

# Comparative Estimation of Muscle Protein Content in *Labeo Rohita* and *Carassius Spp.* from Baramati Fish Market using Lowry's Method

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**Abstract:** Fish constitutes an important source of high-quality animal protein and plays a significant role in human nutrition, particularly in developing countries. The present study was undertaken to estimate and compare the muscle protein content of two commonly consumed freshwater fish species, *Labeo rohita* and *Carassius spp.*, collected from the Baramati fish market, Maharashtra. Muscle tissues were dissected, dehydrated, powdered, and analyzed for total protein content using Lowry's colorimetric method with bovine serum albumin (BSA) as the standard. Absorbance was measured at 660 nm and protein concentration was determined from the standard calibration curve. The results revealed that *Carassius spp.* possessed a higher muscle protein content (160 µg/ml) compared to *Labeo rohita* (140 µg/ml). The observed variation in protein content may be attributed to differences in feeding habits, metabolism, and physiological characteristics of the species. The findings highlight the nutritional importance of these locally available fish species and their potential role in combating protein deficiency and malnutrition.

**Keywords:** Fish protein, Lowry's method, *Labeo rohita*, *Carassius spp.*, Muscle tissue, Nutritional analysis

## I. INTRODUCTION

Proteins are the fundamental building blocks of life and play a crucial role in the structure and function of all living organisms. They serve as structural components of cells, enzymes for metabolic reactions, hormones for physiological regulation, transport molecules, and signaling agents essential for cellular communication. Adequate dietary protein intake is particularly important for higher organisms, as they are unable to synthesize all essential amino acids required for normal growth and maintenance (Niamke & Faulet, 2005).

With the rapid increase in global population, traditional terrestrial agriculture alone is insufficient to meet the growing demand for high-quality food. Aquaculture and fisheries have emerged as sustainable alternatives for providing nutritionally rich food, particularly protein. Fish proteins are highly digestible and possess high biological value due to the presence of all essential amino acids, including methionine and cysteine, which are often limited in plant-based diets (Venugopal & Shahidi, 1996).

Fish and seafood are recognized for their superior nutritional profile, as they provide not only proteins but also lipids, vitamins, minerals such as calcium, iodine, iron, and zinc, and omega-3 polyunsaturated fatty acids (Ranjini et al., 2017). Muscle tissue, which forms the major edible portion of fish, primarily consists of proteins, lipids, moisture, and vitamins. Fish muscle proteins are particularly valuable because of their favorable amino acid composition and ease of digestion (Dal Bosco et al., 2010).



Protein deficiency remains a significant nutritional problem in many developing regions, leading to impaired growth, muscle wasting, and compromised immune function. In conditions of inadequate dietary intake, muscle proteins act as a major reservoir of amino acids to meet metabolic demands of other tissues (Zhang, 2017). Therefore, identification of affordable and locally available animal protein sources is essential for improving nutritional security.

Several analytical techniques are available for protein estimation, including the Biuret method, Bradford assay, Bicinchoninic acid (BCA) assay, and Lowry's method. Among these, Lowry's method is widely used due to its high sensitivity and reliability for total protein determination (Lowry et al., 1951; Bessman, 1972). The method is based on the reaction of proteins with copper ions under alkaline conditions followed by reduction of the Folin–Ciocalteu reagent, resulting in a blue-colored complex.

Labeo rohita (Rohu) is one of the major Indian carps and is economically important in South Asia. It is widely consumed due to its high protein content, essential vitamins, and omega-3 fatty acids. Carassius spp., commonly known as crucian carp, is an omnivorous freshwater fish and is also valued for its nutritional properties and adaptability to diverse environments (Hänfling et al., 2005). Despite their widespread consumption, comparative studies on the muscle protein content of these species from local markets remain limited. The present study aims to estimate and compare the muscle protein content of Labeo rohita and Carassius spp. using Lowry's method, thereby providing scientific evidence for their nutritional significance.

## **II. MATERIALS AND METHODS**

### **Sample Collection**

Fresh specimens of Labeo rohita and Carassius spp. were collected from the Baramati fish market, Maharashtra. The samples were transported to the laboratory in iced containers to prevent spoilage and processed immediately for analysis.

### **Preparation of Muscle Tissue**

Fish were washed thoroughly with distilled water. Muscle tissue was dissected aseptically from the dorsal region, avoiding skin, bones, and visceral organs. The collected muscle samples were weighed and then dehydrated in a hot air oven at 80 °C for 24 hours, following the method described by Gandotra et al. (2012). After dehydration, the samples were cooled in a desiccator and powdered using a clean mortar and pestle.

### **Reagents Preparation (Lowry's Method)**

Protein estimation was carried out following the procedure of Lowry et al. (1951) with minor modifications:

- Reagent A: 4 g NaOH and 20 g sodium carbonate dissolved in 1000 ml distilled water.
- Reagent B: 1 g potassium sodium tartrate and 0.5 g copper sulfate dissolved in 100 ml distilled water.
- Reagent C (Alkaline copper reagent): 600 ml of Reagent A mixed with 12 ml of Reagent B.
- Reagent D: Folin–Ciocalteu reagent diluted 1:1 with 0.1 N NaOH.

### **Preparation of Standard Protein Solution**

Bovine Serum Albumin (BSA) was used as the standard protein. A stock solution was prepared by dissolving 0.05 g BSA in 50 ml distilled water. Working standards ranging from 0–200 µg/ml were prepared by appropriate dilution, as recommended by Satpathy et al. (2020).

### **Protein Estimation Procedure**

Aliquots of standard and unknown samples were taken in test tubes and volume adjusted to 1 ml with distilled water. Five milliliters of Reagent C were added and incubated at room temperature for 10 minutes. Subsequently, 0.5 ml of Reagent D was added and the mixture was incubated for 30 minutes at room temperature. Absorbance was measured at 660 nm using a spectrophotometer against a reagent blank.



**Calculation of Protein Content**

A standard calibration curve was plotted using absorbance values of BSA standards. Protein concentration of unknown samples was calculated from the standard curve and expressed as  $\mu\text{g/ml}$ .

**III. RESULTS AND DISCUSSION**

TABLE 1. STANDARD BSA CALIBRATION DATA (LOWRY'S METHOD)

BSA Volume (ml)	Protein Concentration ( $\mu\text{g}$ )	Absorbance at 660 nm
0.0	0	0.521
0.2	40	0.468
0.4	80	0.450
0.6	120	0.606
0.8	160	0.719
1.0	200	0.658

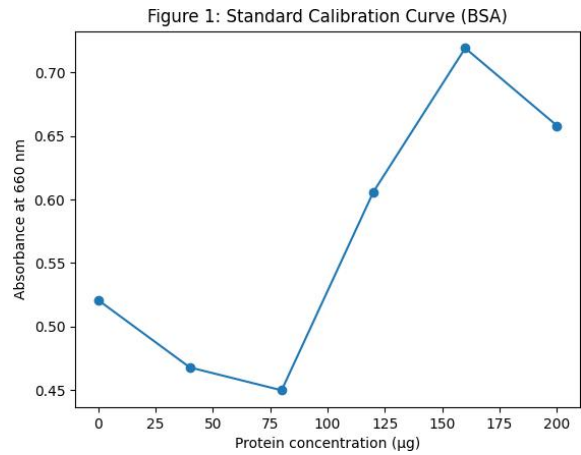


Figure 1. Standard calibration curve showing the relationship between protein concentration ( $\mu\text{g}$ ) and absorbance at 660 nm using BSA. The curve demonstrates a linear relationship, confirming the suitability of Lowry's method for protein estimation.

Table 2. Muscle Protein Content of Carassius spp.

Sample	Absorbance at 660 nm	Protein Concentration ( $\mu\text{g/ml}$ )
Unknown sample	0.705	160



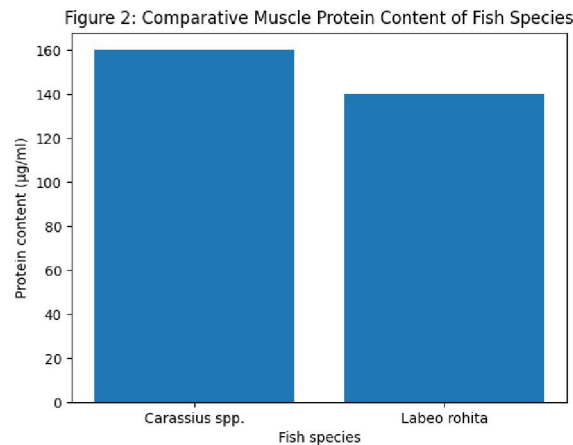


Figure 2. Graphical representation of protein content in muscle tissue of Carassius spp. estimated using Lowry's method.

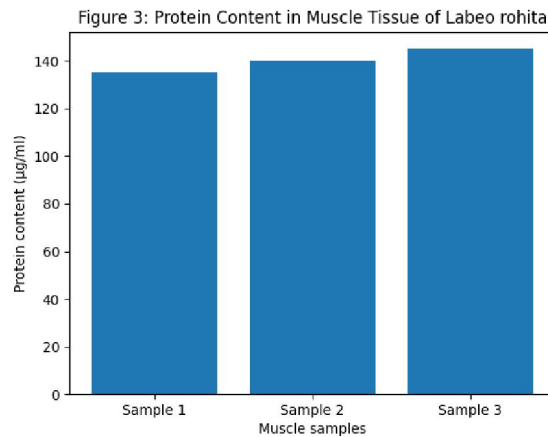


Figure 3. Graphical representation of protein content in muscle tissue of Labeo rohita estimated using Lowry's method. The protein content of muscle tissue from Labeo rohita and Carassius spp. was estimated using Lowry's method. The standard BSA curve showed a linear relationship between protein concentration and absorbance at 660 nm, confirming the reliability of the assay.

Table 3. Muscle Protein Content of Labeo rohita

Sample	Absorbance at 660 nm	Protein Concentration (µg/ml)
Unknown sample	0.605	140

The muscle protein content of Carassius spp. was found to be 160 µg/ml, whereas Labeo rohita showed 140 µg/ml protein content. These results indicate that Carassius spp. possesses comparatively higher protein concentration than Labeo rohita. The observed variation in protein content may be attributed to species-specific factors such as feeding habits, metabolic rate, growth pattern, and environmental adaptation. Carassius spp. is an omnivorous fish with active feeding behavior, which may contribute to greater protein deposition in muscle tissue. Similar findings have been reported by Dal Bosco et al. (2010) and Pruthviraj (2020), who observed significant variation in muscle protein content among freshwater fish species.



Earlier studies by Malik et al. (2019) and Doloi and Basumatari (2020) also reported variations in protein content among Indian major carps, emphasizing the influence of habitat, diet, and physiological condition. The protein values obtained in the present study fall within the range reported for freshwater fishes, supporting the nutritional quality of both species. Lowry's method has been widely used for fish muscle protein estimation due to its sensitivity and accuracy (Zhou & Regenstein, 2006). The present findings further validate the applicability of this method for routine nutritional assessment of fish samples.

#### **IV. CONCLUSION**

The present study concludes that both *Labeo rohita* and *Carassius* spp. are rich sources of high-quality dietary protein. However, *Carassius* spp. exhibited comparatively higher muscle protein content than *Labeo rohita*. The results emphasize the nutritional importance of these locally available freshwater fishes and their potential.

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**Annexure**

Figure 1 labiro rohita



Figure 2 carassius spp.



Figure 3. Muscle tissue extraction



Figure 4. Dry form of Muscle extraction



Figure 5. Reagent Prepetition

