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SEASONAL CHANGES OF CHOLESTEROL IN THE TISSUES OF MALE CATFISH *MYSTUS CAVASIUS* (HAM) IN BHADRA RESERVOIR, KARNATAKA, INDIA

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Abstract – Seasonal variation in cholesterol of the different tissues of the freshwater catfish *Mystus cavasius* was investigated from Bhadra Reservoir. The amount of cholesterol in liver, muscle and testes was measured. A decline was recorded during the period when the gonads were passing through the peak ripe stage. The highest value of the cholesterol was however attained before this phase of gonad maturation. Concentration pattern of liver cholesterol seemed related to variations in the cholesterol metabolism of the fish, necessitated, besides other factors, by the demand for sex hormones. A possibility of the influence of feeding intensity on liver cholesterol content has also been indicated.

INTRODUCTION

Fish are quite different from the other animal food source, because they provide low energy and have high- level proteins. So, they are beneficial nutrition sources. Fish are not only has protein but also contain other biochemical components such as carbohydrates and lipids. Cholesterol is a fatty substance that is produced by liver and is present in all cells. It helps in the synthesis of vitamin D, break down foods, and make hormones. A number of workers have studied the depletive effects of maturation and spawning in the chemical composition of fish (Chang and Idler, 1960; Appa Rao, 1967; Pandy *et al*., 1976; Piska and Prasad, 1991; Kiran and Puttaiah, 2005). *Mystus cavasius*is a commercially important fish having high protein content and taste. The seasonal biochemical variations correlating testes, muscle and liver have not been given much attention of *Mystuscavasius* of Bhadra reservoir. Hence, keeping in view of the commercial importance of fish, an attempt have been made to study the storage and utilization of liver contents for testicular growth and spermatogenesis.

MATERIALS AND METHODS

The male fish *Mystus cavasius* were collected several times per month from Bhadra reservoir during January 2004 to December 2004 from the fisherman. They were brought in to the laboratory and then scarified for further studies. The tissue was processed for total cholesterol estimations. Total cholesterol content was estimated by Lieberman-Burched reaction as described by Natelson (1917).

RESULT AND DISCUSSION

The cholesterol content of the testes was increased from February (4.25 ± 0.09) and reaching maximum during April (8.65±0.05). This increase was maintained up to July. In the liver and muscle, the cholesterol was low during July. From August, onwards it shows an increasing trend to reach maximum in the month of December (10.45±0.04). Correlation coefficient and regression line indicated that liver cholesterol had inverse relationship with testes cholesterol (r= -0.750) and a linear relationship with muscle cholesterol was observed (r= 0.952) with r value being statistically significant. It was observed that the testicular cholesterol also showed inverse relationship with muscle cholesterol (r= -0.634) which was statistically significant (Table 1 and Fig.1).

Cholesterol forms a major component of lipids. It plays an important role in the physiological and

metabolic process of the animal. The liver, muscle, gonads and nervous tissues of fishes contain large amount of cholesterol. Cholesterol is precursor for steroid hormone production i.e., steroidiogenesis. Fatty acids are required as an alternate source of relatively high energy in the place of carbohydrate as a constituent of growing cell particularly during spawning period. Cholesterol acts as the basic substance for the synthesis of the testosterone hormone (Ryan and Short, 1966). The Leydig cells of the testes reportedly utilize cholesterol from the circulating blood for the synthesis of testosterone. Ecological factors are reported to influence cholesterol composition and lipids in the fish gonads (De Vlaming, 1978). However, testis exhibits seasonal changes, it contains maximum content of cholesterol during maturing phase, which reduces during the mature phase, suggesting its availability for steroid hormone production needed for spermatogenesis. It is known that the liver stores glycogen, protein, lipid and cholesterol for utilization during the reproductive cycles (Rao, 1967).

In the present investigation the cholesterol content of the testes of the fish *Mystus cavasius* increases during February reaches maximum during April (8.65±0.05) and this was maintained till July. A significant decrease was observed during August as that of February. Further decline was seen in subsequent months. In the liver, the cholesterol was low during April to July. From August onwards it shows an increasing trend and reaches maximum during December (10.45±0.04). The increase in the testicular cholesterol from April to July indicates the involvement of cholesterol for steroidogenesis. The highest level of cholesterol during April coincides with the beginning of spermatogenesis.

Normen (1962) reported that the stage of gonads might play a great role in the biochemical composition of a fish. This result was similar as Premjith *et al*. (1992), according to him cholesterol content in the steroidogenic tissue has been shown to associate with production of male hormone and Rishi and Kaul (1984) found that in *H. Fossils* lowest cholesterol levels during maximal testicular activity and highest during breeding phase and thereby indicate that the cholesterol content is gonadotropin dependent. The lower levels of cholesterol were attributed by them to its utilization in steroid hormone synthesis. The cholesterol was highest when GSI value was minimal and lowest when GSI was maximum. Shankar and Kulkarni (2005) have observed that the cholesterol being the precursor for the synthesis of steroid, which in turn influencing the maturation phenomena in *Notopterus* The hepatic and testicular cholesterol studies in *Mystus cavasius* suggest that there is an existence of positive cholesterol relationship between testis and liver for spermatogenesis. Similar results were observed by Mohammed Rafiq (1994) in *Notopterus notopterus*; Rishi and Kaul (1984) in *Heteropneustes fossilis*; Diwan and Krishnan (1986) in *Etroplus suratensis*; Shankar and Kulkarni (2004) in *Notopterus notopterus* and Kaur and Kaur (2006) in *Channa punctatus.*

Cholesterol is an important compound of cell membranes. It is precursor of biological steroids and is synthesized from acetyl CoA (Lehninger, 1982). In the present investigation it has been noticed that

Table 1. Monthly variations in total cholesterol contents of male fish Mystuscavasius in various tissues

Months	Testes	Liver	Muscle
January 2004	3.85±0.11	10.25±0.12	4.4±0.14
February 2004	4.25±0.09	7.55±0.07	3.5±0.27
March 2004	6.7±0.13	5.92±0.13	3.3±0.13
April 2004	8.65±0.05	5.95±0.23	3.2±0.13
May 2004	6.95±0.05	4.87±0.17	3.0±0.17
June 2004	5.85±0.16	4.52±0.20	2.75±0.10
July 2004	5.75±0.11	4.1±0.16	2.2±0.13
August 2004	5.5±0.12	6.57±0.11	2.9±0.01
September 2004	5.39±0.14	7.45±0.31	3.1±01
October 2004	5.25±0.08	7.65±0.31	3.5±0.31
November 2004	3.7±0.03	9.52±0.18	4.0±0.28
December 2004	3.3±0.14	10.45±0.04	4.6±0.07

*Values are means of two years (± Standard error)
P value for each item: between months within the phase = $P<0.05$ and between the phases = $P<0.001$

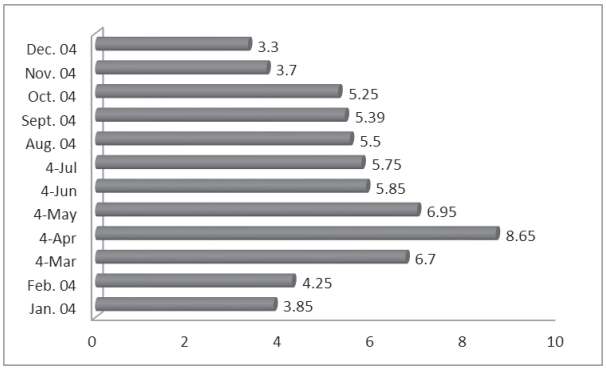

Fig. 1. Monthly variations in total cholesterol contents of male fish Mystuscavasius in Testis

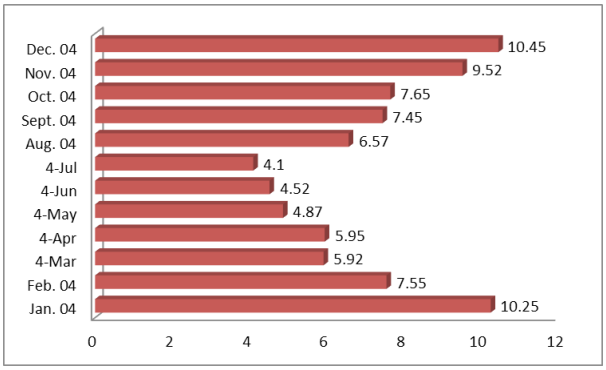

Fig. 2. Monthly variations in total cholesterol contents of male fish Mystuscavasius in Liver

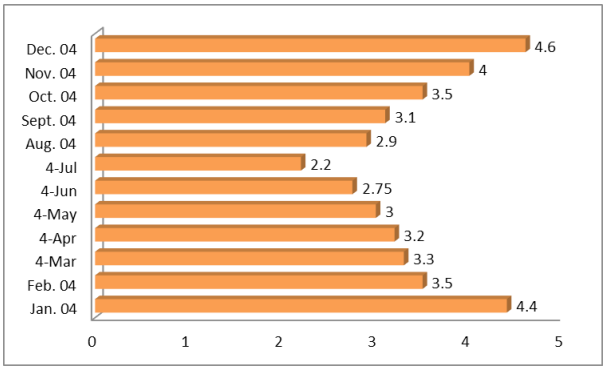

Fig. 3. Monthly variations in total cholesterol contents of male fish Mystuscavasius in Muscle

cholesterol content in muscle and liver was high during post-spawning phase and low during preparatory phase. These changes indicate that, their necessity for the metabolic activity of the fish and energy needed for preparation of gonads growth during preparatory phase of the reproductive cycle.

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