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Biochemical Compositions in Muscle and Liver of Normal and Infected Fish of *Lutjanus Johni* off Visakhapatnam Coast

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Abstract: Proteins, lipids and carbohydrates in muscle and liver tissues were studied with respect to different seasons in *Lutjanus johni.* Lipids are elevated in infected liver tissues, 10.27mg/g, (±0.58). Whereas decline of protein has been observed in infected muscle tissue 74.60mg/g, (±2.61) compared with normal fish 78.29mg/g, ±1.86. Some fluctuations have been observed in total carbohydrate content in infected fishes.

***Key* Words:** Carbohydrates, Lipids, *Lutjanus johni* and Proteins.

I. INTRODUCTION

The snapper family, Lutjanidae, belongs to the order Perciformes, the largest order of vertebrates, with 148 families, 17 genera and nearly 9,300 species. *Lutjanus johni* (Bloch, 1792) are commercially important fish species distributed in tropical to temperate regions all over the world Allen[1], Polovina and Ralston [2]. The present study has been held for a period of wo years (2010-2012) aimed at conducting a detailed investigation on the biochemical constituents i.e., proteins, carbohydrates and lipids in muscle and liver tissues were studied with respect o different seasons.

II. MATERIAL AND METHODS

To find out the constituents of proteins, lipids and carbohydrates in *Lutjanus johni* samples were collected at regular seasonal intervals for two years from Visakhapatnam Coast. After recording the necessary morphmetric and meristic characters of the fish collected from the study area the specimens were dissected immediately to avoid decomposition. Muscle samples were removed without skin; liver was removed separately from fish samples.

The tissue was kept in hot air oven at 60^{o} C for about a week to dry the material. After drying the tissue samples were pulverized and ground into a fine powder with the help of a porcelain mortar. The powder was preserved in desiccators for later use. Individually weighed powder samples were used for the quantitative estimation of proteins, lipids and carbohydrates in muscle and liver tissue. All the chemicals used were of analar grade.

The protein content of the muscle tissue was estimated by following Lowry's method (1951). The total lipids were extracted from the dry tissues, by following the method of Folsch *et al*., (1957). Anthrone in sulphuric acid can be used for colorimetric determination of sugars, methylated sugars and polysaccharides Dubois *et al*., (1956).

III. RESULTS

Analysis of biochemical composition was carried out in season wise samples of muscle and liver tissues of normal and infected fishes (infected with metazoan parasites) (Graph 1&2).

3.1 PROTEINS:

The maximum value of protein content in *Lutjanus johni* muscle occurred as 85.56 mg/g(**±1.39**) during the year of 2010-2011 in monsoon period and minimum values in post-monsoon season 75.01 mg/g (**±1.95**). In the year 2011-2012 also having maximum value 84.92 mg/g (**±1.11**) in monsoon and minimum value encountered as 73.99 mg/g (**±3.51**) in post-monsoon season. While the minimum values of protein content in infected *Lutjanus johni* muscle occurred as 74.60 mg/g (**±2.61**) and maximum value is 81.56 mg/g (**±2.50**) during the season of 2010-2011 and minimum value in post monsoon 72.8 mg/g (**±2.53**) and maximum value in monsoon 81.21mg/g (**±2.42**) during 2011-2012. During post-monsoon infected muscle encountered high value 75.71 mg/g (**±2.58**) than normal muscle value 75.01 mg/g (**±1.95**) of 2010-2011.

The maximum value of protein content in liver of *Lutjanus johni* occurred, as 86.89 mg/g (**±1.33**) during the monsoon season and low value occurred in pre monsoon, 78.38 mg/g (**±1.60**) during the year 2010-2011, in the year 2011-2012 high value 84.96 mg/g (**±2.64**) during post-monsoon and minimum values encountered as 77.77 mg/g (**±1.71**) during pre-monsoon. While the maximum value protein content in infected *L. johni* liver occurred as 82.63 mg/g (**±2.57**) in post monsoon, minimum values of 60.67 mg/g (**±2.45**) during the season of 2010-2011 and maximum values in 78.63 mg/g (**±2.51**) in post monsoon, minimum value 71.37 mg/g (**±1.93**) in pre monsoon during 2011-2012.

3.2 LIPIDS

The maximum value of lipid content in the normal muscle of *Lutjanus johni* occurred as 8.24 mg/g (**±0.49**) during the monsoon period and minimum values encountered as 5.01 mg/g (**±0.24**) in the post-monsoon season during the year of 2010-2011. While during the year 2011-2012, increased the lipid level as 8.30 mg/g (**±0.72**) in monsoon period and decreased in the lipid values as 5.04 mg/g (**±0.78**) during the season of post-monsoon. When compared all the seasons during the study period of two years, the lipid levels decreased in post monsoon. While the maximum values of lipid level in infected *L. johni* muscle occurred as 3.23 mg/g (**±0.36**), minimum values 2.13 mg/g (**±0.16**) in pre monsoon during 2010-2011 and maximum values 4.76 mg/g (**±0.61**) in monsoon and minimum 2.95 mg/g (**±0.70**) in post monsoon during 2011-2012.

The maximum value of Lipid content in the liver of *Lutjanus johni* occurred as 8.44 mg/g (**±0.59**) during the pre-monsoon season and minimum value occurred as 6.39 mg/g (**±0.54**) during the post monsoon season in the period of 2010-2011. While the lipid content level increased as 8.39 mg/g (**±1.16**) in the season of pre monsoon and decreased value as 5.88 mg/g (**±0.67**) during the monsoon season in the year of 2011-2012. While in infected *L. johni* liver maximum values of lipids were occurred as 10.27 mg/g (**±0.58**) in monsoon, minimum values 5.94 mg/g (**±0.74**) in post monsoon during 2010-2011 and maximum values 9.67 mg/g (**±0.48**) in pre monsoon, minimum values 5.06 mg/g (**±0.06**) in post monsoon during pre-monsoon of 2011-2012.

3.3 CARBOHYDRATES

There is increase in carbohydrate level 4.79 mg/g (**±1.08**) in the muscle of *Lutjanus johni* during the pre-monsoon season, minimum values are encountered as 3.16 mg/g (**±0.24**) in post monsoon during the year 2010-2011. While in 2011-2012, muscle carbohydrate value of normal fish shows high value 4.40 mg/g (**±0.52**) in the period of pre monsoon season and shows the low value 2.95 mg/g (**±0.22**) in the season of post monsoon. While the maximum values of carbohydrate level in infected *L. johni* muscle occurred as 3.72 mg/g (**±0.65**) in pre monsoon, minimum values 2.46 mg/g (**±0.57**) in post monsoon during the seasons of 2010-2011 and maximum values 3.66 mg/g (**±0.48**) in pre monsoon, minimum values 2.39 mg/g (**±0.45**) in post monsoon during 2011-2012.

In the liver of *Lutjanus johni* carbohydrate values occurred, as maximum 0.38 mg/g (**±0.03**) in the seasons of pre-monsoon, whereas minimum values encountered as 0.30 mg/g (**±0.01**) in the monsoon season during the year of 2010-2011. While in the year 2011-2012, the carbohydrate level increased 0.33 mg/g (**±0.04**) during the pre monsoon and decreased 0.25 mg/g (**±0.04**) in the monsoon period. While the maximum values of carbohydrate level in infected *L.johni* liver occurred as 0.37 mg/g (**±0.05**) in monsoon, minimum values 0.27 mg/g (**±0.05**) in post monsoon during the seasons of 2010-2011 and maximum values 0.28 mg/g (**±0.07**) in pre monsoon, minimum values 0.19 mg/g (**±0.07**) in post monsoon during 2011-2012.

IV. DISCUSSION

Marine fish is supposed to be an integral part of a nutritious human diet. However, fish of various species do not provide the same nutrient profile to their consumers Takama *et al*., [3]. and the nutritive value of a fish varies with season Imad Patrick Saoud *et al*., [4]. The chemical composition of the different fish species show variation depending on seasonal variation, migratory behavior, sexual maturation, feeding cycles, etc; these factors are observed in wild, free-living fishes in the open sea and inland waters Ravichandran *et al*., [5].

Proteins occur in the body in the form of amino acids and other metabolites, which serve as building blocks of the body. Hence, protein content of the cell is considered as an important tool for evaluation the physiological standards Chezhian *et al*., [6]. In the present study, the maximum value of total muscle protein content reported in normal *Lutjanus johni* in the monsoon during the study period 2010 to 2012. While the minimum values of total proteins noticed in the post-monsoon season during the study period. Whereas the maximum value of total liver protein reported in normal *L.johni* in the monsoon during the study period 2010-2011, while during 2011-2012 liver proteins were high when post-monsoon season. In this study showed that protein was the most dominant biochemical constituent in the muscle of *Lutjanus* species. These findings correlated with many authors. Sivani [7] reported that protein content was more in fishes during early summer and winter months corresponding to their maturity stages. Parulekar [8] reported maximum protein content in the spawning specimens and the minimum associated with the spent and early maturation phases.

Protein content can be correlated with the phases of maturity and spawning Parulekar and Bal [9]. Accordingly, protein content goes on increasing with the advancement in maturity. Similar elucidation in *Mugil cephalus* was suggested by Das [10]. Martinez *et al.*, [11] stated that the increase in muscle aerobic capacity and protein contents. Bhuyan *et al*., [12] reported higher protein content observed.Lipid content is an essential organic constituent of the tissues of all animals, and plays a key role in energy metabolism. Lipids are the best energy producers of the body next to carbohydrates Chezhian *et al*., [6]. Total lipids and cholesterol content found to be good indication of nutritional values. In the present study, the increased value of lipid content in the normal muscle occurred during the monsoon and pre monsoon whereas, the decline values encountered in the post monsoon in both the species. While increased value of lipid content in the normal liver occurred during the pre monsoon. Whereas, the decline values were encountered in post monsoon. But during 2011-2012 normal liver value declined in monsoon. The greatest concentrations of fat may be found at the end of prolific feeding in summer and the least in winter Love [13]. There was a parallel decrease in the muscle lipid during same period. This could be attributed to less food intake. During starvation the source of energy is lipid and carbohydrate in fishes. Higher fat was observed in ripe and gravid fish where a low level of fat was recorded in spent and young fish Bhuyan *et al*., [12]. The fat content of the muscle showed two peak periods of accumulation- one during November and other during May–July Shreni [14].

Reduction in the lipid content during the spawning season has been recorded in *Bregmaceros mclellandi* Parulekar and Bal, [9], *Mugil cephalus* Das [10] and *Ambassis commersoni* Bumb [15]. Chandrasekhara Rao and Krishnan [16] has observed depleted lipid in the muscle of *E. diacanthus*. Lund *et al*., [17] stated at the total protein levels and plasma lipid showed fluctuations according to seasonal changes in both males and females of stripped bass. Nordgarden *et al*., [18] stated that fatty acids are low during early spring and increased slowly during spring in Atlantic salmon. Garrido [19] studied the spatio-temporal variability in fatty acid trophic biomarkers in stomach contents and muscle of Iberian sardine (*Sardina pilchardus*) and its relationship with spawning. Changes in the muscle fat were not well marked with the growth of the fish. George *et al*., [20] reported that lipids were present in the body in the form of non-calorific metabolic proteins. Fat content evidently increased due to heavy feeding Huss,[21,22].

When compared all seasons of two years the lipid content in the infected muscle was elevated. 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.There is increase in carbohydrate level in the muscle and liver of normal fish during the pre monsoon season in the year 2010-2012, low level values are encountered during the post-monsoon season. Very low values of carbohydrates recorded in the present study could be because of glycogen in many marine animals does not contribute much to the reserves in the body. Ramaiyan *et al*., [23] reported similar findings in 11 species of clupeids. Carbohydrates are considered to be the first degraded under the stress condition of animals Chezhian *et al*., [6]. According to Dhavale and Masurekar [24] decreased level of carbohydrate constituents in tissues of toxicant exposed animals may be due to the prevalence of hypoxic condition in the tissues as a result of pollutant stress. Carbohydrate and mineral content of garfish were almost constant (Gökhan Boran and Hikemt Karaçam, [25]. Whereas contrary with the highest amount of carbohydrate was found in *L. calcarifer* Ravichandran *et al*., [5].

The carbohydrate levels in muscle and liver of infected fish, in the season of pre monsoon maximum value occurred and declined value during the post monsoon season in the year 2011-2012. Maximum carbohydrate value occurred in monsoon season and minimum encountered in the season of post monsoon. Which is in good agreement with previously reported results by Sivakami *et al*., [26] observed gradual increase of muscle carbohydrate content with the maturation of gonads in the *Cyprinus carpio*. The increase of carbohydrate concentrations causes harmful physiological effects, reduces hormonal immune response and enhances dietary toxicity Mona *et al*., [27]. We can conclude that carbohydrates are the major energy source in infected fishes.

In the present study, proteins, lipids and carbohydrates were observed. Lipids are elevated in infected muscle tissues. Whereas decline of protein has been observed in infected muscle tissue compared with normal fish. Some fluctuations have been observed in total carbohydrate content in infected fishes.

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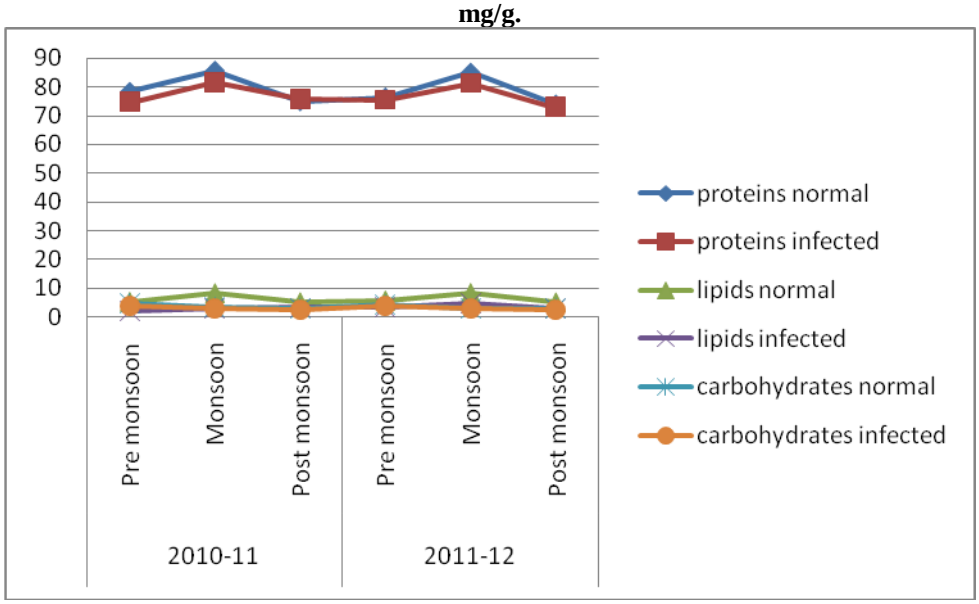
Graph-1. Biochemistry compositions of normal and infected muscle tissue of *L. johni* during 2010-2012-mg/g.



Graph-2. Biochemistry compositions of normal and infected liver tissue of *L. johni* during 2010-2012-mg/g.