efficient source of energy and show 0f carbohydrates and more than twice the protein energy” [10]. In the present study, the lipids (3.25mg/gm) content was higher in freshwater fish when compared to the lipids (0.35mg/gm) content in liver of brackish water fish. Das, [13] stated that “various species showed lipid levels in diverse states (temperature, freezing time and location size)”. “With lipid content Rohu (*Labeo rohita*), Grass (*Ctenopharyngodon idella*) and Tilapia (*O. mossambicus*) was 5.12%, 4.61% and 2.55% fresh. The present study was almost similar to report of Das”, [13].

Carbohydrates are chemically defined as aldehydes or ketone derivatives of higher polyvalent alcohols. Carbohydrates are simple or complex and the main source of energy is in all human diets (4.1 Kcal / g). They are a source of the main energy components of complex lipids and conjugated proteins. The degradation product acts as a promoter or is used to synthesize other substances such as fats and amino acids, which are components of mucopolysaccharides, which form the basal substance of the mesenchyma tissue. An inherited deficiency of certain enzymes in metabolic pathways or various carbohydrates can cause diseases. Carbohydrates make up only a small percentage of the total biochemical composition.

“Carbohydrates in seafood do not contain any fiber fibers, but only sugar, most of which consist of glycogen (polysaccharides). It also contains traces of glucose, fructose, sucrose and other mono and disacaride” [10]. “In addition to hunger, feeding, rest, exercise and other physiological conditions, the development of gonads changes the carbohydrate level like various factors. In this study, carbohydrates from freshwater fish (0. 42 mg / gm) content, brackish liver carbohydrates (11. It was higher than the content of 63 mg / gm. The same study was carried out on various freshwater fish” [14].

The most likely reason for the difference observed in fish from two ecosystems as fresh water and brackish water in this study. This led to an increase in the amount of nutrients in fresh

water and increased hyacinth growth, while the nutrient concentration in brackish water was reduced. As a result, the chemical composition of fish from brackish water sources has been affected. The results of this study support the concept that monitoring the hyacinth in brackish water reduces the amount of oxygen dissolved in water. The amount of dissolved oxygen is a factor that interacts with other factors such as fish size, discharge density and fish behavior and influences fish feeding [15]. Dissolved oxygen is an essential factor for the growth and survival of fish in the tropics and for the ability to tolerate low levels of dissolved oxygen in the early morning. The ability of fish to quickly recover from physiological stress caused by low oxygen levels can also improve growth rates by extending the feeding period.

5. CONCLUSION

This analysis provided a better understanding of the nutritional value of *Oreochromis mossambicus* in fresh and brackish water conditions. In brackish water in particular, the chemical composition of fish meat has been clearly demonstrated due to water pollution from sewage and industrial wastewater. In addition, depletion of the oxygen content of water is detected due to monitoring of weeds in hyacinth and associated changes in dry matter, protein and fat content of the carcass. The study could help determine the compatibility of different ecosystems with fish meat production and safety. Variations in the biochemical constituents of fish are closely associated to environmental conditions and water chemistry

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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