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ORIGINAL ARTICLE

Comparative Study of Proximate Parameters of both Farmed and Wild Selected Fish Species

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ABSTRACT

Present study was conducted to determine and compare the proximate parameters of farm and River Chenab (wild) selected fish species including (Labe orohita, Cirrhinus mrigala, Cyprinus carpio, Hypophthalmichthys molitrix, Ctenopharyn godonidella). These fish species generally used as source of food for local community. Fishes were collected with the help of different nets from river and farm and placed in clean container having ice. Boxes having fish were carried to laboratory for proximate analysis. Statistical analysis of proximate parameters of river and farmed fishes shows similar trends in terms of moisture, crude fat and crude protein contents; however variations observe in terms of ash content. According to statistical test (ANOVA and LSD) results the moisture and ash content shows no significant (P>0.05) differences among the selected species of farm. Highest amount of crude fat was observed in grass carp and lowest in silver; however highest amount of crude protein was observed in rohu and lowest in grass carp, While different species of river during statistical test (ANOVA and LSD) the moisture content was highest in grass carp and lowest in silver carp while ash and crude fat were highest in silver and lowest in grass carp. Crude protein was highest in rohu and lowest in grass carp. After comparison of the both type the Protein, Fat, and Ash content were higher in cultivated rohu while the moisture content was higher in wild rohu. Protein and Fat content was higher in farmed mori while Ash content was higher in wild mori; however there was no significant (P>0.05) difference which was observed in moisture content of farm and river.It was concluded that the farmed fish is nutritionally better than wild fishes.

Keywords: *farmed fish, wild fish, proximate analysis, river Chenab.*

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INTRODUCTION

Fish is an immense source of protein and also comprise many other nutrients which are required for human health [1]. Fish flesh contains different proportions of protein, carbohydrates, fat, vitamins, water and ash and. It is reported that fish meat consists of almost, 72% water, 0.1% vitamins, 0.25% phosphorus, 0.5% calcium, 19-50% protein and 8% carbohydrates [2]. Fish is also an important portion of our nutrition and contain great amount of omega 3 fatty acids principally containing Eicosapentaaenoic acid (EPA) and Docosahexaenoic acid (DHA), which play crucial role in human health. Several studies have proved that fish meat as healthy diet [3].The successful aquaculture practice requires balanced diet, pleasant environment and economically important techniques. All essential nutrients must be provided

by fish feed which provide energy and fulfill the physiological requirements of growing fish. The artificially formulated feed must be simply digestible and promote fish growth [4]. Major ingredients in palatable portion of fish are water, protein, lipid and ash. The analysis of these four basic constituents of fish meat is frequently mentioned to as 'proximate analyses' [5]. The knowledge of proximate composition of fish is of prime significance to evaluate its feeding status and physiological condition. Fishes are the cheapest source of important minerals and nutrients. Several variables including fish species, environmental conditions, age, size of fish, sex, level of protein in given diet along with feeding rate have greater influence on proximate composition of fish. Exact estimation of proximate composition of economically important cultured and wild fishes at specific body weight of fish could reduce food waste, improve efficiency and enhance the profit abilities [6].Proximate analysis is a technique being frequently used by researchers to observe the physiological situation and fitness of fish. The aim of the study was to determine and compare the proximate analysis values of selected species of farm and river.

MATERIAL AND METHODS

Study area Specification

River Chenab has agri-forest land located adjacent to district Chiniot with variable flora and fauna it also provide refuge to many migratory birds. It have moderate climate having all four seasons. Summer season is relatively elongated with temperature varies up to 45 degree [7]. Rajpoot fish farm is located in Alaph 8 Chak, Kotmomin District Sargodha.

Table 1: Names of selected fish species along with number, site, weight and length

S. N	Common name	Scientific name	Replicates	Collection site	Average weight	Average length
1.	**Silver carp**	***Hypophthalmi-chthys molitrix***	7	RCHQ	1059.67±122.54	42.9±4.98
			7	Farm	1080.96±335.46	41.42±7.63
2.	**Rohu fish**	***Labeo rohita***	7	RCHQ	822.1±100.59	34.36±4.23
			7	Farm	662.04±132.53	26.92±5.13
3.	**Gulfam**	***Cyprinus carpio***	7	RCHQ	1024.51±115.16	39.83±4.51
			7	Farm	881.43± 42.15	39.28±1.95
4.	**Mori**	***Cirrhinus mrigala***	7	RCHQ	861.13 ± 119.50	46.07±6.61
			7	Farm	752.83±105.94	40.87±5.73
5.	**Grass carp**	***Ctenopharyn-godonidella***	7	RCHQ	552.33±174	30.81±8.93
			7	Farm	730.5±32.08	34.00±9.27

Fish Sampling and Storage

Fish sampling was done in two segments 35 from river and 35 from farm (total 70) with the help of local trained fisherman by using different type of nets including gill nets, mesh nets etc (table 1). After collection the fishes were brought to the laboratory of University of Lahore Sub Campus Sargodha. All fishes were dissected and converted into fillets by using dissection box and refrigerated at -20 degree centigrade till proximate analysis and sent to the Fish Quality Control Laboratory Manawan Lahore.**Moisture Content Determination (%)**

Take 2 gram of each fish sample (farm and wild) with the help of digital balance and put separately in already weighted low heft plates made up of Aluminum foil then transfer to oven immediately, adjust the oven at 135 degree centigrade for almost two hours after completion of this step placed in desiccators immediately for cooling purpose. Then again weighed out and use the following formula for moister content

$$\textbf{Percent water in given sample} = \frac{\textbf{weight loss after dehtdration in grams}}{\textbf{weight of sample in gram}} \times \mathbf{100}$$

Ash Content Determination (%)

2 gram of fish sample was weighed out with digital weighing balance and put into crucible made up of porcelain. The crucible positioned in preheated incinerator at 600 degree centigrade temperature for almost two hours after this step the crucible was shifted to desiccator immediately for cooling purpose and weighted the sample again. Then estimate the ash content by following formula [8].

$$\textbf{Percent ash in given sample} = \frac{\textbf{weight of sample after ashing}}{\textbf{weight of sample}} \times \mathbf{100}$$

Fatty Content Determination (%)

Dry extraction technique was used for determination of fatty content. 20 milligram of dry sample in the form of fine powder was taken in glass tube. Added 10 milliliter methyl alcohol and tri chloromethane mixture of 2 is to 1 ratio in glass tube of sample and mixed well, retained overnight and then centrifuged. Small already weighted glass bottles were used for accumulation of supernatant. The supernatant containing bottles were placed in oven at 70 degree centigrade temperature for 30 minutes to vaporize the solvent and remaining sample was weighted again [9]. Following formula was used to calculate fat content.

$$\boldsymbol{Percent\ fat\ in\ given\ sample} = \frac{\boldsymbol{weight\ of\ fat}}{\boldsymbol{dry\ weight\ of\ of\ sample}} \times \mathbf{100}$$

Protein Content Determination (%)

Protein content was determined by Kjeldhal's methodology.

Digestion amalgamation; consist of Ferrous Sulfate, Copper Sulfate and Potassium Sulfate with the ratio of 1, 2 and20 multiply with 5 respectively. With Sodium Hydroxide (40 percent), Sulphuric Acid (concentrated), H_2SO_4 (0.1 Normality) and Boric acid1 gram of dried out fish sample, 5 gram of digestion amalgamation and 25 to 30 milliliter of Sulphuric acid was taken in Kjeldhal flask and boiled for 3 hours during this time period the solution turned greenish in color. 10 milliliter digested sample and 40 percent Sodium Hydroxide were taken in digester and steam distillation was done. NH_3 was accumulated in boric solution flask when pinkish boron changed into golden ammonia collection was done for almost two minutes then sluphuric acid (0.1 Normality) was titrated in contradiction of NH_3 and used quantity of sulphuric acid was estimate [10].

Percentage of nitrogen was calculated by this formula.

$$\boldsymbol{Percent\ nitrogen} = \frac{\boldsymbol{acid\ in\ milliliter} \times \boldsymbol{standard\ solution\ normality}}{\boldsymbol{weight\ of\ sample}} \times \mathbf{0.014} \times \mathbf{100}$$

Protein percentage in sample was calculated by multiplying the nitrogen percentage with 6.25.

$$\boldsymbol{Protein\ percentage} = \boldsymbol{nitrogen\ content}\ (\%) \times \mathbf{6.25}$$

Statistical Analysis

The data obtained from proximate analysis of wild and farmed fish species of farm and river Chenab were analyzed statistically by using R studio software (version 3.5.3) and applying ANOVA and LSD to determine the differences among the selected parameters of selected species.

RESULT

Proximate Analysis of Selected Fish Species of Farm

Proximate analysis of selected fish species of farm was done which reveals that, proximate parameters of Grass carp were as follows, Moisture% (79.90±4.46), Ash% (11.59±6.99), Crude Fat% (23.74±7.23) and Crude Protein% (74.16±4.97). Proximate parameters of Gulfam were as follows, Moisture% (66.40±4.24), Ash% (6.75±2.65), Crude Fat% (17.15±3.63), and Crude Protein% (77.57±9.37). Proximate parameters of Mori were as follows, Moisture% (66.98±7.82), Ash% (7.37±3.28), Crude Fat% (15.8±6.94) and Crude Protein% (76.55±4.67). Proximate parameters of **Rohu** were as follows, Moisture% (71.19±6.32), Ash% (10.28±2.64), Crude Fat% (14.87±3.79) and Crude Protein% (91.75±2.76). Proximate parameters of **Silver carp** were as follows, Moisture% (73.20±5.47), Ash% (7.00±5.40), Crude Fat% (9.59±5.80) and Crude Protein% (78.05±7.43) (Figure 3.1)

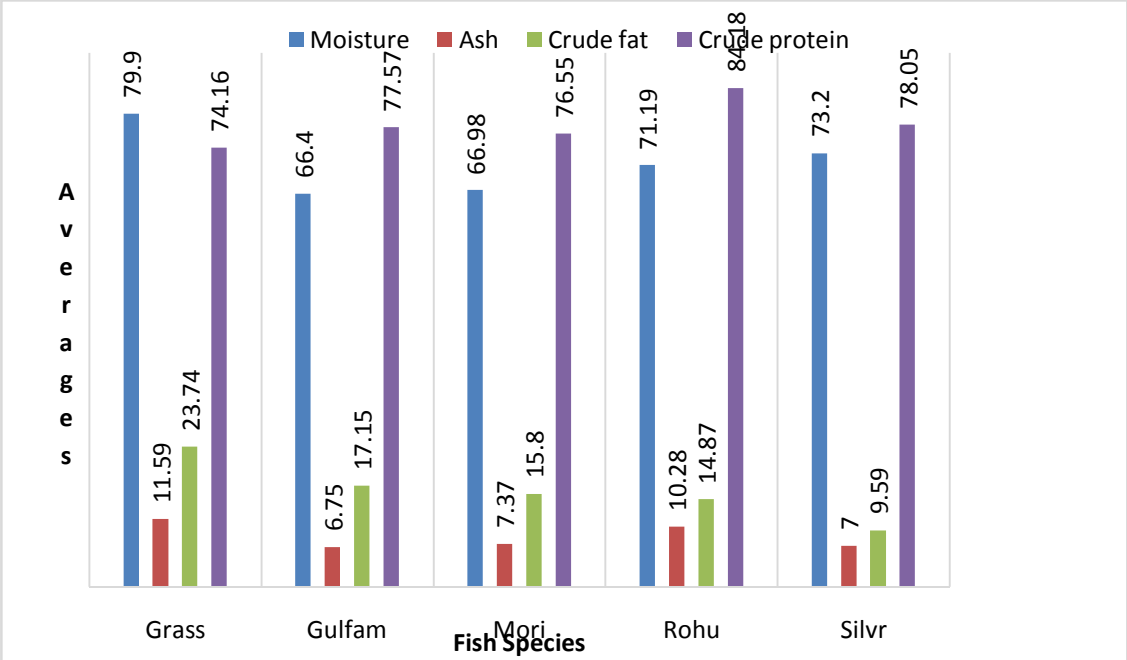

Figure 3.1: Proximate parameters of selected fish species of farm.

Proximate Analysis of Selected Fish Species of Wild

Proximate analysis of selected fish species of wild (River Chenab) was done which reveals that, Proximate parameters of **Grass carp** were as follows, Moisture% (80.11±5.83), Ash% (12.30±4.55), Crude Fat% (13.28±6.24) and Crude Protein% (54.85±11.26). Proximate parameters of **Gulfam** were as follows, Moisture% (77.82±3.17), Ash% (7.24±1.96), Crude Fat% (6.85±2.82), and Crude Protein% (63.00±7.33). Proximate parameters of **Mori** were as follows, Moisture% (77.83±7.14), Ash% (12.91±4.25), Crude Fat% (7.66±3.78) and Crude Protein% (62.51±4.90). Proximate parameters of **Rohu** were as follows, Moisture% (78.98±5.50), Ash% (4.81±2.09), Crude Fat% (7.00±2.10) and Crude Protein% (85.89±3.91). Proximate parameters of **Silver carp** were as follows, Moisture% (72.84±8.15), Ash% (12.66±2.60), Crude Fat% (17.89±3.52) and Crude Protein% (68.08±2.73). (Figure 3.2)

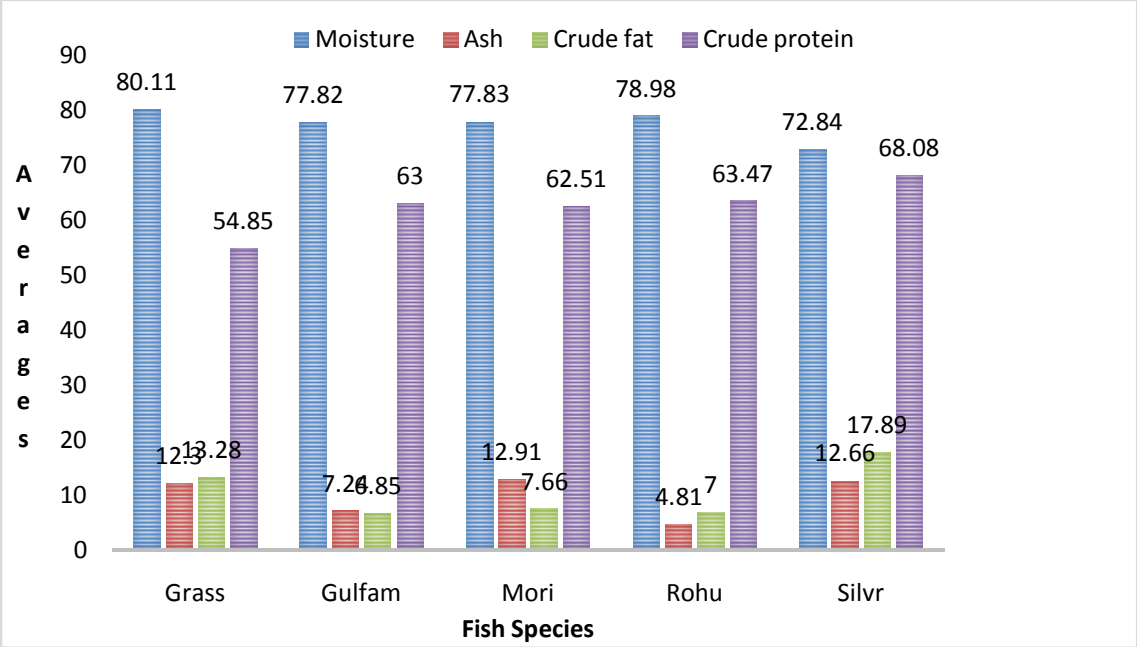

Figure 3.2: Proximate parameters of selected fish species of wild

Comparison of Proximate Parameters of Wild and Cultivated *Cyprinus carpio* Measured in %.
In present study comparison was made between proximate parameters including moisture content, ash content, crude fat and crude protein of wild and cultivated *Cyprinus carpio*(Table 3.1, Figure 3.3).

Table 3.1: Comparative Proximate composition of wild and cultivated *Cyprinus carpio*

Parameters	***Cyprinus carpio* farm**	***Cyprinus carpio* river**
	Mean±S.D	***Mean±S.D***
Moisture	66.40±4.24	77.82±3.17
Ash	6.75±2.65	7.24±1.96
Crude Fat	17.15±3.63	6.85±2.82
Crude Protein	77.57±9.37	63.00±7.33

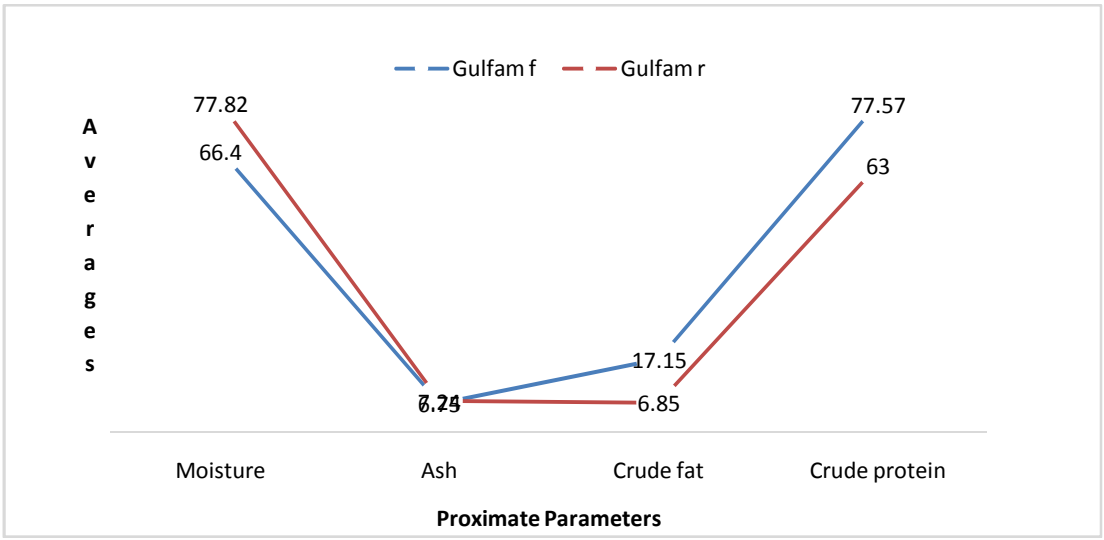

Figure 3.3: Comparative proximate values of wild and cultivated *Cyprinus carpio* measured in %.

Comparison of Proximate Parameters of Wild and Cultivated *Cirrhinus mrigala* Measured in %.
In present study comparison was made between proximate parameters including moisture content, ash content, crude fat and crude protein of wild and cultivated *Cirrhinusmrigala*(Table 3.2, Figure 3.4).

Table 3.2: Comparative Proximate composition of wild and cultivated *Cirrhinusmrigala*

Parameters	***Cirrhinusmrigala* farm**	***Cirrhinusmrigala* river**
	Mean±S.D	***Mean±S.D***
Moisture	66.98±7.82	77.83±7.14
Ash	7.37±3.28	12.91±4.25
Crude Fat	15.8±6.94	7.66±3.78
Crude Protein	76.55±4.67	62.51±4.90

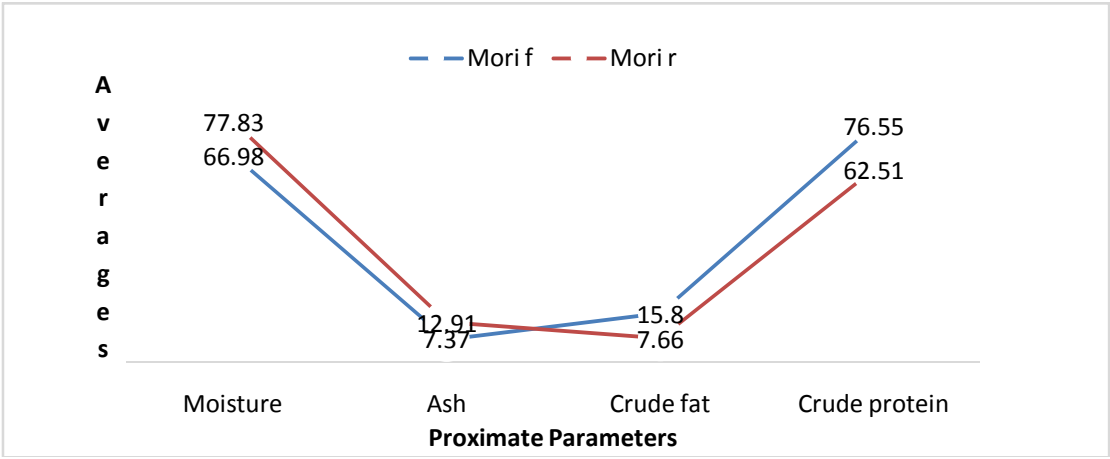

Figure 3.4: Comparative proximate values of wild and cultivated *Cirrhinus mrigala* measured in %.

Comparison of Proximate Parameters of Wild and Cultivated *Labeo rohita* Measured in %.
In present study comparison was made between proximate parameters including moisture content, ash content, crude fat and crude protein of wild and cultivated *Labeo rohita* (Table 3.3, Figure 3.5).

Table 3.3: Comparative Proximate composition of wild and cultivated *Labeo rohita*

Parameters	***Labeo rohita* farm**	***Labeo rohita* river**
	Mean±S.D	***Mean±S.D***
Moisture	71.19±6.32	78.98±5.50
Ash	10.28±2.64	4.81±2.09
Crude Fat	14.87±3.79	7.00±2.10
Crude Protein	91.75±2.76	85.89±3.91

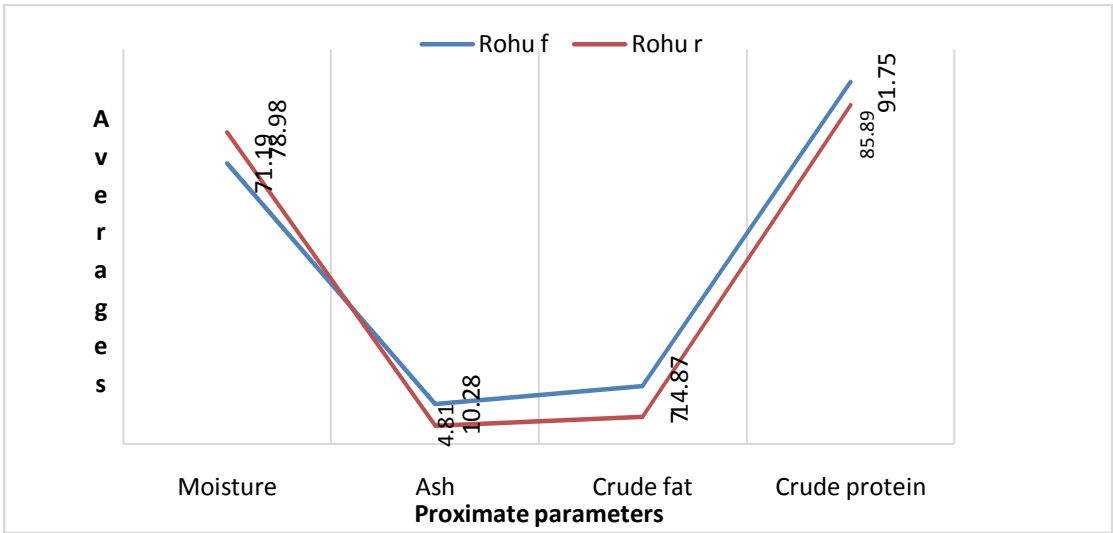

Figure 3.5: Comparative proximate values of wild and cultivated *Labeorohita* measured in %

Comparison of Proximate Parameters of Wild and Cultivated *Hypophthalmichthys molitrix* Measured in %.
In present study comparison was made between proximate parameters including moisture content, ash content, crude fat and crude protein of wild and cultivated *Hypophthalmichthys molitrix*(Table 3.4, Figure 3.6).

Table 3.4: Comparative Proximate composition of wild and cultivated *Hypophthalmichthys molitrix*

Parameters	*Hypophthalmichthys molitrix* farm	*Hypophthalmichthys molitrix* river
	Mean±S.D	***Mean±S.D***
Moisture	73.20±5.47	72.84±8.15
Ash	7.00±5.40	12.66±2.60
Crude Fat	9.59±5.80	17.89±3.52
Crude Protein	78.05±7.43	68.08±2.73

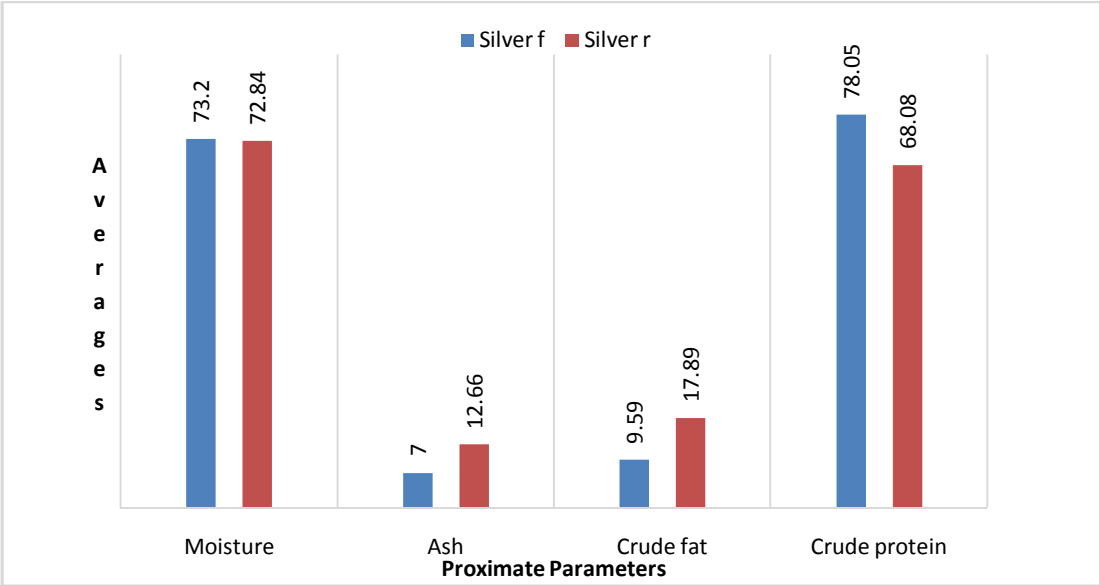

Figure 3.6: Comparative proximate values of wild and cultivated *Hypophthalmichthys molitrix* measured in %.

Statistical Analysis

ANOVA and LSD Results of Farmed Fish Species

In present study selected different species of same environmental condition (Farm) show following trends according to statistical test (ANOVA and LSD) results. Moisture and Ash content shows no significant (P>0.05) differences among the selected species of farm. Highest amount of Crude fat was observed in grass carp and lowest in silver and mori, however highest amount of Crude protein was observed in rohu and lowest in all other species (Table 3.5)

Table 3.5: ANOVA and LSD Results of Proximate analysis of Farmed Fish Species

Parameters	Silver	Mori	Rohu	Gulfam	Grass carp	P-values
Moisture	73.20±5.47^{a}	66.98±7.82^{ab}	71.19±6.32^{ab}	66.40±4.24^{b}	79.90±4.46^{ab}	0.16
Ash	7.00±5.40^{a}	7.37±3.28^{a}	10.28±2.64^{a}	6.75±2.65^{a}	11.59±6.99^{a}	0.19
Crude Fat	9.59±5.80^{c}	15.8±6.94^{b}	14.87±3.79^{bc}	17.15±3.63^{b}	23.74±7.23^{a}	**
C.Protein	78.05±7.43^{b}	76.55±4.67^{b}	91.75±2.76^{a}	77.57±9.37^{b}	74.16±4.97^{b}	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Values in a row with different superscript are significantly different from each other.

ANOVA and LSD Results OF Wild Fish Species

In present study selected different species of same environmental condition (River) show following trends according to statistical test (ANOVA and LSD) results. Moisture content was highest in grass carp and lowest in silver carp while Ash and Crude fat were highest in silver and lowest in grass carp. Crude protein was highest in rohu and lowest in grass carp (Table 3.6).

Table 3.6: ANOVA and LSD Results of Proximate analysis of Wild Fish Species

Parameters	Silver	Mori	Rohu	Gulfam	Grass carp	P-values
Moisture	72.84±8.15^{b}	77.83±7.14^{ab}	78.98±5.50^{ab}	77.82±3.17^{ab}	80.11±5.83^{a}	0.254
Ash	12.66±2.60^{a}	12.91±4.25^{a}	4.81±2.09^{b}	7.24±1.96^{b}	12.30±4.55^{a}	***
Crude Fat	17.89±3.52^{a}	7.66±3.78^{c}	7.00±2.10^{c}	6.85±2.82^{c}	13.28±6.24^{b}	***
C.Protein	68.08±2.73^{b}	62.51±4.90^{b}	85.89±3.91^{a}	63.00±7.33^{b}	54.85±11.26^{c}	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Values with different superscripts in a row are significantly different from each other.

DISCUSSION

Fishes are an important indicator in an ecosystem because of delicate nature and widespread range of tolerance at community level.Proximate composition of same fish species may vary in different environmental and feeding circumstances, water depth and water quality. It is observed in different studies that farm cultured fish showed better results in terms of nutritional and commercial values then that of wild. Ashraf *et al*. [11] revealed that farmed fish is nutritionally better as compared to its wild counterpart wild grass and silver carp showed higher moisture content respectively as compared to their farmed counterpart (75.3% wild, 74.16 farmed and 78.43% wild, 77.47% farmed)however farmed raise grass carp shows higher fat content (2.72%) as compared to silver carp (2.18%) while grass carp shows higher protein content (19.56%) as compared to silver carp (15.61%). Similar results obtained in present work in terms of fat content farmed grass carp contain higher fat content as compared to farmed silver carp (23.74%>9.59%) however protein content results of present study are contrary to ashraf findings. Moisture contents result is similar for grass carp (80.11% wild and 79.90% farmed) and contrary for silver carp. Hadyait *et al.* [12] reported that wild rohu and mori shows higher moisture contents as compared to their wild counter parts respectively (75.81% wild>73.89% farmed and 77.75% wild>74.51%farmed) and higher fat content (4.80% wild>3.24% farmed and 3.89% wild>2.66% farmed) while higher protein content was reported in farmed rohu and mori respectively (78.81% farmed>74.83% wild and 77.55% farmed>73.02% wild). Similar results with few contradictions were obtained from present research wild rohu and mori show higher moisture contents as compared to their farmed counter parts respectively (78.98% wild>71.19% farmed and 77.83% wild>66.98% farmed) and higher protein content in farmed rohu and mori as compared to wild counterpart respectively (91.75% farmed>85.89% wild and 76.55% farmed>62.51% wild) while fat content result of present study is contrary to Hadyait findings. So from the current result it may be confirmed that farmed fish is healthier than the uninhabited fish type in relationships of nutrient substances for human feeding. Due to different habitat of different species the body pattern varies nutritionally.

CONCLUSION

The present study concluded that the farmed fish is better than the wild fish species in terms of nutrient contents for human consumption. Due to different habitat of different species the body pattern varies nutritionally.

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