



Virtual Analysis on Proximate Body Composition of *Labeo rohita* and *Cirrhinus mrigala*

Muhammad Atif Sikandar^{1,a}, Zaigham Hassan^{1,2,b}, Abdul Basit^{3,c}, Raees Khan^{3,d,*}, Fethi Ahmet Ozdemir^{4,e}

¹Department of Animal Sciences, Faculty of Biological Sciences, Quaid-i-Azam University, Islamabad 45320, Pakistan

²Department of Zoology, University of Peshawar, Khyber Pakhtunkhwa, Pakistan

³Department of Plant Sciences, Quaid-i-Azam University, Islamabad 45320, Pakistan

⁴Department of Molecular Biology and Genetics, Faculty of Science and Art, Bingol University, 1200 Bingol, Turkey.

*Corresponding author

ARTICLE INFO	ABSTRACT
<p>Research Article</p> <p>Received : 08/07/2019 Accepted : 30/08/2019</p> <p>Keywords: <i>Labeo rohita</i> <i>Cirrhinus mrigala</i> Proximate body composition Fat Protein</p>	<p><i>Labeo rohita</i> and <i>Cirrhinus mrigala</i> are the two Indian major carps and chief components of polyculture system in the local population. Proximate body composition is the analysis of water, fat, protein and ash contents of fish. Values are vary considerably within and between species, size, sexual condition, feeding season and physical activity. The percentage of water is a good indicator of its relative contents of energy, proteins and lipids. Determination of some proximate profiles such as protein content, lipid, ash and other nutrients is often necessary to ensure that they are within the range of dietary requirement and commercial specifications. Based on this background the present study was aimed to evaluate the nutritional value of some major carps (<i>Labeo rohita</i> and <i>Cirrhinus mrigala</i>) fishes of Peshawar Carp Hatchery and training centre Sherabad. The proximate composition of <i>Labeo rohita</i> and <i>Cirrhinus mrigala</i> samples were determined and data was evaluated statistically by performing t-test through Sigma Plot and graphs were made by using Graph Pad Prism. The average value of crude protein for <i>Cirrhinus mrigala</i> was found higher than <i>Labeo rohita</i> (51.7% and 39.04%) similarly the water contents were also found higher in <i>Cirrhinus mrigala</i> than <i>Labeo rohita</i> (75.88% and 73.95%). The average value of dry matter and muscle fats contents were lowered in <i>Cirrhinus mrigala</i> than <i>Labeo rohita</i> (24.11% and 26.04%) and (13.00% and 13.45%) respectively. However, the ash contents were similar in both of experimental species (23.91% and 23.93%). From these results, it is concluded that both <i>Cirrhinus mrigala</i> than <i>Labeo rohita</i> are very proteineous and have low fats contents so it is very good for the health of consumers. Further research is recommended on the other parameters and miss rays of this work.</p>

^a matif@bs.qau.edu.pk

^b <https://orcid.org/0000-0002-0807-3541>

^b zaighamhasan@bs.qau.edu.pk

^d <https://orcid.org/0000-0002-2445-6710>

^c abdulbasit95mrd@gmail.com

^c <https://orcid.org/0000-0002-2917-6478>

^d raeeskhanbotanist@gmail.com

^e <https://orcid.org/0000-0003-1388-7141>

^e ozdemirfethiahmet23@yahoo.com

^e <https://orcid.org/0000-0001-7215-9692>



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Introduction

The science and practice of culturing fish or other aquatic organisms under controlled or semi-controlled conditions is called aquaculture (Ali and Narejo, 2009). Globally, slightly over half (54%) of the total food fish supply is obtained from marine and inland capture fisheries. While the remaining (46%) is drawn from aquaculture. Globally, aquaculture's contribution to per capita food availability grew from 0.7 kg in 1970 to 7.8 kg in 2008. The contribution of capture fisheries to per capita food supply stabilized at 10 – 11 kg per capita in the period 1970 – 2000, and then declined to 9.3b kg per capita in 2008. Recent increases in per capita availability are attributed to inland aquaculture (World Aquaculture, 2010). All over the world, aquaculture has become the fastest growing food production sector in the world with an

average annual increase of about 10% since 1984 when compared with 3% increase for livestock meat and 1.6% increase for capture fisheries (Umar et al., 2011). Aquaculture in Pakistan is a very new activity and there is huge potential for development due to its rich aquatic resources. The total area under fish ponds is about 60,470 hectares (Akhtar, 2001). In Pakistan it is semi-intensive in nature and is based on composite polyculture of three Indian major carps viz. Rohu, Thaila Mori and two Chinese carps viz. Grass carp (*Ctenopharyngodon idella*) and silver carp (*Hypophthalmichthys molitrix*). Like India polyculture is quite successful. Fish production is very high than single species culture system and pond quality dos not deteriorate (Sahu et al., 2007). *Labeo rohita* is commonly known as Rohu. While common name of *Cirrhinus mrigala* is Mori.

These two chief components of polyculture system of Indian major carps along with *Catla catla*. These belong to Cyprinidae family found commonly in rivers and freshwater lakes (Devi and Ali, 2011). Proximate body composition is the analysis of water, fat, protein and ash contents of fish. Carbohydrates and non-protein compounds are present in negligible amount and are usually ignored for routine analysis. The live weight of majority of fishes usually consists of about 70 – 80% of water, 20 – 30 percent % and 2 – 12% of lipid. However, these values alter considerably within and between species, size, sexual condition, feeding season and physical activity (Aberoumand, 2012). The percentage of water is good indicator of its relative contents of energy, proteins and lipids. The lower the percentage of water would be greater the lipids and protein contents and higher the energy density of the fish. Furthermore, the variations in proximate composition of fish are closely related to the feed intake and the water where they live (Dempson et al., 2004). Data on proximate composition are critical for many applications and investigations on these lines had been carried out since 1880s. Determination of some proximate profiles such as protein content, lipid, ash and other nutrients is often necessary to ensure that they are within the range of dietary requirement and commercial specifications. (Watchman, 2000). Culture of these two fish is common in the local population. It is the first attempt to find the basic nutritional components of these two fish. Based on this background the present study was conducted. This study is carried out to find out the nutritional value of the flesh, compare the nutritional elements and body composition and of *Labeo rohita* and *Cirrhinus mrigala* and to decide about the nutritionally better species between the Indian major carps.

Materials and Methods

The brooder fishes were transported from PCH & TC in 1:2 water and oxygen ratios. The fishes were acclimatized in the Proximate Analysis Laboratory, Analysis Laboratory Department of Food and Nutrition, the Agriculture University Peshawar, Pakistan. Fishes were slaughtered and 100 g pellets were taken for proximate analysis. Proximate compositions of fish were determined by conventional method of AOAC (Association of Official Analytical Chemicals) on weight basis (AOAC, 1990). All data was analysed by applying t-test for comparison of two groups through Sigma Plot. Significant change was considered when $P < 0.05$. Data represented in graphs made by Graph Pad Prism and tables in form of mean and standard error of mean.

Estimation of Moisture

About 20-30 gram of fresh samples were taken into each known weight basin and weighed in a digital balance (Toledo, Switzerland). The samples were allowed to dry into the oven (Memmet 854 Schwabach) at 70°C for 24 hours in order to remove the moisture until constant weight. After that, the basins are taken out of the oven, cooled in a desiccators and were weighed in a digital balance. Then moistures were calculated by using the following equation (1);

$$\% \text{ of Moisture} = \frac{\text{Weight of loss}}{\text{Weight of Sample taken}} \times 100 \quad (1)$$

Estimation of Protein

Protein was determined using Kjeildal method which involves digestion, distillation and titration as recommended by AOAC (2001).

Digestion: 0.5 gm sample was weighted. It was taken in a tube and add 2-3 gm catalyst (CuSO_4 and K_2SO_4). 7-10 ml of H_2SO_4 was added and placed in the digestion assembly of Fuming Hood (420-430°C) for 4 hours.

Dilution: Digested sample was cooled. We make volume of 100 ml in volumetric flask by adding distilled water and then store in a bottle for further analysis.

Distillation: 5ml of sample was taken in a distillation flask. Distilled water was added. 10ml NaOH solution was placed on a heater. 10ml boric acid reagent was taken in receiving flask. Colour of boric acid reagent will change in distillation. Distillation was continued for 7 minutes.

Titration: It was titrated against 0.02N H_2SO_4 solution. From the titration reading we calculate the %N by the following equation (2);

$$\% \text{ of } \text{N}_2 = \frac{(\text{TR}-\text{BR}) \times 0.02 \times 20 \times 100}{\text{Weight of sample taken}} \quad (2)$$

TR = Titration reading

BR = Blank reading

% of protein = % of total $\text{N}_2 \times 6.25$

Estimation of Fats

A sample of fish flesh was dried and latter it was dried with the help of mortar with the help of pistle, the grounding was done thoroughly, but at the same time care was made to prevent the loss of flesh. The dried sample in powdered form was weighted as W_1 now petroleum ether was added to dissolve its fats contents; the petroleum ether is used to extract fats from organic dried sample in powdered form, (Howard and Leonard, 1982). The petroleum ether along with dissolved fats was then removed and the remaining dried samples without fats are again weighted as W_2 .

Now fats can be estimated by using the following equation (3);

$$\% \text{ of Fat} = \frac{\text{Weight of residue } (W_2)}{\text{weight of Sample taken } (W_1)} \times 100 \quad (3)$$

Estimation of Ash

About 1-2 g fish sample was weighed into a pre-weighed crucible. The crucible with the contents was heated first over a long flame till all the material was completely churned. Then it was transferred in the Muffle Furnace held at dark red at a rate of 550°C for 4 hours until the residue become white. The crucible were cooled in desiccators and weighed. Finally the % of ash content was calculated by following equation (4):

$$\% \text{ of Ash} = \frac{\text{Weight of fish}}{\text{Weight of Sample taken}} \times 100 \quad (4)$$

Results

Statistically significant alteration was found in moisture contents of *Labeo rohita* and *Cirrhinus mrigala*. The moisture contents of Mori are higher than Rohu ($P < 0.05$) (Figure 1). The CP values showed strong significant change between two groups of fishes in this regard. Mori has greater CP than Rohu ($P < 0.001$) (Figure 2). In case of Ash contents, no such significant change was found. Ash contents of Rohu has non-significant greater contents of ash than Mori ($P > 0.05$) (Figure 3). Similarly, no statistically significant difference was found between the input groups. Rohu has non-significant higher fats contents ($P > 0.05$) (Figure 4). Overall data represented for both fishes as shown in Figure 5. and Table 1.

Discussion

Fish is widely accepted because of its high deliciousness, low cholesterol and tender flesh (Onyia et al., 2010). However, less number of consumers eats fish because of its nutritional value. It is therefore necessary to make information available to consumers and fishery workers on the nutritional contribution of some fish species in their diets (Adewoye et al., 2003). The biochemical composition of a fish is the consequence of complex interactions between biological and physical characteristics like sex, size, reproductive stage, temperature and food availability (Javaid, 1992). Many reports are available on biochemical composition of fish muscle with reference to annual growth, season, migration and spawning (Basade et al., 2000). The current observation is also a part of such type of study. The proximate composition of *Labeo rohita* and *Cirrhinus mrigala* were compared. The higher value of crude protein, ash contents and moisture were observed in the *Cirrhinus mrigala* while fats and dry matter were higher in *Labeo rohita*. Our results of water contents are matching with the finding of Shakir (Shakir et al., 2013). They reported that water contents of *Cirrhinus mrigala* is higher than *Labeo rohita* and lower than *Catla catla* (Shakir et al., 2013). Similarly in another study conducted by Naz (Naz, 2013) the moisture contents were 74.02% for cultured *Labeo rohita* which is almost similar with our result of moisture contents for *Labeo rohita* (73.92%). She reported 77.37% moisture contents in cultured *Cirrhinus mrigala*. Her comparative study of moisture contents shows similarity with our result that the moisture contents of *cirrhinus mrigala* are significantly higher than that of *Labeo rohita* (Naz, 2013).

The Fats contents are not significantly different in both of our experimental species and fats content was found in an inverse relation with water contents. Similar results were also observed by Love (Love, 1970). His results evaluate that a decrease in water content and increase in fat content of fish is attributed with a good condition, while the water content of a non-fatty muscle rises during non-feeding or fasting conditions, due to utilization of protein for metabolic activities (Love, 1970). The possible reason for this is that the main constituent of muscle of the fish is moisture, which plays an important role in their metabolism. Water acts as a solvent and takes part in biochemical reaction in the fish body.

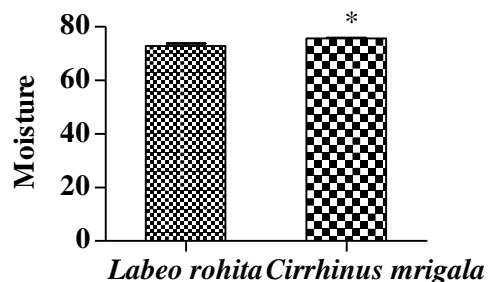


Figure 1 Moisture contents of Rohu and Mori. Statistical difference was considered when $*P < 0.05$

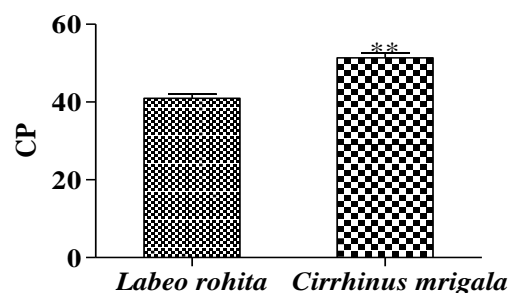


Figure 2 CP contents of Rohu and Mori. Statistical difference was considered when $**P < 0.001$

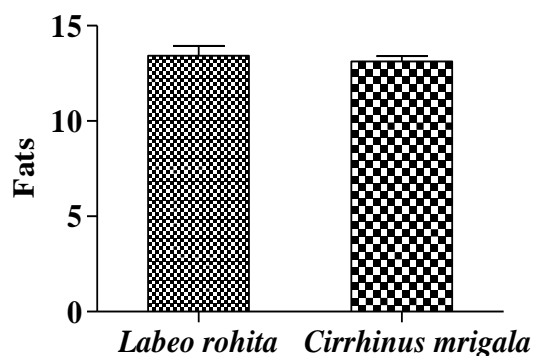


Figure 3 Fats contents of Rohu and Mori. Statistical difference was considered when $*P < 0.05$

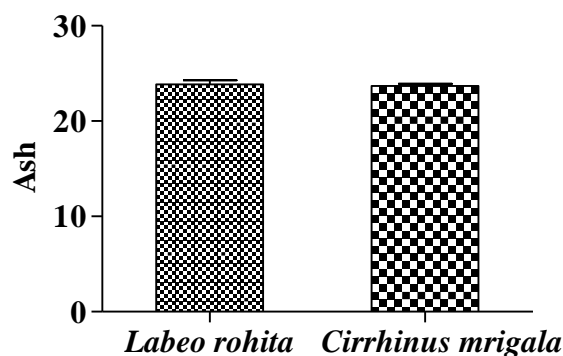


Figure 4 Ash contents of Rohu and Mori. Statistical difference was considered when $*P < 0.05$

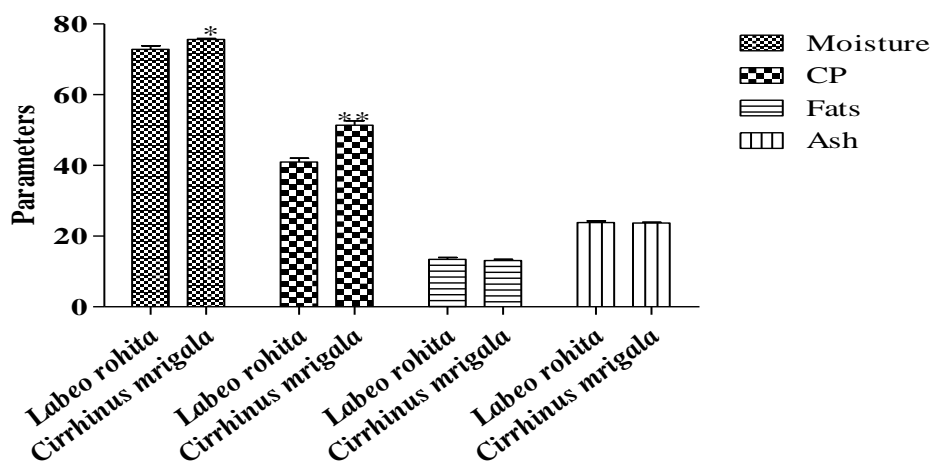


Figure 5 Overall data representation of data. Significant differences were considered when *P<0.05 and **P<0.001

Table 1 Data represented as Mean±SEM

Fish Type	Moisture	CP	Fats	Ash
<i>Labeo rohita</i>	72.823 ± 0.981	40.963 ± 1.080	13.429 ± 0.507	23.841 ± 0.433
<i>Cirrhinus mrigala</i>	75.644 ± 0.288	51.391 ± 1.254	13.127 ± 0.277	23.671 ± 0.250

The water content of fish is varied within the limited range in various species (Afser et al., 1981). Similarly body moisture undergoes cyclic changes along with fattening of the body (Jana, 2014). In body composition water content or moisture content is an important attribute which is affected by pond ecosystems; fertilization (Hassan, 1996) feed ingredients (Javed et al., 1995), probiotics (Krishna, et al., 2009) and feeding rates (Hasan and Macintosh, 1993). Our result of Crude protein is in accordance with the results of Ali (Ali et al., 2005). They found crude protein in *Cirrhinus mrigala* (18.97%) in comparison with *Labeo rohita* (18.49%) is significantly higher while lower than *Cyprinus carpio* and *catla catla* (Ali et al., 2005). According to Love (1976), the process of spending protein in non-fatty fish is accompanied by an increase in moisture content. Mori showed higher protein level, which was probably due to their lower fat content (Grigorakis et al 2002). Naz (Naz, 2013) reported 20.97% in farmed *Labeo rohita* and 19.33% in farmed *Cirrhinus mrigala*. Our result of crude protein cannot match with Naz (2013) because she followed the procedure to find the contents on wet basis and we determined the crude protein on dry basis. Over result of ash contents that's are insignificant in both experimental species shows similarities with the results of Memon et al. They find out out the proximate body composition of *Labeo rohita*, *Cirrhinus mrigala* and *Catla catla* reared in a farm at Sukkur Pakistan. The ash contents of all the species were insignificant (Memon et al., 2011). In this work the ash contents were found similar in both experimental species and this is in agreement with the results of Shakir (Shakir et al 2013).

Conclusion and Recommendations

It is concluded from this work that *Labeo rohita* and *Cirrhinus mrigala* are very proteinaceous and have low fats contents so they are very good for the health of consumers. Further research is recommended on the other parameters and missing rays of this work.

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