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Seasonal Changes in Biochemical Composition of Fresh Water Fish *Labeo bata* (Hamilton, 1822)

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ABSTRACT
The freshwater fish L. batawere analyzed to determine their seasonal variations in biochemical composition. The fish specimens were purchased from local markers of Guntur over a period of one year from January 2017 to December 2017. It is evident from the present results that the percentage of protein and carbohydrate content in female was higher than that of male. Likewise the moisture content of female fish was higher than that of male. The higher value of lipid was noticed in male fish than that of female. The higher value (4.76±0.02) of ash was recorded in male when compared to female ash value of 4.65±0.15.
Key words: *Labeo bata, Moisture, Protein, Carbohydrate*

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INTRODUCTION

Hitesh U. Shingadia [1] determined proximate composition of *Harpodon nehereus* (Ham-Buch) in muscle tissues varied by seasons from Mumbai coast. Shi Pei-Song*et al.,* [2] showed the contents of the proximate structure of amino acids and fatty acids in the muscle of *Aristichthys nobilis* and *Polypodon spathula* that were nourished with live feed for 60 days were studied. Chandan Debnath *et al.,*[3] mentioned that the fish species specifically *Amblypharyngodon mola*, *Esomus danricus*, *Puntius Sophore*, *Colisa fasciata*, *Labeo bata*, *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala* were examined for protein and mineral composition from Tripura, India. Daniel [4] determined the proximate layout of important commercial fishes of *Cynoglossus senegalensis*, *Polydactylus quadrifilis* and *Chrysichthys nigrodigitatus* obtained from Ayadehe on Alwa, Ibom state, Nigeria and compare the nutritional values in other to help consumer in choosing fish based on their nutrients values. Oyase Anthony*et al.,* [5] worked on biochemical composition of five fresh water fish species (*C. laticeps; D. rostratus; S. schall; S. mystus and H. bebe*) from river of Niger. Very limited information is available on the proximate composition of *L. bata* from Indian waters; hence the purpose of the present investigation is to determine the seasonal variations in biochemical parameters in two sexes of *Labeo bata*.

MATERIAL AND METHODS

For studies on biochemical composition, freshly caught specimens of *Labeo bata* were collected. The collected fish in fresh conditions are kept in the ice box which has transferred to laboratory, Department of Zoology, Acharya Nagarjuna University, Guntur.In the laboratory they were thoroughly cleaned with the running tap water and the excess water is removed with blotting paper. The specimens are dissected immediately to avoid decomposition. Muscles are removed and their weights are taken immediately. For the analysis, muscle tissue is taken just below the dorsal and above the lateral line is used. The muscle tissue is kept in hot air oven at 58º- 60ºC for about 48 hours to dry the material for constant dry weight. The dry tissue is ground in to a fine powder in the porcelain mortar. The samples obtained are used for the estimation of proteins, lipids, carbohydrates and ash.

The moisture and ash contents of the fish samples were analysed by Association of Official Agrichemicals, AOAC method [6]

Total protein is estimated by the method ofLowry protein assay method, for protein concentration determination is one of the most venerable and widely used protein assays. The method is first described in 1951 by Lowry *et al*., [7].
The total lipids were extracted from the dry tissues, by following the method of Folsch *et al*., [8]. Anthrone in sulphuric acid can be used for colorimetric determination of sugars, methylated sugars and polysaccharides Dubois *et al*., [9].

RESULTS AND DISCUSSION
The seasonal changes in the biochemical composition of *Labeo bata* is another important attempt to the present study, for this fact as % of protein, lipid, carbohydrate, moisture and ash contents are shown in (Table 1 and 2).
Moisture:
It is evident from the present results, maximum and minimum % of moisture content was observed as 74.39±0.65, 71.76±0.42 during the year 2017 in the months of September and January respectively for the males of *Labeo bata*(Table 1). Similarly maximum and minimum % of moisture content was observed as 74.94±0.63, 70.60±0.12 during the year 2017 in the months of May, January months respectively for the females of *Labeobata*(Table 2).
Among all the major constituents studied the moisture (water) is a major constituent in the body of fish, which is essential for all living systems. The body fluids act as median of transport for nutrients, metabolites etc. Brandes and Dietrich [10] reported variation in the moisture content of the some fish species when setting two different temperatures and found that the difference up to 1.57% between determination done at 60 ^{0}C and those done at 96 ^{0}C. Therefore, in the present study the moisture content of the fish species were determined at constant temperature (105 ^{0}C) for 24 hours which is a standard protocol as recommended by AOAC [11]. The whole body moisture content of *Labeo bata* shows wide variation among the male and females in relation to seasons in the present study and the values are reported within the range of 71% to 83%. In the present study the significant variation in moisture content among two sexes of *Labeo bata* have been reported.
Proteins:
The maximum and minimum % of protein content was observed as18.82±1.32, 15.42±0.78 during the year 2017 in the months of May, September respectively for the males of *Labeo bata*(Table 1).Similarly the maximum and minimum % of protein content was observed as 19.74±0.19, 16.87±1.16 during the year 2017 in the months of January and July months respectively for the females of *Labeobata*(Table 2). Protein which is next to the moisture content or second major component in the muscle tissue of the fish and is generally reported in the range of 12-19.5% in fresh water fish species.
Results clearly indicated a marked fluctuation among the seasons for both sexes of the *Labeo bata*. Borgstrom [12] observed that the protein and fat contents in fishes depend on some factors such as size, age, sex, seasonal change and habitat. Similar observation was also reported by in different fish species in brackish water pond [13] and in small indigenous fish species of Bangladesh [14] and in some fish species from black sea [15]
Lipids:
The maximum and minimum % of lipid content was observed as 5.78±0.04, 3.29±0.19 during the year 2017 in the months of September and May months respectively for the males of *Labeobata*(Table 1). Similarly the maximum and minimum % of lipid content was observed as 5.73±0.72, 3.29±0.37 2017 in the months of October and April respectively for the females of *Labeobata*(Table 2).
In the present study the fat content of *Labeo bata* varied considerably and reported within the range of 2.85-5.89% among the male and female fish species. Idlers and Wood [16] reported that the fat content of herring, *Elupea pallasi*, varies between 4-20% with different season. The present result related to the fat content is in accordance with the above study. The Fishes were generally classified on the basis of their fat content [17] which means that fat content is one of the most important constituent in the body of fish and its quantity will determine the quality of the fish.
Salam [18] reported the variation of fat content of different fish species from 3.25% in *H. fossils* to 5.41% in *G. Chapra*. The present results are quite similar to the findings of the Salam [18] in respect to the variation in fat content both male and female of *Labeo bata.* Pillay and Nair [19] marked an inverse relationship between fat and moisture content in some prawn species. Marked fluctuation in the fat constituent in some fish species indicated in the present study might be due to dependence on some

factors [12]. The other factor could be the inverse relationship between moisture and fat [20]. Bumb [21] reported coincidence of intensive feeding with occurrence of high fat content. Similar observation was reported by Mazumdar *et al*., [14] in some indeginous fish species of Bangladesh, Bouriga *et al*., [22] in three fish species i.e. *Atherina boyeri, A. lagunae, A. species.*

Carbohydrates:

The maximum and minimum % of carbohydrate content was observed as 1.02±0.07 and 0.62±0.05during the year 2017 in the months of January and June months respectively for the males of *Labeobata*(Table 1). Similarly the maximum and minimum % of carbohydrate content was observed as 1.17±1.23 and 0.54±0.01 during the year 2017 in the months of January and August respectively for the females of *Labeo bata*(Table 2). It is evident from the present study that the reported carbohydrate contents in both the sexes are in well agreement with the previous worker [14].

Ash:

The maximum and minimum % of ash content was observed as 4.76±0.02 and 3.71±0.09 during the years 2017 in the months of March and July months respectively for the males of *Labeobata*(Table 1). Similarly the maximum and minimum % of ash content was observed as 4.65±0.15,3.28±0.14 during the year 2017 in the months of December and May months respectively for the females of *Labeobata*(Table 2).

Mostly both marine and freshwater fish species have reported similar amount of ash contents in the whole body usually 3.34-4.84%.The results of ash content in the *Labeo bata* showed similarity with the previous worker [18]. The similar observations were also made by Mazumder *et al*., [14] in some indigenous fish species of Bangladesh.

Table 1. Monthly changes of biochemical composition of male *Labeobata* in the year. 2017

Months	Moisture %	Proteins%	Lipids%	Carbohydrates%	Ash %
January	71.76±0.42	18.48±0.21	4.02±0.11	1.02±0.07	4.72±0.12
February	72.75±0.02	17.94±0.08	3.76±0.01	0.87±0.12	4.68±0.01
March	73.11±0.23	17.82±0.97	3.52±0.47	0.79±0.23	4.76±0.02
April	74.29±1.07	17.01±0.97	3.45±0.10	0.72±0.07	4.53±0.03
May	73.36±0.39	18.82±1.32	3.29±0.19	0.65±0.03	3.88±0.10
June	73.79±0.16	17.76±0.56	4.07±1.18	0.62±0.05	3.76±0.04
July	73.33±0.42	17.55±0.11	4.69±0.23	0.72±0.10	3.71±0.09
August	73.80±0.28	16.43±1.23	4.94±0.46	0.67±0.03	4.16±0.02
September	74.39±0.65	15.42±0.78	5.78±0.04	0.68±0.02	3.73±0.08
October	73.52±0.02	17.33±0.14	3.77±0.01	0.81±0.04	4.57±0.07
November	73.14±0.26	17.97±0.57	4.01±0.15	0.85±0.02	4.03±0.02
December	72.81±0.62	18.04±0.84	3.97±1.28	0.92±0.08	4.26±0.01

Table 2. Monthly changes of Biochemical composition of female*Labeobata* in the year 2017

Months	Moisture %	Proteins%	Lipids%	Carbohydrates%	Ash %
January	70.60±0.12	19.74±0.19	4.03±1.01	1.17±1.23	4.46±0.01
February	72.43±0.27	18.27±0.76	3.86±0.25	0.97±0.02	4.47±0.05
March	72.96±0.62	18.08±0.10	3.73±0.07	0.88±0.13	4.35±0.03
April	74.31±0.27	17.81±1.01	3.29±0.37	0.74±0.28	3.85±0.22
May	74.94±0.63	17.37±0.18	3.58±0.26	0.83±0.13	3.28±0.14
June	72.72±0.43	17.83±0.79	4.96±0.34	0.78±0.19	3.71±0.21
July	73.96±0.61	16.87±1.16	5.01±0.42	0.72±0.05	3.44±0.35
August	72.26±0.18	17.24±1.09	5.47±0.01	0.54±0.01	4.49±0.21
September	73.40±0.32	16.96±0.14	5.54±0.41	0.67±0.28	3.43±0.37
October	72.17±0.46	17.27±0.46	5.73±0.72	0.59±0.43	4.24±0.26
November	72.83±0.09	17.22±0.07	4.74±0.53	0.75±0.15	4.46±0.18
December	71.28±0.84	18.29±0.15	4.99±1.03	0.79±0.28	4.65±0.15

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