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Research Article **Zoology**

Biochemical Analysis of Fresh water And Infected Fish Of *Catla catla* And *Rohu*

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ABSTRACT

The present study was carried out to analyze the various biochemical parameters in fresh water fish and infected fish. Fresh water fish of normal and infected fish of *Catla catla* and *Rohu* were collected from Ariyalur fish market. The fish was washed with saline and used for experimental work. To estimate the amount of carbohydrate present in gill, intestine and flesh normal and infected of the fish of *rohu* and *catla*. The study concludes that infected fish of *catla* deregulation of carbohydrate, protein and lipid metabolism as compared to *rohu*. The infected fish of *rohu* affect the carbohydrate and protein metabolism. Over all, the metabolic deregulation observed in infected fish as compared to fresh water fish.

Keywords: *Catla catla*, *Rohu*, Fresh water fish, Infected fish, Carbohydrate and Protein.

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INTRODUCTION

The severe world population explosion is presenting complex challenges, being the most important one is malnutrition and shortage of food in terms of quantity and quality. Milk, meat and eggs are the animal source of animal protein. Animal production is a long term project to produce adequate amount of quality protein to meet the national demand. Meat production in terms of demanding protein requirement is improving with the establishment of poultry industry and fish farming. The production of quality protein is associated with the development of fisheries on commercial basis. Fish production sector is very important not only as a main source of animal protein to ensure food security (Sheikh and Sheikh, 2004) but also to improve employment and income for poverty elimination in developing countries like India. The advent of Blue Revolution has become one of the man's great hopes for future food supplies as the human population multiplies and industrialization increases the problem of environmental pollution. Fishes often referred to as "rich food for poor people" provides essential nourishment especially proteins of high biological values and fat. Fish is very important dietary animal protein source in human nutrition. Production of aquatic species through freshwater fisheries

and aquaculture for protein supply is being encouraged in developing countries but in under- developed countries, it is declining. According to nutritionists, fish is an excellent substitute for red meat and an excellent source of protein. Fish flesh contains all the essential amino acid and minerals viz., iodine, phosphorus, potassium, iron, copper and vitamin A and D in desirable concentrations. It serves as valuable ingredient to a healthy diet because of its low carbohydrate and unsaturated fat contents. It is often recommended by doctors to heart patients since it is an excellent source of Omega 3. So the inclusion of fish in our diet can make a valuable contribution to any diet that contain mainly of cereals, starchy roots and sugar for the healthy growth (Salim, 2006; Yildrim *et al.*, 2008).

Nutrient content varies with fish species and depending on the health status of the fish. There are limited data on the nutritional composition of fish species which are commonly consumed by the poor in developing countries of Asia and sub-Saharan Africa. Therefore, the crust of this study was to evaluate the nutritional content in normal and infected fish. The following are main objectives of the present study. Normal and Infected fish of *rohu* and *catla*. collected from Ariyalur fish market. Collection of gill, intestine and flesh from fish of *rohu* and *catla*. To estimate the amount of protein present in gill, intestine and flesh of the normal and infected fish of *rohu* and *catla*. To estimate the amount of lipids present in gill, intestine and flesh of the normal and infected fish of *rohu* and *catla*. To estimate the amount of carbohydrate present in gill, intestine and flesh normal and infected of the fish of *rohu* and *catla*.

MATERIALS AND METHODS

Collection of fish

Fresh water fish of normal and infected fish of *Catla catla* and *Rohu* were collected from Ariyalur fish market. The fish was washed with saline and used for experimental work.

Fig.1.*Rohu*

Fig.2.*Catla*

Preparation of homogenate

The normal and infected fish were sacrificed and the gill, intestine and flesh 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 estimations

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). To estimate the amount of carbohydrate present in the given sample by using Anthrone method

Statistical analysis

The results were presented as mean ± SD. Data was statistically analyzed using student "t" test. P. values developed or set as lower than 0.05 was considered as statistically significant.

RESULTS

The present study was carried out to analyze the various biochemical parameters in fresh water fish and infected fish. The observations made on different subjects of fishes were compared as follows.

Table II - Shows the levels of protein in fresh water fish and infected fish of Rohu and catla. Protein was decreased in gills, intestine and flesh of infected fish of Rohu and catla when compared to fresh water fish.

Table II Shows the content of protein in fresh water fish and infected fish of *Rohu* and *catla*

Fishes	Protein (mg/gm tissues)					
	Organs of fish					
	Rohu			*Catla catla*		
	Gills	Intestine	Flesh	Gills	Intestine	Flesh
Normal	5.94±0.90	12.66±0.8	10.78±0.56	7.99±0.92	12.14±1.81	9.21±0.86
Infected	6.71±0.87*	3.68±1.00*	8.35±1.06*	3.79±1.03*	5.02±0.91*	8.09±0.31*

Values were expressed as mean ± SD

* Significantly different from fresh water fish (P< 0.05)

Table III - Shows the levels of carbohydrate in fresh water fish and infected fish of *Rohu* and *catla*. Carbohydrate was decreased in gills, intestine and flesh of infected fish in of *Rohu* and *catla* when compared to fresh water fish.

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Table III Shows the content of carbohydrate

Fishes	Carbohydrate (mg/gm tissues)					
	Organs of fish					
	Rohu			*Catla catla*		
	Gills	Intestine	Flesh	Gills	Intestine	Flesh
Normal	96.24±4.26	97.36±64.18	85.91±3.98	90.37±5.25*	125.34±5.23*	242.24±10.65*
Infected	47.17±6.52*	63.14±2.54*	71.07±2.15*	34.50±2.58*	110.79±3.94*	51.63±4.16*

Values were expressed as mean ± SD.

* Significantly different from fresh water fish (P< 0.05)

Table III - Shows the levels of Lipids in fresh water fish and infected fish of *Rohu* and *catla*. Lipids were decreased in gills, intestine and flesh of infected fish in of *catla* when compared to fresh water fish. No significant changes of lipids were observed in gills, intestine and flesh of infected fish in of *Rohu* when compared to fresh water fish.

Table III Shows the content of lipids in fresh water fish and infected fish of *Rohu* and *catla*

Fishes	Lipids (mg/gm tissues)					
	Organs of fish					
	Rohu			*Catla catla*		
	Gills	Intestine	Flesh	Gills	Intestine	Flesh
Normal	0.020±0.01	0.050±0.02	0.030±0.01	0.22±0.20*	0.08±5.20*	0.12±0.20*
Infected	0.020±0.01	0.050±0.02	0.040±0.01	0.050±0.01*	0.190±0.04*	0.040±0.01*

Values were expressed as mean ± SD.

* Significantly different from fresh water fish (P< 0.05)

Fig.1.Shows the content of protein in fresh water fish and infected fish of *Rohu* and *catla*

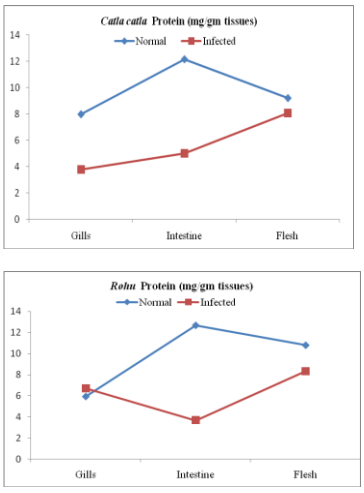


Fig.2 Shows the content of carbohydrate in fresh water fish and infected fish of *Rohu* and *catla*

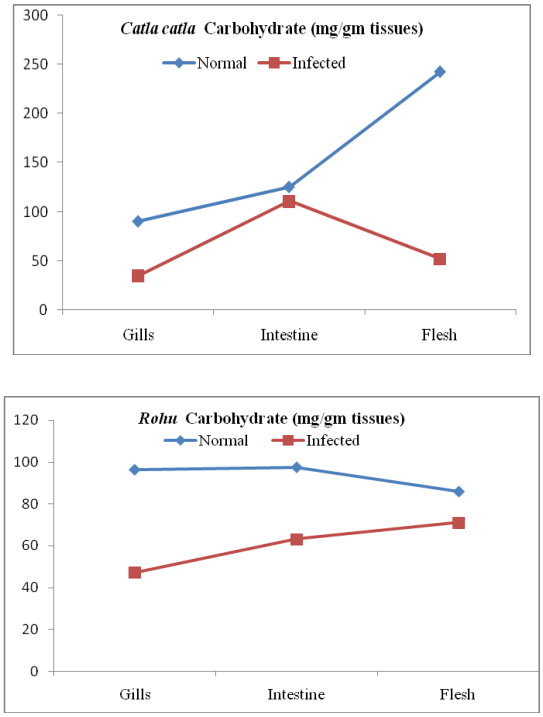
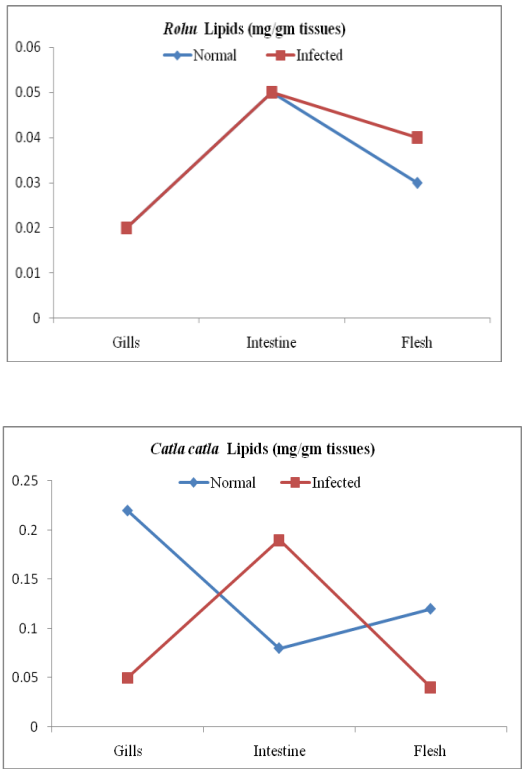


Fig.3.Shows the content of lipids in fresh water fish and infected fish of *Rohu* and *catla*



DISCUSSION

Biochemical studies are very important from the nutritional point of view. Protein is essential for the sustenance of life and accordingly exists in the largest quantity of all nutrients as a component of the human body (Sudhakar et al., 2011). In various fish species, proteins are of important as structural compounds, biocatalysts and hormones for control of growth and differentiations (Amal and Naheb, 2012). Protein in fish is a main component constituent of tissue and organs. They are precursors of other nitrogen compounds (enzymes, hormones, slurry, neurotransmitters, cofactors, etc) and constitute an important energy source. The effect of dietary lipid levels on fish growth performance varies considerably within species, size, age, diet and composition, range of lipids level tested and rearing conditions (Arredondo, 2012). Inadequate protein levels in the diets result in a reduction of growth and loss of weight. However, when an excess of protein is supplied in the diet, only part of it is used for protein synthesis (growth) and the remaining is transformed into energy (Arredondo et al., 2013). Each body cell is composed mainly of protein. Protein makes up the membrane surrounding the cell and also occurs within the cell. During growth period, adolescence and pregnancy, the number of cell increases and more protein is required for

cell growth. In all stages of life tissue protein is constantly being broken down and must be replaced by dietary protein. Protein plays a vital role in the formation of enzymes, antibodies and hormones and other substances that regulate the body process.

Protein

Fish and shellfish are important source of protein and income for people in Southeastern Asia (Agusa et al., 2007). They are also increasingly marketed for the health benefits to consumers (Schmidt et al., 2006). The requirement of nitrogen and sulphur is regulated by dietary protein. The protein immunoglobins act as prime defense against bacterial and viral infections. Proteins by means of exerting osmotic pressure help in maintenance of electrolyte and water balance in human system. Several studies show that protein derived from fish, balances many body regulatory factors. It is well known that protein is the most important and expensive item that should be supplied in adequate amounts to support good growth with minimal cost (Wec *et al*., 1982: Zehra et al., 2011; Nurnadia *et al*., 2011) determined the proximate composition and energetic values of selected marine fish and shellfish from West Coast of Penisular Malaysia. This study has included fresh water and sea water fish. The study revealed that sea water fish contained high protein content. Long-tailed butterfly ray contained the highest protein According to the work done by Anbuchezhian et al. (2012) in Catfish it is clear that antimicrobial proteins and peptides play key role in innate immunity and they had been observed from a wide variety of organisms in last few years. Hence, the fishes rich in protein will produce more innate immunity. In the present study demonstrated that decreased the protein content in infected fish of gills, intestine and flesh as compared to fresh water fish.

Lipids

Cholesterol is undoubtedly the most publicized lipid in nature, because of the strong correlation between high levelsof cholesterol in the blood and the incidence of disease of the cardiovascular system in humans. Usually, the cholesterol content will be more in fish liver oils but in the present investigation the consumable part of fish, muscle and brain were found to contain cholesterol. It is the essential constituent of cells. It aids in the permeability of the cells. It controls the red cells from being easily homolyzed. It functions as the defensive action and transports fat to liver in the form of cholesterol ester for oxidation. It assists the formation of bile acids and bile salts, 7- dehydrocholestrol and vitamin D3, corticosteroid hormone, androgens, estrogens and progesterone. Cholesterol helps the granulation of cell division and acts as an antagonist to phospholipids. High Density Lipoprotein (HDL) transports cholesterol and its esters from peripheral tissues to the liver for its catabolism (scavenging action). Very Low Density Lipoprotein (VLDL) transports mainly endogenous triglycerides synthesized in hepatic cells from the liver to the extra-hepatic tissue including adipose tissue for storage. Low Density Lipoprotein (LDL) regulates cholesterol synthesis in extra-hepatic tissue. The triglycerides are the most abundant of all lipids. They constitute about 98% of total dietary lipids, the remaining 2% consists of phospholipids and cholesterol and its ester. They are major components of storage or depot fats in animal cells but not normally found in membranes. Triglycerides can be stored in quantities, sufficient to supply the energy needs of the body for many months as in the case of obese person. They are not only stored for longer duration but also yield over twice as much energy as carbohydrates. 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.(Kumaran et al., 2012). Previous studies correlate with our present investigation pertaining to lipid observations. In the present study deccreased the lipids content in infected fish of gills, intestine and flesh of *catla* as compared to fresh water fish but no changes were observed in *rohu*.

Carbohydrate

Components like carbohydrate play a vital role as energy precursors for fish under stress conditions (Umminger, 1970). Glucose is a carbohydrate that has a major role in the bioenergetics of animals, being transformed to chemical energy (ATP), which in turn can be expressed as mechanical energy (Lucas, 1996). Changes in carbohydrate metabolism measured as plasma glucose (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). Glucose (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. In the present study decreased the carbohydrate content in infected fish as compared to fresh water fish gills and flesh.

The study concludes that infected fish of *catla* deregulation of carbohydrate, protein and lipid metabolism as compared to *rohu*. The infected fish of *rohu* affect the carbohydrate and protein metabolism. Over all, the medtabolic deregulation observed in infected fish as compared to fresh water fish.

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