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Research Article

Proximate composition of *Labeo calbasu* at different seasons in Sunamgonj of Bangladesh

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ABSTRACT

Fish is a good source of protein and other elements for maintenance of good health. This study was conducted to investigate the proximate composition of *Labeo calbasu* in different seasons (Monsoon and post monsoon). The study examined 65 *L. calbasu* over a period of 6 months from June 2016 to November 2016. The proximate composition of *L. calbasu* varied seasonally. Protein, lipid, ash and moisture contents were 14.6±0.43, 2.84±0.21, 1.99±0.08 and 77.27±1.62, respectively during Monsoon and 16.13±0.49, 3.65±0.16, 2.54±0.21 and 74.82±0.58, respectively during Post-monsoon. It was noticed that protein, lipid and ash contents were higher in post monsoon season, but the water content was higher in Monsoon. This study provides valuable information on proximate composition of the fish species to distinguish their nutritional value and make a choice based on the information by the consumers.

INTRODUCTION

The chief components of fish tissue include water, protein, lipid and ash. The amount or percentage of each component within fish body is termed as proximate composition. Fish is one of the most important sources of animal protein and has been widely accepted as a good source of protein and other elements for maintenance of good health (Andrew, 2001). The people of Bangladesh have crying need of dietary protein. Protein is the main source of energy and plays an important role in determining the population levels, growth rate and condition of fishes. Knowledge of chemical composition is essential in order to compare its value as food with other protein containing foods.

It is also necessary to have data on the composition of fish in order to make the best use of them as food and in order to develop the technology of processing fish and fish products. Fishes are excellent source of protein when compared with other sources of protein due to the amino acid composition and protein digestibility (Louka *et al*., 2004). Fish muscle comprises of moisture, protein and fat as a major nutrient component, and carbohydrates, vitamins and minerals as minor components. So fish muscle contains the entire nutrient component that is necessary for the maintenance of human body. Fish and fish products are the most important sources of animal protein in the human diet. It comprises of all ten essential amino acids in desirable quantity for human consumption. Fish protein is very rich in such amino acids as methionine and lysine, and low in tryptophan compared to mammalian protein (Nowsad, 2007). Fishes have rich source of essential nutrients required for supplementing both infant and adult dietary requirements (Abdullahi and Abolude, 2001). The nutritional composition of fish varies greatly from one species and individual to another, depending on age, sex, and sexual changes connected with spawning, environment and season. Development of reproductive organ and egg size, and quality hormone and enzyme production in fish largely depend on protein composition. Protein is the main source of amino acid which is the building block of tissue.

The knowledge of fish composition is essential for its maximum utilization. The nutritional composition of fish varies greatly from one species and individual to another, depending on age, feed intake, sex and sexual changes connected with spawning, environment and season (Silva and Chamul, 2000). Studies on the proximate and anatomical weight compositions are essential for fish and fish products to be utilized efficiently. Non edible portion can be used as a source of raw material in the feed industry.

Apart from this limited information, there is no published information on the proximate composition of this species in Bangladesh, especially from the Haor basin area of Sylhet. The people of Sylhet region like this fish very much. But they do not know about the food and feeding habit, and nutritional value of this fish. This study can give them information about nutritional value of *L. calbasu*. Therefore, the present study is aimed to obtain the proximate composition of *L. calbasu*.

MATERIALS AND METHODS

Study area

The study was conducted utilizing the fishes collected from Dekhar *haor*, which is located at Dakshin Sunamgonj Upazilla in Sunamgonj district of Bangladesh. In total, 60 individuals of *L. calbasu* harvested from Dekhar *haor*, were collected from different fishermen of Purbo pagla bazar.

Collection and preparation of sample

The fish samples were put into ice box and brought to the laboratory, and stored in the freezing temperature until used. Fishes were carefully washed with cold tap water. Head, scales, fins, gills and viscera were removed and washed with tap water. Only fresh muscle tissue from dorsal region without skin and bone were taken as sample. Then the muscles were chopped and grinded by mortar and pestle to make a homogenous sample.

Proximate composition analysis

The proximate composition of fish tissue was determined by conventional method of AOAC (1980) with minor modification and triplicate determinations were carried out on each chemical analysis.

Determination of moisture content

The fish sample was taken and chopped into small pieces, and was grinded by grinder. The sample (15g) was taken in a pre-weighed porcelain crucible and kept into a hot air oven at a temperature of 105°C for 24 hours until constant weight was obtained. The loss of moisture was calculated as percent basis. The moisture content is estimated using the following formula:

$$\text{Moisture (\%)} = \frac{\text{Original sample weight (g) - Dried sample weight (g)}}{\text{Original sample weight (g)}} \times 100$$

Determination of ash content

The fish sample was taken and chopped into small pieces, and was grind by grinder. Accurately weighted 5g sample was taken in a pre-weighted porcelain crucible and kept into a muffle furnace at a temperature of 600°C for 6 hrs. Then porcelain crucible was kept in desiccators for cooling. The weight of the remaining material was taken. The ash content is estimated using the following formula:

$$\text{Ash(\%)} = \frac{\text{Weight of ash (g)}}{\text{Weight of sample (g)}} \times 100$$

Determination of lipid content

Accurately weighted 5g sample was taken in the thimble paper and placed into the hollow spaces of Soxhlet apparatus. Then 200-300 ml acetone was poured into ground round join bottom flask of Soxhlet apparatus, and the flask was carefully heated at 70-90°C for about 2-3 hours as acetone evaporated at this temperature. Then acetone was slowly accumulated in the hollow spaces of Soxhlet apparatus and siphoning to the ground round join bottom flask. Then acetone was taken into pre-weighted beaker and transmitted to hot air oven at 70°C for about 45-50 minutes to evaporate acetone. The lipid containing beaker was kept in desiccators for cooling and the weight was measured after cooling. The lipid content was estimated using following formula:

$$\text{Lipid (\%)} = \frac{\text{Weight of (lipid containing beaker-empty beaker)(g)}}{\text{Weight of sample (g)}} \times 100$$

Determination of crude protein content

Kjeldahl method was used to determine protein content of fish samples. Approximately 1g of each sample was taken in a clean Kjeldahl flask and 4g digestion mixture was added along with 25 ml of concentrated H_2SO_4 by swirling the flask. Then the Kjeldahl flask was placed in an inclined position on heating device of digestion chamber and carefully heated at more than 100°C for about 1-1.5 hours. The end point of digestion was indicated by a completely clear and light blue color solution. Then the content of flask was cooled at room temperature. Distilled water (100 ml) and $Na_2S_2O_2$ (25ml) were continuously added in each flask, and were mixed and cooled. A few glass beds were added in each flask to prevent bumping. Then 100-120 ml of 40% NaOH was added in each flask to make solution sufficiently alkaline. The flask was immediately connected to distilling bulb on condenser. A conical flask containing 50 ml 2% H_3BO_3 with 2-3 drops of mixed indicators was placed under the condenser against Kjeldahl flask to collect the distillate. After completion of distillation (about100 ml distillate) the collected distillates were titrated with standard HCl (0.1). The end point was indicated by light pinkish color. Total crude protein was calculated using the following formula:

$$\text{\% Nitrogen} = \frac{\text{0.14 x (Titration final- blank) reading x Strength of HCl (0.01)}}{\text{Weight of sample (g)}} \times 100$$

For most routine purposes the percent of protein in the sample is then calculated by multiplying the % of nitrogen with protein conversion factor of 6.25 for fish. Crude protein (%) = Total N_2 (%) × 6.25

Data analysis

Data were analyzed using Microsoft Excel and presented as mean ± SD, correlation, and R^2.

RESULTS AND DISCUSSION

Seasonal variation in proximate composition of Labeo calbasu

In most fish individuals the moisture content, protein and fat are between 75.65 - 78.89%, 14.17 –15.03% and 2.63 – 3.05%, respectively during Monson and 74.24 –

79.4%, 15.64 – 16.62% and 3.49 – 3.81%, respectively during Postmonson (Table 1).

Table 1. Seasonal variation in proximate composition of *Labeo calbasu*

Season	Protein	Lipid	Moisture	Ash
Monsoon	14.60± 0.43	2.84± 0.21	77.27± 1.62	1.99± 0.08
Postmonsoon	16.13± 0.49	3.65± 0.16	74.82± 0.58	2.54± 0.21

In general, the biochemical composition of the fish body indicates the fish quality. Therefore, proximate biochemical composition of a species helps to assess its nutritional and edible value in terms of energy units compared to other species. Variation of biochemical composition of fish flesh may also occur within same species depending upon the fishing ground, fishing season, age and sex of the individual and reproductive status. The variation in the chemical composition of fish is closely related to feed intake, migratory swimming and sexual changes in connection with spawning. Salam *et al*. (1995) studied biochemical composition of body muscles and its caloric contents of *Puntius gonionotus* and stated that variation in proximate composition of fish flesh may vary with species variation, season, age and feeding habit of the fish. Biochemical composition, nutritive values and seasonal variation in the chemical composition of fish tissues associated with reproductive cycle were also reported by Al-Dubaikel (1996).

Devadsan *et al.* (1978) found lower amount of ash content in six freshwater fishes *L. rohita* (1.31%), *Catla catla* (0.93%), *Cirrihinus cirrhosus* (1.40%), *L. calabasu* (1.02%), *Mystus seenghala* (0.91%) and *Wallagu attu* (0.72%) in his experiment. Ahmed *et al*. (2012) found moisture, fat, protein and ash content of *Labeo calbasu* were 79.80%, 2.65%, 16.47%, 1.08 %, respectively.

Nahar *et al*. (2012) studied the body composition of carp fishes commonly available in Bangladesh. They found the moisture content of *Labeo rohita*, *Catla catla*, *Labeo gonius*, *Labeo calbasu*, *Cirrhinus mrigala* and *Labeo bata* as 77.91%, 79.90%, 80.11%, 79.80%, 79.23% and 79.48%, respectively. The protein content of these fishes were 17.49%, 16.90%, 17.05%, 16.47%, 17.16% and 15.42%, respectively and lipid content were 2.77%, 2.01%, 1.71%, 2.65%, 1.95% and 3.73%, respectively.

Seasonal variation in protein content

In the present study the average protein content (%) of *L. calabasu* was 14.6±0.43 in monsoon and 16.13±0.49 in post monsoon (Table 1). The gradual increase in protein contents in the post monsoon season in the fishes suggests a recovery of the fish from the strenuous act of spawning (Bano, 1977). Ganeshwade (2015) reported that in *L. calbasu* protein level were more during pre-spawning period and its level decreases during spawning period. Similar result was observed by Bruce (1924) in the muscles of herrings. Jafri (1969) observed high value of muscle protein in *Ophiocephalus punctatus* with ripe gonads. The same pattern of variation was observed in the muscles of the *Puntius kolus* (Ganeshwade, 2015). During spawning, muscle protein started declining gradually due to its transfer into gonads to meet energy requirement of fish. Hickling and Rutenberg (1936) and Iles (1974) reported that protein synthesized and accumulated in the somatic tissues during pre-maturation period and would be utilized for gamete formation in addition to the growth of fish. Protein contents of *Amblypharyngodon mola*, *P. ticto*, *P. beculis*, *Chanda nama*, *Colisa fasciatus* and *C. lalia* were 17.95%, 18.08%, 15.60%, 17.77%, 15.82% and 16.13%, respectively (Ahmed *et al.* 2012).

Seasonal variation in lipid content

In the present study the average lipid content (%) of *L. calbasu* was 2.84±0.21 in monsoon season and 3.65±0.16 in post monsoon season (Table 1). The high lipid content in postmonsoon months might be due to active feeding of fish. Ganeshwade (2015) stated that the highest values of lipid content were observed in August (0.55995 ± 3.5603^{-}3), December (0.6069 ± 2.4842^{-}3) and January (0.6097 ± 2.8588^{-}3). But Decreased values are found in the pre-spawning period, which indicates that lipid content is utilized during maturation. Due to this its level is very low in the months of April, May, June, September and October. There was also decline in the lipid content during spawning period and this is possibly due to mobilization of lipid as an energy source to meet the high energy demands during the act of ovulation and spawning and due to low feeding intensity and low availability of food items. Reduction in the amount of lipid content in the muscles for the development and maturation of gonads has been well discussed by Raina (1999) and Samyal *et al.* (2011). Ahmed *et al.* (2012) found the lipid contents of *Channa punctatus*, *C. marulius*, *C. striata*, *A. mola*, *P. ticto*, *P. beculis*, *C. nama*, *C. fasciatus* and *C. lalia* were 1.60%, 1.79%, 1.47%, 2.87%, 3.56%, 2.86%, 2.05%, 2.58% and4.15%, respectively.

Seasonal variation in ash content

In the current study, average ash content found in examined fishes were 1.99±0.08 in monsoon season and 2.54±0.21 in post monsoon season (Table 1). The increase in ash content in the species indicates higher mineral metabolism during this period (Bano, 1977). It is presumed that the amount of food and concentration of minerals after the water recedes in the post-monsoon period increased considerably. The percentage of ash content in both the seasons was more or less similar. The ash content of *Gudusia chapra*, *C. soborna* and *Auchenipterichthys punctatus* was 1.70%, 1.68%, and 1.54%, respectively (Begum and Minar 2012), whichwere lower than the present study. Ash content of *C. striata*, *C. micropeltes* and *C. lucius* was 1.04%, 0.31% and 0.37%, respectively (Mustafa *et al.* 2013). In the present study the ash content of *L. calbasu* is higher than the results found by Mustafa *et al.* (2013).

Seasonal variation in moisture content

Moisture of a given sample simply refers to the water content of that sample. Results obtained from the proximate analysis of the fish species showed that the average moisture content of analyzed fish species was 77.27±1.62 in monsoon season and 74.82±058 in post monsoon season

(Table 1). Changes in water and fat indicate that while fat content evidently increased, there was a decline in water content due to heavy feeding during this period, which is in good agreement with previously reported results by Huss (1988; 1995). Osman *et al.* (2001) reported that lean fish have high level of moisture content and in a consequence their flesh is white in color. Moisture content of *A. mola*, *P. ticto*, *P. beculis*, *C. nama*, *C. fasciatus* and *C. lalia* was higher as 76.68% 75.02%, 78.62%, 78.03%, 80.75%, 77.52%, respectively (Ahmed *et al.* 2012). The moisture content found in the present study agreed with the research findings of others.

CONCLUSION

This research work provides information about proximate composition of *L. calbasu*. Proximate composition of fish was also found to vary seasonally. Protein, lipid and ash content were higher in post monsoon season, but the moisture content was higher in monsoon season. This study clearly indicates that the proximate values obtained would be useful to help the consumers in choosing fish based on their nutritional values, providing an update to food composition database. The result suggests that the proximate composition of fish species greatly varies from season to season. This might be due to physiological reasons and changes in environmental condition i.e. spawning, starvation, or heavy feeding. This study provides valuable information on variation in proximate composition of the fish species studied in order to take necessary precaution to distinguish their nutritional value and make a choice based on the information from consumer point of view.

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