



NUTRITIVE VALUES OF TWO INDIGENOUS COBITID FISHES *BOTIA BERDMOREI* AND *LEPIDOCEPHALUS GUNTEA* OF MANIPUR

CH. Sarojnalini

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CH. SAROJNALINI

Department of Life Sciences

Manipur University, Canchipur, Imphal - 795 003

E- mail: sarojnalini_ch@yahoo.com

ABSTRACT

Nutritive value of *Botia berdmorei* and *Lepidocephalus guntea*, endemic in the water bodies of Manipur (India) has been studied. Higher crude protein and calcium were in *Botia berdmorei*, Iron, Ash and lipid were higher in *Lepidocephalus guntea*. Digestibility in vitro showed that pepsin + trypsin digested 92.02% for *Botia* and 96.43% of *L. guntea*. The enzyme digest of *Botia* contained 6 essential amino acids and 7 essential amino acids in *L. guntea*. The species specific nutritional value of common indigenous species to regions where the populations are highly dependent on fish in their diets indicates that the conservation of biodiversity in these environments is important and can be contribute towards improved nutrition.

INTRODUCTION

Many native species have a high regional importance. Some of these species have high local demand and supply form capture fishery is very limited. Aquaculture of native species appeals to those involved in conservation of these species and those concerned with the ecological damage due to exotic species establishment. In contrast to India, there has been an organized and serious effort for development of native species aquaculture in other countries. A number of native finfish species have been identified by the country as suitable for extensive and intensive culture. The stock is left to grow on its own, utilizing natural food sources. Attempts are now being made to culture these fishes.

It was generally accepted in the nutrition sector that small indigenous fish species made up the greater part of the fish intake especially among the rural poor and there were large seasonal variations on the intake of small indigenous fish species. Fish is also a dietary source of other important nutrients small fish which are eaten with bones are a valuable source of highly bioavailability calcium (Larsen *et al.*, 2000). Small indigenous fish is an important source of vitamin A, as well as calcium in poor rural house holds (Roos *et al.*, 2003) Iron content in small fish species from Bangladesh and Cambodia range from 2-7 mg/100g.

Small-sized varieties of fish are not readily acceptable to consumers because of low meat yield bony nature and poor taste (Sarojnalini and Vishwanath, 1988). Such fish offer minerals in their edible forms more abundantly than large sized fishes do (Higashi, 1962). In Manipur any type of fish big or small including small sized cobitids are consumed either in fresh or processed forms. *Botia berdmorei* and *Lepidocephalus guntea* are riverine cobitid fishes, which is endemic in fresh water bodies of Manipur. These fishes have a special taste of each own. A good food fish and a potential aquarium fish also. They were chiefly available in Imphal market of Manipur in 1980's, but now it is verse of extinction.

During the past two decades there has been an increasing trend towards culture of Indian major carps and exotic carps as a result of the initiative taken by the state Fisheries Department to boost the fish production (Chaudhuri and Bannerjee, 1965). However, the distinguished taste and flavour of indigenous fishes of Manipur *Botia berdmorei* and *Lepidocephalus guntea*, endemic in this area are still very highly esteemed. Attempts are being made to culture these fishes. This paper reports the results of investigations of the nutritive quality of the two indigenous fishes of Manipur.

MATERIALS AND METHODS

Lepidocephalus guntea

Fish measuring 6.0 – 8.0 cm in standard length were collected from the Imphal River in the months of September to December using a dip net (Manipuri: Nupi eel).

Botia berdmorei

The fishes for study were processed from the Kharungpat and Ithai Barrage areas in the months of September to December. A sized of 6.0-6.9 cm in standard length and 3.2 – 4.0 g weight were packed in ice in wide mounted thermoflasks and then brought to the laboratory.

Biochemical analysis

Total N, moisture and lipid contents were estimated following AOAC methods (1975). Total ash content was estimated by igniting a sample at 1550°C for 2 hr. Calcium was estimated by standard methods (ISI, 1982). Iron content by the modified method of Wong. Carbohydrate was estimated using anthrone method (Dubois *et al.*, 1951).

Digestibility *in vitro*

Defatted and moisture free samples were taken, in each of which 1g of powdered sample and 150 mL of 0.2% pepsin (activity 1:10,000) were put. The flasks were bated at $40 \pm 1^\circ\text{C}$ for 2 hr with constant shaking in a metabolic shaker. At the end of 2 hr all the flasks were removed. These flasks out of six were taken.

The contents were adjusted to pH 8.2 with 1 N NaOH and then 0.3g of trypsin (Activity 1:250) was added to each. Incubation was continued for another 22 hr. The suspensions, after digestion were centrifuged at 3000 rpm for 20 min. Digestible N was estimated from supernatants. Digestible protein in pepsin phase, and combined pepsin and trypsin digestions, were expressed as percentages of total protein of the sample. The results were compared with that of Casein, processed as described above (Singh *et al.*, 1990).

Amino acids in the pepsin and pepsin + trypsin digest were separated in two dimensional TLC using 0.25 mm thick Silica Gel G plates and were identified using *rf* values of standard amino acids run previously in the same condition.

RESULTS AND DISCUSSION

Biochemical composition of the two fishes are shown in Table 1. Protein contents of the present fishes are comparable with those of other freshwater fishes of India (Sarojnalini and Vishwanath, 1988). Total lipid contents of the fishes were generally high, ranging from 7.05 in *Botia berdmorei* to 11.40 in *Lepidocephalus guntea*. Lipid contents of the fishes are much above the average value. This might be related to the food availability and food habits of the fishes. It is also believed that in winter months are more tasty. Muscle lipid contents in freshwater fishes of India are reported to be higher on November to December (Jafri, 1948 abc). The calcium and iron contents are considerable.

Table 2 shows the digestibility *in vitro* digestibility of casein and fish samples by pepsin and pepsin + trypsin *in vitro*. The fish were more digested (88.22) in the pepsin phase whereas this was less on the case of *L. guntea* (80.20). However, over all casein was more digestible than any of the fish samples in pepsin +

Table 1: Biochemical composition

Species	Total protein %	Total lipid %	Moisture %	Carbohy-drate %	Ash %	Iron	Calcium
<i>Botia berdmorei</i>	18.21±0.55	7.05±0.66	71.50±0.65	0.12±0.01	8.12±4.05	13.3±0.01	40.30±0.01
<i>Lepidocephalus guntea</i>	17.60±0.94	17.40±1.02	75.43±0.99	0.12±0.004	9.20±0.03	18.21±0.03	38.10±0.01

Table 2: Digestibility of protein *in vitro*

Sample	Digestibility of protein (%)	
	Pepsin action	Pepsin + Trypsin action
<i>Casein</i>	88.00±0.70	98.03±0.33
<i>Botia berdmorei</i>	88.99±0.10	92.02±0.27
<i>Lepidocephalus guntea</i>	92.30±0.21	96.43±0.44

Results are mean ± SD of 6 samples.

Table 3: Amino acids liberated from fish protein in enzyme actions

Amino acids	<i>Botia berdmorei</i>		<i>Lepidocephalus guneta</i>	
	Pepsin	Pepsin + trypsin	Pepsin	Pepsin + trypsin
Leucin	-	-	+	+
Phenyl alanine	+	+	+	+
Valine	+	+	+	+
Methionine	+	+	+	+
Butyric acid	+	+	+	+
Alanine	-	-	-	-
Threonine	+	+	+	+
Tyrosine	+	+	+	+
Glutamic acid	-	-	-	-
Glycine	-	-	-	-
Arginine	+	+	+	+
Serine	+	+	-	-
Aspertic acid	-	-	-	-
Histidine	-	+	-	+
Lysine	+	+	+	+
Cystine	-	-	+	+

trypsin. *L. guntea* compared to *Botia* has more bones and low flesh content as the whole body of the fish was taken. Valanju and Sohoni (1957) carried out the in vitro digestibility of fish proteins by subjecting them to action of pepsin and combined action of pepsin + trypsin. They also added that all the essential amino acids are liberated from fish protein in the course of digestion. In present analysis 4 essential amino acids, viz. phenylalanine, valine, lysine, Histidine were readily liberated on pepsin hydrolysis. Valanju and Sohoni (1957) reported that arginine was readily released in case of Bombay fish but it was not detected in *B. berdmorei* and *L. guntea*. As much as six essential amino acids were liberated in pepsin + trypsin digest of present study (Table 3). The amino acid composition is directly correlated to its nutritive value. Thus, a qualitative and quantitative study of amino acids liberated would provide us a better picture of the protein quality of fish.

The traditional consumption of small fishes as whole body including head intact and therefore as an edible part has a nutritional advantage as more iron is made available in the diet. The head of the fish may also contribute to other nutrients in the diet. It has previously been found that the Bangladeshi small indigenous fish species. *A. mola* is very rich in vit. A., with more than half of the vit-A located in the eyes (Roos *et al*., 2002).

So we need to conserve the small indigenous fishes. Promotion of native species for aquaculture would require a specific policy by the government and the various research and development agencies, need to coordinate their efforts in this regard. Habitat restoration and management is a major goal in the conservation of most species and communities. Enormous damage has been done to many fish habitats and the situation is often not easy to reserve especially in the short term where fish species or communities are severely threatened in many cases, potentially unique stories have completely disappeared.

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