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BIOCHEMICAL COMPOSITION IN THE MUSCLE TISSUE OF *TILAPIA MOSSAMBICA* INFECTED WITH METAZOAN PARASITES IN POLLUTED WATER OF ESTUARINE INDUSTRIAL AREA

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Fish is an excellent source of protein of high biological values. The nutritional value of the diet is measured by the presence of necessary element and catalyst (vitamins and mineral) and auxiliary food. Investigations regarding the protein content of the fish and fish products have been initiated as early as 19th century. The last three decades have seen significant developments in farming of *Tilapia mossambica* worldwide. They are being farmed in about 85 countries worldwide (FAO, 2008). Metazoan parasites play very important and diverse role in aquaculture operations, that are extremely adverse and may result in complete production loss. Nutritive values of fish meat also greatly reduced.

INTRODUCTION

Tilapia mossambica fisheries originated in Africa. The accidental and deliberate introductions of *Tilapia mossambica* into Asian freshwater lakes have inspired outdoor aquaculture projects in various countries with tropical climates. *Tilapia mossambica* has become the third most important fish in aquaculture after carp and salmon. Worldwide production exceeded 1,500,000 metric tons in 2002 and increases annually. Because of their high protein content, large size, rapid growth. The *Tilapia mossambica* were introduced to India during late 1970s. In 2005, River Yamuna harboured only negligible quantity of *Tilapia mossambica* , but in two years time, its proportion has increased to about 3.5% of total fish species in the river. Presently in the Ganges River system, proportion of *Tilapia mossambica* is about 7% of the total fish species.

However, *Tilapia mossambica* holds vast promise to become an important species for aquaculture in India, considering the demand for more fish. M/s Vorion Chemicals, Chennai had successfully cultured and marketed some varieties of *Tilapia mossambica*, and reported neither escapes to natural water bodies nor any ecological threats. There are many unpublished data about the

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availability of *Tilapia mossambica* in reservoirs of Tamil Nadu and some other states of India. In the Kolkata Wetlands, some farmers are producing mono sex *Tilapia mossambica* on commercial scale in waste water.

Studies carried out at Department of Zoology, Govt. Arts College, Nandanam, Chennai – 600 035, for a period of three years during 1998 to 2000 with GIFT *Tilapia mossambica* had demonstrated production levels of 5-6 mt per crop of 4-6 months duration. Further, the study also showed the possibility of *Tilapia mossambica* farming under polyculture with the three Indian major carps and showed higher growth over roho and mrigal at similar stocking levels. Increased interest in fish culture has also increased awareness and experience with parasites that affect fish health, growth, and survival.

MATERIAL AND METHODS

The samples required for the present study were collected from polluyed water in Ponneri Industrial areas of Chennai, Tamil Nadu. During the period from July 2013 to June 2014. All the organs of the fish including scales, fins, gills, stomach, intestine, liver and muscles were examined separately for parasites. The stomach and intestine were slit open and the contents washed several times to free from mucus and examined under a binocular microscope for the presence of metazoan parasites. In the present study metazoan parasites like- *Caligus sp, Argulus. sp Camallanus sp*. were collected and then the muscle samples were removed without skin and bone pieces and dried in hot air oven for about 48 hours at temperature of 58°C. After drying the samples were pulverized and ground into fine powder with the help of mortar. Individually weighed powder samples were used for quantitative estimation of proteins, carbohydrates, lipids moisture and ash.

PROTEINS

The protein content of the muscles tissue was estimated by following Lowry's method (1951),

CARBOHYDRATE

Anthrone in Sulphuric acid can be used for colorimetric determination of sugar; methylated sugars and polysaccharides (Dubios *et al.*, 1956).

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LIPIDS

The total lipids were extracted from the dry tissues, by following the method of Folsch *et al.*, (1957).

MOISTURE

A known quality of sample dried in hot air oven at 150c for overnight to a constant weight. And loss of weight is expressed as moisture. The difference in weight represents the moisture content of the original sample weight (AOAC methods,2000)

ASH

Ash content was determined by ignition of dried samples at 550 0C for five hours in muffle furnace, the organic matter burns away and inorganic matter is lift(AOAC methods,2000).

RESULTS AND DISCUSSION

The aim of the present research was to investigate the biochemical characteristics of *Tilapia mossambica* in order to provide better information to the consumer. The alterations of the biochemical constituent of muscle tissue of the normal and infected with metazoan parasites have been presented here. Protein was the most dominant biochemical constituent in the muscle of *Tilapia mossambica* . Proteins form one of the most important and complex group of biological material, as they form the chief nitrogenous constituents of the tissues of the body. The results obtained in the present investigation of total protein content in the normal muscle tissue sample- I, II, III, IV, V and VI were 38.17, 33.89, 37.92, 38.87, 40.68 and 39.86 mg/ gm, (mean value 38.23 mg/gm) while infected muscle sample- I, II, III, IV, V and VI were 25.28, 22.86, 26.8, 27.94, 30.91, 29.83 and 29.83 mg/gm, (mean value 27.27 mg/gm) respectively. Values obtained for total protein content found to be good indication of nutritional values. These observations correlated with many authors. Parulekar, (1964) reported maximum protein content in the spawning specimens. Similar elucidation calculated to be 38.23 mg/gr. in *Mugil cephalus* was suggested by Das (1978). He noticed that high values of protein coincided with the spawning season.

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Protein is not an efficient energy source for fish. It will be used for energy if the available energy from other sources (lipid and carbohydrates) is insufficient (Phillips *et al*, 1960). In the present study, protein was the most dominant biochemical constituent in the muscle of *Tilapia mossambica*. In the present study, muscle protein was decreased in infected fish, this was correlated to many authors. Seasonal changes affect on the biochemical constituents, Lund *et al.,* (2000) stated at the total protein levels and plasma lipid showed fluctuations according to seasonal changes in both males and females of Stripped bass. Plana *et al.,* (1996) reported protein content may be used because of this degeneration under stress conditions (starvation, emersion, abnormal temperature); a decrease in protein amounts was observed in starved infected individuals. According to Mc Cay and Tunison (1936) and Satti Reddy (1992), the fall in the protein content is due to a fall in the rate of feeding,

Lipids are organic substances insoluble in water, but soluble in organic solvents. They form important dietary constituents on account of their high calorific value and fat soluble vitamins and essential fatty acids contained in them. Total lipid content in normal muscle sample-I, II, III, IV, V and VI were 12.41, 13.64, 13.91, 12.57, 12.96 and 12.78 mg/ gm (mean value 13.04mg/gm), whereas infected muscle sample I, 11, III, IV, V and VI were 18.61, 17.42, 18.42, 17.56, 16.98 and 17.48 (mean value 17.74 mg/gm) mg/gm respectively. Such distribution of lipids in the infected muscle suggests that are evidence for that fishes like other animals, store fat in their muscle for the supply of energy during starvation, reproductive phases and infestation period. The crude fat content found in the present study was similar to the observations made by Men *et al.,* (2005); Ho and Paul, (2009). In the present study, muscle lipid was increased in infected fish; this was correlated to many authors. Waagbo *et al.,* (1998) showed increased levels of water, lipid, protein, and iron in muscle tissues of infected Atlantic salmon (Salmo salar. L) Suffering with cold water vibriosis or Hitra diseases. According to Marcogleise *et al.,* (2005) infected yellow perch exhibited higher levels of lipid peroxidation caused by parasitism demonstrate that contaminants and parasite together exacerbate oxidative stress in fish of polluted environment. Celik and Aydin (2006) stated that the lipid levels of infected fish were significantly greater than those in healthy black scorpion fish (Scorpaena procus) resulted in fin rot, swollen foci of skin, hemorrhages of gill and abdominal skin.

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Carbohydrates are basic substances of protoplasm and involved in the storage and release energy. They defined chemically as aldehyde or ketone derivatives of the higher polyhydric alcohols or as compounds which yield these derivatives on hydrolysis. Glucose, fructose, mannose, sucrose, galactose, maltose, lactose, trehalose, and glycogen are the important carbohydrates in the animal cells. Energy stored in carbohydrates is readily available for the cellular functions. The carbohydrate level in normal muscle tissue sample- I, II, 111, IV, V and VI were 4.10,4.28,4.69,4.31,4.43,and4.57mg/ gr (mean value 4.39 mg/gr) whereas infected muscle tissue sample- I, II, III, IV, V and VI were 17.1 2,15.39,16.18,16.23,15.64,and 16.32 mg/gr (mean value 16.14 mg/gr There is increase in carbohydrate level in the infected muscle tissue at all the samples, low level values are encountered in normal muscle tissues. This could be revealed that carbohydrates were utilized rapidly to meet the stress caused when fish was infected. In the present study, total carbohydrates were observed abrupt increased in infected fish. This is an agreement with findings of several authors. The increase in the glucose level of the tissue while decrement in tissue glycogen in infected fish makes it clear that the glycogen reserves are being used to meet the stress caused. Increase in serum glucose levels in fish under stress was reported by Almeida *et al.*, (2001), Chowdhury *et al.*, (2004), Bedii and Kenan (2005). This can be attributed to several factors and one of them is the decrease in the specific activity of some enzymes like phosphofructokinase, lactate dehydrogenase and citrate kinase that decrease the capacity of glycolysis (Almeida *et al.*, 2001)

Moisture forms the major component of the biochemical composition. Total moisture percentage in normal muscle sample-I, II, III, IV, V and VI were 1.08, 1.32, 0.97, 2.0, 1.6 and 1.42 mg/ gm, (mean value 1.39 mg/gm) whereas infected muscle sample- I, II, III, IV, V and VI were 2.45, 2.31, 2.38, 2.68, 2.76 and 2.32 mg /gm (mean value 2.49 mg/gm) respectively The maximum values of moisture content in infected fishes suggested that could be due to the decline in food intake at the infestation phase. These results correlated with the following findings. Ramaiyan *et al.*, (1976) reported generally when oil content is high the moisture content is low in Septipinnataty. Whereas Chandra Shekhar *et al.*, (2004) reported moisture content was low when other constituents (Lipid, protein and carbohydrate) were high in Labeo rohita. (Shamsan *et al.*, 2010) high values of moisture

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were observed in Sillago sihama. Moisture showed a negative relationship with lipid content of the fish muscle.

Ash, though not really a nutrient as such, an entry for ash is sometimes found on nutrition labels, especially for pet food. It does not include water, fiber, and nutrients that provide calories, but it does include some nutrients, such as minerals. Total ash percentage in normal muscle sample-I, II, III, IV; V and VI were 4.81, 4.73, 4.34, 4.96, 4.78 and 4.69 mg/ gm, (mean value 4.71 mg/gm) whereas infected muscle sample- I, II, III, IV, V and VI were 3.79, 3.21, 3.69, 3.75, 3.98 and 4.1 mg/gm (mean value 3.75 mg/gm) respectively . These-results are similar to the findings of the others (Kordyl, 1951; Love, 1957;1958; Love *et al.*, 1968) reported decline in the ash content of the body. It was rather striking that ash was reported to increase in cases where whole fish including the bones and the skin was analyzed. However the percentage of ash was invariable accompaniment of infestation. It was clear from the present investigations that the percentage of ash declined with the duration of infestation.

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