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ORIGINAL ARTICLE

EFFECT OF TEMPERATURE AND PH ON METABOLIC ACTIVITY OF FISH C. BATRACHUS

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1. **ABSTRACT**;

The animal living between tide marks are obliged to adapt themselves to circumstances to an even more marked degree than the land of purely aquatic forms because they are exposed to regular alteration between submergence and emergence. Inter tidal organism appear to be well adopted to resist the stress and two of the most obvious of such stresses are those of temperature and decision.

Temperature tolerance as an experimental criterion for the demonstration of physiological change has found many uses much of the experimental literature was found on fishes and comparatively very little on invertebrates. The animal subject to slowly increasing temperature and the temperature at which occurred was conformed as lethal point. Since different workers raised the temperature at different rates, the result could not be compared adequately because the time over which the temperature was increased would be expected to have marked effect on final lethal point. Experiments in which animals were mentioned at constant temperature for a period of time provided more accurate determination of lethal temperature.

2.**KEY WORDS**; Lethal point, submerge.

3.INTRODUCTION

The deference in thermal sensitivity may be associated with both latitudinal difference and with variations in shore level, as well as with topography and aspects of the particular shore from which the animals were connected. Most of such data, particularly those for upper lethal temperature have been obtained in laboratory by slowly raising the temperature of water bath in which the organism were kept at a rate of approximately 1 degree centigrade in 5 minute. Such procedures were also adopted by many scientist. It is found that low temperature causes same mortality as brief exposure low temperature as well as high temperature.

Temperature is one of the most important factors of biological important. Aquatic animals show remarkable response to the temperature changes on metabolic activity. Temperature fluctuation on metabolic activities. Amongst various other factors that affecting on

oxygen consumption the influence of body size and temperature has been studies extensively. Studies on oxygen consumption has been studied by various workers.

Temperature is probably most potent factor controlling the metabolism of animals. In many animals it has been demonstrated that within limits of lethality the rate of any biological process undergoes a variation in the same direction as that of the temperature . The poikilotherms which have little or no body temperature regulation are more influenced by temperature changes than homiotherms. They have their metabolic activities directly control by the temperature of external medium. In fishes, for instance, a rise in temperature leads to and increased maintenance requirements and consequently almost all life process such as feeding, development, respiration, soon become temperature dependent.

The differences in thermal sensitivity may be associated with both latitudinal differences and with variations in shore level, as well as with topography and aspects of particular shore from which the animal were collected. Most of such data, Particularly those for the upper lethal temperature have been obtain in laboratory by slowly raising the temperature of water bath in which the organisms were kept at a rate of approximately 1^{o} in 5 minutes. The duration of exposer of the animal to each temperature is of important.

Influence of different pH and temperature on amylase activity in liver pyloric caecae and intestine of C.batrachus was studied. The optimum pH for amylase activity in liver and pyloric caecae was studied and it has been found that the digestion depends upon the physical state of food as well as kind and quality, quantity of enzyme secreted. Fishes are more specific in the digestion of different kinds of foods.

The diversity in feeding habit is reflected in the structural adaptations in the alimentary canal. The study of digestive enzyme shows correlation with the feeding habit.

The determination optimum pH and temperature in the various parts of digestive track for different digestive enzyme is the most important aspects in the study of digestion because different enzyme act optimally under different a biotic factors. The study of digestive enzyme would be useful in the understanding the adjustment of feed of fishes in the piscicultural practices.

Though C.btrachus is one of the important, protenaceous and delicious food fish, no work has been done on this aspects.

The literature on diagram in fishes shows a need for further investigation is specially by systematic comparison of the digestive enzyme in representative through out the vertebrates series.

It would be of value to know if differences in digestive enzyme have occurred in the course of evolution of groups of higher vertebrates from more primitive ones, with the migration of aquatic vertebrates to land habitats, and with the metabolic changes necessitated by the transformation from aquatic life on land.

It would be of interest to know more of relations of digestive enzyme to different types of alimentary structure and adaption of digestive enzymes' to differences in habits.

Present communication relates to study effect of various pesticides pollutions on fish C.batrachus the quantitative estimation of amylase in liver, pyloric caecae and intestine of fish C.batrachus at various pH and temperature.Considerable amount of literature is available showing relationship between respiratory activity and pollution stress in aquatic animals (**Robberts, 1972; Davis 1973 and Perry 1957**). Several workers have noted alternation of physiological process in bivalves and gastropods due to pollutants (**Scott and Major 1972; Brown and Newell 1972; Lomte and Jadhav 1982; Dallingeret.**

4.MATERIAL AND METHOD FOR INFLUENCE OF PH AND TEMPERATURE ON AMYLASE ACTIVITY OF C. batrachus

Clarius batrachus weighing about 25 to 50 gm procured from the river, near Amravati and brought about to the laboratory and acclimatize for seven days. Before proceeding to the experiment specimens the starved for 24 hours.Later specimens were dissected and liver, pyloric caecae and intensive were isolated and washed with cold distilled water.The mucosal lining of each part was then scraped off and ground in a homogenizer.1% aqueous enzyme extracts were prepared and centrifuged. The supernatants were use immediately of the addition of toluene to prevent bacterial growth.The amylase activity was then studied. For the determination of optimum hydrogen ion concentration phosphate buffer was used.

5.**OBSERVATIONS AND RESULTS**

EFFECTS OF TEMPERATURE ON AMYLASE ACTIVITY IN C. Batrachus

Influence of different pH and temperature on the amylase activity in liver pyloric caecae and intensitine of C.batrachus was studied.

The observations depicted in table and reveal that amylase activity showed optimum pH at 7 for liver and pyloric cae cal extract where as at pH 7.5 maximum activity was shown by intestinal extract of C.batrachus.

The enzyme was showed a proportional increased up to the optimum pH, decreasing thereafter proportionally towards more alakalinity.

As regard the effect of temperature on amylase activity it was observed that maximum activity was found to be at 35 degree c. for liver, 40 degree c, for pyloric caecae and 45 degree c. for intestinal extract the, activity failing down these temperature.

Influence of different pH and temperature on the amylase activity in liver pyloric cae was studied and it showed in table.

TABLE_1; Rate of reaction of amylase under varying pH at 37 degree c in liver and different regions of alimentary canal of the C.batrachus

pH	Expressed in mg/of maltose/100mg of wet tissue per 30 minutes		
	Liver	Pyloric caecae	Intestine
5.0	3.983+0.374	2.732+0.189	5.833+0.658
5.5	7.016+0.903	5.133+0.431	9.999+0.658
6.0	10.683+0.676	6.933+0.360	12.399+0.616
6.5	11.716+0.874	10.533+0.361	14.999+0.657
7.0	17.206+0.767	15.299+0.491	16.499+0.474
7.5	15.884+0.761	13.515+0.487	17.916+0.658
8.0	9.866+0.590	10.376+0.541	11.736+0.353
8.5	8.133+0.535	7.083+0.300	8.749+0.658
9.0	5.449 +0.412	3.616+0.266	5.999+0.725

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TABLE 2;

Rate of reaction of activity under different temperature but at constant optimum pH in liver and different regions of alimentary canal of the C.batrachus

Mean +SD; n=5

Values expressed in mg of maltose/100 mg of wet tissue per 30 minutes			
Temperature	Liver	Pyloric caecae	Intestine
15°c	7.949+0.320	6.985+0.346	5.633+0.466
20°c	11.299+0.566	7.149+0.494	7.133+0.456
25°c	13.283+0.332	8.992+0.498	8.234+0.545
30°c	16.249+0.344	12.016+0.314	11.884+0.335
35°c	19.540+0.450	13.483+0.355	13.560+0.331
40°c	18.599+0.490	16.149+0.375	15.834+0.429
45°c	16.109+0.311	15.931+0.648	11.630+0.314
50°c	12.079+0.340	10.185+0.502	14.758+0.309
55°c	12.079+0.340	10.185+0.502	14.756+ 0.343
60°c	0.288+0.501	8.043+0.348	11.385+0.386

signification decrease in oxygen consumption, significant enhanced was found in the A direct and approximately liner relationship was found between logarithm of oxygen consumption and locomotory activity. At both temperature the standard metabolic rate was increased significantly for 24th exposure. Average locomotory activity of the fish showed an up ward shift with the increase in temperature. Analysis of covariance indicated highly significant difference among slope value at 30 degree c. only. This gives an evidence of a higher rate of oxygen consumption was observed in the C. batrachus (Alf et al. 1985) exposed to the lethal concentration of Dimecron and aldicarb. Fishes exposed to sublethal concentration of Dimecron and Aldicarp, showed aerial mode of respiration However incrase in the total 02 consumption was observed after exposure, to lethal sublethal concentration in both pesticides. Dichlorvos reduced oxygen consumption of the excised tissues (gill, brain, muscle) of Tilapia (Rath and Misra, 1980)

Toxicity of Mercuric chloride (HgCl 12) and methyl mercuric chloride (CH3Hgcl) in catfish, M.vittatus was studied on respiratory metabolism of, sublethal concentration of both the substance lowered the oxygen consumption values (Dev Dutt and Ashok Kumar Sharma, 1989) The oxygen uptakes data indicated that in general there was a critical threshold times for the hyperactivity response, between 2 to 5 hours for Hgc12 and CH3HgCl. Measurement of oxygen consumption not only indicated metabolic rate but also provided an index for stress conditions. The depression increased the oxygen uptake in sublethal concentration which implied the adaptive rf the fish on exposure to a toxic chemical.

6.DISCUSSION

There is a definite correlation between the diet consumed and the type of relative strength of digestive enzyme (Young 1937). Amylase activity is stronger in herbivorous fishes

than in carnivorous and omnivorous fishes (A1-Hussaini, 1949 b) Chesley (1934) reported that the pancrease whether compact of diffused was the main site of enzyme production.

Amylase activity was certainly due to the enzyme produced in pancreas of telecast (Barrington, 1957). Preliminary studies in C.batrachus confirmed that the amylase is strongly present in liver, pyloric caecae and intestine.The pH and temperature have an important role in the activities of enzymes in the aquatic animals. A particular enzymes shows its maximum activity at a particular pH and temperature.

The amylase activity is considerably less at pH 7.4 in certain marine fishes (Chesley, 1934). In the intestine of pleluronectus it is active at pH 7.5 and 8 (Bayliss, 1935). Cockson and Bourne (1973) found optimum pH for amylas 7.5 and 7.0 for anterior and posterior intestine of Barbus palidiniosus.

Amylase activity is maximum at pH 7.5 in the intestine of Tilapia nilotica (sinha, 1975). Agrawal et al . (1975) recorded optimum pH for amylas activity from 5 to 6 in Wallago attu, and Labeo rohita. Maximum digestion of starch takes place at pH 7.4 due to liver extract and at pH 7.2 due to intestinal extract of periopthalamus oelrecuteri (Dhage and Mohammad, 1977).

The extract of liver and pyloric caecae of C.batrachus demonstrated the optimum activity at pH 7.0 and in the intestine at pH 7.5 There are slight variations from the above author's findings in the optimum pH. Variations are due to species variations (Agrawal et al, 1975). Table 1 clearly indicates that the amylase activity is highest in intestine followed by that in liver and pyloric caecae. Pancreas, which is main source of enzyme secretion, is diffused in liver lobes mesenteric tissue and alimentary canal and hence intestine3 shows the maximum activity where actually the process of digestion takes place where slightly alkaline medium is required, whereas pyloric caecae supplements the digestion.

It is generally agreed that the enzymes of fishes are similar to those of warm blooded animals (Chesley, 1934). Fishes being poikilothermic animals are liable to show changes in the digestive capabilities with thermal fluctuations. In the present investigation, the amylase activity was found to be maximum at 35^{o}c in liver at 40 ^{o}c in pyloric caecae and at 45 ^{o}c in intestine. Later the activity decreases proportionally up to 60 ^{o}c (Table 2)

The present findings are in concurrence with those of Dhage and Mohammad (1977). The velocity of the reaction catalysed by enzyme is accelerated in relation to the increase in temperature within a particular level. The increase in temperature brings down the velocity of reaction.

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