JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Comparative Study on the Proximate Composition of Two Fresh Water Fishes, *Labeo rohita* and *Catla catla*

Kawade Sujata[1] and Deshmukh Pratiksha[2]
[1] Assistant Professor, Department of Zoology, Shri Shivaji Science College, Amravati, Maharashtra
[2] Shri Shivaji Science College, Amravati

Abstract:

Fishes are one of the cheapest sources of animal protein. Determination of proximate profiles such as protein, lipid, carbohydrate contents, often becomes 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, *Labeo rohita* & *Catla catla*. This information is helpful for consumer guidance, preference and also the, dieticians, scientists, physicians, food manufacturers and policy makers to take decision on production and value addition of fish food products.

Keywords: Proximate Composition, protein, lipid, carbohydrate.

INTRODUCTION:

Fishes are a diverse group of animals that live and breathe in water. All fishes are vertebrates with gills for breathing, fins for swimming, scales for protection, and a streamlined body for moving easily through the water (Beveridge et al, 2013).

Fish is one of the cheapest sources of animal protein (Dempson et al., 2004). Fish accounts for 16.7% of the global population's intake of animal protein (FAO, 2014). However, in addition to protein, fish are also important dietary sources of micronutrients which include Iron, copper, zinc and manganese (Chanda et al, 2015). These micronutrients are indispensable for the maintenance of normal growth and reproduction (Mohanty, 2015). Fish is also a rich source of omega 3 and polyunsaturated fatty acids (PUFAs) which are beneficial for human health (Stickney and Hardy, 1989).

Fish is the rich source of nutrients (protein, vitamins and mineral) with relatively low cholesterol content (Afser, M. R. 1992). The most important constituent of the fish muscle is protein, which generally varies from 17 to 25% in fresh condition. Fish is generally less expensive, as compared to other food proteins, it has a high protein quality

(Hossain, M.A., Afsana, K. and Azad Shah, A.K.M. 1999). As fishes have a high palatability and high digestible, they have a high biological value (Mohanty et al, 2017). The fat content of the fish varies greatly between different species and those with low amount of fat are particular suited for weight control diets. The consumption of fish fulfils the dietary needs of many micronutrients, fatty acids, amino acids etc (Thilsted et al., 2014).

Fish has long been recognized as valuable resource of high-quality food in human diet (Aberoumand, 2012). For enhanced fish production, aquaculture is practiced on a large scale. In comparison to other agriculture sectors, Aquaculture is a low energy expenditure and protein yielding (Gopakumar, K. 2003). Aquaculture production is affected by multiple factors like physical and chemical characteristic of water bodies, seed quality, stocking density, season, cultural system, feeding and harvesting patterns (Hussain et al, 2011). Hence all these characteristics must be measured and analyzed for production.

Amravati district affords natural facilities for the development of inland fisheries, in addition to the rivers. Many ponds of the city have been brought under scientific fish culture with remarkable success during the last five years. They are stocked with fry and finger-lings of the Indian Major Carps.

Determination of proximate profiles such as protein, lipid, carbohydrates and Moisture contents is often necessary to make sure that they are within the range of dietary requirement and commercial specifications. Indian major carp viz., Rohu and Catla are the more commonly consumed freshwater fish in India. The aim of this study was to analyze and document the comparative account of proximate composition of the 2 Indian major carp, *Labeo rohita* and *Catla catla*. This information will be helpful for consumer guidance and preference.

Labeo rohita (Common Hindi name: Rohu, rui) is a species of fish of the carp family, found in rivers in South Asia. It is a large omnivore and extensively used in aquaculture. Body bilaterally symmetrical, moderately elongate, dorsal profile more arched than the ventral profile; body with cycloid scales, head without scale; snout fairly depressed, projecting beyond mouth, without lateral lobe; eyes dorsolateral in position, not visible from outside of head; mouth small and inferior; lips thick and fringed with a distinct inner fold to each lip, lobate or entire; a pair of small maxillary barbels concealed in lateral groove; no teeth on jaws; pharyngeal teeth in three rows; upper jaw not extending to front edge of eye; simple (unbranched) dorsal fin rays three or four, branched dorsal fin rays 12 to 14; dorsal fin inserted midway between snout tip and base of caudal fin.

Catla catla is commonly called as Katla in Hindi. It is very fast growing and suitable fish breed for farming in freshwater pond (It is a fish with large and broad head, a large protruding lower jaw and upturned mouth. Catla is a surface feeder. Adults feed on zooplankton but young ones on both zooplankton and phytoplankton. Catla attains sexual maturity at an average age of two years and an average weight of 2 kg. Egg laying capacity of per kg of catla is 1-1.50 lakh. Breeding season is June- July. A tasty and nutritious fish and very popular to all types of people throughout the South Asia. It is a very suitable fish species for commercial fish farming business.

Labeo rohita

Catla catla

MATERIAL AND METHODS:

The test fish *Labeo rohita* and *Catla catla* were collected from the local market of Amravati. Both test fishes were washed with water to remove slime and then dissected to isolate pieces of 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:

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

Estimation of Carbohydrate Content:

Total Carbohydrates were estimated using Anthrone reagent method. 100 mg of tissue was dissolved in 30% KOH. 0.5 ml of this sample was taken to which 0.5 ml of Distilled water & 5ml of Anthrone reagent in Sulphuric acid was added. Contents were shaken well and kept for incubation for 15 mins, 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.

OBSERVATION AND RESULTS:

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

Moisture Content:

The amount of moisture in the muscles was recorded 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 tissue of *Labeo rohita*:

W1 = 5 gms; W2 = 1.20 gms

$$\text{Moisture content} = \frac{5 - 1.20}{5} \times 100 = 76\ \%$$

Moisture content of muscle tissues of *Catla catla:*

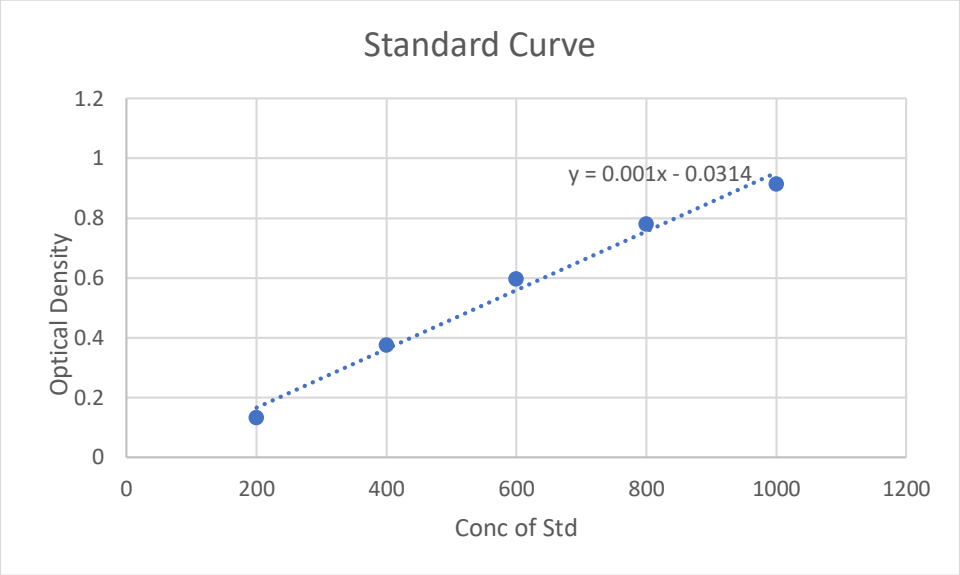
W1 = 5 gms; W2 = 1.16 gms

$$\text{Moisture content} = \frac{5 - 1.16}{5} \times 100 = 76.80\ \%$$

Protein content:

OD of Muscle tissue of *Labeo rohita* = 0.103

OD of Muscle tissue of *Catla catla* = 0.128



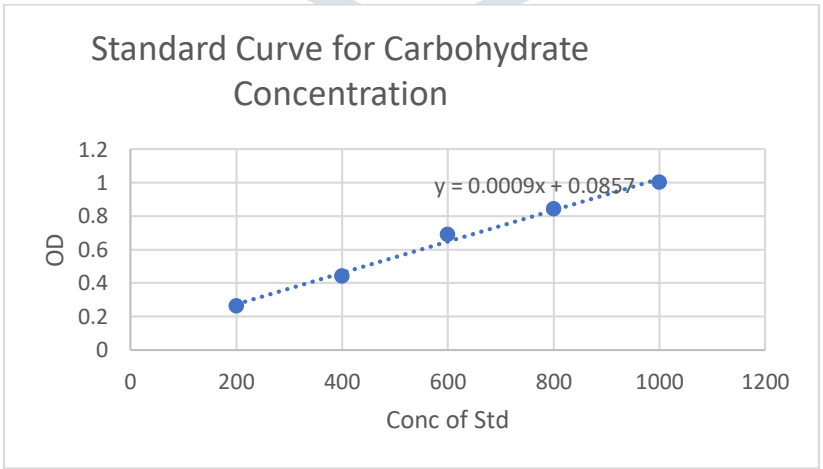
Protein content in the Muscle tissue of Labeo rohita: 14.22 mg/100 mg (14.22 %)

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

Total Carbohydrate Content:

OD of Muscle Tissue of *Labeo rohita* = 0.086

OD of Muscle Tissue of *Catla Catla* = 0.088



Total Carbohydrate content in the Muscle tissue of *Labeo rohita*: 4.95 mg/100 mg (4.95 %)

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

Total Lipid Content:

W1-W2=Total lipids

Where,

W1- Initial weight of the sample

W2 - weight of the sample after evaporation

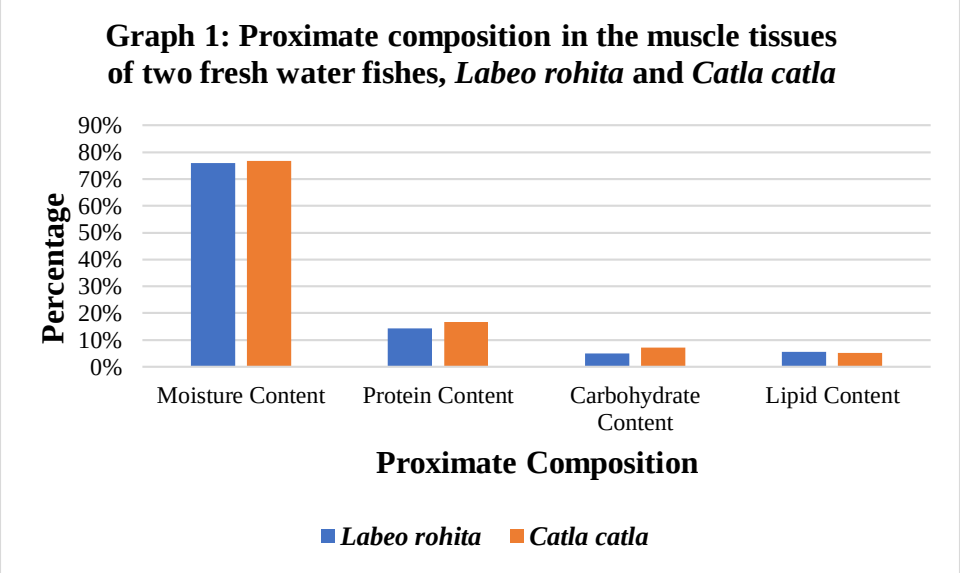
Total Lipid content in the Muscle tissue of *Labeo rohita*: 53.12 - 47.57 = 5.56%

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

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

Sr no	Proximate Composition	*Labeo rohita*	*Catla catla*
1.	Moisture Content	76 %	76.80 %
2.	Protein Content	14.22 %	16.73 %
3.	Carbohydrate Content	4.95 %	7.07 %
4.	Lipid Content	5.56 %	5.22%

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



DISCUSSION:

Fishes account for more than 40 % of all vertebrate species worldwide, making them one of the essential components of the aquatic ecosystem. They represent a wide range of Species and indicate a healthy aquatic ecosystem (Parveen & Gaikwad, 2018). Fish are high-quality source of animal protein and have a unique position as a high-protein food commodity for human consumption. They play a significant role for improving nutritional status, food security, cardiovascular health and other health-related disorders (Bezbaruah & Deka, 2021). A fish meal provides essential nutrients, fatty acids, amino acids and some important vitamins and minerals, which serve as a source of energy for healthy living. Therefore, it is sometimes referred to as 'rich food for poor people' (Balami et al., 2019).

Fish is a perfect food for newborns and adults as it is abundant in key nutrients needed during the early stages of development (Abdullahi et al, 2001). They also contain omega-3 fatty acids, that aid in the prevention and treatment of cardiovascular, inflammatory and neurological diseases (Li et al., 2019). It is also helpful in reducing the serum cholesterol level in humans. The chemical composition of fish flesh is regarded as a predictor of the fish's quality, nutritional value, physiological state and habitat (Begum et al, 2012). The body composition of fish is constituted by moisture, protein, fat and ash. The evaluation of these components is known as the 'proximate composition' of fish.

It has been suggested that the proximate composition of each fish species varies and is primarily influenced by both exogenous and endogenous factors (Ayas et al 2012), which includes the effect of water temperature, feeding habit, age and seasonal variations. Species to species variation is also seen. Besides this, various other factors such as season, intensive feeding or starvation, migration, spawning, feed, maturity stage, have also been found to have a pronounced impact on the proximate Composition.

In the present study, the moisture content in the muscle tissues of *Labeo rohita* was recorded to be 76% and *Catla catla* to be 76.80%. The water content of fish varies within the limited range in various species (Afser and Ali, 1981). The main constituent of fish muscle is moisture, which play an important role in their metabolism.

In the present study, the amount of protein content in the muscles tissues was higher in *Catla* (16.73 %) as compared to *Labeo* (14.22 %). The protein contributed from the supplementary feed and natural diet combination 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 *Rohu* (4.95 %). 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 muscle tissues was higher in *Rohu* (5.56 %) 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 variation may be due to consumption or absorption capability and conversion potentials of essential nutrients from their diets or their local environment (Tsegay Teame et al., 2016).

Information regarding fish contents such as protein, fats, carbohydrates and other nutrients and how they vary in different fish species used is important for the consumers. This information may help them to select the suitable fish species as required by them. It is also facilitating the consumer to select fish, suitable for consumption.

CONCLUSION:

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, *Labeo rohita* and *Catla catla*. From a nutritional point of view, the two fish species demonstrated acceptable quality and are economically affordable. Consumers could secure their nutrition by consuming these fish species. Such study helps in comparing the nutritional profiles of fish species in order to determine their dietary value for the future development. A greater segment of the population will get help out of this investigation as it helps to co-relate their value as a source of protein with other foods. The study also help in redressing the issues of malnutrition and could aid 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, strong preference should be given to the nutritional profile of fish, apart from its flavour, size, freshness, and other relevant external characteristics.

REFERENCES:

1. **Aberoumand, A. (2012).** Proximate composition of less known some processed and fresh fish species for determination of the nutritive values in Iran. Journal of Agricultural Technology 8(3): 917–922.
2. **Abdullahi, S. A., Abolude, D. S., & Ega, R. A. (2001).** Nutrient quality of four oven dried freshwater catfish species in Northern Nigeria. Journal of Tropical Bioscience, 1(1), 70–76.
3. **Afser, M. R. 1992.** Observation on caloric value and moisture content of some freshwater fishes. Indian Journal of fisheries 4(2): 108-110.
4. **Afser, M. R and Ali, F. 1981**. Comparative study of body composition and caloric value of some air breathing fishes. The Indian Journal of Zoology. XXII (2): 81-85.

5. **Ayas, D., Ozogul, Y., Ozogul, I and Uçar, Y. (2012**). The effects of season and sex on fat, fatty acids and protein contents of Sepia officinalis in the northeastern Mediterranean Sea. International Journal of Food Sciences and Nutrition 63(4): 440–445.
6. **Balami, S., Sharma, A., & Karn, R. (2019**). Significance of nutritional value of fish for human health. Malaysian Journal of Halal Research, 2(2), 32–34.
7. **Begum, M., Akter, T., & Minar, M. H. (2012).** Analysis of the proximate composition of domesticated stock of pangas (Pangasianodon hypophthalmus) in laboratory condition. Journal of Environmental Science & Natural Resources, 5(1), 69–74
8. **Beveridge, MCM. Thilsted SH., Phillips MJ., Metian M., Troell M and Hall SJ (2013).** Meeting the food and nutrition needs of the poor: the role of fish and the opportunities and challenges emerging from the rise of aquaculture. Journal of Fish Biology. 2013; 83, 10; 67–1084
9. **Bezbaruah, G., & Deka, D. D. (2021).** Variation of moisture and protein content in the muscle of three catfishes: A comparative study. International Journal of Fisheries and Aquatic Studies, 9(1), 223–226.
10. **Chanda, S., Paul, B.N. and Ghosh, K. 2015.** Dietary essentiality of trace minerals in aquaculture: an overview. Agric. Review. 36: 100-112.
11. **Dempson I. B., Schwarz C. J., Shears M. and Furey G., 2004**. Comparative proximate body composition of Atlantic salmon with emphasis on parr from fluvial and lacustrine habitats. J. Fish Biol., 64, 1257- 1271.
12. **De Silva, S. S and Gunasekara, R. M. 1989**. Effects of dietary protein level and amount of plant ingredients (Phaseolus aureus) incorporated into diets on consumption of growth performance and caracass composition in Oreochromis mloticus (L) fry. Aquaculture 80: 121-133.
13. **FAO. 2014.** The State of World Fisheries and Aquaculture 2014. Food and Agriculture Organization of the United Nations, Rome, Italy. p 223.
14. **Gopakumar, K. 2003.** Indian Aquaculture. Jour. Of Aquaculture 13(1/2): 1-1
15. **Hossain, M.A., Afsana, K. and Azad Shah, A.K.M. 1999.** Nutritional value of some small indigenous fish species (SIS) of Bangladesh. Bangladesh J. Fish. Res. 3: 77-85
16. **Hussain, B.**, Mahboob S., Hassan, M., Sultana, T and Tariq, H (2011): Comparative Analysis of Proximate Composition of Head from Wild ad Farmed Catla catla. The J of Animal and Plat Sciences 21 (2) : 2011: 207-210
17. **Jena, J. K., S. Ayyappan, P. K. Aravindakshan, B. Dash, S. K. Singh and H. K. Muduli. 1998.** Comparative evaluation of growth and survival of Indian major carps rearing fingerlings. J. Aquqcult.Trop., 13(2): 143-149.

18. **Li, X., Bi, X., Wang, S., Zhang, Z., Li, F., & Zhao, A. Z. (2019).** Therapeutic potential of ω-3 polyunsaturated fatty acids in human autoimmune diseases. Frontiers in Immunology, 10, 2241

19. Mohanty B. Nutritional value of food fish. *Conspectus Inland Fish Manag.* (2015) 4:15–21.

20. **Mohanty, B.P., Ganguly, S., Mitra, T., Mahanty, A., Patra, S., Karunakaran, D., Raman, R.K., Parida, P.K., Abdulla, T., Behera, P., Anandan, R., Dayal, J.S., Chakraborty, K., Paul., B.N., Sharma, D., Mathew, S., Asha, K.K., Akhtar, M.S., Shahi, N., Sridhar, N., Sankar, T.V. and Das, B.K. 2017.** Fish would be an important player in eradicating protein hunger. In "National Seminar on Priorities in Fisheries and Aquaculture (PFA-2017)" held on March 11-12, 2017 at College of Fisheries, Rangeilunda, Berhampur, Odisha. India.

21. **Parveen, I., & Gaikwad, J. M. (2018**). Diversity of fish parasites from fresh water fishes of Masooli Reservoir of Parbhani district. International Journal of Scientific and Research Publications, 8, 371-376

22. **Stickney, R. R and Hardy, R. W. 1989.** Lipid requirement of some warm water species. Aquaculture 79: 145- 156.

23. **Thilsted S.H., James D., Toppe J., Subasinghe R., Karunasagar I. (2014).** Maximizing the contribution of fish to human nutrition. ICN2 Second International Conference on Nutrition: Better Nutrition Better Lives, Rome, Italy.

24. **Tsegay Teame, Natarajan, P., Zelealem Tesfay (2016).** Proximate and mineral composition of some commercially important fish species of Tekeze Reservoir and Lake Hashenge, Ethiopia. International Journal of Fisheries and Aquatic Studies 4(1): 2394-0506.