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BIOCHEMICAL ANALYSIS OF SOME DRIED SIS FISHES OF THE RIVER PADMA IN RAJSHAHI

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Abstract: Seven different species *viz. Chanda baculis, Chanda ranga, Amblypharyngodon mola, Oxygaster bacaila, Clupisoma atherinoides, Corica soborna, Mystus vittatus* and a group of mixed SIS fishes *viz. Mastacembelus pancalus, Xenntodon cancila, Chanda baculis* and *Glossogobius giuris* were used for preparation of dust which can be preserved for a time period. The fishes were sun dried or oven dried, which are also method of preservation. Quality of the oven-dried fish was better than that of the sun-dried fish, but sun-drying process is easy and can be used in large scale. The fish powder remained in good condition for 7-9 months at normal room temperature, but at -18°C the powder was in good condition throughout the year. Highest quantity of powder from 1 kg of fish was obtained in case of the mixed species as 24.61% and the lowest in *O. bacaila* which was 20.52%. Biochemical analysis showed that the maximum calcium content was found as 1.34% in *M. vittatus* and minimum was 0.80% in mixed SIS fishes. Maximum phosphorus content was 2.90% in *C. ranga* and minimum was 1.72% in *C. soborna*. Maximum iron content was found as 45.20 mg/100g in mixed SIS fishes and minimum was found as 16.85 mg/100g in *O. bacaila*. The maximum moisture content was found in *C. ranga* (13.50%) and the minimum in mixed SIS fishes (11.65%). The maximum protein content was recorded in the mixed SIS fishes (72.45%) and the minimum in *C. ranga* (52.65%). The experiment was replicated three times and conducted from July 2005 to July 2008.

Key words: Nutrient, biochemical, SIS, Padma.

mvivsk: `xN mgq msi¶‡Yi Rb¨ mvZvU wfb cRwZi *(Chanda baculis, Chanda ranga, Amblypharyngodon mola, Oxygaster bacaila, Clupisoma atherinoides, Corica soborna, Mystus vittatus)* Ges GK `j wgk †QvU gvQ *(Mastacembelus pancalus, Xenntodon cancila, Chanda baculis, Glossogobius giuris)* †bqv n‡qwQj | gvQ¸‡jv‡K c_‡g m‡hi Zv‡c Ges c‡i I‡fb G ïKv‡bv n‡qwQj | m‡hi Zv‡c ïKv‡bv c×wZ †ewk mnR Ges e¨vcK fv‡e e¨eüZ hvq| ïKv‡bv gvQ¸wj‡K ¸ov Kiv n‡qwQj | ¯vfweK K¶ Zvcgv‡Îvq 7-9 gvm fv‡jv _v‡K wKš Ñ18° †m. Zvcgv‡Îvq mviv eQi fv‡jv _v‡K| GK †KwR UvUKv gvQ †_‡K m‡ev"P cwigvY ¸ov cvIqv †M‡Q wgk cRwZ †_‡K 24.61% Ges mewbæ cvIqv †M‡Q *O. bacaila* †_‡K 20.52%| cvDWvi¸wji ^Reivmvqwb bK we‡klY †`Lvq †h me‡P‡q †ewk K¨vjwmqvg cvIqv †M‡Q *M. vittatus* G 1.34% Ges me‡P‡q Kg cvIqv †M‡Q 0.40% hv wgk gv‡Qi †¶‡Î| me‡P‡q †ewk dmdivm cvIqv †M‡Q 2.90% *C. ranga* †Z Ges Kg 1.72% *C. soborna* †Z| m‡ev"P Avqib cvIqv †M‡Q wgk gv‡Qi `‡j 16.85 mg/100g Ges Kg *O. bacaila* †Z hv 16.85 mg/100g| m‡ev"P Av`Zv cvIqv †M‡Q *C. tengra* †Z hv 13.50% Ges mewbg wgk gv‡Qi `‡j hv 11.65%| m‡ev"P †cwUb cvIqv †M‡Q wgk gv‡Qi `‡j hv 72.45% Ges mewbg cvIqv †M‡Q *C. ranga* †Z hv 52.65%| M‡elYwU RjvB 2005 n‡Z RjvB 2008 chš cwiPwjZ n‡qwQj|

Introduction

Throughout the world, it is well accepted that fishes are good sources of animal protein and other elements for the maintenance of healthy body (Andrew, 2001). Fish flesh contains up to 15-25% protein, 80% water, 1-2% mineral matter (CSIR, 1962). FAO 1991 report shows that fishes contain 72% water, 19% protein and 5% calcium. In terms of weight of food consumed, fish ranks third after rice and vegetables (Minkin *et al*., 1997 and Hels *et al*., 2002). The protein content of fishes ranges from 14 to 18g/100g raw edible parts (Darnton-Hill *et al*., 1988). From the last national survey in rural Bangladesh, the mean total protein intake was 48g/person/day, of which fish contributed 3g (Ahmad and Hassan, 1983). Besides protein source, small indigenous species (SIS) of fishes are also a rich source of vitamins and minerals, which is often overlooked in developing countries (Hossain and Afroze, 1991; Roos *et al*., 2007).

The Small Indigenous Species (SIS) of fishes in Bangladesh are generally considered to be those which grow to a length of approximately 5-15 cm at maturity (Felts *et al.* 1996). Detailed biological information of these species is scanty, but important data are available on culture and biology of Mola fish (*A. mola*) and some other related species. The SIS fishes have short life cycle and can grow in all types of inland water bodies. Because of overfishing in inland water bodies and habitat destruction, a number of small fishes are now under the threat of extinction. In Bangladesh 143

freshwater fish species are categorized as small indigenous fishes. In the past, these fishes were abundant in the rivers, beels, canals, streams and ponds. So, presently there is an urgent need to conserve the SIS fish and to increase their production through proper management of the water bodies of Bangladesh. Side by side these species should be introduced in the farming systems of the country.

Thilsted *et al.* (1997) and Roos *et al*. (2007) reported that vitamin A, calcium, iron and zinc are present in commonly consumed small fish species of Bangladesh. Very high content of vitamin A (500-1500 μg RE/100g raw edible parts) are obtained from Dhela (*Osteobrama cotio cotio*), Darkina (*Esomus danricus*), mola and chanda (*C. baculis*) (Roost *et al*., 2003). The sun-dried SIS fishes contain up to 60-80% protein (Hoq, 2004). A good number of works on nutrient composition of freshwater fishes of Bangladesh have been done by different researchers *viz.,* Gheyasuddin *et al.* (1979), Kamaluddin *et al.* (1977), Mazumder *et al.* (2008), Naser *et al.* (2007) and Rubbi *et al.* (1987) but very little attention has been paid on the proximate composition of nutrients which are present in dried fishes or dry fish dust.

Because the importance of SIS fishes is growing among all classes of consumers, some of these species are presently included in the aquaculture system. During the peak fishing time, when large quantities of SIS fishes are caught, these fishes are sun-dried. Major amount of these sun-dried SIS fishes are consumed inside the country and a smaller portion is exported. Owing to the lack of reports on the nutritional values of the dried fish, the present work was aimed at estimating the nutritional value of the dried fish dust and/or powder of some selected SIS fishes of the country.

Materials and Methods

Fish species used: Seven small fish species namely *Chanda baculis, Chanda ranga, Amblypharyngodon mola, Oxygaster bacaila, Clupisoma atherinoides, Corica soborna,* and *Mystus vittatus* were used separately. In addition, a group of mixed SIS fishes *viz. Mastacembelus pancalus, Xenntodon cancila, Chanda baculis, Glossogobius giuris* were also used in the experiment.

Collection of fish and estimation of the nutrient components: The experimental fishes were collected afresh from July 2005 to July 2008 from different fish markets of Rajshahi City Corporation and experimental ponds. Soon after collection, the fishes were brought to the Fisheries Research Laboratory, Department of Zoology, Rajshahi University, washed carefully with tap water and the waste materials were discarded. After cleaning the species were isolated and depending on size sun-dried up to 4-7 days under fly nets. Using an electric blender the dried fishes were then powdered species wise and kept in separate airtight glass containers with proper labeling. The biochemical tests of the powered samples were done in July 2008.

Calcium (%) was determined by precipitating method while phosphorous and iron were determined calorimetrically. Moisture content (%) was determined by drying the material at 110°C. Quantitative determination of protein was done following Kjeldhal method, and that of fat was done following the methods described by Cocks and van Reda (1966) and Mehlenbacher (1960). The biochemical analysis was done in the laboratory of the Institute of Food and Technology, Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka. The experiment was conducted during a period from July 2007 to July 2008.

Results and Discussion

Depending on the species, results showed a wide variation in proximate composition of calcium, phosphorous, iron, protein, fat and moisture present in the dried samples (Figs. 1a-1f). Among the mineral contents, calcium was found to range from 0.80% (mixed species) to 1.22% in *C. baculis*. The highest amount of phosphorus was found in *C. ranga* (2.90%) and the lowest was found in *C. soborna* (1.72%). Maximum amount of iron was found in mixed species (45.20/100g) and the least amount was found in *C. atherinoides* (16.85mg/100g). Moisture content was high in *C. ranga* (13.50%) and low in mixed species (11.65%). The highest percent of protein content was found in the mixed species (72.45%) and lowest was found in *C. ranga* (52.65%). The fat content was maximum (23%) in mixed species and minimum (12.66%) in *C. soborna*. The results revealed that *C. soborna* contained less fat and *Chanda* species were less proteneous compared to mola, tengra and gharua. *C. baculis*, *A. mola* and *M. vittatus* were rich in calcium. Phosphorous was minimum in *C. coborna* and *C. atherinoides*. Whereas, iron was less in *C. ranga* and *O. bacaila* compared to others. The percentage of moisture was more or less same in all the experimental fishes.

According to the works of Kamal *et al*. (2007), Mazumder *et al*. (2008) and Musa (2009) the nutritional values of the SIS fishes are richer compared to the larger fish species. As these fishes are caught from common property resources and 'Khash' (government owned) water bodies, provide an important source of income and nutrition for rural landless people (Mazumder and Lorenzen 1999).

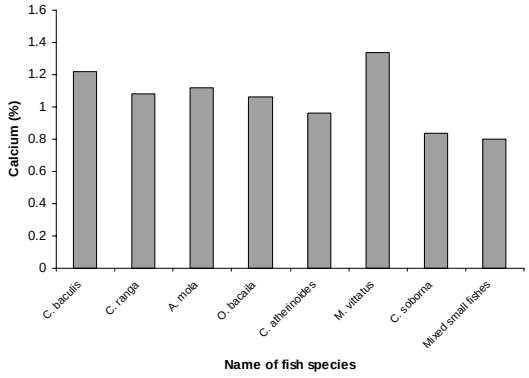

Fig. 1a. Percentage of calcium in the SIS fishes

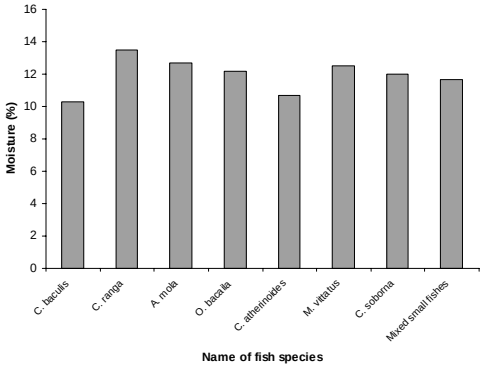

Fig. 1b. Percentage of moisture in the SIS fishes

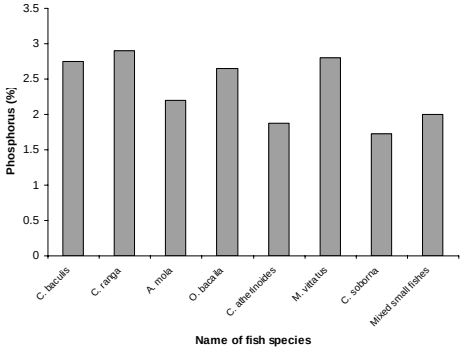

Fig. 1c. Percentage of phosphorus SIS fishes

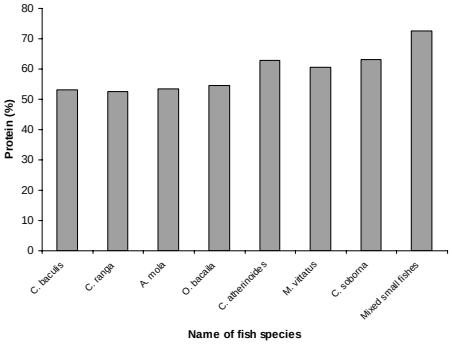

Fig. 1d. Percentage of protein in the SIS fishes.

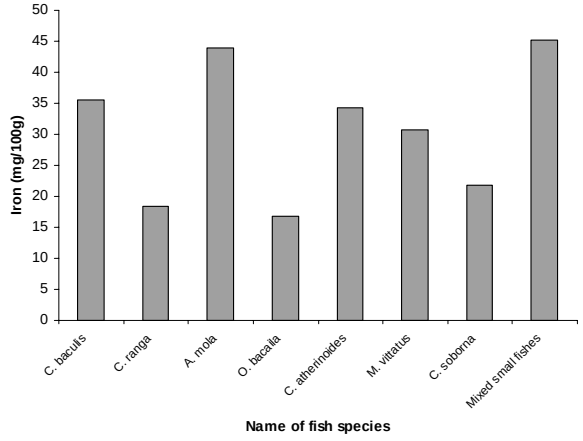

Fig. 1e. Percentage of Iron in the SIS fishes.

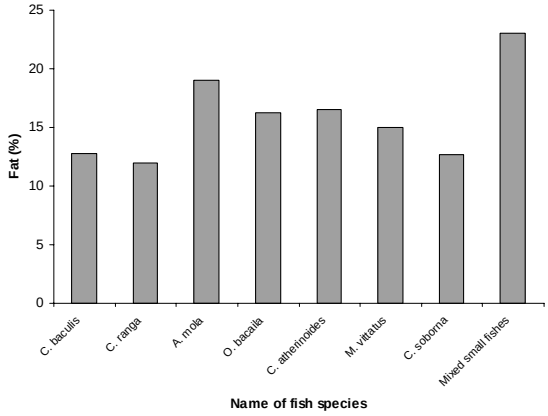

Fig. 1f. Percentage of fat in the SIS fishes.

The biochemical analysis of nutrient composition shows that the dried SIS fishes used in the experiments are rich in protein containing 52.66 to 72.45%; from 12-23% fat was obtained in these dry fishes. These dried fishes were also rich in iron and contained good amount of calcium and phosphorous. Calcium plays essential role in human body for the formation of bones muscle tone and nervous impulse (Mollah *et al*., 1998). It has been reported that *Cirrhina reba* contains 822 mg calcium/100g of fish (Islam *et al*., 2003), species like *Gudusia chapra*, *Channa punctatus* and *A. mola* contain 1063, 1093 and 1171 mg Ca/100g, respectively of raw edible parts (Roos *et al*., 2003). As SIS fishes are consumed totally along with bones, so there is no wastage of calcium from these fishes. Phosphorous is another essential nutritional element for human, which is also present at a high percentage in the tested fishes.

The moisture of all living systems contributes as much to the essential properties of life. After drying the moisture remained in the fish dust, which ranged from 11.65-13.50% in different species. More or less similar result was reported by Azam *et al.* (2003). The authors found in 14 dried fish species, moisture content varied from 18.23 to 23.61%. Saha (1999) also reported that sun-dried SIS fishes contained 36.50 to 82.80% moisture. Nurullah *et al.* (2003) reported that moisture ranged from 72.97 to 76.35% in six SIS fishes, the highest moisture content was in *G. chapra* and the lowest in *P. sarana*. Sun-dried *G. chapra* contains 9.61-18.64% moisture (Bhattacharyaya *et al*., 1985). Hoq (2004) reported that normally the sun-dried fishes contain an average of 10 to 20% moisture.

The mixed fish dust contained the highest percentage of protein (72.45%). Among the tested fishes *C. ranga* is less proteinous. Protein content varies among the species according to their food habit, and Azam *et al.* (2003) found that the values ranged from 6.52 to 40.69% in 14 species of dried fishes. Hoq (2004) concluded that normally the sun-dried fishes contain 60 to 80% protein. Fat content also varies among the species of SIS fishes. Hussain *et al.* (1992) obtained 3.7 to 17.8% fat in 23 sun-dried fish species. In the present experimental fishes more or less equal amount of fat was obtained. *C. soborna* contained the minimum fat (12.66%) whereas the dust of mixed species contained a higher percentage of fat (23%).

In present dried fishes were found to contain iron ranging from 16.85 mg/100g fish (*O. bacaila*) to 45.20 mg/100g fish (mixed species). Nurullah *et al*. (2003) reported that iron was present at a range from 14.50 to 42.20 mg/100 g of raw fish, and Chapila (*G. cahpra*) contained the highest amount of iron among the studied SIS fishes. *Esomus danricus*, *A. mola*, *G. chapra*, *M. vittatus*, etc. were rich in iron, but the SIS fishes normally present in the fish culture ponds of Bangladesh are low in iron and calcium content and NCR (Nutrient Contribution Ratio) value of these fishes were all low as <5% (Roos *et al*. 2003).

The results of the present study provided the information that the dried or powdered SIS fishes are equally nutritive as they are in fresh condition. The protein content was more than 50%, with rich supply of iron, calcium and phosphorous (the essential minerals for human growth and life). So, for the nutritional security, SIS fishes should be grown in every possible water bodies, and also along with the cultured fishes in the fish culture system. During the peak season (monsoon and post-monsoon), at distant rural areas of northern districts of Bangladesh, SIS fishes are captured at such an amount that a part of the catch were wasted because of their small size, soft body, absence of preservation method during transportation to a long way (Parween *et al*. 1997). In such circumstances these fishes can be sun-dried and stored, and consumed for longer period. Similar to fresh fishes, these dry SIS fishes will provide equal nutrition. So, SIS fishes in dry or fresh condition can play role in the nutritional security for the rural people of low income groups.

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