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Studies on proximate composition of four edible fresh and salt-dried freshwater fishes

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Abstract: **The chemical composition of fish varies from species to species. Knowledge on chemical constituent is very essential in order to compare the constituent's value of raw and dried fishes. It is also necessary to have data on the chemical composition of fish in order to make the best use of them as food and in order to develop technology of processing fish and fish products. Present investigation was carried to find out the proximate composition of four edible freshwater fishes collected from Charon beel, Morigaon District, Assam, India. The work was directed towards the study of proximate composition of fresh and salt dried edible freshwater fishes *Chanda nama, Amblypharyngodon mola, Channa punctatus,* and *Trichogaster fasciatus* and compared the effect of drying on the nutritive value of fishes. In both fresh and dry fishes, proximate analysis targeted the determination of the percentage of moisture, ash, protein, fat and carbohydrate. The results of fresh fishes found that the moisture content was 76.01±0.71% in *Chanda nama*, 75.23±0.445% in *Amblypharyngodon mola,* 79.88±0.281% in *Channa punctatus* and 76.85±0.23% in *Trichogaster fasciatus*; ash content was 4.73±0.233% in *Chanda nama*, 4.03±0.212% in *Amblypharyngodon mola,* 2.21±0.117% in *Channa punctatus* and 5.56±0.179% in *Trichogaster fasciatus*; the protein content was 15.81±0.22% in *Chanda nama*, 18.1±0.31% in *Amblypharyngodon mola,* 19.01±0.243% in *Channa punctatus* and 16.1±0.155% in *Trichogaster fasciatus*; fat content was 4.12±0.121% in *Chanda nama*, 4.59±0.24% in *Amblypharyngodon mola,* 0.317±0.112% in *Channa punctatus* and 2.77±0.16% in *Trichogaster fasciatus* and carbohydrate was 1.61±0.482% in *Chanda nama*, 1.57±0.615% in *Amblypharyngodon mola,* 0.98±0.51% in *Channa punctatus* and 1.43±0.34% in *Trichogaster fasciatus.* The results of salted and sundried fishes revealed that the moisture content was 75.22±0.756% in *Chanda nama,* 74.18±0.581% in *Amblypharyngodon mola,* 79.14±0.270% in *Channa punctatus* and 76.38±0.192% in *Trichogaster fasciatus*; ash content was 4.44±0.241% in *Chanda nama,* 3.16±0.270% in *Amblypharyngodon mola,* 1.16±0.114% in *Channa punctatus* and 5.06±0.167% in *Trichogaster fasciatus*; the protein content of *Chanda nama, Amblypharyngodon mola, Channa punctatus* and *Trichogaster fasciatus* was 15.12±0.13%, 17.14±0.207%, 18.5±0.265%, and 15.2±0.158% respectively. The fat content was 3.5±0.223% in *Chanda nama,* 3.22±0.192% in *Amblypharyngodon mola,* 0.26±0.114% in *Channa punctatus* and 2.13±0.159% in *Trichogaster fasciatus*; Carbohydrate content of *Chanda nama, Amblypharyngodon mola, Channa punctatus* and *Trichogaster fasciatus* was 1.52±0.563%, 1.3±0.628%, 0.94±0.498% and 1.06±0.336% respectively. Statistical analysis also shows that the fat content was significantly decreased in all the dried fishes but the other parameters such as moisture, ash, protein and carbohydrate showed no significant differences. The examined fresh and dried fishes contains highly appreciable amounts of moisture, ash, protein, fat and less amounts of carbohydrate suggested that the experimental fish species can be used as good sources of nutrients.**

Keywords: **Proximate composition, Fresh, Salted, Sundried freshwater fishes, Morigaon, Assam, India.**

1. INTRODUCTION

The aboriginal people of the North Eastern Region of India consider various fish species as a major source of protein food. In Assam, drying of fish is also a common practice among various ethnic groups. The dried products can be stored for a long period of time and consumed as and when desired. When the fish is dried and preserved, the people can have

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access to the fish product all round the year. During monsoon season, different species of fresh water fish is caught from the rivers, beels, ponds, streams, swamps, bogs, etc. A bulk amount of such catch is traditionally dried by different methods (Kalita *et al*., 2016). It is known to all that approximately 16 % of animal proteins consumed by the world's population are derived from fishes and over one billion people depend on fish as their main source of animal proteins (FAO, 2000). Besides protein, fishes are also a good source of other nutritional components too. Due to the increasing popularity of dried fishes, scientific assessment of the quality aspects of the product is taking place worldwide.

Fresh fish rapidly deteriorates unless some way can be found to preserve it. Drying is a method of food preservation that works by removing water from the food which inhibits the growth of microorganisms. Water is removed by evaporation or air drying or sun drying or wind drying or smoking. Microorganisms like bacteria, yeast, fungus or virus needs the water in the food to grow and drying effectively prevents them from surviving in the food.

Therefore, considering the various nutritional benefits associated with fish consumption, it has therefore become important that fish's proximate composition is necessary to ensure the nutritional values, be assessed in order to establish the level of nutrients prior consumption. Although a good number of research works on proximate composition of fishes has been done by many authors like Neil, 1996; Mollah *et al.*, 2000; Azam *et al.*, 2003; Muzaffarian *et al.*, 2003; Nurullah *et al*.,2003; Mazumder *et al.*,2008; Flowra and Tumpa, 2012; Marichamy *et al.*, 2012; Kalita *et al.*, 2016. The nutritional composition of fishes differ vary greatly and it depends upon the physico-chemical characteristics of freshwater, so it is necessary to ensure the eating quality of these freshwater fishes are urgently required. The objective of the present study was to analyze the proximate composition of four freshwater edible fishes collected from Charon beel, Morigaon district, Assam, India.

2. MATERIALS AND METHODS

Edible freshwater fishes *Chanda nama, Amblypharyngodon mola, Channa punctatus* and *Trichogaster fasciatus* are selected for the study. All the fresh specimens for analysis were collected from unpolluted Charon beel. They were taken up soon for analysis after their capture when they were in fresh condition. Before sampling, the fishes were measured and weighed, skinned, the edible portion is separated and weighed then minced well in a meat mincer. For smaller fishes, the entire fish is taken as a whole. A portion of the well minced sample is taken up for finding out moisture, ash, protein, fat and carbohydrate content following the methods AOAC (2000). Some fishes were salted and sundried for the study. After salting of fishes, sun drying is done. After drying, fishes were carried to the laboratory for analysis. The moisture content of fresh and salt drying fish was determined by drying the fish in at oven 105^0c until a constant weight was obtained. Crude protein content was calculated by converting the nitrogen content, determined by Kjeldahl's method (6.25_N). Fat was determined using the Soxhlet apparatus. Ash content was determined by dry ashing in a furnace oven at 525_C for 24 h. The percentage of carbohydrate was calculated by simply subtracts the total percentage of protein, fat, moisture and ash from 100. T-test ($t_{0.05}$) was done following the methodology of Gupta (1997).

3. RESULTS AND DISCUSSIONS

Fish received increased attention as a potential source of animal protein (Ladipo *et al.*, 1982; Foran *et al.*, 2005; Kalita *et al.*, 2016) and essential nutrients for human diets. Fish meat contains significantly low lipids and high protein and water content than chicken or beef or red meats (Fawole *et al.*, 2007). According to Arannilewa (2005), fish is one of the most important sources of animal protein available and has been widely accepted as a good source of protein and other elements for the maintenance of a healthy body. Moreover, the measurement of such proximate composition is often necessary to ensure whether they can meet the requirement of food regulations and commercial specifications (Watermann, 2000). The proximate compositions of the fresh and dried samples were determined and the results obtained were presented in Table-1 and Table-2. Each value is the percentage of mean± standard deviation of five determinations.

Table-1: Proximate composition of four fresh freshwater fishes (Mean±SD of five replicates)

Parameters	Fresh edible fishes			
	Chanda nama	***Amblypharyngodon mola***	***Channa punctatus***	***Trichogaster fasciatus***
Moisture (%)	**76.01±0.71**	**75.23±0.445**	**79.88±0.281**	**76.85±0.23**
Ash (%)	**4.73±0.233**	**4.03±0.212**	**2.21±0.117**	**5.56±0.179**
Protein (%)	**15.81±0.22**	**18.1±0.31**	**19.01±0.243**	**16.1±0.155**
Fat (%)	**4.12±0.121**	**4.59±0.24**	**0.317±0.112**	**2.77±0.16**
Carbohydrate (%)	**1.61±0.482**	**1.57±0.615**	**0.98±0.51**	**1.43±0.34**

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Results obtained from the present study revealed that the moisture content of fresh fishes was 76.01±0.71% in *Chanda nama*, 75.23±0.445% in *Amblypharyngodon mola*, 79.88±0.281% in *Channa punctatus* and 76.85±0.23% in *Trichogaster fasciatus*; moisture of fresh *Channa punctatus* was higher than that of other fishes. The ash content was 4.73±0.233% in *Chanda nama*, 4.03±0.212% in *Amblypharyngodon mola*, 2.21±0.117% in *Channa punctatus* and 5.56±0.179% in *Trichogaster fasciatus*; the ash content was highest in *Trichogaster fasciatus* (5.56%). The protein content of fresh *Chanda nama* was 15.81±0.22%, Amblypharyngodon *mola* was 18.1±0.31%, *Channa punctatus* was 19.01±0.243% and *Trichogaster fasciatus* was 16.1±0.155% with highest in *Channa punctatus.* The fat content was 4.12±0.121% in *Chanda nama*, 4.59±0.24% in *Amblypharyngodon mola*, 0.317±0.112% in *Channa punctatus* and 2.77±0.16% in *Trichogaster fasciatus* and the carbohydrate was recorded 1.61±0.482% in *Chanda nama*, 1.57±0.615% in *Amblypharyngodon mola*, 0.98±0.51% in *Channa punctatus* and 1.43±0.34% *Trichogaster fasciatus* (Table-1).

Table-2: Proximate composition of four salt and sundried freshwater fishes (Mean±SD of five replicates)

Parameters	Salted and sundried edible fishes			
	Chanda nama	***Amblypharyngodon mola***	***Channa punctatus***	***Trichogaster fasciatus***
Moisture (%)	**75.22±0.75**	**74.18±0.581**	**79.14±0.270**	**76.38±0.19**
Ash (%)	**4.04±0.241**	**3.16±0.270**	**2.16±0.114**	**2.56±0.167**
Protein (%)	**15.12±0.13**	**17.14±0.207**	**18.5±0.265**	**15.2±0.158**
Fat (%)	**3.5±0.223**	**3.22±0.192**	**0.26±0.114**	**2.13±0.159**
Carbohydrate (%)	**1.52± 0.563**	**1.3±0.628**	**0.94±0.498**	**1.06±0.336**

In salted and sundried fishes moisture content was 75.22±0.75% in *Chanda nama*, 74.18±0.581% in *Amblypharyngodon mola*, 79.14±0.270% in *Channa punctatus* and 76.38±0.19% in *Trichogaster fasciatus* ; the ash content 4.04±0.241% in *Chanda nama*, 3.16±0.270% in *Amblypharyngodon mola*, 2.16±0.114% in *Channa punctatus* and 2.56±0.167% in *Trichogaster fasciatus* ; the protein content 15.32±0.13% in *Chanda nama*, 17.14±0.207% in *Amblypharyngodon mola*, 18.5±0.265% in *Channa punctatus* and 15.2±0.158 % in *Trichogaster fasciatus* ; fat content was 3.5±0.223 % in *Chanda nama*, 3.22±0.192% in *Amblypharyngodon mola*, 0.26±0.114% in *Channa punctatus* and 2.13±0.159% in *Trichogaster fasciatus* ; carbohydrate content was 1.52± 0.563% in *Chanda nama*, 1.3±0.628% in *Amblypharyngodon mola*, 0.94±0.498% in *Channa punctatus* and 1.06±0.336% in *Trichogaster fasciatus* (Table-2).

On comparing the raw and dried fish the results indicated that drying has considerable affect on proximate composition. Fresh samples presented high moisture, ash, protein, fat content and less carbohydrate. Decrease of moisture, ash, protein and fat contents were the most prominent changes in all the four species after drying. The concentration of carbohydrate in the dried fishes showed small differences when compared between fresh and salt dried fishes.

The result of fresh fish moisture content was similar to that of previous author Mazumder *et al.*(2008), who found that the moisture content of fresh Labeo spp. was (70.4-71.2%) and the trend is in agreement with the results of previous authors Ahmed (2006), Mohamed (2008) and Ali and Kiumars (2010). The lowest fat and carbohydrate content, highest moisture, ash and protein content were found in the investigation. Similar results have also been obtained by Philips *et al.* (1960), Ahmed *et al*. (2012) and Kalita *et al*. (2016).The highest percentage of ash content was found in all the dried fishes is in agreement with the results recorded by previous author in hydrocynus spp. (Ahmed, 2006), in *C.batrachus* and *H.fossilis* (Ackman, 2000) and in indigenous and exotic fishes (Ahmed *et al.*, 2012). The protein content was ranged between 15.81±0.22 to 19.01±0.243% in fresh fishes, while in salt dried fishes varied from 15.12±0.13 to 18.5±0.265% among all the fishes. The result showed that protein percentage was decreased after salt drying. The result agrees with the findings of Azam *et al.* (2003), Fawole *et al*. (2007) and Kalita *et al.* (2016). Protein content was highest in *Channa punctatus* and lowest in *Chanda nama* which is in favour of the results of Flowra and Trumpa (2012).

On the whole traditional processing of fish by salting had a significant effect on the proximate composition of fishes. Salt drying is the most widely practice method in Assam. It has been observed that different processing methods have different effects on the proximate composition of fishes. This may be the cause of sun drying and exposure to salt which lead to chemical and physical changes and digestibility is increased due to protein denaturation but the content of polyunsaturated fatty acids may also be reduced. The fat content was significantly decreased ($P<0.05$) in all the dried fishes. The significant decrease in fat content levels when compared with the fresh or raw fishes, suggests that fat was lost in all the fishes during drying. The other parameters such as moisture, protein and ash showed no significant differences. The insignificant decrease in protein levels when compared with the fresh fishes, suggests that protein nitrogen was lost during drying.

4. CONCLUSION

Fish is an important component in the diet of many people in Assam. So fishes are consumed by the people in Assam from the rural poor to urban rich. It is estimated that about 60% of the animal protein requirement in Assamese diet comes from fishes. A large percentage of consumers eat fish because of its nutritional values. It can be concluded that application of salt may controlled the growth of microorganisms and lowering the level of protein and fat. Percentage of moisture, ash and protein were normally higher in fresh fishes than the dried one, yet the dried fishes may be used as a good source of healthy food and can be preserved for consumption to fulfill the nutrient requirement. Therefore, sun dried fishes have been suggested as a key component for a healthy diet in humans.

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