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Studies on seasonal variations in four inorganic elements in muscle tissue of *Xenentodon cancila* (Hamilton-Buchanan 1822) from Mehadrigedda reservoir of Visakhapatnam, India

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Abstract:

Concentration of four inorganic elements calcium, phosphorus, iron and copper were estimated in the muscle of Xenentodon cancila from Mehadrigedda reservoir during pre-monsoon, monsoon and post-monsoon seasons. The composition of calcium was 0.51, 0.56, 0.59, phosphorus 0.88, 0.85, 0.89, iron 0.34, 0.36, 0.39, and copper 0.03, 0.03, 0.04 respectively in pre-monsoon, monsoon and post-monsoon seasons. The fish has abundant amount of Ca and P, whereas, Cu and Fe were in trace amounts.

Key words: Muscle, calcium, phosphorus, copper, iron, *Xenentodon cancila*

Introduction

The studies on inorganic elements present in living organisms have biological importance since, they involve in metabolic processes and are known to be indispensible (Shulman, 1974). Phosphorus is a mineral essential for normal growth, bone

mineralization, reproduction and energy metabolism in fish (Albrektsen, et al., 2009). The ratio of Ca/P is the important indicator for healthy bone (Haram et al, 2013; Celik and Oehlenschlager 2004).Composition of elements play major role in several physiological processes and are directly involved in the development and maintenance of the skeletal system (Andem and Ekpo, 2014). The most significant mineral salts are calcium, phosphorous and iron, which are required for all living organisms. According to FAO (2008) fish provides 20% of animal protein intake to about 2.6 billion people globally and at least 50% of animal protein intake for over 400 million in Asia and Africa. Hence, the present study was conducted to assess the composition of four inorganic elements in the muscle of freshwater fish, *X. cancila* from Mehadrigedda reservoir.

Material and methods

The fishes were collected at monthly intervals from Mehadrigedda reservoir and their body weight and length were recorded. For the purpose of analysis, flesh of various portions were dissected aseptically and kept in oven for dehydration at 50-100˚C temperature for 8-10 hours. The dried flesh samples were ashed at 400˚C in a muffle furnace and was analysed for four inorganic elements i.e. calcium, phosphorus, copper and iron. Methodology for the estimations was carried out by titrimetric method of Clark and Collip (1925) for calcium, Simonsen et al., (1946) for phosphorus, Ventura and King (1951) for copper and San Yin Wong (1928) for Iron. For standard statistical analysis, eight samples were taken for each element in each season.

Results and discussion

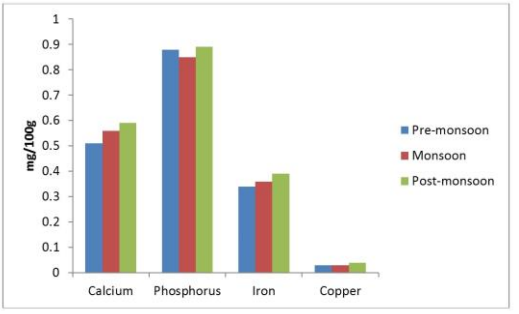
The mineral composition of muscle of *X. cancila* was assessed from April 2013 to March 2014 and is displayed in Table 1and graph 1. Significant differences ($P < 0.05$) were found in calcium, phosphorus, iron and copper concentrations. The results were found as, calcium 0.51, 0.56, 0.59, phosphorus 0.88, 0.85, 0.89, iron 0.34, 0.36, 0.39 and copper 0.03, 0.03, 0.04 respectively in pre-monsoon, monsoon and post-monsoon seasons.

Table 1. Mineral composition (mg/ 100g, dry weight) of *X. cancila*.

Mineral	Pre-monsoon	Monsoon	Post-monsoon
Calcium	0.51±0.050	0.56±0.050	0.59±0.060
Phosphorus	0.88±0.070	0.85±0.080	0.89±0.090
Iron	0.34±0.029	0.36±0.029	0.39±0.040
Copper	0.03±0.002	0.03±0.002	0.04±0.003

Values are mean ± SD (P< 0.05)

Fig 1. Mineral composition (mg/ 100g dry weight) of *X. cancila*.



Fish is an important source of protein for humans and provides essential fatty acids that reduce the risk of heart diseases. It contributes to lower cholesterol levels in blood and provides vitamins and minerals (Al-Busaidi et al., 2011).

The highest content of Ca (0.59 mg/100g) and P (0.89mg/100g) was observed during post-monsoon season. The present values were lower than those reported in *Clarias*

gariepinus, Oreochromis niloticus, Lates niloticus, Bagrus bayada, Citharinus citharus (Effiong and Fakunle, 2011, Oyedapo et al., 2005) and higher than in *O. niloticus* (Kefas et al 2014). Calcium level was much greater in the wild fish compare to the culture fish (Oksuza, 2012). Ca is necessary to maintain an optimal bone development (Erkan and Ozden, 2007). Kumaran (2012) reported that, among the eight nutrient elements investigated, the most abundant were Ca and Fe. Phosphorus is structural component of hard tissues such as bone and scales, as well as a constituent of various coenzymes, phospholipids and nucleic acids. Fish can obtain a substantial number of required minerals directly from their rearing water, but phosphorus is an essential mineral that must be supplied by the diet (Lall, 2002). Fish meat is a rich source of phosphorus as 140-200 mg per 100 g and occurs in almost all species of fish (Stanek and Janick, 2011). The high levels of these elements in the fish samples may be attributed to the rate in which they are available in the water body and the ability of the fish to absorb these inorganic elements from their diet and the environment where they live (Adewoye and Omotosho, 1997, Ibiyo *et a*l., 2006).

Highest iron amount was observed in the muscle 0.39 mg /100g in the post-monsoon season. The observed values were higher than those reported by (Alasalvar et al., 2002, Erkan and Ozden, 2007, Yeldiz ,2008 and Kefas et al., 2014). Fe serves as a carrier of oxygen to the tissues from the lungs by red blood cell haemoglobin, as a transport medium for electrons within cells and as an integrated part of important enzyme systems in different tissues (Wagner and Boman, 2003 and Camara et al., 2005). Several studies have considered fish as a major source of Fe for children and adults (Fraga, 2005). The results indicated that the concentration of copper is sub optimal to regulations level, as the present species is identified to contain 0.04 mg/100g only. However, it revealed from this study that, micro-

nutrients were low, which could be due to the fact that the body needs of the fish and the concentrations in the water body (Andem and Ekpo, 2014). Copper is essential for good health but very high intake can cause adverse health problems such as liver and kidney damage (Ikema and Egieborn, 2005). Copper is a cofactor in a wide range of enzymes including cytochrome oxidase, superoxide dismutase and Lysol oxidase (Takeshi et al., 1997). Copper and Iron were significantly different in different salt concentration in various fish (Haram et al, 2013). The present results are in agreement with the results of previous work of freshwater fish (Akinneye et al. 2007). This study therefore, showed that the freshwater fish, *X. cancila* is a good source of minerals.

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