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Research Article

STUDIES ON THE VARIATIONS IN THE PROXIMATE COMPOSITION OF LABEO BOGA IN RELATION TO HABITAT AND SEASON

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ABSTRACT

The present investigation was aimed to conduct seasonal proximate composition analysis of *Labeo boga* collected from upstream section and downstream section of River Tawi. The results clearly revealed that both habitat variation and seasonal changes has an impact on the muscle proximate composition of *Labeo boga.* In the present study, the water quality parameters(DO, pH and water temperature) of the two sections were analysed and compared for the four studied seasons i.e post monsoon, winter, pre monsoon and monsoon and results revealed that pollutant load in section 2 (downstream section) not only affected the water quality but also the proximate profile of fish. For all the studied seasons, the DO content in downstream section (Section 2) were found in the range 3.33±0.50-5.36±0.25 and these values were found to be significantly($p<0.05$) low as compared to DO content obtained for the upstream section(section 2) i.e 7.13±0.35-8.6±0.6. Also, the pH values were found to be low at downstream section i.e 6.93±0.96-8.16±0.115 as compared to upstream section i.e 8.13±0.208-8.46± 0.15. At upstream section, the protein, lipid and ash content were found in the range 16.41±0.47 - 17.54±0.31, 1.95±0.46 - 3.26±0.43, 1.03±0.012-1.23±0.01 respectively, with the higher values obtained during the pre monsoon(summer) and post monsoon(autumn) period and low values of the lipid, protein and ash content were observed during the winter and monsoon season. At section 2, similar trend of seasonal variation (high values during the pre and post monsoon and low during the winter and monsoon) were observed and the range of values so obtained for protein, lipid and ash were 15.57±0.12-16.13±0.4 (for protein); 1.66±0.07-2.25±0.07 (for lipid); and 1.02±0.05-1.19±0.02(for ash); however these values were found to be low as compared to the values obtained for section 1 for all the studied seasons. For the moisture content, the values obtained were found to be high during the winter season and low during the summer (pre monsoon season) for both the studied sections, thus showing inverse trend of relationship between moisture and other proximate constituents viz. protein, lipid and ash. During the present course of investigation, the proximate profile was found to be significantly low ($p<0.05$) in downstream section than upstream section which may be due to the heavy pollution load in downstream section.

INTRODUCTION

Fish is an important source of nutrients from time immemorial. Fish is a complete food source and is highly valuable in the diet because they provide good quantity of protein and lipid of higher biological value. Fish provide a good source of readily digested high quality animal protein, fat, mineral and vitamins especially Vit A, D, E. Besides being used as a source of food, fish is also increasingly demanded for use as feed in aquaculture. Fish meat has very beneficial impact on human health. It is certified that it minimizes the appearance of cardiac vascular diseases as it lowers the triglyceride and cholesterol level. Fish body mainly composed of water, lipid, ash and protein though small amount of carbohydrates and non-protein compounds are present (Cui and Wootten, 1988; Love, 1980, Azim *et al,* 2012). The quality of fish depends on the quality of water, geographical distribution and also varies with the age, season, maturity, food, space, temperature, salinity, physical activity which influence the growth of fish (Weatherley and Gill,1987; Ahmed *et al*,2012) and the fish body elements may change due to these factors (Kamal *et al*, 2007). Knowledge of the proximate composition of fish is of paramount importance to evaluate it in regard to nutrient value and physiological condition (Love, 1970; Geshanovich *et al* 1984; Brown and Murphy, 1991) and also to determine whether they are in range of commercial specifications (watchman, 2000).

Water pollution is recognized globally as a potential threat to both human and other animal populations which depends for

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their survival on aquatic environment. River Tawi is an important lifeline for Jammu city and its outskirts, It serves as a source of drinking water as well as a source of nutritious food (fish) to the residents of jammu region but it is increasingly getting polluted due to discharge of untreated sewage and dumping of municipal solid wastes. The important sources of water pollution are domestic sewage, drainage which pollute the river and other major water resources (Maruthanayagam, 2004. *Labeo boga* is an important commercial fresh water fish commonly found in the rivers and streams of jammu region. So, knowledge of its nutritional composition is important for human dietary. Hence, presently an attempt has been made to study the impact of seasonal changes and habitat variation on the proximate composition of *Labeo boga.*

MATERIAL AND METHODS

Study area and sampling

During the present course of investigation, the samples of *Labeo boga* (15±1.5cm L, 110±15g W) were collected during sep 2015-aug 2016 from upstream section (Nagrota-Section 1, Latitude 32º 46', Longitude 74º 54') with the clear and fast flowing water and downstream section (Gujjar nagar – Section 2, Latitude 32º 43', Longitude 74º 52') with slow moving and polluted water due to sewage discharge, cremation wastes, religious wastes, ill treated drainage. Distance between the two stations was more than 10 kms. Water quality parameters (Water temperature, pH, DO) were analysed by using the standard methods prescribed by APHA (1985), also muscle samples were seasonally collected and subjected to biochemical analysis to determine the proximate composition i.e protein, moisture, lipid and ash, using following standard methods:

Proximate composition analysis

Protein

The protein content was determined by Lowry's method (1951). The amount of protein /g was calculated by obtaining standard curve prepared in Bovine Serum Albumin (BSA) protein (0-100mg) and finally calculating in percent basis.

Lipid

The lipid content was determined by Folch's method. 5g of muscle was taken and then left in the dark overnight to extract lipid in 50 ml of chloroform /methanol (2:1). After about 18 hrs the mixture was filtered using Whatman paper 1. The filterate was then given washing with 0.9% saline solution to remove the non-lipid contaminants and allowed to separate, using separating funnel. The lower phase was then taken and dried, and then weight was taken.

$$\text{Lipid} = \frac{\text{Weight of residue(mg)}}{\text{Weight of sample taken (mg)}} \times 100$$

Moisture

Moisture content was estimated by the method of AOAC (1995). The moisture content was determined by drying 5g of sample in oven for 18hrs at 105±1ºC. Then sample was cooled and again weighed to take dry weight of sample.
Calculations-

$$\text{MOISTURE} = \frac{\text{weight loss(mg)}}{\text{Original weight of sample taken (mg)}} \times 100$$

ASH

The ash content was determined by the method of AOAC (1995). 2g of muscle was taken in crucible and then burnt out by placing the sample in hot plate. The crucibles were kept in muffle furnace raising the temperature to 600ºC. Sample then ignited for 4 hrs at 600ºC and then transferred to dessicator for cooling and then was weighed

$$\text{Ash} = \frac{\text{weight of residue(mg)}}{\text{Weight of sample taken(mg)}} \times 100$$

Statistical Analyses

The results obtained were then analysed using t-test. Significance level was set using alpha level of 0.05. The statistical analysis is indicated with the help of suitable letters in the data.

RESULTS AND DISCUSSION

The results of present findings are given in Table 1-2 and Fig 1-4 which clearly reveal the water quality parameters and seasonal and habitat variations in the proximate muscle

Table 1 showing the average (Mean±S.D) seasonal physico chemical parameters of water at section 1(upstream section) and section 2(downstream section).

Season	Water temp(Mean±S.D)		pH (Mean±S.D)		DO (Mean±S.D)	
	Section 1	Section 2	Section 1	Section 2	Section 1	Section 2
Post monsoon (Sep, Oct, Nov)	23.5±1.80	25.83±2.02	8.46±0.15	8.10±0.17	7.50±0.36	4.50±0.62
Winter (Dec, Jan, Feb)	16.83±2.36	17.16±2.46	8.43±0.15	8.16±0.12	8.6±0.60	5.36±0.25
Pre monsoon (Mar, Apr,May)	26.5±1.5	28.83±2.08	8.36±0.20	7.73±0.05	7.8±0.55	3.6±0.95
Monsoon (Jun, Jul, Aug)	30.33±0.76	34.16±2.25	8.13±0.20	6.93±0.96	7.13±0.35	3.33±0.50

Table 2 showing seasonal variation in the proximate composition of *Labeo boga* in upstream section (section1) and downstream section (section2) of River Tawi. (Values are mean ± SD of 3 observations)

SEASON	PROTEIN %		LIPID%		MOISTURE%		ASH%	
	Section 1	Section2	Section 1	Section 2	Section 1	Section 2	Section 1	Section 2
Post monsoon	17.21 ± 0.17^{a}	16.06 ± 0.16^{b}	2.96 ± 0.06^{a}	1.93 ± 0.04^{b}	81.40 ± 1.01^{a}	76.60 ± 0.37^{a}	1.17±0.03	1.12±0.02
Winter	16.41 ± 0.47^{c}	15.57 ± 0.12^{c}	2.33 ± 0.12^{c}	1.66 ± 0.07^{d}	83.11 ± 0.6^{b}	78.54 ± 0.99^{b}	1.06±0.05	1.02±0.1
Pre monsoon	17.54 ± 0.31^{d}	16.13 ± 0.4^{e}	3.26 ± 0.43^{e}	2.25 ± 0.07^{e}	77.22 ± 1.98^{c}	76.20 ± 0.05^{a}	1.23±0.02	1.19±0.02
Monsoon	16.46 ± 0.64^{c}	15.81 ± 0.29^{f}	1.95 ± 0.46^{f}	1.91 ± 0.20^{f}	78.62 ± 0.78^{d}	76.89 ± 0.58^{d}	1.03±0.012	1.02±0.005

composition- protein, lipid, moisture and ash of *Labeo boga* from both section 1(upstream) and section 2 (downstream)

Within columns, values with different letters are significantly different ($p<0.05$), Also, for each component between the two sections, values with different letters vary significantly ($p<0.05$).

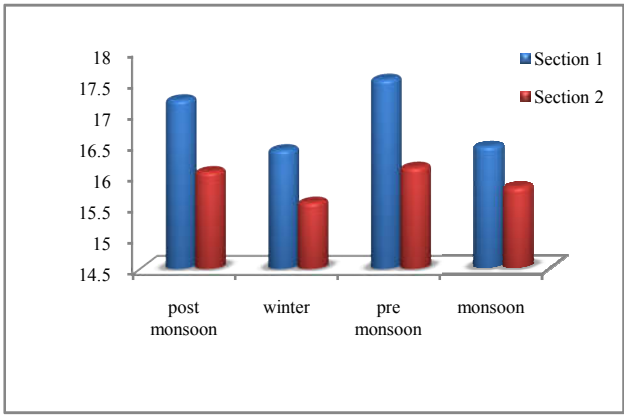

Fig 1 showing average seasonal variation of protein in muscle of *Labeo boga* between the upstream section (Section 1) and downstream section (Station 2) of river Tawi.

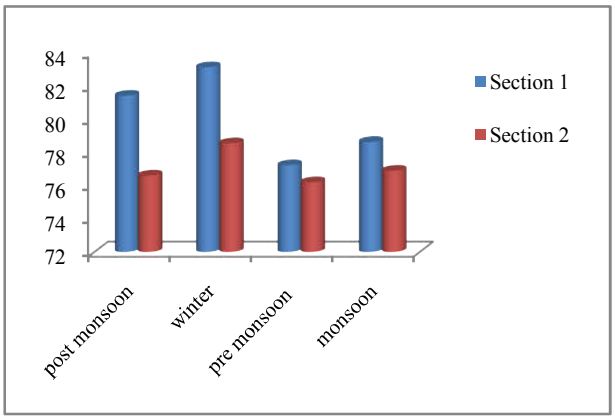

Fig 2 showing average seasonal moisture variation in the muscle of *Labeo boga* between the upstream section (section 1) and downstream section (section 2) of river Tawi

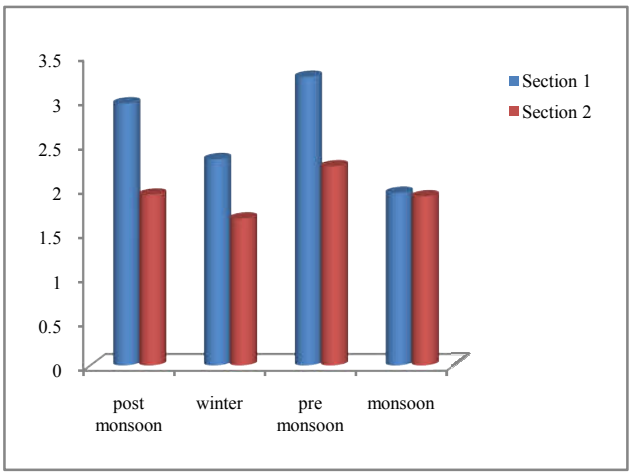

Fig 3 showing average seasonal lipid variation in muscle of *Labeo boga* between the upstream section (section 1) and downstream section (section 2) of river Tawi

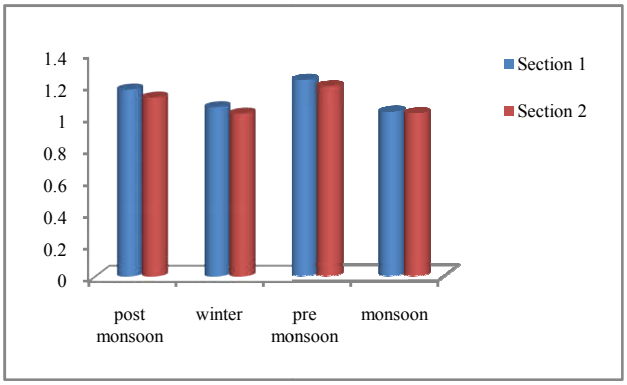

Fig 4 showing average seasonal ash variation in muscle of *Labeo boga* between the upstream section (section 1) and downstream section (section 2) of river Tawi.

The physico - chemical studies revealed the low water quality of section 2(downstream section) as compared to section 1(upstream section). Water temperature, pH and DO of the two studied sections were analysed spanning over four studied seasons i.e post monsoon, winter, pre monsoon and monsoon. For the section1 (upstream section), the pH values ranged from 8.13±0.208 - 8.46± 0.15; while for the section 2(downstream section), the pH values ranged from 6.93±0.96 - 8.16±0.115. Also, the values obtained for DO in section 1 were in range of 7.13±0.35 - 8.6±0.6, while for the section 2, the DO content ranged from 3.33±0.50 - 5.36±0.25. Thus conducted studies revealed the low water quality of section 2 than the section 1.

Protein is the basic building nutrient of any growing animal and usually account for 65-68% of dry matter of most fish species (Tayel 2007). At section 1, the protein content ranged from 16.41±0.47% - 17.54±0.31% with higher percentage of protein reported during pre monsoon period i.e17.54±0.31%, when the water temperature was 26.5 c and lowest during winter i.e 16.41± 0.47%, when the water temperature was 16.83 C. The present findings of low values of protein content in winter and higher content in pre monsoon period may be due to the insufficient food availability to the fish during winter and due to active feeding by fish during pre monsoon period respectively. This observation was well supported by Shekhar *et al* (2004) for seasonal protein variation in muscle of *Labeo rohita*, also similar type of results were obtained by Geri *et al*, 1995 in *Cyprinus carpio*. Observations also revealed that the protein content decreases during the monsoon/spawning period(Jun-Aug) i.e16.46±0.47 which may be due to increased energy requirements during the monsoon season; while protein content showed increasing trend after the spawning period which may be due to voracious feeding by the fish after spawning as observed by Somvanshi(1983) in *Garra mully* (Sykes) and Geetha *et al* (1991) in *Heteropnuestes fossilis*. Similar observations with low protein content during the spawning (monsoon) season reported by Basade *et al* 2000. At section 2, the protein content obtained for fish ranged from 15.57±0.12% – 16.13±0.4 % with the same pattern of seasonal variation as observed for section 1 ; but values found to be comparatively low than observed for section 1. The decrease in the protein content in fish muscle in Section 2 indicates the physiological adaptability of the animal to compensate for the stress. The decline in DO and pH in section 2 revealed the depleted quality status of section 2 (shown in table 1). Also,

the present observation of depleting protein content in downstream polluted station may be due to the degradation of proteins and this was supported by the findings of Muthukumaravel *et al*, 2013 for fish *Labeo rohita*, where they stated that the depletion in the protein content in polluted water may have been due to their degradation and possible utilization of degraded products for metabolic purposes. Further, the decline in protein content in polluted habitat may also be due to the depletion of DO as revealed by the conducted observations (table 1) for DO content in section 1 and section 2 and this observation was in line with the results of Massoud *et al*, 1973 for fish *Tilapia zillii.* Such observations were also in conformity with findings of Tuckey and Fabrizio, 2015.

In the present findings at upstream section, moisture content in the fish ranged from 77.22±0.17% -83.11±0.6% with the higher content observed during winter and low during pre monsoon (summer). For downstream section, similar trend of seasonal variations but comparatively low values of moisture content were observed with the range 76.20±0.05% - 78.54±0.99%. The low values of moisture content during the pre monsoon period was due to more water loss from fish body owing to higher temperature as revealed by the present conducted studies on water quality(shown in Table 1). Moisture variation with the season in the present study also complements with observation of Ashwini *et al*, 2016 for fish *Decapterus russelli*. Their observations supported the present results of high moisture content during winter. In the present findings, the variations obtained in the moisture content of the fish muscle between the two stations may be due to the pollution load in section 2(downstream), which were in line with with the result obtained by Kandil (1987) for the effect of environmental pollutants on physiology of fish, *Ctenopharyngodon idella.* and also supported by Tayel 2003 for *Tilapia zillii*, who explained the depletion in water content to the activity of proteolytic enzymes that minimize the water holding capacity of tissue and the proteolytic activity was marked variable according to the pH value changes and they also reported the decrease in extracellular fluid volume (because of dehydration of whole animal under the stress of pollution).

The lipid content also observed to be vary with the season and with the habitat. In the present findings at upstream section, the lipid content ranged from 1.95±0.46% – 3.26±0.43% with the higher value reported in pre monsoon period(3.26±0.43%); while lowest value were recorded during the monsoon season(1.95±0.46). For the fish from downstream section, the values ranged from 1.66±0.07% - 2.25±0.07% which followed the same pattern of seasonal variation as observed for the section 1 but comparatively low values were obtained. The higher values of lipid during the pre monsoon period may be result of the preparation of fish for spawning. For both the sections, low values were reported during monsoon season which complements with the findings of Basade *et al* 2000 for golden mahseer, *Tor putitora*. Present results also revealed the higher lipid content in post monsoon period as compared to winter, which may be due to the active feeding habit of fish during post monsoon season (Sep-Nov) i.e after spawning. The present findings of high lipid content in fish from upstream station (fast running water) than downstream station (slow running water) were found to be in line with the observations of Deka *et al*, 2012 for fish *Labeo gonius*,they reported habitat variation in the lipid content with the higher mean value of lipid in pre monsoon season in fast running water. The lipid content observations in the present study were found to be lower than observed by Sarower-E-Mahfuz *et al* (2012) for *Labeo bata* in Bangladesh waters. This variation might be due to the difference in habitat and ecological conditions and may be due to specie difference also. Present variation observed in the lipid content of fish between both the stations might be a function of food availability, seasonal variation and biochemical activity of fish as observed by Bayomy *et al* 1993 for fish *Clarias lazrea* and also depends on habitat quality. The degraded quality of water at section 2 (downstream section) as revealed by DO and pH studies may also be responsible for the low lipid profile of fish in section 2 as compared to section 1. Similar observations were reported by Tuckey and Fabrizio (2015). In both the studied stations, lipid content varies in inverse proportion to moisture content. Statistical analysis revealed the significant variation in lipid content between different seasons at $p<0.05$ level

The ash content represents the total inorganic matter as mineral constituents in the tissue. At upstream section, the ash content were in range of 1.03±0.01% - 1.23±0.02 % and for downstream section, the ash content were in range 1.02±0.1% - 1.19±0.02%. At both the studied sections, the similar trend of variation in ash content were obtained, with higher values in pre monsoon season and lower in winter. The ash content observed in the present study in *Labeo boga* was in line with the observations of Gandotra *et al*, (2015) for *Labeo rohita* in raw muscle. Also the pattern of seasonal variation in ash content were found to be in agreement with the results of Shekhar *et al*, 2004 for *Labeo rohita*. The present observation of high ash content in pre monsoon period (preparatory spawning phase) complements with the findings of Khwaja, 1996 who observed that high level of ash indicates greater mineral requirement during pre monsoon season. The present observations of decline in the ash content with the pollution load in section 2 were in conformity with the observations of Mohammed and Gad, 2008 for fish *Tilapia zillii*, they made observation that an inverse relationship exist between the ash content and water pollution as the ash content decreases according to the stress of pollution as revealed by the depleting DO content of section 2 as compared to section 1. Similar observation has been reported by Tayel, 2003 for *Tilapia zillii*. However, the differences in ash content obtained for the fish in two studied sections were not significant ($p>0.05$).

CONCLUSION

The present findings revealed that the proximate composition of fish muscle varies in relation to season and habitat. Thus, it can be concluded from the present findings that nutritional composition of *Labeo boga* is comparatively better in upstream section than in downstream section of River Tawi. This depletion in the important muscle constituents contents is due to the heavy loading of waste in downstream section and hence depleted water quality of downstream section whereas the upstream section is blessed with less anthropogenic disturbance. It is therefore suggested that proper treatment of drainage before discharging it into the river and effective management of sewage should be done to control the deterioration of water body and its aquatic life.

References

Ahmed S, Arifur rahman AFM, Mustafa Ghulam MD, Hossain MB and Nahar N (2012). Nutrient composition of indigeneous and exotic fishes of rainfed waterlogged paddy fields in Lakshmipur, Bangladesh. World journal of Zoology, 7:135-140.

AOAC (1995). Official methods of analysis of the association of official agricultural chemist .16Th Edn., Association of Analytical Communities International, Washington, USA.pp: 1141.

Ashwini L, Benakappa S, Anjanayappa HN and Akshay (2016). Seasonal changes in the proximate composition of *Decapterus russelli* in Mangaluru coast. *IJESC*,6(6).

Basade Y, Kapila S and Kapila R (2000). Changes in the muscle composition and energy contents of Golden Mahseer, *Tor putitora* (Hamilton) in relation to it's spawning cycle. *Indian Journal of Fisheries* 47(1):37-41

Bayomy MF, Kallaf EA and Gaber N (1993). Studies on the fat content and their relation to the reproduction of *Clarias lazrea* (CUV and VAL) in Bahr Shebeen Nile canal. *J. Egypt,Ger. Soc.Zool*, 10(B) : 165-182

Brown ML and Murphy BR (1991). Relationship of relative weight to proximate composition of juvenile striped bass and hybrid striped bass. *Trans Am. Fish Soc*, 120:509-518.

Chandra S, Rao AP and Abidi AB (2004). Changes in the muscle biochemical composition of *Labeo rohita* (Ham.) in relation to season. *Indian J. Fish*, 51(3):319-323.

Cui Y and Wootten RJ (1988). Effect of ration, temperature and body size on the body composition, energy content and condition of the minnow, *Phoxinus phoxinus. Journal of fish biology*, 32:749-764.

Deka BK, Mahanta R and Goswami UC (2012). Impact os seasonal and habitat variation on the composition of total lipid content in muscle and liver of *Labeo gonius* (Ham) *International Journal of Scientific and Research Publications*, 2(6).

Dempson JB, Schwarz CJ, Shears M and Furey G (2004). Comparative proximate body compostion of atlantic salmon with emphasis on parr from the fluvial and lacustrine habitats. *Journal of fish biology*, 64:1257-1271.

Ebiary EH, Zaki MA and Mourad (1997). Effect of salinity on growth feed utilization and haematological parameters of Florida red Tilapia fingerlings. *Bull.Nat. Inst. Of Oceanogr And Fish,* A.R.E, 23:203-216.

Folch J, Less M, Sloane GSW (1957). A simple method for the isolation and purification of total lipids from animal tissues. *J. Biol. Chem*, 226 :497-509.

Gandotra R, Koul M, Gupta S and Gupta V (2015). Studies on the effect of vaccum packaging on some seasonal quality changes in *Labeo rohita* during frozen storage period. *International Journal of Applied Biology and Pharmaceutical Technology*.

Geetha S.H Sreenarayaranam and N.B Nair (1991). On the nature of biochemical constituents during the breeding cycle in *Heteropnuestes fossilis* (Bloch.) *Proc. Nat. Acad. Sci* India 61(B):311-315.

Geri G, Poli BM, Gualtieri M, and Parisi GL9 1995). Body traits and chemical composition of muscle in the commoncarp (*Cyprinus carpio* L.) as influenced by size and rearing environment. *Aquaculture*, 329-333.

Gershanovich AD, Markevich NM and Dergaleva ZT (1984). Using the condition factor in Ichthyological research. *Journal of Ichthyology*, 24:78-90.

Kamal D, Khan AN Rahman MA and Ahmed F (2007). Biochemical composition of some small indigeneous fresh water fishes from the river Mouri Khulna,Bangladesh. *Pak J. Biol. Sci*, 10:1559-1561.

Kandil AE (1987). Physiological studies on the grass carp; *Ctenopharyngodon idella* val. under different environmental pollution. Ph. D. Thesis, Cairo University, Cairo Egypt

Khwaja, DK, 1966. Biochemical composition of the muscle of some freshwater fishes during prematurity phase. *Fish Tech.,* 3: 94-102).

Love RM (1957). The biochemical composition of fish. (In :The physiology of fishes) (Ed, Brow, ME). Academic London and New York, 1:401-418.

Love RM (1970). The chemical biology of fishes. Academic press, London.

Lowry OH, Rosenbrough NJ, Farr AL and Randall RJ (1951). Protein measurement with the folin phenol reagent. *J. Biol. Chem*, 193:265-275.

Maruthanayagam C and Sharmila G (2004). Haematobiochemical variations induced by the pesticide, Monocrotophos in *Cyprinus carpio* during the exposure and recovery periods. *Nat.Environ.Poll. Tech*, 3:491-494.

Massoud A, Saad H, Ezzat A and Shabana MB (1973). Effect of pollution on the blood characteristics of *Tilapia zillii*. G. Air and Soil Pollution, 2:171-179

Mohamed FA and Gad NS (2008). Enviornmental pollution induced biochemical changes in the tissue of *Tilapia zillii*, *Solea vulgaris* and *Mugil capito* from the lake darum, Egypt, Global veterinaria, 2:327-336.

Muthukumaravel K, Sivakumar B, Kumaraswamy P and Govindarajan M (2013). Studies on the toxicity of pesticide Monocrotophor on the biochemical constituents of the fresh water fish *Labeo rohita*. *International journal of Current Biochemistry and Biotechnology*, 2(10): 20-26.

Sarower –E- Mahfuj Md, Hossain MB and Minar MH (2012). Biochemical composition of endangered fish, *Labeo bata* (Hamilton 1882) from Bangladesh waters. *American Journal of Food Technology*,7(10): 633-641.

Somvanshi V.S (1983). Seasonal changes in the biochemical composition of a hill stream fish *Garra mullya* (Sykes). *Indian Journal of Fisheries*. 30:55-60.

Tayel SI (2003). Histopathological, biochemical and haematological studies on *Tilapia zillii* and *Clarias gariepinus* in relation to water quality criteria at different localities in Delta barrage Phd thesis Fac Sci, Benha branch, Zagazig Univ

Tayel SI (2007). Histological and biochemical seasonal changes of *Oreochromis niloticus* muscle in relation to water quality at Zefta and El-mansoura cities. Damietta branch River Nile, *Egypt. J. Egypt. Acad. Soc.Envioron. Develop*., 8(2):81-92.

Tuckey TD and Fabrizio MC (2015). Variability in fish tissue proximate composition is consistent with indirect effects of Hypoxia in Cherapeake Bay Tributaries. Marine and Coastal fisheries 8(1):1-15.

Weatherley AH and Gill HS (1987). The biology of fish growth. Academic Press, London

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