Seasonal variation and effect of salinity on the total protein, glycogen and cholesterol content in the testes of *Mystus vittatus* (Bloch.)

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**ABSTRACT**

The present study has been undertaken to find out whether the biochemical constituents viz., protein, glycogen and cholesterol content of the freshwater catfish, *Mystus vittatus* at different seasons, could be related to reproductive cycle of the fish. The study on the salinity has been undertaken to find out its effect on the fish growth and maturation of testes. During the post spawning season, October, November and December 2009, the Gonadosomatic index of the testes of *Mystus vittatus* (Bloch) gradually decreased. During the resting season, in the months of January to March 2010, the Gonadosomatic index of the testes reaches minimum. The total protein, glycogen and cholesterol content in the testes during the post spawning and resting season decreased along with the Gonadosomatic index. The maximum number of fishes survived at 20‰S salinity. The fishes subjected to 20‰S salinity, during the post spawning and resting season showed that the Gonadosomatic index of the testes and the values of the total protein, glycogen and cholesterol content in the testes increased when compared to that of the control fish.

**KEY WORDS:** Cholesterol, glycogen, *Mystus vittatus*, post spawning season, salinity

**INTRODUCTION**

Biochemical studies on fish tissues have drawn the attention of several researchers because tissues are major source of protein, carbohydrate and have high calorific value (Joshi *et al.*, 1979). Various studies have been carried out on the biochemical constituents in relation to the reproductive cycle of fishes. (Das, 1978; Jyotsna *et al.*, 1995) Study of seasonal variations in biochemical constituents of fish, forms an important and interesting aspect of biochemical studies. Biochemical composition of fish varies from species to species and with in the same species from one and another (Stansby, 1962). Seasonal variations were observed in the concentration of different biochemical constituents and these changes have been attributed to factors like gonad maturation. Changes occurring in the biochemical composition of fish from season to season were found to be influenced by factors such as sex and maturation. (Saksena and Saksena, 1999).
The biochemical composition of a species helps to assess its nutritional and edible value. Though a lot of work on biochemical composition has been undertaken, very few have correlated with the reproductive cycle in fishes like *Sockeye salmon*; *Channa gachua* (Gupta and Raina Sujata, 1977; Dabhade et al., 2009).

Seasonal variations in the chemical composition were reported in the catfish *Heteropneustes fossilis* (Bloch) (Shrenikalpana, 1980). The seasonal variation was studied in *Oreochromis mossambicus* (Pathan and Baile 2005), *Heteropneustes fossilis* (Hunge and Baile, 2003), *Channa orientalis* (Saksena and Saksena 1999).

The effect of salinity suggesting its influence on gonadal maturation in fresh water catfish *Mystus montanus* (Arockiaraj et al., 2001) and grey mullets (Brusle, 1981). The effect of salinity on the growth of freshwater fishes were reported in *Micropterus salmoides* and *Lepomis macrochirus* (Meador and Kelso, 1990). Many studies have reported an influence of water salinity on fish development and growth (Bouef and Payan, 2001).

Not much work has been done on the freshwater catfish, *Mystus vittatus* (Bloch), a commercial food fish of Karnataka. Hence, the present studies were undertaken on the seasonal variation and effect of salinity on the testes of *Mystus vittatus* (Bloch) during the post spawning and resting season. This attempt has been made to find out whether the biochemical constituents i.e. the total protein, glycogen and cholesterol content of testes at different seasons, could be related to the reproductive cycle of the testes of *M. vittatus*.

**MATERIALS AND METHODS**

Live male fishes of *Mystus vittatus* were collected monthly from October to December 2009 during the post pawning season and January to March 2010, during the resting season from Ramanayakkan lake in Hosur, 35 kmts from Bangalore city situated at an altitude of 12º43’0"N and Longitude 77º49’0"E with an altitude of 878mts. They were brought to the laboratory in plastic containers. They were acclimatized to the laboratory conditions and to the natural photoperiod and temperature of 25º ±3°C. The fish were fed daily ‘adlibitum’ with commercial fish feed. The water in the aquaria was changed every alternate day. The fishes were individually weighed and their body weights were recorded. The testes were removed and the Gonadosomatic index was determined by using the formula.

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\text{GSI} = \frac{\text{Wet weight of the testes (gm)}}{\text{Live body weight of the fish (gm)}} \times 100
\]

The testes were estimated for the total protein, glycogen and cholesterol content by using the standard methods mentioned below.

**Effect of 20% S salinity on the testes of *M. vittatus***: Live male fishes of *M. vittatus* were subjected to 20‰S salinity for 30 days. On the 31st day the fishes were autopsied, the testes were removed the GSI were calculated as mentioned above. The fishes were grouped into 2 groups viz., Control
and Experimental group. The testes were analysed for the total protein, glycogen and cholesterol content by using the following standard methods:

Estimation of total protein content ------ by Lowry et al. Method (1951)
Estimation of total glycogen content ---- by Dubois et al. Method (1956)
Estimation of total cholesterol content -by Schoennerimer Sperry and Webb Method (1950)

The values are expressed as mg/gm wet weight of the testes.

RESULTS AND DISCUSSION

It is evident that, in the fish, Mystus vittatus there is a gradual decrease in the Gonadosomatic index of the testes during the post spawning season (October, November and December 2009) and resting season (January, February and March 2010). (Fig: 1). Similar results were reported in Barbus scalateri and Mystus montanus where where the lowest value of the Gonadosomatic index of the testes were due to the somatic energy depletion. (Encina and Lorencio, 1977; Arockiaraj et al., 2001). It is evident that the protein content of the testes decreased during the post spawning and resting season in the fish Mystus vittatus. (Fig: 2). Similar results were reported in Ophiocephalus punctatus (Jafri and Khawaja, 1968), Clarias batrachus (Srikar et al., 1979) and Garra mullya (Somvanshi, 1983). The low level of protein is due to the active utilization of the testes during the process of maturation. Similar results were reported in Nemipterus leptilepis (Joshi and Hameed, 1995).

Protein cycle is influenced by the maturation of gonads as reported in Ophiocephalus punctatus and Wallogonia attu (Jafri and Khawaja, 1968; Jafri 1969).

It was evident that the glycogen content of the testes decreased during the post spawning season (October, November and December 2009) and resting season (January, February and March 2010) (Fig: 3). Similar results were reported in Notopterus notopterus, Channa punctatus, Channa striatus (Sajal basu, 1991). Glycogen, a polymer of glucose and the main reserve food of all animals, is known to be used up continuously for energy requirement during the development.

The cholesterol content decreased in the testes of Mystus vittatus during the post spawning and resting season. It is evident that deposited energy were used for reproductive activity. (Fig: 4). Similar results were reported in rainbow trout (Andrew, 2001; Diwan and Krishnan, 1986). The decrease in the cholesterol content in the post spawning and resting season is related to the decrease in the accumulation of steroid level in male fish as reported in Etroplus suratensis (Diwan and Krishnan,1986).The steroids like androgen in male fish, is used up during the gonadal maturation.

The fishes subjected to 20‰ S salinity during the post spawning season (October, November and December 2009) and resting season (January, February and March 2010), the Gonadosomatic index of the testes increased when compared to that of the control fish. (Fig: 5). Similar results were reported in grey mullets (Brusle,
1981) and *Mystus montanus* (Arockiraj *et al.*, 2001). It is evident that the protein, glycogen and cholesterol content increased in the fish subjected to 20‰S salinity when compared to the control fish.

It was evident that during the post spawning season October, November and December 2009 and resting season January, February and March 2010, the protein content, glycogen and cholesterol was minimum and increased when the fish was subjected to 20‰S salinity during the post spawning season when compared to the control fish. (Figs: 6, 7, 8). It is inferred that salinity has a marked effect on gonadal maturation in *Mystus vittatus*. Salinity induces maturation of gonads (Sudha, 1986). The increase in the cholesterol content indicates that the environmental factor such as salinity plays a regulatory role cholesterol supply to the gonads and its utilization there on.

**CONCLUSION**

The present study has been undertaken to correlate the seasonal variations in biochemical composition of protein, glycogen and cholesterol content of the testes to its reproductive seasons in freshwater catfish *Mystus vittatus*. Knowledge of biochemical composition of fish assists in elucidating its environmental, physiological and nutritive status. The Gonadosomatic index (GSI) is the ratio of the fish gonad weight to body weight. This information can be helpful for better management of freshwater fisheries and prevention of fish capture in breeding season to conserve the diversity of fish. The biochemical composition of testes helps to analyze whether the fish is in good condition. The present study on the effect of salinity shows that salinity influences gonadal maturation. There by providing the information for the selection process of hatchery for the artificial propagation of this fish.

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Fig. 1: Seasonal variations on the Gonadosomatic index (GSI) of the testes during the post spawning and resting season in *Mystus vittatus* (Bloch) Values represent Mean ± S.E

Fig. 2: Seasonal variations on the total protein content of the testes during the post spawning and resting season in *M. vittatus* Values represent Mean ± S.E
Fig. 3: Seasonal variations on the total glycogen content of the testes during the post spawning and resting season in *M. vittatus*. Values represent Mean ± S.E.

Fig. 4: Seasonal variations on the total cholesterol content of the testes during the post spawning and resting season in *M. vittatus*. Values represent Mean ± S.E.
Fig. 5: Effect of 20‰ S salinity on the Gonadosomatic index of the testes during the post spawning and resting season in *M. vittatus* Values represent Mean ± S.E

Fig. 6: Effect of 20‰ S salinity on the total protein content of the testes during the post spawning and resting season in *M. vittatus* Values represent Mean ± S.E
Fig. 7: Effect of 20‰ S salinity on the total glycogen content of the testes during the post spawning and resting season in *M. vittatus*. Values represent Mean ± S.E.

Fig. 8: Effect of 20 ‰ S salinity on the total cholesterol content of the testes during the post spawning and resting season in *M. vittatus*. Values represent Mean ± S.E.
REFERENCES


