PSM | Biological Research ISSN: 2517-9586 – An International Peer-reviewed Journal

Research Article 2018 | Volume 3 | Issue 1 | 34-38

**Article Info**

**Open Access**
**Citation:** Hadyait, M.I., Ali, A., Bhatti, E.M., Qayyum, A., Ullah, M.Z., 2018. Study of Proximate Composition of Some Wild and Farmed *Labeo rohita* and *Cirrhinus mrigala* Fishes. PSM Biol. Res., 3(1): 34-38.

**Received:** January 2, 2018

**Accepted:** January 26, 2018

**Online first:** January 31, 2018

**Published:** January 31, 2018

***Corresponding author:**
Muhammad Arfan Hadyait;
**Email:** marfan39@gmail.com



Scan QR code to see this publication on your mobile device.

# Study of Proximate Composition of Some Wild and Farmed *Labeo rohita* and *Cirrhinus mrigala* Fishes

**Muhammad Arfan Hadyait*, Asif Ali, Ehsan Mahmood Bhatti, Aroosa Qayyum, Muhammad Zafar Ullah**

Fish Quality Control Labs, Fisheries Research and Training Institute, Manawan, Lahore Pakistan.

**Abstract**
The proximate composition of farmed and wild *Labeo rohita* and *Cirrhinus mrigala* was determined to identify nutritional differences due to habitat change. Thirty (30) fishes in total from wild and farm raised population of size group (700-1000 gm) were collected from Head Qadirabad River Chenab, Head Rasul River Jehulm and Army Fish Farm, Lahore. Fish samples were analyzed for protein, fat, moisture and ash. The chemical composition of two fish species collected from different sources was compared and the difference was observed. Elevated levels of protein and low fat contents were observed in the farmed fishes. The moisture and ash contents were higher in both wild and farmed fishes, respectively. It is concluded the farmed fish is nutritionally better than wild irrespective of the species.
**Keywords:** *Labeo rohita, Cirrhinus mrigala*, FQCL, River Jehulm. River Chenab, Protein.

## INTRODUCTION

As world population continues to increase the demand for food is increasing day by day. Fishes are important source of protein in human diet. Their flesh is usually low in saturated fats, carbohydrates and cholesterol and it provides not only high value proteins, but also a diversified range of essential micronutrients, including vitamins, minerals and Ω-3 fatty acids, with a few exceptions of certain species (Fawole *et al.,* 2007; Petricorena, 2015; Merdzhanova et al., 2015) Pakistani population is not a fishes eating nation and the annual consumption is fairly low (2 kg/ capita/ year) (FAO, 2014). The different species of freshwater fishes provide food, subsistence and additional income to a wide range of people, especially those who live around rivers (Arts *et al.,* 2001; Mohammed and Alim, 2012).

Fishes are excellent source of protein rich in essential amino acids (EAA) (Nestel, 2000; Fawole *et al.,* 2007; Petricorena, 2014), which play a very important role in human nutrition and health (Limin *et al.,* 2006). Evidence exists of beneficial effects of eating fishes in relation to coronary heart disease, stroke, age-related muscular degeneration and mental health (Franzese et al., 2015; Karlsson *et al.,* 2015). Besides the benefits in terms of growth and development, particularly for women during gestation and kids during infancy for optimal brain development (Chan, 2015; Lim *et al.,* 2015).

Fishes when compared to chicken or beef, it has significantly lower lipid contents (Nestel, 2000). By-catch and low quality fish including trash fish combined with staple cereals when presented in different forms/ appearance, taste or shape like porridge, snacks, crackers or other light foods can offer many other utilizable protein sources (Oduor-Odote and Kazungu, 2008). The knowledge of proximate composition of fishes can be used to assess the food value of fishes and help to plan the most apt industrial and commercial processing. Variation in the diet of fishes has shown to have significant effects on the preference of consumers (Torstensen *et al.,* 2005).

Condition of the fishes indicated as fatness usually represents the well-being of individual or individual groups and has been extensively used in fish's population ecology. Fishes physiological condition has been defined as the gross nutritional state and reserve nutrients level, fat especially, there in the body (Gershanovich *et al.,* 1984; Hassan and Javed, 1999; Giacalone *et al.,* 2010; Gupta *et al.,* 2010, 2011). Therefore, chemical body composition of fishes could characterize their physiological condition and health status (Saliu *et al.,* 2007). Moreover, the proximate composition of fishes can provide information about their habitat which has been found to vary within regions. Body composition of the same fish species may differ in varying conditions resulting from different diets, different quality of water, sex and maturity state (Craig *et al.,* 1989). Several workers have found out that the chemical composition of a fishes is influenced by their condition factor (Javaid *et al.,* 1992; Hassan and Javed, 1999; Froese, 2006; Gupta *et al.,* 2010; Koundal *et al.,* 2014).

Fishes are eaten seasonally and there is preference for wild caught fishes. There is a myth which claimed that the wild fishes are richer in protein than the farmed fishes. On the other hand, the wild catches are decreasing day by day and the contribution of the farmed fishes is increasing with time. The previous myth has to be tested; accordingly, this research work has, therefore, been proposed to test and compare the proximate composition of wild and farmed major carps (Rohu and Mrigal).

## MATERIALS AND METHODS

Freshly captured five samples of Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*) from fishes farms, River Chenab and River Jhelum were brought to the laboratory where these were weight (nearest to gram). All pre weighed samples were processed for proximate composition using standard methods, including the determination of crude protein, crude fat, ash and total moisture contents (AOAC, 2012).

### Moisture Determination

Regulate air oven to 135° ± 2°C. Take low, covered Aluminum dishes. Weigh 2 gm test portion into each dish and shake until contents are evenly distributed. With covers removed, place dishes and covers in oven as quickly as possible and dry 2 h ± 5 min. Place covers on dishes and transfer to desiccators to cool. Reweigh, and calculate loss in weight on drying as estimate of $H_2O$.

$$Moisture\ contents\ of\ sample\ (\%) = \frac{wt.\ loss\ on\ drying, g}{\text{wt. of sample, g}} \text{x}100$$

### Ash Determination

Weigh 2 g test portion into porcelain crucible. Place in temperature controlled furnace preheated at 600°C. Hold at this temperature for 2 hours. Transfer crucible directly to desicator to cool and weigh immediately. Calculate percentage of ash.

$$Ash\ of\ contents\ of\ sample\ (\%) = \frac{(\text{wt. of test portion (g) x wt. loss on Ashing (g)})}{\text{wt. of sample}} \text{x}100$$

### Protein Determination

Weigh accurately approximately 1 gm of sample into a digestion test tube. Add 10 gm of potassium sulphate, 0.7 gm mercuric oxide and 20 ml sulphuric acid. Heat the test tube on heating digester and then boil until the solution

clears. On cooling add about 90 ml distilled water. Recool, add 25 ml sulphide solution and mix. Add a small piece of pumic to prevent bumping and 80 ml of sodium hydroxide solution while tilting the flask so that two layers are formed. Connect rapidly to the condenser unit heat and collect distilled ammonia in 50 ml boric acid/indicator solution. Collect 50 ml of distillate. On completion of distillation remove the receiver and titrate against standard 0.1N HCL acid solution.

$$Nitrogen\ content\ of\ sample\ (\%) = \frac{(\text{ml acid x Normality of standard acid})}{\text{wt. of sample}} \text{x} 0.014 \text{x} 100$$

$$crude\ protein\ content\ (\%) = Nitrogen\ content\ x\ 6.25$$

**Fat Determination**

Weigh into an extraction thimble 2-3 g of the dried sample. Place the thimble inside the soxhlet apparatus. Place a dry, tared solvent flask in position beneath, add the required quantity of petroleum ether and connect to condenser. Adjust heating rate to give a condensation rate 2 to 3 drops/second and extract for 16 hours. On completion remove the thimble. Complete the removal of ether on a boiling water bath and dry flask at 105 $^{o}$C for 30 minutes. Cool in a desiccator and weigh.

$$Fat\ contents\ of\ sample\ (\%) = \frac{wt.\ of\ fat, g}{\text{wt. of sample, g}} \text{x} 100$$

## RESULTS AND DISCUSSION

The results of proximate composition of sample fishes are given in Table 1. The results of current studies have revealed that culture habitat of fish has direct bearing on its nutritional quality. The proximate composition of fish flesh of wild Rohu and Mori showed higher moisture content (75.81 ± 1.08 % & 77.75 ± 0.87 % in Head Qadirabad and 77.68 ± 0.98 % & 76.16 ± 0.62 % in Head Rasul) and low protein (74.83 ± 1.71 % & 73.02 ± 1.38 % in Head Qadirabad and 77.15 ± 2.02 % & 73.37 ± 0.76 % in Head Rasul) than their farmed counter parts (Moisture = 73.89 ± 0.71 % & 74.51 ± 0.87 % and protein = 78.81 ± 0.91 % & 77.55 ± 1.24 %). Our results are similar as observed by Jankowaska *et al.,* (2007) who observed that contents of protein are higher in cultivated fillets of perch (*Perca fluviatilis*) than the wild perch.

**Table 1. Proximate Composition of (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*) Fishes**

| Source | Fish Species | Scientific Name | Replicate | Parameters | | | |
|---|---|---|---|---|---|---|---|
| | | | | Moisture (%) | Ash (%) | Crude Protein (%) | Crude Fat (%) |
| Army Fish Farm, Lahore | Rohu | *Labeo rohita* | 5 | 73.89 ± 0.71 | 7.65 ± 0.57 | 78.81 ± 0.91 | 3.24 ± 0.58 |
| | Mrigal | *Cirrhinus mirgala* | 5 | 74.51 ± 0.87 | 7.07 ± 0.39 | 77.55 ± 1.24 | 2.66 ± 0.21 |
| Head Qadirabad, River Chenab | Rohu | *Labeo rohita* | 5 | 75.81 ± 1.08 | 4.90 ± 0.47 | 74.83 ± 1.71 | 4.80 ± 0.18 |
| | Mrigal | *Cirrhinus mirgala* | 5 | 77.75 ± 0.87 | 6.10 ± 0.51 | 73.02 ± 1.38 | 3.89 ± 0.13 |
| Head Rasul, River Jhelum | Rohu | *Labeo rohita* | 5 | 77.68 ± 0.98 | 5.44 ± 0.31 | 77.15 ± 2.02 | 4.33 ± 0.24 |
| | Mrigal | *Cirrhinus mirgala* | 5 | 76.16 ± 0.62 | 4.37 ± 0.44 | 73.37 ± 0.76 | 3.16 ± 0.20 |

The fat contents were significantly higher in wild fishes (4.80 ± 0.18 % and 3.89 ± 0.13 % in head Qadirabad and 4.33 ± 0.24 % and 3.16 ± 0.20 % in Head Qadirabad) compared to farmed fishes (3.24 ± 0.58 % and 2.66 ± 0.21%). A result similar to those studied by Tahir (2003), reported highest lipid content in wild fishes compare to farmed fishes. The ash contents of farmed fishes (7.65 ± 0.57 % and 7.07 ± 0.39 %) are greater than that of the wild fishes (4.90 ± 0.47 % and 6.10 ± 0.51 in head Qadirabad and 5.44 ± 0.31 % and 4.37 ± 0.44 % in Head Rasul).

Chakraborty et al. (2016), studied the proximate composition of three small indigenous fishes available in Kokrajhar district. Proximate composition includes moisture, lipid, protein and ash content. The selected fish species were *Channa punctatus* (Bloch), *Channa gachua* (Hamilton) and *Amblypharyngodon mola* (Hamilton). The analysis was carried out following the standard methods. These species shows the resemblance results with our study.

Chrisolite et al. (2015), studied the proximate composition (moisture, protein, fat and ash content) and mineral composition (Sodium, Potassium, Calcium, Iron and Phosphorus content) of fifteen freshwater fishes to create a baseline data on the nutritional quality of freshwater fishes. They found that the moisture content of the fishes under study ranged from 73.21 to 81.90%, the protein content of fishes ranged from 3.46% in pearl spot (*Etroplus suratensis*) to 27.44% in eels (*Anguilla bengalensis*) and nine species had protein content over 15 %. The lipid content ranged from 0.25% (*Channa striatus*) to 8.26% (*Mystus aor*) and only three fishes viz. grass carp (*Ctenopharyngodon idella*), catfish (*Mystus aor*) and pearl spot (*Etroplus suratensis*) had higher lipid value of over 7%. The carbohydrate content was very low (0.07 to 1.0%) and ash content ranged from 0.92 to 2.18%. Sodium, Potassium, Calcium, Iron and Phosphorus content ranged from 0.35-1.19%. The study showed that freshwater fishes had protein and lipid content similar to marine fishes and can be used as a protein rich food at relatively cheaper cost. These results are also similar with our study.

## CONCLUSION

The experimental data suggest that nutrionally farmed fish is better than the wild one for human consumption and body comparison varies from species to species and from habitat to habitat with the predetermined set of principles.

## ACKNOWLEDGMENT

The authors are highly thankful to Fish Quality Control Labs (Chemistry Section), Fisheries Research and Training Institute, Manawan, Lahore Department of Fisheries, Punjab for financial and technical support during this research work.

## CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

## REFERENCES

AOAC. 2012. Official methods of analysis of AOAC International (17th ed.). Gaithersburg, MD. USA.

Arts, M.T., Ackman, R.G ., Holub, B.J., 2001. Essential fatty acids in aquatic ecosystems: a crucial link between diet and human health and evolution. Can. J. Fish. Aquat. Sci., 58(1): 122-137.

Chakraborty, S., Brahma, B.K., Goyal, A.K., 2016. Proximate composition of three small indigenous fish Species encountered in the local fish market of Kokrajhar, BTAD, Assam. Indi. J. Appl. Res., 5 (10): 712-714.

Chan, L.L.H., 2015. Increasing fish consumption in women of child-bearing age: an evaluation of risks and benefitsThesis, Flinders University.

Chrisolite, B., Shanmugam, S., Arumugam, S.S.S., 2015. Proximate and mineral composition of fifteen freshwater fishes of Thoothukudi, Tamil Nadu. J. Aquacult. Trop., 30(1/2): 33.

Petricorena, C.Z., 2015. Chemical Composition of Fish and Fishery Products. Handbook of Food Chemistry.

Craig, J., Smiley, K., Babaluk, J., 1989. Changes in the body composition with age of goldeye, Hiodon alosoides. Can. J. Fish. Aquat. Sci., 46(5): 853-858.

FAO. 2014. The state of world fisheries and aquaculture. Rome: Food and Agriculture Organization of the United Nations (FAO).

Fawole, O., Ogundiran, M., Ayandiran, T., Olagunju O., 2007. Proximate and mineral composition in some selected fresh water fishes in Nigeria. Inter. J. Food Safety, 9(1): 52-55.

Franzese, C. J., Bliden, K. P., Gesheff, M.G., Pandya, S., Guyer, K.E., Singla A., Tantry, U.S., Toth, P.P., Gurbel, P.A., 2015. Relation of fish oil supplementation to markers of atherothrombotic risk in patients with cardiovascular disease not receiving lipid-lowering therapy. Am. J. Cardio., 115(9): 1204-1211.

Froese, R., 2006. Cube law, condition factor and weight–length relationships: history, meta-analysis and recommendations. J. Appl. Ichthyol., 22(4): 241-253.

Gershanovich, A., Markevich, N., Dergaleva, Z.T., 1984. Using the condition factor in ichthyological research. J. Ichthyol., 24(3): 78-90.

Giacalone, V.M., D'anna, G., Badalamenti, F., Pipitone, C., 2010. Weight-length relationships and condition factor trends for thirty-eight fish species in trawled and untrawled areas off the coast of northern Sicily (central Mediterranean Sea). J. Appl. Ichthyol., 26(6): 954-957.

Gupta, B. K., Sarkar, U. K., Bhardwaj, S.K., Pal, A., 2010. Condition factor, length–weight and length–length relationships of an endangered fish Ompok pabda (Hamilton 1822) (Siluriformes: Siluridae) from the River Gomti, a tributary of the River Ganga, India. J. Appl. Ichthyol., 27(3): 962–964.

Gupta, B. K., Sarkar, U.K., Bhardwaj, S.K., Pal , A., 2011. Condition factor, length–weight and length–length relationships of an endangered fish Ompok pabda (Hamilton 1822) (Siluriformes: Siluridae) from the River Gomti, a tributary of the River Ganga, India. J. Appl. Ichthyol., 27(3): 962-964.

Hassan, M., Javed, M., 1999. Length-weight Relationships and Condition Factor Studies in Three Major Carps

Reared under Integrated Polyculture System. Pak. J. Bio. Sci., 2(4): 1620-1622.
Javaid, M., Salam, A., Khan, M., Naeem, M., 1992. Weight-length and condition factor relationship of a fresh water wild Mahaseer (Tor putitora) from Islamabad (Pakistan). Proc. Proc. Pak. Cong. Zool., 6(2): 335-340.
Karlsson, T., Strand, E., Drevon, C. A., Dierkes, J., Nygård, O., 2015. Fish Intake and Incident Type 2 Diabetes Mellitus in Patients with Coronary Artery Disease. Clin. Nutr., (34) : S23-S24.
Koundal, A., Dhanze, R., Sharma, I., 2014. Length-weight relationship, condition factor and relative growth patterns of Channa punctata (Bloch) from Himachal Pradesh, India. Mag. Zoo Outreach Organiz., 25.
Lim, W.Y., Chong, M. P., Calder, C., Kwek, K., Chong, Y.S., Gluckman, P.D., Godfrey, K.M., Saw, S.M., Pan, A., 2015. Relations of Plasma Polyunsaturated Fatty Acids With Blood Pressures During the 26th and 28th Week of Gestation in Women of Chinese, Malay, and Indian Ethnicity. Medici. (Baltimore)., 94(9): 1-9.
Limin, L., Feng, X., Jing, H., 2006. Amino acids composition difference and nutritive evaluation of the muscle of five species of marine fish, Pseudosciaena crocea (large yellow croaker), Lateolabrax japonicus (common sea perch), Pagrosomus major (red seabream), Seriola dumerili (Dumeril's amberjack) and Hapalogenys nitens (black grunt) from Xiamen Bay of China. Aquac. Nutr., 12(1): 53-59.
Merdzhanova, A., Dobreva, D., Stancheva, M., 2015. Quality evaluation of dietry lipid of Channel Catfish (Ictalurus punctatus) from Bulgaria. Bulgari. J. Agricult. Sci., 21(1): 202-207.
Mohammed, M. O., Alim, D. I., 2012. Amino acids contents of four commercial Nile fishes in Sudan. Afri. J. Environ. Sci. Technol., 6(2): 142-145.
Nestel, P. J., 2000. Fish oil and cardiovascular disease: lipids and arterial function. The Am. J. Clinic. Nutri., 71(1): 228S-231S.
Oduor-Odote, P., Kazungu, J., 2008. The body composition of low value fish and their preparation into a higher value snack food. W. Indi. Ocean J. Marine Sci., 7(1): 111-117.
Petricorena, Z.C., 2014. Chemical Composition of Fish and Fishery Products.
Saliu, J.K., Joy, O., Catherine, O., 2007. Condition factor, fat and protein content of five fish species in Lekki Lagoon, Nigeria. Life Sci. J., 4(2): 54-57.
Tahir, T.S., 2003. Total protein and amino acid profile of mussle, liver and gonads from wild and farmed Labeo rohita. M.Sc. thesis. G.C.Uni., Faisal. Pak.,105.
Torstensen, B.E., Bell, J.G., Rosenlund, G., Henderson, R. J., Graff, I.E., Tocher, D.R., Lie, O., Sargent , J.R., 2005. Tailoring of Atlantic salmon (Salmo salar L.) flesh lipid composition and sensory quality by replacing fish oil with a vegetable oil blend. J. Agric. Food Chem., 53(26): 10166-10178.