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BIOCHEMICAL ANALYSIS OF VARIOUS TISSUES IN *Tachysurus sona* FROM KUDUVAIYR ESTUARY AT NAGAPATTINUM DISTRICT IN SOUTH EAST COAST OF TAMIL NADU, INDIA

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ABSTRACT

The aim of the study to investigate the contents of carbohydrate, lipids and proteins in *Tachysurus sona* from Kuduvaiyr estuary, Nagapattinum east coast, Nagapattinum district, Tamil Nadu India.The impact of a number of contaminants on aquatic ecosystems can be assessed by the measurement of their external levels in the surrounding water or sediments, or by determining some biochemical parameters in fish and other organisms that respond specially to the degree and type of contamination. Analysis of chemical substances in tissues and body fluids, toxic metabolites, enzymes activities and other biochemical variables have frequently been used in documenting the toxin interaction with biological systems. Composition of the body is a good indicator for the physiological condition of a fish but it is relatively time consuming process. The results of the present study shows the content of protein, carbohydrate and lipids differ in different organs. The highest in muscles and lowest in intestine were observed.

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1. INTRODUCTION

The ocean is tremendously diverse and species-rich. It is the home of countless organisms living in very different ecosystems. Fish are a key component of marine biotic communities. Fish is highly nutritious, tasty and easily digestive. It is much sought after by a broad cross-section of the world's population particularly in developing countries. Monitoring the quality of fish is essential for marine ecosystem. Measurement of biochemical parameters is a commonly used diagnostic tool in aquatic toxicology and biomonitoring (López-Barea and Pueyo, 1998). The impact of a number of contaminants on aquatic ecosystems can be assessed by the measurement of their external levels in the surrounding water or sediments, or by determining some biochemical parameters in fish and other organisms that respond specially to the degree and type of contamination (Machala *et al*., 2001).

Information on the gross chemical composition of marine organisms contributes remarkably to our understanding of the species. Analyses of substances such as proteins, lipids and carbohydrateshave great importance, since they are major constituents of living matter (Barbarino and Lourenço, 2009; Diniz *et al*., 2012). Carbohydrates

are complex biomolecules that perform structural roles in cells, but they also serve as a fundamental reservoir of chemical energy (Lairson *et al*., 2008). Lipids are a diverse set of hydrophobic substances that work as important energy reserves for marine animals, contribute for floating and they are structural components of cell membranes and organelles (Subramaniam *et al*., 2011). Proteins play extremely important roles in most biological processes of living beings, such as enzymatic catalysis, transport and storage, coordinated motion, mechanical support, immune protection, generation and transmission of nerve impulses, and control of growth and differentiation (Zaia *et al*., 1998). The properties and functions of a certain type of proteins depend on their particular amino acid sequence (Sumar *et al*., 1994). In the present to investigate the contents of carbohydrate, lipids and proteins in Tachysurus sona (Family: Ariidae) from Kuduvaiyr estuary, Nagapattinum east coast, Nagapattinum district, Tamil Nadu India.

2. MATERIALS AND METHODS

Collection and Identification of sample

The fish collected from Kuduvaiyr estuary, Nagapattinum east coast, Nagapattinum district, Tamil Nadu India. The collected fish was packed in oxygenated polythene bags and kept on ice box until the arrival in the laboratory, where the samples were washed with distilled water. The fish was identified in the department.

Tissue homogenate

The liver, kidney, muscles, intestine and gill were dissected out, washed with ice-cold physiological saline. The required amount was weighed and homogenized using a Teflon homogenizer. Tissue homogenate was prepared in 0.1 M Tris Hcl buffer (pH 7.4) and used for the estimation of various biochemical parameters.

Biochemical analysis

Protein was estimated by the method of Lowry *et al*., (1951). Total lipids in tissues were estimated by the method of Folch *et al*., (1957). Carbohydrate estimated by the method of Hedge and Hofreiter, (1962).

3. RESULTS AND DISCUSSION

Fish are the most at threat from aquatic pollution and together with their long-term exposure in natural habitat they are suitable biomonitors of environmental pollution (Padmini *et al*., 2004). Fish is generally acknowledged as a worthy model for assessing aquatic contamination and is used as an environmental sentinel for water toxicants. Fish liver can be regarded as the body's detoxification organ and hence a target organ of various xenobiotic substances. Fish also are widely (and increasingly) used as animal models in toxicological research. Several features of fish make them valuable as models in toxicology (Ballatori and Villalobos, 2002; Hinton *et al*., 2005). As vertebrates, fishes have a close evolutionary relationship to humans, with shared genes and biochemical pathways that have become even more apparent as a result of recent whole-genome analyses (Aparicio *et al*., 2002; Jaillon *et al*., 2004). Most of the fish species used in toxicological research are small; develop rapidly with a short generation time. Saravanan *et al*. (2009) has reported the use of employing fish as a bioindicator species in monitoring water pollution since it responds with great sensitivity to changes in the aquatic environment.

Measurement of biochemical and physiological parameters is a commonly used diagnostic tool in aquatic toxicology and biomonitoring. The impact of a number of contaminants on aquatic ecosystems can be assessed by the measurement of their external levels in the surrounding water or sediments, or by determining some biochemical parameters in fish and other organisms that respond specially to the degree and type of contamination. Analysis of chemical substances in tissues and body fluids, toxic metabolites, enzymes activities and other biochemical variables have frequently been used in documenting the toxin interaction with biological systems (Leatherland *et al*., 1998).

Table 1 shows Protein, carbohydrate and lipids content of the different organ of fishes. Changes in carbohydrate metabolism measured as carbohydrate (energy substrate whose production is thought to metabolically assist the animal to cope with an increased energy demand caused by stress) used as general stress indicators in fish (Teles *et al*., 2007). Carbohydrate (or glucose 6-phosphate) is released through the degradation of glycogen by glycogen phosphorylase (GP) (Roach *et al*., 1998) and energy is mainly supplied by the oxidation of glucose and lactate as a result of carbohydrate metabolism (Morgan *et al*., 1997). The glucose concentration was proposed to be mediated by endocrine release such as cortisol (Hontela *et al*., 1996). Silbergeld (1974) stated that assay of this important blood parameter can serve as an indicator of environmental stress.

Proteins are important organic substance required by organisms in tissue building. They are intimately related with almost all physiological processes, which maintain a simple biochemical system in ‘living condition’ (Joshi and Kulkarni,

2011). Proteins are mainly involved in the architecture of the cell. Proteins occupy a unique position in the metabolism of cell because of the proteinaceous nature of all the enzymes which mediate at various metabolic pathways. During stress conditions fish need more energy to detoxify the toxicant and to overcome stress. Since fish have fewer amounts of carbohydrates so next alternative source of energy is protein to meet the increased energy demand (Singh *et al*., 2010).

The protein content of the cell is considered to be an important tool for the evaluation of physiological standards. They are central to several vital blood activities, including homeostasis and blood coagulation, vitamin and hormone transport, and specific immunity to pathogens (Leatherland *et al*., 1998).

Table 1 shows Protein, carbohydrate and lipids content of the different organ of fishes

Organs	Protein (mg/gm)	Carbohydrate (mg/gm)	Lipids (mg/gm)
Kidney	101.59±7.11	60.86±4.26	8.23±0.56
Liver	135.45±9.48	73.04±5.11	10.45±0.70
Intestine	43.82±3.06	26.18±1.88	4.52±0.28
Muscles	171.31±11.99	84.34±5.90	18.41±1.35
Gills	93.62±6.55	46.08±3.22	4.18±0.28

Values were expressed as Mean ± SD for triplicates

Lipids and fatty acids play a significant role in membrane and have a direct impact on membrane mediated process such as osmoregulation, nutrient assimilation and transport. On the other hand, the nature and quantity of these lipids in fish vary according to species and habit. Lipids play an important role in energy metabolism after glycogen lipids are used as energy source (Kumaran *et al*., 2012).

Composition of the body is a good indicator for the physiological condition of a fish but it is relatively time consuming process. The results of the present study shows the content of protein, carbohydrate and lipids differ in different organs. The highest in muscles and lowest in intestine were observed.

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