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Assessment of the proximate and biochemical profile of *Labeo boga* during pre monsoon and monsoon season

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Abstract
The study was conducted to determine the proximate and biochemical profile of fish, *Labeo boga* during the pre monsoon and monsoon season. The proximate profile was found to be high during pre monsoon (pre spawning season) season with the protein and lipid content was found to be highest during month of may i.e. 17.84±0.03 for protein and 3.70±0.01 for lipid; while the low proximate content was observed during monsoon (spawning season) season with the lowest content for protein and lipid observed during july i.e. 15.94±0.04 for protein and 1.52±0.01 for lipid. Also, biochemical profile showed marked variation between pre monsoon and monsoon season. Lowest concentration for serum biochemical parameters were observed in march i.e. 67.32±0.03mg/dl for Glucose, 49.20±0.01mg/dl for LDH, 75.20±0.02IU/L for ALP, 29.50±0.01IU/L for SGOT, 26.84±0.02IU/L for SGPT and 88.54±0.02mg/dl for Cholesterol while highest concentration was recorded during june i.e. 112.31±0.04mg/dl for Glucose, 61.50±0.04mg/dl for LDH, 97.32±0.02IU/L for ALP, 34.30±0.04IU/L for SGOT, 36.84±0.06IU/L for SGPT, 130.52±0.01mg/dl for Cholesterol; thus showing variable biochemical response of fish with the changing season. Thus conducted studies revealed the significant variation ($p<0.05$) in the proximate and biochemical profile of fish in the two studied seasons and such information can help the consumer in making choice for nutritious food based on information.

Keywords: proximate, biochemical, *Labeo boga*, pre monsoon, monsoon

Introduction
Fish is one of the main food constituent in our diet as it includes essential fatty acids, amino acids, some of the principal vitamins and minerals in sufficient amounts for healthy living (Borgstorm, 1964; Boran and Karacam, 2011) [8]. Fish contains most important nutritional components and serve as source of energy for human beings (Ojewola and Annah, 2006) [29]. An increasing amount of evidence suggest that fish meat and oil contains high amount of polyunsaturated fatty acids that are important in decreasing the serum cholesterol to prevent number of Coronary heart diseases (Noreloy *et al* 2001, Turkmen *et al* 2005) [38]. The Proximate body composition involves the determination of fats, protein, moisture and ash content of fishes. Moisture, Protein, Lipid and Minerals are the most important components that act as sources of nutrient value of fish meat (Steffens, 2006; Devi and Devi, 2014) [36, 13]. The serum biochemical components (for example LDH, SGOT, SGPT, GLUCOSE etc.) act as biomarkers which are used as tools to assess biological changes that may reveal the exposure of organism to environmental conditions. At any given time, the biochemical composition of an individual fish is the result of complex interactions between physical and biological characteristics like size, sex, temperature, food availability and reproductive age (Basade *et al* 2000) [5]. The biochemical composition of whole body indicates the quality of fish. A number of workers have studied the depletive effects of maturation and spawning on the chemical composition (Pandey *et al* 1796 and Kiran and Puttaiah, 2005) [31, 23] and biochemical changes (Ganeshwade, 2012) [16]. Some workers have studied the seasonal variation in biochemical composition of fresh water fishes (Jan *et al*, 2012; Pawar and Sonawane, 2014) [20]. Fishes are intimately associated with aqueous environment; physical and chemical changes in the environment are rapid and reflected as metabolic changes in fish (Fazio *et al* 2013). Information about the biochemical profile of fish is an important tool that can be used for effective and sensitive monitoring of physiological and pathological state of fish (Kohanestani *et al* 2013) [24].
Many reports are available on the biochemical and nutritional aspects of fish. But, there is very little data so far present on the difference in biochemical and proximate content of fish during pre monsoon and monsoon season. Thus, the present study was intended to find out such difference.

Material and Methods
The samples of *Labeo boga* were collected from river Tawi during the pre monsoon (March-May) and monsoon (June-Aug) season. The proximate and biochemical profile of fish was determined using standard methods. 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. 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 what man 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. Moisture content was estimated by the method of AOAC (1995) [2]. 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. The ash content was determined by the method of AOAC (1995) [2]. 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 for biochemical analyses, the blood was taken from the caudal vein of fish. The blood was collected in clot activator tube and then it was centrifuged to get serum. The serum so obtained was then subjected to biochemical analyses. Glucose content was measured by Correll and Langley, 1956 method. Alkaline phosphatase content was measured by Hillman, 1971 [19] method. For SGOT and SGPT, Bergmeyer *et al*, 1986 [6, 7] method was used. Stadman, 1957 [35] method was used for determining Cholesterol levels. For Lactate Dehydrogenase (LDH), Henry *et al* (1961) [18] method was used. Also APHA (1985) [3] methods were used to determine the physico chemical parameters (DO, pH) of water. The results obtained were then analysed using t-test to determine significance.

Results and Discussion

Table 1: showing variation in physico chemical parameters (Temp, pH, DO) of water during the pre monsoon and monsoon season.

Season	Months	Temp •C	pH	DO
Pre Monsoon Season	March	26	8.3	8.3
	April	28	8.2	7.9
	May	37.9	8.6	7.2
Monsoon Season	June	32	8.2	6.8
	July	30	7.9	7.1
	August	28	8.0	7.2

Table 2: Showing percental variation in the proximate composition of fish between pre monsoon and monsoon season.

Season	Months	Protein %	Lipid %	Moisture %	Ash %
Pre Monsoon	March	17.21±0.01	2.84±0.02	79.52±0.02	1.22±0.03
	April	17.45±0.02	3.25±0.03	76.14±0.04	1.25±0.03
	May	17.84±0.03	3.70±0.01	76.02±0.03	1.24±0.03
Monsoon	June	17.18±0.03	2.45±0.01	77.84±0.01	1.04±0.01
	July	15.94±0.02	1.52±0.01	78.62±0.02	1.02±0.02
	August	16.28±0.01	1.88±0.02	79.41±0.01	1.04±0.01

Table 3: showing variation in the serum biochemical composition of *Labeo boga* between pre monsoon and monsoon season.

Season	Month	Glucose Mg/Dl	Ldh Mg/Dl	Alp Iu/L	Sgot Iu/L	Sgpt Iu/L	Cholesterol Mg/Dl
Pre Monsoon	March	67.32±0.03	49.20±0.01	75.20±0.05	29.50±0.01	26.84±0.02	88.54±0.02
	April	84.29±0.01	53.70±0.06	78.00±0.03	28.94±0.02	29.50±0.11	96.44±0.05
	May	93.63±0.04	57.23±0.03	84.00±0.03	32.20±0.05	33.45±0.01	112.41±0.03
Monsoon	June	112.31±0.04	61.50±0.04	97.32±0.02	34.30±0.04	36.84±0.06	130.52±0.01
	July	92.52±0.02	54.65±0.2	86.25±0.04	31.80±0.05	32.80±0.06	120.51±0.05
	Aug	83.64±0.01	52.50±0.01	80.10±0.06	28.40±0.02	31.40±0.01	114.62±0.02

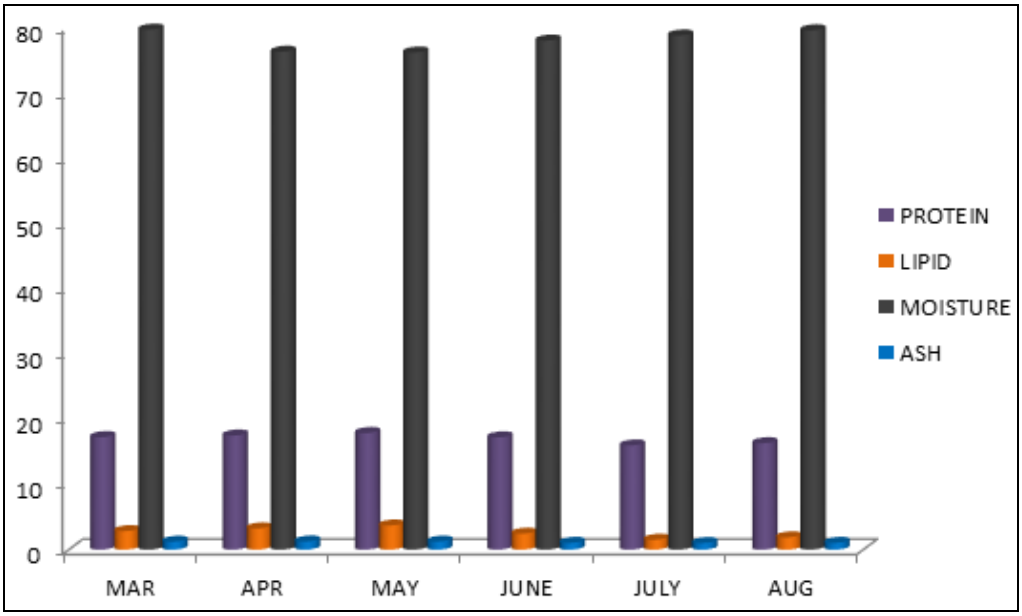

Fig 1: showing the percental variation in proximate composition of fish during the pre monsoon and monsoon season.

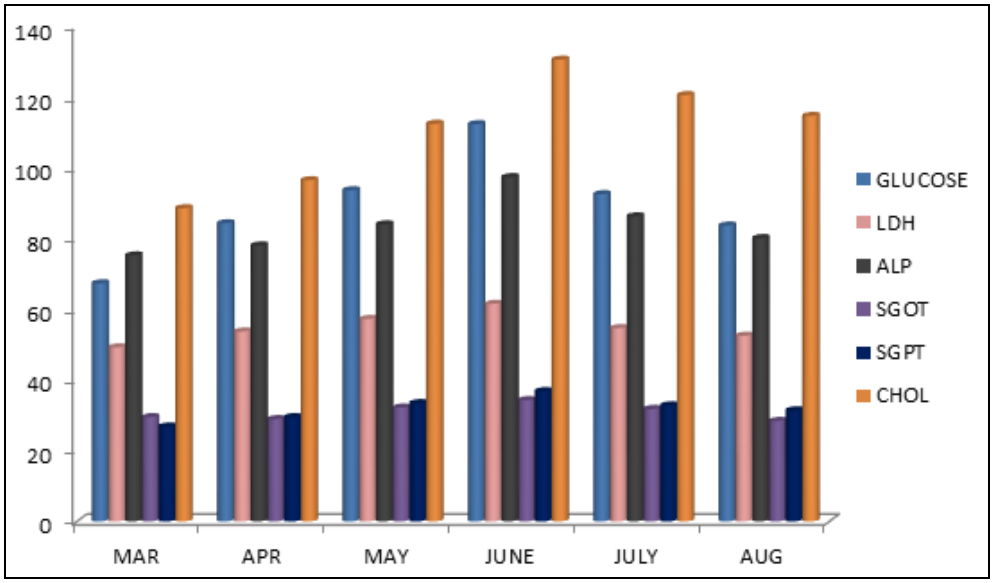

Fig 2: Showing the biochemical variation in fish serum during pre monsoon and monsoon season.

Discussion

The Proximate and serum biochemical profile of *Labeo boga* is given in table 2 and 3 and fig 1 and 2 respectively. *Labeo boga* in most of the north western India breeds during the monsoon period (June to August). The percental composition of protein, lipid and ash in the pre monsoon season (March-May) ranged from 17.21±0.01- 17.84±0.03, 2.84±0.02-3.70±0.01 and 1.22±0.03- 1.24±0.03 respectively; while in the monsoon season (june- Aug), the percental composition for protein, lipid and ash ranged from 15.94±0.02- 17.18±0.03, 1.52±0.01-2.45±0.01 and 1.02±0.02- 1.04±0.01 respectively. The proximate profile of the fish is found to be high during the pre monsoon (March- May) season. During May, the concentration of protein and lipid was found to be highest i.e. 17.84±0.03 for protein and 3.70±0.01 for lipid respectively. While the concentration of moisture seemed to follow the reverse trend with the higher concentration was found to be during monsoon than the pre monsoon season. During the pre monsoon season, the food is available in more quantity therefore excess amount of food is stored in muscle tissue. Also, this pre monsoon period (March-May) serve as a preparatory phase for spawning, so protein and lipid accumulation occurs more. This deposited energy source decreased by the spawning phase (monsoon period, June-Aug), as the fish utilize the energy reserve for reproductive activities. Similar observations were reported by Ganesh wade *et al* 2016 in *Labeo boga*, the protein and lipid level increases during preparatory phase and decreased in the spawning period. Such results were supported by Bruce (1924) In the muscles of herrings. Also, Mahdi *et al* 2006 and Jan *et a*l 2012 [20] studied seasonal variations in the muscle of *Shizothorax esocinus*, where they reported high level of protein during the summer (pre monsoon season). During Monsoon (Spawning period), muscle protein declined gradually due to the transfer of protein from the muscle to ovaries to meet the energy requirements of fish. Similar observations were reported by Srikar *et al* 1979 [34], Basade et al, 2000 [5], Hails, 1983 [17]. For lipid, high content was observed in the pre monsoon and decline in lipid content was observed during the monsoon period. This could be attributed to the mobilization of lipid as an energy source to meet the high energy demands during the act of ovulation and spawning. Another reason could be low availability of food and low feeding intensity. These observations were in line with the observations of Langer *et al* 2011 [33], Raina 1999 [32], Samyal *et al* 2011 [33], Jorgensen *et al* 1997.Increase in the proximate content of muscle during the pre monsoon season (preparatory phase) has been well elaborated by Devi and Devi (2014) [13]. While during the monsoon season, the decline in proximate content of muscles observed as the energy content move towards the gonads to complete the act of spawning, which is an energy consuming process. However after monsoon season, increase in energy content can be observed as suggested by Bano, 1997 [4], who showed the increase in protein and lipid content during the post monsoon season.

The concentration of Glucose, LHD, SGOT, ALP and Cholesterol showed marked variation between pre monsoon and monsoon season. Changes in blood serum components are mostly related to changes in water quality. When the water conditions become less favourable, the biomarkers showed elevated response. For all the serum components studied, the maximum concentration was recorded during the month of june. Fresh water environment are subjected to variations in the environmental factors such as temperature, DO, light peneteration, density etc. During the pre monsoon period (March-May) and monsoon period, the water quality changes appreciably as revealed by changes in DO, Water temperature, pH (Table 1), hence biochemical response of the fish do varies. Such results were in conformity with the findings of De Pedro *et al* 2005, Kori Siakpere *et al* 2005. Information about the haematological profile is an important tool that can be used for effective and sensitive monitoring of physiological and pathological state of a fish (Kohanestani *et al* 2013) [24]. Influence of temperature on the biochemical composition also revealed by the findings of Fernandez and Mazon, 2003 [14]; Zaragabadi *et al* 2009 [39]. Increased temperature in pre

monsoon period and comparatively low water temperature in late monsoon period due to rainfall directly affect the fish physiology. Such observations were in conformity with the findings of Collazos *et al* 1998 [11]. Because of high body metabolic rate due to high ambient temperature and reproductive activities, most of the biochemical markers shows higher values during the months of may and june. These results were supported by the findings of Adebayo *et al* 2007 [1]; Joshi 1989 [22], Orun *et al* 2003 [30] and Kohanestani *et al* 2013 [24], have reported that serum biochemical parameters may increase to meet the high energy demands i.e. preparation for preparing phase (during pre monsoon season). Also during the monsoon season, the biochemical parameters started showing declining trend, this might be due to the declining water temperature and less stress due to the flushing effect.

Conclusion

The result suggests that proximate and biochemical profile of fish varies from season to season. Also, biochemical markers suggest the environmental variations which affect the fish physiology and hence fish quality. Such conducted research helps in establishing information on variation in proximate and biochemical quality of fish and also suggest precautions to be taken to distinguish their nutritional value with respect to season and thus helps the consumer in making choice based on information.

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