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Nutritional Quality Components of Indigenous Freshwater Fish Species, *Puntius Stigma* in Bangladesh

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Abstract:

Proximate biochemical compositions of body muscles of *Puntius stigma* (male and female) such as moisture, protein, lipid, ash and carbohydrate were determined in freshly caught fishes. Some mineral compositions, such as phosphorous, potassium, magnesium, calcium, zinc, copper, manganese and iron were also evaluated. Some amino acids were also detected during analysis. The moisture content 75.60% was found to be higher in female, while protein 21.50%, fat 2.70%, ash 1.90% and carbohydrate contents of 1.55% were higher in male. In protein analysis of two fishes (male and female), most of the minerals were found in higher in male. But manganese and iron were lower in male. Essential amino acids were also estimated. Nutritional values were higher in males than in females. Overall, the fish has a high nutritional value in terms of protein, fat, vitamin and minerals, which are not common in other foods in Bangladesh.

Key words: *Puntius stigma*, Nutritional value, Freshwater fish species.

Introduction

Small sized indigenous fishes are a valuable and easily available source of food rich in protein, oil and minerals for the rural people in Bangladesh (Felts *et al.*, 1996). The poor rural people including children generally catch small fishes from the natural waters for their meals. About 80% of the population is poor and they mainly depend on small fish for their source of animal protein (Siddiqui, 1985).

Thilsted *et al.* (1997) reported that many nutrients such as vitamin A and C, iron, calcium, zinc and iodine which are not found in rice and have to be obtained from other sources. Small fish which are usually eaten whole with the organs and bones contain large amounts of calcium and possibly iron and zinc. Small fishes play a vital role in diet and economy of rural poor people in Bangladesh. Recent research has highlighted the importance of self-recruiting species in both natural and managed habitats to the livelihoods of the rural poor (Roos *et al.*, 1999; Mazumder and Lorenzen, 1999). To evaluate the nutritional and freshness quality, it is essential to gather information on biochemical composition. There are some information on the biochemical and nutritional studies on some freshwater fish species (Khuda *et al.*, 1960, 1962; Gheysuddin *et al.*, 1979; Gheysuddin and Shaik, 1980; Kamaluddin *et al.*, 1977). In addition, considerable studies have been made on *Macrogonathus aculeatus* (Nabi and

Hossain, 1980), *Oreochromis nilotica* (Ahmed *et al.*, 1981) and *Cirrhina reba* (Islam *et al.*, 2003). The available information suggests that small indigenous fishes also contain large amount of vitamin A (Thilsted *et al.*, 1997).

In spite of huge amount of fish protein consumption, there is no available report on the nutritive or caloric values of fishes. This fish is available in lentic, lotic and even floodplain habitats. The present study, describes the nutritive value and food quality of *Puntius stigma*.

Materials And Methods

Fresh samples of *Puntius stigma* were collected from January, 2005 to December, 2006 from Shaheb bazaar fish market of Rajshahi. Determination of moisture content was done following the conventional procedure and lipid was determined by the method of Bligh and Dyer (1959). Carbohydrate was estimated by Anthrone method, ash content was determined following the method of Jayaraman (1985), protein content was determined by the micro Kjeldahl method.

In the present study, mineral analysis was made from the samples taken from the whole fish. Macro and micro nutrient compositions of fresh fish samples were determined

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using Perkin-Elmer 2380 Atomic Absorption Spectrophotometer following modified method of Cresser and Parson (1979). Amino acid analysis was done following the methods of Bidlingmeyer *et al.* (1994) using column from waters corporation (catalogue # 10950).

Results and Discussion

The biochemical composition was done on various tissues such as dorsal and ventral muscles of both male and female fishes of *Puntius stigma*. The major component of fish fillets is water. Generally, the body composition of fish seems to depend on age, sex, seasons and diet (FAO, 1995; Love, 1970). Lipid and proteins are used as a source of energy. It was also reported that changes in body components during starvation are dependent upon water, temperature, season, reproduction stage and age (Muir and Niimi, 1972).

Proximate composition

Results of proximate analyses of *Puntius stigma* are presented in Table I.

and average value was 21.33% in case of female. The protein content was also highest in the ventral region than the dorsal in both male and female *P. stigma*. The average protein content was found higher in males than in females.

Fish lipid contains poly-saturated fatty acids which transports the cholesterol from the blood and save the cardiovascular system in human body. Table I shows the fat contents of *P. stigma* in the dorsal and ventral portions were 2.70% and 8.48% respectively, with an average of 5.59% in case of male. In case of female, average fat content was lower compared to male and it was 4.13%.

Ash content of *P. stigma* in the dorsal and ventral portions were 1.90% and 1.12% respectively having average value of 1.51% for male. In case of female, the ash content was higher in the dorsal region and it was 1.30% but lower in ventral region having 1.20% with an average of 1.25%.

Carbohydrate contents of *P. stigma* is also higher in males than the females. Fish flesh contains minerals like K, P, Mg, Ca, Zn, Cu, Mn, Fe etc. which play crucial roles in our body-

Table I. Comparative proximate composition in different parts of *P. stigma* (male and female).

Components	Male			Female		
	Dorsal region	Ventral region	Average \pm SD	Dorsal region	Ventral region	Average \pm SD
Moisture (%)	72.45	64.75	68.60 \pm 5.44	75.60	69.35	72.47 \pm 4.42
Protein (%)	21.50	24.62	23.06 \pm 2.21	20.15	22.52	21.33 \pm 1.68
Fat (%)	2.70	8.48	5.59 \pm 4.09	2.35	5.91	4.13 \pm 2.52
Ash (%)	1.90	1.12	1.51 \pm 0.55	1.30	1.20	1.25 \pm 0.07
Carbohydrate (%)	1.55	1.05	1.30 \pm 0.35	0.06	1.02	0.54 \pm 0.68

The moisture content of fish fillet was estimated. The moisture contents of dorsal and ventral regions were 72.45% and 64.75% respectively and the average moisture content was about 68.60% in case of male. It was found that the amount of moisture was higher in dorsal region than that of the ventral region. The average moisture of *P. stigma* in case of female was 72.47% which was higher than *P. stigma* (male) with 75.60% and 69.35% in dorsal and ventral regions respectively.

In the present study, the protein contents in dorsal and ventral region were 21.50% and 24.62% respectively and average value was 23.02% in case of male fish. The protein content was therefore higher in the ventral region than that of the dorsal region. On the other hand, protein content in dorsal and ventral regions were 20.15% and 22.52% respectively

metabolism. Calcium and phosphorus are essential elements for formation of bone and teeth. Iron is necessary component for the formation of haemoglobin, which is required to form red blood cells. Table II shows the minerals present (dorsal and ventral) such as Potassium (K), Magnesium (Mg), Calcium (Ca), Phosphorous (P), Zinc (Zn), Copper (Cu) are higher in males than those of females. Manganese and iron are lower in males.

Essential amino acid composition of male and female fishes are shown in Table III. The essential amino acids in both males and females were determined. In the male, the amount of essential amino acids were 3.10%, 6.57%, 1.62%, 3.24%, 2.11%, 2.31%, 1.54%, 2.91%, 2.51%, 1.39%, 2.24%, 1.24%, 0.67%, 2.02%, 3.11%, 1.90% and 3.41% for aspartic acid, glutamic acid, serine, glycine, histidine, arginine, threonine,

Table II. Comparative mineral contents of *P. stigma* (mg/100g).

Sex of the species	K	P	Mg	Ca	Zn	Cu	Mn	Fe
Male	719	251	142	156	22.80	4.38	8.50	29.30
Female	655	240	108	120	18.30	3.90	10.56	38.60

Table III. Amino acid compositions of *P. stigma* (g/100g).

Names of Amino acid	Male	Female
Aspartic acid	3.10	2.80
Glutamic acid	6.57	5.76
Serine	1.62	1.30
Glycine	3.24	3.22
Histidine	2.11	1.11
Arginine	2.31	2.27
Threonine	1.54	1.68
Alanine	2.91	2.88
Proline	2.51	2.31
Tyrosine	1.39	1.60
Valine	2.24	2.24
Methionine	1.24	1.22
Cysteine	0.67	0.24
Isoleucine	2.02	2.02
Leucine	3.11	3.00
Phenyl amine	1.90	1.85
Lysine	3.41	3.36

alanine, proline, tyrosine, valine, methionine, cysteine, isoleucine, leucine, phenyl amine and lysine respectively. In the female fish, the amount of essential amino acids were 2.80%, 5.76%, 1.30%, 3.22%, 1.11%, 2.27%, 1.68%, 2.88%, 2.31%, 1.60%, 2.24%, 1.22%, 0.24%, 2.02%, 3.00%, 1.85% and 3.36% for aspartic acid, glutamic acid, serine, glycine, histidine, arginine, threonine, alanine, proline, tyrosine, valine, methionine, cysteine, isoleucine, leucine, phenyl amine and lysine respectively which showed higher level of glutamic acid and lower level of cysteine than males. The essential amino acid spectrum is an index of biological value of the fish protein. Both male and female fishes are important nutritionally because of their relatively higher amount of fat and protein contents.

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