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Comparative Study on Proximate Composition of Two Fresh Water Fishes, *Catla catla* and *Cirrhinus mrigala*

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ABSTRACT

Fishes are a diverse group of animals living in water and form one of the cheapest sources of animal protein. Determination of proximate profiles such as protein, lipid, carbohydrate contents is often necessary to make sure these parameters are within the range of dietary requirement and commercial specifications. The present study is aimed to analyze the comparative account of proximate composition of the 2 Indian major carp, *Catla catla* and *Cirrhinus mrigala*. This information is helpful for consumer guidance, preference and also the scientists, dieticians, physicians, food manufacturers and policy makers to take decision on production and value addition of fish food products.

Keywords: proximate composition, major carp, *Catla catla*, *Cirrhinus mrigala*

INTRODUCTION

Fish have been a key source of food for humans since time immaterial (Hantoush *et al*., 2014). At the same time, fish protein forms an important part in human nutrition. Fish is also a good source of essential amino acids, fatty acids, vitamins and minerals. The consumption of fish and fish products helps in preventing diseases (Mazrough *et al*., 2015). Flesh texture, protein and fat composition are usually the main factors that determine consumer acceptance (Farid *et al*., 2014). A portion of 75 gms of fish can provide about 25-30 % of an adult's protein requirement (FAO, 2014). Fish provides readily available sources of low fat and high protein content with finest quality of flavour and texture and safety for the consumers (Zafar *et al*., 2004). Rural households in India dependent on the basic cereals are greatly benefitted by including fish in the diet as most of the cereal-based diets lack these, providing an affordable source of food.

India is the third largest fish producing country and the second largest aquaculture fish producer in the world. India contributes about 7% to the global fish production (Ngasotter *et al.,* 2020). The country is also home to more than 10% of the global fish biodiversity. Around 14 million people are engaged in fisheries and its allied activities. Andhra Pradesh is the largest

fish producer in the country followed by West Bengal and Gujarat. More than 50 different types of fish and shellfish products are being exported to 75 countries around the world. The advantage as well as the risk of fish-eating could be determined by analyzing the proximate composition of fish. The biochemical composition and the nutritive profile play an important role to determine the quality of fish. Feeding habit, seasonality, environmental factors and fertility affects the nutritional profile of fish (Mohamed *et al*., 2013). The nutritional profile of fish varies from species to species. Nutrient quality level variations are due to fluctuations that occurred in the environmental factors and water quality parameters. Protein content of the fish offers a rich source of amino acids to several under-developed countries facing a deficit of enormous vital protein and amino acids in their diet.

Proximate analysis provides information on the nutritional value of fish used as a source of food and it varies widely from species to species and within the same species (Fawole *et al*., 2007). The chemical composition (protein, lipid, moisture content) is traditionally used as indicator of the nutritional value of the fish (Moghaddam *et al*., 2007).

The present study deals with the proximate composition: Protein, Lipid, Carbohydrates, Moisture content of 2 Indian major carps *Catla catla* and *Cirrhinus mrigala.* Proximate composition of fish is the percentage composition of the four basic constituents- water, protein, fat and Lipids. The chemical analysis of fish provides useful information to the nutritionists with easily digestible protein of high biological value. This information will help the scientists, dieticians, physicians and food manufacturers on production and value addition of fish food products, also for consumer guidance and preference.

The Fish species selected for the study are *Catla catla* and *Cirrhinus mrigala*. Both these carps are the highly valued due to their flavor and high nutritional value. *Catla catla,* commonly called Katla in Hindi is a large fish with broad head, large protruding lower jaw and upturned mouth. It is a surface feeder with adults feeding on zooplanktons but young ones on both zooplankton and phytoplankton. Catla attains sexual maturity at an average age of 2 years and an average weight of 2 kg. Breeding season is June-July.

Fig 1: A - *Catla catla,* **B**- *Cirrhinus mrigala*

Cirrhinus mrigala, commonly known as mrigal in Hindi. Body elongated, depressed with rounded snout, mouth inferior and thick, upper lips not continuous with lower lip. Large cycloids scales present. Body dark grey on back and silvery on the belly sides. One pair of short barbles present on the mouth. A bottom feeder, attaining sexual maturity attains 1-2 kg. Breeding season is June – July.

MATERIAL AND METHODS

The test fish *Catla catla* and *Cirrhinus mrigala* were collected from the local markets of Amravati. The test fishes were washed with water to remove slime, dissected to isolate muscles and weighed on a digital balance.

Estimation of Moisture Content:

5 gm of muscle tissue was weighed and kept in an oven at 58^0 C for 24 hrs. After 24 hrs the tissue was weighed and the moisture content calculated.

Estimation of Protein Content:

Protein content of the muscle tissue was estimated using Lowry's method. 100 mg of muscle tissue was added 5 ml 1N Sodium Hydroxide and homogenized. Sample was centrifuged for 15 mins at 2500 rpm. 0.1 ml of the sample diluted with 0.9 ml DW and 4 ml of Lowry's mixture was added. 0.5 ml Folin-Phenol reagent was added. The Optical Density measured at 530 nm using Spectrophotometer.

Estimation of Carbohydrate Content:

Total Carbohydrates were estimated using Anthrone reagent method. 100 mg of tissue dissolved in 30% KOH. 0.5 ml of this sample taken to add 0.5 ml of Distilled water. 5ml of Anthrone reagent in Sulphuric acid was added. Contents were kept for incubation for 15 mins and boiled on a water bath. Optical density at 620 nm was measured using a spectrophotometer.

Estimation of Lipid Content:

Total lipids were estimated in 100 mg dry tissues homogenized in chloroform and Methanol mixture. Contents were centrifuged for 15 minutes at 2500 rpm. The supernatant was dried in an oven at 50^0C and weighed. The difference in the initial and final weight was recorded.

RESULT

The results of the Proximate Composition including Moisture, Protien, Carbohydrates and Lipids in the muscles of the two fresh water fishes, *Catla catla* and *Cirrhinus mrigala* were measured by universally accepted Standard methods.

Moisture Content:

The amount of moisture in the muscle was recorded

$$\text{moisture (\%)} = \frac{W1 - W2}{W1} \times 100$$

Where,
W1 - Weight of the sample before drying.
W2 - Weight of the sample after drying

Moisture content of muscle tissues of *Catla catla:*

W1 = 5 gms; W2 = 1.16 gms

$$\text{Moisture content} = \frac{5 - 1.16}{5} \times 100$$

Moisture content = 76.80 %

Moisture content of muscle tissue of *Cirrhinus mrigala*:

W1=5 gms ; W2 =1.10gms

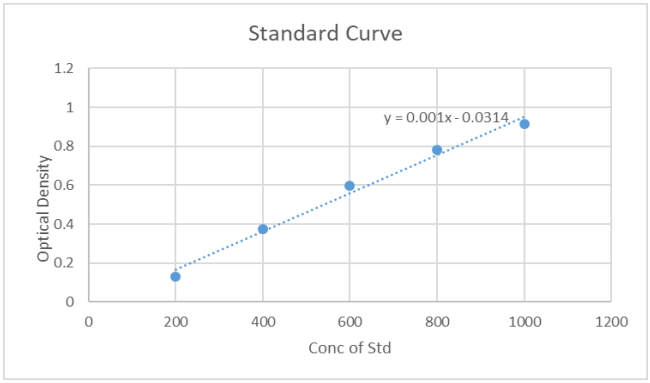
$$\text{Moisture content} = \frac{5 - 1.10}{5} \times 100$$

Moisture content = 78 %

Protein content:

The OD of the muscle tissue of *Calta catla* = 0.128

The OD of the muscle tissue of *Cirrhinus mrigala* = 0.15



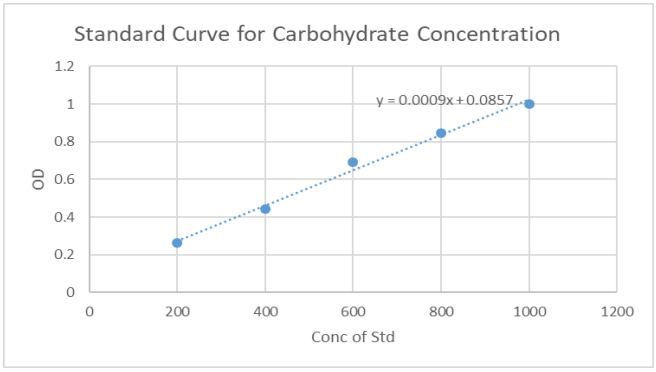
Protein content in the Muscle tissue of *Catla catla*: 16.73 mg/100 mg (16.73 %)

Protein content in the Muscle tissue of *Cirrhinus mrigala*: 18.94mg/100 mg (18.94 %)

Total Carbohydrate Content:

OD of Unknown Sample (*Catla catla*) = 0.088

OD of Unknown Sample (*Cirrhinus mrigala*) = 0.087



Total Carbohydrate content in the Muscle tissue of *Catla catla*: 7.07 mg/100 mg (7.07 %)

Total Carbohydrate content in the Muscle tissue of *Cirrhinus mrigala*: 6.01 mg/100 mg (6.01 %)

Total Lipid Content:

W1-W2=Total lipids

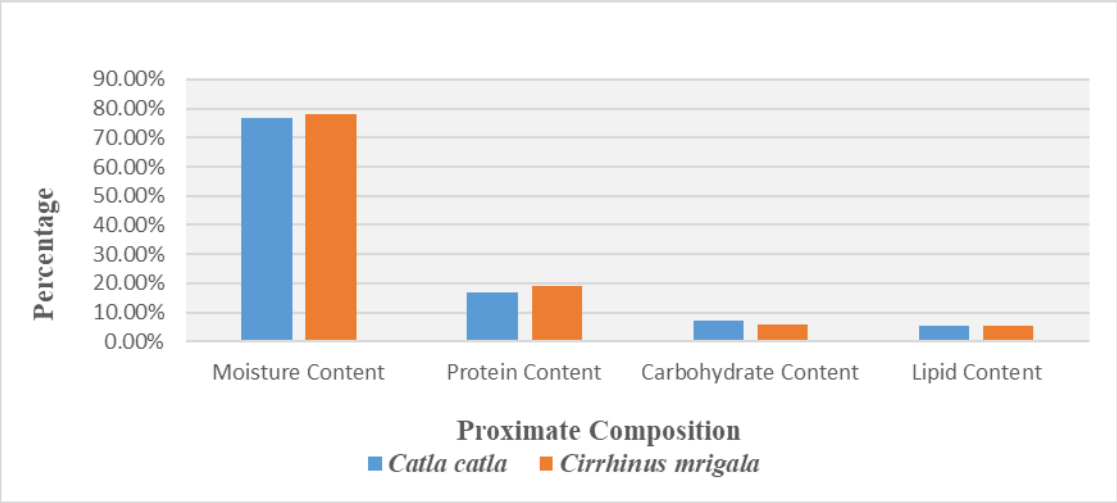
Where, W1- Initial weight of the sample; W2 - weight of the sample after evaporation

Total Lipid content in the Muscle tissue of *Catla catla*: 53.17 gms - 47.95 gms = 5.22%

Total Lipid content in the Muscle tissue of *Cirrhinus mrigala*: 53.12-47.78=5.34

Table 1: Table showing the Moisture, Protein, Total Carbohydrate and Total Lipid Content in the muscle tissues of 2 fresh water fishes, *Catla catla* and *Cirrhinus mrigala*

Sr. No	Proximate Composition	*Catla catla*	*Cirrhinus mrigala*
1.	Moisture Content	76.80 %	78%
2.	Protein Content	16.73 %	18.94 %
3.	Carbohydrate Content	7.07 %	6.01 %
4.	Lipid Content	5.22%	5.34%



Graph 1: Comparative study of the proximate composition including moisture, Protein, Carbohydrates and Lipid content in the muscle tissues of 2 fresh water fishes *Catla catla* and *Cirrhinus mrigala*

DISCUSSION

Fishes are a diverse group of aquatic animals and their food habits differ according to their habitats. Fishes are available in three different environments - fresh water, marine and brakish water habitats. The composition of fish in the marine environment is different from the composition of fish in the fresh and brakish water environment (Ahmed, *et al* 2012). The water conditions like the temperature, salinity, pressure, seasonality and feeding habitats also contribute to the Proximate Composition of the fish (eseyet, 2012). The composition also varies according to the genus and species specific. Within the same species, changes in the composition are noticed, depending on the season.

Fish plays an important role in the human nutrition (Thilsted *et al.,* 2014) due to their high quality, easy digestibility and a source of balanced diet food. Fish is a source of high-quality protein, and several micronutrients. It has been universally accepted as a healthy food.

Thus, there is a primary requirement to understand the proximate composition of the fish. In the present study, the proximate composition including Moisture, Protein, Carbohydrate and Lipid content of the muscle tissues of two fresh water fishes, *Catla calta* and *Cirrhinus mrigala* were studied.

In the present study, the moisture content in the muscle tissues of *Cirrhinus mrigala* was found to be higher (78%) as compared to *Catla catla* (76.80%). The main constituent of fish muscle is moisture, playing an important role in their metabolism. The water content of fish is varied within the limited range in various species (Afser and Ali, 1981).

In the present study, the amount of protein content in the muscles tissues was higher in *Cirrhinus* (18.94 %) as compared to *Catla* (16.73 %). The protein contributed from the natural diet might be efficiently utilized by the fish for synthesis of tissue protein, leaving the scope for diversion to energy production (Dempson *et al.,* 2004).

In the present study, the amount of Total Carbohydrate content was higher in Catla (7.07%) as compared to *Cirrhinus* (6.01 %). The quality and the quantity of the food has a pronounced effect on the growth rate, feed conversion, efficiency, and the proximate composition of the fish (Jena *et al*.,1998).

In the present study, the Lipid content in the muscles tissues was higher in the *Cirrhinus* (5.34%) as compared to *Catla* (5.22%). These changes in the body composition of the two fishes is due to the chemical composition of the diet. Changes in the body composition in relation to the food ingested is a common phenomenon in all fish species (Desilva and Gunasekera, 1989).

In general, proximate composition varied among the two studied fish species. This may be due to consumption or absorption capability and conversion potentials of essential nutrients from their diets or their local environment (Adewoye and Omotosho, 1997; TsegayTeame *et al*., 2016).

Information regarding different fish contents such as protein, fats, carbohydrates and other nutrients and how they vary in different fish species used is very important for the consumers. This information helps them to select the most suitable fish species because of having elevated protein contents.

CONCLUSION:

Fish is largely eaten due to its good flavour, high digestibility and comparatively cheaper price. But at the same time there is little awareness of its nutritional value. From the present study it can be concluded that there was variation in the proximate composition in the muscle tissues of two fresh water fishes, *Catla catla and Cirrhinus mrigala*. The current study is an important step in considering future research on the nutrient composition of consumable and economical fish species, like *Catla calta* and *Cirrhinus mrigala.* The goal of this study is to assess the nutritional value of these two important fish species in order to get insight of their potential future applications. Such study adds to our knowledge in comparing the nutritional profiles of fish species to determine their dietary value for the future development. Since the study is attempting to analyse data on some readily available and affordable common fresh water fish, a greater segment of the population will get help out of this investigation. It also helps to co-relate their value as a source of protein with other foods. The study may also help in redressing the issues of malnutrition and could aid in pharmaceutical industries to devise drugs and medicines based on the biochemical profile of diverse fishes. Thus, it can be recommended that, while buying a fish, its flavour, size, freshness, and other relevant external characteristics should not be the only elements to consider but a strong preference should be given to the nutritional profile of fish.

Conflicts of interest: The authors stated that no conflicts of interest.

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