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Protein and Mineral Compositions of Some Local Fishes of Tripura, India

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ABSTRACT

In this study, eight fish species namely, *A. mola*, *E. danricus*, *P. sophore*, *C. fasciata*, *L. bata*, *C. catla*, *L. rohita* and *C. mrigala* from Tripura were analyzed for protein and mineral compositions in their dried form as limited study is available in this line. The specimens were collected live, processed and oven-dried before analysing them in triplicate using standard procedures. All fishes irrespective of major, medium and small indigenous species were found nutritive even in their dried state. Protein and mineral contents showed significant variations among the species. Protein content varied from 39.37% (*C. lalia*) to 75.43% (*L. bata*). Phosphorus content varied from 0.09% (*P. sophore*) to 0.54% (*C. fasciata*), potassium from 0.28% (*C. fasciata*) to 0.95% (*P. sophore*) and calcium from 0.06% (*Labeo* species) to 1.66% (*C. fasciata*). Copper content was found from 16.1 mg/kg (*P. sophore*) to 273.9 mg/kg (*C. mrigala*), zinc from 23.5 mg/kg (*L. rohita*) to 154.4 mg/kg (*E. danricus*), iron from 91.8 mg/kg (*C. catla*) to 997.7 mg/kg (*C. fasciata*) and manganese from 3.9 mg/kg (*L. rohita*) to 51.4 mg/kg (*C. fasciata*). Moisture content was the highest in *C. fasciata* (14.17%) whereas, *L. bata* and *C. catla* showed the least amount (11.17%).

Keywords: Protein and mineral content of fish, Indian major carps, medium carp, small indigenous species

INTRODUCTION

Fish is the third largest commodity consumed globally after rice and vegetables (Hels et al. 2002). Fish provides protein and other essential nutrients for the maintenance of a healthy body (Andrew 2001). Like other countries, it contributes significantly to the livelihood baskets in India. Tripura, a state of North-East India, is known to be the highest per-capita fish consumer among the inland states of the country. With nearly 95% population being fish eater, there is a huge demand for any form of fish. Local fish namely, Indian major carps and *Labeo bata* enjoys the premium because of their taste, ready availability and market price. Small indigenous species (SIS) which are nutrient-dense and often overlooked in developing nations (Roos et al. 2007), abound in it together. Earlier, they were said to be miscellaneous fish, but nowadays, it is admired in all classes of society. Some of them are presently included in organized farming as well. To know proximate composition of fish is of utmost importance from public health point of view and to understand the condition of fish. Many workers have studied fish biochemically, but yet, no published information is available on nutritive values of fishes of Tripura. Therefore, this study was undertaken on some popular local fishes of Tripura to see their nutrient contents.

MATERIALS AND METHODS

The study was done in the ICAR Research Complex for NEH Region, Tripura Centre during the pre-monsoon months. Eight fish species, namely

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Amblypharyngodon mola (Hamilton), *Esomus danricus* (Hamilton), *Puntius sophore* (Hamilton), *Colisa fasciata* (Bloch & Schneider), *Labeo bata* (Hamilton), *Catla catla* (Hamilton), *Labeo rohita* (Hamilton) and *Cirrhinus mrigala* (Hamilton) were analysed for this study. Thirty individuals of each specimen of *catla*, *rohu*, *mrigal* and *bata*, and one kilogram each of *mola*, *darkina*, *puti* and *colisa* were collected live locally and were washed with tap water, degutted and dried in an oven at $60-70^0$C for 4-7 days until the samples weighed constantly. Then, they were packed separately in polyethelene bags until further analysis. Moisture was analyzed by drying the samples in a hot air oven (NSW 143) at 105^0C to constant weight, whereas, Kjeldahl method (N x 6.25) using an automatic kjeldahl system (Pelican, Kel Plus) was employed for protein estimation. Potassium was determined by flame photometer (Systronics flame photometer 130) and phosphorus by phosphor-vanadomolybdate method. Calcium, copper, zinc, iron, and manganese contents were determined in a semi-automated atomic absorption spectrophotometer (GBC 932 plus). All tests were performed in triplicate. Data were analysed in SPSS 11.5 using one-way ANOVA and compared by Duncun post-hoc analysis to find out the differences in mean values of proximate contents in different species at 5% significance level.

RESULTS AND DISCUSSION

The study demonstrated the protein and mineral contents of some of the local fish species of Tripura. All the fish species were found nutritionally competitive even in their dried state irrespective of major carps, medium carp and small indigenous species (Fig. 1- 9). Moisture content varied from 11.17% (*L. bata* and *C. catla*) to 14.17% (*C. fasciata*); protein from 39.37% (*C. lalia*) to 75.43% (*L. bata*). Among the macro-minerals, phosphorus varied from 0.09% (*P. sophore*) to 0.54% (*C. fasciata*), potassium from 0.28% (*C. fasciata*) to 0.95% (*P. sophore*) and calcium 0.06% (*Labeo* species) to 1.66% (*C. fasciata*). Among the micro-minerals, copper ranged from 16.1 mg/kg (*P. sophore*) to 273.9 mg/kg (*C. mrigala*), zinc from 23.5 mg/kg (*L. rohita*) to 154.4 mg/kg (*E. danricus*), iron from 91.8 mg/kg (*C. catla*) to 997.7 mg/kg (*C. fasciata*) and manganese from 3.9 mg/kg (*L. rohita*) to 51.4 mg/kg (*C. fasciata*).

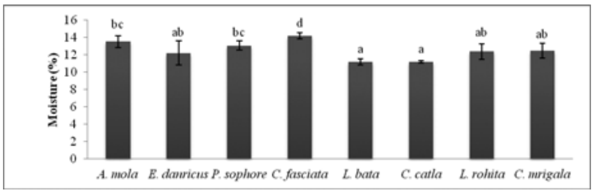

Fig. 1: Moisture content (%) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

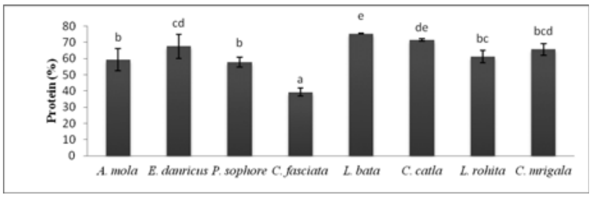

Fig. 2: Protein content (%) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

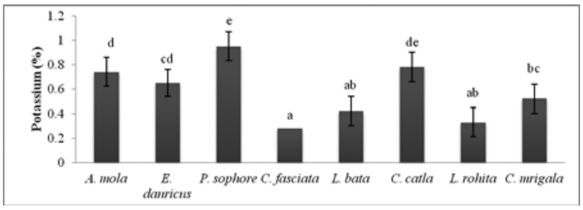

Fig. 3: Potassium content (%) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

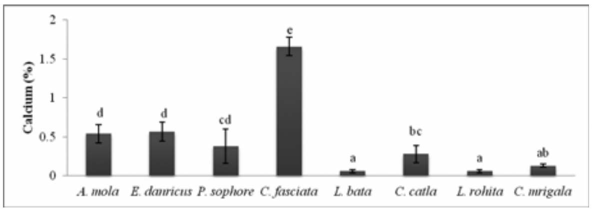

Fig. 4: Calcium content (%) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

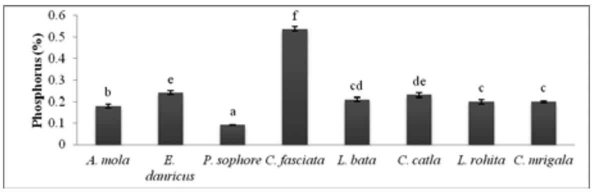

Fig. 5: Phosphorus content (%) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

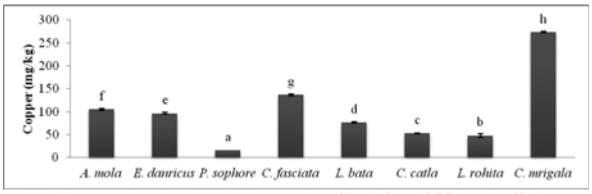

Fig. 6: Copper content (mg/kg) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

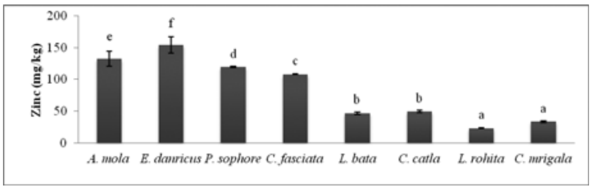

Fig. 7: Zn content (mg/kg) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

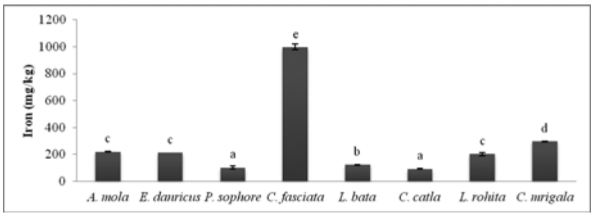

Fig. 8: Iron content (mg/kg) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

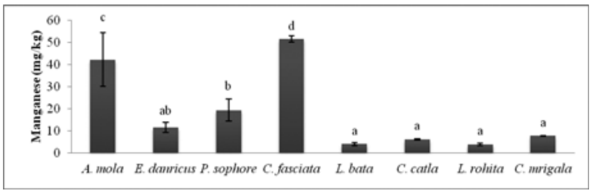

Fig. 9: Manganese content (mg/kg) in different fish species. Species-wise bar bearing different alphabet are significantly different (p=0.05)

In general, fish is said to be an excellent source of protein and minerals. The wide arrays of results detected in this study have attested the same. However, the contents varied in their concentrations when compared with earlier reports in the identicle line (Hei and Sarojnalini 2012; Effiong and Fakunle 2011; Sultana et al. 2011; Kabahenda et al. 2011; Onyia et al. 2010; Pirestani et al. 2009; Fawole et al. 2007; Hoq 2004). This variation can be due to differences in environmental conditions, age and size of fish, season of sample collection, food availability, etc. (Reinitz 1983; Abdullahi 2001; Effiong and Mohammed 2008).

Mineral contents of fish, in particular, make fish unavoidable as healthy diet (Eyo 2001). Mineral contents in fish depend on its availability in their environment followed by diet absorptive capability and preferential accumulation of same by the fish (Windom et al. 1987; Ibiyo et al. 2006; Adewoye and Omotosho 1997). Minerals play numerous roles. Calcium and phosphorus together help in skeleton formation. Phosphorous helps in the activity of adinosine polyphosphates and phospholipids (Nair and Mathew 2001). Potassium helps in normal functioning of nerves, muscle and heart, sugar metabolism, acid-base balance, oxygen metabolism in the brain. Copper acts as a part of several enzyme systems, including cytochrome oxidase and tyrosinase. With iron, copper catalyses oxidation-reduction mechanisms and tissue respiration. Numerous aspects of cellular metabolism are zinc dependent. Iron prevents anaemia (Demirezen 2006) and fish is one of the major sources of iron for adults and children. Manganese is needed for growth and good health, and its deficiency can cause nervous problems (Demirezen 2006).

Hence, the study concluded that the local fishes of Tripura are rich in nutrients and can ensure nutritional security even in their dried state. Small indigenous species are equally competitive; therefore, they can be recommended in every possible way. In some cases, if they are excessively produced and a part of it is wasted because of their smaller size, soft body, and absence of preservation methods, they can be dried and stored for off-season use as they can provide nutrition similar to fresh fishes. These indigenous fishes can improve the nutritional security of low-income groups. In this study, we focused only on selected elements in fish, and their high levels indicated that they also would be rich in other nutrients, which are expected to be high in fish.

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