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Studies on Changes of Sodium, Potassium and Calcium in Liver of Two Species of Fishes off Jodia Coast in Gulf of Kutch

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ABSTRACT
Similar to the variation observed in biochemical parameters variation like sodium, potassium and calcium in liver in both the species was studied, rise and fall level in minerals content in liver organ in both the species was observed in relation to pre spawning, spawning and post spawning period, all these observed decreasing and increasing trends in minerals content in respectively organs have correlation with the gonadial cycle of both the fish.

Keywords : Sodium, Potassium, Calcium, Liver

I. 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.

Sodium is measured in the form of organic ion in liver of fishes. Its importance in fish metabolism. Its role in maintaining pH of the body is also known. The influence of aldosterone on electrolyte metabolism of salmon is already recorded (Philips, et al; 1959). Rise in sodium during the depletion in fishes is recorded by some workers, (Love 1970). Tomlinson et, al; (1967), have reported that feeding has negligible effects on concentration of minerals but the changes of some type are associated with the development of gonads in which hormonal role is suggested.

Role of potassium in active transport in body is long back realized. Rise in potassium level in fish body with increase in size of fish has been reported thrust on and McMaster (1959). MaCleod et, al; (1958); and Idler and Bitners (1959) have recorded reduction in potassium content during depletion in fish. Role of sex hormones in potassium and sodium of fish body have been suggested by MaCleod et al. (1958). Chester Jones (1959) has also shown influence of adrenal corticoid in sodium and potassium concentration of blood of fish. Importance of potassium in various metabolic path ways is well documented and there

exists a relation between potassium and Protein level (Love, 1970).

In most of the tissues calcium is mainly bound to proteins. In fishes with an advancement of maturity increase in serum calcium in female fish has been reported (Love, 1970). calcium is linked to serum protein which is utilized during development of ova (Bailey, 1957). During depletion of fishes no significant change in calcium content was recorded in the fishes (Love, 1970).

With a purpose to investigate whether sodium, potassium and calcium content of liver of both of the fish *E. tetradactylum* and *L. tade* varies during various stages of reproductive cycle, the present investigation was undertaken.

II. MATERIALS AND METHODS

The liver of fifteen to twenty of *E. tetradactylum* and *L. tade* of length 10 to 20 cm. were dissected out from the live fishes in the field every month talking care to avoid stress. Then the samples were brought to the laboratory and after removing water gently with help of blotting papers, the samples were dried in an oven at 46^0C for three to five days. Known amount of homogenized powder was digested with conc. H_2SO_4 and per chloric acid. Digested solutions were made up to certain volume. Sodium and potassium was determined by flame photometer (Eel make) using sodium filter and sodium filter and calcium present above solution was determined by E.D.T.A. Method, using Erichrome Black – T as indication, the all minerals reading were then converted to mg/gm of dry weight of Liver muscles respectively.

III. RESULTS AND DISCUSSION

It is evident from Fig-1 and table-1 that sodium level decline during depletion in both the species in March *E. tetradactylum* and April *L. tade.* The sodium content gradually increases during pre-spawning period and it remains same trend during spawning period. It shows a gradual decline level from May, to Sept. in case of *E. tetradactylum.* the sodium content shows an increase level during May, June and gradually decreased from July to October. Reduction of the liver sodium during the just after spawning is over in *L. tade,* it is attributed to depletion. An increase level of sodium in liver of both the species along with the enhancement of sexual maturity, Varghese (1976) had also found, the same result in *Pampus argenteus.*

Potassium content in liver of *E. tetradactylum* show moderate level during pre-spawning and beginning of spawning. It shows higher level during peak period of spawning and fall down during just after spawning is over i.e. Mach and April. Again it rises in May and shows higher level in June and July. Regarding *L. tade* it shows highest level during pre-spawning and it again shows an increase trend during peak period of spawning and falls down during just after spawning is over i.e. Mach and April. Again it rises in May and shows higher level in June and July. Regarding *L. tade* it shows highest level during pre-spawning and spawning, it again shows an increase during peak period of spawning i.e. January, February it immediately falls down just after the spawning i.e. March and April it shows moderate up and down level from April to August.

A decrease in the level of potassium during depletion in *Gadus morrhua is* recorded by Love et, al; (1968). However, in liver of male and female of *Pampus argenteus,* notable decrease in liver during spent season of the fish was recorded by Varghese, (1976), Love (1970) correlated high protein level with high potassium level in fish.

The calcium in liver of *E. tetradactylum* shows an increase and decrease level during January to December. Calcium content in liver shows no significant increase and decrease level, in case of *L. tade.* Calcium level in liver shows an increase level during post spawning and pre-spawning except (August), and decrease trend during the period of spawning and late period of spawning.

The liver calcium shows elevated level during period of gametogenesis. It shows a peak level at the time of just spawning. It remains higher level during peak period of spawning and again fall down just after spawning. It can be attributed to, that the mobilization of calcium for ovarian growth. As fall in calcium during late spawning period can be attributed to depletion in February. Bailey (1957) and Varghese (1976) have recorded decrease, in Calcium level in mature fishes and have explained, that in liver to mobilization of calcium from liver to ovary. In both the fishes the decrease in calcium level in September, October can be considered for such type of mobilization.

Table-1 Showing the sodium content in liver in mg/gm

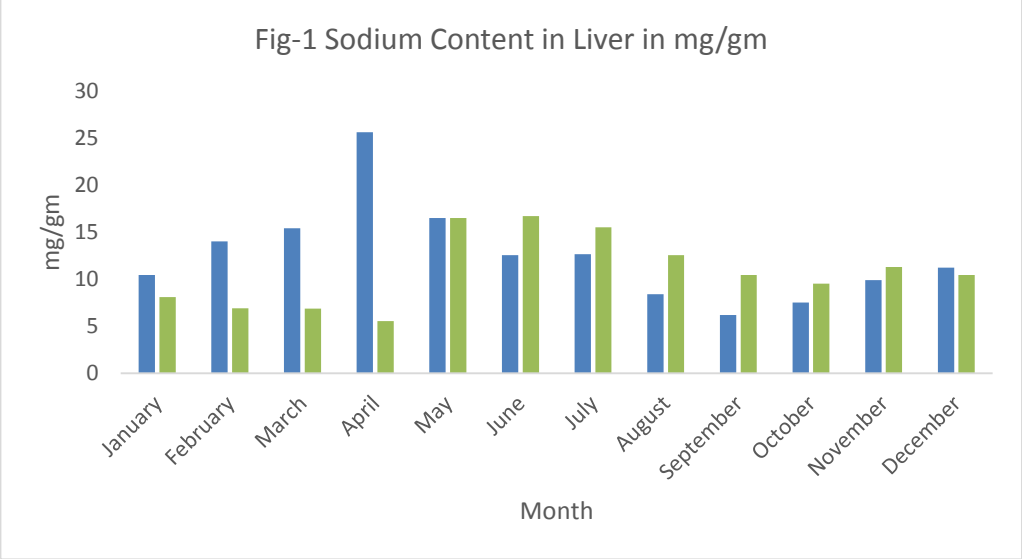
Month	*E. tetradactylum*	*L. tade*
January	10.45±0.17	8.10±0.17
February	14.00±0.30	6.90±0.69
March	15.40±.35	6.85±0.17
April	25.60±0.18	5.55±0.16
May	16.50±0.17	16.50±0.17
June	12.55±0.35	16.69±0.00
July	12.65±0.46	15.50±.30
August	8.40±0.17	12.55±0.35
September	6.20±0.17	10.45±0.34
October	7.50±0.17	9.51±0.35
November	9.90±0.18	11.30±0.17
December	11.23±0.00	10.45±.17

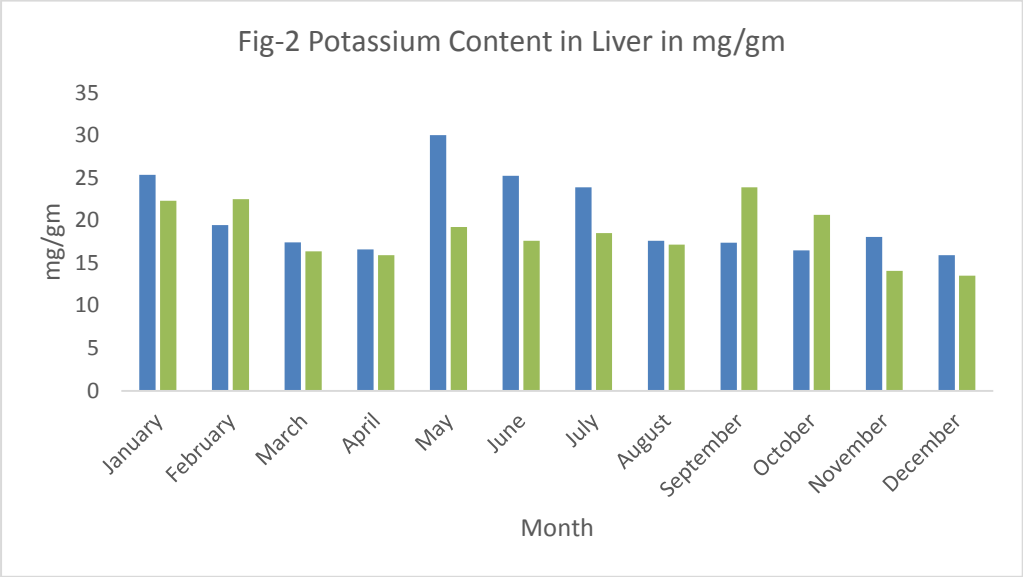
Table-2 Showing the potassium content in liver in mg/gm

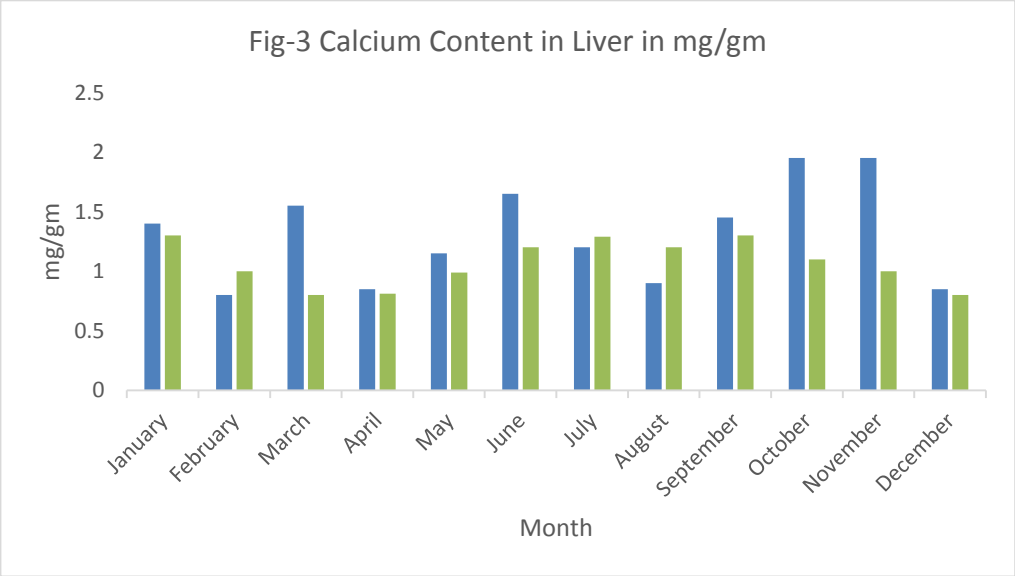
Month	*E. tetradactylum*	*L. tade*
January	25.40±0.20	22.33±0.86
February	19.50±0.40	22.55±0.34
March	17.45±0.34	16.40±0.59
April	16.63±0.20	15.95±0.20
May	30.07±0.00	19.25±0.39
June	25.29±0.60	17.65±0.19
July	23.92±0.34	18.55±0.71
August	17.65±0.20	17.20±0.51
September	17.43±0.34	23.92±0.34
October	16.52±0.40	20.70±0.79
November	18.11±0.59	14.10±.39
December	15.95±0.20	13.55±0.20

Table-3 Showing the calcium content in liver in mg/gm

Month	*E. tetradactylum*	*L. tade*
January	1.40±0.02	1.30±0.03
February	0.80±0.00	1.00±0.06
March	1.55±0.12	0.80±0.00
April	0.85±0.12	0.81±0.06
May	1.15±0.12	0.99±0.02
June	1.65±0.07	1.20±0.00
July	1.20±0.00	1.29±0.06
August	0.90±0.12	1.20±0.02
September	1.45±0.12	1.30±0.02
October	1.95±0.12	1.10±0.02
November	1.95±0.05	1.00±0.04
December	0.85±0.05	0.80±0.00







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