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NUTRITIONAL AND FOOD QUALITY ASSESSMENT OF DRIED FISHES IN SINGRA UPAZILA UNDER NATORE DISTRICT OF BANGLADESH

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ABSTRACT
The present study was conducted on dry fish for determining proximate composition and microbial load. Samples were collected from Atrai upazila under Naogaon district from September 2011 to February 2012. Four species were used for this purpose, such as *Puntius* sp. (puti), *Amblypharyngodon mola* (mola), *Channa punctatus* (taki) and *Glossogobius giuris* (bele). The moisture content of the dried fishes obtained was in the range of 29.25 – 34.43% and the highest value obtained from *Channa punctatus* (taki) and the lowest from *Amblypharyngodon mola* (mola). On the other hand, protein content was found in the range of 32.02 to 41.38% with the highest value in *Channa punctatus* (taki) and the lowest in *Amblypharyngodon mola* (mola). There was a huge variation in lipid content which is in the range of 3.21 to 14.03% where the highest value in *Amblypharyngodon mola* (mola) and the lowest in *Channa punctatus* (taki). Ash content was in the range of 20.14 -24.40 % with the highest value obtained from *Amblypharyngodon mola* (mola) and the lowest value from *Puntius* sp. (puti). The Aerobic Plate Count (APC) was found in the range of 2.3×10^5– 3.6×10^7 CFU/g in the dried fishes with the highest value from *Channa punctatus* (taki) and the lowest from *Puntius* sp. (puti). Taking the 10^7 CFU/g as the upper acceptable limit, only *Channa punctatus* (taki) fish was considered as unacceptable quality.

KEY WORDS: Dried fish; proximate composition; nutrition; food quality; microbial load; Bangladesh

INTRODUCTION

Drying is one of the most important methods of preserving fish by the traditional fishermen. The consumers now a day are very much concerned about the quality of dried products, particularly chemical contaminants, spoilage and infestation by blow flies. The high water activity in tropical climate, denaturation of protein, oxidation of lipids and browning reaction probably are major causes of loss of qualities of dried products. Although there is no quantifiable data available on the volume of post-harvest losses both qualitatively and quantitatively yet losses between 10-35% have been reported for marine fishes (Doe *et al*., 1977; Ahmed *et al*., 1978).

The proximate composition is an important aspect of fish quality and it influences both the keeping quality and technological characteristics of the fish. The main chemical components such as water, crude protein, lipid and ash have the largest impact on the nutritive value, the functional properties, and the sensory quality and storage ability of flesh. Therefore, information on the nutritive value and its food quality are equally important regarding the proper utilization of products. Although a good number of works on biochemical composition of fishes in Bangladesh has been done by many researchers viz. Rubbi *et al.* (1987), Mollah *et al.* (1998, 2000), Nurullah *et al.* (2002, 2003), Islam *et al.* (2003), Mazumder *et al.* (2008), Flowra and Tumpa (2012) etc. But nutritional composition varied in large scale in different dried fish product. So it is necessary to ensure the nutritional value as well as eating quality of the dried fish products and the present investigation was carried out in order to assess the percentage of proximate composition and bacteriological aspects of sun dried products of some important fresh water fish species through laboratory analysis.

MATERIALS AND METHODS

Traditional dried fish products were collected from storage of different drying spots in Singra upazila under the Natore district. The species used for investigation were *Amblypharyngodon mola* (Mola), *Puntius sp.* (Punti), *Channa punctata* (Taki), *Glossogobius giuris* (Bele). Biochemical analysis such as moisture, ash, lipid and crude protein were carried out according to the methods given in AOAC (1980) in the Fish Nutrition Laboratory of Bangladesh Agricultural University, Mymensingh, Bangladesh. Bacteriological Analysis was done in the Fisheries Department Laboratory of Rajshahi University, Bangladesh. Total aerobic plate count expressed as colony forming units (CFU/g) of the representative samples were determined by standard plate count method on plate count agar following the serial dilution technique described by Seeley and Vandemark (1972). All determinations were done in triplicate and the mean value was reported. The result was performed from following formula- No. of bacteria (CFU/g) = No of Colony × Dilution Factor

RESULTS AND DISCUSSION

Proximate Composition of Dried Fishes: The results of the proximate composition of the dried products obtained from different locations of the study area have been presented in Table 1.

Table 1: Proximate composition of traditional dried fish products

Ingredients	Based on	*Puntius sp.*(Punti)	*Amblypharyngodon mola* (Mola)	*Channa punctatus* (Taki)	*Glossogobius giuris* (Bele)
% of Moisture		31.35	29.25	34.43	33.84
% of Crude protein	Wet	37.12	32.02	41.38	38.96
	Dry	54.07	45.26	63.11	58.89
% of Lipid	Wet	11.22	14.03	3.21	4.88
	Dry	16.34	19.83	4.90	7.38
% of Ash	Wet	20.14	24.4	20.74	21.68
	Dry	29.34	34.49	31.63	32.77
% of Carbohydrate	Wet	0.17	0.3	0.24	0.64
	Dry	0.25	0.42	0.37	0.97

The moisture content of the dried fishes obtained from the studied area was in the range of 29.25 – 34.43% with the highest value obtained from *Channa punctatus* (Taki) and lowest value from *Amblypharyngodon mola* (Mola) fish (Table 1). Flowra and Tumpa (2012) worked five selected dry fish from Chalan Beel, Bangladesh and found the moisture content varies from 12.13% *(Puntius ticto)* to 18.18% *(Palaemon* sp.) The quality of dried fish products is related to the final a_w values below 0.95. Frazier and Westhoff (1978) stated that, generally no microbe could grow in dried products with moisture content below 15%. The results obtained from the present study revealed that moisture of dried fish were much higher than the normally prepared from freshly dried products. However, when salt is added to the fish before drying, less water needs to be removed to achieve the same effect, and the product with a water content of 35-45%, depending on amount of salt present, is often dry enough to inhibit the growth of molds and bacteria under most climatic condition (Kamruzzaman 1992).

Moreover, there is a tendency in our country that fish processors sometimes allow more moisture in dried fish products to gain weight for economic benefit. The other reason is that the dried products used for selling in the wholesale and retail market and during storage normally do not use suitable packaging material. In a tropical country like Bangladesh where relative humidity is always high and there is a chance of uptake moisture from the environment. Excessive moisture uptake increases the water activity which facilitates the growth of micro-organisms and reduces the loss of nutrient and shelf life of dried products. On the other hand, protein, the most important chemical component was ranged from 32.02 to 41.38% with the highest value in *Channa punctatus* (Taki) and the lowest in *Amblypharyngodon mola* (Mola) (Table 1). This result is more or less similar with the previous study conducted by Azam *et al.* (2003) who found that the values ranged from 6.52 to 40.69% in 14 species of dried fishes. Flowra and Tumpa (2012) found the protein content of selected dried fishes varied from 28.20% *(Wallago attu)* to 51.19 % (*Palaemon* sp.).

Lipid content was in the range of 3.21 to 14.03% with the highest lipid content in *Amblypharyngodon mola* (Mola) and the lowest in *Channa punctatus* (Taki) (Table 1). Fat content also varies among the species of SIS fishes. This finding is almost similar to the finding of Flowra and Tumpa (2012). They got the range of lipid content 5.38% (*Labeo bata)* to 15.86 % *(Wallago attu).* On the other hand Hussain *et al.* (1992) obtained 3.7 to 17.8% fat in 23 sun-dried fish species, which is similar to the present study. Ash content was in the range of 20.14 -24.40 % with the highest value obtained from *Amblypharyngodon mola* (Mola) and the lowest value from *Puntius sp.* (Punti) (Table 1). Average ash content in the samples obtained from the study area was high as generally expected for the dried products. This is perhaps due to contamination with sand and filth during drying and storage in different marketing chains. Flowra and Tumpa (2012) found the ash content was ranging from 10.78% (*Labeo bata)* to 15.67% *(Palaemon* sp.) in their study.

Very less amount of carbohydrates also obtained from the dried fishes ranging from 0.17 to 0.64% (Table 1).The result obtained in this investigation is more or less in agreement with the general rule formulated by Stansby (1962) where there is an inverse relationship exists between the oil and moisture content of fish. Generally it was seen that proximate composition was variable and depend on various factors like species, size, sex, age and season of the year. These results correspond to some previous report on proximate composition of fresh water of Bangladesh (Rahman *et al.*1978*)* and of some small indigenous fish species (SIS) of Bangladesh (Kamruzzaman, 1992). Food Quality of Dried Fishes: Food quality of the dried products was analyzed by determining the bacteriological aspects of dried fishes where aerobic plate counts (APC) are very important. The results of the Aerobic Standard plate count (APC) of dried products are presented in Table 2.

Table 2: Aerobic plate count (APC) of traditional dried fish products

Fish species	APC (CFU/g)	APC (Log CFU/g)
Puntius sp. **(Puti)**	**2.3×10^5**	**5.36**
Amblypharyngodon mola **(Mola)**	**2.5×10^5**	**5.40**
Channa punctatus **(Taki)**	**3.6×10^7**	**7.56**
Glossogobius giuris **(Bele)**	**9.4×10^5**	**5.97**

The total aerobic plate count expressed as colony forming unit in one gram of sample (CFU/g) of the representative samples was determined by standard plate count (SPC) method on plate count agar media. Total bacterial load varied in the range of 2.3×10^5– 3.6×10^7 CFU/g in the dried fishes obtained from the studied area. The highest value was obtained from *Channa punctatus* (Taki) fish and the lowest from *Puntius sp*. (Puti) fish (Table 2). Mansur (1989) determined the total bacterial count of some traditionally dried SIS ranged from 1.0×10^5 to 1.5×10^6 cfu/g which is in agreement with the present study. Taking the 10^7CFU/g as the upper acceptable limit for fresh and frozen fish and cold-smoked fish species (ICMSF, 1986), only *Channa punctatus* (Taki) fish is considered as unacceptable quality.

There is a close relationship between the moisture content and bacterial load in food products. Fish is an ideal substrate for the growth and multiplication of microorganisms. Various factors are responsible for this. Suitable moisture content is one of them. The heat applied during drying cause considerable reduction of microorganisms of various types. Drying by heat usually destroys all yeasts and most of the bacteria, but spores of some bacteria and molds usually survive. Bacteria, yeast and mold do not grow with moisture content below 18%, 20% and 16% respectively. So, if the drying process and storage conditions are adequate, there will be no growth of microorganism in dried fish. But in practical, it is about impossible to control moisture and growth of microbes during processing and storage of dried fish. Especially during improper storage and exposed condition in the retail market, dried products absorb a considerable amount of moisture. According to Sen *et al*. (1961), when water content of fish fell below 25% of wet weight, bacterial action stopped and when the water content further reduced to 15%, mold ceased to grow. Frazier and Westhoff (1978) reported that, generally no microbe (yeast, mold and bacteria) can grow in a product with moisture content below 15%.

Conclusion

In most of the observed fish drying places, sun drying is carried out in an unhygienic condition. If modified drying processes are followed with maintaining the proper hygiene and sanitation, the produced dry fishes will get higher price. The quality and safety of dried fish product is highly desirable in the health conscious people in the country and to achieve this, scientific and improved drying method should be practiced throughout the country.

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