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ROLE OF ACID PHOSPHATASE IN THE REPRODUCTIVE CYCLE OF FEMALE *LABEO ROHITA* (HAM)

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ABSTRACT

Acid phosphatase, lysosomal enzyme play an important role in the reproduction of fish and shows seasonal variation in its expression in reproductive cycle of *Labeo rohita*. Lowry method was used to study the enzyme activity. Acid phosphatase activity was observed to increase in post-spawning phase. In the resting and preparatory phase, significant decreased in the activity was noticed. Enzyme activity was continuously increased from preparatory to post-spawning phase. Gonadosomatic index (GSI) was highest in spawning phase due to increase in the size of ovary that was not corresponding with enzyme activity. Significantly highest enzyme activity was recorded during the post-spawning phase and might be due to their lytic activities which lead to degeneration of ovary during this phase.

KEYWORDS: Ovary, acid phosphatase, Gonadosomatic index, *Labeo rohita*.

INTRODUCTION

The ovary of *Labeo rohita* is of cystovarian type because the lumen of ovary is continuous with oviduct as in *Clarias batrachus* (Lehri, 1968). Number of fishes exhibits seasonal variation in their ovarian cycle consists of different type oocytes with their dominancy in particular phase of the reproductive phase. Gonadosomatic indices also changes with respect to reproductive of cycle and always highest in spawning phase.

The acid phosphatases are widely distributed in animal tissues, such as prostate, spleen and liver which are the richest sources. The work of Folley and Kay (1936) indicates that there

were three types of acid phosphatases which could be differentiated by their pH optima, their sensitivity to Mg^{2+} ions and their relative activity towards α and β- glycerophosphates. Further studies by Roches (1950) definitely suggested that more than one acid phosphatase were present in the liver and later work by Goodlad and Mills (1957) produced further indicate that this was the case. More modern studies continue to support the idea that a number of separate acid phosphatase exist in single situation. As very scanty work is available on the role of acid phosphatase in the reproduction of teleosts and therefore the present work was undertaken for the investigation.

MATERIALS AND METHODS

In every month six adult females of *Labeo rohita* were collected fortnightly from Pench fish seed center near Nagpur from the month of January to December. Fish ranged between 1.5 to 3.5 Kg was selected for the study which was brought to the laboratory and after acclimatization, they were anesthetized, weighed and killed by decapitation. The ovaries were removed, weighed and Gonadosomatic index was calculated by the following formula (Roff, 1983) to ascertain the gonadal activity throughout the year.

GSI= Weight of Gonad + Weight of Fish x 100

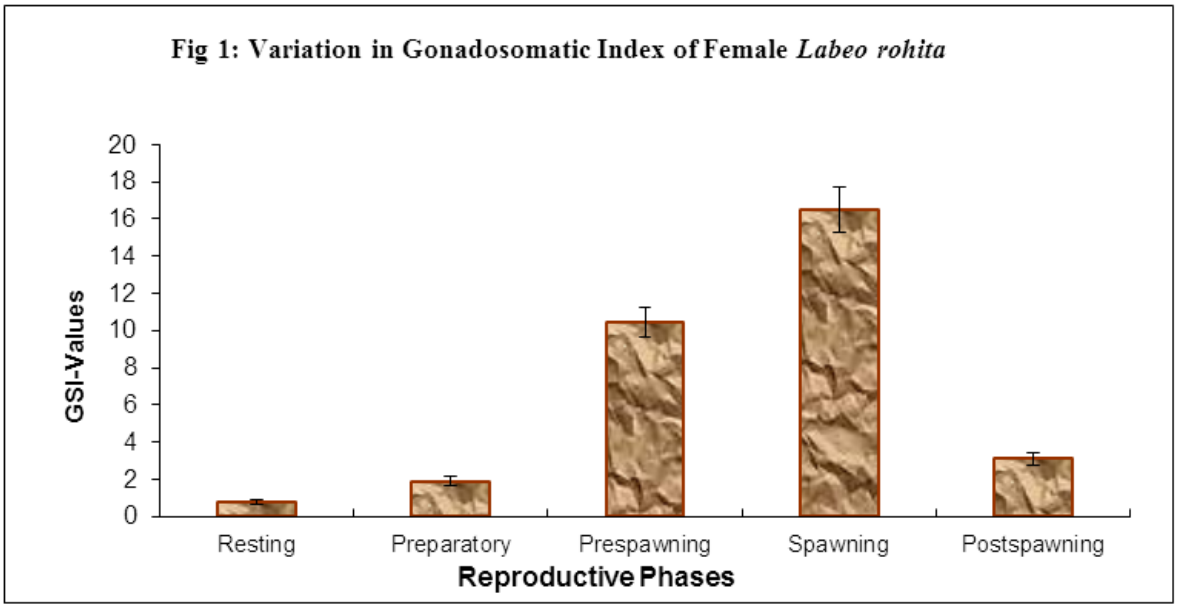
Estimation of acid phosphatase was carried out as per method of Lowry *et al*., (1954) and the optical density was measured at 405 nm on visible spectrophotometer. All statistics presented in this study are mean ± standard error. Students's test was made for testing the significance of difference between the mean of reading of experimental and control group in this study, using 5% level of significance.

RESULT AND DISCUSSION

The reproductive cycle of females *Labeo rohita* was divided into five phases, such as resting, preparatory, pre-spawning, spawning and post-spawning depending upon seasonal changes in the ovary and variations in GSI (Table 1 and Fig.1). It was observed that the GSI increases gradually from preparatory and the increase is statistically significant ($P < 0.01$) both in pre-spawning and spawning phases. It drastically decreases in post-spawning and resting phases. In *Garra mullya* GSI exhibits increase trend from February onwards and highest was in July (spawning phase). It decreases sharply from November to January (Khan and Mehrotra, 1991). Same result was reported in *Heteropneustes fossilis* (Hunge and Baile, 2003) and *Oreochromis mossambicus* (Pathan and Baile, 2005).

Table 1: Seasonal Gonadosomatic indices (GSI) in the reproductive cycle of female *Labeo rohita.*

Phases	Months	GSI	Mean
Resting (Control)	November	0.69 ± 0.10	0.74 ± 0.12
	December	0.60 ± 0.12	
	January	0.95 ± 0.16	
Preparatory	February	1.26 ± 0.05	1.89 ± 0.24 P < 0.01
	March	2.53 ± 0.63	
Pre-spawning	April	3.43 ± 0.89	10.42 ± 0.79 P < 0.01
	May	8.83 ± 1.66	
	June	19.00 ±1.02	
Spawning	July	21.98 ± 1.80	16.49 ± 1.70 P < 0.01
	August	11.01 ± 1.60	
Post-spawning	September	1.30 ± 0.36	3.08 ± 0.34 P < 0.01
	October	0.87 ± 0.09	



Deficiency of enzymes and metabolites interrupt metabolic pathways and lead to the accumulation or loss of distinct substrates and metabolites (Lahnsteiner *et al*., 1999). Enzymes such as β-D glucuronidase, acid and alkaline phosphatase were implicated in lytic and degenerating processes especially in association with yolk protein degradation in Trout (Sire *et al*., 1994). In female *Labeo rohita* the acid phosphatase activity exhibits quite variation in the reproductive cycle. Enzyme activity was significally low (P≤0.001) in pre-spawning phase (Table 2 and Fig.2). in the synthesis phase of *Clarias batrachus* highest alkaline phosphatase activity was reported, indicating the possible involvement of this enzyme in protein synthesis and a drop in enzyme activity in mature ovary bearing fully grown oocytes points towards fall in synthesis of reserves, as oocytes by this stage appear to

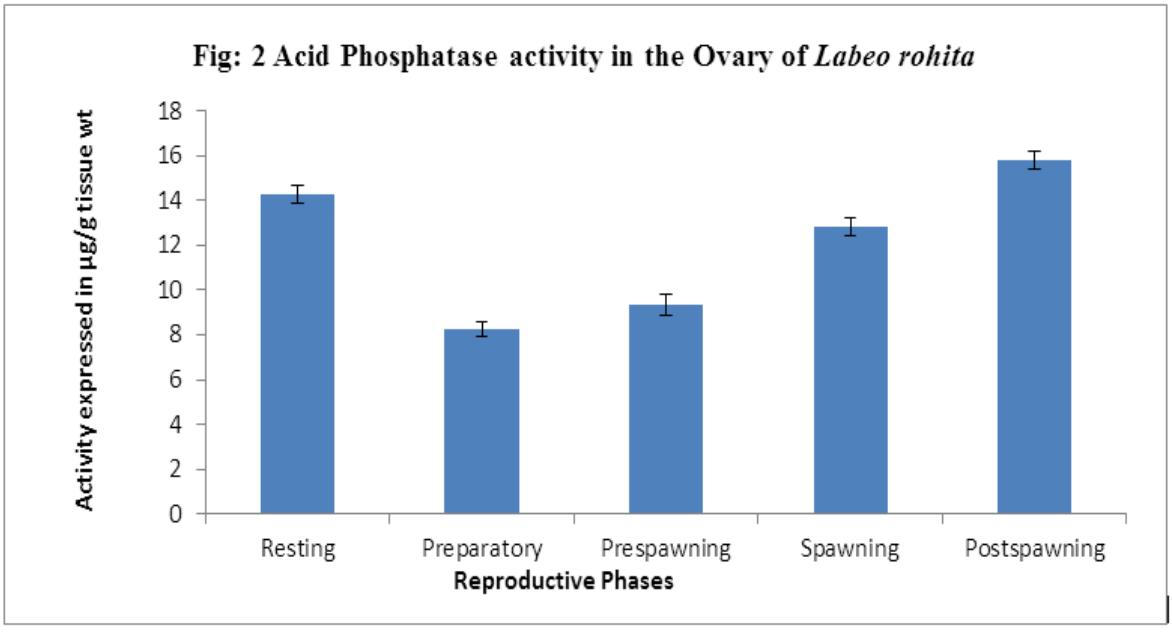
complete their growth and differentiation. The lowest level of enzyme activity during the spent phase signifies that the enzyme apparently plays no significant physiological role during this stage in *Clarias batrachus* (Shaffi *et al*., 1974). But, increase in acid phosphatase activity during post-spawning phase exhibit its role in the destruction of leftover oocytes in the ovary of *Labeo rohita.*

Presence of acid phosphatase activity in the atretic follicles indicated that these follicles do not have an endocrine function in *Tilapia nilotica* (Yaron, 1971). Livni (1971) reported same observation in the ovaries of *Cyprinus carpio*, *Mugil capito* and *Tilapia aurea*. It was also reported that, peritubular cells were characterized by the activity of alkaline phosphatase in rat (Chapin *et al*., 1987; Palombo and Di Carlo, 1988; Anthony and Skinner, 1989). Our finding suggest that, there may be very little role of this enzyme during preparatory and pre-spawning phase while in spawning phase it might have significant function in matured oocytes.

Table 2: **Acid Phosphatase activity in reproductive cycle of Female *Labeo rohita* during different phases of the reproductive cycle.**

Phases	**Ovary**
Resting (Control)	10.3 ± 0.40
Preparatory	8.25±0.35 P<0.001
Prespawning	9.36±0.48 P<0.001
Spawning	12.8±0.40 P<0.001
Postspawning	15.8 ± 0.40 P<0.001

Fig: 2 Acid Phosphatase activity in the Ovary of *Labeo rohita*



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