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STUDY ON CHANGES OF GLYCOGEN AND LIPID CONTENT IN LIVER OF TWO SPECIES OF FISHES OFF JODIA COAST IN GULF OF KUTCH

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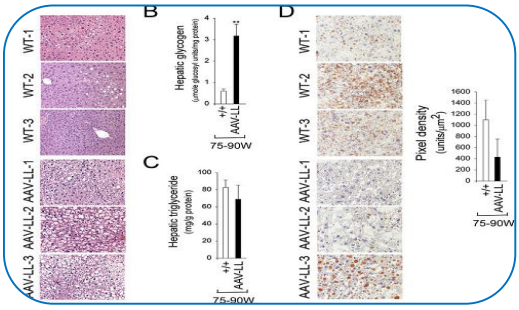
ABSTRACT :

The Glycogen content, in liver of E. tetradactylum shows a decreasing trend during pre-spawning period and increasing trend during spawning period. The decreased level in glycogen content in the liver of L. tade during post spawning period indicate it in active utilization, and The total lipid of E. tetradactylum increases during spawning period and in L. tade liver total lipid shows an increasing trend during spawning and increasing and decreasing trend is recorded during post spawning period.



KEYWORDS : *Glycogen, Lipid, E. tetradactylum, L. tade*

INTRODUCTION

The liver in fishes perform may function as liver of higher vertebrates. It is generally believed to be main site for production and distribution of intermediary metabolites (Popper and Schaffner, 1957). A relative increase in liver size and maturity in fish has been reported and a steady increase in liver weight of female fish along with gonadal maturation has been recorded. Marked variations in liver, glycogen, lipids, amino acids, inorganic ions, in liver of fishes in relation to sexual maturity have been presented by many workers (Love, 1970; a review). The liver in *L. tade* is of dark red colour whereas *E. tetradactylum* is of yellow brown colour and it has occupied the largest protein viscera.

It is obvious that when the main sites of metabolic processes in *E. tetradactylum* and *L. tade* the liver is studied biochemically to investigate the variations in glycogen, lipids, cholesterol, protein, sodium, potassium, calcium, magnesium, phosphorus and iron. An attempt to throw some lights on various facets of metabolism of *E. tetradactylum* and *L. tade* would be fruitful.

The fish liver stores carbohydrate as glycogen, a polysaccharide built of glucose units The liver glycogen is broken down and transported to the muscles as the glucose supplies energy as and when required. It is also reported that of all energy reserves the preference to the carbohydrates is given for immediate utilization for energy requirement. Among main three energy reserves glycogen lipid, protein, a rapid decrease in glycogen during starvation was recorded in *Anquilla japonica* (inuins Ohshina; 1966). In *Opsanus tau* starved for last 1 to 3 months the liver glycogen deflected from 12.7% to 4.1% but fall in lipid was from 5.38 to 4.4% (Tshima and Cahill, 1965).

The energy requirement in spawning migratory fishes comes from lipid reserve. However, during the spawning, change in carbohydrate has also been recorded. Several reports are also suggestive of

mobilization of liver glycogen during starvation in fishes. (Bellamy, 1968; Love, 1970; Hochachka and Simplair, 1962; Inui and Toshima, 1966).

As liver performs various functions in fishes. One of its major functions is to store lipid. In fishes liver and skeletal muscles both are considered at storage site for lipids (Balinsky, 1969; Tashima and Kahil, 1965). An increase in content of either liver or muscles oil during growth of *Anguilla anguilla* (Hovern, 1938b); *Gadus morrhua* (Jangaard et al., 1967); *Galeorhinus zyopterus* (Riply and Bolomey, 1946). Raja patis (Fisher, 1964); *Trachurus trachurus* (Arevalo, 1948) and significant increase in lipid content of *Pampus argenteus* and *Parastromateus niger* during maturity stages was recorded by Varghese (1976). Joseph (1967) has also reported significant increase in lipids of liver of migratory *Hilsa ilisha* and non-migratory mature *Hilsa toil.* The mobilizations of phospholipids from liver to the gonads for the formation of gametes in fish is now well documented (Love, 1970).

Role of hormonal variations occurring during maturation is considered to be affecting fluctuations in lipid contents of plasma, liver and visceral adipose tissues of mature and immature fishes (Takashima et al., 1975). The same author has reported the synthesis of lipo-protein in liver and the release in to blood which is under influence of ovarian steroid hormones (Takashima et al., 1972).

With a view to investigate monthly variations in lipid content of liver of both the fish *E. tetradactylum* and *L. tade,* the present investigation was under taken.

MATERIALS AND METHODS:

The ten to fifteen live *E. tetradactylum* and *L. tade* of length group 10 to 20 cm were sacrificed in the field very quickly and the liver of the fish was dissected out and immersed in 30% KOH to estimate glycogen in liver. Enough care was taken to dissect the fish individually rapidly. Hassid and Abraham (1957) method was followed. The readings obtained from different samples were subjected to statistical analysis and are presented Fig. 1 and Table 1.

Total lipid was estimated quantitatively. The liver samples were dissected out from ten to fifteen live *E. tetradactylum* and *L. tade* of 10 to 20 cm in total length. The samples were then brought to the laboratory, and were dried in an oven at 48^0C temperature for 3 to 5 days and homogenized powder were made. The total lipids of the dried samples were estimated by Soxhlet apparatus using ethanol and petroleum ether mixture (3:1 ratio) as a solvent system. The results are recorded in milligrams per gram and are presented in Fig. 2 and Table 2.

RESULT AND DISCUSSION: -

It is evident from Graph 39 and Table 39 that glycogen content of liver *E. tetradactylum* shows higher level during January, March, May, July, November and December with peak period in May. The lowest level in glycogen of liver is observed during August and September. Generally higher level in glycogen content is studied during post spawning and pre-spawning period. Indicating, that fish might be accumulating glycogen during this period. A gradual increase level is observed during spawning period which may be for supplying metabolites to gonads for the preparation for spawning seasons.

Regarding glycogen content in liver of *L. tade* shows decrease level during spawning and post spawning period. The glycogen content shows higher level in May to August with two peaks in June and August respectively. A gradual decrease level is observed during September to December. The lowest level of glycogen content in liver is studied during March and April. Low glycogen content in liver during post-spawning and spawning. Indicates, the mobilization of metabolites from liver to muscles and gonads. It also indicates that fish muscles require higher metabolites content for the migration from open see to Gulf of Kuchchh and for the movement during spawning time. The glycogen of female of *Clarias lazera* is preferentially depleted during ovarian maturation (Fontaine and Hatey, 1953: Chang and Idler, 1960). In spawning *Salmo salar,* notable depletion in liver glycogen is also recorded. It is obvious that their drop in glycogen after spawning is due to depletion. Low value of glycogen in liver of both the species during post

spawning and pre-spawning period may be due to migration and movement of fish during this period in such of spawning ground.

It is evident from Graph 40 and table 40 that liver among all the organs, stores the highest amount of lipids compared to white muscles, red muscles, testes and ovary. The lipid stores of liver of *E. testradactylum* increases considerably in January, Mach and June, it also shows higher level in December The lipid reserved of liver falls down during pre-spawning period, and it shows higher level during spawning and post spawning period of decline level in liver. Total lipids content, indicates that mobilization of total lipids towards gonads for gamete formation An increase level in total lipids in liver during spawning period indicates, the active metabolic activities during this period. It is reported that liver fat reserve of *Cirrihina mrigala* possibly takes place when gonads are on the way to maturation (Joseph, 1968). Our results are agreeing with these results, agree content in liver during pre-spawning period might be utilization of total lipids by gonads through liver. The results show that as maturing advances the lipids store level goes up.

Regarding total lipid content in liver of *L. tade* increase level is observe in September, October, November, December, February and April. Generally, an increase level of total lipid content is observed during pre-spawning, spawning period. A decline level as observed during late period of post spawning, highest level in total lipid of liver is study during pre-spawning and spawning time. Suggest that fish might be accumulating total lipid in liver for movement and in breeding grounds and for gonadial activities. Accumulation of lipid in liver of many fishes is recorded with growth (Mann, 1960; Jhangaard, et al., 1967; Fisher, 1964; Arevalo, 1948. In *Hilsa ilisha* and *Hilsa toli* also during sexual maturing considerable quantity of fat was accumulated in liver. However in *Pampus argenteus* and *Parastromateus niger* during the stage of sexual maturing rise in fat of liver has observed. Both species shows rise in liver lipids before spawning and during the period of gametogenesis (Bhavsar, 1978). The muscles of the fishes are also storage site of lipids. When the lipid variations of white and red muscles are compared with that of liver it can be stated that liver appears to be major storage site of fat. The muscles fat decrease after spawning. The trend similar to that of liver, is suggestive of utilization of fat from liver as well as from white and red muscles in post spawning period. This indicates that muscles and liver both function as fat depots in both the species.

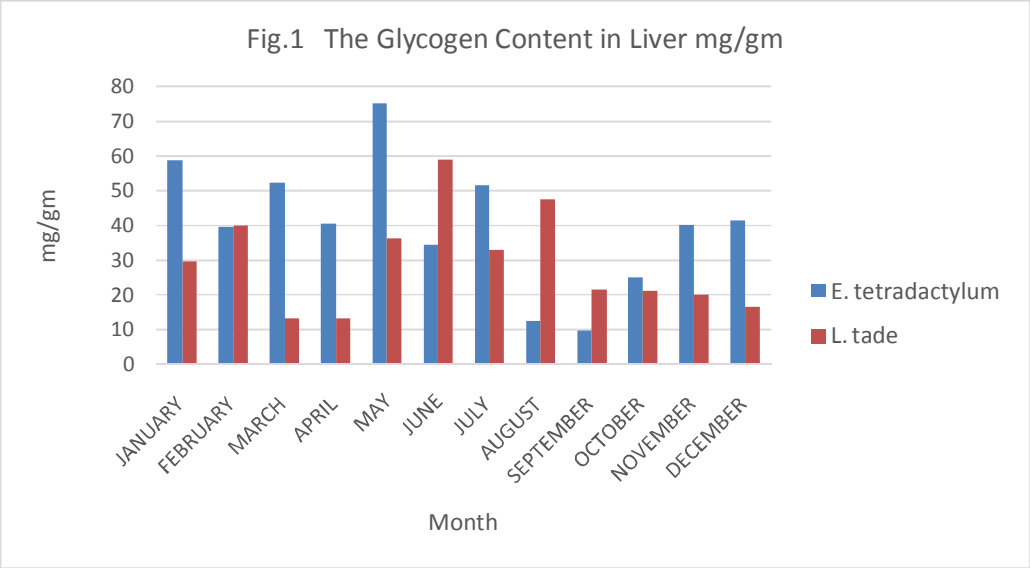
TABLE: -1 THE MOTHWISE GLYCOGEN CONTENT IN LIVER mg/gm

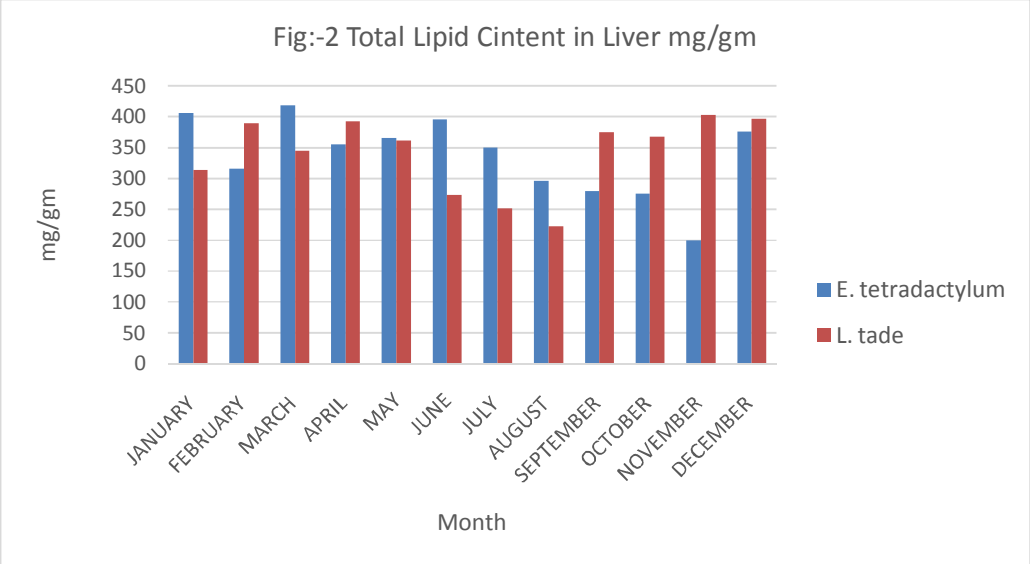
MONTH	***E. tetradactylum***	***L. tade***
JANUARY	58.75±0.1	29.60±0.03
FEBRUARY	39.45±0.03	39.90±0.08
MARCH	52.25±0.10	13.15±0.05
APRIL	40.55±0.03	13.10±0.00
MAY	75.10±0.00	36.20±0.07
JUNE	34.25±0.10	58.90±0.03
JULY	51.50±0.10	32.85±0.10
AUGUST	12.50±0.00	47.50±0.05
SEPTEMBER	9.75±0.08	21.40±0.03
OCTOBER	24.85±0.10	21.20±0.10
NOVEMBER	40.05±0.03	20.10±0.05
DECEMBER	41.45±0.08	16.50±0.05

TABLE: -2 THE MOTHWISE TOTAL LIPID CONTENT IN LIVER mg/gm

MONTH	**E. tetradactylum**	**L. tade**
JANUARY	405±0.5	314±3.2
FEBRUARY	316±1.7	389±3.6
MARCH	418±2.5	344±1.5
APRIL	355±3.6	392±2.5

MAY	365±5	360±2.0
JUNE	395±2.6	273±1.5
JULY	350±0.0	251±1.5
AUGUST	295±2.9	222±2.0
SEPTEMBER	280±1.7	374±0.00
OCTOBER	275±1.5	367±2.5
NOVEMBER	200±0.0	402±2.9
DECEMBER	375±2.5	396±5.7





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