Research Article

International Journal of Bioassays
ISSN: 2278-778X
www.ijbio.com

IMPACT OF SAGO EFFLUENT ON THE LEVELS OF ACID PHOSPHATASE ACTIVITY IN THE LIVER TISSUE OF THE FRESH WATER FISH *CLARIAS BATRACHUS*

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Received for publication: July 19, 2013; **Revised**: August 23, 2013; **Accepted**: September 27, 2013

Abstract: The aim of the study was to determine the effect of Sago effluent on the activity of Acid phosphatase in the liver tissue of the fresh water fish *Clarias batrachus.* The fish were exposed to control and different concentrations of treated sago effluents. The concentrations chosen were 25%, 50% and 75% of treated sago effluent. The levels of the enzyme acid phosphatase decreased significantly in the liver tissue of the experimental fish *Clarias batrachus*, when compared with that of controls.

Keywords: Acid phosphatase, Sago effluent, *Clarias batrachus*.

INTRODUCTION

The aquatic environment is the ultimate sink for all the environment pollutants any chemical pollutant either natural or synthetic is most likely to reach the aquatic environment sooner or later. The toxicity may be either acute or chronic to all forms of biota in aquatic system and also varies to different aquatic organisms. The toxic effects may include both lethal and sub lethal concentrations, which may change the growth rate, development, reproduction, histopathology, biochemistry, physiology and behavior (Rand & Petrocelli, 1985).

Alterations in the physiological and biochemical parameters of toxicant treated fish have recently emerged as an important tool for the water quality assessment and to know the pathological status of fish in the field of environmental toxicology (Racicot *et al*., 1975; Wieser & Hinterleitner, 1980). The alteration in various physiological and biochemical parameters of an aquatic animal due to exposure of different toxicant has been shown to be directly or indirectly related to the behavior, immune system, neuro transmission, energy metabolism and reproduction (Ekwoezor *et al*., 2001; Adeyemo, 2005).

Accumulation of the environmental pollutants and toxicants has been shown to cause alteration in the activity of many enzymes concerning to cellular energy metabolism (Niwelmski, 1990; Claireaux & Dutil, 1992; Sebert *et al*., 1993; Almeida *et al*., 1995).

Alteration in enzyme activities of the fish is one of the major biomarker indicating the level of changes consequent of pollutants in the tissues, organs and body fluid of the fish that can be recognized and associated with established health impairment process (Akinrotimi *et al*., 2009). Moreover, Gabriel and Akinrotimi (2011) noted that enzymes can be used to confirm and asses fish exposure to toxicants, providing a link between external and internal structure and degree of responses to toxicant exposure observed between different individuals. However, the applications of enzyme determinations in fish, as an indicator of chemical intoxication seem to be promising. It is most relevant and appropriate in sub lethal exposure which spans over many days (Cengiz & Vnlu, 2006). Toxicants also can inhibit the activity or synthesis of enzymes (Jung *et al*., 2003), resulting in decreased activities in the organs.

Acid phosphatase is a phosphatase which frees attached phosphate groups from other molecules during digestion. It is a lysosomal, hydrolytic enzyme with an acid pH optimum. It takes part in the dissolution of dead cells and as serves as a good indicator of stress condition in the biological system (Gupta *et al*., 1993; Verma *et al*., 1984).

Fish are sensitive indicators of pollutants present in water. These pollutants cause various physiological and physical alterations in fishes. In the present work alternations in the activity of the enzyme Acid phosphatase has been evaluated in the liver tissue of fresh water fish *Clarias batrachus*.

MATERIALS AND METHODS

The Sago industry effluents were collected from a private Sago industry, situated at Ponnachi near Ammapet of Erode District, Tamil Nadu, India. The effluent from the industry was collected and transported to the laboratory and used for further experiments. Fingerlings of healthy *Clarias batrachus* were brought to the laboratory and acclimatized for 15 days. The fish were well fed during the acclimatized

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period. Then fish were exposed to control and 25%, 50%, 75% concentrations of treated sago effluents for period of 28 days. Feeding was stopped one day before commencement of the experiment.

For the enzyme assay, the liver of six fishes were cut and homogenized with cold distilled water and centrifuged at 7000 RPM for about 7 minutes. The supernatant was taken for assay. The enzyme activities were estimated by GCCA / kinetic method of Anonymous (1970, 1972) and Webinar *et al*., (1975).

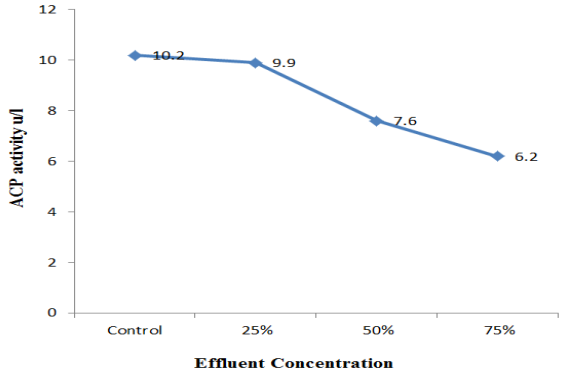
RESULTS

The results of the enzyme activity in response to sub lethal exposure of sago effluents are shown in Table 1 and Figure 1& 2. The values of Acid phosphatase, obtained in liver decreased as the concentration of the effluents increased the highest value (10.2u/l) recorded in control group, while the lowest value 6.2u/l was recorded in 75% concentration of the effluent and in the fish exposed in 25% and 50% concentrations the values were 9.9u/l and 7.6u/l respectively.

Table.1: Levels of Acid phosphatase activity in the liver tissue of *Clarias batrachus* exposed to control and different concentrations of sago effluent.

Effluent concentration	ACP activity u/l
Control	10.2 u/l
25%	9.9 u/l
50%	7.6 u/l
75%	6.2 u/l

Fig.1: Levels of Acid phosphatase activity in the liver tissue of the fish *Clarias batrachus* exposed to control and different concentrations of sago effluent.



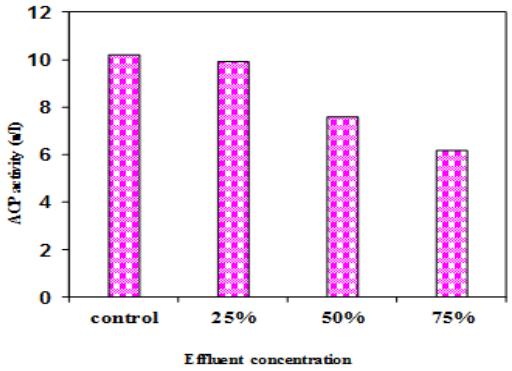


Fig. 2: Acid phosphatase levels in the liver tissues of *Clarias batrachus* on exposure to control and different concentrations of treated sago effluent

DISCUSSION

Enzymes are fragile substances with a tendency to undergo denaturation and inactivation under unsuitable conditions. The activity of acid phosphatase enzyme in liver of freshwater fish *Clarias batrachus* exposed to sago effluent was studied in the present investigation. The enzyme acid phosphatase is present in almost all the tissues. It is a hydrolytic enzyme concerned with the process of transphosphorylation and has an important role in the general energetics of an organism. It is associated with the transport of metabolites, with metabolism of phospholipids, phosphor proteins, nucleotides and carbohydrate, and with synthesis of proteins (Srivastava *et al*., 1994).

In the present investigation a marked decrease in the activity of the enzyme with increasing the concentrations of the effluents was studied. Variation in the metabolic enzyme activities in fish is directly proportional to the concentration of the toxicant (Pesce *et al*., 2009). Similar observations have been made by Chetna and Aditi (2011) in the liver of fish *Cyprinus carpio* exposed to steel plant effluent. Kamble *et al*., (2011) have studied the decreased activities of ACP in liver, muscle and kidney of the fish *Barilius burna* exposed to dimecron. Similar decreasing trends were observed in *Ophiocephalus punctatus* exposed to copper and in *Notopterus notopterus* exposed to phenolic compounds (Dalela *et al*., 1980). The accumulation of toxicants beyond a tolerable level in the liver might cause such enzymatic changes. The phosphatases (ACP and ALP) are important biomarkers because they are involved in adaptive cellular response to the potential cytotoxicity and genotoxicity of pollutants (Leohner *et al*., 2001). Nteet *al*., (2011) have observed decreased activity of ACP in the fish *Sarotherodon melanotheron* exposed to industrial effluents. Similar findings were observed by Das *et al*., (2004) in the fish *Labeo rohita* exposed to industrial effluents. The decrease in ACP activities in the liver reflects a possible decrease in biosynthetic activities and anaerobic capacity of fish (Tripathi *et al*., 2003).

ACP is mainly involved in the catabolic and autophagic processes in the cells. The decreased synthesis or increased rate of degradation targets the lysosomal disruption (Palanisamy *et al*., 2012). The decreased activities of ACP enzyme indicate disturbance in the structure and integrity of cell organelles, like endoplasmic reticulum and membrane transport system. (Nchumbeni et *al*., 2007).

From the above findings, the results of this present investigation clearly confirm the fact that the decrease in the activity could be due to disturbance in the structure and integrity of cell organelles.

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Source of support: Nil
Conflict of interest: None Declared