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Biochemical Quality Assessment of Ten Selected Dried Fish Species of North East India

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Abstract: Biochemical analysis was done on 10 (ten) dried fish samples traditionally prepared in the North East India. Samples were collected from various parts of three different states of this region namely Assam, Arunachal Pradesh and Manipur. The samples included the fish species locally known as Bhokua, Chanda, Dorikona, Goroi, Mua (i), Mua (ii), Ngupi, Phabaonga, Puthi, and Ukabi. The moisture content of the samples was ranged from 2.772% to 7.818%. Protein varied from 27.46% to 56.84% and lipid content was ranged from 11.47% to 18.45%. Ash content varied from 11.177% to 29.197%. Elemental analysis was carried out through XRD which showed the presence of Fe, Ca, K, C, S, P, Si, Al, Mg, Na, O. The pH of the samples was ranged from 6.23% to 8.33%. All the experiments were replicated three times.

Keywords: dried fish, moisture, protein, lipid and ash.

I. INTRODUCTION

A large number of fresh water fish species are available in the North Eastern Region of India (NER), many of which are endemic to this area. The aboriginal people of the area consider various fish species as a major source of protein food. In general fresh fishes are used in culinary. However, drying of fish is also a common practice among various ethnic groups. The dried product can be stored for a long period of time and consumed as and when desired. It provides as an important source of protein. Nutritional studies show that fish protein is ranked in the same class as chicken protein, yet beef protein, milk and egg albumin are inferior to it (Srivastava, 1959). Thus, when the fish is dried and preserved, the people can have access to the fish product all round the year. During monsoon season, in NER, different species of fresh water fish is caught from the rivers and 'beels' (a natural bounded water body). A bulk amount of such catch is traditionally dried by different methods (Sharma *et al.* 2013). Approximately, 16 percent 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). In the NER, dried fish constitutes a dominant portion of a standard diet in a given population, supplying a significant fraction of the protein source. Besides protein, dried fishes are a source of other nutritional compounds too. Fishes are dried in various ways by different ethnic groups and thus their smell, taste or texture varies from product to product. Due to the increasing popularity of dried fishes, scientific assessment of the quality aspects of the product is taking place world over. A good number of works on the biochemical composition of fishes have been done in Bangladesh by Rubbi *et al.*(1987); Mollah *et al.* (1998, 2000); Nurullah *et al.* (2002,2003); Islam *et al.* (2003); Mazumder *et al.* (2008); Flowra *et al.* (2012), etc. In India, Thapa *et al.* (2007); Sharma *et al.* (2013); Geetha *et al.* (2014), etc. has worked on quality aspects of traditionally fermented dried fish products. In various different countries like Nigeria, Mali, etc workers such as Zakhia *et al.* (1998); Akinola *et al.* (2006); Davies *et al.* (2009),etc have worked on the various preservation technologies for fish storage, giving quality assurance.

II. MATERIALS AND METHOD

A. Sample Collection

Dried fish species were collected from traditional dry fish markets of three different states of North East India namely, Assam, Arunachal Pradesh and Manipur. Seven numbers of traditionally dried fish species were collected from local producer cum traders of four local markets, namely, Dibrugarh, Barpeta, Bijni and Chaigaon of Assam. Two dried fish species were collected from the local market of Imphal, Manipur. One dried fish species was collected from local market of Naharlagun, Arunachal Pradesh. For each species, five samples were collected from various vendors of the same area. The fish samples were enumerated giving local name, scientific name and place of collection. The sampling sites are listed in table1. The collected dried fish samples were taken to the laboratory in airtight polythene bags and stored at 4°C for further biochemical investigations.

TABLE 1 SAMPLES WITH SAMPLING SITE

Samples	Collection sites
Bhokua (*Catla catla*)	Barpeta, Assam
Chanda (*Chanda ranga*)	Chaigaon, Assam
Dorikona Big (*Rasbora daniconius*)	Bizni, Assam
Goroi (*Channa punctatus*)	Dibrugarh, Assam
Mua (i) (*Amblypharyngodon mola*)	Barpeta, Assam
Mua (ii) (*Amblypharyngodon mola*)	Dibrugarh, Assam
Ngupi (*Tor tor*)	Nahalagun, Arunachal Pradesh
Phabaonga (*Puntius shalynius*)	Imphal, Manipur
Puthi (*Puntius chola*)	Dibrugarh, Assam
Ukabi (*Badis tuivaiei)*	Imphal, Manipur

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B. Biochemical analysis

Biochemical analysis such as moisture content, lipid content, ash content , pH were analysed according to AOAC, 1980.

1) Moisture content:

5g of dried fish sample was taken and kept at 105° C in the hot air oven until a constant weight is obtained. The difference in weight can be calculated and expressed as % moisture content of the sample. Percentage was calculated by the following formula:

Moisture % = (weight of tissue – dry weight of tissue) X100 / Weight of tissue

2) Protein content:

Protein content was determined by Lowry's method with slight modification (Lowry et al.1951). To a 10 mg of sample 1 ml of 1N NaOH was added for protein extraction in water bath for 30 minutes. Thereafter, it was cooled at room temperature and neutralized with 1 ml of 1N HCL. The extracted sample was centrifuged at 2000 rpm for 10 minutes, and an aliquot of the sample (1 ml) was further diluted with distilled water (1/9 v/v). From the diluted sample, 1 ml was taken and treated with 2.5 ml of mixed reagent (carbonate – tartarate – copper) and 0.5 ml of 1N Folin's reagent. After 30 minutes, sample absorbency was read at 750 nm using uv-vis spectrophotometer (EVOLUTION 201, Thermo Scientific) and results were expressed in percentage.

3) Lipid content:

3 gm of dried sample was extracted with petroleum ether in a Soxhlet apparatus for about 8 hours. After that the petroleum ether was removed by fractional distillation. The flask was dried at room temperature and the amount of lipid in the flask was calculated:

Percent lipid= weight of lipid / weight of sample × 100.

4) Ash content:

About 3-5g prepared sample was taken in a pre-weighed porcelain crucible and was placed in muffle furnace at 550°C for 6 hours. Then the crucibles were cooled in desiccators. After recording the weight of ash, the ash content of the sample can be computed as below:

Percent Ash content = Weight of ash / weight of sample × 100

5) Determination of pH: 1g sample was homogenized in 10 ml of distilled water and the mixture was filtered. The pH of the filtrate was measured using a pH meter (Cyberscan 510). (Farid *et al.*, 2014).

III. RESULTS AND DISCUSSION

A. Moisture content (%)

The highest moisture content was found as 7.818% in Phabaonga (*Puntius shalynius*) and the lowest was 2.772% in Goroi (*Channa punctatus*). Detailed moisture percentages in other species are shown in Fig. 1. According to Haque (2004), the sun dried fish normally contain an average of 10-20% moisture. Mansur *et al.* (2013) found that the moisture content had ranged from 19.17 to 23.12 in three selected dried fish species. The market samples of sun-dried *Gudusia chapra* had moisture ranging from 9.61 to 18.64% (Bhattacharya *et al.*, 1985). Azam *et al.* (2003) reported the range of moisture content of fourteen selected dried fishes to be 18.23 to 23.61%. In our study, the moisture content was found to be low despite of high relative humidity in North East India due to proper packaging and good storage facilities.

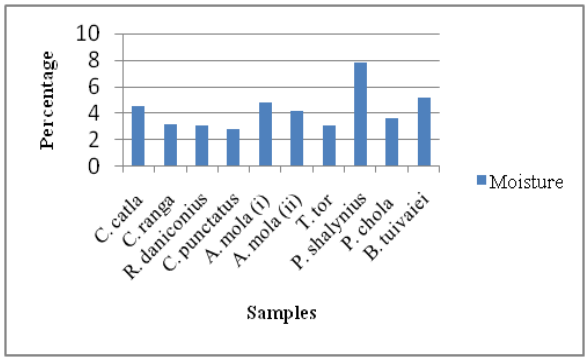

Fig.1: Moisture content of the ten dried fish species

B. Protein content (%)

Among the studied ten dried fishes, protein content varied between 56.84% (*P. shalynius*) and 27.46% (*B. tuivaiei*). The detailed results in other species are shown in fig. 2. Normally the sun-dried fishes contain 60 to 80% protein (Haque, 2004). Mansur et al. (2013) found the protein content ranged from 49.23 to 62.85% in three selected dried fish species. Rahman et al. observed protein content in dry fish in the range of 55.75-64.49%. Azam *et al.* (2003) found that the protein content varied between 40.69 to 66.52% in fourteen selected dried fish species. Higher percentage of protein is desirable, it being an important factor for quality assessment.

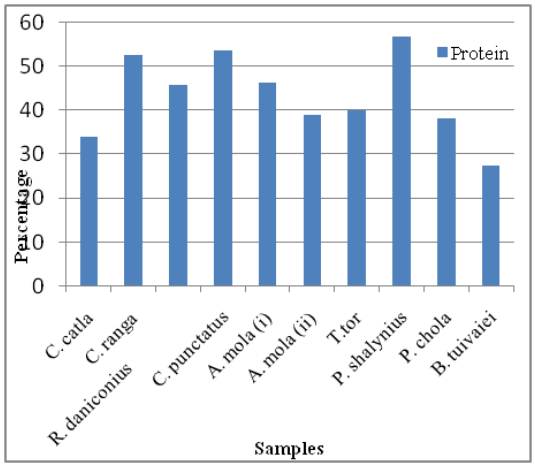

Fig. 2: Protein content (%) of ten dried fish species.

C. Lipid content (%)

The highest lipid content was found in *A. mola* (ii) to be 18.45% and lowest in *P. chola* to be 11.47%. The detailed percentages of the other dried fish are shown in Fig. 3. Azam *et al.* (2003) found the lipid content range from 97.7 to 26.13%. Islam *et al.* found lipid content in the range of 3.21 to 14.03% where the highest value was in *Amblypharyngodon mola* and the lowest in *Channa punctatus.* Geetha *et al.* reported the lipid content in the range of 0.65- 0.4% which differs significantly from our study.

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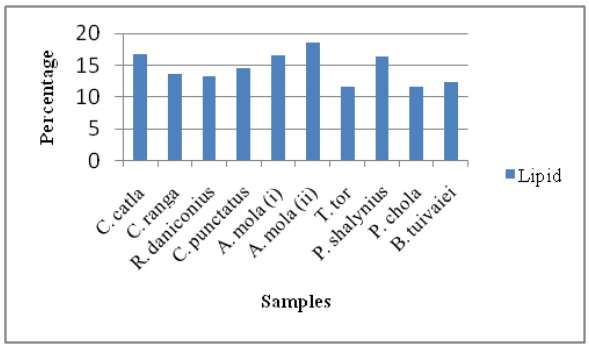

Fig. 3: Lipid content (%) of ten dried fish species.

D. Ash content (%)

The ash content among the dried fish ranged from 29.197 to 11.177. The highest value was found in *P. shalynius* and lowest was found in *T. Tor*. The detailed ash percentages of the species are shown in fig. 4. According to Hussain *et al.* (1992) the ash content ranged from 1.4-21.6%. Azam *et al.* (2003) found the range of ash content to be 5.08 to 12.14%. Islam *et al.* (2003) reported the ash content of *Cirrhina reba* to be 1.7%. Ash content describes the presence of minerals which indicates the importance of the species qualitatively and our report matches comparatively with other findings.

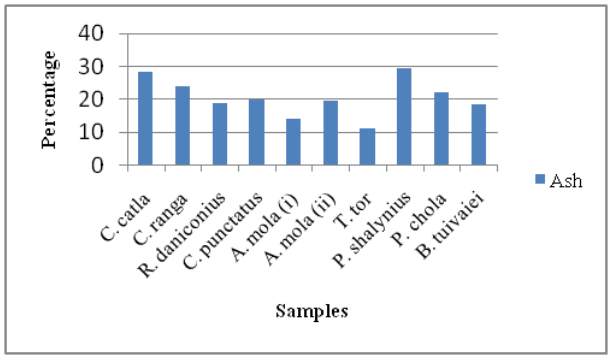

Fig. 4: Ash content (%) of ten dried fish species.

E. pH

The pH of the dried fish samples ranges from 6.23 to 8.33. The lowest pH was found in *C. Ranga* and the highest was found in *B. tuivaiei*. Farid *et al.* (2014) found the pH of fresh Shoal fish to be 6.9. According to Erkan *et al.* the accpetable pH limit lies within 6.8 and 7. But in the present study we found two species viz. *P. shalynius* and *B. tuivaiei* having pH 8.09 and 8.33 respectively. The detailed ph ranges of the ten species are shown in fig. 5.

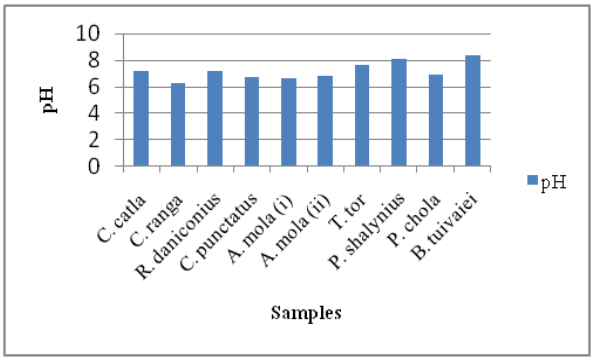

Fig. 5: pH of ten dried fish species.

F. Elemental analysis

Elemental analysis of the 10 dried fish species was done with the help of XRD. As a result the following elements viz. Fe, Ca, K, C, S, P, Si, Al, Mg, Na and O were detected in almost all the samples as shown in table 2. The presence of the elements in the dried fish species shows the importance of the product in accordance with the nutritional values.

TABLE 2 ELEMENTAL ANALYSIS OF THE TEN DRIED FISH SPECIES.

Samples	Elements Present										
	Fe	Ca	K	C	S	P	Si	Al	Mg	Na	O
C. catla	+	+	+	+	+	+	+	-	+	+	+
C. ranga	-	+	+	+	+	+	+	-	+	+	+
R. daniconius	+	+	+	+	+	+	+	+	+	+	+
C. punctatus	+	+	+	+	+	+	+	+	+	+	+
A. mola (i)	+	+	+	+	+	+	+	+	+	+	+
A.mola (ii)	+	+	+	+	+	+	+	+	+	+	+
T. tor	+	+	+	+	+	+	+	+	+	+	+
P. shalynius	+	+	+	+	+	+	+	+	+	+	+
P. chola	+	+	+	+	+	+	+	+	+	+	+
B. tuivaiei	+	+	+	+	+	+	+	+	+	+	+

'+' denotes presence of the element and '-' denotes absence of the element.

IV.CONCLUSION

The study was undertaken to analyse the various nutritional parameters of the ten selected dried fish species. Though the moisture content varied from species to species yet the result was satisfactory which indicates proper storage of the sample. The traditionally processed dried fish samples are prone to contamination due to its open access to fields and sand while drying which in return may affect in the increase of ash content. The percentage of protein content in the selected dried fish is quite satisfactory which indicates its high nutritive value. The lipid content as well is considerable. The elemental analysis showed the presence of almost all the important elements for maintaining a healthy diet. The study as a whole gives us the idea that dried fish can provide satisfactory nutrition if the product is not contaminated.

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